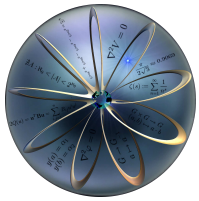

planetmath.org

Math for the people, by the people.

rate of return

Canonical name	RateOfReturn
Date of creation	2013-03-22 16:41:05
Last modified on	2013-03-22 16:41:05
Owner	CWoo (3771)
Last modified by	CWoo (3771)
Numerical id	5
Author	CWoo (3771)
Entry type	Definition
Classification	msc 91B28

Suppose you invest P at time 0 and receive payments $P_1, \ldots, P_n$ at times $t_1, \ldots, t_n$ corresponding to interest rates (evaluated from 0) $r_1, \ldots, r_n$. The net present value of this investment is

$$NPV = -P + \frac{P_1}{1+r_1} + \frac{P_2}{1+r_2} + \cdots + \frac{P_n}{1+r_n}.$$

The *rate of return* r of this investment is a compound interest rate, compounded at every unit time period, such that the net present value of the investment is 0. In other words, if r, as a real number, exists, it satisfies the following equation:

$$P = \frac{P_1}{(1+r)^{t_1}} + \frac{P_2}{(1+r)^{t_2}} + \cdots + \frac{P_n}{(1+r)^{t_n}}.$$

Remarks.

- We typically assume that $t_1 \leq t_2 \leq \cdots \leq t_n$, and, in most situations, that they are integers, so that the equation is a polynomial equation.
- However, there is no guarantee that r exists, and if it exists, that it is unique.
- Nevertheless, one can usually, by trial-and-error, determine if such an r exists. If r exists, and if P_i are all non-negative, then by `http://planetmath.org/DescartesR` rule of signs, r is always unique and $r > -1$.