Introduction to Annuities

Warmup Problem

Suppose Ben has $5000 in his savings account. It collects interest at 2.5%/a compounded monthly. How much will Ben have in exactly one year towards the purchase of a vehicle?

Consider this situation:

Ben wants to save money to purchase a new vehicle. At the end of every month, he deposits $450 into a savings account that collects interest at 2.5%/a compounded monthly. How much will Ben have in his account after 12 months?

An annuity is a series of payments made at regular intervals. (For a simple annuity the compounding periods and payment periods are equal).

Ben's Savings: Timeline Solution

Month	Deposit
1	$450
2	$450
3	$450
4	$450
5	$450
6	$450
7	$450
8	$450
9	$450
10	$450
11	$450
12	$450

Final Value of Ben's Savings:

Thankfully, there is a formula that can be used to determine the final value of a simple annuity such as the one above.

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

FV is the future value of the annuity
R is the regular payment
i is the interest rate (per compounding period)
n is the number of payments.

To calculate the final value of Ben's annuity we could use this formula with:

Example

In order to save for her own college education, Rachel's grandparents provide her with a gift of $1000 on her birthday. Rachel invests this money at 2.1%/a compounded annually. How much will she have after 18 years?

Example

Gary is 35 years old and starts saving for retirement. He is paid biweekly and $100 from each paycheque is deposited into an RRSP that pays 3%/a compounded bi-weekly. How much money will he have if he wants to retire at age 60? How much interest would he earn?

Bi-weekly = every other week RRSP = registered retirement savings plan

Example

Kari wishes to backpack around Europe in 3 years. She has decided that she needs $5000 in savings to do this. She has decided to contribute to a savings account every month. The savings account pays interest at 1.75%/a compounded monthly. How much does she need to deposit in the savings account every month?

TVM Solver

In regular life, most individuals do not use this formula. One option is to search and use a TVM solver (**T**ime **V**alue of **M**oney)

Use a **TVM Solver** to answer the following:

1) For 4 years you put $20 a week into a savings account that pays 3.25% interest. What would the final value of this annuity be? How much interest would you have earned?

2) Mr. Elliott wants to have one million dollars saved. He will make monthly payments for the next 20 years to achieve this goal. The money will collect interest at 2%/a compounded monthly. How much does he need to save each month?