# ***Assignment 2***

1. *You deposit $12,000 annually into a life insurance fund for the next 10 years, at which time you plan to retire. Instead of a lump sum, you wish to receive annuities for the next 20 years. What is the annual payment you expect to receive beginning in year 11 if you assume an interest rate of 6 percent for the whole time period?*

**Solution**

Find the FV of annual deposit

| | | |
|---|---|---|
| PMT | = | 12,000 |
| I | = | 6% |
| N | = | 10 |
| PV | = | 0 |
| FV | = | 158,169.5393 |

Find the annual payment you expect to receive in year 11

Cash inflow = Cash outflow

Thus, FV of annual deposit = PV of annual payment

Find the PMT

| | | |
|---|---|---|
| I | = | 6% |
| N | = | 20 |
| FV | = | 0 |
| PV | = | -158,169.5393 |
| PMT | = | 13,789.9412 |

**Therefore the annual payment that you will receive in the beginning of year 11 is equal to $13,789.94 .**

2. *Suppose a 65-year-old person wants to purchase an annuity from an insurance company that would pay $20,000 per year until the end of that person's life. The insurance company expects this person to live for 15 more years and would be willing to pay 6 percent on the annuity. How much should the insurance company ask this person to pay for the annuity?*

**Solution**

Find the PV of annual payment in order to solve for the lump sum amount that he needs to pay the insurance company

| | | |
|---|---|---|
| PMT | = | 20,000 |
| I | = | 6% |
| N | = | 15 |
| FV | = | 0 |
| PV | = | - 194,244.9798 |

**Therefore the lump sum amount for annuity is $19,4244.98 .**

*b. A second 65-year-old person wants the same $20,000 annuity, but this person is much healthier and is expected to live for 20 years. If the same 6 percent interest rate applies, how much should this healthier person be charged for the annuity?*

**Solution**

Find the PV of annual payment in order to solve for the lump sum amount that he needs to pay the insurance company

PMT = 20,000
I = 6%
N = 20
FV = 0
PV = - 229,398.4244

**Therefore the lump sum amount for annuity is *$229,398.42* .**

*c. In each case, what is the difference in the purchase price of the annuity if the distribution payments are made at the beginning of the year?*

**Solution**

*For case A,*

If the distribution payments are made at the beginning of the year,
*F*ind the PV of annual payment in order to solve for the lump sum amount that he needs to pay the insurance company

PMT = 20,000
I = 6%
N = 14
FV = 0
PV = - 185,899.6785
Present value = 185,899.6785 + 20,000
= 205,899.6785
The difference = Payment at the beginning - Payment at the end
= 205,899.6785 – 194,244.9798
**= 11,654.987**

*For case B,*

If the distribution payments are made at the beginning of the year,
Find the PV of annual payment in order to solve for the lump sum amount that he needs to pay the insurance company

PMT = 20,000
I = 6%
N = 19
FV = 0
PV = - 223,162.3298
Present value = 223,162.3298+ 20,000
= 243,162.3298
The difference = Payment at the beginning - Payment at the end
= 243,162.3298- 229,398.4244
**= 13,763.9054**

3. *An insurance company's projected loss ratio is 77.5 percent and its loss adjustment expense ratio is 12.9 percent. The company estimates that commission payments and dividends to policyholders will be 16 percent. What must be the minimum yield on investments to achieve a positive operating ratio?*

**Solution**

The loss ratio + The loss adjustment expense ratio + Commission ratio = Combined ratio

0.775 + 0.129 + 0.16 =1.064 = 106.4%

**Therefore the company must invest on the asset that have minimum yield on investment equals to 6.4% in order to achieve a positive operating ratio.**

4. *An insurance company collected $3.6 million in premiums and disbursed $1.96 million in losses. Loss adjustment expenses amounted to 6.6 percent and dividends paid to policyholders totaled 1.2 percent. The total income generated from the company's investments was $170,000 after all expenses were paid. What is the net profitability in dollars?*

**Solution**

| | |
|---|---|
| Insurance premium | 3,600,000 |
| Disbursement | (1,960,000) |
| Loss adjustment expense; 3,600,000x0.066 | (237,600) |
| Dividend paid to policyholders; 3,600,000x0.012 | (43,200) |
| Total income from investment | 170,000 |
| Net profit | **1,529,200** |

**Therefore the net profitability in dollars is *$1,529,200 .***