



Open source information, investor attention, and asset pricing



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ABSTRACT

In this paper, we advocate the search frequency of stock name in Baidu Index as a novel and direct proxy for investor attention. Firstly, empirical results show that the quantified investor attention is a desired explanatory variable for abnormal return even trading volume is considered. Secondly, the Main Board is more efficient than the ChiNext and the SME Board in the view of informational efficiency. Thirdly, investor attention exhibits strong contemporary relationship with abnormal return. Fourthly, open source information can enhance the speed of information dissemination and make the market efficient.

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1. Introduction

Over the past decade and a half, the emergency of the internet has become a mainstream platform for information gathering, processing and interaction. In stock market, the internet has not only enhanced the existing processes (e.g., the electronic system facilitates the broker in sending orders), but also created new processes and interactions (e.g., stock message board, blog and email). The efficiency of stock market is in large attributable to the efficient dissemination of information. Therefore, the internet is undoubtedly playing an increasing role in stock market.

Market efficiency has double-meanings in financial economics. Allocative efficiency is concerned with the optimal distribution of scarce resources among individuals in the economy; Informational efficiency refers to how much information is revealed by price process (Brunnermeier, 2001). Infer from these two viewpoints of efficiency, the efficient market is characteristic of prices incorporate all available information and does not have any unexploited gains from trade. Therefore, if prices do not precisely and fully reflect public information, then there would be a profitable trading opportunity for individuals and paying attention to research the opportunity from internet is worthy.

Considering these two aspects mentioned above, it's an empirical question to ask whether the open source information has some impacts on information dissemination, investor behavior and even explanatory power for stock return.

2. Literature review

There are many empirical studies which contribute to the relationship between open source information and asset pricing. Some of the studies support that the open source information is not just noise, but also associated with the arrival of information. For example, Wysocki (1999) firstly finds that overnight message postings are indicative of the trading volume and the stock return on the next day. This result is also further confirmed by Antweiler and Frank (2004), Bollen et al. (2011), and Loughran and McDonald (2011). In contrast to this anecdotal evidence, Tumarkin and Whitelaw (2001) find that message board activity does not predict the industry-adjusted returns or the abnormal trading volume. However, all of these studies only focus on the contextual content of message board, blogosphere and twitter. A major flaw of the contextual content is that noise information is inevitable, since advertising also exists on the internet.

Our paper also contributes to the literature in investor attention. Based on the theoretical models (Hirshleifer and Teoh, 2003; Merton, 1987; Sims, 2003) of investor attention, different kinds of indirect proxies, including advertising (Chemmanur and Yan, 2009; Grullon et al., 2004), media coverage (Chan, 2003; Fang and Peress, 2009), excessive trading volume and stock return (Barber and Odean, 2008) and price limit event (Seasholes and Wu, 2007), are applied in study the dynamics of investor attention and asset pricing. However, all of these indirect proxies have their limitations. Media coverage always gives bias account of certain stocks, e.g. the local bias (Gurun and Butler, 2012) and the effect of investor relations (IR) firms (Solomon, 2012), which may result in improper interpretation. Excessive trading volume and

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abnormal return can also be driven by macroeconomic environment (Engle and Rangel, 2008), which is unrelated to investor attention.

In this paper, we advocate the search frequency of stock name in Baidu Index as a direct proxy for investor attention and study the implications for asset pricing of Chinese stock market. Our paper is directly related to Da et al. (2011), who propose Google Trends as a direct proxy. Nevertheless, due to the better data than Google Trends, our paper gains some interesting findings. We will state the advantages of Baidu Index in Section 3.1.

The remainder of this paper is organized as follows: Section 3 provides the data description. Section 4 reports the empirical results. Section 5 summarizes this paper.

3. Baidu Index and data

3.1. Description of Baidu Index

Baidu Index is a keyword analysis tool officially launched by Baidu, which is the largest search engine in China. It uses the search queries on Baidu web searches to calculate the “user attention”. “User attention” represents the search frequency of certain keywords on Baidu web searches based on actual searching behavior of its users. Appendix A gives a detailed description.

There are many reasons for why we use search frequency of stock name in Baidu Index as the measure of investor attention. Firstly, as is generally admitted, investor always uses search engines to collect information. Searching for stock name undoubtedly represents paying attention to the stock. According to the IResearch Report,¹ Baidu extended its market share to 77.7% in the third quarter of 2011 in China. Thus, the aggregate search frequency in Baidu Index is a good representation for investor attention in China. Secondly, Google Trends only analyzes a portion of real search data on Google web and calculate the total search volume through simulation.² Baidu Index, based on Baidu web searches by tens of millions of internet users, provides more scientific, authentic and objective data, which comes from users' authentic retrieving record without any simulation. Thirdly, Google Trends only retrieve Google News, resulting in deficient and obsolete to some keywords. Especially for some Chinese stock names, it does not have enough search volumes to show graphs. Baidu Index provides vast quantities of Chinese retrieve data. Therefore, for Chinese keywords analysis, Baidu Index is better. Fourthly, Google Trends only provides weekly data, which is given in relative term in the corresponding time interval. This data transformation done by Google not only eliminates a general trend in search volume, but also hinders us from studying the variations in search frequency (Bank et al., 2011). On the contrary, Baidu Index is updated daily in absolute term. Consequently, Baidu Index offers us a further way to observe the implications of variations in investor attention for investor behavioral and information dissemination process.

3.2. Data

As for the search identifier, in contrast to Da et al. (2011) employing specific tickers for stocks, we simply focus on the search frequency of stock name as a proxy for investor attention. We do this for two reasons: firstly, owing to the intrinsic attribute of Chinese language, most of the stock names are compounding words, which signifies that they have exclusive meanings; secondly, from our point of view, the internet can affect the expected stock returns through aggregate information dissemination. Naively searching the stock name provides us such an aggregate information dissemination channel, regardless of whether the searching identifications are purely stock names listed on the

Shanghai Stock Exchange (SSE) and the Shenzhen Stock Exchange (SZSE) or contain noise information.³

Our sample focuses on the SSE and the SZSE and particular on the ChiNext, the SME Board and the Main Board.⁴ We completely random select 30 stocks from each board, covering the calendar date from March 1st 2011 to March 30th 2012. Amounting to more than 24,000 records with 267 trading date, which is sufficient for our analysis.

The capital market data used in this paper come from the China Stock Market and Accounting Research (CSMAR) database for the period corresponding to time series of Baidu Index. We use the daily return rate after dividend reinvestment (Dretwd), stock daily trading volume (Dnshrtrd) and index return (Retindex) in this paper.

4. Empirical results

4.1. Market efficiency

As the old Wall Street aphorism goes, “It takes volume to make prices move.” Traditional asset pricing theory and empirical studies seem at odds concerning this issue. On the one hand, the semi-strong efficient market (Fama, 1970) argues that if the market is informational efficiency, the investor should not have the opportunity to profit on the basis of public information, because the price has already reflected all available information in stock market. On the other hand, researchers as well practitioners spend a lot of time on trading volume (Campbell et al., 1993; Choi et al., 2002; Wang, 1994), security analyst recommendation (Barber et al., 2001; Morgan and Stocken, 2003), and technical analysis (Brock et al., 1992).

Among these variables, the relationship between price and trading volume has received considerable attention. In the survey of Karpoff (1987), the importance of the price and volume relationship is clear illustrated. Wang (1994) further signifies that the quantity variable (trading volume) has important roles on investor heterogeneity. To make this issue deeper, we argue that the quantity variables, investor attention, once was recognized as scarce cognitive resource (Kahneman, 1973), can also have important roles in deeper understanding of the stock market. To test our hypothesis, we construct the following three basic models based on principal component analysis⁵:

$$AR_t = \lambda + \beta_{TV} TV_t + \varepsilon_t, \quad (1)$$

$$AR_t = \lambda + \beta_{IA} IA_t + \varepsilon_t, \quad (2)$$

$$AR_t = \lambda + \beta_{TV} TV_t + \beta_{IA} IA_t + \varepsilon_t, \quad (3)$$

where, AR_t denotes the abnormal return at time t , TV_t denotes the trading volume at time t , IA_t denotes the investor attention at time t , ε denotes the white noise, λ denotes the constant, and β_{TV} and β_{IA} denote the regression coefficients.

Based on the regression results of model (1) and model (2), model (3) aims to prove our hypothesis that investor attention can show explanatory power for abnormal return even trading volume is considered. Table 1 presents the definition and calculation of variables in this paper.

Table 2 presents the regression results of the models. Focus on the regression results of model (1) and model (2), the ChiNext, the Main Board and the SME Board display the identical results. This reveals that both the trading volume and the investor attention are desirable variables to predict the abnormal return. To lucubrate the collaborative predicting power, the results in model (3) show distinctive differences. For the ChiNext and the SME Board, the number of significant stocks in

³ At this point, the noise information refers the search identifier, i.e., the stock name, has other meanings. In fact, we find that the only insignificant stock in the Main Board (in Table 2) is the stock, with its name the same as the company name.

⁴ For a detailed description, see <http://www.szse.cn/main/en/>.

⁵ Although, it seems that this method is very simple. The main contribution in this paper lies in we find a desirable variable to predict the abnormal return. Many empirical studies (De Bondt and Thaler, 1985, Antweiler and Frank, 2004) in this category also employ the simple linear regression.

¹ For the report, see http://www.iresearch.com.cn/coredata/2011q3_5.shtml.

² For the description of Google Trends, see <http://support.google.com/trends/answer/87276/?hl=en>.

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