

Net Present Value (NPV) or NPW Equation

$$NPV = PW(i) = \frac{A_0}{(1+i)^0} + \frac{A_1}{(1+i)^1} + \frac{A_2}{(1+i)^2} + \dots + \frac{A_N}{(1+i)^N}$$

$$\Rightarrow NPV = \sum_{n=0}^N \frac{A_n}{(1+i)^n}$$

A_n =Net cash flow(+ or -) at end of period n

i =MARR

N =Service life of project

If NPV>0 Accept Investment

NPV=0 Indifferent

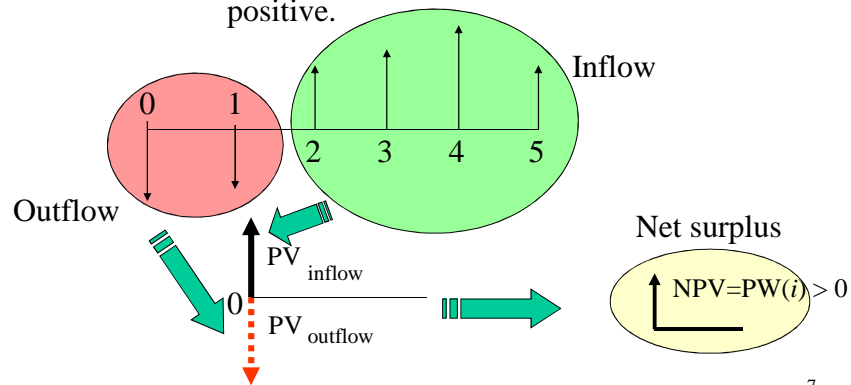
NPV<0 Reject Investment

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Net Present Value (NPV) or NPW Application-Graphically

Principle: Compute the equivalent net surplus at $n = 0$ for a given interest rate of i .

Decision Rule: Accept the project if the net surplus is positive.



Example 1:

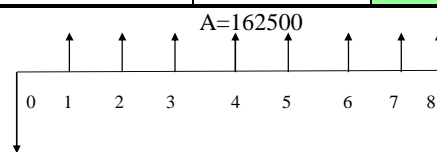
XL Chemicals is considering the installation of a computer process control system (CPCS) in one of its process plants. The proposed system will cost 650,000€ and its expected to provide specific benefits in the production. The expected service life of the system is 8yrs. The maintenance costs of this system are 53000€/yr and the benefits rise up to 215500€/yr.

If MARR is 15% should the company go through with the investment?

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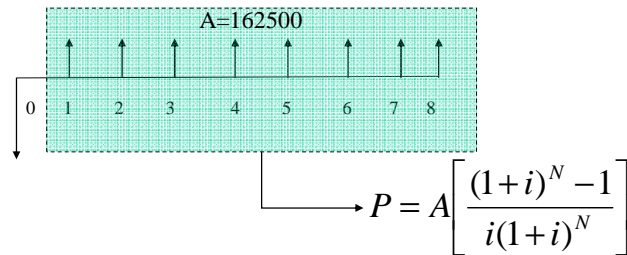
Example 1-Solution:

Year (n)	Cash inflow	Cash Outflow	Net cash flow
0	0	650000	-650000
1	215500	53000	162500
2	215500	53000	162500
3	215500	53000	162500
4	215500	53000	162500
5	215500	53000	162500
6	215500	53000	162500
7	215500	53000	162500
8	215500	53000	162500



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Example 1-Solution



$$NPV = \frac{-650000}{(1+0.15)^0} + 162500(P/A, 0.15, 8)$$

$$\Leftrightarrow NPV = -650000 + 162500 \left[\frac{(1+0.15)^8 - 1}{0.15(1+0.15)^8} \right] = -650000 + 729189.74$$

$$\Leftrightarrow NPV = 79189.74 > 0 \text{ Accept the project}$$

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Example 2

- Tiger Machine tool company is considering the acquisition of a new metal cutting machine. The required initial investment of 75000€ and the projected cash benefits over 3yrs project life are as follows:

Year	Net cash Flow
0	-75000
1	24400
2	27340
3	55670

You have been asked to evaluate the economic merit if MARR is 15%

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Example 2-Solution

$$\begin{aligned} NPV &= \frac{-75000}{(1+0.15)^0} + 24000(P/F, i, N) + 27340(P/F, i, N) + 55760(P/F, i, N) \\ &= -75000 + 24000(1+0.15)^{-1} + 27340(1+0.15)^{-2} + 55760(1+0.15)^{-3} \\ &\Rightarrow NPV = 3553.46\text{€} > 0 \text{ Accept investment} \end{aligned}$$

Remember:

$$\frac{24000}{(1+i)^N} = 24000(1+i)^{-N}$$