Research on the Relationship Between FinTech Attention and Its Sector Returns

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Abstract: With the development and application of Internet technology, investors usually use Internet search engine to investigate the corporation and related information before making investment decision. As a result, Internet search engine has become an indicator of investors' attention. This paper uses FinTech Baidu index derived from Baidu public platform to measure investors' attention, as well as FinTech index from Shenzhen stock exchange, whose index code is 399699. SZ. The index data covers a date range from June 9, 2017 to June 30, 2019. Empirically, this paper discusses the impact of online attention on the stock returns of financial science and technology sector. A vector auto-regressive (VAR) model is built to reveal the correlation between Fintech investor attention and its sector returns. Furthermore, the granger causality, impulse response and variance decomposition are analyzed. Granger causality test result indicates that FinTech investor attention is the granger cause of the stock returns of Fintech sector, and conversely the stock returns of Fintech sector are not the cause of FinTech investor attention. That is, FinTech online attention has a certain impact on the stock returns of Fintech sector. Impulse response indicates that the impact of FinTech online attention is positive, but the effect lasts in a short term. The conclusions play an important role for investors to understand the hotspot attention on FinTech which is a new emerging market investment opportunity, and provide a general knowledge about the relation between Fintech attention and market returns.

Keywords: Investor Attention, Internet Search, FinTech, Index Return
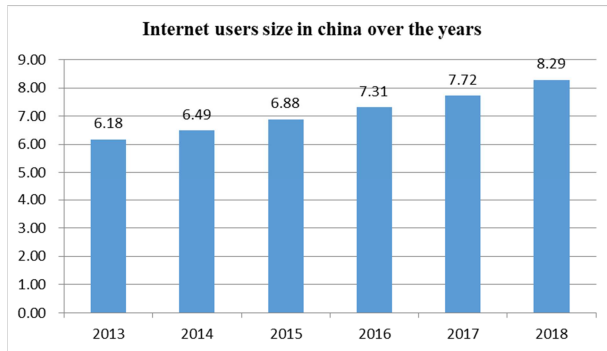
1. Introduction

In recent years, the research of behavioral finance is in the ascendant as a branch of economics. Richard Seiler, a researcher in behavioral finance, won the Nobel Prize in Economics in 2017, which once again aroused widespread attention in society about it. Scholars found that investor attention is often used in behavioral finance research [1, 2]. It affects investment decisions by influencing psychological activities, emotional tendencies, etc. However, with the wide application of Internet technology, the relevant information about stocks on the Internet is growing rapidly. When people face the explosive growth of data, efficiency and effective information cannot be obtained at the same time, which makes it necessary to use Internet search engines. The more searches, the more concerned related investors are, that is, the Internet search records are directly related to their attention. Therefore, choosing Internet search volume as the proxy variable of investor attention becomes the natural choice of researchers.

As shown in figure 1, the number of Internet user in China has increased year by year, ranking first in the world. With the increase of the number of people, our country has passed the explosive growth in the early development of the Internet. It has tended to grow steadily since 2015. This means that in the Internet industry, the huge advantages brought by the size of users are gradually diminishing, and the era of rapid growth of Internet finance due to the expansion of the size of users is coming to an end. User quantity orientation is gradually replaced by quality improvement. Science and technology are constantly transforming financial services, making the traditional closed financial system more open, broadening the financial boundaries and extending the extension gradually. FinTech, as a larger and more far-reaching development of Internet finance, integrates finance with technologies such as big data, artificial intelligence and block chain. The more is

the investment, the more is the attention from domestic and foreign investors. As shown in figure 2, the Baidu index of FinTech has gradually increased since 2016.

Source: China Internet Network Information Center (CNNIC)

Figure 1. *Statistics of scale of Internet users size in china over the years.*

As can be seen from figure 2, with the popularization of financial technology in life, internet users are paying more and more attention to Fintech. New technologies such as big data, artificial intelligence, block chain and cloud computing are pushing Fintech to a new stage of development. Furthermore, it will promote the transformation and reform of China's financial industry. Therefore, it is of great significance to study the impact of investors' attention on the stock price of the Fintech sector.
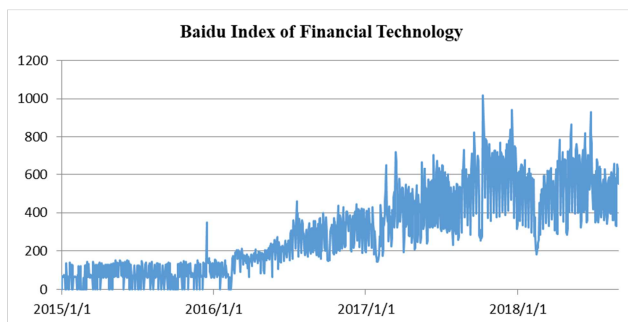

Figure 2. *Baidu Index of Financial Technology.*

2. Literature Review

In the early relevant studies, traditional social media such as advertisements and newspapers were used to measure investor attention. Through empirical analysis, Chemmanur (2010) found that advertising expenditures are positively correlated with investors' buying decisions [3]. Peress (2008) also published similar views in the Wall Street Journal [4]. However, due to the characteristics of advertisement and newspaper, investors often receive information passively, which is not enough to infer the attention of investors. And its information is too extensive to verify the specific content that investors are concerned about. Therefore, the results are often inaccurate when investors' attention is only measured by traditional social media.

With the development and application of Internet technology, the restrictions of traditional media have been broken out. Investors can search for topics of interest through search engines. As a result, Internet search volume has become an indicator. Actually, foreign scholars used Internet search volume to conduct relevant research, involving market characteristics such as stock price, excess returns, trading volume, etc. For example, Da et al. (2011) used the relevant search volume of Google Index to measure investors' attention to study the impact of investors' attention on stock prices [2]. They found that Google Index can well reflect the attention of investors, and its level is closely related to the highs and lows of stock price. This is consistent with the research results of Hirshleifer &Teoh (2003) [5], that is, the limited attention of investors has a significant relationship with the excess returns of stocks. Bank, Larch& Peter (2011) used Google search volume as an index to study the stock market [6]. The results show that with the increase of search volume, the trading activity and stock volatility in the stock market usually change to a certain level. Dimpfl&Jank (2012) [7] used Google Index to measure the attention of individual investors. Preis et al. (2013) designed relevant variables to predict the trend of stock market prices based on Internet search volume [8]. The results proved that stock market prices tend to fall when these volumes rise. Besides, Bukovina (2016) provided an overview of academic research related to a link between social media and stock returns [9].

Scholars from China have also done a lot of research on Internet search volume, and many research results indicate that changes in Internet search volume have a significant impact on relevant indicators of the stock market. Based on the evolution of Baidu index, Wang Xiaoyan, Chen Xiaofan & Hu Debao studied its relationship with the artificial intelligence concept stock price in 2017 in stages [10]. The results show that the increase of Internet search volume will lead to an increase in the return of concept stocks, i.e. Baidu index has a significant positive correlation with stock returns. Hu Changsheng, Xia Fanjie (2016) discussed the relationship between investor attention and stock returns by using the data of Oriental Wealth Choice investors' self-selection as the proxy variable of limited attention from investors [11]. The results show that investor attention will have a positive impact on stock returns in the short term and then reverse. At the same time, the "unpopular stock effect" in China's securities market has been clearly proved, that is, stocks with low investor attention will benefit more in the long run. Wang Yong and Yang Qingyun (2014) studied the relationship between China's Internet attention and stock returns based on Hexun attention [12]. From the research, they find that the stocks with high attention on that day will have high turnover on that day and the day after that. However, from the perspective of return, high attention has a positive impact on the return on the same day, but has a negative impact on the following day. Jia Chunxin et al. (2010) used Google index to measure investors' attention, confirming that investor attention will cause abnormal returns on stocks [13]. Song Shuangjie (2011) also used Google Index (SVI) to construct abnormal search volume index ASVI. After reducing the impact of market volatility,

ASVI has more effectively linked changes in network concerns with investor behavior. This paper mainly explains the abnormal phenomenon of IPO market, and puts forward the network search index as the forward index, which has higher accuracy in measuring the network attention [14].

Yu Qingjin and Zhang Bing (2012) took 196 stocks on the Growth Enterprise Market as samples and used Baidu Index to prove that limited investor attention will have a positive impact on stocks [15]. Their research has found that investors receive information lagging behind. When decisions are made within a few trading days, stocks will have abnormal returns in a short period of time, but these returns will disappear or even reverse in a long period of time. In order to analyze information more accurate, researchers directly extract sentiment index from information with the application of computer text analysis technology. Duan Jiangjiao et al. (2017) combined the analyst rating data and studied the information content of the posts by Dongfang Fortune Stock Exchange [16]. The study found the number of messages significantly positively affects contemporaneous price volatility, and greater disagreement among the posted messages induces more trading volume on the next two days.

Based on the research literatures above, it is not difficult to find that researchers often choose GEM and Main Board stocks to study the influence of investor attention. With the development of economy, "concept stocks" began to rise. It is different from "performance shares" and does not need to be supported by the company's financial performance. On the basis of judgment, investors believe that a certain industry is of great significance at present, and choose to buy stocks in expectation of earning profits. Obviously, the impact of investor attention on stock prices is more prominent in "concept stocks" and has more research value. Different from other literature, which lack researches on "concept stocks", we choose stocks in the Fintech sector and delve into the influence of investor attention on stock returns.

3. The Influence Mechanism of Internet Attention on Stock Return

From the literature review above, Internet search volume can be used as an agent variable for investors' attention. In other words, the impact of investor attention on stock price returns can be measured from the aspect of Internet search volume. Specifically, when investors' attention affects their trading behavior, the stock price has sustainability and price reversal in a certain period of time. On the one hand, due to excessive attention and overreaction, the stock shows a net buying state. Abnormal amplification of trading changes will further affect stock price and return. On the other hand, due to the limited attention of investors, the information response to the market is not promptly, which also affects the asset price, causing the asset price to deviate. It is easy for investors to ignore relevant important information, and there is a lag effect.

What has been described above is the general mechanism.

For Fintech sector, targeted analysis can also be made. In the analysis of the introduction, we can see that the concept of financial science and technology involves big data, artificial intelligence, block chain, cloud computing and so on. The continuous development of these industries has attracted the attention of many investors. Therefore, driven by favorable factors, many investors will gradually pay attention to investment. However, as the application of these technologies in the financial field is still developing, there is some uncertain. Many challenges and difficulties will also be attended by investors as topics. This bad news has had a negative impact on investors from another angle. With the continuous development of financial science and technology, this positive and negative effect appear alternately, and may eventually show price volatility in the stock market, which is also the inevitable performance of new technologies.

4. Empirical Analysis

4.1. Methodology

In this paper, vector auto-regression (VAR) model, a multi-equation model based on the statistical properties of data, is selected as time series data is used. Each endogenous variable in the model is regarded as a function of the lag value of all endogenous variables in the model. The specific details are that all current variables in the model are used to regress some lag values of all variables. By using VAR model, we can accurately estimate the dynamic relationship between all endogenous variables, so it is widely used in time series.

4.2. Data Collection and Source

This paper selects Fintech index from Shenzhen stock exchange as stock price sample, whose index code is 399699. SZ. This index was released on June 9, 2017, with a base period of May 26, 2017 and a base point of 3,000 points, including 66 components. The selected Baidu index sample comes from Baidu public platform (http://index.baidu.com). The date is from June 9, 2017 to June 30, 2019. The final sample recorded a total of 752 data samples. And the other related stock traction data can be obtained from Wind database. In order to better analyze financial technology attention effect on its sector returns, FinTech investor attention (Ftbd) is computed as formula (1):

$$Ftbd_t = \frac{FintechSV_t - FintechSV_{t-1}}{FintechSV_{t-1}} \qquad (1)$$

Where Fintech SV_t represents the baidu index of key words "financial technology".

4.3. Empirical Results and Analysis

4.3.1. Descriptive Statistics

The descriptive statistical result of the variables is shown in Table 1. From table 1, we can see that the minimum value of FinTech investor attention (Ftbd）obtained by taking logarithm with daily search volume is positive, while the minimum value of Baidu index is 0. Obviously, in the observation interval,

investors have maintained a high interest in "financial technology". Combined with the median and average, it can be judged that the Baidu index of Fintech is always at a high point. From the aspect of attention, this also confirms the above mentioned content, "Fintech" is a hot search.

***Table 1.** Descriptive statistics.*

Variable	Mean	Median	Maximum	Minimum	Std.
Ftbd	0.0362	-0.0084	1.4461	-1.7323	0.3133
FtRt	0.0383	-0.1293	7.7957	-8.1153	1.9842

***Table 2.** Results of Unit Root Test.*

Variable	T Value	P Value	1% Threshold	5% Threshold	Result
Ftbd	-4.666226	0.0001	-3.457747	-2.873492	stable
FtRt	-16.52216	0.0000	-3.457630	-2.873440	stable

***Table 3.** Lag Length Test.*

Lag	LogL	LR	FPE	AIC	SC
0	-475.4114	NA	0.012408	4.124236	4.168806
1	-269.8019	404.1289	0.002278	2.429327	2.607606*
2	-250.8701	36.72109	0.002092	2.343708	2.655697
3	-239.1323	22.46379	0.002043*	2.320106*	2.765805
4	-237.6389	2.819373	0.002180	2.384818	2.964227
5	-227.4402	18.99072	0.002158	2.374485	3.087603
6	-213.6501	25.32158*	0.002072	2.333190	3.180018
7	-209.1930	8.068817	0.002156	2.372353	3.352891
8	-204.8240	7.796453	0.002245	2.412276	3.526523

***Table 4.** Granger Causality Test.*

Original hypothesis	observed value	P value	Result
FtRt is not the Granger reason for Ftbd	752	0.5242	Accept
Ftbd is not Granger reason for FtRt	752	0.0114	Refuse

4.3.2. Stationary Test

Because of time series model, the stability test of the data is necessary. If the test shows that the data are non-stationary, then we need to make further difference to the data, because the non-stationary data easily lead to pseudo-regression. In this paper, the determination of stability specifically refers to the ADF (Augmented Dickey-Fuller test) unit root test of Ftbd and FtRt variables through EVIEWS. The result of ADF inspection is shown in table 2.

From table 2, it shows that Ftbd and FtRt both passed ADF unit root test and VAR model can be directly built without making first-order difference.

4.3.3. VAR Model

To build VAR model, the lag length test is needed, which the result is shown in table 3. According to table 3, the optimization lag of VAR model is 3. The dependent variables in the two equations are the current values of Ftbd and FtRt respectively. The explanatory variables are the delayed first phase value, delayed second phase value and delayed third phase value of the two variables.

4.3.4. Granger Causality Test

Granger causality test result is shown in table 4. From table 4, we can see that FinTech investor attention (Ftbd) is the Granger cause of the FtRt in the Fintech sector. At the same time, FtRt is not Granger causes of FinTech investor attention (Ftbd). This shows that investors' attention come first. Baidu Index, as an indicator to measure investors' concern, represents

the amount that investors search for "Fintech" under the influence of other information. It is not affected by the index of the stock itself and has high independence.

4.3.5. Impulse Response Test

Impulse response function is to study the dynamic process of interaction between FinTech investor attention (Ftbd) and return FtRt. Through simulation, a response process of each variable to the innovation impact of 0-10 periods can be obtained. Figure 3 is a graph of impulse response functions of FinTech sector returns (FtRt) to FinTech investor attention (Ftbd), and figure 4 is a graph of impulse response functions of Ftbd to FtRt. As can be seen from figure 3, when there is a positive impulse of Ftbd, the response of FtRt is positive. This is also consistent with the result of Granger causality analysis in table 4, that is, Ftbd is the Granger cause of FtRt. The experimental results show that FinTech online attention has a certain impact on the stock returns of Fintech sector, the positive impact will last 4 periods and disappear in the long run. Possible reason for the positive impact is that with the increase of the internet attention to Fintech, the buy-in volume of the market rises, leading to the increase of stock returns in Fintech sector.
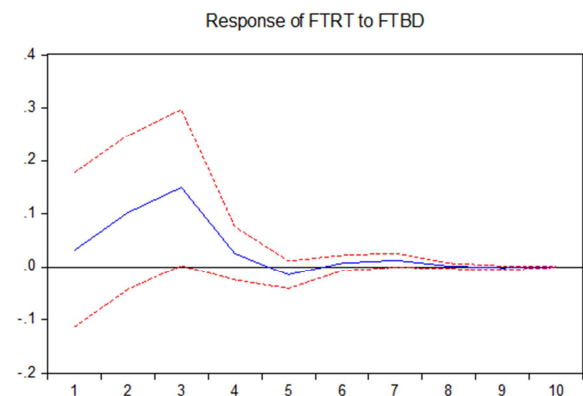

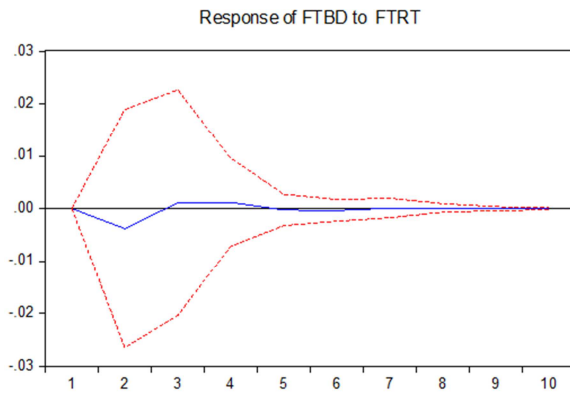***Figure 3.** Impulse Response of FtRt to Ftbd.*

Figure 4. Impulse Response of Ftbd to FtRt.

4.3.6. Variance Decomposition

Variance decomposition based on VAR model help to study the degree of mutual influence between FinTech investor attention and return. The result is shown in table 5. Through the observation of table 5, it can be found that FtRt has the greatest influence on its own variance decomposition FtRt. Its value gradually decreased from 96.9% in the first phase, and remained at about 96.87% after the third phase. Although Ftbd initially contributed only 3.1% to FtRt, it showed an increasing trend in each period. Until the 4th phase, its contribution was 3.124%. This value is second only to FtRt itself, indicating that Ftbd has a great influence on FtRt in the long run.

Table 5. FtRt variance decomposition result.

Period	S. E.	Ftbd	FtRt
1	0.290963	3.106036	96.893964
2	0.290987	3.122909	96.87709
3	0.305354	3.122739	96.87726
4	0.305356	3.124252	96.87575
5	0.30678	3.124152	96.87585
6	0.30678	3.124283	96.87572
7	0.306924	3.124276	96.87572
8	0.306924	3.124291	96.87571
9	0.306939	3.12429	96.87571
10	0.306939	3.124292	96.87571

5. Conclusion

This paper uses Baidu index as the proxy variable of network attention to study the investor attention effect of Fintech sector in China's stock market. A vector auto-regressive (VAR) model is built for the correlation between Fintech investor attention and its sector returns, and analyzes the granger causality, impulse response and variance decomposition. The empirical results are as follows:

According to granger causality, FinTech investor attention is the granger cause of FinTech sector returns. Furthermore, we can know from the impulse effect diagram that the impact of FinTech online attention on FinTech sector returns is positive which will last 4 periods and disappear in the long run. At the same time, although there is a positive correlation between network attention and stock price changes, the relationship is weak. As a result, the research in the Fintech

has verified the effect of investor attention once again, supplementing the deficiencies of the existing research on hot-spot sectors.

It means that when Internet attention rises, "financial technology" becomes a popular sector. This has two advantages: on the one hand, the hot spot attract more investors' attention, making volume rise. Further, the increase in turnover leads to higher prices and higher FinTech sector returns. On the other hand, there is a large number of "hot spots" in China's stock market. Investors prefer companies with high attention, which leads to a rise in returns. On the contrary, when network attention decreases, it means a lack of volume. As a result, stock prices supported by volume will stagnate or fall, thus bringing about a drop in FinTech sector returns.

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