7.12 Yield-Based Bond Convexity and Portfolio Properties

Question 1

An analyst owns a bond portfolio made up of the following two bonds:

	Bond A	Bond B
Par value (SAR)	30,000,000	50,000,000
Yield-to-maturity (%)	6.26	9.06
Market value (SAR)	29,300,000	25,400,000
Macaulay duration	2.7	19.2

The analyst uses the following assumptions:

- There is no accrued interest.
- Market values are full prices.
- Coupons are paid semiannually.
- YTMs are stated on a semiannual bond basis.
- Macaulay durations are annualized.

Calculated using the most common method, the average annual portfolio modified duration is *closest* to:

A. 9.93

B. 10.36

C. 12.46

Question 2

A noncallable bond's market value decreases by $4,832 when its yield changes by 0.15%. The price change is due only to the effects of duration and convexity. If the convexity adjustment is $191, then the bond's money duration is *closest* to:

A. −$3,348,666.67

B. $3,221,333.19

C. $3,348,666.67

Question 3

A bond portfolio is made up of the following three bonds:

	Bond X	Bond Y	Bond Z
Price (EUR)	55.00	92.50	98.00
Market value (EUR)	4,950,000	9,250,000	4,900,000
Modified duration	10.7	6.2	4.7

Assuming annual coupon payments and no accrued interest, the portfolio's modified duration is *closest* to:
A. 6.61
B. 6.98
C. 7.58

Question 4
Portfolio duration is usually calculated as the weighted average duration of each portfolio security. A weakness of portfolio duration is that it assumes yield curves:
A. are always flat.
B. make only parallel shifts.
C. are usually upward sloping.

Question 5
If the yield to maturity of a noncallable bond changes, then compared with the actual market price of the bond, duration-based estimates of bond value *most likely*:
A. underestimate the market price if yield increases or decreases.
B. overestimate the market price if yield increases and underestimate it if yield decreases.
C. underestimate the market price if yield increases and overestimate it if yield decreases.

Question 6
A fixed-rate corporate bond's flat price is 99.50 and its annual modified duration is 3.5. Assuming the benchmark yield does not change, if the bond's credit spread, a component of yield spread, narrows by 0.22%, its new price is *closest* to:
A. 98.73
B. 99.72
C. 100.27

Question 7
A noncallable, 10-year, 7% annual coupon bond is trading at a 6% yield-to-maturity. The bond has an annual modified duration of 7.180 and an annual convexity of 67.300. If the bond's yield is expected to decrease to 5.50%, the expected price change is *closest* to:
A. 3.51%
B. 3.67%
C. 3.76%

Question 8
An analyst estimates the following for a noncallable bond with a price of £90.16:

Bond price change based on modified duration	7.68%
Annual convexity	167.85

If the bond's yield declines by 100 basis points, the convexity-adjusted estimate of the bond's new price (in £) is *closest* to:

A. 90.99
B. 97.84
C. 98.68

Question 9
An analyst gathers the following information on a noncallable, €1,000,000 par value bond that pays coupons annually:

Full price of the bond	€974,710
Money duration	€9,084,000
Convexity adjustment	€3,776
Time-to-maturity	12 years
Yield-to-maturity	5.9%
Annual coupon rate	5.6%

If the bond's YTM declined to 4.9%, the estimated price change based only on duration is €90,840. Given that 100 basis point decline in the bond's yield, the difference between the convexity-adjusted estimate of the bond's new price and its actual new price (in €) is *closest* to:
A. 3,156
B. 6,381
C. 6,932

Question 10
An analyst reviewing the change in a bond's price after its yield decreased has compiled the following data:

Selected Data	
Bond original price	88.1
Bond price when yield is increased	87.3
Bond price when yield is decreased	93.1
Decrease in yield	1.1%

Based only on this data, the convexity adjustment is *closest* to:
A. 2.38%
B. 3.78%
C. 5.68%

Question 11
A noncallable bond has a 6% YTM based on annual compounding. The bond has an annual modified duration of 18.868 and an annual convexity of 372.027. If the bond's yield is expected to increase to 6.20%, the expected price change is *closest* to:

A. −3.85%
B. −3.70%
C. −3.33%

Question 12
A government agency bond was issued at par several years ago and has the following characteristics today:

Time to maturity	10 years
Coupon rate	5%
Yield to maturity	3%
Callable at par	1 year from today

If interest rates continue to fall over the next year, the price of the callable bond is *most likely* affected by:
A. positive convexity.
B. negative convexity.
C. key rate duration risk.

Question 13
A 20-year zero-coupon bond is currently priced at 31.1805 and its yield-to-maturity is 6% based on annual compounding.

- If the yield decreases to 5.90%, the price is expected to increase to 31.7747.
- If the yield increases to 6.10%, the price is expected to fall to 30.5979.

The security's approximate convexity is *closest* to:
A. 18.869
B. 186.013
C. 372.027

Question 14
A noncallable bond with a market value of EUR 712,862 has an annual modified duration of 4.2 and a money convexity of EUR 245,000,000. If the bond's YTM decreases by 20 basis points, then based on only this information and assuming no change in credit risk, the bond's new price (in EUR) is *closest* to:
A. 707,364
B. 719,340
C. 719,830

Question 15
An option pricing model is used to calculate the following information about a callable bond:

Selected Bond Data	
Bond's initial price	84.62
Bond's price after yield increase	81.71
Bond's price after yield decrease	86.47
Benchmark yield curve increase	30 bps
Bond's YTM increase	35 bps

The bond's convexity is *closest* to:
A. −8,493.63
B. −1,391.84
C. −1,022.58

Question 16
An analyst estimates a bond portfolio's duration using the weighted average of the modified durations of the bonds in the portfolio. A limitation of this approach is that it:
A. requires calculating the portfolio's cash flow yield.
B. assumes all rates change by the same amount in the same direction.
C. is not as practical as the most commonly used portfolio duration calculation method.

Question 17
A bond portfolio contains the following three bonds:

	Bond X	**Bond Y**	**Bond Z**
Type	**Noncallable**	**Noncallable**	**Callable**
Par value (SAR)	18,000,000	20,000,000	15,000,000
Market value (SAR)	9,800,000	20,200,000	14,900,000
Modified duration	12.1	8.6	3.0
Effective duration	11.9	8.3	3.9

Assuming annual coupon payments and no accrued interest, the bond portfolio's duration is *closest* to:
A. 7.5
B. 7.8
C. 8.5

Question 18
An investment portfolio consists of the following two bonds:

	Bond A	Bond B
Par value (GBP)	10,000,000	20,000,000
Market value (GBP)	9,920,000	13,200,000
Modified duration	2.1	8.4

The bonds pay coupons annually and are trading flat (ie, the market price is equal to the full price). If each bond's YTM declines by 10 basis points, the portfolio's estimated value, based only on portfolio duration, is *closest* to:
A. GBP22,988,288
B. GBP23,251,712
C. GBP23,265,656

Question 19
For otherwise identical callable and noncallable coupon bonds, effective convexities are *most likely* to differ to the greatest degree when the:
A. benchmark yield curve is very low.
B. benchmark yield curve is very high.
C. value of embedded call options is very low.

Question 20
A noncallable bond has a money duration of €7,812,000. If the bond's YTM decreases by 30 basis points, then the bond's price increase is estimated to be €23,600. If this estimate includes the effects of both money duration and money convexity, the bond's money convexity (in €) is *closest* to:
A. 164
B. 109,333
C. 36,444,444

Question 21
A bond position with a market value of EUR 810,992 has a money duration of EUR 4,460,456 and an annual modified duration of 5.5. A decrease of 50 basis points in the bond position's YTM results in a new market value of EUR 833,861. Based on only this information and assuming no change in credit risk, the bond position's money convexity (in EUR) is *closest* to:
A. −226,688
B. 56
C. 45,337,600

Question 22
As a measure of interest rate risk, effective convexity differs from approximate convexity in that effective convexity:

A. is based on a shift in a benchmark yield curve.
B. is a closer estimate of a bond's price than approximate convexity.
C. accounts for the curvature in the relationship between a bond's price and its YTM.

Question 23
The price of a noncallable bond increases by 3.70% when its annual YTM decreases by 0.50%. If the bond's Macaulay duration is 6.51 and its annual modified duration is 6.20, the convexity adjustment is *closest* to:
A. 0.45%
B. 0.60%
C. 3.10%

Question 24
A noncallable bond has an annual modified duration of 9.12. If the bond's yield decreases by 0.18% and its convexity adjustment is 0.21%, then the bond's percentage change in price is *closest* to:
A. −1.43%
B. 1.85%
C. 3.74%

Question 25
An analyst compiles the following information about a noncallable bond:

Selected Bond Data	
Bond's initial price	90.34
Bond's price after yield increase	90.17
Bond's price after yield decrease	90.57
Benchmark yield curve shift	18 bps
Bond's YTM decrease	20 bps

The bond's convexity is *closest* to:
A. 166
B. 205
C. 1,580

Question 26
An analyst obtains the following information on a portfolio of three bonds:

Bond	Par value	Price	Maturity	Modified duration
X	80,000,000	105	3 years	2.40
Y	70,000,000	80	10 years	6.75
Z	50,000,000	120	20 years	12.50

Each bond is a fixed-rate bond paying annual coupons, there is no accrued interest, and prices are per 100 of par value. The modified duration of the portfolio is *closest* to:
A. 6.45
B. 6.65
C. 7.22

Question 27
For otherwise identical fixed-coupon bonds, the greatest difference between the effective convexity of a callable bond and approximate convexity of a noncallable bond *most likely* occurs when the benchmarks bond's yield is:
A. significantly lower than the bonds' coupon rates.
B. approximately equal to the bonds' coupon rates.
C. significantly higher than the bonds' coupon rates.

Question 28
A noncallable bond has an annual modified duration of 8.12 and annual approximate convexity of 317. If the bond's yield increases by 0.9%, then the expected price change is *closest* to:
A. −7.31%
B. −6.02%
C. 8.59%

Question 29
If a noncallable bond has an annual modified duration of 9.718 and an annual convexity of 167.574, the estimated percentage price increase if its YTM declines by 50 basis points is *closest* to:
A. 4.65%
B. 4.86%
C. 5.07%

Question 30
An option pricing model is used to determine the following information about a callable bond:

Selected Bond Data	
Bond's initial price	107.21
Bond's price after yield increase	104.66
Bond's price after yield decrease	107.83
Effective convexity	−89.90
Approximate convexity	−65.47

Based on only this information, the implied shift (in basis points) in the benchmark yield is *closest* to:

A. 142

B. 166

C. 181