IOV RVF THE VALUER Bi- Monthly Journal, Vol. 02 , Issue-05 Sep - Oct 2023, PP. 36 - 41

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ENGINEERING ECONOMY FACTORS AND ITS SPREAD SHEETS

INTRODUCTION:

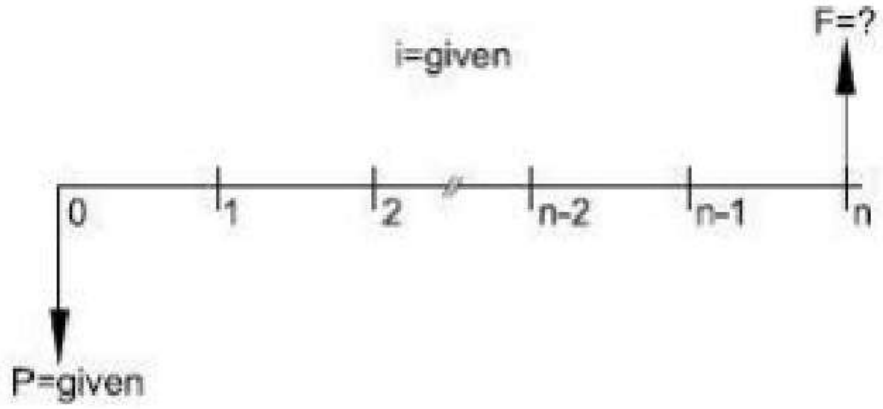
The cash flow is fundamental to every economic study. Cash flows occur in many configurations and amounts – isolated single valuers, series that are uniform, and series that increase or decrease by constant amounts or constant percentages. This chapter develops derivations for all the commonly used engineering economy factors that take the time value of money into account.

The Various Engineering economy factors (Valuation Tables) are

- Single Amount Factors (Future - F and Present - P)
- Uniform Series Present worth Factor (Present - P)
- Capital Recovery Factor (Uniform Series –A)
- Sinking Fund Factor (Uniform Series – A)
- Uniform Series Compound Amount Factor (Future – F)

Single Amount Factors (F/P and P/F)
Future Amount – F/P

The most fudamental factor in engineering economy is the one that determines the amount of money F accumulated after n years (or period) from a single present worth P, with interest compounded one time per year (or period).



(a) - Graphical representation

Equation with Factor Formula, $F=P(1+i)^n$

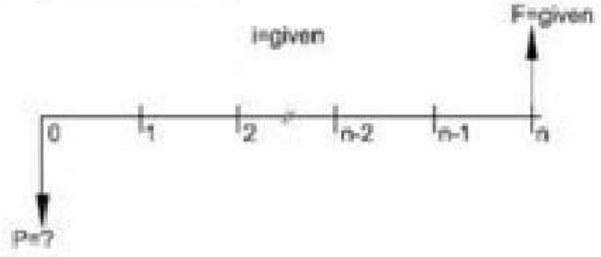
F = Future amount, P = Present amount, i = interest rate per year, n = Number of years. The factor $(1+i)^n$ is called the single payment compound amount factor.

Using Spread Sheet

Excel Function		
F	= FV (i%,n,,P)	
Example		
P = 200	i=10%	n=3
F	=FV(10%,3,,200)	
F=	266.20	

Present Amount – P/F

Reverse the situation to determine the P value for a stated amount F that occurs n periods in the future.



(b) - Graphical representation

Equation with Factor Formula, $P = F(1+i)^{-n}$ or $P = F\left[\frac{1}{(1+i)^n}\right]$

F = Future amount, P = Present amount, i = interest rate per year, n = Number of years.

The factor $(1+i)^{-n}$ is called the single payment Present worth factor.

Using Spread Sheet

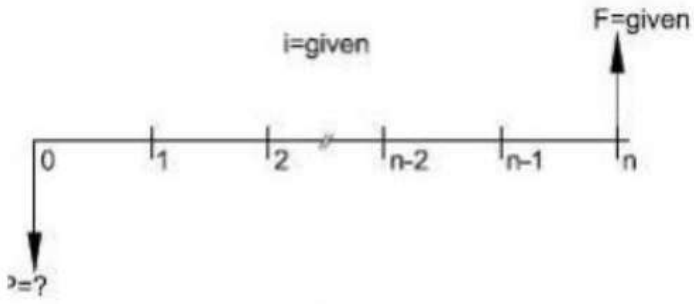
Excel Function		
P	= PV (i%,n,,F)	
Example		
F = 200	i=10%	n=4
P	=PV(10%,4,,200)	
P=	136.60	

Uniform Series Present worth Factor (P/A)

Uniform Series Present worth Factor (P/A)The equivalent present woth P of a uniform series A of end of period cash flows (investment) for n years and for given interest rate i

Present Amount – P/F

Reverse the situation to determine the P value for a stated amount F that occurs n periods in the future.



(b) - Graphical representation

Equation with Factor Formula, $P = F\,(1+i)^{-n}$ or $P = F\left[\frac{1}{(1+i)^n}\right]$

F = Future amount, P = Present amount, i = interest rate per year, n = Number of years.

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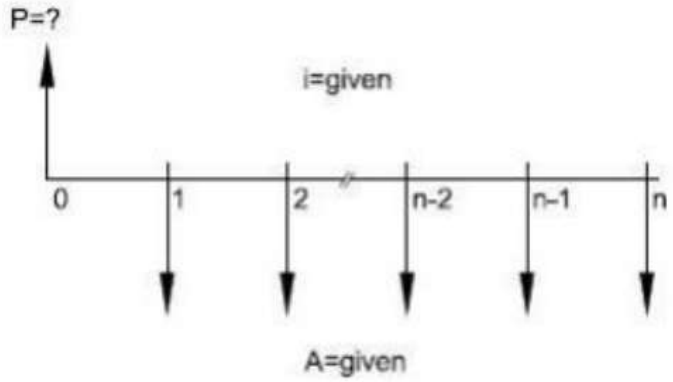
Using Spread Sheet

Excel Function		
P	= PV (i%,n,,F)	
Example		
F = 200	i=10%	n=4
P	=PV(10%,4,,200)	
P=	136.60	

Uniform Series Present worth Factor (P/A)

The equivalent present woth P of a uniform series A of end of period cash flows (investment) for n years and for given interest rate i



(C) - Graphical representation

Equation with Factor Formula, $P=A\left[\frac{(1+i)^n-1}{i(1+i)^n}\right]$

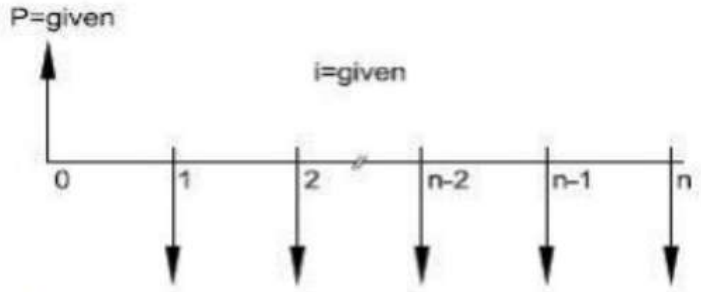
A = Uniform Series amount, P = Present amount, i = interest rate per year, n = Number of years.

The factor $\left[\frac{(1+i)^n-1}{i(1+i)^n}\right]$ is called the uniform series Present worth factor.

Excel Function		
P	= PV (i%,n,A)	
Example		
A = 50	i=10%	n=5
P	=PV(10%,5,50)	
P=	189.54	

Capital Recovery Factor (A/P)

The present worth P is known and the uniform series amount A is sought. The first A value occurs at the end of period 1, that is, one period after P occurs.



Equation with Factor Formula, $A = P\left[\frac{i(1+i)^n}{(1+i)^n-1}\right]$

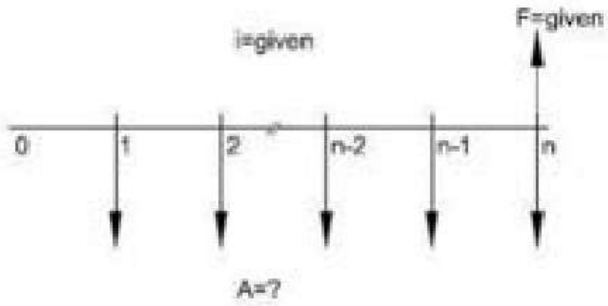
A = Uniform Series amount, P = Present amount, i = interest rate per year, n = Number of years.

The factor $\left[\frac{i(1+i)^n}{(1+i)^n-1)}\right]$ is called the Capital recovery factor(CRF) and it calculates equivalent uniform annual worth A.

Using Spread Sheet

Excel Function		
A	= PMT (i%,n,p)	
Example		
P = 200	i=10%	n=5
A	=PMT(10%,5,200)	
A =	52.76	

Sinking Fund Factor (A/F)
For a given future amount F, i, and n the equivalent uniform annual series A is determined by



(e) - Graphical representation

Equation with Factor Formula, $A = F\left[\frac{i}{(1+i)^n-1}\right]$

A = Uniform Series amount, P = Present amount, i = interest rate per year, n = Number of years.

The factor $\left[\frac{i}{(1+i)^n-1}\right]$ is called the Sinking fund factor

Using Spread Sheet

Uniform Series Compound Amount Factor(F/A)
For a given uniform series A, i, and n the equivalent future worth of the uniform series F is determined by

Excel Function		
A	= PMT (i%,n,F)	
Example		
F = 305.26	i=4.5%	n=5
A	=PMT(4.5%,5,305.26)	
P=	55.80	

Equation with Factor Formula, $F = A\left[\frac{(1+i)^n-1}{i}\right]$

A = Uniform Series amount, P = Present amount, i = interest rate per year, n = Number of years.

The factor $\left[\frac{(1+i)^n-1}{i}\right]$ is called the Uniform series compound amount factor

Using Spread Sheet

Excel Function		
F	= FV (i%,n,A)	
Example		
A = 50	i=10%	n=5
F	= FV (10%,5,50)	
F=	305.26	