Empirical Analysis of SSE 180 Index Effect on the

China's Stock Market

by

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Abstract

This study statistically analyzes SSE 180 Index additions and deletions, and examines the impact of SSE 180 Index adjustments on trading activity and price behavior. By investigating the index performances during different market conditions and dividing company sizes, this study are able to shed new light on widely accepted Index Effect. Specifically, I observe price and volume changes around the announcement date of SSE 180 index adjustments from 2014 to 2016 in hope that investors can better understand the Index Effect on the China's stock market and during crashes. I find evidence that shows a close and positive correlation between the SSE 180 Index Effect and the external environment. In terms of company size, larger companies are more likely to guarantee an excess return regardless of the market condition. Smaller companies, on the other hand, provide with much more arbitrage opportunities in a bull market, but they sink severely when the market is falling.

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Part 1 Introduction

Understanding the performance of China's stock market index became an intrigue topic when the Shanghai Stock Exchange (SSE) Composite Index rose up from 2400 to the highest 5178 points during the first half of 2015, while the Index slipped and lost more than 30% in mid June and closed at 3507 points on July 8th. During such a market crash, passive stock investors, especially index trackers, lost money in the speed of downslope of a roller coaster. Those investors track and follow the benchmark and make necessary adjustments in order to minimize the difference between their portfolio and the chosen benchmark. Investing in index has been popular since the China's stock market established several market-wide indices in late 90s. However, the recent intensively volatile index performance beats the passive investment strategy and calls for a closer investigation of China's stock indices when the market condition changes.

Because trackers make their investment decisions based on the chosen market index, they prefer stocks listed in the index. Index listing adjustments in which stock exchange authority announces inclusion and exclusion of securities give a significant implication for corresponding portfolio reconstructions. A new relationship, as known as Index Effect, builds up between demand and supply of the added and deleted securities. Empirically, Harris and Gurel show Index Effect in the report "Price and Volume Effects Associated with Changes in the S&P 500 List" in 1986, and demonstrate that "immediately after an addition is announced, prices [of the added shares] increase by more than 3 percent. This increase is nearly fully reversed after 2 weeks" (Harris and Gurel, 1986). Statistically, Harris and Gurel put forward a recovery time of 2 weeks for the S&P 500. Literature reviews for S&P 500 mostly show a positive demand and an increase in price for newly added securities, whereas a negative demand and a drop in price for deleted ones. The same phenomenon is also found in the UK market (Goodacre and Lawrence,

1994), German market (Deininger et al., 2000), and the New Zealand market (Elayan et al., 2001).

Is "buying additions and selling deletions" a lucrative strategy for China's stock indices regardless of the macro-environment? The empirical results show a close and positive correlation between the index effect and the external environment. Specifically, index trackers can lock safer returns and make more profits if they follow the market conditions and rebalance their portfolios correspondently. In this thesis, I empirically observe price and volume changes around the announcement date of SSE 180 index adjustment from 2014 to 2016 in hope that people can better understand the Index Effect in the China's stock market and during crashes. Consequently, this understanding can serve as guidance for passive stock investors to reconstruct their portfolios when SSE 180 Index listing adjusts, if they so wish.

My study on SSE 180 Index Effect extends existing studies from three important perspectives. Firstly, the most recent data is collected to observe the trading activity and price performance, which is exclusively in domestic literature regarding SSE 180 Index. Second, macro-market conditions and the stock crash are considered as strong factors that affect the Index Effect, the topic of which is less covered in previous reports. Third, to further understand the impact of market conditions on individual stocks, I also separately examine larger size companies and smaller size companies. The remainders of the study are organized as follows.

Part 2 Overview of SSE 180 and Adjustment Regulation

To understand the China's Index Effect, we need to first understand the index adjustment regulations and the characteristics of China's indices different from other markets. Shanghai Stock Exchange indices are the authoritatively statistical indices widely accepted in Mainland

China and also for international investors to measure the performance of the China's stock market. In June 2002, Shanghai Stock Exchange extends the original SSE 30 to SSE 180. SSE 180 Index selects 180 the most representative securities of the China's stock market "based on sector representation, size and liquidity"¹. SSE 180 Index reflects the overall performance of non-traditional blue-chip A shares² issued in Shanghai Stock Exchange and serves the underlying financial derivatives. SSE 380, SSE 180, and SSE 50 make up the main blue-chip stock indices in Mainland China. In this study, I focus on SSE 180 Index as a representative because it is the most referred one and has a controllable size.

Regularly, SSE 180 Index has adjustments twice every year in June and December to assure that its constituents can typify the whole market in terms of market capitalization and trading value. Conditionally, events that effectively cease the current existing form of the listed firms such as bankruptcy, merger and acquisition or delisting lead to particular adjustments by China Securities Index Committee³. The China Securities Index Committee pre-announces the changes on average 10 days before the events. The announcement information is available on, but not limited to, the CSIC official website, SSE official website, Securities Times, as well as Thomson Reuters and Bloomberg for international investors. In most cases, the announcement takes place on Mondays after the close of market, and reveals the exact name and ticker of both 18 additions and 18 deletions (10 percent of total 180 securities), and the exact date of the event, which is the Announcement Date (AD). The adjustment officially takes place on the next trading day after the close of the second Friday in June and December, which is the Effective Date (ED).

¹ Source: Shanghai Stock Exchange, english.sse.com.cn

² A shares designates stocks that trade on the China Stock Exchange, and are shares of mainland China-based companies and were historically only available to the Chinese investors. Since 2003, several qualified foreign institutions are allowed to purchase.

³ Source: China Securities Corporation, www.csindex.com.cn

The ten-day period from AD to ED offers enough time for investors and index fund managers to react.

It is worth noting that China's stock indices are different from those of the US market in four perspectives in terms of regulations and index adjustments for foreign scholars to better review my study.

- Historically speaking, SSE 180 Index has only 15 years of existence while S&P 500 has over 60 years of operations. SSE 180 is still experimenting and has limitations for the listed companies.
- 2. From a regulation aspect, SSE sets a positive/negative ten percent daily movement range for all listed companies. The security will be suspended for trading on that day as long as it hits the ten percent threshold. Investors also cannot buy and sell the same security on one day. Both regulations suppress the volatility and trading liquidity that may constrain the Index Effect of SSE 180 Index.
- 3. The selection process of listed companies varies as well. SSE 180 Index uses valueweighted measurement to include 180 securities that quantitatively rank the highest based on market capitalization⁴. On the contrast, the selection process of S&P 500 does not refer to a similar ranking system, which makes it more difficult for institutional investors to anticipate the possible listing adjustments.
- 4. There is a ten-day period of time between AD and ED for SSE 180 Index adjustment, while most indices in the US market, such as S&P 500, make announcements on average of five days prior to the event⁵. Five more days give chances and time for

⁴ Source: China Securities Corporation, www.csindex.com.cn

⁵ Source: S&P Corporation, www.spglobal.com.

investors to rebalance their portfolio while it may also cause the lag of SSE 180 Index Effect.

Part 3 Data and Methodology

Shanghai Stock Exchange official website (and other sources listed in Part 2) provides with the names/tickers, exact announcement dates and effective dates of all stocks added to and deleted from the SSE 180 Index between June 3rd, 2014 and May 30th, 2016. Meanwhile, this period is chosen because it includes the market crash in 2015 and helps to compare the Index Effect under contrasting market conditions.

My initial sample includes seven adjustments consisting of 92 stocks added to and 92 stocks deleted from SSE 180 Index. Stock closing prices adjusted for dividends, daily trading volume, and 1-month Chinese government bill rate are obtained from Bloomberg. My final sample contains five regular adjustments with 90 additions and 90 deletions due to the elimination of two temporary adjustments with 2 additions and 2 deletions. The temporary adjustments are either caused by a merger or by an acquisition. If the 2 added stocks and the 2 deleted stocks were included, the sample results would be biased for two concerns. The first concern is that merger and/or acquisition provide with additional firm-specific information and therefore investors are more likely to buy the added stocks for reasons other than the Index information. The second concern is that the deleted stocks are delisted afterwards so that no data regarding closing prices or trading volume would be available after the effective date. All 180 stocks in final sample are traded in Shanghai Stock Exchange.

The statistical results presented in Part 4 examine the firm's performance 80 days before the announcement date Day AD-80. My short-term event window is defined to end 20 days after the effective date Day ED+20, or Day $AD+30^6$

3.1. The Calculation of Excess Volume

Excess volumes are examined in order to observe the changes of trading activity or of demand of stocks, which might have been caused by index adjustments. In this study, excess volumes are calculated based on Volume Ratio (VR), a method that Harris and Gurel employed in 1986 to calculate for S&P 500 Index⁷. Similarly, to get rid of the outliers, I take Median instead of Mean of the data sets to represent daily average trading volume. The average volume ratios are estimated over a base period of 8 weeks (40 trading days) before the event window. The cross sectional medians are computed as follows

$$MedVR_t = Median\{VR_{it}\}$$

where

$$VR_{it} = \left(\frac{V_{it}}{V_{mt}}\right) * \left(\frac{V_m}{V_i}\right)$$

where V_{it} and V_{mt} are the trading volumes of the stock *i* and of the SSE 180 index points respectively at day *t* during the event window. V_m and V_i are the average trading volumes of the stock *i* and of the SSE 180 index points 8 weeks prior to the announcement date. Therefore, $MedVR_t$ is the volume ratio that represents the trading volumes of security *i*, adjusted for the market variation. The null hypothesis is that $MedVR_t$ should statistically equal to 1 if there is no change of the trading volumes during the event window *t* relative to the prior 8 weeks.

⁶ Adding 10 days interval between AD and ED.

⁷ Harris and Gurel, 1986

3.2. The Calculation of Excess Returns

Previous literature reviews have used a variety of methods to calculate excess returns during the event window. This study employs the Capital Asset Pricing Model to calculate the expected returns because it is the most common method and therefore make the results comparable with other studies. Estimates of the beta coefficient are obtained using a historic estimation period that starts from 250 trading days before the event window and ends with 250 trading days after the event window from Bloomberg Beta Calculator. The Capital Asset Pricing Model (CAPM) is specified as follows for each stock *i* at time *t*:

$$ER_{it} = R_{ft} + \beta * (R_{mt} - R_{ft})$$

Where ER_{it} represents the expected return of the stock *i* at time *t*; R_{ft} is the risk free rate. In this study, the risk free rate is the 1-month Chinese government bill rate; R_{mt} is the market return, and this study uses the SSE 180 market return. The actual returns for each stock is given by:

$$AR_{it} = (EP_t - EP_{t-1})/EP_{t-1}*100\%$$

Where R_{it} represents the actual return of the stock *i* at time *t*; EP_t is the closing price of the stock at time *t* and EP_{t-1} the end price of the stock at time *t*-1. The excess returns for each stock is thus given by

$$ER_{it} = ER_{it} - AR_{it}$$

I use Median for all stocks at each event day *t* of the event window as the average excess returns. Using Median instead of Mean aims to prevent outliers affecting the central tendency of each event day.

$$MedER_t = Median\{ER_{it}\}$$

where t = Day AD-10 to Day AD+30 for the observation event window. The median excess returns are summed over the event window to obtain a median cumulative excess returns from day "*T*" to day "*TT*"

$$CMER_{T,TT} = \sum_{t=T}^{TT} MER_t$$

Part 4 Results

4.1. Volume

To determine how the trading activity changes after a SSE 180 Index adjustment, trading volumes are analyzed. Table 1 shows the summary of Median Volume Ratio data occurring from the first day after the announcement date to 5 days beyond effective date for each adjustment.

		Median V	olume Ratio			
Event (AD)	SSE 180 Adjustment Type	Day 1	Days 1-5	Days AD- bef_ED	ED	Days 1-5 post_ED
Whole Comple	A*	0.75	0.88	0.93	0.85	0.82
whole Sample	D*	0.83	0.86	0.90	0.95	0.78
Pofore the crash	А	0.72	0.81	0.83	0.80	0.75
Before the clash	D	0.97	0.89	0.88	0.88	0.75
During the crash	А	1.12	1.00	1.01	1.01	0.96
During the crash	D	1.23	1.15	1.18	1.11	0.97
After the cresh	А	0.73	0.75	0.80	0.71	0.70
After the crash	D	0.83	0.79	0.86	0.86	0.73
612/14	Before the Crash A	0.86	0.98	0.98	0.74	0.98
0/3/14	Before the Crash D	1.25	1.10	1.10	0.96	1.00
12/1/14	Before the Crash A	0.58	0.64	0.68	0.87	0.52
12/1/14	Before the Crash D	0.69	0.69	0.66	0.81	0.49
6/1/15	During the Crash A	1.12	1.00	1.01	1.01	0.96
0/1/15	During the Crash D	1.23	1.15	1.18	1.11	0.97
11/20/15	After the Crash A	0.71	0.63	0.67	0.57	0.59
11/30/15	After the Crash D	0.83	0.72	0.81	0.77	0.67
5/20/16	After the Crash A	0.75	0.88	0.93	0.85	0.82
5/30/10	After the Crash D	0.82	0.86	0.90	0.95	0.78

Table 1

* Event (AD) refers to the announcement date of the adjustment

* A stands for Addition

* D stands for Deletion

For all five adjustments in my data sample ("whole sample" in table 1), Median Volume Ratio for added securities on Day AD+1 (the first day after the announcement date) is 0.75 times than the daily median volume over the 8 weeks prior to the announcement. Then, the summed trading volume is slightly growing to its largest during the announcement date and the day before the effective date, that is 0.93 times as large as the previous weekly median. Similarly, the Volume Ratio for deleted securities on Day 1 is 0.83 times as large. The summed trading volume reaches the maximum at the effective date by 0.95 times, while the trading activity drops sharply during the following five days. Overall, the smaller-than-1 MVR shows a decrease of trading activity after the announcement of SSE 180 Index adjustment for both additions and deletions.

To check whether there is an impact of market conditions on the trading activity, I also divide five adjustments into three periods, namely before, during and after the 2015 stock crash. Although the Median Volume Ratios perform alike before the crash and after the crash with the whole sample, a much higher trading volume is observed during the crash. Actually, during the stock market crash, the trading volume jumps significantly on Day AD+1 by 12 percent and 23 percent for additions and deletions respectively. The median volume ratios are shrinking gradually throughout the event window whereas still remain larger than 1 until the effective date. By contrary, the trading volume drops and becomes slightly smaller than the previous weekly median in the long term. It is worth noting that deleted stocks have an even larger trading volume than added ones. The investors who have bought the deleted stocks before the index adjustment probably initiate the jump of trading activity for deletions during the crash. There is a possibility that they lose confidence on their portfolios and become extremely anxious to sell those to-be-excluded securities.

Opposite to the high trading volume at the market crash, there is a significant and continuous trend of decreasing trading activity for stocks added into SSE 180 Index when the China's stock market runs relatively stable, as shown in the periods before the crash and after the crash. Therefore, I argue that arbitrageurs are less interested in those additions: they are more willing to trade high volatile stocks to bet on high returns in short period of time. Stocks listed in the index, on average, can only give back market returns.

4.2 Price

The volume data suggests a decrease in demand for the adjusted securities during stable conditions while a jump in trading activity during the market crash, but do not show to which direction prices would move.

4.2.1 Additions

Table 2

Median Excess Returns Around the Announcement Date for the Securities Added to the SSE 180 List

Event Day	Median	St.Dev	Percent > 0
-10	-0.788%	2.80%	30%
-9	-0.119%	2.52%	47%
-8	0.577%	1.83%	64%
-7	-0.261%	1.73%	40%
-6	-0.219%	2.46%	44%
-5	0.024%	2.41%	52%
-4	0.244%	2.61%	60%
-3	-0.032%	2.72%	47%
-2	0.319%	2.52%	58%
-1	0.434%	2.64%	63%
AD	0.564%	1.98%	64%
1	0.950%	2.53%	65%
2	0.458%	2.43%	58%
3	0.042%	2.64%	52%
4	-0.020%	2.81%	47%
5	0.000%	3.32%	51%
6	-0.054%	3.62%	48%
7	-0.164%	2.94%	45%
8	-0.238%	2.80%	43%
9	-0.085%	2.70%	44%
ED	-0.250%	2.91%	46%
11	0.726%	2.84%	66%
12	0.685%	2.94%	61%
13	-0.436%	2.87%	38%
14	0.753%	2.71%	65%
15	0.579%	4.01%	62%
16	-0.265%	2.55%	42%
17	-0.644%	3.40%	37%
18	0.272%	2.16%	62%
19	0.018%	3.25%	52%
20	0.397%	2.95%	57%

The summed price behavior for stocks added to SSE 180 index from Day AD-10 to Day ED+10 is shown in Table 2. Table 2 includes 90 additions from five index adjustments. The data of median excess returns suggests an immediate price increase of 0.950 percent for the first day after the announcement date (as the data I highlight in Table 2). There is also a jump in excess returns after the effective date from -0.250 percent to 0.726 percent. Moreover, the increases in returns are not brought by some outliers; individual stocks generate positive returns right after AD and ED in 65 and 66 percent respectively. The significantly post-announcement price increases correspond with the argument of Harris and Gurel's finding in S&P 500 Index Effect as "the evidence of price pressure or imperfect substitution among securities as new demanders purchase the added securities" (Harris and Gurel, 1986). This 0.950 positive excess return on Day AD+1 is also consistent with previous reports internationally and domestically, as I have discussed in Part 1. Besides, although Table 2 shows marginally significant and positive returns on Day AD+2 and Day ED +2, or Day AD+12, their abnormal returns cannot be compared with Day AD+1 or Day ED +1.

The excess returns indicate that information associated with SSE 180 Index would affect stock prices, but it does not tell the time range of the effect. To examine how long the abnormal positive return **Table 3** would remain, median cumulative excess returns are calculated from Day 1 to Day 30 after the announcement date, as shown in Table 3. The median cumulative returns are of great interest in that they show a continuous trend of positive returns until 24 trading days after the announcement date. The finding of 24-day effect of price increase violates the statement from Shanghai Stock Exchange that the inclusion of securities does not relate to the future investment that appeal to the firms. Instead, the results show a potential improvement of the firms after they are added to the SSE 180 stocks. It matters to a company to become an Index member.

Day 1 to Day 30	Median Cum.	Percent > 0
1	0.950%	55%
2	1.408%	56%
3	1.450%	54%
4	1.430%	52%
5	1.430%	52%
6	1.376%	51%
7	1.212%	50%
8	0.973%	49%
9	0.889%	48%
ED	0.639%	48%
11	1.365%	49%
12	2.050%	50%
13	1.613%	49%
14	2.366%	50%
15	2.945%	51%
16	2.681%	50%
17	2.037%	49%
18	2.309%	50%
19	2.327%	50%
20	2.724%	50%
21	2.584%	50%
22	1.812%	51%
23	1.170%	52%
24	0.531%	52%
25	-0.050%	47%
26	0.177%	52%
27	0.323%	52%
20	0.2020	2007

Median Cumulative Excess Returns from Day 1 to Day 30 for the Securities Added to the SSE 180 List

In order to examine the effect of stock market crash on prices and correspond to the volume analysis beforehand, I divide the observations into three subsamples, before, during and after the crash. The price behavior for the comparison of added stocks during those three periods is demonstrated in Table 4. Excess returns perform very differently among the three periods. Before the crash, price behavior is similar to the whole sample that there are immediate price increases on the first day after the announcement date and on the first day after the effective date by 1.735 percent and 2.093 percent respectively. Notably, the excess returns increase much more before the crash than the whole sample: the median excess returns even get doubled. Additionally, the maximum abnormal return happens on the first day after the effective date, which has already been known 10 days before on the announcement date.

	Before	During	After	
Event Day	the	the	the	
	Crash	Crash	Crash	
-10	-0.674%	-1.360%	-0.877%	
-9	-0.658%	0.275%	-0.027%	
-8	-0.039%	0.116%	1.231%	
-7	0.377%	-0.775%	-0.718%	
-6	0.889%	-0.399%	-0.794%	
-5	0.635%	0.722%	-0.199%	
-4	0.559%	-0.844%	0.251%	
-3	1.113%	-1.183%	-0.185%	
-2	1.646%	0.685%	-0.600%	
-1	0.698%	-0.133%	0.667%	
AD	0.636%	-1.566%	0.871%	
1	1.735%	0.417%	0.398%	
2	0.310%	1.563%	-0.307%	
3	1.467%	1.386%	-0.723%	
4	1.480%	-1.401%	-0.265%	
5	0.973%	1.073%	0.753%	
6	-0.783%	-0.667%	0.481%	
7	0.139%	-2.307%	-0.196%	
8	-0.164%	0.884%	-0.789%	
9	0.134%	-1.564%	0.321%	
ED	0.205%	0.588%	-0.799%	
11	2.093%	-1.318%	1.600%	
12	2.082%	0.611%	0.066%	
13	-0.150%	-0.686%	-0.646%	
14	0.918%	1.177%	0.660%	
15	2.314%	0.542%	0.320%	
16	0.000%	-0.669%	-0.273%	
17	-1.043%	-2.029%	-0.383%	
18	0.668%	0.336%	-0.064%	
19	1.449%	-0.886%	-0.492%	
20	0.824%	0.358%	-0.118%	

Table 4Median Excess Returns Around the AnnouncementDate for the Securities Added to the SSE 180 List

This Day ED+1 outperforming Day AD+1 is mainly caused by significant arbitrageurs who have bought the added stocks on Day AD +1. Before the crash, China's stock market goes through a bull condition where stock prices appreciate and the Chinese stock investors have the faith that the uptrend will continue over a long period. Under such a bull market, those arbitrageurs hold the additions during AD and ED, attempt to push up the stock price and sell the stocks to index funds on the effective date.

Compared to the sharp jump before the crash, there is only a modest increase in the excess returns on the first day after the announcement date during the crash and after the crash with a median increase of 0.417 percent and 0.398 percent. During the market crash, the whole China's stock prices shrink altogether with the decline of the SSE 180 index points from 5000 to 3000. Therefore, the price effect originating from index adjustment information is crippled. The recess of China's stock market extends after the crash.

As opposite to the positive excess returns after the effective date, a negative 1.318 percent loss is observed on Day ED +1 during the crash. Such a price burst, however, is barely related to the SSE 180 index adjustment *pre se*; the slump is in conjunction with the macro-environment that the China's stock market drops from the brink of the crisis to the abyss for all investors: China's stock market has plunged 6 percent in two days starting from June. 15th, which happens on the day right after the index adjustment.

	Before	During	After
Event Day	the	the	the
	Crash	Crash	Crash
1	1.735%	0.417%	0.398%
2	2.045%	1.980%	0.091%
3	3.512%	3.366%	-0.631%
4	4.992%	1.965%	-0.896%
5	5.966%	3.038%	-0.143%
6	5.183%	2.370%	0.338%
7	5.322%	0.063%	0.143%
8	5.158%	0.947%	-0.646%
9	5.292%	-0.617%	-0.325%
ED	5.497%	-0.029%	-1.124%
11	7.590%	-1.347%	0.476%
12	9.672%	-0.735%	0.542%
13	9.522%	-1.421%	-0.104%
14	10.441%	-0.244%	0.555%
15	12.755%	0.297%	0.875%
16	12.755%	-0.372%	0.602%
17	11.711%	-2.401%	0.220%

Median Cumulative Excess Returns Around the
Announcement Date for that Solar Sties Added to the SSE 180 List

Table 5 represents separate median cumulative excess returns for the three periods. It shows a more comprehensive picture that the price effect of SSE 180 Index adjustment is positively correlated with the macro- stock market performance. When the market is performing amazingly well, the excess returns of added stocks reach strikingly 14.653 percent in twenty trading days after the announcement date----almost seven times outperforms 2.754 percent on Day AD+20 from the whole sample (in Table 3). If investors follow a strategy that exactly rebalances the portfolio on the announcement date, a 14 percent return on profits is transferred to those arbitrageurs with no additional risk other than tracking errors. During the crash, median cumulative returns show diametrically different performance that stock prices sink after the effective date and remain a pure loss until at least Day AD+20. After the debacle, the stock market turns flagging. The SSE 180 Index fluctuates below 3000 points. Cumulative returns move modestly around zero, showing little arbitraging opportunities and declining investing confidence on index listed companies. Striking differences have shown before, during and after the crash. By buying added stocks after the announcement date, investors can get a 14 percent excess returns or a negative 2 percent loss depending on the market condition.

To examine more closely how companies of different sizes perform in correspondence with the market environment, I divide companies based on market capitalization to relative large (top 25 percent) and relative small categories (bottom 25 percent). The price behavior of

comparison between larger and smaller companies in three market periods is shown in Table 6. Before the crash, both smaller and larger companies have price jumps on the first day after the announcement date and the first day after the effective date. During the crash, price climbs and drops frequently with large volatility. Larger firms suffer largely by losing over 4 percent several times.

	Large Firms (Top 25 Percent)		rcent)	Small Firms (Bottom 25 Percent)		
	Before	During	After	Before	During	After
Event Day	the	the	the	the	the	the
	Crash	Crash	Crash	Crash	Crash	Crash
-10	-0.128%	0.113%	-0.192%	0.395%	-3.969%	-0.959%
-9	0.188%	-1.065%	0.899%	-0.226%	0.594%	-0.119%
-8	0.331%	-1.476%	0.971%	-0.228%	-0.250%	1.546%
-7	0.256%	-1.546%	0.043%	0.250%	-1.194%	-0.871%
-6	0.899%	-0.663%	-0.794%	-0.027%	-1.825%	-0.740%
-5	-0.527%	-1.419%	0.897%	0.004%	0.722%	-1.038%
-4	0.602%	-0.522%	0.798%	0.994%	-5.802%	0.119%
-3	1.591%	-1.474%	-0.656%	1.113%	-4.491%	-0.271%
-2	0.045%	1.154%	-0.226%	1.425%	-0.400%	-0.760%
-1	0.597%	0.475%	1.098%	1.401%	-6.480%	0.231%
AD	0.003%	-0.829%	1.240%	1.114%	-2.046%	0.993%
1	1.735%	0.773%	0.081%	1.106%	1.942%	-0.421%
2	0.236%	1.099%	0.201%	-0.284%	2.584%	-0.650%
3	1.909%	-0.245%	-1.113%	1.467%	-0.940%	-0.578%
4	1.482%	-1.650%	0.352%	1.412%	-1.401%	-0.295%
5	0.085%	-4.600%	-0.088%	2.699%	4.142%	-0.632%
6	-0.495%	-4.040%	0.758%	-1.128%	-1.231%	0.461%
7	-0.878%	-2.365%	-0.838%	0.979%	-4.029%	-0.506%
8	-0.046%	1.298%	-0.769%	-1.682%	-2.016%	0.670%
9	0.178%	-1.494%	1.019%	0.171%	0.055%	-0.301%
ED	-0.445%	-3.728%	-0.491%	0.564%	0.795%	-0.057%
11	2.072%	-4.131%	0.306%	2.125%	-0.820%	-0.752%
12	1.375%	1.162%	-0.127%	2.082%	3.890%	0.216%
13	-0.675%	-4.171%	0.161%	0.389%	-0.495%	-0.798%
14	-0.960%	-0.881%	0.753%	2.106%	1.203%	0.443%
15	0.590%	-4.839%	0.722%	4.281%	2.328%	-0.669%
16	1.106%	-5.561%	-0.290%	-0.005%	1.346%	-0.296%
17	-0.930%	-2.029%	0.860%	-0.466%	1.673%	-0.515%
18	-0.343%	-0.911%	0.768%	1.657%	0.656%	-0.411%
19	1.550%	-5.464%	-0.709%	1.486%	-4.977%	-0.336%
20	-0.297%	4.738%	0.603%	0.896%	0.421%	0.551%

 Table 6

 Median Excess Returns Around the

 Announcement Date for the Securities Added to the SSE 180 List

On the other hand, larger companies recover very soon and get positive excess returns after the crash while small ones still experience decline that is even worsened than their performance during the crash. To get a deeper understanding of how companies with different sizes perform during bull and bear market conditions, I get rid of the period of stock crash because it has high deviations that may cause event-specific results instead of general conclusions. Table 7 represents the cumulative returns for larger and smaller firms and indicates

Table 7

	Larger Firms (top 25%)		Smaller Firms	(bottom 25%)
	Before	After	Before	After
Event Day	the	the	the	the
	Crash	Crash	Crash	Crash
1	1.735%	0.081%	1.106%	-0.421%
2	1.971%	0.282%	0.822%	-1.071%
3	3.880%	-0.831%	2.289%	-1.649%
4	5.362%	-0.479%	3.701%	-1.944%
5	5.447%	-0.567%	6.399%	-2.576%
6	4.952%	0.191%	5.271%	-2.115%
7	4.074%	-0.647%	6.251%	-2.620%
8	4.028%	-1.416%	4.569%	-1.950%
9	4.206%	-0.397%	4.740%	-2.251%
ED	3.761%	-0.888%	5.303%	-2.308%
11	5.833%	-0.582%	7.429%	-3.060%
12	7.208%	-0.710%	9.511%	-2.844%
13	6.532%	-0.548%	9.900%	-3.642%
14	5.572%	0.205%	12.006%	-3.198%
15	6.162%	0.927%	16.287%	-3.867%
16	7.269%	0.637%	16.282%	-4.163%
17	6.338%	1.497%	15.816%	-4.678%
18	5.996%	2.264%	17.473%	-5.089%
19	7.546%	1.556%	18.959%	-5.425%
20	7.249%	2.158%	19.855%	-4.875%

Median Cumulative Excess Returns Around the Announcement Date for the Securities Added to the SSE 180 List

clearly the distinction before and after the crash. Negative numbers are put in red to highlight the contrast. Before the crash, smaller companies have a summed return of 19.855 percent by Day AD+20. The market is very speculative. When smaller stocks get the extra visibility of being added to the SSE180 Index, even more arbitrageurs focus on them. After the crash, smaller firms experience turbulence falls on the stock prices. In other words, large companies improve their performance throughout the time whereas the included stocks from smaller companies are worsened. The reason for the failure of small firms can be argued that investors avoid small firms because they believe large firms are safe in relative terms.

4.2.2 Deletions

There are relative less scholar reports on deletions because the price behaviors of the deleted stocks might not only originate from index adjustment information, but also result from firm-specific events such as bankruptcy, delisting, merger and acquisition. It is comparably difficult to construct a pure sample that is unbiased with respect to other events. Shanghai Stock Exchange does state the reason for temporary adjustments, which are mostly due to firm-specific events; yet for regular adjustments SSE 180 authority does not disclose any further reason for excluding stocks. Therefore, my observation excludes the deleted stocks from temporary adjustments. For regular adjustments, stocks are regarded as "pure" deletions if they continue trading on Shanghai Stock Exchange 250 trading days after the announcement date. In total, 90 stocks deleted from SSE 180 stocks are investigated.

The following study repeats the above analysis to examine the price effect. Table 8 summarizes the whole sample price behavior for the securities deleted from SSE 180 list. However, the maximum -1.283 percent price loss takes place right on the announcement date. Theoretically, Shanghai Stock Exchange announces the adjustment after the market closes so no price affection should occur on the announcement date, and Day AD +1 should be the first day

when the	
SSE 180's	Event Day
	-10
	-9
	-8
	-7
T1 C	-6
Therefore,	-5
	-4
	-3
suggesting	-2
suggesting	-1
	1
	2
leakage of	3
	4
	5
hafana tha	6
before the	7
	8
	9

10

12

13

14

Median Excess Returns Around the Announcement Date for the Securities Deleted from the SSE 180 List

St.Dev

1.986%

2.426%

1.908%

2.050%

1.839%

1.644%

2.070%

2.299%

2.690%

2.381%

2.614%

2.668%

3.102%

3.276%

3 4 3 9 %

2.802%

2.741%

2.485%

2 417%

2.212%

2.338%

3.260%

2.516%

1.682%

2.257%

Percent >0

31%

61%

44%

50%

43%

56%

42%

51%

56%

55%

72%

47%

63%

58%

48%

55%

48%

59%

45%

44%

43%

46%

62%

36%

53%

Median

0.376%

-0.303%

-0.023%

-0.117%

0.168%

-0.265%

0.010%

0.307%

0.956%

-0.170%

0.370%

0.265%

-0 077%

0.220%

-0.038%

0.342%

-0 330%

-0.275%

-0.226%

-0.210%

0.764%

-0.370%

0.237%

-0.965% Table 8

market trades new composition. the result is a potential information **SSE 180**

authority press release.

This study also examines the price effect in different crash periods with key findings mirroring of those additions. Figure 1 illustrates the median cumulative excess returns from Day AD+1 to Day AD+20 for each time period and for additions and deletions separately.



Concerning before the crash, there is a price increase in the to-be-deleted stocks following the announcement date. A further increase later occurs followed by a slight fall around the effective date, or Day AD+10 as shown in the figure. Even though the price effect for

deletions is not so significant as additions whose cumulative excess returns reach 15 percent, a positive cumulative excess return throughout the event window gives evidence of overheated stock market condition before the crash.

The higher prices have over-reached, the lower they can sink during the market slump. The price drops more pronouncedly for deletions with immediate decrease after the announcement date. Although price rises by 3 percent before the effective date, cumulative median excess returns decrease by 15 percent 20 days after the announcement, suggesting a more permanent effect. After the crash, volatility decreases notably and price changes tend to be stable as cumulative excess returns move up and down modestly and converge around zero during the whole event window.

Company size division is not tested on deleted stocks because market capitalizations of exclusions concentrate on the range between 20 billion and 30 billion in CNY. Only a few companies have market capitalizations that are over 50 billion or below 10 billion in CNY.

Part 5 Conclusions

To sum up, I have closely examined volume and price effects of stocks that are included into and excluded from the SSE 180 index list during the most recent period 2014-2016. The crash period division and company size division (only for added stocks) are of great importance to help understand how market conditions and company sizes can impact Index Effect.

From the whole sample analysis, I find that on Day AD+1 and Day ED, trading activity is 0.75 and 0.85 times below its normal level respectively for additions, and 0.83 percent and 0.90 percent below for deletions. Only during the market crash, trading activity reversely increases by 1.12 and 1.23 for additions and deletions on the first day after the announcement date. At the end

of the whole event window, both median volume ratios subsequently remain slightly below 1. Concerning price effects, sharp jumps are founded for added securities on the first day after the announcement date and on the first day after the effective date, according to the analysis of whole sample, as well as before the crash and after the crash. The cumulative price effects of SSE 180 Index information do not get exhausted over time but tend to be permanent during the 20-trading-day event window. During the market crash, excess returns encompass a wrenching 5 percent decline. This study further disaggregates whole sample into large and small companies, and examines respective performances under bull and bear market conditions. When the market is booming, smaller companies outperform larger ones by reaching almost 20 percent cumulative excess returns 20 trading days after the announcement date. However, the results are altered when it comes to slump. Larger companies outperform smaller companies by a significant marginal excess returns. Large firms improve their performance by obtaining 2 percent investment excess returns whereas small companies that added to the SSE 180 index get worsened day by day throughout the event window.

This study also examines the performance of pure deletions with no additional firmspecific information. A sharp drop of to-be-deleted stock price occurs on the announcement date, suggesting potentially leakage of inside information. Price performances with respect to market condition division follow similar trends with additions, while excluded stocks experience a more severe cumulative loss during the market crash by negative 17 percent.

China's stock market is ever evolving where opportunities and crisis co-exist. Market turbulences make stocks performance diametrically different in a comparably short time. Macroenvironment affects hugely even on passive investment strategies such as index tracking. Hence, the interpretations of the findings in this study are in hope to provide insights for individual

index followers or index funds to get prepared when market condition changes.

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