

# **S&P BSE Factor Indices** *Methodology*

**S&P Dow Jones  
Indices**

A Division of **S&P Global**



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# Introduction

## Index Objective and Highlights

The S&P BSE Factor Indices are constructed from the constituents of S&P BSE LargeMidCap and consist of the following indices:

**S&P BSE Enhanced Value Index.** The index measures the performance of the 30 companies in the S&P BSE LargeMidCap with the most attractive valuations, based on their value scores (*see Appendix A*). Constituents are weighted by the product of their value score and float-adjusted market capitalization.

**S&P BSE Low Volatility Index.** The index measures the performance of the 30 least volatile companies in the S&P BSE LargeMidCap (*see Appendix B*). Constituents are weighted by their inverse volatility.

**S&P BSE Momentum Index.** The index measures the performance of the 30 companies in the S&P BSE LargeMidCap that exhibit the most persistence in their relative performance, based on their momentum scores (*see Appendix C*). Constituents are weighted by the product of their momentum score and float-adjusted market capitalization.

**S&P BSE Quality Index.** The index measures the performance of the 30 highest quality companies in the S&P BSE LargeMidCap, based on their quality scores (*see Appendix D*). Constituents are weighted by the product of their quality score and float-adjusted market capitalization.

## Partnership

On February 19, 2013, S&P Dow Jones Indices and the BSE Ltd. (formerly Bombay Stock Exchange (“BSE”)) announced their strategic partnership to calculate, disseminate and license the widely followed BSE suite of indices.

## Index Family

The S&P BSE Factor Indices are part of the strategy family of S&P BSE Indices.

For more information on other S&P BSE Indices, please refer to [www.spdji.com](http://www.spdji.com) or [www.asiaindex.co.in](http://www.asiaindex.co.in).

## Supporting Documents

This methodology is meant to be read in conjunction with supporting documents providing greater detail with respect to the policies, procedures and calculations described herein. References throughout the methodology direct the reader to the relevant supporting document for further information on a specific topic. The list of the main supplemental documents for this methodology and the hyperlinks to those documents is as follows:

Supporting Document	URL
S&P Dow Jones Indices' Equity Indices Policies & Practices Methodology	<a href="#">Equity Indices Policies &amp; Practices</a>
S&P Dow Jones Indices' Index Mathematics Methodology	<a href="#">Index Mathematics Methodology</a>
S&P Dow Jones Indices' Float Adjustment Methodology	<a href="#">Float Adjustment Methodology</a>

This methodology was created by Asia Index Private Limited to achieve the aforementioned objective of measuring the underlying interest of each index governed by this methodology document. Any changes to or deviations from this methodology are made in the sole judgment and discretion of Asia Index Private Limited so that the index continues to achieve its objective.

# Eligibility Criteria

## Index Eligibility

The universe of the S&P BSE Factor Indices is drawn from the constituents of the S&P BSE LargeMidCap, a size sub-index of the S&P BSE AllCap.

*For details and index management rules of the S&P BSE AllCap and S&P BSE LargeMidCap, please refer to the S&P BSE AllCap Methodology available at [www.spdji.com](http://www.spdji.com) and [www.asiaindex.co.in](http://www.asiaindex.co.in).*

As part of the constituent eligibility process of each index, the following are calculated for each company:

1. Average daily float-adjusted market capitalization
2. Annualized traded value
3. Turnover ratio
4. Number of non-trading days

These are calculated based on an observation period defined as the prior six-month period, as of the rebalancing reference date.

Annualized traded value is calculated by taking the median of the monthly medians of the daily traded values over the observation period. The annualization is calculated using 250 trading days in a year.

The turnover ratio is calculated by dividing the annualized traded value by the average daily float-adjusted market capitalization.

Only common stocks which satisfy all the following criteria at each semi-annual rebalancing are eligible.

1. Have an average daily float-adjusted market capitalization greater than or equal to INR 20 billion. Current index constituents with a float-adjusted market capitalization of at least INR 16 billion remain eligible for index inclusion provided they meet the other eligibility criteria.
2. Have an annualized traded value greater than or equal to INR 10 billion. Current index constituents with an annualized traded value of at least INR 8 billion remain eligible for index inclusion provided they meet the other eligibility criteria.
3. Have a turnover ratio greater than or equal to 20%. Current index constituents with turnover ratio of 16% remain eligible for index inclusion provided they meet the other eligibility criteria.
4. Have no more than five non-trading days in the past six months, as of the rebalancing reference date

Asia Index Private Limited believes turnover in index membership should be avoided when possible. At times, a company may appear to temporarily violate one or more of the addition criteria. However, the addition criteria are for addition to an index, not for continued membership. As a result, an index constituent that appears to violate criteria for addition to the index may not be deleted unless ongoing conditions warrant an index change.

# Index Construction

## S&P BSE Enhanced Value Index

**Constituent Selection.** Companies satisfying the eligibility criteria are ranked based on their value scores (see *Appendix A*).

The top 24 companies (whether a current constituent or not) are selected for index inclusion. Existing constituents ranked 25-36 are selected in order of highest rank until the target constituent count of 30 is reached. If after this step the target constituent count is not achieved, then non-constituents ranked 25-36 are selected in order of highest rank until the target constituent count is reached.

**Constituent Weightings.** The index employs a non-market capitalization weighting scheme, using the divisor methodology used in S&P Dow Jones Indices' equity indices. Each company is weighted by the product of its float-adjusted market capitalization weight in the eligible index universe and value score, subject to security and sector constraints. This is done using an optimization procedure that chooses final weights in such a way as to minimize the sum of the squared differences of capped weight and uncapped weight, divided by uncapped weight for each stock, subject to the following constraints: the maximum weight of each security is the lower of 5% and 20 times its float-adjusted market capitalization weight in the eligible index universe, and the maximum weight of any given BSE sector is 30%. Each stock's weight is floored at 0.05%. Note that the capping algorithm redistributes the excess weight to the other stocks in proportion to their value weights, such that the tracking error is minimized.

Where the optimization procedure fails for a given period, the constraints are then relaxed in the following order: the maximum weight of the security, 20 times its float-adjusted market capitalization weight and then the maximum weight of the BSE sector.

Weight caps are applied at each semi-annual rebalancing.

Index constituents that are classified as part of the Diversified sector are treated as if they are part of the Industrials sector for index purposes.

*For more information on weighting schemes, please see S&P Dow Jones Indices' Index Mathematics Methodology.*

## S&P BSE Low Volatility Index

**Constituent Selection.** Companies satisfying the eligibility criteria and with listing history of at least one year, as on the reference date, are ranked based on the inverse of their volatility (see *Appendix B*).

The top 24 companies (whether a current constituent or not) are selected for index inclusion. Existing constituents ranked 25-36 are selected in order of highest rank until the target constituent count of 30 is reached. If after this step the target constituent count is not achieved, then non-constituents ranked 25-36 are selected in order of highest rank until the target constituent count is reached.

**Constituent Weightings.** The index employs a non-market capitalization weighting scheme, using the divisor methodology used in S&P Dow Jones Indices' equity indices. The weight,  $w$ , for each index constituent,  $i$ , is set inversely proportional to its volatility, subject to a maximum weight for each security of 5%. Note that the capping algorithm redistributes the excess weight to the other stocks in proportion to their initial weights, such that the tracking error is minimized.

$$w_i = \frac{\frac{1}{Volatility_i}}{\sum_{i=1}^N \frac{1}{Volatility}}$$

where:

$N = 30$  (The number of index constituents)

Weight caps are applied at each semi-annual rebalancing.

*For more information on weighting schemes, please see S&P Dow Jones Indices' Index Mathematics Methodology.*



## **S&P BSE Momentum Index**

**Constituent Selection.** Companies satisfying the eligibility criteria are ranked based on their momentum scores (see *Appendix C*).

The top 24 companies (whether a current constituent or not) are selected for index inclusion. Existing constituents ranked 25-36 are selected in order of highest rank until the target constituent count of 30 is reached. If after this step the target constituent count is not achieved, then non-constituents ranked 25-36 are selected in order of highest rank until the target constituent count is reached.

**Constituent Weightings.** The index employs a non-market capitalization weighting scheme, using the divisor methodology used in S&P Dow Jones Indices' equity indices. Each company is weighted by the product of its float-adjusted market capitalization weight in the eligible index universe and momentum score, subject to a maximum weight limit. This is done using an optimization procedure that chooses final weights in such a way as to minimize the sum of the squared differences of capped weight and uncapped weight, divided by uncapped weight for each stock, subject to the following constraints: the maximum weight of each security is the lower of 5% and three times its float-adjusted market capitalization weight in the index. Note that the capping algorithm redistributes the excess weight to the other stocks in proportion to their momentum weights, such that the tracking error is minimized.

Where the optimization procedure fails for a given period, the constraints are then relaxed in the following order: the maximum weight of the security and three times its float-adjusted market capitalization weight in the index.

Weight caps are applied at each semi-annual rebalancing.

*For more information on weighting schemes, please see S&P Dow Jones Indices' Index Mathematics Methodology.*

## **S&P BSE Quality Index**

**Constituent Selection.** Companies satisfying the eligibility criteria are ranked based on their quality scores (see *Appendix D*).

The top 24 companies (whether a current constituent or not) are selected for index inclusion. Existing constituents ranked 25-36 are selected in order of highest rank until the target constituent count of 30 is reached. If after this step the target constituent count is not achieved, then non-constituents ranked 25-36 are selected in order of highest rank until the target constituent count is reached.

**Constituent Weightings.** The index employs a non-market capitalization weighting scheme, using the divisor methodology used in S&P Dow Jones Indices' equity indices. Each company is weighted by the product of its float-adjusted market capitalization weight in the eligible index universe and quality score, subject to security and sector constraints. This is done using an optimization procedure that chooses final weights in such a way as to minimize the sum of the squared differences of capped weight and uncapped weight, divided by uncapped weight for each stock, subject to the following constraints: the maximum weight of each security is the lower of 5% and 20 times its float-adjusted market capitalization weight in the eligible index universe, the maximum weight of any given BSE sector is 30%. Each stock's weight is floored at 0.05%. Note that the capping algorithm redistributes the excess weight to the other stocks in proportion to their quality weights, such that the tracking error is minimized.

Where the optimization procedure fails for a given period, the constraints are then relaxed in the following order: the maximum weight of the security and then the maximum weight of the BSE sector.

Weight caps are applied at each semi-annual rebalancing.

Index constituents that are classified as part of the Diversified sector are treated as if they are part of the Industrials sector for index purposes.

*For more information on weighting schemes, please see S&P Dow Jones Indices' Index Mathematics Methodology.*

# Index Maintenance

## Rebalancing

The indices are rebalanced semi-annually, effective at the open of the Monday following the third Friday of March and September. The rebalancing reference dates are after the market close on the third Friday of February and August, respectively. Weights calculated as a result of the reference date data are implemented in the indices using closing prices as of the Wednesday prior to the second Friday of the rebalancing month as the reference price.

## Ongoing Maintenance

The indices are also reviewed on an ongoing basis to account for events such as mergers, takeovers, delistings, group changes, suspensions, surveillance objections, graded surveillance measure objections, spin-offs/demergers or bankruptcies. Changes to index composition and related weight adjustments are made as soon as they are effective. These changes are typically announced one to five business days prior to implementation date.

## Additions

No companies are added to an index between semi-annual rebalancings. As such, the number of stocks in each index may fall below the targeted constituent count of 30 due to any deletions made between the semi-annual rebalancings.

## Deletions

A company can be deleted from an index between semi-annual rebalancings due to events such as mergers, takeovers, delistings, group changes, suspensions, surveillance objections, graded surveillance measure objections, spin-offs/demergers or bankruptcies. In addition, index constituents removed from an index's underlying universe are also deleted from the index on the same effective date.

- Whenever possible, changes in the index's components are announced at least one to five business days prior to the implementation date.
- Whenever practicable, Asia Index Private Limited Indices uses the closing price for all deletions.

## Graded Surveillance Measure (GSM)

On a monthly basis, companies added to the GSM list are dropped from the indices. The effective date of the drop is at the open of the Tuesday following the first Monday of each month. The reference date for the GSM list data is the third Friday of the previous month.

Any company dropped due to inclusion on the GSM list must remain off the list for six consecutive months prior to the rebalancing reference date to be reconsidered for index inclusion.

## Corporate Actions

Corporate Action	Adjustment to Index	Divisor Adjustment?
Spin Off	In general, the parent company is dropped from the index. However, if information regarding price adjustment is available, the parent company may remain in the index with an adjusted price, at the discretion of the Index Committee.	Yes
Rights Offering	The price is adjusted to the Price of the Parent Company minus the Price of the Rights Offering/ Rights Ratio. Index shares change so that the company's weight remains the same as its weight before the rights offering.	No
Stock Dividend (Bonus), Stock split, Reverse Stock Split	Index shares are multiplied by and price is divided by the split factor.	No
Change in Shares (new issue, repurchase, warrant conversion etc.)	None	No
Special Dividend	Price of stock making special dividend is reduced by the per share special dividend amount after the close of trading on the day before the dividend ex-date.	Yes
Constituent Change	No intraday rebalancing.	No
	Deletions due to delisting, acquisition or any other corporate event resulting in the deletion of the stock from the index will cause the weights of the rest of the stocks in the index to change.	Yes
	Stocks that are reclassified into Z group between rebalancings are removed from the index as soon as practicable.	Yes
	Rebalancing changes including additions, deletions and weight changes.	Yes
	Constituents changing their BSE Industry Sub-Group classification to an ineligible BSE Industry Sub-Group classification are removed quarterly.	Yes

For more information, please refer to *S&P Dow Jones Indices' Equity Indices Policies & Practices Methodology*.

## Currency of Calculation and Additional Index Return Series

The indices are calculated in Indian rupees and U.S. dollars.

Spot foreign exchange rates provided by Thomson Refinitiv are taken daily at 3:00 PM India Time and used in the end-of-day calculation to calculate these indices in U.S. dollars.<sup>1</sup>

In addition to the indices detailed in this methodology, additional return series versions of the indices may be available, including, but not limited to: currency, currency hedged, decrement, fair value, inverse, leveraged, and risk control versions. For a list of available indices, please refer to the [S&P DJI Methodology & Regulatory Status Database](#).

For information on the index calculation, please refer to *S&P Dow Jones Indices' Index Mathematics Methodology*.

<sup>1</sup> WM/Refinitiv foreign exchange rates were used in calculating index history prior to April 23, 2009.

For the inputs necessary to calculate certain types of indices, including decrement, dynamic hedged, fair value, and risk control indices, please refer to the Parameters documents available at [www.spdji.com](http://www.spdji.com).

### Base Date and History Availability

Index history availability, base dates, and base values are shown in the table below.

Index	Launch Date	First Value Date	Base Date	Base Value
S&P BSE Enhanced Value Index	03-Dec-15	16-Sep-05	16-Sep-05	100
S&P BSE Low Volatility Index	03-Dec-15	16-Sep-05	16-Sep-05	100
S&P BSE Momentum Index	03-Dec-15	16-Sep-05	16-Sep-05	100
S&P BSE Quality Index	03-Dec-15	16-Sep-05	16-Sep-05	100

# Index Data

## Calculation Return Types

S&P Dow Jones Indices calculates multiple return types which vary based on the treatment of regular cash dividends. The classification of regular cash dividends is determined by S&P Dow Jones Indices.

- Price Return (PR) versions are calculated without adjustments for regular cash dividends.
- Gross Total Return (TR) versions reinvest regular cash dividends at the close on the ex-date without consideration for withholding taxes.
- Net Total Return (NTR) versions, if available, reinvest regular cash dividends at the close on the ex-date after the deduction of applicable withholding taxes.

In the event there are no regular cash dividends on the ex-date, the daily performance of all three indices will be identical.

For a complete list of indices available, please refer to the daily index levels file (“.SDL”).

*For more information on the classification of regular versus special cash dividends as well as the tax rates used in the calculation of net return, please refer to S&P Dow Jones Indices’ Equity Indices Policies & Practices Methodology.*

*For more information on the calculation of return types, please refer to S&P Dow Jones Indices’ Index Mathematics Methodology.*

# Index Governance

## **Index Committee**

The S&P BSE Index Committee oversees these indices. The Index Committee is composed of full time employees of S&P Dow Jones Indices and the BSE. The Index Committee meets regularly. At each meeting, the Index Committee reviews pending corporate actions that may affect index constituents, statistics comparing the composition of the indices to the market, companies that are being considered as candidates for addition to an index, and any significant market events. In addition, the Index Committee may revise index policy covering rules for selecting companies, treatment of dividends, share counts or other matters.

Asia Index Private Limited considers information about changes to its indices and related matters to be potentially market moving and material. Therefore, all Index Committee discussions are confidential.

S&P Dow Jones Indices' Index Committees reserve the right to make exceptions when applying the methodology if the need arises. In any scenario where the treatment differs from the general rules stated in this document or supplemental documents, clients will receive sufficient notice, whenever possible.

In addition to the daily governance of indices and maintenance of index methodologies, at least once within any 12-month period, the Index Committee reviews the methodology to ensure the indices continue to achieve the stated objectives, and that the data and methodology remain effective. In certain instances, S&P Dow Jones Indices may publish a consultation inviting comments from external parties.

*For information on Quality Assurance and Internal Reviews of Methodology, please refer to S&P Dow Jones Indices' Equity Indices Policies & Practices Methodology.*

# Index Policy

## Announcements

All index constituents are evaluated daily for data needed to calculate index levels and returns. All events affecting the daily index calculation are typically announced in advance via the Index Corporate Events report (.SDE), delivered daily to all clients. Any unusual treatment of a corporate action or short notice of an event may be communicated via email to clients.

## Pro-forma Files

In addition to the corporate events file (.SDE), Asia Index Private Limited provides constituent pro-forma files each time the indices rebalance. The pro-forma file is typically provided daily in advance of the rebalancing date and contains all constituents and their corresponding weights and index shares effective for the upcoming rebalancing. Since index shares are assigned based on prices prior to the rebalancing, the actual weight of each stock at the rebalancing differs from these weights due to market movements.

Please visit [www.spdji.com](http://www.spdji.com) for a complete schedule of rebalancing timelines and pro-forma delivery times.

## Holiday Schedule

The indices are calculated on all business days when the BSE is open.

A complete holiday schedule for the year is available on the BSE Ltd. Web site at [www.bseindia.com](http://www.bseindia.com).

**Special Trading Sessions.** The indices will be calculated on special trading sessions as declared by the Bombay Stock Exchange. Some examples include, but are not limited to, special trading sessions on Saturday and Mahurat trading. Asia Index Private Limited will issue a notice to inform market participants regarding such special trading sessions.

If the special trading session falls on the Saturday following the third Friday of any rebalancing month, the new portfolio will be effective at the discretion of the Index Committee. Asia Index Private Limited will issue a notice to inform market participants detailing when the new portfolio will become effective.

## Rebalancing

The Index Committee may change the date of a given rebalancing for reasons including market holidays occurring on or around the scheduled rebalancing date. Any such change will be announced with proper advance notice where possible

## Unexpected Exchange Closures

For information on Unexpected Exchange Closures, please refer to S&P Dow Jones Indices' Equity Indices Policies & Practices Methodology.

## Recalculation Policy

For information on the recalculation policy, please refer to S&P Dow Jones Indices' Equity Indices Policies & Practices Methodology.



**Real-Time Calculation**

Real-time, intra-day index calculations are executed on the BSE real-time platform, “EPIC”. Real-time indices are not restated.

*For information on Calculations and Pricing Disruptions, Expert Judgment and Data Hierarchy, please refer to S&P Dow Jones Indices’ Equity Indices Policies & Practices Methodology.*

**End-of-Day Calculation**

End of day index calculation are executed on an S&P proprietary platform.

**Contact Information**

For questions regarding an index, please contact: [index\\_services@spglobal.com](mailto:index_services@spglobal.com).

# Index Dissemination

Index levels are available through S&P Dow Jones Indices' Web site at [www.spdji.com](http://www.spdji.com), Asia Index Private Limited's Web site at [www.asiaindex.co.in](http://www.asiaindex.co.in), major quote vendors (see codes below), numerous investment-oriented Web sites, and various print and electronic media.

## Tickers

The table below lists headline indices covered by this document. All versions of the below indices that may exist are also covered by this document. Please refer to the [S&P DJI Methodology & Regulatory Status Database](#) for a complete list of indices covered by this document.

Index	Return Type	Bloomberg		Refinitiv
		INR	USD	INR
S&P BSE Enhanced Value Index	Price Return	SPBSEVIP	SPBSEVUP	.SPBSEEVI
	Total Return	SPBSEVIT	SPBSEVUT	--
S&P BSE Low Volatility Index	Price Return	SPBSLVIP	SPBSLVUP	.SPBSELVI
	Total Return	SPBSLVIT	SPBSLVUT	--
S&P BSE Momentum Index	Price Return	SPBSMOIP	SPBSMOUP	.SPBSEMOI
	Total Return	SPBSMOIT	SPBSMOUT	--
S&P BSE Quality Index	Price Return	SPBSQIP	SPBSQUP	.SPBSEQLI
	Total Return	SPBSQIT	SPBSQUT	--

## Index Data

Daily constituent and index level data are available via subscription.

For product information, please contact S&P Dow Jones Indices, [www.spdji.com/contact-us](http://www.spdji.com/contact-us).

## Web site

For further information, please refer to S&P Dow Jones Indices' Web site at [www.spdji.com](http://www.spdji.com).

# Appendix A – Value Score

## Fundamental Ratios Calculation

The first step to determine the overall value score is to calculate, as of the rebalancing reference date, the three fundamental ratios below for each security in the index universe. They are defined as follows:

- **Book Value-to-Price Ratio.** This is calculated as a company's latest book value per share divided by its price:

$$\text{Book Value-to-Price} = \frac{BVPS}{P}$$

- **Earnings-to-Price Ratio.** This is calculated as a company's trailing 12-month earnings per share divided by its price:

$$\text{Earnings-to-Price} = \frac{EPS}{P}$$

- **Sales-to-Price Ratio.** This is calculated as a company's trailing 12-month sales per share divided by its price:

$$\text{Sales-to-Price} = \frac{SPS}{P}$$

**Outlier Handling and Winsorization.** Outlier fundamental ratios are winsorized to ensure that the average values used to calculate the overall value score are less distorted by extreme values. For a given fundamental variable, the values for all securities are first ranked in ascending order. Then, for securities that lie above the 97.5 percentile rank or below the 2.5 percentile rank, their value is set as equal to the value of the 97.5 percentile ranked or the 2.5 percentile ranked security, whichever is applicable.

## Z-score & Value Score Computation

**Z-score Computation.** Computing a z-score is a widely adopted method of standardizing a variable in order to combine it with other variables that may have a different scale or unit of measurement. After winsorizing all the three fundamental ratios, the z-score for each of the three ratios for each security is calculated using the mean and standard deviation of the relevant variable within the index universe.

The z-score is calculated as follows:

$$z_{\alpha} = \frac{(x_{\alpha} - \mu_{\alpha})}{\sigma_{\alpha}}$$

where:

$z_{\alpha}$  = Z-score for a given security

$x_{\alpha}$  = Winsorized variable for a given security

$\mu_{\alpha}$  = Arithmetic mean of the winsorized variable in the index universe, excluding any missing values

$\sigma_{\alpha}$  = Standard deviation of the winsorized variable in the index universe

**Average Z-score Computation.** For each security, the average z-score is computed by taking a simple average of the three scores. Where there is a missing value, the average z-score is computed by taking a simple average of the remaining two scores. A security must have at least one z-score for it to be included in the index.

**Outlier Handling and Winsorization.** Outlier average z-scores are winsorized to ensure that the average values used to calculate the overall value score are less distorted by extreme values. To do this, for a given average z-score, the values for all securities are first ranked in ascending order. Then, for securities that lie above 4 or below -4, their value is set as equal to 4 or -4, whichever is applicable.

**Value Score Computation.** Using the winsorized average z-scores for the three value factors, a value score is computed for each of the securities. For a given security, if its winsorized average z-score is above 0, then its value score will be the addition of 1 and the average z-score. On the other hand, if its winsorized average score is below 0, then its value score will be the result of the reciprocal of 1 subtracted by its average z-score.

If average  $Z > 0$ , Value Score =  $1 + Z$

If average  $Z < 0$ , Value Score =  $(1 / (1 - Z))$

If average  $Z = 0$ , Value Score = 1

# Appendix B – Volatility

## Volatility Calculation

Volatility is defined as the standard deviation of the security's daily price returns over the prior one year of trading days. It can be mathematically expressed as:

$$\sqrt{\frac{\sum_{i=1}^N (X_i - \bar{X})^2}{N-1}}$$

where:

$$X_i = \text{Price change} = \frac{P_t}{P_{t-1}} - 1$$

$P_t$  = Closing price of the stock on day  $t$

$P_{t-1}$  = Closing price of the stock on day  $t-1$

$t$  = 1 to  $N$

$\bar{X}$  = Average price change

$N$  = Number of trading days in a year based on local calendar

# Appendix C – Momentum Score

## Momentum Value Calculation

Momentum value is calculated for each of the securities in the index universe on each of the rebalancing reference dates. The momentum value is determined as follows:

1. The momentum value is computed as the 12-month price change, excluding the most recent month of the security in local currency. If 12 months of price history is not available, momentum value is calculated from nine months of price history. The effective rebalancing month is stated as month (M).

- a. Momentum Value =  $\left( \frac{\text{price}_{M-2}}{\text{price}_{M-14}} \right) - 1$

- b. Or, Momentum Value =  $\left( \frac{\text{price}_{M-2}}{\text{price}_{M-11}} \right) - 1$  if 12 months of price history is not available.

**NOTE 1:** For example, if the effective rebalancing date is on 03/24/2014, the reference date is 02/21/2014, and the momentum value will be calculated based on the prices from 01/31/2014 ( $\text{price}_{M-2}$ ) and 01/31/2013 ( $\text{price}_{M-14}$ ).

**NOTE 2:** If there is no price available on day  $M-2$  or day  $M-14$ , the price from the day prior will be used. If there is no price available on any of the ten days prior, the momentum value will be calculated using formula (b) above. If the same condition exists for formula (b), the stock is excluded from the S&P BSE Momentum Index.

**NOTE 3:** For a stock to be included in the S&P BSE Momentum Index, it must be trading for at least ten months prior to the rebalancing reference date.

2. The momentum value is further adjusted by the security's volatility. For a given *positive* price change over the evaluation period, *lower* volatility improves the adjusted momentum value. For a given *negative* price change over the evaluation period, *higher* volatility improves the adjusted momentum value. When many securities within a given index universe experience negative price changes over a relevant evaluation period, the volatility adjustment may cause the selection of constituents with higher negative price changes.

$$\text{Risk-Adjusted Momentum Value} = \frac{\text{MomentumValue}_i}{\sigma_i}$$

where:

$\sigma$  = Standard deviation of daily price returns for the same date period used in Step 1 above.

## Z-Score & Momentum Score Computation

**Z-Score Computation.** Computing a z-score is a widely adopted method of standardizing a variable. The z-score for risk-adjusted momentum value for each security is calculated using the mean and standard deviation of the relevant variable within the index universe.

The z-score is calculated as follows:

$$z_{\alpha} = \frac{(x_{\alpha} - \mu_{\alpha})}{\sigma_{\alpha}}$$

where:

$z_{\alpha}$  = Z-score for a given security

$x_{\alpha}$  = Observed value for a given security

$\mu_{\alpha}$  = Arithmetic mean of the variable in the index universe, excluding any missing values

$\sigma_{\alpha}$  = Standard deviation of the variable in the index universe

Winsorization reduces the impact of outliers on a data set by limiting them to a designated value or score. For the S&P BSE Momentum Index, the winsorized z-score of a security is capped at  $\pm 3$ .

**Momentum Score Computation.** Using the winsorized z-scores, a momentum score is computed for each of the securities. For a given security, if its winsorized z-score is above 0, then its momentum score will be the addition of 1 and the z-score. On the other hand, if its winsorized score is below 0, then its momentum score will be the result of the inverse of 1 subtracted by its z-score.

If  $Z > 0$ , Momentum Score =  $1 + Z$

If  $Z < 0$ , Momentum Score =  $(1 / (1 - Z))$

If  $Z = 0$ , Momentum Score = 1

# Appendix D – Quality Score

## Fundamental Ratios Calculation

The first step to determine the overall quality score is to calculate, as of the rebalancing reference date, the three fundamental ratios below for each security in the index universe. They are defined as follows:

- **Return on Equity (ROE).** This is calculated as a company's trailing 12-month earnings per share divided by its latest book value per share:

$$ROE = \frac{EPS}{BVPS}$$

- **Accruals Ratio.** This is computed using the change of a company's net operating assets over the last year divided by its average net operating assets over the last two years:

$$\text{Accruals Ratio} = \frac{(NOA_t - NOA_{t-1})}{((NOA_t + NOA_{t-1})) / 2}$$

- **Financial Leverage Ratio.** This is calculated as a company's latest total debt divided by its book value.

$$\text{Leverage} = \frac{\text{Total Debt}}{(BVPS \times \text{Common Shares outstanding})}$$

**Outlier Handling and Winsorization.** Outlier fundamental ratios are winsorized to ensure that the average values used to calculate the overall quality score are less distorted by extreme values.

- **Return on Equity and Accruals Ratio.** For a given fundamental variable, the values for all securities are first ranked in ascending order. Then, for securities that lie above the 97.5 percentile rank or below the 2.5 percentile rank, their value is set as equal to the value of the 97.5 percentile ranked or the 2.5 percentile ranked security, whichever is applicable. If the underlying data points for a given stock's ROE are both negative, leading to a positive ROE, its ROE value is excluded and the stock assigned an ROE Z-score set as equal to the ROE Z-score value of the 2.5 percentile ranked security.
- **Financial Leverage Ratio.** The values for all securities are first ranked in ascending order. Then, for securities that lie above the 97.5 percentile rank or below the 2.5 percentile rank, their value is set as equal to the value of the 97.5 percentile ranked or the 2.5 percentile ranked security, whichever is applicable. If the underlying data point for a given stock's BVPS is negative, leading to a negative Leverage, its Leverage value will be excluded and the stock will be assigned a Leverage Z-score set as equal to the Leverage Z-score value of the 97.5 percentile ranked security.

## Z-score & Quality Score Computation

**Z-score Computation.** Computing a z-score is a widely adopted method of standardizing a variable in order to combine it with other variables that may have a different scale or unit of measurement. After winsorizing all the three fundamental ratios, the z-score for each of the three ratios for each security is calculated using the mean and standard deviation of the relevant variable within the index universe.

- **Return on Equity.** The z-score is calculated as follows:

$$z_\alpha = \frac{(x_\alpha - \mu_\alpha)}{\sigma_\alpha}$$

- **Accruals and Financial Leverage Ratios.** The z-score is calculated as follows:



$$z_{\alpha} = -\frac{(x_{\alpha} - \mu_{\alpha})}{\sigma_{\alpha}}$$

where:

$z_{\alpha}$  = Z-score for a given security

$x_{\alpha}$  = Winsorized variable for a given security

$\mu_{\alpha}$  = Arithmetic mean of the winsorized variable in a given index universe, excluding any missing values

$\sigma_{\alpha}$  = Standard deviation of the winsorized variable in a given index universe

**Average Z-score Computation.** For each security, the average z-score is computed by taking a simple average of the three scores. Where there is a missing value, the average z-score is computed by taking a simple average of the remaining two scores. A security must have at least one z-score for it to be included in the index.

**Outlier Handling and Winsorization.** Outlier average z-scores are winsorized to ensure that the overall quality scores are less distorted by extreme values. To do this, for a given average z-score, the values for all securities are first ranked in ascending order. Then, for securities that lie above 4 or below -4, their value is set as equal to 4 or -4, whichever is applicable.

**Quality Score Computation.** Using the winsorized average z-scores, a quality score is computed for each of the securities. For a given security, if its winsorized average z-score is above 0, then its quality score will be the addition of 1 and the average z-score. On the other hand, if its winsorized average score is below 0, then its quality score will be the result of the inverse of 1 subtracted by its average z-score.

If average Z > 0, Quality Score = 1 + Z

If average Z < 0, Quality Score = (1 / (1 - Z))

If average Z = 0, Quality Score = 1

# Appendix E – Methodology Changes

Methodology changes since January 1, 2015 are as follows:

Change	Effective Date (After Close)	Methodology	
		Previous	Updated
Ongoing Maintenance:  Graded Surveillance Measure	21-Sep-18	--	On a monthly basis, companies added to the GSM list are dropped. The effective date of the drop is at the open of the Tuesday following the first Monday of each month. The reference date for the GSM list data is the third Friday of the previous month.  Any company dropped due to its inclusion on the GSM list must remain off the GSM list for six consecutive months prior to the rebalancing reference date in order to be reconsidered for index inclusion.
Buffer Rule:  Float-Adjusted Market Capitalization	16-Sep-16	--	Current index constituents with a float adjusted market capitalization of at least INR 16 billion remain eligible for index inclusion provided they meet the other eligibility criteria
Buffer Rule:  Annualized Traded Value	16-Sep-16	--	Current index constituents with an annualized traded value of at least INR 8 billion remain eligible for index inclusion provided they meet the other eligibility criteria.
Buffer Rule:  Turnover Ratio	16-Sep-16	--	Current index constituents with turnover ratio of 16% remain eligible for index inclusion provided they meet the other eligibility criteria.
Constituent Weightings:  S&P BSE Quality Index	16-Sep-16	This is done using an optimization procedure such that the maximum weight of each security is 5% and the maximum weight of any given BSE sector is 30%. Each stock's weight is floored at 0.05%.	This is done using an optimization procedure such that the maximum weight of each security is 5% and 20 times its float-adjusted market capitalization weight, the maximum weight of any given BSE sector is 30%. Each stock's weight is floored at 0.05%.
Outlier Handling and Winsorization:  S&P BSE Quality Index Return on Equity and Accruals Ratio	16-Sep-16	For a given fundamental, the values for all securities are first ranked in ascending order. Then, for securities that lie above the 97.5 percentile rank or below the 2.5 percentile rank, their value is set as equal to the value of the 97.5 percentile ranked or the 2.5 percentile ranked security, whichever is applicable.	For a given fundamental variable, the values for all securities are first ranked in ascending order. Then, for securities that lie above the 97.5 percentile rank or below the 2.5 percentile rank, their value is set as equal to the value of the 97.5 percentile ranked or the 2.5 percentile ranked security, whichever is applicable. If the underlying data points for a given stock's ROE are both negative, leading to a positive ROE, its value will be set as equal to the value of the 2.5 percentile ranked security.
Outlier Handling and Winsorization:  S&P BSE Quality Index Financial Leverage Ratio	16-Sep-16	The values for all securities are first ranked in ascending order. Then, for securities that lie above the 97.5 percentile rank, their value is set as equal to the value of the 97.5 percentile ranked security and for securities that lie below 0, their value is excluded.	The values for all securities are first ranked in ascending order. Then, for securities that lie above the 97.5 percentile rank or below the 2.5 percentile rank, their value is set as equal to the value of the 97.5 percentile ranked or the 2.5 percentile ranked security, whichever is applicable.
Rebalancing Reference Date	18-Mar-16	Last trading day of February and August.	Third Friday of February and August.

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