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OPTION CONTRACTS: A PRIMER

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INTRODUCTION

Option contracts, futures contracts and swaps are financial instruments known as "derivatives." Derivatives are financial contracts whose value is derived from the value of another asset (equity, bond or commodity). They can also be designated as "contingent claims," i.e., their payoff is contingent on the prices of other assets.(1) Regardless of their diversity, derivatives are essentially found in two forms of financial instruments: forward contracts and option contracts.

In forward contracts, one party agrees to buy something from another at a specified future date for a specified price. In option contracts, one party agrees to provide the right, but not the obligation, to buy or sell something (stock, bond, currency or commodity) at a set price, within a predetermined period of time.

Contrary to popular belief, derivatives have been used over the centuries. The concept behind option contracts is mentioned in the Old Testament,(2) and by Aristotle in his work "Politics." Traders at medieval fairs used arrangements that were very similar to forward contracts, while in the 17th century there was an organized market for future delivery of rice in Osaka, Japan, and an active market for tulip options in Amsterdam.

In this century, most option and forward trading has been executed on over-the-counter markets between brokers. In the mid-1970s, options and future contracts began active trading on organized markets such as the Chicago Board Options Exchange (CBOE) and the New York Mercantile Exchange (NYMEX).

Options can be based on stocks, stock market and industry indexes, and foreign currency. They can also be based on the future prices of, for example, agricultural products, commodities, precious metals, or even fixed income securities. Essentially, option contracts act

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(1) Zvi Bodie, Alex Kane and Alan J. Markus, *Investments*, 2nd edition, Irwin, 1993, pp. 618-619.

(2) Jacob bought an option to marry Rachel from her father Laban in exchange for seven years of labour.

as insurance for investors as a way of managing investor risk and are used to protect the value of an asset or commodity against unfavourable price movements.

This document will:

- focus on describing the nature, function and use of option contracts;
- give a brief description of the concepts involved;
- explain some of the elementary terminology used in option trading; and
- offer some examples of basic options strategies used by investors to protect the value of their assets.

CALL OPTIONS(3)

The ownership of a call option gives the holder the right, but not the obligation, to buy or "call away" a specified quantity of an asset from an option writer (or maker) at a specified price, up to some specified date. A *European* call option allows the asset to be called away only on the specific date. An *American* call option allows it to be called away at any time up to and including the specified date.

PUT OPTIONS

A "put" is an option contract that allows its purchaser the right, but not the obligation, to sell an underlying asset at a specified price, up to a given expiration date. As with calls, there are both American puts and European puts.

THE OPTION BUYER AND OPTION SELLER(4)

For every option contract, there is both a buyer and a seller. In a *call* option, the buyer obtains the right to purchase a given quantity of an asset from the option seller (writer or maker) at a specified price, until a particular date.

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(3) William F. Sharpe, *Investments*, Prentice-Hall, 1978, pp. 347-352.

(4) Robert W. Kolb and Ricardo J. Rodriguez, *Financial Institutions and Markets*, 2nd edition, Blackwell Publishers, 1996, pp. 573-578.

Similarly, in a *put* option, the buyer obtains the right to sell a given quantity of an asset to the writer at a specified price, until a particular date.

In both calls and puts, the option buyer or holder is under no commitment to perform any action. The option holder merely purchases the right to carry out a certain financial transaction. Depending on the circumstances, the option holder can choose to exercise the option contract or do nothing and let the option expire. The owner of the option always has the discretionary authority to engage in a transaction. The option writer, however, is committed to certain specific obligations. If the option owner decides to exercise the option, the writer is obligated to perform the transaction.

It is also important to note that the option holder and the option writer have opposite expectations about the future movement in the price of the underlying asset. An investor hopes to make a profit by purchasing a call option in the expectation that the price of the underlying asset will appreciate in the future, while the call writer expects the price to depreciate or remain stable. In put options, the situation is reversed, with the put holder hoping to profit from a future drop in price, while the put writer is betting that the price of the underlying asset will appreciate.

Investors desiring to liquidate their call option contract position need not wait until the expiration date to do so; they can liquidate their position by selling an identical call. The transaction will be profitable if the sale of the call option commands a higher price than the initial purchase price of the call option, after taking into consideration brokerage fees and other transaction costs.

An investor who initially sold a call option can liquidate the current position by purchasing an identical call option. In this case, the investor will profit from the transaction if the purchase price of the call is below the initial selling price of the call option.

SOME OPTION CONTRACT TERMINOLOGY

The holder must pay the writer in order to secure the ownership of the option; the amount paid is called the option *premium* or *price*. This represents the amount the holder has to pay to secure the ability to exercise the option if the transaction is deemed profitable.

An option contract is said to have been *exercised* if it has been converted into a pre-set quantity of the underlying asset to be bought or sold at a fixed price. The final date on which the exercise may take place is known as the *expiration date*. The price specified in the option contract as being that at which the holder can buy or sell the underlying asset is termed the *exercise price* or the *strike price*.

An option is described as being *in the money* when its exercise would produce a profit for its holder. An option is said to be *out of the money* when it would be unprofitable to exercise it. When the exercise price is equal to the price of the underlying asset, the option is said to be *at the money*.

A call option will be *in the money* if its exercise price is below the value of the asset so that purchase at the exercise price would be profitable. In other words, when exercising the call option, the call holder purchases the asset at a price lower than it is currently trading on the market. The call option is *out of the money* if the exercise price is above the price of the underlying asset or commodity. Conversely, a put option will be in the money if its exercise price exceeds the value of the asset and out of the money if the exercise price is less than the value of the asset.

OVER-THE-COUNTER AND LISTED OPTIONS

A. Over-the-Counter Options

Option contracts can be traded on the over-the-counter (OTC) market where put and call dealers and brokers bring potential buyers and sellers together to negotiate terms and make transactions. The advantages of OTC markets are that the terms of the option contract – the exercise price, expiration date, and the quantity of the asset – can be negotiated and the option contract can be tailored to meet the specific needs of the investors.

However, trading options over the counter involves substantial risks. There is little standardization of option contracts, which inhibits the number of transactions to be completed, and there is virtually no secondary market for option contracts. For the same reasons, if some of the parties involved in an option contract decide to opt out of the transaction or

default, it becomes very difficult and expensive to find alternative parties willing to accept the same conditions.

B. Listed Options

Since 1973, virtually all option contracts have been traded on organized markets such as the Chicago Board Options Exchange (CBOE), the Chicago Mercantile Exchange, or the New York Mercantile Exchange (NYMEX). In Canada, call options on stocks began to be listed on stock exchanges in 1975; put options on stocks began trading in 1978.

Some advantages of trading on exchanges are described below.

1. Standardization

Unlike the OTC markets, options listed on exchanges are standardized with respect to maturity dates and exercise prices for each listed option. This means that all participants trade in a limited and uniform set of securities, thereby increasing the volume of transactions and lowering the cost of trading.

2. Clearing Houses

To ease trading and ensure that holders can exercise their option contracts, exchanges have created organizations known as *clearing houses*, which act as intermediaries between option buyers and sellers. Once the two parties have agreed on the price and struck a deal, the clearing house steps in and acts as middleman, becoming the effective holder of the option from the writer and the effective writer of the option to the holder. The clearing house acts as issuer and commits itself to performing the transaction, either to sell the underlying asset to the holder (for calls), or to buy it at the prearranged price (in the case of puts). All direct linkages between original buyer and seller are thus severed. If a holder decides to exercise an option, the clearing house will randomly select a writer whose position has not been closed and assign the exercise notice accordingly. The clearing house also guarantees delivery of stock if the writer defaults. In this way, the clearing house removes what is known as the credit risk, i.e., the risk associated with having one of the contractors default or refuse to pay the option contract.

Because clearing houses guarantee performance, option writers are required to post margin accounts to guarantee the fulfilment of their contract obligations. The margin requirement is determined in part by the amount by which the option is *in the money*; that value is an indicator of the potential obligation of the option writer when the option is exercised. If the margin required exceeds the posted margin, the option writer will receive a margin call. Option holders are not required to post margins because they will exercise their option contracts only if it is profitable to do so.

The clearing house allows a buyer to "sell out" a position and a seller to "buy in" a position at any time, thereby increasing the volume of transactions and lowering the transaction costs, in other words, increasing the liquidity of the market.

VALUE OF OPTIONS AT EXPIRATION

The value or price of an option can be influenced by a variety of factors, such as the level and volatility of the asset price, the exercise price, the time remaining before expiration, and interest rates. The continuous interaction of all these factors makes it more complicated to understand how options are priced; however, as the option nears its expiration date, many of the complications affecting its pricing disappear. Thus, the price of options near or at their expiration date helps to explain the basic dynamics of option valuation.

A. Call Options

A call option gives its holder the right, but not the obligation, to purchase an underlying asset at the exercise price for a period of time. A call has a theoretical or "floor" value that is determined by supply and demand. The market value of a call cannot be less than its theoretical value; otherwise, it would be possible for an investor to make profits through arbitrage by buying a call on a secondary market, exercising it, and then reselling the underlying asset on the secondary market.

For a call option, the payoff to the holder can be summarized by the following formula, where S is the price of the underlying asset at the expiration date and X is the exercise or "strike" price of the option.

$$\text{Call Option Payoff} = S - X \text{ (if } S > X)$$

The call option will have positive value or be *in the money* if and only if the price of the underlying asset is greater than the exercise price. For sake of illustration, let's assume the current market price of a stock is trading on the secondary market at $50 (S = $50) and the exercise or "strike" price of the call option at $30 (X = $30). The difference between the stock's market price and exercise price is positive (S - X = $50 - $30 = $20) and thus the call option will have an extrinsic value of $20. It is thus more profitable for the holder to convert the option and obtain the underlying asset at a lower price than it would be to buy it directly from the market.(5)

Call Option Payoff = S - X = 0 (if S <= X)

On the other hand, if the call option is *at the money* or *out of the money*, the market price is equal to or less than the exercise price; the difference is then zero or negative and the payoff value of the call option is zero. In this case, we assume the market price of the stock has dropped to $25 (S = $25). Now, the difference between the stock price and the strike price is negative (S - X = $25 - $30 = - $5) and the call option payoff is zero. Because it is no longer profitable for the call option holder to convert or "exercise" it, the holder lets it expire worthless.

B. Put Options

For a put option, the payoff to the holder can be summarized in the following manner:

Put Option Payoff = X - S > 0 (if S < X)

Put option contracts possess positive extrinsic value if they are *in the money*, i.e., if the price of the underlying asset is less than the exercise price. In such a situation, the put holder can more profitably sell the underlying asset by converting the put than by directly selling the underlying asset on the open market.

Let's say an investor holds units of ABC shares and a put option for the same amount of ABC stock units with an exercise price of $45 per share. The same ABC shares are currently trading at $35. Thus, the put option has positive extrinsic value because the exercise price is greater than the trading share price (X - S = $45 - $35 = $10). So the investor profits

(5) For the sake of simplicity, these examples do not take into account transaction costs and brokerage fees for the option.

from converting the put option because by exercising it, the holder receives a higher price for the securities than he/she would have if he/she had sold the securities directly on the market.

If, on the other hand, the market price for the underlying asset is currently higher than the put option's exercise price, then the holder will profit by selling the underlying asset directly on the market instead of converting the put option. Thus, the put option payoff will have negative extrinsic value and the put option payoff will be zero.

Put Option Payoff = X - S = 0 (if S >= X)

Repeating the example, let us say an investor holds shares and a put option for the same amount of stock units with an exercise price of $45 per share. Let's assume that same shares are currently trading at $60. The put option thus has negative extrinsic value because the exercise price is less than the trading share price (X - S = $45 - $60 = - $15). So the investor will not exercise the put option because the investor can receive greater receipts from selling the shares directly on the open market than by converting the put option.

OPTION STRATEGIES(6)

Option contracts can be used in a variety of investment strategies, either singly or in various combinations with other calls or puts. Many payoff strategies are possible by combining puts and calls with various exercise prices.

Purchasing calls or writing puts is considered a "bullish" strategy because the investor is expecting that the price of the underlying asset will appreciate in the future. If, on the other hand, the asset price is expected to depreciate, the investor may consider purchasing puts or writing calls.

A. Buying Call Options

Buying a call option can be done to:

- produce a leverage effect;

(6) Denis Morissette, *Valeurs Mobilières et Gestion de Portefeuille*, 2nd edition, Les éditions SMG, 1993.

- protect a short sale position; and
- fix the purchase price of securities for future delivery.

1. Leverage Effect

An investor who expects the value of securities to appreciate in the near future may decide to buy those securities, or alternatively, to purchase the same securities at much lower cost through the acquisition of call options. If the price of the securities evolves favourably, the return or yield on investment will be much greater for the call holder, owing to the leverage effect.

2. Protecting a Short Sale Position

A short sale involves selling borrowed securities with the intention of re-purchasing them later at a lower price. To protect a short sale position, an investor can use a call option. To illustrate the point, let us assume an investor wishes to initiate a short sale of 1,000 shares of ABC stock at a unit cost of $7.75. If, contrary to expectation, the share price appreciates to $15 per unit, the investor then faces a loss of $7,250 ($15,000 - $7,750). The investor can be protected against such an exposure by purchasing call options to offset the financial loss. Instead of buying the ABC shares directly on the stock market, the investor buys 10 call options, each with 100 shares of ABC, with an exercise price of $6 and premium of $1.90 per unit. When the share price appreciates to $15 per unit, rather than buying back the shares on the secondary market, the investor decides to exercise the 10 calls, paying the exercise price of $6 per share plus the $1.90 premium. Because the investor originally received $7,750 by selling 1,000 ABC shares and then disburses $7,900 ($6,000 + $1,900) for buying back the shares through the conversion of the 10 calls, the investor’s total risk exposure or financial liability is limited to $150.

However, if the share price depreciates as expected, an investor who had performed the short sale (buying the ten calls in order to reduce exposure) would realize a smaller profit than an investor who had performed the uncovered short sale.

3. Fixing the Purchase Price of Securities for Future Delivery

An investor who expects the price of a security to appreciate in the near future but does not possess the financial resources to buy, can acquire call options in order to purchase the securities at a pre-set price. In doing so, the investor locks in the maximum purchase price while gaining time to accumulate the required capital for buying.

B. Buying Put Options

1. Leverage Effect

As with call options, the purchase of put options can have an important leverage effect boosting the portfolio's yield; option contracts are proportionally more sensitive to changes in the value of the underlying security. In put options, the investor's potential loss is limited to the cost of acquiring the put plus the brokerage fees.

2. Protecting against a Drop in Price of the Underlying Security

An investor holding a particular stock may acquire some protection against financial losses resulting from a drop in price by purchasing a put option on the same stock. This type of transaction is designated as a *protected put*. If the stock price goes below the strike price of the put, the investor will convert the put and sell the underlying stock at the higher exercise price. If the prevailing stock market price stays above the exercise price of the put, the investor can let it expire worthless.

C. Selling or Writing Call Options or Put Options

An investor can sell or issue calls in order to increase the portfolio's return and to be protected against the depreciation of the security's value.

The put writer receives the premium (minus brokerage fees) and, if the put is converted, must buy back the underlying security at the exercise price. The maximum profit the writer can obtain is the premium; however, the put writer remains exposed to considerable loss if the security price drops substantially, because the writer is obligated to buy back the underlying security at the higher stipulated strike price.

An investor can also issue a put in the expectation of acquiring securities at a lower-than-market price.

The above transactions are among the most elementary investment strategies involving option contracts. In more complicated strategies, two or more option contracts can be combined. For example, the "long straddle" involves the simultaneous purchase of a call and put on a stock, each with the same strike price and expiration date. Straddles are used when substantial price fluctuations are expected for a security, but the direction of the fluctuation is unknown. Varying the exercise price and expiration dates provides almost unlimited permutations of option contracts whereby investors can protect themselves against the many types of price movements in the underlying security.

OPTION-LIKE SECURITIES

Many other types of financial instruments and agreements, such as warrants and convertible securities, have characteristics that are very similar to option contracts.

For example, stock purchase warrants are securities issued by a company that grants the holder the right to buy a given quantity of that company's stock, for a specified price ("strike price"), for a certain period of time. Essentially, warrants act much like call options, providing protection against financial losses owing to unfavourable price movements in the underlying stock, and, through leverage, amplifying capital gains opportunities when the price of the stock appreciates.

Some firms issue convertible debt instruments that give the holder the right to exchange each bond or preferred share for a fixed number of shares of common stock, regardless of the market price of the securities at the time.

CONCLUSION

Option contracts are useful financial instruments that protect the value of an asset against unfavourable price movements. They can provide *leverage*, i.e., they can secure control and ownership of an asset for a fraction of the amount that it would cost the investor to buy that asset on the market. Options also provide *insurance* against unfavourable price movements by

distributing the price risk between investors with opposing expectations on the future price movements of an underlying asset. Thus, option contracts help to reduce the price volatility of assets by transferring risk from those who do not want it (hedgers) to those who do (speculators).

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