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Stock Market Investor Overreaction Effect: A Pragmatic Study on Emerging Markets

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The existing literature about the overreaction effect in Chinese stock markets is inconclusive and controversial. Therefore, the purpose of this paper is to investigate the presence of overreaction effect in the Shanghai A stock market in the post-financial crisis period. To examine the overreaction effect in the stocks listed at SSE 50 Index, Average Cumulative Abnormal Return methodology of (Maheshwari and Dhankar, 2015; Tripathi and Agrawal, 2009) within a unified framework is applied from January 2009 to December 2014. The results confirm the presence of high market volatility due to more individual investors than institutional investors who lead to more irrational decisions making that confirms the presence of overreaction effect in the Chinese Stock market SSE index. The authors caution readers from generalizing the findings of this study, as the focus is only on A stocks listed on the Shanghai Stock Exchange. The study will benefit government, policymakers and regulators of the economy by studying how the presence of more individual investors than institutional investors of China stock market leads to more irrational decisions giving rise to volatility. The study of China market with these distinctive features provides a potential contribution for emerging markets investors especially for results that contribute with effect of post-global financial crises news effect on Chinese investors.

Keywords: Stock Market, Overreaction, Global Financial Crisis, Shanghai Stock exchange

INTRODUCTION

The existence of anomalies like mean reversal in the stock markets have been well documented in the developed markets literature. It highlights the volatility and unpredictability of the equity market. Return reversal effect is one of anomaly that brings researchers to question the reliability of Efficient Market Hypothesis (EMH) (Rosenberg, Reid, & Lanstein, 1985; Chan, 1988; Lehmann, 1990; Lo, & MacKinlay, 1990). According to EMH the stock prices reflect all possible market information and earning a significant abnormal return is impossible (Basu, 1977). Whereas, with return reversal effect investor could earn significant abnormal return which is close to the weak form of efficient market hypothesis. According to return reversal effect, the preceding period's poorly performed stock (losers) performs better than the previous period's best-performed stocks (winners) in the following period which contradicts with EMH (Zhang et al., 2018; Malkiel, 2003; Zarowin, 1990). This abnormal return earning behaviour is referred as the "overreaction" phenomenon.

The overreaction phenomenon suggests that due to new information; the investors overreact in the initial period, leading the prices to deviate from its fundamental values and later on correct it by bringing the prices back to fundamental values. Initially, De Bondt and Thaler (1985) showed that buying stocks that have been losers (worst-performance) and selling those that have been winners (best-performers) over the previous 3-to-5 years could generate excess profitability over the next 3-to-5 years. They called this method of generating abnormal return 'Contrarian Strategies'. Later, Fama and French (1988), Poterba and Summers (1988), and Cutler et al. (1991) show that stock prices reverse their trend lines over long horizon period, that is, winners in the past may become losers in the future and vice versa. Chopra et al. (1992), Richards (1997), and Balvers et al. (2000) tested the mean reversion and investigated the profitability of contrarian strategies.

A plausible interpretation of mean reversion is that the stock markets consistently overreact to new information and drive the winner and loser stocks to the opposite positions. In USA, individual stock returns exhibit a short-term reversal effect within a few days or weeks, a medium-term momentum effect in 3 months to 1 year, and a long-term reversal effect within 3–5 years (Zhang et al., 2018). The short-term mean reversal effect focuses on reactions to unexpected information. The Long-term mean reversal effect studies indicate stock prices indeed temporarily swing away from their fundamental value due to both optimistic and pessimistic news (Li, Xie, Chen, Wang, & Deng, 2014). According to De Long et al. (1990) the existence of "optimistic" traders can push stock prices away from fundamental values. Rational trader may jump on the bandwagon and purchase (sell) ahead of the "optimistic" traders upon hearing good (bad) news which leads to short-term momentum. Thus, market overreacts to news asymmetrically, the loser overreacting more than the winner.

The concept of emerging markets is described as the countries with specific characteristics with less developed equity markets, less liquid, less industrialized (Schoenfeld, 2011), higher transaction costs but also characterized with high growth potential and more intended for economic liberalization (Bekaert, Harvey, & Lundblad, 2007). Due to differential behaviour of stakeholders in emerging market, they need different criterion to deal with market information. Fama and French (1996) document that emerging markets have value premium in their stock returns. The Chinese stock markets were established in the 1990s and have been growing rapidly in terms of the trading volume, companies and market capitalization. These are fourth largest in the world with over

US$ 5.0 trillion market capitalization. The purpose of the study is to examine overreaction effect in the Chinese stock market after the global financial crises of 2007 for all the stocks listed in Shanghai Stock Exchange (SSE) Composite 50 index.

This enlightens us to examine this study for several reasons. Chinese stock market is fastest growing in the emerging world. i.e. between November 2014 and June 2015 Shanghai Stock Exchange composite index rose by 150% and fell by 40% in the following three months. The Chinese stocks markets could be characterized with high returns and excessive volatility, as compared to stocks traded in developed markets such as the US and UK. Thus, fast growth and excessive volatility warrant an investigation from investors, practitioners and policymakers' viewpoint. Further, it has more asymmetries due to limited access to information and high transaction costs (Harvey, 1995). Contrary to the developed markets where large institutional investors invest in stock markets, around 85% investors in Chinese stock market are inexperienced individuals who trade more frequently than foreign counterparts i.e. average stock holding period in China is two months (Zhang et al., 2018). According to Nofsinger and Sias (1999) individual investors made more irrational decisions than institutional investors. These investors' irrational behaviour, market volatility, high transactions costs due to short holding period and asymmetric information offer strong case for investigating overreaction in the Shanghai 50 index. Additionally, previous researchers analysed the generation of abnormal returns through contrarian and momentum-based trading strategies covering developed markets and did not account for after effects of Global Financial Crises (GFC) with relevant to tremendous increase in trading volume and market capitalization in Chinese stock market. Hence, current study provides fresh evidence post-GFC of 2007.

To cover mean reversal effect in post-financial crises horizon very scarce studies are here to mention where most of the studies worked on collectively Asian markets or emerging market countries, the study on China alone for seeking mean reversion and momentum existence after financial crises is still an open question. Zijun and Lin (2015) studied the overreaction in Shanghai Stock Market during 2004 to 2014. Their results explored that after 2007 the effects of overreaction start decreasing. They indicate changing behaviour of overreaction to be due to global financial crisis. Lim et al. (2008) examined pre and post financial crises overreaction effect of in emerging markets of Asia. They showed that most of the Asian markets in post-financial crises improved their market efficiency. They indicate that investor not only reacts to local news but also to the news originating in other markets leading to higher overreaction effect in post-financial crises period. Moreover, the accounting system and stock types are different in SSE where A-shares are available to mainland investors and B shares available for mainland and foreign investors. The different characteristics of both types of stocks (A and B) could affect the intensity and speed of overreaction and mean reversal effect (Wang et al., 2004). Furthermore, presence of strict government regulation, transaction cost and limited investment tools may also affect the significance overreaction effect in this respect.

To capture overreaction effect in the stock listed at SSE50 Index, a time series analysis of (Maheshwari and Dhankar, 2015; Tripathi and Agrawal, 2009; Balvers and Wu, 2006) of Average Cumulative Abnormal Return within a unified framework is applied for the period of January 2009 to December 2014. The portfolios construction is based on 12 months formation period and 6 months' testing period for intermediate-term analysis. For short-term analysis 6 months formation and 3 months' testing periods are taken. As the period taken for analysis covers the post-global financial crises in China market, the empirical evidence about overreaction effect after GFC in China is scarce and it will be interesting to seek that either findings prior to crisis still hold after the crisis as well. Results indicate that overreaction in the loser portfolio is significant for the testing periods of 6 months and 3 months. Furthermore, biggest winner and loser portfolios follow the mean reversal effect. Our results on mean reversion support the hypotheses of overreaction and positive-feedback trading framework. The remainder of the paper formulated are as follows. Section 2 provides a brief review of the relevant literature. Section 3 describes the data and method used. Section 4 provides the results and discuss and section 5 presents the conclusion.

LITERATURE REVIEW

To understand overreaction in the market, it is best to first review the normal reaction. The most interesting, well-studied, and controversial theory of market normality is the Efficient Market Hypothesis (EMH). EMH states that "Markets are rational and efficient," and "Prices fully reflect all available information". According to the EMH, it is impossible to gain abnormal returns because stocks will always trade at their fair value and will yield normal returns based only on the information available about the past. The EMH has been widely accepted by the financial economists even up until now and even with much questioning of it.

It provides investors with a rule and equation to calculate returns in the real market which is close to weak form of EMH. Most of the empirical studies have examined whether Chinese stock markets are weak-form efficient. For example, in early studies (Bailey, 1994; Ma, 1996; Su, & Fleisher, 1998) documents a significant under-pricing in the Chinese equities due to overreaction effect. The overreaction hypothesis generally focuses on the market participants rather than the market itself, predicting that the participants will overreact to new and extremely unexpected events by pulling the stock prices far from their true value, thus virtually creating the market. At first, it was considered to apply to short periods, because investors realise their mistakes rapidly and take corrective actions later. Corrective actions include investing in the opposite direction, and prices therefore revert to their true fundamental levels. Hence, according to this hypothesis, it is possible to earn abnormal returns by means of 'contrarian strategy' that is the investors can purchase stocks that have performed poorly and sell those which have performed well in the past.

This predictability of earning abnormal return in the stock market with contrarian strategy had received increased attention. Overreaction hypothesis introduced the consideration of behaviour of investors into market perspectives, resulting in the perspective of behavioural finance. Behavioural finance offers unconventional explanations for the deviation of prices from their fundamental values. According to Hirshleifer (2001), behavioural finance is based on the factors affecting human behaviour relevant to investment decisions and focuses on factoring the psychological biases to improve financial decisions. Daniel, Hirshleifer, and Subrahmanyam (1998) assume that investors are overconfident about their own information or experience and that, due to self-attribution bias, this overconfidence keeps on increasing and leads to overreaction in their investments. Mean reversions are not the only anomalies leading to overreaction effect. The other various market anomalies giving rise to overreaction effect are well examined by previous researchers including risk mis-measurement (Chan, 1988), bid-ask spread (Atkins, & Dyl, 1990), size effect (Zarowin, 1990), and biases in computed return (Conrad, & Kaul, 1993; Dissanaike, 1994).

De Bondt and Thaler (1985) introduced "winner" and "loser" portfolios and argued that people systematically overreact to unexpected news. They suggested two hypotheses i.e. (1) extreme movements in stock prices will be followed by subsequent price movements in the opposite direction; and (2) the more extreme the initial price movement, the greater will be the subsequent adjustment. From here the extreme movements are described as investor reaction based on new market information leading to high fluctuation in stock prices due to information asymmetry. The higher the fluctuation in stock prices, the greater would be the deviation from fundamental values and greater the adjustment time where prices revert back to their original values. The overreaction effect has been confirmed in developed countries like UK (Clare, Thomas 1995), Spain (Alonso, Rubio 1990), New Zealand (Bowman and Iverson, 1998) and Germany (Lobe, & Rieks, 2011), with a variety of formation and testing periods. Researchers also focused on short-run overreaction (daily and weekly data from a one-week testing period) (Ahmed, & Hussain, 2001; Bowman and Iverson, 1998) whereas others use longer testing periods of one or two years (Daniel, & Hirshleifer, 1998).

For the Spanish stock market, strong overreaction was observed from 1967-1984 and 1963-1997, which gets stronger when longer formation and testing periods are used (Alonso and Rubio, 1990; Forner and Marhuenda, 2000). Stock (1990) for Germany, Swallow and Fox (1998) for New Zealand, and Dubois and Bacmann (1998) for France confirmed the presence of overreaction effect and reported that standard contrarian strategy leads to smaller yet significant profits. However, Brailsford (1992) for Australia and Kryzanowski & Zhang (1992) for Canada found weak evidence of the overreaction effect with one, two, three, five, eight and ten years testing and formation periods. Similarly, Clare and Thomas (1995) found weak overreaction effect in stock market of UK from 1955-1990, and these abnormal returns were due to the size effect.

Richards (1997) with usage of total returns of sixteen market indices of loser and winner portfolios examined common international risk factors that were well integrated into markets. He documented that for longer horizons of three to four years, losers outperformed winners. Similarly, Baytas and Cakici (1999) examined seven developed stock markets (US, Canadian, Japanese, French, Italian, German, and UK) and found strong overreaction effect in two- and three-year periods for all countries except the US and Canada stock markets. These results are indicating the significant implication of overreaction effect in developed economies but with varying intensity.

Conversely, various studies also explored the overreaction effect for developing countries. Da Costa (1994) found an overreaction effect in the Brazilian stock market, but it was asymmetrical, which means that only the winner portfolios reversed. Similarly, Locke and Gupta (2009), and Tripathi and Gupta (2009) reported overreaction effect in Sri Lankan, and Indian stock markets respectively. Similarly, Farag, (2015) studied the implication of overreaction within price limit regimes in case of Egyptian stock market. Ahmad and Hussain (2001) and Ali et al. (2011) reported on the overreaction effect and seasonality in Malaysia. They highlighted that overreaction was significant prior to the Asian financial crises of 1997 and had gradually diminished and become insignificant since then.

In China, most of the studies related to overreaction effect are examined without consideration of financial crises of 2007. Amongst these studies Li, Qiu and Wu (2010) examine 25 momentum and contrarian trading strategies using monthly stock returns in China for the period from 1994 to 2007. Their results indicate that no momentum profitability in any of the 25 strategies exists. However, there was evidence of reversal effects where the past winners become losers and past losers become winners afterwards. The contrarian profit strategy significantly holds for short-term formation and holding periods 1 to 3 months. They indicate that contrarian strategies could generate about 12 per cent return per annum. Kang, Liu and Ni (2002) examined short-term contrarian reversal effect and intermediate term momentum effect in China using weekly data for the period of 1993 to 2000. The explained the main cause of abnormal return to be investor overreaction to firm-specific information but this did not hold for intermediate-term momentum effect.

Wu (2011) explored the contrarian and momentum strategies in SSE from the sample period of 1990-2001. They found that contrarian strategies with high overreaction effect provide more abnormal returns as compared to momentum strategies. Wang and Chin (2004) examined mean reversal and momentum effect in China stock market. They report past trading volume to be the main driving factor of mean reversal and momentum effect in China market. They also document market characteristics such as dominance of individual investors and prohibition on short sales may explain these abnormal stock returns. Chan et al. (2000) argues that firm-specific events are drivers of momentum effect in China. The investors may under-react to the specific event or there may be delayed overreaction to information due to positive feedback trading. Shumway and Wu (2006) documents

disposition effect as a driving factor of momentum effect in Chinese stock market.

To cover mean reversal effect in post-financial crises horizon very few studies are here to mention where most of the studies worked on collectively Asian markets or emerging market countries, the study on China alone for seeking mean reversion and momentum existence after financial crises is still an open question. Zijun and Lin (2015) studied the overreaction in Shanghai Stock Market during 2004 to 2014. Their results explored that after 2007 the effects of overreaction start decreasing. They indicate changing behaviour of overreaction to be due to global financial crisis. Susan et. Al. (2015) documented presence of herding behaviour of investors in pre and post financial crises in both Shanghai and Shenzhen stock market. They showed the evidence of asymmetric herding behaviour with greater magnitude of herding behaviour on up markets than on down markets. Lim et al. (2008) examined pre and post financial crises overreaction effect of in emerging markets of Asia. They showed that most of the Asian markets in post-financial crises improved their market efficiency. They indicate that investor not only reacts to local news but also to the news originating in other markets leading to higher overreaction effect in post-financial crises period.

Banz (1981) introduced size as an important factor in affecting returns of a security indicating that stocks with lower market capitalization (small stocks) tend to have higher average returns. Fama and French (1996:2012) revealed that maximum variation in stock returns is explained by book to market equity and size. The returns on small stocks are more sensitive to the risk captured by size factor than the returns on big stocks. This emphasize that profitability of the long run return reversal effect is associated with size risk. Zarowin (1990) depicted that past loser portfolios are dominated by small size stocks with higher risks that generates higher return in longer time horizons compared to past winner portfolios of big size stocks and vice versa. Past winner, portfolios with big size stocks of large-scale companies could become loser portfolios.

With this size effect explained above, since 50 largest companies of China are listed on the Shanghai A-Stock Exchange 50 index compared to the Shenzhen listing, we assume return reversal effect would be present in the Shanghai market. Therefore, this research explored the presence of weak form of efficient market hypothesis with mean reversal effect during 2009 to 2014 in SSE with consideration of size effect as well as post financial crises after effects. The sample includes 50 constituent stocks in the SSE 50 Index. These 50 largest firms represent highest market capitalization. This research intends to explore that whether mean reversal effect prevails for large firms after global financial crisis in China. If results explored significant implication of overreaction, then it can be argued that it is not due to only size effect but also due to financial crises or specific market characteristics. Thus, the contribution of this research will be its investigation of overreaction for large size firms after global financial crises in case of Chinese listed firms.

DATA AND METHODOLOGY

The data for this study consists of the monthly returns of all 50 constituent stocks in the SSE 50 Index in the Shanghai Stock Exchange from January 2009 to December 2014 (part of the sample extends back to 2006 for relevant purposes). The market return is taken as the total return of the Shanghai Stock Exchange shown in the index. Following methodology of (Maheshwari & Dhankar, 2015; Tripathi and Agarwal, 2009 and Balvers and Wu, 2006), the time series analysis of cumulative abnormal return is applied for construction of loser and winner portfolios. From these loser and winner portfolios, contrarian strategy is applied to build arbitrage portfolio which is the difference of mean reversions between loser and winner portfolios. In this contrarian strategy, formation and holding periods are formed for winner and loser portfolios construction. The portfolios construction is based on 12 months formation period and 6 months' testing period for intermediate-term analysis. For short-term analysis 6 months formation period and 3 months' testing periods are taken. The study employed overlapping portfolios where portfolios are rebalanced at the start of each year.

Excess Cumulative Return

At first the stock price data is converted into simple percentage returns as follows where $R_{i,t}$ is the monthly return, $P_{i,t}$ is the price on month t and $P_{i,t-1}$ is the price on month t-1.

$$R_{i,t} = \frac{P_{i,t} - P_{i,t-1}}{P_{i,t-1}}$$

Beginning on January 2009 to December 2014, the cumulative market return of stock i in a period of t months ($CR_{i,t}$) is calculated as follows:

$$\boldsymbol{CR_{i,t}} = \prod_{i=1}^{t}(1 + R_{i,j}) = (1 + R_{i,1})(1 + R_{i,2}) \cdots (1 + R_{i,t}) \quad (1)$$

Where $R_{i,j}$ is the monthly return of stock i in month j. Monthly stock returns from the period of January, 2009 to December, 2015 in the index is calculated for both the 12 month formation and 6 month test periods in intermediate term analysis and 6 month formation and 3 month test periods for short term analysis. The cumulative returns for t months in the testing periods are the buy-and-hold returns for the period of t months. We employed a geometric mean instead of an arithmetic mean because the former can reduce the error caused by bid-ask spread, as stated by Conrad and Kaul (1993). Similarly, Dissanaike (1993) argued that calculation with arithmetic mean is an inaccurate method in computing multi-period returns from single period returns as the strategy involves rebalancing to equal weights in each single period. The **excess cumulative return** $ECR_{i,t}$ for stock i in a period of t month is defined as;

$$\boldsymbol{ECR_{i,t}} = CR_{i,t} - CR_{m,t} \quad (2)$$

Where, $CR_{m,t}$ is the total return of market in the corresponding period of t month. To calculate excess cumulative return ECR, six years returns have been used. The formation period is 12 months and testing period is 6 months for intermediate term analysis whereas 6-month formation period and 3-month test periods for short term analysis. The formation periods are sorted based on their Excess Cumulative Return $ECR_{i,t}$.

Based on excess cumulative returns, the monthly cumulative returns of 12-month formation period and separate 6-month

formation period are sorted in descending order. The winner portfolios would be regarded to those stocks having the highest excess cumulative returns whereas the loser portfolios are those having the lowest value of excess cumulative returns. The winner portfolio contains the top 5th percentile stocks with the highest ECR returns, termed as $ECR_{W,T}$. The loser portfolio contains the bottom 5th percentile stocks with the lowest ECR termed as $ECR_{L,T}$.

Average Excess Cumulative Return

For intermediate term analysis and for short term analysis in each testing period *T*, the **average of excess cumulative returns** of top 5th percentile stocks are taken termed as $AECR_{W,T}$ and average of excess cumulative return of bottom 5th percentile stocks $AECR_{L,T}$ are constructed.. In intermediate term analysis the AECR for all portfolio securities are calculated for each of the next 12 months formation period (*F*) and 6 months testing periods (*t*). In short term analysis the formation period (*F*) are 6 months and testing periods (*t*) are 3 months. The arbitrage portfolio as described above is the difference between loser and winner portfolios that is $AECR_{L,T} - AECR_{W,T} = D_{L,T-W,T}$ is calculated using following equations respectively:

Intermediate Term Analysis

$$\boldsymbol{AECR_{W,T}} = \frac{\sum_{j=1}^{N} \boldsymbol{ECR_{w,i,t}}}{N} \quad ;F = 1,2,3,\ldots..12; \quad t = 1,2,3,\ldots\ldots \text{ 6 months} \tag{3}$$

$$\boldsymbol{AECR_{L,T}} = \frac{\sum_{j=1}^{N} \boldsymbol{ECR_{L,i,t}}}{N} \quad ;F = 1,2,3,\ldots..12; \quad t = 1,2,3,\ldots\ldots \text{ 6 months} \tag{4}$$

$$\boldsymbol{D_{L,T-W,T}} = AECR_{L,T} - AECR_{W,T} \tag{5}$$

Short Term Analysis:

$$\boldsymbol{AECR_{W,T}} = \frac{\sum_{j=1}^{N} \boldsymbol{ECR_{w,i,t}}}{N} \quad ;F = 1,2,3,\ldots..6; \quad t = 1,2,3 \text{ months} \tag{6}$$

$$\boldsymbol{AECR_{L,T}} = \frac{\sum_{j=1}^{N} \boldsymbol{ECR_{L,i,t}}}{N} \quad ;F = 1,2,3,\ldots..6; \quad t = 1,2,3 \text{ months} \tag{7}$$

$$\boldsymbol{D_{L,T-W,T}} = AECR_{L,T} - AECR_{W,T} \tag{8}$$

Where, $AECR_{W,T}$ *and* $AECR_{L,T}$ is the average excess cumulative return. $ECR_{W,i,T}$ is the excess return of stock *i* in the winner portfolio, $ECR_{Li,T}$ is the excess return of stock *i* in the loser portfolio? $D_{L-W,T}$ is the return of the arbitrage portfolio.

Grand Average Excess Return

The excess returns of the winner and loser portfolios of all testing periods are combined and averaged to obtain the grand average excess returns of the winner portfolios $GAECR_W$ and of the loser portfolios $GAECR_L$ as follows. This is done separately for intermediate term analysis and for short term analysis.

$$\boldsymbol{GAECR_W} = \frac{1}{n}\sum_{T=1}^{n} AECR_{W,T} \tag{9}$$

$$\boldsymbol{GAECR_L} = \frac{1}{n}\sum_{T=1}^{n} AECR_{L,T} \tag{10}$$

$$\boldsymbol{DG_{L-W}} = GAECR_L - GAECR_W \tag{11}$$

Where, DG_{L-W} is the grand average return of the arbitrage portfolio. The t-test is applied to find whether, $GAECR_W$, $GAECR_L$ or DG_{L-W} is significant in all testing periods being non-overlapping. The cumulative returns for *t* months in the testing periods are the buy-and-hold returns for the period of *t* months. Only the beginning and ending prices are needed to calculate these cumulative returns. The method is consistent with Equation 1.

Hypothesis

If the mean reversal effect exists in SSE Shanghai 50 index stock, then during the testing period (t), the GAECR of losers must be greater than zero while the GAECR of winners must generate negative returns because the overreaction hypothesis predicts reversals in returns of past losing and winning stocks. Hence, it could be stated if the GAECR of arbitrage (DG) portfolio that is (GAECR (L) – GAECR (W)) is greater than zero then it suggests the presence contrarian profits in intermediate term and short-term period analysis. The profitability of contrarian strategies could be explained with average GAECR of the arbitrage portfolio (DG). As contrarian strategy suggests long position in past losers and short position in past winners, any positive return in arbitrage portfolio predicts the profitability of contrarian strategy in Chinese stock market. Based on this, three hypotheses of mean reversal are tested:

Hypothesis 1: The grand average excess cumulative return is less than equal to 0

Hypothesis 2: The grand average excess cumulative return is greater than equal to 0

Hypothesis 3: The loser minus winner grand average excess difference is greater than equal to 0.

$$\boldsymbol{H_1}: GAECR_W \leq 0$$
$$\boldsymbol{H_2}: GAECR_L \geq 0$$
$$\boldsymbol{H_3}: DG_{L-W} \geq 0$$

The test statistics were calculated as follows:

$$\boldsymbol{t_W} = \frac{GAECR_W}{S_W/\sqrt{N}}$$

$$\boldsymbol{t_L} = \frac{GAECR_L}{S_L/\sqrt{N}}$$

$$\boldsymbol{t_D} = \frac{DG_{L-W}}{S_D/\sqrt{N}}$$

Where,S_W, S_L and S_D are the standard deviations of winner portfolio, loser portfolio and arbitrage portfolio return for testing periods.

RESULTS

Intermediate Term Analysis

Table 1 reports the average excess returns of the loser, winner and arbitrage portfolios for intermediate term analysis with 12 months formation and 6 months testing periods. As testing period is 6 months of 5 overlapping years, it gives 6*10=60 months. Therefore total 10 tests hold in testing periods. The arbitrage portfolio return is positive in test 1 which means in the next 6 months after the formation period the loser portfolio outperform the winner portfolio but the number is not significantly higher than zero and in test 2, it drops to negative then recovers again in the next test. Because of the longer formation and test period, the volatility of winner and loser portfolios seems to be around zero and slightly decreasing (increasing) for winner (loser) portfolios in tests 8 and 10. Figure 1 shows the graph of Table 1. The winner portfolios showing a downward trend after formation period, the highest return of AECRW in test periods is 0.083441(test 5) which is much lower than formation one (1.16402) and lowest return of AECRL in test period is -0.0946 which is higher than the formation one (-0.3831) and reaches peak of 0.68 in test 10. Overall Test 1,3,4,7,8 and 10 confirms the presence of mean reversion that is contrarian profits in China stock market SSE 50 index whereas Test 2,5,6 and 9 confirms the presence of momentum effect.

Table 1: Average excess returns of winner portfolios, loser portfolios and arbitrage portfolios (Testing period of 6 months)

Test period	AECRW Mean	AECRL Mean	DLW Mean
TEST1	0.039202	0.062999	0.023797
TEST2	0.020995	-0.03561	-0.0566
TEST3	0.029166	0.056293	0.027127
TEST4	-0.00255	0.007472	0.010024
TEST5	0.083441	-0.03047	-0.11391
TEST6	-0.03025	-0.09465	-0.0644
TEST7	0.017718	0.11838	0.100661
TEST8	-0.10543	0.268075	0.373508
TEST9	-0.04165	-0.08829	-0.04664
TEST10	-0.47409	0.683826	1.157917
Average	-.04634480	.09480250	.14114840
T statistic	-.922	1.285	1.168

AECRW average excess cumulative returns of the winner portfolios after formation; AECRL average excess cumulative returns of the loser portfolios after formation; DLW average excess cumulative returns of arbitrage portfolios (longing loser portfolios and shorting winner portfolios) after formation. * Significant at 5% level.

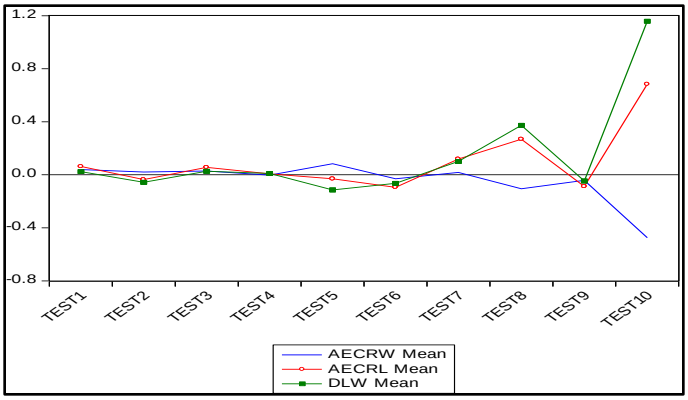


Figure 1: Average excess cumulative returns of winner portfolios, loser portfolios and arbitrage portfolios (Testing period of 6 months)

Short Term Analysis

Table 2 shows the average excess returns of loser, winner and arbitrage portfolios in the 3 months testing period (Formation period: 6 months). This gives 22 tests with 6 overlapping years. The arbitrage portfolio returns (0.025) is positive in test 1 which means in the next three months after formation period the loser portfolio outperform the winner portfolio but the number is not significantly higher than zero and in test 2, it drops to negative then recovers in the next test. The winner portfolios return (0.07204) keep outperforming the market in test 1 but lower than loser portfolio returns (0.09743). In test 3 to test 16, the winner portfolios appear to have volatility around zero and it drops under zero for test 16 and test 21 and recovers slightly above zero in test 22. Figure 2 shows the graph of Table 2. The winner portfolios suffer an average decrease after formation period, the highest return of AECRW in test periods is 0.076 (test 11) which is much lower than the formation one (0.61897), and the lowest return of AECRL in test period is -0.0716 which is higher than the formation one (-0.3147) and reaches the peak of 0.259104 in test 20. Overall Test 1,3,4,6,8,12,15…21 confirms the presence of return reversal effect in 3-month testing periods. Test 2,5,7,9,10,11,13,14 and 22 confirms presence of momentum effect.

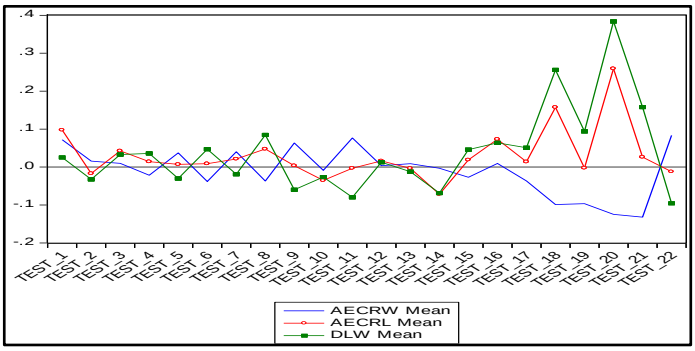


Figure 2: *Average excess cumulative returns of winner portfolios, loser portfolios and arbitrage portfolios (Testing period of 3 months)*

Table 2: Average excess returns of winner portfolios, loser portfolios and arbitrage portfolios (Testing period of 3 months)

Test period	AECRW Mean	AECRL Mean	DLW Mean	Test period	AECRW Mean	AECRL Mean	DLW Mean
TEST_1	0.07204	0.09743	0.02538	TEST_12	0.003582	0.016248	0.012666
TEST_2	0.01553	-0.0170	-0.03257	TEST_13	0.008809	-0.00339	-0.0122
TEST_3	0.00970	0.04260	0.03289	TEST_14	-0.00311	-0.07168	-0.06857
TEST_4	-0.0216	0.01416	0.03579	TEST_15	-0.02709	0.018837	0.045922
TEST_5	0.03742	0.00714	-0.03028	TEST_16	0.009431	0.073163	0.063732
TEST_6	-0.0382	0.00883	0.04703	TEST_17	-0.03678	0.013985	0.050764
TEST_7	0.04023	0.02130	-0.01893	TEST_18	-0.09873	0.157361	0.256086
TEST_8	-0.0368	0.04766	0.08454	TEST_19	-0.09662	-0.00274	0.093871
TEST_9	0.06355	0.00357	-0.05997	TEST_20	-0.12459	0.259104	0.383698
TEST_10	-0.0088	-0.0351	-0.02626	TEST_21	-0.13207	0.026054	0.158122
TEST_11	0.07672	-0.0031	-0.07984	TEST_22	0.083372	-0.01241	-0.09578
				Average	-.009279	.0300907	.0393687
				T statistic	-.700	2.045*	1.657

Intermediate Term Analysis:

Table 3 shows the results of Grand average excess returns for intermediate term analysis (Formation period: 12 months, testing period: 6 months) giving 10 Tests as depicted in Table 1. Results show that the winner portfolios underperform the market in all the test periods and loser portfolios only have two negative test periods. The arbitrage portfolio shows only in fourth test period winner portfolio beats loser ones. Based on the results reported in Table that the reversal effect occurs after formation period. Figure 3 shows the graph of Table 3; the arbitrage portfolios mostly beat the market which indicate there is a profit space when investors employ contrarian strategy.

Table 3: Grand average excess returns of winner portfolios, loser portfolios and arbitrage portfolios (Testing period of 6 months).

Number of testing period	Grand average excess cumulative returns of portfolios GAECR_W	t	GAECR_L		DG_L-W	
	ean		ean		ean	
Test 1	-.0256	.5259	.0118	.3160	.8234	0374
Test 2	-.0736	.7810	-.020	-.3695	.7062	0515
Test 3	-.0087	.4823	.0169	.2573	.3281	0256
Test 4	-.0079	.1961	-.0176	-.1914	-.0752	.0097
Test 5	-.0468	-10.3763*	.0205	.1753	.5926	0674
Test 6	-.0989	3.6431*	.0078	.0458	.6263	1067
Test 7	-.1312	2.7278*	.2280	10.6746*	7.4999*	3592
Test 8	-.2072	4.0528*	.3275	3.6703*	3.8096*	5348

*GAECRW average excess cumulative returns of the winner portfolios after formation; GAECRL average excess cumulative returns of the loser portfolios after formation; DG_L-W Grand average excess cumulative returns of arbitrage portfolios (longing loser portfolios and shorting winner portfolios) after formation. * Significant at 5% level.*

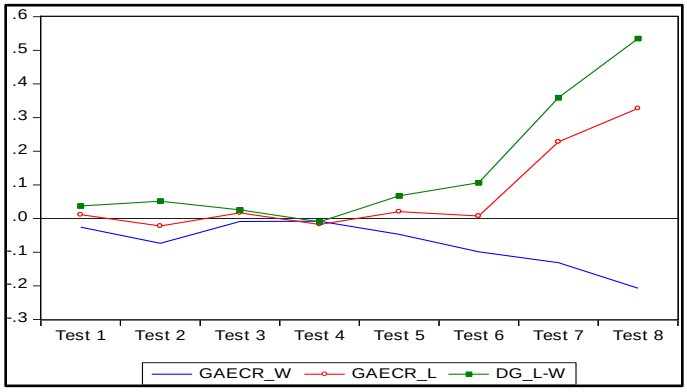


Figure 3: Grand average excess cumulative returns of winner portfolios, loser portfolios and arbitrage portfolios (Testing period of 6 months)

Short Term Analysis:

Table 4 shows the grand average excess cumulative returns of loser portfolio, winner portfolio and arbitrage portfolio for short term analysis (Formation period: 6 months, test period: 3 months). The 3 months testing periods give 22 tests for 6 overlapping years. In comparison with market return, the winner portfolio returns keep slightly positive after formation period which means the average of first 12 test periods winners are still winners (compare with market) and become negative since test period 13, meanwhile the loser portfolio returns keep positive trend in the whole test period (except test 19 and 22) which means the most test periods they beat the market. And the arbitrage portfolio return is also positive except for test 19 and 22, which shows that the loser portfolios not only beat the market but also are the winners. Figure 4 shows the graph of Table 4. In the 22 test periods, winner portfolio recovered to 0.08 which is the highest after formation period, it outperforms the market but not the loser portfolio before test 13 and then even worse than the market. Loser portfolios perform better than the market after formation period (except for test 19 and 22) with the highest return of 0.165 in average of 18 tests periods.

Table 4: Grand average excess returns of winner portfolios, loser portfolios and arbitrage portfolios (Testing period of 3 months)

	GAECR_W				GAECR_L			DG_L-W		
NNo. of testing period	t-stat	Mean	S.D		t-stat	Mean	S.D	t-stat	Mean	S.D
Test 1	0.95	0.02	0.06		2.15*	0.09	0.13	1.40	0.07	0.15
22	0.07	0.00	0.04		1.74	0.04	0.06	1.40	0.03	0.08
33	0.60	0.01	0.04		2.218*	0.04	0.05	1.24	0.03	0.07
44	0.16	0.00	0.05		2.469*	0.03	0.04	1.71	0.03	0.05
55	0.96	0.01	0.03		3.769*	0.03	0.03	1.73	0.02	0.04
66	0.12	0.00	0.04		4.856*	0.03	0.02	1.76	0.03	0.05
77	0.98	0.01	0.03		4.086*	0.03	0.02	1.17	0.02	0.05
88	0.73	0.01	0.03		4.882*	0.03	0.02	2.028*	0.03	0.04
99	1.67	0.02	0.03		5.035*	0.03	0.02	0.81	0.01	0.04
110	1.52	0.02	0.03		3.219*	0.03	0.02	0.55	0.01	0.04
111	1.73	0.02	0.02		5.285*	0.03	0.01	1.21	0.02	0.03
212	0.34	0.01	0.04		4.074*	0.03	0.02	1.21	0.03	0.06
113	-0.09	0.00	0.04		2.888*	0.03	0.03	1.17	0.04	0.07
114	-0.33	-0.01	0.05		2.029*	0.03	0.03	1.08	0.04	0.08
115	-0.66	-0.02	0.07		2.489*	0.05	0.04	1.35	0.07	0.10
116	-0.65	-0.02	0.07		1.916*	0.06	0.06	1.22	0.08	0.13
117	0.77	-0.05	0.12		1.22	0.09	0.13	1.00	0.14	0.25
118	-0.89	-0.09	0.18		1.03	0.17	0.28	0.97	0.26	0.46
119	0.20	0.00	0.02		-0.15	0.00	0.01	-0.33	0.00	0.02
220	-0.04	0.00	0.01		1.08	0.02	0.02	1.57	0.02	0.01
221		-0.02				0.01			0.03	
222		0.08				-0.01			-0.10	

*GAECRW average excess cumulative returns of the winner portfolios after formation; GAECRL average excess cumulative returns of the loser portfolios after formation; DG_L-W Grand average excess cumulative returns of arbitrage portfolios (longing loser portfolios and shorting winner portfolios) after formation. * Significant at 5% level.*

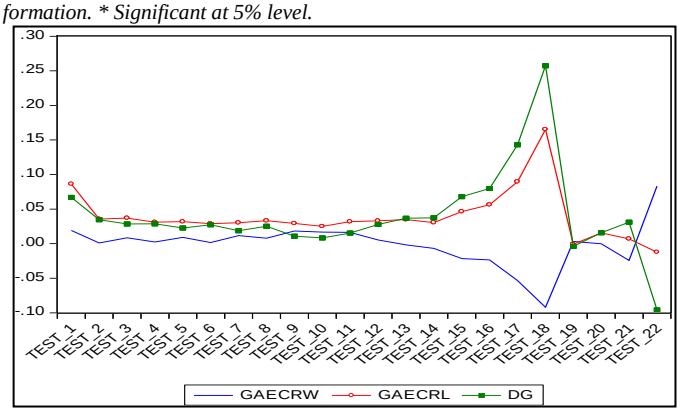
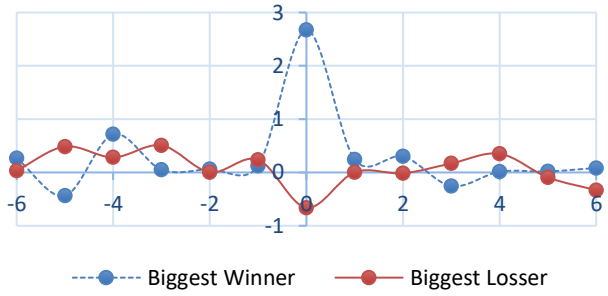


Figure 4: Grand average excess cumulative returns of winner portfolios, loser portfolios and arbitrage portfolios (Testing period of 3 months)

With the comparison of all winner portfolios and loser portfolios in all formation periods (1-year formation period), we find the first formation period (2009) winner portfolio has highest average excess return (2.673488) and the third formation (2011) period loser has the lowest average excess return (-0.66059). Based on this, we have chosen the first formation period winner portfolio as the biggest winner portfolio and the third formation period loser portfolio as the biggest loser portfolio (6-month formation period biggest winner: January to June 2009; biggest loser: January to June 2011). We ranked the biggest winner and loser portfolios 6 test periods before and after formation period and the results are reported in Figures 5 and 6 below. The biggest loser portfolio performance better before and after formation period and winner perform worse before and after formation period. The sharp increase (decrease) of excess return is the overreaction of the "news" released in the market.

Figure 5: Winner and loser portfolios volatility (ACER) test period of 6 months before and after formation



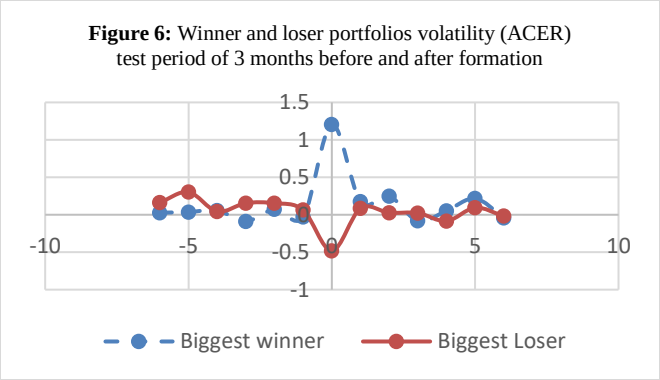


Figure 6: Winner and loser portfolios volatility (ACER) test period of 3 months before and after formation

Table 6: Coefficients between formation and test period

Coefficients between Formation Period and Test Period					
Formation 1 year, Test 6 months			**Formation 6 months, Test 3 months**		
Winner		**t-stat**	**Winner**		**t-stat**
Test1	0.056	1.537	Test1	0.105	1.634
Test2	0.040	0.450	Test2	0.053	1.229
Loser			**Loser**		
Test1	-0.077	-0.806	Test1	-0.272	-2.235732*
Test2	0.040	0.386	Test2	0.057	0.796

*significant at the 0.05 level

Additional tests:

To further confirm the above results, we also applied regression analysis to test a return reversal effect in a period of market. Our regression model used is as follows:

$$\boldsymbol{AR_1} = \alpha + \beta AR_0 + \varepsilon.$$

Where 0 is the formation period and 1 is the first test period after formation. The coefficient β will be a measure of mean reversal. If there is a reversal, a negative β will be found in the regression. And if there is a "big news" in the market, β should be significant, indicating the abnormal return in the "news" time. The table 6 results show that the loser portfolios with 3-month test periods have significant negative coefficients, and sample loser portfolios of the longer period also have negative coefficients but are not significant. Meanwhile, all winner portfolios for both sample periods have insignificant positive coefficients. Based on these results, the winner portfolios kept outperforming the market with lower abnormal returns in test periods 1 and 2. They were still winners compared with the market; however, their advantage was insignificant. The loser portfolios outperformed the market in test period 1 and turned back into losers in test period 2. From the research sample period, the shorter the formation and test periods, the more significant the reversal effect for both loser and winner portfolios: there is a momentum effect in the 3 months after the formation period. These results strongly show asymmetry between winner and loser portfolios.

Prior research on the overreaction hypotheses has tested long-run phenomena (3 years, 5 years) and short-run phenomena (1 week and 1 month). Medium-term tests were undertaken by Kryzanowski and Zhang (1992) and Jegadeesh and Titman (1993), they reported different result, that is, return continuation, which supports the hypotheses of momentum rather than reversal. However, our results show that the reversal effect and overreaction exist, but are insignificant in the test period, and shorter sample periods seem to have more explanatory power. Therefore, we assume that reversal effect and overreaction to news occurs in the very short term after the formation period. Moreover, other issues need to be considered, that is, time-period, stability, seasonality, and size. We have considered each of them as given below.

Overreaction and subsequent reversal are a real phenomenon in the stock market and can be expected across periods. In our test, the winner and loser portfolios in different periods show large statistically abnormal returns. The overreaction hypothesis is thus confirmed for different periods. Seasonality has been introduced as the January effect and the Monday effect, confirmed by Zarowin (1990) and Chopra et al. (1992) in the long-run, overreaction. However, Bremer and Sweeney (1991) evidence for the January effect from the short-run perspective. Our research is not influenced by monthly or weekly effects, since its formation and test periods are both over 3 months. The effect of size is ubiquitous in the study of overreaction and other hypotheses about the stock market. As is known, size is correlated with a range of relevant factors. However, size is not affecting these results as the sample includes firms from the SSE50 index, which means that none in the sample were small or weak.

CONCLUSION

We have tested evidence for the existence of short-term and intermediate-term overreaction in the SSE. Using monthly data of samples with formation periods of 1 year and test periods of 6 months, the loser portfolios of 50 sample stocks in the SSE50 Index outperformed the winner portfolios by 0.024 in 1 test period after formation and by an 0.141 average. In the samples with formation periods of 6 months and test periods of 3 months, the loser portfolios outperformed the winner portfolios by 0.025 in 1 test period after formation and by a 0.039 average. In this research, all stocks in the index represent respective industries and had great capitalisation and liquidity. The arbitrage portfolios were formed with an approach minimum cost and easy execution. The findings of the study suggest that there are asymmetrical overreactions in the stock market – there are overreactions especially for loser portfolios. The before-after test for the biggest winner and loser portfolios shows that the losers recovered and beat the market immediately.

The findings of this study support the findings of Maheshwari and Dhankar, 2015; Tripathi and Agarwal, 2009 worked on emerging markets. Contrary to the developed markets where large institutional investors invest in stock markets, Chinese stock market are inexperienced individuals who trade more frequently than foreign counterparts i.e. average stock holding period in China is two months (Zhang et al., 2018). According to Nofsinger and Sias (1999) individual investors made more irrational decisions than institutional investors. These investors' irrational behaviour leads to high market volatility, high transactions costs due to short holding period and asymmetric information. The results confirm the presence of high market volatility due to more individual investors than institutional investors who leads to more irrational decisions making the confirm presence of overreaction effect in Chinese Stick market SSE index. The findings are also in consistent with

Kang, Liu and Ni (2002) and Wu (2011) who explained the main cause of abnormal return to be investor overreaction to firm-specific information but this hold for more short term than for intermediate term similar to our results.

We have used different formation periods, and the results are strongly consistent for each. There is no evidence that monthly returns and reversals are driven by seasonality or size. This research contributes to market behaviour research, showing how, working under hypotheses of overreaction; gains can be made with contrarian investment strategy through arbitrage portfolios. We provide specific additional support for the short and medium-term overreaction in the Shanghai Stock Exchange for the period 2009-2014 using regression analysis. The winner portfolios kept outperforming the market with lower abnormal returns in test periods 1 and 2and were still winners compared with the market. While the loser portfolios outperformed the market in test period 1 and turned back into losers in the test period 2.

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