2025 CFA®
Exam Prep

SchweserNotes™
Derivatives, Risk Management, and Ethical and Professional Standards

Level III Book 3

KAPLAN SCHWESER

Book 3: Derivatives, Risk Management, and Ethical and Professional Standards

SchweserNotes™ 2025

Level III CFA®

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SCHWESERNOTES™ 2025 LEVEL III CFA® BOOK 3: DERIVATIVES, RISK MANAGEMENT, AND ETHICAL AND PROFESSIONAL STANDARDS

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ETHICAL AND PROFESSIONAL STANDARDS

Learning Outcome Statements (LOS)

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The candidate should be able to:

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b. discuss the investment objective(s), structure, payoff, risk(s), value at expiration, profit, maximum profit, maximum loss, and breakeven underlying price at expiration of a covered call position.
c. discuss the investment objective(s), structure, payoff, risk(s), value at expiration, profit, maximum profit, maximum loss, and breakeven underlying price at expiration of a protective put position.
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19 & 20. Code of Ethics and Standards of Professional Conduct, Guidance for

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The candidate should be able to:

19a. describe the structure of the CFA Institute Professional Conduct Program and the disciplinary review process for the enforcement of the CFA Institute Code of Ethics and Standards of Professional Conduct.

19b. explain the ethical responsibilities required by the Code and Standards, including the subsections of each standard.

20a. demonstrate a thorough knowledge of the CFA Institute Code of Ethics and Standards of Professional Conduct by interpreting the Code and Standards in various situations involving issues of professional integrity.

20b. recommend practices and procedures designed to prevent violations of the Code and Standards.

21. Application of the Code and Standards: Level III

The candidate should be able to:

a. evaluate practices, policies, and conduct relative to the CFA Institute Code of Ethics and Standards of Professional Conduct.

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The candidate should be able to:

a. explain the purpose of the Asset Manager Code and the benefits that may accrue to a firm that adopts the Code.

b. explain the ethical and professional responsibilities required by the six General Principles of Conduct of the Asset Manager Code.

c. determine whether an asset manager's practices and procedures are consistent with the Asset Manager Code.

d. recommend practices and procedures designed to prevent violations of the Asset Manager Code.

READING 16

OPTIONS STRATEGIES

EXAM FOCUS

The primary focus of this topic area is on the ways in which derivative contracts (i.e., instruments whose values derive from the economic performance of underlying securities, currencies, or other instruments or factors) may be used to hedge, or change the degree of exposure to, existing positions (for example, a holding of a stock, or the exposure to a foreign currency caused by the ownership of an asset or liability in that currency). We will also see how derivatives, particularly options, can be used to obtain exposures to instruments and factors that cannot be obtained directly from the instruments and factors themselves (e.g., strategies such as straddles and spreads).

Reading 16 deals with options, mainly focusing on options on individual stocks, although the principles apply equally well to options on any other instruments. Reading 17 looks at the principles and uses of futures and forward contracts, while Reading 18 is concerned with currency management, beginning with the various approaches to currency along the passive-active spectrum, moving on to active currency strategies (including volatility trading via options), before considering currency hedging using futures and forwards (mainly the latter), and options.

The sequence of topics in our coverage of Reading 16 differs from the LOS order. We start by looking at the payoffs and profits associated with holding option positions to expiration. Since value at expiration is purely reflective of intrinsic value, the calculations involved are simple (but highly examinable, so worth getting clear before the complicating issue of time value is addressed). Only then do we move on to the more theory-heavy areas associated with time value—the option "Greeks" and strategies derived from them.

MODULE 16.1: OPTIONS BASICS—VALUE AT EXPIRATION AND PROFIT AT EXPIRATION

Video covering this content is available online.

PROFESSOR'S NOTE

Options have already been covered at the previous levels, of course, so the material in this first module is largely review. However, we recommend that you don't skip it, since it is vital to everything that follows.

In particular, distinguishing between option value and profit (respectively pre- and post-initial premium), and the graphical representation of how they vary with differing values of the underlying price, is very helpful when we move on to analyze more complex strategies.

A Refresher on Options Terminology

- A **call** is a right to **buy**
- A **put** is a right to **sell**

Each option contract will specify the **underlying** to which the right relates.

- Underlyings include stocks and stock indices, bonds and bond futures, currencies, commodities, and more abstract factors such as stock volatility.

The contract will specify the **exercise** (**strike**) price at which the right can be exercised, and the **expiration** (**expiry**) date (and time) at which the right can be exercised (or not).

- **European-style options** may only be exercised at the point of expiration, while **American-style options** may be exercised on any trading day up to and including the point of expiration.
  - Note that European- and American-style are just labels for the two main styles of option and have nothing to do with where the options are traded (there are other, more exotic, styles, such as Bermudan, but the details of such exotics are beyond the scope of the syllabus).

The buyer of an option pays a **premium** (the value of the option) to the seller.

- The **buyer** (who takes the **long** position in the option) has the right.
- The **seller** (taking the **short** position) receives the premium as payment for taking on the contingent liability associated with the buyer's right:
  - In the case of a **call** option, the short has undertaken to deliver the underlying if the buyer chooses to exercise (receiving the strike price in exchange).
  - In the case of a **put** option, the short has undertaken to take delivery of the underlying if the buyer chooses to exercise (paying the strike price).

Symbols and Formulas

PROFESSOR'S NOTE

We must minimize the use of formulas, where possible. The curriculum text does include some formulas and, if they help your understanding, by all means learn and use them. However, our experience is that it is more reliable to focus on the underlying principles embedded in the formulas. None of the strategies tested are greatly complex, and in all cases, answers can be determined from the basic principles of in/out the moneyness that follow in the next section.

When symbols are used, we will follow the notation in the curriculum:

- X = the e**x**ercise (strike) price.
- S = the underlying (**s**tock) price.
- p and c = the prices (premiums) of the **p**ut and **c**all options.

- Subscripts on S, p, and c will stand for time, with 0 = the point at which the position is entered and T = option expiration.

Intrinsic Value and Time Value

At any point in time any given option will have a value. This is set, as are all values, by supply and demand but is likely to be determined by reference to one of the many option pricing models, of which the Black-Scholes-Merton (BSM) was the first (introduced in 1973), and is still widely used.

The key determinants of an option's value are:

- The strike price.
- The current level of the underlying (e.g., stock price, currency rate, etc.).
- The remaining time to expiration.
- The volatility of the underlying (the **expected** annualized standard deviation of the underlying over the period to option expiration).
- The annualized risk-free interest rate over the period to expiration.
- The annualized yield expected from the underlying (if any) over the period to expiration.
- Whether it is European- or American-style (in principle the latter might be worth more because they give the right to exercise before expiration, in addition to at expiration).

Market participants may not agree on what an option is worth—most likely because they disagree on the appropriate figure to use for volatility. However, note that all options that trade on exchanges will have a value, which is reflective of the consensus at that point in time. The current value of an option can be used to infer the consensus estimate of volatility for the underlying, known as **implied volatility**. This is done by working backwards through a pricing model, given the other factors can be directly observed.

Note that implied volatility is not the same as **historical (realized) volatility**, which is the square root of the **actual** realized variance of returns to date.

It is important to note that the volatility that is used to determine the option value is an estimate of the volatility **looking forward**, which is not the same as actual movement in the stock price. For example, the implied volatility for a stock option could well rise, even though the stock price is currently stable, if the consensus view changes on the potential for price moves during the period to expiration.

The value of an option can be decomposed into its intrinsic value and its time value, the total premium being the sum of these two.

- **Intrinsic value** is the value of immediate exercise.[1] It reflects the degree to which the option is in the money (ITM).
- **Time value** is the additional value reflective of *what might happen* between now and the point of expiration (i.e., over the option's remaining life).

An option is ITM if the long would derive a benefit from immediate exercise.

- **A call option is ITM if the current price of the underlying > strike price**, so the long has the right to pay less than the current market price for the underlying.

  The intrinsic value in such a case equals the underlying price minus the strike price (the extent to which the underlying price exceeds the strike price, which is the amount the long could gain by exercising their right, then immediately selling the underlying in the market). Note that here, and throughout, we will ignore transaction costs.

- **A put option is ITM if the current price of the underlying < strike price**, so the long has the right to receive more than the current market price for the underlying.

  The intrinsic value in such a case equals the strike price minus the underlying price (the extent to which the strike price exceeds the underlying price, which is the amount the long could gain by buying the underlying in the market, then immediately exercising their right to sell at the strike price).

Note that the intrinsic value is not the same as the profit to the long, which would have to factor in the premium that the long originally paid for the option. This means that it is perfectly possible for an option to be ITM, but for exercise to result in a loss to the long (if the intrinsic value < initial premium paid).

Note also that we are not saying that the long will *choose* to exercise, just that (ignoring premium paid) exercise would lead to a gain.

An option that is not ITM will have zero intrinsic value. It could be at the money (ATM), with the underlying = strike price, or out of the money (OTM):

- **A call option is OTM if current price of the underlying < strike price.**
- **A put option is OTM if current price of the underlying > strike price.**

At any point before expiration an option also has time value, which reflects what might happen over its remaining life. This is a much more complex concept, which explains why the first option pricing formula only appeared in 1973. Time to expiry, volatility, the risk-free rate, and the yield on the underlying all have a part to play, in addition to the underlying price and the strike price.

The details of pricing models are beyond the scope of the Level III curriculum—you will not be plugging figures into the BSM model, for example—but a couple of general principles are worth remembering, namely that with **all other factors held constant**:

- **Higher** volatility means **higher** option premiums (both for calls and puts).
- **Less** time to expiry means **lower** option premiums (both for calls and puts).

Data for Examples

For most of the examples in this reading we will use the following options on XYZ stock (current stock price = $52.14). The premiums are quoted as of "now" (assumed to be 20 March), and the April, May, and June expiration dates are respectively 31, 61, and 91 days in the future. The risk-free interest rate is 3%, and volatility has been assumed to be a constant 60% (we will see later that this is unrealistic, but this is not in itself a problem). The XYZ stock pays no dividends.

Each option contract is a right over 100 shares, but this table shows prices per share (in $), and we will work in per-share terms, unless otherwise stated:

Call Price			Strike	Put Price		
APR	MAY	JUN	Price	APR	MAY	JUN
4.80	6.26	7.40	**50**	2.53	3.87	4.88
3.53	5.05	6.22	**52.5**	3.75	5.14	6.19
2.52	4.02	5.20	**55**	5.24	6.61	7.65

We refer to the May expiry call with a strike price of 50 as the MAY 50 call, for instance.

PROFESSOR'S NOTE

We will initially be limiting ourselves to evaluating values and profits at expiration. This simplifies things since at expiration there will be no time value—only intrinsic value (which may be referred to as the option's payoff).

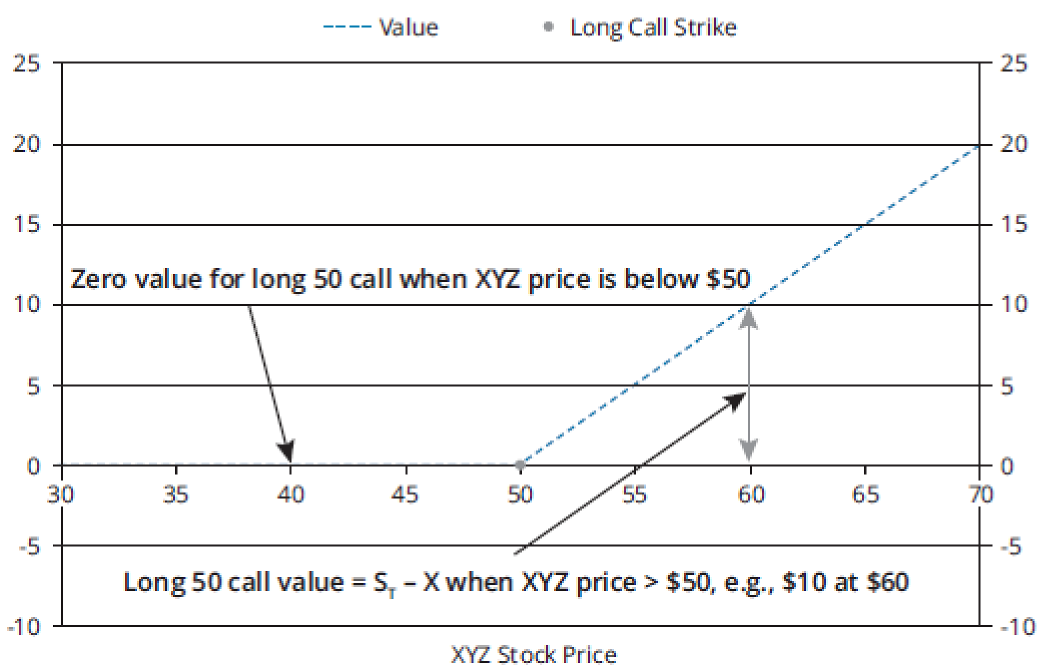
Basic At-Expiration Payoff Diagrams for Calls and Puts

Calls

Let us use the example of a long call to illustrate the way in which option values and profits can be depicted graphically.

Consider an investor who buys (goes long) an XYZ MAY 50 call, paying the $6.26 premium.

At the May expiration the option will either be ITM or OTM, dependent on whether the stock price then is above or below $50. Below $50 it will be OTM, with no (intrinsic) value, while above $50 the intrinsic value will equal stock price—$50:



In all such diagrams, the horizontal axis represents the value of the underlying, while the vertical axis represents the value or profit of the position [which it is will be clear from the labelling of the line(s)] corresponding to that underlying value.

For example, if the XYZ stock price at expiry is $40 then the 50 call will expire OTM, with zero value, while if the stock price at expiry is $60 then the 50 call will expire ITM, with a value of $60 – $50 = $10.

The initial cost of the option was $6.26 (per the table), so the profit at expiration will equal the value of the call minus $6.26, implying:

- If XYZ stock price = $40, profit = $0 – $6.26 = loss of $6.26.
- If XYZ stock price = $60, profit = $10 – $6.26 = $3.74.

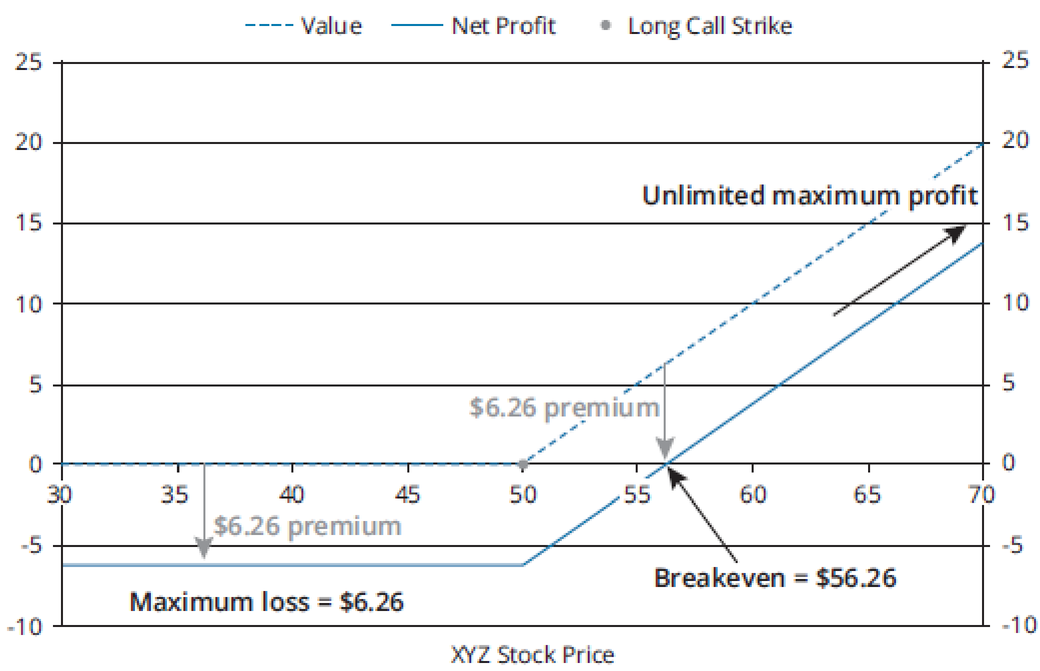
Overall, the profit line will be the value line shifted downward uniformly by the $6.26 initial premium.

As a rule, for each and every strategy we consider, the profit line will be the value line shifted:

- **Downward** by the amount of the (net) initial premium – if the (net) initial premium is an outflow (as here).
- **Upward** by the amount of the (net) initial premium – if the (net) initial premium is an inflow.

This means that if we know the shape of the value line for a strategy, the profit line will have exactly the same shape.

For the long XYZ MAY 50 call:



It is clear that the maximum loss from a long call occurs when the option expires OTM with zero value, thus equals the premium paid.

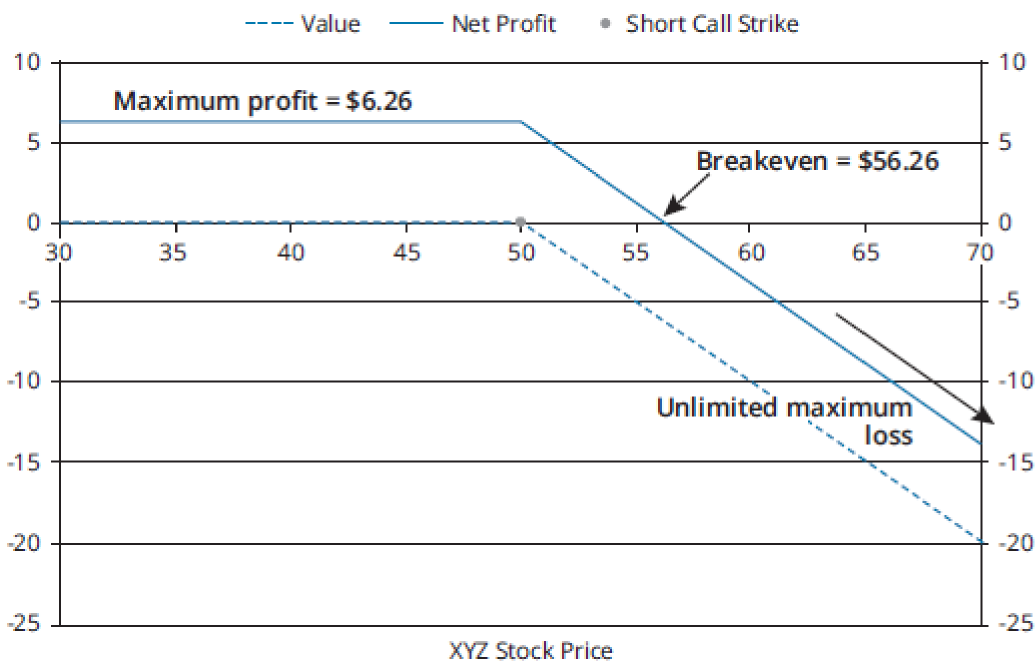
The long call position will break even at expiration if the value at expiration is exactly equal to the premium paid. This will happen when the stock price expires at the sum of the strike and the premium, $50 + $6.26 = $56.26 as shown on the previous diagram.

A long call has no maximum profit—the higher the stock price at expiry, the higher the profit on the call, with no upper limit.

The diagrams for a short call are identical, except that plus values, vertically, become minus, and vice-versa (since, in the absence of transaction costs, a positive result for the long is a negative result for the short, and vice-versa (in the jargon, it is a zero-sum game).

This means that equivalent long and short positions will have identical breakeven values for the underlying, while their maximum losses and profits will just swap around.

The short XYZ MAY 50 call has value and profit at expiration as here:



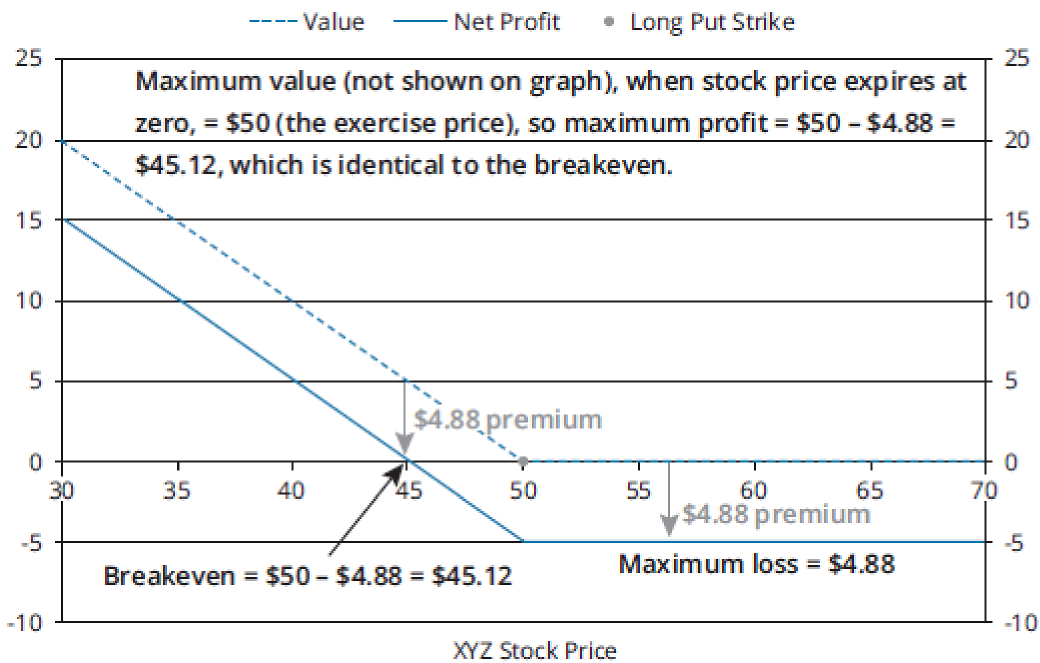
The basic motivation for buying a call is to profit from a rise in the underlying price, while limiting the downside.

When a call is sold (without any hedging position in place) then the position is described as a **naked** (uncovered) **call**, and limited upside from falls in the underlying price is balanced against unlimited potential losses from the underlying rising.

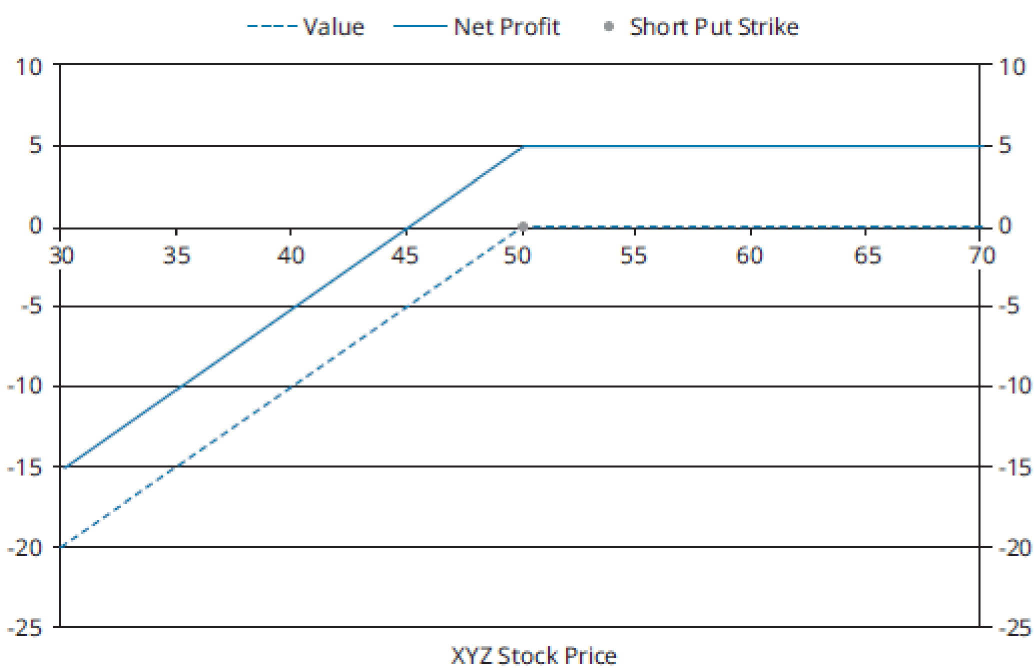
Puts

Puts are ITM on expiry when the underlying value ends below the strike price. This means that the graph for a put exposure will look like the call graph with left and right reversed.

For example, a long XYZ JUN 50 put (initial premium = $4.88) at expiration:



Here is the corresponding short XYZ JUN 50 put at expiration:



Confirm that you understand why the short XYZ JUN 50 put has maximum profit at expiration of $4.88, and breakeven = maximum loss = $45.12.

The basic motivation for buying a put is to profit from a fall in the underlying price, while limiting the downside.

When a put is **sold**[2] limited upside from rises in the underlying price is balanced against large (although limited) potential losses from the underlying falling.

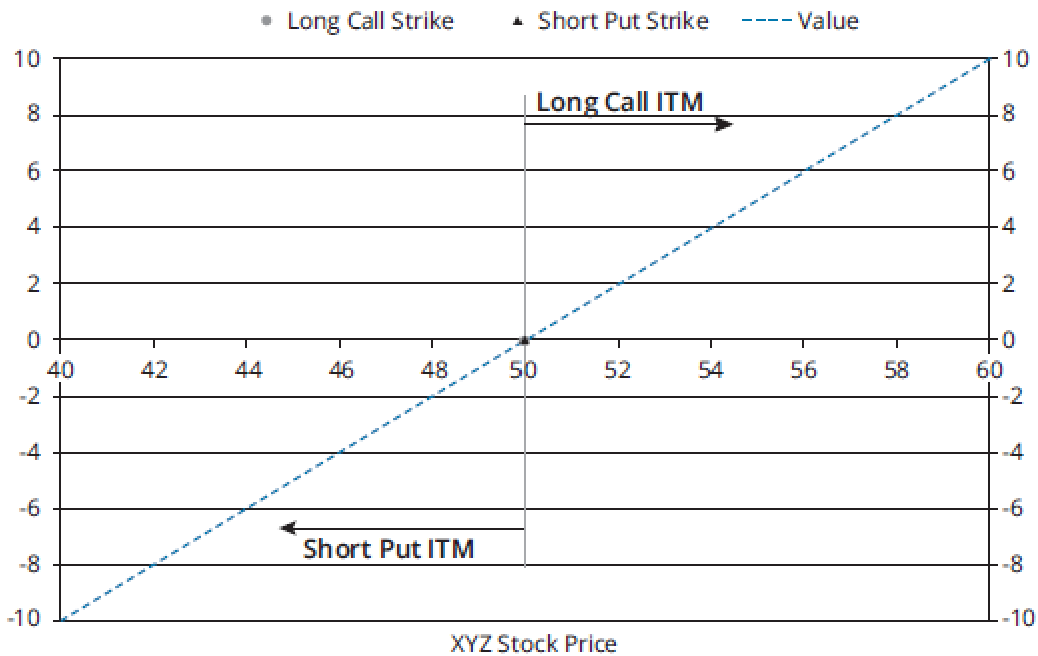
Video covering this content is available online.

MODULE 16.2: SYNTHETIC POSITIONS USING OPTIONS

LOS 16.a: Demonstrate how an asset's returns may be replicated by using options.

If we combine a long call with a short put (both on the same underlying, with the same strike price and expiration) then we create a synthetic long forward position.

For example, here are the values at expiration from being long an XYZ 50 call and short an XYZ 50 put:



For values of the underlying above 50 the long call expires ITM (while the put is OTM), giving positive value, while if the underlying is below 50 the short put expires ITM (the call is OTM), giving negative value (it is exercised by the counterparty). Whatever happens to the stock price this position gives the same payoff at expiration as does an identical-maturity long forward contract on XYZ at 50—both result in buying the stock for 50.

- In symbols, the value at expiration = $S_T - X$.

Suppose both options were for May expiration, then the premium paid for the call would have been \$6.26, while the premium received on the put would have been \$3.87, for a net initial payment of \$6.26 – \$3.87 = \$2.39. The profit line would thus be \$2.39 below the value line. The breakeven at expiration for the position is \$50 + \$2.39 = \$52.39 (the call would be \$2.39 ITM at this stock price, just covering the net premium paid).

This profit calculation has ignored the time value of money, as we do throughout this topic review when we calculate net profits, but in this section let us be a bit more accurate. The premiums are paid "now" (assumed to be 20 March), whereas the value at expiration is in May, 61 days later, so we should not really just net them off.

As an alternative to buying the call and selling the put, consider buying the underlying XYZ stock in March (for $52.14) and holding it to the May expiration date. If we simultaneously borrow the PV of the strike price then at the May expiration date we will end up with a position with a net value exactly the same as the value of the long call + short put position we just examined: we will be able to sell the stock for the stock price at expiration and will have repay the borrowing (the amount to repay will be the strike price, since the amount borrowed was its present value), leaving us with S_T – X, as before.

Since these two positions end up with identical values, irrespective of the stock price at expiration, they must cost the same, so:

- Call premium (paid initially) – put premium (received initially) = initial stock price paid – PV(X) received
- In symbols, **$c_0 - p_0 = S_0 - PV(X)$**, which can be rearranged to **$S_0 + p_0 = c_0 + PV(X)$**.

This, of course, you will recognize as the **put-call parity** relationship. Note that this version of the put-call parity formula assumes that the underlying pays no yield (during the period to expiry).

In this case, we have $c_0 - p_0$ = \$6.26 – \$3.87 = \$2.39. The risk-free interest rate is 3%, so PV(\$50) = $\$50/(1.03)^{61/365}$ = \$49.75, and the equation works, since $S_0 - PV(X)$ = \$52.14 – \$49.75 = \$2.39.

Were PV(X) exactly equal to S_0 then put-call parity tells us that the call and put should have identical premiums (because $c_0 - p_0$ would equal zero). X in that situation would be the fair price for a forward contract.

Put-call forward parity substitutes **$PV(F_0(T))$** in place of S_0, where $F_0(T)$ is the forward price for a contract that matures at the same time as the options expire, giving **$PV(F_0(T)) + p_0 = c_0 + PV(X)$**. Given that cash-and-carry arbitrage means that the fair forward price for an underlying that pays no yield equals $FV(S_0)$, and $PV(FV(S_0)) = S_0$, this is just a restatement of standard put-call parity.

EXAMPLE: Synthetic long forward position

Gavin Ennis is a dealer who has just sold a four-month forward contract on AlphaCo Stock to a client who will thereby purchase 1,000 shares of the stock for 179.59. AlphaCo's current share price is 179, and AlphaCo will not be paying a dividend during the next four months. The annualized interest rate is 1%, and AlphaCo 179.59 calls and puts are both currently trading at 16.34 per share.

Explain how Ennis could hedge his short forward position using a synthetic long forward position, and **explain** what happens at expiry if the AlphaCo share price is above or below 179.59.

Answer:

Ennis should purchase a 179.59 call and sell a 179.59 put (both on 1,000 shares) with expiration matching the maturity of the forward contract. The net premium for these options will be zero.

At forward contract maturity, whatever happens, Ennis will have to sell the 1,000 shares to his client and receive 179.59 × 1,000. This is also the expiry point of the options.

If the share price is above 179.59 then Ennis will exercise the call, which is ITM, and purchase 1,000 shares, whereas if the share price is below 179.59 then the put counterparty will exercise the put (ITM) and sell 1,000 shares to Ennis. In either case Ennis buys 1,000 shares for 179.59 per share, which precisely offsets his obligation under the forward contract.

MODULE 16.3: COVERED CALLS

Video covering this content is available online.

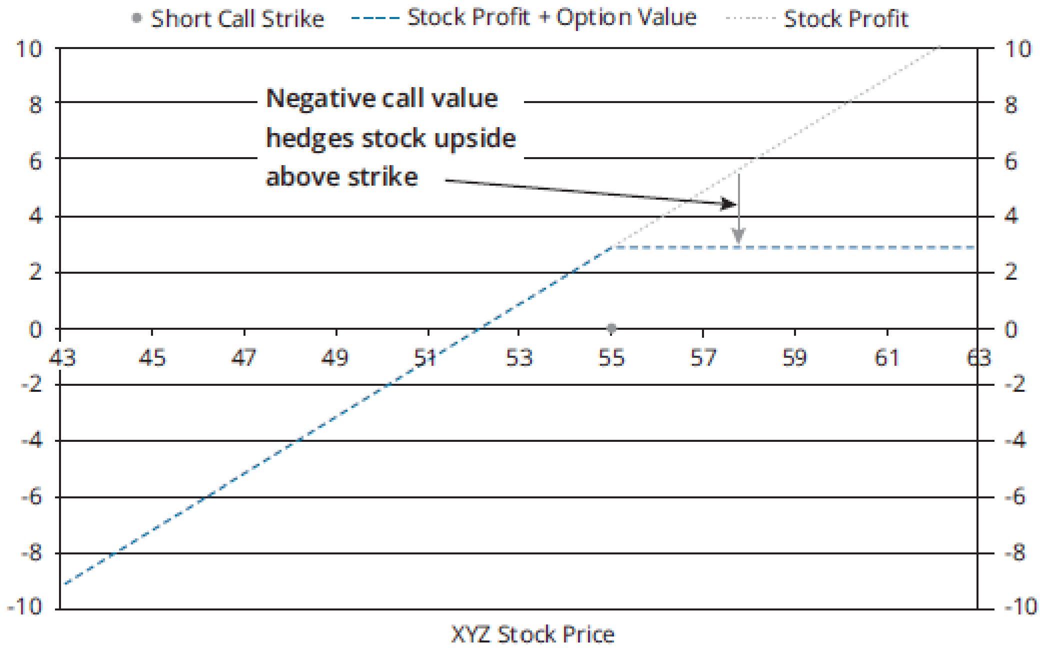
LOS 16.b: Discuss the investment objective(s), structure, payoff, risk(s), value at expiration, profit, maximum profit, maximum loss, and breakeven underlying price at expiration of a covered call position.

Covered Calls with Extra Yield the Main Focus

Suppose an investor has a long position in XYZ stock on 20 March. They think that the stock has limited upside over the next month, and are prepared to sell off upside above $55 ($2.86 above the 20 March stock price of $52.14).

The classic way of doing this is to sell a call (a **covered call**, because the risk of the short option position is hedged by ownership of the stock), in this case an XYZ APR 55 call. This will give premium income of $2.52 (per share) in March.

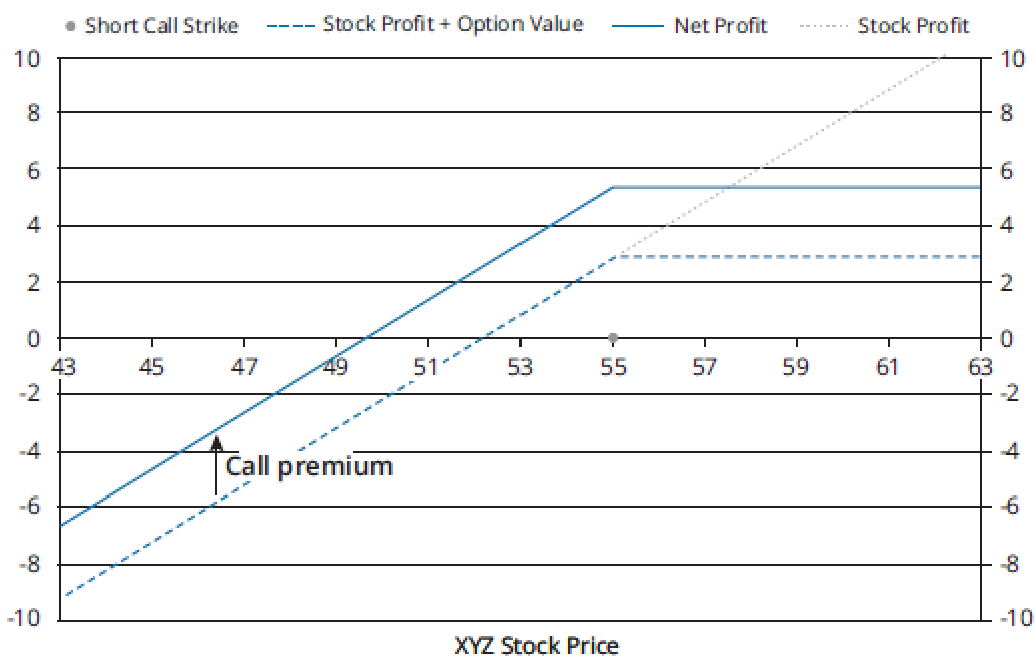
At expiration, if the XYZ stock price is above $55 then the call will be exercised by the counterparty and the investor will be obliged to sell the stock to them for $55. If the stock price is below $55 the call will expire OTM and unexercised, so the investor continues to hold the stock. Ignoring the call premium received, this means the gain/loss associated with holding the stock is capped for stock prices above $55:



An equivalent way of thinking about it is that below $55 the call has zero intrinsic value, so adding this to the original stock gain/loss leaves us as we were, whereas above $55 the call's intrinsic value is the stock price minus the strike price (with a minus sign in front, since it is short). Thus, any gain on the stock above $55 is precisely offset by the increasing negative value of the short call.

At $55 the stock has risen by $2.86, and this is thus the maximum gain (ignoring the call premium). Note also that, ignoring the call premium, the breakeven point is the original stock price of $52.14.

Taking account of the $2.52 call premium received takes us to the overall net profit/loss line:



The net profit line is the stock gain/loss (as modified by the call intrinsic value) shifted uniformly upward by the call premium received.

The maximum profit equals \$2.86 + \$2.52 = \$5.38, while the breakeven is \$2.52 lower than it was without the premium received, which is at \$52.14 – \$2.52 = \$49.62 (up to a \$2.52 fall in the stock price is cushioned by the call premium).

Notice that the profit line has the same general shape as a short put and, as for a short put, the maximum loss is the same as the breakeven (since the loss increases one-for-one below breakeven, but the stock price cannot fall below zero). Thus, maximum loss = \$49.62.

Since the investor holding the stock believed the stock had limited upside over the month, they have turned upside potential (which they did not need) into cash in hand. They will only end up worse off if the stock price at expiry exceeds \$55 + \$2.52 = \$57.52, which is the level at which the original stock gain/loss line cuts through the net profit line.

In general, for a covered call:

- maximum profit at expiry = $X - S_0 + c_0$
- breakeven stock price at expiry = maximum loss at expiry = $S_0 - c_0$

The motivation in the previous example of a covered call was earning extra yield (the focus was on the premium income).

There are two other likely motivations: reducing a position at a favorable price and target price realization. Let us look at each in turn.

Reducing a Position at a Favorable Price

A second scenario where covered calls might be written is when an investor holds a position in a stock and intends to reduce that holding in the near future. For example, Jenkins might hold 5,000 shares in XYZ on 20 March (share price = \$52.14), but plans to dispose of 1,500 shares. She might simply sell 1,500 shares at \$52.14, realizing \$78,210, but instead could write 15 exchange-traded XYZ April 50 call contracts (on 1,500 shares), receiving a total premium of 1,500 × \$4.80 = \$7,200. Note that the options are currently ITM.

Provided the share price at the April expiry is no lower than \$50, the options will get exercised, and Jenkins will be obliged to deliver 1,500 shares for 1,500 × \$50 = \$75,000. Adding the premium already received to this brings the total proceeds to \$75,000 + \$7,200 = \$82,200, which exceeds the proceeds had she simply sold at the market price on 20 March.

However, there is a risk: if the XYZ price at expiration is lower than \$50 then the calls will not be exercised and the shares will not be sold—the opportunity to sell at the current favorable price will have been missed.[3]

Target Price Realization

A third motivation is realizing a target price. In this case calls are written with a strike just above the current market price. The idea is that the investor believes the stock should be worth a bit more than its current price and would be happy to sell it at that slightly-higher price. For example, Perkins holds XYZ shares at $52.14 and writes APR 52.5 calls, receiving $3.53 per share. If the calls are exercised in April, then the shares are sold at the $52.50 strike price, so a total per share of $52.50 + $3.53 = $56.03 has been realized.

The dangers are twofold. First, the stock price may rise substantially, in which case Perkins would regret having to sell at $52.50, rather than the higher market price. Second, the stock price might decline, and the opportunity to sell at the current level will have been missed.

Note that this use of covered calls is best seen as a hybrid of the previous two.

The observable difference between these three uses of covered calls is the value of the strike relative to the current stock price:

- For yield enhancement, the calls are OTM (possibly substantially so).
- For reducing a position at a favorable price, the calls are ITM.
- For target price realization, the calls are marginally OTM.

MODULE QUIZ 16.1, 16.2, 16.3

1. Which of the following trades would create a synthetic short exposure to PQR stock? The options expire in 6 months, and the risk-free interest rate is 2%.
   A. Borrow 99, buy a PQR 100 put, and sell a PQR 100 call.
   B. Borrow 101, buy a PQR 100 put, and buy a PQR 100 call.
   C. Buy a PQR 100 call, sell a PQR 100 put, and sell a six-month forward contract on PQR at 100.
2. An investor purchases a stock for $43 and sells a call for $2.10 with a strike price of $45. At expiration of the call:
   a) **compute** the maximum profit and loss and the breakeven price.

   b) **compute** the profit or loss when the stock price is $0, $35, $40, $45, $50.

MODULE 16.4: PROTECTIVE PUTS

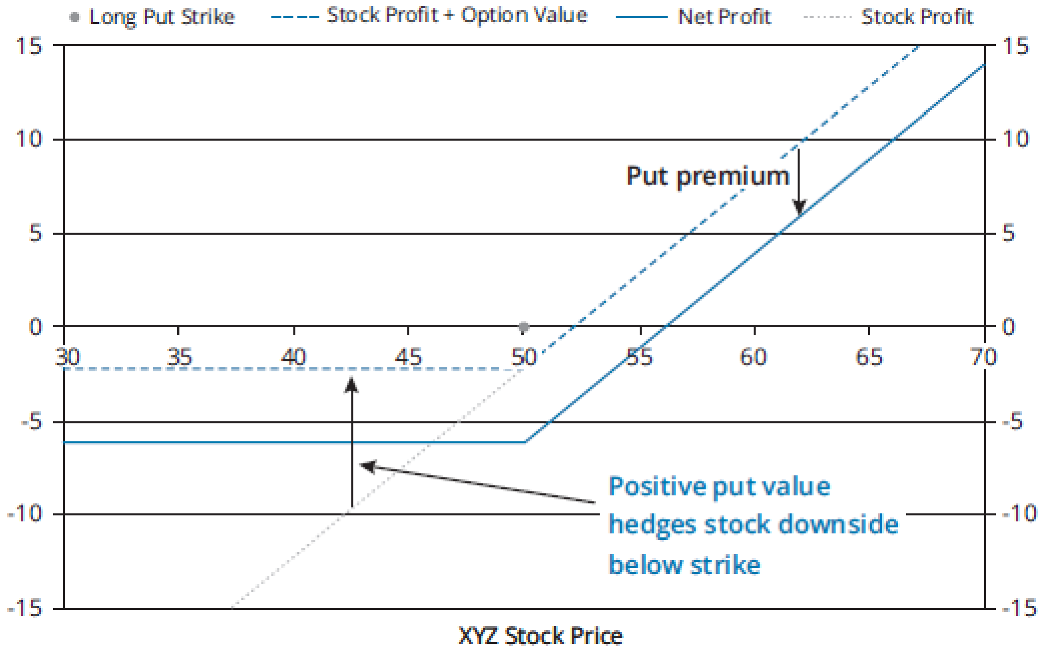
Video covering this content is available online.

LOS 16.c: Discuss the investment objective(s), structure, payoff, risk(s), value at expiration, profit, maximum profit, maximum loss, and breakeven underlying price at expiration of a protective put position.

For an investor who has a long position in an underlying, the classic options-based hedge is the protective put—buying a put option to protect against the underlying falling in value, while retaining upside.

Suppose that an investor has a holding of XYZ stock on 20 March, and purchases XYZ May 50 puts on an equal number of shares as a hedge. The puts will cost $3.87 per share, and the share price is $52.14.

The position at May expiry is as shown on the next graph (in per-share terms, as always):



As with the covered call, when the initial option premium cost is ignored, the breakeven is the same as for the unhedged stock, but this time we see that the stock loss is limited to the distance of the strike below the initial stock price ($52.14 – $50 = $2.14). Factoring in the initial premium, the net maximum loss is $2.14 + $3.87 = $6.01, while the breakeven is the premium added to the unhedged breakeven of $52.14, so $52.14 + $3.87 = $56.01. This breakeven can also be inferred from the fact that at 50 there is a loss of $6.01, so the underlying needs to expire $6.01 above that, at $56.01, to break even.

In general, for a protective put:

- Maximum loss at expiry = $S_0 - X + p_0$
- Breakeven stock price at expiry = $S_0 + p_0$
- Maximum profit = unlimited

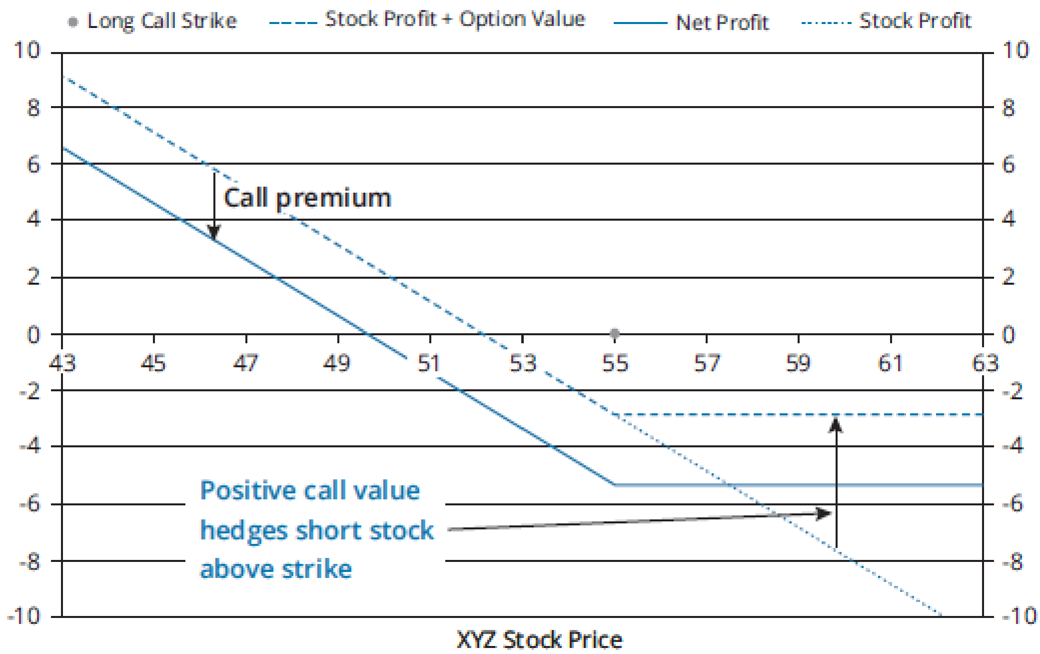
MODULE 16.5: OPTIONS AS A HEDGE OF A SHORT POSITION

Video covering this content is available online.

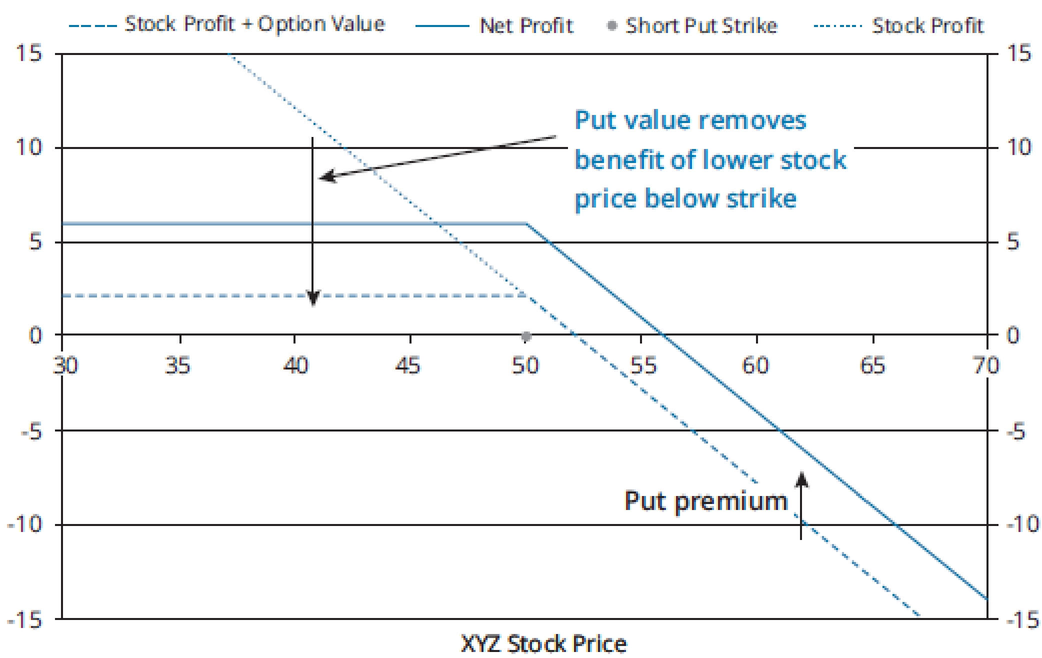
LOS 16.e: Compare the effect of buying a call on a short underlying position with the effect of selling a put on a short underlying position.

If an investor starts with a short position in the underlying, they will gain if the price falls and lose if the price rises.

Buying a call (probably above the current stock price) would provide a hedge against the stock rising. This is analogous to the way a protective *put* hedges a *long* stock position against a *fall* in the price:



Similarly, the sale of a put (probably below the current stock price) sells off (part of) the benefit of the stock falling, in the same way a **covered *call*** sells off the upside of a ***long* stock** position:



MODULE QUIZ 16.4, 16.5

1. An investor purchases a stock for $37.50 and buys a put for $1.40 with a strike price of $35. At expiration of the put:
   a) **compute** the maximum profit, maximum loss, and breakeven price.

   b) **compute** the profit or loss for when the stock price is $30, $35, $40, and $50.

2. It is September, and Jones has a short position in Alphacorp stock. The share price is currently 220 and Jones anticipates little movement in the price over the next month, although his long-term view is bearish. To increase his yield from the holding Jones would *most likely* sell:
   A. October 240 calls.
   B. October 240 puts.
   C. October 200 puts.

MODULE 16.6: COLLARS

Video covering this content is available online.

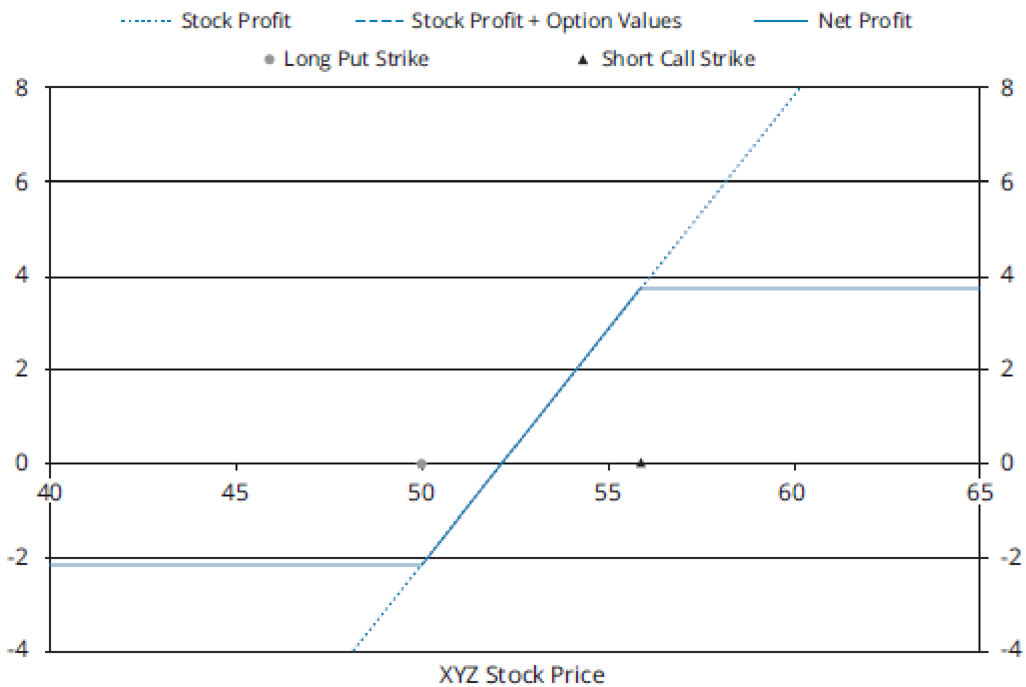
LOS 16.f: Discuss the investment objective(s), structure, payoffs, risk(s), value at expiration, profit, maximum profit, maximum loss, and breakeven underlying price at expiration of the following option strategies: bull spread, bear spread, straddle, and collar.

The **collar**[4] is probably best thought of as combination of protective put and covered call.

An investor who is long the underlying could buy a put (most likely OTM) to hedge the stock's downside, while at the same time selling a call (also most likely OTM) to sell off the upside and subsidize the cost of the put.

Usually the put strike is set, then an appropriate call strike is determined such that the call and put have the same premium. If the options are over-the-counter, rather than exchange-traded, this will be easy to do. In this case there will be no net inflow or outflow at initiation and the investor will have constructed a **zero-cost collar**.

For example, consider an investor with a holding of XYZ stock on 20 March (price = $52.14). They buy a June 50 put (premium = $4.88) and sell a June 55.87 call (premium = $4.88). At the June expiration:



Notice, in this case, that the line for stock profit + option values is the same as the net profit line because of the zero net initial premium.

The stock value is hedged beyond the strikes, with a maximum profit equal to the rise from the initial stock price up to the call strike ($55.87 – $52.14 = $3.73) and a maximum loss equal to the fall from the initial stock price down to the put strike ($52.14 – $50 = $2.14). The breakeven stock price is simply the initial stock price of $52.14, as when it was unhedged.

MODULE 16.7: STRADDLES

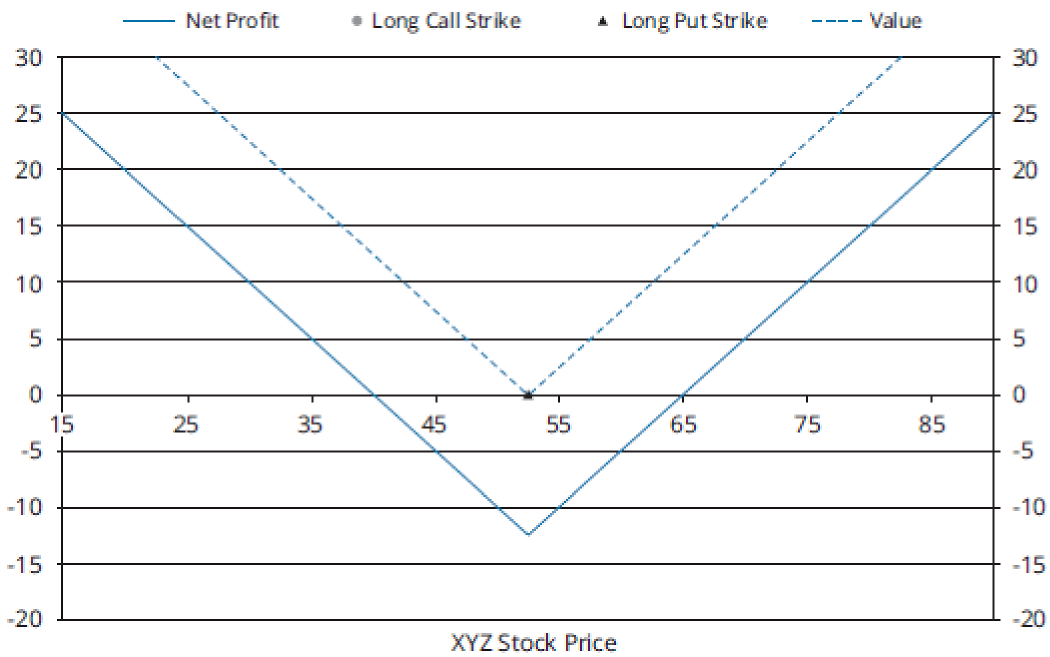
Video covering this content is available online.

The **straddle** is the classic volatility play. A **long straddle** involves the purchase of an equal number of calls and puts on a given underlying. The options all have the same expiry date and strike.[5]

Notice that, unlike the strategies we have considered up to now, the straddle (and the spreads that follow) do not involve a position in the underlying—they just use options.

Keeping it simple, let us consider the purchase of a call and a put on one share of XYZ on 20 March. Typically, the strike would be close to ATM, so given the stock price is $52.14, let us go long both the June 52.5 call and the June 52.5 put.

At expiration *either* the call *or* the put will be ITM, but not both. The call is ITM for stock prices above 52.50, while the put is ITM for stock prices below 52.50:



The value line for a long straddle is always V-shaped, centered on the strike, where both options expire worthless, so the total value is 0.

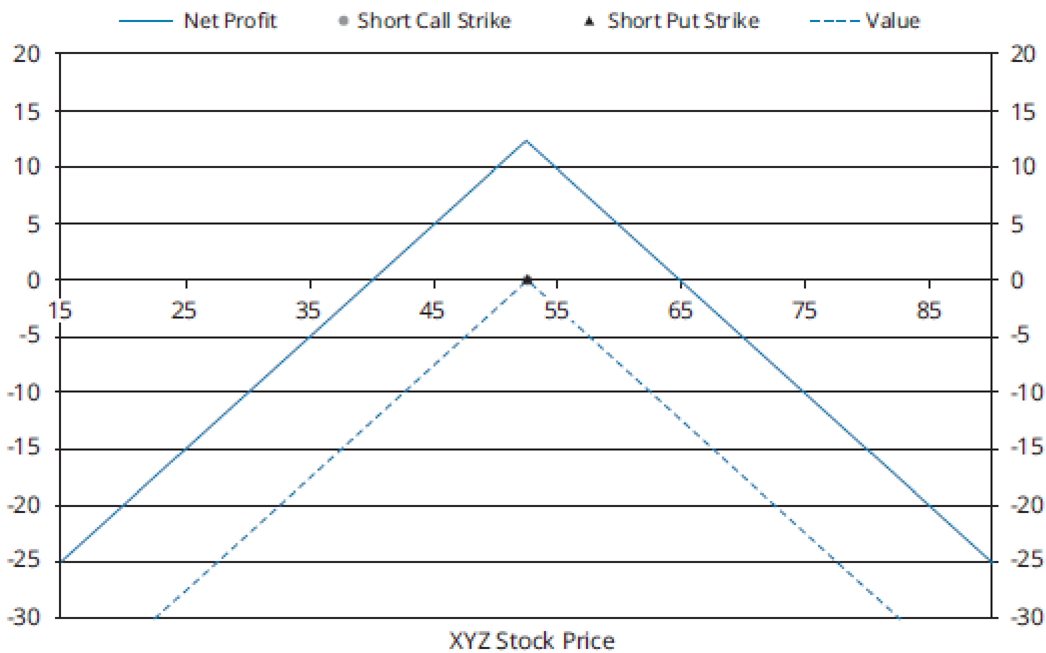
In this case, the premium for the call was $6.22, while the premium for the put was $6.19. Both were paid at initiation, so there was a total outlay of $6.22 + $6.19 = $12.41. This is thus the maximum loss (at the strike). The strategy breaks even at expiration when

- either the call is $12.41 ITM at $52.50 + $12.41 = $64.91, or
- the put is $12.41 ITM at $52.50 – $12.41 = $40.09.

The strategy, if held to expiration, makes larger profits the further from the strike the underlying ends up (i.e., the more the underlying moves, either way). There is no maximum profit on the long call. Maximum profit on the long put is the strike price minus the cost of the options.

A **short straddle** involves selling instead of buying, and is a neutrality play. It makes more profit the closer to the strike the underlying ends up, with no limit on potential loss.

The at-expiration value and profit for the short XYZ June straddle is shown here:



MODULE QUIZ 16.6, 16.7

1. An investor purchases a stock for $29 and a put for $0.20 with a strike price of $27.50. The investor also sells a call with the same expiration date for $0.20 with a strike price of $30. At expiration of the options:
   a) **calculate** the maximum profit and loss and the breakeven price.

   b) **calculate** the profit or loss when the price is $20, $25, $28.50, $30, and $100.

2. An investor purchases a call on a stock, with an exercise price of $45 and premium of $3, and a put option with the same maturity that has an exercise price of $45 and premium of $2. At expiration of the options:
   a) **compute** the maximum profit, maximum loss, and breakeven price.

   b) **compute** the profit or loss when the price is $0, $35, $40, $45, $47, $55, and $100.

3. The EUR is trading at USD 1.035. A trader expects the EUR to become much more volatile than is reflected in current option prices. Puts and calls on the EUR are available. Puts with a strike of USD 0.98 are trading at USD 0.005 and with a strike of USD 1.04 are trading at USD 0.017. Calls with a strike of USD 0.98 are trading at USD 0.068 and with a strike of USD 1.04 are trading at USD 0.004. **Compute** the at-expiry breakeven price or prices of the correct option strategy.

MODULE 16.8: SPREADS

Video covering this content is available online.

Bull and bear spreads are positions that have equal numbers of long options on one strike and short options on a second strike. A spread will *either* be constructed using calls *or* using puts.

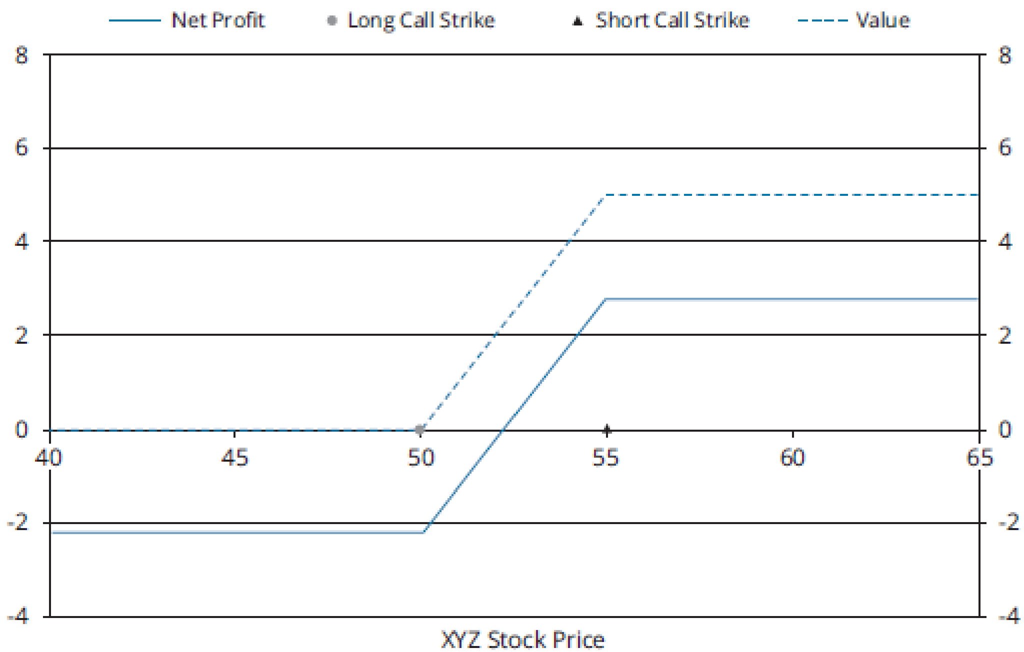
- **Bull** spreads use **long** options on the **lower** strike (**Bu**ll = **Buy L**ow) and **short** options on the **higher** strike.
- **Bear** spreads use **short** options on the **lower** strike and **long** options on the **higher** strike.

Bear spreads are just short bull spreads, in fact.

Bull Call Spread

Suppose that on 20 March an investor buys an XYZ June 50 call for $7.40 and sells an XYZ June 55 call for $5.20. This will involve a net outlay of $7.40 – $5.20 = $2.20.

The following diagram shows the value of the position, and the net profit, for a range of stock prices at expiration:



It is clear that the exposure is bullish, but limited, compared to just having a long call at 50.

We can think of the bull call spread as similar to a covered call, but with a long call taking the place of the stock.

Below the lower strike the position has zero value since both options expire OTM.

Between the strikes only the long call expires ITM, so the value is equal to the difference between the stock price and the lower strike.

At 55, the value will equal 5, the difference between the strikes. This is also the maximum value, since any further upside to the long call is hedged away by the short call, which goes ITM above 55.

The maximum loss (when value = 0) is the net premium paid, $2.20.

Breakeven occurs when the value of the long call exactly compensates for the net premium paid. This will be $2.20 above the lower strike, at $50 + $2.20 = $52.20.

The maximum profit is the maximum value of $5 less the net premium, thus $5 – $2.20 = $2.80.

In general, for a bull call spread:

- Maximum loss = net premium paid
- Breakeven = lower strike + net premium paid
- Maximum profit = difference between strikes – net premium paid

The bull call spread is an example of a **debit spread** since it entails a net outlay: the bought call, with a lower strike, is more valuable than the sold call.

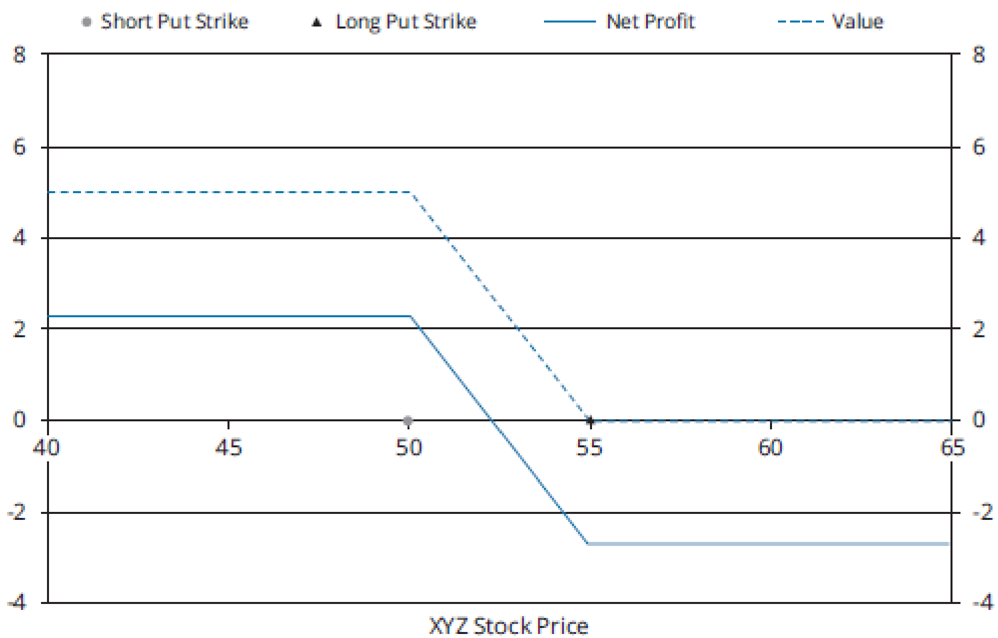
The other debit spread is the bear put spread.

Bear Put Spread

Here we sell a lower strike put and buy a higher strike put.

Suppose that on 20 March an investor buys an XYZ May 55 put for $6.61 and sells an XYZ May 50 put for $3.87. This will involve a net outlay of $6.61 – $3.87 = $2.74.

Value and profit at May expiration:



It is clear that the exposure is bearish, but limited, compared to just having a long put at 55.

Both options are OTM above the higher strike, for zero value.

Between the strikes the value reflects the moneyness of the long 55 put (how far the stock price is below the upper strike).

At the lower strike, the value is maximized and is hedged at that level for any lower stock price.

For a bear put spread:

- Maximum loss = net premium paid ($2.74 in this case)

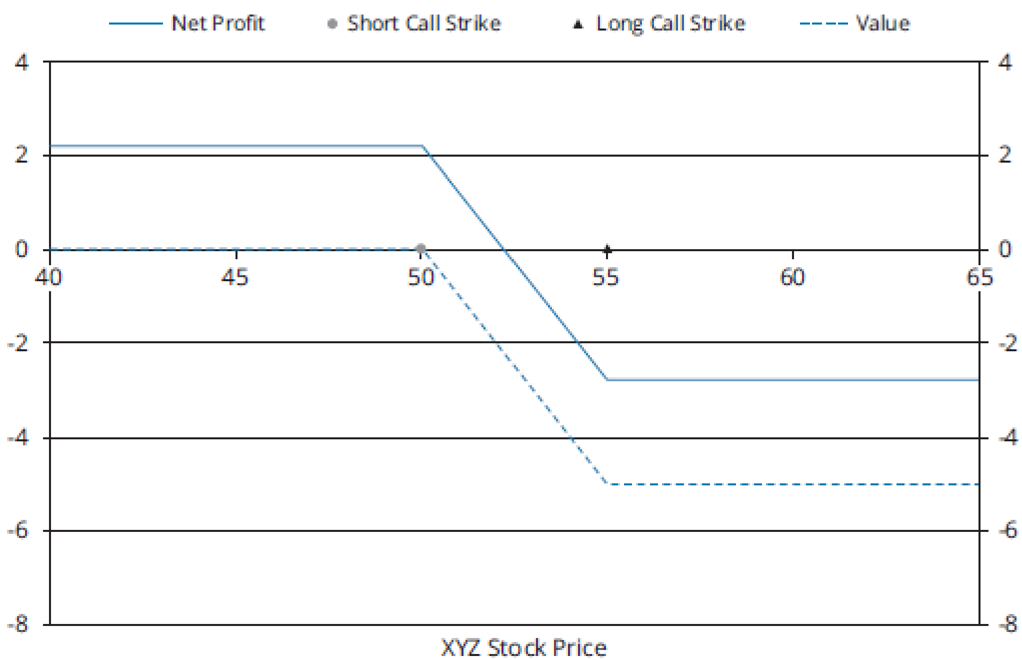
- Breakeven = higher strike – net premium paid ($55 – $2.74 = $52.26)
- Maximum profit = difference between strikes – net premium paid ($5 – $2.74 = $2.26)

Bear Call and Bull Put Spreads

It is also possible, of course, to use calls to create a bear spread, or puts to create a bull spread. In both cases there would be a net inflow of premium (since the relatively more valuable option is sold) and they are referred to as **credit spreads**.

PROFESSOR'S NOTE
As a general rule, assume that a bull spread would be constructed using calls and that a bear spread would be constructed using puts (i.e., that debit spreads are to be preferred over credit spreads) unless a question states otherwise.

For example, a bear call spread could use a short XYZ June 50 call ($7.40) plus a long XYZ June 55 call ($5.20), with a net initial inflow of $7.40 – $5.20 = $2.20, which is the maximum profit at 50 and below. At 55 and above, the net intrinsic value is –$5, resulting in a maximum loss of $2.80.



- Maximum profit = net premium received
- Breakeven = lower strike + net premium received
- Maximum loss = difference between strikes – net premium received

Similarly, a **bull put spread** is the reverse of a bear put spread, in this case a short XYZ May 55 put ($6.61) and a long XYZ May 50 put ($3.87). At expiration: