

1 Option Basics

An option contract is a financial instrument; specifically, a type of derivative. But what is a derivative?

The clue is in the name. A derivative derives from an underlying asset, such as an equity, an interest rate or a commodity. The price of a derivative is derived from the price of the underlying asset.

So a coffee *futures contract* (a coffee “future”) is a derivative of *physical coffee*.

A dollar/euro *option* is a derivative of the *spot* or *cash* dollar/euro rate. BP *futures* or *options* are derivatives of *cash* BP shares, as traded on the LSE.

Derivatives, whether options or futures, are contracts. When we trade a future, we are trading a *futures contract*. When we trade an option, we are trading an *options contract*. In the context of derivatives markets, the word “future” is an abbreviation of the term “futures contract”. The word “option” is an abbreviation of the term “option contract”.

These contracts are transferable, they are tradable between market participants. We can buy an option from one person and sell it to a different person. Trades are executed via the exchange and the related clearing house, such as LIFFE and LCH Clearnet, respectively. Trading is *anonymous*. We don’t know who we have traded with and nor do we care; it is irrelevant.

When we buy 5 futures and then sell 3 of them, we do not have two positions. We are not long of 5 futures *and* short of 3 futures. Rather, we have a *net* position of long 2 futures. There may also be a profit or loss, depending upon the prices at which we traded, but our position is simply the net result of the two trades. Furthermore, we can trade in and out of derivatives positions as and when we want, at any time while the market is open up until expiry. Futures and options positions do not have to be held until expiry. We may buy some options this morning and sell them an hour later (“intra-day” trading). Or we may buy some futures or options today and sell them tomorrow or next week or next month, any time until the contracts expire.

There are three basic types of derivative: futures, options and swaps. Here, we are concerned with options, but it is worth giving a brief explanation of the difference between physical, forward and option trades. Consider the following everyday example.

Imagine that we want to buy a house for £100K. We pay £100K in cash to the house vendor; the vendor hands us the deeds to the house. This is an example of a “physical” or “cash” or “spot” transaction. “Physical” because we are buying something tangible, a physical house in this case. “Cash” because we are paying for the house in cash. And “spot” because we are paying the price right now, we are paying “on the spot”.

Now consider that we want to buy the same house for £100K, but don’t wish to complete the transaction for 3 months. If we wait 3 months to buy the house, the price may have changed, so we make a contract with the house vendor to buy the house for £100K in 3 months’ time. This is an example of a “forward” or “future” transaction. The cash is not exchanged for the house right now. Rather we have agreed to exchange cash for the house on a forward date, on a date in the future.

Now consider that we want the option to buy the same house for £100K in 3 months’ time. Unsurprisingly, this is an example of an option transaction, an example that is expanded upon in the following section.

Options convey the right, *but not the obligation*, either to buy or sell an asset. Hence the name option, because option ownership conveys *choice*.

There are two types of option:

1. *Calls*, which convey the right to *buy* something. For example, a BP call conveys the right but not the obligation to *buy* BP shares.
2. *Puts*, which convey the right to *sell* something. For example, a Vodafone put conveys the right but not the obligation to *sell* Vodafone shares

Before considering equity options in detail, consider an everyday example of a call and a put:

EVERYDAY EXAMPLE: A CALL OPTION ON A HOUSE

We want to buy a house and, on the first day of our property search, we find a suitable house on offer at a price of £100K.

We are now in something of a quandary. This is the first and only house that we have looked at so far. What about all the other houses on offer? We want to look at other houses on the market, but don’t want to miss out on this one. How can we retain the right to buy this house but also have time to look at the alternatives? How can we “have our cake and eat it”?

The solution is to ask the house seller if we can have a month in which to look at other properties on the market. We want to be able to come back in a month’s time and have the choice of buying the house for £100K (in the event that we have found

nothing better in the meantime) or not buying the house (in the event that we *have* found a better choice). We want time. We want choice. We want an option to buy the house; a *call option*.

Not unreasonably, the seller of the house wants something in return for giving us this time and flexibility. After all, by giving us a month in which to decide whether or not to buy the house, he has to take his house off of the market and may miss out on a quick sale.

To compensate the house seller for this missed opportunity, we agree to pay him £500. This is the price of the call option, the price of time and choice. This price of £500 is non-refundable, non-returnable. It is the price of the option, also known as the *option premium*. At which point an important point must be made. We have paid £500 for an option. We have paid away cold, hard cash but – we now have control; we are *proactive*. We decide whether or not to exercise our right to buy the house.

On the other side of the transaction, the option seller is entirely *reactive*. The option seller has received the same £500 in cold, hard cash but he is now entirely reactive. Specifically, the option seller must wait for our decision as to whether we do or do not want to buy the house for £100K.

Furthermore, in giving us the month in which to make our decision, he is taking on risk. Specifically, he is taking the risk that the property market will move significantly in the next month. Consider the effect of such a move.

As the owner of the call option on the house, what will we choose to do if there is a property *crash* in the next month? Will we still want to buy the house for £100K if we can now find better and/or cheaper alternatives? The answer is “no”. We will *not* exercise our right to buy the house for £100K *because we are not obliged to*. We will allow our call option to *expire worthless*. And while the £500 spent on the option has been lost, this is more than compensated for by the saving that we are making on the cheaper and/or “better” house that we can now buy.

Consider this from the option seller’s perspective. He has sold us the right (but not the obligation) to buy his house for £100K in 1 month’s time. He cannot therefore sell the house to anyone else during this period. If there *is* a property crash during the period, then he knows that we will no longer wish to buy his house for £100K (because there are cheaper alternatives) and he will only be able to sell on the open market at a lower price.

We can see that a fall in property prices will benefit the house buyer and hurt the house seller, but what if property prices *rise*?

As the owner of the call option on the house, what will we choose to do if property prices rise significantly through the next month? Will we want to buy the house for £100K if the alternatives are significantly more expensive? Of course we will! We will *exercise* our right to buy the house for £100K. The call option has cost us £500 but it has protected us against the cost of property rising.

Again, consider this from the option seller’s perspective. He has sold us the right to buy his house for £100K in 1 month’s time. And if property prices rise significantly through the month, we will definitely exercise our right to buy at such a (now)

attractive price. Although the house seller is selling his house at the original asking price, it could be argued that, since he has missed out on the rise in property prices, he has incurred opportunity cost. This point will be revisited at a later stage.

Exercise 1.1

In the above example of a call option, we paid £500 for the right to choose to buy a house for £100K in 1 month's time.

Formally, we paid a premium of £500 for a 1 month £100K call on a house. The price of the option was £500. How did we arrive at this price? What three key factors helped determine this price?

Hint 1: How much would we expect to be charged for a *1 day* option to buy the house?

How much would we expect to be charged for a *1 year* option to buy the house?

Hint 2: How much would we expect to be charged for an option on a *£50K* house?

How much would we expect to be charged for an option on a *£950K* house?

Hint 3: In terms of the underlying property market, what is of most concern to the house seller?

Exercise 1.1: Answers and Explanation

The question asked for the three key factors that might influence the price of a 1 month £100K call on a house. The answers are not given in order of importance but rather in relation to hints 1 to 3 above.

1. **Time:** We would expect to pay far more for a *1 year* option than a *1 day* option because we are getting more time, more flexibility. In general then, all other things being equal, the longer-dated the option, the greater the option price.
2. **Underlying value:** We would expect to pay more for an option on an expensive house than an option on a cheap house, simply because there is more *value* at stake. In general then, all other things being equal, the greater the amount of underlying value, the greater the option price.
3. **Probability:** Specifically, probability of the underlying property market moving around. Remember, by selling you a 1 month call option on his house, the house seller is exposing himself to the risk of the underlying property market changing. If there is a property crash, we will not choose to buy the house and the house seller will be left with an unsold house that has reduced in value. And if there is a sharp rise in property prices, the house seller will not be able to take advantage of the increased value of his house as we will exercise our right to buy at £100K. In summary, a significant change in the property market will cause the house seller

either to lose money or to miss out on a profitable opportunity. In general then, all other things being equal, the greater the probability of the underlying market moving, the greater the option price.

CALL OPTIONS: FORMAL DEFINITION

Consider the formal, textbook definition of a call option:

The right but not the obligation to buy the underlying at a given price on or before a given date.

At first glance, this may seem a little complex, a little long-winded. However, breaking this definition down into its constituent parts simplifies matters considerably.

The key part of this definition is highlighted: “The right *but not the obligation* to buy the underlying at a given price on or before a given date”. It is this element of *choice* that is key to the *optional nature* of an option. Indeed, that is why an option is called an option. Essentially, buying an option confers choice; selling an option concedes choice. This is the basic dynamic of options.

So, a call option is the right but not the obligation to *buy the underlying* at a given price on or before a given date.

Any option to buy is a call. The underlying can be just about anything, as long as it may be priced. For example, a copper call confers the right but not the obligation to buy copper. A FTSE call confers the right but not the obligation to buy the FTSE. And, as in our intuitive example above, a house call confers the right but not the obligation to buy a house. This may seem a little imprecise, a little general, but we will look at this in greater detail in the section entitled “Option Specifications”.

To reiterate, a call option confers the right but not the obligation to buy the underlying *at a given price* on or before a given date. Consider the highlighted phrase “at a given price” The price at which the call owner has the right to buy is known as the *strike price*, often abbreviated simply to the *strike*.

Now consider the last part of the definition. A call option confers the right but not the obligation to buy the underlying at a given price *on or before a given date*. All options have an *expiry date*, a date on which they cease to exist.

So, to summarise, we have taken the formal, textbook definition of a call option and broken it down into its constituent parts. A call option is:

The right but not the obligation to buy (because it is a call) a given amount of a given asset (the underlying) at a given price (the strike price) on or before a given date (expiry).

Now, having dealt in basic terms with calls, let’s consider the other type of option – puts.

EVERYDAY EXAMPLE: INSURANCE (A PUT OPTION ON HOME CONTENTS)

Put options convey the right but not the obligation to *sell* something. For that reason, they are sometimes a little harder to understand than call options. After all, we are very used to the idea of buying things in our everyday lives. We may buy property, stocks and shares, any number of assets and commodities. We are familiar with the idea of being “long” of assets, of owning them. The opposite, the idea of being “short” of selling things before we have bought them, is less commonplace. For that reason, the best everyday example of a put option is insurance. This comparison is by no means perfect but does have the great advantage of being something with which we are all familiar.

Let's assume that we wish to insure £10 000 worth of home contents. We pay an insurance company £300 for the right to make a claim for up to £10 000. In the event of a fire or a flood, we have the right to (notionally) “sell” our now damaged and worthless home contents back to the insurance company for £10 000. We have choice. We have the right to sell, should we need it. We have a *put option*.

Again, some important observations need to be made. In paying a price of £300 for the option, we have gained control. We decide whether or not to make a claim; we are *proactive*.

The insurance company, the option seller, is entirely *reactive*. The option seller has received a premium, a price of £300 in cash, but is now reactive. The insurer can only wait and react to a claim if and when it is made.

Exercise 1.2

In the above example of a put option, we paid £300 for the right to choose to “sell” our home contents for £10 000 at any time in the next year.

Formally, we paid a premium of £300 for a 1 year £10 000 put on our home contents. The price of the option was £300. How did the insurance company price this insurance? What three key factors helped determine this price?

Hint 1: How much should we expect to be charged for insurance for *1 month*?

How much should we expect to be charged for insurance for *5 years*?

Hint 2: How much should we expect to pay to insure *£500 worth* of home contents?

How much should we expect to pay to insure *£1 million worth* of home contents?

Hint 3: How does the *location* of your home affect the cost of insurance?

Exercise 1.3: Answers and Explanation

The question asked for the three key factors that might influence the price of a 1 year £10 000 put on home insurance. The answers are not given in order of importance but rather in relation to hints 1 to 3 above.

1. **Time:** We would expect to pay far more for 5 years' insurance than 1 month's insurance because we are protected for a far longer period. As a general rule, all other things being equal, the longer-dated the option, the greater the option price.
2. **Underlying value:** We would expect to pay far more for insurance on £1 million worth of home contents than insurance on £500 worth of home contents, simply because there is more *value* at stake. As a general rule, all other things being equal, the greater the amount of underlying value, the greater the option price.
3. **Probability:** Specifically, the probability of a claim being made. This is directly related to the *location* of the property. Simply, the greater the probability of a claim, the greater the price of the insurance. As we will see at a later stage, broadly speaking, *probability* in the insurance world translates as *volatility* in the option world. Probability and volatility are closely related. As a general rule, all other things being equal, the greater the probability of a claim, the greater the option price.

PUT OPTIONS: FORMAL DEFINITION

Consider the formal, textbook definition of a put option. This is identical to the definition of a call option except that a put conveys the right to *sell* rather than buy something. A put option is:

The right but not the obligation to sell the underlying at a given price on or before a given date.

Again, at first glance, this may seem a little complex but breaking this definition down into its constituent parts simplified matters considerably.

As with the definition of a call, the key part of the definition is highlighted: "The right *but not the obligation* to sell the underlying at a given price on or before a given date".

Remember, it is this element of *choice* that is key. Buying an option confers choice; selling an option concedes choice. This is the basic dynamic of options.

So, a put option is the right but not the obligation to *sell the underlying* at a given price on or before a given date.

Any option to sell is a put. Remember, the underlying can be just about anything. For example, a copper put confers the right but not the obligation to sell copper. A FTSE put confers the right but not the obligation to sell the FTSE. And, as in our intuitive example above, a home contents put confers the right but not the obligation to "sell" our damaged home contents in the event of some sort of accident. We will look at more detailed examples in the section entitled "Option Specifications".

To reiterate, a put option is the right but not the obligation to sell the underlying *at a given price* on or before a given date. Consider the highlighted phrase "at a given price". The price at which the put owner has the right to sell is known as the *strike price*, often abbreviated simply to the *strike*.

Now consider the last part of the definition. A put option is the right but not the obligation to sell the underlying at a given price *on or before a given date*. All options have an *expiry date*, a date on which they cease to exist.

So, to summarise, we have taken the formal, textbook definition of a put option and broken it down into its constituent parts. A put option is:

The right but not the obligation to sell (because it is a put) a given amount of a given asset (the underlying) at a given price (the strike price) on or before a given date (expiry).

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