PGDM, 2016-18

Fixed Income Securities

DM-512/IB-511

Trimester – V, End-Term Examination: December 2017

Time allowed: 2 Hrs 30 Min
Max Marks: 50

Roll No: ____________

Instruction: Students are required to write Roll No on every page of the question paper, writing anything except the Roll No will be treated as **Unfair Means.** All other instructions on the reverse of Admit Card should be followed meticulously.

Sections	No. of Questions to attempt	Marks	Marks
A	3 out of 5 (Short Questions)	5 Marks each	3*5 = 15
B	2 out of 3 (Long Questions)	10 Marks each	2*10 = 20
C	Compulsory Case Study	15 Marks	15
		Total Marks	**50**

A. Please attempt 3 questions out of 5 given below.

A1. A bond with a $ 100 par value pays a 5% coupon annually for 4 years. The spot rates corresponding to the payment dates are as follows; Year 1: 4.0%, year 2: 4.5%, year 3: 5.0% and year 4: 5.5%. Assume the price of the bond is $ 98.47. Show the calculation of the price of the bond using spot rates and determine the Yield to maturity (YTM) for the bond.

A2. An investor buys a 15-year semiannual coupon bond yielding 4%. The bond has a market value of $100 and is currently trading at par. The bond's DV01 is 0.1119. The investor plans to hedge this bond position by selling call options. The DV01 of the call options when the rate is 4% is 0.1045. Compute the face value of the call options that is needed to hedge the 15-year bond position.

A3. Suppose there is a 15-year, option free non callable bond with an annual coupon of 7%. trading at par. Compute and interpret the bond's duration for a 50 basis point increase and decrease in yield.

A4. Estimate the percentage price change in bond price from a 25 basis point increase in yield on a bond with a duration of 7 and a convexity of 243.

A5. Compute the 6-month forward rate in one year given the following spot rates, z(1.0)= 2.15% and z(1.5)= 2.53%.

B. Please attempt 2 questions out of given 3 given below.

B1. An investor is estimating the interest rate risk of a 14% semiannual pay coupon bond with 6 years to maturity. The bond is currently trading at par. The effective duration and effective convexity of the bond for a 25 basis point increase and decrease in yield is what?

B2. Given the STRIPS price in the below figure, compute the discount factors and spot rates for maturities ranging from six months to three years, and graph the spot rate curve.

Maturity (Years)	STRIPS Price	Discount factor
0.5	99.2556`	0.992556
1.0	97.8842	0.978842
1.5	96.2990	0.962990
2.0	94.3299	0.943299
2.5	92.1205	0.921205
3.0	89.7961	0.897961

B3. A European put option has two years to expiration and a strike price of $ 101.00. The underlying is a 7% annual coupon bond with three years to maturity. Assume that the risk-neutral probability of an up move is 0.76 in year 1 and 0.60 in year 2. The current interest rate is 3.00%. At the end of year 1, the rate will either be 5.99% or 4.44%. If the rate in year 1 is 5.99%, it will either rise to 8.56% or rise to 6.34% in year 2. If the rate is 4.44%, it will either rise to 6.34% or rise to 4.70%. The value of put option is closest to?

C. This is Compulsory question.

Suppose Company X pays 5% annually (in euros) to Company Y and receives 4% annually (in dollars). Company X pays a principal amount of $ 150 million to Y, and Y pays a Euro 100 million to X at the inception of the swap. Assume the yield curve is flat in the United States and in Germany (Europe). The U.S. rate is 3%, and the German rate is 5%. The current spot exchange rate is $ 1.45/ Euro. What is the value of the currency swap to Company X using the bond methodology if it is expected to last for two more years?

Formulas

1. To determine the future value of any sum of money invested today the following equation is used.

   $P_n = P_0(1+r)^n$

   Where:

   - n= number of periods
   - P_n=future value n periods from now (in dollars)
   - P_0= original principal (in dollars)
   - r= interest rate per period (in decimal form)

2. Future Value of an ordinary annuity $P_n = A[\frac{(1+r)^n-1}{r}]$
3. Present Value formula $PV = P_n[\frac{1}{(1+r)^n}]$
4. Present value of a series of future values PV=$\sum_{t=1}^{n} \frac{P_t}{(1+r)^t}$
5. Present value of an ordinary annuity PV=$A[\frac{1-\frac{1}{(1+r)^n}}{r}]$
6. Pricing a Bond-Formula

   In general the price of a bond can be computed using the following formula P=$\sum_{i=1}^{n} \frac{C}{(1+r)^t} + \frac{M}{(1+r)^n}$ Where,

   - P=price (in dollars)
   - n=number of periods
   - C=semiannual coupon payment
   - r=periodic interest rate
   - M= Maturity value
   - t= time period when the payment is to be received.

   or Since, the semiannual coupon payments are equivalent to an ordinary annuity, applying the formula for the present value of an ordinary annuity gives the present value of the coupon payments,

   P=$C[\frac{1-\frac{1}{(1+r)^n}}{r}] + \frac{M}{(1+r)^n}$

7. Pricing a Bond-Zero Coupon Bond P=$\frac{M}{(1+r)^n}$
8. Yield or internal rate of return on any investment

   $P = \sum_{t=1}^{N} \frac{CF_t}{(1+y)^t}$

   where

   - CF_t= Cash flow in year t

- P= Price of the investment
- N= Number of years

9. Yield - Special case (Investment with only one future cash flow
P= $\frac{CF_n}{(1+y)^n}$

10. Annualizing Yields
effective annual yield= $(1 + periodicinterestrate)^m - 1$

    - where, m is the frequency of payments per year.

11. Current Yield
current yield= $\frac{annual-dollar-coupon-interest}{price}$

12. Macaulay Duration Macaulay duration= $\frac{\frac{1C}{1+y} + \frac{2C}{(1+y)^2} + ... + \frac{nC}{(1+y)^n} + \frac{nM}{(1+y)^n}}{P}$
where,

    - P= price of the bond
    - C= semiannual coupon interest (in dollars)
    - y= one-half the yield to maturity or required yield.
    - n= number of semiannual periods (number of years*2)
    - M= maturity value (in dollars)
    - the term in brackets is the weighted average average term to maturity of the cash flows from the bond, where the weights are the present value of the cash flow.

13. Modified Duration
Modified Duration=[Macaulay Duration/(1+ $\frac{YTM}{n}$)]

14. dollar duration=-(modified duration)P