1. **INTRODUCTION**
   1. **Evolution of Future and Option Market**

**1.1.1Futures Markets**

In the late 1970s and early 1980s, radical changes in the international currency system and in the way the Federal Reserve managed the U.S. [**money supply**](http://www.econlib.org/library/Enc/MoneySupply.html) produced unprecedented volatility in [**interest rates**](http://www.econlib.org/library/Enc/InterestRates.html) and currency exchange rates. As market forces shook the foundations of global financial stability, businesses wrestled with heretofore unimagined challenges. Between 1980 and 1985, Caterpillar, the Peoria-based maker of heavy equipment, saw exchange-rate shifts give its main Japanese competitor a 40 percent price advantage. Meanwhile, even the soundest business borrowers faced soaring double-digit interest rates. Investors clamored for dollars as commodity prices collapsed, taking whole nations down into insolvency and ushering in the Third World debt crisis.

In the nineteenth century, Chicago’s trading pits offered an organized venue in which farmers and other suppliers of agricultural commodities, such as warehouse owners and brokers, could remove the risk of price fluctuations from their business plans. The futures exchanges were private, member-owned organizations. Members bought “seats” on the exchange and enjoyed various trading rights. It may seem strange that markets originally established to trade agricultural commodity futures in the nineteenth century should become centers of trade for financial contracts in the twentieth. But the key to success as a trader is to understand the market; traders therefore consider themselves experts on market movements rather than authorities on minerals and crops. This is why financial futures were relatively easy to introduce to markets originally designed for agricultural commodity futures: one thing interest rates and corn have in common is a fast-changing market.

Although the underlying risks have changed, some important futures markets still operate much as they always have, with traders standing in a ring or a pit shouting buy and sell orders at each other, competing for each fraction of a cent. But electronic trading is rapidly changing how traders trade. Computer terminals linked to each other through electronic trading systems let traders access a virtual trading floor from anywhere in the world. The need to raise capital to build these systems has led several big exchanges to go public, issuing stock to investors and operating as any public corporation providing a service—the service of a market. Exchanges compete with each other to attract traders by doing a better job of providing the benefits that traders expect from a fair market.

Take futures contracts, for example. They are not contracts directly between buyers and sellers of goods. The farmer who sells a futures contract and commits to deliver corn in six months does not make his commitment to a specific corn buyer, but rather, through a broker, to the clearinghouse of the futures exchange. The clearinghouse, another modern institution, stands between buyers and sellers and, in effect, guarantees that both buyers and sellers will receive what they have contracted for.

The biggest users of the futures markets rely on them for risk management. That is surely one reason why defaults are rare. But there is an additional security measure between the individual trader and the clearinghouse. Buyers and sellers of futures must do business through intermediaries who are exchange members. Instead of standing between two individual traders, therefore, the clearinghouse stands between two exchange member firms. Each firm monitors its own customers and makes a “margin call” when the customer’s losses make additional margin necessary. If the customer cannot pay the margin, the firm closes the account, sells off the positions, and may have to take a small loss. While firms pay attention to the credit of their customers, the clearinghouse pays attention to the credit of the firms. The clearinghouse needs to make good on a trade only if losses are so great that the exchange member firm itself fails. This happens occasionally when firms badly mismanage their risks or when a major financial crisis occurs.

Because futures contracts offer assurance of future prices and availability of goods, they provide stability in an unstable business environment. Futures have long been associated with agricultural commodities, especially grain and pork bellies, but they are now more likely to be used by bankers, airlines, and computer makers than by farmers—at least in North America and Europe. By the early 2000s, although commodities remained the mainstay of futures markets in Asia, in the developed countries of the West financial futures contracts had almost totally eclipsed commodities. The Chicago Mercantile Exchange claimed in 2004 that financial futures accounted for 99 percent of its business, and financial futures also accounted for the lion’s share of business at the Chicago Board of Trade and at Euronext.liffe. (Euronext.liffe is the international derivatives business of Euronext, comprising the Amsterdam, Brussels, London, Lisbon, and Paris derivatives markets. It was formed following Euronext’s purchase of the London International Financial Futures and Options Exchange [LIFFE] in 2001.) In Japan, by contrast, commodity futures trading dwarfed financial futures. This does not mean that commodities were more important than finance in the Japanese economy, of course. Financial futures got a slow start in Japan because Japanese regulations discouraged them. Traders who wanted to trade such futures had to—and did—trade them elsewhere. Thus, the first futures on Japan’s Nikkei stock index traded in Singapore, and the first yen futures traded in Chicago.

Obviously, the idea of hedging against an unstable financial environment has great appeal. Companies like Caterpillar, Microsoft, or Citibank can now protect themselves against currency shifts by buying and selling futures contracts or similar instruments. Investors use contracts on interest rates, [**bonds**](http://www.econlib.org/library/Enc/Bonds.html), and stock indexes to protect against a decline in the value of their [**investment**](http://www.econlib.org/library/Enc/Investment.html)s, just as farmers have long used futures to protect against a drop in the price of corn or beans.

For the market to function, however, it cannot consist only of hedgers seeking to lay off risk. There must be someone who comes to market in order to take on risk. These are the “speculators.” Speculators come to market to take risk, and to make money doing it. Some speculators, against all odds, have become phenomenally wealthy by trading futures. Interestingly, even the wealthiest speculators often report having gone broke one or more times in their career. Because speculation offers the promise of astounding riches with little apparent effort, or the threat of devastating losses despite even the best efforts, it is often compared to casino gambling.

Meanwhile, international [**stock market**](http://www.econlib.org/library/Enc/StockMarket.html) investors have discovered that stock-index futures, besides being useful for hedging, also are an attractive alternative to actually buying stocks. Because a stock-index future moves in tandem with the prices of the underlying stocks, it gives the same return as owning stocks. Yet the stock-index future is cheaper to buy and may be exempt from certain taxes and charges to which stock ownership is subject. Some large institutional investors prefer to buy German stock-index futures rather than German stocks for this very reason.

Because stock-index futures are easier to trade than actual stocks, the futures prices often change before the underlying stock prices do. In the October 1987 crash, for example, prices of stock-index futures in Chicago fell before prices on the New York Stock Exchange collapsed, leading some observers to conclude that futures trading had somehow caused the stock market crash that year. In fact, investors who wanted to sell stocks could not sell quickly and efficiently on the New York Stock Exchange and therefore sold futures instead. The futures market performed its function of price discovery more rapidly than the stock market did.

Futures contracts have even been enlisted in the fight against air pollution and the effort to curb runaway [**health insurance**](http://www.econlib.org/library/Enc/HealthInsurance.html) costs. When the Environmental Protection Agency decided to allow a market for sulfur dioxide emission allowances under the 1990 amendments to the Clean Air Act, the Chicago Board of Trade developed a futures contract for trading what might be called air pollution futures. The reason? If futures markets provide price discovery and liquidity to the market in emission allowances, companies can decide on the basis of straightforward economics whether it makes sense to reduce their own emissions of sulphur dioxide and sell their emission allowance to others, or instead to sustain their current emission levels and purchase emission allowances from others.

**1.1.2Option Markets**

Options are among the most important inventions of contemporary finance. Whereas a futures contract commits one party to deliver, and another to pay for, a particular good at a particular future date, an option contract gives the holder the right, but not the obligation, to buy or sell. Options are attractive to hedgers because they protect against loss in value but do not require the hedger to sacrifice potential gains. Most exchanges that trade futures also trade options on futures.

There are other types of options as well. In 1973 the Chicago Board of Trade established the Chicago Board Options Exchange to trade options on stocks. The Philadelphia Stock Exchange has a thriving business in currency options. The options market owes a good deal of its success to the development of the Black-Scholes option pricing model. Developed by economists Fischer Black, [**Robert C. Merton**](http://www.econlib.org/library/Enc/bios/Merton.html), and [**Myron Scholes**](http://www.econlib.org/library/Enc/bios/Scholes.html), it was first published in 1973. The model considers factors including the current price of the stock or currency, its volatility, the price at which the option allows the buyer to buy the stock or currency in the future, interest rates, and time to calculate what the option is worth. In 1997, Merton and Scholes received the Nobel Prize for this breakthrough. Fischer Black had died, and the prize cannot be awarded posthumously, but the Nobel citation said,

Black, Merton and Scholes thus laid the foundation for the rapid growth of markets for derivatives in the last ten years. Their method has more general applicability, however, and has created new areas of research—inside as well as outside of financial economics. A similar method may be used to value insurance contracts and guarantees, or the flexibility of physical investment projects.

Not all options trade on exchanges. There is also a large, so-called over-the-counter (OTC) market in options. Participants in the OTC market include banks, investment banks, insurance companies, large [**corporations**](http://www.econlib.org/library/Enc/Corporations.html), and other parties. OTC options differ from exchange-traded options. Whereas exchange-traded options are standardized contracts, OTC options are usually tailored to a particular risk. If a corporation wants to hedge a stream of foreign currency revenue for five years, but exchange-traded options are available only out to six months, the corporation can use the OTC market. An insurance company or bank can design and price a five-year option on the currency in question, giving the company the right to buy or sell at a particular price during the five-year period.

* 1. **OPTION BASICS**

**1.2.1 OPTION BASICS**

**1.2.1.1 Options**

An option is a contract to buy or sell a specific financial product officially known as the option's underlying instrument or underlying assets. For exchange-traded equity options, the underlying instruments are stocks of listed companies. The contract itself is very precise. It establishes a specific price, called the *strike price*, at which the contract may be exercised or acted on and it has an *expiration date*. When an option expires, it no longer has value and no longer exists. Option is known as security, or contingent claim, or contract, or derivative security or simply derivative. An option gives its holder the right to purchase (sell), a specified quantity (lot size) of an underlying asset for a specified price (exercise price or strike price) on or before some specified date called expiration date, but the holder has no obligation to purchase (sell)**.**

If we keenly observe, the volume and the range of options offered by NSE in India and the actual options that are traded, it is easily understood that still the Indian investors are not familiar with the options. At random, samples of 30 companies were taken which are given in Table no.1.1

**TABLE 1.1**

**DETAILS OF THE STOCK CALL OPTIONS OFFERED, TRADED AND NON - DIVIDEND PAYING STOCKS AT NSE FROM 1.1.02 TO 31.10.07**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.**  1 | **Company**  2 | | **From**  3 | **To**  4 | | **Offered**  5 | **Traded**  6 | | **Non- Dividend Paying**  7 |
| 1 | Tata Steel | | 01/01/02 | 31/10/07 | | 59,912 | 18,462 | | 16,100 |
| 2 | Reliance Ind. | | 01/01/02 | 31/10/07 | | 53,118 | 16,271 | | 14,145 |
| 3 | Infosys | | 31/01/03 | 31/10/07 | | 60,653 | 18,046 | | 12,559 |
| 4 | ACC | | 01/01/02 | 31/10/07 | | 56,006 | 11,577 | | 9,334 |
| 5 | MTNL | | 01/01/02 | 31/10/07 | | 49,049 | 13,085 | | 9,298 |
| 6 | Satyam | | 01/01/02 | 31/10/07 | | 53,376 | 16,122 | | 8,673 |
| 7 | HUL | | 01/01/02 | 31/10/07 | | 49,742 | 12,444 | | 7,776 |
| 8 | Ranbaxy | | 01/01/02 | 31/10/07 | | 57,502 | 9,975 | | 7,481 |
| 9 | ITC | | 01/01/02 | 31/10/07 | | 50,349 | 8,864 | | 7,264 |
| 10 | M & M | | 01/01/02 | 31/10/07 | | 56,020 | 8,739 | | 7,232 |
| 11 | Maruti | | 09/07/03 | 31/10/07 | | 46,591 | 8,599 | | 7,157 |
| 12 | Ambuja Cements | | 01/01/02 | 31/10/07 | | 47,152 | 7,643 | | 6,793 |
| 13 | ICICI | | 31/01/03 | 31/10/07 | | 47,754 | 7,989 | | 6,475 |
| 14 | ONGC | | 31/01/03 | 31/10/07 | | 48,223 | 9,567 | | 5,978 |
| 15 | SCI | | 31/01/03 | 31/10/07 | | 45,178 | 6,962 | | 5,574 |
| 16 | Hindalco | | 01/01/02 | 31/10/07 | | 56,464 | 6,114 | | 5,353 |
| 17 | BPCL | | 01/01/02 | 31/10/07 | | 53,954 | 7,780 | | 5,347 |
| 18 | Cipla | | 01/01/02 | 31/10/07 | | 56,632 | 5,665 | | 4,833 |
| 19 | Dr. Reddy'S | | 01/01/02 | 31/10/07 | | 55,490 | 5,805 | | 4,721 |
| 20 | Bank Of India | | 29/08/03 | 31/10/07 | | 40,364 | 6,203 | | 4,660 |
| 21 | Andhra Bank | | 29/08/03 | 31/10/07 | | 33,559 | 5,896 | | 4,518 |
| 22 | Wipro Ltd. | | 31/01/03 | 31/10/07 | | 47,780 | 6,417 | | 4,505 |
| 23 | Syndicate Bank | | 26/09/03 | 31/10/07 | | 32,941 | 5,759 | | 4,389 |
| 24 | UBI | | 29/08/03 | 31/10/07 | | 36,327 | 5,166 | | 4,122 |
| 25 | BHEL | | 01/01/02 | 31/10/07 | | 65,471 | 6,051 | | 4,083 |
| 26 | PNB | | 29/08/03 | 31/10/07 | | 49,229 | 4,661 | | 3,870 |
| 27 | Bank Of Baroda | | 29/08/03 | 31/10/07 | | 49,764 | 4,457 | | 3,589 |
| 28 | Canara Bank | | 29/08/03 | 31/10/07 | | 46,500 | 4,676 | | 3,262 |
| 29 | Bajaj Auto | | 01/01/02 | 31/10/07 | | 63,292 | 2,331 | | 1,790 |
| 30 | Grasim | | 01/01/02 | 31/10/07 | | 64,195 | 2,086 | | 1,761 |
| **Total** | | **15,32,58** | | | **2,53,412** | | | **1,92,642** | |

The total turnover on the F&O Segment increased by 60.43 % to ` 17,663,665 crore (US $ 3,913,085 million) during 2009-10 as compared with ` 11,010,482 crore (US $ 2,161,037 million) during2008-09. The average daily turnover during 2009-10 was ` 72,392 crore (US $ 16,037 million). The business growth of F&O segment and the number of contracts traded during the year is presented in table.

**Fig 1.1: Average Daily Trading Volume**



**1.2.1.2 Calls and Puts**   
The two types of options are calls and puts:   
  
A [call](http://www.investopedia.com/terms/c/call.asp) gives the holder the right to buy an asset at a certain price within a specific period of time. Calls are similar to having a [long position](http://www.investopedia.com/terms/l/long.asp) on a stock. Buyers of calls hope that the stock will increase substantially before the option expires.   
  
A [put](http://www.investopedia.com/terms/p/put.asp) gives the holder the right to sell an asset at a certain price within a specific period of time. Puts are very similar to having a [short position](http://www.investopedia.com/terms/s/short.asp) on a stock. Buyers of puts hope that the price of the stock will fall before the option expires.   
**1.2.1.3 Participants in the Options Market**   
There are four types of participants in options markets depending on the position they take:   
  
1. Buyers of calls   
2. Sellers of calls   
3. Buyers of puts   
4. Sellers of puts   
  
People who buy options are called holders and those who sell options are called [writers](http://www.investopedia.com/terms/w/writer.asp); furthermore, buyers are said to have long positions, and sellers are said to have short positions.   
  
Here is the important distinction between buyers and sellers:   
-Call holders and put holders (buyers) are not obligated to buy or sell. They have the choice to exercise their rights if they choose.   
-Call [writers](http://www.investopedia.com/terms/w/writer.asp) and put writers (sellers), however, are obligated to buy or sell. This means that a seller may be required to make good on a promise to buy or sell.

**1.2.2 Types of Options**

There are two main types of options:

* [American options](http://www.investopedia.com/terms/a/americanoption.asp) can be exercised at any time between the date of purchase and the expiration date. The example about Cory's Tequila Co. is an example of the use of an American option. Most [exchange-traded options](http://www.investopedia.com/terms/e/exchangetradedoption.asp) are of this type.
* [European options](http://www.investopedia.com/terms/e/europeanoption.asp) are different from American options in that they can only be exercised at the end of their lives.

The distinction between American and European options has nothing to do with geographic location.   
 **Long-Term Options**   
So far we've only discussed options in a short-term context. There are also options with holding times of one, two or multiple years, which may be more appealing for long-term investors.   
  
These options are called [long-term equity anticipation securities](http://www.investopedia.com/terms/l/leaps.asp) (LEAPS). By providing opportunities to control and manage risk or even to speculate, LEAPS are virtually identical to regular options. LEAPS, however, provide these opportunities for much longer periods of time. Although they are not available on all stocks, LEAPS are available on most widely held issues.   
  
**Exotic Options**   
The simple calls and puts we've discussed are sometimes referred to as [plain vanilla](http://www.investopedia.com/terms/p/plainvanilla.asp) options. Even though the subject of options can be difficult to understand at first, these plain vanilla options are as easy as it gets!   
  
Because of the versatility of options, there are many types and variations of options. Non-standard options are called [exotic options](http://www.investopedia.com/terms/e/exoticoption.asp), which are either variations on the payoff profiles of the plain vanilla options or are wholly different products with "option-ality" embedded in them.

**1.2.3 Option terminology**

1. Index options: These options have the index as the underlying. Some options are European while others are American. Like index futures contracts, index options contracts are also cash settled.

2. Buyer of an option: The buyer of an option is the one who by paying the option premium buys the right but not the obligation to exercise his option on the seller/writer.

3. Writer of an option: The writer of a call/put option is the one who receives the option premium and is thereby obliged to sell/buy the asset if the buyer exercises on him.

4. Call option: A call option gives the holder the right but not the obligation to buy an asset on a certain date for a certain price.

5. Put option: A put option gives the holder the right but not the obligation to sell an asset on a certain date for a certain price.

6. Option price: Option price is the price which the option buyer pays to the option seller. It is also referred to as the option premium.

7. Expiration date: The date specified in the options contract is known as the expiration date / the exercise date /the strike date or the maturity.

8. Strike price: The price specified in the options contract is known as the strike price or the exercise price.

9. American options: American options are options that can be exercised at any time up to the expiration date. Most exchange-traded options are American.

10. European options: European options are options that can be exercised only on the expiration date itself. European options are easier to analyze than American options, and properties of an American option are frequently deduced from those of its European counterpart

11. In-the-money option: An in-the-money (ITM) option is an option that would lead to a positive cash flow to the holder if it were exercised immediately. A call option on the index is said to be in-the-money when the current index stands at a level higher than the strike price (i.e. spot pricestrike price). If the index is much higher than the strike price, the call is said to be deep ITM. In the case of a put, the put is ITM if the index is below the strike price.

12. At-the-money option: An at-the-money (ATM) option is an option that would lead to zero cash flow if it were exercised immediately. An option on the index is at-the-money when the current index equals the strike price (i.e. spot price = strike price).

13. Out-of-the-money option: An out-of-the-money (OTM) option is an option that would lead to a negative cash flow it was exercised immediately. A call option on the index is out-of-the-money when the current index stands at a level which is less than the strike price (i.e. spot price strike price). If the index is much lower than the strike price, the call is said to be deep OTM. In the case of a put, the put is OTM if the index is above the strike price.

14. Intrinsic value of an option: The option premium can be broken down into two components – intrinsic value and time value. The intrinsic value of a call is the difference between stock price and the strike price, if it is ITM. If the call is OTM, its intrinsic value is zero. Putting it another way, the intrinsic value of a call is Max [0, St – X] which means the intrinsic value of a call is the greater of 0 or (St – X) Similarly, the intrinsic value of a put is Max [0, X - St], i.e. the greater of 0 or (X - St) where X is the strike price and St is the spot price.

15. Time value of an option: The time value of an option is the difference between its premium and its intrinsic value. Both calls and puts have time value. An option that is OTM or ATM has only time value. Usually, the maximum time value exists when the option is ATM. The longer the time to expiration, the greater is an option’s time value. At expiration, an option should have no time value.

**1.2.4 Option Pricing**

The price, or cost, of an option is an amount of money known as the premium. The buyer pays this [premium](http://www.investopedia.com/terms/p/premium.asp) to the seller in exchange for the right granted by the option. For example, a buyer might pay a seller for the right to purchase 100 shares of stock XYZ at a strike price of $60 on or before December 22. If the position becomes profitable, the buyer will decide to exercise the option; if it does not become profitable, the buyer will let the option expire worthless. The buyer pays the premium so that he or she has the "option" or the choice to exercise or allow the option to expire worthless.  
  
Premiums are priced per share. For example, the premium on an IBM option with a strike price of $205 might be quoted as $5.50, as shown in Figure 1. Since equity option contracts are based on 100 stock shares, this particular contract would cost the buyer $5.50 X 100, or $550 dollars. The buyer pays the premium whether or not the option is [exercised](http://www.investopedia.com/terms/e/exercise.asp) and the premium is non-refundable. The seller gets to keep the premium whether or not the option is exercised.

**1.2.4.1 Factors affecting Option Pricing**

There are six primary factors that influence option prices, as shown in Figure and discussed below. 

|  |
| --- |
| Six factors that affect option prices. |
| **Figure :** Six factors that affect option prices are shown on the top row. As indicated, the underlying price and strike price determine the intrinsic value; the time until expiration and volatility determine the probability of a profitable move; the interest rates determine the cost of money; and dividends can cause an adjustment to share price. |

**Underlying Price**The most influential factor on an option premium is the current market price of the [underlying asset](http://www.investopedia.com/terms/u/underlying-asset.asp). In general, as the price of the underlying increases, call prices increase and put prices decrease. Conversely, as the price of the underlying decreases, call prices decrease and put prices increase.

|  |  |  |
| --- | --- | --- |
| **If underlying prices ...** | **Call prices will ...** | **Put prices will ...** |
| Increase | Increase | Decrease |
| Decrease | Decrease | Increase |

**Expected Volatility**[Volatility](http://www.investopedia.com/terms/v/volatility.asp) is the degree to which price moves, regardless of direction. It is a measure of the speed and magnitude of the underlying's price changes. [Historical volatility](http://www.investopedia.com/terms/h/historicalvolatility.asp) refers to the actual price changes that have been observed over a specified time period. Option traders can evaluate historical volatility to [determine possible volatility in the future](http://www.investopedia.com/articles/06/historicalvolatility.asp). [Implied volatility](http://www.investopedia.com/terms/i/iv.asp), on the other hand, is a forecast of future volatility and acts as an indicator of the current market sentiment. While implied volatility is often difficult to quantify, option premiums will generally be higher if the underlying exhibits higher volatility, because it will have higher expected price fluctuations.

|  |
| --- |
| **The greater the expected volatility, the higher the option value** |

**Strike Price**The [strike price](http://www.investopedia.com/terms/s/strikeprice.asp) determines if the option has any [intrinsic value](http://www.investopedia.com/terms/i/intrinsicvalue.asp). Remember, intrinsic value is the difference between the strike price of the option and the current price of the underlying. The premium typically increases as the option becomes further in-the-money (where the strike price becomes more favorable in relation to the current underlying price). The premium generally decreases as the option becomes more out-of-the-money (when the strike price is less favorable in relation to the underlying). 

|  |
| --- |
| **Premiums increase as options become further in-the-money** |

**Time Until Expiration**The longer an option has until expiration, the greater the chance that it will end up [in-the-money](http://www.investopedia.com/terms/i/inthemoney.asp), or profitable. As expiration approaches, the option's time value decreases. In general, an option loses one-third of its time value during the first half of its life and two-thirds of its value during the second half. The underlying's volatility is a factor in time value; if the underlying is highly volatile, one could reasonably expect a greater degree of price movement before expiration. The opposite holds true where the underlying typically exhibits low volatility; the time value will be lower if the underlying price is not expected to move much.

|  |
| --- |
| **The longer the time until expiration, the higher the option price** |
| **The shorter the time until expiration, the lower the option price** |

**Interest Rate and Dividends**Interest rates and dividends also have small, but measurable, effects on option prices. In general, as interest rates rise, call premiums will increase and put premiums will decrease. This is because of the costs associated with owning the underlying; the purchase will incur either interest expense (if the money is borrowed) or lost interest income (if existing funds are used to purchase the shares). In either case, the buyer will have interest costs.

|  |  |  |
| --- | --- | --- |
| **If interest rates ...** | **Call prices will ...** | **Put prices will ...** |
| Rise | Increase | Decrease |
| Fall | Decrease | Increase |

Dividends can affect option prices because the underlying stock's price typically drops by the amount of any cash dividend on the [ex-dividend date](http://www.investopedia.com/terms/e/ex-dividend.asp). As a result, if the underlying's dividend increases, call prices will decrease and put prices will increase. Conversely, if the underlying's dividend decreases, call prices will increase and put prices will decrease. 

|  |  |  |
| --- | --- | --- |
| **If dividends ...** | **Call prices will ...** | **Put prices will ...** |
| Rise | Decrease | Increase |
| Fall | Increase | Decrease |

**1.3 Black Scholes Option Pricing Formula**

The **Black–Scholes equation** is a [partial differential equation](http://en.wikipedia.org/wiki/Partial_differential_equation), which describes the price of the option over time. The key idea behind the equation is that one can perfectly [hedge](http://en.wikipedia.org/wiki/Hedge_(finance)) the option by buying and selling the [underlying](http://en.wikipedia.org/wiki/Underlying) asset in just the right way and consequently “eliminate risk". This hedge, in turn, implies that there is only one right price for the option, as returned by the Black–Scholes formula. The Equation:

\frac{\partial V}{\partial t} + \frac{1}{2}\sigma^2 S^2 \frac{\partial^2 V}{\partial S^2} + rS\frac{\partial V}{\partial S} - rV = 0 (1.1)

### Derivation

The following derivation is given in [Hull's](http://en.wikipedia.org/wiki/John_C._Hull) *Options, Futures, and Other Derivatives*. That, in turn, is based on the classic argument in the original Black–Scholes paper.

Per the model assumptions above, the price of the [underlying asset](http://en.wikipedia.org/wiki/Underlying_asset) (typically a stock) follows a [geometric Brownian motion](http://en.wikipedia.org/wiki/Geometric_Brownian_motion). That is

\frac{dS}{S} = \mu \,dt + \sigma \,dW\, (1.2)

where *W* is [Brownian motion](http://en.wikipedia.org/wiki/Wiener_process). Note that *W*, and consequently its infinitesimal increment *dW*, represents the only source of uncertainty in the price history of the stock. Intuitively, *W(t)* is a [process](http://en.wikipedia.org/wiki/Random_process)that "wiggles up and down" in such a random way that its expected change over any time interval is 0. (In addition, its [variance](http://en.wikipedia.org/wiki/Variance) over time *T* is equal to *T*; see [Wiener process: Basic properties](http://en.wikipedia.org/wiki/Wiener_process#Basic_properties)); a good discrete analogue for *W* is a [simple random walk](http://en.wikipedia.org/wiki/Simple_random_walk). Thus the above equation states that the infinitesimal rate of return on the stock has an expected value of *μ dt* and a variance of \sigma^2 dt .

The payoff of an option V(S,T) at maturity is known. To find its value at an earlier time we need to know how V evolves as a function of S and t. By [Itō's lemma](http://en.wikipedia.org/wiki/It%C5%8D%27s_lemma) for two variables we have

dV = \left(\mu S \frac{\partial V}{\partial S} + \frac{\partial V}{\partial t} + \frac{1}{2}\sigma^2 S^2 \frac{\partial^2 V}{\partial S^2}\right)dt + \sigma S \frac{\partial V}{\partial S}\,dW (1.3)

Now consider a certain portfolio, called the [delta-hedge](http://en.wikipedia.org/wiki/Delta_hedging) portfolio, consisting of being short one option and long \frac{\partial V}{\partial S} shares at time t. The value of these holdings is

\Pi = -V + \frac{\partial V}{\partial S}S (1.4)

Over the time period [t,t+\Delta t], the total profit or loss from changes in the values of the holdings is:

\Delta \Pi = -\Delta V + \frac{\partial V}{\partial S}\,\Delta S (1.5)

Now discretize the equations for *dS/S* and *dV* by replacing differentials with deltas:

\Delta S = \mu S \,\Delta t + \sigma S\,\Delta W\, (1.6)

\Delta V = \left(\mu S \frac{\partial V}{\partial S} + \frac{\partial V}{\partial t} + \frac{1}{2}\sigma^2 S^2 \frac{\partial^2 V}{\partial S^2}\right)\Delta t + \sigma S \frac{\partial V}{\partial S}\,\Delta W (1.7)

and appropriately substitute them into the expression for \Delta \Pi:

\Delta \Pi = \left(-\frac{\partial V}{\partial t} - \frac{1}{2}\sigma^2 S^2 \frac{\partial^2 V}{\partial S^2}\right)\Delta t (1.8)

Notice that the \Delta W term has vanished. Thus uncertainty has been eliminated and the portfolio is effectively riskless. The rate of return on this portfolio must be equal to the rate of return on any other riskless instrument; otherwise, there would be opportunities for arbitrage. Now assuming the risk-free rate of return is r we must have over the time period [t,t+\Delta t]

r\Pi\,\Delta t = \Delta \Pi (1.9)

If we now equate our two formulas for \Delta\Pi we obtain:

\left(-\frac{\partial V}{\partial t} - \frac{1}{2}\sigma^2 S^2 \frac{\partial^2 V}{\partial S^2}\right)\Delta t = r\left(-V + S\frac{\partial V}{\partial S}\right)\Delta t (1.10)

Simplifying, we arrive at the celebrated Black–Scholes partial differential equation:

\frac{\partial V}{\partial t} + \frac{1}{2}\sigma^2 S^2 \frac{\partial^2 V}{\partial S^2} + rS\frac{\partial V}{\partial S} - rV = 0 (1.11)

With the assumptions of the Black–Scholes model, this second order partial differential equation holds for any type of option as long as its price function V is twice differentiable with respect to S and once with respect to t. Different pricing formulae for various options will arise from the choice of payoff function at expiry and appropriate boundary conditions.

The Black–Scholes formula calculates the price of [European](http://en.wikipedia.org/wiki/European_option) [put](http://en.wikipedia.org/wiki/Put_option) and [call options](http://en.wikipedia.org/wiki/Call_option). This price is [consistent](http://en.wikipedia.org/wiki/Consistency) with the Black–Scholes equation [as above](http://en.wikipedia.org/wiki/Black%E2%80%93Scholes#The_Black.E2.80.93Scholes_equation_and_its_derivation); this follows since the formula can be obtained [by solving](http://en.wikipedia.org/wiki/Equation_solving#Differential_equations) the equation for the corresponding terminal and boundary conditions.

The value of a call option for a non-dividend-paying underlying stock in terms of the Black–Scholes parameters is:

(1.12)

\begin{align}
  C(S, t) &= N(d_1)S - N(d_2) Ke^{-r(T - t)} \\
     d_1 &= \frac{1}{\sigma\sqrt{T - t}}\left[\ln\left(\frac{S}{K}\right) + \left(r + \frac{\sigma^2}{2}\right)(T - t)\right] \\
     d_2 &= \frac{1}{\sigma\sqrt{T - t}}\left[\ln\left(\frac{S}{K}\right) + \left(r - \frac{\sigma^2}{2}\right)(T - t)\right] \\
         &= d_1 - \sigma\sqrt{T - t}
\end{align}

(1.14)

(1.13)

The price of a corresponding [put option](http://en.wikipedia.org/wiki/Put_option) based on [put-call parity](http://en.wikipedia.org/wiki/Put-call_parity) is:

\begin{align}
  P(S, t) &= Ke^{-r(T - t)} - S + C(S, t) \\
          &= N(-d_2) Ke^{-r(T - t)} - N(-d_1) S
\end{align}\, (1.15)

The model makes certain assumptions, including:

* The options are European and can only be exercised at expiration
* No dividends are paid out during the life of the option
* Efficient markets (i.e., market movements cannot be predicted)
* No commissions
* The risk-free rate and volatility of the underlying are known and constant
* Follows a lognormal distribution; that is, returns on the underlying are normally distributed.

1. **REVIEW OF LITERATURE – RESEARCH STUDIES**

There are many studies about the Black - Scholes model and some of the studies referred are listed below.

The authors Black, Fisher, and Scholes ,Myron, themselves admitted some biases of the model in their research paper, “*The Valuation of Option Contracts and a Test of Market Efficiency”***,** expressed as “Using the past data to estimate the variance caused the model to overprice options on high variance stocks and underprice options on low variance stocks. While the model tends to overestimate the value of an option on a high variance security, market tends to underestimate the value, and similarly while the model tends to underestimate the value of an option on a low variance security, market tends to overestimate the value”.

During 1979, Macbeth, James D., and Merville, Larry J. in their research paper, “An Empirical Examination of the Black - Scholes Call Option pricing Model” revealed that B-S model predicted prices are on average less (greater) than market prices for in the money options (out of the Money) and also had biases over the life of the options also. This study has some coincidences and differences with the above findings which are also explained in this chapter.

LIU, JINLIN, while researching the topic, “An Empirical Investigation of Option Bounds Method”, opined that the BS formula worked better as a whole than the Option Bounds Method. This phenomenon is interesting because although one key assumption of BS’ is untrue, BS still works well for real data of options. One possible explanation is that too many participants in the market are using BS formula to price the options. Even when BS cannot work well in reality, they apply something as OAS to modify the results. However, the modifiers are still are based on the BS method. Consequently, the BS method would fit the price in the market well.

Fortune, Peter , in his series of Federal Reserve Bank of Boston studies titled “Anomalies in option pricing: the Black-Scholes model revisited” published in New England Economic Review, March-April, 1996, had concluded that “the combined results suggest a 10 to 100 percent error for calls”. He also added “In summary, the probability distribution of the change in the logarithm of the S&P 500 does not conform strictly to the normality assumption. Not only is the distribution thicker in the middle than the normal distribution, but it also shows more large changes (either up or down) than the normal distribution. Furthermore, the distribution seems to have shifted over time. After the Crash an increase in the kurtosis and a shift in skewness occurred”

Ball, Clifford A. and Torous, Walter N. during their study, "On Jumps in Common Stock Prices and Their Impact on Call Option Pricing," compared between Merton’s Jump- diffusion model and the Black - Scholes model. They observed that there were no operationally significant differences in the models.

Empirical evidences confirm the systematic mispricing of the Black - Scholes call option pricing Model. These biases have been documented with respect to the call option’s exercise price, its time to expiration, and the underlying common stock’s volatility. Black reports that the model over prices the deep in-the-money options, while it underprices deep out-the-money options. By contrast, Macbeth, James D. and Merville, Larry J. state that deep in-the-money options have model prices that are lower than the market prices, whereas, deep out -the-money options have model prices that are higher. These conflicting results may perhaps be reconciled by the fact that the studies examined market prices at different point in time and these systematic errors vary with time.

1. **Objective of the study**

**3.1 Test for the Black Scholes model.**

Our approach will be structured in two parts. The first part will focus on estimating the daily implicit volatilities and comparison of the model’s prediction with historical data to determine its accuracy. In the second part the assumptions made in developing the model will be assessed to determine whether they are consistent with observed behaviour and historical data.

The main objective of this research is to make an empirical study of black scholes option pricing model in Indian banking stocks call option market and to make comparison in result of private and public banks. And To find an improvement in the model for better prediction ability, if possible.

**Sub-Objetives:**

* 1. To measure the variation in the call option price in the market from the theoretical calculation through the model.
  2. To analyze various assumptions of the model.
  3. To make comparison between the results of public and private banks.
  4. To statistically test the deviation obtained between call option market price and theoretical value as obtained from BS model
  5. **Need for the study**

Once the investor decided to cap the downside risk of his investment, using options, the next question arises that what is the premium to be paid or the price to be given to enjoy such a risk management tool. This price shall be logical and correct to make a decision of buying or selling an option. The question of pricing the asset can be done in any number of ways. But the investor - friendly, parsimonious method of option pricing is the Black - Scholes option pricing model. Universally this model is used in all the leading option exchanges including the developed nations like USA, UK, Japan and emerging nations like India, China etc.

1. **Research Methodology**

**4.1 Introduction**

This chapter deals with the research methodology and research design. More precisely covers tests to be conducted for predictability and validity of assumptions. Data collection, editing, categorization and the rationalization of each step are explained. It also covers the analysis method.

* 1. **The DATA**

**4.2.1 Option Data**

This research mainly depends on the secondary data from exchange-traded options in India. There are two stock exchanges viz. Bombay Stock Exchange (BSE) and National Stock Exchange (NSE) that are trading derivatives in India. The volume of cash market of BSE is about two third lower than the NSE volume. In derivative segment, the volume of trading in BSE is negligible and almost all the derivatives (99%) are traded only in NSE.

**4.2.2 Share price Data**

As the volatility of returns of the stock prices are to be calculated, stock prices of the 10 banks were downloaded. On a safer side, stock prices were downloaded from 20-04-2011 to 28-04-2013 from NSE web site. For the 10 banks almost about 15,000 price data were collected.

**4.2.3 Risk free rate of Interest**

In all the developed nations where options are traded in exchanges, risk-free rate of interest is calculated by the yield of the Treasury Bills which will mature as on the same date of expiration of the options. But in India, the Treasury Bills market is not matured and deep, the NSE itself uses the MIBOR and MIBID rates as the risk-free rate of interest. Hence his study also uses the same for research. Risk free rate of interest is taken as 9.12 for 2011-12 as given on NSE website and for simplification same rate is used for 2012-13.

* 1. **The Sample**

Research has been conducted on five Public sector banks and five Private sector banks, As five banks in each sector can give good proxy of these sectors. Banks in the each sector were chosen by convenience sampling method based on the availability of data.

For each bank approximately 10,000 data was available which was further filtered and reduced to around 1500 and from that 200 data was obtained using random sampling method. Thus the test has been conducted on 200 data for each bank.

**4.4 Research Design**

**4.4.1 Test for the Black-Scholes Model**

This empirical study is planned in such a way that it addresses the question of how well the best-known option pricing model - the Black-Scholes model works.

A long tradition in economics focuses on the first type of tests, arguing that "the proof is in the pudding." It is argued that any theory requires assumptions that might be judged "unrealistic," and that if we focus on the assumptions, we can end up with no foundations for deriving the generalizations that make theories useful. The only proper test of a theory lies in its predictive ability. The theory that consistently predicts best is the best theory, regardless of the assumptions required to generate the theory.

Tests based on assumptions are justified by the principle of “garbage-in garbage-out”. This approach argue that no theory derived from invalid assumptions can be valid. Even if it appears to have predictive abilities those can slip away quickly when changes in the environment make the invalid assumptions more pivotal.

Our Analysis takes an agnostic position on this methodological debate, looking at both prediction and assumptions of the black-Scholes model.

**4.4.2 Analysis of assumptions.**

The model is built on the following main assumptions.

1. Stock prices follow random walk.

2. Stock returns are log normally distributed.

3. Continuous time frame is assumed.

4. Continuous compounded risk free interest rate **r** and volatility **σ** of the log returns on the stock are constant throughout the life of the options.

5. No taxation and transaction cost and stocks are perfectly divisible.

6. Options are European and stocks pay no dividend.

7. There are no risk-less arbitrage opportunities.

**4.4.3 Statistical testing of Deviation by one sample T-Test**

One sample t-test is a statistical procedure often performed for testing the mean value of a distribution. It can be used under the assumption that sampled distribution is normal. For large samples, the procedure often performs well even for non-normal populations.

This is used to compare the mean of one variable with a known or hypothesised value.  In other words, the One-sample t tests procedure tests whether the mean of a single variable differs from a specified constant.

**Hypothesis:**

Null Hypothesis Ho: Deviations are nearly equal to zero.

Alternate Hypothesis H1: Deviations are not equal to zero.

**P value**: The p stands for probability therefore the p-value is a probability value between zero and one. It helps you to draw conclusion about statistics you perform. The three common situations are:

1. If the p-value is greater than 0.05, the null hypothesis is accepted and the result is not significant.
2. If the p-value is less than 0.05 but greater than 0.01, the null hypothesis is rejected and the result is significant beyond the 5 percent level.
3. If the p-value is smaller than 0.01, the null hypothesis is rejected and the result is significant beyond the 1 percent level.

**5. Analysis and Results**

This Section critically analysis various assumptions of the model, Analysis of the deviation between the market price of the stock option and theoretical price as obtained by the model, Statistical measure of applicability of BS Model.

**5.1 Analyzing the main assumptions of BS Model**

**5.1.1 Stock prices follow random walk**

The stock prices are not predictable and they follow random walk. The basics of this argument being efficient market theory. Most of the times, investment banks, stock brokers, financial advisors, and equity researchers use the technical analysis to predict the movement of the prices. Many famous techniques of Technical analysis such as Exponential Moving Averages (EMA), Moving Averages Convergences and Divergences (MACD), Rate of Change (ROC), and Relative Strength Index (RSI) are used to predict the future stock prices. Hence these techniques are used to test the random walk theory.

**5.1.2 Stock returns are log-normally distributed**

The meaning is that the returns of the stock prices should be lognormally distributed. Otherwise, the natural logarithms of the stock returns are to be normally distributed. Normality can be tested using quick exploratory check and a formal test.

In addition, it can be tested with more resistant order-based statistics such as median, upper, lower quartiles , and Bowley’s Coefficient of Skewness. Finding the skewness and kurtosis will check the normality assumption. SAS package is used for the above analysis for calculation and drawing of charts like Histograms, Box-plot, normal percentile and normal quartiles.

**5.1.3 Options are European and stocks pay no dividend.**

European options mean they can be exercised only on the expiration day and not before. Actually the options offered by NSE can be exercised any time during the life of the options and hence, they are American in nature. Hence, to make the American type stock options suitable to be used in Black - Scholes model,

• The arbitrage opportunities are to be taken off from the sample.

• The options having dividend payment during the life of the options are removed from the sample.

If, the options satisfy the above two conditions, then, Black - Scholes model can be used for American type options, theoretically, as it will be never optimal to exercise it early. This is explained clearly by Hull, John C in his book Options, Futures and Other Derivatives, 5e, in pages 175 to 177.

Accordingly, the research is so planned that it will collect all the dividend details like record dates, ex-dividend dates, and dates of the board meeting announcing the dividend for each stock have been collected. From the above data, the stocks with cum-dividends are found and the options having of such stocks in their lives are found and taken away from the samples. This is a very tedious process for which separate software has been developed using dotnet.

All options should follow the boundary condition of the model. That is the call option price should be greater than the lower boundary of So - X e-rt. Any option which violates it will have a risk-free arbitrage opportunity. As the model assumes no that the options have no arbitrage opportunities they are found and taken off from the sample.

**5.2 Volatility calculation**

The call options under study have the underlying assets as the shares of the companies mentioned above in the table. One of the five variables of the BS option pricing is the volatility (standard deviation) of the stock returns. As per the model, volatility is calculated using the historical stock prices. When company exercise stock splits or issue bonus shares, the stock prices have to be adjusted for when calculating the returns.

* + 1. **Method of calculating volatility**

Annualized volatility: Annualized volatility describes the variation in an asset's value over the course of a year. This measure indicates the level of risk associated with an investment. standard deviation of the stock's daily returns for whatever period is calculated.

The standard deviation of this set of daily data point is then annualized using the no. of trading days in a year:-

StdDev(annualized) = StdDev \*SQRT(252)

**Table 5.1: Volatility calculation of Public Sector Banks**

|  |  |  |
| --- | --- | --- |
|  | **Bank of India** |  |
| Year | **Annualized Volatility** | **stdDEV %** |
| 2011-12 | 2.0716 | 0.1305 |
| 2012-13 | 1.6112 | 0.1015 |
|  | **State Bank of India** |  |
| Year | **Annualized Volatility** | **stdDEV %** |
| 2011-12 | 2.1255 | 0.1339 |
| 2012-13 | 1.215 | 0.0766 |
|  | **Punjab National Bank** |  |
| Year | **Annualized Volatility** | **stdDEV %** |
| 2011-12 | 1.5763 | 0.0993 |
| 2012-13 | 1.3175 | 0.0830 |
|  | **Syndicate Bank** |  |
| Year | **Annualized Volatility** | **stdDEV %** |
| 2011-12 | 1.8541 | 0.1168 |
| 2012-13 | 2.0620 | 0.1299 |
|  | **Andhra Bank** |  |
| Year | **Annualized Volatility** | **stdDEV %** |
| 2011-12 | 2.1143 | 0.133196 |
| 2012-13 | 2.1143 | 0.133196 |

**Table 5.2: Volatility calculation of Private Sector Banks.**

|  |  |  |
| --- | --- | --- |
|  | **HDFC BANK** |  |
| Year | **Annualized Volatility** | **stdDEV %** |
| 2011-12 | 13.6727 | 0.8613 |
| 2012-13 | 1.54122 | 0.0971 |
|  | **Yes Bank** |  |
| Year | **Annualized Volatility** | **stdDEV %** |
| 2011-12 | 1.7338 | 0.109222 |
| 2012-13 | 2.5101 | 0.158122 |
|  | **Axis Bank** |  |
| Year | **Annualized Volatility** | **stdDEV %** |
| 2011-12 | 1.8920 | 0.119194 |
| 2012-13 | 2.1652 | 0.13648 |
|  | **ICICI Bank** |  |
| Year | **Annualized Volatility** | **stdDEV %** |
| 2011-12 | 2.0901 | 0.131666 |
| 2012-13 | 1.9589 | 0.123401 |
|  | **IDBI Bank** |  |
| Year | **Annualized Volatility** | **stdDEV %** |
| 2011-12 | 2.3927 | 0.150753 |
| 2012-13 | 2.4275 | 0.15292 |

* 1. **Theoretical calculation of Call Option Price using BS Model**

Theoretical Price of stock options are calculated using Black Scholes Call option pricing formula and it is compared with the settle price of these options to find out the deviation in two. The Deviation in theoretical Price and Settle market price shows how accurately the model predicts the price of call options of Indian Banking Sector.

**Table 5.3: Deviation between Settle Price and Theoretical Price**

|  |  |  |  |
| --- | --- | --- | --- |
| **Bank** | **Settle Price** | **Theoretical Price** | **Deviation** |
| **Andhra Bank** | 24.90296 | 24.32483 | -0.57812 |
| **Bank of India** | 60.40415 | 56.75292 | -3.65122 |
| **PNB** | 220.5277 | 216.6589 | -3.86878 |
| **SBI** | 473.9199 | 466.8453 | -4.63138 |
| **Syndicate Bank** | 23.06699 | 22.0999 | -0.96709 |
| **Axis Bank** | 383.1628 | 376.8145 | -6.34828 |
| **HDFC Bank** | 199.7764 | 203.656 | 3.879563 |
| **ICICI Bank** | 218.1037 | 2132339 | -4.8698 |
| **IDBI Bank** | 15.52843 | 14.91808 | -0.61035 |
| **Yes Bank** | 71.20777 | 69.01569 | -2.19207 |

**5.4 Statistical Testing of the Deviation**

Statistical measures such as mean and standard deviation to predict the applicability of black Scholes model in Indian Banking sector stocks.

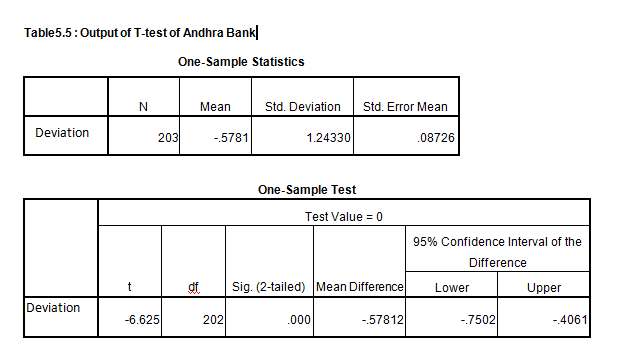
**Table 5.4: P-Value, Mean and Standard deviation of deviation**.

|  |  |  |  |
| --- | --- | --- | --- |
| Banks | Mean of deviation from theoretical price | Standard Deviation of deviation from theoretical price | p-value |
| **Public Banks** |  |  |  |
| Andhra bank | -0.57812 | 1.2432 | 0.000 |
| Bank of India | -3.6512 | 6.1498 | 0.000 |
| Punjab National Bank | -3.86878 | 9.9185 | 0.000 |
| State bank of India | -4.63138 | 38.900 | 0.091 |
| Syndicate Bank | -0.96709 | 1.495675 | 0.000 |
| **Private Banks** |  |  |  |
| Axis Bank | -6.3482 | 13.95704 | 0.000 |
| HDFC | 3.879 | 8.4596 | 0.000 |
| ICICI Bank | -4.8698 | 9.09647 | 0.000 |
| IDBI | -0.61035 | 1.025633 | 0.000 |
| Yes Bank | -2.19207 | 3.350767 | 0.000 |

For both the public and private banks deviation from the theoretical price is nearly the same. Hence no special factor can be determined which effect the call option price of either public bank or the private bank.

P-Value of all the banks is 0.000 except that of SBI. As P-Value is less than 0.05 null hypothesis is rejected i.e deviation is not equal to zero. Thus the deviation is significant, level of significance of deviation is 95%. Only deviation for SBI bank is not significant.

**5.4.1 Output of T-Test**

****

Output tells us that with 203 observations (N), the mean of deviation is -0.5781 and the standard deviation of the number of deviation is 1.2433. The standard error of the mean (the standard deviation of the sample distribution of mean) is 0.08726(1.2433/sq root of 203)

Degree of freedom is 202 degree and p-value is 0.000 which is less than 0.05 thus we reject the null hypothesis i.e deviation is not equal to 0. Thus deviation between market settle price and theoretical price is significant.

1. **Conclusion and Recommendation**
   1. **Conclusion:**

Tests conducted on Stock Option pricing shows that Difference in market stock option price and theoretical price is not very huge but difference is prevailing between the two. Thus Black Scholes Model is approximately predicting the stock option price of Indian Banking Sector.

The Deviation calculated between the actual and theoretical price was further tested to test its significance level using one sample T-Test, the result of the test shows that deviation is significant.

**6.2 Recommendation:**

The BS model is the most recommended model for predicting the call option price of Indian Banking Sector. Thus banks can use BS model to price the stocks in derivative market, and they should try to minimise the difference between actual pricing and pricing by BS model as difference in price may represent inefficient pricing of stock.

The investors / academicians need not waste time in predicting the future stock prices using technical analysis etc, as it is proved futile. They may watch fundamentals of the economy, industry and company before decision making. The investors may concentrate on the volatility of the stock returns.

**6.3 Limitations:**

This research covers only Indian baking sector, so the conclusion is limited to the banking sector stocks and the time period which is selected is from 2010- 2012, it is covering only 2 year data. The data is obtained from NSE website so the credibility is dependent upon the data provided by them. 10 Banks in total out of which 5 are public bank and 5 are private banks were chosen due to limitation of availability of data and time limitation for the study.

1. **BIBLIOGRAPHY/REFERENCES**

* “The Valuation of Option Contracts and a Test of Market Efficiency” by Black, Fisher and schools
* Research paper, “An Empirical Examination of the Black - Scholes Call Option pricing Model” by Macbeth, James D., and Merville, Larry J
* “An Empirical Investigation of Option Bounds Method” by LIU, JINLIN.
* "On Jumps in Common Stock Prices and Their Impact on Call Option Pricing," by Ball, Clifford A. and Torous, Walter N
* The concise encyclopedia of economics- Future and option markets by Gregory J.Millman
* Empirical study of the Black-Scholes European option pricing formula in pricing the stock call: options in Indian stock option market by Nagendran, R.
* Hull, John C in his book Options, Futures and Other Derivatives

# Options Basics Investopedia

* Options Pricing Investopedia
* <http://www.wikipedia.org/>

**Annexures**

**Data for Public Sector Banks**

1. **SBI Bank**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Symbol | Date | Expiry | Strike Price | Settle Price | Underlying Value | Value of call option | Deviation |
| SBIN | 29-Dec-11 | 23-Feb-12 | 1150 | 498.4 | 1628.85 | 494.8291 | 494.8291 |
| SBIN | 8-Nov-11 | 25-Jan-12 | 1250 | 772.95 | 1997.3 | 771.4258 | -1.52422 |
| SBIN | 28-Nov-11 | 25-Jan-12 | 2400 | 13.85 | 1779.6 | 9.19E-09 | -13.85 |
| SBIN | 2-Jun-11 | 28-Jul-11 | 3100 | 9.35 | 2334.2 | 4.54E-08 | -9.35 |
| SBIN | 13-Jun-11 | 25-Aug-11 | 1750 | 510.4 | 2219.95 | 501.5807 | -8.81934 |
| SBIN | 2-Mar-12 | 29-Mar-12 | 1100 | 1155 | 2246.7 | 1154.096 | -0.90404 |
| SBIN | 17-May-11 | 30-Jun-11 | 2000 | 460.7 | 2414.7 | 436.5675 | -24.1325 |
| SBIN | 15-Sep-11 | 24-Nov-11 | 1400 | 529.45 | 1898.05 | 522.3237 | -7.12632 |
| SBIN | 5-Jul-11 | 28-Jul-11 | 1700 | 782.75 | 2473.3 | 783.0416 | 0.291625 |
| SBIN | 20-May-11 | 28-Jul-11 | 1800 | 570.75 | 2320.45 | 551.217 | -19.533 |
| SBIN | 22-Nov-11 | 25-Jan-12 | 2400 | 7.15 | 1689.5 | 6.7E-11 | -7.15 |
| SBIN | 23-Feb-12 | 26-Apr-12 | 1200 | 1081.45 | 2260.5 | 1079.242 | -2.20825 |
| SBIN | 21-Dec-11 | 29-Dec-11 | 1250 | 376.2 | 1623.5 | 375.9961 | -0.20387 |
| SBIN | 5-Sep-11 | 25-Oct-11 | 2700 | 2.4 | 2006.55 | 4.53E-10 | -2.4 |
| SBIN | 28-Dec-11 | 29-Dec-11 | 1250 | 360.55 | 1610.2 | 360.5123 | -0.03771 |
| SBIN | 20-Jul-11 | 29-Sep-11 | 1750 | 753.1 | 2471.4 | 752.1717 | -0.92828 |
| SBIN | 29-Mar-12 | 31-May-12 | 1250 | 835.65 | 2061.35 | 830.8727 | -4.77735 |
| SBIN | 17-Jun-11 | 25-Aug-11 | 1750 | 499.4 | 2213.1 | 493.0124 | -6.38763 |
| SBIN | 21-Feb-12 | 26-Apr-12 | 1100 | 1372.2 | 2452.45 | 1370.171 | -2.02909 |
| SBIN | 26-Oct-11 | 25-Jan-12 | 1800 | 221.15 | 1866.65 | 115.8435 | -105.307 |
| SBIN | 17-Jun-11 | 28-Jul-11 | 3000 | 0.4 | 2213.1 | 5.37E-13 | -0.4 |
| SBIN | 18-Nov-11 | 29-Dec-11 | 2500 | 1.3 | 1726.65 | 2.71E-19 | -1.3 |
| SBIN | 2-May-11 | 28-Jul-11 | 2050 | 695.1 | 2692.7 | 686.7822 | -8.3178 |
| SBIN | 5-Sep-11 | 29-Sep-11 | 1450 | 565.1 | 2006.55 | 565.2192 | 0.119214 |
| SBIN | 22-Nov-11 | 24-Nov-11 | 1150 | 540.1 | 1689.5 | 540.0745 | -0.02546 |
| SBIN | 7-Oct-11 | 25-Oct-11 | 1200 | 557.75 | 1752.3 | 557.6849 | -0.06508 |
| SBIN | 6-Mar-12 | 29-Mar-12 | 1200 | 955.95 | 2147.85 | 954.7264 | -1.22356 |
| SBIN | 26-May-11 | 30-Jun-11 | 2950 | 2.55 | 2188.3 | 8.85E-15 | -2.55 |
| SBIN | 6-Feb-12 | 26-Apr-12 | 1100 | 1086.35 | 2162.65 | 1084.42 | -1.93036 |
| SBIN | 7-Mar-12 | 31-May-12 | 1300 | 876.55 | 2141.55 | 868.8687 | -7.68127 |
| SBIN | 25-Oct-11 | 29-Dec-11 | 1200 | 661.05 | 1839.8 | 659.1319 | -1.9181 |
| SBIN | 14-Jun-11 | 30-Jun-11 | 1750 | 487.45 | 2230.25 | 487.2322 | -0.2178 |
| SBIN | 19-Sep-11 | 25-Oct-11 | 2750 | 0.55 | 1916.95 | 6.31E-21 | -0.55 |
| SBIN | 16-Jan-12 | 29-Mar-12 | 1100 | 738 | 1816.4 | 736.2821 | -1.71788 |
| SBIN | 21-Feb-12 | 29-Mar-12 | 2350 | 190 | 2452.45 | 127.4388 | -62.5612 |
| SBIN | 24-Aug-11 | 25-Oct-11 | 1650 | 376.7 | 1989.75 | 365.1143 | -11.5857 |
| SBIN | 30-Dec-11 | 23-Feb-12 | 2450 | 1.45 | 1619.05 | 7.96E-18 | -1.45 |
| SBIN | 3-Jun-11 | 30-Jun-11 | 1700 | 623.85 | 2312.5 | 623.9301 | 0.080113 |
| SBIN | 21-Dec-11 | 25-Jan-12 | 2500 | 0.45 | 1623.5 | 9.24E-31 | -0.45 |
| SBIN | 16-Dec-11 | 29-Dec-11 | 1250 | 433.35 | 1679.1 | 433.1537 | -0.19631 |
| SBIN | 13-Jun-11 | 30-Jun-11 | 1750 | 477.45 | 2219.95 | 477.3677 | -0.08234 |
| SBIN | 19-Jan-12 | 29-Mar-12 | 1150 | 755.9 | 1884.3 | 754.2391 | -1.66091 |
| SBIN | 15-Jun-11 | 30-Jun-11 | 1750 | 439.25 | 2182.5 | 439.0466 | -0.20337 |
| SBIN | 6-May-11 | 28-Jul-11 | 2050 | 655 | 2649.9 | 641.9764 | -13.0236 |
| SBIN | 27-Sep-11 | 24-Nov-11 | 1500 | 525.05 | 1997.3 | 518.8813 | -6.16867 |
| SBIN | 19-Jul-11 | 28-Jul-11 | 1700 | 816.4 | 2512.65 | 816.4686 | 0.068609 |
| SBIN | 16-Aug-11 | 29-Sep-11 | 1900 | 323.65 | 2196.95 | 317.7254 | -5.92462 |
| SBIN | 16-Nov-11 | 25-Jan-12 | 1250 | 544.65 | 1765.95 | 537.6229 | -7.02707 |
| SBIN | 14-Dec-11 | 29-Dec-11 | 1250 | 540.05 | 1785.15 | 539.8262 | -0.22384 |
| SBIN | 14-Feb-12 | 26-Apr-12 | 1150 | 1072.75 | 2200.15 | 1070.654 | -2.09633 |

1. **Syndicate Bank**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Symbol | Date | Expiry | Strike Price | Settle Price | Underlying Value | Value of call option | Deviation |
| SYNDIBANK | 3-Jan-12 | 23-Feb-12 | 75 | 7.2 | 73.85 | 1.176399 | -6.0236 |
| SYNDIBANK | 7-Mar-12 | 31-May-12 | 140 | 4.05 | 110.45 | 8.61E-05 | -4.04991 |
| SYNDIBANK | 29-Sep-11 | 24-Nov-11 | 130 | 1.45 | 103.35 | 9.82E-07 | -1.45 |
| SYNDIBANK | 16-Feb-12 | 23-Feb-12 | 135 | 0.1 | 116.45 | 7.45E-21 | -0.1 |
| SYNDIBANK | 8-Jul-11 | 25-Aug-11 | 110 | 11.45 | 118.75 | 10.09109 | -1.35891 |
| SYNDIBANK | 16-Dec-11 | 29-Dec-11 | 100 | 0.3 | 89.4 | 1.16E-07 | -0.3 |
| SYNDIBANK | 12-Jan-12 | 23-Feb-12 | 80 | 8.45 | 82.95 | 3.966379 | -4.48362 |
| SYNDIBANK | 19-Sep-11 | 24-Nov-11 | 130 | 1.85 | 102.3 | 3.18E-06 | -1.85 |
| SYNDIBANK | 10-Oct-11 | 29-Dec-11 | 50 | 52.2 | 101.15 | 52.13953 | -0.06047 |
| SYNDIBANK | 1-Feb-12 | 29-Mar-12 | 70 | 29.45 | 97.8 | 28.78989 | -0.66011 |
| SYNDIBANK | 9-Nov-11 | 29-Dec-11 | 80 | 24.3 | 102.95 | 23.94323 | -0.35677 |
| SYNDIBANK | 5-Sep-11 | 24-Nov-11 | 140 | 1.9 | 102.55 | 4.05E-08 | -1.9 |
| SYNDIBANK | 17-May-11 | 30-Jun-11 | 100 | 14.3 | 112.1 | 13.19442 | -1.10558 |
| SYNDIBANK | 13-Feb-12 | 29-Mar-12 | 120 | 0.9 | 115.45 | 0.706784 | -0.19322 |
| SYNDIBANK | 21-Oct-11 | 24-Nov-11 | 65 | 37.25 | 101.65 | 37.19986 | -0.05014 |
| SYNDIBANK | 24-Oct-11 | 29-Dec-11 | 50 | 51.5 | 100.65 | 51.46779 | -0.03221 |
| SYNDIBANK | 20-Dec-11 | 25-Jan-12 | 90 | 2.25 | 78.3 | 0.000124 | -2.24988 |
| SYNDIBANK | 19-Aug-11 | 29-Sep-11 | 80 | 16.95 | 95.15 | 15.96537 | -0.98463 |
| SYNDIBANK | 21-Mar-12 | 31-May-12 | 140 | 4.3 | 115.15 | 0.000396 | -4.2996 |
| SYNDIBANK | 18-Jul-11 | 28-Jul-11 | 130 | 0.15 | 120.6 | 4.18E-05 | -0.14996 |
| SYNDIBANK | 4-Nov-11 | 24-Nov-11 | 55 | 51.35 | 106.05 | 51.32416 | -0.02584 |
| SYNDIBANK | 26-Sep-11 | 24-Nov-11 | 130 | 1.2 | 100.3 | 6.54E-08 | -1.2 |
| SYNDIBANK | 5-Dec-11 | 23-Feb-12 | 65 | 38.75 | 102.35 | 38.63639 | -0.11361 |
| SYNDIBANK | 8-Dec-11 | 23-Feb-12 | 60 | 40.4 | 99.15 | 40.29333 | -0.10667 |
| SYNDIBANK | 4-Jul-11 | 29-Sep-11 | 200 | 0 | 119.75 | 1.5E-18 | 1.5E-18 |
| SYNDIBANK | 10-Aug-11 | 29-Sep-11 | 120 | 4 | 113.65 | 0.43005 | -3.56995 |
| SYNDIBANK | 3-Mar-12 | 29-Mar-12 | 70 | 39.6 | 109.05 | 39.50328 | -0.09672 |
| SYNDIBANK | 27-May-11 | 25-Aug-11 | 200 | 0 | 113.85 | 1.85E-21 | 1.85E-21 |
| SYNDIBANK | 26-Jul-11 | 29-Sep-11 | 50 | 71.2 | 120.35 | 71.1555 | -0.0445 |
| SYNDIBANK | 16-May-11 | 26-May-11 | 110 | 5.55 | 114.3 | 4.587051 | -0.96295 |
| SYNDIBANK | 21-Jun-11 | 28-Jul-11 | 120 | 1.05 | 111.45 | 0.067137 | -0.98286 |
| SYNDIBANK | 22-Nov-11 | 25-Jan-12 | 60 | 40.3 | 99.3 | 40.25184 | -0.04816 |
| SYNDIBANK | 22-Sep-11 | 29-Sep-11 | 70 | 31.1 | 100.95 | 31.07233 | -0.02767 |
| SYNDIBANK | 6-Feb-12 | 29-Mar-12 | 85 | 20.1 | 102.1 | 18.19725 | -1.90275 |
| SYNDIBANK | 3-Nov-11 | 24-Nov-11 | 50 | 54.55 | 104.25 | 54.51167 | -0.03833 |
| SYNDIBANK | 11-Aug-11 | 29-Sep-11 | 170 | 0 | 112.75 | 1.5E-21 | 1.5E-21 |
| SYNDIBANK | 28-Oct-11 | 29-Dec-11 | 125 | 3.8 | 109.5 | 0.01273 | -3.78727 |
| SYNDIBANK | 23-Jun-11 | 25-Aug-11 | 50 | 62.15 | 111.3 | 62.08091 | -0.06909 |
| SYNDIBANK | 26-May-11 | 28-Jul-11 | 70 | 42.2 | 111.05 | 42.14327 | -0.05673 |
| SYNDIBANK | 23-Nov-11 | 25-Jan-12 | 60 | 36.85 | 95.85 | 36.78709 | -0.06291 |
| SYNDIBANK | 16-Feb-12 | 29-Mar-12 | 160 | 0.4 | 116.45 | 1.5E-15 | -0.4 |
| SYNDIBANK | 20-Jul-11 | 29-Sep-11 | 50 | 70.5 | 119.6 | 70.47919 | -0.02081 |
| SYNDIBANK | 23-May-11 | 26-May-11 | 110 | 3 | 110.1 | 0.556673 | -2.44333 |
| SYNDIBANK | 27-Jul-11 | 25-Aug-11 | 130 | 2.35 | 121 | 0.036408 | -2.31359 |
| SYNDIBANK | 8-Nov-11 | 25-Jan-12 | 130 | 2.1 | 105.95 | 0.000417 | -2.09958 |
| SYNDIBANK | 12-Oct-11 | 29-Dec-11 | 50 | 54.55 | 103.55 | 54.51503 | -0.03497 |
| SYNDIBANK | 7-Feb-12 | 26-Apr-12 | 140 | 3.05 | 106.7 | 1.79E-06 | -3.05 |
| SYNDIBANK | 5-Oct-11 | 24-Nov-11 | 80 | 19.15 | 97.15 | 18.14324 | -1.00676 |
| SYNDIBANK | 22-Nov-11 | 24-Nov-11 | 85 | 14.35 | 99.3 | 14.34247 | -0.00753 |
| SYNDIBANK | 16-Nov-11 | 24-Nov-11 | 70 | 31.1 | 100.95 | 31.08978 | -0.01022 |

1. **Punjab National Bank**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Symbol | Date | Expiry | Strike Price | Settle Price | Underlying Value | Value of call option | Deviation |
| PNB | 8-Feb-13 | 28-Feb-13 | 520 | 344.95 | 862.55 | 345.1421 | 0.192093 |
| PNB | 13-Nov-12 | 29-Nov-12 | 520 | 249.35 | 767.4 | 249.4747 | 0.12471 |
| PNB | 6-Dec-12 | 31-Jan-13 | 480 | 349.4 | 823 | 349.6695 | 0.269548 |
| PNB | 13-Jun-12 | 28-Jun-12 | 500 | 316.1 | 814.15 | 316.0205 | -0.07953 |
| PNB | 18-Apr-13 | 30-May-13 | 1080 | 0.15 | 766.5 | 3.18E-11 | -0.15 |
| PNB | 29-Oct-12 | 31-Jan-13 | 740 | 86.5 | 755.35 | 41.60001 | -44.9 |
| PNB | 19-Jul-12 | 30-Aug-12 | 1060 | 0.85 | 823.7 | 3.2E-06 | -0.85 |
| PNB | 4-Jan-13 | 31-Jan-13 | 480 | 431.15 | 908.1 | 431.3273 | 0.177326 |
| PNB | 3-May-12 | 26-Jul-12 | 1160 | 3.15 | 843.8 | 0.000121 | -3.14988 |
| PNB | 6-Sep-12 | 25-Oct-12 | 1080 | 0 | 666.35 | 1.14E-18 | 1.14E-18 |
| PNB | 1-Feb-13 | 28-Mar-13 | 1060 | 24.25 | 899.85 | 0.060534 | -24.1895 |
| PNB | 8-Jun-12 | 26-Jul-12 | 560 | 229.3 | 782 | 228.6762 | -0.6238 |
| PNB | 1-Jun-12 | 28-Jun-12 | 540 | 191.15 | 727.35 | 190.9807 | -0.16926 |
| PNB | 11-Jan-13 | 28-Feb-13 | 1020 | 3.35 | 880.75 | 0.07652 | -3.27348 |
| PNB | 30-Nov-12 | 28-Feb-13 | 1000 | 6.55 | 784.9 | 0.018495 | -6.53151 |
| PNB | 15-Nov-12 | 27-Dec-12 | 1080 | 0.15 | 763.25 | 1.71E-11 | -0.15 |
| PNB | 14-Sep-12 | 27-Sep-12 | 500 | 210.6 | 709.05 | 210.6715 | 0.071475 |
| PNB | 18-May-12 | 26-Jul-12 | 540 | 192.95 | 721.65 | 190.8801 | -2.0699 |
| PNB | 7-Aug-12 | 25-Oct-12 | 520 | 243.05 | 752.2 | 242.3637 | -0.68627 |
| PNB | 20-Apr-12 | 31-May-12 | 580 | 332.45 | 906.2 | 332.1114 | -0.33859 |
| PNB | 7-Nov-12 | 29-Nov-12 | 520 | 258.35 | 775.7 | 258.5506 | 0.200591 |
| PNB | 26-Feb-13 | 25-Apr-13 | 640 | 198.25 | 827.45 | 196.658 | -1.59196 |
| PNB | 2-Jan-13 | 28-Feb-13 | 1100 | 3.8 | 905.5 | 0.011727 | -3.78827 |
| PNB | 22-Feb-13 | 25-Apr-13 | 640 | 223.8 | 853.05 | 222.8882 | -0.91184 |
| PNB | 16-Jan-13 | 28-Mar-13 | 500 | 391.4 | 882.95 | 391.7419 | 0.341921 |
| PNB | 20-Feb-13 | 28-Mar-13 | 940 | 16.05 | 866.2 | 0.924549 | -15.1255 |
| PNB | 3-Oct-12 | 29-Nov-12 | 1020 | 11.3 | 827.9 | 0.004224 | -11.2958 |
| PNB | 2-May-12 | 26-Jul-12 | 1160 | 4.1 | 866.95 | 0.000817 | -4.09918 |
| PNB | 2-Apr-12 | 26-Apr-12 | 540 | 393 | 929 | 392.2285 | -0.77147 |
| PNB | 14-Aug-12 | 27-Sep-12 | 1140 | 0.05 | 732.1 | 1.48E-17 | -0.05 |
| PNB | 11-Sep-12 | 25-Oct-12 | 960 | 0.05 | 685.05 | 1.96E-10 | -0.05 |
| PNB | 22-Jun-12 | 28-Jun-12 | 560 | 220.85 | 780 | 220.8389 | -0.01109 |
| PNB | 30-Jul-12 | 27-Sep-12 | 1140 | 0.55 | 730.6 | 3.72E-13 | -0.55 |
| PNB | 11-Apr-12 | 26-Apr-12 | 550 | 352.3 | 899.95 | 352.0075 | -0.29249 |
| PNB | 13-Jul-12 | 30-Aug-12 | 1060 | 2.3 | 842.95 | 0.000173 | -2.29983 |
| PNB | 18-Dec-12 | 27-Dec-12 | 520 | 325.35 | 844.25 | 325.418 | 0.068045 |
| PNB | 11-Jan-13 | 31-Jan-13 | 480 | 403 | 880.75 | 403.1427 | 0.142701 |
| PNB | 18-Jun-12 | 30-Aug-12 | 560 | 214.1 | 760.25 | 210.3718 | -3.72819 |
| PNB | 22-Nov-12 | 31-Jan-13 | 520 | 222.7 | 733.75 | 222.7659 | 0.065938 |
| PNB | 8-Oct-12 | 29-Nov-12 | 1000 | 6.7 | 796.4 | 0.000431 | -6.69957 |
| PNB | 24-Aug-12 | 27-Sep-12 | 1120 | 0 | 711.15 | 6.94E-24 | 6.94E-24 |
| PNB | 16-Apr-13 | 25-Apr-13 | 540 | 201.6 | 740.45 | 201.663 | 0.06297 |
| PNB | 19-Dec-12 | 31-Jan-13 | 520 | 336.45 | 851.05 | 336.607 | 0.157031 |
| PNB | 12-Nov-12 | 29-Nov-12 | 520 | 253.95 | 771.9 | 254.1041 | 0.154105 |
| PNB | 11-Jun-12 | 26-Jul-12 | 1020 | 1.2 | 771.95 | 4.9E-07 | -1.2 |
| PNB | 7-Feb-13 | 25-Apr-13 | 580 | 309 | 877.3 | 308.3522 | -0.64778 |
| PNB | 11-Oct-12 | 27-Dec-12 | 480 | 350.2 | 821.35 | 350.4967 | 0.296666 |
| PNB | 25-Mar-13 | 28-Mar-13 | 460 | 264.5 | 724.1 | 264.4447 | -0.05532 |
| PNB | 28-Apr-12 | 28-Jun-12 | 620 | 228.9 | 838.5 | 227.8782 | -1.02183 |
| PNB | 30-Apr-12 | 28-Jun-12 | 620 | 240.05 | 850.15 | 239.2229 | -0.82705 |

1. **Bank of India**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Symbol | Date | Expiry | Strike Price | Settle Price | Underlying Value | Value of call option | Deviation |
| BANKINDIA | 19-Dec-11 | 25-Jan-12 | 360 | 2.25 | 294.8 | 4.42E-07 | -2.25 |
| BANKINDIA | 6-Sep-11 | 25-Oct-11 | 340 | 17.35 | 326.05 | 2.093957 | -15.256 |
| BANKINDIA | 23-Jan-12 | 29-Mar-12 | 420 | 3.55 | 319.05 | 4.32E-07 | -3.55 |
| BANKINDIA | 5-Jan-12 | 25-Jan-12 | 160 | 127.5 | 286.65 | 127.4476 | -0.05243 |
| BANKINDIA | 23-Dec-11 | 25-Jan-12 | 360 | 3.4 | 292.8 | 2.2E-08 | -3.4 |
| BANKINDIA | 30-Dec-11 | 23-Feb-12 | 420 | 0.5 | 266.35 | 4.11E-22 | -0.5 |
| BANKINDIA | 13-Feb-12 | 23-Feb-12 | 320 | 49.9 | 368.2 | 48.99856 | -0.90144 |
| BANKINDIA | 2-Dec-11 | 29-Dec-11 | 380 | 5.4 | 340.55 | 0.002094 | -5.39791 |
| BANKINDIA | 31-Jan-12 | 23-Feb-12 | 240 | 106.2 | 344.65 | 106.0253 | -0.17471 |
| BANKINDIA | 24-Feb-12 | 26-Apr-12 | 340 | 59.85 | 372.6 | 37.91023 | -21.9398 |
| BANKINDIA | 15-Mar-12 | 31-May-12 | 200 | 181.4 | 376.05 | 179.8611 | -1.53889 |
| BANKINDIA | 2-Dec-11 | 23-Feb-12 | 500 | 2 | 340.55 | 1.83E-10 | -2 |
| BANKINDIA | 1-Feb-12 | 29-Mar-12 | 340 | 32.1 | 340.9 | 9.55051 | -22.5495 |
| BANKINDIA | 22-Nov-11 | 29-Dec-11 | 260 | 71.85 | 328.95 | 71.34261 | -0.50739 |
| BANKINDIA | 5-Dec-11 | 23-Feb-12 | 500 | 2.05 | 346.65 | 6.34E-10 | -2.05 |
| BANKINDIA | 10-Feb-12 | 23-Feb-12 | 320 | 47.9 | 364.9 | 45.93774 | -1.96226 |
| BANKINDIA | 11-Jul-11 | 25-Aug-11 | 440 | 5.35 | 408.15 | 0.464629 | -4.88537 |
| BANKINDIA | 2-Nov-11 | 24-Nov-11 | 320 | 20.8 | 333.45 | 15.41805 | -5.38195 |
| BANKINDIA | 5-Dec-11 | 29-Dec-11 | 360 | 8.1 | 346.65 | 0.805667 | -7.29433 |
| BANKINDIA | 3-Mar-12 | 31-May-12 | 300 | 95.4 | 368.25 | 74.84792 | -20.5521 |
| BANKINDIA | 2-Mar-12 | 29-Mar-12 | 220 | 150.25 | 368.45 | 149.9292 | -0.32081 |
| BANKINDIA | 21-Feb-12 | 29-Mar-12 | 340 | 66.85 | 396.9 | 60.02881 | -6.82119 |
| BANKINDIA | 28-Jun-11 | 30-Jun-11 | 380 | 34.1 | 413.9 | 34.08985 | -0.01015 |
| BANKINDIA | 21-Nov-11 | 29-Dec-11 | 280 | 45.9 | 320.8 | 43.44614 | -2.45386 |
| BANKINDIA | 3-Aug-11 | 29-Sep-11 | 400 | 10 | 372.4 | 0.94687 | -9.05313 |
| BANKINDIA | ######### | 26-May-11 | 420 | 8.3 | 408 | 0.832141 | -7.46786 |
| BANKINDIA | 5-Mar-12 | 29-Mar-12 | 180 | 176.1 | 354.8 | 175.8762 | -0.22382 |
| BANKINDIA | 1-Nov-11 | 24-Nov-11 | 320 | 23.8 | 336.85 | 18.78382 | -5.01618 |
| BANKINDIA | 20-Mar-12 | 31-May-12 | 240 | 128.4 | 359.95 | 124.229 | -4.17097 |
| BANKINDIA | 24-Nov-11 | 29-Dec-11 | 340 | 5.9 | 345.15 | 10.04461 | 4.144615 |
| BANKINDIA | 30-Dec-11 | 25-Jan-12 | 480 | 0 | 266.35 | 7.08E-77 | 7.08E-77 |
| BANKINDIA | 14-Mar-12 | 26-Apr-12 | 380 | 45.9 | 392.55 | 17.74911 | -28.1509 |
| BANKINDIA | 13-Feb-12 | 29-Mar-12 | 180 | 190.4 | 368.2 | 190.2126 | -0.18745 |
| BANKINDIA | 21-Mar-12 | 29-Mar-12 | 180 | 190.65 | 370.2 | 190.5594 | -0.09056 |
| BANKINDIA | 20-Dec-11 | 23-Feb-12 | 240 | 50.35 | 279.2 | 43.06765 | -7.28235 |
| BANKINDIA | 16-Nov-11 | 29-Dec-11 | 240 | 98.45 | 335.7 | 98.26478 | -0.18522 |
| BANKINDIA | 17-Jan-12 | 23-Feb-12 | 220 | 85.65 | 303.2 | 85.22451 | -0.42549 |
| BANKINDIA | 7-Mar-12 | 29-Mar-12 | 220 | 131.7 | 350.2 | 131.406 | -0.29398 |
| BANKINDIA | 27-Dec-11 | 23-Feb-12 | 240 | 57.2 | 288.05 | 51.50305 | -5.69695 |
| BANKINDIA | 8-Jul-11 | 28-Jul-11 | 440 | 2.3 | 412.9 | 0.071818 | -2.22818 |
| BANKINDIA | 2-Aug-11 | 25-Oct-11 | 340 | 49.75 | 375.85 | 43.02715 | -6.72285 |
| BANKINDIA | 15-Jul-11 | 25-Aug-11 | 420 | 8.35 | 405.6 | 2.638016 | -5.71198 |
| BANKINDIA | ######### | 28-Jul-11 | 320 | 95.4 | 400.25 | 86.42622 | -8.97378 |
| BANKINDIA | 4-Aug-11 | 29-Sep-11 | 400 | 7.95 | 366.7 | 0.430516 | -7.51948 |
| BANKINDIA | 1-Dec-11 | 25-Jan-12 | 320 | 34.1 | 333.9 | 19.05465 | -15.0454 |
| BANKINDIA | 3-Nov-11 | 29-Dec-11 | 380 | 5.7 | 334.35 | 0.03641 | -5.66359 |
| BANKINDIA | 1-Mar-12 | 31-May-12 | 320 | 86.25 | 367.9 | 55.1117 | -31.1383 |
| BANKINDIA | 28-Dec-11 | 25-Jan-12 | 360 | 1 | 275.7 | 1.19E-15 | -1 |
| BANKINDIA | 1-Nov-11 | 29-Dec-11 | 380 | 7.4 | 336.85 | 0.069904 | -7.3301 |
| BANKINDIA | 20-Mar-12 | 26-Apr-12 | 360 | 32.9 | 359.95 | 7.159152 | -25.7408 |

1. **Andhra Bank**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Symbol | Date | Expiry | Strike Price | Settle Price | Underlying Value | Value of call option | Deviation |
| ANDHRABANK | 6-Jun-12 | 26-Jul-12 | 90 | 24.8 | 112.9 | 24.01739 | -0.78261 |
| ANDHRABANK | 29-Aug-11 | 29-Sep-11 | 130 | 3 | 127 | 0.993328 | -2.00667 |
| ANDHRABANK | 20-Mar-12 | 26-Apr-12 | 180 | 0.3 | 123.1 | 5.19E-22 | -0.3 |
| ANDHRABANK | 23-Feb-12 | 29-Mar-12 | 150 | 1.05 | 121.65 | 5.23E-08 | -1.05 |
| ANDHRABANK | 6-Feb-13 | 28-Mar-13 | 100 | 10.5 | 104.9 | 6.337174 | -4.16283 |
| ANDHRABANK | 15-Nov-12 | 31-Jan-13 | 50 | 57.25 | 106.3 | 57.25278 | 0.002778 |
| ANDHRABANK | 12-Sep-11 | 29-Sep-11 | 100 | 23.4 | 122.95 | 23.37387 | -0.02613 |
| ANDHRABANK | 25-Apr-12 | 28-Jun-12 | 150 | 1.2 | 118 | 8.69E-06 | -1.19999 |
| ANDHRABANK | 24-Aug-12 | 27-Sep-12 | 135 | 0 | 95.5 | 3.43E-20 | 3.43E-20 |
| ANDHRABANK | 13-Sep-11 | 29-Sep-11 | 100 | 20.35 | 119.9 | 20.29898 | -0.05102 |
| ANDHRABANK | 14-Feb-12 | 29-Mar-12 | 85 | 44.5 | 128.4 | 44.32937 | -0.17063 |
| ANDHRABANK | 11-Oct-11 | 24-Nov-11 | 120 | 5.9 | 118.45 | 1.892022 | -4.00798 |
| ANDHRABANK | 6-Sep-12 | 29-Nov-12 | 135 | 0.05 | 90.05 | 2.83E-11 | -0.05 |
| ANDHRABANK | 18-Dec-12 | 31-Jan-13 | 60 | 58.25 | 117.6 | 58.25603 | 0.006026 |
| ANDHRABANK | 3-Jan-12 | 29-Mar-12 | 115 | 1.05 | 84.05 | 4.76E-07 | -1.05 |
| ANDHRABANK | 9-Aug-12 | 27-Sep-12 | 90 | 8.85 | 95.65 | 6.834264 | -2.01574 |
| ANDHRABANK | 28-Jun-12 | 26-Jul-12 | 140 | 0.35 | 116.1 | 3.97E-08 | -0.35 |
| ANDHRABANK | 11-Apr-12 | 26-Apr-12 | 70 | 52.5 | 122.2 | 52.46187 | -0.03813 |
| ANDHRABANK | 31-Aug-12 | 27-Sep-12 | 70 | 20.65 | 90.2 | 20.67065 | 0.020652 |
| ANDHRABANK | 4-Apr-12 | 31-May-12 | 50 | 73.05 | 122.2 | 72.90706 | -0.14294 |
| ANDHRABANK | 5-Mar-13 | 30-May-13 | 65 | 31.95 | 95.15 | 31.53183 | -0.41817 |
| ANDHRABANK | 31-Dec-12 | 28-Feb-13 | 110 | 11.85 | 117.85 | 9.560989 | -2.28901 |
| ANDHRABANK | 7-Jun-12 | 28-Jun-12 | 110 | 3 | 112.1 | 3.050425 | 0.050425 |
| ANDHRABANK | 22-Aug-12 | 25-Oct-12 | 160 | 0 | 97.4 | 2.22E-21 | 2.22E-21 |
| ANDHRABANK | 13-Mar-13 | 30-May-13 | 50 | 49.1 | 98.05 | 49.01503 | -0.08497 |
| ANDHRABANK | 13-Jul-12 | 30-Aug-12 | 130 | 1.4 | 115.2 | 0.012443 | -1.38756 |
| ANDHRABANK | 2-Apr-12 | 31-May-12 | 190 | 0.4 | 121.1 | 3.3E-19 | -0.4 |
| ANDHRABANK | 29-Jun-12 | 26-Jul-12 | 170 | 0 | 118.4 | 3.04E-27 | 3.04E-27 |
| ANDHRABANK | 2-Jul-12 | 27-Sep-12 | 50 | 69.35 | 118.2 | 69.27518 | -0.07482 |
| ANDHRABANK | 17-Jul-12 | 27-Sep-12 | 60 | 53.75 | 112.65 | 53.71976 | -0.03024 |
| ANDHRABANK | 1-Apr-13 | 30-May-13 | 140 | 0.1 | 96.3 | 1.01E-13 | -0.1 |
| ANDHRABANK | 18-Mar-13 | 30-May-13 | 50 | 50.45 | 99.45 | 50.35373 | -0.09627 |
| ANDHRABANK | 13-Jun-12 | 26-Jul-12 | 80 | 36.8 | 115.85 | 36.70493 | -0.09507 |
| ANDHRABANK | 24-Dec-12 | 28-Feb-13 | 50 | 65.45 | 114.65 | 65.46779 | 0.017786 |
| ANDHRABANK | 16-Nov-11 | 25-Jan-12 | 60 | 45.45 | 104.35 | 45.3903 | -0.0597 |
| ANDHRABANK | 30-Mar-12 | 26-Apr-12 | 105 | 16.95 | 119.15 | 14.856 | -2.094 |
| ANDHRABANK | 8-Apr-13 | 25-Apr-13 | 50 | 43.1 | 92.9 | 43.11193 | 0.011933 |
| ANDHRABANK | 7-Sep-11 | 24-Nov-11 | 200 | 0.1 | 131 | 5.79E-13 | -0.1 |
| ANDHRABANK | 5-Mar-13 | 28-Mar-13 | 105 | 1.55 | 95.15 | 0.001086 | -1.54891 |
| ANDHRABANK | 19-Oct-11 | 25-Oct-11 | 100 | 22.55 | 122.4 | 22.54981 | -0.00019 |
| ANDHRABANK | 28-Jun-11 | 25-Aug-11 | 230 | 0 | 134 | 1.62E-27 | 1.62E-27 |
| ANDHRABANK | 23-Oct-12 | 29-Nov-12 | 60 | 53.9 | 113.35 | 53.90214 | 0.00214 |
| ANDHRABANK | 10-Oct-12 | 27-Dec-12 | 70 | 39 | 107.65 | 39.00104 | 0.001044 |
| ANDHRABANK | 2-Nov-11 | 25-Jan-12 | 60 | 59.65 | 118.3 | 59.54619 | -0.10381 |
| ANDHRABANK | 18-Nov-11 | 24-Nov-11 | 140 | 0 | 103.8 | 1.21E-81 | 1.21E-81 |
| ANDHRABANK | 11-Mar-13 | 30-May-13 | 55 | 48.1 | 101.95 | 48.03848 | -0.06152 |
| ANDHRABANK | 17-Feb-12 | 23-Feb-12 | 75 | 56.6 | 131.45 | 56.56235 | -0.03765 |
| ANDHRABANK | 14-Oct-11 | 24-Nov-11 | 130 | 3.15 | 121.85 | 0.219459 | -2.93054 |
| ANDHRABANK | 16-Jan-13 | 28-Feb-13 | 50 | 72.3 | 121.75 | 72.28433 | -0.01567 |

**Data for Private Banks**

1. **Axis Bank**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Symbol | Date | Expiry | Strike Price | Settle Price | Underlying Value | Value of call option | Deviation |
| AXISBANK | 17-Jan-12 | 29-Mar-12 | 860 | 151.45 | 962.25 | 117.7624 | -33.6876 |
| AXISBANK | 10-Oct-11 | 25-Oct-11 | 550 | 500.9 | 1048.85 | 500.9075 | 0.007512 |
| AXISBANK | 27-Mar-12 | 26-Apr-12 | 900 | 253.4 | 1141.5 | 248.2211 | -5.17892 |
| AXISBANK | 5-Jan-12 | 29-Mar-12 | 840 | 110.95 | 870.65 | 52.95869 | -57.9913 |
| AXISBANK | 6-Jan-12 | 25-Jan-12 | 620 | 236.65 | 853.5 | 236.4364 | -0.21359 |
| AXISBANK | 13-May-11 | 28-Jul-11 | 750 | 509.55 | 1244.7 | 508.8078 | -0.74218 |
| AXISBANK | 12-Aug-11 | 25-Aug-11 | 600 | 611.15 | 1209.25 | 611.1958 | 0.04577 |
| AXISBANK | 13-Jan-12 | 25-Jan-12 | 600 | 341.6 | 939.7 | 341.4963 | -0.10368 |
| AXISBANK | 14-Dec-11 | 23-Feb-12 | 980 | 71.35 | 959.15 | 19.69201 | -51.658 |
| AXISBANK | 23-Aug-11 | 25-Aug-11 | 600 | 483.85 | 1083.55 | 483.8498 | -0.00024 |
| AXISBANK | 8-Sep-11 | 29-Sep-11 | 600 | 553.7 | 1150.55 | 553.69 | -0.00997 |
| AXISBANK | 30-Dec-11 | 23-Feb-12 | 1500 | 0.05 | 808.1 | 2.57E-34 | -0.05 |
| AXISBANK | 11-Aug-11 | 25-Oct-11 | 600 | 622.3 | 1210.85 | 621.9891 | -0.31086 |
| AXISBANK | 24-Oct-11 | 29-Dec-11 | 1150 | 124.3 | 1168.55 | 47.78403 | -76.516 |
| AXISBANK | 24-Feb-12 | 31-May-12 | 950 | 294.9 | 1183.45 | 256.1997 | -38.7003 |
| AXISBANK | 9-Aug-11 | 29-Sep-11 | 550 | 662.4 | 1205.2 | 662.1642 | -0.23581 |
| AXISBANK | 18-Jul-11 | 28-Jul-11 | 550 | 713.85 | 1262.5 | 713.8725 | 0.022531 |
| AXISBANK | 15-Nov-11 | 24-Nov-11 | 550 | 459.65 | 1008.4 | 459.6354 | -0.01457 |
| AXISBANK | 28-Jun-11 | 25-Aug-11 | 600 | 711.9 | 1302.9 | 711.5325 | -0.36747 |
| AXISBANK | 3-Nov-11 | 25-Jan-12 | 1900 | 1.7 | 1115.85 | 1.42E-16 | -1.7 |
| AXISBANK | 12-Jan-12 | 25-Jan-12 | 600 | 342.55 | 940.5 | 342.4458 | -0.10423 |
| AXISBANK | 17-Aug-11 | 25-Oct-11 | 700 | 482.25 | 1169.8 | 481.7649 | -0.48505 |
| AXISBANK | 3-Aug-11 | 25-Oct-11 | 600 | 714 | 1301.15 | 713.465 | -0.53496 |
| AXISBANK | 27-Jan-12 | 26-Apr-12 | 500 | 585.15 | 1073.05 | 584.1684 | -0.98165 |
| AXISBANK | 4-May-11 | 28-Jul-11 | 750 | 501.95 | 1235.6 | 501.3608 | -0.58919 |
| AXISBANK | 23-Sep-11 | 24-Nov-11 | 750 | 351.75 | 1086.85 | 348.3791 | -3.3709 |
| AXISBANK | 16-Jan-12 | 25-Jan-12 | 600 | 336.7 | 935.25 | 336.5977 | -0.10226 |
| AXISBANK | 22-Dec-11 | 25-Jan-12 | 780 | 120 | 873.65 | 100.2555 | -19.7445 |
| AXISBANK | 3-Jun-11 | 28-Jul-11 | 2050 | 0.05 | 1242.75 | 1.93E-22 | -0.05 |
| AXISBANK | 25-Jan-12 | 23-Feb-12 | 700 | 369.1 | 1063.65 | 368.7039 | -0.39611 |
| AXISBANK | 7-Jan-12 | 29-Mar-12 | 820 | 105.15 | 852.2 | 53.12649 | -52.0235 |
| AXISBANK | 5-May-11 | 28-Jul-11 | 700 | 524.95 | 1209.85 | 524.3888 | -0.56116 |
| AXISBANK | 12-Sep-11 | 24-Nov-11 | 650 | 414.95 | 1051.55 | 413.2985 | -1.65147 |
| AXISBANK | 15-Nov-11 | 29-Dec-11 | 920 | 129 | 1008.4 | 98.59968 | -30.4003 |
| AXISBANK | 30-Sep-11 | 24-Nov-11 | 1550 | 2.55 | 1018.9 | 6.34E-16 | -2.55 |
| AXISBANK | 14-Sep-11 | 25-Oct-11 | 1800 | 0.25 | 1088.7 | 1.28E-30 | -0.25 |
| AXISBANK | 26-Mar-12 | 26-Apr-12 | 900 | 239.05 | 1125.15 | 232.0942 | -6.95575 |
| AXISBANK | 13-Dec-11 | 29-Dec-11 | 550 | 412.2 | 959.9 | 412.0944 | -0.10559 |
| AXISBANK | 7-Jun-11 | 30-Jun-11 | 600 | 648.1 | 1244.65 | 648.0882 | -0.01178 |
| AXISBANK | 9-Mar-12 | 31-May-12 | 1550 | 42.3 | 1213.4 | 0.002099 | -42.2979 |
| AXISBANK | 3-Jun-11 | 25-Aug-11 | 650 | 607 | 1242.75 | 606.0913 | -0.90871 |
| AXISBANK | 2-May-11 | 26-May-11 | 1950 | 0 | 1276.45 | 1.96E-37 | 1.96E-37 |
| AXISBANK | 16-Jun-11 | 30-Jun-11 | 750 | 470.55 | 1217.85 | 470.469 | -0.08102 |
| AXISBANK | 14-Mar-12 | 31-May-12 | 550 | 737.05 | 1274.05 | 734.6653 | -2.38466 |
| AXISBANK | 15-Jun-11 | 30-Jun-11 | 650 | 576.9 | 1224.4 | 576.8316 | -0.0684 |
| AXISBANK | 13-Feb-12 | 23-Feb-12 | 580 | 537.9 | 1116.35 | 537.7974 | -0.1026 |
| AXISBANK | 21-Oct-11 | 24-Nov-11 | 940 | 205.35 | 1127.7 | 195.6518 | -9.6982 |
| AXISBANK | 13-Oct-11 | 25-Oct-11 | 500 | 588.05 | 1086.55 | 588.0469 | -0.00307 |

1. **Yes Bank**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Symbol | Date | Expiry | Strike Price | Settle Price | Underlying Value | Value of call option | Deviation |
| YESBANK | 16-Nov-11 | 29-Dec-11 | 250 | 33.8 | 270.7 | 24.39385 | -9.40615 |
| YESBANK | 29-Dec-11 | 25-Jan-12 | 460 | 0 | 239.3 | 1.81E-28 | 1.81E-28 |
| YESBANK | 21-Mar-12 | 31-May-12 | 180 | 198.35 | 374.35 | 197.5151 | -0.83491 |
| YESBANK | 11-Jul-11 | 29-Sep-11 | 160 | 164.6 | 321.35 | 164.5165 | -0.08351 |
| YESBANK | 11-Oct-11 | 25-Oct-11 | 260 | 11.2 | 263.8 | 7.14348 | -4.05652 |
| YESBANK | 18-Nov-11 | 29-Dec-11 | 250 | 32.05 | 270.4 | 23.9312 | -8.1188 |
| YESBANK | 29-Sep-11 | 24-Nov-11 | 160 | 119.45 | 277.1 | 119.3232 | -0.12682 |
| YESBANK | 15-Jul-11 | 28-Jul-11 | 320 | 11 | 324.65 | 8.542047 | -2.45795 |
| YESBANK | 16-Feb-12 | 26-Apr-12 | 200 | 171.1 | 367.25 | 170.7177 | -0.38233 |
| YESBANK | 22-Mar-12 | 29-Mar-12 | 160 | 207.1 | 366.75 | 207.0296 | -0.0704 |
| YESBANK | 29-Aug-11 | 29-Sep-11 | 240 | 37.8 | 271.25 | 33.21191 | -4.58809 |
| YESBANK | 12-Aug-11 | 25-Aug-11 | 220 | 79.65 | 298.95 | 79.66345 | 0.013449 |
| YESBANK | 4-Jan-12 | 29-Mar-12 | 340 | 4 | 241.05 | 0.007615 | -3.99238 |
| YESBANK | 24-Oct-11 | 29-Dec-11 | 160 | 124.45 | 281.65 | 124.2669 | -0.18308 |
| YESBANK | 4-Jan-12 | 25-Jan-12 | 250 | 6.75 | 241.05 | 2.114095 | -4.63591 |
| YESBANK | 30-Mar-12 | 31-May-12 | 280 | 97.65 | 368.8 | 93.10805 | -4.54195 |
| YESBANK | 29-Jul-11 | 29-Sep-11 | 360 | 5.5 | 310.65 | 0.885267 | -4.61473 |
| YESBANK | 11-Jan-12 | 25-Jan-12 | 250 | 23.35 | 272.3 | 23.24184 | -0.10816 |
| YESBANK | 10-Jan-12 | 25-Jan-12 | 250 | 17.75 | 264.3 | 15.68164 | -2.06836 |
| YESBANK | 31-May-11 | 30-Jun-11 | 280 | 28.2 | 300.8 | 23.7318 | -4.4682 |
| YESBANK | 13-Jun-11 | 28-Jul-11 | 320 | 6.95 | 294.25 | 2.063526 | -4.88647 |
| YESBANK | 3-Mar-12 | 29-Mar-12 | 160 | 190.35 | 349.15 | 190.1861 | -0.16394 |
| YESBANK | 26-Oct-11 | 24-Nov-11 | 420 | 1.25 | 308.55 | 1.4E-06 | -1.25 |
| YESBANK | 10-Jan-12 | 23-Feb-12 | 250 | 29.6 | 264.3 | 18.97906 | -10.6209 |
| YESBANK | 12-Sep-11 | 25-Oct-11 | 260 | 29.85 | 273.65 | 18.62707 | -11.2229 |
| YESBANK | 2-Sep-11 | 29-Sep-11 | 440 | 0.05 | 278.65 | 1.86E-14 | -0.05 |
| YESBANK | 8-Jul-11 | 29-Sep-11 | 160 | 165.6 | 322.25 | 165.534 | -0.06599 |
| YESBANK | 23-Nov-11 | 25-Jan-12 | 220 | 52.75 | 264.75 | 48.27713 | -4.47287 |
| YESBANK | 14-Sep-11 | 29-Sep-11 | 260 | 20 | 276.55 | 17.86395 | -2.13605 |
| YESBANK | 28-Nov-11 | 23-Feb-12 | 420 | 2.45 | 281.1 | 0.001306 | -2.44869 |
| YESBANK | 1-Mar-12 | 29-Mar-12 | 160 | 181.3 | 340 | 181.1155 | -0.18452 |
| YESBANK | 28-Apr-11 | 26-May-11 | 220 | 91.85 | 310.4 | 91.93378 | 0.083785 |
| YESBANK | 1-Jul-11 | 29-Sep-11 | 160 | 162.05 | 318.35 | 161.9079 | -0.14213 |
| YESBANK | 1-Aug-11 | 25-Aug-11 | 220 | 97.6 | 316.3 | 97.61533 | 0.015329 |
| YESBANK | 30-Nov-11 | 25-Jan-12 | 300 | 12.2 | 272.2 | 2.03716 | -10.1628 |
| YESBANK | 28-Jul-11 | 25-Aug-11 | 280 | 34.85 | 310.45 | 32.62219 | -2.22781 |
| YESBANK | 13-May-11 | 30-Jun-11 | 280 | 30.6 | 295.85 | 21.5998 | -9.0002 |
| YESBANK | 20-Jun-11 | 25-Aug-11 | 440 | 0.1 | 290.65 | 4.59E-05 | -0.09995 |
| YESBANK | 29-Jun-11 | 30-Jun-11 | 280 | 32.85 | 312.75 | 32.81995 | -0.03005 |
| YESBANK | 12-Aug-11 | 25-Oct-11 | 180 | 122.35 | 298.95 | 122.2476 | -0.1024 |
| YESBANK | 30-May-11 | 30-Jun-11 | 280 | 26.95 | 298.3 | 21.61913 | -5.33087 |
| YESBANK | 18-Oct-11 | 29-Dec-11 | 160 | 123 | 279.9 | 122.7527 | -0.24732 |
| YESBANK | 22-Jul-11 | 28-Jul-11 | 320 | 10.85 | 329.1 | 10.22917 | -0.62083 |
| YESBANK | 9-Sep-11 | 25-Oct-11 | 280 | 28.85 | 293.9 | 19.78766 | -9.06234 |
| YESBANK | 15-Jun-11 | 25-Aug-11 | 440 | 0.1 | 293.2 | 0.00016 | -0.09984 |
| YESBANK | 25-Nov-11 | 29-Dec-11 | 200 | 76.15 | 274.1 | 75.79187 | -0.35813 |
| YESBANK | 1-Feb-12 | 29-Mar-12 | 220 | 120.1 | 336.15 | 119.2611 | -0.83892 |
| YESBANK | 29-Jun-11 | 28-Jul-11 | 320 | 8.85 | 312.75 | 5.407867 | -3.44213 |
| YESBANK | 9-May-11 | 28-Jul-11 | 220 | 84.1 | 297.5 | 81.85874 | -2.24126 |
| YESBANK | 18-Jan-12 | 29-Mar-12 | 380 | 3.55 | 281.05 | 0.012066 | -3.53793 |

1. **IDBI Bank**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Symbol | Date | Expiry | Strike Price | Settle Price | Underlying Value | Value of call option | Deviation |
| IDBI | 30-Apr-12 | 31-May-12 | 125 | 0.3 | 101.55 | 8.43E-07 | -0.3 |
| IDBI | 6-Mar-13 | 30-May-13 | 130 | 0.45 | 91.45 | 1.41E-06 | -0.45 |
| IDBI | 24-Feb-12 | 31-May-12 | 160 | 1.55 | 109.5 | 1.6E-06 | -1.55 |
| IDBI | 4-Oct-11 | 24-Nov-11 | 90 | 11 | 97.35 | 8.581843 | -2.41816 |
| IDBI | 6-Nov-12 | 29-Nov-12 | 110 | 0.5 | 98.2 | 0.001521 | -0.49848 |
| IDBI | 23-Sep-11 | 24-Nov-11 | 190 | 0 | 103 | 3.21E-24 | 3.21E-24 |
| IDBI | 9-Apr-13 | 25-Apr-13 | 55 | 25.05 | 79.85 | 25.06944 | 0.019441 |
| IDBI | 30-Aug-12 | 27-Sep-12 | 115 | 0 | 85.7 | 1.55E-13 | 1.55E-13 |
| IDBI | 22-Jul-11 | 29-Sep-11 | 100 | 36.95 | 135.15 | 36.85928 | -0.09072 |
| IDBI | 19-Aug-11 | 25-Oct-11 | 60 | 47.3 | 106.25 | 47.24609 | -0.05391 |
| IDBI | 13-Mar-12 | 29-Mar-12 | 55 | 59.05 | 113.75 | 58.96944 | -0.08056 |
| IDBI | 29-Feb-12 | 26-Apr-12 | 145 | 1.9 | 108.1 | 5.96E-07 | -1.9 |
| IDBI | 17-Aug-11 | 25-Aug-11 | 110 | 3.7 | 112.45 | 2.823299 | -0.8767 |
| IDBI | 16-Dec-11 | 29-Dec-11 | 160 | 0 | 86.3 | 2.2E-114 | 2.2E-114 |
| IDBI | 3-Mar-12 | 29-Mar-12 | 50 | 62.05 | 111.65 | 61.97377 | -0.07623 |
| IDBI | 4-Jul-12 | 30-Aug-12 | 85 | 14.05 | 96.6 | 12.81225 | -1.23775 |
| IDBI | 27-Jun-11 | 25-Aug-11 | 80 | 54.1 | 132.85 | 54.0207 | -0.0793 |
| IDBI | 12-Jan-12 | 23-Feb-12 | 80 | 12.5 | 90.35 | 11.18942 | -1.31058 |
| IDBI | 19-Jun-12 | 26-Jul-12 | 80 | 10.7 | 88.6 | 9.345705 | -1.35429 |
| IDBI | 31-Jul-12 | 27-Sep-12 | 115 | 0.25 | 88 | 6.07E-06 | -0.24999 |
| IDBI | 15-Jan-13 | 28-Mar-13 | 160 | 0.05 | 115.3 | 1.04E-06 | -0.05 |
| IDBI | 14-Jun-12 | 28-Jun-12 | 75 | 15.75 | 90.45 | 15.7119 | -0.0381 |
| IDBI | 10-Feb-12 | 26-Apr-12 | 140 | 1.1 | 105.25 | 4.39E-05 | -1.09996 |
| IDBI | 27-Mar-12 | 26-Apr-12 | 75 | 32.9 | 107.15 | 32.71009 | -0.18991 |
| IDBI | 10-Aug-11 | 25-Oct-11 | 210 | 0 | 120.3 | 1.52E-16 | 1.52E-16 |
| IDBI | 24-Jul-12 | 30-Aug-12 | 95 | 1.55 | 88.75 | 0.197306 | -1.35269 |
| IDBI | 16-Feb-12 | 29-Mar-12 | 140 | 1.4 | 116.25 | 0.000249 | -1.39975 |
| IDBI | 27-Nov-12 | 31-Jan-13 | 55 | 47.9 | 102.05 | 47.93605 | 0.036046 |
| IDBI | 29-Nov-11 | 23-Feb-12 | 75 | 20.35 | 91.45 | 18.04571 | -2.30429 |
| IDBI | 17-Oct-12 | 25-Oct-12 | 85 | 13.3 | 98.1 | 13.26974 | -0.03026 |
| IDBI | 29-Aug-11 | 29-Sep-11 | 100 | 6.9 | 108.25 | 9.051678 | 2.151678 |
| IDBI | 12-Jun-12 | 28-Jun-12 | 75 | 18.3 | 92.95 | 18.24924 | -0.05076 |
| IDBI | 17-Jul-12 | 26-Jul-12 | 95 | 1 | 92.45 | 0.143786 | -0.85621 |
| IDBI | 26-Oct-11 | 25-Jan-12 | 190 | 0.05 | 106.9 | 9.48E-15 | -0.05 |
| IDBI | 7-Jun-11 | 30-Jun-11 | 130 | 4.8 | 131.85 | 3.456422 | -1.34358 |
| IDBI | 29-Jul-11 | 29-Sep-11 | 200 | 0 | 128.75 | 4.91E-13 | 4.91E-13 |
| IDBI | 13-Jul-12 | 26-Jul-12 | 95 | 2.55 | 95.05 | 1.216689 | -1.33331 |
| IDBI | 2-Apr-13 | 30-May-13 | 125 | 0.05 | 84.15 | 1.27E-11 | -0.05 |
| IDBI | 5-Jul-12 | 27-Sep-12 | 60 | 39.85 | 98.55 | 39.79619 | -0.05381 |
| IDBI | 21-Sep-12 | 27-Sep-12 | 90 | 9.05 | 98.6 | 8.734825 | -0.31517 |
| IDBI | 19-Feb-13 | 28-Feb-13 | 115 | 0 | 100.3 | 5.07E-10 | 5.07E-10 |
| IDBI | 7-Sep-12 | 27-Sep-12 | 95 | 0.75 | 87.95 | 0.017726 | -0.73227 |
| IDBI | 22-Feb-13 | 25-Apr-13 | 160 | 0 | 97.05 | 1.35E-16 | 1.35E-16 |
| IDBI | 4-Apr-13 | 27-Jun-13 | 65 | 19.85 | 83.15 | 19.5001 | -0.3499 |
| IDBI | 1-Feb-12 | 26-Apr-12 | 60 | 41.45 | 100 | 41.26086 | -0.18914 |
| IDBI | 3-May-11 | 30-Jun-11 | 150 | 4 | 136.4 | 0.295725 | -3.70427 |
| IDBI | 11-Nov-11 | 25-Jan-12 | 190 | 0.1 | 107 | 8.7E-18 | -0.1 |
| IDBI | 11-Jan-13 | 28-Feb-13 | 50 | 64.6 | 114 | 64.59609 | -0.00391 |
| IDBI | 13-Jun-12 | 28-Jun-12 | 55 | 38.5 | 93.25 | 38.45575 | -0.04425 |
| IDBI | 6-Mar-12 | 31-May-12 | 170 | 0.9 | 106.05 | 7.76E-11 | -0.9 |

1. **ICICI Bank**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Symbol | Date | Expiry | Strike Price | Settle Price | Underlying Value | Value of call option | Deviation |
| ICICIBANK | 30-Jul-12 | 25-Oct-12 | 760 | 224.7 | 964.5 | 220.8433 | -3.8567 |
| ICICIBANK | 6-Sep-12 | 27-Sep-12 | 580 | 319.3 | 896.45 | 319.4854 | 0.185361 |
| ICICIBANK | 27-Apr-12 | 26-Jul-12 | 760 | 134.95 | 860.85 | 118.0404 | -16.9096 |
| ICICIBANK | 19-Mar-13 | 30-May-13 | 1250 | 15.7 | 1032.6 | 0.043657 | -15.6563 |
| ICICIBANK | 25-May-12 | 31-May-12 | 580 | 235.5 | 814.6 | 235.4689 | -0.03113 |
| ICICIBANK | 11-Dec-12 | 28-Feb-13 | 1350 | 7.6 | 1122.65 | 0.116958 | -7.48304 |
| ICICIBANK | 15-Oct-12 | 25-Oct-12 | 550 | 504.7 | 1053.4 | 504.7725 | 0.072531 |
| ICICIBANK | 17-Oct-12 | 27-Dec-12 | 500 | 558 | 1049.55 | 558.3419 | 0.341921 |
| ICICIBANK | 30-Jan-13 | 31-Jan-13 | 500 | 712.85 | 1212.7 | 712.8249 | -0.02508 |
| ICICIBANK | 13-Apr-12 | 26-Apr-12 | 540 | 326.95 | 865 | 326.7512 | -0.19881 |
| ICICIBANK | 17-Dec-12 | 27-Dec-12 | 1450 | 0 | 1144.1 | 4.92E-25 | 4.92E-25 |
| ICICIBANK | 20-Apr-12 | 26-Apr-12 | 540 | 321.9 | 861.05 | 321.8589 | -0.04105 |
| ICICIBANK | 23-Oct-12 | 25-Oct-12 | 550 | 529.7 | 1079.45 | 529.7248 | 0.024781 |
| ICICIBANK | 18-Apr-13 | 25-Apr-13 | 620 | 503.65 | 1122.65 | 503.7335 | 0.083458 |
| ICICIBANK | 1-Feb-13 | 28-Feb-13 | 1500 | 0 | 1171.15 | 3.39E-10 | 3.39E-10 |
| ICICIBANK | 14-May-12 | 26-Jul-12 | 580 | 232.3 | 797.1 | 227.5833 | -4.7167 |
| ICICIBANK | 22-Jan-13 | 31-Jan-13 | 1700 | 0 | 1170.15 | 3.99E-67 | 3.99E-67 |
| ICICIBANK | 20-Feb-13 | 28-Mar-13 | 1600 | 0 | 1121.55 | 2.44E-15 | 2.44E-15 |
| ICICIBANK | 30-Oct-12 | 31-Jan-13 | 800 | 264 | 1045.15 | 263.5257 | -0.47435 |
| ICICIBANK | 15-Feb-13 | 25-Apr-13 | 1100 | 65.25 | 1121.85 | 51.31053 | -13.9395 |
| ICICIBANK | 14-Sep-12 | 25-Oct-12 | 1160 | 12.1 | 1008 | 0.032423 | -12.0676 |
| ICICIBANK | 13-Nov-12 | 29-Nov-12 | 540 | 521.75 | 1059.75 | 521.9045 | 0.154507 |
| ICICIBANK | 5-Jul-12 | 30-Aug-12 | 1180 | 3.1 | 920.85 | 7.16E-05 | -3.09993 |
| ICICIBANK | 11-Jan-13 | 31-Jan-13 | 1700 | 0 | 1163.55 | 2.5E-31 | 2.5E-31 |
| ICICIBANK | 21-Jan-13 | 28-Feb-13 | 1700 | 0 | 1177.55 | 1.84E-15 | 1.84E-15 |
| ICICIBANK | 25-Apr-12 | 28-Jun-12 | 600 | 248.8 | 838.4 | 247.9184 | -0.88157 |
| ICICIBANK | 25-Sep-12 | 29-Nov-12 | 1040 | 101.3 | 1066.9 | 51.90992 | -49.3901 |
| ICICIBANK | 17-Jan-13 | 28-Mar-13 | 1200 | 41.55 | 1162.5 | 20.3908 | -21.1592 |
| ICICIBANK | 22-Oct-12 | 29-Nov-12 | 750 | 332.35 | 1075.6 | 332.6874 | 0.337396 |
| ICICIBANK | 18-Dec-12 | 31-Jan-13 | 1600 | 0 | 1148.95 | 6.82E-11 | 6.82E-11 |
| ICICIBANK | 17-Jan-13 | 28-Feb-13 | 1650 | 0 | 1162.5 | 9.79E-13 | 9.79E-13 |
| ICICIBANK | 5-Sep-12 | 25-Oct-12 | 1100 | 1.5 | 879.65 | 0.000162 | -1.49984 |
| ICICIBANK | 30-Aug-12 | 25-Oct-12 | 540 | 387.35 | 919.95 | 387.4532 | 0.103241 |
| ICICIBANK | 1-Nov-12 | 31-Jan-13 | 600 | 470.25 | 1057.35 | 470.8386 | 0.588591 |
| ICICIBANK | 6-Jun-12 | 30-Aug-12 | 540 | 280.6 | 808.4 | 279.7478 | -0.85222 |
| ICICIBANK | 21-Nov-12 | 29-Nov-12 | 540 | 505.45 | 1044.45 | 505.5283 | 0.07833 |
| ICICIBANK | 8-Mar-13 | 30-May-13 | 1200 | 57.95 | 1139.3 | 15.4217 | -42.5283 |
| ICICIBANK | 22-Feb-13 | 25-Apr-13 | 1100 | 52.5 | 1092.55 | 29.45852 | -23.0415 |
| ICICIBANK | 18-Sep-12 | 27-Sep-12 | 540 | 510.25 | 1049.05 | 510.263 | 0.01297 |
| ICICIBANK | 21-Jun-12 | 28-Jun-12 | 580 | 270.7 | 849.65 | 270.6636 | -0.03644 |
| ICICIBANK | 14-Feb-13 | 28-Mar-13 | 1550 | 0 | 1126.2 | 1.17E-10 | 1.17E-10 |
| ICICIBANK | 4-Sep-12 | 27-Sep-12 | 560 | 355.7 | 912.65 | 355.859 | 0.159006 |
| ICICIBANK | 1-Mar-13 | 30-May-13 | 1200 | 29.6 | 1056.35 | 1.983615 | -27.6164 |
| ICICIBANK | 23-Jan-13 | 31-Jan-13 | 550 | 632.05 | 1181 | 632.0983 | 0.048299 |
| ICICIBANK | 28-Aug-12 | 27-Sep-12 | 1180 | 0.05 | 922.35 | 3.44E-09 | -0.05 |
| ICICIBANK | 8-Mar-13 | 25-Apr-13 | 1650 | 0.1 | 1139.3 | 2.15E-12 | -0.1 |
| ICICIBANK | 2-Jan-13 | 28-Mar-13 | 1200 | 54.7 | 1174 | 30.50019 | -24.1998 |
| ICICIBANK | 24-Dec-12 | 31-Jan-13 | 1500 | 0 | 1121.5 | 7.55E-10 | 7.55E-10 |
| ICICIBANK | 28-Apr-12 | 26-Jul-12 | 780 | 125.15 | 868.75 | 106.4704 | -18.6796 |
| ICICIBANK | 10-Sep-12 | 29-Nov-12 | 620 | 326.4 | 934.3 | 326.5702 | 0.170163 |

1. **HDFC Bank**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Symbol | Date | Expiry | Strike Price | Settle Price | Underlying Value | Value of call option | Deviation |
| HDFCBANK | 29-Aug-11 | 29-Sep-11 | 310 | 148.95 | 456.45 | 150.1918 | 1.241828 |
| HDFCBANK | 21-Sep-11 | 29-Sep-11 | 310 | 185.15 | 494.5 | 185.1192 | -0.03075 |
| HDFCBANK | 10-Oct-11 | 25-Oct-11 | 360 | 96.05 | 454.7 | 97.83526 | 1.785259 |
| HDFCBANK | 19-Jan-12 | 25-Jan-12 | 440 | 45 | 486.8 | 51.02334 | 6.023344 |
| HDFCBANK | 5-Jul-11 | 28-Jul-11 | 1950 | 602 | 2541.15 | 618.2443 | 16.24429 |
| HDFCBANK | 8-Sep-11 | 29-Sep-11 | 310 | 175.35 | 483.7 | 175.5003 | 0.150309 |
| HDFCBANK | 23-Sep-11 | 29-Sep-11 | 320 | 136.9 | 456.4 | 136.8809 | -0.01914 |
| HDFCBANK | 23-May-11 | 26-May-11 | 2750 | 0 | 2264.7 | 0.151533 | 0.151533 |
| HDFCBANK | 2-May-11 | 26-May-11 | 2950 | 0.05 | 2290.15 | 26.02306 | 25.97306 |
| HDFCBANK | 6-Feb-12 | 23-Feb-12 | 580 | 0.25 | 507.7 | 11.3604 | 11.1104 |
| HDFCBANK | 21-Feb-12 | 23-Feb-12 | 660 | 0 | 532.05 | 0.000687 | 0.000687 |
| HDFCBANK | 8-Jun-11 | 30-Jun-11 | 1600 | 764 | 2355.25 | 766.6125 | 2.612529 |
| HDFCBANK | 26-Dec-11 | 29-Dec-11 | 500 | 0 | 443.7 | 0.611033 | 0.611033 |
| HDFCBANK | 11-Nov-11 | 24-Nov-11 | 500 | 1.9 | 464.05 | 14.08391 | 12.18391 |
| HDFCBANK | 13-Jun-11 | 30-Jun-11 | 1600 | 779.45 | 2372.6 | 780.2938 | 0.843783 |
| HDFCBANK | 21-Mar-12 | 29-Mar-12 | 340 | 176.5 | 515.65 | 176.3304 | -0.16958 |
| HDFCBANK | 7-Jul-11 | 28-Jul-11 | 2000 | 576 | 2565.8 | 592.5311 | 16.53112 |
| HDFCBANK | 19-Oct-11 | 25-Oct-11 | 460 | 31.85 | 491.85 | 39.36718 | 7.517175 |
| HDFCBANK | 2-Jun-11 | 30-Jun-11 | 1600 | 771.2 | 2360.3 | 776.6536 | 5.453579 |
| HDFCBANK | 28-Nov-11 | 29-Dec-11 | 480 | 4.85 | 440.85 | 25.77727 | 20.92727 |
| HDFCBANK | 22-Nov-11 | 24-Nov-11 | 360 | 84.25 | 444.05 | 84.23051 | -0.01949 |
| HDFCBANK | 21-Oct-11 | 25-Oct-11 | 440 | 49.55 | 487 | 49.26569 | -0.28431 |
| HDFCBANK | 13-Mar-12 | 29-Mar-12 | 360 | 166.1 | 524.4 | 166.0576 | -0.04241 |
| HDFCBANK | 29-Jul-11 | 25-Aug-11 | 310 | 178.9 | 486.8 | 179.3041 | 0.404061 |
| HDFCBANK | 24-May-11 | 26-May-11 | 2750 | 0 | 2255.3 | 0.009817 | 0.009817 |
| HDFCBANK | 16-Feb-12 | 23-Feb-12 | 300 | 227.05 | 526.45 | 226.9743 | -0.07575 |
| HDFCBANK | 20-Jul-11 | 28-Jul-11 | 330 | 173.75 | 503.1 | 173.7602 | 0.010167 |
| HDFCBANK | 30-Jan-12 | 23-Feb-12 | 580 | 0.1 | 479.05 | 9.777992 | 9.677992 |
| HDFCBANK | 10-May-11 | 26-May-11 | 2950 | 0 | 2246.4 | 8.364459 | 8.364459 |
| HDFCBANK | 29-Jun-11 | 30-Jun-11 | 1600 | 889.5 | 2489.1 | 889.4997 | -0.00027 |
| HDFCBANK | 16-Jun-11 | 30-Jun-11 | 1600 | 748.7 | 2343 | 749.0978 | 0.397792 |
| HDFCBANK | 9-Jun-11 | 30-Jun-11 | 1600 | 771.2 | 2362.8 | 773.2958 | 2.095822 |
| HDFCBANK | 28-Feb-12 | 29-Mar-12 | 340 | 193.3 | 530.5 | 193.7463 | 0.446296 |
| HDFCBANK | 27-May-11 | 30-Jun-11 | 2850 | 0.35 | 2303.65 | 63.97761 | 63.62761 |
| HDFCBANK | 12-Mar-12 | 29-Mar-12 | 360 | 160.75 | 518.95 | 160.8085 | 0.058518 |
| HDFCBANK | 18-Jul-11 | 28-Jul-11 | 330 | 185.85 | 515.05 | 185.8766 | 0.026592 |
| HDFCBANK | 9-Nov-11 | 24-Nov-11 | 360 | 118.65 | 477.25 | 119.466 | 0.816034 |
| HDFCBANK | 23-Jan-12 | 25-Jan-12 | 440 | 47 | 484 | 44.73246 | -2.26754 |
| HDFCBANK | 15-Dec-11 | 29-Dec-11 | 480 | 1.6 | 431.35 | 10.09082 | 8.490822 |
| HDFCBANK | 13-May-11 | 26-May-11 | 2950 | 0 | 2251.05 | 4.929743 | 4.929743 |
| HDFCBANK | 16-Mar-12 | 29-Mar-12 | 300 | 209.05 | 507.85 | 208.8248 | -0.22517 |
| HDFCBANK | 18-Nov-11 | 24-Nov-11 | 500 | 0.55 | 458.3 | 5.079282 | 4.529282 |
| HDFCBANK | 14-Jul-11 | 28-Jul-11 | 330 | 177.1 | 505.95 | 177.1423 | 0.042348 |
| HDFCBANK | 17-Nov-11 | 24-Nov-11 | 340 | 119.95 | 459.35 | 119.9734 | 0.023392 |
| HDFCBANK | 9-Dec-11 | 29-Dec-11 | 400 | 47.55 | 443.75 | 58.50718 | 10.95718 |
| HDFCBANK | 1-Aug-11 | 25-Aug-11 | 310 | 179.85 | 488 | 180.1175 | 0.267491 |
| HDFCBANK | 19-Dec-11 | 29-Dec-11 | 300 | 106.8 | 406 | 106.8753 | 0.075255 |
| HDFCBANK | 7-Feb-12 | 23-Feb-12 | 660 | 0 | 509.3 | 2.288694 | 2.288694 |
| HDFCBANK | 24-Jun-11 | 30-Jun-11 | 1600 | 785.6 | 2383.15 | 785.5481 | -0.05194 |
| HDFCBANK | 26-Aug-11 | 29-Sep-11 | 320 | 121.8 | 438.95 | 125.0408 | 3.240825 |

**T-test Data of Public Sector Bank**

**T-Test of Deviation (Between Actual call option value and theoretical Value)**

1. **Bank of India**

| **One-Sample Statistics** | | | | |
| --- | --- | --- | --- | --- |
|  | N | Mean | Std. Deviation | Std. Error Mean |
| Deviation | 205 | -3.6512 | 6.14988 | .42953 |

| **One-Sample Test** | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
|  | Test Value = 0 | | | | | |
|  | t | df | Sig. (2-tailed) | Mean Difference | 95% Confidence Interval of the Difference | |
|  | Lower | Upper |
| Deviation | -8.501 | 204 | .000 | -3.65122 | -4.4981 | -2.8043 |

1. **Andhra Bank**

| **One-Sample Statistics** | | | | |
| --- | --- | --- | --- | --- |
|  | N | Mean | Std. Deviation | Std. Error Mean |
| VAR00001  Deviation | 203 | -.5781 | 1.24330 | .08726 |

| **One-Sample Test** | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
|  | Test Value = 0 | | | | | |
|  | t | df | Sig. (2-tailed) | Mean Difference | 95% Confidence Interval of the Difference | |
|  | Lower | Upper |
| Deviation | -6.625 | 202 | .000 | -.57812 | -.7502 | -.4061 |

1. **Punjab National Bank**

| **One-Sample Statistics** | | | | |
| --- | --- | --- | --- | --- |
|  | N | Mean | Std. Deviation | Std. Error Mean |
| Deviation | 204 | -3.8688 | 9.91853 | .69444 |

| **One-Sample Test** | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
|  | Test Value = 0 | | | | | |
|  | t | df | Sig. (2-tailed) | Mean Difference | 95% Confidence Interval of the Difference | |
|  | Lower | Upper |
| Deviation | -5.571 | 203 | .000 | -3.86878 | -5.2380 | -2.4995 |

1. **SBI Bank**

| **One-Sample Statistics** | | | | |
| --- | --- | --- | --- | --- |
|  | N | Mean | Std. Deviation | Std. Error Mean |
| Deviation | 204 | -4.6314 | 38.90034 | 2.72357 |

| **One-Sample Test** | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
|  | Test Value = 0 | | | | | |
|  | t | df | Sig. (2-tailed) | Mean Difference | 95% Confidence Interval of the Difference | |
|  | Lower | Upper |
| Deviation | -1.700 | 203 | .091 | -4.63138 | -10.0015 | .7387 |

1. **Syndicate Bank**

| **One-Sample Statistics** | | | | |
| --- | --- | --- | --- | --- |
|  | N | Mean | Std. Deviation | Std. Error Mean |
| Deviation | 206 | -.9671 | 1.49567 | .10421 |

| **One-Sample Test** | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
|  | Test Value = 0 | | | | | |
|  | t | df | Sig. (2-tailed) | Mean Difference | 95% Confidence Interval of the Difference | |
|  | Lower | Upper |
| Deviation | -9.280 | 205 | .000 | -.96709 | -1.1725 | -.7616 |

**T-test Data of Private Sector Bank**

**T-Test of Deviation (Between Actual call option value and theoretical Value)**

1. **HDFC Bank**

| **One-Sample Statistics** | | | | |
| --- | --- | --- | --- | --- |
|  | N | Mean | Std. Deviation | Std. Error Mean |
| VAR00001  Deviation | 208 | 3.8796 | 8.45965 | .58657 |

| **One-Sample Test** | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
|  | Test Value = 0 | | | | | |
|  | t | df | Sig. (2-tailed) | Mean Difference | 95% Confidence Interval of the Difference | |
|  | Lower | Upper |
| Deviation | 6.614 | 207 | .000 | 3.87956 | 2.7231 | 5.0360 |

1. **Axis Bank**

| **One-Sample Statistics** | | | | |
| --- | --- | --- | --- | --- |
|  | N | Mean | Std. Deviation | Std. Error Mean |
| Deviation | 203 | -6.3483 | 13.95704 | .97959 |

| **One-Sample Test** | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
|  | Test Value = 0 | | | | | |
|  | t | df | Sig. (2-tailed) | Mean Difference | 95% Confidence Interval of the Difference | |
|  | Lower | Upper |
| Deviation | -6.481 | 202 | .000 | -6.34828 | -8.2798 | -4.4167 |

1. **ICICI Bank**

| **One-Sample Statistics** | | | | |
| --- | --- | --- | --- | --- |
|  | N | Mean | Std. Deviation | Std. Error Mean |
| Deviation | 203 | -4.8698 | 9.09647 | .63845 |

| **One-Sample Test** | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
|  | Test Value = 0 | | | | | |
|  | t | df | Sig. (2-tailed) | Mean Difference | 95% Confidence Interval of the Difference | |
|  | Lower | Upper |
| Deviation | -7.628 | 202 | .000 | -4.86980 | -6.1287 | -3.6109 |

1. **IDBI Bank**

| **One-Sample Statistics** | | | | |
| --- | --- | --- | --- | --- |
|  | N | Mean | Std. Deviation | Std. Error Mean |
| Deviation | 204 | -.6104 | 1.02563 | .07181 |

| **One-Sample Test** | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
|  | Test Value = 0 | | | | | |
|  | t | df | Sig. (2-tailed) | Mean Difference | 95% Confidence Interval of the Difference | |
|  | Lower | Upper |
| Deviation | -8.500 | 203 | .000 | -.61035 | -.7519 | -.4688 |

1. **Yes Bank**

| **One-Sample Statistics** | | | | |
| --- | --- | --- | --- | --- |
|  | N | Mean | Std. Deviation | Std. Error Mean |
| Deviation | 206 | -2.1921 | 3.35077 | .23346 |

| **One-Sample Test** | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
|  | Test Value = 0 | | | | | |
|  | t | df | Sig. (2-tailed) | Mean Difference | 95% Confidence Interval of the Difference | |
|  | Lower | Upper |
| Deviation | -9.390 | 205 | .000 | -2.19207 | -2.6524 | -1.7318 |