

Case study:

Jane, who is 45 years old and planning her retirement, wants a reliable income source upon retiring at 65. Her financial advisor has outlined two investment choices: an annuity and a perpetuity.

Annuity Option:

Jane can invest \$200,000 in an annuity plan that will pay her \$20,000 per year for 20 years, starting from her retirement at age 65. The annuity plan has an annual interest rate of 6%.

Perpetuity Option:

Alternatively, Jane can opt for a perpetuity that guarantees her \$15,000 per year indefinitely, beginning from her retirement at age 65. The perpetuity plan also offers an annual interest rate of 5%.

Objective:

Jane wants to evaluate these two options to determine which investment plan would be more beneficial for her retirement income.

Now based on this, answer the following questions:

1) Calculate the present value of both the annuity and perpetuity options at the time of Jane's retirement (age 65). Use the appropriate formulas for the present value of an annuity and perpetuity given the provided interest rates and payment structures. (2 marks)

2) Examine the differences in the present worth between an annuity and a perpetuity. Analyze how these valuation variances could impact Jane's retirement income. (2 marks)

Answers without any steps/calculations won't fetch you any marks.



Annuity \rightarrow investment \rightarrow \$200,000

Returns \rightarrow \$20,000 / year
for 20 years

Perpetuity \rightarrow investment \$200,000 interest rate = 6%

Returns \rightarrow \$15,000 / year $\rightarrow \infty$
interest rate = 5%

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$$PV_{\text{annuity}} = \frac{C \times (1 - (1 + r)^{-n})}{r}$$

$$= \frac{20,000 (1 - (1 + 0.06)^{-20})}{0.06}$$

$$= \frac{20,000 (1 - 0.31180)}{0.06}$$

$$= \frac{20,000 (0.688195)}{0.06}$$

$$= 20,000 \times 11.4699 = \boxed{\$229,398.42}$$

$$PV_{\text{perpetuity}} \rightarrow = \frac{C}{r} = \frac{15,000}{0.05} = \boxed{\$300,000}$$

2Annuity

fixed number of payments
over specific period of
time

(∴ It will have a less present
value than annuity if cash inflows
and rate are same)

- It is important to consider
- life expectancy
 - financial needs
 - risk tolerance

If life expectancy > 20 years → **Perpetuity is better**

If wants higher income in initial years of retirement → **Annuity is better**

Perpetuity

infinite number of payments
(till holder dies)

→ here in this case the annuity
has higher cash flow and
higher rate of interest
(making it more attractive
option)