CHAPTER 7

Market for Currency Options

Learning Objectives

The market for currency options is the other form of the market for derivatives where currencies are traded. The present chapter acquaints the readers with specific characteristics of this form of market and also with how it works. In particular, it:

- Delineates the broad features and types of a currency options contract.
- Describes different forms of the currency options market.
- Explains commonly used terminologies in this respect.
- Evaluates the gains and losses of the options traders.
- Discusses options pricing and the factors influencing it.
- Examines how hedgers and speculators operate in this market.

The market for currency options is the other form of the derivatives market representing large-scale sale and purchase of currencies. This form of market possesses some distinguishing features and also the methods of operation are different. The present chapter thus acquaints the readers with the functioning of the market for currency options.

BROAD FEATURES

Privilege of Non-execution of Contract

Foreign currencies are traded in the market for currency options as well. The

purpose is either the hedging of foreign exchange exposure or making of profits through speculation. As in currency forward and futures contracts, the buyer of currency options possesses the right to buy or sell foreign currency after the lapse of a specified period at a rate determined on the day the contract is made, but the currency options contract has a distinctive feature that is not found in a forward or futures contract. It is that the buyer of currency options has the freedom to exercise the option if the agreed-upon rate turns in his favour. If the rate does not turn in his favour, he can let the options expire. Thus the exercising of options is the buyer's right but not his obligation. For this privilege, the buyer has to pay a premium to the option-seller. Suppose a person decides to acquire call options to buy Swiss francs at a price of US $ 0.70 along with a premium for US $ 0.02. On the maturity date, if spot rate of the Swiss franc is lower than the agreed upon rate, he will let the option expire because he will be able to buy it in the spot market at a cheaper rate. But if the spot rate is US $ 0.75, he will exercise the option because his cost of buying Swiss francs under the options contract (inclusive of premium) will be US $ 0.72, whereas he can sell this currency in the spot market at a higher rate and can thereby earn a profit.

Currency options contract confers on options-buyer privilege of not exercising the contract when exchange rate is not in his favour.

Some features of currency options contracts are common irrespective of their type or the market in which these contracts are formalised. But some of the features vary from one type of market or of options contract to another. The three different types of currency options market are explained here so as to reveal the distinctive features of these contracts.

Types of Options Market

Listed currency options market

The first such market was set up at the Philadelphia Stock Exchange in December 1982. Initially, trading was done in British pounds, but subsequently, some other currencies such as the Australian dollar, Canadian dollar, Deutsche mark, French franc, Japanese yen and Swiss franc were added to the list. Listed currency options are standardised contracts. In such contracts, the clearinghouse is essentially a party to the contract. For the option-buyer, the clearinghouse is a seller of the options and for the seller of the options, it is a buyer. It guarantees both sides of the contract and charges a small fee for facilitating such contracts.

Options market may be: 1. listed one being located at stock exchange 2. over-the-counter market where banks dominate 3. futures options market being a listed one with marking to market facilities.

The writer of the currency options, especially a 'put' option, may not have sufficient funds to purchase the underlying currency when such an option is exercised. In order to avoid such a risk, the clearinghouse asks the writer to deposit margin money that is normally equal to the current market price of the option along with a specific percentage of the underlying currency's value. This percentage varies with the changes in the option's price.

The maturity is fixed in this market and expiration months are March, June, September and December. The expiration day is the Friday preceding the third Wednesday of the expiration month. The trading process begins when the customer places an order with a broker who is a member of the exchange. The broker relays the order to the broker's booth located on the exchange trading floor. The broker's floor trader shouts out his bid that is answered by offers to sell from other traders. The offers are made either by specialists, or market makers or by floor brokers acting as agents for other customers. Specialists are normally the firms employed by the exchange to manage the limit orders for each currency. The market maker is a member firm that transacts on its own account. When a transaction is finalised, it is recorded by the exchange's reporting system. The floor trader communicates the deal to the broker who passes on this information to the customer.

Currency futures options market

In this market, which is basically a listed currency options market, the contracts present a mixture of currency futures and currency options. They are basically currency options because the buyer of the contract possesses the privilege of either exercising the option or letting it expire. The buyer and the seller of options have, however, to deposit margin money with the exchange that is equal to a small fraction of the contract price. The options are marked to market meaning that they undergo daily settlement as in the case of a futures contract.

Over-the-counter options market

The second type of market for currency options is known as the *inter-bank currency options market* or the *over-the-counter options market*. Such a market is centred in New York and London and the size of transactions is many times that of the market in the organised exchanges. The amount involved in a particular contract is also larger. It is usually US $ 1.0 million or more of foreign currency. Again, European options are usually found in over-the-counter market, while American options are prevalent in the organised exchanges. The number of currencies exchanged in the over-the-counter market is larger and the options are tailored to the clients' needs. The size of contract is standardised, but the banks repackage sizes according to the clients' needs. The organised clearinghouse is not in evidence, rather the commercial banks or investment banks write the options for the clients. In order to offset their exposure, these banks transact currency options on the listed stock exchanges.

The over-the-counter market is a two-tier market. The retail market embracing non-bank customers dealing with the banks forms one tier while the other is the wholesale market representing transactions among the banks.

Comparison between Listed Currency Options Market and the Over-the-counter Options Market

	LCOM	*OTCOM*
Contract specifications	Standardised and Customised contract	Only customised contract
Regulation	Regulated by regulatory authorities	Self-regulated
Types of market	Open outcry, auction market	Dealers' market
Counter-party to each transaction	High-rated options clearing house	Bank on the contra side
Transparency	Yes	No
Margin required for short position	Yes	No
Orders anonymously represented in the market	Yes	No
Required to mark positions daily	Yes	No
Audit trail	Yes (for each transaction)	No
Participants	Individuals, institutions/corporate	Institutions/corporate

Types of Options

In a call option, options-buyer buys the underlying currency. In a put, he sells it.

Broadly speaking, there are two types of options. In a call option, the buyer of the option agrees to buy the underlying currency, while in a put option contract, the buyer of the option agrees to sell the underlying currency.

European options cannot be exercised before maturity. American options can be.

The call and put options are also of two types. One, known as the *European option*, is exercised only on maturity. The other, the *American option*, may be exercised even before maturity. It is normally in the buyer's interest to exercise the option before maturity and so American options command higher prices than European options.

In recent years, some more variants of options often known as *exotic options* have become available. The first is, for example, known as a *forward reversing option*. In this case, a call option premium is paid only when the spot rate is below a specified level. The premium is quoted by the seller who charges the premium only when the options are not exercised. This way the buyer gets liberal terms. Secondly, there are *preference options* in which the buyer gets an additional privilege to designate the option either as a call option or as a put option. Though this privilege is exercised only after the lapse of a specified period. In the case of *average rate options*, it is the arithmetic average of the spot rate during the life of the option that is taken into account at maturity instead of the spot rate. This type of option enables the buyer to hedge a series of daily cash inflows over a given period in one single contract. If the average rate on maturity is lower than the strike price, the buyer gets the difference between the two. If the average rate is higher than the strike rate, the buyer lets the option expire.

Exotic options contracts are: 1. forward reversing options, 2. preference options, 3. average rate options, 4. look-back options, 5. cylinder/tunnel options, 6. down and out options, 7. down and in options, 8. basket options.

A *look-back option* gives the holder the right to purchase or sell foreign currency at the most favourable exchange rate realised over the life of the option. For example, the buyer of a call has the right to buy the underlying currency at the lowest exchange rate realised between the creation of the call and the expiry date. The buyer of a put option has the right to sell the underlying currency at the highest exchange rate during the life of the option. All this means that the strike rate in a look-back option is not known until the expiry date. Naturally, because of this speciality, the premium of a look-back option is normally higher than the premium of a traditional option.

In a *cylinder* or *tunnel option*, two strike rates exist. When the spot rate is lower than the lower strike rate, the buyer has to pay the lower strike rate. He pays the higher strike rate if the spot rate is higher than the higher strike rate. If the spot rate is between the two strike rates, the buyer pays the spot rate.

There are also barrier options. In the case of *down-and-out option*, the option expires automatically if the spot rate reaches a level mentioned in the contract. In a *down-and-in option*, option is activated only when the spot rate reaches a specified barrier within the expiry date.

The *basket option* caters to buyers who are confronted with foreign exchange risk in respect of many currencies.

OPTIONS TERMINOLOGY

For a clear understanding of currency options, the readers must acquaint themselves with some terms that are used in this context.

Option buyer: A person or a firm who gets the right to buy options, is also known as the *option-holder*.

Option seller: The party having obligation to perform if option is exercised or the party who charges the premium for granting such privilege to the buyer, is also known as the *option-writer*.

Call option: An option bought by an option buyer for buying a particular currency.

Put option: An option bought by an option buyer to sell a particular currency.

Exercise price: The price at which options are exercised, is also known as the *strike price*.

At-the-money: The situation is known as at-the-money when the strike price is equal to the spot price on the maturity date.

In-the-money: The situation is known as *in-the-money* if in case of a call option, the strike price is lower than the spot rate. In case of a put option, an in-the-money situation warrants that the spot rate should be lower than the strike price. In that situation when the option-buyer exercises the option, he is in the money because then only he can gain.

In
Call = Stri < Spot
Put - Stri > Spot.

Out
Stri > Spot
Stri < Spot

Out-of-the-money: This is the exact opposite situation of the in-the-money situation. This entails that the spot rate should be lower than the strike rate in case of a call option; and higher than the strike rate in case of a put option.

Premium: Also known as the option value or option price, premium is the value or price of the option that the option-buyer pays to the option-seller at the time of signing the contract. It is not refundable even when the option is not exercised. The amount of premium is the sum of the option's *intrinsic value* and its *time value* which are explained hereunder.

Intrinsic value: Intrinsic value denotes the extent to which an option would currently be profitable to exercise. In other words, it represents the gains accruing to the holder on the exercise of the option. In case of a call option, it is the excess of the current spot rate over the strike price. If S is the current spot rate and X the strike price, the intrinsic value of a call option,

$$I_{call} = S - X \quad (7.1)$$

The intrinsic value of a put option will naturally be represented by an excess of strike price over the current spot rate. In other words, the intrinsic value of a put option is

$$I_{put} = X - S \quad (7.2)$$

Thus, it can be said that when the option is in-the-money, it has some intrinsic value. The intrinsic value of an option—put or call—may be positive. It may be zero. But it cannot be negative because the option-buyer will not exercise the option if the option is out-of-the-money.

Time value: Time value of an option represents the sum of money that a buyer is willing to pay over and above the intrinsic value. Time value of an option exists because the spot rate of the underlying currency is expected to move towards an in-the-money position between the signing of the contract and the maturity date. On the maturity date, the time value of the option is zero and the premium is entirely represented by the intrinsic value. Again, if there is an at-the-money position that means that there is no intrinsic value, and option premium is represented entirely by the time value. Between these two positions, the premium is represented partly by the intrinsic value and partly by the time value. Suppose the strike price of a call option is Rs. 83.00/£. The premium is Rs. 0.05 per British pound. The spot rate is Rs. 83.02/£.

The amount of premium = Rs. 0.05 × 62,500 = Rs. 3,125

Intrinsic value = Rs. (83.02 – 83.00) × 62,500 = Rs. 1,250

Time value = Rs. 3,125 – 1,250 = Rs. 1,875

(*Note:* The standard size of a pound options contract is £ 62,500)

GAINS OR LOSSES OF THE OPTION TRADERS

The gains accruing to the option-buyers are unlimited, while the loss borne by them is limited to the amount of premium paid by them. On the other hand, the option-seller's risk of loss is unlimited and its gain is limited to the amount of

premium it receives. This is why the market for currency options carries an asymmetry between income and risk of loss. Let us examine this phenomenon separately for call option and put option.

Gain to options buyer in a call = $S - X - C$. In a put, it is $X - S - C$. The loss is limited to premium. Gain/loss to the options seller is just the mirror image of that of the buyer.

Call Options

The buyer will gain if spot price is greater than the strike price along with the premium, C. This means:

$$\text{Buyer's gain} = S - X - C \tag{7.3}$$

Suppose a firm buys a call option at a strike price of Rs. 83.50/£ along with a premium for Rs. 0.05 per pound sterling. If the spot rate at maturity is Rs. 83.60, the gain to the option-buyer will be:

$$\text{Rs. } (83.60 - 83.50 - 0.05) \times 62{,}500 = \text{Rs. } 3{,}125$$

If the spot rate at maturity is Rs. 83.55, gain to the option buyer will be zero. Any spot rate between Rs. 83.50 and Rs. 83.55 will make up partially any loss on account of the premium. If the spot rate is below Rs. 83.50, the buyer will let the option expire. The maximum loss will then be the amount of premium, that is Rs. 3,125.

For the seller of the call option, a profit profile is simply the mirror image of the loss profile of the option-buyer. If the buyer does not exercise the option, the gain accruing to the seller will be equal to the amount of the premium, but if the buyer exercises the option, the seller will have to face a loss equal to the excess of the spot price over the strike price.

PROBLEM 7.1

A pound options call contract has strike rate of $ 1.820/£ and a premium of $ 0.08. Spot rate on maturity is $ 1.920/£. Find gain/loss to options buyer/options seller.

Solution

Since $S > (X + P)$, options buyer will gain. If options buyer gains, options seller has to lose.

Gain to the options buyer = $ 1.920 − 1.820 − 0.08 = $ 0.02/£.

Total gain = $ 0.02 × 62,500 = $ 1,250.

The seller of pound gets $ 0.10 less than the rate in the open market but he gets a premium for $ 0.08. Thus his loss per pound is $ 0.02. Total loss is $ 0.02 × 62,500 = $ 1,250.

PROBLEM 7.2

A pound options call contract has strike rate of $ 1.820/£ and a premium of $ 0.08. Spot rate on maturity is $ 1.812/£. Find gain/loss to options buyer/ options seller.

Solution

Here $S < X$ and so contract is out-of-money. The buyer will not exercise the contract. His loss will be $ 0.08/£ as he has to pay the premium. The seller has nothing to pay, rather he will get the premium. Premium is the seller's gain.

Put Options

In the case of put option, the buyer will let the option expire if the spot rate is greater than the strike rate. The buyer will be put to a loss equivalent to the amount of premium, and profit will accrue to the buyer only if the spot price is lower than the strike price by more than the amount of the premium. That is,

$$\text{Buyer's Gain} = X - S - C \qquad (7.4)$$

Suppose the put option price of a deal is Rs. 83.50/£ along with a premium of Rs. 0.02 per pound. If the spot price at maturity falls to Rs. 83.45, the profit to the buyer will be:

$$\text{Rs. } (83.50 - 83.45 - 0.02) \times 62{,}500 = \text{Rs. } 1{,}875$$

As far as the seller is concerned, the profit will be equal to the amount of premium when the buyer does not exercise the option. It occurs when the spot price is greater than the strike rate. On the other hand, the seller will face a loss if the option is exercised. The amount of loss will vary depending upon how much lower the spot price is.

PROBLEM 7.3

A pound options put contract has strike rate of $ 1.820/£ and a premium of $ 0.08. Spot rate on maturity is $ 1.830/£. Find gain/loss to options buyer/ options seller.

Solution

The contract is out-of-money. The options buyer will not exercise the put. His loss will be equal to the amount of premium that he will pay to the seller. On the other hand, the premium received will be the seller's gain. The amount of gain/ loss will be $ 0.08 × 62,500 = $ 5,000.

PROBLEM 7.4

A pound options put contract has strike rate of $ 1.910/£ and a premium of $ 0.05. Spot rate on maturity is $ 1.810/£. Find gain/loss to options buyer/options seller.

Solution

The buyer will exercise the contract. The gain will be: $ 1.910 – 1.810 – 0.05 = $ 0.05. The seller will have to pay $ 0.10 more than the market rate, but he will get $ 0.05 premium. So his loss will be $ 0.10 – 0.05 = $ 0.05.

OPTIONS PRICING

Numerous models of pricing of options have been developed, important among which are the ones developed by Garman and Kohlhagen (1983), Grabbe (1983), and Bizer and Hull (1983). Explanation of these models lies outside the scope of the present work. However, the readers will be acquainted with the concept of option pricing. The value of an option, which is known as the premium, is equal to the

sum of its intrinsic value and time value. The meaning of intrinsic value and time value has already been explained in this chapter. Here the discussion will be confined to the factors that influence the value of an option. Knowledge about the factors to which the value of an option is sensitive is very important for the hedgers and speculators who trade in the options. These factors or sensitivities are:

- Changes in forward rates
- Changes in spot rates
- Time to maturity
- The degree of volatility in exchange rate
- Interest rate differential
- Alternative strike price

Changes in Forward Rates

The current spot rate and the interest rate differential form the basis of option pricing as well as the forward rate. This is why option rates are close to the forward rates. In other words, forward rates are central to option pricing and so, changes in the forward rates influence the pricing of an option.

Changes in Spot Rates

Changes in the spot rates influence the option prices. At an at-the-money position, the intrinsic value is zero and the entire premium is represented by the time value. At the out-of-the-money position, the intrinsic value is zero but it cannot be negative because in that case, the option will not be exercised. But as the spot rate moves to in-the-money position, intrinsic value will emerge and the premium will be made up partly of the intrinsic value and partly of the time value. Again, with the spot rate moving into the in-the-money position, both the intrinsic value and the time value will change and as a result, and so will the premium. The extent of change in the premium due to change in the spot rate is represented by *delta*. This means:

$$\text{Delta } (\delta) = \text{Change in premium/Change in spot rate} \qquad (7.5)$$

If we know the value of delta, the impact of the spot rate changes on the value of option value can easily be determined. Suppose spot rate moves from Rs. 83.00/£ to Rs. 83.15/£ and delta is 0.5, the premium of a call option will increase by Rs. $(83.15 - 83.00) \times 0.5 = 0.075$. If the initial premium is Rs. 0.02, it will move up to Rs. 0.095. Delta varies between +1 and 0 for a call option and between –1 and 0 for a put option.

Time to Maturity

The longer the time to maturity, the greater is the option's value. The impact of change in time to maturity on the option value is represented by *theta*. In other words,

$$\textit{Theta } (\theta) = \text{Change in premium/Change in time} \qquad (7.6)$$

If theta is 0.5 and if time to maturity diminishes from 30 days to 29 days, the value of the option will diminish by $0.5 \times (30 - 29) = 0.5$.

Theta represents an exponential, and not a linear, relationship between time to maturity and the value of an option. The option price shrinks fast as maturity approaches. A trader buying options for shorter maturity has to pay proportionately less. A six-month option's value is approximately 2.5 times more expensive than that of a one-month option, but a 12-month option is only 3.5 times costlier than a one-month option.

Volatility in Exchange Rate

Volatility is expressed as the standard deviation of daily percentage changes in the spot rate of the underlying currency. It is stated as per annum percentage. If the annual volatility is 10.0 per cent, a single day volatility can be found as:

$$10.0\%/\sqrt{365} = 10.0\%/19.105 = 0.523\%$$

The larger the volatility, the larger is the chance for the spot rate moving into the in-the-money zone and greater is the value of the option.

The impact of volatility on the option's value is expressed by *vega*. In other words,

$$Vega = \text{Change in premium/Change in volatility} \qquad (7.7)$$

If *vega* is 0.5 and the annual volatility changes from 10 per cent to 12 per cent, the option's value will increase by $0.5 \times (0.12 - 0.10) = 0.01$. This is normally a linear relationship meaning that the doubling of volatility will double the option's value. However, the problem is that it is difficult to know the extent of volatility in advance. The traders base their forecast on historical data but that is not always correct because the changes in the spot rate are influenced by a number of economic and non-economic factors that may or may not happen to exist in the future.

Sensitivity to Varying Interest Rate Differential

It is evident from the theory of option pricing that an option value is either equal to the difference between the strike price and the forward rate, or it may be higher. It has already been explained in the earlier chapters that the changes in interest rate differentials lead to a change in the forward rate, and the changes in the interest rate differential will also cause changes in the value of an option. The impact of changes in domestic interest rate on the option's value is expressed by *rho* and the impact of change in the foreign interest rate on the option's value is expressed by *phi*. If foreign interest rate increases, forward rate of the foreign currency will be at a discount and the value of the option denominated in this currency will fall. But if the domestic interest rate rises, the value of this option will improve.

Changing Strike Price

Any change in the strike price leads to a change in the intrinsic value and thereby in the value of an option. In a call option, if the strike price falls with the spot rate

being constant, the intrinsic value will be larger and the option's price will be higher. But in a put option, the lowering of strike price with the spot price being constant will lower the intrinsic value. The value of the option will fall.

European Options versus American Options

The different factors explained above may work in the same direction or in different directions and the value of an option would change accordingly. However, it should be noted here that the value of an American option is different from that of a European option. We have just discussed about sensitivity in the context of a European option. The value of an American option will be somewhat different insofar as it is exercised even before the expiry date. In a call option, if the spot rate, although higher than the strike price, is tending towards depreciation, the buyer of the American option will like to exercise the option earlier. In case of a European option, which cannot be exercised before maturity, the spot price may have depreciated more by the expiration date, as a result of which the profit reaped by the buyer would have been eroded. In a put option, when spot rate is tending towards appreciation, the buyer would like to exercise the option earlier in order to avoid erosion of profit. He can do it in case of the American option but not in the case of a European option. *American options command a greater value* for the reason.

HEDGING WITH CURRENCY OPTIONS

Hedging through Purchase of Options

Hedgers in short position buy a call or sell a put or go for both simultaneously.

In order to hedge their foreign exchange risks, if it is a direct quote, the importers buy a call option and the exporters buy a put option. Take first the case of an *importer*. Suppose an Indian firm is importing goods for £ 62,500 and the amount is to be paid after two months. If an appreciation in the pound is expected, the importer will buy a call option on it with maturity coinciding with the date of payment. If the strike price is Rs. 83.00/£, the premium is Rs. 0.05 per pound and the spot price at maturity is Rs. 83.20, the importer will exercise the option. It will have to pay Rs. 83.00 × 62,500 + 3,125 = 51,90,625. If the importer had not opted for an option, it would have had to pay Rs. 62,500 × 83.20 = 52,00,000. Buying of the call option reduces the importer's obligation by Rs. 52,00,000 – 51,90,625 = 9,375. If, on the other hand, the pound falls to Rs. 82.80, the importer will not exercise the option since his obligation will be lower even after paying the premium.

However, one question that arises is whether hedging through buying of an option is preferable to forward market hedging. Buying of currency options is preferred only when strong volatility in the exchange rate is expected and if volatility is only marginal, forward market hedging is preferred. Suppose, in the earlier example, the pound appreciates to only Rs. 83.04 or depreciates to only Rs. 82.97, the amount of premium paid by the importer will be more than the benefit from hedging through purchase of options. There will then be net positive cost of hedging through buying of option.

Hedgers in long position buy put and sell a call or go for both simultaneously.

The *exporter* buys a put option. Suppose an Indian exporter exports goods for £ 62,500. It fears a depreciation of pound within two months when payments are to be received. In order to avoid the risk, it will buy a put option for selling the pound for a two-month maturity. Suppose the strike rate is Rs. 83.00, the premium is Rs. 0.05 and the spot rate at maturity is Rs. 82.80. In case of the hedge, it will receive Rs. 62,500 × 83.00 – 3,125 = 51,84,375. In the absence of a hedge, it will receive only Rs. 51,75,000. This means, buying of a put option helps increase the exporter's earnings, or reduces its exposure, by Rs. 51,84,375 – 51,75,000 = Rs. 9,375.

Hedging through Selling of Options

Hedging through selling of options is advised when volatility in exchange rate is expected to be only marginal. The importer sells a put option and the exporter sells a call option. Let us first take the case of *importers*. Suppose an Indian importer imports for £ 62,500. It fears an appreciation in the pound and so it sells a put option on the pound at a strike price of Rs. 83.00/£ and at a premium of Rs. 0.15 per pound. If the spot price at maturity goes up to Rs. 83.05, the buyer of the option will not exercise the option. The importer as a seller of the put option will receive the premium of Rs. 9,375 which it would not have received if it had not sold the option. If the spot price at maturity falls to Rs. 82.95, the buyer of the option will exercise the option. But in that case, the importer received premium of Rs. 9,375. The net gain to the importer will be Rs. 9,375 – 3,125 = Rs. 6,250.

The *exporters* sell the call option. If an Indian exporter exports for £ 62,500 and fears that the pound will depreciate and sells a call option on the pound at a strike price of Rs. 83.00 at a premium of Re. 0.15 per pound. If the spot rate at maturity really falls to Rs. 82.95, the buyer of the call option will not exercise the option. The exporter being the seller of the call option will get Rs. 9,375 as the premium.

Tunnels: Simultaneous Purchase and Sale of Options

Tunnel means combining call and put.

Foreign exchange exposure can be hedged also through the use of tunnels or, through simultaneous sale and purchase of options. An importer buys a call and sells a put option. The exporter buys a put and sells a call option.

The importer buys an out-of-the-money call and sells an out-of-the-money put option. As a result, neither the call, nor the put option is exercised if the exchange rate moves within a narrow margin. Here the premium to be received on the sale of the put must be enough to cover the premium to be paid on the purchase of the call option.

The exporter buys a put and sells a call—both out-of-the-money. If the exchange rate moves within a narrow margin, the premium received covers the premium paid. But if the currency depreciates sharply, the put option is there to guarantee a minimum price.

PROBLEM 7.5

An American importer importing goods from UK fears an appreciation in pound. Pound options are available at a strike price of $ 1.830/£ with a premium of $ 0.03/£. The spot rate on the maturity rises to $ 1.930/£. How will he compensate his loss?

Solution

The importer will buy a call and sell a put. Call gives him a gain of $ 1.930 – 1.830 – 0.03 = $ 0.07/£. Selling put will bring him premium as put will not be exercised. The extent to which risk would be reduced is $ 0.03/£. The total amount of risk reduced will be $ 0.10/£ = $ 0.10 × 62,500 = $ 6,250.

PROBLEM 7.6

An American exporter exporting goods to UK fears a depreciation of pound. Pound options are available at a strike price of $ 1.884/£ with a premium of $ 0.03/£. The spot rate on the maturity falls to $ 1.824/£. How will he compensate his loss?

Solution

The exporter will buy a put and sell a call. Put gives him a gain of $ 1.884 – 1.824 – 0.03 = $ 0.03/£. Call will not be exercised by the buyer and so, as a seller of the call, the exporter will receive the premium of $ 0.03/£. Consequently, risk will be reduced to the extent of $ 0.06/£ or in all $ 0.06 × 62,500 = $ 3,750.

SPECULATING WITH OPTIONS

Purchase of Options

Speculators buy a call when the underlying currency is to appreciate. They buy a put if the currency is to depreciate.

Speculators make profit out of purchase of currency options. *They normally buy call options when they expect upward movement in the value of the underlying currency*. On the expiry date, they buy the currency at the agreed-upon rate and sell it in the open market at a higher rate and thereby reap profits. On the contrary, *they buy put options when they expect depreciation of the underlying currency*. They sell the underlying currency at an agreed-upon rate that is higher than the spot rate. This way they get more of the other currency than they could get in the open market. Besides these simple operations, they often go in for complicated deals mixing either two calls or two puts or one call and the other put. Here we explain some of the common modes of options transactions.

PROBLEM 7.7

Pound is expected to appreciate to $ 1.930. Pound options are available at a strike price of $ 1.830/£ with a premium of $ 0.03/£. How do speculators react to the appreciation of pound?

Solution

Speculator will buy a call. On the maturity, he will get £ 62,500 at $ 1.830/£. Immediately after getting pound, he will sell those pounds in the open market to get dollar back and this way, he will gain $ (1.930 – 1.830 – 0.03) × 62,500 = $ 4,375.

PROBLEM 7.8

Pound is expected to depreciate to $ 1.730. Pound options are available at a strike price of $ 1.830/£ with a premium of $ 0.03/£. How do speculators react to the depreciation of pound?

Solution

Speculator will buy a put. On the maturity, he will get $ 1,14,375 through selling £ 62,500 at $ 1.830/£. Immediately after getting dollar, he will sell those dollars in the open market at $ 1.730/£ to get pound back and this way, he will gain $ (1.830 – 1.730 – 0.03) × 62,500 = $ 4,375.

Spreads

Spread means combining either two or more calls or two or more puts.

In a spread, speculators combine either two calls or two puts. In case of two calls or puts, one is sold and the other is purchased. If the expiry of the two is the same but the strike prices differ, it is known as a *vertical spread*. When the strike price is the same but the expiry differs, it is known as a *horizontal spread*. When the strike price and the expiry date both differ between the two calls, it is known as a *diagonal spread*. Similar features are marked with two puts.

Vertical spread involves differing strike rates of two or more calls/puts.

Horizontal spread involves differing maturities of calls/puts.

Diagonal spread involves differing strike price and differing maturities, both.

Vertical spread on call combinations

Vertical spread may be either bullish or bearish. The former generates profit when exchange rate moves upward. The latter is profitable when the exchange rate moves downward.

In a bullish vertical spread, different strategies can be applied. One involves purchase of in-the-money call and sale of out-of-the-money call. Suppose a speculator purchases a call on the British pound with a strike price of Rs. 83.00 with a premium of Rs. 0.05 and sells a call with strike price of Rs. 83.90 and with the same premium. If the spot rate at expiry moves up to Rs. 83.20, he will exercise the option and make a profit of Rs. 0.20 × 62,500 – 3,125 = 9,375. Since the other call will not be exercised, the speculator will receive the premium amounting to Rs. 3,125. His total income will be Rs. 12,500 through this kind of bullish spread.

The other strategy in a bullish spread is to buy an in-the-money call and to sell another in-the-money call with a higher strike price. If the spot price moves up and crosses the strike price of the second call only marginally, and possibly if the premium to be received on the second call is greater than its intrinsic value, the exercise of the second call will add to the gain accruing from the first call.

In a *bearish vertical spread* too, there are different strategies. One is to purchase a call with a strike price below the spot exchange rate and to sell another call with

a lower strike price. If the spot rate at expiry falls to a level below the two strike rates, neither of the options will be exercised, but if the amount of premium varies and the premium received is greater than the premium paid, there will be net gain to the speculator.

Horizontal spread on call combinations

The strike price of the two calls may be the same, but the spot rate may vary between two expiry dates and so the sale and purchase of two calls may give different profitability to the speculator. Suppose the speculator buys a call option for the pound with 31 July as expiry date and at a strike price of Rs. 83.00 and at a premium of Rs. 0.03. He sells another call expiring on 31 August at the same strike price and a premium of Rs. 0.05. If the pound is depreciating from a current rate of Rs. 83.20 to Rs. 83.10 on the 31 July and to Rs. 82.95 on the 31 August, this combination will give the speculators a profit. As a buyer of the call option, he will exercise it and gain Rs. $0.10 \times 62,500 - 1,875 = 4,375$. But on 31 August, the option will not be exercised and the speculator will receive premium to the tune of Rs. 3,125. In all, his profit will be Rs. $4,375 + 3,125 = 7,500$. If the spot rate falls below Rs. 83.00 on the two expiry dates, the speculator's earning will be equal to the difference in the amount of premium.

Diagonal spread on call combinations

Diagonal spread is a combination of vertical and horizontal spreads. The speculator buys a call with a relatively long maturity and sells another call with a shorter maturity and a higher strike price. If the spot rate of the underlying currency moves up and is greater than the strike rate of the first call, the first call option will be exercised and the speculator as an option-buyer will reap profits. At the same time, with a higher strike rate of the second call option, there is every possibility of its not being exercised and the speculator as a seller of the option will get the premium. Thus his total profit will be equal to the sum of profit in the first case and the premium in the second case. He reaps the advantages of both vertical and horizontal spreads, but at the same time, his cost is equal to the sum of the cost of the two spreads.

Spread on combination of puts

In a *bullish vertical spread*, the speculator buys one put and sells another put with the same maturity but a lower strike price. There may be different variants. In one case, both strike prices are higher than the spot rate. In the other, price of the bought put is higher than the spot rate but the price of the sold put is lower. Suppose the speculator buys a put option for the pound at Rs. 83 and sells another put at Rs. 82.90 with a premium of Rs. 0.03. The spot rate at maturity is Rs. 82.95. In the first, his gain as buyer will be Rs. $62,500 \times (83.00 - 82.95 - 0.03) = 1,250$. As a seller, he will get the premium amounting to Rs. 1,875 as it will not be exercised.

In a *bearish vertical spread*, the speculator buys one put and sells another put with two different strike prices. In one case, the put is exercised, while in the other case, it is not. The speculator's gain depends upon this possibility.

In a *horizontal spread*, the speculator buys a put with a longer maturity and sells another put with a shorter maturity. Since the premium varies with the maturity, the difference in premium may result in gain to the speculator.

Combination of Calls and Puts

Straddles and strangles involve a combination of one call and the other put. The former involves the same strike price and maturity. In the latter, strike price and expiry differ in the combination.

As a practice, different from spreads, the speculators combine calls with puts and such combinations are of two types. One is known as *straddles* where the two options have the same strike price and the same expiry date. The other, called *strangles* is when the strike price and maturity differ in case of the two options of the combination.

Straddles

The technique of straddles is used when the exchange rate is expected to change suddenly and in a big way. When the speculators buy straddles and the currency appreciates, the bought call gives profit, while the bought put is not exercised. The gain is equal to the profit earned on the bought call minus the premium paid on the bought put. When the currency depreciates, the put generates profit and the call is not exercised. The gain in this case is equal to the profit on the bought put minus the premium paid on the bought call. It may be noted that if the change in the exchange rate is not big, there is every possibility of loss and this is biggest when the spot rate is equal to the strike price on the expiry date. When the speculators sell straddles, they sell one call and one put. In such cases, the risk is normally high and so it is practised only by well-qualified speculators.

Strangles

A speculator can buy strangles or it can sell strangles. In the former, the speculator buys one call and one put with different strike rates and with different maturity. In the latter, it sells one call and one put but with different strike rates and different maturity. The difference in strike rates and the difference in the premium depending upon the difference in the maturity result in gain to the speculators.

Various Combinations of Options

Tunnel for importers	Buying call and selling put
Tunnel for exporters	Buying put and selling call
Vertical spread: call	Buying one call and selling another call with same expiration but different strike prices
Vertical spread: put	Buying one put and selling another put with same expiration but differing strike prices
Horizontal spread: call	Buying one call and selling another call with same strike price but different expiry dates
Horizontal spread: put	Buying one put and selling another put with same strike price but different expiry dates
Diagonal spread: call	Buying one call and selling another call with varying expiry and strike prices
Diagonal spread: put	Buying one put and selling another put with varying expiry and strike prices
Buying of Straddles	Buying a call and buying a put with same expiry and strike price
Selling of Straddles	Selling a call and selling a put with same expiry and strike price
Buying of Strangles	Buying a call and buying a put with different expiry and strike prices
Selling of Strangles	Selling a call and selling a put with differing expiry and strike prices

PROBLEM 7.9

Two pound options are available at two different rates. One is available at a strike rate of $ 1.830/£ with a premium of $ 0.003/£. The other is available at strike rate of $ 1.815/£ with a premium of $ 0.007/£. The spot rate on maturity is $ 1.825/£. How will speculators react?

Alternative 1

A speculator may go for spread treating both these options as call. If he has bought both these calls, his profit/loss will be:

Profit $ (1.825 – 1.815 – 0.007) = $ 0.003 per pound on the second call minus payment of premium on the first call @ $ 0.003 as it will not be exercised = zero profit/loss.

Alternative 2

If the speculator sells the first call and buys the second call, the profit on the second call @ $ 0.003 plus the receipt of premium on the first call will mean a combined profit of $ 0.006 per pound. Total profit = $ 0.006 × 62,500 = $ 375.

Alternative 3

If the speculator sells both the calls, there will be receipt of premium at $ 0.003 per pound on the first call but loss on the second call at $ 0.003 meaning combined profit/loss being zero.

Alternative 4

If the speculator buys the first call and sells the second call, the combined loss will be $ 0.006 per pound.

Alternative 5

The speculator treats both the options as put. Buying both the puts means a profit of $ 0.002 from the first put and loss of $ 0.007 from the second put meaning a combined loss of $ 0.005 per pound.

Alternative 6

The speculator buys the first put and sells the second put. Profit from the first put at $ 0.002 and receipt of premium from the second put mean a combined profit of $ 0.009 per pound.

Alternative 7

The speculator buys the second put and sells the first put. There will be a loss of $ 0.009 per pound – loss of $ 0.002 from the first put and loss of $ 0.007 from the second put.

Alternative 8

The speculator sells both puts. There will be loss of $ 0.002 from the first and gain of $ 0.007 from the second put meaning a combined gain of $ 0.005 per pound.

Alternative 9

The speculator designates the first as a call and the second as a put. If he buys the call and sells the put, there will be a combined loss of $ 0.006 per pound.

Alternative 10

The speculator designates the first as a call and the second as a put. If he sells the call and buys the put, there will be a combined gain of $ 0.006 per pound.

Alternative 11

The speculator designates the first as a put and the second as a call. If he buys the call and sells the put, there will be a combined gain of $ 0.001 per pound.

Alternative 12

The speculator designates the first as a put and the second as a call. If he sells the call and buys the put, there will be a combined loss of $ 0.001 per pound.

Note: There are 12 possibilities. The speculator will choose that option where the gain is the maximum.

SUMMARY

- Currency options are derivatives like currency futures. They involve trading of currencies normally for hedging of exchange risk or for speculative purposes. However, they differ from the futures and also from forward contracts insofar as the buyer of currency options possesses the freedom of exercising the options or letting them expire. For this privilege, the buyer pays a small premium to the option seller.
- The currency options market exists normally at the organised exchanges, although there is also an over-the-counter market for them. The futures-type options are traded in the currency futures option market. The features of the options traded in these markets are broadly the same, though the details vary among them.
- Options are either call options or put options. In the former, the option buyer agrees to buy the underlying currency. In the latter, it agrees to sell the underlying currency. European options cannot be exercised before expiry, but the American options can be. Over the years, a few other variants of the options have emerged. These are known as the *second-generation options*.
- The gain of the buyer of call option is represented by the excess of the spot rate over the sum of the strike rate and the premium. In case of the put option, it is represented by how far the spot rate is lower than the sum of the strike rate and the premium. The loss to the option-buyer is limited to the amount of premium. On the other hand, the loss to the option-seller is unlimited while the gain is limited to the amount of premium.
- The value of the options, which is equal to the sum of intrinsic value and time value, depends, *inter alia*, upon changes in the forward rate and spot rate, time to expiration, degree of volatility of the exchange rate, the interest rate differentials and the strike rate. American options that may be exercised earlier command greater value than the European options.

- Currency options are used by traders and speculators. The importers buy call and sell put and the exporters buy the put and sell the call options. The speculators buy calls when they expect appreciation of the underlying currency. When they expect a depreciation, they buy puts. But more often, they blend two call options or two puts or calls and puts—commonly known as *spreads, straddles and strangles.*

STUDY TOPIC
Currency Options Trading at Philadelphia Stock Exchange (PHLX)

The United Currency Options Market of the Philadelphia Stock Exchange, the pioneering Exchange for options, offers both customised and standardised currency options. It involves individual as well as institutional traders, although the purpose of these two groups of trader is different. While individuals try to make profits from foreign investment and the directional change in the underlying currency, the institutional investors/corporate treasurers use options to limit risk against adverse currency fluctuations, lock in maximum cost/minimum revenues on a foreign exchange transaction with an uncertain completion date.

Standardised Options

Currency options are quoted in two ways: first, American terms in which a currency is quoted in terms of US dollar per unit of foreign currency; second, European terms where dollar is quoted in terms of a foreign currency. The exchange lists six dollar-based standardised currency option contracts which settle upon exercise in the actual physical currency. The size of the contract is:

Currency	*Units*
US $/Australian $	50,000 AUD
US $/British pound	31,250 GBP
US $/Canadian $	50,000 CAD
US $/Euro	62,500 Euro
US $/Japanese yen	62,50,000 Japanese yen
US $/Swiss franc	62,500 CHF

Both European and American options are transacted. Maturity falls in March, June, September and December with two additional near-term months—on Friday preceding the third Wednesday of the month. Exercise price, expressed in terms of US cents per unit of foreign currency, relates to prevailing currency values.

Customised Options

Customised options are traded on any combination of currencies currently available for trading. Foreign currency is matched with US dollar only. Premium is denominated in US dollar. Maturity falls on any business day up to two years from the date of trade. Expiry time is 10 A.M. as against the standardised options that expire at 2.30 P.M. Unlike in the standardised options, exercise notice must be received by 10 A.M. Again, only European options are traded.

Since the customised options are meant for the institutional investors, there is the minimum operating transaction size that equates/exceeds 50 contracts. Trading is done in an open outcry auctions market. The floor member presents a request for quotes to an Exchange staff member for dissemination. Subsequently, competing market makers generate responsive quotes.

Again, unlike in standardised options where market makers give the price to specialists who look after proper execution of orders, no specialist exists in case of customised options. It is the market maker who is responsible for the job.

Both the standardised and customised options are marked to market daily. The US Securities and Exchange Commission regulates the transactions. There is physical settlement of the transaction.

Source: Philadelphia Stock Exchange.

QUESTIONS

1. Differentiate between standardised options market and customised options market.
2. Why is there a minimum operating transaction size in customised options?
3. How do you distinguish between American terms and European terms?
4. When does the maturity fall?

CASE STUDY

ALWYN SPORTS HEDGING THROUGH CURRENCY FUTURES/OPTIONS

Alwyn Sports, a US company, made an order for import of sport goods for Pound 63,000 from a British supplier. The supply is to reach US port after two months. The importer may:

(a) purchase one call option

(b) purchase one futures contract

The futures price on pound has shown a marginal discount from the existing spot rate. But the importing firm would prefer to use currency options for hedge, especially because British pound has shown oscillations. With pound becoming more stable, the importing firm may prefer to let the transaction unhedged.

Under these conditions, the hedger prefers going for options because as an option buyer, it enjoys the privilege of not exercising the contract if pound depreciates. The following table shows the futures and options details available to the firm:

	Before event	*After event*
Spot rate	US $ 1.7400	1.7400
Futures price	1.7380	1.7380
Options strike price	1.7420	1.7426
Options premium per pound	0.0500	0.0500

QUESTIONS

1. If the importer goes for buying the call, which strike price should it use?
2. Should the importer allow its pound position to remain unhedged?
3. Should the importer go for a futures hedge?

REVIEW QUESTIONS

Objective-Type Questions

1. State whether true (T) or false (F):
   (a) Straddles are a combination of two calls. ☐
   (b) Strangles are the combination of two puts. ☐
   (c) Diagonal spread is a combination of vertical and horizontal spread. ☐
   (d) Options are exercised when they are in-the-money. ☐
   (e) In a call option, the option buyer buys the underlying currency. ☐
   (f) The intrinsic value cannot be negative. ☐
2. Choose the correct answer:
   (a) Tunnels are:
      (i) a combination of one call and the other put
      (ii) a combination of two calls
      (iii) none of these
   (b) In strangles:
      (i) the strike price and maturity differ between two deals
      (ii) strike price and maturity do not differ
      (iii) none of these
   (c) In a cylinder option:
      (i) two strike rates exist
      (ii) two strike rates do not exist
      (iii) none of these
   (d) Options are exercised when they are:
      (i) in-the-money
      (ii) out-of-the-money
      (iii) at-the-money
   (e) The time value of options on the date of maturity is:
      (i) zero
      (ii) negative
      (iii) more than the intrinsic value

Short-Answer Questions

1. What are the types of the currency options market?
2. Distinguish between:
   (a) Call option and put option
   (b) American option and European option
   (c) Exercise rate and spot rate
   (d) Vertical and horizontal spread
   (e) Straddles and strangles
3. Explain that premium is the sum of the intrinsic value and time value of an option contract.

Long-Answer Questions

1. How do you arrive at the gain from the options contract accruing both to the options buyers and sellers?
2. What are the factors on which the value of an options contract depends?
3. How do the exporters and importers hedge in the market for currency options?
4. How do the speculators operate in the market for currency options?

Numerical Problems

1. On the basis of the following figures, find out:
   (a) The intrinsic value of the British Pound options contract assuming it (i) call option, and (ii) put option
   (b) Gain/loss to the option buyer assuming it (i) call option, and (ii) put option
   (c) Gain/loss to the option seller assuming it (i) call option, and (ii) put option
   (i) Spot rate on maturity: US $ 1.68/£
   (ii) Strike rate: US $ 1.60/£
   (iii) Premium: US $ 0.05/£
2. A US importer importing goods for Pound 62,500 fears an appreciation of Pound. He likes to hedge the risk through options. Options are available to him at two different strike rates. One is US $ 1.60/£, and the other is US $ 1.70/£. The premium in both the cases is US $ 0.03/£. If the spot rate on the maturity goes up to US 1.65/£, what will be his course of action?

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