FE-620 – Assignment 2

Problem 1.

The following table gives Treasury zero rates and cash flows on a Treasury bond:

Maturity (years	Zero rate	Coupon payment	Principal
0.5	2.0%	$20	
1.0	2.3%	$20	
1.5	2.7%	$20	
2.0	3.2%	$20	$1000

Zero rates are continuously compounded

(a) What is the bond's theoretical price?

(b) What is the bond's yield assuming the bond sells for its theoretical price?

Problem 2.

Portfolio A consists of a one-year zero-coupon bond with a face value of $2,000 and a 10-year zero-coupon bond with a face value of $6,000. Portfolio B consists of a 5.95-year zero-coupon bond with a face value of $5,000. The current yield on all bonds is 10% per annum.

(a) *Show that both portfolios have the same duration.*
(b) *Show that the percentage changes in the values of the two portfolios for a 0.1% per annum increase in yields are the same.*
(c) *What are the percentage changes in the values of the two portfolios for a 5% per annum increase in yields?*

Problem 3.

A stock is expected to pay a dividend of $1 per share in two months and in five months. The stock price is $50, and the risk-free rate of interest is 8% per annum with continuous compounding for all maturities. An investor has just taken a short position in a six-month forward contract on the stock.

a) *What are the forward price and the initial value of the forward contract?*
b) *Three months later, the price of the stock is $48 and the risk-free rate of interest is still 8% per annum. What are the forward price and the value of the short position in the forward contract?*

Problem 4.

It is March 10, 2017. The cheapest-to-deliver bond in a December 2017 Treasury bond futures contract is an 8% coupon bond, and delivery is expected to be made on December 31

31, 2017. Coupon payments on the bond are made on March 1 and September 1 each year. The rate of interest with continuous compounding is 5% per annum for all maturities. The conversion factor for the bond is 1.2191. The current quoted bond price is $137. Calculate the quoted futures price for the contract.

Problem 5.

On June 25, 2017, the futures price for the June 2017 bond futures contract is 118-23.

a) *Calculate the conversion factor for a bond maturing on January 1, 2033, paying a coupon of 10%.*
b) *Calculate the conversion factor for a bond maturing on October 1, 2038, paying coupon of 7%.*
c) *Suppose that the quoted prices of the bonds in (a) and (b) are 169.00 and 136.00, respectively. Which bond is cheaper to deliver?*
d) *Assuming that the cheapest to deliver bond is actually delivered on June 25, 2017, what is the cash price received for the bond?*