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# The different impacts of news-driven and self-initiated search volume on stock prices

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## ABSTRACT

Big data benefits both Internet finance and behavioral finance research; Internet search frequency on stocks has been widely used to measure investor attention. In this study, we divide the search volume into news-driven and self-initiated by the online media coverage collected from Baidu Index. In a sample of CSI 300 stocks from 2009 to 2013, we find that self-initiated (news-driven) search volume is more likely to generate buy (sell) pressure, and media coverage can negatively moderate the impact of search volume on stock prices, suggesting that distinguishing search environment for investors can help improve the measure for investor attention.

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## 1. Introduction

In this big data era, information plays the most important role. Data generated from social media, Internet search, and click stream grow exponentially. The rapid expansion of online-generated content creates many opportunities for both industry and academic research [29,18]. The most significant application of big data should be Internet finance, which has commercialized the online posts and searches to select stocks. Big data are closely related to investors, companies, and stock market.

The wisdom of crowds based on massive information has great power and possibility of influencing the financial market [7]. The usage and popularity of social media such as Twitter, Facebook, and Wikipedia has changed investors, companies, and stock market considerably in recent years. For instance, to companies, the usage of social media is associated with firm equity value; the transformative power of social media is crucial to company development [23]. To investors, the usage of Twitter can significantly reduce the information asymmetry and is associated with lower abnormal bid–ask spreads [6,9]. To the stock market, Wikipedia can improve the information environment in the financial market and moderate the timing of managers' voluntary disclosure of companies' bad news [34,33].

Furthermore, taking advantage of big data, Da et al. [8] collected the search volume data for Russell 3000 stocks from Google Trends and found “An increase in search volume index (SVI) predicts

higher stock prices in the next 2 weeks.” Subsequently, many studies further confirmed this conclusion [11,19,32]. Investors in the financial market have limited attention, and attention allocation has a profound impact on asset prices. An important step in empirically examining the impact of attention on prices is to measure investor attention in a direct and timely manner. Recent work has shown that Internet search frequency can achieve such an objective. The most commonly used Internet search frequency is the SVI from Google Trends, especially after Da et al. [8] showed that SVI can directly measure the attention of retail investors and predict short-term stock returns. However, Internet searches under different circumstances do not guarantee equal attention. This is especially true when there is an overabundance of information, which can lead to scarcity in attention.

Searches prompted by news headlines differ from searches motivated by research for trading ideas in the likelihood that attention will lead to action. News-driven search volume can be generated when there has been a news release, for example, earning announcements, mergers and acquisitions, and even rumors [2]. Many studies show that stocks with no media coverage earn higher returns than stocks with high media coverage [12,31,30,5]. Thus, news-driven search volume is more likely to induce lower returns. Self-initiated search volume is usually conducted by the investors who are searching for information to trade. As compared with news-driven search volume, which is passive, self-initiated search volume is more likely to generate buy pressure as initiative searching shows a demand for investment. Thus, different types of searches may have different impacts on stock prices. It is therefore an important exercise to explore the

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heterogeneity of Internet search and investigate its varying impact on the asset prices.

Only when investors pay attention to the massive information can it influence the financial market. The current studies further confirmed the impact of investor attention on the stock market by virtue of big data; this is the first step as information is worthless without attention. However, an implicit assumption in existing studies is that investor attention (measured by proxies such as search volume) under different situations is supposed to be identical or equal. Our study extends the current studies to the second step, in search of attention heterogeneity, and contributes to the knowledge of how investors treat information differently under different situations: the same amount of search volume performed under different situations captures distinct attention, and results in different decision-making processes.

In this study, we set out to distinguish news-driven search volume from self-initiated search volume, and explored the moderating effect of media coverage. Here, we choose China's stock market and Baidu Index as our research sample for at least three advantages. First, the stock tickers in China are chosen to be unique (Chinese stock tickers are composed of six digits, defined as unique; searching for a six-digit stock code through Baidu is absolutely for the corresponding stock). Second, China's stock market has a higher proportion of retail investors than the US stock market; thus, it is better to explore the individual investor's behavior. Third, Baidu Index offers the online media coverage index (MCI) of each search term, which is more appropriate than the traditional newspaper news when studying the online search frequency, as online searching is more likely to be influenced by online news rather than the newspaper news. By contrast, Google Trends only offers the SVI of each search term and does not provide the online MCI (see Figs. 1 and 2).

## 2. Backgrounds and hypotheses

Big data are becoming an increasingly important asset for decision makers; four main features characterize big data: volume, variety, velocity, and veracity [24]. Large volumes of highly detailed data from various sources are rapidly generated, providing the opportunity to deliver significant benefits to both industry and academic research [14].

In practice, the significant and successful implication of big data helps many funds and Internet enterprises to stand out. Baidu is the largest Chinese search engine, which occupies >80% of the Chinese search market; the enormous search traces generated by innumerable users is a great wealth. Baidu combined with GF Fund established the first Internet big data fund (first released on 20 October 2014 and sold at 1.2 billion RMB on the first day) in China. This fund commercializes the search volume from Baidu Index, and considers it a key tool to select stocks (the stocks are updated monthly by the overall rating of fundamental financial factors and user-generated search volume).

In academic research, with big data, it is possible to conduct some studies that could not be performed before [3]; for instance, attention is difficult to be directly measured until innumerable search traces are recorded by search engine. However, information surplus is more serious along with the increase of observational data; thus, limited attention is exacerbated. The success of using search volume to measure investor attention is a big step in the research of behavioral finance.

### 2.1. Measures of investor attention

Empiricists face a substantial challenge in testing theories of attention as direct measures of investor attention are difficult to observe. Instead, researchers have resorted to indirect proxies for investor attention such as extreme returns [4], trading volume [4,15], news and headlines [4,35], advertising expense [16,22], and price limits [27]. These proxies are indirect because of the reliance on the critical assumption that if a stock's return or turnover was extreme or its name was mentioned in the news media, then investors should have paid attention to it. This assumption can be especially problematic when investor attention is too scarce to cover all these events or when investor attention is not associated with these events.

The novel approach by Da et al. [8] introduces SVI from Google Trends as a timely and efficient proxy to measure investor attention. As compared with the traditional indirect measures, SVI at least has the following advantages. First, Internet users commonly use a search engine to collect information, and Google (Baidu) continues to be the favorite in the US (China). Indeed, up to now, Google (Baidu) has accounted >70% (80%) of all search queries performed in the US (China). The search volume reported by Google (Baidu) is thus likely to be representative of the Internet search behavior of the general population. Second, and more critically, search is a direct attention measure: if you search for a stock in Google (Baidu), you are undoubtedly paying attention to it. Third, Google Trends (Baidu Index) offers timely (weekly/daily) search data of any keywords, which can effectively measure the real-time attention from investors. Therefore, SVI from Google (Baidu) is a direct and unambiguous measure of attention. These advantages of using SVI to capture investor attention lead to widespread adoption in empirical studies.

### 2.2. Limited attention and asset prices

Traditional asset pricing models in finance and economics assume that information is instantaneously incorporated into prices when it arrives. This assumption requires that investors allocate sufficient attention to the asset. Many recent theoretical studies relax this assumption and provide a framework in which limited attention can affect asset prices (for instance Refs. [28,17,25]). The rationale behind this extension is that attention is a scarce cognitive resource in reality [20] and investors have a



Fig. 1. SVI from Google Trends.

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