**Problem Definition**

Problem 31. **Effective Yield** The effective yield is the annual rate $i$ that will produce the same interest per year as the nominal rate $r$.

(a) For a rate $r$ that is compounded $n$ times per year, show that the effective yield is

$$i = \left(1 + \frac{r}{n}\right)^n - 1$$

(b) Find the effective yield for a nominal rate of 6% compounded monthly.

**Solution Step 1:**

The yield is determined by the amount produced in a year. The return on an investment with nominal rate $r$ compounded $n$ times is

$$P = A \left(1 + \frac{r}{n}\right)^n$$

The net amount gained in a year is given by

$$Y = A \left(1 + \frac{r}{n}\right)^n - A$$

where $A$ is the initial amount invested. Then

$$Y = A \left(\left(1 + \frac{r}{n}\right)^n - 1\right)$$

and the yield, $i$, is the coefficient multiplying $A$ in the yield.

$$i = \left(1 + \frac{r}{n}\right)^n - 1$$

**Solution Step 2:**

For the nominal rate 6% compounded monthly ($n = 12$) the effective yield will be

$$i = \left(1 + \frac{0.06}{12}\right)^{12} - 1 \approx 0.0617$$

or the effective yield is approximately 6.17%.