Some Useful Economics Equations and Related Excel Functions

Present Value

The present value, \( P \), is the current value of some cash amount. The future or final value, \( F \), is the value of some cash amount at a future date. For an interest or discount rate, \( i \), over a period of years, \( n \), the present value of some future value is given by:

\[
P = \frac{F}{(1 + i)^n}
\]

Net Present Value

For a time series of payments or receipts over a finite number of years, \( N \), the net present value (NPV) is the sum of the present values of those payments and receipts. That is, the sum of the present value of those future cash flows, \( F_n \) in year, \( n \):

\[
NPV = \sum_{n=1}^{N} \frac{F_n}{(1 + i)^n}
\]

Note that this summation starts with \( n=1 \). No interest rate would be applied to money spent in the present (i.e. at \( n=0 \)). The Excel function “NPV” performs this calculation.

Special Case: Uniform Future Values

A special case involves uniform future values, that is the case when all \( F_n \) equal some constant we’ll call \( C \). Because \( C \) is in each term of the summation (see NPV equation above), it can be pulled out of the summation:

\[
NPV_{Uniform Future Value} = C \sum_{n=1}^{N} \frac{1}{(1 + i)^n}
\]

Annual Value

The annual value, \( A \), is the value of annual installments distributed over a period of years, \( n \), for a given interest or discount rate, \( i \), of some present value, \( P \), and is given by:

\[
A = P \left[ \frac{i(1 + i)^n}{(1 + i)^n - 1} \right]
\]

The Excel function “PMT” performs this calculation.