

The Present Value of an Annuity

The present value of an annuity is the principal that must be invested today to provide the regular payments of an annuity.

Present value of an ordinary simple annuity

$$PV = \frac{R[1 - (1+i)^{-n}]}{i}$$

where:

- PV is the present value in dollars
- R is the regular payment in dollars
- i is the interest rate per compounding period as a decimal
- n is the number of compounding periods

The present value formula can only be used when:

- The payment interval is the same as the compounding period.
- A payment is made at the end of each compounding period.
- The first payment is made at the end of the first compounding period.

Example 1: Top prize winners of the PayDay lottery in British Columbia can receive their winnings as an annuity of \$2000 every 2 weeks for 20 years.

What cash payment received today is the equivalent of receiving \$2000 every 2 weeks for 20 years? Assume money can be invested at an annual interest rate of 5.6% compounded biweekly.

PV =

R =

r =

i =

N =

n =

N =

I% =

PV =

PMT =

FV =

P/Y =

C/Y =

PMT:

The actual cash payment for the PayDay lottery is \$625 000. Compare this value to the one you calculated. What might account for the difference?

Use the TVM Solver to verify the amount above.

Most loans are repaid by making equal monthly payments over a fixed period of time. These payments form an annuity whose present value is the principal borrowed. When all of the payments are made, both the principal borrowed and the interest due will have been paid.

Example 2: Aaron borrows money to buy a computer. He will repay the loan by making monthly payments of \$112.78 per month for the next 2 years at an interest rate of 7.75% per year compounded monthly.

a) How much did Aaron borrow?

Method 1: Present value formula

PV =

r =

i =

N =

n =

R =

Method 2: TVM Solver

N =

I% =

PV =

PMT =

FV =

P/Y =

C/Y =

PMT:

b) How much interest does Aaron pay?

Homework: Pg. 423: #2,3,6-8,10,13