

EC 247 Financial Instruments and Capital Markets

Class Exercise 8 Solutions

These questions reflect the topics on option contracts and swaps which are addressed in chapter 24 of the Frederic S. Mishkin and Stanley G. Eakins, *Financial Markets and Institutions*, 7th Edition, Pearson Prentice Hall, 2012.

Question 1

Why does a lower strike price imply that a call option will have a higher premium and a put option a lower premium?

Because for any given price at expiration, a lower strike price means a higher profit for a call option and a lower profit for a put option. A lower strike price makes a call option more desirable and raises its premium and makes a put option less desirable and lowers its premium.

Question 2

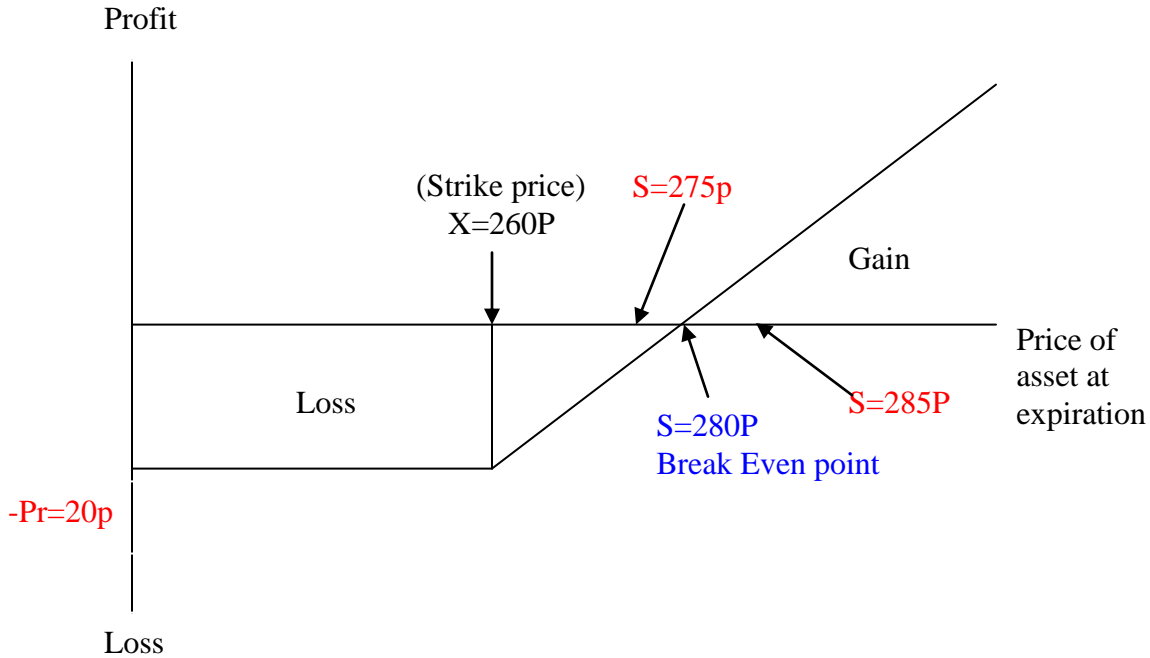
Assume that the spot price, of the EMI share, on 9th June 2005 was 254p. Also, assume that Mr A buys a call option with a strike price of 260 for December 2005. The premium is 20p per share and so he has paid £200 (=1000 x 20p), (ignoring transaction costs).

Assume the following spot prices for EMI shares in December 2005, and work out the consequences:

- i) Share price < 260p.
- ii) Share price >260p.
- iii) Share price is 275p.
- iv) Share price is 285p.

The purpose of this exercise is to illustrate the profit or loss profile for a long call option. The investor buys a call option with exercise price $X = 260p$. The exercise price is the price that the underlying asset (the share) may be bought in December if the investor decides to exercise the option. We are also given the option price or option premium, which is $Pr = 20p$ per share and we know that the investor will pay £200 (£200=1000 shares x 20p per share). For simplicity we ignore transaction costs. Given the assumed spot prices $[S]$ in December, we have to work out whether or not the investor will decide to exercise the option and the related profits or losses from such a decision. The figure below illustrates the profits/losses from a long call option.

Profit/Losses from a long call option.



1. If the spot price of the share in December turns out to be less than the strike price i.e. $S < 260p$.

The investor can buy shares more cheaply on spot exchange and will not exercise his call option. He will suffer a loss of: $20p \times 1000 \text{ shares} = \text{£}200$. The writer of the contract receives $\text{£}200$.

2. If the spot price of the share in December turns out to be greater than the strike price i.e. $S > 260p$.

The investor will exercise the option (buying the shares for $\text{£}2600$) and can sell immediately for more than he paid. At this point we do not have enough information to infer whether he will realize a profit or he will suffer a loss.

3. If the spot price of the share in December turns out to be 275p i.e. $S = 275p$.

The investor will exercise the option, since $(275p > 260p)$. He will buy the shares at a price of $260p$ per share (pay $\text{£}2600$) and sell immediately at the price of $275p$ per share (receive $\text{£}2750$). So he has a payoff of $S - X = 275p - 260p = 15p$ per share. Overall, his payoff will be $\text{£}150$ ($\text{£}0.15 \times 1000$). However, he has also paid a premium of $\text{£}200$. So he will suffer a loss of $\text{£}50$.

4. If the share price in December turns out to be 280p i.e. $S = 280p$.

The investor will break even. The investor will gain $20p$ per share that offsets the cost of the option.

5. If the spot price of the share in December turns out to be 285p i.e. $S = 285p$.

The investor will exercise the option, since $(285p > 260p)$. He will buy the shares at a price of $260p$ per share (pay £2600) and sell immediately at the price of $285p$ per share (receive £2850). So he has a payoff of $S - X = 285p - 260p = 25p$ per share. Overall, his payoff will be £250 ($£0.25 \times 1000$). As he has paid a premium of £200, his profit will be £50.

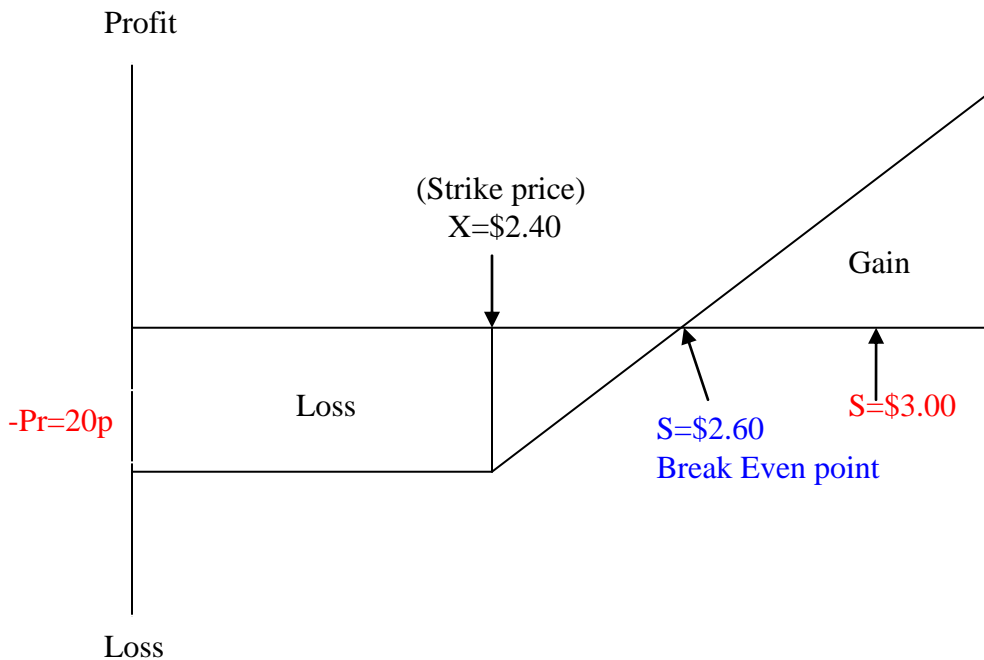
Question 3

An investor has £1000 to spend and is considering buying shares in Megabucks plc at £2 each whose price he thinks will rise in the next 6 months to around £3. One strategy is to buy 500 shares. If the prediction is correct, the shares can be sold for a profit of $£1500 - £1000 = £500$, on an outlay of £1,000. Suppose, however, that 6-month call options are available with a strike price of £2.40 at a premium of 20p per share. An alternative strategy is to use the £1,000 to buy 5 calls (= 5,000 shares).

Suppose that the prediction is correct and the price is £3 per share in 6 months time.

- What is the investor's profit?
- What is the position if the price fails to reach £2.40?

Profit/Losses from a long call option.



(a) Question 3 follows a similar notion as question 2. In this exercise we have an investor that has £1000 to spend. He has two strategies to choose from. If he follows the first strategy, he will buy now 500 shares at a price of £2 per share, so he will pay £1000. After 6 months he will sell the shares for £3 each and realize a profit of £500. According to the second strategy, he can buy 5 call options today which correspond to 5000 shares since the option price is 20p per share. Six months later the share price turns out to be £3 per share, so the investor will decide to exercise the option. As a result, his payoff will be $S - X = £3 - £2.40 = £0.60$ per share. We can work out his profit by subtracting the premium from his payoff. As a result, his profit per share will be $0.60£ - 0.20£ = 0.40£$. Consequently, his total profit will be $0.40£ \times 5000 = 2000£$.

Alternatively, our investor exercises the call and receives 5,000 shares for which he pays £12,000 ($5,000 \times £2.40$). He then sells the shares at their current market price and receives £15,000. Ignoring transaction costs, he has made $£2,000 = (15,000 - 12,000 - 1,000)$ on an outlay of £1,000.

(b) If the price fails to reach £2.40, the option will go unexercised and our investor loses the whole of the £1,000 premium.

Question 4

A swap agreement calls for Durbin Industries to pay interest annually based on a rate of 1.5% over the one year T-Bill rate, currently 6%. In return, Durbin receives interest at a rate of 6% on a fixed rate basis. The notional principal for the swap is \$50,000. What is Durbin's net interest for the year after the agreement?

In this swap agreement, Durbin pays 7.5% ($6\% \text{ T-Bill} + 1.5\%$) on the notional principal of \$50,000 and receives a fixed interest rate of 6% on the same notional principal. As a result, the net payment is $1.5\% \times 50,000 = \$750$.