UNIST
School of Business Administration

FIA303: Futures and Options — Daejin Kim
Fall 2018

Assignment 2
Due Date : **Tuesday, November 27, 2018**

1. **(35 points)** Suppose that you want to manage a chain of coffee shops across the US. You are worrying about coffee price increases and would like to lock-in the price at which you can buy coffee each second month over the next year. Your total demand over the year is 36 million pounds, with equal amounts needed at the end of each two months. Suppose that the risk-free rate of interest is 5% with continuous compounding.

   In order to lock-in your price over the next year, you consider buying exchange-traded futures contracts. You check the internet to get price quotes for coffee futures contracts traded on the Chicago Mercantile Exchange(CME), and you get the following price structure.

CME coffee futures prices
Contract size : 37,500 pounds

Months to Maturity	Dollars per pounds
2	1.9330
4	1.9750
6	1.9980
8	2.0145
10	2.0215
12	2.0265

   (a) **(15 points)** Suppose that you want to hedge your exposure using CME futures. How many of each contract should you buy initially when you can take telescoping futures position? (Each futures contract is for 37,500 lbs.)

   (b) **(20 points)** Suppose that you decide to try and negotiate a "fixed-price, fixed-supply" contract with a commodity swap dealer. Under the terms of the swap, you would pay a "fixed-price" per pound in each two months of the contract, and receive a "fixed supply" of 6 million pounds at the end of each two months. Assuming that you are indifferent between buying futures and buying the fixed-price, fixed-supply contract from a delivery standpoint, what is the maximum price per 37,500 pounds that you are willing to pay?

2. **(20 points)** Suppose that you distribute gasoline to residences in Korea. Fearing increases in crude oil price, you decide to lock-in the price that you will pay for gasoline over the next 12 months. Your demands for gasoline over the next year will be 200 million liters for months 1 to 4, 180 million liters for months 5 to 8, and 150 million liters for the rest of the year. A commodity swap dealer has promised to deliver for the gasoline that you need at a fixed price of KRW 1,790 per liter. Compute swap dealer's margin assuming he hedges using forward contracts. The gasoline forward curve is

$$f_t = 1750 + 100 \ln(1 + t)$$

and the zero-coupon yield curve for risk-free bonds is

$$r_t = 0.03 + 0.01 \ln(1 + t)$$

3. **(30 points)** Suppose that you want to enter a 3-year swap such that interest payments are made semiannually and netted. Assume the zero-coupon yield curve is described by the following equation

$$r_t = 0.02 + 0.015 \ln(1 + t)$$

where r_t is the continuously compounded zero-coupon rate on a t-year bond.

   (a) **(10 points)** Based on this zero-coupon yield curve, compute 3-year swap rate assuming the fixed rate is set such that the initial value of the swap is zero.

   (b) **(20 points)** Assume that you entered a 3-year swap two months ago when the yield curve was as specified above. Interest rates have changed and the current yield curve is

$$r_t = 0.03 + 0.02 \ln(1 + t)$$

   Compute the new value of the swap assuming you are paying fixed and receiving floating.