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1 Hull, Chapter 11: Trading Strategies Involving Options

Learning Outcomes:

Explain the motivation to initiate a covered call or a protective put strategy.

Describe and explain the use and payoff functions of spread strategies, including bull spread, bear spread, calendar spread, butterfly spread, and diagonal spread.

Calculate the pay-offs of various spread strategies.

Describe and explain the use and payoff functions of combination strategies, including straddles, strangles, strips, or straps.

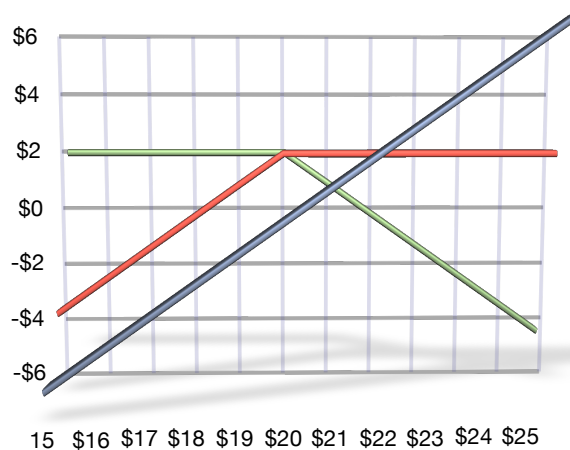
Compute the pay-offs of combination strategies

1.1 Explain the motivation to initiate a covered call or a protective put strategy and calculate the payoff functions of the respective strategies

1.1.1 Covered Call

To “write a covered call” is combine a long stock position with a short position in a call option. Writing a covered call = long stock + short call option. In many cases, the call option is out-of-the-money. The rationale of the covered call is either:

1. To generate income via the sale of the short call, or
2. To cover the cost of the potential short call payoff with the stock.



Payoff: Red; **Option:** Green; **Stock:** Blue

Covered call: Long stock @ \$20 + Short call Strike @ \$20 (premium = \$1.99)

Writing a covered call is an income strategy, that is, we will enter into this trade if our outlook is neutral to bullish. That is, if the stock rises significantly, the call option will be exercised; however, we have the underlying to protect ourselves from that scenario. On the other hand, by writing a call option we collect the premium, thus if the stock price stays about the same or rises modestly, we collect the premium. We can then use this strategy by *rolling over* the options each month, collecting our premium. At first look we might view this as an easy way to generate a healthy income each month. However, chances are that we are not the only ones who have thought of this, hence, it will be priced into the option. Accordingly, over time, when we take into account the transaction costs we incur, as well as the fact that from time to time the option will get exercised, this is a poor income generating strategy.

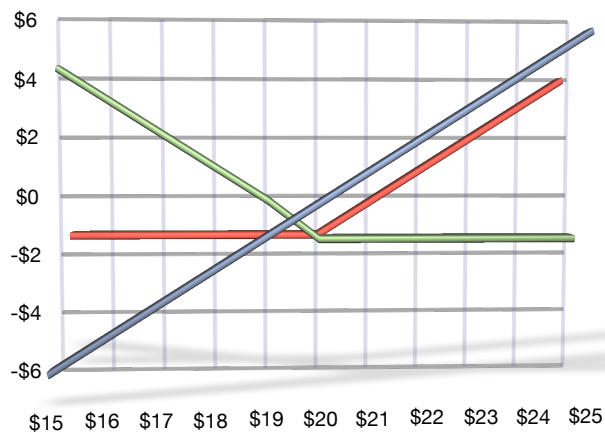
IMPORTANT CONCEPT:

If the payoff strategy looks like a short put option, that's because it is! Remember the put-call parity $S_0 - c = Ke^{-rt} - p$. We can infer from this that going long the stock and short a call is the same as going short a put with the PV of the strike price in the bank. By knowing the intuition behind the put-call parity you can often reason your way to the answer!

1.1.2 Protective Put

A protective put can be thought of as a form of insurance. Indeed, looking at the strategy and the payoff, it looks like we have created a *synthetic call option*!

Again, the put-call parity comes in handy. Now, it is tempting to think that having protective puts on your portfolio and rolling them over at maturity is a great way to benefit from the potential increase in the stock price while having our losses capped. However, the premium paid and transaction costs incurred dilute the profits from such a strategy, just like in the case of the Covered call. We can generalize this concept further by noting that, after adjusting for risk, there is no one strategy that offers an easy way to make money in a [weak form] efficient market. There is no free lunch.



Payoff: Red; **Option:** Green; **Stock:** Blue

Protective put: Long stock @ \$20 + Long put Strike @ \$20 (premium = \$1.20)

IMPORTANT CONCEPT:

The covered call generate income (the short call option premium) when the (long) stock holder does not expect further price appreciation on the long position. The protective put forfeits some income (the long put option premium) in exchange for downside protection.

1.2 Describe and explain the use and payoff functions of spread strategies, including bull spread, bear spread, calendar spread, butterfly spread, and diagonal spread.

A spread strategy is a position with two or more options of the same type, i.e., two or more calls; or, two or more puts.

1.2.1 Bull spread (type of vertical spread)

buy (long) a call option and sell (short) a call option on the same stock (and same expiration) but with a higher strike price. In this example, long call (strike = \$20, premium = \$1.99) + short call at higher strike (strike = \$23, premium = \$0.83)

Features of bull spread:

- Net debit but outlook is bullish

1.2.2 Bear spread (type of vertical spread)

Buy (long) a call option call option and sell (short) a call option on the same stock (and same expiration) but with a lower stock price. In this example, bear spread: long put (strike = \$23, premium = \$2.93) + short put at lower strike (strike = \$20, premium = \$1.20)

Features of bear spread:

- Net debit but outlook is bearish

1.2.3 Butterfly spread (sideway strategy)

Buy a call option at low strike price K1, buy a call option with high strike price K3, and sell two call options at strike price K2 halfway between K1 and K2. In this example, the butterfly spread: Long call (strike @ \$18, premium = \$3.21), long call (strike @ \$22, premium = \$1.13), short two calls (strike @ \$20, premium = \$1.99)

Features of butterfly spread:

- Expects low volatility (range-bound), Capped risk

1.2.4 Calendar spread

In a calendar spread, the options have the same strike price but different expiration dates. The calendar spread can be created with calls or puts.

Two calls: sell a call option with strike price K1 and buy a call option with same strike price K1 but with a longer maturity term

Two puts: sell a put option with strike price K1 and buy a put option with same strike price K1 but with a longer maturity term

Short call with 1 year maturity (strike = \$20, premium = \$1.99) + Long call with 1.25 year maturity (strike = \$20, premium = \$2.27)

1.2.5 Diagonal spread

In a diagonal spread, both the expiration date and the strike price of the calls are different.

1.2.6 Box spread

A box spread is a combination of a bull call spread with strike prices K_1 and K_2 and a bear put spread with the same two strike prices. The payoff from a box spread is always $K_2 - K_1$. The value of the box spread is always the present value of its payoff or $(K_2 - K_1) \times e^{-rT}$.

1.3 Describe and explain the use and payoff functions of combination strategies, including straddles, strangles, strips, or straps

A combination strategy involves taking a position in both call(s) and put(s) on the same stock

1.3.1 Straddle

To straddle is to *buy a call and buy a put* on the same stock with same strike price and expiration date. **Why the (bottom) straddle?** The investor expects a large move in either direction. The worst-case scenario is that the stock settles at the strike price: the investor has paid two premiums but does not receive any pay-offs. This illustrated straddle consists of a long call (strike @ \$20, premium = \$1.99) plus a long put (strike \$20, premium = \$1.20). This straddle is a “bottom straddle.”

IMPORTANT CONCEPT:

A straddle is a **direction neutral volatility strategy**: we don't mind which way the underlying moves. As an example, a **bottom straddle** involves buying both a call and a put with the same strike price and expiration date. In this case, as long as the price move sufficiently, we are invariant to which way it moves. Conversely, for a **top straddle**, we want the price to deviate from the strike as little as possible.

A top straddle (or straddle write) is to *sell a call and sell a put* on the same stock with same strike price and expiration date. **Why the top straddle?** The investor is highly confident that the stock will not stray from the strike price in either direction. If the stock price equals the strike price, the investor has collected two premiums for profit. This is a very risky strategy however, because the potential loss is unlimited. As you can see, a top straddle is also a direction neutral volatility strategy; however, unlike with the bottom straddle, we want little to no movement in the underlying.

1.3.2 Strip

Strip: To take a long position in one call and two puts with same strike price and expiration date. **Why the strip?** The investor bets on a large stock price

move but considers a decrease more likely than an increase. This illustrated strip consists of a long call (strike @ \$20, premium = \$1.99) plus two long puts (strike @ \$20, premium = \$1.20)

Features of strip

- Strip: Like straddle, but biased toward downside

1.3.3 Strap

Strap: To take a *long position in two calls and one put* with same strike price and expiration date. **Why the strap?** Like the strip, the investor bets on a large stock price movement but instead considers an increase more likely. This illustrated strap consists of two long calls (strike @ \$20, premium = \$1.99) plus a long put (strike @ \$20, premium = \$1.20)

Features of strap

- Strap: Like straddle, but biased toward upside

1.3.4 Strangle

Strangle: To *buy a put and a call* with the same expiration and different strike prices. **Why the strangle?** The investor is betting on a large price movement (similar to the straddle). This illustrated strangle is a long call (strike @ \$22, premium = \$1.13) plus a long put (strike \$18 premium = \$0.51)

Features of strap

- Strangle: like a straddle but cheaper to install

1.4 Compute the pay-offs of combination strategies.

Please see the practice question (PDF) set. [Elaborate on this with one or two examples, possibly from question PDF in order to enhance understanding and retention]

1.5 Summary of Options Strategies

The options strategies we have seen are but a few of the many that are used on a daily basis. However, they form the basis of many such strategies. That is, a combination of the strategies we have reviewed can be used to construct any Options strategy - your imagination (and wallet) is the limit. **[Placeholder for brief summary of material and key points]**

1.6 Concept check - questions & answers

1.6.1 Questions

1. What are some of the benefits of “options strategies” over a single call or put option?
2. How is a butterfly strategy created, what is its payoff and when would one potentially use it?
3. You believe volatility is about to drop, what is the appropriate strategy?
4. Of the following options strategies, which one is the riskier?
 - (a) Buying a bull spread
 - (b) Buying a bear spread
 - (c) Writing (selling) naked put options
 - (d) Writing (selling) naked call options
5. An investor wants to hedge her bond portfolio. Being sensitive to interest rate the investor decides to sell a call option with $K_{call} > S$ to finance entirely the cost of going long a put option where $K_{put} < S$ which hedges against an increase in interest rate (remember the value of a portfolio of bonds decreases when the payments are discounted more heavily). Which options strategy is the investor employing?
 - (a) Butterfly
 - (b) Costless collar
 - (c) Strangle
 - (d) Box spread
6. You are bearish on the market (you think the market will go down) so you decide to the following options, all with the same maturity: buy a put with $K_{put} = \$49$ for \$8, sell two puts with $K_{put} = \$40$ for \$5 each, and buying one put where $K_{put} = \$36$ for \$3. If at maturity the underlying trades at $S = \$34$, what is the profit of your trade?
 - (a) \$3
 - (b) \$4
 - (c) \$5
 - (d) \$6

1.6.2 Answers

1. One of the primary goals of the various options strategies is to hedge against exposure from different risk factors
2. A butterfly **[placeholder for explanation/answer]**
3. When volatility is about to drop, you want to enter into a direction neutral volatility strategy, hoping that the underlying will barely move. In this case the appropriate strategy is a top straddle.
4. Both a, b and c have bounded losses, whereas the potential loss from d is unbounded (limiteless). Thus, writing naked call options is the riskier of the strategies.
5. The investor is employing a costless-collar. Notice that in a costless collar, the premium from selling the call option exactly matches the cost of the put option. The investor accordingly locks in a range of profit and losses since the investor is already long the underlying, buys a [protective] put and sells a call.
6. The profit from the trade is \$4, thus (c) is correct. We can calculate this as follows: $S_{maturity} < K$, meaning that at maturity the underlying is worth less than the strike of all the options. Accordingly, all the put options will get exercised. $[(\$49 - \$34) - 2 \times (\$40 - \$34) + (\$36 - \$34)] = \$5$. The initial option premiums sum up to: $(-\$8 + 2 \times 5 - 3) = -\1 . Thus $\$5 - \$1 = \$4$.