

Table 1.1 Business growth of futures and options market: Turnover (Rs.crore)

Month	Index futures	Index options	Stock options	Stock futures
Jun-00	35	-	-	-
Jun-01	590	195	-	-
Jun-02	2,123	389	4,642	16,178
Jun-03	9,348	1,942	15,042	46,505
Jun-04	64,017	8,473	7,424	78,392
Jun-05	77,218	16,133	14,799	163,096

1.7.2 Trading mechanism

The futures and options trading system of NSE, called NEAT-F&O trading system, provides a fully automated screen-based trading for Nifty futures & options and stock futures & options on a nationwide basis and an online monitoring and surveillance mechanism. It supports an anonymous order driven market which provides complete transparency of trading operations and operates on strict price-time priority. It is similar to that of trading of equities in the Cash Market(CM) segment. The NEAT-F&O trading system is accessed by two types of users. The Trading Members(TM) have access to functions such as order entry, order matching, order and trade management. It provides tremendous flexibility to users in terms of kinds of orders that can be placed on the system. Various conditions like Immediate or Cancel, Limit/Market price, Stop loss, etc. can be built into an order. The Clearing Members(CM) use the trader workstation for the purpose of monitoring the trading member(s) for whom they clear the trades. Additionally, they can enter and set limits to positions, which a trading member can take.

1.7.3 Turnover

The trading volumes on NSE's derivatives market has seen a steady increase since the launch of the first derivatives contract, i.e. index futures in June 2000. Table 1.1 gives the value of contracts traded on the NSE. The average daily turnover at NSE now exceeds Rs.10000 crore. A total of 77,017,185 contracts with a total turnover of Rs.2,547,053 crore were traded during 2004-2005.

Solved Problems

Q: Futures trading commenced first on

1. Chicago Board of Trade
2. Chicago Mercantile Exchange
3. Chicago Board Options Exchange
4. London International Financial Futures and Options Exchange

A: The correct answer is number 1.

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Q: The underlying asset for a derivative contract can be

- | | |
|----------------|---------------------|
| 1. Equity | 3. Interest rate |
| 2. Commodities | 4. Any of the above |

A: The correct answer is number 4

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Q: Derivatives first emerged as _____ products

- | | |
|----------------|---------------|
| 1. Speculative | 3. Volatility |
| 2. Hedging | 4. Risky |

A: The correct answer is number 2.

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Q: Who are the participants in the derivatives market?

- | | |
|----------------|---------------------|
| 1. Hedgers | 3. Arbitrageurs |
| 2. Speculators | 4. All of the above |

A: The correct answer is number 4.

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Q: The first exchange traded financial derivative in India commenced with the trading of _____

- | | |
|------------------|--------------------------|
| 1. Index futures | 3. Stock options |
| 2. Index options | 4. Interest rate futures |

A: The correct answer is number 1.

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Q: OTC derivatives are considered risky because

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|---|--|
| 1. There is no formal margining system. | 3. They are not settled on a clearing house. |
| 2. They do not follow any formal rules or mechanisms. | 4. All of the above |

A: The correct answer is number 4.

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Q: Which of the following is not an example of a derivative on security derivative?

- | | |
|------------------|--------------------------|
| 1. Index futures | 3. Stock futures |
| 2. Index options | 4. Interest rate futures |

A: The correct answer is number 4.

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Chapter 2

Market index

To understand the use and functioning of the index derivatives markets, it is necessary to understand the underlying index. In the following section, we take a look at index related issues. Traditionally, indexes have been used as information sources. By looking at an index, we know how the market is faring. In recent years, indexes have come to the forefront owing to direct applications in finance in the form of index funds and index derivatives. Index derivatives allow people to cheaply alter their risk exposure to an index (hedging) and to implement forecasts about index movements (speculation). Hedging using index derivatives has become a central part of risk management in the modern economy.

2.1 Understanding the index number

An index is a number which measures the change in a set of values over a period of time. A stock index represents the change in value of a set of stocks which constitute the index. More specifically, a stock index number is the current relative value of a weighted average of the prices of a pre-defined group of equities. It is a relative value because it is expressed relative to the weighted average of prices at some arbitrarily chosen starting date or base period. The starting value or base of the index is usually set to a number such as 100 or 1000. For example, the base value of the Nifty was set to 1000 on the start date of November 3, 1995.

A good stock market index is one which captures the behavior of the overall equity market. It should represent the market, it should be well diversified and yet highly liquid. Movements of the index should represent the returns obtained by “typical” portfolios in the country.

A market index is very important for its use

1. as a barometer for market behavior,
2. as a benchmark portfolio performance,
3. as an underlying in derivative instruments like index futures, and
4. in passive fund management by index funds

2.2 Economic significance of index movements

How do we interpret index movements? What do these movements mean? They reflect the changing expectations of the stock market about future dividends of the corporate sector. The index goes up if the stock market thinks that the prospective dividends in the future will be better than previously thought. When the prospects of dividends in the future becomes pessimistic, the index drops. The ideal index gives us instant readings about how the stock market perceives the future of corporate sector.

Every stock price moves for two possible reasons:

1. News about the company (e.g. a product launch, or the closure of a factory)
2. News about the country (e.g. budget announcements)

The job of an index is to purely capture the second part, the movements of the stock market as a whole (i.e. news about the country). This is achieved by averaging. Each stock contains a mixture of two elements - stock news and index news. When we take an average of returns on many stocks, the individual stock news tends to cancel out and the only thing left is news that is common to all stocks. The news that is common to all stocks is news about the economy. That is what a good index captures. The correct method of averaging is that of taking a weighted average, giving each stock a weight proportional to its market capitalization.

Example: Suppose an index contains two stocks, A and B. A has a market capitalization of Rs.1000 crore and B has a market capitalization of Rs.3000 crore. Then we attach a weight of $1/4$ to movements in A and $3/4$ to movements in B.

2.3 Index construction issues

A good index is a trade-off between diversification and liquidity. A well diversified index is more representative of the market/economy. However there are diminishing returns to diversification. Going from 10 stocks to 20 stocks gives a sharp reduction in risk. Going from 50 stocks to 100 stocks gives very little reduction in risk. Going beyond 100 stocks gives almost zero reduction in risk. Hence, there is little to gain by diversifying beyond a point. The more serious problem lies in the stocks that we take into an index when it is broadened. If the stock is illiquid, the observed prices yield contaminated information and actually worsen an index.

2.4 Types of indexes

Most of the commonly followed stock market indexes are of the following two types: Market capitalization weighted index or price weighted index. In a market capitalization weighted index, each stock in the index affects the index value in proportion to the market value of all shares outstanding. A price weighted index is one that gives a weight to each stock that is proportional to its stock price. Indexes can also be equally weighted. Recently, major indices in the world like the S&P 500 and the FTSE-100 have shifted to a new method of index calculation called the “Free float” method. We take a look at a few methods of index calculation.

Table 2.1 Market capitalization weighted index calculation

In the example below we can see that each stock affects the index value in proportion to the market value of all the outstanding shares. In the present example, the base index = 1000 and the index value works out to be 1002.60

$$\text{Index} = \frac{7330566.20}{7311383.40} * 1000 = 1002.62$$

Company	Current Market capitalization (Rs.Lakh)	Base Market capitalization (Rs.Lakh)
Grasim Inds	1,668,791.10	1,654,247.50
Telco	872,686.30	860,018.25
SBI	1,452,587.65	1,465,218.80
Wipro	2,675,613.30	2,669,339.55
Bajaj	660,887.85	662,559.30
Total	7,330,566.20	7,311,383.40

1. *Price weighted index*: In a price weighted index each stock is given a weight proportional to its stock price.
2. *Market capitalization weighted index*: In this type of index, the equity price is weighted by the market capitalization of the company (share price * number of outstanding shares). Hence each constituent stock in the index affects the index value in proportion to the market value of all the outstanding shares. This index forms the underlying for a lot of index based products like index funds and index futures. Table 2.1 gives an example of how market capitalization weighted index is calculated.

In the market capitalization weighted method,

$$\text{Index} = \frac{\text{Current market capitalisation}}{\text{Base market capitalisation}} * \text{Base value}$$

where :

Current market capitalization = Sum of (current market price * outstanding shares) of all securities in the index.

Base market capitalization = Sum of (market price * issue size) of all securities as on base date.

2.5 Desirable attributes of an index

A good market index should have three attributes:

1. It should capture the behavior of a large variety of different portfolios in the market.

2. The stocks included in the index should be highly liquid.
3. It should be professionally maintained.

2.5.1 Capturing behavior of portfolios

A good market index should accurately reflect the behavior of the overall market as well as of different portfolios. This is achieved by diversification in such a manner that a portfolio is not vulnerable to any individual stock or industry risk. A well-diversified index is more representative of the market. However there are diminishing returns from diversification. There is very little gain by diversifying beyond a point. The more serious problem lies in the stocks that are included in the index when it is diversified. We end up including illiquid stocks, which actually worsens the index. Since an illiquid stock does not reflect the current price behavior of the market, its inclusion in index results in an index, which reflects, delayed or stale price behavior rather than current price behavior of the market.

2.5.2 Including liquid stocks

Liquidity is much more than trading frequency. It is about ability to transact at a price, which is very close to the current market price. For example, a stock is considered liquid if one can buy some shares at around Rs.320.05 and sell at around Rs. 319.95, when the market price is ruling at Rs.320. A liquid stock has very tight bid–ask spread.

2.5.3 Maintaining professionally

It is now clear that an index should contain as many stocks with as little impact cost as possible. This necessarily means that the same set of stocks would not satisfy these criteria at all times. A good index methodology must therefore incorporate a steady pace of change in the index set. It is crucial that such changes are made at a steady pace. It is very healthy to make a few changes every year, each of which is small and does not dramatically alter the character of the index. On a regular basis, the index set should be reviewed, and brought in line with the current state of market. To meet the application needs of users, a time series of the index should be available.

2.6 The S&P CNX Nifty

What makes a good stock market index for use in an index futures and index options market? Several issues play a role in terms of the choice of index. We will discuss how the S&P CNX Nifty addresses some of these issues.

Diversification As mentioned earlier, a stock market index should be well-diversified, thus ensuring that hedgers or speculators are not vulnerable to individual–company or industry risk.

The S&P CNX Nifty is an market capitalisation index based upon solid economic research. It was designed not only as a barometer of market movement but also to be a foundation of the new world of financial products based on the index like index futures, index options and index funds. A trillion calculations were expended to evolve the rules inside the S&P CNX Nifty index. The results of this work are remarkably simple: (a) the correct size to use is 50, (b) stocks considered for the S&P CNX Nifty must be liquid by the 'impact cost' criterion, (c) the largest 50 stocks that meet the criterion go into the index.

S&P CNX Nifty is a contrast to the adhoc methods that have gone into index construction in the preceding years, where indexes were made out of intuition and lacked a scientific basis. The research that led up to S&P CNX Nifty is well-respected internationally as a pioneering effort in better understanding how to make a stock market index.

The Nifty is uniquely equipped as an index for the index derivatives market owing to its (a) low market impact cost and (b) high hedging effectiveness. The good diversification of Nifty generates low initial margin requirement. Finally, Nifty is calculated using NSE prices, the most liquid exchange in India, thus making it easier to do arbitrage for index derivatives.

Box 2.3: The S&P CNX Nifty

Liquidity of the index The index should be easy to trade on the cash market. This is partly related to the choice of stocks in the index. High liquidity of index components implies that the *information* in the index is less noisy.

Operational issues The index should be professionally maintained, with a steady evolution of securities in the index to keep pace with changes in the economy. The calculations involved in the index should be accurate and reliable. When a stock trades at multiple venues, index computation should be done using prices from the most liquid market.

2.6.1 Impact cost

Market impact cost is a measure of the liquidity of the market. It reflects the costs faced when actually trading an index. For a stock to qualify for possible inclusion into the Nifty, it has to have market impact cost of below 0.75% when doing Nifty trades of half a crore rupees. The market impact cost on a trade of Rs.3 million of the full Nifty works out to be about 0.05%. This means that if Nifty is at 2000, a buy order goes through at 2001, i.e. $2000 + (2000 \times 0.0005)$ and a sell order gets 1999, i.e. $2000 - (2000 \times 0.0005)$.

2.6.2 Hedging effectiveness

Hedging effectiveness is a measure of the extent to which an index correlates with a portfolio, whatever the portfolio may be. Nifty correlates better with all kinds of portfolios in India as compared to other indexes. This holds good for all kinds of portfolios, not just those that contain index stocks. Similarly, the CNX IT and BANK Nifty contracts which NSE trades in, correlate well with information technology and banking sector portfolios.

Nifty, CNX IT and CNX Bank (underlying index for BANK Nifty) indices are owned, computed and maintained by India Index Services & Products Limited (IISL), a company setup by NSE and CRISIL with technical assistance from Standard & Poor's.

2.7 Applications of index

Besides serving as a barometer of the economy/market, the index also has other applications in finance.

2.7.1 Index derivatives

Index derivatives are derivative contracts which have the index as the underlying. The most popular index derivatives contracts the world over are index futures and index options. NSE's market index, the S&P CNX Nifty was scientifically designed to enable the launch of index-based products like index derivatives and index funds. The first derivative contract to be traded on NSE's market was the index futures contract with the Nifty as the underlying. This was followed by Nifty options and thereafter by sectoral indexes, CNX IT and BANK Nifty contracts.

2.7.2 Index funds

An index fund is a fund that tries to replicate the index returns. It does so by investing in index stocks in the proportions in which these stocks exist in the index. The goal of the index fund is to achieve the same performance as the index it tracks.

For instance, a Nifty index fund would seek to get the same return as the Nifty index. Since the Nifty has 50 stocks, the fund would buy all 50 stocks in the proportion in which they exist in the Nifty. Once invested, the fund will track the index, i.e. if the Nifty goes up, the value of the fund will go up to the same extent as the Nifty. If the Nifty falls, the value of the index fund will fall to the same extent as the Nifty. The most useful kind of market index is one where the weight attached to a stock is proportional to its market capitalization, as in the case of Nifty. Index funds are easy to construct for this kind of index since the index fund does not need to trade in response to price fluctuations. Trading is only required in response to issuance of shares, mergers, etc.

2.7.3 Exchange Traded Funds

Exchange Traded Funds(ETFs) are innovative products, which first came into existence in the USA in 1993. They have gained prominence over the last few years with over \$300 billion invested as of end 2001 in about 360 ETFs globally. About 60% of trading volume on the American Stock Exchange is from ETFs. Among the popular ones are SPDRs(Spiders) based on the S&P 500 Index, QQQs(Cubes) based on the Nasdaq-100 Index, iSHARES based on MSCI Indices and TRAHK(Tracks) based on the Hang Seng Index.

ETFs provide exposure to an index or a basket of securities that trade on the exchange like a single stock. They have a number of advantages over traditional open-ended funds as they can

Futures markets can be used for creating synthetic index funds. Synthetic index funds created using futures contracts have advantages of simplicity and low costs. The simplicity stems from the fact that index futures automatically track the index. The cost advantages stem from the fact that the costs of establishing and re-balancing the fund are substantially reduced because commissions and bid-ask spreads are lower in the futures markets than in the equity markets.

The methodology for creating a synthetic index fund is to combine index futures contracts with bank deposits or treasury bills. The index fund uses part of its money as margin on the futures market and the rest is invested at the risk-free rate of return. This methodology however does require frequent roll-over as futures contracts expire.

Index funds can also use the futures market for the purpose of spreading index sales or purchases over a period of time. Take the case of an index fund which has raised Rs.100 crore from the market. To reduce the tracking error, this money must be invested in the index immediately. However large trades face large impact costs. What the fund can do is, the moment it receives the subscriptions it can buy index futures. Then gradually over a period of say a month, it can keep acquiring the underlying index stocks. As it acquires the index stocks, it should unwind its position on the futures market by selling futures to the extent of stock acquired. This should continue till the fund is fully invested in the index.

Box 2.4: Use of futures market by index funds

be bought and sold on the exchange at prices that are usually close to the actual intra-day NAV of the scheme. They are an innovation to traditional mutual funds as they provide investors a fund that closely tracks the performance of an index with the ability to buy/sell on an intra-day basis. Unlike listed closed-ended funds, which trade at substantial premia or more frequently at discounts to NAV, ETFs are structured in a manner which allows to create new units and redeem outstanding units directly with the fund, thereby ensuring that ETFs trade close to their actual NAVs.

The first ETF in India, “Nifty BeEs”(Nifty Benchmark Exchange Traded Scheme) based on S&P CNX Nifty, was launched in December 2001 by Benchmark Mutual Fund. It is bought and sold like any other stock on NSE and has all characteristics of an index fund. It would provide returns that closely correspond to the total return of stocks included in Nifty.

Solved problems

Q: Nifty includes the _____ most liquid stocks that trade on NSE.

- | | |
|-------|--------|
| 1. 30 | 3. 100 |
| 2. 50 | 4. 500 |

A: The correct answer is number 2.

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Q: The Indian company which provides professional index management services is

- | | |
|----------|-----------|
| 1. IISL | 3. S&P |
| 2. NSCCL | 4. CRISIL |

A: The correct answer is number 1.

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Q: Impact cost measures the

- | | |
|----------------------------|----------------------|
| 1. Volatility of the stock | 3. Return on a stock |
| 2. Liquidity of the stock | 4. None of above |

A: The correct answer is number 2.

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Q: Assume that the base value of a market capitalization weighted index were 1000 and the base market capitalization were Rs.35000 crore. If the current market capitalization is Rs.77,000 crore, the index is at

- | | |
|---------|---------|
| 1. 2200 | 3. 1200 |
| 2. 2250 | 4. 1350 |

A: The current index value is $(77000/35000)*1000$. The correct answer is number 1.

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Q: The market impact cost on a trade of Rs.3 million of the full Nifty works out to be about 0.5%. This means that if Nifty is at 2000, a buy order will go through at roughly

- | | |
|---------|----------------------|
| 1. 2010 | 3. 2500 |
| 2. 2050 | 4. None of the above |

A: 0.5% of 2000 works out to be 5. Hence a buy order will go through at 2010. The correct answer is number 1.

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Q: Index funds are _____ managed

- | | |
|--------------|----------------------|
| 1. Actively | 3. Family |
| 2. Passively | 4. None of the above |

A: The correct answer is number 2.

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