OPTIONS COMBINATIONS

and

PORTFOLIO STRATEGIES

In this chapter we present a host of applications for users of options. Our focus continues to be the option’s payoff at expiration. That is, the trader, investor, banker, etc. is given the price of the option along with its parameters and constructs a portfolio in order to achieve a particular set of possible outcomes for the portfolio on the expiration date of the option. In some cases the portfolio consists exclusively of options – known as option combinations. In other cases options are employed together with the underlying stock, bond or commodity.

CALLS AND PUTS

We examined simple call and put strategies in chapter 3. We looked at their payoffs as well as profit and loss functions once the premiums are netted. We considered the perspectives of both the buyer and writer. Let’s review their main points before we go on to the combinations and strategies which are the primary focus of this chapter.

Figure 1 shows the payoff of an ordinary call with a strike price of K. The call buyer receives, at expiration, the difference between the cash price of the underlying asset on the expiration date and K, assuming it is a costive amount. This is so whether the call is cash settled or physically delivered, in which case the call owner receives the asset, pays K and sells it for the higher cash price. The points labeled a and b will become clear later.

Call Payoff

K

b

What motivates the buyer? On a stand-alone basis, the call provides unlimited upward price participation with limited downside. His net profit is the payoff less the premium paid (plus interest). If the asset finished below K, the premium is lost. The writer’s net profit, on the other hand, is the premium minus the payoff. There is no limit to her potential loss – she is totally naked.

Let’s work through examples. We’ll follow a process that involves three parts, as follows.

Parameters

Type: ordinary call

Underlying asset: General Electric shares

Exercise price: 28

Expiration: 1 year

Market Situation

Underlying cash price: 25

Premium: 1.4

Analysis

Breakeven price of underlying: 29.4

Profit/loss if nothing changes: loss of 1.4

Maximum gain: infinite

Maximum loss: 1.4

The market situation examined in this example corresponds to point a in the figure. The net profit to the call buyer equals the payoff less the 1.4 premium. Graphically, this is simply the payoff transposed downward by 1.4, as shown in Figure II. The breakeven price for GE, SBE, is that price at the call’s expiration which produces zero net profit, or Payoff − Premium = 0. Equivalently, GE price at expiration less strike = Premium, or SBE = 28 + 1.4 = 29.4.

What if, instead of reaching its breakeven point, GE at the call’s expiration is where it is today, 25? In that case, the call’s finishes out-of-the-money and the payoff is 0. As shown in Figure II, the net profit is a loss of 1.4.[[1]](#footnote-1) this is an example of a “breakpoint analysis,” as described at the end of chapter 3.[[2]](#footnote-2)

K

Price of Underlying Asset, S

S0

SBE

What about point b in the Figure? We’re dealing with the same option, but a different market situation. GE is 30, so the call is in-the-money. Its premium, therefore, is significantly higher, as explained in chapter xx (and to be analyzed at length in chapter yy).

Market Situation

Underlying cash price: 30

Premium: 3.8

Analysis

Breakeven price of underlying: 31.8

Profit/loss if nothing changes: loss of 1.8

Maximum gain: infinite

Maximum loss: 3.8

The maximum gain to be had, as in the previous situation, is infinite. The maximum loss, 3.8, is greater. This is as it should be, similar to purchasing the underlying when its price has risen. The breakeven price at expiration is the strike plus the premium, 28 + 3.8 = 31.8. Notice that the underlying must increase by only 1.8 from its current value in order for this call to breakeven, compared to an increase of 4.4 necessary in the previous example. Furthermore, should GE end at 30 when the option expires, the call buyer loses only 1.8 because it is in-the-money.

EXERCISE

Perform the above analysis when GE is 28 and the call premium is 2.0.

Now consider a strike of 30, with GE at 28. Assume the premium is 1.2. Compare the two calls by going through the same analysis.

Address the following question: If the maximum loss is greater for the ATM (28 strike) than the OTM (30) and the maximum gain is no better, and breakeven is higher, why would anyone buy the ATM instead of OTM?

The payoff of an ordinary put is displayed in Figure III. The buyer receives the excess of the put’s strike over the cash price of the underlying on the expiration date. This is so whether the option is cash settled or physical delivery. In the latter, the put owner purchases the asset in the cash market and delivers it to the writer for the higher strike price.

FIGURE III

K

Price of underlying asset

0

Put options allow the buyer to participate in the underlying asset’s price decline – i.e., substituting for a short position – with the potential loss limited to the premium. The maximum potential profit is the strike price less the premium paid. An outright short position in the underlying asset, on the other hand, leaves the trader completely naked. The put writer’s net profit equals the premium minus the payoff. Her loss is capped because the asset can at worst decline to 0.

Consider the following:

Parameters

Type: ordinary put

Underlying asset: General Electric shares

Exercise price: 23

Expiration: 1 year

Market Situation

Underlying cash price: 25

Premium: 1.25

Analysis

Breakeven price of underlying: 21.75

Profit/loss if nothing changes: loss of 1.25

Maximum gain: 21.75

Maximum loss: 1.25

The put buyer’s net profit equals the payoff less the 1.25 premium. Because GE can drop at most to zero, his maximum net profit is 25 − 1.25 = 23.75. The breakeven price of GE for the put is that price at the put’s expiration which produces zero net profit, or where Payoff = Premium. As a put’s Payoff is K − S, we have that SBE = 23 − 1.25 = 21.75. These are summarized in Figure IV, which is simply the payoff of Figure III transposed downward by 1.25.

Net Profit for Put BuyerPut Payoff

23Net Profit to Call Buyer

Price of underlying asset

0Price of Underlying Asset

21.a75a

25

What if GE is 25, its current price, at the put’s expiration? The put finishes out-of-the-money and the payoff is 0. As shown in Figure IV, the net profit is a loss of 1.25, an important breakpoint.

EXERCISE

Perform the above analysis when the cash price of GE is 20 and the put premium is 5.0.

BUY-WRITE

Probably the most widely employed option combination, a buy-write strategy involves owning an asset and writing a call on it. The Table below displays the value of a buy-write portfolio at expiration. The portfolio comprises a share of General Electric and a short (i.e., written) call. Note that the current prices of the share and call are not relevant to the portfolio4’s value at the call’s expiration (they are, of course, relevant to the net profit of the buy-write). In a sense, therefore, the Table calculates the combination’s “payoff.”

Buy GE, Write Call, Exercise Price 25

Calculation of Value at Expiration

GE Call Payoff Combination Value (Payoff)

15 0 15

20 0 20

25 0 25

30 5 25

35 10 25

100 75 25

Let’s think about the possible outcomes at expiration from two perspectives: dynamic and arithmetic.

Dynamic

This means follow the actions precipitated by the option. If GE is 15 at expiration, the call buyer (to whom the buy-write investor sold the option) will not exercise. The investor keeps his GE, now worth 15, the entry in the third column of the Table. The same dynamic holds for GE finishing at 20 at the call’s expiration, and at 25 – indeed, for any price until 25: the asset remains in the hands of the buy-write investor, whose value is shown in the final column, equal to the first column.

Consider now what happens should GE reach 30 at the call’s expiration. Say you are the buy-write investor. The call owner will exercise – pay you 25 and take the GE share from you. This leaves you with $25. If GE reaches 35, he’ll exercise, which leaves you with $25 again. In fact, this is the case for any price above 25. Notice that this “dynamic” perspective does not involve the second column of the Table.

Arithmetic

By “arithmetic” we mean adding up the pieces of the portfolio to arrive at its value. Every entry for GE at expiration in the Table’s first column produces a Payoff for the call, as shown in the second column. We know the payoff given the exercise price (see chapter zz to review payoffs). You as the buy-write investor own the asset and are short the option. Hence, your portfolio is worth the asset mimes the option. At expiration, this is simply the first column less the second, shown in the third.

Notice that the buy-write combination’s payoff, as described above, does not take into account the option premium. But neither does it consider the cost of GE when the combo was initiated. The payoff is shown in Figure IV.

Buy-Write Payoff

Price of Underlying Asset

25

Net Value and P&L

The net value of the portfolio at expiration simply recognizes the premium. Suppose the premium was 2 when the call was sold. Because the buy-write combo involves writing the option, the portfolio’s net value adds the premium to the final column of the table:

Buy GE, Write Call, Exercise Price 25, premium 2

Calculation of *Net* Value at Expiration

GE Call Payoff Combination Value Net Value

15 0 15 17

20 0 20 22

25 0 25 27

30 5 25 27

35 10 25 27

100 75 25 27

The maximum value of the portfolio is 27, since the call will be exercised and GE taken at any price above 25 at expiration. Notice that even if GE is worthless, the portfolio generates $2.[[3]](#footnote-3)

Figure V displays the buy-write’s net value at expiration. Superimposed on it is the price of GE, that is, the portfolio’s value without the call. For prices of GE above 27 at expiration, the Buy-Write combination underperforms. Why? Because the maximum net value of the combo is 27. For prices below 27 at expiration, the Buy-Write is superior. This is surely the case for GE prices below 25 at expiration, when the Buy-Write investor has GE plus the $2 premium. What about between 25 and 27, say 26? In that case, the call buyer will exercise. The buy-write investor must give up GE in exchange for 25, but he has the $2 premium in pocket. At 27, the two strategies – owning GE versus the Buy-Write – have equal net values. $27 is the breakeven price.

Price of Underlying Asset

25

Price of Underlying Asset

Buy-Write Net Value

SBE

0

Figure VI looks at this comparison another way, one amenable to the analyses above. Assume the cash price of GE is 24/share. To analyze the Buy-Write investor’s potential profits, losses and breakevens, we recognize that his initial outlay – his cost – was 24. Therefore, a portfolio value at expiration above 24 produces a profit. Because he receives the premium of 2, GE needs to finish above 22. The breakeven point is 22, and a price below 22 means a loss. Should GE end where it is now, 24/share, at expiration, the investor sells at the same price purchased, but pockets the premium. His maximum loss, therefore, is the purchase price less 2. His maximum gain is 3. For example, if GE reaches 30 at the call’s expiration, the stock is called away for 25, for a profit of 1, plus the 2 premium.[[4]](#footnote-4) It should be clear that Figure VI is simply the Buy Write Net Value line of Figure IV translated downward by 24, the cost of the underlying asset.[[5]](#footnote-5)

Parameters

Type: Buy-Write

Underlying asset: General Electric shares

Exercise price: 25

Expiration: 1 year

Market Situation

Underlying cash price: 24

Premium: 2

Analysis

Breakeven price of underlying: 22

Profit/loss if nothing changes: profit of 2

Maximum gain: 3

Maximum loss: 22

Price of Underlying Asset

Net Profit of Buy-Write

22

-22

Let’s think about a Buy-Write strategy from a “bigger picture” perspective as opposed to the more detailed analysis above. Why would an investor purchase this combination? A trivial answer is that because the call premium is received up front, the net purchase price of GE is reduced compared to a stand-alone purchase of the stock. It is “trivial” in the sense that it is, relatively speaking, a rather minor compensation for giving up the potential appreciation of GE. Figure V clearly shows that, once the breakeven point is passed, the Buy-Write combination underperforms the outright purchase, and the degree of underperformance accelerates with every increase in GE stock price.

The answer lies in the question. Clearly, the Buy-Write investor is not expecting a significant increase in the or ice of the asset (above the breakeven or ice) by the call’s expiration. Of course, she doesn’t expect a decrease, either; if she does, why would she buy it?!! To capitalize on her expectations of price stability, she writes a call in order to earn income (and retain the asset for potential *future* price appreciation). Her earnings are:

Buy-Write yield = (dividend + call premium) / price of underlying stock [[6]](#footnote-6)

Multiplying the dividend by 4 (as it is typically paid quarterly) and the premium by, for example 2, if it is a six-month option, puts this on an annualized basis, which allows comparison to other market yields.[[7]](#footnote-7)

EXERCISE

Redo the Net Value table, the graphs and the numerical analysis assuming the cash price of GE was 26 when this Buy-Write was initiated. And the call’s premium was 3.

PROTECTIVE PUT

Next in terms of popularity is the Protective Put. It is a simple idea: together with the stock, purchase a put in order to protect the portfolio from a decline in the asset’s price.[[8]](#footnote-8) The Table below displays the combination’s value at expiration. The underlying asset is Coca-Cola. The put has an exercise price of 40, and cost 1 when it was purchased. It also shows the net value: unlike the Buy-Write, the Protective Put’s net value *subtracts* the premium paid.

Buy KO, Purchase Put, Exercise Price 40, premium 1

Calculation of *Net* Value at Expiration

KO Put Payoff Combination Value Net Value

20 20 40 39

30 10 40 39

40 0 40 39

45 0 45 44

50 0 50 49

100 0 100 99

As with the Buy-Write, we can examine the outcome of the Protective Put combination on the put’s expiration dynamically and arithmetically. Suppose you’re the buyer. At a price of 30, you will exercise, which involves ridding yourself of KO in return for 40. The combination’s value, therefore, is 40. Because the put cost you 1, the net value of your portfolio is 39. This scenario holds for any price below 40. At 45 you certainly would not exercise. Hence, you retain your Coke shares, worth 45 each, producing a net value of 44 as the put premium needs to be recognized. This is the case for any price above (or at) 40 – your net portfolio value is the cash price of Coe less the one dollar premium.

Arithmetically, simply add the Put payoff in the second column to the cash price of KO at expiration, subtract 1 for the premium, which leaves the net value in the final column. Figure VII presents both the net value of the Protective Put position together with the portfolio’s value without the put (i.e., the cash price of KO). These are simply the fourth and first columns of the Table, respectively.

Price of Underlying Asset

Net Values

Protective Put, Net Value

Underlying Asset

39

39

40

The Table and the graphs in Figure VII do not depend on the price paid for KO by the investor. In a sense, this is as it should be, since the Put could be purchased simultaneously with the stock, or added later to provide protection. Suppose, for example, you paid 44/share for Coca-Cola. Your net profit & loss graph would be the net portfolio value of Figure VII translated downward by 44. Your portfolio will never fall in value below 39 – you can exercise at 40, but it cost you 1. In this region the combination is superior to a stand-alone Coke investment. For KO above 40, you will allow the put to expire. Clearly, the stand-alone position is superior, as no premium was paid for. But even between 39 and 40 – where you will exercise – you would have been better off without the put, as its payoff is below the premium.

The above analysis compares the Protective Put position to the Coke shares. An analysis of the combination on its own is as follows.

Parameters

Type: Protective Put

Underlying asset: Coca-Cola shares

Exercise price: 40

Expiration: 1 year

Market Situation

Underlying cash price: 44

Premium: 1

Analysis

Breakeven price of underlying: 45

Profit/loss if nothing changes: loss of 1

Maximum gain: unbounded

Maximum loss: 5

Notice there are two breakevens: the point where the combo achieves the same value as the underlying (39, as in Figure VII), the price where the combination produces zero net profit (45, as in the analysis above).[[9]](#footnote-9)

EXERCISE

Assume the cash price of Coke was 39 when the 40-put was purchased. Its premium was 3, reflecting its in-the-money status. Redo the table, the graphs and the numerical analysis. What are both breakevens?

SHORT STOCK WITH CALL

You believe that Seagate Technology is very likely to fall in price over the near term. A simple strategy would be to sell STX short, providing you with profit should your forecast be correct, and greater profit the further it falls. (Chapter 1 outlined the mechanics of borrowing and selling short, along with the dynamic costs and carry.) Of course, you might be wrong. If Seagate rises in price, you lose the difference between the current price – the price at which you sold – and the price you pay to buy it, which covers your short. In fact, your possible loss is unlimited, as Seagate can theoretically rise with no limit – you have a “naked” position.

To limit your potential loss, you can purchase a call on Seagate. Suppose STX is currently 62/share. A one-year call option, with an exercise price of 65, carries a premium of 2. As the table shows, your potential loss of combining the short position with the long call is limited to the call premium plus the difference between the strike – 65 – and the price at which you sold short – 62. You will never pay more than 65 to cover your short. Your downside, relative to the outright short, is a subtraction of 2 dollars should STX decline.

Sell Short STX vs. Short STX / Purchase Call Combination

Spot Price STX 62; Call Exercise Price 65, Premium 2

STX Short P/L Call Payoff Combo P/L

50 12 0 10

60 2 0 0

62 0 0 −2

65 −3 0 −5

70 −8 5 −5

100 −38 35 −5

Parameters

Type: Short sale with Purchased Call

Underlying asset: Seagate Technology

Exercise price: 65

Expiration: 1 year

Market Situation

Underlying cash price: 62

Premium: 2

Analysis

Breakeven price of underlying: 60

Profit/loss if nothing changes: loss of 2

Maximum gain: 60

Maximum loss: 5

The graph shows clearly the tradeoff between the naked short position and the short/call combination. The combo break even with the short at a price of 67 for STX. At that price, the short loses 5, as does the combo – the premium of 2 plus the cost, 65−62, of covering.

Net Profit

Price of underlying asset

62

short

Short

+ Call

EXERCISES

Repeat the above Table, Analysis and Graph but substituting an ATM call with a premium of 4.

Substitute a short put for the long call. Assume the put is struck at 58 for a Premium of 3. In which way is comparing this short stock/short put combo to the outright short similar to comparing the buy-write combo to the outright long?

STRADDLE

SYNTHETICS

COLLAR

CALL AND PUT SPREADS

BINARY OPTIONS

1. Recognizing time value of money, this amount is grossed up by the relevant one-year interest rate. [↑](#footnote-ref-1)
2. Other breakpoints would be the exercise price, the fair forward and, of course, the breakeven. [↑](#footnote-ref-2)
3. As always in this chapter, we ignore the interest earned on the call between its sale and exercise. [↑](#footnote-ref-3)
4. We could have alternatively generated the same analysis (as well as Figure VI) by focusing on the *net* investment amount – 24, GE’s cash price, less 2, the call premium, or 22. After all, this is the net amount actually invested in GE. Looked at this way, the analysis becomes quite simple: the maximum possible loss is 22, and any price for GE above 22 at expiration produces profit, hence the breakeven of 22. (Once again, ignoring time value of money.) [↑](#footnote-ref-4)
5. It should also be observed that the shape of the graph in Figure VI is precisely that of the Net {Profit/Loss of the put writer in chapter 3. This is an illustration of the put-call parity relationship studied in chapter zzz. [↑](#footnote-ref-5)
6. A more analytically correct way to express the strategy’s yield is as: dividend / (price of underlying – call premium) [↑](#footnote-ref-6)
7. In that case it is also known as the “carry.” Se chapter xxx. [↑](#footnote-ref-7)
8. As with the Buy-Write, the option in the Protective Put can be added after the stock has been in the portfolio, or it can purchased simultaneously with the asset. [↑](#footnote-ref-8)
9. The first breakeven is relevant only to those combinations involving a purchase of the underlying. The next sections, therefore, examine only the second. [↑](#footnote-ref-9)