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FE-620 – Final Exam – Fall 2018

The procedure is in the attached files

Problem 1

A one-year call option on a stock with a strike price of $30 costs $3; a one-year put option on the stock with a strike price of $30 costs $4. Suppose that a trader buys two call options and one put option.

(i) What is the breakeven stock price, above which the trader makes a profit?

35

(ii) What is the breakeven stock price below which the trader makes a profit?

20

Problem 2

You sell one December gold futures contracts when the futures price is $1,010 per ounce. Each contract is on 100 ounces of gold and the initial margin per contract that you provide is $2,000. The maintenance margin per contract is $1,500. During the next day the futures price rises to $1,012 per ounce. What is the balance of your margin account at the end of the day? 1800

Problem 3

Tailing the hedge is (circle one) D

(a) A strategy where the hedge position is increased at the end of the life of the hedge
(b) A strategy where the hedge position is increased at the end of the life of the futures contract
(c) A more exact calculation of the hedge ratio when forward contracts are used for hedging
(d) None of the above

Problem 4

The yield curve is flat at 6% per annum with semiannual compounding. What (to the nearest cent) is the value of an FRA where the holder receives interest at the rate of 8% per annum for a six-month period on a principal of $1,000 starting in two years? 8.61

Problem 5

A short forward contract that was negotiated some time ago will expire in three months and has a delivery price of $40. The current forward price for three-month forward contract is $42. The three month risk-free interest rate (with continuous compounding) is 8%. What to the nearest cent is the value of the short forward contract? -1.96

Problem 6

A portfolio is worth $24,000,000. The futures price for a Treasury note futures contract is 110 and each contract is for the delivery of bonds with a face value of $100,000. On the delivery date the duration of the bond that is expected to be cheapest to deliver is 6 years and the duration of the portfolio will be 5.5 years. How many contracts are necessary for hedging the portfolio? 200

Problem 7

Suppose that the yield curve is flat at 5% per annum with continuous compounding. A swap with a notional principal of $100 million in which 6% is received and six-month LIBOR is paid will last another 15 months. Payments are exchanged every six months. The six-month LIBOR rate at the last reset date (three months ago) was 7%. Answer in millions of dollars to two decimal places.

(i) What is the value of the fixed-rate bond underlying the swap? 102.61
(ii) What is the value of the floating-rate bond underlying the swap? 102.21

(iii) What is the value of the payment that will be exchanged in 3 months? -0.49
(iv) What is the value of the payment that will be exchanged in 9 months? 0.45
(v) What is the value of the payment that will be exchanged in 15 months? 0.44
(vi) What is the value of the swap? 0.4

Problem 8

Consider an exchange traded put option to sell 100 shares for $20. Give (a) the strike price and (b) the number of shares that can be sold after

(i) A 5 for 1 stock split (a) 4 (b) 500

(ii) A 25% stock dividend (a) 16 (b) 125

(iii) A $5 cash dividend (a) 20 (b) 100

Problem 9

The price of a European call option on a non-dividend-paying stock with a strike price of $50 is $6. The stock price is $51, the continuously compounded risk-free rate (all maturities) is 6% and the time to maturity is one year. What, to the nearest cent, is the price of a one-year European put option on the stock with a strike price of $50? 2.09

Problem 10

A three-month call with a strike price of $25 costs $2. A three-month put with a strike price of $20 and costs $3. A trader uses the options to create a strangle. For what two values of the stock price in three months does the trader breakeven with a profit of zero?

30 and 15

Problem 11

The current price of a non-dividend-paying stock is $30. Over the next six months it is expected to rise to $36 or fall to $26. Assume the risk-free rate is zero

(i) What long position in the stock is necessary to hedge a short call option when the strike price is $32? Give the number of shares purchased as a percentage of the number of options that have been sold 0.4

(ii) What is the value the call option 1.6

(iii) What long position in the stock is necessary to hedge a long put option when the strike price is $32. Give the number of shares purchased as a percentage of the number of options purchased option 0.6

(iv) What is the value of the put option 3.6

(v) What is the risk neutral probability of the stock price moving up 0.4

Problem 12 C

The risk-free rate is 5% and the expected return on a stock is 12%. A derivative can be valued by (circle one)

(a) Assuming that the expected growth rate for the stock price is 13% and discounting the expected payoff at 12%
(b) Assuming that the expected growth rate for the stock price is 5% and discounting the expected payoff at 12%
(c) Assuming that the expected growth rate for the stock price is 5% and discounting the expected payoff at

5%

(d) Assuming that the expected growth rate for the stock price is 13% and discounting the expected payoff at 5%

Problem 13

Consider a European call option on a currency. The exchange rate is 1.0000, the strike price is 0.9100, the time to maturity is one year, the domestic risk-free rate is 5% per annum, and the foreign risk-free rate is 3% per annum. What is a lower bound to the option price? (Give four decimal places.) 0.1048

Problem 14

A futures price is currently 40 cents. It is expected to move up to 44 cents or down to 34 cents in the next six months. The risk-free interest rate is 6%.

(i) What is the probability of an up movement in a risk-neutral world? 0.722

(ii) What is the value of a six-month put option with a strike price of 37 cents? (Give two decimal places) 0.81

(iii) What is the value of a six-month call with a strike price of 33 cents? (Give two decimal places) 7.98

Problem 15

A portfolio of derivatives on a stock has a delta of 2400 and a gamma of –100. An option on the stock with a delta of 0.6 and a gamma of 0.04 can be traded.

(i) What position in the option creates a portfolio that is gamma neutral? Give size of position and state whether it is long or short 2500 long

(ii) After this position has been taken what position in the stock is then necessary for delta neutrality? Give size of position and state whether it is long or short
3900 short