

FX Derivatives Terminology

Education Module: 5

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Foreign Exchange Options

Option Markets and Terminology

A

American Options

American Options are options that are exercisable for early value at any time during the term of the structure.

American Options can be more expensive than the equivalent European-style option. Theoretically, the American Option will be more expensive when the Call currency interest rate is close to or exceeds the Put currency interest rate. Due to the interbank market trading European Options, the hedge risk on American Options will translate to a more expensive price compared to the equivalent European Option in most cases.

At-the-Money (ATM)

The following two terms are used in the market:

- ATM Spot.
- At-the-Money-Forward (ATMF).

ATM Spot

This is where the strike of the option is equal to the spot rate at which you hedge the option delta.

ATM Forward (ATMF)

This is where the strike of the option is equal to the outright forward rate at which you hedge the option delta. Options referred to as ATM are normally ATMF.

B

Barrier Date

The Barrier Date is the date on which the barrier(s) of a partial barrier option commence or cease to exist.

Barrier Options

The existence of Barrier Options are dependant on predetermined market events occurring or not occurring during the term (or portion of the term) of the option.

Break-Even Rate

The Break-Even Rate is the rate in the market at which, after taking into account any premium costs, the owner's profit and loss on the option is net zero compared to market.

C

Call

A Call gives the owner the right, but not the obligation, to buy (Call in) the specified currency at a predetermined rate and at a predetermined time in the future.

A Call will oblige the seller to potentially sell the specified currency at a predetermined rate and at a predetermined time in the future.

Consistent Pricing

The prices of Vanilla Options with a delta lower than 50 will be less sensitive to volatility. If the same volatility spread is used for a 50 delta option and an Out-of-the-Money (OTM) option, the price spread on the low delta option will be reduced (all other factors remaining the same). The interbank market works on consistent FX points pricing spread, rather than consistent volatility spread pricing. This ensures that the spread of the price, rather than the volatility spread, remains consistent. As a consequence, the volatility spread for low delta options will be wider than the volatility spread quoted on ATM options.

Correlation

Correlation refers to the association between two currencies. It is the degree of certainty with which the move in one currency can be predicted as a result of a change in the other. Correlation is also the expected ratio of the moves between two currencies, divided by their corresponding volatility.

Correlation Options

Correlation Options are options in which the hedge amount or rate is dependent on the correlation between two or more assets during the term of the strategy.

In general, Correlation Options are unpopular in the corporate market, and are usually not offered by the Global Options desk.

Cut Time

At the outset of the contract, a Cut Time is agreed between the counter-parties. The Cut Time is the time on the expiry date after which the option ceases to exist. It is at this time that the owner of European Options nominates whether the option will be exercised or lapsed. The Cut Time is also the last opportunity for the owner of American Options to exercise. After the expiry time on the expiry date, the option ceases to exist. Normal market cut times include 3pm Tokyo, 10am New York, 3pm Sydney and 3pm Wellington.

D

Definition (Vanilla Option)

A Vanilla Option is a contract that gives the buyer the right, but not the obligation, to exchange one currency for another at a predetermined rate and at a predetermined time in the future for a nominated amount.

Delivery

An option will have a nominated delivery date. The delivery date is the date on which the exchange of Face Values on any Vanilla Options or Barrier Options occurs between the counter-parties. The delivery day is the day on which the payout due on a European digital option will be paid to the owner. The payout on an American (instantaneous) digital is due two days after the trigger event occurs.



Delivery Dates – Calculation

One Week

The one-week run will always be seven days from today to the expiry date (i.e. a one-week option written on a Tuesday will expire on a Tuesday). Delivery date of the one-week option will be two business days after the expiry date.

Month or Year Runs

Delivery dates for straight-month runs are based on calendar dates, rather than a fixed number of days. The delivery date of a straight-month run will be the same as the value date of the corresponding forward.

The delivery date of any option must not be a holiday in the currencies' major financial centres or in the US. If there is a holiday on the delivery date, the delivery date automatically moves to the next clear business day. If spot is the last business day of the month, the delivery date for the month run will also be on the last business day of the straight-month run.

Calculating Straight-Month Delivery Dates

Example:

Deal date	22/02/2000
Spot date	24/02/2000
One month delivery date	24/03/2000 (29 days)
Deal date	03/03/2000
Spot date	07/03/2000
One month delivery date	07/04/2000 (31 days)

For more information, see Straight Dates.

Delta

The delta of an option describes its premium's sensitivity to changes in the price of the underlying. An option's delta will be the amount of the underlying asset necessary to hedge changes in the option price for small movements in the underlying. An ATM Vanilla Option will have a delta of 50%. The delta falls for OTM Vanilla and increases for In-the-Money (ITM) Vanilla Options. The change as the option moves ITM to OTM is non-linear. In addition, the change in delta will be most rapid when the option is close to the money.



Delta Hedging

An option is said to be Delta Hedge if a position has been taken out in the underlying asset (currency) in proportion to its delta. This Delta Hedge can cover the spot market, or the spot and forward position. In general, you will only be required to hedge the Spot Delta. With longer dated options or options on illiquid currencies, you may be required to hedge the Forward Delta.

Spot Delta

Spot Delta is the sensitivity of an option's premium to changes in the spot market.

Forward Delta

Forward Delta is the sensitivity of an option's premium to changes in the forward market.

Derivative Instrument

A Derivative Instrument is any instrument whose performance is based on (or derived from) the behaviour of the price of an underlying asset. In the case of a currency derivative, the underlying is usually taken to mean the outright forward.

Digital Options

Digital Options are options that give the owner a payout dependant on certain market(s) occurring or not occurring during the term of the contract. Unlike Vanilla Options and Barrier Options, no exchange of Face Value occurs.

E

Effective Rate

Effective Rate is the rate the owner of the option achieves, once premium costs have been taken into account.

European Options

European Options are options that are exercisable at expiry. However, the option can be sold back prior to expiry to receive a premium, and alternative physical cover taken in its place.

European Options are traded in the OTC interbank market.



Expiry

An option has an expiry date that is nominated at the outset of the option. The expiry date is the day after which the option ceases to exist. The owner of a European Option (and American Option that has not been exercised prior to this date) will nominate whether the option will be exercised or lapsed on this day.

Expiry Date Calculation

Expiry dates are calculated from the Delivery Dates – Calculation. The delivery date of an option will generally be the same as the value date for a forward for the same period.

One Week

The one-week run will always be seven days from today to the expiry date (i.e. a one-week option written on a Tuesday will expire on a Tuesday).

Month or Year Runs

Delivery dates for straight-month runs are based on calendar dates, rather than a fixed number of days. The delivery date of a straight-month run will be the same as the value date of the corresponding forward.

The expiry date is then calculated from the delivery date by moving back two business days.

Note: CAD options, like CAD spot, only have a one-day difference between the delivery and expiry dates (i.e. the expiry date is only one day back from the delivery date).

Calculating Straight-Month Delivery and Expiry Dates for Non-CAD Options

Example:

Deal date	22/02/2001
Spot date	24/02/2001
One month delivery date	24/03/2001 (29 days)
Therefore:	
Expiry Date	22/03/2001
Deal date	03/03/2001
Spot date	07/03/2001
One month delivery date	07/04/2001 (31 days)
Therefore:	
Expiry Date	05/04/2001

For more information, see Straight Dates.



Extrinsic Value

Extrinsic Value is the time value of an option. This includes cost of carry and the probability that the option will be exercised.

F

Forward Delta

Forward Delta is the sensitivity of an option's premium to changes in the forward market.

FX Points Price Expression

There are two ways that the price of the option can be expressed:

- The percentage of the Face Value.
- As an FX points cost.

Example:

A EUR/USD option with a Face Value of 10mio EUR and a cost of 122FX points will cost 122,000 USD (i.e. 10mio EUR x .0122 = 122,000 USD).

G

Gamma

Gamma is the rate of change in the delta of an option for a small change in the underlying asset. The rate of change is greatest when an option is close to the money. A long (positive) gamma position is one in which a trader is long Vanilla Options, while a short (negative) gamma position is one in which the trader is short Vanilla Options.

H

Historical (Actual) Volatility

Historical Volatility is the degree of price movements of a currency in the past. It is defined as the annualised standard deviation of the natural log of the ratio between two successive prices, and represents the amount of variability of returns on a specified asset.



Implied Volatility

Implied Volatility is the volatility parameter derived from the option price. Option traders use the Black&Scholes pricing formula (and its derivatives) to derive volatility. Like a currency, Implied Volatility is a commodity that is traded by dealers and quoted on market screens.

Implied Volatility – Effect on Option Pricing

The Implied Volatility level used will effect the price of a Vanilla Option. All other factors being equal, an option priced with a higher volatility price will be more expensive.

Example:

1) EUR Call	Volatility of 9.50%	1.89%EUR (208 FX points).
2) EUR Call	Volatility of 12.00%	2.39%EUR (262 FX points).

This rule will hold true for Vanilla Options, but not for some exotic options that are negative vega. For example, Barrier Options with triggers that are ITM (with respect to the strike) will have negative vega. This is because an increase in volatility can not increase their maximum intrinsic value potential; however, it does increase the likelihood of the option being triggered while it has intrinsic value.

In-the-Money (ITM)

An option that is ITM will have intrinsic value, compared to the relative outright forward rate in the underlying asset. Options that are ITM are more expensive than options that are ATM.

Intrinsic Value

An option premium is comprised of the options intrinsic and extrinsic value. The intrinsic value of an option is the amount it is ITM, as compared to the relative current forward market price for the underlying asset.



O

Odd Date

An Odd Date option is an option that expires on an irregular date (i.e. it expires on a day other than the straight one week, one month, two month dates).

Optimal Options¹

Optimal Options are options that provide the buyer with an opportunity to lock in an exercise, against the most favourable rate or chosen rate seen in the market during the life of the option.

¹Optimal and Correlation Options are generally more expensive than Vanilla Options. Due to this expense, these options have proven unpopular in the corporate market, and are usually not offered by the Global Options desk.

Out-of-the-Money (OTM)

An option that is OTM will not have any intrinsic value compared to the relative outright forward rate in the underlying asset. Options that are OTM are less expensive than ATM options.

P

Percentage Price (Pricing Expression)

There are two ways that the price of the option can be expressed:

- As a percentage of the Face Value.
- As an FX points cost.

Example:

A EUR/USD option with a Face Value of 10mio EUR and a cost of 1.11% will cost 111,000 EUR.

Pricing Expression

There are two ways that the price of the option can be expressed:

- As a percentage of the Face Value.
- As an FX points cost.

Percentage

Example:

A EUR/USD option with a Face Value of 10mio EUR and a cost of 1.11% will cost 111,000 EUR.

FX Points

Example:

A EUR/USD option with a Face Value of 10mio EUR and a cost of 122FX points will cost 122,000 USD (i.e. 10mio EUR x .0122 = 122,000 USD).

Pricing Sensitivities of Vanilla Options

The price of a Vanilla Option will be effected by three factors:

- The option strike and proximity to market.
- The Implied Volatility price used.
- The tenure of the option.

Pricing Sensitivity	Lower Price	Higher Price
Proximity to Market (Intrinsic Value)	OTM	ITM
Volatility	Low Volatility	High Volatility
Expiry Date (Extrinsic Value)	Short Dated	Long Dated

Proximity to Market – Effect on Option Pricing

The strike of a Vanilla Option as compared to the market (spot and forward) will effect the price of the option. An option with a hedge strike that is ATMF will be more expensive than an option that has a hedge strike that is OTM. The more ITM the option, the more expensive the option will be (all other factors being equal).

Example:

1) EUR Call	Strike ATMF (1.1050)	1.89% EUR (208 FX points).
2) EUR Call	Strike OTM (1.1250)	1.14% EUR (125 FX points).

Put

A Put gives the owner the right, but not the obligation, to sell (Put in the market) the specified currency at a predetermined rate, and at a predetermined time in the future.



A Put will oblige the seller to potentially buy the specified currency at a predetermined rate, and at a predetermined time in the future.

R

Rho

Rho is the measure of an option's sensitivity to a change in the counter (premium) currency interest rates. This will have impact on both the future price of the option and the time value of the premium. Its impact increases towards the maturity of the option.

Risk Reversal

Risk Reversal is a term used in the interbank market. Compared to ATM volatility, Risk Reversal is a price quoted to purchase a 25 delta Put and sell a 25 delta Call (or vice versa) for the same term and amounts.

The Risk Reversal price represents the bias (see Volatility Skew) in the market for either Puts or Calls. Since both options are vega neutral at instigation, the directional bias in the market will be an important consideration.

A Risk Reversal will be quoted as a bid/offer price. The price on a USD/JPY R/R may be 0/.3 JPY Puts. This would be quoted as 'flat at 0.3, JPY Puts'.

Here, the price is quoted in terms of JPY Puts, as JPY Puts are quoted at a premium in the market. So, the bid is where the bank buys JPY Puts, and the offer is where the bank sells JPY Puts.

If JPY Calls were at a premium, the Risk Reversal price would be quoted in terms of JPY Calls (i.e. the bid of the Risk Reversal would represent where the market buys JPY Calls, while the offer would represent where the market sells JPY Calls).

For example:

The price on a USD/JPY R/R is 0/.3 JPY Puts.

This price suggests that 25 delta JPY Puts will be bought (and simultaneously 25 delta JPY Calls sold) for the usual volatility spread. Whereas 25 delta JPY Puts will be sold (and simultaneously 25 delta JPY Calls bought) if the bank receives 0.3% of the volatility spread.

This tells us that there is a bias in the market towards JPY Puts (i.e. a bank will only sell JPY Puts if it receives an additional 0.3% volatility spread).



If the bias for JPY Puts increases, the price may change to 0.2/0.5 JPY Puts, quoted as '0.2/0.5 JPY Puts'. This price suggests that JPY Puts will be bought (and simultaneously JPY Calls sold) where the bank will pay away 0.2% of the usual volatility spread (i.e. the market is keen to buy JPY Puts).

Whereas JPY Puts will be sold (and simultaneously JPY Calls bought) if the bank receives an additional 0.5% of the volatility spread.

Although Risk Reversals are generally quoted at 25 delta in the interbank market, a price for any delta Risk Reversal can be obtained from your market maker.

S

Spot Delta

Spot Delta is the sensitivity of an option's premium to changes in the spot market.

Straight Date

A Straight Date option is an option that expires on an even expiry date (i.e. on the day it is quoted, the Straight Day option matures in exactly seven days, one month, two months, and so on).

Calculating Straight Date Expiry and Delivery Dates

One Week

The one-week run will always be seven days from today to the expiry date (i.e. a one-week option written on a Tuesday will expire on a Tuesday). The delivery date of the one-week option will be two business days after the expiry date.

Month or Year Runs

Delivery dates for straight-month runs is based on calendar dates, rather than a fixed number of days. The delivery date of a straight-month run will be the same as the value date of the corresponding forward. The expiry date is then calculated from the delivery date by moving back two business days.

The delivery date of any option must not be a holiday in the currencies' major financial centres or in the US. If there is a holiday on the delivery date, the delivery date automatically moves out to the next clear business day. If spot is the last business day of the month, the delivery date for



the month run will also be on the last business day of the straight-month run.

Note: CAD options, like CAD spot, only have a one-day difference between the delivery and expiry dates (i.e. the expiry date is only one day back from the delivery date).

Calculating Straight-Month Delivery and Expiry Dates

Example:

Deal date	22/02/2000
Spot date	24/02/2000
One month delivery date	24/03/2000 (29 days)

Therefore:

Expiry Date	22/03/2000
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Deal date	03/03/2000
Spot date	07/03/2000
One month delivery date	07/04/2000 (31 days)

Therefore:

Expiry Date	05/04/2000
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Calculating straight-month delivery and expiry dates where there is a holiday on the delivery date in the currencies' major financial centre or the US.

Example:

Deal date	19/01/2000
Spot date	21/01/2000
US holiday	21/02/2000

One month delivery date	22/02/2000
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Therefore:

Expiry Date:	18/02/2000
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Calculating straight-month delivery and expiry dates where the spot date is on the last business day of the month.

Example:

Deal date	29/03/2000
Spot date	31/03/2000
One month delivery date	28/04/2000

Therefore:

Expiry Date:	26/04/2000
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Strike (K)

The Strike is the hedge rate on any barrier or Vanilla Option. It is the rate against which the owner decides whether to exercise or lapse the option.

Strike Risk

Strike Risk occurs on or near the expiry date of an option. On the expiry date of an option, the option can be ITM, OTM or ATM.

In theory, if the option is ITM, the option trader can totally hedge the option in the spot market. Therefore, at expiry, no additional position will result. The option hedge will offset the exercise.

If the option is OTM, there will be no hedge and no exercise.

If the option is ATM, on expiry date the hedge required on the option will change as the spot moves. The spot market before expiry time may move 20 points. As a consequence of the spot move, the option may shift from slightly ITM to slightly OTM. The resulting hedge required will change rapidly.

This rapid change in the hedge required for an ATM option on expiry date is known as the Strike Risk.

Smile

See Volatility Smile.

I

Term

Term is the length of time for which an option contract is written. In the case of Barrier Options, the option may not exist for any or part of this term. Term is a word that is normally used when the option has a straight date maturity.

Term – Effect on Option Pricing

The tenure of a Vanilla Option will effect the price of an option. All other factors being equal, the longer the term of the option, the more expensive it will be.

Example:

1) EUR Call	Three month term	1.89% EUR (208 FX points).
2) EUR Call	One month term	1.10% EUR (122 FX points).

Theta

Theta (Time Decay) is the measure of the effect on the option price of a one-day decrease in time to expiration. The more the market and strike price diverge, the less effect Theta has on the option price. Non-linear, Theta's value decreases at a faster rate as the option gets closer to maturity.

V

Vanilla Options

A Vanilla Option is a contract that gives the buyer the right, but not the obligation, to exchange one currency for another at a predetermined rate, and at a predetermined time in the future for a nominated amount. The existence of the option contract is not dependent on any market events during the life of the option. In addition, the option has a nominated face value for which the two counter-parties will exchange in full on the delivery date.

Vega

Vega measures the change in an option's price caused by changes in volatility. Vega is at its highest when an option is ATM, and decreases as the strike and market prices diverge. Options closer to expiry have a lower Vega than those with more time to run. A long (positive) vega position will result when a Vanilla Option is purchased. This position will benefit from an increase in Implied Volatility levels, and if the position is delta hedged from actual volatility levels as well.

Volatility

Volatility is the amount of variability in the returns of a particular currency. There are two forms of volatility often referred to in the markets:

- Implied Volatility.
- Historical (Actual) Volatility.

Implied Volatility

Implied Volatility is the volatility parameter derived from the option price. Option traders use the Black&Scholes pricing formula (and its derivatives) to derive volatility. Implied Volatility is a



commodity, like a currency, that is traded by dealers and quoted on market screens.

Historical (Actual) Volatility

Historical Volatility is the degree of price movements of a currency in the past. It is defined as the annualised standard deviation of the natural log of the ratio between two successive prices, and represents the amount of variability of returns on a specified asset.

Disparity Between Historical Volatility and Implied Volatility

Disparity occurs when there is a mismatch between what was expected to occur and what actually occurred during a specified time period. Due to their differences, there will always be some disparity between actual levels of Historical Volatility and Implied Volatility. The former is the annualised standard deviation of the natural log of the ratio between two successive prices; the latter is a measure of future volatility (per annum) implied by the Black&Scholes pricing model.

Volatility Skew

Volatility Skew is the difference in Implied Volatility between OTM Call and Put.

In general, there is a natural skew in the market towards Puts. As a currency depreciates, Implied Volatility will normally increase. Buying volatility when the spot market depreciates is therefore more expensive than buying it when the spot market is appreciating.

Therefore, if the market is expecting depreciation in spot, it will want two things:

- Buy volatility (to sell back at higher level later).
- Buy Puts (to back the directional move in the spot market).

Hence the natural skew towards Puts.

The Volatility Skew in a market will also be dependent on:

- The directional bias of the market in the underlying asset.
- The bias caused by a forward curve.

Volatility Smile

Volatility Smile is the implied volatility of OTM options, as compared to ATM options. In most markets, the Implied Volatility of OTM volatility will be higher than the Implied Volatility for ATM options for the same period. Graphically, it looks like a smile – hence the name.



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