CHAPTER 43

FIXED-INCOME SECURITIES DEFINING ELEMENTS

1. (A) increase by more than 10.03%.

Explanation

Because of positive convexity, (bond prices rise faster than they fall) for any given absolute change in yield, the increase in price will be more than the decrease in price for a fixed-coupon, noncallable bond. As yields increase, bond prices fall, and the price curve gets flatter, and changes in yield have a smaller effect on bond prices. As yields decrease, bond prices rise, and the price curve gets steeper, and changes in yield have a larger effect on bond prices. Here, for an absolute 150bp change, the price increase would be more than the price decrease.

(Study Session 14, Module 43.3, LOS 43.h)

Related Material

SchweserNotes - Book 4

2. (C) the change in the price of the bond when its yield changes by 0.01%.

Explanation

PVBP represents the change in the price of the bond when its yield changes by one basis point, or 0.01 %. PVBP = duration x 0.0001 x bond value. This calculation ignores convexity because for a small change in yield, the curvature of the price-yield relationship typically has no material effect on the PVBP.

(Study Session 14, Module 43.2, LOS 43.f)

Related Material

SchweserNotes - Book 4

3. (A) -4.06%.

Explanation

Recall that the percentage change in prices = Duration effect + Convexity effect = [-duration x (change in yields)] + [(1/2)convexity x (change in yields)^2] = (-4.5)(0.01) + (1/2)(87.2)(0.01)^2 = -4.06%. Remember that you must use the decimal representation of the change in interest rates when computing the duration and convexity adjustments.

(Study Session 14, Module 43.3, LOS 43.i)

Related Material

SchweserNotes - Book 4

4. (C) **increase by 7.5%.**

Explanation

Percentage Price Change = -(duration) (ΔYTM) + (1/2)convexity (ΔYTM)^2

therefore

Percentage Price Change = -(7) (-0.01) + (1/2)(100) (-0.01)^2 = 7.5%.

(Study Session 14, Module 43.3, LOS 43.i)

Related Material

SchweserNotes - Book 4

5. (A) **less price volatility at higher yields.**

Explanation

The only true statement is that putable bonds will have less price volatility at higher yields. At higher yields the put becomes more valuable and reduces the decline in price of the putable bond relative to the option-free bond. On the other hand, when yields are low, the put option has little or no value and the putable bond will behave much like an option-free bond. Therefore at low yields a putable bond will not have more price volatility nor will it have less price volatility than a similar option-free bond.

(Study Session 14, Module 43.2, LOS 43.e)

Related Material

SchweserNotes - Book 4

6. (B) **ten year, option-free 4% coupon bond.**

Explanation

If two bonds are identical in all respects except their term to maturity, the longer term bond will be more sensitive to changes in interest rates. All else the same, if a bond has a lower coupon rate when compared with another, it will have greater interest rate risk. Therefore, for the option-free bonds, the 10 year 4% coupon is the longest term and has the lowest coupon rate. The call feature does not make a bond more sensitive to changes in interest rates, because it places a ceiling on the maximum price investors will be willing to pay. If interest rates decrease enough the bonds will be called.

(Study Session 14, Module 43.2, LOS 43.e)

Related Material

SchweserNotes - Book 4

7. (B) -7.45%.

Explanation

Return impact = -(Duration x ΔYield) + (1/2) x (Convexity x (ΔYield)^2)

= -(7.8 x 0.0100) + (1/2) x (69.8) x (0.0100)^2

= -0.0780 + 0.0035

= -0.0745 or -7.45%

(Study Session 14, Module 43.3, LOS 43.i)

Related Material

SchweserNotes - Book 4

8. (A) 1.74%.

Explanation

The effective duration is computed as follows:

$$\text{Effective duration} = \frac{105.56 - 98.46}{2 \times 101.76 \times 0.01} = 3.49$$

Using the effective duration, the approximate percentage price change of the bond is computed as follows:

Percent price change = -3.49 x (-0.005) x 100 = 1.74%

(Study Session 14, Module 43.3, LOS 43.i)

Related Material

SchweserNotes - Book 4

9. (A) callable bonds.

Explanation

All noncallable bonds exhibit the trait of being positively convex. Callable bonds have negative convexity because once the yield falls below a certain point prices will rise at a decreasing rate, thus giving the price-yield relationship a negative convex shape.

(Study Session 14, Module 43.3, LOS 43.h)

Related Material

SchweserNotes - Book 4

10. (A) long-term interest rates are more variable than short-term interest rates.

Explanation

If the term structure of yield volatility slopes upward, long-term interest rates are more variable than short-term interest rates.

(Study Session 14, Module 43.3, LOS 43.j)

Related Material

SchweserNotes - Book 4

11. (A) 5.37.

Explanation

Approximate modified duration is computed as follows:

$$\frac{105.50 - 100}{2 \times 102.50 \times 0.005} = 5.37$$

(Study Session 14, Module 43.1, LOS 43.b)

Related Material

SchweserNotes - Book 4

12. (B) **approximate percentage change in a bond's value for a 1% change in its yield to maturity.**

Explanation

Modified duration is the approximate percentage change in a bond's value for a 1% change in its YTM. Macaulay duration is the weighted average number of periods until a bond's cash flows are scheduled to be paid and represents the investment horizon at which a bond's market price risk and reinvestment risk exactly offset.

For Further Reference:

(Study Session 14, Module 43.1, LOS 43.b)

CFA® Program Curriculum, Volume 5, page 14

CFA® Program Curriculum, Volume 5, page 45

Related Material

SchweserNotes - Book 4

13. (C) $0.82.

Explanation

PVBP = initial price - price if yield changed by 1 bps.

Initial price:	Price with change:
FV = 1000	FV = 1000
PMT = 80	PMT = 80
N = 18	N = 18
I/Y = 9%	I/Y = 9.01
CPT PV = 912.44375	CPT PV = 911.6271

PVBP = 912.44375 - 911.6271 = 0.82

(Study Session 14, Module 43.2, LOS 43.g)

Related Material

SchweserNotes - Book 4

14. (B) +12.675%.

Explanation

Approximate percentage price change of a bond = (-)(modified duration)(ΔYTM) = (-16.9)(-0.75%) = +12.675%

(Study Session 14, Module 43.3, LOS 43.i)

Related Material

SchweserNotes - Book 4

15. (A) $50.

Explanation

Effective duration should be used for callable bonds as it takes into account the impact the embedded option has on the bond's cash flows.

Approximate percentage price change of a bond = (-)(effective duration)(ΔYTM)

(-5)(1 %) = -5%

The change in price is therefore $1,000 x -5% = -$50

(Study Session 14, Module 43.3, LOS 43.i)

Related Material

SchweserNotes - Book 4

16. (B) Macaulay duration.

Explanation

Macaulay duration is the investment horizon at which reinvestment risk and market price risk approximately offset each other.

(Study Session 14, Module 43.3, LOS 43.k)

Related Material

SchweserNotes - Book 4

17. (B) 6.15.

Explanation

Duration is a measure of a bond's sensitivity to changes in interest rates.

Modified duration = (V_ - V+) / [2V0(change in required yield)] where:

V_- = estimated price if yield decreases by a given amount

V_+ = estimated price if yield increases by a given amount

V_0 = initial observed bond price

Thus, modified duration = (103.14 - 96.99) / (2 x 100 x 0.005) = 6.15. Remember that the change in interest rates must be in decimal form.

(Study Session 14, Module 43.2, LOS 43.e)

Related Material

SchweserNotes - Book 4

18. (A) **is lower.**

Explanation

Modified duration = Macaulay duration / (1 + YTM). Modified duration is lower than Macaulay duration unless YTM equals zero.

For Further Reference:

(Study Session 14, Module 43.1, LOS 43.b)

CFA® Program Curriculum, Volume 5, page 14

Related Material

SchweserNotes - Book 4

19. (B) **7.515%.**

Explanation

The reinvestment assumption that is embedded in any present value-based yield measure implies that all coupons and principal payments must be reinvested at the specific rate of return, in this case, the yield to maturity. Thus, to obtain a 7.515% total dollar return, the investor must reinvest all the coupons at a 7.515% rate of return. Total dollar return is made up of three sources, coupons, principal, and reinvestment income.

(Study Session 14, Module 43.1, LOS 43.a)

Related Material

SchweserNotes - Book 4

20. (B) **0.58%.**

Explanation

The convexity effect, or the percentage price change due to convexity, formula is: (1/2)convexity x $(\Delta YTM)^2$. The percentage price change due to convexity is then: $(1/2)(51.44)\ (0.015)^2 = 0.0058$.

(Study Session 14, Module 43.3, LOS 43.i)

Related Material

SchweserNotes - Book 4

21. (A) **decreases.**

Explanation

The higher the yield on a bond the lower the price volatility (duration) will be. When interest rates increase the price of the bond will decrease and the yield will increase because the current yield = (annual cash coupon payment) / (bond price). As the bond price decreases the yield increases and the price volatility (duration) will decrease.

(Study Session 14, Module 43.2, LOS 43.e)

Related Material

SchweserNotes - Book 4

22. (A) negative convexity at low yields for the callable bond and positive convexity for the option-free bond.

Explanation

Since the issuer of a callable bond has an incentive to call the bond when interest rates are very low in order to get cheaper financing, this puts an upper limit on the bond price for low interest rates and thus introduces negative convexity between yields and prices.

(Study Session 14, Module 43.3, LOS 43.h)

Related Material

SchweserNotes - Book 4

23. (A) effective duration.

Explanation

Effective duration is appropriate for bonds with embedded options because their future cash flows are affected by the level and path of interest rates.

(Study Session 14, Module 43.1, LOS 43.c)

Related Material

SchweserNotes - Book 4

24. (A) 10-year maturity, 10% coupon rate.

Explanation

All else constant, a bond with a longer maturity will be more sensitive to changes in interest rates. All else constant, a bond with a lower coupon will have greater interest rate risk.

(Study Session 14, Module 43.2, LOS 43.e)

Related Material

SchweserNotes - Book 4

25. (B) low coupon and a long maturity.

Explanation

Other things equal, a bond with a low coupon and long maturity will have the greatest price volatility.

(Study Session 14, Module 43.2, LOS 43.e)

Related Material

SchweserNotes - Book 4

26. (A) carrying value.

Explanation

Capital gains and losses on bonds purchased at a discount or premium are measured relative to carrying value (original price plus amortized discount or minus amortized premium) from the constant-yield price trajectory, not from the purchase price.

(Study Session 14, Module 43.1, LOS 43.a) ‘

Related Material

SchweserNotes - Book 4

27. (A) 5.27.

Explanation

The formula for effective duration is: $(V_{-} - V_{+}) / (2V_0\Delta curve)$. Therefore, effective duration is: ($1.110 - $1.053) / (2 x $1.081 x 0.005) = 5.27.

(Study Session 14, Module 43.1, LOS 43.b)

Related Material

SchweserNotes - Book 4

28. (C) **Price increases when yields drop are greater than price decreases when yields rise by the same amount.**

Explanation

A convex price/yield graph has a larger increase in price as yield decreases than the decrease in price when yields increase.

(Study Session 14, Module 43.3, LOS 43.h)

Related Material

SchweserNotes - Book 4

29. (B) 10.6.

Explanation

If the yield on the bond were 7.25%, the price would be 97.402 and would be 102.701 if the yield were 6.75%. The approximate modified duration for this bond based on a 25 basis point change in yield is calculated as:

$$\frac{102.701 - 97.402}{2(100)(0.0025)} = 10.5976$$

For Further Reference:

(Study Session 14, Module 43.1, LOS 43.b)

CFA® Program Curriculum, Volume 5, page 14

Related Material

SchweserNotes - Book 4

30. (B) **increases the bond's duration, increasing price risk.**

Explanation

A call provision decreases the bond's duration because a call provision introduces prepayment risk that should be factored in the calculation.

For the investor, one of the most significant risks of callable (or prepayable) bonds is that they can be called/retired prematurely. Because bonds are nearly always called for prepayment after interest rates have decreased significantly, the investor will find it nearly impossible to find comparable investment vehicles. Thus, investors have to replace their high-yielding bonds with much lower-yielding issues. From the bondholder's perspective, a called bond means not only a disruption in cash flow but also a sharply reduced rate of return.

Generally speaking, the following conditions apply to callable bonds:

- The cash flows associated with callable bonds become unpredictable, since the life of the bond could be much shorter than its term to maturity, due to the call provision.
- The bondholder is exposed to the risk of investing the proceeds of the bond at lower interest rates after the bond is called. This is known as reinvestment risk
- The potential for price appreciation is reduced, because the possibility of a call limits or caps the price of the bond near the call price if interest rates fall.

(Study Session 14, Module 43.2, LOS 43.e)

Related Material

SchweserNotes - Book 4

31. (C) yield to maturity is lower.

Explanation

In this case the only determinant that will cause higher interest rate risk is having a low yield to maturity. A higher coupon rate and a higher current yield will result in lower interest rate risk.

(Study Session 14, Module 43.2, LOS 43.e)

Related Material

SchweserNotes - Book 4

32. (A) 10.03.

Explanation

Calculate the new bond prices at the 50 basis point change in rates both up or down and then plug into the approximate modified duration equation:

Current price: N = 50; FV = 1,000; PMT = (0.075/2) x 1,000 = 37.50; I/Y = 4.625; CPT → PV = $830.54.

+50 basis pts: N = 50; FV = 1,000; PMT = (0.075/2)1,000 = 37.50; I/Y = 4.875; CPT → PV = $790.59.

-50 basis pts: N = 50; FV = 1,000; PMT = (0.075/2)1,000 = 37.50; I/Y = 4.375; CPT → PV = $873.93.

Approximate modified duration = (873.93 - 790.59) / (2 x 830.54 x 0.005) = 10.03.

(Study Session 14, Module 43.1, LOS 43.b)

Related Material

SchweserNotes - Book 4

33. (C) approximately 7.5%.

Explanation

The change in price due to a change in yield is only approximate because the calculation of effective duration does not reflect all of the curvature of the price-yield curve (convexity). It is a linear approximation of a non-linear relation.

For Further Reference:

(Study Session 14, Module 43.1, LOS 43.b)

CFA® Program Curriculum, Volume 5, page 14

Related Material

SchweserNotes - Book 4

34. (A) time to maturity.

Explanation

The term structure of yield volatility refers to the relationship between yield volatility and time to maturity.

(Study Session 14, Module 43.3, LOS 43.j)

Related Material

SchweserNotes - Book 4

35. (B) lower.

Explanation

The effective duration of a putable bond is less than the effective duration of an otherwise identical option-free bond at relatively high yields. Assuming no default, the price of a putable bond will not fall below its put price. The put price acts as a floor. Therefore, as yields increase into the range in which the embedded put option becomes valuable, the price of a putable bond decreases less than that of an otherwise identical option-free bond.

(Study Session 14, Module 43.1, LOS 43.b)

Related Material

SchweserNotes - Book 4

36. (B) Effective Duration   Modified Duration or Effective Duration

Explanation

Effective duration is that effective duration is used for bonds with embedded options. Modified duration assumes that all the cash flows on the bond will not change, while effective duration considers expected cash flow changes that may occur with embedded options.

(Study Session 14, Module 43.1, LOS 43.c)

Related Material

SchweserNotes - Book 4

37. (B) change in yield at a single maturity.

Explanation

Key rate duration is the price sensitivity of a bond or portfolio to a change in the interest rate at one specific maturity on the yield curve.

(Study Session 14, Module 43.2, LOS 43.d)

Related Material

SchweserNotes - Book 4

38. (C) Zero-coupon bond.

Explanation

The Macaulay duration of a zero-coupon bond is equal to its time to maturity. Its price is greatly affected by changes in interest rates because its only cash-flow is at maturity and is discounted from the time at maturity until the present.

(Study Session 14, Module 43.2, LOS 43.e)

Related Material

SchweserNotes - Book 4

39. (C) $1,041.25.

Explanation

$$\frac{\Delta P}{P} = \text{Duration}\ (\Delta YTM) + \frac{1}{2}\ \text{Convexity}\ (\Delta YTM)^2$$

$$\frac{\Delta P}{P} = (-)\ (8)\ (-0.005) + \frac{1}{2}\ (100) - (-0.005)^2$$

= +0.0400 + 0.00125

= +0.04125, or up 4.125%

The price would thus be $1,000 x 1.04125 = $1,041.25.

For Further Reference:

(Study Session 14, Module 43.3, LOS 43.i)

CFA® Program Curriculum, Volume 5, page 36

Related Material

SchweserNotes - Book 4

40. (A) -11.72%.

Explanation

The estimated percentage price change = the duration effect plus the convexity effect. The formula is: [-duration x (ΔYTM)] + 1/2[convexity x $(\Delta YTM)^2$]. Therefore, the estimated percentage price change is: [-(10.27)(0.0125)] + [(1/2)(143)(0.0125)2] = -0.128375 + 0.011172 = -0.117203 = -11.72%.

(Study Session 14, Module 43.3, LOS 43.i)

Related Material

SchweserNotes - Book 4

41. (C) the same method used when estimating the effect of changes in yield.

Explanation

We can use duration and convexity to estimate the price effect of changes in spread in the same way we use them to estimate the price effect of changes in yield:

Percent change in bond value = -duration (change in yield or spread) + (1/2) (convexity)(squared change in yield or spread)

No adjustment for credit risk is needed and an analyst should use modified or effective duration.

(Study Session 14, Module 43.3, LOS 43.1)

Related Material

SchweserNotes - Book 4

42. (C) 2.05%.

Explanation

The total percentage price change estimate is computed as follows:

Total estimated price change = -1.89 x (-0.01) x 100 + (1/2)(32) x $(-0.01)^2$ x 100 = 2.05%

(Study Session 14, Module 43.3, LOS 43.i)

Related Material

SchweserNotes - Book 4

43. (A) +11.0%.

Explanation

You can answer this question without calculations. A decrease in interest rates must cause the price to increase. Because duration alone will underestimate a price increase, the price must increase by more than 10%.

percentage change in price

$$= [-\text{duration} \times \Delta YTM] + \frac{1}{2}[\text{convexity} \times (\Delta YTM)^2] \times 100$$

$$= [(-10)(-0.01)] + \frac{1}{2}[(200)(-0.01)^2] = 0.11 = 11\%$$

For Further Reference:

(Study Session 14, Module 43.3, LOS 43.i)

CFA® Program Curriculum, Volume 5, page 36

Related Material

SchweserNotes - Book 4

44. (A) 0.965%.

Explanation

Modified duration indicates the expected percent change in a bond's price given a 1% (100 bp) change in yield to maturity. For a 50 by (0.5%) increase in YTM, the price of a bond with modified duration of 1.93 should decrease by approximately 0.5(1.93%) = 0.965%.

(Study Session 14, Module 43.3, LOS 43.i)

Related Material

SchweserNotes - Book 4

45. (B) 12.8%.

Explanation

Approximate modified duration =

(price if yield down - price if yield up) / (2 x initial price x yield change expressed as a decimal).

Here, the initial price is par, or $1,000 because we are told the bond was issued today at par. So, the calculation is: (1039.59 - 962.77) / (2 x 1000 x 0.003) = 76.82 / 6.00 = 12.80.

(Study Session 14, Module 43.1, LOS 43.b)

Related Material

SchweserNotes - Book 4

46. (A) 4.187.

Explanation

The YTM on the bond is 6.5%. N=5, PV = -979.22, PMT = 60, FV =1,000, CPT I/Y = 6.5%

Modified duration = Macaulay duration / (1 + YTM) = 4.4587 / 1.065 = 4.187.

For Further Reference:

(Study Session 14, Module 43.1, LOS 43.b)

CFA® Program Curriculum, Volume 5, page 14

Related Material

SchweserNotes - Book 4

47. (A) approximately 4.5%.

Explanation

With Macaulay duration equal to the investment horizon, market price risk and reinvestment risk approximately offset and the annualized horizon return should be close to the yield to maturity at purchase.

(Study Session 14, Module 43.3, LOS 43.k)

Related Material

SchweserNotes - Book 4

48. (B) greater than price risk and the realized yield will be lower than the YTM at purchase.

Explanation

If the bond is held to maturity, the investor will receive all coupons and principal and reinvest them at a lower return than the YTM at purchase, resulting in a lower realized yield.

(Study Session 14, Module 43.1, LOS 43.a)

Related Material

SchweserNotes - Book 4

49. (A) a bond with greater convexity.

Explanation

Duration is a linear measure of the relationship between a bond's price and yield. The true relationship is not linear as measured by the convexity. When convexity is higher, duration will be less accurate in predicting a bond's price for a given change in interest rates. Short-term bonds generally have low convexity.

(Study Session 14, Module 43.3, LOS 43.h)

Related Material

SchweserNotes - Book 4

50. (C) Inclusion of a call feature.

Explanation

Inclusion of a call feature will decrease the duration of a fixed income security. The other choices increase duration.

For Further Reference:

(Study Session 14, Module 43.2, LOS 43.e)

CFA® Program Curriculum, Volume 5, page 26

Related Material

SchweserNotes - Book 4

51. (B) -167.

Explanation

Approximate effective convexity is calculated as $[V_- + V_+ - 2V_0] / [(V_0)(\text{change in curve})^2$. $[96.75 + 94.75 - 2(95.80)] / [(95.80)(0.0025)^2] = -167.01$.

(Study Session 14, Module 43.3, LOS 43.h)

Related Material

SchweserNotes - Book 4

52. (C) **only one of these effects.**

Explanation

The analyst is correct incorrect with respect to coupon rate. As the coupon rate decreases, the interest rate risk of a bond increases. Lower coupons cause greater relative weight to be placed on the principal repayment. Because this cash flow occurs farther out in time, its present value is much more sensitive to changes in interest rates. As the coupon rate goes to zero (i.e., a zero-coupon bond), all of the bond's return relies on the return of principal which as stated before is highly sensitive to interest rate changes.

The analyst is correct with respect to maturity. As the maturity of a bond increases, an investor must wait longer for the eventual repayment of the bond principal. As the length of time until principal payment increases, the probability that interest rates will change increases. If interest rates increase, the present value of the final payment (which is the largest cash flow of the bond) decreases. At longer maturities, the present value decreases by greater amounts. Thus, interest rate risk typically increases as the maturity of the bond increases. (The exception is for long-term discount bonds, which may exhibit a range of long maturities over which an increase in maturity decreases interest rate risk.)

(Study Session 14, Module 43.2, LOS 43.e)

Related Material

SchweserNotes - Book 4

53. (A) **the bond contains embedded options.**

Explanation

Effective duration takes into consideration embedded options in the bond. Modified duration does not consider the effect of embedded options. For option-free bonds, modified duration will be similar to effective duration. Both duration measures are based on the value impact of a parallel shift in a flat yield curve.

(Study Session 14, Module 43.1, LOS 43.c)

Related Material

SchweserNotes - Book 4

54. (C) **may be greater or less than the realized yield.**

Explanation

For the realized yield to equal the YTM, coupon reinvestments must occur at that YTM. Whether reinvesting the coupons at the coupon rate will result in a realized yield higher or lower than the YTM depends on whether the bond is at a discount (coupon < YTM) or a premium (coupon > YTM).

(Study Session 14, Module 43.1, LOS 43.a)

Related Material

SchweserNotes - Book 4

55. (A) decrease by less than 5.3%.

Explanation

The positive convexity effect will mean yields will drop by less than 5.3% (the effect of duration alone).

Price change = (-5.3 x 0.01) + (0.5 x 110 x 0.01^2)= -0.0475 = -4.75%.

(Study Session 14, Module 43.3, LOS 43.i)

Related Material

SchweserNotes - Book 4

56. (C) 4.98%.

Explanation

The estimated price change is -(duration) (ΔYTM) + (1/2)(convexity) x $(\Delta YTM)^2$ = -8 x (-0.006) + (1/2)(100) x (-0.006^2) = +0.0498 or 4.98%.

(Study Session 14, Module 43.3, LOS 43.i)

Related Material

SchweserNotes - Book 4

57. (A) has a negative duration gap.

Explanation

A duration gap is a difference between a bond's Macaulay duration and the bondholder's investment horizon. If Macaulay duration is less than the investment horizon, the bondholder is said to have a negative duration gap and is more exposed to downside risk from decreasing interest rates (reinvestment risk) than from increasing interest rates (market price risk).

(Study Session 14, Module 43.3, LOS 43.k)

Related Material

SchweserNotes - Book 4

58. (A) It is theoretically more sound than the alternative.

Explanation

Compared to portfolio duration based on the cash flow yield of the portfolio, portfolio duration calculated as a weighted average of the durations of the individual bonds in the portfolio is easier to calculate and can be used for bonds with embedded options. Portfolio duration calculated using the cash flow yield for the entire portfolio is theoretically more correct.

(Study Session 14, Module 43.2, LOS 43.f)

Related Material

SchweserNotes - Book 4

59. (A) **a linear approximation of the actual price-yield function for the portfolio.**

Explanation

Duration is a linear approximation of a nonlinear function. The use of market values has no direct effect on the inherent limitation of the portfolio duration measure. Duration assumes a parallel shift in the yield curve, and this is an additional limitation.

(Study Session 14, Module 43.2, LOS 43.f)

Related Material

SchweserNotes - Book 4

60. (B) **15-year, 8% coupon bond.**

Explanation

If bonds are identical except for maturity and coupon, the one with the longest maturity and lowest coupon will have the greatest duration. The later the cash flows are received, the greater the duration.

For Further Reference:

(Study Session 14, Module 43.2, LOS 43.e)

CFA® Program Curriculum, Volume 5, page 26

Related Material

SchweserNotes - Book 4

61. (B) **Yes, because the bond's yield to maturity may have changed.**

Explanation

Prior to maturity, a zero-coupon bond's price may be different than its constant-yield price trajectory and the bondholder may realize a capital gain or loss by selling the bond. For a zero-coupon bond that is held to maturity, the increase from the purchase price to face value at maturity is interest income.

(Study Session 14, Module 43.1, LOS 43.a)

Related Material

SchweserNotes - Book 4

62. (B) **greater than 7.0% on the Kano bonds and less than 8.0% on the Samuel bonds.**

Explanation

The yield to maturity calculation assumes that all interim cash flows are reinvested at the yield to maturity (YTM). Since Horn's reinvestment rate is 7.5%, he would realize a return higher than the 7.0% YTM of the Kano bonds, or a return less than the 8.0% YTM of the Samuel bonds.

(Study Session 14, Module 43.1, LOS 43.a)

Related Material

SchweserNotes - Book 4

63. (B) **Key rate duration.**

Explanation

Price sensitivity to a non-parallel shift in the yield curve can be estimated using key rate durations. Modified duration and effective duration measure price sensitivity to a parallel shift in the yield curve.

(Study Session 14, Module 43.2, LOS 43.d)

Related Material

SchweserNotes - Book 4

64. (B) **4.33.**

Explanation

Modified duration is a measure of a bond's sensitivity to changes in interest rates.

Approximate modified duration = $(V_- - V_+) / [2V_0(\text{change in required yield})]$ where:

V_- = estimated price if yield decreases by a given amount

V_+ = estimated price if yield increases by a given amount

V_0 = initial observed bond price

Thus, duration = (104.45 - 95.79)/(2 x 100 x 0.01) = 4.33. Remember that the change in interest rates must be in decimal form.

(Study Session 14, Module 43.1, LOS 43.b)

Related Material

SchweserNotes - Book 4

65. (C) **4.33%.**

Explanation

The estimated percentage price change is equal to the duration effect plus the convexity effect. The formula is: $[-\text{duration} \times (\Delta YTM)] + 1/2[\text{convexity} \times (\Delta YTM)^2]$. Therefore, the estimated percentage price change is: $[-(5.61)(-0.0075)] + [(1/2)(43.84)(-0.0075)^2]$ = 0.042075 + 0.001233 = 0.043308 = 4.33%.

(Study Session 14, Module 43.3, LOS 43.i)

Related Material

SchweserNotes - Book 4

66. (B) **£1 20.95.**

Explanation

Return impact	$= -(\text{Duration} \times \Delta\text{ Yield}) + (1/2) \times (\text{Convexity}) \times (\Delta\text{Yield})^2$ $=-(9.5 \times -0.0125) + (1/2/) \times (107.2) \times (-0.0125)^2$ = 0.1188 + 0.0084 = 0.1272 or 12.72%
Estimated price of bond	$= (1 + 0.1272) \times 107.30$ = 120.95

(Study Session 14, Module 43.3, LOS 43.i)

Related Material

SchweserNotes - Book 4

67. (A) –12.2%

Explanation

Recall that the percentage change in prices = Duration effect + Convexity effect = [-duration x (change in yields)] + [(1/2)convexity x (change in yields)^2] = [(-7)(0.02) + (1/2)(90)(0.02)^2] = -0.12 = -12.2%. Remember that you must use the decimal representation of the change in interest rates when computing the duration and convexity adjustments.

(Study Session 14, Module 43.3, LOS 43.i)

Related Material

SchweserNotes - Book 4

68. (C) A shorter maturity.

Explanation

Other things being equal, the amount of reinvestment risk embedded in a bond will decrease with lower coupons as there are fewer coupons to reinvest and with shorter maturities because the reinvestment period is shorter.

A lower Macaulay duration may reflect more or less reinvestment risk, depending on what causes Macaulay duration to be lower. A lower Macaulay duration could result from a shorter maturity (which reduces reinvestment risk) or a higher coupon (which increases reinvestment risk).

(Study Session 14, Module 43.1, LOS 43.a)

Related Material

SchweserNotes - Book 4

69. (C) €25 million.

Explanation

Money duration is expressed in currency units.

(Study Session 14, Module 43.2, LOS 43.g)

Related Material

SchweserNotes - Book 4

70. (B) callable bond at low yields.

Explanation

A callable bond trading at a low yield will most likely exhibit negative effective convexity.

(Study Session 14, Module 43.3, LOS 43.h)

Related Material

SchweserNotes - Book 4

71. (C) zero-coupon bond.

Explanation

The duration of a zero-coupon bond is equal to its time to maturity since the only cash flows made is the principal payment at maturity of the bond. Therefore, it has the highest interest rate sensitivity among the four securities.

A floating rate bond is incorrect because the duration, which is the interest rate sensitivity, is equal to the time until the next coupon is paid. So this bond has a very low interest rate sensitivity.

A coupon bond with a coupon rate of 5% is incorrect because the duration of a coupon paying bond is lower than a zero-coupon bond since cash flows are made before maturity of the bond. Therefore, its interest rate sensitivity is lower.

(Study Session 14, Module 43.2, LOS 43.e)

Related Material

SchweserNotes - Book 4

72. (C) $574.

Explanation

$935(1.035)^{30} = \$2,624$

Bond coupons: 30 x 35 = $1,050

Principal repayment: $1,000

2,624 - 1,000 - 1050 = $574 required reinvestment income

(Study Session 14, Module 43.1, LOS 43.a)

Related Material

SchweserNotes - Book 4

73. (B) 19.7.

Explanation

Approximate modified convexity is calculated as [$V_- + V_+ - 2V_0$]/ [(V_0)(change in YTM)^2]. [105.90 + 97.30 - 2(101.50)1/ [101.50(0.01)^2] = 19.70.

(Study Session 14, Module 43.3, LOS 43.h)

Related Material

SchweserNotes - Book 4

74. (C) $96.0 million.

Explanation

Money duration = annual modified duration x portfolio value = 8 x $12 million = $96,000,000.

For Further Reference:

(Study Session 14, Module 43.2, LOS 43.g)

CFA® Program Curriculum, Volume 5, page 34

Related Material

SchweserNotes - Book 4

75. (C) $0.64.

Explanation

PVBP = initial price - price if yield changed by 1 bps.

Initial price:	Price with change:
FV = 1000	FV = 1000
PMT = 50	PMT = 50
N = 14	N = 14
I/Y = 3%	I/Y = 3.005

CPT PV = 1225.92 CPT

PV = 1225.28 PVBP = 1,225.92 - 1,225.28 = 0.64

(Study Session 14, Module 43.2, LOS 43.g)

Related Material

SchweserNotes - Book 4

76. (C) underestimates the increase in price for decreases in yield.

Explanation

For large changes in yield, duration underestimates the increase in price when yield decreases and overestimates the decrease in price when yield increases. This is because duration is a linear estimate that does not account for the convexity (curvature) in the price/yield relationship.

(Study Session 14, Module 43.1, LOS 43.b)

Related Material

SchweserNotes - Book 4

77. (A) effective duration.

Explanation

Effective duration is used to measure the sensitivity of a bond price to a parallel shift in the yield curve. Key rate duration, also known as partial duration, is used to measure the sensitivity of a bond price to a change in yield at a specific maturity.

(Study Session 14, Module 43.2, LOS 43.d)

Related Material

SchweserNotes - Book 4

78. (A) 3.49.

Explanation

The effective duration is computed as follows:

$$\text{Effective duration} = \frac{105.56 - 98.46}{2 \times 101.76 \times 0.01} = 3.49$$

(Study Session 14, Module 43.1, LOS 43.b)

Related Material

SchweserNotes - Book 4

79. (B) 6.8.

Explanation

The formula for calculating the effective duration of a bond is:

$$\frac{V_{-} - V_{+}}{2V_0(\Delta curve)}$$

where:

- V_{-} = bond value if the yield decreases by Ay
- V_{+} = bond value if the yield increases by Ay
- V_0 = initial bond price

The effective duration of this bond is calculated as:

$$\frac{684 - 639}{2(660)(0.005)} = 6.8$$

(Study Session 14, Module 43.1, LOS 43.b)

Related Material

SchweserNotes - Book 4

80. (B) 7.66.

Explanation

The change in the yield is 30 basis points.

Approximate modified duration = (98.47 - 94.06) / (2 x 96.00 x 0.003) = 7.6563. (Study Session 14, Module 43.1, LOS 43.b)

Related Material

SchweserNotes - Book 4

81. (B) higher than the YTM at the date of purchase.

Explanation

If the investment horizon is shorter than the Macaulay duration, the price impact of a decrease in YTM dominates the loss of reinvestment income and the realized yield will be higher than the YTM at purchase.

(Study Session 14, Module 43.3, LOS 43.k)

Related Material

SchweserNotes - Book 4

82. (C) Increase in expected inflation.

Explanation

Interest rates on the benchmark yield curve are composed of expected inflation and the real risk-free rate. Spreads to the benchmark yield curve include premiums for credit risk and lack of liquidity.

(Study Session 14, Module 43.3, LOS 43.1)

Related Material

SchweserNotes - Book 4

83. (A) **decrease by $124, price will increase by $149.**

Explanation

As yields increase, bond prices fall, the price curve gets flatter, and changes in yield have a smaller effect on bond prices. As yields decrease, bond prices rise, the price curve gets steeper, and changes in yield have a larger effect on bond prices. Thus, the price increase when interest rates decline must be greater than the price decrease when interest rates rise (for the same basis point change). Remember that this applies to percentage changes as well.

(Study Session 14, Module 43.3, LOS 43.i)

Related Material

SchweserNotes - Book 4

84. (A) **$0.50.**

Explanation

First we compute the yield to maturity of the bond. PV = -$958.97, FV = $1,000, PMT = $21, N = 12, CPT I/Y = 2.5%, multiply by 2 since it is a semiannual bond to get an annualized yield to maturity of 5.0%. Now compute the price of the bond at using yield one basis point higher, or 5.01 %. FV = $1,000, PMT = 21, N = 12, I/Y = (5.01 / 2 =) 2.505, CPT PV = -$958.47. The price changes from $958.97 to $958.47, or $0.50.

For Further Reference:

(Study Session 14, Module 43.2, LOS 43.g)

CFA® Program Curriculum, Volume 5, page 34

Related Material

SchweserNotes - Book 4

85. (C) **Bonds with higher coupons have lower interest rate risk.**

Explanation

Other things equal, bonds with higher coupons have lower interest rate risk. Note that the other statements are false. Bonds with longer maturities have higher interest rate risk. Callable bonds have a ceiling value as yields decline.

(Study Session 14, Module 43.2, LOS 43.e)

Related Material

SchweserNotes - Book 4

86. (B) **incorrect, because these are not the only sources of return from investing in a bond.**

Explanation

The advisor's description of the sources of return from investing in a bond is incomplete because it does not include the income from reinvesting the bond's coupon payments. Although it is true that an investor who holds a bond to maturity will not realize a capital gain or loss, this is not why the advisor's statement is incorrect.

For Further Reference:

(Study Session 14, Module 43.1, LOS 43.a)

CFA® Program Curriculum, Volume 5, page 7

Related Material

SchweserNotes - Book 4

87. (C) 5.7%decrease.

Explanation

$\Delta P/P = -DA i$

$\Delta P/P = -7.6(+ 0.0075) = -0.057$, or -5.7%.

(Study Session 14, Module 43.3, LOS 43.i)

Related Material

SchweserNotes - Book 4

88. (A) Default risk deals with the likelihood that the issuer will fail to meet its obligations as specified in the indenture.

Explanation

Reinvestment is crucial to bond yield, and interest rate risk is the risk of changes in a bondholder's return due to changes in a bond's yield.

(Study Session 14, Module 43.1, LOS 43.b)

Related Material

SchweserNotes - Book 4

89. (B) 6.0.

Explanation

Effective duration is the percentage change in price for a 1% change in yield, which is given as 6.

(Study Session 14, Module 43.1, LOS 43.b)

Related Material

SchweserNotes - Book 4

90. (B) 6.07.

Explanation

The duration of a bond portfolio is the weighted average of the durations of the bonds in the portfolio. The weights are the value of each bond divided by the value of the portfolio:

portfolio duration = 8 x (1050 / 3000) + 6 x (1000 / 3000) + 4 x (950 / 3000) = 2.8 + 2 + 1.27 = 6.07.

(Study Session 14, Module 43.2, LOS 43.f)

Related Material

SchweserNotes - Book 4

91. (C) -1.820%.

Explanation

The formula for the percentage price change is: -(duration)(∆YTM). Therefore, the estimated percentage price change using duration is: -(7.26)(0.25%) = -1.82%.
(Study Session 14, Module 43.3, LOS 43.i)

Related Material

SchweserNotes - Book 4

92. (B) duration gap is positive.

Explanation

Price risk will dominate reinvestment risk when the investor's investment horizon is less than the bond's Macaulay duration (i.e., when the duration gap is positive).
(Study Session 14, Module 43.3, LOS 43.k)

Related Material

SchweserNotes - Book 4

93. (B) will increase by approximately $117,700.

Explanation

A portfolio's duration can be used to estimate the approximate change in value for a given change in yield. A critical assumption is that the yield for all bonds in the portfolio change by the same amount, known as a parallel shift. For this portfolio the expected change in value can be calculated as: $7,545,000 x 6.24 x 0.0025 = $117,702. The decrease in yields will cause an increase in the value of the portfolio, not a decrease.
(Study Session 14, Module 43.2, LOS 43.f)

Related Material

SchweserNotes - Book 4

94. (B) 3.11.

Explanation

First, find the current yield to maturity of the bond as:

FV = $1,000; PMT = $120; N = 4; PV = -$1,063.40; CPT → I/Y = 10%

Then compute the price of the bond if rates rise by 50 basis points to 10.5% as:

FV = $1,000; PMT = $120; N = 4; WY = 10.5%; CPT → PV = -$1,047.04

Then compute the price of the bond if rates fall by 50 basis points to 9.5% as:

FV = $1,000; PMT = $120; N = 4; WY = 9.5%; CPT → PV = -$1,080.11

The formula for effective duration is:

$(V_- - V_+) / (2V_0 \text{Acurve})$

Therefore, effective duration is:

($1,080.11 - $1,047.04) / (2 x $1,063.40 x 0.005) = 3.11

(Study Session 14, Module 43.1, LOS 43.b)

Related Material

SchweserNotes - Book 4

95. (B) less than $36.

Explanation

The bond described will have positive convexity. Because of convexity, the bond's price will decrease less as a result of a given increase in interest rates than it will increase as a result of an equivalent decrease in interest rates.

For Further Reference:

(Study Session 14, Module 43.3, LOS 43.h)

CFA® Program Curriculum, Volume 5, page 36

Related Material

SchweserNotes - Book 4

96. (C) the slope of the price/yield curve is not constant.

Explanation

Modified duration is a good approximation of price changes for an option-free bond only for relatively small changes in interest rates. As rate changes grow larger, the curvature of the bond price/yield relationship becomes more prevalent, meaning that a linear estimate of price changes will contain errors. The modified duration estimate is a linear estimate, as it assumes that the change is the same for each basis point change in required yield. The error in the estimate is due to the curvature of the actual price path. This is the degree of convexity. If we can generate a measure of this convexity, we can use this to improve our estimate of bond price changes.

(Study Session 14, Module 43.3, LOS 43.h)

Related Material

SchweserNotes - Book 4

97. (B) decreases increases

Explanation

As coupon rates increase the duration on the bond will decrease because investors are receiving more cash flow sooner. As maturity increases, duration will increase because the payments are spread out over a longer period of time.

(Study Session 14, Module 43.2, LOS 43.e)

Related Material

SchweserNotes - Book 4

98. (A) fall, the bond's price increases at a decreasing rate.

Explanation

Negative convexity occurs with bonds that have prepayment/call features. As interest rates fall, the borrower/issuer is more likely to repay/call the bond, which causes the bond's price to approach a maximum. As such, the bond's price increases at a decreasing rate as interest rates decrease.

(Study Session 14, Module 43.3, LOS 43.h)

Related Material

SchweserNotes - Book 4

99. (B) parallel shifts of the benchmark yield curve.

Explanation

Portfolio duration as a weighted average of the individual bonds' durations is calculated assuming parallel shifts in the yield curve. Cash flow yield is used to calculate duration based on the weighted average time until a bond portfolio's cash flows are scheduled to be received.

For Further Reference:

(Study Session 14, Module 43.2, LOS 43.f)

CFA® Program Curriculum, Volume 5, page 32

Related Material

SchweserNotes - Book 4

100. (B) Par value government bond maturing in five years.

Explanation

The bond with the least percentage price change will be the bond with the lowest interest rate risk. Higher coupons or shorter maturities decrease interest rate risk. The coupon paying bond with only five years to maturity will have the lowest interest rate risk.

For Further Reference:

(Study Session 14, Module 43.2, LOS 43.e)

CFA® Program Curriculum, Volume 5, page 26

Related Material

SchweserNotes - Book 4

101. (B) flat.

Explanation

Duration and convexity assume the yield curve shifts in a parallel manner. A downward (upward) sloping term structure of yield volatility suggests shifts in the yield curve are likely to be non-parallel because short-term interest rates are more (less) volatile than long-term interest rates.

(Study Session 14, Module 43.3, LOS 43.j)

Related Material

SchweserNotes - Book 4

102. (B) -17.58%.

Explanation

The estimated price change is:

$-(\text{duration})(\Delta YTM) + 1/2(\text{convexity}) \times (\Delta YTM)^2 = -10.62 \times 0.02 + (1/2)(182.92)(0.02^2) = -0.2124 + 0.0366 = -0.1758$ or -17.58%.

(Study Session 14, Module 43.3, LOS 43.i)

Related Material

SchweserNotes - Book 4

103. (C) $606.

Explanation

Money duration per $100 par value = annual modified duration x full price per $100 par value = 6.1 x $99.30 = $605.73

(Study Session 14, Module 43.2, LOS 43.g)

Related Material

SchweserNotes - Book 4.

104. (A) -$61.10.

Explanation

First, compute the current price of the bond as: FV = 1,000; PMT = 55; N = 10; I/Y = 4.7; CPT → PV = -1,062.68. Then compute the price of the bond if rates rise by 75 basis points to 5.45% as: FV = 1,000; PMT = 55; N = 10; I/Y = 5.45; CPT → PV = -1,003.78. Then compute the price of the bond if rates fall by 75 basis points to 3.95% as: FV = 1,000; PMT = 55; N = 10; I/Y = 3.95; CPT → PV = -1,126.03.

The formula for approximate modified duration is: $(V_{-}-V_{+}) / (2V_{O}y)$. Therefore, modified duration is: ($1,126.03 - $1,003.78) / (2 x $1,062.68 x 0.0075) = 7.67.

The formula for the percentage price change is then: -(duration)(ΔYTM). Therefore, the estimated percentage price change using duration is: -(7.67) (0.75%) = -5.75%. The estimated price change is then: (-0.0575)($1,062.68) = -$61.10

(Study Session 14, Module 43.1, LOS 43.b)

Related Material

SchweserNotes - Book 4