INSTITUTE OF ACTUARIAL & QUANTITATIVE STUDIES

Subject: IDFM

Chapter:

Category: Assignment 2 solutions

1. Answer : c

2. Answer: c

3. Answer: b

4. Answer: b

5. Answer: b

Answer: B

An investor who buys (has a long position) has a gain when a futures price increases. An investor who sells (has a short position) has a loss when a futures price increases.

6. Answer: c

Answer: C

Suppose that S_T is the final asset price and K is the strike price/forward price. A short forward contract leads to a payoff of $K-S_T$. A long position in a European call option leads to a payoff of $\max(S_T-K, 0)$. When added together we see that the total position leads to a payoff of $\max(0, K-S_T)$, which is the payoff from a long position in a put option. C can also be seen to be true by plotting the payoffs as a function of the final stock price.

7. Answer: b

Answer: B

One futures contract protects a portfolio worth 1250×250. The number of contract required is therefore 5,000,000/(1250×250)=16. To remove market risk we need to gain on the contracts when the market declines. A short futures position is therefore required.

8. Answer: d

Answer: D

There will be a margin call when more than \$1000 has been lost from the margin account so that the balance in the account is below the maintenance margin level. Because the company is short, each one cent rise in the price leads to a loss or 0.01×50,000 or \$500. A greater than 2 cent rise in the futures price will therefore lead to a margin call. The future price is currently 70 cents. When the price rises above 72 cents there will be a margin call.

9. Answer: a

The optimal hedge ratio is

$$0.7\times\frac{1.2}{1.4}=0.6$$

ASSIGNMENT 2 SOLUTIONS

The beef producer requires a long position in $200000 \times 0.6 = 120,000$ pounds of cattle. The beef producer should therefore take a long position in 3 December contracts closing out the position on November 15.

10. Answer: d
A short position in

$$1.3 \times \frac{50,000 \times 30}{50 \times 1,500} = 26$$

contracts is required. It will be profitable if the stock outperforms the market in the sense that its return is greater than that predicted by the capital asset pricing model.

11.
a) The minimum variance hedge ratio is 0.95×0.43/0.40=1.02125.
b) The hedger should take a short position.
c) The optimal number of contracts when daily settlement is not considered is 1.02125×55,000/5,000=11.23 (or 11 when rounded to the nearest whole number)
d) The optimal number of contracts is $\hat{\rho}\hat{\sigma}_S V_A/(\hat{\sigma}_F V_F)$ where $\hat{\rho}$ is correlation between percentage one-day returns of spot and futures, $\hat{\sigma}_S$ and $\hat{\sigma}_F$ are the standard deviations of percentage one-day returns on spot and futures, V_A is the value of the position and V_F is the futures price times the size of one contract. In this case V_A = 55,000×28 = 1,540,000 and V_F=5,000×27=135,000. If we assume that $\hat{\rho}$=0.95 and $\hat{\sigma}_S / \hat{\sigma}_F = 0.43/0.40 = 1.075$, the optimal number of contracts when daily settlement is considered 0.95×1.075×1,540,000/135,000=11.64 (or 12 when rounded to the nearest whole number).

12. C

13. C

14. A is correct.
Infrastructure projects involving construction have more risk than investments in existing assets with a demonstrated cash flow or investments in assets that are expected to generate regular cash flows because the assets will be leased back to a government.

15.

The notional value of this short futures position is 1500(20)(250) = 7.5 million. The initial margin requirement is 5% of 7.5 million, or 375,000, and the maintenance margin requirement is 90% of 375,000, or 337,500. Judy has a short position, so when the index decreases/increases, her margin account would increase/decrease.

At the first marking-to-market, when the index has fallen to 1498, the margin account is:

$375{,}000 \times \exp(0.04/365) + (1500 - 1498)(20)(250) = 375{,}041.10 + 10{,}000 = 385{,}041.10.$

For Judy not to get a margin call at the second marking-to-market, the value of the index, X, would have to rise so that the account balance decreases to 337,500:

$385{,}041.10 \times \exp(0.04/365) + (1498 - X)(20)(250) = 337{,}500$

$X = 1507.52.$

16. Solution:
The effective paid realized is $59.50. This can be calculated as the March 1 futures price (=59) plus the basis on July 1 (=0.50).

17. Solution:
The optimal hedge ratio is 0.9×(2/3) or 0.6

18. Solution:
Equation (3.1) shows that the hedge ratio should be 0.6 × 1.5 = 0.9. The company has an exposure to the price
of 100 million gallons of the new fuel. It should therefore take a position of 90 million gallons in gasoline futures. Each futures contract is on 42,000 gallons. The number of contracts required is therefore

$$\frac{90{,}000{,}000}{42{,}000} = 2142.9$$

or, rounding to the nearest whole number, 2143.