Seminar 3

A. Multiple Choice Questions

A1. The following data is available:

Interest rate	5.10%	5.20%	5.30%
Bond's Price	99.75	99.50	99.30

The duration of the bond is closest to:
a. 0.2 years
b. 2.3 years
c. 4.5 years

A2. Duration measures the sensitivity of a bond's price changes in the:
a. Shape of the yield curve
b. Bid-ask spread
c. Bond's yield

A3.A bond has Duration of 2.5. Assuming interest rates increase from 4.0% to 4.2%, what is the percentage change in the bond's price?
a. -0.05%
b. -0.5%
c. -4.0%

A4. In which of the following situations would a portfolio's effective duration be *least likely* to produce accurate estimates of a bond portfolio's price change.
a. The bonds have long maturities and high durations.
b. The bonds have short maturities and low duration.
c. Long-term interest rates fall and short-term interest rates rise.

A5. If a 10-year, 8% coupon bond with Duration of 6.7 is priced at 101.28 immediately after a 90 basis points increase in yield, the bond's price prior to the change in yield is *closest* to:
a. 107.78
b. 106.95
c. 96.67

A6. Based on the following information, compute the duration of the bond.

Bond Price	Interest Rate
95.0	4.0%
94.0	4.2%
93.5	4.4%

a. 2.0
b. 4.0
c. 8.0
d. 7.5

A7. Which one of the following bonds has the shortest duration?
a. zero-coupon, 10-year maturity.
b. zero-coupon, 13-year maturity.
c. 8% coupon, 10 year maturity.
d. 8% coupon, 13-year maturity.

A8. Identify the *most accurate* statement concerning duration.
a. The higher the yield, the greater the duration.
b. The higher the coupon, the greater the duration.
c. The difference in duration between two similar coupon-paying bonds maturing in more than 15 years is small.
d. For coupon bonds, duration is the same as term to maturity.

A9. 6% semi-annual coupon bond is priced at 80 for an 8% yield-to-maturity (YTM). Convexity is 60. If YTM increases to 9.5%, how much of the percentage change in price is due to convexity?
a. 1.08 percent.
b. 1.35 percent.
c. 2.40 percent.
d. 7.35 percent.

A10. Which of the following *most accurately* measures interest rate sensitivity for bonds with embedded options?
a. Modified duration.
b. Effective duration.
c. Modified duration.
d. Macaulay duration.

A11. A bond currently sells at $925 and has a duration of 3.65. Compute the approximate percentage price change of the bond for a 75 basis point decrease in rates.
a. 2.74%
b. -2.53%
c. -2.74%
d. 2.53%

A12. Calculate the effective duration of a 15-year 8% coupon bond that is currently trading at par, assuming that a valuation model indicates a 20 basis point decline in yield causes the price to increase to $1,027, while a corresponding 20 basis point increase in yield causes the price to decline to $975.
a. 2.6
b. 13.0
c. 6.8
d. 6.5

A13. A bond priced at $102.5 has an effective duration of 4.5. If interest rates increase by 40 basis points, calculate the new price of the bond.
a. $101.80
b. 100.86
c. 98.20
d. 104.35

A14. Assuming a bond has effective duration of 4.68 and effective convexity of 16.35, what is the percentage change in the price of the bond for a 65 basis point decline in interest rates?
a. -3.11%
b. 10.65%
c. 3.11%
d. -2.97%

A15. Which of the following is a characteristic of an option-free (straight) bond:
a. As interest rate decline, the duration and convexity of the bond will increase.
b. The price-yield relationship is positive.
c. All option-free bonds exhibit negative convexity.
d. For a given change in interest rates (same percentage increase or decrease), the upside price movement will be less than the downside price movement on a percentage basis.

A16. Which of the following accurately states the difference modified convexity and effective convexity?
a. When bonds with embedded options are in the money, modified convexity should be used.
b. When bonds with options are out of the money by a significant amount, then modified convexity and effective convexity will be equal, and either one can be used to measure a bond's interest rate risk.
c. Modified convexity includes the impact of embedded options on the price of the bond, while effective convexity ignores the effect of embedded options.
d. When bonds with embedded options are at the money. Modified convexity should be used.

B. Excel Application

B1. Assume 5% coupon bond maturing in 4 years, with a face value of 1,000 and the YTM is 9% (annualized). Coupons are paid semiannually.

Calculate:
a. The fair price of the bond.
b. Macaulay and Modified Duration
c. The Duration approximation for different YTM's.
d. Convexity
e. Duration and convexity approximation for different YTM's.

f. Plot for different YTM's the Annual Percentage change in price, the Duration approximation and the Duration with convexity approximation.

B2. Assume two bonds: a 6% coupon bond maturing in 9 years, with a face value of 1,000 and YTM equal to 7% and a 4% coupon bond maturing in 2 years and face value of 100. Both bonds pay coupons semi-annually.
Additionally the following information is provided.

Maturity	0.5	1	1.5	2
Spot Rates	2.00%	2.50%	3.00%	4.00%

The spot rates are all quoted in annual basis. All calculations should be done in semi-annual rates

Calculate:

a. The fair price for the two bonds.
b. The Macaulay and Modified Duration for both bonds
c. Assume that the YTM for the bond maturing in 9 years change by ± 2%. Calculate:

  1. The effective duration.
  2. The price approximation using duration
  3. The price approximation using both duration and convexity

A3. Assume a 6.5% couponbond maturing in 15 years, with a face value of 1,000 and YTM equal to 7.2%. Coupons are paid semi-annually.

a. The Macaulay Duration, Modified Duration and Convexity for the 6.5% coupon bond.
b. Assume that the YTM for the 6.5% bond maturing in 15 years change by $\pm 1\%$
Calculate:

  i. The price approximation using duration
  ii. The price approximation using both duration and convexity
  iii. Suppose that over the first 10 years of the holding period, interest rates decline, and the yield-to-maturity on the bond falls to 5.5%. What is the price of the bond in 10 years, time?