Other type of annuities

Annuities where the payments vary in an arithmetic progression:

An annuity where the first payment = P, second payment = P + Q, third payment = P + 2Q, . . . , that is, the payments are in arithmetic progression with a constant increase of Q, has present value:

\[ P \overline{a_m^i} + Q \frac{a_m - nv^n}{i} \]

and future value:

\[ P \overline{s_m^i} + Q \frac{s_m - n}{i} \]

An increasing annuity is an annuity where the first payment = 1, second payment = 2, third payment = 3, . . .

\[
(Ia)_m = \frac{a_m - nv^n}{i} \\
(Is)_m = \frac{s_m - n}{i} = \frac{s_{m+1} - (n + 1)}{i} \\
(Ia)_\infty = \frac{1}{i} + \frac{1}{i^2}
\]

A decreasing annuity is an annuity where the first payment = n, second payment = n − 1, third payment = n − 2, . . .

\[
(Da)_m = \frac{n - a_m}{i} \\
(Ds)_m = \frac{n(1 + i)^n - s_m}{i}
\]

Payments varying in geometric progression:

annuity immediate with a term of \( n \) periods in which the first payment is 1, and successive payments increase in geometric progression with common ratio \((1 + k)\). The present value when \( k \neq i \) is

\[ v + v^2(1 + k) + v^3(1 + k)^2 + \ldots + v^n(1 + k)^{n-1} = \frac{1 - (1+k)^n}{i - k} \cdot \frac{1}{i}. \]

When \( k = i \) the present value is: \( nv \).

Other payments patterns:
Learn to sum geometric sums !!!!