The Impact of Investors' Attention on the Trading Activity of the Stock Market ——Evidence from the Online Education Industry

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Abstract. The emergence of the COVID-19 pandemic has sparked heightened concerns regarding remote learning, leading investors to shift their focus from traditional industries towards the realm of online education. In this study, we employ a multiple linear regression model to investigate the correlation between investors' attention and the stock return and liquidity of companies listed in the online education sector. The analysis encompasses pertinent indicators and investors' attention data of these listed companies spanning the years 2013 to 2020.In the process of selecting indicators, we have chosen Baidu Index as the primary gauge of investor attention, owing to its extensive utilization in China. Furthermore, we have selected stock yield as the representative metric for return, while trading volume and turnover rate have been adopted as proxies for liquidity. Our findings indicate a positive correlation between investor attention and both stock return and liquidity for the listed companies operating within the online education industry.

Keywords: Investor attention,Online education, Multiple linear regression

1 Introduction

The abrupt outbreak of the novel coronavirus pandemic at the beginning of 2020 caught the entire world unprepared. The education industry received unprecedented attention despite economic pressure, business closures, and high unemployment. Due to the effects of the epidemic, offline education was not possible, and education is an irreversible element in the development of national quality. Therefore, whether the education industry can overcome the limitations of time and space and implement "online education" efficiently has become a topic of heated debate.

The concept of online education was initially proposed in 2013 during the "First International Online Education Summit 2013," which was effectively organized by China Economic Net. During that period, it represented a pivotal juncture in the rise of smartphone usage in China. In China, the proportion of mobile Internet users constituted 81% of the overall population of Internet users. Since 2013, online education has emerged as a prominent area of investment, garnering significant attention from industry investors. The significant proliferation of projects, numerous instances of financing, and the entry of prominent entities such as BAT and other industry giants serve as compelling evidence to designate 2013 as the inaugural year of online education.

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Simultaneously, the period spanning from 2013 to 2010 witnessed a notable surge in the advancement of China's Internet and communication technology, thus establishing itself as a prosperous era. The advent of big data has resulted in a substantial increase in information volume and redundancy, thereby presenting a challenge for inexperienced investors in effectively discerning relevant information. Hence, the issue of acquiring information at a reduced cost and making informed investment decisions within the online education sector has emerged as a matter of collective contemplation.

To address this issue, previous scholarly investigations frequently employ excess returns and headlines as indicators of investor attention toward the market. The proxy variables appear to be plausible, although they may not comprehensively capture the extent of investors' proactive behavior. The advent and utilization of Internet technology have facilitated the emergence of Baidu as the predominant and highly favored search engine for investors in China. This platform allows investors to swiftly access desired information and also provides a means to document and retain investors' subjective interests. Consequently, this feature has proven to be a cost-effective method for acquiring investment information in China.

Hence, this study opts for Baidu Index as the chosen method for empirical investigation. Baidu Index is deemed capable of significantly reflecting the level of interest exhibited by Chinese stock market investors. Moreover, it offers a more comprehensive means of observing the emerging enthusiasm of investors toward the market performance of online education companies listed on the stock exchange.

2 Literature Review and Hypothesis

2.1 Research status at home and abroad

2.1.1. Investors focus on literature related to stock market performance

The efficient market hypothesis posits that in a stock market characterized by high levels of transparency and intense competition, stock prices have the ability to incorporate and reflect all available information, thereby accurately representing the underlying value of the respective companies. Nevertheless, the emergence of behavioral finance has prompted individuals to question the validity of this assertion.

Zhang and Wang examined the GEM stock market as a case study and observed a significant relationship between investors' attention and stock performance. The findings indicated that this influence was predominantly positive [1]. Klemola et al. employed Google search volume as a means to monitor fluctuations in investors' positive and negative attention toward the market. Their findings revealed that investors exhibited optimistic and pessimistic expectations regarding variations in the search frequency of negative terms such as "market crash" and "bear market," as well as variations in the search frequency of positive terms such as "market rebound." The utilization of this method allows for the anticipation of forthcoming earnings in the short term [2]. In a study conducted by Lu Han, an additional variable was introduced into the three-factor model, specifically the interaction between market value and search index. The analysis focused on examining the combined effect of these two variables and revealed that, when influenced by fresh information pertaining to the company, the attention of investors had a more pronounced influence on stock yield [3]. Zhang and Tao examined the influence of haze on

China's stock market, specifically focusing on the role of investors as intermediaries. Their findings indicate that the deterioration of haze conditions and the dissemination of related news have a positive effect on investors' attention toward haze-related stocks. Consequently, this heightened attention leads to a decrease in stock returns [4]. Mohsin et al. employed Google search volume as a metric to assess the prevalence of the term "coronavirus" across 34 countries over the period spanning from January 23 to June 12, 2020. The researchers discovered that heightened investor focus on the COVID-19 pandemic during the financial crisis led to adverse stock market performance, resulting in negative returns [5].

2.2 Relevant literature that quantifies investors' attention indicators

The information that investors encounter on the financial market must be screened and screened by themselves, and the attention of individuals to information is skewed due to psychological and cultural differences among individuals. Therefore, it is worth discussing how to effectively quantify the interest of investors.

Chan used the headlines of news as a proxy variable and divided the news with and without headlines into two categories based on the yield equivalence standard. He discovered that the news reports that investors paid attention to had a positive effect on stock prices [6]. The allocation of investors' attention was found to be related to the daily limit of stock trading [7] by Seasholes and Wu, who used the daily limit as a proxy variable. Engelberg, Sasseville, and Williams discovered, using a particular television program as the research object, that if a particular stock is mentioned by the program, there will be a high trading volume, thereby impacting the return rate [8]. In addition, they used the Google Trends search volume index as a proxy variable to examine the stock market performance of retail investors. It is found that the Google Trends search volume index accurately reflects the interest of retail investors [10].

3 Literature review and hypothesis

The aforementioned literature demonstrates that the attention of investors will not only influence people's investment decisions but also the equilibrium price of the market, thus demonstrating that the financial market is not entirely efficient.

According to the literature, when selecting proxy indicators of investor attention and market performance of listed companies, the Internet search index has two advantages over traditional indicator media reports, such as saving time and reducing search costs, which leads more and more scholars to view it as a proxy variable of investor attention. And the stock yield, turnover, and turnover rate as yield and liquidity proxy variables for the stock market.

In addition, the aforementioned literature reveals that when investors seek relevant information about a particular stock, they pay close attention to the stock. This behavior will ultimately affect the volatility of the stock price, and the effect will be predominantly positive.

In this paper, we propose the hypothesis that investors will purchase online education equities after paying attention to online education-related information in order to increase the returns of the stocks:

H1: Investor attention is positively correlated with stock returns of listed online education companies.

It is worth considering that the profitability or loss incurred by a stock in the stock market is contingent upon the frequent trading activities of investors. Consequently, the focus of investors will lead to an augmentation in both liquidity and stock returns. In order to achieve this objective, the following assumptions are posited:

H2: Investor attention is positively correlated with the stock liquidity of listed online education companies.

In the context of the online education industry, it is observed that the number of enterprises within this sector undergoes a gradual increase over eight years. This upward trend in enterprise participation signifies a heightened level of investor interest and suggests that the industry is currently experiencing a phase of growth and expansion. Therefore, the following assumptions are made:

H3: Investors' attention is positively correlated with the stock returns of listed online education companies with the different entry times of enterprises.

H4: Investor attention is positively correlated with the stock liquidity of listed online education companies with the different entry times of enterprises.

4 Model construction and data selection

Based on the findings of this study and the comprehensive literature review, it is evident that the influence of investor attention on stock return rate and liquidity encompasses multiple variables, including company market value, market net ratio, and market portfolio return rate [9]. Simultaneously, it is postulated that the focus of investors and the timing of entry into the industry by each company will exert influence on the stock returns and liquidity of online education companies that are listed. Hence, the inclusion of investors' attention and its corresponding dummy variables of time is incorporated into the model, thereby constituting the ultimate model in this study. The formula is as follows (1):

$$Y_{i,t} = \alpha + \beta_1 AT_{i,t} + \beta_2 Ln(MV_{i,t}) + \beta_3 MR_{i,t} + \beta_4 PB_{i,t} + \beta_5 AT_{i,t} \times D + \varepsilon \quad (1)$$

Where,$AT_{i,t}$ is investor attention,$Y_{i,t}$ is the proxy indicator of stock liquidity and return rate, $MV_{i,t}$is the proxy variable of company market value,$MR_{i,t}$ is the proxy variable of market portfolio return rate, $PB_{i,t}$is the proxy variable of the price-to-book ratio, D is the dummy variable, and is 0 before entering the industry and 1 after entering the industry. $AT_{i,t} \times D$ is used to measure the influence of investor attention on stock return rate and liquidity brought by enterprises entering the industry at different times.

5 Sample selection

This study focuses on the stocks of online education companies listed on the Shanghai and Shenzhen Stock exchanges. The sample interval spans from January 1, 2013, which marks the beginning of online education, to December 31, 2020. Companies with incomplete financial

information disclosure and those whose shares were suspended during this period are excluded from the analysis.

5.1 Index selection

5.1.1 Explanatory variable -- selection of proxy indicators of investor concern

This study utilizes the Baidu Index, which relies on the quantity of subjective search conducted by Chinese internet users on the Baidu search engine. Specifically, the Baidu Index of 60 stocks is employed as a measure of search volume for investment targets. Additionally, a proxy index of attention is constructed using commonly used stock codes by shareholders. Utilize web crawling technology for structuring and arranging data into Microsoft Excel documents (2).

$$\mathrm{AT}_{\mathrm{i,t}} = \mathrm{Numberindex}_{\mathrm{i,t}}/100 \tag{2}$$

It is important to acknowledge that the unit in this paper is set as 100, owing to the significant level of daily investor attention.

5.1.2 Explained variables -- data sources and processing of stock market proxy indicators

The stock yield rate (R), which signifies the rate of return, along with the turnover rate (VOL) and turnover rate (TUR), which serve as indicators of liquidity, are sourced from the Guotai 'a database. Given the substantial magnitude of daily turnover (VOL), it is common practice to take the natural logarithm of these values, denoted as Ln(VOL).

5.1.3 Source and processing of proxy indicator data of control variables

The Gutai 'database is utilized to calculate market value (MV), market return (MR), and price-to-book ratio (PB). In the meantime, the market value is represented by the logarithmic form Ln (MV) owing to its immense magnitude.

The following describes the data source and processing of interactive items: Initially, manually search the pages of 60 companies and annual financial reports for the year the company entered the industry between 2013 and 2020, generate statistics with EXCEL, and use Stata16 to generate dummy variable D about time, which is 0 prior to entering the industry and 1 after entering the industry. Then, for ease of demonstration, the explanatory variable Baidu index (AT) is multiplied by the dummy variable D to produce an interaction term.

6 Empirical Research and Results

6.1 Descriptive statistical analysis

In this paper, Stata16 is used to undertake a descriptive statistical analysis of the indicators for all trading days of 60 sample companies from January 1, 2013 to December 31, 2020. The following are the outcomes [Table 1]:

Table 1. Descriptive statistical analysis

Variables	Obs.	Mean	S.D.	Min.	Max.
AT	109520	12.219	23.897	0.000	5024.970

R	109520	0.086	3.289	-23.404	20.080
Ln(VOL)	109520	6.919	0.505	3.886	8.962
TUR	109520	2.177	2.483	0.001	38.540
Ln(MV)	109520	9.870	0.399	8.885	11.425
MR	109520	0.048	1.439	-8.748	6.715
PB	109520	4.380	4.349	0.479	77.462

As can be seen from the above table, all data are available.

6.2 Correlation test

In order to gain a preliminary comprehension of the relationship between the variables of the subsequent multiple linear regression, the correlation analysis of each proxy variable is conducted, with the following results [Table 2]:

Table 2. Result of correlation test

	AT	R	Ln(VOL)	TUR	Ln(MV)	MR	PB
AT	1						
R	0.020	1					
Ln(VOL)	0.284	0.068	1				
TUR	0.173	0.133	0.589	1			
Ln(MV)	0.321	0.012	0.433	-0.080	1		
MR	0.003	0.472	0.025	0.016	0.009	1	
PB	0.232	0.033	0.047	0.107	0.327	0.012	1

Based on the results of the correlation test, it can be observed that the explanatory variable, investor attention (AT), exhibits a positive correlation with all other indicators. Simultaneously, when the correlation between variables is substantial, it is deemed that the model exhibits multicollinearity, thereby resulting in imprecise outcomes. Typically, when the magnitude of the correlation coefficient for each variable is below 0.5, the presence of collinearity is essentially negligible. Based on empirical analysis, the magnitudes of the data presented in the paper consistently fall within a range of 0.5. Hence, it can be posited that the issue of multicollinearity is essentially absent, thereby enabling the pursuit of further empirical investigation.

7 Multiple linear regression analysis

This paper selects descriptive statistical analysis, correlation test and multiple linear regression to complete the empirical study. The final result is as follows [Table 3]:

Table 3. Results of multiple linear regression analysis

	R		Ln(VOL)		TUR	
	Coefficient	T-value	Coefficient	T-value	Coefficient	T-value
Intercept	0.615**	(2.260)	1.860***	(6.900)	13.919***	(9.190)

AT	0.015***	(6.330)	0.012***	(7.460)	0.075***	(8.210)
Ln(MV)	-0.073***	(-2.590)	0.513***	(17.840)	-1.259***	(-7.780)
MR	1.078***	(143.18)	0.008***	(8.020)	0.026***	(4.590)
PB	0.019***	(6.840)	-0.016***	(-11.850)	0.063***	(7.970)
AT×D	-0.013***	(-6.180)	-0.008***	(-21.35)	-0.054***	(-20.210)
AdjR2	0.224		0.236		0.081	

Note: With the t statistic in brackets, *, * * and * * * are significant at 10%, 5% and 1%, respectively

8 Conclusion

The empirical findings reveal a positive correlation between investors' attention and the stock liquidity, as well as the return rate, of online education companies that are listed on the stock market. However, the influx of enterprises entering the market continuously between 2013 and 2020 has led to an adverse impact on the return rate and return rate of the listed companies. This contradiction challenges the assumptions put forth in hypotheses 3 and 4.

This trend underscores the substantial growth experienced by the online education sector from 2013 to 2020. Nonetheless, it is crucial to acknowledge that online education encounters certain limitations when compared to traditional offline education. Specifically, online education lacks a robust foundation and grapples with establishing a favorable reputation. Instead, it often relies on strategies that revolve around attracting large user volumes, commonly referred to as "traffic competition."

A striking example of this phenomenon can be observed in the endorsement of Guagualong Education by the esteemed international film star Zhang Ziyi during the Spring Festival Gala. The extensive marketing efforts and publicity surrounding this endorsement have a detrimental impact on the cognitive processes and decision-making abilities of small and medium-sized investors. As a result, further investigation through Baidu searches reveals that these investors develop reservations and conflicting sentiments regarding the business model associated with such excessive marketing and publicity. This phenomenon subsequently leads to heightened investor attention but a decline in both stock yield and liquidity.

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