

ANNUITIES.

An Annuity is an investment where a fixed payment is made into the future.

Superannuation is an example of an annuity.

The recurrence relation that can be used to model the value after n payments is

$$V_0 = \text{Principal} \quad V_{n+1} = R V_n - D.$$

Where $R = 1 + \frac{r}{100}$

r = interest rate per compounding period

D = payment received.

Pg 330 Eg 11

Eg George plans to travel overseas for 6 months. He invests \$12 000 in an annuity that earns interest at the rate of 6% pa, compounding monthly. He receives a monthly income of \$2035 per month.

a) Write down the recurrence relation for this annuity.

b) What is the value of the Annuity after 3 payments.

Solution

a) $V_0 = 12\,000$

$D = 2035$

$r = 6\% \text{ pa} = \frac{6}{12} = 0.5\% \text{ per month}$

$R = 1 + \frac{0.5}{100} = 1.005$

$V_0 = 12\,000$

$V_{n+1} = 1.005 V_n - 2035$

b) Using Calculator

$$n = 3 \quad \sqrt[3]{3} = 6045.33$$

Financial Solver can also be used.

Pg 333 Eg 13.

Eg Judy invests \$200,000 into an annuity paying 5% p.a. Compounding Monthly.

a) If she is to be paid for 10 years, how much will she receive each month?

b) If she receives a payment of \$3,000, how long will the annuity last?

c) What interest rate would be needed for Judy to receive \$2,500 each month for 10 years.

Solution

$$\begin{array}{ll} \text{a) } N = 10 \times 12 = 120 & I = 5 \\ C/Y = 12 & P/Y = 12 \\ PV = -200,000 & FV = 0 \end{array}$$

\uparrow Put in by Judy.
PMT = ?

$$PMT = \$2121.31$$

$$\begin{array}{ll} \text{b) } N = ? & I = 5 \\ C/Y = 12 & P/Y = 12 \\ PV = -200,000 & FV = 0 \\ PMT = 3000 & \end{array}$$

$N = 76.26$ Months.

c) $N = 120$ $I = ?$
 $C/Y = 12$ $P/Y = 12.$
 $PV = -200\,000$ $FV = 0.$
 $PMT = 2500.$

$$I = 8.6692.$$
$$= 8.69\%.$$

Questions: Text Ex 9E Pg 335

All Questions.