Tutorial - Class Activity (Solution)

17 September, 2019

Problem 1

1.7 Suppose you desire to short-sell 400 shares of JKI stock, which has a bid price of $25.12 and an ask price of $25.31. You cover the short position 180 days later when the bid price is $22.87 and the ask price is $23.06.

    a. Taking into account only the bid and ask prices (ignoring commissions and interest), what profit did you earn?

    b. Suppose that there is a 0.3% commission to engage in the short-sale (this is the commission to sell the stock) and a 0.3% commission to close the short-sale (this is the commission to buy the stock back). How do these commissions change the profit in the previous answer?

Solution

a) A short sale of JKI stock entails borrowing shares of JKI, then selling them and receiving cash, and we learned that we sell assets at the bid price. Therefore, initially, we will receive the proceeds from the sale of the asset at the bid (ignoring the commissions and interest). After 180 days, we cover the short position by buying the JKI stock, and we saw that we will always buy at the ask. Therefore, we earn the following profit:

$$400 \times (\$25.12) - 400 \times (\$23.06) = \$10,048 - \$9,224.00 = \$824.00$$

b) We have to pay the commission twice. The commission will reduce our profit:

$$400 \times (\$25.12) - 400 \times (\$25.12) \times 0.003 - (400 \times [\$23.06] + 400 \times [\$23.06] \times 0.003)$$

$$= \$10,048 \times 0.997 - \$9,224 \times 1.003$$

$$= \$10,017.86 - \$9,251.67$$

$$= \$766.19.$$

Problem 2

Show that the payoff of a covered put (short a stock and sell a K-strike put on the stock) is equal to the payoff of selling a zero-coupon bond with face value of K and selling a K-strike call. Both options have a strike price K and time to expiration T.

Solution

The cash flows for the portfolio of a covered put (short a stock and sell a K-strike put on the stock) is given as follows

			$t = T$
Transactions	$t = 0$	$S_T \leq K$	$S_T > K$
Short a stock	S_0	$-S_T$	$-S_T$
Sell (Short) a K-strike put	P	$-(K - S_T)$	0
Total	$S_0 + P$	$-K$	$-S_T$

The cash flows for the portfolio of selling a zero-coupon bond with face value of K and selling a K-strike call are given as follows

			$t = T$
Transactions	$t = 0$	$S_T \leq K$	$S_T > K$
Sell a zero-coupon bond with face value of K	$PV(K)$	$-K$	$-K$
Sell (Short) a K-strike call	C	0	$-(S_T - K)$
Total	$PV(K) + C$	$-K$	$-S_T$

The above tables show that two portfolios have the identical payoff.

Problem 3

3.8 Suppose the premium on a 6-month S&R call is $109.20 and the premium on a put with the same strike price is $60.18. What is the strike price?

Given that the S&R 6-month forward price is $1,020 and the effective 6-month interest rate is 2%.

Solution

This question is a direct application of the Put-Call-Parity.

Let *Call* (K, t) and *Put* (K, t) denote the premiums (prices) of options with strike price K and <u>time t until expiration</u>, and $F_{0,t}$ be the forward price of the forward contract with time t until expiration. Here, all the prices are <u>at time 0</u>.

$$Call\ (K,\ t) - Put\ (K,\ t) = PV\ (F_{0,t} - K\ )$$

$$\Leftrightarrow Call\ (K,\ t) - Put\ (K,\ t) - PV\ (F_{0,t}\ ) = -PV\ (K\ )$$

$$\Leftrightarrow \$109.20 - \$60.18 - \$1{,}000 = -\frac{K}{1.02}$$

$$\Leftrightarrow K = \$970.00$$