Homework #2 (Due before lecture 3)

1. *Valuing forward contracts*

   A long forward contract on a non-dividend-paying stock was entered into some time ago. It currently has 6 months to maturity. The risk-free rate of interest (with continuous compounding) is 10% per annum, the stock price is $25, and the delivery price is $24.

   a. Program a MATLAB function to value a forward contract. ($f = s_0 - Ke^{-r\tau}$)
   b. Write a script file that uses your function to value the forward contract in this problem.

2. *Bond Price and Duration*

   A 5-year bond with a yield of 11% (continuously compounded) and a face value of $100 pays an 8% coupon at the end of each year.

   a. Program a MATLAB function that assumes the face value as $100 and the time to maturity as 5 years, takes the yield and the coupon rate as **input** and returns the bond price and the bond's duration as **output**.

   (Bond price: $B = \sum_{i=1}^{n} c_i e^{-yt_i}$; Duration: $D = \frac{1}{B}\sum_{i=1}^{n} t_i c_i e^{-yt_i}$)

   b. Write a script file that uses your MATLAB function to compute the price and duration of the bond described in this problem.

3. Straddle

One popular combination is a *straddle*, which involves buying a call and put with the same strike price and expiration date. The profit pattern is shown in Figure 10.10. The strike price is denoted by K. If the stock price is close to this strike price at expiration of the options, the straddle leads to a loss. However, if there is a sufficiently large move in either direction, a significant profit will result. The payoff from a straddle is calculated in Table 10.5.

Figure 10.10 Profit from a straddle.

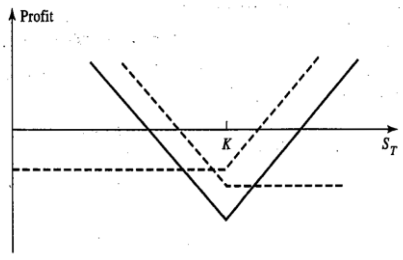

Table 10.5 Payoff from a straddle.

Range of stock price	*Payoff from call*	*Payoff from put*	*Total payoff*
$S_T \leq K$	0	$K - S_T$	$K - S_T$
$S_T > K$	$S_T - K$	0	$S_T - K$

a. Program a MATLAB function to compute the payoff of a straddle when s and k are given.
b. Write a script that uses your function to plot the payoff of a straddle with k = 30 for s varying from 10 to 50, incrementing by one.

4. Cheapest-to-Deliver Issue in Treasury Bond Futures

Chicago Board of Trade lists 25 treasury bonds that are eligible for delivery for futures expiring in three months, and you are asked to select the cheapest to deliver. Suppose the implied repo rates for these 25 bonds are provided, and they are given in *HW_2_impliedRepo.xlsx*.

Please write a Matlab program (script) to select the bond with the Maximum implied repo rate, which is the cheapest to deliver. Your program should display both the bond ID and the repo rate for the bond that is cheapest to deliver. (Hint: type "help max" on the Matlab command line to see how you can get the maximum value and the index of the maximum value, which will be helpful for finding the corresponding bond ID)

Note:

- Put all your answers and MATLAB code in one Word file and post it to Blackboard.