Exercise 1. [5]

A stock has current price $55. The annual continuously interest rate is 4% and the continuously dividend yield is 2%.

a) What is the price of a prepaid forward contract that expires in one year from today?
b) What is the price of a forward contract that expires at the same time?
c) If the market forward price of the contract is $35, construct an arbitrage portfolio and find the arbitrage profit.

<u>Answer</u>

Exercise 2. [5]

XYZ stock cost $50 per share. It pays $2 in dividends every 3 months. The first dividend is paid in 3 months. The risk–free interest rate continuously compounded is 8%.

i) Calculate the price of a prepaid forward contract that expires 2 years from today, immediately after the dividend is paid.
ii) Calculate the price of a forward contract that expires 2 years from today, immediately after the dividend is paid.

<u>Answer</u>

Exercise 3. [5]

1) Prove the following property for creating a synthetic short forward contract:

> Short Forward Contract = Short Stock + Zero-coupon bond

2) A dealer enters into a long forward agreement to buy 1000 shares of a stock in three months for $51 per share. The stock is currently priced for $50 and pays no dividends. Which of the following strategies would hedge his risk so that his total profit would be zero in all cases?
   A) Buy 1000 shares of the stock today with $50,000 cash borrowed on a three-month loan at the risk-free rate.
   B) Buy 1000 shares of the stock today and invest an amount of $50,000 at the risk-free rate for 3 months.
   C) Sell 1000 shares of the stock short and invest an amount of $50,000 at the risk-free rate for 3 months.
   D) Sell 1000 shares of the stock short and borrow an amount of $50,000 at the risk-free rate for 3 months.
   E) No hedging is necessary

Answer

Exercise 4. [6]

A trader enters in 3 long units of gold futures contract (100 ounces per contract) on the opening of April 24th when the futures price is $100 per ounce.

- The initial margin is 10%.
- The maintenance margin is 55%.
- The margin account earns interest of 5% compounded continuously.

a)   Calculate the margin account balance at the end of April 24th.

b)   Find the greatest value of the futures price on April 25th ($x) at which you receive a margin call?

Day	Futures Price (closed)
April 24th	$101
April 25th	$x

c)   Now suppose the maintenance margin is y% and the futures price on April 25th is x=$96 and you received a margin call.
Find the lowest value of y.

Answer

Exercise 5. [4]

A stock A has current price of 40. A correctly priced 6-month forward contract has a price 40.564.

Stock B has current price of 30. A correctly priced 6-month forward contract has price 30.271.

Both stocks pay dividends. The continuously compounded dividend rate for stock B is twice the continuously compounded dividend rate for stock A.

Find the continuously compounded risk-free rate r.

Answer

Using $F = S\,e^{(r-\delta)T}$ with $T = 0.5$.

Stock A: $40.564 = 40\,e^{(r-\delta)(0.5)}$
$$(r-\delta)(0.5) = \ln\!\left(\frac{40.564}{40}\right) = 0.014 \implies r-\delta = 0.028$$

Stock B: $30.271 = 30\,e^{(r-2\delta)(0.5)}$
$$(r-2\delta)(0.5) = \ln\!\left(\frac{30.271}{30}\right) = 0.009 \implies r-2\delta = 0.018$$

Subtracting: $\delta = 0.028 - 0.018 = 0.01$

Therefore $r = 0.028 + \delta = 0.038 = 3.8\%$.

Extra Page