

Fourth Year BS (Honors) 2020-2021

Math Lab Assignment 03

Course Code: AMTH 450 Course Title: Math Lab IV

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Question 1

Which of the two investments described below is preferable? Assume the first payment will take place exactly one year from now and further payments are spaced one year apart. Assume the continually compounded annual interest rate is 2.75%.

Year	1	2	3	4
Investment A	200	211	198	205
Investment B	198	205	211	200

Question 2

Suppose an investor will receive payments at the end of the next six years in the amounts shown in the table.

Year	1	2	3	4	5	6
Payment	465	233	632	365	334	248

In the interest rate is 3.5% compounded semiannually, what is the present value of the investment?. [Assume the first payment will arrive one year from now].

Question 3

A company borrows \$100,000 at 12 percent compounded semiannually. The debt is amortized by making equal payments at the end of each 6 months for 7 years.

Formula: Amortization Payment, $R = P \left[\frac{r}{1 - (1+r)^{-n}} \right]$

- (i) Find the amount of each payment.
- (ii) Construct a table which will show how much of the balance you paid and how much does it reduce the balance owed?

Question 4

Write a Matlab script m-file to draw the Payoff and Profit diagrams of (i) long call, (ii) short call, (iii) long put, and (ii) short put. [Use $K = \$100$, premium= \$3].

Question 5

Call options on a stock are available with strike prices of \$15, \$17.5, and \$20, and expiration dates in 3 months. Their prices are \$4, \$2, and \$0.5, respectively. Now draw Payoff diagram of butterfly spread. [Note: $K_{long_1} < K_{short} < K_{long_2}$ and $K_{short} = \frac{K_{long_1} + K_{long_2}}{2}$ occurs in butterfly spread, $\text{Premium}_{put} \propto K_{put}$ and $\text{Premium}_{call} \propto \frac{1}{K_{call}}$].

Question 6

Call and Put options on a stock are available with strike prices of \$15 and expiration dates in 3 months. Their prices are \$2 and \$1, respectively. Now draw Payoff diagram of butterfly strip and strap. [Note: A strip consists of a long position in one European call and two European puts with the same strike price and expiration date. A strap consists of a long position in two European calls and one European put with the same strike price and expiration date.]

Question 7

Consider an American call option on a stock when there are ex-dividend dates in two months and five months. The dividend on each ex-dividend date is expected to be \$0.50. The current share price is \$40, the exercise price is \$40, the stock price volatility is 30% per annum, the risk-free rate of interest is 9% per annum, and the time to maturity is six months. Find the call option price.

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