

Individual investor attention and stock market performance ——Based on big data measurement

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Abstract—Investor attention is a Sizerce resource, and only the information that investors pay attention to can be reflected in the stock market through transactions. Considering about the development of big data, this paper uses data mining and crawling software to crawl the daily indicators of individual investor attention in 2019. Through a fixed-effect panel data regression model, this paper examines the relationship of personal attention and stock market performance indicators over the same period. This paper found that individual investors' attention can have a significant positive correlation with the liquidity and profitability indicators of stock market performance.

1 Introduction

The selective attention model in psychology shows that not all external stimulus information will be recognized by the individual, and the individual's attention will not be concentrated on the excluded information. Also, the distributive theory shows the premise that even if all information can be recognized under the circumstance, the allocation of limited cognitive resources with different strengths and precisions in different information will also make it difficult for humans to process and analyze additional new information that exceeds the upper limit of resources, and individual responses to external information show different strengths. Although there are differences between the selective attention model and distributive theory and the scope of application is also different, both show that people's attention is limited, and we cannot pay attention to all external information. In addition, since it is difficult for individuals to maintain the same state of arousal and sensitivity to information, it is impossible for us to respond to all information with the same intensity. This also means that existing theories or models based on effective information processing are debatable. Due to the upper limit of cognitive resources, investors are irrelevant to all the information disclosed in the market, that is to say, the price of assets cannot fully reflect this information.

In the past, researchers used proxy indicators (indirect indicators) to measure investor attention when conducting research. In the context of the current era of big data, there are more direct measurement methods to improve it.

In the early analysis of network effects for investors, domestic researchers mainly used manual statistics of historical information on the Internet platform as the main measurement index, or directly used Google Trends. Nowadays, Baidu Search is the most used search engine

by individual investors in China, so the Baidu Search Index is the most direct and important indicator of individual investors' attention. Baidu officially launched the Baidu index service in 2007.

2 Literature review

2.1 Literature Review

2.1.1 Limited attention of investor

Investors may not necessarily buy all the stocks that attract their attention, but the stocks they buy must be able to attract their own attention. Some researchers have studied that People's attention to one thing is at the cost of attention to other things [1]. Therefore, attention is a kind of Sizerce resource. In the case of ensuring that other variables remain constant (such as the economy and company's value), limited attention itself will have a significant impact on investment decisions[2]. Some studies have shown that this attention effect has a greater impact on personnel investors than on institutional investors[3].

Apparently, only when the investor pays attention to the stock price, can it be recognized to the stock market performance[4]. For investors, especially individual investors, constrained by the search cost and limited information processing ability, it is impossible to collect the information of all stocks. They can only focus on the information of several stocks. Given this problem of investors, they tend to buy stocks that can attract their attention, thus reducing their selection set.

Given the limited attention of investors, the relationship between stocks that can attract investors' attention and the stock market performance has always been a hot spot in the academic area. Some researchers

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believe that investors do not have enough energy to analyze and compare all available stocks, so they tend to buy stocks that attract their attention. Therefore, the prices of stocks that are followed by many people tend to rise [5]. This hypothesis has been empirically obtained in the research of the American stock market by Da and other researchers[6]. Foreign research in this area is relatively complete, some researchers have studied the complete stock price trend [7]. Xiang Cheng et al[8] found that based on the diffusion of industry information, investors have limited attention. This will cause differences in the returns of stocks with different degrees of concern in the industry. At the same time, as news spreads between industries, it will also lead to asynchrony of returns between industries.

Therefore, this paper proposes the first assumption.

Hypothesis 1: There is a positive correlation between individual investors' attention and stock returns

In fact, the above-mentioned factors, such as stock exchange rate, can be ignored by other investors, When investors pay attention to a stock, most of them will choose to trade the stock. Whether they buy or sell it, the liquidity of the stock will be affected and its liquidity will rise.

Therefore, this paper proposes the second assumption.

Hypothesis 2: There is a positive correlation between individual investors' attention and liquidity index of stocks.

2.1.2 Big data application in

In the early years, researchers often use some proxy variables as the proxy of investor attention. For example, Jia Chunxin used historical information as a measure of investors' limited attention to study the impact of reports on the lifting of restricted stocks on stock returns[9]. They studied the impact of Internet open source information on asset pricing, and found that Internet information already contains information that has a significant ability to explain the abnormal daily return rate of China's stock market. Some researchers used different weekly calendar periods as the representative variables of investor attention to study the impact of investors' limited attention on information interpretation efficiency[10].

With the development of big data information, methods of using search engine data to measure investor sentiment have begun to emerge. Song et al. Use Google Trends data as a proxy variable to attract investors' attention to study the anomalies that exist in the Chinese stock market during IPOs[11]. In terms of foreign research, Da, Engelberg and Gao use Google Trends weekly data to measure investor attention. This provides new ideas for the research of limited investors[6].

2.1.3 New ideas in this paper

In this paper, we use BAIDU search index as the daily proxy indicator of investor attention, which is a more direct measurement method than previous method. Besides, we considered three dependent variables in order to show the different impact of investor limited attention.

3 Research method

3.1 Sample Selection

The sample of this paper is selected from the ChiNext of Shenzhen Stock Exchange. Most companies on ChiNext have no long history and have fewer channels to obtain their information. Moreover, due to the nature of the Growth Enterprise Market, most of its listed companies are high-tech enterprises, which easily become the direction of hot topics.

The Size of the stocks listed on the ChiNext is relatively small, and the fund companies have the restrictions on the investment proportion and the consideration of risk control, so the Size of investment in the ChiNext is relevantly small. The main body of trading in the ChiNext is tend to be individual investors, which is extremely appropriate for studying the behavior of individual investors

In the choice of time interval, this paper selects the time interval from January 1st, 2019 to December 31st, 2019. This paper uses the daily data, so we can get enough time series observation values in a short time interval. After removing the securities code of Baidu search index that has been delisted and unable to obtain Baidu search index, as well as the data of non-trading days, the total number of stocks is 499, 244 days of Baidu search index, the total of 121756 data observations.

3.2 Measurement of Key Indicators

3.2.1 Investor attention

In the early days, most of the research was conducted through indirect measurement indicators closely related to the financial market, but often these indicators are directly obtained from the market and have potential noise; later, the academic community began to analyze them through Internet search indexes and community activity, and believed that these indicators It can directly reflect the needs of investors for information, and is more suitable as a direct indicator to measure attention. At present, most domestic and foreign researches on the application of web search indexes in economics and finance have verified the important value of web big data by establishing models of search indexes and economic and financial indicators.

Individual investors may use the securities abbreviation, securities code or company name of listed companies to search the relevant information of investment objects by Baidu, and the search amount of different keywords is different. The noise of company name search data is relatively large, because users may query company address, company recruitment and other information when searching company name (full name)[14]. When we use the company's abbreviation, we may also search the products of the company. The users who search the securities code are more inclined to be the investors of the security. This kind of attention is what we want to analyze[6]. In this paper, we use the search volume of ticker as the investor's attention. Therefore, this paper obtains Baidu search index of stock code through crawler,

and uses the search index $Tickerindex_{i,t}$ to represent individual investor's attention.

3.2.2 Stock Market Performance

The function of the stock market is the inherent function of the stock market itself. From the functional point of view, the functions of the stock market are embodied in four categories: accumulation of capital, conversion of capital, conversion of capital, and determination of stock [12]. This paper measures the performance of the stock market from the function of the stock market, excluding the functions of the invested company (accumulation of capital and converted capital). We use the function of converting capital and determining stock price to measure the performance of stock market

a) Conversion of capital function

The so-called conversion capital refers to the conversion of short-term capital into long-term capital. Stock is the ownership certificate of capital. The capital invested in stock is indefinite and cannot be withdrawn once invested. However, in the presence of the stock market, the stock can be freely sold on the stock market at any time [12]. In this paper, we use the stock market turnover rate as a measure of the market turnover

b) The function of determining the stock price

The stock price is determined by the expected return of the stock, the market interest rate and the supply and demand of the stock. Although the first two factors have nothing to do with the market determination of the stock price, they are all reflected by the supply and demand of the stock. If there is no stock market, no matter how the expected return increases or decreases, the market interest rate will change. There will be no change in the stock price. Therefore, the stock price is determined by the stock market [12]. When reflecting the information of stock price determination, measuring the change of daily return rate can better compare different stocks

3.2.3 control variables

This paper refers to the three-factor model of Fama [13]. The return of stocks is related to company size, market portfolio return and price-to-book ratio. Based on this, this article chooses the company's market capitalization (Size), market portfolio return (MktRet) and market-to-book ratio (P/B) as the control variables. Accordingly, the specific variables of this article are shown in the following table.

Table1. variables using in this paper

Variables	Meaning of variables
$Invatt_{i,t}$	The Baidu search index of stock i on day t
$Volume_{i,t}$	Trading volume of stock i on day t
$Ret_{i,t}$	The daily return of stock i on day t
$Turnover_{i,t}$	Intraday turnover rate of the stock i on day t
$MktRet_t$	ChiNext index yield on day t
$Size_t$	Market value of stock i on day t
$P/B_{i,t}$	The price to book ratio of the stock i on day t

3.2.4 Regression model

According to the results of Hausman test, the random effect of the regression model in this paper is not significant. Therefore, the fixed-effect model is used for panel data regression

$$Y_{i,t} = \beta_{0,i} + \beta_1 Invatt_{i,t} + \beta_2 SCA_{i,t} + \beta_3 MRE_t + \beta_4 PB_{it} + \epsilon_{i,t} \quad (1)$$

The variable 'Y' will use three dependent variables (stock daily return, daily turnover, daily turnover) to conduct three panel regression respectively.

4 Empirical Result

The fixed-effect panel regression result of volume, turnover and stock return has been shown in the three table below respectively:

Table2. Volume regression result

Volume	Coef.	T-value	p-value
Invatt	9.761***	333.05	0.000
MktRet	952.713***	5.06	0.000
P/B	-67.621***	-15.02	0.000
Size	0.533***	30.16	0.000
Constant	-1529.262***	-110.50	0.000

Table3. Turnover regression result

Turnover	Coef.	T-value	p-value
Invatt	0.001837***	294.49	0.000
MktRet	0.025463***	6.35	0.000
P/B	0.0036036***	37.62	0.000
Size	-0.0000105***	-27.95	0.000
Constant	-0.024***	-82.53	0.000

Table4. Return regression result

Return	Coef.	T-value	p-value
Invatt	0.000179***	26.69	0.000
MktRet	1.03***	238.28	0.000
P/B	0.00116***	11.25	0.000
Size	-4.62	-1.14	0.254
Constant	-.0088***	-27.80	0.000

Note: P values are given in brackets with superscripts *, **, and *** respectively representing statistical significance of 10%, 5%, and 1%.

It is not difficult to see that both the stock market return index and the liquidity index have a very significant positive correlation with investors' attention, and they are all positively correlated, which proves that investors' attention in the same period (same day) Will be significantly correlated with the stock market performance on that day, which also confirms the hypothesis put forward in this article.

5 conclusion and outlook

5.1 Conclusion

This paper uses Baidu Index as the proxy variable of investors' attention, which can directly measure the degree

of investors' attention to a specific stock. Combined with 499 stock samples of ChiNext, we reveal that this proxy variable has a significant correlation with market indicators. Investors' limited attention can have an independent impact on the stock market

Search engine provides accurate and large amount of data, which can remove many individual differences. It has great application value for social science research. In this paper, Baidu search index of stock code is used to accurately measure the attention of individual investors and reveal the relationship between them and the performance of the stock market. This article has a certain contribution in the field of big data measurement of investor behavior.

5.2 Outlook in the future

Looking to the future, when using the Baidu index, variables such as the information index can be included to study media effects on media effects. At the same time, researchers can use lag order or Granger test of causality to test the causality relationship between investor attention and stock market performance. That will be more practical.

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