Tools for ECE    Excel Financial Functions

The spreadsheet application was invented by accountants, and is used extensively as a management planning tool. Accordingly, the financial functions are described in terminology associated with accounting and financial management. The following is a description of entities commonly computed in engineering economy, along with the usage of the Excel financial function which calculates each entity and its mathematical formula.

Present value of an annuity of payments $p$, paid at the end of the periods, for $n$ periods:

$$ PV(r, n, p, 0, 0) = p \cdot \sum_{j=1}^{n} (1+r)^{-j} $$

Present value of an annuity of payments $p$, paid at the end of the periods, for $n$ periods, plus a future payment $f$ at the end of $n$ periods:

$$ PV(r, n, p, f, 0) = p \cdot \sum_{j=1}^{n} (1+r)^{-j} + f \cdot (1+r)^{-n} $$

Present value of an annuity of payments $p$, paid at the beginning of each period, for $n$ periods:

$$ PV(r, n, p, 0, 1) = p \cdot \sum_{j=0}^{n-1} (1+r)^{-j} $$

The payment of an annuity of $n$ payments, paid at the end of each period, of given present value $v$, with a future payment $f$ after $n$ periods:

$$ PMT(r, n, v, f, 0) = \frac{v - f \cdot (1+r)^{-n}}{\sum_{j=1}^{n} (1+r)^{-j}} $$

The annuity payment needed to accumulate an amount $a$ at the end of $n$ periods, starting with an amount $a_0$, with payments at the end of each period:

$$ PMT(r, n, a_0, a, 0) = \frac{a \cdot (1+r)^{-n} - a_0}{\sum_{j=1}^{n} (1+r)^{-j}} $$

To see this, solve the accumulation formula

$$ a = a_0 \cdot (1+r)^n + p \cdot \sum_{k=0}^{n-1} (1+r)^k $$

for $p$ by multiplying through by $(1+r)^{-n}$ and substituting $j = n - k$.

The net present value of a set of $n$ periodic payments (positive) or outlays (negative) $p_i$, $i = 1, 2, \ldots, n$:

$$ NPV(r, p_1, p_2, \ldots, p_n) = \sum_{j=1}^{n} p_j \cdot (1+r)^{-j} $$

Note: A range may be used for $p_1, p_2, \ldots, p_n$ in the NPV function.