Simple & Compound Interest

% per year

Simple Interest

When investing (saving) money, simple interest is a quick way to calculate interest.

Simple interest is calculate using the formula $I = Prt$.

Where ***I*** **is the interest earned (in $),** ***P*** **is the principle (amount invested in $),** ***r*** **is the annual (yearly) interest rate, and** ***t*** **is the time (in years).**

Example

Sheldon puts $3000 into a Guaranteed Investment Certificate (G.I.C). savings that collects 4.5%/a simple interest.

a) How much interest does he earn in 4 years?

$I = Prt$

$I = 3000(0.045)4$

$I = 540$

$540

b) What is the total value of the G.I.C. in 4 years?

$3000 + $540 = $3540

135 every year

You might ask yourself, what happens to Sheldon's interest each year? This question leads to compound interest.....

Compound Interest "interest on interest"

Refer to the example with Sheldon above. Suppose at the end of each year the interest Sheldon has earned is added to the G.I.C., so that for the next year, Sheldon collects even more interest. In this scenario Sheldon is earning **compound interest. (compounded annually).** Complete the table below to find the final value of Sheldon's investment.

Year	Principle at Beginning of Year	Interest Earned	Principle at End of Year
1	$3000	$3000 \times .045 = \$135$	$\$135 + \$3000 = \$3135$
2	$\$3135$	$3135 \times .045 = \$141.08$	$\$3135 + \$141.08 = \$3276.08$
3	$\$3276.08$	$3276.08 \times .045 = \$147.42$	$\$3276.08 + \$147.02 = \$3423.50$
4	$\$3423.50$	$3423.50 \times .045 = \$154.06$	$\$3423.50 + \$154.06 = \$3577.56$

Is there a shorter way to solve this problem? (Hint: think about last unit).

$$3000(1.045)^4 = \$3577.56$$

Suppose that Sheldon's interest was compounded semi-annually. (Twice a year). What would the final value of the G.I.C. be?

$$3000\left(1+\frac{.045}{2}\right)^8 = \$3584.49$$

$$\frac{.045}{2}$$

Suppose that Sheldon's interest was compounded ***every month***. What would the final value of the G.I.C. be?

$$3000\left(1+\frac{.045}{12}\right)^{48} = \$3590.44$$

$4 \times 12 = 48$

Compound Interest is an example of ***exponential growth***. Simple Interest is an example of ***linear growth***.

Compound Interest Formula

$y = ab^x$

$A = P(1+i)^n$

Where A is the final amount of the savings.
P is the principle or starting amount.
i **is the interest rate *per compounding period***
n **is the number of *compounding* periods**

Common Compounding Periods

-annually
-semi-annually
-quarterly - 4 times year.
-monthly
-daily 365

Examples

1) Find the final value of a $6000 investment compounded quarterly for 5 years at 4%/a.

$A = P(1+i)^n$

$A = 6000\left(1 + \frac{.04}{4}\right)^{20}$

$A = 6000\,(1.01)^{20}$

$= 7321.14$

$n = 5 \times 4$

$n = 20$

2) Find the value of a $3000 investment compounded monthly for 2 years at 3.4% per annum.

$A = P(1+i)^n$

$A = 3000\left(1 + \frac{.024}{12}\right)^{24}$

$A = \$3210.79$

3) Find the final value of a $10,000 G.I.C. from CIBC compounded daily for 3 years. How much interest was earned?

$A = P(1+i)^n$

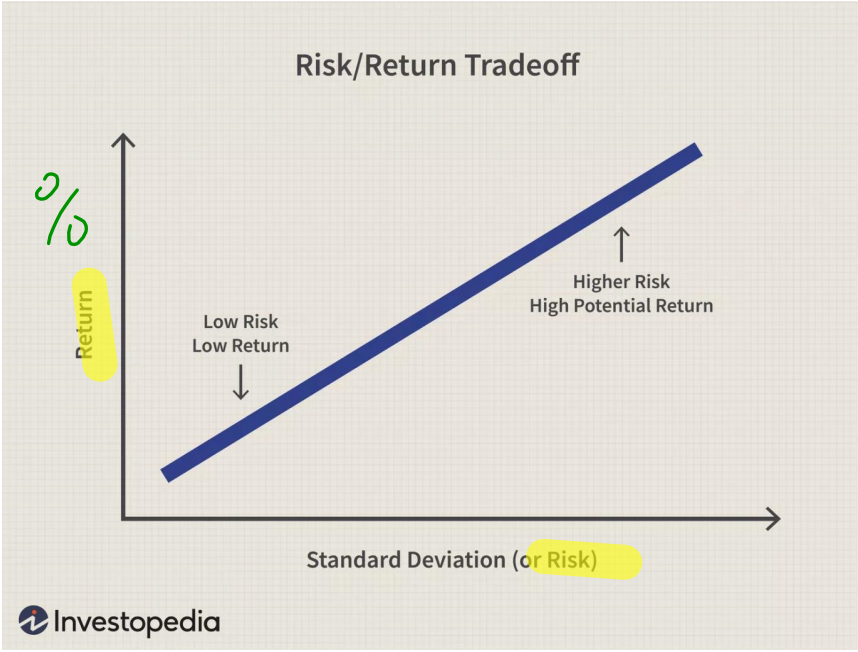
$= 10000\left(1 + \frac{.0145}{365}\right)^{1095}$ (x365, 1.45%)

$= \$10\,444.59$

$I = Prt$

$\$10\,444.59 - \$10\,000$

$= \$444.59$


Risk/Return Tradeoff
%
Return
Low Risk
Low Return
Higher Risk
High Potential Return
Standard Deviation (or Risk)
Investopedia

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