1.0 Introduction

1.1 What is an Index?

Any Index is used to give information about some system or financial markets. Financial Indexes are constructed to measure price movements of stocks, bonds, and other investments. Stock market Indexes are meant to capture the overall behaviour of equity markets. It is created with a group of stocks that are representative of the whole market or a specified sector or segment of the market. Any Index is calculated with reference to a base period and a base Index value.

1.2 What are the uses of Indexes?

Traditional uses

- Indicator of Market Movement / Returns
- Indexes reflect highly up-to-date information
- Lead indicator of the economy

Higher Applications

- Index Funds - Passive Fund Management
- Index Derivatives - Index Futures and Index Options

1.3 What is Indexing ?

"Indexing" is an investment approach that seeks to match the investment returns of a specified stock market benchmark, or Index. When Indexing, an investment manager attempts to replicate the investment results of the target Index by holding all -- or in the case of very large Indexes, a representative sample -- of the securities in the Index. There is no attempt to use traditional "active" money management or to make "bets" on individual stocks or narrow industry sectors in an attempt to outpace the Index. Thus, Indexing is a "passive" investment approach emphasising broad diversification and low portfolio trading activity.

An **Index fund** is a mutual fund scheme that invests in the securities of the target Index in the same proportion or weightage. Though they are designed to provide returns that closely track the benchmark Index, Index funds carry all the risks normally associated with the type of asset the fund holds. So, when the overall stock market falls, you can expect the price of shares in a stock Index fund to fall, too. In short, an Index fund does not mitigate market risk -- the chance that the overall market for bonds or stocks will decline. Indexing merely ensures that your returns will not stray far from the returns on the Index that the fund mimics.
The underlying assumption of Indexed management is that financial markets are efficient over the long term, making it virtually impossible for active managers to consistently outperform market averages consistently. For this reason, Indexing has become popular with corporate pension fund managers who seek steady returns through a conservative, long term, low-risk investment strategy.

2.0 Evolution of Index funds

As equity markets in U.S evolved and became more sophisticated, the fund managers found it more and more difficult to outperform the Index net of trading costs, broker commissions, market spreads and taxes. It has been seen that over the last 20 years over 85% of active fund managers have underperformed the S&P 500. To add to that, as the mutual fund industry grew in size, it became difficult to say that a fund manager who had outperformed the Index this year would be able to do the same year after year. Realising this, it was felt that if it was difficult to beat the Index consistently, one could atleast get Index returns.

Thus, many Investment managers purchased stocks in proportion to the Index, either knowingly or simply by default. As a result this process became to known as closet Indexation. Out of this evolved the idea of a passive buy and hold portfolio with a reduced trading cost and with a greater control over the portfolio risk. These factors along with technological advancement formed the foundation for the development of Index funds.

Well Fargo bank pioneered Index funds offering its first product in 1971 with a $ 6 million contribution from the Samsonite pension fund. The growth in Index funds thereafter has been a natural consequence of increased emphasis on equity investment by institutional investors around the world. However, in the US markets, the growth in Index funds and Index products gained momentum only from 1996
.

3.0 Why Indexing?

Index funds in comparison to actively managed funds are better in the following aspects:

1. Lower expense ratio
2. Lower transaction costs
3. Better control of risk through greater diversification.
4. Difficult to consistently beat the market
5. Less prone to the risk of fund manager's performance

1. **Low expenses:** Index fund is a less expensive form of investment than actively managed funds. Index funds do not require the services of high price portfolio managers, analytical work of security analysts, etc. Portfolio management of Index funds is much less labor intensive than that of actively managed funds.

2. **Transaction costs:** They are the charges incurred when one enters the market in order to buy or sell securities. The burden of transaction costs depends on two factors :-

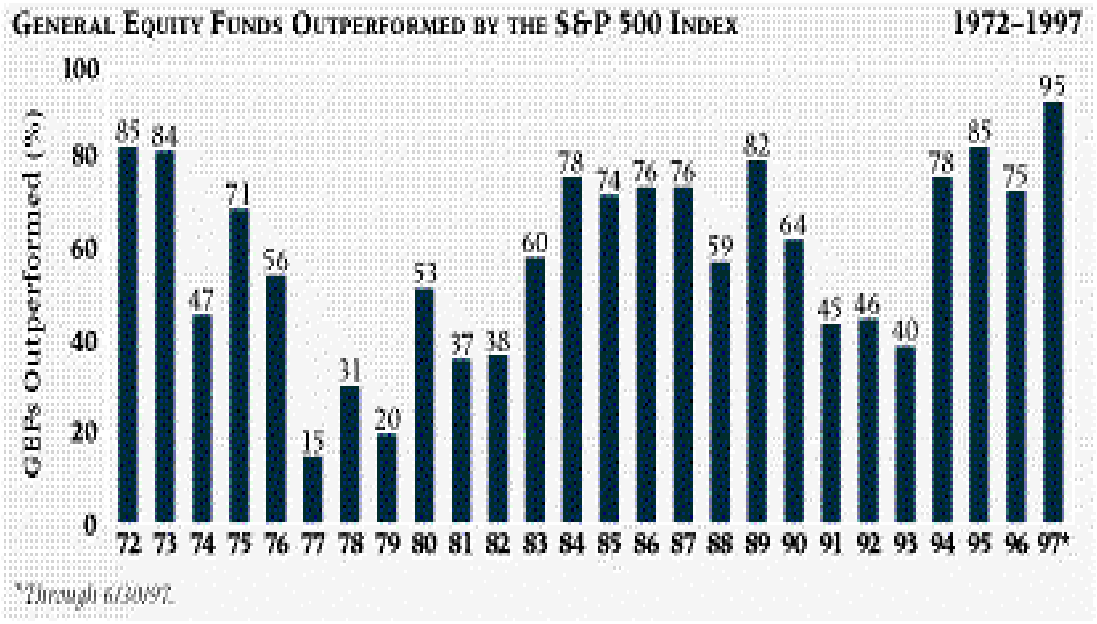
    - **The average cost per transaction:** It reflects both the broker's commissions and the hidden cost, which is impact cost. Impact Cost is the percentage degradation over and above the ideal price. For liquid securities this cost is low while for illiquid ones it is high.

- **Portfolio Turnover:** As the objective of an Index fund is to mimic the Index, a fund manager does not need to keep changing his portfolio like in the case of active fund management. He would need to change his portfolio only if there is a change in the Index constituents.

Thus, Index Fund is a low cost concept. These savings in costs taken over a long period of time result in substantial gains for the investor.

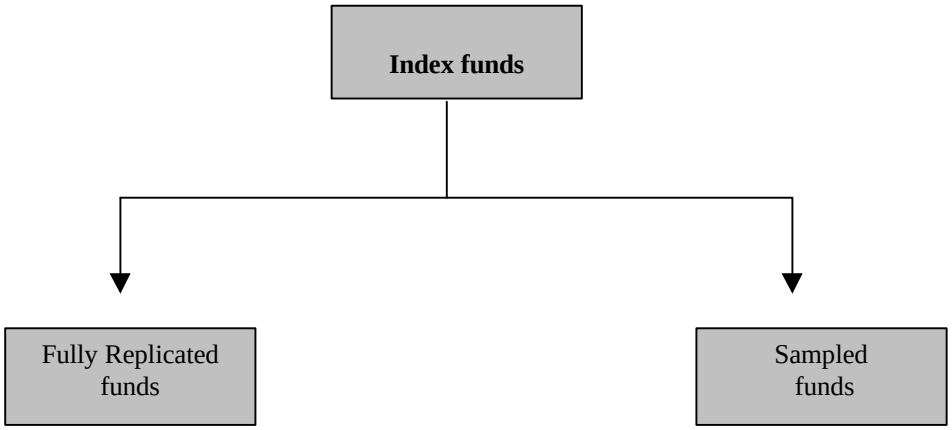
3. **Low risk through diversification:** Market Indexes are constructed to represent performance of the stock market as a whole. The constituents of an Index would represents the largest and most liquid companies from different sectors of the economy. By diversifying, the company specific risk is largely reduced.

4. **Difficult to consistently beat the market:** Though active fund managers have been able to beat the market in certain years, it becomes difficult to say whether they would be able to do so consistently. Moreover, the underlying assumption of Indexed management is that financial markets are efficient over the long term, making it virtually impossible for active managers to consistently outperform market averages. Experience in the US has shown that in the last 20 years, over 80% of the actively managed funds have underperformed the benchmark S&P 500.



5. **Less prone to the performance risk of the fund manager:** An Index fund manager's job is limited to the extent of tracking the Index as closely as possible. In actively managed funds the investments are at the stake of the fund manager's performance. Thus an actively managed fund is totally exposed to the risk of fund manager's performance.

4.0 Types of Index funds



a) ***Fully Replicated Funds****:* Fully Replicated Funds hold all the constituents of the chosen Index in the same proportion as held in the Index. This type of fund is expected to have the lowest tracking error.

b) ***Sampled funds:*** If the benchmark Index is large in size (number of constituents) then fully replicated fund is likely to have a huge establishment and annual maintenance cost. In such cases, it may be easier and beneficial to select a sample from the target Index to represent the entire Index. Sampling enhances savings in transaction costs but on the flip side the tracking error is likely to be much higher.

5.0 Index funds Vs Non Index funds

	Index funds	**Non Index funds**
1.	The objective of the fund is to mimic the target Index.	The objective of the fund is to beat a specified Index.
2.	It is known as passively managed funds. The process of management of an Index fund does not involve any fundamental research. It is a fund with a very low level of trading.	It is known as actively managed funds. The process of management of Non-Index funds involves fundamental research and quantitative analysis to identify securities, which are to be bought and sold in order to fulfill the objective.
3.	It requires expertise in determining the target Index and in designing the Index fund to meet the characteristics of the chosen Index.	It requires superior forecasting skills to determine when and which security to buy and sell.
4.	Investors in Index funds are committed to a low risk profile. Since the Indexes have diversified portfolios and the stocks in the Index fund are held in the same proportion as in the Index, it is less prone to risk.	The portfolio of a Non-Index fund is subjective and the portfolio changes according to the fund manager's decision. Here the success of the portfolio totally depends on the fund manager's ability.
5.	The job of an Index fund manager is to track the Index as closely as possible. They should make timely adjustments in the portfolio to match the Index.	The Non Index fund manager's job is to pick stocks that he believes will do well with the implicit goal of doing better than a comparable Index.
6.	The expense ratio of an Index fund is low. As the Index fund follows the buy and hold strategy, the turnover of stocks are less leading to minimal transaction cost.	The expense ratio is high in this case. The portfolio is often churned depending on the markets resulting in a high turnover and transaction cost.
7.	The returns on the fund depend on the performance of the whole equity markets.	The returns on the funds depend on the performance of the fund managers.

6.0 Tracking Error

Tracking error is defined as the annualised standard deviation of the difference in returns between the Index fund and its target Index. In simple terms, it is the difference between returns from the Index fund to that of the Index. An Index fund manager needs to calculate his tracking error on a daily basis especially if it is open-ended fund. Lower the tracking error, closer are the returns of the fund to that of the target Index. Tracking Error is always calculated against the Total Returns Index which shows the returns on the Index portfolio, inclusive of dividend.

Tracking error indicates

1. **How closely the fund is tracking the Index:** It refers to the how close the weightages of the stocks in the portfolio are to the weightages of the stocks in the Index. The more closely the weightage of the stocks are tracked in the Index, lower will be the tracking error. The factors that affect tracking error are inflows / outflows in the fund, corporate actions, change of Index constituents and the level of cash maintained in the fund for liquidity purposes.

2. **The cost that routinely subtracts from fund returns:** Expenses like transaction costs including broker' commission, bid and ask spread, etc. gets subtracted from the returns of the fund. Higher the expenses incurred, greater will be the tracking error

6.1 Calculation of tracking error

Step 1:	Obtain the NAV values and the TR Index values for each day of the total time period required
Step 2:	Calculate the percentage change in the NAV and TR Index for each day over its previous day ***Percentage change in the NAV*** $= \dfrac{NAV\ as\ on\ day\ (t) - NAV\ as\ on\ day(t\text{-}1)}{NAV\ as\ on\ day\ (t\ -\ 1)}$
Step 3:	Calculate the difference between the percentage change in the NAV and the percentage change in the TR Index for each day
Step 4:	Calculate the standard deviation of the difference obtained from day(1) to day(n) in Step 3
Step 5:	Calculate the annualised tracking error as per the formula given below ***Annualised tracking error*** = *Standard deviation obtained (Step 4) * sqrt (250)*

7.0 Choosing the Right Index

The aim of an Index fund is to match as closely as possible the returns of its target Index. This makes it all the more essential to choose the right Index. In most cases around the world today, market Indexes were created years ago, in an environment with limited information access, poor computation and limited knowledge of financial economics. However, all three factors are much altered today. Over the last two decades, the revolution in technology and greater research into Index funds and Index derivatives has shed new light upon issues of Index construction.

Every stock market Index is a trade-off between diversification and liquidity. Small market Indexes are liquid but under-diversified while large market Indexes tend to be well-diversified but illiquid. Hence an Index that that has the right mix of both would be the best Index. Thus the characteristics of a good Index should be :-

- Representation of the market
- Well diversified
- Highly Liquid
- Calculation of Total Returns
- Professionally managed

8.0 The S&P CNX Nifty

In India, the S&P CNX Nifty is the most scientific Index that was constructed keeping in mind Index funds and Index derivatives.

The S&P CNX Nifty is a market capitalisation-weighted Index with base year as November 03, 1995. The base value has been set at 1000. The S&P CNX Nifty is an event-driven Index i.e., price change in any of the Index securities will lead to a change in the Index. It also takes into account substitutions in the Index set and importantly, corporate actions such as stock splits, rights, etc without affecting the Index value. For the purpose of Indexation, market cap weighted Index offers the advantage of simplifying the day to day management of the fund. As market prices rise or fall, the value of the Index fund rises and falls in tandem with the target Index. Since market price change does not require any rebalancing, there are savings in the number of transactions, thus reducing transaction cost.

The construction of the S&P CNX Nifty was motivated by the need to create a methodology to intelligently address the following four major issues in Index creation:-

- **Evolution of an Index set**
  India's corporate sector is dynamic: old companies go defunct, and IPOs (including newly-disinvested public sector companies) frequently turn into some of the largest companies in the country.

- **The problem of stale prices**
  The market Index should reflect market conditions at a point in time – when some components trade infrequently, they detract from this objective. Stringent liquidity

conditions should be applied so as to minimise the difficulties caused by non-synchronous trading, and its more extreme version, non-trading.

- **The size of the Index set**
  Should an Index set comprise 30, or 50, or 100, or 3000 stocks ? We should have a clear quantitative foundation for implementing the choice of the set size.

- **Modern applications**
  The Index should have liquidity of a form which is well-suited for modern applications such as Index funds and Index derivatives, both of which require the entire Index set to be treated and traded as a portfolio.

An Index Committee consisting of eminent personalities in the field of finance such as mutual fund managers, trading members, academicians and persons who have experience trading in futures and options markets abroad, designed the S&P CNX Nifty so as to make it more representative of the entire market, provide high hedging effectiveness for any portfolio and minimise impact cost of transactions.

Among the biggest findings of the committee was that the number 50 was found to be the ideal size of the Index and that liquidity should be judged by impact cost. It is indeed the case that putting more stocks into the Index yields more diversification. However, two things go wrong when we do this too much: Firstly, there are diminishing returns to diversification. Going from 10 stocks to 20 gives a sharp reduction in risk. Going from 50 stocks to 100 stocks gives very little reduction in risk. Going beyond 100 stocks to gives almost zero reduction in risk. Hence, there is little gain by diversifying, beyond a point. The more serious problem is the inclusion of illiquid stocks due to diversification.

Liquidity of the asset is one of the most important criteria for an investor. In the derivatives market, investors are more concerned with the liquidity of the underlying. All the securities constituting the S&P CNX Nifty are highly liquid. Liquidity of the S&P CNX Nifty is important in reducing the reflection of stale prices and in enabling spot-to-futures arbitrage.

A variety of measures such as trading volume, trading frequency, bid-ask spread etc are used for quantifying liquidity. For measuring liquidity of Nifty securities, their impact costs have been calculated. Impact cost of a security as the term suggests, is the cost of executing a transaction in the given security in proportion of its weightage in the portfolio under consideration, on immediate basis at any point of time in the market.

8.1 Selection Criteria

- All companies to be included in the Index should have a market capitalisation of Rs. 5 billion or more
- Company entering the Index should have double the market capitalisation of the company leaving the Index

Liquidity (Impact Cost)

- All securities should fully satisfy the required execution on 90% of the trading days at an impact cost of less than 0.75% in the last six months.

8.2 Total Returns Index

A Total Returns (TR) Index is calculated on S&P CNX Nifty. This Index shows the returns on the Index portfolio, inclusive of dividend. The difference between the two Indexes Nifty and TR Index at any given time is the return obtained on reinvestment of dividends through the intervening period. Thus it is the ideal benchmark for Index Funds which earns dividend and reinvests promptly.

8.3 Calculation Methodology of the S&P CNX Nifty

The S&P CNX Nifty is computed using market capitalisation weighted method wherein the level of the Index reflects the total market value of all the stocks in the Index relative to the base period November 3,1995. The total market cap of a company or the market capitalisation is the product of market price and the total number of outstanding shares of the company.

*Market Capitalisation = Outstanding Equity Capital * Price*

In this method the weightages are not fixed, they change with the stock price movements and changes in the number of shares outstanding. All selected securities in the Nifty bear a weight in the proportion of their market capitalisation.

General Index formula calculation

Base Capitalisation Method

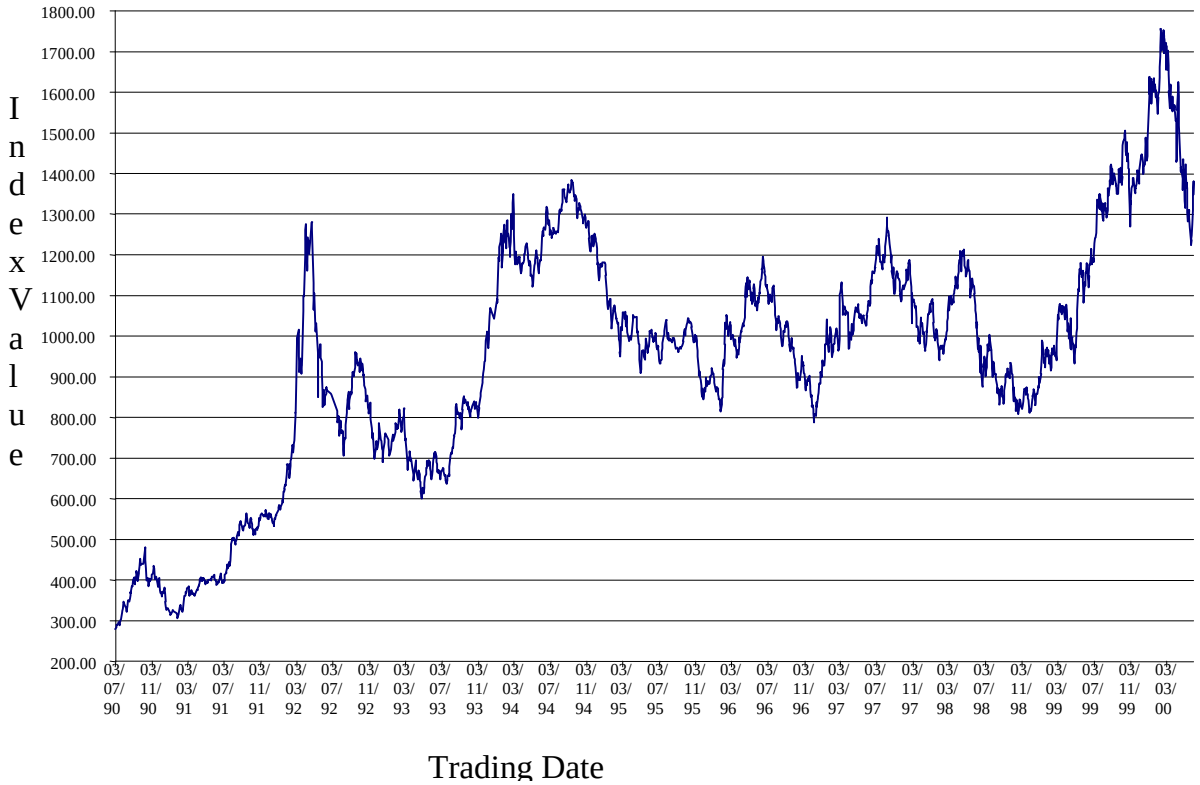
$$\text{Index } \textit{value} = \frac{\textit{Current market capital}}{\textit{Base market capital}} * \textit{Base} \text{ Index } \textit{Value (1000)}$$

Base market capital of the Index is the aggregate market capitalisation of each scrip in the Index during the base period. The market cap during the base period is equated to an Index value of 1000 known as the base Index value.

Current market capital of the Index is the aggregate market capitalisation of each scrip in the Index during the current period. The current price of each stock is multiplied by the number of shares outstanding to give the aggregate current market cap of the Index

At any given time , the Index level is equal to the total current market value of the portfolio, divided by the base period market value , multiplied by base Index value. A **Nifty** Index level of 1500 will indicate that the aggregate price of the portfolio has risen by 50% over the base period.

8.4 Nifty's movements over the past few years



9.0 Maintaining an Index fund

An Index fund should track the weightages of the securities in the Index. Weightages of the securities in the Index fund would need to be rebalanced due to the following two reasons :-

1. Corporate Actions and change in Index set.
2. Inflows or Outflows for the fund

First we will see how the adjustments are made in the Index for Corporate actions and later on we will examine how an Index fund should be rebalanced.

9.1 Corporate Actions

The current market cap of a company is the product of number of shares outstanding and the current market price. The market cap of the company changes if there is either a change in the

- Price (or)
- number of shares outstanding changes

However, equity Index should reflect changes in the market cap of its companies only due to a change in prices of the scrips and not due to changes in the number of outstanding shares of the companies. Therefore any corporate action leading to a change in the market cap of the company due to a change in the number of shares outstanding requires an adjustment in the Index Base capital / Divisor. The Index is adjusted in a manner, which keeps the Index value constant. Any corporate action would lead to a change in the weightage of the stock in the Index.

Corporate Actions such as rights issue, mergers & acquisitions, debt conversion, etc. result in a change in the number of outstanding shares of the company. The market cap method allows adjustment for such corporate actions without affecting the continuity of the Index. When such actions are initiated in an Index security, their effect will reflect through a change in the Index divisor / base capitalisation required for Index computation. By adjusting the Index divisor / base capitalisation for a change in market value, the value of the Index remains constant.

IISL will carry out the following changes to its Indexes: -

- The base market capitalisation / divisor of the Index will be revised to adjust for the change in the outstanding shares due to a corporate action.
- The revision of the base capitalisation / divisor will be done off-line and before the commencement of the normal market.

- Subsequent Index values will be calculated using the revised base capitalisation or revised divisor

9.2 Types of Corporate Actions

Sr. No.	Type of corporate action	Base Capitalisation / Divisor Adjustment	- / ¯ in Base Capitalisation / Divisor
1.	Rights	Yes	-
2.	Bonus	No	«
3.	Share splits	No	«
4.	Debt conversion	Yes	-
5.	Warrant Conversion	Yes	-
6.	Public Issue (Domestic)	Yes	-
7.	Public Issue (Foreign-GDR/ADR)	Yes	-
8.	Forfeiture of shares	Yes	¯
9.	Corporate restructuring	Yes	- / ¯
10.	Mergers and Amalgamations	Yes	- / ¯

Events other than corporate actions that have an impact on the Index are: -

Sr. No.	Type of corporate action	Base Capitalisation / Divisor Adjustment	- / ¯ in Base Capitalisation / Divisor
1.	Addition / Deletion of Index companies	Yes	- / ¯

9.2.1 Rights Equity Issue

Rights offer:

In rights offer a company comes up with a new issue available only to the existing shareholders. The company invites more funds from its existing shareholders. The price per share for additional equity, called the subscription price is left to the discretion of the company. It results in capital inflow and increase in the share capital of the company. Rights issue results in increase of the market capitalisation of the company thus needs to be adjusted in the Index.

Action :

Step1 : Find out the ratio in which the rights issue is made i.e. for how many shares held in the company will one rights share be issued.
Step 2 : Find out the offer price of the rights issue by the company
Step 3 : Calculate the additional market cap due to rights issue (additional rights shares * rights price)
Step 4 : Add it to the existing market cap of the Index
Step 5 : Calculate the new base capital of the Index after the rights issue as per the formula given below

Calculation of change in the base capital

$$\text{Revised base capital} = \frac{\text{New market Cap}}{\text{Index value}} * 1000$$

*New Market Cap = (N * P) + Old Market Cap of the* Index

N = number of new shares offered under rights issue
P = offer price
Old market cap is the closing market cap of the Index *before the adjustment is made.*

Changes would be made on the ex-date set by the exchange (NSE). All changes would be made before commencement of the normal market. After the market opens all subsequent Index values will be calculated with respect to the revised base capitalisation

The above changes are made on the assumption that the rights issue is fully subscribed. In the case of the rights issue not being fully subscribed, the share capital of the company will be adjusted based on the subscription received. This would be done once the company intimates the exchange.

Consider the event of rights issue by ACC in the ratio 1:4 (1 right share for every 4 shares held in the company) at an offer price of Rs.55
Ex date 19 may 1999

Market Cap of **S&P CNX Nifty** on May 18, 1999	Rs. 2,553.6 bn
Closing Index Value of **S&P CNX Nifty** on May 18, 1999	1,160.15
Existing number of Equity shares of ACC	137,012,320
Price of ACC on May 18, 1999	Rs. 181.45
Market Cap of ACC on May 18, 1999 (137,012,320 * 181.45)	Rs. 24.9 bn
Additional shares of ACC due to Rights (137,012,320 / 4)	34,253,080
Rights Price	Rs. 55
Market Cap of shares added (34,253,080 * 55)	Rs. 1.9 bn
New Market Cap of ACC (24.9 bn + 1.9 bn)	Rs. 26.8 bn
Theoretical Price (26.8 bn / 171,265,400)	Rs. 156.16
New Market Cap of **S&P CNX Nifty** (2553.6bn+ 1.9bn)	Rs. 2,555.5 bn
Old Base Cap of Index (old market cap * 1000 / Index value)	Rs. 2,201 bn
New Base Cap of Index (new market cap * 1000 / Index value)	**Rs. 2,202.7 bn**

9.2.2 Bonus Issue & Share Splits

Bonus issue: Bonus issues are shares issued to existing shareholders as a result of capitalisation of reserves. It increases the number of outstanding shares of the company. Bonus event do not require any adjustment to the Index as the increase in number of shares is accompanied by a fall in the share price in the same ratio, hence having no theoretical effect on its market capitalisation.

Action :

Step 1: Find out the ratio in which the bonus issue is made i.e. for how many shares held in the company will one bonus share be issued.

Step 2: Increase the number of outstanding shares of the company as a result of bonus issue.

Share Splits: Share Splits is the change in face value of a stock. In a share split the par value per share is reduced and the number of shares is increased proportionately resulting in no change in the share capital of the company.

The treatment is similar to that of a bonus issue. Changes will be made in the ratio set by the company on the ex-date set by NSE. All changes would be made before the commencement of the normal market.

Consider the event of NIIT coming up with a bonus issue of 1:2 (one bonus share for every two shares held) on ex date March 3-1999

Market Cap of **S&P CNX Nifty** on Mar 02, 1999	Rs. 2,227 bn
Closing Index Value of **S&P CNX Nifty** on Mar 02, 1999	1,015.80
Number of existing equity shares of NIIT	25,768,086
Price of NIIT on Mar 02, 1999	Rs. 2,862.00
Market Cap of NIIT on Mar 02, 1999 (25,786,086 * 2,862)	Rs. 73.75 bn
No of shares added on account of bonus(25,786,086 / 2)	12,884,043
Total number of shares of NIIT after bonus issue (25,768,086 +,12,884,043)	38,652,129
Theoretical Ex-Bonus Price of NIIT(2,862 * 2/3)	Rs. 1,908.00
New Market Cap of NIIT (38652129 * 1,908)	Rs. 73.75 bn

Since there is no change in the market capital of NIIT, no adjustment in the base capital will be required.

9.2.3 Debt Conversion, Warrant Conversion / Public Issue (Domestic/Foreign), Private Placement, Forfeiture

Debt conversion: When a company issues fully or partly convertible debentures, these debentures can be converted partially or fully into equity shares during a certain period.

Warrant conversion: A warrant provides its holders with the option to subscribe to the equity shares of the company during a certain period at a price specified by the company. Warrants are normally issued as an incentive along debt issue and the holder is given the right to subscribe equity shares.

Private Placement: A Private Placement results in a company's sale of shares to one or few investors. All these corporate actions like Debt conversion, Warrant conversion, Public issue, preferential allotment and Private placement in the increase in the share capital of the company.

Action :

Step 1: Find out the number of shares arrived for listing on the NSE Issue as a result of Debt conversion or Warrant conversion
Step 2: Find out the market prices of the shares before the adjustment is made
Step 3: Compute the increase in current market cap due to the above corporate action
Step 4: Compute the new base capital as per the formula given below.

Note: The size of the share capital of the company will be changed on the date of listing of the additional shares on the National Stock Exchange (NSE). It is carried out before the commencement of the normal market. After the market opens all subsequent Index values will be calculated with respect to the revised base capitalisation.

Calculation of revised base capital

$$\textit{Revised base capital} = \frac{\textit{New market Cap}}{\text{Index } \textit{value}} * 1000$$

*New Market Cap = (N * P) + Old Market Cap*
N = number of new shares offered
P = previous closing price

Old market cap is the closing market cap of the Index *before the adjustment is made.*

Consider the event of debenture conversion by Reliance Petroleum into 236,462,800 shares on Sep 23, 1998.

Market Cap of **S&P CNX Nifty** on Sep 22, 1998	Rs. 1,852.2 bn
Closing Index Value of **S&P CNX Nifty** on Sep 22, 1998	897.25
No of shares offered for conversion	236,462,800
Share Price of Rel Petro on Sep 22, 1998	Rs. 17.80
Current equity shares of Rel Petro	903,156,100
Total O/S Equity shares of Rel Petro after conversion (903,156,100 + 236,462,800)	1,139,618,900
Additional Market Cap of Rel Petro (236,462,800 * 17.80)	Rs. 4.2 bn
New Market Cap of Rel Petro (1,139,618,900 * 17.80)	Rs. 20.3 bn
New Market Cap of **S&P CNX Nifty** (1,852.2 + 4.2)	Rs. 1,856.4 bn
Old Base Cap of **S&P CNX Nifty** (1,852.2 * 1,000 / 897.25)	Rs. 2,064 bn
New Base Cap of **S&P CNX Nifty** (1,856.4 bn * 1,000 / 897.25)	**Rs. 2,069 bn**

Forfeiture of Shares:

The company has the right to forfeit the shares incase the shareholder defaults on call money and for other reasons also. If the shares are forfeited then the number of shares outstanding of the company comes down resulting in a decline of the market cap of the company. The base capital adjustment would be made once the exchange receives information about the delisting of shares.

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9.2.4 Mergers and Acquisitions

It is the combination of two or more companies into one. The shareholders of the merged entity get shares in the acquiring company. It results in the change of the capital structure of the acquiring company. The merged company becomes a non-existing entity.

We have the following cases :

1. Merger of any listed company with an Index company

In this case the acquiring company is an Index company and the merged company is any Non-Index, listed company on the stock exchange.

Action :

Step 1: Find out the agreed ratio for the merger i.e. for how many shares of the merged company will one share of the acquiring company be issued.
Step 2: Compute the number of additional shares being issued of the acquiring company under the merger.
Step 3: Compute the increase in current market cap due to the issue of new shares
Step 4: Compute the new base capital in the same way as done for debt conversion. (explained above)

The adjustment in the share capital of the acquiring company and the base capital in the Index will be made on the delisting/ex-date of the merging entity. After the market opens all subsequent Index values will be calculated with respect to the revised base capitalisation

2. Merger of an unlisted company with Index company

In this case a company in the Index acquires another company which is not listed on the stock exchange.

Action : Additional shares of the acquiring company would be issued to the shareholders of the merging entity. These additional shares would be added to the existing share capital of the acquiring company on the listing date of these shares.

Step 1: Find out the number of additional shares being issued by the acquiring company under the merger.
Step 2: Compute the increase in current market cap due to the issue of new shares
Step 3: Compute the new base capital in the same way as done for debt conversion. (explained above)

3. Merger of two Index companies

In this case both the acquiring and the merging companies are Index companies. In other words two of the Index companies will merge into a single company thus requiring the Index to be added with one more company.

Action :

Step 1: Find out the merger ratio and thus the number of shares issued by the acquiring company to the shareholders of the merged company.

Step 2: Compute the increase in the market cap of the acquiring company as a result of merger.

Step 3: Compute the net addition or deletion in the market cap of the Index as a result of the merger according to the formula given below.

Step 4: Compute the new base market cap of the Index according to the formula given below.

One more important step after the court approves the merger of the two companies in addition to the above is to find a replacement for the company which is getting merged. After the merger it would become a non- existing entity and hence would be removed from the Index. The new company will be selected according to the set criteria of replacement for that Index. The selected company will be included in the Index giving prior intimation of 5 weeks through a press release. All changes are made before the commencement of normal market.

Calculation of revised base capital

$$\text{Revised Base capital} = \frac{\text{New market cap}}{\text{Index value}} * 1000$$

New market cap = (NAD) + Old market cap of the Index

NAD = Net addition / deletion of the market cap

NAD = (Increase in market capital of company post merger)
– (Market Capital of the merged company)

Old market cap is the closing market cap of the Index before the adjustment is made.

The NAD can also be negative if the market cap of new shares offered is less than the value of the market capital of the merged company.
After this there is another adjustment required regarding the inclusion of the new company in the Index as the merged company becomes a non-existing entity. This adjustment is explained under the head Addition and deletion of companies in the Index.

Consider the event of Ponds merger with HLL on Jan 20, 1999 . The Merger Ratio being 3 Equity shares of HLL for 4 Equity shares held in Ponds.

Market Cap of **S&P CNX Nifty** on Jan 19, 1999	Rs. 1,990 bn
Closing Index Value of **S&P CNX Nifty** on Jan 19, 1999	924.10
Market Cap of Ponds on Jan 19, 1999	Rs. 37.1 bn
Existing Equity shares of HLL	199,167,287
Price of HLL on Jan 19, 1999	Rs. 1,704.20
Market Cap of HLL on Jan 19, 1999 (199,167,287 * 1,704.20)	Rs. 339.4 bn
Addition to O/S Equity Cap of HLL on account of merger with Ponds	20,402,209
Additional Market Cap of HLL on account of merger with Ponds (20,402,209 * 1,704.20)	Rs. 34.8 bn
New Market Cap of HLL (339.4 + 34.8)	Rs. 374.2 bn
Net Addition/Deletion of Market Cap to Index on account of merger (Rs. 34.8 bn – Rs. 37.1 bn)	(Rs. 2.3 bn)
New Market Cap of **S&P CNX Nifty**(Rs.1,990 bn + (Rs. 2.3 bn))	Rs. 1,987.7 bn
Old Base Capital of **S&P CNX Nifty**	Rs. 2,153.5 bn
New Base Capital of **S&P CNX Nifty** (1,987.7 * 1000 / 924.10)	**Rs. 2,151 bn**

4. Merger of an Index company with a company outside the Index

In this case an Index merges with a company which is not in the Index. Here the acquiring company is the company outside the Index and the merging entity is the company within the Index. Henceforth after the merger the Index Company would become a non-existing entity. In this case an adjustment would need to be made on account or removal of the merging entity and replacement with a new company.

Action : A replacement would be found for the Index company using the set selection guidelines. The selected company will be included in the Index and the merging entity removed giving prior intimation of 5 weeks through a press release. All changes will be made before the commencement of the normal market.

9.2.5 Addition / Deletion from the Index Set

The composition of an Index can change from time to time due to various factors such as merger /acquisition, bankruptcy, restructuring, lack of representation, not fulfilling Index selection criteria, etc.

Each Index has a Replacement Pool comprising companies that meet all criteria for candidacy to that Index. All replacements of companies in the Index take place from this pool.

Action :

Step 1: Compute the market capitalisation of the companies being deleted from the Index with the closing market prices before the adjustment is made.

Step 2: Similarly compute the market cap of the companies being included in the Index

Step 3: Compute the net change to the total market cap of the Index by deducting the market cap of the companies deleted from the market cap of the companies added.

Step 4: Compute the new base capital of the Index.

The companies to be added and deleted from the Index would be informed through a press release 5 weeks in advance. The changes would be carried out before the commencement of normal market on Wednesday. After the market opens all subsequent Index values will be calculated with respect to the revised base capitalisation and revised constituents.

Calculation of revised base capital

$$\textit{Revised Base capital} = \frac{\textit{New market cap}}{\text{Index } \textit{value}} * 1000$$

New market cap = Net change + Old market cap of the Index

Net change = (Market capital of companies added to the Index *)*
- (Market Capital of the companies deleted from the Index *)*

Old market cap is the closing market cap of the Index *before the adjustment is made*

Consider the event when seven securities were added and deleted to the S&P CNX Nifty on Oct 07, 1998

Companies Added	**Market Cap on Oct 06, 1998**
1. Infosys Technologies LTD	Rs. 36.2 bn
2. NIIT Ltd.	Rs. 33.4 bn
3. Bank of India	Rs. 15.8 bn
4. Smithkline Beecham Consumer Healthcare	Rs. 21.6 bn
5. Hero Honda Motors Ltd.	Rs. 23.5 bn
6. Procter & Gamble Ltd.	Rs. 16 bn
7. Cipla Ltd.	Rs. 15.9 bn
Total	**Rs. 162.4 bn**

Companies Deleted	**Market Cap on Oct 06, 1998**
1.BPCL	Rs. 33.8 bn
2.Ashok Leyland LTD	Rs. 2.7 bn
3.Indo Gulf Fertilisers	Rs. 5.8 bn
4.Andhra Valley Power Supply LTD	Rs. 4.6 bn
5.Thermax LTD	Rs. 3.8 bn
6.MRPL	Rs. 5.4 bn
7.Ponds India LTD	Rs. 35.3 bn
Total	**Rs. 91.4 bn**

Market Cap of **S&P CNX Nifty** on Oct 06, 1998	Rs. 1,750 bn
Closing Index Value of **S&P CNX Nifty** on Oct 06, 1998	845.75
Net Addition / Deletion of Market Cap to **S&P CNX Nifty** on account of Addition / Deletion of constituents (Rs. 162.4 bn – Rs. 91.4 bn)	Rs.71 bn
New Market Cap of **S&P CNX Nifty** on account of Addition / Deletion. (Rs. 1750 bn + Rs. 71 bn)	Rs. 1,821 bn
Base Market Cap of **S&P CNX Nifty**	Rs. 2,069 bn
New Base Market Cap of **S&P CNX Nifty** (Rs. 2069 bn * 1000 / 845.75)	Rs. 2,446 bn

9.2.6 Dividend announcement

Corporate actions like Dividend announcement do not require any adjustment in the normal price Index. A separate **Total Returns Index (TR)** is calculated which shows the returns on Index portfolio, inclusive of dividends. **The Total Returns Index** is always calculated on an existing market capitalisation Index.

Action :

Step 1: Find out the dividend per share declared by the company
Step 2: Find out the outstanding number of shares of the company
Step 3: Compute the total amount of dividend payable by the company. It is the product of dividend per share and the outstanding number of shares of the company
Step 4: Compute the Index dividend for the day as per the formula given below
Step 5: Compute the new **TR Index** according to the formula given below

Changes to the **Total Returns Index** will only be done in the case of a dividend event. Dividend events will be accounted for on the ex-date as decided by the NSE.

***Calculation of the TR* Index**

TR Index

$$= \textit{Old TR Index value} * \frac{(\textit{MC Index value}) + (\textit{Index dividend for the day})}{\textit{Old MC Index value}}$$

$$\text{Index } \textit{dividend for the day} = \frac{\textit{Total Dividends of the scrips in the Index}}{\text{Index } \textit{divisor of the MC Index}}$$

MC Index = *Market cap based* Index *for which the Total returns* Index *is calculated*

Total dividends of scrips in the Index = *Dividend per share * shares outstanding*

Consider the event of Dividend declaration by two companies included in the Nifty Index on March 08, 2000.

1. Hindustan Lever Limited declared a final dividend of Rs. 17 per share
2. Glaxo India Limited declared a dividend of Rs. 6 per share

Calculation of Total Returns Index for March 08, 2000
Nifty is the market cap based Index on which the TR Index is calculated

Closing **Nifty Index** value on March 08,2000	1666.35
Closing **Nifty Index** value on March 07,2000	1702.75
Closing **TR Index** value on March 07,2000	1806.31
Nifty Index Divisor	2,427,483,702
Number of outstanding equity shares of HLL	219,569,495
Total dividends payable by HLL (219,569,495 * 17)	Rs. 3.73 bn
Number of outstanding equity shares of Glaxo	59,775,000
Total dividends payable by Glaxo (59,775,000 * 6)	Rs. 359 mn
Index Dividend ***(*** (Rs.3.73 bn + Rs. 359 mn) / 2,427,483,702 ***)***	1.68542
New TR Index value ***(*** 1806.31 * (1666.35 + 1.68542) ***)*** ---------- 1702.75	1769.48

9.3 Adjusting Index funds for corporate actions

9.3.1 Rights issue

The Index fund needs to adjust the weightages of its portfolio due to a rights event.

- Every fund maintains some portion of its portfolio in cash to meet liquidity, hence it can be used to subscribe the rights issue.
- The fund can sell a portion of all the other securities from the basket and subscribe to the rights issue.
- The fund can let the rights issue expire and rebalance its portfolio on the ex-date.

9.3.2 Bonus Issue

In bonus issue theoretically there is no change in the market cap of the underlying security, therefore it does not require any adjustment to the base capital. Since no adjustment is made to the base capital of the reference Index, there is no adjustment required to the Index fund.

9.3.3 Debt conversion / Warrant conversion / Public Issue / Private Placement

A Debt / Warrant / Public Issue / Private Placement conversion leads to an increase of the weightage of the security in the Index. Thus, the Index fund will have to increase the weightage of that security in its portfolio. It would need to do this by purchasing extra shares from the open market on the date the adjustment is made to the Index. The cash for this purchase can be generated either by selling off securities from the existing basket of stocks or from the cash buffer.

9.3.4 Mergers and Acquisitions

The different possibilities of mergers and acquisitions are

.

1) **Merger of any listed company with an Index company:** As shares of the acquiring company will be issued to the shareholders of the merging entity, the market cap of the acquiring entity would increase leading to an increase in its weightage in the Index. In this case the only adjustment required would be to increase the weightages of the acquiring company. Therefore shares have to be purchased to rebalance the fund weightages on the ex-date when the adjustment in the Index is made. The cash for this purchase can be generated either by selling off securities from the existing basket of stocks or from the cash buffer.

2) **Merger of any unlisted company with an Index company:** The adjustment has to be the same as in the case above. Shares of the acquiring company has to be purchased to the extent the weightage in the Index increases due to a change in the number of outstanding shares.

3) **Merger of two Index companies:** In this case there are two adjustments taking place

   a) The market cap of the acquiring company will increase : This might not be an issue of concern as the fund would automatically get shares in the acquiring company for their holdings in the merging company.
   b) A new company would be included in the Index : The fund should be rebalanced by selling off a part of all the stocks in the Index in order to generate enough cash to buy the new stock that is entering the Index.

4) **Merger of an Index company with a company outside the Index :** In this case the adjustment in the portfolio is to sell off the entire shares of the merging Index company and buy the shares of the new Index company according to its new weightage. The fund may even need to sell a part of its existing portfolio in order to generate enough cash to buy shares of the new company in case of a difference of the market cap[s of the two companies.

9.3.5 Addition and Deletion of companies in the Index: The fund needs to sell the shares of the company being removed from the Index. In case if the market cap of the incoming company is greater than that of outgoing company, a portion of all the other securities in the Index has to be sold to buy the incoming stock.

9.3.6 Cash dividends : Cash dividends require prompt reinvestment unless they are directly passed on to the investors. A simple alternative is to accumulate cash dividends in a short-term investment fund. At the end of a specified period the fund manager can move the funds into the stock markets.

10.0 Practical problems faced in managing Index funds

On the face of it, though Index funds are passively managed funds, there are a number of practical problems faced in running an Index fund which have an impact on the tracking error. They are as follows:-

1. An Index fund is not fully invested at all times. It needs to maintain a sufficient cash buffer in order to meet its liquidity requirements. As a result the returns on this money held for liquidity purpose would differ from the returns on the Index.

2. Fund may not be able to obtain new issues at the price at which they are included in the Index.

3. An Index fund may find it difficult to adjustment its portfolio if certain securities are in the no delivery period.

4. Adjustments to the Index for corporate actions such as rights issue, bonus issue, cash dividends are made on the ex-date but the fund gets the actual shares or the dividend amount only after a certain period. Till then, it will have an impact on the tracking error.

11.0 Maintaining liquidity and cash flows

It is impossible for an Index fund to be 100% invested in stocks at all times. Some portion of the portfolio must be kept in cash for redemption purposes. A number of techniques may be used to handle the flow of cash into an Index fund. There are different ways in which cash flow may be invested into an Index fund

1. **By use of Index futures**

   Index fund managers in order to keep their funds fully invested can use futures contracts. Index futures are contractual agreements to buy or sell the Index at a specific date in the future but at a price fixed today. The asset allocated to futures contract will obtain the same rate of return as the Index and entry in and out of the futures market can be made at a very low cost.

   Cash derived from dividend income and other inflows can be used to invest in futures contracts for a short period till reinvestment is made in the stocks. When the cash reaches a size that is sufficient to invest the futures positions can be closed and the funds can be invested in physical assets.

2. **By temporarily investing into fixed income securities**

   The cash can be invested in short-term money market instruments carrying fixed income or in the call money markets. Thus the cash held for liquidity purpose can be used to generate returns to reduce the risk of the fund being hit on the tracking error.

12.0 Measuring the performance of Index funds

Index funds are designed to produce returns in line with the predefined Index. The returns of an index fund as measured by its NAV, should be compared with the **Total Returns** Index (as explained on Page 25). The reason being, Index funds reinvest their dividends and the Total Returns Index shows the returns on Index portfolio inclusive of dividends.

13.0 Other related concepts

13.1 Synthetic Index funds : Index funds can be created both on physical assets as well as derived instruments like stock Index futures. Funds based upon derivative instruments are called Synthetic Index funds and they try to give the same returns as the Index without any need to hold the underlying securities. Synthetic Index funds offer a low transaction cost than normal Index funds provided the Index future markets are liquid. They do not require any adjustment for any corporate actions or any changes in the Index constituents. On the negative side they are deprived of the benefits of stock lending and cash dividends distributed by the company.

Secondly the Index future contracts expire, and the Index fund would need to re-establish this position on the next available contract, a process called rollover. Large Index funds would suffer considerable transaction cost when doing the rollover and if the markets are not adequately liquid it would not support such large transactions.

13.2 Stock lending : Stock lending is a mechanism whereby an investor requiring a particular security borrows it from the holder of the security in return for a fee. Index funds are ideal for stock lending programs as they hold log-term assets.

13.3 Tilted Funds: It is constructed with a portfolio similar to the Index but with a bias towards a certain factor. The aim of such a fund is to outperform the Index on a consistent basis. It may be biased towards factors like high yield stocks, sector specific stocks, stocks with higher correlation, etc. Some funds abroad offer a tilt rotational approach i.e. different factors may govern the investment philosophy of the fund at different points of time depending on market condition.

14.0 The markets abroad

Index funds became well established in the United States at the end of 1970's. It is observed that more than 25% of the domestic equities in the US are held by institutional investors in form of passive investment. Index funds abroad have grown as a consequence of the expansion of the pension fund industry. Investments by institutional investors in Index funds (retirement plans and endowment funds) have grown from $ 10 billion in 1980 to more than $1 trillion by the end of 1996. The Vanguard group is the leader in Index funds worldwide. Galaxy, Fidelity, Merill Lynch are the other mutual funds providing Indexation.

Interest in Index funds spread from the US markets to the UK. UK recorded a significant Index fund presence such that by the end of 1989 it was estimated that around 30 billion pounds had been invested in a combination of domestic and international Index portfolios. Once again, it was the pension funds, which represented a major portion of the institutional assets that were Indexed in the U.K market. The wave of Indexation continued into continental Europe, the Middle East. However, in Asia, with the exception of Japan, Indexation is still in its infancy.

15.0 Potential in India

Pension funds

The use of Index funds found its early support from the pension funds in the US markets. The growth of Index funds in the US and UK markets have been largely due to the investments of pension funds. In the Indian context, it is likely that the government will liberalise the pension fund sector in the coming years, to allow them to invest in the equity markets. However, most of these investments are likely to flow into the equity market through the Index fund route. Further, with banks now allowed to invest a portion of their assets in the equity markets, Index funds may be a good avenue for such investments.

16.0 SEBI Guidelines for Index funds

The guidelines for Index funds are the same as applicable to mutual funds in India with the following one exception:

> "The investments by Index funds shall be in accordance with the weightage of the scrips in the specific Index as disclosed in the offer document. In case of sector/industry specific scheme, the upper ceiling on investments may be in accordance with the weightage of the scrips in the representative sectoral Index/sub Index as disclosed in the offer document or 10% of the NAV of the scheme whichever is higher."
>
> (With reference to the proviso to clause 10 of Seventh Schedule to the SEBI (Mutual Funds) Regulations, 1996 circulated on Jan 5, 2000)
>
> According to the new clause 10, Seventh schedule of the SEBI (Mutual funds) (Amendments) Regulations 1999 :
>
> "No mutual fund scheme shall invest more than 10 per cent of its NAV in the equity shares or equity related instruments of any company.
> **Provided that, the limit of 10 per cent shall not be applicable for investments in Index fund or sector or industry specific scheme".**