

Session 2

Questions

Question 1

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

Question 2

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

Question 3

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%

Question 4

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.

Question 5

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

Question 6

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

Question 7

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.

Question 8

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.

Question 9

A 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.

Question 10

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.

Question 11

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%

Question 12

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

Question 13

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

Question 14

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%

Question 15

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.

Question 16

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.

Excel Application

Question 1

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.

Question 2

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 $\pm 2\%$. Calculate:
 1. The effective duration.
 2. The price approximation using duration
 3. The price approximation using both duration and convexity

Question 3

Assume a 6.5% coupon bond 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?