

Chapter-13 Option Strategies

Certificate in Risk Management



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Contents

Chapter – 13 Option Strategies	4
13.1 Index & Barrier Options	5
13.2 Option Strategies.....	8
13.3 Option-Adjusted Spread (OAS) as a measure of yield of an instrument.....	19
Summary	23



Chapter – 13 Option Strategies

Introduction

This session deals with the introduction to some specialized derivatives such as equity index derivatives, Barrier Options, Forward Rate Agreements. The construction, use, benefits and trading with these derivatives has also been covered in this session. Some of the specialized equity derivatives like LEAPS and CAPS have also been talked about. Difference between weighted and unweighted indices has also been discussed.

Learning Objective

- Understand the index options and their benefits
- Understand the Barrier options and their uses
- Understand the different Option Combinations and also option spread strategies.



13.1 Index & Barrier Options

An index option is a call or put option on a financial index. Using index options investors bet on overall movement of the stock market. Indexed derivatives have been explained in detail in session 8. After having a fair understanding of equity index, it is easier to learn about index options. In the index options, underlying asset is stock index. The most popular index at which the options are traded is S&P 500 and S&P 100 which are traded on the Chicago Board of Options Exchange. One contract is to buy or sell 100 times the index at a specific strike price.

Index options provide a wide variety of strategies to its investors. Some of the strategies like straddle and spreads, which are used for equity options, can also be used for index options.

Barrier Options

It's a type of financial option where the option to exercise depends on the underlying crossing or reaching a given barrier level. Barrier options are just like plain options but along with a strike price they also have a trigger price. Touching this trigger only, the option either stops existing or comes into existence. In other words Barrier Options are options that are activated or deactivated when a certain threshold is touched. These options come with a 'Trigger Rate' which when touched, depending upon the option type; the option will either come into action or will be out of action.

A barrier option is a path dependent option with one of two below mentioned features:

A knockout option feature: This feature causes the option to terminate if the underlying instrument reaches a specified barrier level.

A knock-in option feature: This feature causes the option to become effective only if the underlying instrument reaches a specified barrier level

Options could be call or put and a barrier option is called 'in' if it is knocked in when the trigger is touched, otherwise it is called 'out'. 'Up' and 'Down' show the direction of the movement needed in the price of the underlying to touch the barrier.

Eight types of barrier options are possible:

Calls

Puts

Down and In	Down and In
Down and Out	Down and Out
Up and In	Up and In
Up and Out	Up and Out

A 'Down and In' Call means that the option will exist only when the price of the underlying falls and a certain barrier price is touched. This is for investors who want to buy only at a certain low level. For example, if an investor wants to buy the option only if the prices drop to 80 USD from the current 90 USD, he can buy a Down and In call with strike price 80 and trigger price also 80 (it is not necessary that strike and trigger prices are equal).

A 'Down and In' Put option means that the option will start to exist when the price of the underlying would fall and touch a low point, this is for investors who think the prices will not fall, but in case they do fall by a lot, they do not want to lose out on the opportunity. For these options, the strike price will usually be a little more than the trigger price. The option writer for call options can justify the higher strike price with the assumption that prices are going to rise further.



To price a barrier option, the probability that the barrier will be breached has to be considered, the more probable it is, higher the premium for an in option and lower it is for an Out option. The option value for Out options becomes zero when the barrier is breached; therefore the prices of Out options are very sensitive to the changes in the price of the underlying.

i. The disappearing barrier options

Disappearing Barrier options are the mostly commonly used for hedging. Disappearing options are the Knock Out options, which go out of action when the barrier price is touched. The Down and Out Call and the Up and Out Put are the most commonly used disappearing options.

ii. Down and Out Call, called the Disappearing Call

The Down and Out Call option ceases to exist when the trigger price is touched. This is for investors who expect that prices are not going to fall by much, but in case the prices do

tumble down, they can buy it at a much lower market price by incurring much lower costs on the premium.

Even if the investor wants to protect his position once the option is knocked out, he can enter into a new option at a much lower premium than the normal plain option.

For example, an investor who does not think that prices will fall buys a Down and Out Call option to buy an underlying that is currently trading at 100 USD. The strike price of the option is USD 110. The trigger price is 90 USD. If the price of the underlying rises, then the investor makes a profit by buying at lower than the market. If the prices fall, but not touch 90, then he incurs a loss, which is equal to the option premium. If the price touches 90, he can then buy at the market price itself (because the option is then knocked out), which is much lower than the strike price of the option, thus making a bigger profit.

iii. Up and Out Put, called the Disappearing Put

It ceases to exist when the price of the underlying rises and touches the trigger. It is for investors who do not think that the prices will rise. In case the prices rise, then they can sell at the higher prices.

For example, an investor who does not think that the prices will rise gets into a disappearing put with strike price USD 100 and triggers USD 110. Say the price of the underlying is 90 USD currently. If the prices do not rise, the investor is safe as he can sell at above the market. If the prices rise and do not touch 110, then he is at a loss as he can only sell at 100 (which he will not, therefore the loss equals the option premium). If the price goes beyond 110, the option falls apart and the investor can sell at the market price, which brings bigger gains to him.

iv. Reverse Barrier Options and their uses

Ordinary KOs and KIs come into existence (or are cancelled out) when they are out-of-money. Reverse barrier options are those that come into existence (or cease to exist) when they are in-the-money.

For example, let the swap rate for 5 years be 5%, then an ordinary KO with strike rate 6% and trigger 5.5% if out-of-money. However, a Reverse KO, RKO would have a strike rate of 6% and trigger of 4%. It would cease to exist if the rate falls to 4%.

Exotic collars, created using Reverse KIs are used with a normal cap, as a hedging instrument. For example, let the at-the-money swap rate for 5 years be 6%. Buying a cap at 7% and selling a floor at 5% can get a standard collar. But in the exotic collar, instead of the vanilla floor, a RKI floor is sold at a strike rate of 7% (same as the cap) with a trigger calculated to achieve zero premium structure. Let the trigger rate be 4%. With this, he would have to pay 7% at the maximum, but that is the worst case scenario, if the interest rates plummet so much to 4%. Otherwise, he has brought down the minimum interest he has to pay from 5% to 4.1%.

Uses of Barrier Options

The reason for the popularity of the barrier options is that the prices of normal options, that is the premium paid to enter into an option is very high and the loss incurred by investor if his expectations turn out to be wrong would be a substantial amount because they'll lose the premium which they have paid for the option.

Options also give extra protection, which may be unnecessary for many investors and may become a hindrance. A call that has a strike price of 100 has to be bought at 100 even when the price drops to 50. For a call option, protection in the downward direction is not necessary and similarly for a put, protection in the upward direction is not necessary.

Barrier options provide solutions to both of these problems, they give protection only in the direction required and they come at a much lower premium than the standard options.

13.2 Option Strategies

Spread strategies are employed for exploiting moderately bullish or bearish beliefs about the market. Spread strategies involve only the use of options. There are three types of spreads:

i. Straddle

Straddle is the spread where a trader buys (or sells) both a call option and a put option on the same underlying at the same strike price. The strike price is usually the at-the-money

price for the underlying. A trader who buys the call and put options is said to be long on the straddle, the trader who sells the call and put options is said to be short on the straddle.

Buy or Long Straddle is considered as a non-directional strategy and is used when the underlying is expected to show large movements in either direction i.e. Upside or Downside. This strategy involves Buying a Call as well as Put on the same underlying for the same maturity and Strike Price.

This strategy gives the investor an advantage of a movement in either direction a soaring or plummeting value of the underlying. Profits can be made in either direction if the underlying shows volatility to cover the cost of the trade. Loss is limited to the premium paid in buying the options.

All that the investor is looking out for is the underlying to break out exponentially in either direction.

Investor View: Neutral direction but expecting significant volatility in underlying movement.



Risk: Limited to the premium paid.

Reward: Unlimited.

Lower Breakeven: Strike Price - net premium paid.

Higher Breakeven: Strike Price + net premium paid.

Example - Nifty is currently trading @ 5500. Long Straddle can be created by Buying Call and Put Option for Strike 5500 having premium of 65 and 35 respectively. Net outflow of premium is 100.

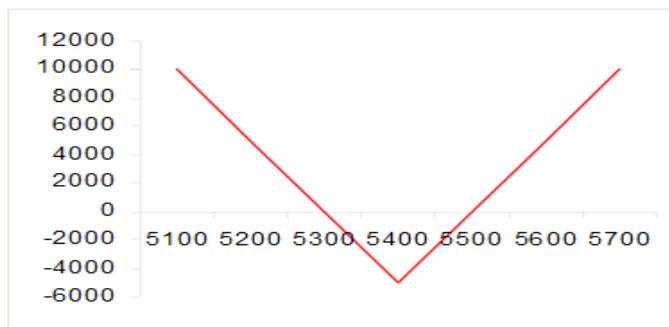
Strategy	Stock/Index	Type	Strike	Premium Outflow
Buy Straddle	Nifty(lot size 50)	Buy call	5500	65
		Buy Put	5500	35

The Payoff Schedule and Chart for the above is below

Payoff Schedule

Nifty @ Expiry	Net Payoff (Rs)
4900	2000
5000	15000
5100	10000
5200	5000
5300	0
5400	-5000
5500	0
5600	5000
5700	10000
5800	15000
5900	20000

Payoff Chart



In the above chart, the breakeven happens the moment Nifty crosses 5300 or 5500 and risk is limited to a maximum of 5000 (calculated as Lot size* Premium Paid). Here it is important to note that the premium is calculated as the sum of premium paid for the Call and Put option.

ii. Strangle

A strangle is very much like a straddle, except that the options are bought (or sold) with different strike prices. Both the strikes are out-of-money. Straddles, unlike strangles which are used in the short-term, are used for longer-period holding. Strangles are a cheaper alternative than straddles as strangles involve the purchase of out-of-money options, which are cheaper than at-the-money options.

Long Strangle

Long Strangle is a strategy to be used when the investor is Neutral on the market direction and bullish on volatility. This strategy involves buying an "Out-of-the-Money Call Option" and buying an "Out-of-the-Money Put Option". Both options must have the same underlying security and expiration month.

Long Strangle is a slight modification to the Long Straddle to make it cheaper to execute. The investor makes profit when the underlying makes significant movement on the upside or downside. The strategy has limited downside.

Investor view: Neutral on direction but bullish on volatility of the Stock/ Index.

Risk: Limited to net premium paid.

Reward: Unlimited.

Upper breakeven: Buy Call Strike price + net premium paid.

Lower breakeven: Buy Put Strike price – net premium paid.



Example- Nifty is currently trading @ 5500. A Long Strangle can be created by buying Put strike 5400 @ premium of 40 and buying Call strike 5600 @ 60 respectively. Net outflow of premium is 100.

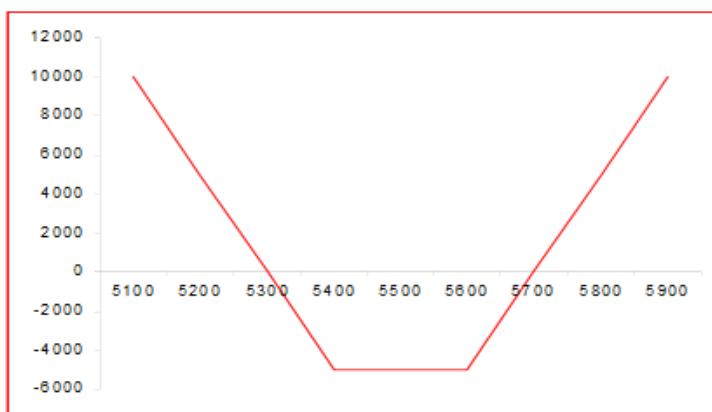
Strategy	Stock/Index	Type	Strike	Premium Outflow
Long Strangle	Nifty(lot size 50)	Buy put	5400	40
		Buy Call	5600	60

The Payoff Schedule and Chart for the above is below

Payoff Schedule

Nifty @ Expiry	Net Payoff (Rs)
5000	15000
5100	10000
5200	5000
5300	0

5400	-5000
5500	-5000
5600	-5000
5700	0
5800	5000
5900	10000
6000	15000

Payoff Chart

In the above chart, the breakeven happens the moment Nifty crosses 5300 or 5700 and risk is limited to a maximum of 5000 (calculated as Lot size* Premium Paid). Here it is important to note that the premium is calculated as the sum of premium paid for the Call and Put option.

iii. Strips

A strip consists of a long position in one call and two puts with the same exercise price and expiration date. The buyer of a strip believes that there will be a big stock price move but the stock price is more likely to fall than it is to rise.

Investors must use Strip strategy when they are bullish on volatility and bearish on market direction. This strategy involves buying two lots of "At-the-Money Put Option" and buying an "At-the-Money Call Option". Both Options must have the same underlying security and expiration month. Strip is similar to bearish version of the common Long Straddle. Large

profit is attainable with the Strip strategy when the underlying makes a strong move either upwards or downwards at expiration, with greater gains to be made with a downward move.

Investor view: Bearish on direction but bullish on volatility of the Stock/ Index.

Risk: Limited to net premium paid.

Reward: Unlimited.

Upper breakeven: Strike price + net premium paid.

Lower breakeven: Strike price – (net premium paid/2).

iv. Straps

A strap consists of a long position in two calls and one put with same strike price and expiration date. A strap is like a strip that is skewed in the opposite direction. The buyer of a strap expects bullish and bearish possibilities for the optioned security with a price rise being more likely.

Investors must use Strap strategy when they are bullish on volatility and bullish on market direction going upwards. This strategy involves buying two lots of "At-the-Money Call Option" and buying an "At-the-Money Put Option". Both options must have the same underlying security and expiration month. Strap is similar to bullish version of the common Long Straddle. Large profit is attainable with the Strap strategy when the underlying makes a strong move either upwards or downwards at expiration, with greater gains to be made with an upward move.

Investor view: Bullish on direction as well volatility of the Stock/ Index.

Risk: Limited to net premium paid.

Reward: Unlimited.

Upper breakeven: Strike price + (net premium paid/2).

Lower breakeven: Strike Price – net premium paid.

v. Vertical or Price Spreads

Vertical Spread involves buying an option and another option of the same type and time to expiration, but with a different exercise price.

For example: Buy March 270 Call @ Rs.50
 Buy March 350 Call @ Rs.3

vi. Horizontal/Time Spread

Horizontal Spread involves buying an option and selling another option of the same type with the same exercise price, but with a different time of expiration.

For Example: Buy March 310 Call @ Rs. 21
 Buy June 310 Call @ Rs. 30

Time spreads, are also called Horizontal spreads. These consist of opposing positions which expire in different months. When all the options in a spread have the same execution date (after which the option expires), the value of the spread is a function of the price of the underlying at expiry.

Time spreads are options on the same underlying with different expiry dates for the options. When the options in the spreads expire at different times, the value of the option spread can be determined only after both the options are executed. Typically both the options in the time spread have the same strike price.

vii. Bull Spread

A bull spread is a combination of options created to profit from a rise in prices of the underlying asset. This strategy is used if the prices are expected to rise; both calls and puts can be used to build this spread. If you wish to buy a bull spread using a call, then you purchase a call at a lower strike price and sell a call with a higher strike price. The cost of a bull spread would be the cost of the option bought less the cost of the option sold.

A Bull Call Spread is formed by buying an "In-the-Money Call Option" (lower strike) and selling an "Out-of-the-Money Call Option" (higher strike). Both the call options must have the same underlying security and expiration month.

The net effect of the strategy is to bring down the cost and breakeven on a Buy Call (Long Call) strategy. The investor will benefit if the underlying Stock/Index rallies. However, the risk is limited on the downside if the underlying Stock/Index makes a correction.

If for example, a call is bought at strike price 100 USD and a call is sold at strike price 150 USD, if the price of the underlying rises to 120 USD, then a profit is made on the lower strike price call (20 is the profit), if the price rises above 150 USD, then out of the profit made, a part is paid to the sold call option.

The same strategy can be used with Puts also, if the expectation is that the prices will rise above the higher put strike price (which is the sold option). Then neither option is executed and the trader books a profit through the premium.

viii. Bear Spread

The Bear spread is the opposite of the Bull spread, it expects the prices to go down, and an investor buys at a higher strike price and sells at a lower strike price.

A Bear Call Spread is formed by buying an "Out-of-the-Money Call Option" (higher strike) and selling an "In-the-Money Call Option" (lower strike). Both Call options must have the same underlying security and expiration month.

The investor receives a net credit because the Call bought is of a higher strike price than the Call sold. The concept is to protect the downside of a Call sold by buying a Call of a higher strike price to insure the Call sold.

Investor view: Moderately bearish on the Stock/ Index.

Risk: Limited.

Reward: Limited to the net premium received.

Breakeven: Strike price of Short Call + premium received.

For example, a put is bought at 1000 USD strike price and a put is sold at 800 USD. If the prices fall to between 800 and 1000, the difference in the spot and strike price is the profit. If the prices fall further, the payoff is always fixed at 1000-800, i.e. 200 USD. If the prices rise, contrary to the expectations, then both the options are left to expire.

ix. Diagonal Spread

Diagonal Spread involves buying an option and selling another option of the same type with a different exercise price and a different time to expiration.

For example: Buy March 270 Put @Rs.2
Sell June 310 Put @Rs.50

A diagonal spread is similar to a time spread. Except that the options have different exercise prices. While many diagonal spreads are executed one-to-one (one long term option for each short term option), they can also be executed with unequal number of long and short market contracts. Diagonal spreads come with a large number of variations and hence each needs to be analyzed separately.

x. **Butterfly spread**

Butterfly spread is also a kind of straddle, which would minimize the cost and the losses that may be incurred in a straddle. It also reduces the potential profits. In a butterfly spread, along with buying at-the-money call and put, an out-of-money call and put are sold, to minimize the total cost incurred on the premiums, and to cut down on the potential losses. The spread is most apt when a trader expects slight movements in the prices of the underlying.



Long Call Butterfly -Long Call Butterfly is a strategy that must be devised when the investor is neutral on the market direction and expects volatility to be less in the market. A Long Call Butterfly strategy is formed by selling two At-the-Money Call Options, buying one Out-of-the-Money Call Option and one In-the-Money Call Option.

A Long Call Butterfly is similar to a Short Straddle except that here the investor's losses are limited. The investor will benefit if the underlying Stock/ Index remains at the middle strike at expiration.

Investor view: Neutral on direction and bearish on Stock/ Index volatility.

Risk: Limited to the premium paid.

Reward: Limited.

Lower Breakeven: Strike price of Lower Strike Long Call + net premium paid.

Higher Breakeven: Strike Price of Higher Strike Long Call – net premium paid.

Example: Nifty is currently trading @ 5500. Buying Call Option of Nifty having Strike 5400 @ premium 200, Strike 5600 @ premium 80 and selling two lots of Call Option of Nifty

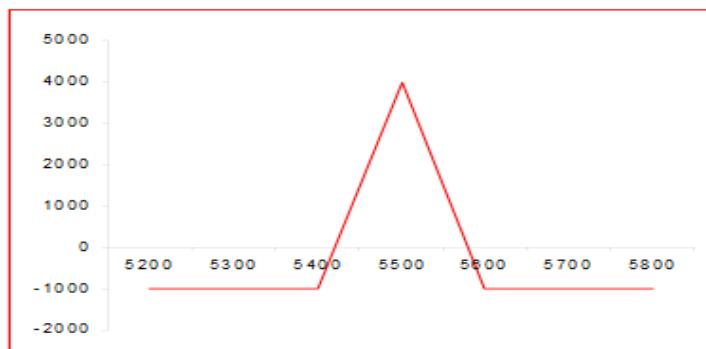
having Strike 5500 @ premium 130 will help the investor benefit if Nifty expiry happens at 5500.

Strategy	Stock/Index	Type	Strike	Premium Outflow
Long call Butterfly	Nifty(lot size 50)	Buy call	5400	200
		Sell call– 2 lots	5500	130
		Buy call	5600	80

Payoff Schedule

Nifty @ Expiry	Net Payoff (Rs)
5100	-1000
5200	-1000
5300	-1000
5400	-1000
5420	0
5500	4000
5580	0
5600	-1000
5700	-1000
5800	-1000
5900	-1000

Payoff Chart



In the above chart, the breakeven happens the moment Nifty crosses 5420 or 5580. The reward is limited to 4000 [calculated as (Difference in strike prices - net premium paid) * Lot Size]. The risk is limited to 1000 (calculated as Net premium paid * Lot Size).

xi. Long Synthetic

Long Synthetic is a strategy to be used when the investor is bullish on the market direction. This strategy involves buying a Call Option and selling a Put Option at the same Strike price. Both Options must have the same underlying security and expiration month.

Long Synthetic behaves exactly the same as being long on the underlying security. The investor going for Long Synthetic strategy expects payoff characteristics similar to holding the stock or futures contract. It has the benefit of being much cheaper than buying the underlying outright.

Investor View: Bullish on direction of the Stock / Index.

Risk: Unlimited.

Reward: Unlimited.

Breakeven: Strike Price +/- net premium paid/ received.



xii. Calendar Spread

A calendar spread is almost similar to a butterfly spread. It is created by selling a call option with a certain strike price and purchasing another call option with longer maturity but the same strike price. Despite the initial investment, the long maturity option can be sold when the short maturity option expires, thus resulting in a profit.

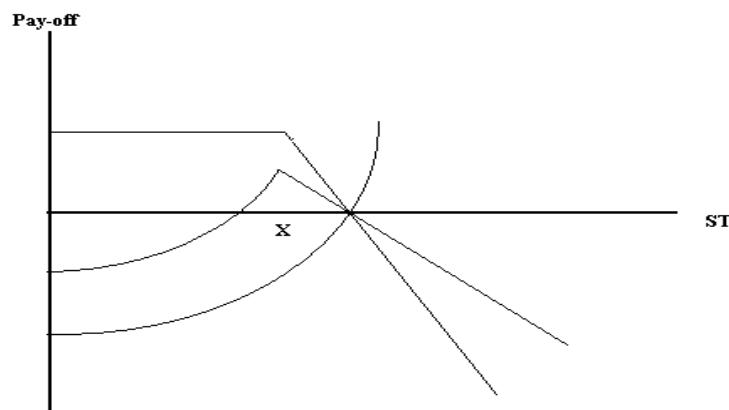


Figure 11.2: Calendar spread using Two Call Options

xiii. Ratio Spread

In a ratio spread two or more related options are traded in a specific proportion. As the ratio can be varied without any limit, there are infinite possibilities of designing a ratio spread. In a ratio spread the number of options bought is different from the number of options sold to form a spread. If the ratio is 1, then the ratio spread becomes similar to a bull or a bear spread depending upon the strategy adopted. Buying two options and selling one option gives a 2:1 ratio spread.

xiv. Collar Spread

Collar is a strategy that is devised when an investor is holding shares in the underlying and feels that the underlying position is good for "medium to long term" but is moderately bullish on the near term.

In Collar, an investor sells a Call option on a stock he owns. The investor also buys a Put Option to insure against the fall in the price of the underlying. This is a low risk strategy since the Put prevents downside risk. The profits are also capped on the upside because the Call sold prevents profits when the underlying rallies.

Investor view: Neutral to bullish on direction.

Risk: Limited.

Reward: Limited.

Breakeven: Stock Price – Call premium + Put premium

13.3 Option-Adjusted Spread (OAS) as a measure of yield of an instrument

OAS is a measure of yield of an instrument on a risk-adjusted basis. OAS is a tool for measuring the price difference between two similar products, which have different embedded options (For example, Bonds can broadly be divided as Callable Bonds (which the issuing firm can call back, that is taking back before the maturity date) and ordinary bonds (also called plain vanilla option which is the standard type of option, one with a simple expiration date and strike price and no additional features.)

Obviously, the embedded options come at a cost. OAS gives the means to compare the returns on an ordinary investment instrument against an embedded instrument. OAS for an

embedded instrument is its current spread over the benchmark minus the component of spread that is because of the embedded option. That is OAS is the spread it would have if it were not embedded.

The common benchmarks used for the calculation of the instrument's spread are either the rate of return of the government treasury bills, or the inter market call rate like the LIBOR (London Inter Bank Offer Rate) or MIBOR (Mumbai Inter Bank Offer Rate) rate.

OAS = Spread – Spread due to optionality

(Optionality could be defined as the additional features in an instrument, like being callable, etc).

Therefore, Spread = OAS + Spread due to optionality

But, Spread + Bench mark yield = Yield of the bond.

Therefore, Yield of the bond = OAS + Spread due to Optionality + Bench mark Yield

OAS=Bond's yield – spread due to optionality

Did You Know: OAS was first used for Mortgage Backed Securities in the 1980s. The investors then were offered instruments with extraordinary current yields- 500 or 600 points over the treasury rate

Calculation of OSA

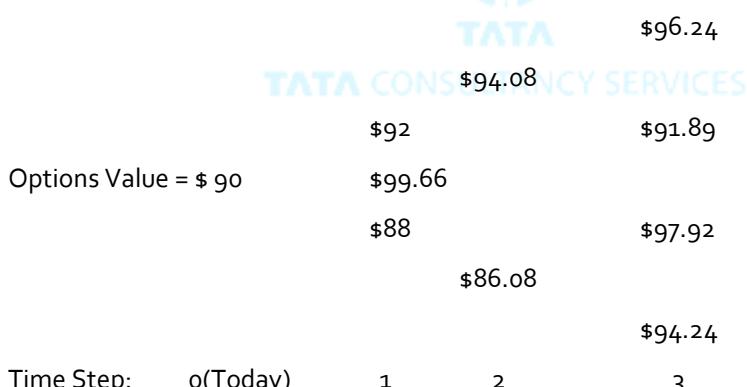
OAS can be calculated using Monte Carlo Method of Random Numbers. Monte Carlo simulation is the technique used to find the probability of certain outcomes by running multiple trials called simulations; this method involves the use of random variables. In this method, Cash Flows are generated from various forecasted coupon rates offered. These Coupon Rate patterns are generated using the Monte Carlo simulation method. These cash flows are discounted (Discounting example: if you expect \$100 dollars in one year's time.

To determine the present value of this \$100 (i.e. to find out what it is its value to you today) you discount it by a particular rate of interest. If the discount rate is 5%, then the value of your \$100 in one year time would be the equal to \$90.909 to you today ($100/[1.00 + 0.10]$). The distribution of the present value (PV) is identified and the average PV is found. The PV

is equated to the current market price of the instrument by adding a 'Spread' to the PV. The added Spread is called the OAS of the instrument.

The other method used to find the options spread is binomial pricing model. The model not only reduces the possibilities of price changes but also removes the possibility for arbitrage. There are a few assumptions like: a perfectly efficient market is assumed to be there. Under these assumptions and simplifications, this particular model is able to provide the valuation for an option at each specified point in time. It starts with the current risk-free short-term interest rate and the assumption made is that volatility in the next period either increases or decreases with respect to the current period. A binomial tree is constructed by moving from the current period to the maturity period and applying the volatility conditions for each period. The embedded call can be determined by working backwards on the tree.

A simplified example of a binomial tree might look something like this:



Using this approach the spread for any option can be found from the tree at a specified time.

Uses of OSA

Traditional methods of valuation assume consistent cash flows (CFs), without considering the effect of volatile interest rates and the contingent nature of the CFs. Compared to traditional methods, OAS assumes a probability based view of the possible interest rate changes in the future.

OAS enables investors to compare between the vanillas [ordinary] and embedded instruments, before the use of OAS became prominent, the comparisons, for example

between the yields of a callable bond versus the yield of an ordinary bond were meaningless. Also, OAS enables to separate optionality and judge the degree to which an instruments yield compensates to the credit, liquidity or other risks undertaken by the investors. For example, in comparing two bonds, holding all other things equal (same maturity, yield and risk profile), the bond that has a higher OAS offers greater return for the risk undertaken.



Summary

- Barrier options are just like plain options but along with a strike price they also have a trigger price.
- These options come with a 'Trigger Rate' which when touched, depending upon the option type; the option will either come into action or will be out of action.
- Disappearing Barrier options are the mostly commonly used for hedging. Disappearing options are the Knock Out options, which go out of action when the barrier price is touched.
- Straddle is the spread where a trader buys (or sells) both a call option and a put option on the same underlying at the same strike price.
- A strangle is very much like a straddle, except that the options are bought (or sold) with different strike prices.
- A strip consists of a long position in one call and two puts with the same exercise price and expiration date. The buyer of a strip believes that there will be a big stock price move but the stock price is more likely to fall than it is to rise.
- OAS is a measure of yield of an instrument on a risk-adjusted basis.



References

This document is prepared from the material available on www.hsbcinvestdirect.co.in



TATA CONSULTANCY SERVICES

www.tcs.com