Section 7 problems:

1. A non-dividend paying stock currently sells for 50. A 2-year forward contract has forward price equal to 60. Determine the forward premium and the annualized forward premium.

2. A non-dividend paying stock currently sells for 50. The risk free interest rate is 3% compounded continuously. Under a no arbitrage assumption, determine the forward price for a 2-year forward contract, and determine the annualized forward premium for the contract.

3. A non-dividend paying stock currently sells for 50. The risk free interest rate is 3% compounded continuously. A 2-year forward contract has forward price equal to 60. Describe a position that would guarantee a profit, and determine the amount of the profit.

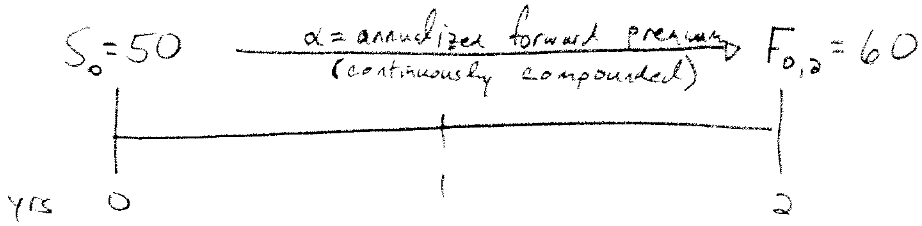
4. A non-dividend paying stock currently sells for 50. The risk free interest rate is 3% compounded continuously. A 2-year forward contract has forward price equal to 52. Describe a position that would guarantee a profit, and determine the amount of the profit.

5. A stock currently sells for 50. The stock pays semiannual dividends of 0.10 with the next dividend payable in 6 months. The risk free interest rate is 3% compounded continuously. Under a no arbitrage assumption, determine the annualized forward premium for a 2-year forward contract.

6. A stock currently sells for 50. The stock pays continuous dividends at the constant rate of $\delta = 0.02$. The risk free interest rate is 3% compounded continuously. Under a no arbitrage assumption, determine the annualized forward premium for a 2-year forward contract.

Section 7 Solutions

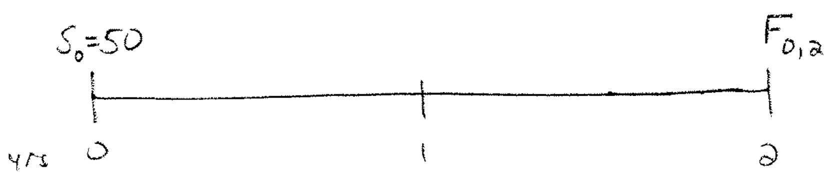
1)



$$\text{forward premium} = \frac{F_{0,2}}{S_0} = \frac{60}{50} = 1.2$$

$$\alpha: \quad 50 \cdot e^{2\alpha} = 60 \implies \alpha = \frac{\ln(1.2)}{2} \doteq 0.091$$

2)



$S_0 = 50 = F^P_{0,2}$ since no dividends

$$F_{0,2} = F^P_{0,2} \cdot a(2) \ \underset{r = \text{risk-free rate}}{\overset{\text{using}}{=}} \ 50 \cdot e^{2(.03)} \doteq 53.09$$

$$\alpha: \quad 50\, e^{2\alpha} = F_{0,2} = 50\, e^{2(.03)} \implies \alpha = .03$$

($\alpha = r$ in this case)

3) By #2, $F_{0,2}$ should equal 53.09, but it is 60. too high

$\therefore$ sell the 2-year forward

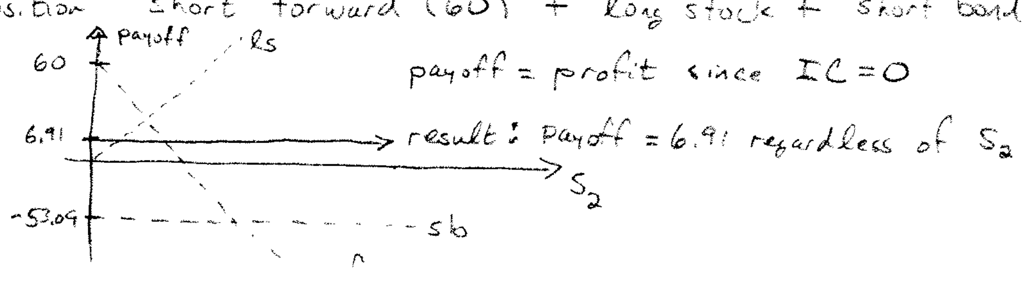
We have to deliver the stock in 2 years

Borrow 50 and buy the stock today (no cost : IC = 0)

Repay 53.09 in 2 years from the 60 we receive.

Deliver stock and close position, resulting in 6.91 profit.

<u>Note</u>: Position short forward (60) + long stock + short bond (53.09)



4) By #2, $F_{0,2}$ should be 53.09, but it's 52 (too low)

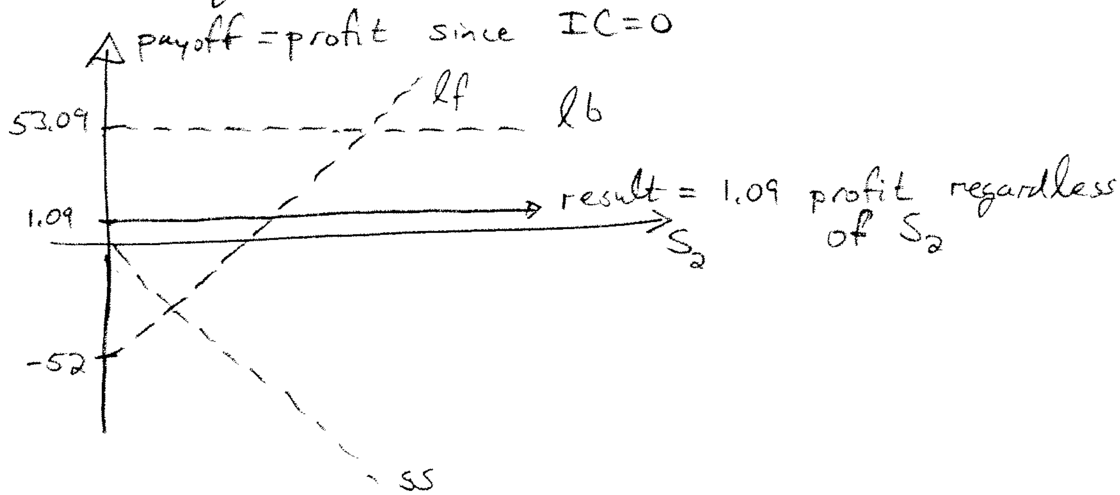
∴ buy the 2-year forward

We will take delivery of the stock in 2 years

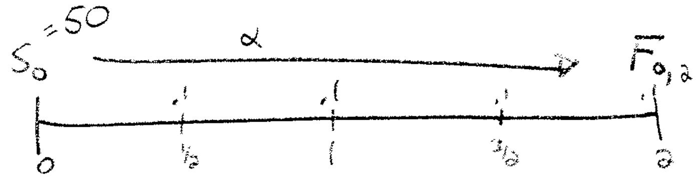
Short the stock today and lend the 50 from the short sale (no cost : IC=0) → we receive 53.09 in 2 years

In 2 years close the forward by paying 52 and taking delivery of the stock. Use the stock to close the short sale and get the 53.09 from the loan, resulting in a profit of $53.09 - 52 = 1.09$

Note: Position long forward (52) + short stock + long bond (53.09)



5)



$$F^P_{0,2} = S_0 - PV(\text{dividends})$$

$$= 50 - .1e^{-.03(1/2)} - .1e^{-.03(1)} - .1e^{-.03(3/2)} - .1e^{-.03(2)}$$

$$\doteq 49.6147$$

$$F_{0,2} = F^P_{0,2} \cdot a(2) = 49.6147 \cdot e^{.06} \doteq 52.68$$

$$\alpha: \quad \underbrace{50}_{S_0} e^{2\alpha} = \underbrace{52.68}_{F_{0,2}} \Longrightarrow \alpha \doteq 0.026$$

6)

$$F^P_{0,2} = S_0 \cdot e^{-2\delta} = 50\, e^{-0.04}$$

$$F_{0,2} = F^P_{0,2} \cdot e^{0.06} = 50\, e^{-0.04} \cdot e^{0.06} = 50\, e^{0.02}$$

$$\alpha: \quad S_0 \cdot e^{2\alpha} = F_{0,2} \Rightarrow 50 e^{2\alpha} = 50 e^{0.02}$$

$$\Longrightarrow \alpha = .01 \quad (\alpha = r - \delta \text{ in continuous dividend case})$$