Interest

1 Preface

For the remainder of this paper, the following variables will be as set forth, unless specified otherwise.

A: Accumulated Amount (*Future Value*)

P: Principal (*Present Value*)

r: Nominal Interest Rate Per Year

m: Yearly Number of Conversion Periods

t: Term (Number of Years)

As well as...

i: Interest Rate Per Period

$$\frac{r}{m} \tag{1}$$

n: Total Number of Conversion Periods

$$m * t \tag{2}$$

2 Simple Interest

The value of an investment after a given period of time with a given rate of interest (non-compounding).

$$A = P(1 + rt) \tag{3}$$

3 Compound Interest

Like simple interest, but you earn interest on your interest.

- Interest that is periodically added to the principal
- Earns interest on itself

$$A = P(1 + i)^n \tag{4}$$

4 Continuous Compounding Interest

Compound Interest that is compounding constantly.

$$A = Pe^{rt} \tag{5}$$

5 Effective Rate of Interest

The yearly interest rate that would be the same as compounding m times a year at rate r.
The **effective rate of interest** is the **annual rate** which would yield the **same accumulated amount** as the **nominal rate** (r) compounded m times over the term (t). It can also be called the **annual percentage yield**.

$$r_{eff} = (1 + i)^m - 1 \tag{6}$$

where:

r_{eff}: Effective Rate of Interest

6 Present Value

The amount of money you would have to put in now to get A out.

6.1 Compound Interest

$$P = A(1 + i)^{-n} \tag{7}$$

6.2 Continuous Interest

$$P = Ae^{-rt} \tag{8}$$