

Derivatives

Revisions 1

Solutions

A. Multiple Choice Questions

A1. The farmer will be concerned about the impact of falling commodity prices, so will seek a position which gives them a higher payoff as the price of a commodity falls. Only a short futures position will achieve this. (Alternatively, as with all hedger's, if they are LONG the underlying, they need to be SHORT in the futures contract)

A2. Answer "a" is correct. The airline will be concerned about the impact of rising oil prices, so will seek a position which gives them a higher payoff as the price of oil rises. Only a long futures position will achieve this.

A3. Answer "d" is correct. Universal stock futures on UK stocks are based on 1000 shares, so the profit is: 10 contracts x 1000 shares x (£4.95 - £4.50) = £4500.

A4. Answer "a" is correct. Worst that could happen with any long option position is that you may lose the premium you pay for it.

A5. Answer "b" is correct. Speculators provide liquidity, arbitrageurs provide price correction, and hedgers obtain risk management from derivatives. A well-functioning derivatives market is needed for price transparency.

A6. Answer "c" is correct. The maximum you can lose from a long option is the premium which is 100% of investment. All the other investments involve a potential loss of much more than 100% of your investment and these are often known as contingent liability positions.

A7. Answer "c" is correct. Forward contract have a much wider choice of terms than futures as it can trade any time you can find counterparties. Although there is normally an agreement on minimum price moves recognized, this is no different to futures. However, being private agreements there is always the chance of default.

A8. Answer "d" is correct. All of these markets trade derivatives in the UK. LME and NYSE-LIFFE have a full range of futures and options, whilst the London Stock Exchange offer 'covered warrants' which are merely a specific form of options.

A9. Answer "d" is correct. All the others are correct, however if one product is more popular with the shorts, it will push the price down rather than up.

A10. Answer "c" is correct. All the statements are true apart from the third one. A short call could be motivated by a belief that the share price could be flat.

B. Questions

B1. When a trader enters into a long forward contract, is agreeing to buy the underlying asset for a certain price at a certain time in the future. When a trader enters into a short forward contract, is agreeing to sell the underlying asset for a certain price at a certain time in the future.

B2. A *trader* is hedging when has an exposure to the price of an asset and takes a position in a derivative to offset the exposure. In a *speculation* the trader has no exposure to offset. He is betting on the future movements in the price of the asset. *Arbitrage* involves taking a position in two or more different markets to lock in a profit.

B3. In the first case the trader is obligated to buy the asset for \$50. (The trader does not have a choice). In the second case the trader has an option to buy the asset for \$50. (The trader does not have to exercise the option).

B4. Selling a call option involves giving someone else the right to buy an asset from you. It gives you a payoff of $-max(S_T - K, 0) = min(K - S_T, 0)$

Buying a put option involves buying an option from someone else. It gives a payoff of $max(K - S_T, 0)$

In both cases the potential payoff is $K - S_T$. When you write a call option, the payoff is negative or zero. (this is because the counterparty choose whether to exercise). When you buy a put option, the payoff is zero or positive. (This is because you choose whether to exercise).

B5.

a. The investor is obligated to sell pounds for 1.900 when they are worth 1.8900. The gain is $(1.9000 - 1.8900) \times 100,000 = \$1,000$

b. The investor is obligated to sell pounds for 1.9000 when they are worth 1.9200. The loss is $(1.9200 - 1.9000) \times 100,000 = \$2,000$

B6.

a. The trader sells for 50 cents per pound something that is worth 48.20 cents per pound. Gain = $(\$0.5000 - \$0.4820) \times 50,000 = \900

b. The trader sells for 50 cents per pound something that is worth 51.30 cents per pound. Loss = $(\$0.5130 - \$0.5000) \times 50,000 = \650

B7. You have sold a put option. You have agreed to buy 100 shares for \$40 per share if the party on the other side of the contract chooses to exercise the right to sell for this price. The option will be exercised only when the price of stock is below \$40. Suppose for example, that the option is exercised when the price is \$30. You have to buy at \$40 shares that are worth \$30; you lose \$10 per share, or \$1,000 in total. If the option is exercised when the price is \$20, you lose \$20 per share, or \$2,000 in total. The worst that can happen is that the price of the stock declines to almost zero during the three-month period. This highly unlikely

event would cost you \$4,000. In return for the possible future losses, you receive the price of the option from the purchaser.

B8. The over-the counter market is a telephone- and computer-linked network of financial institutions, fund managers, and corporate treasures where two participants can enter into any mutual acceptable contract. An exchange-traded market is a market organized by an exchange where traders either meet physically or communicate electronically and the contracts that can be traded have been defined by the exchange. When a market maker quotes a bid and an offer, the bid is the price at which the market maker is prepared to buy and the offer is the price at which the market maker is prepared to sell.

B9. One strategy would be to buy 200 shares. Another would be to buy 2,000 options. If the share price does well the second strategy will give rise to greater gains. For example, if the share price goes up to \$40 you gain $[2,000 \times (\$40 - \$30)] - \$5,800 = \$14,200$ from the second strategy and only $200 \times (\$40 - \$29) = \$2,200$ from the first strategy. However, if the share price goes down to \$25, the first strategy leads to a loss of $200 \times (\$29 - \$25) = \$800$, whereas the second strategy leads to a loss of the whole \$5,800 investment. This example, shows that options contain built in leverage.

B10. You could buy 5,000 put options (or 50 contracts) with a strike price of \$25 and an expiration date of 4 months. This provides a type of insurance. If at the end of 4 months the stock price proves to be less than \$25 you can exercise the options and sell the shares for \$25 each. The cost of this strategy is the price you pay for the put options.

C. Problems

C1. The arbitrageur could borrow money to buy 100 ounces of gold today and short futures contracts on 100 ounces of gold for delivery in one year. This means that gold is purchased for \$600 per ounce and sold for \$800 per ounce. The return (33.3% per annum) is far greater than the 10% cost of the borrowed funds. This is such a profitable opportunity that the arbitrageur should buy as many ounces of gold as possible and short futures contracts on the same number of ounces. Unfortunately arbitrage opportunities as profitable as this rarely arise in practice.

C2. The investment in call options entails higher risks but can lead to higher returns. If the stock price stays at \$94, an investor who buys call options loses \$9,400 whereas an investor who buys shares neither gains nor loses anything. If the stock price rises to \$120, the investor who buys call options gains $2,000 \times (120 - 95) - 9,400 = \$40,600$

An investor who buys shares gains $100 \times (120 - 94) = \$2,600$

The strategies are equally profitable if the stock price rises to a level S , where:

$$100 \times (S - 94) = 2,000(S - 95) - 9,400$$

or, $S = 100$

The option strategy is therefore more profitable if the stock prices rise above \$100.