

# Investing Strategies as Stochastic Oscillator Indicators Staying in Overreaction Zones for Consecutive Days with Big Data Concerns



Yensen Ni<sup>1</sup>, Paoyu Huang<sup>2\*</sup>, Yaochia Ku<sup>1</sup>, Yiching Liao<sup>1</sup>, Min-Yuh Day<sup>3</sup>

<sup>1</sup> Department of Management Sciences, Tamkang University, New Taipei, Taiwan  
ysin@mail.tku.edu.tw, alanku530@gmail.com, janet588@gmail.com

<sup>2</sup> Department of International Business, Soochow University, Taipei, Taiwan  
hpy@scu.edu.tw

<sup>3</sup> Department of Information Management, Tamkang University, New Taipei, Taiwan  
myday@mail.tku.edu.tw

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**Abstract.** Stock price overreaction seems always regarded as an essential issue in recent decades. Due to big data concerns, this study explores whether investors can make profits by trading the constituent stocks of DJ30, FTSE100, and SSE50 as stochastic oscillator indicator (SOI) staying in diverse overreaction zones including overbought and oversold, stricter overbought and oversold, and extreme overbought and oversold zones for consecutive days. Although we argue that the SOI staying in overreaction zones for consecutive days is often appeared in the real world, this issue, to our knowledge, seems unexplored in the existing literature. Results show that momentum strategies are appropriate for holding these stocks in the long run as the SOI staying in overbought zones, whereas contrarian strategies are proper for holding these stocks in the short run as the SOI staying in oversold zones. These revealed results may be beneficial for investors to trade these stocks as the SOI staying in overreaction zones for consecutive days.

**Keywords:** investing strategies, overreaction zones, stochastic oscillator indicator

## 1 Introduction

Share prices may not be easy to predict because all available information is fully reflected according to the efficient market hypothesis [1-2]; thus, market participants encounter difficulty in predicting share prices. Nevertheless, efficiency market hypothesis is challenged by the overreaction hypothesis [3-4], which documents that market participants often overreact to the information released due to excessive self-confidence [5-6].

In addition, moving average (MA) and stochastic oscillator indicators (SOI) regarded as technical indicators are employed to predict share prices when investing in financial instruments. In fact, market participants might predict future share prices by using MA trading rules [7-10]. Chiang et al. also state that employing the trading signals emitted by the SOI<sup>1</sup> may deliver better performance in predicting share prices [11]. Furthermore, based on the overreaction hypothesis proposed by DeBondt and Thaler [3], we argue that the wisdom of SOI appears related to the overreaction hypothesis since investors are suggested to sell (buy) as overbought (oversold) signals emitted by the SOI. In addition, we argue that stock price overreaction seems always regarded as an essential issue in recent decades [3-4, 12-18].

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\* Corresponding Author

<sup>1</sup> For SOI indicators such as K value, the K values over 80 (below 20) are regarded as overbought (oversold) zones in accordance with SOI trading rules. The selling signals are emitted as the SOI falls into overbought zones, whereas buying signals are emitted as the SOI falls into oversold zones. In addition, the SOI such as K value is explained in detail in Section 2.

In this study, our main motivation is to explore whether investors would make profits by employing the SOI in terms of technical analysis since we argue that the wisdom of SOI would be closed with overreaction hypothesis [3-4]. In addition, we document that market participants, including institutional and individual investors, might trade stocks according to the trading signals emitted by SOI in practice [19-20].

Furthermore, we argue that investors might sell (buy) stocks as the overbought (oversold) trading signals emitted by the SOI due to stock market overreaction. However, investors' sentiments might be aroused if the SOI falls into overbought (oversold) zones. Thus, momentum trading might be appropriate because of either trend-following concerns or herding behaviors occurred. However, what would be really happened would be concerned by market participants, which is our second motivation for this study.

Moreover, we argue that stock price overreaction phenomena seem occurred in Chinese stock markets over the period 2014-2015. In fact, we observe that investors often chase higher price as the SOI falling into overbought zones, which might result in share prices soared. In addition, we also detect that investors might chase lower prices as the SOI falling into oversold zones, which might result from short selling index futures and selling weighted stocks beforehand. Thus, these phenomena indeed arouse our interests for investigation, which is our third motivation.

In this study, to familiarize ourselves with these relevant studies, we then survey the literature related to overreaction, technical analysis, investing strategies, and other related studies. DeBondt and Thaler indicate that the deviation of share prices might result from stock market overreaction [3], and similar findings are also disclosed in the subsequent studies [4, 21-25]. Furthermore, Chopra et al. reveal that the overreaction phenomena are shown in the U.S. stock markets and international stock markets [22], such as the British stock markets [24] and Chinese stock markets [26-27].

As for the technical indicators widely explored in the relevant studies [28-32], MA trading rules have been widely explored in the technical analysis [6-8, 33-36]. Park also shows the ratio of the short-term MA to the long-term MA has significant predictive power for future returns [37]. However, we argue that the MA trading rule may not be as effective as before, since market participants may not easily benefit from well-known trading rules like MA trading rule. Thus, market efficiency might be enhanced if the MA trading rule is widely employed by investors. As for the SOI, Chiang et al. reveal that using the trading signals emitted by the SOI may deliver better performance in predicting share prices [11]. Wang et al. also argue that trading stocks according to the trading signals emitted by the SOI is closely related with the wisdom proposed by the overreaction hypothesis [38]. As a result, market participants might employ the SOI trading rule to exploit profits by using appropriate investing strategies.

Concerning investing strategies, Lento et al. indicate that the profitability of technical indicators can be improved by adopting contrarian strategies [39]. Naughton, Truong, and Veeraraghavan indicate that investors can generate superior returns by employing momentum instead of contrarian strategy for trading in the Chinese stock market [40], which may be interpreted as herding behavior because 80% of the trading amounts are dominated by individual investors [41]. Chiang and Zheng also determine that herding behaviors exist in several stock markets in Asia [42]. McKenzie further shows that the return persistence in emerging markets is higher than that in developed markets like the US [43]. Besides, similar results are revealed in Latin American emerging markets [44]. Shen, Szakmary, and Sharma prove that an upward trend of momentum phenomena often appears in share markets [45]. Zhou, Geppert, and Kong also indicate that momentum strategies generate significant and positive returns after China opened its once foreign-restricted B-share market to domestic individual investors [46]. In addition, Ni, Liao, and Huang reveal the investors may use momentum strategy when trading constituent stocks of SSE 50 as the trading signals emitted by SOI [47]. Bhojraj and Swaminathan point out that the momentum phenomena generated during the first year reverse in two years [48]. Barroso and Santa-Clara also indicate that risk-managed momentum is still a greater puzzle [49]. George and Hwang also show that short-run momentum and long-run reversals are largely separate phenomena [50], which presents a challenge to the market efficiency hypothesis. Xu et al. analyze dynamic investment under asymmetric information, find the corporate insiders can signal their private information to outside investors using the timing of investment and avoid selling underpriced equity [51].

Moreover, Jegadeesh reveals that negative serial correlation in monthly stock returns is highly significant [52], but a significant positive serial correlation is found at longer lags. Jegadeesh and Titman further document that strategies which buy stocks that have performed well in the past and sell stocks

that have performed poorly in the past generate significant positive returns over 3- to 12-month holding periods [53]. Shen, Szakmary, and Sharma show that momentum profits are concentrated in the growth stock indices, but short-term overreaction is revealed in other indices [45]. Shen et al. further find that momentum profits in commodities are highly significant for holding periods as long as 9 months [54], but momentum profits would eventually reverse.

However, Moskowitz et al. find persistence in returns for 1 to 12 months that partially reverses over longer horizons [55], consistent with sentiment theories of initial under-reaction and delayed overreaction. Szakmary et al. examine the performance of trend-following trading strategies in commodity futures markets [56] and show that investors employing trend-following strategies would earn significant positive returns. Recently, Szakmary and Lancaster show the profitability of trend-following trading rules over intermediate horizons in futures markets by using technical indicators such as moving average [57].

In addition, contrarian strategies tend to be most profitable at short horizons of 1-month or less [52] and at long horizons of 3-5 years [3]. In contrast, at intermediate horizons of 1-12 months, momentum strategies tend to dominate [53]. Moreover, it is by now well established that many other trading rules based on intermediate horizon past returns such as the 52-week high, performance relative to the risk-free rate, dual moving average crossovers, channels, etc. perform similarly to momentum strategies in a variety of markets [37, 50, 55-58].

After surveying the relevant literature, some studies show that employing contrarian strategies would be appropriate due to stock price overreaction, but other studies also indicate that momentum strategies address the issue of herding behaviors.

Given that Chiang et al. indicate that the trading signals emitted by the SOI instead of MA can have better performance in predicting share prices [11], this study is to explore whether the SOI would matter in trading stocks. Thus, by using the constituent stocks of three representative stock indices including DJ30, FTSE100, and SSE50 as our investment targets, we explore whether investors make profits by employing the SOI for trading these stocks deliberately. We then examine whether investors exploit profits for trading stocks as SOI staying in different degree of the overreaction for consecutive days as well as whether the long-run and short-run performances would differ as the above phenomena released. We also study the differences between investors trading the stocks in the Chinese stock market regarded as a developing stock market as well as US and UK stock markets deemed as mature stock markets.

In fact, the key research problem is whether investors would employ the appropriate investing strategies to make the profit as diverse overreaction phenomena emitted. In this study, in order to derive more valuable information for investors, we define stricter overreaction and extreme overreaction the overreaction signals defined by SOI as well as staying these diverse overreactions for 2, 3, and 4 days.

Thus, in this study, we explore the above issues by taking several concerns into account. First, the different degrees of overreaction including overbought and oversold, stricter overbought and oversold, and extreme overbought and oversold signals<sup>2</sup> (intensity concerns) emitted by the SOI as well as different consecutive days including two, three, or four day<sup>3</sup> (lasting concerns) are examined. Second, the one-, two-, three-, four-, and five-day cumulative abnormal returns (CARs)<sup>4</sup> regarded as short-run CARs as well as the 10-, 20-, 30-, 40-, and 50-day CARs deemed as long-run CARs are investigated. Third, the constituent stocks of three representative stock indices, DJ30, FTSE100, and SSE50, are explored for comparison concerns. These concerns seldom concerned before would differentiate this study from the related works as well as the novelty of this study.

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<sup>2</sup> In general, the overbought zone is set as  $K$  value  $> 80$  as well as the oversold zone is set as  $K < 20$ . In addition, we also set stricter and extreme overreaction zones including  $K > 85$  and  $K > 90$  for overbought zone ( $K < 15$  and  $K < 10$  for oversold zones) for investigation.

<sup>3</sup> The consecutive days employed in this study are two, three, and four days due to the sample declined sharply in the case of consecutive five days.

<sup>4</sup> We use standard event study methodology to examine stock price responses to the overbought and oversold trading signals emitted by SOI trading rules. We define day 0 as the overbought and oversold emitted by the SOI initially. In addition, abnormal return (AR) is defined as the difference between the actual return and an expected return generated by the market model. In this study, we use these representative indices such as DJ30, FTSE100, and SSE50 as the proxies for market returns and estimate the parameters of the market model using the data over the period from -155 to -6 days (i.e. 150 days) before the day of the overbought and oversold trading signals emitted by SOI. In addition, cumulative abnormal returns at  $t$  days (i.e. CAR ( $t$ )) are the cumulative abnormal returns from AR(1) to AR( $t$ ).

In addition, we argue that this study would contribute to existing literature by providing these following technical achievements. First, we use the constituent stocks of these representative indices as our samples seldom concerned in the relevant literature, since we argue that market participants are able to buy the constituent stocks of a stock index even index futures rather than the stock index itself. Second, we measure the CARs for trading these constituents' stocks as the SOI falling into different degrees of overbought (oversold) zones shown as well as different consecutive days released. In fact, we argue that the overreaction with different intensity concerns (i.e.  $K > 80$ ,  $K > 85$ , and  $K > 90$  as well as  $K < 20$ ,  $K < 15$ , and  $K < 10$ ) with different lasting concerns (consecutive two, three, and four days) would provide more valuable information for investors in trading these constituents' stocks. However, both concerns are seldom explored deliberately in relevant studies. Third, we argue that this is, to the best of our knowledge, the first paper to explore whether market participants are able to make profits by trading these constituents' stocks as the SOI staying in overreaction zones including diverse overbought and oversold zones for different consecutive days, which might provide more valuable information for investors to trade these stocks. Besides, we also compare the profitability of trading the constituent stocks of DJ30, FTSE100, and SSE50 as the SOI staying in either diverse overbought or oversold zones for different consecutive days.

In general, the results reveal that momentum strategies are appropriate for holding these constituents' stocks in the long run as the SOI staying in overbought zones, whereas contrarian strategies are proper for holding these constituents' stocks in the short run<sup>5</sup> as the SOI staying in oversold zones. However, while the SOI staying in the extreme overreaction zones (i.e.  $K > 90$  and  $K < 10$ ) for consecutive three to four days, we find that the results shown for these extreme overreaction cases are somewhat different from other overreaction cases. For example, we reveal the overreaction phenomena shown in the short run for the constituent stocks of DJ30 as the SOI staying in extreme overbought zone (i.e.  $K > 90$ ) for consecutive three to four days. In addition, we also reveal that the overreaction phenomena would last for the long run while trading the constituent stocks of FTSE100 and SSE50 as the SOI staying in extreme oversold zone (i.e.  $K < 10$ ) for consecutive three to four days.

The rest of the paper proceeds as follows. Section 2 introduces the technical trading rules used in this study. Section 3 explains the data employed. Section 4 explains the empirical results and analysis, and Section 5 presents the conclusion.

## 2 Study Design and Data

### 2.1 Technical Trading Rules

SOI, such as  $K$ , is rather sensitive to update in the share price, which may result in  $K$  value being modified due to changes in the highest and lowest prices during a certain period<sup>6</sup> as shown below:

$$CL_t = P_t - \min(P_t, P_{t-1}, \dots, P_{t-8}). \quad (1)$$

$$HL_t = \max(P_t, P_{t-1}, \dots, P_{t-8}) - \min(P_t, P_{t-1}, \dots, P_{t-8}). \quad (2)$$

$$RSV_t = \frac{CL_t}{HL_t} \times 100. \quad (3)$$

$$K_t = \frac{2}{3}K_{t-1} + \frac{1}{3}RSV_t. \quad (4)$$

where  $CL_t$  is measured as the lowest closing price in  $N$  recent days subtracted from the latest closing price as shown in Equation (1).  $HL_t$  refers to the difference between the highest and the lowest closing price within  $N$  days as shown in Equation (2).  $RSV_t$  is set as the  $CL_t$  over the  $HL_t$  as shown in Equation

<sup>5</sup> The one-, two-, three-, four-, and five-day cumulative abnormal returns (CARs) are regarded as short-run performance as well as the 10-, 20-, 30-, 40-, and 50-day CARs are deemed as long-run performance in this study. Thus, in this study, we define 1-5 days as short-run period and 10-50 days as the long-run period.

<sup>6</sup> The nine-day  $K$  values often applied in the real world are employed (i.e.  $N$  is set as nine in this study). We would also treat  $RSV_{t-1} = K_{t-1}$  for (4) when no prior  $K$  is available.

(3).  $K$  value is the sum of  $1/3$  of the RSV value and  $2/3$  of the  $K$  value at lag 1 as shown in Equation (4). According to the above equations, the  $K$  value ranges from 0 to 100. The overbought signals are emitted as  $K > 80$ , whereas the oversold signals are emitted as  $K < 20$ . In other words, we would know how to retrieve the  $K$  value in accordance with Equations (1)-(4).

Share prices will deviate from their equilibrium as share prices rise (fall) continuously, which may trigger overbought (oversold) signals,  $K > 80$  ( $K < 20$ ) emitted by the SOI. According to the overreaction hypothesis, market participants may make profits by either short selling stocks as the SOI falls into the overbought zone (i.e.  $K > 80$ ) or buying stocks as the SOI falls into the oversold zone (i.e.,  $K < 20$ ).

## 2.2 Design of this Study

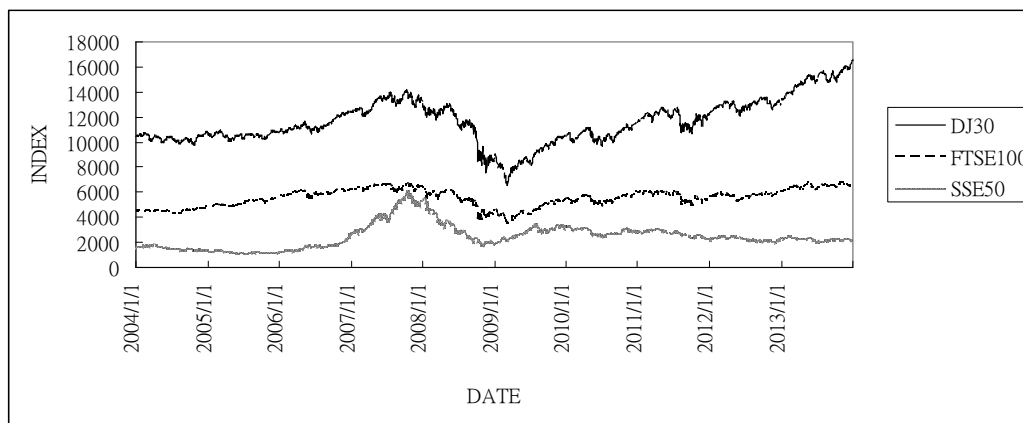
Due to big data concerns, we pioneer to explore whether investors may exploit profits by trading the constituent stocks of DJ30, FTSE100, and SSE50 as the SOI staying in overbought (oversold) zones for consecutive days. In addition, we document that trading these constituents' stocks as the SOI staying in diverse overbought (oversold) zones for consecutive days would provide more information than trading these stocks as the SOI staying in overbought (oversold) zones only.

Thus, we collect the daily data for constituent stocks of the DJ30, FTSE100, and SSE50 indices from Datastream. Table 1 shows the means, medians, standard deviations, minima, and maxima for these indices over the period 2004-2013<sup>7</sup>, a 10-year data period. In addition, we plot our data shown in Fig. 1, which indicates that the bull and bear markets are across the data period.

**Table 1.** Summary statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
DJ30 index	2517	11,616.35	1,799.40	6,547.05	16,576.66
FTSE100 index	2609	5,530.73	716.836	3,512.10	6,840.30
SSE 50 index	2597	2,418.74	987.247	1,011.50	6,092.06

*Note.* This table reports the means, standard deviations, maximums, and minimums for DJ30, FTSE100, and SSE50 indices.



**Fig. 1.** Trend of D 30, FTSE 100, and SSE 50 indices over the 2004-2013 data period

We then explore whether investors would make profits as the SOI staying in overbought (oversold) zones for consecutive days. Table 1 presents the times for the SOI staying in overbought (oversold) zones for two, three, and four days. Afterwards, we use standard event study methodology to calculate CARs as the SOI staying in overbought and oversold zones by defining day 0 as the SOI falling into diverse overbought and oversold zones for consecutive days initially.

<sup>7</sup> We also extend our data either over the period 2004-2016 or over the period 2007-2016 (i.e. ten-year data period for robustness). The empirical results are almost the same as the empirical results shown in Section 3. In order to save space, we explain these results in this footnote.

**Table 2.** Numbers of the SOI staying in overreaction zones for two, three, and four days<sup>8</sup>

	DJ30	FTSE100	SSE50
	No.	No.	No.
<b>Panel A: K value staying in overbought zones for consecutive days</b>			
K > 80 for 2 days	548	528	566
K > 80 for 3 days	454	434	476
K > 80 for 4 days	376	353	396
<b>Panel B: K value staying in oversold zones for consecutive days</b>			
K < 20 for 2 days	329	403	512
K < 20 for 3 days	258	316	424
K < 20 for 4 days	199	241	345

*Note.* Panel A of Table 2 reports the numbers of the SOI staying in overbought zones for two, three, and four days for the constituent stocks of DJ 30, FTSE 100, and SSE 50, respectively. Panel B of Table 2 presents the numbers of SOI staying in oversold zones for two, three, and four days for the constituent stocks of DJ30, FTSE100, and SSE50, respectively.

The numbers of the trading signals such as the SOI staying in diverse overbought zones for consecutive days emitted are more than the numbers of the trading signals as the SOI staying in diverse overbought zones for consecutive days. Results may be due to the upward trend period being longer than the downward trend period over the data period, especially for the DJ30 index. In addition, the trading signals emitted by constituent stocks of FTSE100 are more than those emitted by the constituent stocks of DJ30 and SSE50, which may result from more constituent stocks for FTSE100.

### 3 Empirical Results and Analysis

We measure the one-, two-, three-, four-, and five-day CARs define as short-run CARs as well as the 10-, 20-, 30-, 40-, and 50-day CARs as long-run CARs in this study as the SOI falling in diverse overbought (oversold) zones for consecutive days initially. Table 3 presents the short-run and long-run CARs for trading the constituent stocks of DJ30, FTSE100, and SSE50 respectively as the SOI staying in diverse overbought (oversold) zones for consecutive days, including two, three, and four days.

**Table 3.** Short- and long-run CARs as SOI staying in overreaction zones

Holding days	DJ30		FTSE100		SSE50	
	Returns	<i>t</i> -TEST	Returns	<i>t</i> -TEST	Returns	<i>t</i> -TEST
<b>Panel A: SOI staying in overreaction zones for 2 days</b>						
<b>Panel A1: K &gt; 80 (overbought zone)</b>						
<b>Short-run CARs</b>						
1	-0.04%	-0.536	-0.04%	-0.439	-0.09%	-0.821
2	0.01%	0.103	-0.06%	-0.426	-0.10%	-0.689
3	0.07%	0.538	-0.09%	-0.556	-0.11%	-0.625
4	0.06%	0.345	-0.18%	-0.961	-0.09%	-0.452
5	0.02%	0.133	-0.21%	-1.028	-0.07%	-0.294
<b>Long-run CARs</b>						
10	1.05%	4.574**	0.07%	0.237	1.50%	4.859**
20	1.04%	3.604**	0.99%	2.767**	2.15%	5.221**
30	1.31%	4.334**	2.11%	4.977**	2.73%	5.161**
40	1.79%	5.060**	2.02%	3.911**	3.47%	5.125**
50	1.75%	4.523**	1.96%	3.462**	4.33%	5.798**

<sup>8</sup> As the SOI staying in overbought zones for a period of time occur, we count another SOI staying in overbought (oversold) zones for two-day sample after the SOI staying overbought (oversold) zones for two days, another SOI staying in overbought (oversold) zones for three-day sample after the SOI staying in overbought (oversold) zones for three days, and another SOI in staying overbought (oversold) zones for four-day sample after the SOI staying in overbought (oversold) zones for four days.

**Table 3.** (continue)

Holding days	DJ30		FTSE100		SSE50	
	Returns	<i>t</i> -TEST	Returns	<i>t</i> -TEST	Returns	<i>t</i> -TEST
<b>Panel A2: K &lt; 20 (oversold zone)</b>						
<b>Short-run CARs</b>						
1	0.20%	1.279	0.27%	1.799	0.24%	2.008*
2	0.44%	2.134*	0.58%	2.784**	0.33%	2.042*
3	0.51%	2.152*	0.84%	3.327**	0.38%	1.950
4	0.65%	2.649**	1.05%	3.637**	0.55%	2.539*
5	0.83%	3.223**	1.15%	3.782**	0.56%	2.382*
<b>Long-run HPRs</b>						
10	0.06%	0.141	0.22%	0.554	0.33%	1.180
20	0.43%	0.669	0.08%	0.156	0.14%	0.368
30	1.49%	1.572	-0.14%	-0.245	0.45%	0.932
40	2.45%	2.228*	0.03%	0.048	0.88%	1.726
50	4.01%	3.703**	0.50%	0.628	1.60%	2.673**
<b>Panel B: SOI staying in overreaction zones for 3 days</b>						
<b>Panel B1: K &gt; 80 (overbought zone)</b>						
<b>Short-run CARs</b>						
1	0.03%	0.296	0.04%	0.355	-0.10%	-0.828
2	0.10%	0.832	0.01%	0.099	-0.09%	-0.594
3	0.06%	0.387	0.00%	-0.014	-0.10%	-0.534
4	0.01%	0.065	-0.06%	-0.299	-0.04%	-0.183
5	0.03%	0.135	-0.07%	-0.342	-0.09%	-0.357
<b>Long-run CARs</b>						
10	0.92%	3.937**	0.12%	0.377	1.59%	4.852**
20	0.77%	2.699**	1.12%	2.920**	2.12%	4.706**
30	1.10%	3.550**	2.28%	5.087**	2.72%	4.755**
40	1.63%	4.451**	2.16%	3.777**	3.68%	4.960**
50	1.58%	3.895**	2.19%	3.557**	4.52%	5.554**
<b>Panel B2: K &lt; 20 (oversold zone)</b>						
<b>Short-run CARs</b>						
1	0.33%	1.794	0.35%	1.945	0.36%	2.660**
2	0.47%	1.911	0.73%	3.048**	0.43%	2.392*
3	0.60%	2.219*	1.07%	3.614**	0.54%	2.485*
4	0.88%	3.022**	1.16%	3.467**	0.59%	2.433*
5	1.11%	3.675**	1.26%	3.546**	0.63%	2.432*
<b>Long-run CARs</b>						
10	0.04%	0.082	0.38%	0.814	0.29%	0.924
20	0.74%	0.958	0.28%	0.474	-0.01%	-0.036
30	1.87%	1.623	0.01%	0.023	0.30%	0.587
40	2.97%	2.262*	0.24%	0.299	0.73%	1.323
50	4.54%	3.542**	0.53%	0.582	1.76%	2.697**
<b>Panel C: SOI staying in overreaction zones for 4 days</b>						
<b>Panel C1: K &gt; 80 (overbought zone)</b>						
<b>Short-run CARs</b>						
1	0.06%	0.605	0.02%	0.214	-0.06%	-0.473
2	0.04%	0.293	0.02%	0.148	-0.10%	-0.537
3	-0.05%	-0.348	0.00%	0.014	-0.07%	-0.318
4	-0.02%	-0.123	-0.05%	-0.276	-0.08%	-0.344
5	0.01%	0.043	0.02%	0.079	-0.10%	-0.352
<b>Long-run CARs</b>						
10	0.72%	3.265**	0.00%	-0.001	1.55%	4.424**
20	0.36%	1.335	1.01%	2.522*	2.17%	4.377**
30	0.73%	2.362*	2.25%	4.609**	2.82%	4.498**
40	1.25%	3.364**	2.17%	3.407**	4.04%	4.896**
50	1.23%	2.946**	2.16%	3.178**	4.99%	5.579**

**Table 3.** (continue)

Holding days	DJ30		FTSE100		SSE50	
	Returns	<i>t</i> -TEST	Returns	<i>t</i> -TEST	Returns	<i>t</i> -TEST
<b>Panel C2: <math>K &lt; 20</math> (oversold zone)</b>						
<b>Short-run CARs</b>						
1	0.22%	1.031	0.47%	2.292**	0.37%	2.547**
2	0.45%	1.558	0.94%	3.339**	0.52%	2.541**
3	0.68%	2.095*	1.17%	3.352**	0.51%	2.027**
4	1.07%	3.044**	1.24%	3.138**	0.56%	2.103**
5	1.32%	3.634**	1.24%	2.968**	0.62%	2.222**
<b>Long-run CARs</b>						
10	0.00%	0.008	0.85%	1.617	0.14%	0.412
20	1.02%	1.085	0.50%	0.746	-0.31%	-0.732
30	2.13%	1.541	0.41%	0.579	0.06%	0.106
40	3.55%	2.256*	0.66%	0.704	0.40%	0.694
50	5.04%	3.346**	0.87%	0.811	1.78%	2.517*

*Note.* We investigate whether these CARs including one-, two-, three-, four-, and five-day CARs, short-run CARs defined as short-run performance as well as 10-, 20-, 30-, 40-, and 50-day CARs, long-run CARs defined as long-run performance would be different from 0 if investors take the long positions<sup>9</sup> on the constituent stocks of DJ30, FTSE100, and SSE50 as the SOI staying in overbought zones ( $K > 80$ ) or oversold zones ( $K < 20$ ) for two, three, and four days occurred. We present the statistics of *t*-tests for these short CARs and long CARs. In addition, \* and \*\* represent 5% and 1% significance levels, respectively.

Panel A of Table 3 shows that these CARs are significantly positive for the constituent stocks of DJ30, FTSE100, and SSE50 as the SOI staying in overbought zones for two days. In addition, the constituent stocks of SSE50 outperform than the constituents stocks of DJ30 and FTSE100, as shown above, 4% for SSE50's constituent stocks compared with less than 2% for the DJ30's and FTSE100s' constituent stocks.

Thus, we reveal that the momentum strategies seem appropriate for trading these constituent stocks in the long run (i.e. 10-, 20-, 30-, 40-, and 50-days) as SOI staying in overbought zones, especially for the constituent stocks of SSE50. However, contrarian strategies seem proper for these constituents stocks in the short run (i.e. 1-, 2-, 3-, 4-, and 5-days) as the SOI staying in oversold zones, particularly for trading the constituent stocks of FTSE100 as the SOI staying in oversold zones for consecutive days. Results may be beneficial for investors to trade these constituent stocks as the SOI staying in overbought (oversold) zones for consecutive days.

In addition, the slope of SSE50 is slightly negatively different from the positive slope of DJ30 and FTSE100, which is somewhat beyond expectation. The results may be caused by the herding behaviors of Chinese investors because over-optimistic moods likely exist, as shown by the 80% trading amount traded by individual investors in the China stock market [40-41].

## 4 Further Investigation

This study further explores whether investors would make profits by setting stricter overbought (oversold) zones such as  $K > 85$  ( $K < 15$ ), and even the extreme overbought (oversold) zones such as  $K > 90$  ( $K < 10$ ).

### 4.1 Samples for Stricter and Extreme Overreaction Zones

Aside from employing the  $K > 80$  ( $K < 20$ ) as the SOI staying in overbought (oversold) zones [59], we set stricter and extreme overbought (oversold) zones such as  $K > 85$  and  $K > 90$  ( $K < 15$  and  $K < 10$ ) for further investigation. We then list the numbers of the SOI staying in stricter and extreme overbought (oversold) zones for consecutive days in Table 4. Similarly, the numbers of the trading signals as the SOI staying in stricter and extreme overbought zones for consecutive days are more than the numbers of the trading signals as the SOI staying in stricter and extreme oversold zones for consecutive days, which might result in upward trend longer than the downward trend over the data period.

<sup>9</sup> We present the results of taking long positions only, since the results of taking short positions are opposite to the results of taking long positions.



**Table 4.** Numbers of the SOI staying in stricter and extreme overreaction zones for consecutive days

	DJ30	FTSE100	SSE50
	No.	No.	No.
<b>Panel A: Stricter and extreme overbought zones</b>			
<b>Panel A1: K value staying in stricter overbought zones for consecutive days</b>			
K > 85 for 2 days	414	366	424
K > 85 for 3 days	334	288	344
K > 85 for 4 days	267	226	276
<b>Panel A2: K value staying in extreme overbought zones for consecutive days</b>			
K > 90 for 2 days	244	214	269
K > 90 for 3 days	180	157	204
K > 90 for 4 days	127	118	157
<b>Panel B: Stricter and extreme oversold zones</b>			
<b>Panel B1: K value staying in stricter oversold zones for consecutive days</b>			
K < 15 for 2 days	227	264	369
K < 15 for 3 days	168	193	292
K < 15 for 4 days	125	142	229
<b>Panel B2: K value staying in extreme oversold zones for consecutive days</b>			
K < 10 for 2 days	104	122	231
K < 10 for 3 days	65	84	174
K < 10 for 4 days	36	58	136

*Note.* Panel A of Table 4 reports the numbers of the SOI (K value) staying in stricter and extreme overbought zones for two, three, and four days for the constituent stocks of DJ 30, FTSE 100, and SSE 50, respectively. In addition, Panel B of Table 4 presents the numbers of SOI staying in stricter and extreme oversold zones for two, three, and four days for the constituent stocks of DJ30, FTSE100, and SSE50, respectively.

#### 4.2 CARS for Stricter and Extreme Overreaction Zones

We then present the results of the short- and long-run CARs of trading the constituent stocks of DJ30, FTSE100, and SSE50 as SOI staying in stricter and extreme overbought zones ( $K > 85$  and  $K > 90$ ) as well as oversold zone ( $K < 15$  and  $K < 10$ ) for two, three, and four days in Table 5 to Table 6.

**Table 5.** Short- and long-run CARs as SOI staying in stricter overreaction zones

Holding days	DJ30		FTSE100		SSE50	
	Returns	<i>t</i> -TEST	Returns	<i>t</i> -TEST	Returns	<i>t</i> -TEST
<b>Panel A: SOI staying in stricter overreaction zones for 2 days</b>						
<b>Panel A1: <math>K &gt; 85</math> (stricter overbought zone)</b>						
<b>Short-run CARs</b>						
1	0.06%	0.599	-0.02%	-0.197	-0.09%	-0.786
2	0.10%	0.769	-0.05%	-0.294	-0.03%	-0.182
3	0.10%	0.688	-0.08%	-0.401	0.03%	0.146
4	0.03%	0.226	-0.13%	-0.585	0.04%	0.160
5	0.01%	0.079	-0.30%	-1.202	0.00%	-0.014
<b>Long-run CARs</b>						
10	0.83%	3.794**	-0.48%	-1.480	1.73%	4.696**
20	0.65%	2.371*	0.53%	1.269	2.31%	4.744**
30	0.96%	3.195**	1.81%	3.604**	2.75%	4.406**
40	1.51%	4.352**	1.45%	2.341*	3.50%	4.346**
50	1.11%	2.880**	1.72%	2.587*	4.09%	4.552**
<b>Panel A2: <math>K &lt; 15</math> (stricter oversold zone)</b>						
<b>Short-run CARs</b>						
1	0.35%	1.922	0.34%	1.651	0.46%	3.241**
2	0.48%	1.923	0.74%	2.679**	0.60%	3.071**
3	0.63%	2.216*	1.12%	3.399**	0.69%	2.913**
4	0.84%	2.761**	1.23%	3.194**	0.79%	2.918**
5	1.14%	3.663**	1.11%	2.708**	0.80%	2.720**

**Table 5.** (continue)

Holding days	DJ30		FTSE100		SSE50	
	Returns	<i>t</i> -TEST	Returns	<i>t</i> -TEST	Returns	<i>t</i> -TEST
<b>Long-run CARs</b>						
10	0.28%	0.588	0.41%	0.761	0.04%	0.116
20	0.34%	0.481	0.18%	0.269	-0.25%	-0.582
30	1.56%	1.414	0.31%	0.455	-0.16%	-0.300
40	2.45%	1.875	0.56%	0.625	0.30%	0.531
50	3.88%	3.063**	0.33%	0.322	1.33%	1.900
<b>Panel B: SOI staying in stricter overreaction zones for 3 days</b>						
<b>Panel B1: <math>K &gt; 85</math> (stricter overbought zone)</b>						
<b>Short-run CARs</b>						
1	0.04%	0.346	-0.03%	-0.252	-0.08%	-0.558
2	0.06%	0.469	-0.06%	-0.346	0.01%	0.041
3	0.00%	0.000	-0.07%	-0.370	0.01%	0.049
4	-0.03%	-0.151	-0.13%	-0.608	0.08%	0.309
5	-0.01%	-0.042	-0.12%	-0.482	0.04%	0.123
<b>Long-run CARs</b>						
10	0.70%	3.054**	-0.61%	-1.772	1.80%	4.538**
20	0.48%	1.649	0.49%	1.153	2.46%	4.572**
30	0.85%	2.671**	1.73%	3.279**	2.85%	4.124**
40	1.43%	3.929**	1.24%	1.831	3.73%	4.103**
50	0.98%	2.381*	1.64%	2.276*	4.26%	4.219**
<b>Panel B2: <math>K &lt; 15</math> (stricter oversold zone)</b>						
<b>Short-run CARs</b>						
1	0.46%	2.111*	0.51%	2.093*	0.41%	2.606*
2	0.65%	2.190*	0.97%	2.976**	0.62%	2.680**
3	0.89%	2.707**	1.20%	2.928**	0.61%	2.178*
4	1.05%	2.918**	0.99%	2.115*	0.61%	1.901
5	1.42%	4.058**	0.93%	1.895	0.63%	1.904
<b>Long-run CARs</b>						
10	0.26%	0.501	0.84%	1.369	-0.25%	-0.646
20	0.26%	0.344	0.22%	0.286	-0.69%	-1.545
30	0.73%	0.597	0.72%	0.917	-0.60%	-1.096
40	1.82%	1.225	0.80%	0.745	-0.20%	-0.339
50	2.98%	2.084*	0.41%	0.332	1.20%	1.557
<b>Panel C: SOI staying in stricter overreaction zones for 4 days</b>						
<b>Panel C1: <math>K &gt; 85</math> (stricter overbought zone)</b>						
<b>Short-run CARs</b>						
1	-0.03%	-0.320	-0.03%	-0.252	-0.11%	-0.686
2	-0.08%	-0.676	-0.02%	-0.114	-0.06%	-0.257
3	-0.11%	-0.705	-0.08%	-0.428	0.06%	0.214
4	-0.11%	-0.702	-0.02%	-0.075	0.15%	0.524
5	-0.05%	-0.290	0.10%	0.437	0.04%	0.116
<b>Long-run CARs</b>						
10	0.55%	2.192*	-0.72%	-1.877	1.87%	4.430**
20	0.12%	0.379	0.43%	0.934	2.62%	4.332**
30	0.74%	2.120	1.79%	3.018**	2.88%	3.756**
40	1.21%	3.095**	1.09%	1.443	3.79%	3.688**
50	0.69%	1.546	1.67%	2.064*	4.49%	3.977**
<b>Panel C2: <math>K &lt; 15</math> (stricter oversold zone)</b>						
<b>Short-run CARs</b>						
1	0.50%	2.042*	0.68%	2.244**	0.42%	2.317*
2	0.82%	2.503*	0.99%	2.402**	0.59%	2.135*
3	0.94%	2.515*	0.96%	1.944	0.44%	1.315
4	1.26%	3.027**	0.84%	1.493	0.48%	1.339
5	1.69%	4.150**	0.76%	1.329	0.32%	0.872

**Table 5.** (continue)

Holding days	DJ30		FTSE100		SSE50	
	Returns	<i>t</i> -TEST	Returns	<i>t</i> -TEST	Returns	<i>t</i> -TEST
<b>Long-run CARs</b>						
10	0.05%	0.086	1.02%	1.469	-0.54%	-1.249
20	-0.51%	-0.725	0.34%	0.360	-1.11%	-2.379*
30	-0.70%	-0.606	1.00%	1.097	-0.89%	-1.537
40	0.80%	0.508	0.94%	0.734	-0.63%	-0.981
50	1.77%	1.171	0.50%	0.329	1.02%	1.159

*Note.* We investigate whether these CARs including one-, two-, three-, four-, and five-day CARs defined as short-run CARs as well as 10-, 20-, 30-, 40-, and 50-day CARs defined as long-run CARs would be different from 0 if investors take the long positions on the constituent stocks of DJ30, FTSE100, and SSE50 as the SOI staying in the stricter overbought zone ( $K > 85$ ) or the stricter oversold zone ( $K < 15$ ) for two, three, and four days occurred. We also present the statistics of *t*-tests for these short CARs and long CARs. In addition, \* and \*\* represent 5% and 1% significance levels, respectively.

**Table 6.** Short- and long-run CARs as SOI staying in extreme overreaction zones

Holding days	DJ30		FTSE100		SSE50	
	Returns	<i>t</i> -TEST	Returns	<i>t</i> -TEST	Returns	<i>t</i> -TEST
<b>Panel A: SOI staying in extreme overreaction zones for 2 days</b>						
<b>Panel A1: <math>K &gt; 90</math> (extreme overbought zone)</b>						
<b>Short-run CARs</b>						
1	-0.09%	-0.893	-0.06%	-0.444	-0.04%	-0.230
2	-0.14%	-1.150	-0.15%	-0.809	0.00%	0.000
3	-0.17%	-1.164	-0.21%	-1.024	0.00%	-0.003
4	-0.26%	-1.592	-0.35%	-1.579	0.07%	0.231
5	-0.22%	-1.127	-0.38%	-1.512	0.05%	0.136
<b>Long-run CARs</b>						
10	0.70%	2.845**	-0.27%	-0.671	1.77%	3.964**
20	0.40%	1.227	0.69%	1.407	2.45%	4.091**
30	0.97%	2.551*	2.16%	3.521**	2.30%	2.985**
40	1.60%	3.656**	1.16%	1.448	2.82%	2.786**
50	1.28%	2.555*	1.60%	1.907	3.49%	3.080**
<b>Panel A2: <math>K &lt; 10</math> (extreme oversold zone)</b>						
<b>Short-run CARs</b>						
1	0.46%	1.592	0.47%	1.602	0.35%	1.933
2	0.97%	2.720**	0.90%	2.117*	0.62%	2.212*
3	1.16%	2.932**	1.03%	1.964	0.66%	1.950
4	1.34%	3.261**	0.94%	1.631	0.62%	1.601
5	1.59%	3.377**	0.86%	1.410	0.63%	1.564
<b>Long-run CARs</b>						
10	0.34%	0.534	1.86%	2.337*	-0.37%	-0.787
20	0.32%	0.379	2.26%	2.567*	-1.18%	-2.257*
30	0.33%	0.235	2.84%	3.124**	-0.92%	-1.442
40	1.06%	0.599	3.08%	2.365*	-0.53%	-0.760
50	2.44%	1.437	2.13%	1.405	1.00%	1.129
<b>Panel B: SOI staying in extreme overreaction zones for 3 days</b>						
<b>Panel B1: <math>K &gt; 90</math> (extreme overbought zone)</b>						
<b>Short-run CARs</b>						
1	-0.23%	-1.901	-0.08%	-0.539	-0.03%	-0.167
2	-0.23%	-1.613	-0.28%	-1.500	-0.02%	-0.072
3	-0.40%	-2.388*	-0.42%	-1.997	0.14%	0.455
4	-0.35%	-2.037*	-0.38%	-1.629	0.10%	0.263
5	-0.33%	-1.561	-0.32%	-1.261	0.08%	0.182

**Table 6.** (continue)

Holding days	DJ30		FTSE100		SSE50	
	Returns	<i>t</i> -TEST	Returns	<i>t</i> -TEST	Returns	<i>t</i> -TEST
<b>Long-run CARs</b>						
10	0.67%	2.395*	-0.28%	-0.626	1.61%	3.247**
20	0.27%	0.707	0.33%	0.597	2.19%	3.179**
30	1.15%	2.670**	2.06%	2.895**	1.94%	2.187*
40	1.65%	3.382**	1.09%	1.174	2.30%	1.973
50	1.30%	2.319*	1.51%	1.540	3.17%	2.457*
<b>Panel B2: K &lt; 10 (extreme oversold zone)</b>						
<b>Short-run CARs</b>						
1	0.79%	2.069*	0.36%	0.981	0.43%	1.976
2	1.24%	2.570*	0.38%	0.882	0.59%	1.704
3	1.51%	2.993**	0.25%	0.445	0.53%	1.251
4	1.87%	3.646**	0.60%	0.988	0.48%	1.070
5	2.21%	3.562**	0.49%	0.769	0.33%	0.738
<b>Long-run CARs</b>						
10	0.62%	0.769	2.73%	3.342**	-0.70%	-1.295
20	-0.18%	-0.187	3.08%	3.162**	-1.57%	-2.717**
30	-0.58%	-0.382	4.03%	3.896**	-1.17%	-1.649
40	0.08%	0.040	4.47%	2.844**	-1.04%	-1.353
50	1.59%	0.838	3.38%	1.822	0.59%	0.561
<b>Panel C: SOI staying in extreme overreaction zones for 4 days</b>						
<b>Panel C1: K &gt; 90 (extreme overbought zone)</b>						
<b>Short-run CARs</b>						
1	-0.22%	-2.039*	-0.22%	-1.404	-0.07%	-0.327
2	-0.40%	-2.614*	-0.56%	-2.611	0.05%	0.157
3	-0.51%	-2.847**	-0.51%	-2.101	0.18%	0.472
4	-0.50%	-2.643**	-0.45%	-1.767	0.13%	0.305
5	-0.51%	-2.543*	-0.50%	-1.758	0.15%	0.319
<b>Long-run CARs</b>						
10	0.38%	1.178	-0.37%	-0.689	1.49%	2.794**
20	0.01%	0.032	0.21%	0.315	1.99%	2.621*
30	1.13%	2.349*	2.22%	2.574*	1.52%	1.540
40	1.36%	2.572*	1.53%	1.386	1.82%	1.400
50	0.87%	1.372	1.79%	1.556	2.73%	1.922
<b>Panel C2: K &lt; 10 (extreme oversold zone)</b>						
<b>Short-run CARs</b>						
1	0.70%	1.310	0.12%	0.261	0.28%	1.133
2	1.33%	1.831	-0.01%	-0.027	0.32%	0.811
3	1.87%	2.676*	0.26%	0.370	0.32%	0.688
4	2.18%	2.633*	0.60%	0.835	0.06%	0.135
5	2.92%	3.101**	0.58%	0.816	0.09%	0.183
<b>Long-run CARs</b>						
10	0.33%	0.373	2.58%	2.693**	-1.01%	-1.651
20	-1.14%	-1.056	3.01%	2.558*	-1.92%	-3.142**
30	-2.71%	-1.594	4.52%	3.660**	-1.61%	-2.095*
40	-2.37%	-1.389	5.10%	2.548*	-1.39%	-1.678
50	-0.51%	-0.278	3.98%	1.685	-0.13%	-0.108

*Note.* We investigate whether these CARs including one-, two-, three-, four-, and five-day CARs defined as short-run CARs as well as 10-, 20-, 30-, 40-, and 50-day CARs defined as long-run CARs would be different from 0 if investors take the long positions on the constituent stocks of DJ30, FTSE100, and SSE50 as the SOI staying in extreme overbought zones ( $K > 90$ ) or extreme oversold zones ( $K < 10$ )<sup>10</sup> for two, three, and four days occurred. We also present the statistics of t-tests for these short CARs and long CARs. In addition, \* and \*\* represent 5% and 1% significance levels, respectively.

<sup>10</sup> We define the extreme overbought zones as  $K > 90$  and the extreme oversold zones as  $K < 10$  in this study.

While we set stricter overreaction zones ( $K > 85$  or  $K < 15$ ) for trading the constituent stocks of DJ 30, FTSE 100, and SSE 50, the results are similar to the findings revealed in Table 3. Table 5 shows that the momentum strategies are appropriate for trading these constituent stocks in the long run (i.e. 10-, 20-, 30-, 40-, and 50-days) as SOI staying in overbought zones for two, three, and four days. Nevertheless, contrarian strategies seem to be more proper for holding the constituents stocks of these indices in the short run (i.e. 1-, 2-, 3-, 4-, and 5-days) as the SOI staying in stricter oversold zones.

As we set the extreme overreaction zones ( $K > 90$  or  $K < 10$ ) employed in this study for trading the constituent stocks of DJ 30, FTSE 100, and SSE 50, the results shown for consecutive two days are somewhat similar to the findings revealed in Table 3. That is, momentum strategies are appropriate for trading these constituent stocks in the long run as SOI staying in overbought zones, but contrarian strategies are proper for holding these constituents stocks in the short run as the SOI staying in oversold zones.

However, by setting the extreme overreaction zones ( $K > 90$  and  $K < 10$ ), the negative CARs are shown for the constituent stocks of DJ 30 as SOI staying in extreme overbought zones for consecutive three to four days in the short run (i.e. 1-, 2-, 3-, 4-, and 5-days), which may result from overreaction due to the SOI staying in extreme overbought zones for over two days. Furthermore, the positive CARs are shown for the constituent stocks of FTSE 100 as the SOI staying in extreme oversold zones for consecutive three to four days in the long run (i.e. 10-, 20-, 30-, 40-, and 50-days). This finding indicates that overreaction might appear in the long run as the SOI staying in the extreme oversold zones for consecutive three to four days. Similar findings are also revealed in the constituent stock of SSE 50.

In summary, overreaction is shown in the short run for the constituent stocks of DJ 30 as SOI staying in extreme overbought zones for consecutive three to four days. Besides, the overreaction lasts for the long run for the constituent stocks of FTSE100 and even SSE50 as the SOI staying in extreme overbought zones for consecutive three to four days. The results for staying on the extreme overreaction cases (i.e.  $K > 90$  and  $K < 10$ ) for three to four days are somewhat different from other overreaction cases employed in this study.

## 5 Conclusion

We explore whether investors can make profits by trading the constituent stocks of DJ30, FTSE100, and SSE50 as the SOI staying in overreaction zones such as diverse overbought and oversold zones, for consecutive days. By using different intensity of overreaction (i.e., the cases of  $K > 80$ ,  $K > 85$ , and  $K > 90$  for overbought zones and  $K < 20$ ,  $K < 15$ , and  $K < 10$  for oversold zones), we further explore whether investors are able to beat the market as the SOI staying in diverse overreaction zones including overbought and oversold, stricter overbought and oversold, and extreme overbought and oversold zones for consecutive days. Although we argue that the SOI staying in overreaction zones for consecutive days due to chasing stock price higher (lower) seem often appeared in the real world, this issue, to the best of our knowledge, seems unexplored in the existing literature.

For most of the overreaction cases explored in this study, the momentum strategies are appropriate for trading these constituent stocks in the long run as the SOI staying in overbought zones for consecutive days. However, contrarian strategies seem proper for holding these constituent stocks in the short run as the SOI staying in oversold zones. However, as for the case of staying in the extreme overbought zone ( $K > 90$ ) for consecutive three to four days, overreaction would be shown in the short run for the constituent stocks of DJ30. In addition, we reveal that overreaction would last in the long run for the constituent stocks of FTSE and SSE 50 as the SOI staying in the extreme oversold zone ( $K < 10$ ) for consecutive three to four days. The results for these extreme overreaction cases are somewhat different from other overreaction cases in this study, indicating that investing strategies should be modified in accordance with diverse overreaction cases.

In addition, we argue that this study would contribute to existing literature in several ways. First, it is the first attempt to investigate whether investors can exploit profits by trading stocks as the diverse intensity of overreaction shown for consecutive days. Second, we employ the constituent stocks of DJ30, FTSE100, and SSE50 instead of stock index only because investors can buy these constituent stocks of DJ30, FTSE100, and SSE50 instead of stock indices. Third, we propose investing strategies for trading the constituent stocks of DJ30, FTSE100, and SSE50 as the SOI staying in overreaction zones for consecutive days. In addition, we point out that investing strategy might be modified as the extreme

overreaction cases shown. The results may be taken into account by investors because investors seem interested in how to employ proper investing strategies as the overreaction phenomena shown for the constituent stocks of DJ30, FTSE100, and SSE50.

Practitioners may be able to beat the market if they observe and analyze these overreaction cases emitted by the SOI deliberately. In addition, we argue that this study is able to provide valuable information, including whether market participants enhance profitability as diverse overreaction phenomena emitted by SOI, whether short-run and long-run CARs significantly vary from each other, and whether differences exist among the constituent stocks of DJ30, FTSE100, and SSE50 in this study.

In addition, we employ the constitute stocks of three representative indices instead of all of the stocks in these three markets. Although the constitute stocks would be the representative stocks in these stock markets, these stocks would be heavy-weighted stocks rather small-cap stocks. In other words, the performances of heavy-weighted stocks might not be those of small-cap stocks, which might be the limitation of this study. Regarding future researches, we argue that we may use other technical indicators such as RSI, MA, MACD, etc., and compare whether the results revealed by other technical indicators would be different from those revealed by SOI.

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