

Corporate Finance, Module 20: "Introduction to Options"

Practice Problems: (representative of the final exam problems)

(The attached PDF file has better formatting.)

Exercise 20.1: Payoff and Profit

A one-year European call option has a premium of \$15 and a strike price of \$80. The risk-free rate is 8% with annual compounding and the stock price in one year is \$92.

- A. What is the payoff of the call option?
- B. What is the accumulated value of the call option's premium?
- C. What is the net profit from the call option?

Solution 20.1:

Part A: The payoff at maturity is $\$92 - \$80 = \$12$.

Part B: The accumulated value of the premium is $\$15 \times 1.08 = \16.20 .

Part C: The net profit is $\$12 - \$16.20 = -\$4.20$.

Exercise 20.2: Put Call Parity Relation

The price of a European *call option* that expires in three months and has a strike price of \$30 is \$2. The underlying stock price is \$29, the risk-free interest rate is 10% per annum with annual compounding, and the stock pays no dividends. What is the price of a European *put option* that expires in three months and has a strike price of \$30?

Solution 20.2: The put call parity relation says

$$\begin{aligned} \text{put} + \$29 &= \$2 + \$30 \times 1.10^{-1/4} \\ \text{or put} &= \$30 \times 1.10^{-1/4} - \$27 = \$2.29 \end{aligned}$$

Exercise 20.3: Put Call Parity Relation

An investor sells a 1-year European call option on a non-dividend paying stock with a exercise price of \$110 and buys a 1-year European put option with the same exercise price and term. The current risk-free rate is 12% and the value of the combined position is zero. (The combined position is a long put and a short call, or put value – call value.)

- A. Given the value of $p - c$ (put option minus call option), what is the value of $S_0 - PV(K)$, the stock price minus the present value of the exercise price?
- B. Given the exercise price and the time to maturity, what is $PV(K)$, the present value of the exercise price?
- C. What is the current price of the stock (S_0)?

Solution 20.3: The put call parity relation says that

$$\begin{aligned} \text{call} + \text{present value (exercise price)} &= \text{put} + \text{stock, or} \\ \text{call} - \text{put} &= \text{stock} - PV(K), \text{ where } K \text{ is the exercise price.} \end{aligned}$$

Part A: The value of the combined position of the put option minus the call option is zero, so $S_0 - PV(K) = 0$.

Part B: Since $K = \$110$ and the time to maturity is one year, the present value of the exercise price is $\$110 / 1.12 = \98.21 .

Part C: The current stock price is also $\$98.21$.

{*Note:* If we use continuous compounding for the 12% risk-free rate, we get $S_0 = PV(K) = \$110e^{-0.12} = \97.56 . The actuarial exam syllabi use continuous compounding for option pricing}