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1. If the present value of \$280 paid one year from now is \$250, what is the one-year discount factor?

1 / 1 point

**Make sure to input all currency answers without any currency symbols or commas, and use two decimal places of precision.*

0.89

 **Correct**

The present value formula is $PV = \frac{\$280}{(1+r)}$

$PV = \$250$, then the discount factor, $\frac{1}{(1+r)}$ must be:

$$DF = \frac{1}{1+r} = \frac{\$250}{\$280} = 0.8929$$

2. If the present value of \$400 paid one year from now is \$320, what is the one-year interest rate? (Note: this number is also known as the discount rate.)

1 / 1 point

**Make sure to input all percentage answers as numeric values without symbols, and use two decimal places of precision. For example, if the answer is 6%, then enter 0.06.*

0.25

 **Correct**

Similarly, if $\$320 = \frac{\$400}{(1+r)}$,

$$\text{then } r = \frac{\$400}{\$320} - 1 = 0.25$$

so the discount rate is 0.25 (25%).

3. Lara Beal allocates wealth between two periods: youth and old age. Currently (in her youth) she has \$8,000 in cash. She can lend and borrow at the bank at 15% (that is, lending \$1 in youth will give her \$1.15 in old age). Her only investment opportunity other than the bank is a project that costs \$5,000 now in her youth and has a payoff of \$6,000 in her old age. What is the most she can consume in her old age?

1 / 1 point

**Make sure to input all currency answers without any currency symbols or commas, and use two decimal places of precision.*

9450.00

 **Correct**

We first need to determine if the project is worth doing. Note that $r = 15\%$, $C_0 = -5,000$,

$C_1 = 6,000$. Then $NPV = -5,000 + \frac{6,000}{1.15} = 217 > 0$, so the project is worth doing. Lara starts

with initial wealth of \$8000. The remaining part of her wealth = $8,000 - 5,000 = 3,000$ should be invested in the bank at 15%. Hence the most Lara can consume in old age equals

$$6,000 + 3,000(1.15) = \$9,450$$

4. James Bennett also allocates wealth between youth and old age. He has no cash currently (in his youth), but will inherit \$3000 in his old age. He can lend and borrow at the bank at 18% (that is, lending \$1 in youth will give him \$1.18 in old age). He has an investment opportunity that costs \$12,000 now in his youth and has a payoff of \$15,000 in his old age. This is the only investment opportunity available to him. What is the most he can consume in his youth?

1 / 1 point

**Make sure to input all currency answers without any currency symbols or commas, and use two decimal places of precision.*

3254.24

✓ Correct

Again, the first step is to determine the NPV of the project. Using the same reasoning as in the above question, $NPV = -12,000 + \frac{15,000}{1.18} = 712 > 0$. So James should undertake the project. Given that James will inherit \$3000 in his old age, the most he can consume now is $\$712 + \frac{\$3000}{1.18} = \$3254.37$.

Note that to obtain this level of consumption, he borrows the full amount, plus \$12,000 from the bank. In old age, he then pays this back with interest: $(\$12,000 + \$3254.37)(1.18) = \$18,000$. He can pay back \$18000 because of the \$15000 from the project, plus the \$3000 he inherits.

5. Which of the following investments do you prefer?

1 / 1 point

- (a) Purchase a bond with a single payment of \$1000 in ten years, for a price of \$550.
- (b) Invest \$550 for ten years in PNC Bank at a guaranteed annual interest rate of 4.5%.
- ☒ (a) Purchase a Bond
- ☐ (b) Invest with PNC Bank

✓ Correct

The annual return on the bond is:

$$r = (1000/550)^{1/10} - 1 = .0616$$

The interest on the PNC deposit is only 4.5%. Therefore, the bond is a better investment. After 10 years, the PNC bank deposit will have grown to: $FV = 550(1.045)^{10} = 854.13$, which is lower than the face value (of \$1000) of the bond.

6. You have just applied for a 30-year \$100,000 mortgage at a rate of 10%. What must the annual payment be?

1 / 1 point

**Make sure to input all currency answers without any currency symbols or commas, and use two decimal places of precision.*

10607.92

✓ Correct

From the annuity formula: $100,000 = C \times AF_{.10}^{30}$ where $AF_{.10}^{30}$ is the annuity factor:

$$AF_{.10}^{30} = \left[\frac{1}{.10} - \frac{1}{.10(1+.10)^{30}} \right] = 9.4269$$

Therefore $C = \$100,000/9.4269 = \$10,607.92$

7. Suppose you are given a choice of the following two securities:

1 / 1 point

- (a) an annuity that pays \$10,000 at the end of each of the next 6 years;
- or (b) a perpetuity that pays \$10,000 forever, but the first cash payment is 11 years from today.

Which security do you choose if the annual interest rate is 5%?

- ☐ (a) an annuity that pays \$10,000 at the end of each of the next 6 years
- ☒ (b) a perpetuity that pays \$10,000 forever, but the first cash payment is 11 years from today

✓ Correct

To determine whether (a) is better than (b) we must calculate the present value of each annuity.

Cash flow (a) is a straightforward annuity whose present value is given by:

$$PV = C \left[\frac{1}{r} - \frac{1}{r(1+r)^t} \right]$$

Given the values of $C = \$10,000$ and $t = 6$, when the interest rate, r , is equal to 5%, the present value is \$50,757. When an interest rate of 10% is used with the same cashflows, the present value is \$43,552

Cash flow (b) is a perpetuity that begins 10 years from now. We can value it in two parts. We know that ten years from now, the perpetuity has a present value given by the formula:

$$PV \text{ in 10 yrs} = \frac{C}{R}$$

Thus, with $C = \$10,000$ and $r = .05$ the perpetuity is worth \$200,000 10 years from now. We can solve for the present value of \$200,000 received with a 10 year delay as

$$PV = \frac{\$200,000}{(1+r)^{10}}$$

When we substitute $r = .05$ in the formula above we find that the present value of the perpetuity beginning 10 years from now is \$122,782. Hence we prefer the perpetuity because its present value of \$122,782 is larger than the \$50,757 present value of the annuity in (a).

8. Assume the annual interest rate is 6%. Calculate the value of an investment that pays \$100 every two years, starting two years from now and continuing forever.

1 / 1 point

**Make sure to input all currency answers without any currency symbols or commas, and use two decimal places of precision.*

833.33

✓ Correct

An alternative solution: The formula can be written as

$$\begin{aligned} PV &= \sum_{t=1}^{\infty} \frac{100}{(1+r)^{2t}} \\ &= \sum_{t=1}^{\infty} \frac{100}{(1.06)^{2t}} \\ &= \sum_{t=1}^{\infty} \frac{100}{(1.1236)^t} \end{aligned}$$

We can therefore use the perpetuity formula with $r = .1236$.

Note that if you (incorrectly) solved this problem by assuming that you received \$50 per year rather than \$100 every two years, you would have found

$$PV = 50/.06 = 833.33$$

This is slightly more because of the effect of having cash flows slightly earlier.

9. Suppose money invested in a hedge fund earns 1% per trading day. There are 250 trading days per year. What will be your annual return on \$100 invested in the fund if the manager allows you to reinvest in the fund the 1% you earn each day?

1 / 1 point

**Make sure to input all currency answers without any currency symbols or commas, and use two decimal places of precision.*

1203.22

✓ Correct

Allowing you to reinvest at 1% per day means that you are earning compound interest on your initial \$100 investment. The formula for the future value of P in one year is

$$FV = P(1 + \frac{r_a}{m})^m$$

where m is the number of compounding periods per year and hence r_a/m is the period rate. Given, $r_a/m = 1\%$ per day, the EAR is

$$EAR = (1 + .01)^{250} - 1 = 11.0321.$$

Multiplying by 100 puts this into percentage terms: 1103.21% per annum. Looked at another way, investing \$100 in the hedge fund produces

$$\$100(1 + .01)^{250} = \$1203.22$$

at the end of one year.

10. Suppose money invested in a hedge fund earns 1% per trading day. There are 250 trading days per year. With an initial investment of \$100, what will be your annual return assuming the manager puts all of your daily earnings into a zero-interest-bearing checking account and pays you everything earned at the end of the year?

1 / 1 point

**Make sure to input all currency answers without any currency symbols or commas, and use two decimal places of precision.*

350.0

✓ Correct

If the hedge fund manager insists on putting your daily 1% earnings into a zero-interest-bearing checking account, then you will earn only the daily rate (1%) multiplied by the number of days, or,

$$1\% \times 250 = 250\%$$

Notice that this is equivalent to the annual percentage rate (APR) calculation:

$$APR = \text{periodrate} \times m = 1\% \times 250$$

The value at the end of the year includes interest earnings plus original investment, that is, $100 + 250 = 350$.

