

# SSE Indices Calculation & Maintenance

## 1. Index Calculation

### 1.1 Calculation Formula

1.1.1 SSE Indices are calculated using a Paasche weighted composite price index formula.

1.1.2 SSE 180, 50 and etc. are weighted by adjusted number of shares.

The formula is:

$$\text{Current index} = \frac{\text{Current adjusted market cap of constituent}}{\text{Base Period}} \times 1000$$

Here, Adjusted market cap =  $\sum (\text{Price} \times \text{Adjusted No. of shares})$ .

SSE 180 Infrastructure/Resource/Transportation, 180 Style and etc. are calculated using a Paasche weighted composite price index formula.

The Formula is:

$$\text{Current index} = \frac{\text{Current adjusted market cap of constituent}}{\text{Base Period}} \times 1000$$

Here, adjusted market cap =  $\sum (\text{Price} \times \text{Adjusted No. of shares} \times \text{Weight Cap Factor})$ . Weight cap factor is between 0 and 1. The weight of individual constituent is capped at 15% (to SSE 180 Style Indices are 10% ).

Using category-weighted method (as indicated by the following chart) to adjust constituents' sharers. For example, a stock with a negotiable market cap ratio (negotiable market cap/total market cap) of 7%, which is below 10%, will have a weight equals to its negotiable market cap ratio. A stock with a negotiable market cap ratio of 35% will belong to category (30, 40]. The corresponding weight is 40%, i.e. 40% of total market cap will be used for index calculation.

Negotiable Market Cap Ratio (%)	≤10	(10, 20]	(20, 30]	(30, 40]	(40, 50]	(50, 60]	(60, 70]	(70, 80]	>80
Weight (%)	Negotiable Market Cap Ratio	20	30	40	50	60	70	80	100

1.1.3 SSE Composite Indices and Sector Indices are weighted by shares.

The Formula is:

$$\text{Current index} = \frac{\text{Current total market cap of constituent}}{\text{Base Period}} \times \text{Base Value}$$

Here, Total market capitalization =  $\Sigma$  (Price  $\times$  shares issued).

B share stocks are denominated in USD when B Share Index is calculated. For calculation of other indices, B share stock prices are converted to RMB at the applicable exchange rate (the middle price of USD on the last trading day of each week) at China foreign Exchange Trading Center.

1.1.4 SSE Fund index is weighted by shares issued.

The formula is:

$$\text{Current index} = \frac{\text{Current total market cap of funds}}{\text{Base Period}} \times 1000$$

Here, Total market capitalization =  $\Sigma$  (Price  $\times$  shares issued).

1.1.5 SSE Government Bond Index is weighted by shares issued.

The formula is:

$$\text{Current index} = \frac{\text{Current total market Value of all constituents} + \text{Accrued Interest \& Reinvesting Income}}{\text{Base Period}} \times 100$$

Here, Total market value =  $\Sigma$  (Price  $\times$  Outstanding). Price = Net Price + Accrued Interest.

Accrued Interest and Reinvestment Income is the income earned through investing current month's accrued interest in the index itself.

1.1.6 SSE Corporate Bond Index is calculated using a Paasche weighted composite price index formula. SSE Corporate Bond Index is weighted by amounts outstanding.

The formula is:

$$\text{Current index} = \frac{\text{Current total market Value of all constituents} + \text{Accrued Interest \& Reinvesting Income}}{\text{Base Period}} \times 100$$

Here, Total market value =  $\Sigma$  (Price  $\times$  Outstanding).

Accrued Interest and Reinvestment Income is the income earned through investing current month's accrued interest in the index itself.

1.1.7 SSE Enterprise Bond Index is calculated using a Paasche weighted composite price index formula. SSE Enterprise Bond Index is weighted by amounts outstanding.

The formula is:

$$\text{Current index} = \frac{\text{Current total market Value of all constituents} + \text{Accrued Interest \& Reinvesting Income}}{\text{Base Period}} \times \text{Base Value}$$

Here, Total market value =  $\Sigma$  (Price  $\times$  Outstanding).

Accrued Interest and Reinvestment Income is the income earned through investing current month's accrued interest in the index itself.

1.1.8 SSE Detachable Convertible Bond Index is calculated using a Paasche weighted composite price index formula. SSE Detachable Convertible Bond Index is weighted by amounts outstanding.

The formula is:

$$\text{Current index} = \frac{\text{Current total market Value of all constituents} + \text{Accrued Interest \& Reinvesting Income}}{\text{Base Period}} \times \text{Base Value}$$

Here, Total market value =  $\Sigma$  (Price  $\times$  Outstanding).

Accrued Interest and Reinvestment Income is the income earned through investing current month's accrued interest in the index itself.

## 1.2 Real Time Calculation

SSE Indices are calculated real time tick-by-tick.

After each day's centralized competitive pricing, the resulted opening prices (closed price of previous trading day for no trade stocks) are used to calculate opening prices for indices. Indices are recalculated every 2 seconds and published real time every 6 seconds until the end of trading day. The prices of constituents (X) are determined by the following principles:

- (1) If there is no turnover of the day, X = close price for last trading day.
- (2) If there is turnover of the day, X = the latest transaction price.

## 2. Index Maintenance

### 2.1 Maintenance Formula

The "Divisor Adjustment Methodology" is used to adjust all SSE Indices.

When changes occur to constituent list or the share structure, or constituents' market value changes due to non-trading factors, the divisor is adjusted to keep the index comparable overtime.

The formula is:

$$\frac{\text{Adjusted Market Cap before Adjustment}}{\text{Old Divisor}} = \frac{\text{Adjusted Market Cap after Adjustment}}{\text{New Divisor}}$$

Adjusted Market Cap after Adjustment = Adjusted Market Cap before adjustment + Adjusted Market Cap increased or decreased.

The new divisor (also called new base period) derived from this formula is used for later index calculation.

### 2.2 Circumstances for index maintenance

(1) New listing: to SSE Composite Indices and SSE Sector Indices, newly listed stocks are included in index calculation on the 11<sup>th</sup> day.

(2) Dividend: no index adjustment is required for dividend payment and the index is allowed to fallback naturally.

(3) Right issue and bonus issue: the index is adjusted the day before the issuance.

Adjusted Market Cap after the Adjustment = Adjusted Price × Adjusted No. of Shares + Adjusted Market Cap before the Adjustment (excluding stocks adjusted for right issue and bonus issue).

(4) Exchange rate changes: indices are adjusted according to applicable exchange rate (middle price between RMB and USD on the last trading day of each week) at China foreign Exchange Trading Center.

(5) Suspension from trading: use last trading price to calculate index until trading is resumed.

- (6) Delisting: adjust the index the day before the delisting.
- (7) Share changes: when shares of constituents change due to other reasons (e.g. re-issuance, listing of right issue, listing of employee shares), the index is adjusted the day before the changes. Adjusted Market Cap after the Adjustment = closing price × Adjusted sharers after changes + Adjusted Market Cap before Adjustment (excluding stocks adjusted for share changes).
- (8) Close of Exchange Trading: The index is calculated normally if one of the two exchanges trading is closed and the index is terminated calculation if the two exchanges trading are closed.

### 3. Publish of Indices

SSE Indices are released to domestic foreign public through various mean:

- (1) The indices are broadcasted nationwide via SSE real time satellite broadcast system.
- (2) The indices are released real time globally via Thomson Reuters, Bloomberg and other financial information vendors.
- (3) The indices are also published in SSE Daily Market Quote, Weekly Market Quote and Monthly Market Statistic.
- (4) The indices are also published through the Internet at SSE's website: <http://www.sse.com.cn>.
- (5) The indices are transmitted every day following closing via SSE's Email in the format of an "E-report" to various news media including China Securities Journal, Shanghai Securities News and Securities Times.

### 4. Definition

- (1) A-share: listed stocks denominated in RMB in Mainland China.
- (2) B-share: listed stocks denominated in foreign currency in Mainland China.
- (3) H-share: listed stock denominated in foreign currency in Hong Kong.
- (4) Adjusted price: reference price published by exchange at the opening of a trading day when a listed company distributes dividend, bonus issue and right issue. Adjusted price is used to remind investors that the value of the company is diluted because of issue of dividend or additional shares outstanding.

a) dividend

Adjusted price = Closing price on ex-dividend day – Dividend/share

b) Bonus issue

Adjusted price =  $\frac{\text{Closing price on ex-bonus day}}{1 + \text{Bonus issue ratio}}$

c) Right issue

Adjusted price =  $\frac{\text{Closing price on ex-right day} + \text{Right issue price} \times \text{Right issue ratio}}{1 + \text{Right issue ratio}}$

d) Dividend, bonus issue and right issue

Adjusted price =  $\frac{\text{Closing price on ex-right day} - \text{Dividend} + \text{Right issue price} \times \text{Right issue ratio}}{1 + \text{Bonus issue ratio} + \text{Right issue ratio}}$

## 5. Numerical Examples for SSE Indices Calculation

### Base Day

6 stocks are selected as constituent stocks to calculate 3 indices: Index I, Index II and Index III. Among them, Index I consists of stocks A, B and C. Index II consists of stocks X, Y and Z. Index III consists of all 6 stocks. The base periods of 3 indices are the adjusted total market cap of these stocks on base day. The base value of Index I is 100 points. The base value of Index II is 1000 points. The base value of Index III is 100 points.

Exchange rate of the day: 8.00 RMB/USD

Index	Stock	No. of Shares#	Closing Price (Yuan)	Market Cap (Yuan)	Total Market Cap (Yuan)★
I	A	10,000	8.00	80,000	164,000
	B	8,000	9.00	72,000	
	C×	5,000	0.30	12,000	
II	X	7,000	10.00	70,000	298,000
	Y	9,000	20.00	180,000	
	Z	6,000	8.00	48,000	
III			0		462,000

×: Stock C is B-share.

#: To Constituents Indices, No. of Shares is Adjusted Negotiable No. of Shares. To Composite Indices and Sector Indices, No. of Shares is shares issued.

★: Total Market Cap I:  $80,000 + 72,000 + 12,000 = 164,000$

Total Market Cap II:  $70,000 + 180,000 + 48,000 = 298,000$

Total Market Cap III:  $164,000 + 298,000 = 462,000$

### Index Calculation

Index	Total Market Cap (Yuan) (1)	Base Period (2)	Base Index (3)	Closing Index (3)×(1)/(2)
I	164,000	164,000	100	100.000
II	298,000	298,000	1,000	1,000.000
III	462,000	462,000	100	100.000

### Day 1

No adjustment is required.

Exchange rate of the day: 8.00 RMB/USD

Index	Stock	No. of Shares	Closing Price (Yuan)	Market Cap (Yuan)	Total Market Cap (Yuan)
I	A	10,000	8.50	85,000	173,000
	B	8,000	9.00	72,000	
	C	5,000	0.40	16,000	
II	X	7,000	9.00	63,000	288,000
	Y	9,000	19.00	171,000	
	Z	6,000	9.00	54,000	
III			0		461,000

### Index Calculation

Index	Total Market Cap (Yuan) (1)	Base Period (2)	Base Index (3)	Closing Index (3)×(1)/(2)
I	173,000	164,000	100	105.488
II	288,000	298,000	1,000	966.443
III	461,000	462,000	100	99.784

Stock Y distributes cash dividend: ¥50/share. Today is ex-dividend day. No adjustment is required.

Adjusted price for stock Y is ¥18.50 ( $19.00 - 0.50 = 18.50$ ).

## Day 2

Exchange rate of the day: 8.00 RMB/USD

Index	Stock	No. of Shares	Closing Price (Yuan)	Market Cap (Yuan)	Total Market Cap (Yuan)
I	A	10,000	8.00	80,000	172,000
	B	8,000	9.50	76,000	
	C	5,000	0.40	16,000	
II	X	7,000	9.50	66,500	286,700
	Y	9,000	19.00	171,000	
	Z	6,000	8.20	49,200	
III					458,700

### Index Calculation

Index	Total Market Cap (Yuan) (1)	Base Period (2)	Base Index (3)	Closing Index (3)×(1)/(2)
I	172,000	164,000	100	104.878
II	286,700	298,000	1,000	962.081
III	458,700	462,000	100	99.286

Stock B is to be traded ex-bonus at the ratio of 10 for 10.

Stock Z is to be traded ex-right at the ratio of 5 for 10 at ¥7.60.

Adjusted price for stock B is  $9.50 / (1 + 1) = ¥4.75$ .

Adjusted price for stock Z is  $(8.20 + 7.60 \times 0.5) / (1 + 0.5) = ¥8.00$ .

Index adjustment is required.

### Index Adjustment

Adjusted Market Cap:

Index I =  $80,000 + 4.75 \times 16,000 + 16,000 = ¥172,000$

Index II =  $66,500 + 171,000 + 8.00 \times 9,000 = ¥309,500$

Index III =  $172,000 + 309,500 = ¥481,500$

Index	Total Adjusted Market cap before Adjustment (Yuan) (1)	Total Adjusted Market cap after Adjustment (Yuan) (2)	Old Base Period (3)	New Base Period (3)×(2)/(1)
I	172,000	172,000	164,000	164,000
II	286,700	309,500	298,000	321,699
III	458,700	481,500	462,000	484,964

## Day 3

Exchange rate of the day: 8.00 RMB/USD

Index	Stock	No. of Shares	Closing Price (Yuan)	Market Cap (Yuan)	Total Market Cap (Yuan)
I	A	10,000	8.50	85,000	183,000
	B	16,000	5.00	80,000	
	C	5,000	0.45	18,000	
II	X	7,000	10.00	70,000	326,500
	Y	9,000	20.00	180,000	
	Z	9,000	8.50	76,500	
III					509,500

### Index Calculation

Index	Total Market Cap (Yuan) (1)	Base Period (2)	Base Index (3)	Closing Index (3)×(1)/(2)
I	183,000	164,000	100	111.5853659
II	326,500	321,699	1,000	1014.925025
III	509,500	484,964	100	105.0593384

Stock Y is going to issue 1,000 shares the next day. Adjusted No. of Shares is  $9,000 + 1,000 = 10,000$ .

Bonus shares of Stock B are going to be listed the next day. Adjusted No. of Shares is  $8000 \times (1 + 1) = 16000$ .

Index adjustment is required.

### Index Adjustment

Adjusted Market Cap:

Index I =  $85,000 + 18,000 + 16,000 \times 5 = \text{¥}183,000$

Index II =  $326,500 + 20.00 \times 1,000 = \text{¥}346,500$

Index III =  $183,000 + 346,500 = \text{¥}529,500$

Index	Total Adjusted Market cap before Adjustment (Yuan) (1)	Total Adjusted Market cap after Adjustment (Yuan) (2)	Old Base Period (3)	New Base Period (3)×(2)/(1)
I	183,000	183,000	164,000	164,000
II	326,500	346,500	321,699	341,405
III	509,500	529,500	484,964	504,001

### Day 4

Exchange rate of the day: 8.00 RMB/USD

Index	Stock	No. of Shares	Closing Price (Yuan)	Market Cap (Yuan)	Total Market Cap (Yuan)
I	A	10,000	10.00	100,000	200,000
	B	16,000	5.00	80,000	
	C	5,000	0.50	20,000	
II	X	7,000	11.00	77,000	348,000
	Y	10,000	19.00	190,000	
	Z	9,000	9.00	81,000	
III					548,000

### Index Calculation

Index	Total Market Cap (Yuan) (1)	Base Period (2)	Base Index (3)	Closing Index (3)×(1)/(2)
I	200,000	164,000	100	121.9512195
II	348,000	341,405	1,000	1019.31864
III	548,000	504,001	100	108.7299668

Stock B is going to repurchase 1000 shares from market the next day. Adjusted No. of Shares is  $16,000 - 1,000 = 15,000$ .

Right issue of Stock Z will be listed the next day.

Index adjustment is required.

## Index Adjustment

Adjusted Market Cap:

Index I =  $200,000 - 5.00 \times 1,000 = \text{¥}195,000$

Index II =  $\text{¥}348,000$

Index III =  $195,000 + 348,000 = \text{¥}543,000$

Index	Total Adjusted Market cap before Adjustment (Yuan) (1)	Total Adjusted Market cap after Adjustment (Yuan) (2)	Old Base Period (3)	New Base Period (3)×(2)/(1)
I	200,000	195,000	164,000	159,900
II	321,000	348,000	341,405	341,405
III	521,000	543,000	504,001	499,402

## Day 5

Exchange rate of the day: 8.00 RMB/USD

Index	Stock	No. of Shares	Closing Price (Yuan)	Market Cap (Yuan)	Total Market Cap (Yuan)
I	A	10,000	10.50	105,000	215,000
	B	15,000	6.00	90,000	
	C	5,000	0.50	20,000	
II	X	7,000	11.00	77,000	357,500
	Y	10,000	19.50	195,000	
	Z	9,000	9.50	85,500	
III					572,500

## Index Calculation

Index	Total Market Cap (Yuan) (1)	Base Period (2)	Base Index (3)	Closing Index (3)×(1)/(2)
I	215,000	159,900	100	134.4590369
II	357,500	341,405	1,000	1047.144867
III	572,500	499,402	100	114.6370276

Stock B is going to merge from two to one the next day. Adjusted No. of Shares is  $15,000/2 = 7,500$ .

Stock C is going to be split from one to two the next day. Adjusted No. of Shares is  $5,000 \times 2 = 10,000$ .

No adjustment is required.

## Day 6

Exchange rate of the day: 8.00 RMB/USD

Index	Stock	No. of Shares	Closing Price (Yuan)	Market Cap (Yuan)	Total Market Cap (Yuan)
I	A	10,000	11.00	110,000	220,250
	B	7,500	11.50	86,250	
	C	10,000	0.30	24,000	
II	X	7,000	10.50	73,500	363,500
	Y	10,000	20.00	200,000	
	Z	9,000	10.00	90,000	
III					583,750

### Index Calculation

Index	Total Market Cap (Yuan) (1)	Base Period (2)	Base Index (3)	Closing Index (3)×(1)/(2)
I	220,250	159,900	100	137.742339
II	363,500	341,405	1,000	1064.719327
III	583,750	499,402	100	116.8897203

Exchange rate is changing to 8.50 RMB/USD.

Index adjustment is required.

### Index Adjustment

Adjusted Market Cap:

Index I =  $220,250 + 10,000 \times 0.30 \times (8.50 - 8.00) = \text{¥}221,750$

Index III =  $221,750 + 363,500 = \text{¥}585,250$

Index	Total Adjusted Market cap before Adjustment (Yuan) (1)	Total Adjusted Market cap after Adjustment (Yuan) (2)	Old Base Period (3)	New Base Period (3)×(2)/(1)
I	220,250	221,750	159,900	160,989
II	363,500	363,500	341,405	341,405
III	583,750	585,250	499,402	500,686

## Day 7

Index	Stock	No. of Shares	Closing Price (Yuan)	Market Cap (Yuan)	Total Market Cap (Yuan)
I	A	10,000	11.00	110,000	234,000
	B	7,500	12.00	90,000	
	C	10,000	0.40	34,000	
II	X	7,000	11.50	80,500	374,500
	Y	10,000	19.50	195,000	
	Z	9,000	11.00	99,000	
III					608,500

### Index Calculation

Index	Total Market Cap (Yuan) (1)	Base Period (2)	Base Index (3)	Closing Index (3)×(1)/(2)
I	234,000	160,989	100	145.351555
II	374,500	341,405	1,000	1096.939169
III	608,500	500,686	100	121.5333529

Stock A is going to be delisted the next day.

Stock D is being new listed today (issued 5,000 shares at a price of ¥6 ), which is going to be included in the index the next day.

Index adjustment is required.

### Index Adjustment

Adjusted Market Cap:

Index I = 234,000 - 110,000 + 5,000 × 6 = ¥154,000

Index III = 154,000 + 374,500 = ¥528,500

Index	Total Adjusted Market cap before Adjustment (Yuan) (1)	Total Adjusted Market cap after Adjustment (Yuan) (2)	Old Base Period (3)	New Base Period (3)×(2)/(1)
I	234,000	154,000	160,989	105,950
II	374,500	374,500	341,405	341,405
III	608,500	528,500	500,686	434,860

## Day 8

Exchange rate of the day: 8.50 RMB/USD

Index	Stock	No. of Shares	Closing Price (Yuan)	Market Cap (Yuan)	Total Market Cap (Yuan)
I	A	7,500	11.50	86,250	159,750
	B	10,000	0.50	42,500	
	C	5,000	6.2	31,000	
II	X	7,000	12.00	84,000	387,500
	Y	10,000	20.00	200,000	
	Z	9,000	11.50	103,500	
III					547,250

### Index Calculation

Index	Total Market Cap (Yuan) (1)	Base Period (2)	Base Index (3)	Closing Index (3)×(1)/(2)
I	159,750	105,950	100	150.7786423
II	387,500	341,405	1,000	1135.017164
III	547,250	434,860	100	125.845085