ÉCOLE POLYTECHNIQUE
FÉDÉRALE DE LAUSANNE

Principles of Finance

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Assignment 8

Instructions

- Assignments should be done in groups of 3 students.
- You should remain with the same group through the entire course.
- Submit on Moodle only one copy of solutions per group.
- For each assignment you can get a maximum of 100 points.
- All assignments turned in late will not be graded (zero points).

Due date
The due date is indicated on Moodle.

1. Suppose the stock price evolves according to a binomial tree with three periods ($T = 3$) and the following parameters: Each period, it either moves up by 25% or down by 20%. The stock price at time zero is \$50 and in each period the risk-free rate equals 5%.

   Using a strike price of \$60, price a European call and a European put options. (20 points)

2. Suppose you write a put option contract on 100 IBM shares with a strike price of \$90 and an expiration date of 3 months. The current price of IBM stock is \$100. What have you committed yourself to? How much can you gain or lose? (10 points)

3. "The buyer of the call and the seller of the put both hope that the stock price will rise. There fore the two positions are identical". Is the speaker correct? Illustrate with a diagram. (10 points)

4. The current price of an equity share of Strategy Inc. is \$50. The stock follows a binomial process where each period the stock either goes up 10 percent or down 10 percent. Compute the fair market value of a European call on Strategy Inc. stock with a strike price of \$50 and two periods to expiration. Assume Strategy Inc. pays no dividends over the next two years and the risk-free rate is 2% per year. (20 points)

5. Suppose you own $5,000$ shares of IBM stock worth \$100 each. How can options be used to provide you with insurance against a decline in the value of your holdings over the next six months? (10 points)

6. The current price of a stock that pays no dividends is \$100. In one year the price of the stock can either increase by 10% or decrease by 10%. A European call option on this stock with an exercise price of \$95 and a one year maturity is currently trading at \$10.09615. (30 points)

   (a) Determine the risk-free interest rate and the risk-neutral probability of an upward movement?

   (b) You would like to buy a European put option with an exercise price of \$100 and a two year maturity. Assuming that risk-free rate and the risk-neutral probabilities are constant over time, what is the price you have to pay?

   (c) Determine the price of a European option with maturity of three years ($T = 3$) and strike price of \$95 that pays $\max\{0, \min\{S_t\}_{0 \le t \le T} - K\}$.