Discounted Cash Flow Analysis Factors

Intuition, Illustration, Calculation & Excel

Note: "i" is the appropriate discount rate (MARR, etc.).

Chris Willmore, October 2022

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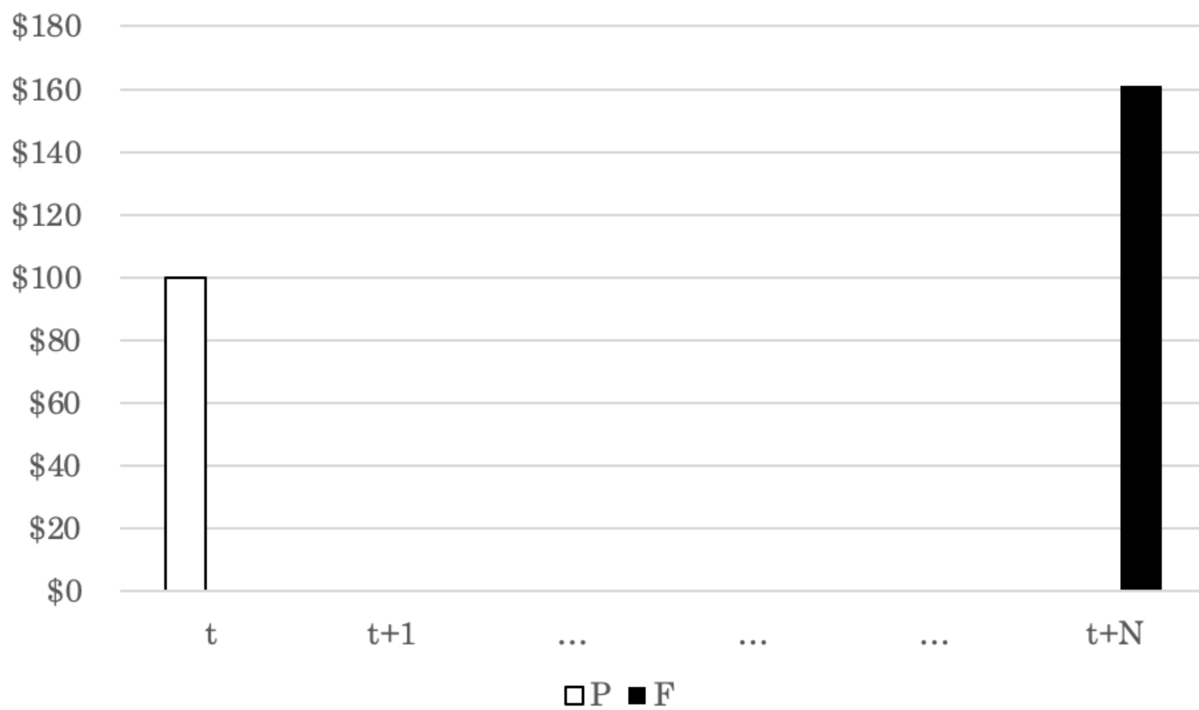
F = P x (F/P,i,N) (Move right on the timeline)

INTUITION

- Start: A single payment of magnitude P, at time t
- End: A single payment of magnitude P x (F/P,i,N), at time t + N.

ILLUSTRATION



Drawn for P = $100, N = 5, i = 10%. Start: White, End: Black

FORMULA

$$P \times (F/P,i,N) = P \times (1 + i)^N$$

EXCEL EQUIVALENT

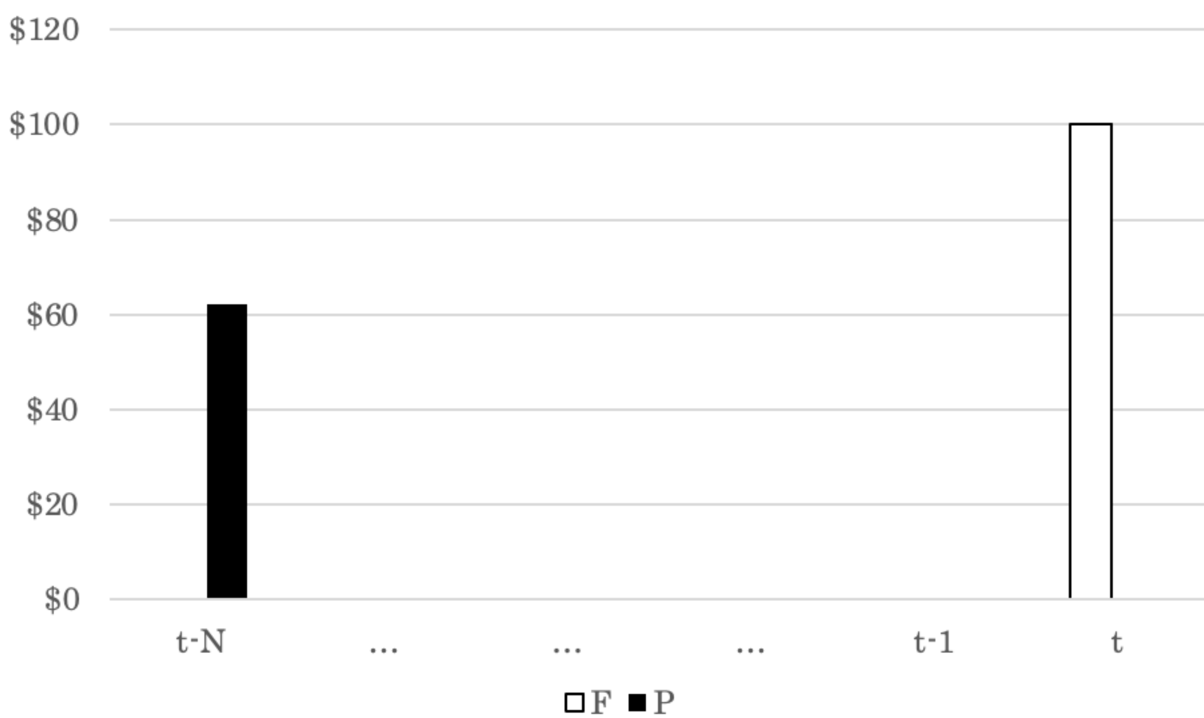
P x (F/P,i,N) =FV(i,N,,-P)

P = F x (P/F,i,N) (Move left on the timeline)

INTUITION

- Start: A single payment of magnitude F, at time t.
- End: A single payment of magnitude F x (P/F,i,N), at time (t – N).

ILLUSTRATION



Drawn for F = $100, N = 5, i = 10%. Start: White, End: Black

FORMULA

$$F \times (P/F,i,N) = F / (F/P,i,N) = F/(1+i)^N$$

EXCEL EQUIVALENT

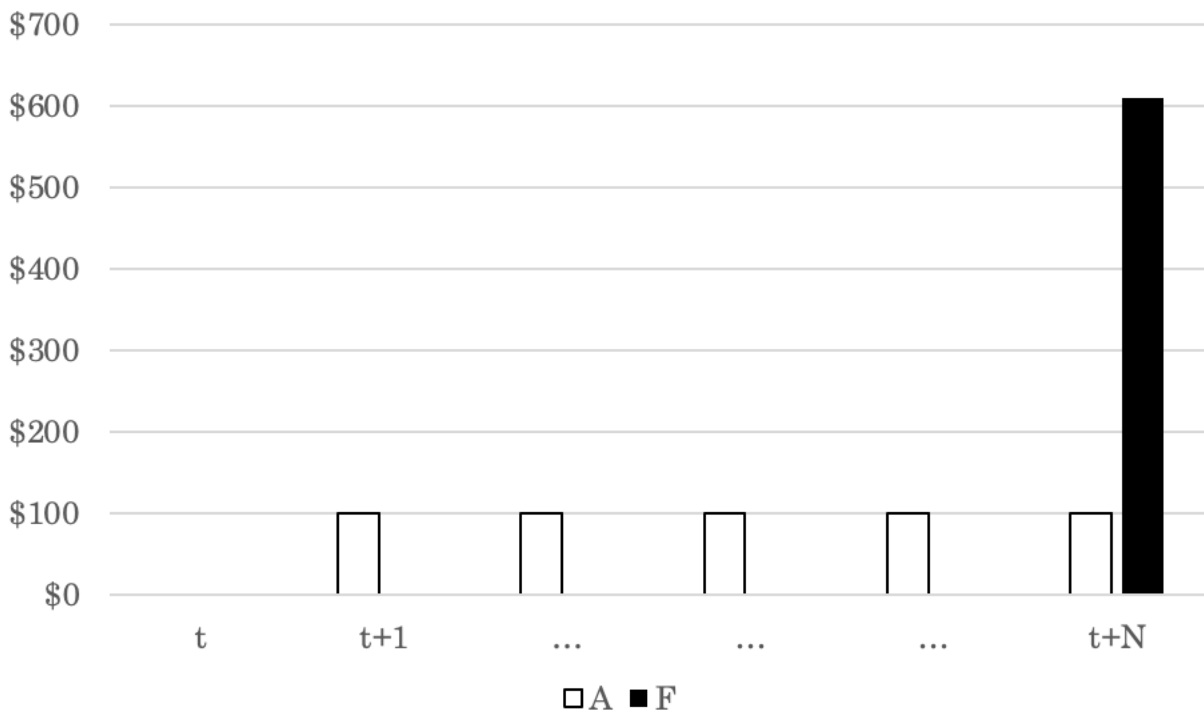
F x (P/F,i,N) =PV(i,N,,-F)

F = A x (F/A,i,N) (Sequence to Single Payment on Right)

INTUITION

- Start: N payments of magnitude A. The last payment is at time t+N.
- End: A single payment of magnitude A x (F/A,i,N), at time t+N.

ILLUSTRATION



Drawn for A = $100, N = 5, i = 10%. Start: White, End: Black

FORMULA

A x (F/A,i,N) = A x $= \frac{(1+i)^{N}-1}{i}$

EXCEL EQUIVALENT

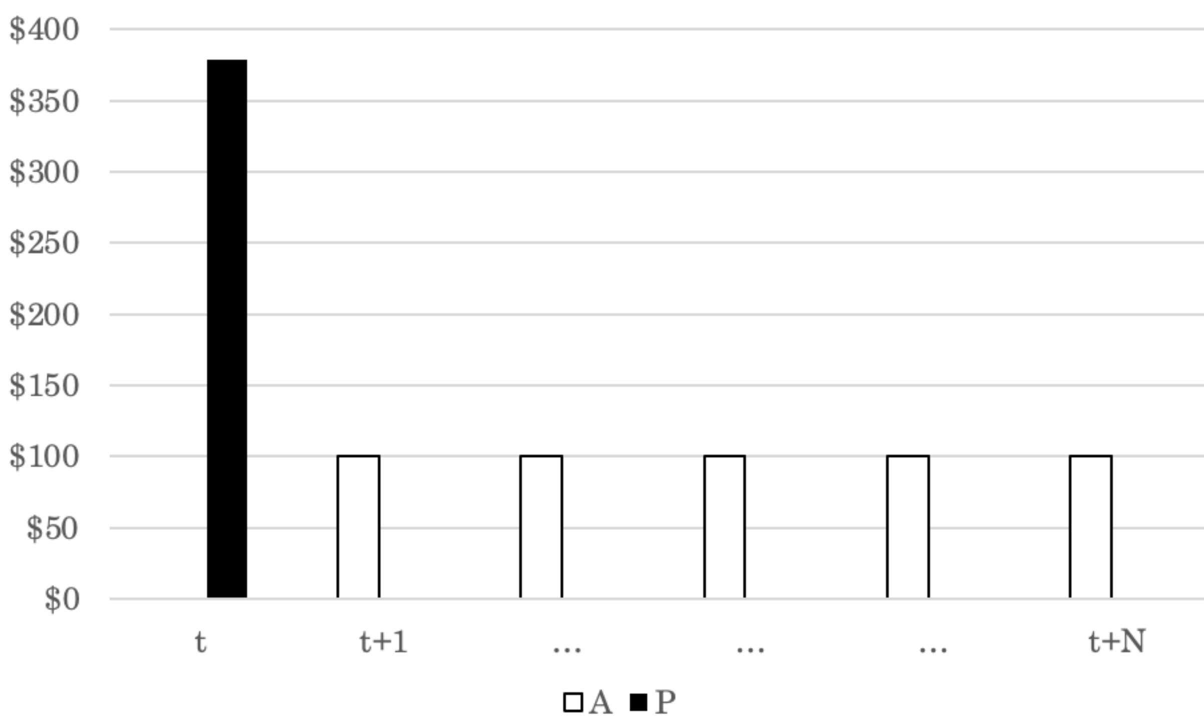
A x (F/A,i,N) =FV(i,N,-A)

P = A x (P/A,i,N) (Sequence to Single Payment on Left)

INTUITION

- Start: A sequence of N payments of magnitude A. First payment: time t+1.
- End: A single payment of A x (P/A,i,N), at time t.

ILLUSTRATION



Drawn for A = $100, N = 5, i = 10%. Start: White, End: Black

FORMULA

$$A \times (P/A,i,N) = A \times = \frac{(1+i)^N - 1}{[i(1+i)^N]}$$

EXCEL EQUIVALENT

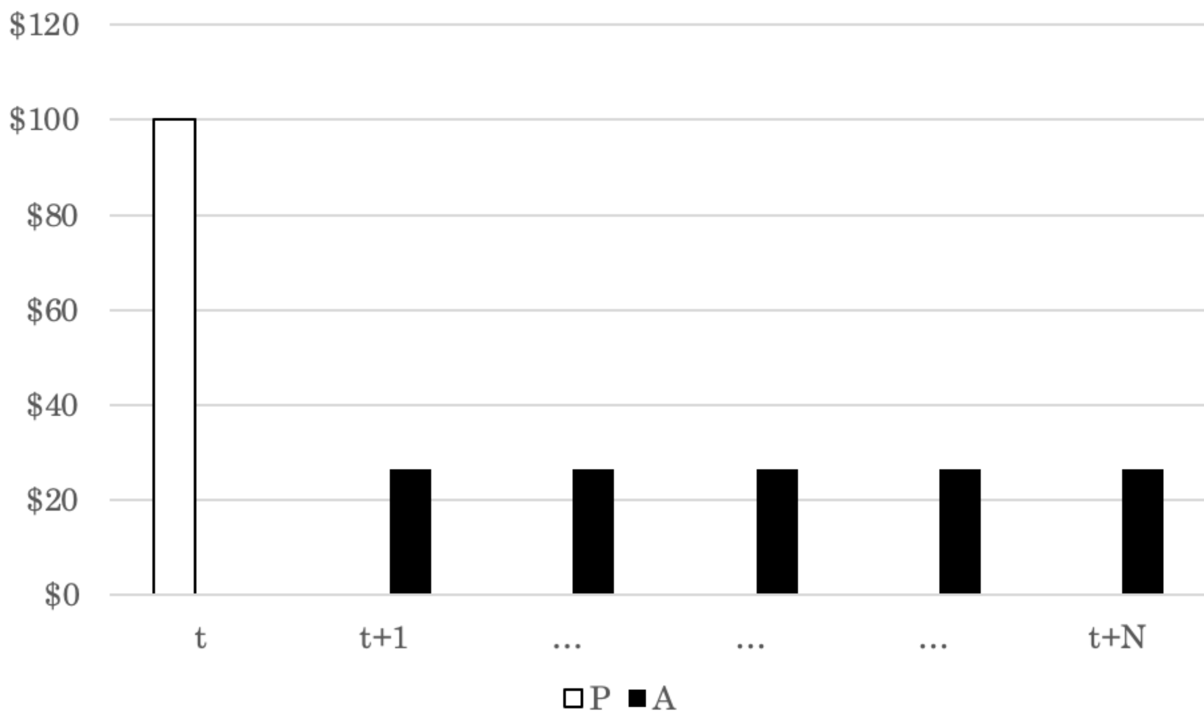
A x (P/A,i,N) =PV(i,N,-A)

A = P x (A/P,i,N) (Single Payment to Sequence on Right)

INTUITION

- Start: A single payment of magnitude P, at time t.
- End: N payments of magnitude P x (A/P,i,N). The first payment is at time t+1.

ILLUSTRATION



Drawn for P = \$100, N = 5, i = 10%. Start: White, End: Black

FORMULA

$$P \times (A/P,i,N) = A / (P/A,i,N) = F/(1+i)^N$$

EXCEL EQUIVALENT

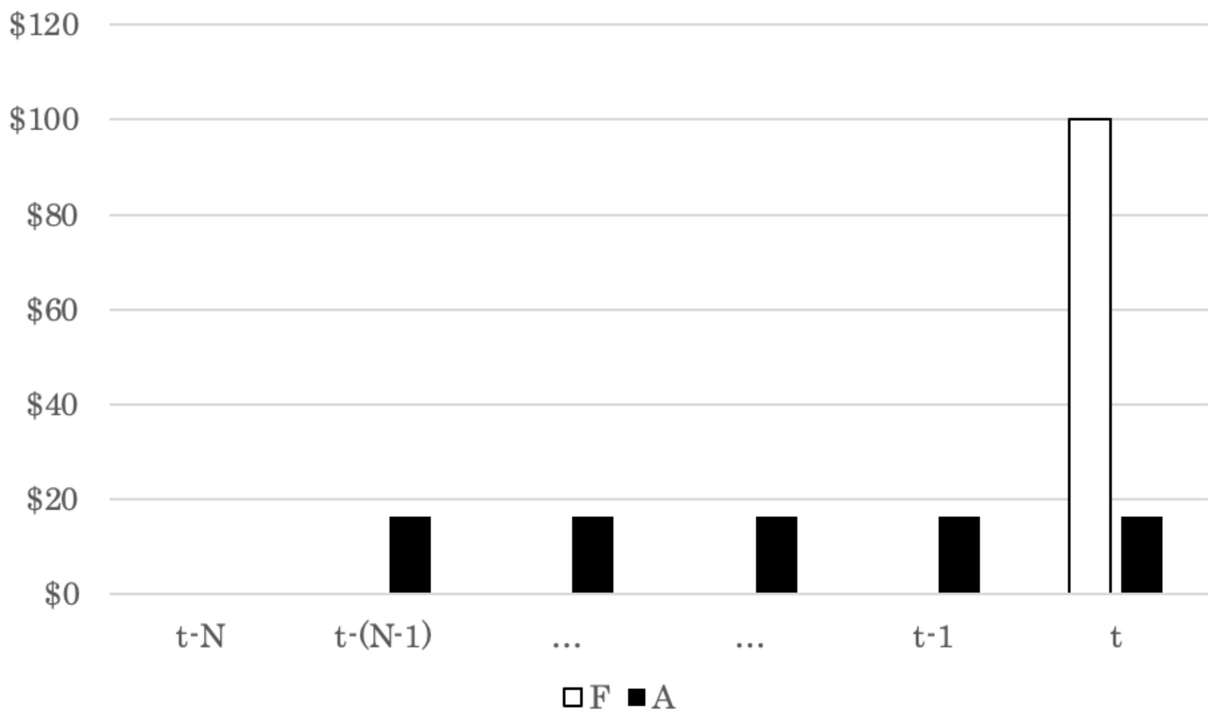
P x (A/P,i,N) =PMT(i,N,-P)

A = F x (A/F,i,N) (Single Payment to Sequence on Left)

INTUITION

- Start: A single payment of magnitude F, at time t.
- End: N payments of magnitude A. The last payment is at time t.

ILLUSTRATION



Drawn for F = \$100, N = 5, i = 10%. Start: White, End: Black

FORMULA

$$F \text{ x } (A/F,i,N) = F/(F/A,i,N) = F \text{ x } \frac{i}{(1+i)^N-1}$$

EXCEL EQUIVALENT

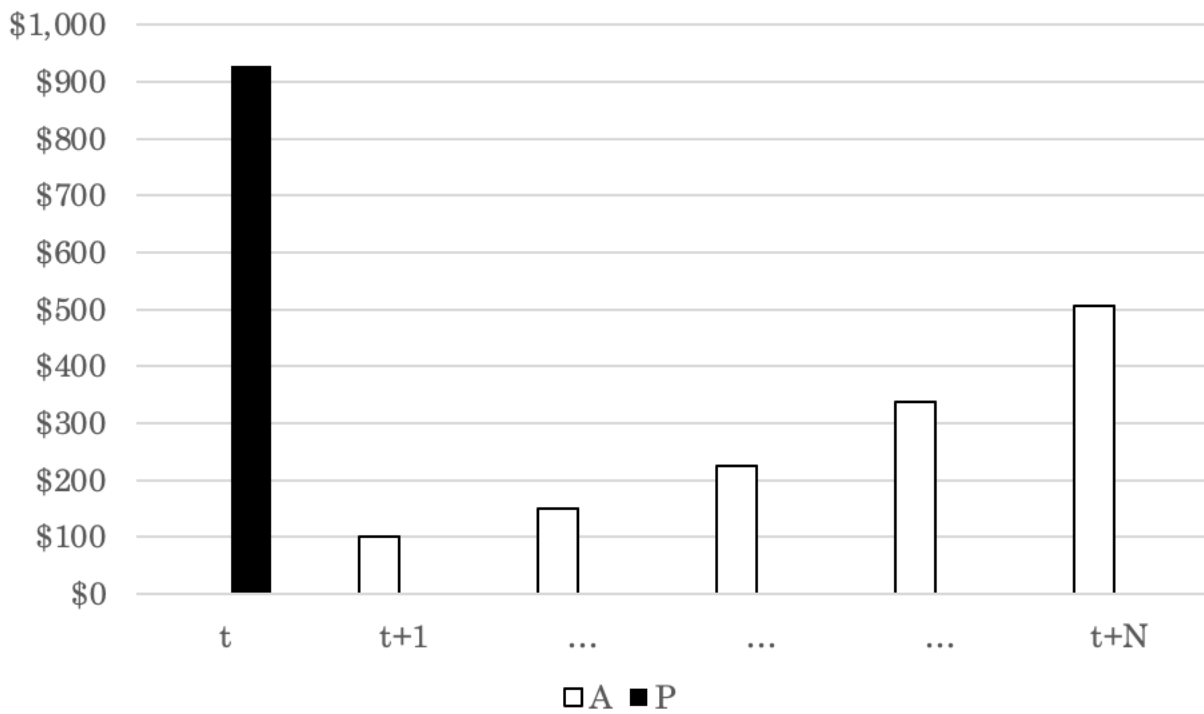
F x (A/F,i,N) =PMT(i,N,,-F)

P = A x (P/A,g,i,N) (Geometric Gradient to Single Payment)

INTUITION

- Start: A sequence of N payments. The first payment is at time t+1, and has magnitude A. Each payment is greater than the last by a factor of (1+g).
- End: A single payment of magnitude A x (P/A,g,i,N), at time t.

ILLUSTRATION



Drawn for A = \$100, N = 5, i = 10%, g = 50%. Start: White, End: Black

FORMULA

A x (P/A,g,i,N) = A x (P/A,i^o,N)/(1+g), where $i^o = (1+i)/(1+g) - 1$

EXCEL EQUIVALENT

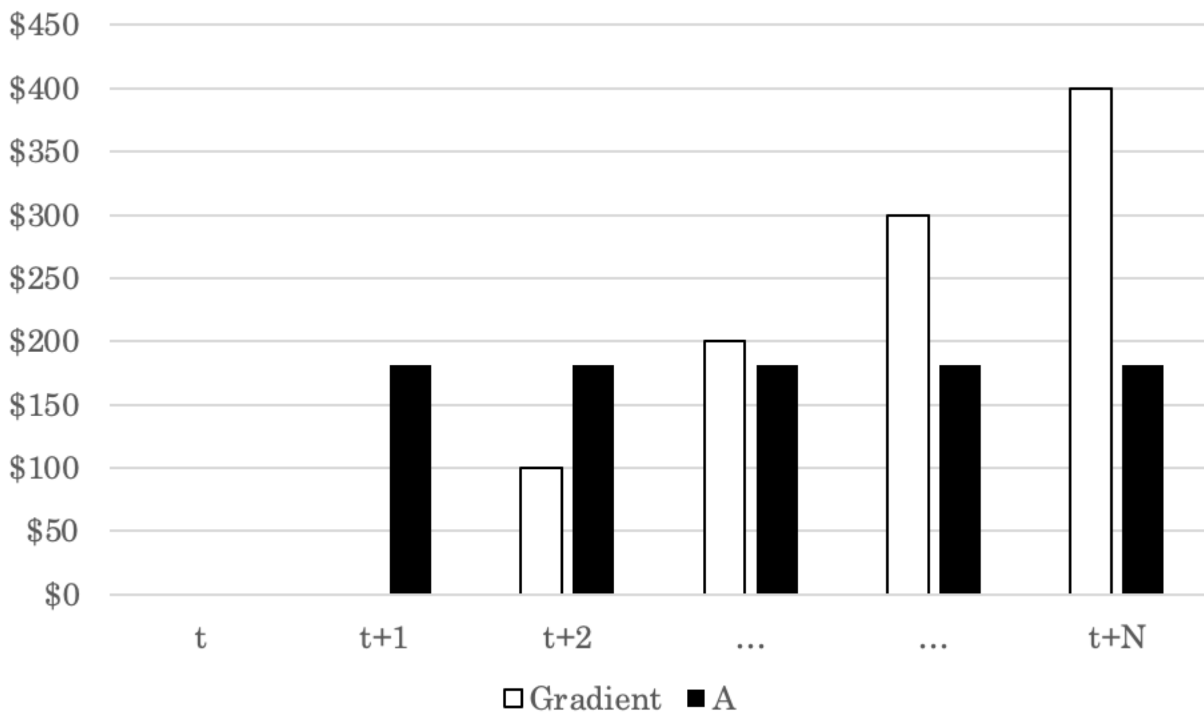
A x (P/A,g,i,N) =PV(((1+i)/(1+g)-1),N,-A)/(1+g)

A = G x (A/G,i,N) (Arithmetic Gradient to Sequence)

INTUITION

- Start: A sequence of (N – 1) payments. The first payment is at time t+2, and has magnitude G. Each payment is greater than the last by G.
- End: A sequence of N payments of magnitude G x (A/G,i,N). The first payment is at time (t+1).

ILLUSTRATION



Drawn for G = $100, N = 5, i = 10%. Start: White, End: Black

FORMULA

$$G \text{ x } (A/G,i,N) = G \text{ x } \left(\frac{1}{i} - \frac{N}{(1+i)^N - 1} \right)$$

EXCEL EQUIVALENT

G x (A/G,i,N) =G*((1/i)-(N/((1+i)^N-1)))