Stock Indices and Sensex

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What is an Index

Index numbers are indicators which reflect the relative changes in the level of a certain phenomenon in any given period called the *current period* with respect to its values in some fixed period, called *the base period* selected for comparison. The phenomenon or variable under consideration may be:

(1) The price of a particular commodity like steel, gold, leather, etc., or a group of commodities like consumer goods, cereals, milk and milk products, cosmetics, etc.

(2) Volume of trade, factory production, industrial or agricultural production, imports or exports, stocks and shares, sales and profits of a business house and so no.

(3) The national income of a country, wage structure of worker in various sectors, bank deposits, foreign exchange reserves, cost of living of persons of a particular community, class or profession and so on.

In other words, an index number measures how much a variable changes over time. We calculate an index number by finding the ratio of the current value to a base value.

"Index numbers are statistical devices designed to measure the relative change in the level of a phenomenon (variable or a group of variables) with respect to time, geographical location or other characteristics such as income, profession, etc."

For example, suppose we are interested in studying the general change in the price level of consumer goods, i.e., goods or commodities consumed by the people belonging to a particular section of society, say, low income group or middle income group or labour class and so on. Obviously these changes are not directly measurable as the price quotations of the various commodities are available in different units, e.g., cereals (wheat, rice, pulses, etc.) are quoted in Rs. per quintal or kg.; water in Rs. per gallon; milk, petrol, kerosene, etc., in Rs. Per litre; cloth in Rs. per metre and so on.

Further, the prices of some of the commodities may to increasing while those of others may be decreasing during the two periods and the rates of increase or decrease may be different for different commodities. Index number is a statistical device, which enables us to arrive at a single representative figure, which gives the general level of the price of the phenomenon (commodities) in an extensive group.

Stock Market Indices

A stock market index is an index number that measures the movement in share prices of stocks under consideration.

Types of Stock Market Indices

Indices can be categorized on the following basis:

1. Based on Size
2. Based on Nature
3. Based on Calculation Methodology

Different indices based on size

SENSEX	Constituted of 30 scrips
BSE-100	Constituted of 100 scrips
BSE-500	Constituted of 500 scrips
Nifty	Constituted of 50 scrips
Nikkie Index	Constituted of 225 scrips
S & P 500	Constituted of 500 scrips
NASDAQ Composite	Constituted of around 4700 scrips

Different indices based on Nature

SENSEX	Broad-based index representing all major industries from the listed universe
BSE IT Sector Index	Index representing the IT sector stocks
BSE TEC*k* Index	Index representing the TMT sector stocks
BSE Healthcare Index	Index representing the Healthcare sector stocks
FTSE-TMT Index	Index based on telecom, media and IT sector stocks
Nasdaq-100 Index	Technology Index

Different indices based on Calculation Methodology

Not all indexes are created in the same way. Three methods primarily used to construct indexes are:

- Market value-weighted Method - Each stock is given a weighting proportional to its market capitalization
- Price Weighted Method - Each stock is given a weighting proportional to its market price
- Equal Weighted Method - Each stock is equally weighted in the index
- Modified Market Capitalisation Weighted Index - Market capitalisation is considered partially on a predefined basis . For example the weightage of any one stock may be capped (at say 10%) or may be considered only to the extent of free-float.

The **market value-weighted method**, where a company worth 200 crores is given twice the weight of a company worth 100 crores, is the most popular way of creating an index. The Standard & Poor's 500 Index and SENSEX are the main examples. By giving larger companies higher weighting, this method reflects the fact that large companies have larger revenues and profits and that any change will have a larger effect on economic activity than change in smaller companies. Nasdaq Composite Index, Wilshire 5000, London FTSE, and MSCI Indexes are also constructed using the market value methodology.

A **price-weighted index** overweights the performance of companies with higher listed stock prices. Early in this century, high prices were synonymous with larger companies and higher market caps. Things are different today but the old method is still used for computing the index. The DJIA and Japanese Nikkei 225 are price-weighted.

An **equally-weighted index** makes no distinction between large and small companies, both of which are given equal weighting. The good performance of large-cap stocks is negated one-for-one by poor performance of smaller-cap stocks in this index. Since there are many more small companies than large ones, this strategy greatly over-emphasizes the importance of small company activity.

Under **modified market capitalisation weighted method**, only a portion of the market capitalisation of a company is considered for the purpose of calculation of index. A popular way is to consider the floating stock or non-promoter holding for this purpose. Since the non-promoter-held equity is actually available for trading in the market (unlocked equity), it is also called the free-float equity. World over, major index providers are gradually moving towards modified market capitalisation weighted index method. For e.g. Nasdaq-100 and BSE TEC*k* index are modified market capitalisation weighted index.

SENSEX

The ***BSE SENSEX***, first compiled in 1986 is a "Market Capitalization-Weighted" index of 30 component stocks representing a sample of large, well-established and financially sound companies. The index is widely reported in both, the domestic and international, print and electronic media and is widely used to measure the performance of the Indian stock markets.

The **BSE SENSEX** *is the benchmark index of the Indian capital market and one, which has the* **longest social memory**. *In fact the* ***SENSEX*** *is considered to be the pulse of the Indian stock markets. As the oldest index of the Indian Stock market, it provides time series data over a fairly long period of time. Small wonders that the* ***SENSEX*** *has over the years become one of the most prominent Brands in the Country. It can be rightly called the 'Oldest barometer' of the Indian equity markets. One can identify the booms and bust of the Indian equities from the SENSEX.*

BSE SENSEX CALCULATION METHODOLOGY

SENSEX is calculated using a **market value-weighted method**. As per this methodology, the level of the Index reflects the total market value of all 30 component stocks relative to a particular base period. The total market value of a company is determined by multiplying the price of its stock by the number of shares outstanding. Statisticians call an index of a set of combined variables (such as price and number of shares)

a composite index. An indexed number is used to represent the results of this calculation in order to make the value easier to work with and track over time. It is much easier to graph a chart based on indexed values than one based on actual values.

SENSEX's base period is 1978-79. The actual total market value of the stocks in the Index during the base period has been set equal to an indexed value of 100. This is often indicated by the notation 1978-79=100. The formula used to calculate the Index is fairly straightforward. However, the calculation of the adjustments to the Index (commonly called Index maintenance) is more complex.

In practice, the daily calculation of SENSEX Index is done by dividing the total market value of the 30 companies in the Index by a number called the Index Divisor. The Divisor is the only link to the original base period value of the SENSEX. The Divisor keeps the Index comparable over time and is the manipulation point for all Index maintenance adjustments.

On-Line Computation of the Index

During market hours, prices of the index scrips, at which trades are executed, are automatically used by the trading system to calculate the **SENSEX** every 15 seconds and continuously updated on all trading workstations connected to the BSE trading system in real time. A day's opening, high and low prices are also given by the computer on an on-line basis. But the closing prices are calculated using spreadsheet to ensure theoretical consistency. The closing SENSEX is computed taking the weighted average of all the trades on SENSEX constituents in the last 15 minutes of trading. If a SENSEX constituent has not traded in the last 15 minutes, then the most recent traded price is taken for computation of the Index closure. If a SENSEX constituent has not traded at all in a day, then its last closing price is taken for computation of Index closure.

Maintenance of BSE SENSEX

One of the important aspects of maintaining continuity with the past is to update the base year average. The base year value adjustment ensures that additional issue of capital and other corporate announcements like bonus etc. do not destroy the value of the index. The beauty of maintenance lies in the fact that adjustments for corporate actions in the Index should not *per se* affect the index values.

The Index Cell of the exchange does the day-to-day maintenance of the index within the broad index policy framework set by the Index Committee. The Index Cell takes special care to ensure that all the BSE indices maintain their benchmark properties by striking a delicate balance between high turnover in Index scrips and its representative character. The present index committee of the Exchange has experts, which include Academicians, Fund-managers from leading Mutual Funds, Journalists, Market Participants, Independent Governing Board members and Exchange administration.

Criteria for the BSE SENSEX Selection and Review

The Index selection and review policy is based on the objective of:

- Transparency
- Simplicity

The Index Committee meets every quarter to review all the BSE indices. In case of a revision in the Index constituent scrips, the announcement of the incoming and outgoing scrips is made six weeks in advance of the actual implementation of the revision of the Index. The general guidelines for adding of component scrips to the SENSEX are as follows:

A. Quantitative Criteria

1. **Market Capitalization**
2. **Liquidity:**
   - Trading Frequency
   - Number of Trades
   - Value of Shares Traded
   - Trading Activity
3. **Continuity**
4. **Industry Representation**
5. **Listed History**

B. Qualitative Criteria

1. **Scrip Group**
2. **Track Record**

Other BSE Indices

1. BSE-100

The Stock Exchange, Mumbai has been compiling and publishing BSE-100 Index numbers since 3rd January, 1989. BSE-100 index is more broad based than SENSEX as this index has 100 scrips in its basket. This index was earlier called BSE National Index (Natex), when the prices of its constituent scrips were collected from other major exchanges in the country. The base year for BSE-100 Index is 1983-84 and the base value is 100.

2. BSE-200

In order to provide a better representation of the industries in the universe, a more broad-based index-BSE-200 was constructed and launched on 27th May, 1994. The base year for BSE-200 Index is 1989-90 and the base value is 100. The BSE-200 index necessarily includes all BSE-100 companies.

3. DOLLEX-200

While BSE-200 index reflects the growth in market value over the base period 1989-90, with both the current market value and the base value expressed in rupee terms, a need was felt to design a yardstick by which these growth values are measured in dollar terms. Such an index would reflect, in one value, the changes in stock prices and the foreign exchange variation. In order to satisfy this need, The Stock Exchange, Mumbai introduced a new index called DOLLEX-200, i.e. a dollar linked version of BSE-200 index. Here the current and base market values are arrived by dividing the current rupee market value by the current rupee-dollar exchange rate and the base value by a constant average rupee-dollar conversion rate in the base year. Thus, DOLLEX-200 reflects not only the share price movements but also the rupee-dollar movement.

4. BSE-500

Although BSE-200 index is a broad-based index, it represents only 200 companies. Hence, a need was felt to construct BSE-500 index to represent all segments of listed stocks and to give more coverage in terms of number of scrips, market capitalisatio and turnover. The BSE-500 Index has a base date of 1st February 1999 and a base value of 1000. The BSE-500 represents around 90% of the total listed market capitalisation of BSE. The selection criteria for the companies include Market capitalisation, Industry representation, Liquidity factors like traded value, trading frequency and average number of trades per day. The BSE-500 index necessarily includes all BSE-200 companies.

5. BSE-PSU INDEX

The Stock Exchange, Mumbai launched **"BSE-PSU Index"** on Monday, 4th June 2001. The index consists of 34 major Public Sector Undertakings listed on the Exchange. The BSE-PSU Index is displayed on-line on the 'BOLT' (BSE On-line Trading Terminal) nationwide.

The BSE - Public Sector Undertaking (PSU) Index **is a stock index that tracks the performance of the listed PSU stocks on the Exchange. The index constituents (currently 34) are part of the BSE-500 Index.**

The Base Date for the **BSE-PSU Index** is **1st February 1999** when the BSE-500 was launched. Being a subset of BSE-500, the BSE-PSU Index ensures a reasonable history of how the Central Government wealth fluctuates on the bourses.

The Base Value for the **BSE –PSU Index** has been set at **1000** to ensure adequacy in terms of Daily Index movement.

The BSE-PSU index consists of listed companies \ institutions \ corporations owned or controlled by the central government within the meaning of **Section 619-B of the Companies Act, 1956.**

6. BSE-TECk Index – The TMT benchmark

Attuning itself to the global standards in equity index construction methodology and leading the way in responding to the market demand for a TMT Benchmark (Technology, Media and Telecommunications), The Stock Exchange, Mumbai (BSE) launched the country's first free-float based Index - BSE TEC*k* Index on July 11, 2001. The new index marks a paradigm shift in the Indian equity indexing scenario by introducing the concept of free-float adjustment – now a globally accepted index construction methodology.

'TEC*k*' stands for the following

'**T**' - **Technology** (BSE Sector: Information Technology)
'E' - Entertainment (BSE Sector: Media & Publishing)
'C' - Communication (BSE Sector: Telecom)
'*k*' - Other Knowledge based companies not falling in any of the above three sectors.

A **free-float** based index construction methodology (also called modified market capitalisation method) takes into consideration only the non-promoter holding for the purpose of calculating the index. All the other existing equity indices in India currently take into consideration the entire market capitalisation for the purpose of calculation of Index. In case of BSE TEC*k* Index, the market capitalisation of a company is adjusted to reflect the free-float portion only. For e.g. if a company has 35% non-promoter-holding, then only 35% of the total market capitalisation of the company would be considered for the purpose of calculating the BSE-TEC*k* index.

The innovative **BSE TEC*k* Index** has been produced specifically as a benchmark that would reflect the dynamic and unique characteristics of the **Technology, Media and Telecommunications** industries in India. With 21 constituents covering around 90% of the market capitalisation of the entire listed TMT universe, the new index ensures a very liquid, tradable index. The base value for the new index has been set as 1000 points as on the base date of April 2, 2001.

The market capitalisation and trading pattern of the TMT sectors on the bourses, coupled with the relevance of a sector specific product, qualifies the BSE TEC*k* Index as an appropriate benchmark for funds tracking these industries.

All other indices of BSE including SENSEX are being calculated according to the Full-Market Capitalisation based methodology.

7. DOLLEX-30

The Stock Exchange, Mumbai launched a new index **'DOLLEX-30'** on July 18, 2001 to track the performance of SENSEX scrips in Dollar terms. Like SENSEX, the base-year for **DOLLEX-30** is 1978-79 and base value at 100 points. The exchange has computed historical index values of **'DOLLEX-30'** since 1979.

While SENSEX reflects the growth in market value of constituent stocks over the base period in rupee terms, a need was felt to design a yardstick by which these growth values are measured in dollar terms. Such an index would reflect, in one value, the changes in both the **stock prices** and the **foreign exchange variation.**

DOLLEX-30 is the second dollar denominated index from The Stock Exchange, Mumbai. Earlier, BSE had launched a dollar version of BSE-200 index called DOLLEX-200 in 1994.

BSE Sectoral Indices

Stocks belonging to 5 major sectors in the BSE-500 index constitute respective sectoral indices. In other words, these sectoral indices are sub-set of BSE-500 index. These sectoral indices are:

- BSE-Capital Goods Index
- BSE-Consumer Durable Index
- BSE-FMCG Index
- BSE-Healthcare Index
- BSE-IT Index

KEY STATISTICS ON SENSEX

VOLATILITY STUDY

	SENSEX		BSE TECk		NIFTY		S&P500	
	Annualised Volatility	Avg. Daily Volatility	Annualised Volatility	Avg. Daily Volatility	Annualised Volatility	Avg. Daily Volatility	Annualised Volatility	Avg. Daily Volatility
3 mths (Apr-01-Jun-01)	25.79	1.61	70.90	4.43	24.31	1.52	20.23	1.26
6 mths (Jan-01-Jun-01)	29.57	1.85	69.14	4.32	28.82	1.80	22.80	1.42
9 mths (Oct-00-Jun-01)	28.09	1.76	62.66	3.92	27.23	1.70	23.23	1.45
12 mths(Jul-01-Jun-01)	28.67	1.79	61.21	3.83	27.11	1.69	21.32	1.33

	Nasdaq (Composite)		DJIA		FTSE 100 (UK)		Singapore Index (STI)	
	Annualised Volatility	Avg. Daily Volatility	Annualised Volatility	Avg. Daily Volatility	Annualised Volatility	Avg. Daily Volatility	Annualised Volatility	Avg. Daily Volatility
3 mths (Apr-01-Jun-01)	44.61	2.79	18.93	1.18	18.59	1.16	20.03	1.25
6 mths (Jan-01-Jun-01)	51.10	3.19	20.59	1.29	20.06	1.25	21.07	1.32
9 mths (Oct-00-Jun-01)	54.11	3.38	20.68	1.29	19.44	1.22	22.24	1.39
12 mths(Jul-01-Jun-01)	49.68	3.11	19.06	1.19	17.99	1.12	21.15	1.32

	NIKKEI (NKY)		HANG SENG (HSI)		KOSPI Index	
	Annualised Volatility	Avg. Daily Volatility	Annualised Volatility	Avg. Daily Volatility	Annualised Volatility	Avg. Daily Volatility
3 mths (Apr-01-Jun-01)	25.45	1.59	26.93	1.68	28.52	1.78
6 mths (Jan-01-Jun-01)	28.31	1.77	25.65	1.60	32.86	2.05
9 mths (Oct-00-Jun-01)	27.13	1.70	26.40	1.65	36.88	2.30
12 mths(Jul-01-Jun-01)	25.58	1.60	27.03	1.69	39.01	2.44

BETA STUDY & CO-EFFICIENT OF DETERMINATION (R^2)

Beta and R^2 of SENSEX scrips for the period July 2001 to June 2001					
Scrip	**Beta**	**R^2 (%)**	**Scrip**	**Beta**	**R^2 (%)**
A.C.C.	1.17	32.30	INFOSYS TECH	1.80	59.42
BAJAJ AUTO	0.34	6.08	ITC LTD.	0.54	18.74
BHEL	1.10	26.89	LARSEN & TOU	1.06	36.50
BSES LTD.	0.74	22.83	MAH & MAH	1.08	34.37
CASTROL IND.	0.52	14.37	MTNL	0.89	24.74
CIPLA LTD.	0.70	21.32	NESTLE LTD.	0.35	7.22
COLGATE	0.31	9.45	NIIT LTD.	1.67	31.79
DR.REDDY'S	0.66	20.26	RANBAXY LAB.	0.76	24.13
GLAXO (I)LTD	0.49	14.11	REL.PETROL	0.98	48.47
GRASIM IND.	0.94	26.56	RELIANCE	0.92	49.89
GUJ AMB CEM.	0.83	24.93	SATYAM COMP	2.39	62.59
HIND.LEVER	0.62	23.50	STATE BANK	0.83	38.20
HIND.PETROL	0.62	12.33	TELCO	1.10	32.09
HINDALCO	0.32	6.67	TISCO	1.12	44.99
ICICI LTD.	1.00	27.58	ZEE TELEFILMS	2.20	49.12

Beta = Covariance (SENSEX, Scrip) / Variance (SENSEX)
(Beta shows the sensitivity of a stock relative to the movement in an Index)
R^2 (%) = Co-efficient of determination – Shows the strength of Beta

CORRELATION OF MAJOR INDICES WITH SENSEX

	DOLLEX-30	BSE	BSE-100	BSE-200	DOLLEX-200	BSE-500	BSEPSU	NIFTY
3 mths (Apr-01-Jun-01)	0.999	0.931	0.967	0.930	0.936	0.921	0.223	0.997
6 mths (Jan-01-Jun-01)	1.000	0.976	0.991	0.986	0.989	0.986	0.725	0.999
9 mths (Oct-00-Jun-01)	1.000	0.843	0.983	0.984	0.987	0.978	0.131	0.998
12 mths(Jul-01-Jun-01)	0.997	0.870	0.982	0.981	0.988	0.978	-0.143	0.995

	Nasdaq Composite	DJIA	FTSE 100 (UKX)	S&P500 (SPX)	NIKKEI (NKY)	HANG SENG (HSI)	SINGAPORE INDEX (STI)	KOSPI Index
3 mths (Apr-01-Jun-01)	0.300	0.368	0.378	0.363	0.593	0.412	0.166	0.37
6 mths (Jan-01-Jun-01)	0.739	0.171	0.634	0.754	0.102	0.905	0.926	0.24
9 mths (Oct-00-Jun-01)	0.448	0.196	0.531	0.618	0.222	0.841	0.867	0.10
12 mths(Jul-01-Jun-01)	0.737	0.349	0.751	0.754	0.677	0.867	0.869	0.66

HIGHLIGHTS OF THE BSE SENSEX

Total Market Value (Rs billion)	3579.9
Mean Market Value (Rs. Billion)	93.55
Median Market Value (Rs. Billion)	49.69
Largest Market Value of a component stock (Rs billion)	603.21
Smallest Market Value of a component stock (Rs billion)	22.16
P/E Multiple	33.66
Dividend Yield %	0.72
Median Share Price (Rs.)	288.55

** All statistics are as of July-end 2001*

➢ The major highlights in the life of the ***BSE SENSEX*** within a day since 1991 are:

Highlight	SENSEX Value	Points/ %	Date
Closing High	5933.56	-	12/9/94
Intra-day High	6150.69	-	14/2/00
Largest Rise (points)	3243.5 to 3669.6	426.1	24/3/92
Largest Fall (points)	4467.3 to 3896.9	570.4	28/4/92
Largest Rise (%)	3243.5 to 3669.6	13.4	24/3/92
Largest Fall (%)	4467.3 to 3896.9	12.8	28/4/92

➢ The maximum rise/fall in a week (Monday to Friday) in terms of points and percent is as follows:

Maximum Rise / Fall	Week ended	Points / %
Rise (points)	29/02/92	538.8
Fall (points)	22/09/00	497.8
Rise (%)	29/02/92	21.7
Fall (%)	29/05/92	12.4

➢ The maximum rise/fall in a calendar year in terms of points and percent is as follows:

Period*	Year	Points / %
Rise (Points)	1991	881.5
Fall (Points)	1998	847.7
Rise (%)	1991	85.8
Fall (%)	1998	23.2

(* Updated July-end)

➢ The maximum rise/fall in 30 day period in terms of points and percent is as follows:

Maximum Rise / Fall	Period	Points / %
Rise (points)	March,1992	1054.00
Fall (points)	April,1992	928.92
Rise (%)	March,1992	30.30
Fall (%)	April,1992	14.5

MAJOR EVENTS IN THE LIFE OF SENSEX

Sr. No.	DATE	Change (%)	EVENT
1	22-Jul-85	+6.68	Rajiv-Longowal accord signed
2	30-Sep-85	-5.82	Longowal assassinated
3	7-Mar-86	-5.34	Tax raids on industrialists
4	26-Oct-89	-3.1	Congress Loses Power
5	25-July-90		**SENSEX** Breaches 1000
6	17-Jan-91	-1.6	Gulf War Begins
7	19-Feb-91	+10.61	US Coalition wins Gulf War
8	15-Jan-92		**SENSEX** Breaches 2000
9	29-Feb-92	+6.6	Manmohan Singh's 2nd Budget
10	29-Feb-92		**SENSEX** Breaches 3000
11	30-Mar-92		**SENSEX** Breaches 4000
12	28-Apr-92	-12.77	SEBI inquiry into suspected Scam
13	6-May-92	-8.41	Harshad Mehta Scam unearthed
14	11-May-92	-6.5	Scam sends shivers
15	12-May-92	-9.76	Scam sell-off continues unabated
16	6-Dec-92	-9.33	Demolition of Babri Mosque in Ayodhya
17	13-Dec-93	-3.15	Carry forward banned
18	12-Sep-94	4646.3	Market Peaks to New high 1st time after SCAM
19	1-Mar-97	+5.63	P. Chidambaram Budget
20	30-Mar-97	-8.3	Congress Withdraws Support
21	11-May-98	-3.5	Pokran Nuclear Test
22	5-Oct-98	-7.23	UTI Announces Equity reduction in US-64
23	27-Feb-99	+5.1	Yashwant Sinha's Budget
24	17-Apr-99	-6.88	Vajpayee Govt. Loses Confidence
25	26-May-99	-2.14	Kargin Conflict Begins
26	11-Oct-99		**SENSEX** Breaches 5000
27	11-Feb-00	6150.69	**SENSEX** Breaches 6000 (intra-Day)
28	29-Feb-00	-5.04	Yashwant Sinha's Budget
29	4-Apr-00	-7.15	Sensex down on accunt of I-T notices to 6 FIIs & Nasdaq fall of 350 points
30	7-Apr-00	7.24	Finance Ministrys intervention on FIIs double taxation issue & all round buying in pivotals pushes index
31	17-Apr-00	-5.63	Nasdaq & Dow Jones fell by 350 pts. & 616 respectively on Friday followed by weak Asian markets
32	26-Apr-00	5.71	SEBI imposes restriction on short sales & Nasdaq recovery
33	2-May-00	-6.13	Relaxation in circuit filter from 8% to 12% brings down market
34	4-May-00	5.04	Tax sops to Software, Pharma, housing and infrastructure industry
35	24-Jul-00	-6.17	FIIs net sellers, disappointing results by old economy stocks &massive hammering by operators
36	22-Sep-00	-5.28	Oil prices concern and global meltdown affects sentiments
37	13-Mar-01	-6.03	Global meltdown, FM's stockspeak, SEBI's decision to remove broker-members from BSE Board
38	14-Mar-01	5.21	Aggressive fund buying across the board