Understanding Options

A Primer to the Uses and Risks of Trading Options

Introduction

Option contracts on currencies offer many investment and risk management strategies, including a wide and diverse range of potentially attractive trading opportunities. A trader knowledgeable in the use of options can define virtually any risk/reward profile and implement strategies appropriate for almost any market condition. However, option trading is a speculative endeavor and should be treated as such. Even though the purchase of options on currencies involves a limited risk (losses are limited to the costs of purchasing the option), it is nonetheless possible to lose your entire investment in a short period of time. And for traders who sell rather than buy options, there is no limit at all to the size of potential losses.

This paper is designed to provide a basic understanding of options on currencies - what they are, how they work and the opportunities and risks involved in trading them. It consists of four parts:

Part One: The Vocabulary of Options Trading. Options trading has its own language - words or terms you may be unfamiliar with or that have a special meaning when used in connection with options.

Part Two: The Arithmetic of Option Premiums. This section describes the major factors that influence option price movements and the all-important relationship between option prices and currencies prices.

Part Three: The Mechanics of Buying and Writing Options. This section outlines the basic steps involved in buying and writing options, as well as the risks involved.

Part Four: A Closer look at the Factors that Determine the Option Premium. This section gives a more detailed description of the factors that determine the premium of an option and gives a basic explanation of the Theoretical Option Pricing Model.

Part One: The Vocabulary of Options Trading

These are some of the major terms you should become familiar with, starting with what is meant by an "option."

Option An trading vehicle which gives the option buyer the right, but not the obligation, to buy or sell a particular currency at a stated price at any time prior to a specified date. There are two separate and distinct types of options: calls and puts.

Call A call option conveys to the option buyer the right to purchase a particular currency at a stated price at any time during the life of the option.

Put A put option conveys to the option buyer the right to sell a particular currency at a stated price at any time during the life of the option.

Strike Price Also known as the "exercise price," this is the stated price at which the buyer of a call has the right to purchase a specific currency or at which the buyer of a put has the right to sell a specific currency.

Underlying Currency This is the specific currency that the option conveys the right to buy (in the case of a call) or sell (in the case of a put).

Option Buyer The option buyer is the person who acquires the rights conveyed by the option: the right to purchase the underlying currency if the option is a call or the right to sell the underlying currency if the option is a put.

Option Seller (Writer) The option seller (also known as the option writer or option grantor) is the party that conveys the option rights to the option buyer.

Premium The "price" an option buyer pays and an option writer receives is known as the premium. Premiums are arrived at through open competition between buyers and sellers according to the rules of the over-the-counter markets where the options are traded. A basic knowledge of the factors that influence option premiums is important for anyone considering options trading. The premium cost can significantly affect whether you realize a profit or incur a loss. See "The Arithmetic of Option Premiums" and "Factors that Determine the Option Premium."

Expiration This is the last day on which an option can be either exercised or offset. See the definition of "Offset" to be certain you know the exact expiration date of any option you have purchased or written. Options often expire during the month prior to the delivery month of the underlying currency. Once an option has expired, it no longer conveys any rights. It cannot be either exercised or offset. In effect, the option rights cease to exist.

Quotations Most, but not all, currencies are reported daily in the business pages of most major newspapers, as well as by a number of Internet services.

Exercise An option can be exercised only by the buyer (holder) of the option at any time up to the expiration date. If and when a call is exercised, the option buyer will acquire a long position in the underlying currency at the option exercise price. The writer of the call to whom the notice of exercise is assigned will acquire a short position in the underlying currency at the option exercise price. If and when a put is exercised, the option buyer will acquire a short position in the underlying currency at the option exercise price. The writer of the put to whom the notice of exercise is assigned will acquire a long position in the underlying currency at the option exercise price.

Offset An option that has been previously purchased or previously written can generally be liquidated (offset) at any time prior to expiration by making an offsetting sale or purchase. Most options traders choose to realize their profits or limit their losses through an offsetting sale or purchase. When an option is liquidated, no position is acquired in the underlying currency.

In-the-money An option is said to be "in-the-money" if it is worthwhile to exercise. A call option is in-the-money if the option exercise price is below the underlying currencies price. A put option is in-the-money if the option exercise price is above the underlying currency price.

At-the-money An option is said to be "at-the-money" if the underlying currency price and the option's exercise price are (approximately) the same.

Out-of-the-money A call option whose exercise price is above the underlying currency price is said to be "out-of-the-money." Similarly, a put option is "out-of-the-money" if its exercise price is below the underlying currency price. Neither option is worth exercising, and has no intrinsic value.

Deep-Out-of-the-Money An out-of-the-money (as described above) option has a strike price which is relatively far from the market price. While no strict definition exists, generally deep-out-of-the-money options can be identified in two ways: 1) the number of strike prices away from the market price, and 2) the value of the premium. An option which is four full strike prices away from the market price, or an option with a value of less than one percent of the value of the underlying currency, may be indications of deep-out-of-the-money options. (However, many exceptions exist.) Such options are considered the most speculative and generally have little likelihood of ever becoming profitable (intrinsic).

Part Two: The Arithmetic of Options Premiums

At the time you purchase a particular option, its premium cost may be $1,000. A month or so later, the same option may be worth only $800 or $700 or $600. Or it could be worth $1,200 or $1,300 or $1,400. Since an option is something that most people buy with the intention of eventually liquidating (hopefully at a higher price), it's important to have at least a basic understanding of the major factors which influence the premium for a particular option at a particular time. There are two, known as intrinsic value and time value. The premium is the sum of these: Premium = Intrinsic Value + Time Value

Intrinsic Value

Intrinsic value is the amount of money, if any, that could currently be realized by exercising the option at its strike price and liquidating the acquired currency position at the present price of the currency. At a time when the Japanese Yen is trading at a price of .8400 (U.S. cents per 100 yen), a call option conveying the right to purchase the currency at a below-the-market strike price of .83 would have an intrinsic value of $1,250 (a yen option is on 12.5 million yen).

As discussed earlier, an option that currently has intrinsic value is said to be "in-the-money" (by the amount of its intrinsic value). An option that does not currently have intrinsic value is said to be "out-of-the-money." At a time when the Japanese Yen is trading at .8400, a call option with a strike price of .8500 would be "out-of-the-money" and have no intrinsic value.

Time Value

Options also have time value. In fact, if a given option has no intrinsic value - because it is currently "out-of-the-money" - its premium will consist entirely of time value.

What's "time value"?

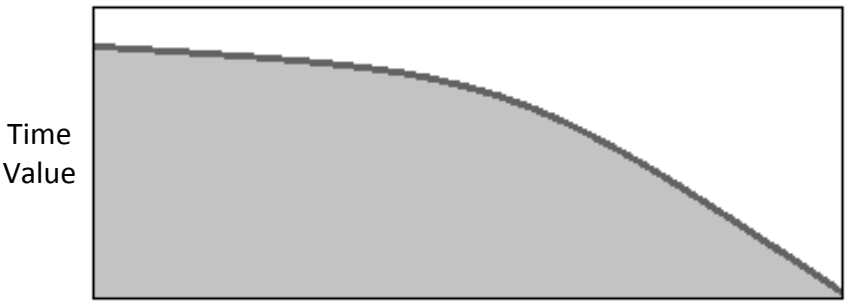
It's the sum of money option buyers are presently willing to pay (and option sellers are willing to accept) - over and above any intrinsic value the option may have - for the specific rights that a given option conveys. It reflects, in effect, a consensus opinion as to the likelihood of the option's increasing in value prior to its expiration.

The farther an option's strike price is from the market price, the less time value it has. Conversely, options which are deep-in-the-money have little time value. The time value of an option is always highest when it is at-the-money.

The three principal factors that affect an option's time value are (this description ignores interest rates):

1. Time remaining until expiration. Time value declines as the option approaches expiration. At expiration, it will no longer have any time value. (This is why an option is said to be a wasting asset.)

Time Value of an Option Under the Passage of Time



2. Relationship between the option strike price and the current price of the underlying currency. The further an option is removed from being worthwhile to exercise the further "out-of-the-money" it is, the less time value it is likely to have.

3. Volatility. The more volatile a market is, the more likely it is that a price change may eventually make the option worthwhile to exercise. Thus, the option's time value, and therefore premiums, are generally higher in volatile markets. Volatility, mathematically expressed, is the standard deviation of price movements of some

period of time. However, as you can see, volatility is the "soft" number of the three factors discussed here; in other words, the other two factors are objective values, only volatility is subjective. As a consequence, there are many ways of calculating and interpreting volatility. Using the market price of option premiums to "back into" the volatility. This calculation derives what is known as "implied volatility."

Part Three: The Mechanics of Buying and Writing Options

Commission Charges

Before you decide to buy and/or write (sell) options, you should understand the other costs involved in the transaction - commissions and fees. Commission is the amount of money, per option purchased or written, that is paid to the brokerage firm for its services, including the execution of the order in the over-the-counter market. The commission charge increases the cost of purchasing an option and reduces the sum of money received from writing an option. In both cases, the premium and the commission should be stated separately. Each firm is free to set its own commission charges, but the charges must be fully disclosed in a manner that is not misleading. In considering option trading, you should be aware that:

1. Commission can be charged on a per-trade or a round-turn basis, covering both the purchase and sale.

2. Commission charges can differ significantly from one brokerage firm to another.

3. Some firms have fixed commission charges (so much per option transaction) and others charge a percentage of the option premium, usually subject to a certain minimum charge.

4. Commission charges based on a percentage of the premium can be substantial, particularly if the option is one that has a high premium.

5. Commission charges can have a major impact on your chances of making a profit. A high commission charge reduces your potential profit and increases your potential loss.

You should fully understand what a firm's commission charges will be and how they're calculated. If the charges seem high - either on a dollar basis or as a percentage of the option premium - you might want to seek comparison quotes from one or two other firms. If a firm seeks to justify an unusually high commission charge on the basis of its services or performance record, you might want to ask for a detailed explanation or documentation in writing.

Leverage

Another concept you need to understand concerning options trading is the concept of leverage. The premium paid for an option is only a small percentage of the value of the assets covered by the underlying currency. Therefore, even a small change in the currency price can result in a much larger percentage profit - or a much larger percentage loss - in relation to the premium. Consider the following example:

A trader pays $750 for a 1 Japanese Yen call option with a strike price of $.8200 at a time when the currency price is $.8200. If, at expiration, the currency price has risen to $.8300 (an increase of about one percent), the option value will increase by $1,250 (a gain of 66 percent on the original trade cost of $750). But always remember that leverage is a two-edged sword. In the above example, unless the currency price at expiration had been above the option's $.8200 strike price, the option would have expired worthless, and the trader would have lost 100 percent of his premium plus any commissions and fees. In fact, even if the market price of the underlying currency were to increase, but did not exceed the strike price of the option at expiration, the option would lose all of its value. This is an ironically perverse situation where the trader was right about the direction of the currency price, but still lost money on the option.

The First Step: Calculate the Break-Even Price

Before purchasing any option, it's essential to precisely determine what the underlying currency price must be in order for the option to be profitable at expiration. The calculation isn't difficult. All you need to know to figure a given option's break-even price is the following:

- The option's strike price;
- The premium cost; and
- Commission and other transaction costs.

Similarly, you have the right to a full disclosure of the costs that will be or may be incurred. In addition to commissions, sales charges or front or back-end "loads" when you buy and/or sell, this includes any other transaction expenses, maintenance or service charges, profit sharing arrangement, redemption fees or penalties and the like.

Determining the break-even price for a call option

There are two ways to calculate the "break-even" of an option. The first is to calculate the break-even of an option which will simply be offset (the more common event). This break-even is expressed in terms of the option's premium.

For example, assume one call option on the Japanese Yen is purchased at .0080 ($1,000), the commission and transaction costs equals $200.00 or .0016. The break-even price of the option premium is .0096. If the market price of the Yen moves up enough for the premium of the option to exceed .0096, the option can be sold for a profit - even if the option is still "out-of-the-money."

Under this method of calculation, one must consider the change in the option premium relative to the underlying currency (delta) when applying expectations of the currency market price movement to option premiums. Certainly, with the ease of which either method can be calculated, a trader is well advised to calculate both break-even points (options premium and underlying currency price) before placing any options trade.

The second break-even calculation involves expressing the break-even price in terms of the underlying currency price - as if the option will be exercised (however, most options are offset, not exercised). This method of break-even calculation only considers the intrinsic value of the option premium and is best applied to at-the-money or in-the-money options.

Example: It's January and the Japanese Yen is currently trading at around $.84. Expecting a potentially significant increase in the currency price over the next several months, you decide to buy a call option on the Yen with a strike price of .86. Assume the premium for the option is .0080 and that the commission and other transaction costs are $150, which amounts to .0012.

Option Strike Price		Option Premium		Commissions and Transaction Costs		Break-Even Price
$.86	+	$.0080	+	$.0012	=	$.8692

Before trading, you need to know how much the currency price must increase by expiration in order for the option to break-even or yield a net profit after expenses. The answer is that the currency price must increase from $.84 up to $.8692 for you to break even and to above that amount for you to realize any profit. The option will exactly break even if the April Japanese Yen currency price at expiration is $.8692. For each 1 cent the price increases above$.8692, the option will yield a profit of $1,250. If the currency price at expiration is $.8692 or less, there will be a loss. But in no event can the loss exceed the $1,150 total of the premium, commission and transaction costs.

Determining the break-even price for a put option

The arithmetic is the same as for a call option except that instead of adding the premium, commission and transaction costs to the strike price, you subtract them.

Example: The price of the Yen is currently about $.84, but during the next few months you think there may be a sharp decline. To profit from the price decrease if you are right, you consider buying a put option with a strike price of $.82. The option would give you the right to sell the Yen at $.82 any time prior to the expiration of the option.

Assume the premium for the put option is $.0080 ($1,000 in total) and the commission and transaction costs are $150 (equal to .0012). For the option to break even at expiration, the currency price must decline to $.8108 or lower.

Option Strike Price		Option Premium		Commissions and Transaction Costs		Break-Even Price
$.82	+	$.0080	+	$.0012	=	$.8108

The option will exactly break even at expiration if the currency price is $.8108. For each $.01 the currency price is below $.8108 it will yield a profit of $1,250. If the currency price at expiration is above $.8108, there will be a loss. But in no case can the loss exceed $1150 - the sum of the premium ($1,000) plus commission and other transaction costs ($150).

Factors Affecting the Choice of an Option

If you expect a price increase, you'll want to consider the purchase of a call option. If you expect a price decline, you'll want to consider the purchase of a put option. However, in addition to price expectations, there are two other factors that affect the choice of option:

- The length of the time of the option; and
- The option strike price.

The length of the option duration

One of the attractive features of options is that they allow time for your price expectations to be realized. The more time you allow, the greater the likelihood the option will eventually become profitable. This could influence your decision about whether to buy, for example, an option that expires in March or one that expires in June. Bear in mind that the length of an option (such as whether it has three months to expiration or six months) is an important variable affecting the cost of the option. The longer the time duration an option has, the more it commands a higher premium.

The option strike price

The relationship between the strike price of an option and the current price of the underlying currency is, along with the length of the option, a major factor affecting the option premium. At any given time, there may be trading in options with a half dozen or more strike prices - some of them below the current price of the underlying currency and some of them above.

A call option with a low strike price will have a higher premium cost than a call option with a high strike price because it will more likely and more quickly become worthwhile to exercise. For example, the right to buy the Yen at $.8200 is more valuable than the right to buy the Yen at $.8600. Conversely, a put option with a high exercise price will have a higher premium cost than a put option with a low exercise price. For example, the right to sell the Yen at .8400 is more valuable than the right to sell it at .8200.

While the choice of a call option or put option will be dictated by your price expectations, and your choice of expiration month by when you look for the expected price change to occur, the choice of strike price is somewhat more complex. That's because the strike price will influence not only the option's premium cost but also how the value of the option, once purchased, is likely to respond to subsequent changes in the underlying currency price. Specifically, options that are out-of-the-money do not normally respond to changes in the underlying currency price the same as options that are at-the-money or in-the-money.

Generally speaking, premiums for out-of-the-money options do not reflect, on a dollar for dollar basis, changes in the underlying currency price (delta). The change in option value is usually less. Indeed, a change in the underlying currency price could have little effect, or even no effect at all, on the value of the option. This could be the case if, for instance, the option remains deeply out-of-the-money after the price change or if expiration is near.

If you purchase an out-of-the-money option, bear in mind that no matter how much the currency price moves in your favor, the option will still expire worthless, and you will lose the entire premium paid, unless the option is in-the-money at the time of expiration. To realize a profit, it must be in-the-money by some amount greater than the option's purchase costs. This is why it's crucial to calculate an option's break-even price before you buy it.

Example: At a time when the price of the Yen $.8400, a trader expecting a substantial price increase buys a March call option with a strike price of $.9000. By expiration, as expected, there has been a substantial price increase to $.8800. But since the option

is still not worthwhile to exercise, it expires worthless and the trader has lost the total premium paid.

After You Buy an Option, What Then?

At any time prior to the expiration of an option, you can:

- Offset the option.
- Continue to hold the option.
- Exercise the option.

Offsetting the option

Liquidating an option in the same marketplace where it was bought is the most frequent method of realizing option profits (exercising an option before its expiration date will cause the loss of any time value embedded in the premium of the option). Liquidating an option prior to its expiration for whatever value it may still have is also a way to reduce your loss (by recovering a portion of the amount you paid for the premium of the option) in case the currency price hasn't performed as you expected it would, or if the price outlook has changed.

In active markets, there are usually other traders who are willing to pay for the rights your option conveys. How much they are willing to pay (it may be more or less than you paid) will depend on (1) the current currency price in relation to the option's strike price, (2) the length of time still remaining until expiration of the option, and (3) market volatility. Net profit or loss, after allowance for commission charges and other transaction costs, will be the difference between the premium you paid to buy the option and the premium you receive when you liquidate the option.

Example: In anticipation of rising Yen prices, you bought a call option on the Yen. The premium cost was $950 and the commission and transaction costs were $150. Yen prices have subsequently risen and the option now commands a premium of $1,450. By liquidating the option at this price, your net gain is $350. That's the selling price of $1,450 minus the $950 premium paid for the option minus $150 in commission and transaction costs.

Premium paid for option	- $ 950
Premium received when option is liquidated	+ $1,450
Increase in premium	= $ 500
Less transaction costs	- $ 150
Net profit	= $ 350

You should be aware, however, that there is no guarantee that there will actually be an active market for the option at the time you decide you want to liquidate. If an

option is too far removed from being worthwhile to exercise or if there is too little time remaining until expiration, there may not be a market for the option at any price.

Assuming, though, that there's still an active market, the price you get when you liquidate will depend on the option's premium at that time. Premiums are arrived at through open competition between buyers and sellers according to the rules of an over-the-counter.

Continuing to hold the option

The second alternative you have after you buy an option is to hold an option right up to the final date for exercising or liquidating it. This means that even if the price change you've anticipated doesn't occur as soon as you expected - or even if the price initially moves in the opposite direction - you can continue to hold the option if you still believe the market will prove you right. If you are wrong, you will have lost the opportunity to limit your losses through offset. On the other hand, the most you can lose by continuing to hold the option is the sum of the premium and transaction costs. This is why it is sometimes said that option buyers have the advantage of staying power. You should be aware, however, options decline in value as they approach expiration. (See "Time Value.")

Exercising the option

You can also exercise the option at any time prior to the expiration of the option. It does not have to be held until expiration. It is essential to understand, however, that exercising an option on a currency means that you will acquire either a long or short position in the underlying currencies long currency position if you exercise a call and a short currency position if you exercise a put.

Example: You've bought a call option on the Yen with a strike price of .8400. The currency price has risen to .8600. Were you to exercise the option, you would acquire a long Yen position at .8400 with a "paper gain" of .0200 ($2,500). And if the currency price were to continue to climb, so would your gain.

However, there are both costs and significant risks involved in acquiring a position in the currency market. For one thing, the broker will require a margin deposit to provide protection against possible fluctuations in the currency price. And if the currency price moves adversely to your position, you could be called upon - perhaps even within hours - to make additional margin deposits. There is no upper limit to the extent of these margin calls. Generally, margin calls must be met immediately, which can mean the necessity of large cash sums available for quick transfer into your currency account.

Secondly, unlike an option which has limited risk, a currency position has potentially unlimited risk. The further the currency price moves against your position, the larger your loss. Even if you were to exercise an option with the intention of promptly liquidating the currency position acquired through exercise, there's the risk that the currency price which existed at the moment may no longer be available by the time you are able to liquidate the currency position. Currency prices can and often do change rapidly.

Thirdly, as discussed earlier, there are two components to the value of an option premium: the time value and the intrinsic value. The exercise of an option into a currency captures only the intrinsic value; the time value is lost. Therefore, very few options are ever exercised, and even then generally only at expiration. Options exercisable before expiration are known as American style options, options exercisable only at expiration are known as European style options.

For all these reasons, only a small percentage of option buyers elect to realize option trading profits by exercising an option. Most choose the alternative of having the broker offset, i.e., liquidate, the option at its currently quoted premium value.

Who Writes Options and Why?

Up to now, this study has discussed only the buying of options. But it stands to reason that when someone buys an option, someone else sells it. In any given transaction, the seller may be someone who previously bought an option and is now liquidating it. Or the seller may be an individual who is participating in the type of trading activity known as option writing.

The attraction of option writing to some traders is the opportunity to receive the premium that the option buyer pays. An option buyer anticipates that a change in the option's underlying currency price at some point in time prior to expiration will make the option worthwhile to exercise. An option writer, on the other hand, anticipates that such a price change won't occur - in which event the option will expire worthless and he will retain the entire amount of the option premium that was received for writing the option.

Example: At a time when the Yen price is $.8400, a trader expecting stable or lower currency prices earns a premium of $900 by writing a call option with a strike price of 8600. If the currency price at expiration is below $.8600, the call will expire worthless and the option writer will retain the entire $900 premium. His profit will be that amount less the transaction costs.

While option writing can be a profitable activity, it is also an extremely high risk activity. In fact, an option writer has an unlimited risk. Except for the premium

received for writing the option, the writer of an option stands to lose any amount the option is in-the-money at the time of expiration (unless he has liquidated his option position in the meantime by making an offsetting purchase). In the previous example, a trader earned a premium of $900 by writing a call option with a strike price of $.8600 when the market price was at $.8400. If, by expiration, the currency price has climbed above the option strike price by more than the $900 premium received, the trader will incur a loss. For instance, if the currency price at expiration has risen to .8800, the loss will be $1,600. That's the $2,500 the option is in-the-money less the $900 premium received for writing the option.

As you can see from this example, option writers as well as option buyers need to calculate a break-even price. For the writer of a call, the break-even price is the option strike price plus the net premium received after transaction costs. For the writer of a put, the break-even price is the option strike price minus the premium received after transaction costs. An option writer's potential profit is limited to the amount of the premium less transaction costs. The option writer's potential losses are unlimited. And an option writer may need to deposit funds necessary to cover losses as often as daily.

Part Four: Closer Look at the Factors that Determine Option Premium

To recap, the option premium consists of two components: time value and intrinsic value. The intrinsic value of a call option is the amount by which the underlying market price is above the strike price. The intrinsic value of a put option is the amount by which the underlying market price is below the strike price. In effect, the intrinsic value is that part of the premium that could be realized if the option were exercised. For example, if the Swiss Franc were trading at 70¢, a call option with a strike price of 68¢ would have an intrinsic value of 2¢. The intrinsic value serves as a floor price for an option. Why? Because if the premium was less than the intrinsic value, a trader could buy and exercise the option, and immediately offset the underlying position, thereby realizing a net gain (assuming that he at least covers his transaction costs). Options that have intrinsic value (i.e., calls with strike prices below the current underlying market price and puts with strike prices above the current price) are said to be *in-the-money*. Options that have no intrinsic value are called *out-of-the-money* options. An option whose strike price equals the market price is called an *at-the-money* option. The term *at-the-money* is also often used less restrictively to refer to the specific option whose strike price is closest to the underlying market price.

An *out-of-the-money* option, which by definition has an intrinsic value equal to zero, will still have some value because of the possibility that underlying market will move beyond the strike price prior to the expiration date. An *in-the-money* option will have a value greater than the intrinsic value because a position in the option will be

preferred to a position in the underlying market. Reason: both the option and the underlying market will gain equally in the event of favorable price movement, but the option's maximum loss is limited. The portion of the premium that exceeds the intrinsic value is called the *time value*. It should be, emphasized that since the time value is almost always greater than zero, one should avoid exercising an option before the expiration date. Almost invariably, the trader who offsets his option position will realize a better return by selling the option, because selling the option will yield the intrinsic value plus some time value. Exercising the option will only yield the intrinsic value.

The time value depends on four quantifiable factors:

1. Relationship between the Strike Price and the Current Price of the Underlying Market: The time value of an option will decline as an option moves more deeply in-the-money or out-of-the-money. Deeply out-of-the-money options will have little time value, since it is unlikely that underlying market will move to the strike price, or beyond prior to expiration. Deeply in-the-money options have little time value because these options offer very similar positions to the underlying market - both will gain and lose equivalent amounts for all but an extreme adverse price move. In other words, for a deeply in-the-money option, the fact that the risk is limited is not worth very much because the strike price is so far away from the prevailing market price. The time value will be at a maximum for an at-the-money option. Theoretically, the time value will also be influenced by price expectations, which are a non-quantifiable factor. This point is discussed in greater detail below.

2. Time Remaining until Expiration. The more time remaining until expiration, the greater the time value of the option. This is true because a longer life span increases the probability of the intrinsic value increasing by any specified amount prior to expiration. In other words, the more time until expiration, the greater the probable price range of the underlying market. Specifically, the time value is assumed to be a function of the square root of time. (This relationship is a consequence of the typical assumption regarding the shape of the probability curve for prices of the underlying market.) Thus, an option with 9 months until expiration would have 1.5 times the time value of a 4-month option with the same strike price (√9 = 3; √4 = 2; 3 / 2 = 1-5) and three times the time value of a 1-month option (√9 = 3; √1 = 1; 3 / 1 = 3).

3. Volatility. Time value will vary directly with the estimated volatility of the underlying market price for the remaining life span of the option. This relationship is the result of the fact that greater volatility raises the probability of the intrinsic value increasing by any specified amount prior to expiration. In other words, the greater the volatility, the greater the probable price range of the underlying market. Volatility can have the strongest impact on option premium values. Although volatility is an extremely important factor in determining option premium values, it should be

stressed that the volatility of the underlying market is never precisely known until after the fact. (In contrast, the time remaining until expiration between the current price of underlying market and the strike price can be exactly specified at any juncture.) Thus volatility must always be estimated on the basis of historical volatility data. As will be explained below, this is a crucial factor in explaining the deviation between theoretical and actual premium values.

4. Interest Rates. The effect of interest rates on option premiums is considerably more minor than any of the above three factors. The effect of interest rates is complicated because changes in the rates affect not only the underlying value of the option, but the market price as well. Taking it in steps, a buyer of any given option must pay the premium up front, and of course the seller receives the money. If interest rates go up and everything else stays constant, the opportunity cost to the option buyer of giving up the use of his money increases, and so his is willing to bid less. Conversely, the seller of options can make more in the premiums by investing the cash received and so is willing to accept less; hence, the value of the options fall. It should be recognized that the above discussion can be rephrased in a supply/demand framework. Thus saying that the premium consists of intrinsic value and time value, which are dependent upon the relationship between the strike price and the current price of the underlying market, time remaining until expiration, estimated volatility, and interest rates is equivalent to the following two statements:

Option prices are determined by supply and demand. The key factors determining the levels of supply and demand for options are the relationship between the strike price and the current price of the underlying market, time remaining until expiration, estimated volatility and interest rates.

The above restatement is stressed because many written explanations seem to suggest that supply/demand and the above four factors are separate influences affecting option premiums. The four factors listed above are the influences that determine supply and demand, which in turn determine the option price. For example, all being equal, as the time remaining until expiration evaporates, the demand curve for a given option will shift downward - that is, the amount buyers will demand at any given price level (premium) will decrease since fewer traders will view the option as being attractively priced.

For similar reasons the supply curve will simultaneously shift upward as sellers offer a larger quantity of options to the market at any given price level. The combination of these supply/demand curve shifts will result in a lower equilibrium price (premium) level.

To be complete, there is an additional factor that will also influence supply and demand levels: price expectations of options traders. For example, if a market is in an

uptrend and most option traders believe that the trend will continue, calls may be higher priced than puts with the same expiration date and equivalently out-of-the-money or in-the-money strike prices.

On the other hand, if in the same situation most option traders believe that the market had climbed too sharply and was due for a correction, puts might be higher priced than equivalent calls. The reason that price expectation is not included with the above four factors as an input in option pricing models is that it is a non-quantifiable item. In other words, there is no way of determining the market consensus regarding the probable price direction. Thus, although theoretically price expectations may influence option supply and demand, and hence option prices, this factor is of no practical consequence since it cannot be measured. It should be noted that the inability to incorporate price expectations in an option pricing model is not a crucial defect, since price disparities between puts and calls tend to be limited in both magnitude and duration.

Theoretical Versus Actual Option Premiums

There are a variety of different mathematical models available that will indicate the theoretical "fair value" for an option. Each model uses specific information and assumptions regarding the four factors detailed in the previous section. Theoretical values will approximate, but by no means coincide with, actual premiums. Does the existence of such a discrepancy necessarily imply that the option is mispriced? Definitely not. The model-implied premium will differ from the actual premium for two reasons:

1. The model's assumption regarding the mathematical relationship between option prices (premiums) and the factors that affect option prices may not accurately describe market behavior. This is always true since, to some extent, even the best option pricing models are only theoretical approximations of true market behavior.

2. The volatility figure used by an option pricing model will normally differ somewhat from the market's expectation of market volatility. This is a critical point that requires further elaboration.

Although volatility is a crucial input in any option pricing formula, its value can only be estimated. The theoretical 'fair value' of an option will depend on the specific choice of a volatility figure. Some of the factors that will influence the value of the volatility estimate are the length of the prior period used to estimate volatility, the time interval in which volatility is measured, the weighing scheme (if any) used on the historical volatility data, and adjustments (if any) to reflect relevant influences (e.g., the recent trend in volatility.) It should be clear that any specific volatility estimate will implicitly reflect a number of unavoidable arbitrary decisions. Different

assumptions regarding the best procedure for estimating future volatility from past volatility will yield different theoretical premium values. Thus, there is no such thing as a single, well-defined fair value for an option.

All that any option pricing model can tell us is what the value of the option should be given the specific *assumptions* regarding the expected volatility and the form of the mathematical relationship between option prices and the key factors that affect option prices. If a given mathematical model provides a close approximation of market behavior, a discrepancy between the theoretical value and the actual premium means that the market expectation for volatility, called the *implied volatility*, differs from the historically based volatility estimate used in the model.

The question of whether the volatility assumptions of a specific pricing model provide more accurate estimates of actual volatility than the implied volatility figures (i.e., market volatility suggested by actual premiums) can only be answered empirically, A bias toward buying "underpriced" options (relative to the theoretical model fair value) and selling 'overpriced' options would only be justified if empirical evidence supported the contention that, on balance, the model's volatility assumptions proved to be better than implied volatility in predicting actual volatility levels.

If a model's volatility estimates were demonstrated to be superior to implied volatility estimates, it would suggest that from a strict probability standpoint, a bullish trader would be better off selling puts than buying calls if options were overpriced (based on the fair value figures indicated by the model), and buying calls rather than selling puts if options were under- priced. Similarly, a bearish trader would be better off selling calls than buying puts if options were overpriced, and buying puts rather than selling calls if options were underpriced. The best strategy for any individual trader, however, would depend on the specific profile of his price expectations (i.e., the probabilities the trader assigned to various price outcomes).

Part Five: Some Risks of Options

In considering whether to trade in high risk currency and options where there exists a substantial degree of price volatility and financial leverage, you should understand and seriously consider the many real risk factors which you are certain to encounter. Trading in currencies and currency options involves an extremely high degree of risk of loss. Traders can and frequently do lose all or part of the money they deposit. Due to of the volatile nature of currency markets, the value of your option positions, and hence the value of your trading account, can rise and fall sharply without notice.

The use of leverage generally causes the value of your market position to change at a greater rate than that of the underlying asset, substantially increasing the risk of loss.

As the result of an adverse price movement (or other factors) you may sustain a total loss of your initial deposit (including commissions paid) and any additional funds that you deposit. You may also be subject to losses that exceed the amount deposited in your account when trading short (opening sell) options.

Option trading is a zero-sum game; for every dollar of profit there is an equal dollar of loss. Some studies have shown that more than eighty-five percent of retail investors who trade options ultimately lose money. An option is an complicated trading vehicle, which carries substantial risks that are not inherent to the trading of the underlying asset. For example, options lose value with the passage of time (time decay); options are generally not fully responsive to the price movement of the underlying asset (delta). Option profitability is substantially dependent on the exercise (strike) price of the option relative to the underlying market price.

Long (opening buy) options have risk that is limited to the amount of the option premium plus the commission, however, short (opening sell) options have unlimited risk. An option with a strike price that is deep out of the money has only a remote chance of ever becoming profitable. You should familiarize yourself with the specific and systematic risks, terminology, and workings of long and short, call and put options before depositing money for options trading.

Option writing as a trading strategy is absolutely inappropriate for anyone who does not fully understand the nature and the extent of the risks involved and who cannot afford the possibility of a potentially unlimited loss. It is also possible in a market where prices are changing rapidly that an option writer may have no ability to control the extent of his losses. Option writers should be sure to read and thoroughly understand the Risk Disclosure Statement that is provided to them.

This brief section cannot identify all of the risks and other significant aspects involved in trading in currency and options. You should, therefore, carefully study and understand the required Risk Disclosure Statement and all aspects of the account, the market, and the trading vehicle, prior to depositing any money for trading. If you do not understand any part of the Risk Disclosure Statement, seek the advice of a qualified attorney or trained financial advisor.

Educational Resources

FX Bridge Technologies offers a free full-length online training course on options (see link below). The curriculum includes modules for beginning, intermediate and advanced traders with chapter exams. It also offers sections specific to spot traders, hedgers, among other relevant applications of option trading.

Link to FX Bridge's online option curriculum OptionsEDU

Recommended Reading:

The Complete Guide to Currency Trading
Jack Schwager, Harper Business

Option Volatility and Pricing Strategies
Sheldon Natenburg, Probus Publishing Co.

Market Wizards
Jack Schwager, Harper Business

Risk, Uncertainty and Profit
Frank H. Knight, McMillan Publishing Co.

The Remarkable History of Risk
Peter L. Bernstein, John Wiley & Sons, Inc.

Options as a Strategic Investment: Fifth Edition Pricing
Lawrence G. McMillan, Prentice Hall

A Currency Options Primer
Shani Shamah, John Wiley & Sons

Trading Options Greeks: Time, Volatility, and Other Pricing Factors
Dan Passarelli, Bloomberg Financial

FX Options and Structured Products
Uwe Wystup, John Wiley & Sons

FX Options and Smile Risk
Antonio Castagna, John Wiley & Sons

The Options Applications Handbook: Hedging and Speculating Techniques
Erik Banks, Paul Siegel, McGraw Hill

Options on Foreign Exchange
David F. DeRosa, John Wiley & Sons

Portfolio Selection & Efficient Diversification of Investments
H. Markowitz, Baldwin Publishing