

## Product Briefing - Options

An option is a contract that gives the holder the right but not the obligation to buy or sell an asset at a pre-agreed price in the future. Essentially it is a forward contract that allows the buyer to walk away if, at maturity, the market rates that prevail make execution of the deal unattractive.

An option that gives the holder to buy an underlying asset is referred to as a 'call option', while the right to sell the asset is referred to as a 'put option'. The price at which the counterparty agrees to deal is referred to as either the strike rate or exercise price.

When the buyer ('holder') of the option can use the option is a function of whether the contract is European, American or Bermudan ('semi-American') in style. A European-style option allows the holder to exercise the option only at expiry. An American-style option allows the holder to exercise the option at anytime prior to its stated maturity. A Bermudan option allows the holder to exercise the option according to a pre-agreed schedule of dates.

The decision to exercise the option will depend on whether the option is 'in'-, 'out'- or 'at-the-money'. An 'in-the-money' option (ITM) is an option where the strike rate is more favourable than the underlying price. If this were the case it would be logical to exercise the option. An 'out-of-the-money' (OTM) option is one where the strike rate is less favourable than the underlying price and so the option would not be exercised. An 'at-the-money' (ATM) option is one where the underlying market price is equal to the strike price. In this case the holder would be indifferent as to whether they would exercise the option.

Assume an investor buys a three month European style call option on an asset, which is trading at a price of 100. Suppose that the strike rate for the option is also 100 and that the agreed is 5 units. If at maturity the underlying asset is trading at 90, the holder would not exercise the option to buy at the strike. The option would lapse as it is OTM and their losses would be equal to the premium paid.

If the underlying asset was 110 at expiry, the holder would exercise the option. They would deliver a cash amount equal to the strike (100) and take delivery of the asset, which has a current value of 110. As a result they would have a profit of 5 units. This is calculated as the difference between the strike price of the option (100) and the expiry value of the underlying asset (110), less the premium paid (5). Note that if the underlying asset is between 100 and 105 at maturity the option would still be ITM as a result of our definition, however, the holder will not have broken even. The holder would still exercise the option as in this range of prices they will be seeking to minimise their losses and recoup some of the premium paid.

An option seller is faced with a profit and loss profile opposite to that of the buyer. If the option is not exercised they will retain the premium but their losses will increase as the underlying price rises. However, the use of the terms ITM, OTM and ATM would remain the same and are defined by convention from the buyer's perspective. So, if the underlying price is 90 at the expiry of the option, the option is OTM but is the preferred outcome from the seller's perspective.

The outcome for the buyer of a put with the same characteristics as the call would follow similar principles. However, a put option will be ITM if the strike price is greater than the underlying price, and would be OTM if the strike price is less than the underlying price.

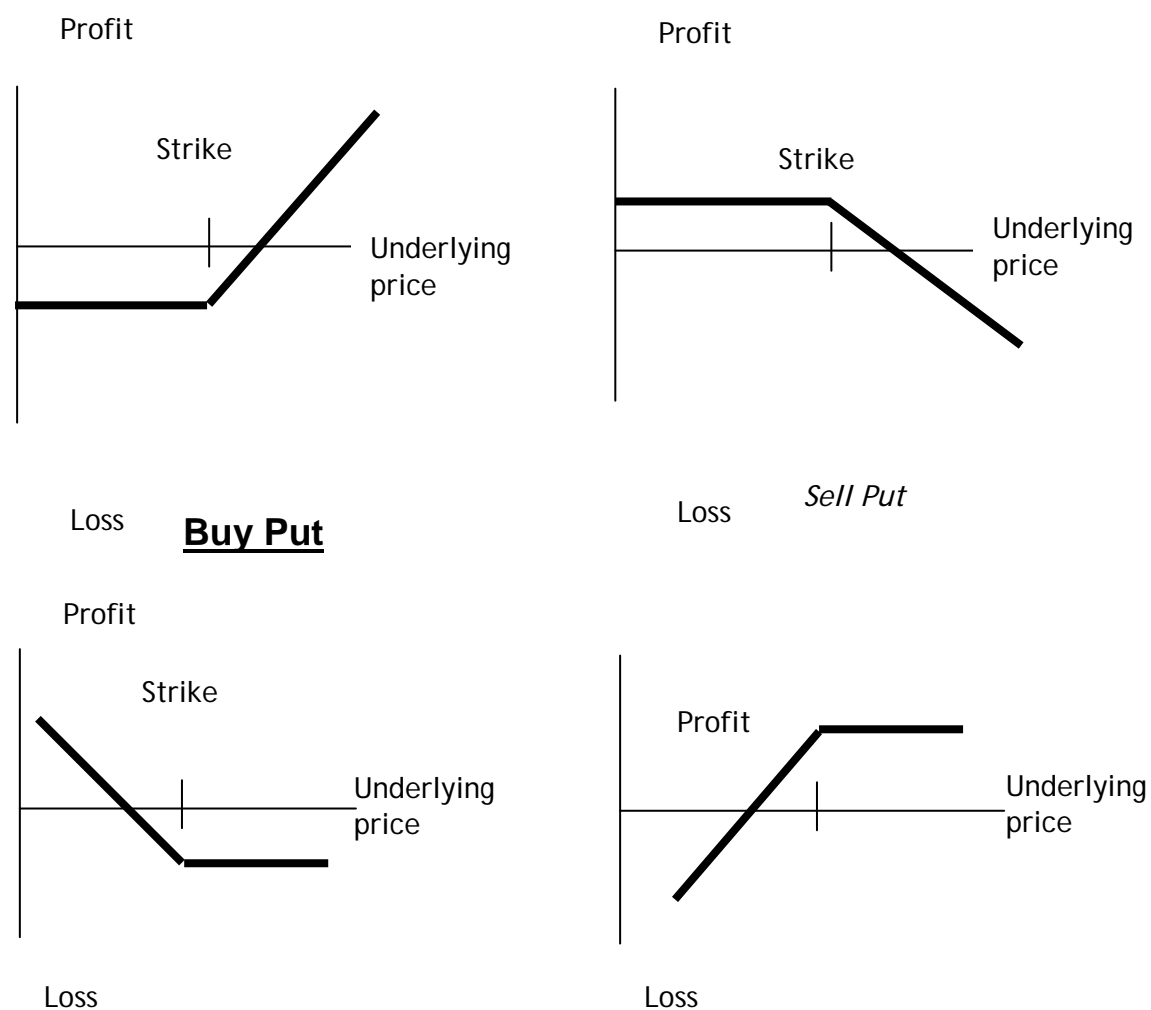


Figure 1: Profit and loss profiles for options at expiry

From the profiles illustrated in figure 1, it can be seen that for buyers of options, the maximum loss can never exceed the premium paid. The buyer's maximum loss represents the maximum profit that could be made by the seller of the option. The maximum profit for the option buyer appears to be unlimited, which is true for the call profile but not for the put. The maximum pay-off on a put option is the difference between the strike rate and 0 as the price of the underlying asset cannot go negative. Selling options can lead to unlimited losses for sellers of calls and significant losses for put writers, with the latter's losses 'benefiting' restrained by the zero price boundary.

The payoff of calls and puts at expiry is often represented using the following expressions:

Expiry payoff of call option =  $\text{MAX}(\text{underlying price} - \text{strike}, 0)$   
Expiry payoff of put option =  $\text{MAX}(\text{strike} - \text{underlying price}, 0)$

So for holder of the call option the payoff will be the greater of either the underlying price less the agreed upon strike, or zero. For the holder of the put option they will exercise the option if the strike rate less the underlying price is greater than zero. These expressions do not measure the profit or loss of the position as they do not take into account the premium paid.

The premium is normally paid at the outset of the option and will be expressed in the same units as the underlying asset. So, if the option is referenced to an interest rate the premium will be paid in percentage points; crude oil options will be expressed in USD per barrel, while options on equity indices will be quoted in index points.