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Abstract

Purpose: This study examines the relationship between investor gambling preferences and stock returns, using data for all firms listed in Shanghai A-share market during 2016 and 2021.

Methodology: This study employs price and trading volume data to capture the behavioral characteristics and gambling preferences of investors. Using the Fama-French three-factor and five-factor models to estimate benchmark returns, this study investigates whether investing in gambling stocks can yield positive excess returns.

Findings: The study reveals that stocks identified as gambling stocks generate high returns in the month they are identified as such, but subsequently experience a significant drop in excess returns compared to non-gambling stocks over the following one to six months. These results are found to be consistent across different methods used to classify gambling stocks and across various industry sectors.

Research implications: This research provides insights into the risk-return tradeoff of different stock types and the factors that fuel irrational investment behavior. It underscores the importance of considering the behavioral elements of investment, particularly in emerging markets where individual investors have a significant impact.

Practical implications: It is advisable for investors to avoid adopting a gambler or speculative mindset and instead make well-informed and calculated investment decisions that are in line with their financial objectives and risk appetite. This approach can help create a more stable and sustainable financial market.

Key words: Gambling stocks; Gambling preferences; Irrational investment behavior; Fama-French three-factor model; Fama-French five-factor model; Chinese stock markets

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1. Introduction

An increasing amount of literature has been dedicated to examining the relationship between investor gambling preferences and stock returns. Most studies have discovered that gambling stocks exhibit negative excess returns and positively skewed returns that are not explicable through classical asset pricing models, including the CAPM and Fama-French three-factor model. To explain why investors with gambling preferences overestimate the returns from risky assets that have lottery-like characteristics, Conrad et al. (2014) showed that companies with high default risk typically have relatively high probabilities of extreme returns, which attracts investors with gambling preferences and leads to overvaluation and abnormally low average stock returns in the long run. Additionally, Bali et al. (2017) showed that demand for lottery-like stocks by investors results in high-beta stocks having lower excess returns, which can explain the beta anomaly, one of the most persistent anomalies in empirical asset pricing research.

Although there are differences between gambling and stock investment, interestingly, the behavior of gamblers is quite similar to that of speculative investors in the stock market. In particular, gamblers participating in a game that gives them negative expected returns always hope to be lucky and get positive realized returns in the future. Similarly, speculative investors tend to buy high-risk stocks whose expected returns are not proportional to their risk level. In fact, theoretical models (such as Mitton and Vorkink, 2007; Barberis and Huang, 2008) and empirical studies (such as Kumar, 2009; Kumar et al., 2011; Bali et al., 2011) have documented

the impact of investor gambling attitudes on stock market outcomes. Research has also shown that speculative trading is driven by retail investors (Han and Kumar, 2013) and small institutions (Fong and Toh, 2014) who can be behavioral biased.

To investigate whether there is a return premium for gambling stocks in Chinese stock markets, this article divide all shares listed in Shanghai A-share market into three types: gambling stocks defined as low share prices and high turnover ratios, non-gambling stocks defined as high share prices and low turnover ratios, and other stocks. Then, we form three portfolios and use the Fama-French three-factor and five-factor models as benchmark pricing models, respectively, to explore the relative return performance of gambling stock portfolio.

There are several unique aspects from the Chinese stock markets that may contribute to our understanding of the relationship between investor gambling preferences and stock returns. Firstly, the Chinese stock market has a large proportion of individual investors, who are known for their tendency to engage in speculative trading and have a higher preference for lottery-like stocks. This provides a rich environment for studying the impact of gambling preferences on stock returns. Secondly, the Chinese stock market has a higher proportion of state-owned enterprises, which are subject to different regulations and market forces compared to private enterprises. This allows for an investigation into whether gambling preferences have a differential impact on the returns of state-owned versus private enterprises. Finally, the Chinese stock market has experienced significant changes and reforms in recent years, including the introduction of stock index futures and margin trading, which may have altered the gambling behaviors of investors and their impact on stock returns. Therefore, studying the relationship between gambling preferences and stock returns in the Chinese context can provide valuable

insights into the impact of these changes on investor behavior and market outcomes.

The incremental contributions of this paper are threefold. Firstly, our research offers new evidence regarding the link between gambling preferences and stock returns. By examining the performance of gambling stocks compared to non-gambling stocks, we contribute to the understanding of how investor behavior and preferences impact financial market outcomes. The findings highlight the importance of considering psychological factors, such as gambling preferences, in analyzing stock market dynamics.

Secondly, an innovative aspect of our study lies in the use of publicly available price and volume information to explore gambling preferences. This approach allows us to circumvent the need for hard-to-obtain detailed account information or survey data, making our findings more accessible and applicable to a wider range of researchers and practitioners. The reliance on publicly available data enhances the replicability and generalizability of our results.

Thirdly, our findings shed new light on the role of irrational factors in investment decisions. By identifying a preference for gambling stocks and its impact on future returns, we highlight the presence of behavioral biases in investor decision-making. This insight can assist market regulators in developing strategies to guide investors towards making more rational investment choices. By reducing the influence of gambling behavior and mitigating return volatility, regulators can contribute to the stability and efficiency of the stock market.

2. Literature Review on Investor Gambling Preferences and Asset Pricing

2.1. Heterogeneity in Investor Gambling Preferences

Psychologists, social scientists, economists, and neuroscientists have long been studying human's fascination with gambling. Recent research has uncovered a preference for gambling-

motivated investments in financial markets, where investors seek lottery-like returns from financial assets.

Grinblatt and Keloharju (2001) argued that compared to individual investors, institutional investors are less susceptible to cognitive biases. Institutional investors tend to hold large and well-diversified portfolios, so should not have a gambling preference. Barberis and Huang (2008) revealed that institutional investors dislike lottery-type stocks more than individual investors. Kumar (2009) provided evidence that individual investors have a stronger preference for lottery-type stocks than institutional investors. Bailey et al. (2011) also found that retail investors demonstrate a stronger gambling bias in stock trading. Han and Kumar (2013) showed that stocks with a higher proportion of retail trading tend to have higher mispricing under the influence of investors' gambling preferences. Blau et al. (2016) argued that because most investors holding gambling stocks, on average, experience negative subsequent returns, this can lead to price instability in the market. Bali et al. (2017) studied the speculative psychology of retail investors using micro-level trading data and recorded significant gambling preferences among retail investors in stock trading.

However, some studies suggest that gambling preferences are not consistent among all types of investors. According to Bali et al. (2011), there is a negative relationship between the maximum daily return in the past month and subsequent stock returns in the U.S. equity market, referred to as the "MAX effect." The anomaly is more prominent for stocks that have less intrinsic value and are more speculative, suggesting that institutional investors have not rectified the mispricing of lottery-type stocks and may also have a gambling preference themselves. Barberis et al. (2016) pointed out that small and less diversified institutional

investors exhibit similar preferences for lottery-type stocks as individual investors. Li et al. (2018) showed that funds as a whole are averse to gambling, but the proportion of shares of lottery-type stocks held by funds varies widely, and some funds actually have a strong gambling preference. Alldredge (2020) found that institutional investors increase their exposure to lottery-type stocks during periods of low market sentiment to trade ahead of individual investors and profit from the subsequent rise in stock prices as market sentiment improves. However, Cox et al. (2020) argued that institutional investors are "smart investors" who have more investment skills and are less influenced by cognitive biases. Thus, the preference for gambling by institutional investors cannot simply be attributed to irrational gambling preferences.

2.2. Gambling Preferences and Asset Pricing

Numerous studies indicate that gambling preferences are an irrational behavior that results in a loss of wealth for investors. For instance, Brunnermeier et al. (2007) proposed an optimal expectation theory that suggests investors overestimate the likelihood of favorable outcomes in the future to maximize current utility. As a result, positively skewed securities may become overpriced in equilibrium compared to expected utility models and experience negative average excess returns. This means that investors with a gambling preference find positively skewed securities attractive, pay a high price for them, and accept negative average excess returns. Barberis and Huang (2008) developed a cumulative prospect theory that suggests investors use value functions to assess risk choices and overweigh the tails of distributions. Consequently, they tend to overestimate the importance of low-probability events, demand assets with lottery features excessively, and are willing to pay high prices, leading to relatively

low average returns on these assets.

Empirically, Kumar (2009) found that investors who invest too much in gambling-type stocks experience greater underperformance. Bali et al. (2011) used the maximum daily stock return within a month to represent extreme (lottery-like) returns and found a significant negative correlation between a firm's expected returns and its maximum returns in the previous month. Han and Kumar (2013) reported that stocks with strong lottery features attract retail investors with strong gambling tendencies, which are often overpriced and receive a significant negative alpha. Don et al. (2014) found that an increase in the jackpots of Powerball and Mega Millions lotteries lead to significant reductions in speculative trading for small stocks, but does not affect trading in bonds and mutual funds. Kumar et al. (2016a) found that individual investors' over-allocation of lottery-type stocks in their asset portfolios damages their investment returns. Barberis et al. (2016) also found evidence that holding gambling stocks harms mutual fund performance. Kumar et al. (2016b) showed that lottery-like stocks comove strongly with one another, and this return comovement is strongest among lottery stocks located in regions where investors exhibit stronger gambling propensity. These findings show that investors with gambling preferences can affect asset pricing and, while they prefer skewed returns, they will accept lower expected returns.

In addition, another body of literature shows that changes in trading clientele have important effects on asset pricing. Barberis and Shleifer (2003) theoretically showed that investors who limit themselves to trading within different stock groups or investment categories generate excess profits within the category when they coordinate in and out of certain stocks. Barberis et al. (2005) and Greenwood (2008) suggested that stocks included in

an index exhibit more co-movement with other index components, and this increase in co-movement cannot be explained by changes in stock fundamentals. Kumar and Lee (2006) found that correlated retail trades in highly concentrated stocks have an incremental impact on explaining return co-movement. Green and Hwang (2009) documented that even after controlling for well-known pricing factors, the return stickiness of low (high) price stocks increases (decreases). Hameed and Xie (2019) provided evidence of an overreaction to investors' preferences for dividends. Overall, these theoretical and empirical studies confirm that clientele-based trading is an important driving force of return volatility.

2.4. Gambling Preferences in Chinese Stock Markets

The Chinese stock market provides a unique opportunity to test our hypothesis. A significant feature of the Chinese stock market is the dominance of retail investors. Retail investors are the largest shareholder category in the Chinese mainland stock market, accounting for 99.6% of total investors and contributing to over 80% of trading volume. The trading behavior of retail investors is highly random and susceptible to non-rational factors such as emotions. Given that Chinese people tend to prefer social gambling and have a higher tendency towards gambling addiction compared to people in Western countries, it is not surprising that retail investors generally exhibit a strong preference for lottery-type stocks, and that the gambling motive in investment behavior may be more pronounced among Chinese stock market investors (Han and Li, 2017). Additionally, since short-selling is prohibited for institutional investors in the Chinese stock market, institutional investors face constraints in eliminating mispricing (Han et al., 2020). Therefore, the Chinese stock market is a highly speculative market, providing an ideal testing ground for studying the outcome of investor

gambling preferences.

As an emerging market, China's financial market has been open for several decades, and its stock market has made significant progress. The number of listed companies in the Chinese A-share market has reached 4,662, and its total market value has jumped to the second in the world. Unlike the international mature stock market, the A-share market in China has its uniqueness. Nartea et al. (2017) emphasized that it is difficult to analyze its risks without explaining the uniqueness of China's capital market. Gu et al. (2018) revealed that the special trading system in the Chinese stock market significantly limits investors' short-selling capabilities compared to mature markets, severely restricting rational investors' arbitrage behavior and promoting non-rational investors' gambling behavior. Ji et al. (2021) documented that firms in regions with stronger gambling preference experience greater stock price crash risk. Based on the theory of explicit preference, Zhu et al. (2021) constructed an index of investor's gambling preference and discovered that the more retail investors gamble, the more they lose. Zhu et al. (2023) documented that investor gambling intensity is strongly persistent and significantly predicts future stock returns. Specifically, stocks with high aggregate gambling intensity underperform stocks with low aggregate gambling intensity by approximately 117 basis points over the following month. Generally, literature supports the hypothesis that investors' gambling preferences influence stock prices in China.

After 234 A-share stocks were included in the MSCI widely tracked stock benchmark index in 2018, the Chinese stock market has been more closely integrated with the global market than ever before. Therefore, it is increasingly important for international investors to understand the uniqueness and behavior of the Chinese stock markets to position themselves

strategically.

3. Empirical Methodology

As the behavior of gambling preferences itself cannot be directly observed and there is a lack of data on the mentality of investor affects trading, it is quite difficult to directly measure the gambling preferences for investors. However, financial asset prices are the ultimate result of numerous decisions made by investors in the market and they themselves contain rich information. Additionally, data on trading volume are widely used in technical and fundamental analysis of the stock market. In other words, we can try to use price and trading volume information in the stock market to capture the behavioral characteristics and decision-making patterns for investors, including gambling preferences.

Kumar (2009) defined gambling stocks as those with low prices, high idiosyncratic volatility, and high idiosyncratic skewness. These characteristics are consistent with those of lotteries, which are typically inexpensive bets (low price), have very high risk-return profiles (high variance), have extremely small chances of a huge payoff (high skewness), and have high turnover. Following Kumar's definition of gambling-type stocks, we distinguish stocks that meet both of the following criteria as gambling stocks: prices below the 50th percentile of the sample and turnover above the 50th percentile. Correspondingly, we categorize stocks that meet both of the following criteria as non-gambling stocks: prices above the 50th percentile and turnover below the 50th percentile, for comparison purposes. Stocks that do not fall into either of these two categories are classified as "other stocks."

Next, because previous research generally found that the CAPM model is not applicable in the Chinese market (Su, 2003), we use the Fama-French three-factor and five-factor models

to capture the benchmark returns. The Fama and French three-factor model adds the book-to-market ratio and size factors to the market portfolio factor in the CAPM to explain value and size effects. The Fama-French five-factor model, based on the three-factor model, incorporates company profitability and investment level factors. It considers the effects of market risk, book-to-market ratio, size factor, profitability factor, and investment factor, enabling a more comprehensive evaluation of portfolio performance and a more effective measurement of a fund's ability to achieve excess returns through active investment management. Below are the Fama-French three-factor and five-factor models:

$$R_{it} - R_{ft} = \alpha_i + \beta_i\left(R_{mt} - R_{ft}\right) + s_i SMB_t + h_i HML_t + \epsilon_{it} \quad (1)$$

$$R_{it} - R_{ft} = \alpha_i + \beta_i\left(R_{mt} - R_{ft}\right) + s_i SMB_t + h_i HML_t + r_i RWM_t + c_i CMA_t + \epsilon_{it} \quad (2)$$

where R_{it} is the return for company *i* in month *t*; R_{mt} is the monthly return on Shanghai-A share index; R_{ft} is the monthly return on the 3-month Chinese Treasury bond; SMB_t is the difference in returns between portfolios of small and large stocks to proxy for the size premium; HML_t is the difference in returns between portfolios of high and low book-to-market stocks to proxy for the book-to-market premium; RWM_t is the difference between the returns of firms with robust (high) and weak (low) operating profitability; and CMA_t is the difference between the returns of firms that invest conservatively and firms that invest aggressively.

After estimating the benchmark pricing models (1) and (2), we explore two issues: First, whether the multifactor models can explain the returns of gambling, non-gambling and other stocks. Second, whether investment in gambling stocks can achieve positive excess returns, i.e., whether $\hat{\alpha}_i$ is on significantly positive across all companies. Finally, we conduct two sets of robustness tests, such as classifying gambling stocks according to industries and using an

alternative method to construct factor premia in benchmark regressions.

4. Empirical Results

Our sample consists of all companies publicly listed in the Shanghai A-share market during 2016 and 2021. The rationale for selecting the specific sample period in our study is as follows: The Chinese stock market experienced a rapid rise in 2014, with the Shanghai Stock Exchange Composite Index reaching a peak in June 2015. However, starting in mid-June 2015, the market began a steep decline during the second half of 2015, leading to a major crash. The Chinese government attempted to stabilize the market through various measures, such as prohibiting major shareholders from selling their stocks, suspending trading in certain stocks, and injecting liquidity into the market. To mitigate the influence of the 2015 stock market crash on our analysis, we have chosen to use only data from 2016 onwards. By excluding data from the period affected by the crash, we aim to focus on a more stable and representative time frame for our study. This approach helps to reduce the potential bias and distortion that could arise from the extreme market conditions during and immediately after the crash.

Our additional sample selection criteria are as follows: (1) we exclude companies labelled as ST (Special Treatment) or PT (Particular Transfer) as they usually suffer from more than two or three years of operating losses; (2) we exclude companies in the financial and real estate industries; (3) we exclude companies with missing return data. The final sample forms a monthly panel data with a time span of 72 months, including 1,321 companies and a total of 69,954 valid observations.

Table 1 presents the descriptive statistics for gambling stocks, non-gambling stocks, other stocks, and all stocks. As shown in the table, the fraction of gambling stocks as a percentage of

the total number of stocks is 19.79%, which is higher than non-gambling stocks (16.98%). In addition, gambling stocks have the lowest average price per share (9.7616), the highest historical average monthly return (7.16%), and the highest average turnover rate (83.25%). In contrast, non-gambling stocks exhibit opposite characteristics—the highest average stock price (36.6018), the lowest historical average monthly return (4.61%), and the lowest average turnover rate (20.31%)—while the values for other stocks are between the two. Moreover, on average, gambling stocks have the smallest market size (value of all tradable shares and value of total market capitalization), the highest individual stock trading activity (monthly trading volume and amount), and the lowest illiquidity indicators (i.e., the highest liquidity). Furthermore, gambling stocks have the highest average market beta (71.16%), indicating that they have greater market risk.

Table 1 Descriptive Statistics

	Gambling stocks	Non-Gambling stocks	Others	Full Sample
Sample Period (Number of Months)	72	72	72	72
Number of Stocks	13846	11878	44230	69954
Percentage of the Full Sample (%)	19.79	16.98	63.23	100
Average Stock Prices	9.7616	36.6018	12.2642	15.9013
Monthly Return (%)	7.16	4.61	4.63	5.12
Monthly Turnover (%)	83.25	20.31	31.92	40.11
Beta (%)	71.16	39.03	49.19	52.12
Illiquidity	0.3315	1.0104	1.2720	1.0414
Average Number of Shares Traded per Month	68.7923	12.8543	27.6948	33.3093
Average Value of Shares Traded per Month	611.6026	411.7411	300.0686	380.6922
Average Value of All Tradable Shares in A Month	0.7498	3.0453	1.4439	1.5784
Average Market Capitalization in A Month	0.9495	3.4085	1.6553	1.8133

Note: All data comes from the CSMAR database, where the magnitude of average number of shares

traded and average value of shares traded per month is 10^7, and the magnitude of average value of all tradable shares and market capitalization in a given month is 10^{10}. The magnitude of illiquidity indicator is 10^{-8}. The currency units involved in the table are all in Chinese yuan.

To analyze investor preferences for gambling stocks, we investigate whether certain stocks are consistently labeled as gambling or non-gambling stocks. In Table 2, we present summary statistics of the average frequency that individual stocks are classified as gambling, non-gambling, or other stocks over a period of 72 months. The table shows that, on average, a stock is classified as a gambling stock for 18.8 months, with a maximum of 60 months. In contrast, the average number of months for a stock to be categorized as non-gambling or other stocks are 25.6 and 45.3 months, respectively. This indicates that there are no specific individual stocks in the Chinese stock markets that are consistently classified as gambling stocks, and the preferences and opinions of gambling investors vary widely.

Table 2 Sample Classifications

	Number of stocks	Average months in the classified group	Average months in the classified group divided by 72	Standard deviation	Maximum months in the classified group	Maximum months in the classified group divided by 72
Gambling stocks	968	18.8	26.05%	19.15%	60	83.34%
Non-gambling stocks	741	25.6	35.58%	31.08%	72	1
Other stocks	1281	45.3	62.85%	22.99%	72	1

In Table 3, the mean raw returns for three categories of stock portfolios are presented for months *t*, *t*+1, *t*+2, and *t*+6. The table reveals that gambling stocks exhibit a remarkably high average return of 7.16% in the month of classification, but their returns decrease gradually over time. On the other hand, the returns for non-gambling and other stocks are relatively alike and

lower than gambling stocks in months *t*, *t*+1, and *t*+2. However, they become slightly higher than gambling stocks in month *t*+6. The findings suggest that investors who focus on stocks with lottery-like features and anticipate high returns may be excessively confident and overestimate the actual worth of gambling stocks, leading to lower returns over time.

Table 3 Mean Raw Returns for Gambling, Non-gambling and Other Stocks

	Gambling stocks	Non-gambling stocks	Other stocks
Month *t* (%)	7.1567	4.6253	4.6133
Month *t*+1 (%)	6.2419	4.8831	4.8204
Month *t*+2 (%)	6.0029	4.9233	4.8735
Month *t*+6 (%)	4.8375	4.8970	4.9173

We then examine whether investing in gambling stocks in the Chinese stock market can yield positive excess returns by utilizing the Fama-French three-factor and five-factor models as benchmark pricing models. Tables 4 and 5 present the regression outcomes for models (1) and (2), respectively. As shown in Table 4, the coefficient estimates associated with the three factors were 0.316 (*t*-value of 25.31), -0.455 (*t*-value of -9.25), and 0.0460 (*t*-value of 0.86) when using gambling stocks as the sample. These findings suggest that there is a significant market risk premium and size anomaly while the book-to-market effect is insignificant. However, the $\hat{\alpha}_i$ estimate is only 0.0000595 for gambling stocks, and it is not statistically significant, indicating that the excess returns for gambling stocks are negligible. Conversely, the $\hat{\alpha}_i$ estimates for non-gambling and other stocks are 0.0104 and 0.00203, respectively, and significant at the 1% and 5% level, indicating that the excess returns for non-gambling and other stocks are relatively high.

As shown in Table 5, the coefficient estimates associated with the five factors were 0.590

(*t*-value of 21.91), -0.00525 (*t*-value of -0.07), -0.685 (*t*-value of -5.52), 1.111 (*t*-value of 6.46) and 0.253 (*t*-value of 1.64) when using gambling stocks as the sample. These findings suggest that there is a significant market risk premium, book-to-market discount, and profitability premium while the size effect is no longer significant and the investment premium is marginally significant. However, the $\hat{\alpha}_i$ estimate is only -0.000115 for gambling stocks, and it is not statistically significant, indicating that the excess returns for gambling stocks are negligible. Conversely, the $\hat{\alpha}_i$ estimates for non-gambling and other stocks are 0.0135 and 0.0043, respectively, and significant at the 1%, indicating that the excess returns for non-gambling and other stocks are relatively high. The results are similar to those from the three-factor model.

Table 4 Estimation Results from the Fama-French Three-factor Model

	Gambling stocks	Non-gambling stocks	Other stocks
Market risk premium	0.316***	0.136***	0.142***
	(25.31)	(10.47)	(21.85)
Size premium	-0.455***	-0.231***	-0.266***
	(-9.25)	(-6.94)	(-14.05)
Book-to-market premium	0.0460	-0.0613	0.0540**
	(0.86)	(-1.24)	(2.13)
Constant	0.0000595	0.0104***	0.00203**
	(0.04)	(9.90)	(2.24)
R-squared	0.045	0.006	0.013
No. of observations	8,722	9,332	36,375
No. of companies	861	619	1,240

Figures in parentheses are *t*-statistics. ***, ** and * denote statistical significance at the 1%, 5% and 10% level, respectively.

Table 5 Estimation Results from the Fama-French Five-factor Model

	Gambling stocks	Non-gambling stocks	Other stocks
Market risk premium	0.590***	0.0140	0.166***
	(21.91)	(0.63)	(14.35)
Size premium	-0.00525	-0.416***	-0.440***

	(-0.07)	(-6.32)	(-12.65)
Book-to-market premium	-0.685***	-0.504***	-0.199***
	(-5.52)	(-4.14)	(-3.10)
Profitability premium	1.111***	-0.511***	-0.555***
	(6.46)	(-4.75)	(-9.25)
Investment premium	0.253	0.354***	0.418***
	(1.64)	(3.08)	(6.57)
Constant	-0.000115	0.0135***	0.00430***
	(-0.06)	(11.59)	(6.55)
R-squared	0.071	0.008	0.016
No. of observations	8,722	9,332	36,375
Number of companies	861	619	1,240

Figures in parentheses are *t*-statistics. ***, ** and * denote statistical significance at the 1%, 5% and 10% level, respectively.

In general, the multifactor models offer a strong match to the data and effectively describe the returns of the three categories of stock portfolios in China. What's more, the findings remain consistent whether analyzing the original return data or the regression outcomes adjusted for the three-factor and five-factor benchmark models. Specifically, the research indicates that investing in gambling stocks in the Chinese stock markets yields significantly lower relative returns compared to non-gambling stocks and other types of stocks.

5. Robustness Tests

5.1 Industry Classification

Kumar's (2009) research demonstrated a significant concentration of gambling stocks within specific industries in the U.S. markets. Is this phenomenon also present in China? To investigate, Table 6 and 7 present the estimation outcomes of the Fama-French five-factor models for both gambling and other stocks across various industries. The findings reveal that compared to other stocks, gambling stocks demonstrate lower excess returns in manufacturing, commerce, public utilities, and conglomerate industries. Thus, regardless of the industry

classification used, our study's conclusion that gambling stocks underperform in Chinese stock markets remains robust.

Table 6 Estimation Results for Gambling Stocks in Different Industries

	Manufacturing	Commerce	Public utilities	Conglomerates
Market risk premium	0.581***	0.831***	0.561***	0.564***
	(18.81)	(8.32)	(7.56)	(4.16)
Size premium	-0.105	0.404	0.615***	-0.205
	(-1.17)	(1.48)	(2.63)	(-0.53)
Book-to-market premium	-0.729***	-1.090***	-0.386	0.257
	(-5.09)	(-2.60)	(-1.13)	(0.37)
Profitability premium	0.996***	3.069***	1.838***	-0.690
	(5.10)	(4.62)	(3.71)	(-0.81)
Investment premium	0.318*	0.583	0.142	-0.809
	(1.80)	(1.02)	(0.32)	(-1.02)
Constant	0.001	-0.001	-0.009*	-0.002
	(0.39)	(-0.17)	(-1.71)	(-0.59)
R-squared	0.06	0.07	0.06	0.06
No. of observations	6,621	582	1,100	412
No. of companies	633	61	141	25

Figures in parentheses are *t*-statistics. ***, ** and * denote statistical significance at the 1%, 5% and 10% level, respectively.

Table 7 Estimation Results for Other Stocks in Different Industries

	Manufacturing	Commerce	Public utilities	Conglomerates
Market risk premium	0.168***	0.199***	0.133***	0.205***
	(12.24)	(4.83)	(5.05)	(2.92)
Size premium	-0.456***	-0.319***	-0.443***	-0.385*
	(-11.00)	(-2.59)	(-5.60)	(-1.78)
Book-to-market premium	-0.225***	0.087	-0.291**	0.298
	(-2.93)	(0.39)	(-1.99)	(0.75)
Profitability premium	-0.503***	-0.837***	-0.593***	-0.881**
	(-7.02)	(-3.95)	(-4.33)	(-2.33)
Investment premium	0.468***	-0.025	0.376**	0.795**
	(6.17)	(-0.11)	(2.56)	(2.12)
Constant	0.005***	0.003	0.004**	0.013
	(6.26)	(1.16)	(2.46)	(1.38)
R-squared	0.015	0.014	0.017	0.015

No. of observations	25,340	2,970	7,168	867
No. of companies	905	86	222	26

Figures in parentheses are *t*-statistics. ***, ** and * denote statistical significance at the 1%, 5% and 10% level, respectively.

5.2. Alternative Proxy for Gambling Stocks

In the spirit of Kumar (2009), we use skewness, rather than stock prices, in conjunction with turnover ratio to classify stocks into gambling, non-gambling and other stocks.

$$SKEWNESS_{it} = \frac{n}{(n-1)(n-2)} \sum_{d=1}^{D} \left(\frac{R_{itd} - \overline{R_{it}}}{sd_{it}} \right) \quad (3)$$

where R_{itd} denotes the daily return of stock i on day d of month t, $\overline{R_{it}}$ is the average daily return of stock i in month t, and sd_{it} is the sample standard deviation of daily return of stock i in month t.

We categorized stocks as gambling or non-gambling based on their skewness and turnover percentiles. Specifically, stocks with both skewness and turnover above the 50th percentile were classified as gambling stocks, while stocks with both skewness and turnover below the 50th percentile were classified as non-gambling stocks. Stocks that did not fall into either category were labeled as "other stocks."

Table 8 displays the estimation results of the Fama-French five-factor models for gambling, non-gambling, and other stocks. As shown in the table, the excess returns for gambling stocks were small, negative, and statistically insignificant. Conversely, the excess returns for non-gambling and other stocks were 0.0149 and 0.00609, respectively, and statistically significant at the 1% level. These findings are consistent with the results presented in Tables 4-5.

Table 8 Estimation Results from the Fama-French Five-factor Model Using Alternative Proxy for Gambling Stocks

	Gambling stocks	Non-gambling stocks	Other stocks
Market risk premium	0.471***	0.075	0.209***
	(24,39)	(0.88)	(18.83)
Size premium	-0.218***	-0.323***	-0.492***
	(-10.36)	(-7.96)	(-14.71)
Book-to-market premium	-0.177***	-0.390***	-0.226***
	(-8.73)	(-3.81)	(-4.29)
Profitability premium	1.025***	-0.665***	-0.410***
	(9.48)	(-7.92)	(-6.21)
Investment premium	0.144	0.406***	0.474***
	(1.27)	(5.77)	(6.18)
Constant	-0.000102	0.0149***	0.00609***
	(-0.04)	(13.70)	(7.55)
R-squared	0.082	0.009	0.018
No. of observations	6,924	9,728	37,787
Number of companies	803	732	1,185

Figures in parentheses are *t*-statistics. ***, ** and * denote statistical significance at the 1%, 5% and 10% level, respectively.

6. Conclusions and Policy Implications

6.1. Summary of Results

Pathological gambling is an impulse control disorder characterized by an uncontrollable urge to gamble despite the negative consequences that follow. It leads to significant damage to individuals, families, and society, as those who suffer from this disorder often struggle to control their impulses and experience problems such as unemployment, debt default, damaged family relationships, and even psychological or physical problems such as drug abuse, anxiety, or depression. In some cases, individuals may turn to illegal activities to obtain more gambling money.

Although gambling is prohibited by law in many parts of the world, including mainland China, many individuals invest all their assets in the stock market, hoping for a reversal of

fortune through legal "gambling." However, they often end up losing everything or incurring debts that cannot be repaid. Therefore, this study aims to investigate the existence of gambling preferences in the Chinese stock markets, and the findings can provide valuable policy implications.

In particular, we propose utilizing "low stock price" and "high turnover ratio" as two indicators to identify gambling stocks in the Chinese stock markets. Our research draws several conclusions. Firstly, we found that there are no individual stocks in the Chinese stock markets that maintain lottery features over an extended period, indicating that gambling investors' views and preferences change significantly. Secondly, the Fama-French three-factor and five-factor models demonstrate good fit in describing the Chinese data, effectively characterizing the returns of the gambling stock portfolio. Thirdly, we observed clear gambling preference behavior among Chinese investors, with significant differences in portfolio characteristics between gambling stocks, non-gambling stocks, and other stocks, and relative returns from gambling stock investments in China are notably negative. Lastly, our analysis reveals that the inferior performance of gambling stocks is robust to industry classification into manufacturing, commerce, public utilities, and conglomerates, indicating no industry concentration phenomenon for gambling stocks in the Chinese stock markets.

6.2. Discussions

Several factors can help explain the observed results. One potential explanation is investor sentiment. Barberis et al. (2016) have proposed that higher investor sentiment can lead to increased speculative and irrational behavior, as well as a stronger tendency towards the anchoring bias. Consequently, during periods of elevated investor sentiment, the preference for

gambling stocks becomes more pronounced. Chinese stock markets are dominated by Individual small investors, who tend to exhibit higher levels of sentiment-driven trading compared to institutional investors, making their investment decisions more susceptible to biases and speculative tendencies.

Another plausible explanation for the observed preference for gambling stocks and their subsequent poor performance is the presence of arbitrage risk in the market. Arbitrage risk refers to the possibility that mispricing or market inefficiencies can persist due to various factors, such as limited arbitrage opportunities, transaction costs, or behavioral biases. In the context of gambling stocks, the presence of arbitrage risk can create an environment where these stocks are perceived as offering higher potential returns. Market participants may be attracted to these stocks due to the belief that their prices are more likely to deviate from their fundamental values, presenting opportunities for profitable trades. However, the inherent nature of gambling stocks, characterized by higher levels of volatility and speculative trading activity, can amplify mispricings and contribute to their poor performance. The higher volatility can result in larger price swings and increased uncertainty, making it challenging for investors to accurately assess their true value. This volatility, coupled with limited arbitrage opportunities, can lead to a situation where mispricings persist for longer periods, eroding the performance of gambling stocks.

6.3. Policy Implications

The findings of our study have important policy implications, which can be divided into several aspects. Firstly, the government should strike a balance between market freedom and effective control to stimulate economic vitality and promote development by supporting the

real economy. It is necessary to ensure the appropriate level of stock market supervision to protect investors' rights and interests, while also encouraging market participation, competition and innovation (Ma et al., 2012).

Secondly, the government should promote financial literacy and education to help investors understand the risks and benefits of the stock market. Investors should allocate their assets reasonably according to their economic status and risk tolerance, avoiding the mentality of gamblers and speculative thinking. This will help to reduce the negative impact of pathological gambling on the stock market and safeguard the stability of the financial system.

Thirdly, investors should be encouraged to adopt an independent and rational mindset while investing. They should not rely on professional authoritative figures to interpret the market trends and analyze the potential risks and benefits of their investments. They should avoid blindly following the crowd or being too rigid with the "specialist" or their own ideas, which can lead to excessive speculation and market manipulation. By promoting a rational and healthy investment atmosphere, the likelihood of gambling behavior can be significantly reduced, ultimately benefiting the stability and sustainability of the financial market (Yang et al., 2012).

Finally, our study emphasizes the importance of educating investors that the stock market is not a shortcut to changing lives, but rather a financial option. Investors should be encouraged to take control of their assets, diversify their investment portfolios, and avoid being manipulated by the stock market. It is essential to promote long-term investment strategies and discourage excessive short-term speculation that can result in market volatility and instability. By doing so, investors can make informed and calculated investment decisions that align with

their financial goals and risk tolerance, ultimately contributing to a more stable and sustainable financial market (Liu et al., 2012).

In summary, the government, investors, and the financial industry should work together to promote a healthy and sustainable development of the financial market, while also ensuring the protection of investors' rights and interests. By doing so, we can create a stable, transparent, and efficient financial market that contributes to the overall economic growth and development of the society.

6.4. Limitations and Future Research

Although we have obtained some interesting findings in this paper, it is important to acknowledge the limitations that exist and suggest avenues for future research.

First, one limitation of our study is the relatively short sample period. We have analyzed data from 2016 to 2021, covering a span of six years. While this timeframe provides valuable insights into the preference for gambling stocks and their performance, it would be beneficial to extend the analysis with a longer time series. By including more years of data, researchers can conduct additional robustness tests and further validate the robustness of our findings.

Second, while we have proposed potential explanations for the observed results, such as investor sentiment and arbitrage risk, we were unable to test these explanations empirically within the scope of this study. Future research can delve deeper into these explanations by employing suitable empirical methodologies with data availability.

Third, an emerging area of research focuses on the market microstructure effects on investors' gambling preference. Factors such as order imbalance and trading constraints can influence the performance of gambling stocks. Future studies could explore how these market

microstructure variables interact with investor behavior and contribute to the observed patterns in gambling stock performance.

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Response to Reviewer 1:

Recommendation: Minor Revision

Comments:
There is no abstract

My response: I included a separate abstract apartment from the main text of the paper during the initial submission, which was not included in the draft generated by the system. In the revised manuscript, the abstract is now presented as part of the main content of the paper.

There is no key words

My response: I have included some key words in the revised manuscript.

number pages correctly!

My response: I have carefully checked the page numbers and have ensured that they are correct in the manuscript.

Are coefficients of both expressions the same?

My response: I am not sure what expressions you refer to and apologize for the confusion they have created. If they are related to equations (1) and (2), the symbols for the coefficients are just notations and are not necessarily the same in magnitude.

“as demonstrated in table 5..” Table 5 shows information, it doesn’t demonstrate anything

My response: I have changed the expression to “as shown in table 5”.

Relation between policy implications and the findings of the study are not clear

My response: I have rewritten Section 6, which is now divided into four subsections. I have provided some explanations for the results and improved the connection between the findings and the overall study. Furthermore, I have addressed limitations and suggested areas for future research. Please refer to pages 21-26 for further details on these revisions.

Additional Questions:
1. Originality: Does the paper contain new and significant information adequate to justify publication?: The paper provides evidence of the relationship between gambling preferences and future stock returns in financial markets

2. Relationship to Literature: Does the paper demonstrate an adequate understanding of the relevant literature in the field and cite an appropriate range of literature sources? Is any significant work ignored?: The paper presents a good literature review

3. Methodology: Is the paper's argument built on an appropriate base of theory, concepts or other ideas? Has the research or equivalent intellectual work on which the paper is based been well designed? Are the methods employed appropriate?: The two models and the robustness tests are sufficient for this study

4. Results: Are results presented clearly and analysed appropriately? Do the conclusions adequately tie together the other elements of the paper?: Results are clear

5. Implications for research, practice and/or society: Does the paper identify clearly any implications for research, practice and/or society such as teaching, public policy or the effect on society?: Implications are too general and are not correctly fitted to the results of the paper

My response: I have rewritten Section 6, which is now divided into four subsections. I have provided some explanations for the results and improved the connection between the findings and the overall study. Furthermore, I have addressed limitations and suggested areas for future research. Please refer to pages 21-26 for further details on these revisions.

6. Quality of Communication: Does the paper clearly express its case, measured against the technical language of the fields and the expected knowledge of the journal's readership? Has attention been paid to the clarity of expression and readability, such as sentence structure, jargon use, acronyms, etc.: A part from other minor problems, the paper does not present the abstract and the key words

My response: I have included an abstract and some keywords in the revised manuscript.

Response to Reviewer 2:

Recommendation: Major Revision

Comments
This is a well-organized paper that studies an interesting topic in volatility spillover. In my opinion, the goal of this paper is mainly achieved. However, authors should revise the paper and address some important issues in the papers. I recommend a major revision. Following are my comments on this paper.

1. The contribution
The contribution of this paper is adequate. However, authors are suggested to explicitly show how this paper contributes to the literature and what does the results mean for investors or policy makers.

My response: I have rewritten the contributions of the paper so that marginal contributions to the literature and policy implications are clearer. Please refer to the end of Section 1 on page 5 to review the details of these revisions.

2. Time Window
I am not sure if the results in this paper are robust given the short time window from 2016 to 2021. Authors should provide more discussion about why this the period before 2016 and after 2021 are not considered. One way to address it is using an extended period analysis. This will increase the robustness of the finding in the paper.

My response: The Chinese stock market experienced a rapid rise in 2014, with the Shanghai Stock Exchange Composite Index reaching a peak in June 2015. However, starting in mid-June 2015, the market began a steep decline during the second half of 2015, leading to a major crash. The Chinese government attempted to stabilize the market through various measures, such as prohibiting major shareholders from selling their stocks, suspending trading in certain stocks, and injecting liquidity into the market.

To mitigate the influence of the 2015 stock market crash on our analysis, I have chosen to use only data from 2016 onwards. By excluding data from the period affected by the crash, I aim to focus on a more stable and representative time frame for our study. This approach helps to reduce the potential bias and distortion that could arise from the extreme market conditions during and immediately after the crash.

At the time when this study was carried out, accounting and financial data required to construct the Fama-French five-factor model for the year 2022 were not available. As a result, I limited the focus to the sample period between 2016 and 2021, during which the necessary data were accessible.

I provide a detailed explanation for the rationale of selecting the specific sample period

in Section 4 on page 13, and discuss the limitation of our study in relation to the chosen sample period in Section 6.4 on pages 25-26.

In addition, I have conducted further robustness tests by utilizing an alternative proxy for gambling stocks. For more details and results of these additional tests, please refer to Section 5.2 on pages 20-21.

3. The Literature
Authors are suggested to update the literature review by adding more recent studies into the discussion.

My response: I have enhanced the literature review by incorporating additional recent studies, which provide a more comprehensive overview of the relevant research. Please refer to Section 2.2 on page 8 and Section 2.4 on page 10 for an in-depth discussion of these studies.

4. The Results
Throughout this paper, I try to find some discussion about why these results exist. There is some discussion but obviously the author could do more on it. For example, authors could try to explore the reason and do some additional tests on it.

My response: I have presented two explanations for the findings in a newly added section, Section 6.2, found on pages 22-23. Due to data limitations, I was unable to empirically test these explanations within the scope of this study. However, I acknowledge and discuss these limitations in Section 6.4 on pages 25-26.

5. Minor Comments
There are some typos in the paper. It is suggested to edit this paper carefully again.

My response: I have carefully proofread the entire manuscript and have corrected all typos and errors.

Conclusion
Overall, this is a paper with good quality. If the comments above are addressed properly by authors, this paper will be in better shape.

Additional Questions:
1. Originality: Does the paper contain new and significant information adequate to justify publication?: More research needs to be done on the study's standout characteristics.

My response: I have rewritten the contributions of our paper so that the marginal contributions to the literature and policy implications are clearer. Please refer to the end of Section 1 on page 5 to review the details of these revisions.

2. Relationship to Literature: Does the paper demonstrate an adequate understanding of the relevant literature in the field and cite an appropriate range of literature sources? Is any significant work ignored?: I advise the authors to review more recently released publications. Make sure the literature review is connected to a systematic as well.

My response: I have enhanced the literature review by incorporating additional recent studies, which provide a more comprehensive overview of the relevant research. Please refer to Section 2.2 on page 8 and Section 2.4 on page 10 for an in-depth discussion of these studies.

3. Methodology: Is the paper's argument built on an appropriate base of theory, concepts or other ideas? Has the research or equivalent intellectual work on which the paper is based been well designed? Are the methods employed appropriate?: The techniques used are appropriate.

4. Results: Are results presented clearly and analysed appropriately? Do the conclusions adequately tie together the other elements of the paper?: Additional explanation of the empirical data is required, as well as consideration of additional issues like the endogenous problem and the exclusion of any other variables that can bias the results.

My response: Endogeneity is not a significant concern in our study as I do not explore the causality of variables. However, I have taken steps to address the return generation process by incorporating both the Fama-French three-factor and five-factor models into the analysis. This allows us to account for potential confounding factors and improve the robustness of the findings.

5. Implications for research, practice and/or society: Does the paper identify clearly any implications for research, practice and/or society such as teaching, public policy or the effect on society?: The analysis is not thorough enough. The results of other investigations are not integrated by the author in this study for comparative analysis. Future directions for this research should be included.

My response: I have added a new subsection, 6.2, to provide explanations for the findings. Furthermore, I have included a new subsection, 6.4, to address the limitations of our study and provide directions for future research.

6. Quality of Communication: Does the paper clearly express its case, measured against the technical language of the fields and the expected knowledge of the journal's readership? Has attention been paid to the clarity of expression and readability, such as sentence structure, jargon use, acronyms, etc.: See my below comments.

My response: I have carefully proofread the entire manuscript and have corrected all typos and errors.