CHAPTER 8: TRADING STRATEGIES INVOLVING OPTIONS

Unless otherwise stated the options we consider are all European. Toward the end of this chapter, we will argue that if European options were available with every single possible strike price, any payoff function could in theory be created.

8.1 Strategies involving a single option and a stock

The dashed line shows the relationship between profit and stock price for the individual securities comprising the portfolio, while the solid line shows the relationship between profit and stock price for the whole portfolio.

In figure 8.1a the investment strategy represented by this portfolio is known as writing a covered call. In figure 8.1b we can see is the reverse of writing a covered call. In figure 8.1c we see a protective put strategy, while in figure 8.1d we see the reverse of a protective put.

The profit patterns have the same general shape as the profit patterns discussed in Chapter 1 for short put, long put, long call, and short call, respectively. Put-call parity provides a way of understanding why this is so. For example, for figure 8.1a:

\[ c + D + X e^{r(T-t)} = p + S \]

\[ S - c = p - D - X e^{r(T-t)} \]

This shows that a long position in a stock combined with a short position in a call is equivalent to a short put position plus an amount of cash. This explains why the profit pattern is similar to that from a short put position.

8.2 Spreads

A spread trading strategy involves taking a position in two or more options of the same type.

**Bull Spreads**

This can be created by buying a call option on a stock with a certain strike price and selling a call option on the same stock with a higher strike price. Both options have the same expiration date. Figure 8-2.
A bull spread, when created from calls, therefore requires an initial investment. If the stock price does well and is greater than the higher strike price, the payoff is the difference between the two strike prices. If the stock price on the expiration date lies between the two strike prices, the payoff is \( S_T - X_1 \). If the stock price on the expiration date is below the lower strike price the payoff is zero.

A bull spread strategy limits both the investor’s upside potential and his or her downside risk. Three types of bull spreads can be distinguished: 1. Both calls initially OTM; 2. One call initially ITM, the other call initially OTM; 3. Both calls initially ITM.

The most aggressive bull spreads are those of type 1. As we move from type 1 to type 2 and from this one to type 3, the spreads become more conservative.

Bull spreads can also be created by buying a put with a low strike price and selling a put with a high strike price. This is illustrated in figure 8-3. Unlike the bull spreads created using calls, bull spreads created from puts involve a positive cash flow to the investor up front (this ignores margin requirements). The final payoffs from bull spreads created using puts are lower than from those created using calls.

**Bear Spreads**

An investor who enters into a bear spread is hoping that the stock price will decline. Like a bull spread, a bear spread can be created by buying a call with one strike price and selling a call with another strike price. However, in the case of a bear spread, the strike price of the option purchased is greater than the strike price of the option sold. This is illustrated in figure 8-4. A bear spread created from calls involves an initial cash inflow (when margin requirements are ignored) since the price of the call sold is greater than the price of the call purchased. Assuming that the strike prices are \( X_1 \) and \( X_2 \) with \( X_1 < X_2 \), if the stock price is greater than \( X_2 \), the payoff is negative at \(- (X_2 - X_1)\). If the stock price is less than \( X_1 \) the payoff is zero. If the stock price is between \( X_1 \) and \( X_2 \), they payoff is \(- (S_T - X_1)\).
Bear spreads can be created using puts instead of calls. The investor buys a put with a high strike price and sells a put with a low strike price. Bear spreads created with puts require an initial investment. Figure 8.5.

**Butterfly Spreads**

A butterfly spread involves positions in options with three different strike prices. It can be created by buying a call option with a relatively low strike price, $X_1$; buying a call option with a relatively high strike price, $X_3$; and selling two call options with a strike price, $X_2$, in the middle. Generally, $X_2$ is close to the current stock price. A butterfly spread leads to a profit if the stock price stays close to $X_2$ but gives rise to a small loss if there is a significant stock price move in either direction. It is therefore an appropriate strategy for an investor who feels that large stock price moves are unlikely. The strategy requires a small investment initially.

Butterfly spreads can be created using put options. The investor buys a put with a low strike price, buys a put with a high strike price, and sells two puts with an intermediate strike price. This is illustrated in figure 8.7. If all options are European, the use of put options results in exactly the same spread as the use of call options. Put-call parity can be used to show that the initial investment is the same in both cases.

A butterfly spread can be sold or shorted by following the reverse strategy to that described earlier. This strategy produces a modest profit if there is a significant movement in the stock price.

**Calendar Spreads**
Options used here have the same strike price and different expiration dates. A calendar spread can be created by selling a call option with a certain strike price and buying a longer-maturity call option with the same strike price. The longer the maturity of an option, the more expensive it is. This calendar spread therefore requires an initial investment. Assuming that the long-maturity option is sold when the short-maturity option expires, the profit pattern given by a calendar spread is as shown in figure 8.8. The investor makes a profit if the stock price at the expiration of the short-maturity option is closed to the strike price of the short-maturity option.

![Figure 8.8 Calendar spread created using two calls.](image)

To understand the profit pattern from a calendar spread, first consider what happens if the stock price is very low when the short-maturity option expires. The short-maturity option is worthless and the value of the long-maturity option is close to zero. The investor therefore incurs a loss that is only a little less that the cost of setting up the spread initially. Consider next what happens if the stock price, $S_T$, is very high when the short-maturity option expires. The short-maturity option costs the investor $S_T - X$ and the long-maturity option (assuming that early exercise is not optimal) is worth a little more than $S_T - X$. Again the investor makes a net loss that is a little less than the cost of setting up the spread initially. If $S_T$ is close to $X$, the short-maturity option costs the investor either a small amount or nothing at all. However, the long-maturity option is still quite valuable. In this case a significant net profit is made.

In a neutral calendar spread, a strike price close to the current stock price is chosen. A bullish calendar spread would involve a higher strike price, while a bearish calendar spread would involve a lower strike price.

Calendar spreads can be created with put options as well as call options. The investor buys a long-maturity put option and sells a short-maturity put option. As shown in figure 8.9, the profit pattern is similar to that obtained from using calls.

![Figure 8.9 Calendar spread created using two puts.](image)

A reverse calendar spread is the opposite to that shown in figure 8.8 or 8.9. The investor buys a short-maturity option and sells a long-maturity option. This creates a small profit if the stock price at the expiration of the short-maturity option is well above or well below the strike price of the short-maturity option. However, it leads to a loss if it is close to the strike price.

**Diagonal Spreads**

A diagonal spread is a spread which is such that both the expiration date and the strike price of the calls are different. Their profit patterns are generally variations on the profit patterns form the corresponding bull or bear spreads.

**8.3 Combinations**

A combination is an option trading strategy that involves taking a position in both calls and puts on the same stock.
**Straddle**

This involves buying a call and put with the same strike price and expiration date. Figure 8.10

A straddle is appropriate when an investor is expecting a large move in a stock price but does not know in which direction the move will be. A straddle would seem to be a natural strategy for the stock of a company that is subject to a takeover bid. If the bid is successful, the stock price can be expected to move up sharply. If it is unsuccessful, the stock price can be expected to move down sharply. In practice, it is not quite that easy to make money! Option prices for a stock whose price is expected to exhibit a large jump tend to be significantly higher than for a similar stock where no jump is expected.

The straddle in figure 8.10 is sometimes referred to as a bottom straddle or straddle purchase. A top straddle or straddle write is the reverse position. It is created by selling a call and a put with the same exercise price and expiration date. It is a highly risky strategy. If the stock price on the expiration date is close to the strike price, it leads to a significant profit. However, the loss arising from a large movement in either direction is unlimited.

**Strips and Straps**

A strip consists of a long position in one call and two puts with the same strike price and expiration date. A strap consists of a long position in two calls and one put with the same strike price and expiration date. In a strip, the investor is betting that there will be a big stock price move and consider a decrease in the stock price to be more likely than an increase. In a strap, the investor is also betting that there will be a big price move. However, an increase in the stock price is considered to be more likely than a decrease. Figure 8-11

**Strangles**

In a strangle, sometimes called a bottom vertical combination, an investor buys a put and a call with the same expiration date and different strike prices. A strangle is a similar strategy to a straddle. Comparing figures 8.12 and 8.10, we see that the stock price has to move farther in a strangle than in a straddle for the investor to make a profit. However, the downside risk if the stock price ends up at a central value is less with a strangle.
The profit pattern obtained with a strangle depends on how close the strike prices are together. The farther they are apart, the less the downside risk and the farther the stock price has to move for a profit to be realized. The sale of a strangle is sometimes referred to as a top vertical combination.

8.4 Other Payoffs

If European options expiring at time T were available with every possible strike price, any payoff function at time T could in theory be obtained. The easiest way to see this is in terms of butterfly spreads. Figure 8.13 shows the payoff from a butterfly spread. This could be described as a “spike”. As $X_1$ and $X_3$ become closer together, the spike becomes smaller. By judiciously combining together a large number of very small spikes, any payoff function can be approximated.