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## Article

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## How investor attention affects stock returns? Some international evidence

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### Abstract

We examine the effects of limited investor attention on stock returns by using Google search volume index to measure investor attention. We also investigate whether national culture and market development have any role in this relationship. We find that the impact of investor attention on stock returns is not consistent throughout the world. The direction and significance of the impact vary from country to country. We also find that investor attention is more significant in individualistic countries, countries with high uncertainty avoidance, and developed countries. Furthermore, we find that the impact of abnormal returns on investor attention is more consistent across countries. One-week lagged absolute abnormal returns can positively predict investor attention in sixteen countries. Our results also show that investor attention returns to normal levels in three weeks in individualistic countries and countries with low uncertainty avoidance.

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*JEL classification:* G12; G40

*Keywords:* Google search volume index; Investor attention; National culture; Panel granger causality; Stock returns

### 1. Introduction

According to the efficient markets hypothesis, asset prices reveal all relevant information in the market. This requires investors to pay attention to all available information. Nevertheless, the literature shows that the purchase decisions of individual investors are heavily influenced by limited attention (Barber & Odean, 2013). Kahneman (1973, 9) states that “the total amount of attention which can be deployed at any time is limited.” Peng and Xiong (2006) show that attention constraints lead to category-learning behavior and make investors prioritize market-wide information over firm-specific information.

The purpose of this study is to investigate whether investor attention has any impact on stock returns. We also contribute to the literature on cultural finance by examining whether the individualism and uncertainty avoidance dimensions by Hofstede (1983) have any role in this relationship. Lastly, we

examine whether the relationship between investor attention and stock returns varies depending on market development. We measure investor attention by Google search volume index and focus on individual stocks in 31 countries in three regions: the Americas, Asia-Pacific, and Europe. Our findings show that the impact of investor attention on stock returns differs from country to country. Investor attention predicts stock returns positively in five countries and negatively in six countries at different lags. Furthermore, we show that the impact of investor attention on stock returns is significant in individualistic countries, countries with high uncertainty avoidance, and developed countries. We also find that one-week lagged absolute abnormal returns can predict increases in investor attention in sixteen countries. Finally, we find that investor attention returns to normal levels within three weeks in individualistic countries and countries with low uncertainty avoidance, but we do not observe a similar pattern in collectivistic countries and countries with high uncertainty avoidance.

Our contribution to the literature is twofold. First, we extend investor attention literature to the international level and show that the impact of investor attention on stock returns

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is not internationally consistent. Second, we examine the influence of national culture and find that the cultural traits that increase the tendency to overreact may moderate the relationship between investor attention and stock returns.

The remainder of the paper is structured as follows: Section 2 presents the relevant literature. Section 3 explains the data and methodology. Section 4 reports the results and finally, Section 5 concludes the study.

## 2. Literature review

Prior studies have used different proxies to measure investor attention, such as internet search data, abnormal trading volume, analyst coverage, and media coverage. Using internet search volume as a proxy for investor attention is the most common approach in the literature. Although other proxies measure the passive attention of investors, internet search volume data measure active attention. [Da et al. \(2011\)](#) explain that the search volume reported by Google is likely to be representative of the internet search behavior of the general population. Moreover, they presume that aggregate search frequency in Google is a direct and unambiguous measure of attention because when individual investors are searching for a stock, they are actively paying attention to it. The impact of investor attention on stock returns has been investigated extensively in the literature in the past decade, especially after the use of search volume data. Whereas most studies find a positive relationship between investor attention and stock returns, others find a negative or insignificant relationship.

In the US market, [Da et al. \(2011\)](#) and [Joseph et al. \(2011\)](#) find that increases in the search volume index (SVI) predict positive returns. [Nelson et al. \(2013\)](#) and [Hu and McInish \(2013\)](#) examine stock spam messages as attention-grabbing events and find that trading volume and returns are higher following the receipt of spam messages. [Bae and Wang \(2012\)](#) find that, during the boom period in the Chinese stock market, stocks of firms with the word “China” in their names attract more investor attention than “non-China-name stocks,” and this increased investor attention leads to higher returns.

A few studies find a negative relationship in the US market. [Bijl et al. \(2016\)](#) measure investor attention with the SVI of company names and find that investor attention negatively predicts stock returns. [Yuan \(2015\)](#) examines Dow record events and front-page market news as attention-grabbing events and finds that these events predict abnormally higher selling activity when the level of the stock market is high.

Studies that examine the impact of investor attention on stock returns in the Chinese market predominantly use the Baidu Index instead of the Google SVI because Baidu is the leader in the search engine market in China. [Zhang et al. \(2013\)](#) find a bidirectional causal relationship between investor attention and abnormal returns. [Yuan and Wenbin \(2014\)](#), [Ying et al. \(2015\)](#), and [Zhang and Wang \(2015\)](#) find that the Baidu Index can positively predict higher stock

returns. By contrast, [Shen et al. \(2017\)](#) find a negative relationship between the Baidu Index and stock returns. [Peng et al. \(2016\)](#) follow a different approach and investigate whether stocks in top 10 lists of daily returns attract more attention from investors. They find that the top 10 stocks not only attract more attention but also have significantly higher abnormal returns on the first post-event day. [Liu and Ye \(2016\)](#) find that an increase in the self-initiated search volume predicts higher returns in the next two weeks.

Another Asian market studied in the literature is Japanese startup exchanges. [Adachi et al. \(2017\)](#) measure investor attention with the Google SVI and find a positive relationship between investor attention and stock returns. [Pyo \(2017\)](#) explores the attention-return relationship in the Korean market and finds that investor attention has a negative effect on KOSPI index returns. [Nguyen et al. \(2019\)](#) focus on five emerging countries in the Asia-Pacific region and use the Google SVI to measure investor attention. They find that investor attention is negatively associated with future stock returns. [Swamy and Dharani \(2019\)](#) also examine an Asia-Pacific country, India. They find that investor attention measured by the Google SVI positively predicts stock returns in the subsequent fourth and fifth weeks.

[Bank et al. \(2011\)](#) examine the German stock market and find that investor attention is positively associated with future stock liquidity. [Tan and Taş \(2019\)](#) and [Ekinci and Bulut \(2021\)](#) focus on the Turkish stock market and find that investor attention is positively associated with stock returns. Nevertheless, [Ekinci and Bulut \(2021\)](#) find that investor attention has no predictive power on stock returns.

Several studies in the literature conduct multicountry analyses, though they examine the index-level relationship and are not focused on individual stocks. For instance, [Tantaopas et al. \(2016\)](#) examine the effect of investor attention on index returns in 10 Asia-Pacific countries. They find that, in most countries, index returns affect investor attention, but not vice versa. [Perlin et al. \(2017\)](#) focus on the US, the UK, Australia, and Canada and examine whether the search volume of keywords related to the stock market, such as “stock,” “finance,” and “market,” affect index returns. They find that the search volume of some keywords is negatively associated with index returns. [Chen \(2017\)](#) conducts a comprehensive study, which includes stock indexes in 67 countries. Using the Google SVI as a measure of investor attention, he finds that in 20 countries, investor attention has a negative effect on stock returns. [Han et al. \(2018\)](#), however, examine the stock indexes of six developed and nine developing countries by constructing positive attention and negative attention indicators based on the Google SVI of keywords related to stock markets. Their findings reveal that investor attention significantly affects index returns and the negative attention indicator is better at predicting the index returns than the positive indicator.

Although most of the studies reviewed in this section find a positive relationship between investor attention and stock

returns, several studies find the existence of an inverse relationship. The findings differ by examined countries and sample construction method, the process of the keyword selection, and the employed methodology. Another important point is that the relationship between investor attention and stock returns is usually examined in the US and China. In addition to the markets in these two countries, the stock markets in Japan, Korea, Germany, India, and Turkey have also been examined in studies with a single-country analysis. International studies that conduct a multicountry analysis focus on the index-level relationship.

### 3. Research methodology

In this study, we explore the relationship between investor attention and abnormal stock returns in 31 countries for the period March 2014 to December 2018. We also examine whether the geographic region, national culture, and market development have any impact on this relationship. Table 1 provides information about countries and indexes included in the sample.

Table 1  
Countries and indexes in the sample.

Country	Region	Index	DEV	IND	UAI	N
Argentina	Americas	Merval	Emerging	Low	High	11
Australia	Asia-Pacific	S&P/ASX 200	Developed	High	Low	138
Austria	Europe	ATX	Developed	Low	High	19
Belgium	Europe	BEL 20	Developed	High	High	14
Brazil	Americas	Bovespa	Emerging	Low	High	66
Canada	Americas	S&P/TSX Comp.	Developed	High	Low	159
Chile	Americas	IGPA	Emerging	Low	High	46
Denmark	Europe	OMXC 20	Developed	High	Low	17
Finland	Europe	OMXH 25	Developed	Low	High	22
France	Europe	CAC 40	Developed	High	High	40
Germany	Europe	DAX	Developed	High	High	31
India	Asia-Pacific	Nifty 50	Emerging	Low	Low	63
Indonesia	Asia-Pacific	LQ45	Emerging	Low	Low	30
Ireland	Europe	ISEQ All Share	Developed	High	Low	18
Italy	Europe	FTSE MIB Index	Developed	High	High	33
Malaysia	Asia-Pacific	KLCI	Emerging	Low	Low	30
Mexico	Americas	S&P/BMV IPC	Emerging	Low	High	35
Netherlands	Europe	AEX 25	Developed	High	Low	25
New Zealand	Asia-Pacific	S&P NZX 50	Developed	High	Low	24
Norway	Europe	OSE Benchmark	Developed	High	Low	25
Pakistan	Asia-Pacific	Karachi SE 100	Emerging	Low	High	46
Peru	Americas	S&P/BVL Gen.	Emerging	Low	High	14
Philippines	Asia-Pacific	PSEi	Emerging	Low	Low	16
Portugal	Europe	PSI 20	Developed	Low	High	14
Singapore	Asia-Pacific	FTSE STI	Developed	Low	Low	22
Spain	Europe	IBEX 35	Developed	Low	High	74
Sweden	Europe	OMXS 30	Developed	High	Low	31
Switzerland	Europe	SMI	Developed	High	Low	16
Turkey	Europe	BIST 100	Emerging	Low	High	100
UK	Europe	FTSE 100	Developed	High	Low	101
US	Americas	S&P 500	Developed	High	Low	532

Note: We use the MSCI market classification to assess market development. DEV is market development. Individualism (IND) and Uncertainty Avoidance (UAI) are two of Hofstede's (1983) cultural dimensions. N is the number of stocks in the index that are in the sample. We obtained data regarding national cultures from Hofstede Insights.

We measure investor attention using internet search volume data, obtained from Google Trends. To examine the influence of national culture, we use the individualism and uncertainty avoidance dimensions in Hofstede (1983) and obtain data from Hofstede Insights.<sup>1</sup> Stock and market data come from Thomson Reuters DataStream. For summary statistics of the variables used in this study, see Table S1 (available online). Further details about the sampling procedure, variables, and empirical models are given in the following sections.

#### 3.1. Sample

The sample is constructed by selecting the largest stock markets from three geographic regions: the Americas, Asia-Pacific, and Europe. We exclude countries that do not have at least one official/recognized language written in the Latin alphabet. For that reason, our regional division includes Europe, but not the Middle East and Africa (MENA), because most countries in that region either do not have large-enough stock markets to be useful or do not use the Latin alphabet. Additionally, because of the language criterion, we omit the stock exchanges of Japan, China, Hong Kong, and South Korea, even though they are among the largest in the Asia-Pacific region. The sample includes every stock that has ever been part of the countries' benchmark indexes during the sample period, March 2014 to December 2018. This period is chosen because Google Trends limits weekly internet search volume data to five years.

To address the survivorship bias, the sample includes inactive, closed, and delisted companies until they are no longer traded. As a robustness check, we conduct all the analyses in the study excluding these stocks. All stock data are adjusted to company events, such as stock splits, dividends, and offerings. We also update the search keywords after mergers and acquisitions. We eliminate stocks with zero search volume and end up with 1738 stocks and 417,554 weekly stock-level observations.

#### 3.2. Abnormal stock returns

We calculate the abnormal stock returns by subtracting the weekly expected returns from weekly realized returns.

$$AR_{i,t} = r_{i,t} - E(r)_{i,t} \quad (1)$$

where  $AR$  represents abnormal returns,  $r$  represents realized returns,  $i$  represents stocks, and  $t$  represents weeks.

We use benchmark indexes to proxy for the market portfolio and weekly interbank rates to proxy for the risk-free rates. For each year, we estimate a beta value by regressing the returns on each stock for the prior three years on the respective market returns.

Although we calculate abnormal returns as deviations from the capital asset pricing model (CAPM), the literature suggests

<sup>1</sup> <https://www.hofstede-insights.com/product/compare-countries/>.

that other factors, such as size, the book-to-market ratio (Fama & French, 1993), and momentum (Carhart, 1997), can also affect stock returns. Nevertheless, our study focuses on the blue-chip indexes in most countries. In most cases, stocks in these indexes are big stocks with high liquidity and do not vary greatly in some characteristics. Furthermore, 19 countries in our sample have fewer than 30 stocks, which makes it difficult to construct portfolios and calculate the factor exposure. Lastly, some studies in the literature (e.g., Ekinçi & Bulut, 2021; Joseph et al., 2011; Tan & Taş, 2019) find that investor attention is influential, even when expected returns are calculated with consideration of these factors. Although we do not expect the size and book-to-market factors to create great differences in our results, the absence of these factors should be noted.

### 3.3. Investor attention

Following the common approach in the literature, we measure investor attention with the Google search volume index (GSVI). GSVI does not reflect absolute search volumes. Google Trends normalizes and scales the data on a range from 0 to 100. For rarely searched keywords, search popularity is generated as zero.<sup>2</sup>

Following Vlastakis and Markellos (2012), we use company names in the search queries. Using stock tickers greatly shrinks our sample size because Google Trends does not share search data if the term is rarely searched. We believe that not having enough search volume for Google to produce data is related to individual investors' use of company names in their information search. In other words, the search volume data on stock tickers might sometimes hide the level of attention received by the stock.

To identify the keywords needed to obtain the Google search volume data, we follow a procedure similar to that of Adachi et al. (2017). For each company in the sample, we examine company logos and company Wikipedia pages to determine the most common use of the company names. We take this step because company logos often include the names of the companies with the widest recognition. Additionally, Wikipedia pages can be edited by anyone, which makes it an ideal tool for obtaining the company names that are widely used by the general population. We also remove the words "Holding," "Group," and "Inc." and the translations of them from the company names unless the final keyword is too generic (e.g., Apple), in which case we retain these words. We check the "Related topics" and "Related queries" sections in Google Trends to see whether there are suggestions unrelated to the company. If there are unrelated suggestions, we remove the company from our sample. To further alleviate concerns about possible noise in the search data, we use abnormal trading volume (AVOL) as an alternative measure of investor

attention, because calculation of it does not involve a keyword identification process.

Da et al. (2011) calculate abnormal investor attention to remove time trends and low-frequency seasonality. We follow their methodology and calculate abnormal investor attention as follows:

$$ASVI_{i,t} = \ln(SVI_{i,t}) - \ln[\text{Med}(SVI_{i,t-1}, \dots, SVI_{i,t-8})] \quad (2)$$

where  $ASVI$ ,  $SVI$ ,  $i$ , and  $t$ , respectively, represent the abnormal search volume index, the search volume index, the company, and the week.

Barber and Odean (2008) argue that when a stock experiences AVOL, it most likely attracts more attention from investors. Although ASVI is the common metric for measuring investor attention, AVOL is also heavily used. Using AVOL also allows us to check whether active and passive attention measures have consistent results. Following Barber and Odean (2008), we calculate AVOL as:

$$AVOL_{i,t} = \ln(VOL_{i,t}) - \ln[\text{Mean}(VOL_{i,t-1}, \dots, VOL_{i,t-52})] \quad (3)$$

where  $AVOL$ ,  $VOL$ ,  $i$ , and  $t$ , respectively, represent the abnormal trading volume, the trading volume, the stock, and time.

### 3.4. National culture

Hofstede (2011, 3) defines culture as "the collective programming of the mind that distinguishes the members of one group or category of people from others." Based on that definition, it can be argued that individual behaviors differ across cultures, including financial behavior. That is why we investigate the role of national culture in the relationship between investor attention and stock returns.

We use two of Hofstede's (1983) national culture dimensions: individualism (IND) and uncertainty avoidance (UAI). These dimensions have been previously studied in the cultural finance literature, and they have been associated with overconfidence and overreactions by investors (Chui et al., 2010; Schmeling, 2009). For each dimension, we calculate the median score, and, then, we cluster countries according to their score relative to the median. If a country's individualism score is higher (lower) than the median, that country is considered an individualistic (collectivist) country. Similarly, if a country's uncertainty avoidance score is higher (lower) than the median, that country is considered as a country with high uncertainty avoidance (low uncertainty avoidance).

### 3.5. Market development

Chui et al. (2010) argue that market development and market integrity can affect information flow and market efficiency. From this perspective, we examine whether there are any differences between emerging and developed markets. We use the country classification of Morgan Stanley Capital International (MSCI) to determine a country's market development. MSCI divides countries into frontier markets,

<sup>2</sup> [https://support.google.com/trends/answer/4365533?hl=en&ref\\_topic=6248052/](https://support.google.com/trends/answer/4365533?hl=en&ref_topic=6248052/).

emerging markets, and developed markets. Argentina is the only frontier market in the sample, and that is why we forgo the frontier markets category and consider Argentina an emerging market.

### 3.6. Empirical models

We first conduct the panel Granger-causality test of Dumitrescu and Hurlin (2012) for each country with the following models.<sup>3</sup>

$$AR_{i,t} = \alpha_i + \sum_{k=1}^n \beta_{i,k} \times ASVI_{i,t-k} + \sum_{k=1}^n \gamma_{i,k} \times AR_{i,t-k} + \varepsilon_{i,t} \quad (4)$$

$$ASVI_{i,t} = \alpha_i + \sum_{k=1}^n \beta_{i,k} \times ASVI_{i,t-k} + \sum_{k=1}^n \gamma_{i,k} \times AR_{i,t-k} + \varepsilon_{i,t} \quad (5)$$

where  $AR$  represents the abnormal return,  $ASVI$  represents the abnormal search volume index,  $i$  represents the stock, and  $t$  represents the week.

The null hypothesis is no causal relation. The number of lags is chosen optimally based on the Akaike information criterion (AIC). A panel Granger-causality test requires a strongly balanced dataset. For that reason, we use linear interpolation to replace the 8174 missing values in the abnormal return series. This number makes up 1.8% of the total 454,812 observations and is very small. That is why interpolation should not affect our results.

Before conducting panel Granger-causality tests, we check whether the interpolated abnormal return and ASVI series are stationary. For each country in the sample, we conduct separate Levin-Lin-Chu tests. Additionally, we conduct a Levin-Lin-Chu test for the full sample as well. In brief, the tests reveal large t-values, which shows that both series are stationary. The results also show that demeaning and including time trends do not change the results. For the t-values, see Table S2, available online.

Our second method is to use panel data regressions. We use fixed-effects regressions with heteroskedasticity-consistent standard errors throughout the study. Our choice of fixed-effects regressions is driven by the results of the Hausman test. We first estimate the predictive power of investor attention on abnormal returns with the following model.

$$AR_{i,t} = \alpha + \sum_{k=1}^4 \beta_k \times ASVI_{i,t-k} + \sum_{k=1}^4 \gamma_k \times AR_{i,t-k} + \delta_1 \times MV_{i,t} + \delta_2 \times MTBV_{i,t} + \varepsilon_{i,t} \quad (6)$$

where  $AR$ ,  $ASVI$ ,  $MV$ ,  $MTBV$ ,  $i$ , and  $t$ , respectively, represent the abnormal return, abnormal search volume index, natural logarithm of market value, natural logarithm of market-to-

book ratio, stock, and week. The last two terms are included in the model to control for size and value effects. The AIC gives a different optimal lag order for different countries. To ensure consistency and comparability, we follow Vozlyublennai (2014) and include four lags. As a robustness check, we run the regression with two lags and six lags as previously done by Vozlyublennai (2014) and Chen (2017).

We also check the effect of abnormal returns on abnormal investor attention. Barber and Odean (2008) argue that extreme returns attract investor attention irrespective of their signs. From this perspective, we take the absolute values of abnormal returns and estimate the following model.

$$ASVI_{i,t} = \alpha + \sum_{k=1}^4 \beta_k \times ASVI_{i,t-k} + \sum_{k=1}^4 \gamma_k \times AbsAR_{i,t-k} + \delta_1 \times MV_{i,t} + \delta_2 \times MTBV_{i,t} + \varepsilon_{i,t} \quad (7)$$

where  $AbsAR$ ,  $ASVI$ ,  $MV$ ,  $MTBV$ ,  $i$ , and  $t$ , respectively, represent the absolute value of abnormal return, abnormal search volume index, natural logarithm of market value, natural logarithm of market-to-book ratio, stock, and week.

## 4. Results

In this section, we first report the results of panel Granger-causality tests. Then, we move on to the results of the panel regressions. Lastly, we briefly explain our robustness checks.

### 4.1. Panel granger causality

Table 2 reports the panel Granger-causality test results for each country. Dumitrescu and Hurlin's (2012) test uses two statistics to interpret the significance of the causal relationship:  $\bar{Z}$  and  $\tilde{Z}$ . It is better to consider  $\bar{Z}$  statistics for large N and large T datasets but  $\tilde{Z}$  statistics for large N and small T datasets (Dumitrescu & Hurlin, 2012). Because we have a relatively large T, we only report the  $\bar{Z}$  statistics.

Panel A in Table 2 reports whether abnormal investor attention (ASVI) Granger causes abnormal returns, and Panel B reports the relation in the other direction. In 12 countries, the two variables have a unidirectional causal relationship. The ASVI Granger causes abnormal returns in Brazil, Indonesia, Netherlands, Norway, and Switzerland, but the direction of the relationship is the opposite in Argentina, Chile, Italy, Peru, Sweden, Turkey, and the US.

In Singapore and Spain, the ASVI and abnormal returns have a bidirectional causal relation. These results imply that the causal relation between the ASVI and stock returns is not the same worldwide and differs from country to country. To see whether we can identify any observable differences, we divide the sample into different groups based on geographic location, national culture, and market development. By doing so, we can also investigate the nature of the relation at a broader level.

<sup>3</sup> We follow the method of Dumitrescu and Hurlin (2012) because it tests heterogeneous non causality, which does not necessitate a causal relation for all the individuals.

Table 2  
Panel Granger-causality test results by country.

	(Panel A) AR – ASVI		(Panel B) ASVI – AR	
	Z	Optimal Lag	Z	Optimal Lag
Argentina	0.602	3	1.892*	7
Australia	1.626	2	0.891	1
Austria	0.930	4	-0.797	2
Belgium	-0.516	1	-0.104	1
Brazil	2.430**	1	-0.786	6
Canada	0.705	2	0.997	1
Chile	1.430	1	1.711*	7
Denmark	-1.045	1	1.298	7
Finland	-0.757	1	0.938	1
France	0.130	2	0.738	8
Germany	-0.456	2	-0.824	7
India	0.460	1	1.456	6
Indonesia	2.548**	1	0.229	1
Ireland	0.108	4	1.115	1
Italy	0.095	5	1.972**	1
Malaysia	1.435	5	0.401	7
Mexico	0.050	2	0.396	8
Netherlands	1.902*	3	1.393	2
New Zealand	0.253	5	-0.430	1
Norway	2.219**	5	0.575	6
Pakistan	-0.204	1	-0.951	1
Peru	-0.764	2	4.525***	2
Philippines	-0.614	1	-1.129	2
Portugal	-1.528	1	1.549	1
Singapore	1.802*	1	1.774*	2
Spain	1.760*	5	2.581***	7
Sweden	-0.983	1	2.608***	7
Switzerland	-1.683*	1	-0.082	2
Turkey	0.293	3	9.243***	1
UK	-0.926	1	-0.109	2
US	-0.363	1	4.538***	6

Notes: This table reports the panel Granger-causality test results for each country. Panel A reports the results of Equation (4), which shows the impact of abnormal investor attention (ASVI) on abnormal returns (AR) and Panel B reports the results of Equation (5), which shows the impact of abnormal returns on abnormal investor attention. The null hypothesis states no causal relation. \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , and \*  $p < 0.1$ .

Table 3  
Panel Granger causality test results by group.

	(Panel A) AR – ASVI		(Panel B) ASVI – AR	
	Z	Optimal Lag	Z	Optimal Lag
Global	0.5613	2	6.6740***	2
Americas	0.6138	1	3.2560***	2
Asia-Pacific	2.7993***	1	1.2153	1
Europe	0.6234	3	6.7802***	2
High IND	-0.1614	2	3.5836***	2
Low IND	1.2205	2	6.5526***	2
High UAI	-0.3111	2	6.0079***	1
Low UAI	0.7026	1	3.9698***	2
Developed	-0.0105	2	5.0234***	2
Emerging	1.1358	2	4.6397***	2

Notes: We divide the full sample based on geographic location, national culture, and market development. This table reports the panel Granger-causality test results for each group. Panel A reports the results of Equation (4), which shows the impact of abnormal investor attention (ASVI) on abnormal returns (AR) and Panel B reports the results of Equation (5), which shows the impact of abnormal returns on abnormal investor attention. The null hypothesis states no causal relation. \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , and \*  $p < 0.1$ .

The results in Table 3 show that the ASVI Granger causes abnormal returns only in the Asia-Pacific region, and the relation is unidirectional. Tantaopas et al. (2016) find that index returns Granger cause the ASVI of stock indexes in most Asia-Pacific countries. There are two possible reasons for the differences between our results and theirs. First, unlike Tantaopas et al. (2016), who focus on stock indexes, we examine the relationship at the stock level. Second, their sample includes countries that we do not examine, such as Hong Kong, Japan, Korea, and China. Abnormal returns Granger cause the ASVI in all groups other than the Asia-Pacific region. We observe no differences between any culture and market development groups. Nevertheless, they reveal that the causal relationship is more likely to flow from abnormal returns to the ASVI.

Many studies argue that individual investors are likely to extrapolate recent returns into the future (Barberis & Shleifer, 2003; De Long et al., 1990; Lakonishok et al., 1994). That is why it is not surprising to see that abnormal returns grab investors’ attention. The reason for the unidirectional relation may be related to the transaction size of individual investors. It is less likely for individual investors to have an impact on the market because of their relatively small trading volumes (Ding & Hou, 2015; Tantaopas et al., 2016).

Alternatively, investors try to obtain more information following an abnormality in the market, but this increased information demand does not turn into transactions. However, the investor attention literature demonstrates that an increase in attention leads to an increase in trading volume (Adachi et al., 2017; Aouadi et al., 2013), which makes the first explanation more plausible.

#### 4.2. Panel regressions

We continue our analysis with the panel regressions to see the magnitude and the directions of the relations. We first examine the predictive power of the ASVI on abnormal returns. Panel A in Table 4 reports the regression estimates of Equation (6). For the sake of brevity, we report only the ASVI coefficients. For the full estimation results, see Table S3, available online. The results show that the ASVI can predict abnormal returns in 11 countries at different lags. The three-week lagged ASVI has the most significant results, which shows that it takes time for investor attention to affect stock returns. The effect of investor attention on stock returns is negative in six countries and positive in five countries. If the positive price pressure hypothesis were true, we would see a significantly positive relationship between the ASVI and abnormal returns. However, we do not see a consistent pattern in the ASVI coefficients in Panel A in Table 4, as their significance and sign vary from country to country. These findings suggest that the validity of the positive price pressure hypothesis cannot be extended to international markets.

We also test the impact of abnormal returns on the ASVI. Barber and Odean (2008) argue that both positive and negative extreme returns can attract investors’ attention. In line with this argument, we use the absolute values of abnormal returns

Table 4  
The relationship between abnormal search volume index and abnormal return, by country.

	Panel A: The effect of ASVI on AR						Panel B: The effect of AbsAR on ASVI					
	ASVI	ASVI	ASVI	ASVI	Obs.	R <sup>2</sup>	AbsAR	AbsAR	AbsAR	AbsAR	Obs.	R <sup>2</sup>
	(t-1)	(t-2)	(t-3)	(t-4)			(t-1)	(t-2)	(t-3)	(t-4)		
Argentina	-0.001	-0.003	0.007	-0.004	2602	0.005	0.386**	-0.105	0.145	0.081	2602	0.038
Australia	0.000	0.001	0.001	0.000	30,975	0.005	0.207***	-0.059	-0.158***	-0.064	30,975	0.049
Austria	-0.001	-0.002	-0.003**	0.003**	4256	0.013	0.640*	0.081	-0.219	-0.112	4256	0.027
Belgium	0.002	0.000	0.000	0.001	3195	0.018	0.622**	0.457*	-0.189	-0.404**	3195	0.046
Brazil	-0.003*	-0.002	0.004**	-0.004**	14,797	0.007	0.028	-0.011	-0.006	0.049	14,797	0.093
Canada	0.002*	-0.001	0.000	-0.002*	36,378	0.005	0.314***	0.020	-0.072	-0.071	36,378	0.040
Chile	0.000	-0.001	0.000	0.001	11,362	0.013	-0.051	-0.095	-0.102	-0.177***	11,362	0.071
Denmark	0.000	-0.004	0.004	-0.002	3766	0.011	0.038	-0.164	-0.490*	0.085	3766	0.073
Finland	-0.001	0.001	0.003**	0.001	5097	0.017	0.287	-0.194	-0.278**	-0.348**	5097	0.063
France	-0.001	-0.001	0.000	0.002	9633	0.008	0.162	-0.182**	0.006	-0.148	9633	0.153
Germany	-0.002	-0.002	0.000	-0.003	7357	0.010	0.403***	0.082	-0.183	0.115	7357	0.090
India	0.000	0.000	-0.003*	0.002	15,470	0.007	0.284***	-0.144***	0.019	-0.081	15,470	0.168
Indonesia	0.003	0.000	-0.001	-0.002	7410	0.008	0.015	-0.138	0.091	-0.019	7410	0.048
Ireland	0.001	-0.001	0.008	-0.004	3365	0.019	0.363**	0.054	-0.220*	0.168	3365	0.065
Italy	0.002	0.001	0.000	-0.003	7167	0.011	0.505**	-0.446***	-0.037	-0.319*	7167	0.134
Malaysia	0.001	0.002	0.000	0.001	6968	0.010	0.604***	0.005	0.112	-0.152	6968	0.050
Mexico	-0.001	-0.001	-0.001	0.000	7494	0.008	0.300*	-0.048	-0.060	-0.063	7494	0.073
Netherlands	0.003	0.004	0.000	0.005**	5825	0.015	0.669***	0.228	-0.454**	-0.232	5825	0.061
New Zealand	-0.001	-0.002*	0.005***	-0.001	4683	0.010	0.036	-0.219	-0.359	-0.062	4683	0.023
Norway	-0.002*	0.002	0.002	0.002	5426	0.005	-0.038	0.119	0.162	0.097	5426	0.037
Pakistan	0.001	-0.001	0.001	-0.001	11,113	0.012	0.000	-0.068	-0.020	0.030	11,113	0.056
Peru	-0.004	0.001	-0.002	0.003	3211	0.018	0.244	0.003	-0.048	0.013	3211	0.036
Philippines	-0.001	0.002	0.000	0.001	3952	0.020	-0.038	-0.137	0.235	0.018	3952	0.069
Portugal	0.001	-0.004**	0.004	-0.001	3211	0.006	-0.112	0.028	-0.212	0.133	3211	0.049
Singapore	0.002	0.001	0.000	0.000	5434	0.007	1.067***	-0.195	0.085	-0.317	5434	0.090
Spain	0.000	0.002	0.001	-0.003	15,908	0.008	0.670***	-0.039	-0.106	-0.107	15,908	0.121
Sweden	-0.002	0.001	-0.002	0.000	6056	0.012	-0.304	-0.038	-0.527**	-0.107	6056	0.056
Switzerland	0.001	0.001	0.003**	0.002	3653	0.008	0.563	-0.049	-0.285	0.026	3653	0.088
Turkey	0.001	-0.001	0.001	0.000	18,702	0.009	0.387***	-0.028	0.019	-0.115*	18,702	0.085
UK	-0.001	0.001	0.002**	0.000	23,556	0.007	0.380***	-0.099	-0.064	0.000	23,556	0.090
US	0.000	0.000	0.000	0.000	12,2683	0.005	0.054	-0.119***	-0.085***	-0.105***	12,2683	0.093

Notes: Panel A reports the estimation results of Equation (6), which shows the effect of lagged abnormal investor attention (ASVI) on abnormal returns (AR). Panel B reports the estimation results of Equation (7), which shows the effect of lagged absolute abnormal returns (AbsAR) on abnormal investor attention. Natural logarithm of market value (MV) and natural logarithm of market-to-book ratio (MTBV) are used as control variables to account for size and value effects. We use fixed-effects regressions with heteroskedasticity consistent standard errors. The sample period is from March 2014 to December 2018. For full estimation results, see Tables S3 and S4, available online. \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , and \* $p < 0.1$ .

to depict a more appropriate research design. Panel B in Table 4 shows that one-week lagged absolute abnormal returns can significantly predict the ASVI in 16 countries. One-week lagged absolute abnormal returns positively affect investor attention, which is consistent with Barber and Odean (2008), who use extreme returns as a proxy for investor attention. For the full estimation results, see Table S4, available online.

We re-estimate Equations (6) and (7) for each region, culture, and market development group. The summary results are reported in Table 5. For the full estimation results, see Tables S5 and S6, available online. Panel A in Table 5 shows that the predictive power of the ASVI on abnormal returns is again concentrated on lag 3, which has a positive coefficient for each region, culture, and market development group. Three-week lagged ASVI has predictive power on abnormal returns in individualistic countries, countries with high uncertainty avoidance, and developed countries. Peng and Xiong (2006) suggest that overconfidence makes investors overreact to their information and causes prices to deviate from

fundamentals. Return predictability occurs as overreactions are corrected in the end, and prices revert to their fundamental values. In general, investors in individualistic countries and countries with high uncertainty avoidance are considered more prone to overreaction (Chui et al., 2010; Schmeling, 2009). Hence, susceptibility to overreaction by investors in these countries may be the underlying reason for the cultural differences we observe. Panel B in Table 5 shows that the impact of absolute abnormal returns on the ASVI is consistent across different cultures and development groups. The coefficients of one-week lagged absolute abnormal returns are significantly positive for every group. These results are not surprising as the GSVI and investor attention are usually associated with demand for information (Vlastakis & Markellos, 2012) to reduce uncertainty (Aouadi et al., 2013) and increase familiarity (Ding & Hou, 2015). It seems that, following abnormal returns, investors search for information that can help them better understand and estimate the price activity. Consistent with this explanation, investor attention returns to normal

Table 5  
The relationship between abnormal search volume index and abnormal returns, by group.

	Panel A: The effect of ASVI on AR						Panel B: The effect of AbsAR on ASVI					
	ASVI	ASVI	ASVI	ASVI	Obs.	R <sup>2</sup>	AbsAR	AbsAR	AbsAR	AbsAR	Obs.	R <sup>2</sup>
	(t-1)	(t-2)	(t-3)	(t-4)			(t-1)	(t-2)	(t-3)	(t-4)		
Global	0.0002	-0.0002	0.0006**	-0.0004	410,705	0.005	0.23***	-0.05***	-0.07***	-0.07***	410,705	0.071
Americas	0.0000	-0.0008*	0.0003	-0.0008**	198,527	0.005	0.13***	-0.06***	-0.07***	-0.08***	198,527	0.069
Asia-Pacific	0.0008	0.0002	0.0002	-0.0000	86,005	0.005	0.21***	-0.08**	-0.06	-0.05	86,005	0.061
Europe	-0.0000	0.0003	0.0012**	-0.0003	126,173	0.007	0.41***	-0.02	-0.10***	-0.06*	126,173	0.081
High IND	0.0001	-0.0001	0.0006*	-0.0003	278,815	0.005	0.21***	-0.06***	-0.12***	-0.08***	278,815	0.067
Low IND	0.0003	-0.0004	0.0005	-0.0006	131,890	0.006	0.28***	-0.04	-0.00	-0.06**	131,890	0.077
High UAI	-0.0000	-0.0005	0.0011**	-0.0007	128,758	0.006	0.29***	-0.04	-0.05	-0.08***	128,758	0.079
Low UAI	0.0003	0.0000	0.0003	-0.0003	281,947	0.005	0.20***	-0.06***	-0.09***	-0.06***	281,947	0.067
Developed	0.0001	0.0000	0.0006*	-0.0004	307,624	0.005	0.25***	-0.05**	-0.11***	-0.08***	307,624	0.070
Emerging	0.0003	-0.0006	0.0005	-0.0004	103,081	0.006	0.20***	-0.05	0.02	-0.05*	103,081	0.074

Notes: We divide the total sample based on geographic location, national culture, and market development. We use Hofstede's (1983) culture dimensions to assess national culture and MSCI market classification to assess market development. Panel A reports the estimation results of Equation (6), which shows the effect of lagged abnormal investor attention (ASVI) on abnormal returns (AR). Panel B reports the estimation results of Equation (7), which shows the effect of lagged absolute abnormal returns (AbsAR) on abnormal investor attention. Natural logarithm of market value (MV) and natural logarithm of market-to-book ratio (MTBV) are used as control variables. Information about the sample countries is in Table 1. We use fixed-effects regressions with heteroskedasticity consistent standard errors. The sample period is from March 2014 to December 2018. For full estimation results, see Tables S5 and S6, available online \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , and \*  $p < 0.1$ .

levels within a few weeks, as investors collect information and become more familiar with the situation. Nevertheless, we observe cultural differences in this reversal. Investor attention returns to normal levels within three weeks in individualistic countries and countries with low uncertainty avoidance, but we do not see a similar pattern in countries with low individualism and countries that are highly uncertainty avoidant.

The differences in the ease of dealing with uncertainty may explain the cross-cultural differences. Everything else being equal, investors who can deal with uncertainty more easily need less time and fewer resources to address any unexpected situations, which enables attention to return to normal levels in a shorter time. Both low uncertainty avoidance and high individualism are associated with greater ease in handling uncertainty and create this effect for investors.

Hofstede (2011, 10) argues that low uncertainty avoidance reflects how comfortable people feel when faced with unstructured situations, which are “unknown, surprising, different from usual.” Additionally, low uncertainty avoidance is associated with less stress and anxiety than high uncertainty avoidance (Hofstede, 2011). Because investors in cultures with low uncertainty avoidance usually have less stress and anxiety, they can handle uncertainty more easily. This creates quicker reversal, as investors need less time and attention to handle uncertain situations. A similar argument can be made for high individualism. In the psychology literature, a strong belief in one's predictions is seen as a reflection of overconfidence (Dunning et al., 1990; Moore & Healy, 2008). As such, overconfidence makes people believe that they know the truth and have highly precise estimates. The literature suggests that investors in individualistic countries are more overconfident than investors in collectivist countries (Chui et al., 2010). Investors in individualistic countries who are more confident in their estimations need fewer resources to handle uncertainty, which leads to quicker reversal, as shown in Table 5.

#### 4.3. Robustness checks

In this section, we check the robustness of our findings using a different proxy for investor attention, running alternative regression specifications, and constructing new samples.

##### 4.3.1. Alternative investor attention proxy

As a robustness check, we use another commonly used proxy for investor attention, namely AVOL, and re-estimate Equation (6). For the estimation results, see Table S7, available online. The results are somewhat different from those of the main model. AVOL coefficients are significant in 13 countries at various lags. Six countries have at least one significant coefficient in the main model and the robustness check, but the signs of the significant terms are the same in four of those countries. The two investor attention proxies here have two noticeable differences. First, the signs of the AVOL coefficients are almost always positive whereas the signs of the ASVI coefficients in Table 4 vary highly from country to country. Second, AVOL affects abnormal returns more quickly, as most of the significant terms are at lag one. Nevertheless, most of the countries in our sample do not have a significant relationship between abnormal returns and abnormal investor attention. However, we obtain significant and positive AVOL coefficients for each region, culture, and development group, which do not reflect the differences captured with ASVI.

Although ASVI and AVOL are both common measures of investor attention, they have some differences. One important difference is that ASVI is a stock-specific measure, whereas AVOL can demonstrate common movement with the market. Chordia et al. (2000) argue that liquidity and liquidity measures have commonalities, such as that the quoted spreads and effective spreads tend to comove with market-wide liquidity.

Brockman et al. (2009) find that commonality in liquidity is not specific to the US markets and exists in most markets in the world. As an important aspect of liquidity, the trading volume can be expected to have this commonality. Da et al. (2011) argue that the trading volume is related to many factors other than investor attention. Chordia et al. (2001) suggest that liquidity and trading activity are affected by many factors, such as interest rates, default spreads, volatility, and the day-of-the-week effect. Changes in these factors or important market-wide news can create significant differences in the trading volume without necessarily causing a stock-specific investor attention shock that affects ASVI. The different findings reported in Table 4 and S7 might be driven by this distinction, as AVOL can contain significant information that ASVI cannot capture. The difference could also be linked to the distinction between active and passive attention, as ASVI captures investors' demand for information that AVOL fails to fully reflect.

#### 4.3.2. Alternative regression specifications

Individualism and market development are usually inter-linked and affect each other. Ball (2001) argues that a bidirectional relationship exists between individualism and a country's economic development. Indeed, in our sample, the correlation coefficient between the individualism dummy and the market development dummy is 0.72. Although it is hard to isolate the effects of these highly correlated variables, we take two approaches to determine which factor is likely to be more influential.

First, we split the developed markets into two groups: individualistic and collectivist cultures. Then, we estimate Equations (6) and (7) for both groups separately to identify any differences between the developed/high-individualism countries and developed/low-individualism countries. For the estimation results, see Table S8, available online. In brief, the results show that the effect of ASVI is significant only for the developed/high-individualism countries, whereas the developed/low-individualism countries do not exhibit any significant results. Furthermore, we find that one-week lagged absolute abnormal returns increase investor attention in both groups, but we observe a significant reversal in the following weeks only in the high-individualism group.

Second, we use an alternative market development classification to reflect the relative market development in the sample. We use the Financial Market Development Index of the International Monetary Fund to divide countries into high-development and low-development groups. If a country's index score is higher than the median for the full sample, that country is considered high development; otherwise, low development. The resulting dummy variable still reflects the market development of a country and is less correlated with the individualism dummy, with a 0.55 correlation coefficient. When we re-estimate Equations (6) and (7) for high-development and low-development groups based on the new market development dummy, we obtain somewhat different results from those with our main model. For the full estimation results, see Table S9, available online. We find that ASVI does

not predict future abnormal returns in high-development countries at any lags whereas only the two-week lags significantly and negatively predict abnormal returns in low-development countries. Nevertheless, the effects of absolute abnormal returns on investor attention do not change with the new market development classification. We also find that one-week lagged abnormal returns are associated with increases in investor attention, and we see a reversal in the high-development group.

Overall, these results support our view that individualism is the main driving factor in cross-country differences, though we acknowledge that the effect of market development requires further analysis. To limit the scope and length of this study, we leave this matter for future studies. We think that the mechanism in the effect of individualism comes from certain psychological biases, such as overconfidence and being prone to overreaction. Perhaps, future studies will focus on these biases and examine investor-level data to see whether cultural or personal traits affect this relationship.

We also conduct two additional robustness checks based on the new regression specifications. First, we estimate Equation (6) with Fama-MacBeth (1973) regressions and calculate standard errors using Newey-West (1987) formula with eight lags. Second, we revise Equation (6) using two lags and six lags. To conserve space, we do not report these regression estimations.

The Fama-MacBeth (1973) regressions have similar but less significant findings. Eight countries demonstrate a significant association between ASVI and abnormal returns at various lags. Furthermore, we obtain less significant results with two lags and equivalent results with six lags, similar to those of Vozlyublennaiia (2014). Nevertheless, more countries start to have significant ASVI coefficients at different lags when the regression includes six lags. This might imply that ASVI affects stock returns slowly, but we do not observe a consistent pattern across countries, as the direction and timing vary from country to country.

#### 4.3.3. Alternative samples

The sample in this study consists mainly of blue-chip stocks, but because of differences in the stock exchanges across countries, the number of stocks is not distributed equally. We perform a robustness check by reconstructing the samples for certain countries. For Australia, Canada, Turkey, and the US, we resample stocks based on the indexes that are reported in Table S10, available online, and rerun Equations (6) and (7).

For the full estimation results, see Table S11, available online. In brief, the results show that the findings are mostly stable when we use different indexes in the sample, yet there are some differences with the main results. At the country level, Canada and Turkey have the same results, whereas Australia has a statistically significant three-week lagged ASVI coefficient at the 0.1 level, unlike the main model. In the US, a sample of Dow Jones Industrial Average (DJIA) stocks has insignificant results, whereas a sample of NASDAQ 100 stocks shows that three-week lagged ASVI can positively

predict abnormal returns. The results also show that the effects of absolute abnormal returns on ASVI are very similar to the main findings, with no significant difference that would affect our interpretation.

Apart from country-level findings, regional, cultural, and development-level groups have consistent results with the main models. For the sake of brevity, we do not report the estimation results but summarize the findings. The effect of ASVI on abnormal returns is almost entirely insignificant at the first two lags. High individualism, high uncertainty avoidance, and developed country groups still have significant and positive ASVI coefficients at lag three. Furthermore, the effect of one-week lagged abnormal returns on ASVI is significantly positive for each group, and a reversal occurs in high-individualism countries, countries with low uncertainty avoidance, and developed countries. Lastly, we rerun the regressions without the inactive, dead, and delisted stocks. All the results are the same as with the main model.<sup>4</sup>

## 5. Conclusion

In this study, we extend the literature on investor attention to the international level and examine its impact on individual stock returns in 31 countries. We also contribute to the cultural finance literature and examine the effects of limited investor attention on stock returns in different cultures. In addition, we examine the role of market development in this relationship.

Following prior studies, we use the internet search popularity of company names to measure investor attention. The search popularity data are published by Google Trends. To measure national culture, we use the individualism and uncertainty-avoidance dimensions by Hofstede (1983). We measure market development using MSCI's country classifications.

Our results show that the impact of investor attention on stock returns is not internationally consistent and is limited to one-third of our sample. Moreover, the sign and the magnitude of the relationship differ from country to country, which makes it difficult to come to any conclusions that apply all over the world. Nonetheless, we find that the predictive power of investor attention on abnormal returns exists in individualistic countries, countries with high uncertainty avoidance, and developed countries. A tendency to overreact might explain these differences, as individualistic countries and highly uncertainty-avoidant countries are usually associated with overreactions due to overconfidence and more emotional reactions, respectively (Chui et al., 2010; Schmeling, 2009). We also find that the effect of absolute abnormal returns on abnormal investor attention is positive and more consistent internationally. We also find that investor attention reverses to normal levels in three weeks in individualistic countries and countries with low uncertainty avoidance, but we do not observe the same reversal in collectivist and high uncertainty-avoidant countries.

Our sample includes stocks that constitute the benchmark indexes of the respective thirty-one countries. Although these indexes cover most of the stock market, they usually exclude small stocks. Arguably, the effect of investor attention might be more pronounced in small stocks. Therefore, future research should examine the impact of investor attention using a larger sample that includes small-cap stocks. Nevertheless, Google Trends do not share search volume data if the search popularity of a keyword is very low, so it might be hard to obtain the search popularity of small-cap stocks. Hence, future research could use another proxy for investor attention that captures the active attention of investors and that is available for small stocks.

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## Declaration of competing interest

None.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.bir.2021.09.001>.

## References

- Adachi, Y., Masuda, M., & Takeda, F. (2017). Google search intensity and its relationship to the returns and liquidity of Japanese startup stocks. *Pacific-Basin Finance Journal*, 46, 243–257. <https://doi.org/10.1016/j.pacfin.2017.09.009>
- Aouadi, A., Arouri, M., & Teulon, F. (2013). Investor attention and stock market activity: Evidence from France. *Economic Modelling*, 35, 674–681. <https://doi.org/10.1016/j.econmod.2013.08.034>
- Bae, K.-H., & Wang, W. (2012). What's in a "China" name? A test of investor attention hypothesis. *Financial Management*, 41(2), 429–455. <https://doi.org/10.1111/j.1755-053X.2012.01197.x>
- Ball, R. (2001). Individualism, collectivism, and economic development. *The Annals of the American Academy of Political and Social Science*, 573(1), 57–84. <https://doi.org/10.1177/000271620157300104>
- Bank, M., Larch, M., & Peter, G. (2011). Google search volume and its influence on liquidity and returns of German stocks. *Financial Markets and Portfolio Management*, 25(3), 239. <https://doi.org/10.1007/s11408-011-0165-y>
- Barberis, N., & Shleifer, A. (2003). Style investing. *Journal of Financial Economics*, 68(2), 161–199. [https://doi.org/10.1016/S0304-405X\(03\)00064-3](https://doi.org/10.1016/S0304-405X(03)00064-3)
- Barber, B. M., & Odean, T. (2008). All that glitters: The effect of attention and news on the buying behavior of individual and institutional investors. *Review of Financial Studies*, 21(2), 785–818. <https://doi.org/10.1093/rfs/hhm079>
- Barber, B. M., & Odean, T. (2013). The behavior of individual investors. In G. M. Constantinides, M. Harris, & R. M. Stulz (Eds.), *Handbook of the economics of finance* (Vol. 2, pp. 1533–1570). Amsterdam: Elsevier. <https://doi.org/10.1016/B978-0-44-459406-8.00022-6>
- Bijl, L., Kringhaug, G., Molnár, P., & Sandvik, E. (2016). Google searches and stock returns. *International Review of Financial Analysis*, 45, 150–156. <https://doi.org/10.1016/j.irfa.2016.03.015>

<sup>4</sup> The estimation results are available from the authors upon request.

- Brockman, P., Chung, D. Y., & Pérignon, C. (2009). Commonality in liquidity: A global perspective. *Journal of Financial and Quantitative Analysis*, 44(4), 851–882. <https://doi.org/10.1017/S0022109009990123>
- Carhart, M. M. (1997). On persistence in mutual fund performance. *The Journal of Finance*, 52(1), 57–82. <https://doi.org/10.1111/j.1540-6261.1997.tb03808.x>
- Chen, T. (2017). Investor attention and global stock returns. *The Journal of Behavioral Finance*, 18(3), 358–372. <https://doi.org/10.1080/15427560.2017.1331235>
- Chordia, T., Roll, R., & Subrahmanyam, A. (2000). Commonality in liquidity. *Journal of Financial Economics*, 56(1), 3–28. [https://doi.org/10.1016/S0304-405X\(99\)00057-4](https://doi.org/10.1016/S0304-405X(99)00057-4)
- Chordia, T., Roll, R., & Subrahmanyam, A. (2001). Market liquidity and trading activity. *The Journal of Finance*, 56(2), 501–530. <https://doi.org/10.1111/0022-1082.00335>
- Chui, A. C. W., Titman, S., & Wei, K. C. J. (2010). Individualism and momentum around the world. *The Journal of Finance*, 65(1), 361–392. <https://doi.org/10.1111/j.1540-6261.2009.01532.x>
- Da, Z., Engelberg, J., & Gao, P. (2011). In search of attention. *The Journal of Finance*, 66(5), 1461–1499. <https://doi.org/10.1111/j.1540-6261.2011.01679.x>
- De Long, J. B., Shleifer, A., Summers, L. H., & Waldmann, R. J. (1990). Positive feedback investment strategies and destabilizing rational speculation. *The Journal of Finance*, 45(2), 379. <https://doi.org/10.2307/2328662>
- Ding, R., & Hou, W. (2015). Retail investor attention and stock liquidity. *Journal of International Financial Markets, Institutions and Money*, 37, 12–26. <https://doi.org/10.1016/j.intfin.2015.04.001>
- Dumitrescu, E.-I., & Hurlin, C. (2012). Testing for Granger non-causality in heterogeneous panels. *Economic Modelling*, 29(4), 1450–1460. <https://doi.org/10.1016/j.econmod.2012.02.014>
- Dunning, D., Griffin, D. W., Milojkovic, J. D., & Ross, L. (1990). The overconfidence effect in social prediction. *Journal of Personality and Social Psychology*, 58(4), 568–581. <https://doi.org/10.1037//0022-3514.58.4.568>
- Ekinci, C., & Bulut, A. E. (2021). Google search and stock returns: A study on BIST 100 stocks. *Global Finance Journal*, 47, 100518. <https://doi.org/10.1016/j.gfj.2020.100518>
- Fama, E. F., & French, K. R. (1993). Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics*, 33(1), 3–56. [https://doi.org/10.1016/0304-405X\(93\)90023-5](https://doi.org/10.1016/0304-405X(93)90023-5)
- Fama, E. F., & MacBeth, J. D. (1973). Risk, return, and equilibrium: Empirical tests. *Journal of Political Economy*, 81(3), 607–636. <https://doi.org/10.1086/260061>
- Han, L., Li, Z., & Yin, L. (2018). Investor attention and stock returns: International evidence. *Emerging Markets Finance and Trade*, 54(14), 3168–3188. <https://doi.org/10.1080/1540496X.2017.1413980>
- Hofstede, G. (1983). The cultural relativity of organizational practices and theories. *Journal of International Business Studies*, 14(2), 75–89. <https://doi.org/10.1057/palgrave.jibs.8490867>
- Hofstede, G. (2011). Dimensionalizing cultures: The Hofstede model in context. *Online Readings in Psychology and Culture*, 2(1). <https://doi.org/10.9707/2307-0919.1014>
- Hu, B., & McInish, T. (2013). Greed and fear in financial markets: The case of stock spam e-mails. *The Journal of Behavioral Finance*, 14(2), 83–93. <https://doi.org/10.1080/15427560.2013.761630>
- Joseph, K., Babajide Wintoki, M., & Zhang, Z. (2011). Forecasting abnormal stock returns and trading volume using investor sentiment: Evidence from online search. *International Journal of Forecasting*, 27(4), 1116–1127. <https://doi.org/10.1016/j.ijforecast.2010.11.001>
- Kahneman, D. (1973). *Attention and effort*. Englewood Cliffs, N.J.: Prentice-Hall.
- Lakonishok, J., Shleifer, A., & Vishny, R. W. (1994). Contrarian investment, extrapolation, and risk. *The Journal of Finance*, 49(5), 1541–1578. <https://doi.org/10.1111/j.1540-6261.1994.tb04772.x>
- Liu, X., & Ye, Q. (2016). The different impacts of news-driven and self-initiated search volume on stock prices. *Information & Management*, 53(8), 997–1005. <https://doi.org/10.1016/j.im.2016.05.009>
- Moore, D. A., & Healy, P. J. (2008). The trouble with overconfidence. *Psychological Review*, 115(2), 502–517. <https://doi.org/10.1037/0033-295X.115.2.502>
- Nelson, K. K., Price, R. A., & Rountree, B. R. (2013). Are individual investors influenced by the optimism and credibility of stock spam recommendations? Investor reaction to stock spam. *Journal of Business Finance & Accounting*, 40(9–10), 1155–1183. <https://doi.org/10.1111/jbfa.12053>
- Newey, W. K., & West, K. D. (1987). A simple, positive semi-definite, heteroskedasticity and autocorrelation consistent covariance matrix. *Econometrica*, 55(3), 703–708. <https://doi.org/10.2307/1913610>
- Nguyen, C. P., Schinckus, C., & Hong Nguyen, T. V. (2019). Google search and stock returns in emerging markets. *Borsa İstanbul Review*, 19(4), 288–296. <https://doi.org/10.1016/j.bir.2019.07.001>
- Peng, D., Rao, Y., & Wang, M. (2016). Do top 10 lists of daily stock returns attract investor attention? Evidence from a natural experiment: Top 10 lists and investor attention. *International Review of Finance*, 16(4), 565–593. <https://doi.org/10.1111/irfi.12091>
- Peng, L., & Xiong, W. (2006). Investor attention, overconfidence and category learning. *Journal of Financial Economics*, 80(3), 563–602. <https://doi.org/10.1016/j.jfineco.2005.05.003>
- Perlin, M. S., Caldeira, J. F., Santos, A. A. P., & Pontuschka, M. (2017). Can we predict the financial markets based on google's search queries? Google search queries and financial markets. *Journal of Forecasting*, 36(4), 454–467. <https://doi.org/10.1002/for.2446>
- Pyo, D.-J. (2017). Can big data help predict financial market dynamics? Evidence from the Korean stock market. *East Asian Economic Review*, 21(2), 147–165. <https://doi.org/10.11644/KIEP.EAER.2017.21.2.327>
- Schmeling, M. (2009). Investor sentiment and stock returns: Some international evidence. *Journal of Empirical Finance*, 16(3), 394–408. <https://doi.org/10.1016/j.jempfin.2009.01.002>
- Shen, D., Zhang, Y., Xiong, X., & Zhang, W. (2017). Baidu index and predictability of Chinese stock returns. *Financial Innovation*, 3(1). <https://doi.org/10.1186/s40854-017-0053-1>
- Swamy, V., & Dharani, M. (2019). Investor attention using the Google search volume index: Impact on stock returns. *Review of Behavioral Finance*, 11(1), 55–69. <https://doi.org/10.1108/RBF-04-2018-0033>
- Tantaopas, P., Padungsaksawadi, C., & Treepongkaruna, S. (2016). Attention effect via internet search intensity in Asia-Pacific stock markets. *Pacific Basin Finance Journal*, 38, 107–124. <https://doi.org/10.1016/j.pacfin.2016.03.008>
- Tan, D. S., & Taş, O. (2019). Investor attention and stock returns: Evidence from Borsa İstanbul. *Borsa İstanbul Review*, 19(2), 106–116. <https://doi.org/10.1016/j.bir.2018.10.003>
- Vlastakis, N., & Markellos, R. N. (2012). Information demand and stock market volatility. *Journal of Banking & Finance*, 36(6), 1808–1821. <https://doi.org/10.1016/j.jbankfin.2012.02.007>
- Vozlyublennai, N. (2014). Investor attention, index performance, and return predictability. *Journal of Banking & Finance*, 41, 17–35. <https://doi.org/10.1016/j.jbankfin.2013.12.010>
- Ying, Q., Kong, D., & Luo, D. (2015). Investor attention, institutional ownership, and stock return: Empirical evidence from China. *Emerging Markets Finance and Trade*, 51(3), 672–685. <https://doi.org/10.1080/1540496X.2015.1046339>
- Yuan, Y. (2015). Market-wide attention, trading, and stock returns. *Journal of Financial Economics*, 116(3), 548–564. <https://doi.org/10.1016/j.jfineco.2015.03.006>
- Yuan, Z., & Wenbin, B. (2014). The impact of investors' attention on stock returns: Study based on Baidu Index. In *2014 11th international conference on service systems and service management (ICSSSM)* (pp. 1–5). <https://doi.org/10.1109/ICSSSM.2014.6874058>
- Zhang, W., Shen, D., Zhang, Y., & Xiong, X. (2013). Open source information, investor attention, and asset pricing. *Economic Modelling*, 33, 613–619. <https://doi.org/10.1016/j.econmod.2013.03.018>
- Zhang, B., & Wang, Y. (2015). Limited attention of individual investors and stock performance: Evidence from the ChiNext market. *Economic Modelling*, 50, 94–104. <https://doi.org/10.1016/j.econmod.2015.06.009>