Chapter 21: Corporate finance

Options

Several options and relating aspects defined

- Financial option: a contract that gives its owner the right (but not the obligation) to purchase or sell an asset at a fixed price at some future date.

- Call option: a financial option that gives its owner the right to buy an asset.

- Put option: a financial option that gives its owner the right to sell an asset.

- Option writer: the seller of an option contract.

- Derivatives: securities whose cash flows depend solely on the prices of other marketed assets.

- Warrant: a call option written by a company itself on new stock.

- Write an option: sell an option

Specific words are used to describe the details of option contracts

- Exercising an option: when a holder of an option enforces the agreement and buys or sells a share of stock at the agreed-upon price.

- Strike (exercise) price: the price at which an option holder buys or sells a share of stock when the option is exercised.

- American options: the most common kind of option, they allow their holders to exercise the option on any date up to and including the expiration date.

- European options: options that allow their holders to exercise the option only on the expiration date.

- Expiration date: the last date on which an option holder has the right to exercise the option.

Some aspects related to stock option quotations:

- Open interest: the total number of contracts of a particular option that have been written and not yet closed.

- At-the-money: describes options whose exercise prices are equal to the current stock price.

- In-the-money: describes an option whose value if immediately exercised would be positive. Call options with strike prices lower than the current stock price are in-the-money. Same holds for put options with strike prices higher than the current stock.

- Out-of-the-money: descries an option that if exercised immediately, results in a loss of money.

- Deep-in-the-money: describes options that are in-the-money and for which the strike price and the stock price are very far apart.

Deep out-of-the-money: describes options that are out-of-the-money and for which the strike price and the stock price very far apart.

Most options are written on stocks but options on other financial assets also exist. Options on stock indexes are an example. These options can protect the value of investors´ investments.

To reduce risk by holding contracts or securities whose payoffs are negatively correlated with some risk exposure is called hedging.

Speculating is when investors use securities to place a bet on the direction in which they believe the market is likely to move.

Options payoffs at expiration

Call value at expiration

Call value = Stock price – Strike price   (if stock price > strike price)

Call value = 0   (if stock price ≤ strike price)

When the stock price is less than the strike price, the holder will not exercise the call, so the option is worth nothing. When the stock price is higher than the strike price, the holder will exercise the call.

Put price at expiration

Put value = Strike price – Stock price   (if stock price < strike price)

Put value = 0   (if stock price ≥ strike price)

The holder of a put option will exercise the option if the stock price is below the strike price. Because the holder receives the strike price when the stock is worth less, the holder's gain is equal to the strike price minus the stock price.

These two cases discussed, put price and call value at expiration, describe the long position in an option contract.

The short position's cash flows are the negative of the long position's cash flows, because the investor takes the opposite side of the contract to the investor who is long. An investors in long position can only receive money at expiration, an investor in short position can only pay money at expiration.

Because the stock price cannot fall below zero, the downside for a short position in a put option is limited to the strike price of the option.

In contrast to the payouts on a long position in an option contract, the profits from purchasing an option and holding it to expiration could be negative. When the profits are negative, the payout at expiration is less than the initial cost of the option. The further in-the-money the option is, the higher its initial price and thus the larger your potential loss.

The profits from a short position in an option are the negative of the profits of a long position, because a short position in an option is the other side of a long position.

Factors affecting option pricesationship

There are several factors affecting option prices

1. Strike price and stock price

2. The exercise date
   According to the Valuation Principle: an American option with a later exercise date cannot be worth less than an otherwise identical American option with an earlier exercise date. Because a European option cannot be exercised early at six months, this is not the case for European options. Consequently, a European option with a later exercise date may potentially trade for less than an otherwise identical option with an earlier exercise date.

3. The risk-free rates
   If the risk-free rate increases, the value of an option increases too. This is because a higher discount rate reduces the present value of the strike price. This reduction in the present value of your payment (you have to pay the strike price to exercise a call option) increases the value of the option. The reduction in the present value of the strike price decreases the value of the put option, because you receive the strike price when you exercise a put.

4. Volatility
   The value of an option generally increases with the volatility of the stock, because an increase in volatility increases the likelihood of very high and very low returns for the stock.

The Black-Scholes option

Black-Scholes price of a call option on a non-dividend-paying stock:

Call price = Stock Price x N(d1) – PV(Strike Price) x N(d2)

You can calculate the present value by using the risk-free rate.
N(d1) and N(d2) are probabilities.

The pricing formula shows that the price of an option on a non-dividend-paying stock is a function of only the current stock price, the strike price, the time to expiration, the volatility of the stock and the risk-free rate. Notable: we do not need to know the expected return of the stock.

Put-call parity

The prices of put and call on a given stock are related to each other, because these prices are influenced by the price of the same underlying stock. We will develop this relation by showing that both put and calls can be packaged in different ways to provide insurance against a drop in the price of a stock.

A possible way to insure against a loss is a protective put, which is purchasing a put option on a stock you already own.

A possible way to insure against a loss on an entire portfolio of stocks (combinations of holding stocks and put options) is a portfolio insurance, which is a protective put written on a portfolio rather than a single stock.

One can also achieve portfolio insurance by purchasing a bond and a call option.

There are the two different ways of constructing portfolio insurance:

1. Purchase the stock and the put

2. Purchase a bond and a call

Both positions provide exactly the same payoff. For this reason, the Valuation Principle and the Law of one price require that they must have the same price:

Stock price + Put price = PV (strike price) + Call price

Left side represents the cost of buying the stock and a put. Right side is the cost of buying a zero-coupon bond with face value equal to the strike price of the put and a call option. Rearranging the formula gives us the put-call parity (for non-dividend paying stocks).

Call price = Put price + Stock price – PV (Strike price)

It gives the price of a call option in terms of the price of a put option plus the price of the underlying stock minus the present value of the strike price.

When the stock pays a dividend, the payoff isn't the same anymore because the stock will pay a dividend while the zero-coupon bond will not. To adjust for the dividends, we need to add the present value of the future dividends to the equation: Stock price + Put price = PV (strike price) + PV (dividends) + Call price

Rearranging this formula gives the general put-call parity formula: Put-call parity:

Call price = Put price + Stock price – PV(strike price) – PV(dividends)

Corporate finance

A very important corporate finance application of options is interpreting the capital structure of the firm as option on the firm's assets.

- A share of stock can be thought of as a call option on the assets on the firm with a strike price equal to the value of the debt outstanding.

- A share of equity can be viewed as a call option on the assets of the firm.

- The debt holders can be viewed as owning the firm and having sold a call option with a strike price equal to the required debt payment.