ISSN 1023-2842
中山管理評論　　2015 年六月號
第二十三卷第二期　　p.631-656
DOI: 10.6160/2015.06.04

投資人關注對多空頭市場的不對稱效應研究

Asymmetric Effects of Investor Attention on Stock Returns in Bull and Bear Markets

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Suggested Citation: Huang, T. L., 2015, "Asymmetric Effects of Investor Attention on Stock Returns in Bull and Bear Markets," **Sun Yat-sen Management Review**, Vol. 23, No. 2, 631-656.

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摘要

近期諸多研究發現：吸引投資人目光的股票，其股價往往會上漲。然而，這些研究忽略了市場狀態所帶來的影響。究竟市場狀態是否及如何影響投資人目光？此議題尚未有充份的實證分析。為填補此知識缺口，本研究以臺灣上市公司為樣本，探討投資人關注於多空頭市場中對股票報酬的影響。實證結果發現：投資人對股票報酬所產生的關注效應，會因市場狀況不同而改變。關注效應於多頭市場中的影響幅度會強於空頭市場。此發現顯示，相較於空頭市場，多頭市場所吸引到的投資人目光，會有較多的比例轉為對股價的正向上漲壓力。隱含著投資人受市場氛圍的影響，較願意化為實際行動進入多頭市場購買股票，而非僅是觀望。

關鍵詞：投資人關注、市場狀態、股票報酬、Google 搜尋量指標

Abstract

Using various proxies for investor attention, past studies find that attention-grabbing stocks tend to experience positive price pressure. However, few studies consider the influences of market states. Whether market states affect investor attention has not been fully explored. To fill up the gap, this study explores the attention effect on stock returns across market states using a sample of firms in Taiwan. The findings show that the attention effect varies under different market conditions. Specifically, investors are relatively active when the market expresses good prospects. The attention effect of investors on stock returns is stronger in a bull market than in a bear market. This result suggests a rising stock market draws more investor attention that translates to positive price pressures than a declining stock market does. Therefore, the attention effect is found varying with market states.

Keywords: Investor Attention, Market States, Bull and Bear Periods, Stock Returns, Google Search Volume Index

1. INTRODUCTION

The attention effect refers to a phenomenon that attention-grabbing stocks are likely to experience positive price pressure (Barber & Odean, 2008; Da et al., 2011b). Barber & Odean (2008) suggest that such positive price pressure comes from attention of individual investors who are net buyers of these stocks. They explain that individual investors need to choose from a wide range of stocks when buying, but can only sell what they own when selling. Consequently, investors' attention reveals their intention and preference which might in turn result in net buying and produces positive price pressure.

Testing the attention effect is a challenging task for lack of a direct measure of investor attention (Da et al., 2011b). Despite the difficulty, previous studies have documented the existence of the attention effect using a variety of proxies for investor attention, such as advertising expenses (Lou, 2014), media coverage (Fang & Peress, 2009), abnormal trading volume (Hou et al., 2008), extreme returns, and news and headlines (Barber & Odean, 2008). However, these proxies are not direct and probably suffer from a question of validity[1]. Recently, Da et al. (2011b) propose a direct measure of investor attention using Google Search Volume Index (SVI). They find that abnormal rises in SVI can predict positive stock returns and thus confirm the attention theory of Barber & Odean (2008). Due to popularity of Google search engine, SVI is found having the ability to predict numerous economic activities (Choi & Varian, 2009; Bank et al., 2011; Da et al., 2011a, 2011b; Mondria & Wu, 2011).

However, few of these studies take into account the impacts caused by market states, which have proven to be a factor of investor sentiment. It is argued that

[1] See Da et al. (2011b) for more details.

market states might affect the trading behavior of investors, and thus moderate the attention effect on stock returns. A bear market, for example, tends to fuel investors' fears of losing money and drive investors to sell stocks irrationally. Consequently, there should be more selling activities than buying ones in the stock market when the market falls, particularly during periods of crisis. Moreover, in a bear market, stocks with falling prices are not attractive so that investors tend to shift their investments to risk-free assets. As a result, positive price pressure predicted by the attention theory will abate due to the shift of investor attention. In a word, fear that spreads in a bear market usually leads to reduced net buying and might thus cause the attention effect to be weak, or even insignificant.

On the other hand, the attention effect is supposed to be strong and significant in a bull market. Using thirty of the largest stocks traded on NYSE and NASDAQ as a sample, Vlastakis & Markellos (2012) find that investors significantly demand more information via the Internet during periods of higher returns. Their finding suggests that investor attention measured by SVI might be also affected by market states. If market states affect investor attention in that manner, the predictive power of SVI for future stock returns documented by Da et al. (2011b) is supposed to differ across market states. However, whether market states affect investor attention has not been fully explored. Therefore, this study endeavors to examine whether and how market states affect the attention effect on stock returns.

This study follows the approach of Pagan & Sossounov (2003) to classifying market states and analyzes the behavior of the Taiwan stock market over the 2004-2012 period with emphasis on the attention effect across market states. The reason for selecting the Taiwan stock market is because individual investors in Taiwan account for a high proportion of trading volume in the Taiwan stock market[2]. Because the attention theory of Barber & Odean (2008) emphasizes the influence of individual investors on capital markets, the setting of the Taiwan stock market is expected to strengthen the attention effect on stock returns. Following previous studies, SVI is used as a direct measure of investor attention. Moreover, besides bull and bear markets, this analysis also takes a neutral market state into account,

[2] Barber et al. (2005) suggest that individual investors occupy about one-third of Taiwan's population and hold more than half of total stock ownership in 2000.

thus providing a new perspective of the attention effect.

Using SVI as a proxy for investor attention, this paper finds the influences of investor attention on stocks returns are statistically significant in neutral and bull market periods. Moreover, the attention effect is stronger in a bull market than in a neutral market. However, during bear market periods, SVI lacks its predictive power for stock returns. The findings suggest that the attention effect varies across bull, bear, and neutral markets. Overall, these findings support the hypothesis that market states alter the influences of investor attention on stocks returns. Accordingly, future researches on the attention effect need to consider the impact of market states when assessing the attention effect.

The rest of the paper is organized as follows. The next section provides theoretical background and reviews the relevant literature. Section 3 presents the methodology of classifying market states. Section 4 describes data and sample construction. Section 5 presents empirical findings and robustness analyses. The final section offers concluding remarks.

2. THEORETICAL BACKGROUND AND LITERATURE REVIEW

2.1. The Attention Effect

Two principal schools of thought have addressed the economic effect of investor attention on stock returns. Merton (1987) argue that firms which capture less investor attention have to offer higher stock returns so that investors can be compensated for imperfect diversification due to incomplete information. Fang & Peress (2009) provide evidence to support the argument of Merton (1987). To approximate attention attracted by companies, they use the number of published newspaper articles, referred to as media coverage, and find that stocks without media coverage earn a higher return than those with extensive media coverage. This is because investors of firms with less media coverage suffer a higher cost due

to information asymmetry and require a higher stock return as a compensation for the risk. The other school of thought postulates an opposite effect of investor attention. According to the attention theory of Barber & Odean (2008), individual investors are net buyers of attention-grabbing stocks; an increase in investor attention leads to net buying and thus results in positive price pressure.

2.2. Google Search Volume Index

In the modern society, the Internet appears to be the largest pool of information available to almost everyone (Bank et al., 2011). The invention of search engine also accelerates the rate of information gathering. Using company names or stock symbols as keywords, investors may take advantage of search engines to gather information. Among a variety of search engines, Google may be the most popular. For example, Google had a market share close to almost 90% in 2010 in the German search engine market. Moreover, Google accounted for 72.1% of all search queries performed in the United States in 2009. Google is the leading representative of search engines and the search volume it reports is thus likely to be representative of the internet search behavior of the general population. With a comprehensive analysis, Da et al. (2011b) argue that Google Search Volume Index (SVI) can be a direct measure of investor attention because when a user searches for a stock in Google, he is certainly paying attention to it. Using a sample of Russell 3000 stocks, they also find that an abnormal increase in SVI predicts higher stock prices in the next two weeks. Similarly, Bank et al. (2011) find evidence that an increase in SVI is associated with temporarily higher future returns. Overall, the documented predictive power of SVI for stock returns supports the attention theory of Barber & Odean (2008).

2.3. Market States

Like economics need to face business cycles, capital markets also experience a series of cycles of ups and downs throughout the years. Long-term upward and downward market trends often lead to bull and bear markets, respectively. Several interpretations have been made on the phenomenon. For example, some economists

explain that irrational animal spirit causes the market to cyclically but erratically swing between two extreme market states (Shiller, 1992; Keynes, 2006; Galbraith, 2009). An alternative view argues that short-term deviations from the fundamental will perish in the long run and market index shall move within bounds (Siegel, 1998). Due to its enormous impacts, market states have received considerable attention from both academics and practitioners. Pagan & Sossounov (2003) offer an approach to studying the characteristics of bull and bear regimes in monthly stock prices. They first identify potential peaks and troughs that can be regarded as turning points of business cycles. Then, they impose minimum duration constraints on these cycles to determine the bull and bear periods. Edwards et al. (2003) perform a similar analysis and find that market states in emerging countries tend to have short duration but large shift as compared with those in developed countries.

2.4. Hypotheses Development

The attention theory of Barber & Odean (2008) predicts that investor attention produces positive price pressure upon attention-grabbing stocks. However, when market falls, fear often causes the number of buyers of attention-grabbing stocks to be less than the number of sellers of the same stocks. The phenomenon occurs because investors are reluctant to trade for fear of bearing substantial risks embedded in the bear market. Their reluctance usually reduces the amount of net buying and thus drops the attention effect predicted by Barber & Odean (2008). Accordingly, market states which lead to irrational sales probably invalidate the positive price pressure predicted by the attention theory of Barber & Odean (2008). Therefore, this study hypothesizes that the predictive power of SVI for stock returns is more powerful in a bull market than in a bear market.

3. DATA AND SAMPLE CONSTRUCTION

Following previous studies (for example, Bank et al. (2011) and Da et al. (2011b)), this study uses Google Search Volume Index (SVI) as a proxy for investor attention. Since data on SVI is not available prior to 2004 from Google Insights for Search, the sample is limited to the period from January 2004 to October 2012. This study focuses on all listed common stocks ever traded on the Taiwan Stock Exchange (TWSE) during the period and thus obtains a sample of 866 common stocks. For each stock in the sample, the corresponding time series of internet search activity is obtained from Google Insights for Search. To avoid arbitrariness and assure the reliability of the analysis, this study employs for each firm its abbreviated name as given by Taiwan Stock Exchange Corporation (TWSE)[3]. These abbreviated company names are commonly seen on mass media and official websites and are quite recognizable to investors. Since Google Insights designates a certain threshold of traffic for search terms, this study obtains SVI data only on 805 common stocks, of which 542 are at weekly frequency[4]. Stocks whose abbreviated firm names have a generic meaning or sound indistinguishable are removed[5]. As a result, the sample contains a total of 217,175 firm-week observations. Moreover, both stock returns and market returns are winsorized by the highest and lowest 1%.

To measure stock trading activity and to construct traditional asset pricing models, all relevant data are collected from the Taiwan Economic Journal database (TEJ), including trading volume, trading volume in NT dollars, stock turnover rate, market information, closing price, risk free rate, market capitalization, book values, and equity values. This study follows conventional approaches to evaluating asset

[3] See http://www.twse.com.tw/en/ .

[4] Those with low volume might be inaccessible or might appear in the form of monthly frequency. Moreover, Google Insights does not return a valid SVI for some of these queries. If a term is rarely searched, Google Insights will return a zero value for that ticker's SVI.

[5] Due to ambiguity, SVIs for these stocks are likely to be higher than they should be. For example, the abbreviated firm name for stock code 9928 is "Greater Taipei", which exhibits a geographical meaning. Another example is "Elite" for stock code 2331, which also possesses multiple meanings.

pricing factors. Take the momentum factor for example. All stocks with a formation period of six months are ranked and then grouped into three portfolios based on stock performance. The top 30% stocks constitute the winner portfolio, while the 30% worst ones form the loser portfolio. Return on the winner portfolio minus return on the loser portfolio yields the momentum factor. For the risk-free rate, this study uses the one-month money market rate. Table 1 provides definitions of all variables considered in this paper.

Table 1: Variable Definition

Variable	Definition
Variables Related to Investor Attention	
SVI	Aggregate search frequency from Google Trends based on official abbreviation of company name
Variables Related to Stock Characteristics	
FirmRet	The return of the stock during week t
Vol	Trading volume; the number of shares traded volume
VolNTD	Trading volume in NT Dollars; the number of shares traded volume multiplied by the respective price
Turnover	The fraction of shares traded relative to the number shares outstanding
Typical Asset Pricing Factors	
MktRet	Market Return
Rf	Risk free return
MktRetRf	The market risk premium is the return on a value-weighted Taiwan market index less the return on the risk free asset.
SMB	The return on a value-weighted portfolio of small stocks minus the return on a value-weighted portfolio of big stocks
HML	The return on a value-weighted portfolio of high book-to-market stocks minus that of low book-to-market stocks
MOM	The return on a value-weighted portfolio of stocks with high recent six-month returns minus the return on a value-weighted portfolio of stocks with low recent six-month returns.

Notes: This table provides definitions for all variables used in this study.

Data source: this research

4. METHODOLOGY

Pagan & Sossounov (2003) offer a statistical approach to classifying the market states into bull and bear markets. This approach uses a sequence of rules to isolate patterns in stock returns. It first locates the turning points, peaks and troughs, of the stock index series. These turning points mark the beginning when the market swings from bullish to bearish or vice versa. However, when the change between them is less than 20%, the trend during that interval appears to be insignificant. This study follows their approach to determine the peaks and the troughs of the stock market, and extend their approach by taking into account the neutral market state, which seems to be neither bull nor bear. Accordingly, market states are classified into three categories in this study, which might be bull, bear, or neutral. The specific procedures for identifying different market states are as follows:

4.1. The Approach of Pagan & Sossounov (2003)

Step 1: Locating the peak and the trough of the stock market

In the approach of Pagan & Sossounov (2003), the peak (trough) is defined as a relatively high (low) point of a stock index during a window of time. Specifically, the peak (trough) is turning a point where the stock market index is higher (lower) than it has been over a prior period and a subsequent period. The length of the period may slightly affect the results. Pagan & Sossounov (2003) suggest that eight month would be a proper choice. Following them and matching weekly SVI data, the length of period is set to 32 weeks. Suppose P_t represents the stock index at week *t*. A peak needs to satisfies

$$[P_{t-32}, ..., P_{t-1} < P_t > P_{t+1}, ..., P_{t+32}], \quad (1)$$

while a trough at week *t* requires

$$[P_{t-32}, ..., P_{t-1} > P_t < P_{t+1}, ..., P_{t+32}], \quad (2)$$

In other words, the peak (trough) is at the midpoint and possesses the highest (lowest) value in a window of 65 weeks.

Step 2: Classifying the market states

A bull market state is a continuous uptrend between a trough and a peak over a long period, while a bear market state is a downward trend beginning from a peak and ending at trough. Moreover, a definitive market state requires a cumulative change of above 20% in the in stock index and its duration, the length of time between trough and peak, should be at least 16 weeks. After identifying bull and bear periods, unspecified states are classified, which are neither bear nor bull, as neutral market states.

4.2. Examining the Attention Effect across Market States

To explore whether and how investor attention affects stock returns across market states, a panel regression analysis is conducted for each subsample based on the previously defined market states. Specifically, the *SVI* variable is used to proxy for investor attention and regress the weekly stock returns on it. Control variables include typical asset pricing factors such as system risk derived from market returns ($MktRet_t$), size (SMB_t), book-to-market (HML_t), and momentum (MOM_t), which come from three traditional asset pricing models: the market model (CAPM), the Fama & French (1993) three-factor model, and the Carhart (1997) four-factor model. Moreover, firm fixed effects are included in all panel regressions. These models can be mathematically expressed as the following equations:

$$FirmRet_{it} = b_0 + b_1 SVI_{it} + b_2\, MktRet_t + c_i + u_t + \varepsilon_{i,t} \tag{3}$$

$$FirmRet_{it} = b_0 + b_1 SVI_{it} + b_2\, MktRet_t + b_3\, SMB_t + b_4\, HML_t + c_i + u_t + \varepsilon_{i,t} \tag{4}$$

$$FirmRet_{it} = b_0 + b_1 SVI_{it} + b_2\, MktRet_t + b_3\, SMB_t + b_4\, HML_t + b_5\, MOM_t + c_i + u_t + \varepsilon_{i,t} \tag{5}$$

5. EMPIRICAL RESULTS

5.1. Classification of Market State

Using the approach of Pagan & Sossounov (2003) to classifying market states divides the whole sample period into nine sub-periods. Of these sub-periods, five fit the Pagan and Sossounov's definition of bull markets, three classified as being of the bear market states, while the rest are viewed as neutral market states. Table 2 lists each sub-period with relevant information, such as the exact beginning and ending dates for the bull and bear periods, and their corresponding market index. The beginning of each sub-period can be seen as dividing points in the timeline. Table 3 shows the summary statistics of market characteristics for each sub-period. The evolution of the stock index is also plotted in Figure 1 along with the bear, neutral, and bull market states. The dark shaded portions denote bull markets, the light gray portions are bear markets, and the white portions of the figure are neutral markets. One can observe that the bull, bear, and neutral market states appear to be consistent with the trend of the market in Taiwan.

The seventh period is particularly worth noting. It is defined as a neutral market state by the approach of Pagan & Sossounov (2003). However, Figure 1 shows an obvious upward trend during the seventh period, making this period appear to be a bull market state rather than a neutral market state. This maybe because the stock market index dramatically drops right after the beginning of the period, 2010/01/15, but slowly move upward for most of the time during the period till the end, 2011/01/28. Therefore, the seventh period is reasonably treated as a bull market state. However, for consistency, this study follows the approach of Pagan & Sossounov (2003) and views the seventh period as a neutral market period. The evidence implies that the results of classifying market states may be slightly sensitive to the choice of the window width. However, a sensitivity analysis suggests that the inference is robust.

In addition, there are several features to note. As shown in Table 2, the number of days in each period varies substantially. On average, the bull market periods last longer than periods of bear and neutral market states. They also

account for most of the observations in the sample, reflecting the fact that most of the time the Taiwan stock market has been in a bull market state. In comparison, the length of each bear market period is relatively short, which lasts no more than 392 days during the whole sample period. The bear market period with the shortest duration begins from 2004/03/05 to 2004/07/23 (about 140 days), while the shortest bull market period, happening around 2008/11/21, lasts for 420 days. This phenomenon is probably due to the efforts of market administrators to eagerly revive the economic and make it come out of recession. Likewise, before 2011, the magnitude of upward movement in a bull market period, which has at least a 71% cumulative return, is apparently larger than that of downward movement in a bear market, which has at most a negative 57% cumulative return.

Table 2: Market Characteristics across Different Periods

		Period			Market Index		
No	Market State	Beginning	Ending	Days	Beginning	Ending	Change (20%)
1	Bull	2002/10/11	2004/03/05	511	3850.04	6943.68	80.35%
2	Bear	2004/03/05	2004/07/23	140	6943.68	5373.85	-22.61%
3	Neutral	2004/07/23	2005/10/28	462	5373.85	5632.97	4.82%
4	Bull	2005/10/28	2007/10/26	728	5632.97	9631.51	70.98%
5	Bear	2007/10/26	2008/11/21	392	9631.51	4171.10	-56.69%
6	Bull	2008/11/21	2010/01/15	420	4171.10	8356.89	100.35%
7	Neutral	2010/01/15	2011/01/28	378	8356.89	9145.35	9.43%
8	Bear	2011/01/28	2011/11/25	301	9145.35	6784.52	-25.81%
9	Bull	2011/11/25	2013/12/31	767	6784.52	8611.51	26.93%

Notes: This study extends the framework of Pagan & Sossounov (2003) and classify the Taiwan stock market into bull, bear and neutral market states. The table shows the breakpoints that divide the whole sample period into sub-periods of distinguished market states.

Data source: this research

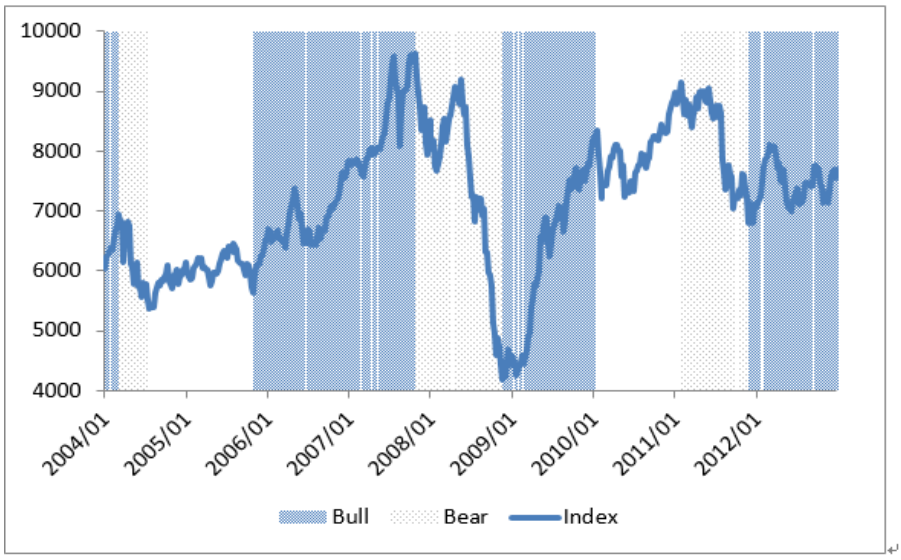

Figure 1: Distribution of Market States

This figure plots the movement of the Taiwan market index during Jan 2004 to October 2012. This study uses the approach of Pagan & Sossounov (2003) to classify the Taiwan market into bull, bear and neutral markets in this sample. Horizontal axis represents time, and vertical axis represents stock index. Dark gray shadow, white and light gray shadow areas are bull market, neutral market and bear market states, respectively.
Data source: this research

Table 3: Descriptive Statistics of the Taiwan Market across Different Periods

Periods	1		2		3		4		5	
Variables	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd
SVI	23.35	30.04	27.84	31.86	25.86	27.06	24.56	20.12	25.87	17.76
FirmRet	2.55	6.13	-1.40	7.32	-0.07	4.93	0.65	5.87	-1.63	7.70
MktRet	1.33	1.04	-1.04	4.42	0.04	1.93	0.47	2.28	-1.46	4.04
Vol	49878	96913	34794	94731	21175	48104	25134	50597	25881	55517
Turnover	8.33	8.56	4.64	6.10	3.25	4.95	4.65	6.39	3.31	4.35
Periods	6		7		8		9		Total	
Variables	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd
SVI	26.73	16.60	26.99	15.68	25.52	15.50	25.43	16.86	25.79	20.06
FirmRet	1.36	6.84	0.18	5.13	-0.70	5.13	-0.08	5.27	0.03	6.06
MktRet	1.04	3.50	0.14	2.33	-0.53	2.95	-0.03	2.49	0.00	2.97
Vol	33968	70893	25819	51493	20392	42285	16426	38433	25099	55641
Turnover	4.98	6.13	4.32	5.83	2.92	3.86	2.40	3.55	3.90	5.48

Notes: This table presents the summary statistics for the variables defined in Table 1.
Data source: this research

5.2. Stock Characteristics across Market States

Table 4 presents the summary statistics of the Taiwan stock market in terms of the full sample and different market states: bear, neutral, and, bull. As mentioned before, the bull market state accounts for most of the observations in the sample with a total of 104,913 observations.

Meanwhile, the bull market state yields an average market return (*MktRet*) of 0.52%, apparently higher than what the bear market state creates, an average market return of -1.04%. The difference is larger in terms of average firm returns (*FirmRet*). Overall, the difference between the bull market state and the bear market state in average market returns and that in average firm returns justifies the approach of Pagan & Sossounov (2003) to classifying market states.

The corresponding standard deviations of market returns for bear, neutral, and bull market states are 3.75, 2.13, and 2.73, respectively. The pattern is similar but with a larger magnitude in terms of firm returns. The finding shows that return volatility appears to be higher in the bear market periods than in the bull market periods, quite consistent with expectation.

The mean of trading volume (*Vol*) and average turnover rate (*Turnover*) is also found slightly higher in a bull market than in a bear market. Thus, on average, investors are more willing to trade in a bull market than in a bear market, consistent with expectation. However, both *Vol* and *Turnover* are low in the neutral market state relative to in the other states. Accordingly, a neutral market may imply uncertainty that prevent investors from trading.

However, the average Google Search Volume Index (*SVI*) level in bull market periods (mean *SVI* = 25.34) is slightly lower than in the bear market (mean *SVI* = 26.04). The finding seems to contradict the evidence of Vlastakis & Markellos (2012) that investors significantly demand more information via the Internet during periods of higher returns.

Table 4: Descriptive Statistics of the Taiwan Market Under Different Market States

Market State	Variables	mean	sd	min	med.	max	skewness	kurtosis
	SVI	25.79	20.06	0.00	24.00	100.00	0.67	3.25
	FirmRet	0.03	6.06	-40.58	-0.02	103.20	0.23	8.58
Overall Market	*MktRet*	0.00	2.97	-11.30	0.31	9.40	-0.69	4.49
N = 217,175	*Vol*	25099	55641	1	6754	2227000	7	104
	VolNTD	869708	2324000	0	158029	128600000	8	129
	Turnover	3.90	5.48	0.00	1.97	109.00	3.66	24.48
	SVI	26.04	19.92	0.00	24.00	100.00	0.83	3.74
	FirmRet	-1.23	6.77	-40.58	-0.81	58.54	-0.35	5.51
Bear Market	*MktRet*	-1.04	3.75	-11.30	-0.89	6.50	-0.50	3.07
N = 56,676	*Vol*	25166	59423	1	5982	2227000	8	141
	VolNTD	953661	2716000	1	149503	65730000	8	86
	Turnover	3.37	4.54	0.00	1.85	82.56	3.87	27.29
	SVI	26.40	22.39	0.00	24.00	100.00	0.60	2.73
	FirmRet	0.05	5.03	-36.11	-0.02	83.08	0.35	9.04
Neutral Market	*MktRet*	0.09	2.13	-7.13	0.15	4.21	-0.77	4.04
N = 55,586	*Vol*	23385	49799	1	6584	1319000	6	61
	VolNTD	756267	1904000	0	153416	45880000	7	77
	Turnover	3.76	5.41	0.00	1.94	109.00	4.18	32.28
	SVI	25.34	18.78	0.00	24.00	100.00	0.58	3.24
	FirmRet	0.71	6.05	-36.16	0.31	103.20	0.73	10.16
Bull Market	*MktRet*	0.52	2.73	-9.93	0.77	9.40	-0.36	4.50
N = 104,913	*Vol*	25970	56435	1	7348	2062000	7	90
	VolNTD	884459	2295000	1	166180	128600000	8	170
	Turnover	4.27	5.93	0.00	2.07	98.98	3.28	19.61

Notes: This table summarizes the movement of the Taiwan market index during Jan 2004 to October 2012. This study uses the approach of Pagan & Sossounov (2003) to classify the Taiwan market into bull, bear and neutral markets in this sample.
Data source: this research

5.3. The Effects of Investor Attention across Market States

Then, this study examines whether and how investor attention affects stock returns across market states by using the SVI variable as a proxy for investor attention and adding it into traditional asset pricing models such as the market model (CAPM), the Fama & French (1993) three-factor model, and the Carhart (1997) four-factor model. Permutation of these three model settings and three market states yields nine specifications. Because we focus on the influences of investor attention on stock returns, the dependent variable $FirmRet_{it}$ in each specification is always return premium, calculated as the stock return minus the risk-free rate. Statistical significance of coefficients on SVI_{it} will determine the existence of the attention effect.

The results are reported in Table 5. Specifications (1) – (3) correspond to the bear market state. In a bear market, investors usually shift their investments to risk-free assets for fear of bearing substantial systematic risks. The shift of investor attention makes what used to be an attention-grabbing stock loses its attractiveness. Therefore, the link between investor attention and stock trading activity is expected to be weak in a bear market, which in turn reduces the attention effect on stock returns. Since coefficients on SVI_{it} in these specifications are not statistically significant at the 5% level, the influences of investor attention on stock returns are found absent in the bear market state. This result confirms the expectation that fear in a bear market causes the attention effect to be weak or insignificant.

Nevertheless, coefficients on SVI_{it} are statistically significant at the 1% level in specifications (4) – (6) that correspond to the neutral state. Because these coefficients are statistically significant and positive, investor attention is found to cause positive price pressure on stock returns. The results confirm the attention theory of Barber & Odean (2008), and support previous empirical findings (Bank et al., 2011; Da et al., 2011b).

Moreover, statistical significance of coefficients on SVI_{it} remains robust in specifications (7) – (9) (*i.e.,* the bull market state) and values of these coefficients are larger than those in other specifications. Therefore, the influences of investor attention on stock returns become stronger in the bull market state. These findings

support the hypothesis that the attention effect on stock returns vary across market states.

Table 5: Attention Effect under Different Market States

Specification	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Market State		Bear			Neutral			Bull	
VARIABLES					$FirmRetRf_{it}$				
Constant	-0.1313***	-0.0053	-0.0052	-0.1572***	-0.0762**	-0.0738**	-0.0290	-0.2291***	-0.2283***
	(0.0453)	(0.0451)	(0.0451)	(0.0340)	(0.0332)	(0.0335)	(0.0397)	(0.0404)	(0.0404)
SVI_{it}	-0.0008	0.0007	0.0007	0.0045***	0.0038***	0.0038***	0.0075***	0.0072***	0.0072***
	(0.0016)	(0.0016)	(0.0016)	(0.0013)	(0.0012)	(0.0012)	(0.0015)	(0.0015)	(0.0015)
$MktRetRf_t$	1.0429***	1.0347***	1.0346***	0.9930***	1.0631***	1.0640***	1.0550***	1.0410***	1.0383***
	(0.0130)	(0.0125)	(0.0125)	(0.0152)	(0.0163)	(0.0166)	(0.0152)	(0.0158)	(0.0157)
SMB_t		0.5281***	0.5278***		0.3921***	0.3913***		0.4440***	0.4404***
		(0.0193)	(0.0197)		(0.0160)	(0.0159)		(0.0159)	(0.0159)
HML_t		0.1098***	0.1095***		0.0054	0.0076		0.0777***	0.0729***
		(0.0158)	(0.0166)		(0.0227)	(0.0226)		(0.0180)	(0.0178)
MOM_t			-0.0012			-0.0082			-0.0258***
			(0.0131)			(0.0123)			(0.0083)
Observations	56,676	56,676	56,676	55,586	55,586	55,586	104,913	104,913	104,913
Number of firms	531	531	531	514	514	514	542	542	542
R-squared	0.3335	0.3848	0.3885	0.1775	0.2110	0.2110	0.2273	0.2588	0.2589

Notes: This table examines the effect of investor attention on asset prices under different market states. Typical asset pricing models are employed, such as CAPM, the Fama & French (1993) three-factor model and the Carhart (1997) four-factor model. Variables are defined in Table 1. Robust standard errors are given in parentheses. *, **, *** denote 10%, 5% and 1% significance levels.
Data source: this research

5.4. Sub-period Analysis

In this section, the regression analysis is repeated for these sub-periods determined by the approach of Pagan & Sossounov (2003). This analytic procedure enables us to observe the influences of investor attention on stock returns across different periods, and to examine whether this inference is robust to the selection of sample period.

Table 6 presents the regression results of the Carhart four-factor asset pricing model. The results indicate that SVI_{it} loses its statistical significance in all of the bear market periods, as in periods (2), (5), and (8). Therefore, the conclusion that the attention effect on stock returns is weak or insignificant in a bear market is quite robust.

Nevertheless, coefficients on SVI_{it} are still statistically significant at 1% level in almost all bull market periods except in period (1), as shown in periods (4), (6), and (9). Insignificance of SVI_{it} in period (1) probably results from insufficient observations. Furthermore, coefficients on SVI_{it} are larger in bull markets than in bear markets. The results are quite consistent with the expectation that the attention effect tends to be stronger in a bull market than in a bear market. Moreover, the results are in line with the findings of Vlastakis & Markellos (2012), who find that investors demand more information via the Internet during periods of high returns.

However, the evidence as to the neutral market state is mixed. The coefficient on SVI_{it} in period (3) is not statistically significant, while that in period (7) possesses explanatory power for stock returns. The evidence implies a distinguished feature between periods (3) and (7): the former is a neutral market state in nature, while the later seems to be a bull market period, as discussed in section 5.1. In period (3), when the market is neutral, the market trend is hard to predict, so investors tend to wait and watch. Therefore, the influence of investor attention on stock returns appears to be insignificant in period (3), as in a bear market. On the other hand, period (7) is reasonably viewed as a bull market period. The attention effect significantly exists in this period.

Overall, the inference that the attention effect varies with market states is quiet robust. No matter using the CAPM model or the Fama-French three factor model,

the inference remains consistently the same.

Table 6: Sub-period analysis

Period	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Market State	Bull	Bear	Neutral	Bull	Bear	Bull	Neutral	Bear	Bull
VARIABLES					*FirmRetRf*$_{it}$				
Constant	1.7445**	0.1117	-0.0172	-0.2700***	-0.2645**	-0.6028***	-0.6665***	-0.0664	-0.3748***
	(0.8089)	(0.1189)	(0.0483)	(0.0579)	(0.1104)	(0.1437)	(0.1245)	(0.1530)	(0.1004)
SVI_{it}	-0.0015	0.0038	0.0020	0.0084***	0.0074*	0.0228***	0.0245***	0.0034	0.0138***
	(0.0097)	(0.0039)	(0.0018)	(0.0023)	(0.0041)	(0.0053)	(0.0046)	(0.0060)	(0.0039)
$MktRetRf_t$	0.6197***	0.9451***	0.9980***	1.0084***	1.1049***	1.0380***	1.0470***	1.0199***	1.0693***
	(0.1962)	(0.0211)	(0.0236)	(0.0173)	(0.0163)	(0.0201)	(0.0176)	(0.0178)	(0.0216)
SMB_t	0.4166	0.4970***	0.3251***	0.4600***	0.5987***	0.4517***	0.4458***	0.5600***	0.5770***
	(0.3095)	(0.0322)	(0.0184)	(0.0190)	(0.0242)	(0.0244)	(0.0214)	(0.0310)	(0.0272)
HML_t	-0.1921	0.0936**	-0.0159	0.1081***	0.0615***	0.0491**	0.0768***	0.0138	0.0256
	(0.1334)	(0.0366)	(0.0259)	(0.0265)	(0.0197)	(0.0238)	(0.0252)	(0.0248)	(0.0216)
MOM_t	0.3936	0.0580	-0.0591***	-0.0139	-0.0627***	-0.0183	0.0125	-0.0113	-0.1074***
	(0.7169)	(0.0360)	(0.0163)	(0.0132)	(0.0170)	(0.0146)	(0.0156)	(0.0217)	(0.0197)
Observations	2,641	8,884	29,137	47,413	25,987	28,508	26,449	21,805	26,351
Number of firms	441	446	455	466	476	493	514	531	542
R-squared	0.0734	0.4782	0.1288	0.1980	0.4081	0.2851	0.3004	0.2675	0.3560

Notes: This table examines model performance in each sample period. SVI_{it}, a direct proxy for attention, is aggregate search frequency from Google Trends based on official abbreviated company names. $MktRetRf_t$, SMB_t, HML_t, MOM_t are common asset pricing factors of the Carhart (1997) four-factor model.

Data source: this research

6. CONCLUSIONS

Using a sample of Taiwan firms, the present study has investigated the attention effect on stock returns across market states. To classify market states, the whole sample is divided into subsamples based on the approach of Pagan & Sossounov (2003). The bull and bear cycles of the Taiwan stock market is described by comparing essential market characteristics. In addition, this study extends the approach of Pagan & Sossounov (2003) by considering a neutral market state.

When examining whether investors have different patterns of trading behavior across market states (bull, bear, and neutral), we can find that average weekly trading volume and turnover rate are lower in a neutral market than in bull and bear markets. The finding implies that investors are less active in a neutral market.

The attention effect is found varying across bull, bear and neutral markets. Specifically, in neutral and bull markets, the influences of investor attention on stocks returns are consistent with prior studies (Choi & Varian, 2009; Bank et al., 2011; Da et al., 2011a, 2011b; Mondria & Wu, 2011). The attention effect becomes particularly strong when the market performs well, as in a bull market. However, investor attention stops exerting significant influences on stock returns when the market falls into a bear market. Overall, these findings support the hypothesis that market states alter the influences of investor attention on stocks returns. Accordingly, future researches on the attention effect need to consider the impact of market states to disentangle the impact on the attention effect.

Using SVI as a direct proxy for investor attention, this study has explored main issues concerning the attention effect across market states. However, SVI may reflect part of investor attention, because investors have other accesses to market information in addition to the Internet. Moreover, there are a variety of definitions of market states which might affect the empirical results. Therefore, a future study that uses different ways to measure the influence of market states would provide comparable evidence.

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Appendix

Table 7: Sub-period analysis

Period	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Market State	Bull	Bear	Neutral	Bull	Bear	Bull	Neutral	Bear	Bull
VARIABLES					*FirmRetRf*$_{it}$				
Constant	3.1124***	-0.3659***	-0.1796***	-0.0639	-0.1141	-0.3852***	-0.7269***	-0.2207	-0.4238***
	(0.2713)	(0.1165)	(0.0479)	(0.0574)	(0.1151)	(0.1425)	(0.1308)	(0.1555)	(0.1019)
SVI_{it}	-0.0150	0.0038	0.0029	0.0096***	0.0046	0.0264***	0.0278***	-0.0013	0.0149***
	(0.0098)	(0.0040)	(0.0019)	(0.0023)	(0.0042)	(0.0053)	(0.0048)	(0.0061)	(0.0040)
$MktRetRf_t$	-0.1624	1.0873***	0.8170***	1.0291***	1.1131***	0.9979***	1.1257***	0.8460***	1.1977***
	(0.1187)	(0.0216)	(0.0220)	(0.0174)	(0.0165)	(0.0189)	(0.0171)	(0.0146)	(0.0234)
Observations	2,641	8,884	29,137	47,413	25,987	28,508	26,449	21,805	26,351
Number of firms	441	446	455	466	476	493	514	531	542
R-squared	0.0019	0.4414	0.1045	0.1585	0.3417	0.2656	0.2597	0.2359	0.3272

Notes: This table examines model performance in each sample period using the CAPM market model. SVI_{it}, a direct proxy for attention, is aggregate search frequency from Google Trends based on official abbreviated company names. $MktRetRf_t$ is the market risk premium is the return on a value-weighted Taiwan market index less the return on the risk free asset. Robust standard errors are given in parentheses. *, **, *** denote 10%, 5% and 1% significance levels.
Data source: this research

Table 8: Sub-period analysis

Period	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Market State	Bull	Bear	Neutral	Bull	Bear	Bull	Neutral	Bear	Bull
VARIABLES					$FirmRetRf_{it}$				
Constant	1.3380***	0.0982	-0.0280	-0.2699***	-0.2583**	-0.6050***	-0.6630***	-0.0673	-0.3421***
	(0.2988)	(0.1175)	(0.0481)	(0.0579)	(0.1106)	(0.1438)	(0.1243)	(0.1529)	(0.1001)
SVI_{it}	-0.0011	0.0038	0.0021	0.0084***	0.0073*	0.0228***	0.0245***	0.0034	0.0127***
	(0.0097)	(0.0039)	(0.0018)	(0.0023)	(0.0041)	(0.0053)	(0.0046)	(0.0060)	(0.0039)
$MktRetRf_t$	0.7007***	0.9377***	1.0124***	1.0075***	1.1017***	1.0419***	1.0508***	1.0230***	1.1050***
	(0.1171)	(0.0205)	(0.0241)	(0.0173)	(0.0162)	(0.0209)	(0.0177)	(0.0183)	(0.0228)
SMB_t	0.2458***	0.4723***	0.3465***	0.4601***	0.6004***	0.4524***	0.4466***	0.5674***	0.5961***
	(0.0245)	(0.0259)	(0.0186)	(0.0190)	(0.0242)	(0.0245)	(0.0213)	(0.0300)	(0.0274)
HML_t	-0.2614***	0.0759**	-0.0355	0.1133***	0.0825***	0.0468*	0.0778***	0.0183	0.0511**
	(0.0402)	(0.0352)	(0.0266)	(0.0277)	(0.0189)	(0.0239)	(0.0251)	(0.0224)	(0.0209)
Observations	2,641	8,884	29,137	47,413	25,987	28,508	26,449	21,805	26,351
Number of firms	441	446	455	466	476	493	514	531	542
R-squared	0.0733	0.4894	0.1283	0.1980	0.4029	0.2796	0.3004	0.2675	0.3608

Notes: This table examines model performance in each sample period. SVI_{it}, a direct proxy for attention, is aggregate search frequency from Google Trends based on official abbreviated company names. $MktRet_t$, SMB_t, HML_t are common asset pricing factors of the Fama & French (1993) three-factor model. Robust standard errors are given in parentheses. *, **, *** denote 10%, 5% and 1% significance levels.

Data source: this research

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Tzu-Lun Huang received his PhD degree in Finance from National Sun Yat-sen University in Taiwan. His current research interests mainly focus on application of computational algorithms in finance, portfolio management, securities pricing, and investment. He has a professional specialty on financial programing and simulations. He has published in refereed journals such as Journal of Financial Studies and Asia Pacific Management Review. One of his papers won the JFS best paper award in 2013. Now, he teaches in Department of Accounting, Nanfang College of Sun Yat-sen University, China.

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