1. Which one would you prefer?

   a. Receive $10,000 now

   b. Receive $1,000 every year for 13 years (the last payment occurs at the end of 13 years), if the annual interest rate is 4%

   Answer:

   The correct answer is a.

   You want to compare the present value of $1000 yearly for 13 years with $10 000 now.

   So you want to calculate the present value of an annuity.

$$P_0 = \frac{A}{r}\left(1 - (1 + r)^{-T}\right)$$

$$T = numbers\ of\ annuity\ payments$$
$$r = the\ interest\ rate$$
$$P_0 = Present\ value\ of\ annuity$$

$$A = annuity\ payment$$

$$In\ our\ example\ we\ have\ P_0 = \frac{1000}{4\%}\left(1 - (1 + 4\%)^{-13}\right) = \$9985.65$$

   Hence you prefer to have $10000 now.

2. How much would you have saved in twenty years if you save $5000 every year and can guarantee earning 6% per year? Round your final answer to three digits after the decimal. State your answer as 'x.xxx'

   Answer:

   The correct answer is 183,927.956.

   We need to compute the future value of an annuity.

   The future value of annuity is given by

   VT = C × ACF(r,n)

   where V_T = future value of the annuity, C = $5000, r = 6%, and n = 20 and ACF(r,n) denotes the Annuity Compound Factor.

$ACF(r,n) = [(1+r)^n - 1]/r$

In this example, ACF(r = 6%, n = 20) = 36.785591

The future value is equal to:

V_T = 5000 x ACF(r = 6%, n = 20) = 5000 x 36.785591 = 183,927.956

3. You are buying a new car. The car dealer gives you three financing options. If your objective is to minimize the present value of your car payments and your opportunity cost of capital is 0.5% per month, which one would you choose?

    a. \$500 per month for 36 months

    We need to compare the present value of each of these payment plans using the present value of an annuity.

    $V_0 = C \times ADF(r,n)$

    where V_0 = present value of the annuity, C = \$500, r = 0.5%, and n = 36 and ADF(r,n) denotes the Annuity Discount Factor.

    $ADF(r,n) = (1-(1+r)^{-n})/r$

    In this example, ADF(r=0.5%, n=36) = 32.8710

    The present value of the payments is equal to 500 x 32.8710 = 16,435.51. This is not the lowest.

    b. \$600 per month for 24 months

    We need to compare the present value of each of these payment plans using the present value of an annuity.

    $V_0 = C \times ADF(r,n)$

    where V_0 = present value of the annuity, C = \$600, r = 0.5%, and n = 24 and ADF(r,n) denotes the Annuity Discount Factor.

    $ADF(r,n) = (1-(1+r)^{-n})/r$

    In this example, ADF(r=0.5%, n=24) = 22.5629

The present value of the payments is equal to 600 x 22.5629 = 13,537.720

This is the lowest.

c. \$350 per month for 48 months

We need to compare the present value of each of these payment plans using the present value of an annuity.

$V_0 = C \times ADF(r,n)$

where V_0 = present value of the annuity, C = \$300, r = 0.5%, and n = 48 and ADF(r,n) denotes the Annuity Discount Factor.

$ADF(r,n) = (1-(1+r)^{-n})/r$

In this example, ADF(r=0.5%, n=48) = 42.580

The present value of the payments is equal to 350 x 42.580 = 14,903.111

This is not the lowest.

Answer:

The correct answer is b.

4. You are buying a new house for \$450,000. Reviewing different financing options, you have determined that you would like to minimize your monthly payment. Which financing option would you choose? Assume monthly payments over the life of the mortgage.

a. 30-year mortgage with annual interest rate of 3.5 percent

We need to solve for the fixed monthly mortgage payments using the present value formula of a 30-year annuity.

$V_0 = C \times ADF(r,n)$

where

$ADF(r,n) = (1-(1+r)^{-n})/r$

Notice that the payments are monthly and the interest rate is annual. So we need to first find the monthly rate.

So n = 30 x 12 = 360 and r = 3.5/12 =0.2917%

We are solving for C where 450,000 = ADF(r= 0.2917%, n=360)

C = 2020.70

This is the lowest.

b. 20-year mortgage with an annual interest rate of 3 percen

We need to solve for the fixed monthly mortgage payments using the present value formula of a 20-year annuity.

$V_0 = C \times ADF(r,n)$

where

$ADF(r,n) = (1-(1+r)^{-n})/r$

Notice that the payments are monthly and the interest rate is annual. So we need to first find the monthly rate.

So n = 20 x 12 = 240 and r = 3/12 =0.25%

We are solving for C where 450,000 = ADF(r= 0.25%, n=240)

C = 2495.69

This is not the lowest.

c. 15-year mortgage with an annual interest rate of 2.8 percent

We need to solve for the fixed monthly mortgage payments using the present value formula of a 20-year annuity.

$V_0 = C \times ADF(r,n)$

where

$ADF(r,n) = (1-(1+r)^{-n})/r$

Notice that the payments are monthly and the interest rate is annual. So we need to first find the monthly rate.

So n = 15 x 12 = 180 and r = 2.8/12 = 0.2333%

We are solving for C where 450,000 = ADF(r= 0.2333%, n=180)

C = 3064.515

This is not the lowest.

Answer:

The correct answer is a.