Reading 1

RATES AND RETURN

1. (A) **51.4%**

Explanation

To calculate the time-weighted return:

Step 1: Separate the time periods into holding periods and calculate the return over that period:

Holding period 1: P_0 = $50.00

D_1 = $5.00

P_1 = $75.00 (from information on second stock purchase)

HPR_1 = (75 – 50 + 5) / 50 = 0.60, or 60%

Holding period 2: P_1 = $75.00

D_2 = $7.50

P_2 = $100.00

HPR_2 = (100 – 75 + 7.50) / 75 = 0.433, or 43.3%.

Step 2: Use the geometric mean to calculate the return over both periods

Return = $[(1 + HPR_1) \times (1 + HPR_2)]^{1/2} - 1 = [(1.60) \times (1.433)]^{1/2} - 1$ 0.5142, or **51.4%.**

(Module 1.2, LOS 1.c)

2. (C) **-0.1178.**

Explanation

This is given by the natural logarithm of the new price divided by the old price; ln (80 / 90) = -0.1178.

(Module 1.3, LOS 1.d)

3. (C) **31.25%**

Explanation

Return = [dividend + (ending value – beginning value)] / beginning price value

= [1.25 + (25 – 20)] / 20 = 6.25 / 20 = 0.3125

(Module 1.3, LOS 1.e)

4. (B) **4.5%, and this represents a required rate of return.**

Explanation

Since we are taking the view of the minimum amount required to induce investors to lend funds to the bank, this is best described as a required rate of return. Based upon the numerical information, the rate must be 4.5% (= 3.0 + 1.5).

(**Module 1.1, LOS 1.a)**

5. (C) opportunity cost

Explanation

Since Wei will be foregoing interest on the withdrawn funds, the 6% interest can be best characterized as an opportunity cost — the return he could earn by postponing his auto purchase until the future.

(Module 1.1, LOS 1.a)

6. (A) discount rate.

Explanation

He needs to figure out how much the trip will cost in one year, and use the 5% as a discount rate to convert the future cost to a present value. Thus, in this context the rate is best viewed as a discount rate.

(Module 1.1, LOS 1.a)

7. (A) 48.9%.

Explanation

To determine the money weighted rate of return, use your calculator's cash flow and IRR functions. The cash flows are as follows:

CF0: initial cash outflow for purchase = $50

CF1: dividend inflow of $5 - cash outflow for additional purchase of $75 = net cash outflow of -$70

CF2: dividend inflow (2 × $7.50 = $15) + cash inflow from sale (2 × $100 = $200) = net cash inflow of $215

Enter the cash flows and compute IRR:

CF0 = -50; CF1 = -70; CF2 = +215; CPT IRR = 48.8607

(Module 1.2, LOS 1.c)

8. (A) 1.5%

Explanation

HPY = [(interest + ending value) / beginning value] – 1

= [(100 + 915) / 1,000] – 1

= 1.015 – 1 = 1.5%

(Module 1.3, LOS 1.e)

9. (B) Real return.

Explanation

No calculations are needed. The real return is greater than the nominal return because the inflation rate is negative. The leveraged return is more negative than the nominal return because the investment lost value and leverage magnifies the loss.

(Module 1.3, LOS 1.e)

10. (C) -6.7%.

Explanation

Continuously compounded rate of return = ln (1 – 0.065) = -6.72%.

(Module 1.3, LOS 1.d)

11. (C) are not affected by the timing of cash flows.

Explanation

Time-weighted returns are not affected by the timing of cash flows. Money-weighted returns, by contrast, will be higher when funds are added at a favourable investment period or will be lower when funds are added during an unfavourable period. Thus, time-weighted returns offer a better performance measure because they are not affected by the timing of flows into and out of the account.

(Module 1.2, LOS 1.c)

12. (B) money-weighted rate of return will tend to be elevated.

Explanation

The time-weighted returns are what they are and will not be affected by cash inflows or outflows. The money-weighted return is susceptible to distortions resulting from cash inflows and outflows. The money-weighted return will be biased upward if the funds are invested just prior to a period of favourable performance and will be biased downward if funds are invested just prior to a period of relatively unfavourable performance. The opposite will be true for cash outflows.

(Module 1.2, LOS 1.c)

13. (A) money-weighted return.

Explanation

The money-weighted return is the internal rate of return on a portfolio that equates the present value of inflows and outflows over a period of time.

(Module 1.2, LOS 1.c)

14. (A) –5.17%.

Explanation

$$\text{in}\left(\frac{S_1}{S_0}\right) = \text{in}\left(\frac{42.00}{44.23}\right) = \text{in}(0.9496) = -0.0517 = -5.17\%$$

(Module 1.3, LOS 1.d)

15. (C) -16.09%.

Explanation

The continuously compounded rate of return = ln (S_1/ S_0) = ln (108,427 /127,350) = –16.09%.

(Module 1.3, LOS 1.d)

16. (B) 1.0%.

Explanation

$$\frac{62.80 + 0.54 + 0.54}{63.25} - 1 = 0.01 = 1\%$$

Because we are asked for the HPR, the beginning and ending dates are irrelevant. If we had been asked to annualize the return, we would need to know the length of the holding period.

(Module 1.1, LOS 1.b)

17. (B) higher.

Explanation

A higher frequency of compounding leads to a higher effective rate of return. The effective rate of return with continuous compounding will, therefore, be greater than any effective rate of return with discrete compounding.

(Module 1.3, LOS 1.d)

18. (A) 13.33%.

Explanation

The holding period return is equal to the change in value from the beginning to the end of the holding period, which will include not only the change in price but also any dividends received over the period. For each share, the price increased by $1, and the dividend received was $0.60. The calculation is equal to:

$$\frac{Pt - P_0 + Div_t}{P_0} = \frac{13 - 12 + 0.60}{12} = 13.33\%$$

Ignoring the dividend produces an 8.33% return, and doubling the dividend produces an 18.33% return. It is important to note that only one dividend was received in the six-month period, and that was on April 1.

(Module 1.1, LOS 1.b)

19. (B) approximately the nominal risk-free rate reduced by the expected inflation rate.

Explanation

The approximate relationship between nominal rates, real rates and expected inflation rates can be written as:

Nominal risk-free rate = real risk-free rate + expected inflation rate.

Therefore, we can rewrite this equation in terms of the real risk-free rate as:

Real risk-free rate = Nominal risk-free rate – expected inflation rate

The exact relation is:

(1 + real) (1 + expected inflation) = (1 + nominal)

(Module 1.1, LOS 1.a)

20. (C) 0.94%.

Explanation

Using the financial calculator, the initial investment (CF_0) is –100,000. The income is +5,000(CF_1), and the contribution is –25,000 (CF_2). Finally, the ending value is +123,000 (CF_3) available to the investor.

Compute IRR = 0.94

(Module 1.3, LOS 1.e)

21. (B) geometric mean return.

Explanation

Geometric Mean Return = $\sqrt[3]{(1+0.06)(1-0.37)(1+0.27)} - 1 = -5.34\%$

Holding period return = $(1+0.06)(1-0.37)(1+0.27)-1=-15.2\%$

Arithmetic mean return = $(6\%-37\%+27\%)/3=-1.33\%$

(Module 1.3, LOS 1.e)

22. (C) 6.35%.

Explanation

T = 0: Purchase of first share = -\$100.00

T = 1: Dividend from first share = +\$1.00

Purchase of 3 more shares = -\$267.00

T = 2: Dividend from four shares = +4.00

Proceeds from selling shares = +\$392.00

The money-weighted return is the rate that solves the equation:

$\$100.00 = -\$266.00 / (1 + r) + 396.00 / (1 + r)^2$

CFO = -100; CF1 = -266; CF2 = 396; CPT → IRR = 6.35%.

(Module 1.2, LOS 1.c)

23. (A) 9.42%.

Explanation

The effective annual rate with continuous compounding =

$e^r - 1 = e^{0.09} - 1 = 0.09417$, or 9.42%.

(Module 1.3, LOS 1.d)

24. (B) fees.

Explanation

The net return on a portfolio is its gross return minus management and administrative fees. A return adjusted for taxes is called an after-tax return. A return adjusted for inflation is called a real return.

(Module 1.3, LOS 1.e)

25. (B) It holding period return.

Explanation

When a stock increases in value, the holding period return is always greater than the continuously compounded return that would be required to generate that holding period return. For example, if a stock increases from $1 to $1.10 in a year, the holding period return is 10%. The continuously compounded rate needed to increase a stock's value by 10% is Ln(1.10) = 9.53%.

(Module 1.3, LOS 1.d)

26. (A) liquidity premium and a premium to reflect the risk associated with the maturity of the security.

Explanation

The required interest rate on a security is made up of the nominal rate which is in turn made up of the real risk-free rate plus the expected inflation rate. It should also contain a liquidity premium as well as a premium related to the maturity of the security.

(Module 1.1, LOS 1.a)

27. (A) 0.06%.

Explanation

The holding period return in year one is ($89.00 – $100.00 + $1.00) / $100.00 = -10.00%.

The holding period return in year two is ($98.00 – $89.00 + $1.00) / $89 = 11.24%.

The time-weighted return is $[\{1 + (-0.1000)\}\{1 + 0.1124\}]^{1/2} - 1 = 0.06\%$.

(Module 1.2, LOS 1.c)

28. (C) $11.20.

Explanation

The formula to calculate the harmonic mean is equal to:

$$\overline{X}_H = \frac{4}{\frac{1}{12} + \frac{1}{14} + \frac{1}{11} + \frac{1}{9}} = 11.2113$$

Note that the arithmetic mean stock price is $11.50, and because the harmonic mean will always be less than the arithmetic mean for any dataset with unequal values, $11.75 would never be possible.

(Module 1.1, LOS 1.b)

29. (B) 3.80%.

Explanation

The arithmetic mean is equal to the average of the four data points, calculated by summing all four returns and dividing by the number of returns:

$$\frac{(R_1 + R_2 + R_3 + R_4)}{4} = \frac{(0.0526 - 0.0210 + 0.0386 + 0.0818)}{4} = 0.0380, \text{or } 3.80\%$$

(Module 1.1, LOS 1.b)

30. (A) less than 12.75.

Explanation

For any dataset where the values are not equal, the harmonic mean will be less than the geometric mean (which, in turn, will be less than the arithmetic mean). Here, the arithmetic mean is 13.25, and the geometric mean is 12.75—so the harmonic mean must be less than 12.75. It is worth noting that all three means are equal if every value in the dataset is the same.

(Module 1.1, LOS 1.b)

31. (B) square of the geometric mean.

Explanation

The mathematical relationship among arithmetic, geometric, and harmonic means is as follows:

arithmetic mean × harmonic mean = $(\text{geometric mean})^2$

(Module 1.1, LOS 1.b)

32. (A) Real risk-free interest rate.

Explanation

The real risk-free interest rate represents time preference, or the degree to which consumers prefer consumption in the present to an equal amount of consumption in the future. Other measures of return include time preference, but it also reflect other factors, such as risk or expected inflation.

(Module 1.1, LOS 1.a)

33. (B) 18.7%.

Explanation

HPY = (1,020 + 30 + 30 – 910) / 910 = 0.1868 or 18.7%.

(Module 1.3, LOS 1.e)

34. (A) 12.5%.

Explanation

The holding period return (HPR) is calculated as follows:

HPR = (P_t – P_{t-1} + D_t) / P_t

where:

P_t = price per share at the end of time period t

D_t = cash distributions received during time period t.

Here, HPR = (850 – 800 + 50) / 800 = 0.1250, or **12.50%.**

(Module 1.3, LOS 1.e)

35. (C) 27.5%.

Explanation

HPR = [ending value – beginning value] / beginning value

= (75 + 1.50 – 60) / 60 = 27.5%.

(Module 1.3, LOS 1.e)

36. (A) nominal risk-free rates because they contain an inflation premium.

Explanation

T-bills are government issued securities and are therefore considered to be default risk free. More precisely, they are nominal risk-free rates rather than real risk-free rates since they contain a premium for expected inflation.

(Module 1.1, LOS 1.a)

37. (B) ln (1 + R).

Explanation

This is the formula for the continuously compounded rate of return.

(Module 1.3, LOS 1.d)

38. (A) 23.44%.

Explanation

HPR = [ending value – beginning value] / beginning value

HPR = [(2 + 37.50) – 32] / 32 = 0.2344.

(Module 1.3, LOS 1.e)

39. (A) arithmetic mean is greater than geometric mean, which is greater than the harmonic mean.

Explanation

As long as there is variability in the data, the arithmetic mean is greater than geometric mean, which is greater than the harmonic mean.

(Module 1.1, LOS 1.b)

40. (A) 10.8%; 9.4%.

Explanation

Time-weighted return = (225 + 5 – 200) / 200 = 15%; (470 + 10 – 450) / 450 = 6.67%; [(1.15) (1.0667)] $^{1/2}$ – 1 = 10.8%

Money-weighted return:

200 + [225 / (1 + return)] = [5 / (1 + return)] + [480 / (1 + return)^2];

money return = approximately 9.4%

Note that the easiest way to solve for the money-weighted return is to set up the equation and **plug in the answer choices** to find the discount rate that makes outflows equal to inflows.

Using the financial calculators to calculate the money-weighted return: (The following keystrokes assume that the financial memory registers are cleared of prior work.)

TI Business Analyst II Plus®

- Enter CF_0: 200, +/-, Enter, down arrow
- Enter CF_1: 220, +/-, Enter, down arrow, down arrow
- Enter CF_2: 480, Enter, down arrow, down arrow,
- Compute IRR: IRR, CPT
- Result: 9.39

HP 12C®

- Enter CF_0: 200, CHS, g, CF_0
- Enter CF_1: 220, CHS, g, CF_j
- Enter CF_2: 480, g, CF_j
- Compute IRR: f, IRR
- Result: 9.39

(Module 1.2, LOS 1.c)

41. (B) 8.12.

Explanation

The relationship between the arithmetic, harmonic, and geometric mean is equal to:

arithmetic mean × harmonic mean = (geometric mean)^2

8.90 × harmonic mean = (geometric mean)2 = (8.50)^2

$$\text{harmonic mean} = \frac{(8.50)^2}{8.90} = 8.12$$

Note: *This could also be answered without performing calculations, knowing that harmonic < geometric < arithmetic, where values are not equal.*

(Module 1.1, LOS 1.b)

42. (C) 10.4%.

Explanation

January – March return = 51,000 / 50,000 − 1 = 2.00%

April – June return = 60,000 / (51,000 + 10,000) − 1 = –1.64%

July – December return = 33,000 / (60,000 − 30,000) − 1 = 10.00%

Time-weighted return = [(1 + 0.02) (1 − 0.0164) (1 + 0.10)] − 1 = 0.1036 or 10.36%

(Module 1.2, LOS 1.c)

43. (B) geometric mean return.

Explanation

Geometric mean return (time-weighted return) is the most appropriate method for performance measurement as it does not consider additions to or withdrawals from the account.

(Module 1.3, LOS 1.e)

44. (B) real return.

Explanation

A real return is adjusted for the effects of inflation and is used to measure the increase in purchasing power over time.

(Module 1.3, LOS 1.e)