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The Asymmetric Overnight Return Anomaly in the Chinese Stock Market

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Abstract: Traditional asset pricing theory suggests that to compensate for the uncertainty that investors bear, risky assets should generate considerably higher rates of return than the risk-free rate. However, the overnight return anomaly in the Chinese stock market, which refers to the anomaly that overnight return is significantly negative, contradicts the risk–return trade-off. We find that this anomaly is asymmetrical, as the overnight return is significantly negative after a negative daytime return, whereas the anomaly does not occur following a positive daytime return. We explain this anomaly from the perspective of investor attention. We show that the attention of individual investors behaves asymmetrically such that they draw more attention on negative daytime returns, and play an essential role in explaining the overnight return puzzle.

Keywords: overnight return anomaly; individual investors; limited attention

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1. Introduction

Financial theory suggests that investors take risks to pursue excess returns in the stock market. Therefore, stocks, being risky assets, should have a positive risk premium. However, studies find that the overnight return rate in the Chinese stock market is significantly negative, and therefore the risk premium during the overnight period is negative, which is an anomaly from the perspective of the classic pricing model (See Gao et al. 2019; Qiao and Dam 2020; Zhou et al. 2021). The negative overnight return indicates that the negative returns between market close of the previous day till the market opening on that trading day. This paradox has not yet been explained well. Research on this anomaly in the Chinese market is essential to gaining insights into differences in asset pricing between the Chinese and international markets, obtaining a more comprehensive understanding of the key factors affecting stock pricing during non-trading hours, and deepening our understanding of the return–risk tradeoff, which is the foundation of modern financial theory.

This paper presents a comprehensive study of the overnight return anomaly in the Chinese stock market. We use A shares stock market data as our sample as we focus on the overnight return anomaly in mainland Chinese stock market[1]. We first measure the overall effect of the anomaly for individual stocks and composite indexes, and we compare these results with the overnight return of indexes in global markets. We find that the overnight return anomaly is more significant in the Chinese stock market than in international stock markets. Then, we decompose the overnight return into two categories: overnight return after positive daytime returns and overnight return after negative daytime returns. An analysis of this decomposition reveals an asymmetry in overnight return in the Chinese stock market, such that the overnight return following negative daytime returns are significantly negative, whereas this anomaly does not occur following positive daytime returns.

We argue that one of the determinants of the overnight return anomaly is the investor structure of the Chinese stock market. In comparison with global markets, Chinese markets comprise a larger percentage of individual investors, and the behaviors of individual investors are different from those of institutional investors in several ways, such as the information channels they use and their investment strategies. We argue that the attention of individual investors plays a critical role in this anomaly because individual investors can only devote a limited amount of attention to information about stocks. Negative daytime returns draw the attention of investors more strongly than positive daytime returns, which leads to negative overnight return. In contrast, positive daytime returns may not attract investors' attention as strongly and therefore may not have a significant overnight effect on stock prices. To investigate whether the limited attention of individual investors causes them to respond asymmetrically to positive and negative information, we use data from an online stock forum to obtain a proxy for individual investors' attention. We find that overnight posts, reads (the sum total of the number of times each post is read over all posts), and comments are significantly higher when daytime returns are negative than when they are positive, confirming the asymmetry in individual investors' attention, which leads to the overnight return anomaly in the Chinese market.

This paper makes two contributions to the literature. First, we provide comprehensive evidence on the overnight return anomaly. Whereas prior studies (Gao et al. 2019; Zhou et al. 2021; Cheema et al. 2022) suggest that the overnight return anomaly only occurs for individual stocks, we document that the anomaly is significant for both individual stocks and composite indexes. Furthermore, our finding that the overnight return anomaly is salient only when the daytime return is negative enhances our knowledge about this anomaly. Second, our study provides a new explanation for the overnight return anomaly in the Chinese market from the perspective of individual investors' behavior. Zhang (2020) and Qiao and Dam (2020) argue that the T + 1 trading mechanism causes the negative overnight return observed in the Chinese stock market. In contrast, our paper suggests that investor structure, which is a key difference between the Chinese stock market and overseas markets, plays an important role in the overnight return anomaly. Our study demonstrates that individual investors' attention plays an important role in the overnight return anomaly, and thus extends the literature on overnight return in financial markets.

2. Literature Review

2.1. Studies on Overnight Return

Overnight return is defined as the returns of stocks from a trading day's closing to the opening of the next trading day, and constitutes an important type of returns during non-trading hours. Granger and Morgenstern (1970) find that periods of market breaks have a considerable effect on stock prices. In a study conducted in the 1980s, Oldfield and Rogalski (1980) examine overnight return and daytime return separately and argue that stochastic fluctuations of stock prices with autoregressive jump processes do not hold for overnight return, and that overnight return is determined by an independent jump process. Lockwood and McInish (1990) suggest that whereas there is a significant difference between stock return and volatility during both bear and bull markets during trading hours, the difference between overnight return and volatility is small in both cases, and the correlations between individual stock return also differ between trading hours and overnight hours. Tsiakas (2008) examine European and US market indexes and find that information disseminated during overnight hours has a significant effect on the prediction of stock volatility, and therefore incorporating returns from overnight hours into the model can improve its predictivity. Tsiakas (2008) model volatility and also suggest that the distinction between trading hours and overnight hours is blurred by economic globalization and the cross-market dissemination of information.

Studies also link overnight return to investor behaviors. Foster and Viswanathan (1993) study differences in return and volatility between overnight hours and trading hours based on data from the New York Stock Exchange (NYSE) and suggest that investors gather private information during overnight hours. When they expect this private information to be released after the market's opening, they tend to overtrade, resulting in a significant yield difference after off-market hours. Investors also tend to transmit information during overnight hours. Chan et al. (2000) suggest that the transmission of information between investors has a significant effect on the opening price of stocks in the NYSE. Berkman et al. (2012) use the Fama–MacBeth regression to verify that individual investor sentiment has a significant effect on overnight return.

2.2. Overnight Return Anomaly

Many studies compare overnight return with daytime return and find a correlation between them. Branch and Ma (2006) indicate that the correlation between overnight return and daytime return is negative in US stock markets, and this negative correlation becomes more significant as the market size of stocks decreases. Kelly and Clark (2011) indicate that between 1999 and 2006, the risk-adjusted overnight return of Nasdaq-100 ETFs exceeded their risk-adjusted daytime return, whereas the volatility of their daytime return was significantly higher than that of their overnight earnings. Overnight risk is a combination of volatility risk and tail risk. Riedel and Wagner (2015) show that when measured only by tail risk, the risk of overnight return is greater than that of daytime return.

The overnight return anomaly is illustrated in studies on the Chinese stock market. Liu et al. (2015) find significantly negative overnight return from data on the Chinese stock market and indicate that the overnight return anomaly is more pronounced in small-cap and illiquid markets and stocks, including the ChiNext and SME boards. Qiao and Dam (2020) document the overnight return anomaly in the Chinese market by analyzing data from the Shanghai Composite Index from 2000 to 2017. They also find that representative market indexes worldwide during the same period showed significantly positive overnight return. Qiao and Dam (2020) argue that the T + 1 trading rule[2], which is unique to the Chinese stock market, could be the main cause for the overnight return anomaly observed in the market because the rule restricts long positions over a single day by limiting buy–sell transactions on the same day but does not limit sell–buy transactions over a single day. Consequently, when the stock market opens, buyers require risk compensation, which drives down the opening price and results in negative overnight return.

In contrast to Qiao and Dam (2020), we explain the overnight return anomaly as a consequence of the investor structure of the Chinese market. We first show that the anomaly only occurs when daytime returns are negative, which cannot be explained as an effect of the T + 1 trading rule. The Chinese stock market has a large number of individual investors, and the investment strategies and market behaviors of individual investors are different from those of institutional investors (Lee et al. 1991). These differences between the two types of investors are important for understanding the overnight return anomaly in the Chinese stock market. Barber and Odean (2008) find that individual investors have limited attention and only focus on stocks that catch their attention. Moreover, negative information is more likely than positive information to attract individual investors' attention (Barber and Odean 2008; Yuan 2015; Sicherman et al. 2016). Therefore, when daytime return is negative, individual investors are more likely to focus on the information and news disseminated on that day, resulting in negative overnight return at the following day's opening.

2.3. Investor Attention and Overnight Return Anomaly

With the internet playing an increasingly important role in information transmission in recent years, an increasing number of studies explore the relationship between investor attention and stock return by using metrics obtained from the internet as proxies for investor attention. Da et al. (2011) propose the use of an internet search frequency index to study investor attention. Using the Google Search Volume Index (SVI), they find that an increase in the volume of searches pertaining to a stock lead to an increase in the stock's prices in the short term and a decrease in the stock's prices in the long term. They argue that SVI serves as suitable proxy for the attention of individual investors. Chen (2018) finds a negative correlation between the search frequency of individual stocks on the internet and the stock returns. This correlation is more significant in markets with high information uncertainty, reflecting the overreaction of individual investors to unexpected information.

In this paper, we adopt data of the Guba platform[3] as a proxy for investors' attention to study the extent of their reactions to negative information. Our paper documents that individual investors indeed tend to allocate considerably higher attention to negative information, which results in the asymmetric overnight return anomaly in the Chinese stock market. In addition, our results are related with De Bondt and Thaler (1987) on investor overaction.

3. Empirical Analysis

3.1. Data

We obtain trading and company data pertaining to 3665 stocks of A-share listed companies in the Shanghai Stock Exchange and Shenzhen Stock Exchange from January 1995 to December 2021, including the opening price, closing price, trading volume, market value, net asset value, Amihud illiquidity index, turnover rate, CSI 300 Index, Shanghai Composite Index, and Shenzhen Stock Exchange Index, from the CSMAR database. We also obtain international market index data containing information on the daytime opening and closing prices of market indexes in 42 countries and regions from January 2007 to December 2021 from the CSMAR database.

Data for measuring investor attention are collected from Guba (east money.com accessed on 27 December 2016), a Chinese financial forum for individual investors, including all posts, reads, replies, and their timestamps in the forum from December 2016 to September 2018. The number of internet users in China from 1997 to 2018 is obtained from the Statistical Reports on Internet Development in China issued by the China Internet Network Information Center.

3.2. Analysis of Overnight Return in Chinese Stock Market

To gain a comprehensive understanding of the overnight return anomaly in the Chinese stock market, we begin by using various methods of testing the existing of anomaly.

3.2.1. Tests for Overnight Return Anomaly

We conjecture that the overnight return of the Chinese stock market is negative which is the null hypothesis. We first test the significance of the overnight return of individual stocks of 3665 listed companies and of three representative stock indexes in the Chinese market (the CSI 300 Index, Shanghai Composite Index, and Shenzhen Component Index) in the sampling period to document the overnight return anomaly in the Chinese stock market, as shown in Table 1.

Table 1. Tests for the overnight return anomaly. Panel A shows the results for individual stocks. "*p*" indicates the significance level and "Number of stocks" indicates the number of stocks with negative return at each significance level. Panel B shows the results for the representative market indexes.

Panel A: Individual stocks	
p	Number of stocks
$p = 0.01$ ($t < -2.58$)	2490 (67.94%)
$p = 0.05$ ($t < -1.96$)	2719 (74.19%)
$p = 0.1$ ($t < -1.56$)	2845 (77.63%)

Panel B: Market indexes	CSI 300 Index	Shanghai Composite Index	Shenzhen Component Index
Overnight return	−0.001 *** (−6.41)	0.000 (0.48)	−0.000 *** (−3.29)
Daytime return	0.001 *** (4.55)	0.001 *** (3.24)	0.001 *** (2.48)

*, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A in Table 1 shows the results of the test for the overnight return of individual stocks, in which the counts column shows the number and proportion of stocks with negative return at various significance levels. Among the 3665 individual stocks, nearly 68% with the number of 2490 stocks show significantly negative overnight return at the significance level of $p = 0.01$, 75% with the number of 2719 stocks at the significance level of $p = 0.05$, and around 80% with the number of 2845 stocks at the significance level of $p = 0.1$. Therefore, most of the individual stocks in the sample period show negative overnight return, which is consistent with the documentation of the overnight return anomaly in the Chinese stock market in the literature.

Panel B in Table 1 presents the results of the test for the overnight return of the three stock indexes and illustrates the occurrence of the anomaly in the overall market. The first row shows the average overnight return of each stock index within the sampling period. The t-statistics are mentioned in parentheses. As the CSI 300 Index was released only in April 2005 (whereas the Shanghai Composite Index and the Shenzhen Component Index were released in January 1991 and April 1991, respectively), the abovementioned average for the CSI 300 Index during the sampling period is from April 2005 onwards. This test proves the occurrence of the overnight return anomaly in the Chinese stock market for both individual stocks and the representative indexes.

Next, we compare the overnight and daytime return of the Chinese market indexes and the international market indexes from 2007 to 2021[4]. We posit that there is negative overnight return anomaly in the Chinses stock market which may be different from the international market indexes. The results are shown in Table 2. Country and regional information on the selected international market indexes is provided in Appendix A.

Table 2. Tests for the overnight return anomaly in global markets. Table 2 presents the overnight and daytime return of Chinese market indexes (Panel A) and international market indexes (Panel B) from 2007 to 2021. Country and regional information on the selected international market indexes is presented in Appendix A.

Panel A: Chinese market indexes			
	CSI 300	Shanghai Composite Index	Shenzhen Component Index
Overnight return	−0.001 *** (−5.81)	−0.001 *** (−7.98)	−0.001 *** (−4.46)
Daytime return	−0.001 *** (−3.42)	−0.001 *** (−4.07)	−0.001 ** (−2.92)

Panel B: Global market indexes						
Group	**AEX**	**AS30**	**ATX**	**BEL20**	**BVSP**	**DJCI**
Overnight return	0.0004 ** (2.98)	0.001 (0.28)	0.0002 (0.64)	0.025 ** (1.99)	−0.006 (−0.98)	−0.123 (−0.37)
Daytime return	−0.0002 (−1.02)	0.016 (0.94)	0.001 (0.33)	−0.006 (−0.32)	0.012 (0.37)	0.034 * (1.92)
	DJI	**DJSX50E**	**DWC**	**FCHI**	**FTSE**	**GDAXI**
Overnight return	0.0001 (1.23)	0.124 * (1.77)	0.087 (1.19)	0.0004 ** (2.59)	−0.000001 (−0.56)	0.0004 *** (3.10)
Daytime return	0.0002 (1.43)	−0.131 *** (−4.35)	−0.041 ** (−2.09)	−0.0002 (−1.04)	0.0001 (0.61)	−0.00005 (−0.26)

Table 2. *Cont.*

Panel B: Global market indexes						
	GSPC	**GSPTSE**	**HERMES**	**HSCCI**	**HSCEI**	**HSI**
Overnight return	0.013 ***	0.0004 ***	−0.0001	0.001 ***	0.007 ***	0.077 ***
	(3.69)	(3.07)	(−0.56)	(5.04)	(3.51)	(4.36)
Daytime return	0.033 *	−0.0001	0.0003	−0.001 ***	−0.001 **	−0.065 ***
	(1.75)	(−1.20)	(1.23)	(−3.66)	(−2.83)	(−3.63)
	IBOV	**JXSE**	**KLCI**	**KLSE**	**KS11**	**MADX**
Overnight return	0.001	0.0002 **	0.001 ***	−0.0000001	0.001 ***	0.027 *
	(0.31)	(2.59)	(2.66)	(−0.001)	(5.36)	(1.7)
Daytime return	−0.003	0.0002	0.012	0.0001	−0.0005 **	−0.035
	(−0.10)	(1.13)	(0.53)	(1.18)	(−2.79)	(−1.30)
	MCIX	**MERVAL**	**MEXBOL**	**N225**	**NDX**	**NIFTY**
Overnight return	−0.001	0.053 ***	0.006 **	0.0004 ***	0.0003 **	0.012 ***
	(−0.26)	(5.63)	(2.15)	(3.12)	(2.43)	(10.46)
Daytime return	0.026	0.07	0.013	−0.0002	0.0004 *	−0.0001 ***
	(0.91)	(1.6)	(0.66)	(−0.98)	(1.95)	(−4.14)
	NYA	**NZSE50FG**	**OEX**	**RAY**	**RIY**	**RTSI**
Overnight return	0.001	0.004 **	0.014 ***	0.0001 ***	0.007	0.0005 *
	(0.91)	(2.47)	(3.6)	(2.84)	(1.11)	(1.74)
Daytime return	−0.000002	0.050 ***	0.031 *	−0.0002	0.036	0.0001
	(−0.01)	(4.11)	(1.65)	(−0.75)	(1.56)	(0.16)
	RTY	**SENSEX**	**SMI**	**STI**	**TA100**	**TWII**
Overnight return	0.0001 **	0.137 ***	0.014	0.0002 *	0.001 ***	0.001 ***
	(2.34)	(13.47)	(1.15)	(1.65)	(4.57)	(7.45)
Daytime return	−0.00003	−0.100 ***	0.004	0.0002 *	0.0003 **	0.001 ***
	(−0.13)	(−5.23)	(0.22)	(1.60)	(2.59)	(5.06)

*, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

The overnight return of the three indexes in the Chinese market is significantly negative from January 2007 to December 2021. In contrast, the 42 international market indexes examined in this study do not show similar negative overnight return during this period, and some indexes instead exhibit positive overnight return. These results demonstrate that the overnight return anomaly is unique to the Chinese market.

3.2.2. Analysis of the Asymmetry of the Anomaly

Abraham and Ikenberry (1994) study the weekend anomaly from the perspective of the behavior of individual investors and find that the anomaly occurs for all companies listed on the NYSE and the American Stock Exchange between 1982 and 1991. They suggest that the asymmetry of the weekend anomaly is due to the aggressive selling of individual investors on bad news. The weekend anomaly and the overnight return anomaly are both non-trading period anomalies. Therefore, we adopt the method used by Abraham and Ikenberry (1994) to examine whether the overnight return anomaly observed in the Chinese market is asymmetric. Specifically, we investigate the relationship between the overnight return anomaly and the limited attention of investors by comparing the overnight return between stocks for which the daytime return on the preceding day is positive with those for which the daytime return on the preceding day is negative. The results are shown in Table 3.

Table 3. Tests for asymmetry in the overnight return anomaly in Chinese markets. Panel A shows the overnight return of stocks with positive and negative daytime return, respectively, from January 1995 to December 2018. "p" indicates the significance level and "Number of stocks" indicates the number of stocks with negative return at each significance level. Panel B shows the overnight return of representative indexes with positive and negative daytime return, respectively.

Panel A: Overnight return of individual stocks		
	p	Number of stocks
With positive daytime return	$p = 0.01$ ($t < -2.33$)	682 (18.61%)
	$p = 0.05$ ($t < -1.65$)	1083 (29.55%)
	$p = 0.1$ ($t < -1.29$)	1299 (35.44%)
	$p = 0.01$ ($t > 2.33$)	320 (8.73%)
	$p = 0.05$ ($t > 1.65$)	571 (15.58%)
	$p = 0.1$ ($t > 1.29$)	733 (20.00%)
With negative daytime return	$p = 0.01$ ($t < -2.33$)	3361 (91.71%)
	$p = 0.05$ ($t < -1.65$)	3573 (97.49%)
	$p = 0.1$ ($t < -1.29$)	3621 (98.80%)

Panel B: Overnight return of market index			
	CSI 300	Shanghai Composite Index	Shenzhen Component Index
With positive daytime return	−0.000 (−0.35)	0.001 *** (7.28)	0.002 *** (5.35)
With negative daytime return	−0.002 *** (−8.16)	−0.002 *** (−13.59)	−0.002 *** (−10.11)

*, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A in Table 3 shows the results of significant the test comparing the overnight return of stocks in the positive and negative daytime return groups, from January 1995 to December 2018. First, for each trading day t, we divide the stocks into two groups, positive daytime return and negative daytime return, based on whether their daytime return (change in market closing price from trading day $t-1$ to trading day t) is positive or negative, respectively. Then, in each group, we count the number of stocks for which the overnight return (the returns from the market closing on trading day t to the market opening on trading day $t+1$) is significantly positive and for which it is significantly negative, based on various significance levels, namely, $p = 0.01$ ($t < -2.33$), $p = 0.05$ ($t < -1.65$), and $p = 0.1$ ($t < -1.29$). Because most overnight return in the negative daytime return group is below 0, for this group we only report the number of significantly negative overnight return. As shown in the table, for positive daytime return, only about 19%, 30%, and 35% of the overnight return is significantly negative at the significance levels of $p = 0.01$, 0.05, and 0.1, respectively. For negative daytime return, these proportions are about 92%, 97%, and 99% respectively, indicating that almost all stocks with daytime return less than 0 on a given day have significantly negative overnight return. In contrast, among stocks with positive daytime return on a given day, only 16% have significantly positive overnight return at the significance level of $p = 0.05$.

Panel B summarizes the overnight return of the three stock indexes grouped into positive and negative daytime returns. The grouping method used here is the same as the one described above for individual stocks. When daytime return is positive, the t-statistics of the overnight return for the CSI 300 Index, the Shanghai Composite Index, and the Shenzhen Component Index is −0.35, 7.27 and 5.35, respectively. When the daytime return is negative, the overnight return of the three stock indexes is significantly negative. Thus, the results of these tests for the stock indexes are consistent with that for individual stocks.

These tests examining the asymmetry of the overnight return anomaly in the Chinese stock market show that the anomaly is driven by negative overnight return that follows negative daytime return. The anomaly does not occur when the daytime return of a stock or an index is positive. The negative overnight return following negative daytime return indicates the dissemination of negative information during the market break, which causes the anomaly.

3.3. Analysis of the Causes of the Overnight Return Anomaly

We investigate whether individual investors' attention is the cause of the asymmetric overnight return anomaly. Before we test the effect of the investors' attention on overnight return anomaly, we need to rule out the impacts of influential foreign stock markets such as the US stock market and European stock market. We analyze the correlation of overnight return of main Chinese stock market indexes and the corresponding daytime return of main indexes of the US and European stock markets (Huang et al. 2000; Malm 2018), and the results are presented in Table 4.

Table 4 provides the Pearson correlation coefficients between indexes of Chinese and the US and European markets. The correlation between the overnight return of Chinese stock market indexes and the daytime return of US and European market indexes is insignificant and small in magnitude. For instance, the correlation between CSI 300 and Dow Jones Industries Average Index (DJI) is −0.0132, and the coefficient between Shanghai Composite Index and DAX 30 Index (GDAXI) is −0.0102, which suggests that relationship between overnight return of Chinese stock market and corresponding daytime overseas market return is weak. To further document the impact of overseas markets on overnight return of Chinese market, we also perform Granger causality tests between overnight return of Chinese stock market indexes and the daytime return of main global markets and the results support our previous findings that the influence of overseas markets on overnight return of Chinese market is not salient (shown in Table A3 of Appendix A).

Table 4. Correlation between overnight return of main indexes of Chinese and daytime return of the US and European markets. This table reports the Pearson correlation coefficients between overnight return of main indexes of Chinese and daytime returns of overseas market. DJI, NYA, RAY and RTY are main indexes of the US stock markets. GDAXI is main index of Germany stock market. The main stock market index information is shown in Appendix A.

Panel A CSI 300					
	CSI 300	DJI	GDAXI	NYA	RAY
DJI	−0.0132				
GDAXI	−0.0139	−0.0010			
NYA	−0.0058	0.9083 *	−0.0176		
RAY	−0.0057	0.9420 *	−0.0073	0.9255 *	
RTY	−0.0091	0.8327 *	0.0034	0.8453 *	0.9178 *
Panel B Shanghai Composite Index					
	Shanghai Composite Index	DJI	GDAXI	NYA	RAY
DJI	−0.0129				
GDAXI	−0.0102	−0.0010			
NYA	−0.0085	0.9083 *	−0.0176		
RAY	−0.0083	0.9420 *	−0.0073	0.9255 *	
RTY	−0.0129	0.8327 *	0.0034	0.8453 *	0.9178 *
Panel C Shenzhen Composite Index					
	Shenzhen Composite Index	DJI	GDAXI	NYA	RAY
DJI	−0.0098				
GDAXI	−0.0194	−0.0010			
NYA	−0.0027	0.9083 *	−0.0176		
RAY	−0.0018	0.9420 *	−0.0073	0.9255 *	
RTY	−0.0041	0.8327 *	0.0034	0.8453 *	0.9178 *

*, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

We then use data obtained from the Shanghai Stock Exchange Index section of the Guba online stock forum from Eastmoney.com to explore whether individual investors' attention to positive and negative information is asymmetrical during the overnight period. Subsequently, we examine whether individual investors' attention explains the overnight return anomaly in the Chinese stock market.

3.3.1. Individual Investors' Limited Attention

Studies show that compared with institutional investors, individual investors' attention is limited because of limitations in their ability to devote time, their sources of information, and their proficiency in processing such information. Individual investors select a significantly smaller range of stocks and tend to buy and sell familiar stocks or stocks that attract considerable attention (French and Poterba 1991; Barber and Odean 2008; Ivković and Weisbenner 2005). This limited attention is reflected not only in their stock selection, but also in the information shocks that they experience.

We use data from the Guba internet stock forum to obtain proxies for individual investors' attention to test the asymmetry of the anomaly. Guba is a Chinese online stock forum with numerous active users that aggregates a variety of market information such as information on individual stocks, market trends, and thematic research. A platform in which individual investors exchange information, it serves as a natural data source of data for analyzing the attention of individual investors. The data samples obtained from Guba include the number of posts, reads, and responses and their corresponding timestamps from users in the Shanghai Stock Exchange Index section from 27 December 2016 to 13 September 2018.

Table 5 presents the descriptive statistics of the data obtained from Guba. As shown in the table, the average daily volume of posts in the platform exceeds 1600 posts, the average daily number of reads is close to 3 million, and the average daily number of comments exceeds 4500. Therefore, the information is updated frequently, the amount of information is large, and the extent of users' attention drawn is high in the platform.

Table 5. Summary statistics of the Guba sample. Table 5 presents the summary statistics of the Guba sample, including mean (*Average*) and *standard deviation*. *Posts*, *Reads*, and *Comments* are the average number of overnight posts, reads, and comments corresponding to a trading day, respectively.

Volume	Posts	Reads	Comments
Average	1625.129	2,933,245.167	4818.833
Std. Dev	1684.269	1,872,821.367	3087.082

To investigate whether the observed asymmetry in the overnight return is related to the attention of individual investors being affected by the information in the market, the average numbers of overnight posts, reads, and comments are grouped according whether the returns on the trading day are positive or negative. We limit the Guba sample to non-trading hours from the closing of the stock market at 3:00 pm to its opening at 9:30 am on the next day because overnight return is recorded following a one-night break and reflects the overnight discovery, generation, and dissemination of information.

Table 6 shows the results of the statistical tests for the grouping of the Guba data based on the Shanghai Composite Index's return for each day. The first line contains the average number of overnight posts, reads, and comments corresponding to trading days with positive return, the second line contains these averages corresponding to trading days with negative return, and the third line reports the difference between these averages corresponding to trading days with negative and trading days with positive return.

Table 6. Grouping of the Guba sample based on positive and negative daytime return. The table reports the average statistics of the Guba sample grouped according to trading days with positive returns and trading days with negative return, and a statistical test of their difference. *Posts*, *Reads*, and *Comments* are the average number of overnight posts, reads, and comments corresponding to a trading day, respectively.

Group	Posts	Reads	Comments
With positive daytime return	417.986	1,867,849.691	3173.755
With negative daytime return	745.864	2,481,500.738	4161.267
Negative-Positive	327.878 *** (8.55)	613,651.047 *** (5.26)	987.515 *** (4.03)

*, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

The results show that the numbers of overnight posts, reads, and comments on trading days with negative return are significantly greater than those on trading days with positive return at the significance level $p = 0.01$, indicating that daytime return has a significant impact on the information that individual investors gather overnight. The finding implies that when stock prices fall, individual investors gather more information through the internet, whereas when stock prices rise, their attention to issues pertaining to the market is relatively low. These results provide preliminary confirmation of our conjecture that the attention of individual investors to information about the market is asymmetric with respect to whether the information is positive or negative, and imply a connection between the asymmetric attention of individual investors and the overnight return anomaly driven by negative daytime return.

3.3.2. Regression Analysis of Attention of Individual Investors

In this section, we investigate the correlation between negative overnight return and the attention of individual investors measured by the number of overnight posts on Guba. Considering the large magnitude variation between posts and overnight return, we have processed the number of overnight posts by $(post\_overnight_t)/10{,}000$ in the following regressions. We use overnight return from one to three lag periods and the daytime return of the index on the current day to control for existing information in the market. Daily data from the Shanghai Composite Index from 27 December 2016 to 13 September 2018 are used for this regression analysis, the equation for which is presented below. The variable descriptions are provided in Appendix A.

$$\begin{aligned} Regression\ 1\ :\ & return\_overnight_t * dummy_t = b_0 + b_1 post\_overnight_t + b_2 return\_overnight_{t-1} + \\ & b_3 return\_overnight_{t-2} + b_4 return\_overnight_{t-3} + b_5 return_t + \varepsilon_t. \end{aligned} \quad (1)$$

Table 7 shows the results of the regression. The adjusted R^2 is 15.07%, indicating that the variables selected generally explain the dependent variable. The coefficients of the five explanatory variables are all significant at the significance level of $p = 0.05$. The coefficient of the number of overnight posts ($post\_overnight_t$) is significantly negative ($t = -4.53$), indicating that an increase in the number of overnight posts by individual investors is associated with a significant decrease in overnight return, proving that there is a negative correlation between individual investors' attention and overnight return.

Table 7. Regression of overnight return against investor attention. The table presents the results of the regression 1 of negative overnight return on posts. The variable *dummy* is an indicator of negative daytime returns (*dummy* = 1 for negative daytime returns, otherwise 0). The lagged returns control for existing information in the market.

Variables	***Overnight* × *Dummy***	***Overnight* × *Dummy***
intercept	0.004 * (1.80)	0.041 (0.15)
$post\_overnight_t$	−0.023 *** (−6.41)	−0.188 *** (−4.53)
$return\_overnight_{t-1}$		−0.103 ** (−2.44)
$return\_overnight_{t-2}$		−0.139 *** (−3.68)
$return\_overnight_{t-3}$		0.089 ** (2.37)
$return_t$		0.067 *** (3.15)
Observations Adj R-square	411 0.089	411 0.151

*, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

To further confirm the relationship between these two variables, we also conduct the following two additional regressions using the overnight return ($return\_overnight_t$) as the dependent variable without jointly with dummy variable to indicate negative daytime return. The same control variables are used in the regression above.

$$\begin{aligned} Regression\ 2\ &: return\_overnight_t = b_0 + b_1 post\_overnight_t + b_2 dummy_t \ + b_3 return\_overnight_{t-1} + \\ & b_4 return\_overnight_{t-2} + b_5 return\_overnight_{t-3} + \varepsilon_t., \end{aligned} \quad (2)$$

$$\begin{aligned} Regression\ 3\ &: return\_overnight_t = b_0 + b_1 dummy_t + b_2 return\_overnight_{t-1} \\ & + b_3 return\_overnight_{t-2} + b_4 return\_overnight_{t-3} + \varepsilon_t. \end{aligned} \quad (3)$$

Table 8 shows a comparison of the results of *Regression* 2 and 3. We find the intriguing result that whereas the variable *dummy* indicating negative daytime return (*dummy* = 1 when the daytime return is negative; dummy = 0 when the daytime return is positive) has a significantly negative coefficient (t = −2.77) in *Regression* 3, its coefficient is insignificant in *Regression* 2. The coefficient of the number of overnight posts ($post\_overnight_t$) in *Regression* 2 is significantly negative (t = −4.87). The change in the significance of the dummy variable from *Regression* 2 to 3 suggests that the number of overnight posts in *Regression* 2 absorbs the explanatory power of the dummy variable, further demonstrating the important role of the number of overnight posts in overnight return. Together, the three regression models indicate that individual investors' attention to information during the overnight period is a determinant of the overnight return anomaly in the Chinese stock market.

Table 8. Further analysis of overnight return against investor attention. This table presents the results of the *Regression* 2 and 3 on overnight return on posts. The results in this table are comparable to those in Table 7. The dependent variable is the overnight return. The variable *dummy* is an indicator of negative daytime return (*dummy* = 1 for negative daytime returns, and 0 otherwise). The variable $post\_overnight_t$ is only included in *Regression* 2. The lagged returns control for existing information in the market.

Variables	Overnight Return	Variables	Overnight Return
	***Regression* 2**		***Regression* 3**
intercept	0.003 (1.00)	*intercept*	−0.006 ** (−2.30)
$dummy_t$	0.000 (−0.85)	$dummy_t$	−0.001 *** (−2.77)
$post\_overnight_t$	−0.246 *** (−4.87)	$return\_overnight_{t-1}$	0.025 (0.50)
$return\_overnight_{t-1}$	−0.021 (−0.42)	$return\_overnight_{t-2}$	−0.072 (−1.48)
$return\_overnight_{t-2}$	−0.104 ** (−2.18)	$return\_overnight_{t-3}$	0.169 *** (3.47)
$return\_overnight_{t-3}$	0.131 *** (2.72)		
Observations Adj. R-square	411 0.096	Observations Adj R-square	411 0.045

*, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

3.4. Further Analysis

3.4.1. Effect of Widespread Internet Use on Overnight Return of Stock Indexes

In this section, we compare the development of the internet in China with the overnight return of stock indexes across various time periods. Because of the limited sources of information that individual investors have, the internet has become their main source of information, as a large amount of information is collected and updated frequently on the internet. Research by Da et al. (2011) shows that internet search indexes closely reflect the attention of investors, especially that of individuals, in the stock market. Therefore, we examine stock indexes across various time periods to verify whether there is a significant difference in overnight return before and after the internet began to be used pervasively in China, and we thereby draw a connection between individual investors' attention and the overnight return anomaly in the Chinese stock market.

The year 2001 is regarded as the beginning of the pervasive use of the internet in China. Several important Chinese internet companies such as NetEase, Sohu, Tencent, and Baidu were established between 1994 and 2000, and after 2001, the internet became an inseparable part of people's lives in China. Therefore, we use 2001 as a milestone for internet development in China, and the sampling period is divided into two parts based on the year 2001, and *t*-tests were conducted to compare the overnight returns between the two parts of the sample. We also include Dow Jones Industries Average Index as a benchmark. Because the CSI 300 index became operational only in April 2005, it is not used in these group tests. Table 9 shows the results of tests for the overnight returns of the Shanghai Composite Index and the Shenzhen Component Index before and after 2001.

Table 9. Tests for overnight return before and after 2001. Table 9 shows the *t*-tests results of tests for the overnight returns of the Shanghai Composite Index and the Shenzhen Component Index before and after 2001. The year of 2001 is used as a milestone for internet development in China, and the sampling period is divided into two parts, before and after this year. Dow Jones Industries Average Index is used as a benchmark to compare with the overnight return in Chinese stock market.

Period	Shanghai Composite Index	Shenzhen Component Index	Dow Jones Industries Average Index
Before 2001	0.0016 *** (3.02)	0.0002 (0.70)	−0.0001 ** (−2.15)
After 2001	−0.0008 *** (−7.36)	−0.0006 *** (−5.59)	0.00002 (0.43)

*, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

The results show that both the indexes exhibit significant negative overnight return after 2001 at a 1% significance level. In contrast, before 2001, the overnight return of the Shanghai Composite Index is significantly positive (t = 3.02), and the return of the Shenzhen Component Index is not statistically significant, implying that its average is not significantly different from 0. These tests document that the overnight return anomaly in the Chinese market began to occur after 2001 as a consequence of the pervasive use of the internet, which is the main channel through which individual investors gather and disseminate information. On the other hand, the overnight return of Dow Jones Index is significantly negative before 2001. After 2001, the overnight return of US stock market is insignificant. The difference between the Chinese and US stock markets may be the difference of market structure that most individual investors are impacted by the pervasive use of the internet in China.

3.4.2. Overnight Return by Firm Characteristics

We group stocks based on their characteristics to identify those characteristics of stocks that are likely to be associated with the overnight return anomaly. According to Kaniel et al. (2008), individual investors tend to use contrarian investment strategies and thereby provide liquidity to institutional investors. Wang and Zhang (2015) suggest that private information contributed by individual traders reduces information asymmetry in stock trading and promotes liquidity, and that a high liquidity of a stock indicates a high amount of individual trading of that stock. Therefore, we use the illiquidity indicator and the daytime stock turnover proposed by Amihud (2002) as liquidity indicators[5]. In addition, we also group stocks based on size, as it has a significant impact on stock returns.

For each indicator (Amihud illiquidity, turnover, and market value), we adopt a monthly frequency to create five investment portfolios by dividing the stocks into five groups. Each stock is assigned to a portfolio i (i = 1, 2, 3, 4, 5) based on the value of the indicator for the stock at each month, ranging from low (i = 1) to high (i = 5). The overnight return of portfolio i in month t is the average overnight returns of individual stocks in that portfolio for that month. We conducted these tests for a period spanning 288 months from January 1995 to December 2018 with 3665 stocks. Table 10 presents the results of these grouping tests based on the three indicators.

Table 10. Overnight return by firm characteristics. This table presents the overnight returns of portfolios grouped on firm characteristics. Each portfolio is constructed based on an indicator (size, Amihud illiquidity, or turnover) using a monthly frequency. The stocks are divided into five groups based on the indicator at each month.

Panel A: Sort by size				
Group	Mean	Standard deviation	Observations	T-statistics
1 (low)	−0.0015	0.0028	288	−8.9730
2	−0.0013	0.0026	288	−8.6607
3	−0.0012	0.0025	288	−7.8779
4	−0.0010	0.0024	288	−6.9647
5 (high)	−0.0008	0.0024	288	−5.7492
High-Low (5–1)	0.0007			5.0526
Panel B: Sort by Amihud illiquidity				
Group	Mean	Standard deviation	Observations	T-statistics
1 (low)	−0.0013	0.0025	288	−8.6306
2	−0.0013	0.0025	288	−9.0446
3	−0.0012	0.0025	288	−8.4675
4	−0.0012	0.0025	288	−8.0994
5 (high)	−0.0007	0.0031	288	−3.8335
High-Low (5–1)	0.0006			5.1178
Panel C: Sort by Turnover				
Group	Mean	Standard deviation	Observations	T-statistics
1 (low)	−0.0006	0.0021	288	−4.8041
2	−0.0008	0.0023	288	−6.2700
3	−0.0011	0.0025	288	−7.2690
4	−0.0014	0.0027	288	−8.6267
5 (high)	−0.0019	0.0032	288	−10.2974
High-Low (5–1)	−0.0013			−6.9789

Panel A of Table 10 shows that the results of the portfolios' overnight returns sorted by size. The overnight returns of these five portfolios are all significantly negative at 1% level, which confirms the negative overnight return anomaly. The portfolio with lowest market value (i.e., the first line of Panel A of Table 10) shows the lowest overnight return of −0.0015, as does the portfolio with highest market value with the overnight return of -0.0008 (i.e., the fifth line of Panel A of Table 10). The overnight return difference between the high market value group and low market value group is 0.0007 significant at 1% level. These results indicate overnight return of small-sized companies is significantly lower than that of large companies.

Panels B and C of Table 10 present the results of the grouping based on the liquidity indicators. In Panel B, the stocks are grouped based on Amihud illiquidity ratio. The difference of overnight return between the high illiquidity group and low illiquidity group is 0.0006 significant at 1% level. When the illiquidity level of individual stocks is high, it is more likely to show higher overnight return. The results of the grouping based on turnover are similar. Based on the *t*-statistic, the overnight return difference is significant between the portfolios with high and low turnover.

3.4.3. Effect of Internet Development on Individual Investors

To further study the correlation between the development of the internet and overnight return, we conduct a panel regression analysis using the number of Chinese internet users ($num\_netizen_t$)[6] as a proxy for internet development, and Amihud illiquidity ($Amihud_{it}$) and the residual of the regression of turnover rate against Amihud illiquidity ($residual\_turnover_{it}$) as measures for liquidity. We also incorporate book-to-market value (BM_{it}), floating market value ($size_{it}$), and the proportion of days with negative return ($ratio\_down_{it}$) as control variables. The descriptions of the variables are provided in Appendix A. Figure 1 illustrates the growth in the number of Chinese internet users from 1997 to 2018. This growth is near-exponential, especially after 2006, and reaches 828.5 million in 2018.

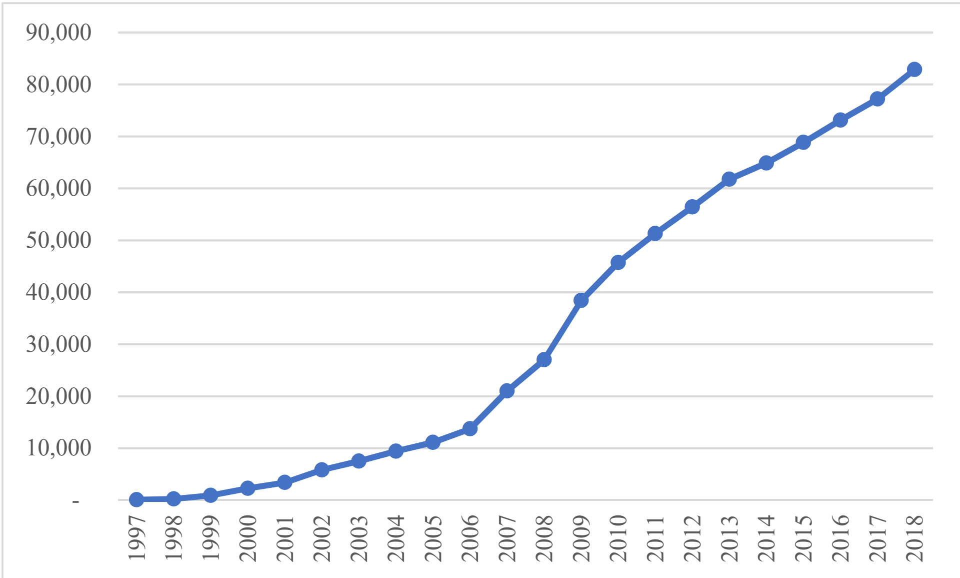

Figure 1. Number of internet users (in 10 thousand) in China from 1997 to 2018. The horizontal axis represents the year from 1997 to 2018. The vertical axis shows the number of internet users (in 10 thousand) in China.

To mitigate collinearity between Amihud illiquidity and turnover in the panel regression, turnover is replaced by the residual of the regression of turnover against Amihud illiquidity (see Equation (4)). Because turnover is also a useful proxy for investor sentiment (Barber and Odean 2008), this residual, in which the liquidity part (captured by Amihud illiquidity) is eliminated, can be regarded as a measure of the sentiment of individual investors. The panel regression is conducted once for each year across the 14 years, and is defined as follows:

$$turnover_i = b_0 + b_1 Amihud_i + \varepsilon_i, \tag{4}$$

$$mean\_overnight_{it} = a_i + b_1 num\_netizen_t + b_2 Amihud_{it} + b_3 residual\_turnover_{it} + b_4 BM_{it} + b_5 size_{it} + b_6 ratio\_down_{it} + \varepsilon_{it}. \tag{5}$$

Table 11 presents the results of the panel regression. Except for *size*, all of the independent and control variables are significant at the level of $p = 0.01$. Consistent with our previous findings, the coefficient of the number of internet users is negative. The coefficient of the turnover rate is also negative, indicating that an increase in investor sentiment results in negative overnight return. The results of the panel regression demonstrate that both the development of the internet in China, represented by the number of internet users, and the liquidity of individual stocks, measured by the Amihud illiquidity, have significant effects on overnight return, further supplementing our main results.

Table 11. Panel regression of overnight return against number of internet users. This table presents the results of the panel regression of the overnight return against the number of internet users ($num\_netizen_t$). Column (1) is a univariate test. Columns (2) and (3) are panel regressions with and without fixed effects, respectively. The turnover ($residual\_turnover_{it}$) is obtained following an orthogonal process to eliminate its liquidity component (using the Amihud illiquidity) to serve as a proxy for investor sentiment.

Variables	**Overnight Return**		
	(1)	**(2)**	**(3)**
intercept	−0.001 *** (−45.44)	0.0002 (1.54)	0.0003 ** (1.97)
$num\_netizen_t$	−0.189 *** (−17.44)	−0.071 *** (−8.25)	−0.075 *** (−9.26)
$Amihud_{it}$		0.001 *** (28.37)	0.001 *** (29.50)
$residual\_turnover_{it}$		−0.002 *** (−31.18)	−0.002 *** (−33.37)
BM_{it}		−0.001 *** (−12.10)	−0.001 *** (−5.78)
$size_{it}$		−0.036 (−0.78)	0.034 (0.93)
$ratio\_down_{it}$		−0.003 *** (−11.04)	−0.003 *** (−12.53)
Fixed effect	Yes	Yes	No
Observation	18,069	14,509	14,509
Number of groups	2105	1792	1792
Adj. R-square	0.013	0.089	0.112

*, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

4. Conclusions

Our study focuses on the overnight return anomaly, which occurs during a specific non-trading period in the Chinese stock market. We show that the anomaly is asymmetric, such that overnight returns following negative daytime returns are significantly negative, whereas the anomaly does not occur following positive daytime returns. Therefore, the overnight return anomaly is caused by overnight return that follows negative daytime return.

We show that the asymmetric overnight return anomaly is due to investor attention. Our examination of users' activity in the Guba financial forum indicates an asymmetry in individual investors' attention to information on stocks, implying that their attention is drawn more strongly to negative daytime returns. Furthermore, our analyses of the development of the internet in China and individual stock liquidity provide further confirmation of the relationship between the attention of individual investors and the overnight return anomaly.

Our findings document the influence of individual investors on the overnight return of the Chinese stock market. Because individual investors are limited in the resources and attention that they can devote to understanding the market, they are prone to making irrational decisions and overreacting to negative news. Therefore, to promote market effectiveness and the attainment of international standards, the Chinese stock market should improve the information disclosure process and facilitate the effective transmission of information, thereby reducing information asymmetry in the market.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. Variable descriptions.

Variable	Description
$open_t$	Opening price on day *t*
$close_t$	Closing price on day *t*
$return_t$	$(close_t - close_{t-1})/close_{t-1}$
$return\_overnight_t$	$(open_{t+1} - close_t)/close_t$
$return\_overnight_{t-1}$	$(open_t - close_{t-1})/close_{t-1}$
$return\_overnight_{t-2}$	$(open_{t-1} - close_{t-2})/close_{t-2}$
$return\_overnight_{t-3}$	$(open_{t-2} - close_{t-3})/close_{t-3}$
$dummy_t$	If $return_t > 0$, $dummy_t = 0$; $return_t < 0$, $dummy_t = 1$
$post\_overnight_t$	Number of posts on night of trading day *t*
$num\_netizen_t$	Number of Chinese internet users over the years released by the China Internet Network Information Center
$Amihud_{it}$	Amihud illiquidity for stock *i* in year *t*
$residual\_turnover_{it}$	Residual of regression of Amihud illiquidity on turnover
BM_{it}	Ratio of book value to market value of stock *i* in year *t*
$size_{it}$	Market value of stock *i* in year *t*
$ratio\_down_{it}$	Ratio of number of days with negative returns of stock *i* to the total number of trading days in year *t*

Table A2. International market indexes examined in the study.

Code	Name	Country/Region
AEX	Amsterdam Exchange AEX Index	Netherlands
AS30	Australian Stock Exchange All Ordinaries Index	Australia
ATX	Vienna Stock Exchange Austrian Traded Index	Austria
BEL20	Belgium 20 Index	Belgium
BVSP	Sao Paulo Bovespa Index	Brazil
DJCI	Dow Jones Composite Average Index	USA
DJI	Dow Jones Industries Average Index	USA
DJSX50E	Dow Jones EURO STOXX 50 Index	USA
DWC	Dow Jones Wilshire 5000 Index	USA
FCHI	CAC 40 Index	France
FTSE	FTSE 100 Index	UK
GDAXI	DAX 30 Index	Germany
GSPC	S&P 500 Index	USA
GSPTSE	S&P/TSX Composite Index	Canada
HERMES	Egypt Hermes index	Egypt

Table A2. *Cont.*

Code	Name	Country/Region
HSCCI	Hang Seng China-Affiliated Corporations Index	Hong Kong
HSCEI	Hang Seng China Enterprises Index	Hong Kong
HIS	Hang Seng Index	Hong Kong
IBOV	Bovespa index	Brazil
JKSE	Indonesia Jakarta Composite Index	Indonesia
KLCI	FTSE Bursa Malaysia KLCI Index	Malaysia
KLSE	Kuala Lumpur Stock Exchange Index	Malaysia
KS11	Korea Stock Exchange KOSPI Index	South Korea
MADX	Madrid Stock Exchange General Index	Spain
MCIX	Russia MICEX Stock Market Index	Russia
MERVAL	The Argentina Merval Index	Argentina
MEXBOL	S&P/BMV IPC Index	Mexico
N225	Nikkei 225 Stock Index	Japan
NDX	NASDAQ 100 Index	USA
NIFTY	S&P CNX NIFTY Index	India
NYA	NYSE Composite Index	USA
NZSE50FG	S&P/NZX 50 Index	New Zealand
OEX	S&P 100 Index	USA
RAY	Russell 3000 Index	USA
RIY	Russell 1000 Index	USA
RTSI	Russia RTS Index	Russia
RTY	Russell 2000 Index	USA
SENSEX	S&P BSE SENSEX Index	India
SMI	Swiss Market Index	Switzerland
STI	FTSE Straits Times Index	Singapore
TA100	The TA-125 Index	Israeli
TWII	Taiwan Weighted Index	Taiwan

Table A3. Granger causality tests.

Panel A Granger Causality Test on CSI 300			
Null Hypothesis:	Obs	F-Statistic	Prob.
CSI 300 does not Granger Cause DJI	3646	1.26052	0.2836
DJI does not Granger Cause CSI 300		1.55010	0.2124
CSI 300 does not Granger Cause GDAXI	3646	4.11302	0.0164
GDAXI does not Granger Cause CSI 300		1.03259	0.3562
CSI 300 does not Granger Cause NYA	3646	1.80157	0.1652
NYA does not Granger Cause CSI 300		1.45278	0.2341
CSI 300 does not Granger Cause RAY	3646	1.04629	0.3513
RAY does not Granger Cause CSI 300		1.03266	0.3562
CSI 300 does not Granger Cause RTY	3646	0.95458	0.3851
RTY does not Granger Cause CSI 300		0.91070	0.4023
Panel B Granger Causality Test on Shanghai Composite Index			
Null Hypothesis:	Obs	F-Statistic	Prob.
SH does not Granger Cause DJI	3646	1.46700	0.2308
DJI does not Granger Cause SH		2.59610	0.0747
SH does not Granger Cause GDAXI	3646	4.52909	0.0109
GDAXI does not Granger Cause SH		0.82271	0.4393
SH does not Granger Cause NYA	3646	1.95545	0.1416
NYA does not Granger Cause SH		2.31752	0.0987
SH does not Granger Cause RAY	3646	1.30585	0.2711
RAY does not Granger Cause SH		1.68997	0.1847
SH does not Granger Cause RTY	3646	1.36520	0.2555
RTY does not Granger Cause SH		1.47632	0.2286

Table A3. *Cont.*

Panel C Granger Causality Test on Shenzhen Composite Index			
Null Hypothesis:	Obs	F-Statistic	Prob.
SZ does not Granger Cause DJI	3646	1.27455	0.2797
DJI does not Granger Cause SZ		1.53380	0.2159
SZ does not Granger Cause GDAXI	3646	3.40143	0.0334
GDAXI does not Granger Cause SZ		1.22990	0.2924
SZ does not Granger Cause NYA	3646	1.66056	0.1902
NYA does not Granger Cause SZ		1.35785	0.2573
SZ does not Granger Cause RAY	3646	1.06953	0.3433
RAY does not Granger Cause SZ		0.90384	0.4051
SZ does not Granger Cause RTY	3646	1.27926	0.2784
RTY does not Granger Cause SZ		1.01274	0.3633

Notes

1. B shares market is lack of liquidity and H shares market represents companies listed in Hongkong stock market.
2. T + 1 trading rule restricts investors from buying the stocks and selling them on the same day. However, this regulation does not prohibit investors to sell the holding stocks and buy other stocks on the same day.
3. Guba platform is an online stock forum with most users in China.
4. As the database has not timely updated all the global indexes, the global indexes including the three main Chinese stock market indexes AEX, ATX, DJI, FCHI, FTSE, GDAXI, GSPTSE, HERMES, HSCCI, HSCEI, JXSE, KLSE, KS11, N225, NDX, NIFTY, NYA, RAY, RTSI, RTY, STI, TA100 and TWII are from 2007 to 2021. The rest of the global indexes are in the period from 2007 to 2017.
5. Stock illiquidity is defined as the average ratio of the daily absolute return to the trading volume on that day (Amihud 2002).
6. The number of Chinese internet users (num_netizent) is collected from the statistical reports of the China Internet Network Information Center.

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