Discounted-cash-flow calculations based on continuous interest compounding and continuous cash flow

Example 2 Using the discount factors for continuous interest and continuous cash flow presented in Tables 5 to 8 of Chapter 7, determine the continuous discounted-cash-flow rate of return r for the example presented in the preceding section where yearly cash flow is continuous. The data follow.

- Initial tied-capital investment = $100,000
- Working-capital investment = $10,000
- Service life = 5 years
- Salvage value at end of service life = $10,000

TABLE3

Discount and compounding factors for continuous interest and cash flows?

r as percent	1%	5%	10%	15%	20%	25%	30%	40%
Discount factors to give present worths for cash flows which								
(a) Occur in an instant at a point in time after the reference point								
n = 1	0.990	0.951	0.905	0.861	0.819	0.779	0.741	0.670
2	0.980	0.905	0.819	0.741	0.670	0.606	0.549	0.449
3	0.970	0.861	0.741	0.638	0.549	0.472	0.407	0.301
4	0.961	0.819	0.670	0.549	0.449	0.368	0.301	0.202
5	0.951	0.779	0.606	0.472	0.368	0.286	0.223	0.135
10	0.905	0.606	0.368	0.223	0.135	0.082	0.050	0.018
15	0.861	0.472	0.223	0.105	0.050	0.024	0.011	0.002
20	0.819	0.368	0.135	0.050	0.018	0.007	0.002	
25	0.779	0.286	0.082	0.024	0.007	0.002	0.001	
(b) Occur uniformly over one-year periods after the reference point								
n = 1. 1st year	0.995	0.975	0.952	0.929	0.906	0.685	0.864	0.824
2. 2nd year	0.985	0.928	0.861	0.799	0.742	0.689	0.640	0.552
3. 3rd year	0.975	0.883	0.779	0.688	0.608	0.537	0.474	0.370
4. 4th year	0.966	0.840	0.705	0.592	0.497	0.418	0.351	0.248
5. 5th year	0.956	0.799	0.638	0.510	0.407	0.326	0.260	0.166

P.W.

t
0

n

$$1.0\left(\frac{1}{e^{rn}}\right) = F_a$$

P.W.

0 n-l n

$$1.0\left(\frac{e^r - 1}{r}\right)e^{-rn} = F_b$$

Example 2

Solution. The following tabulation shows the final result of the trial-and-error solution using the factors F_a, and F_b from Tables 5 and 6 in Chap. 7:

Year	Estimated continuous cash flow to project, $	Trial for r = 0.225		Present value, $
		Discount factor		
		F_b (from Table 6, Chap. 7)	F_a (from Table 5, Chap. 7)	
0	(110,000) In an instant			
O-1	30,000	0.8954		26,850
1-2	31,000	0.7151		22,200
2-3	36,000	0.5710		20,550
3 4	40,000	0.4560		18,250
4-5	43,000	0.3648		15,650
5	+20,000 In an instant		0.3246	6,500
				Total 110,000

Trial is satisfactory

NET PRESENT WORTH

Net present worth (or ***net present value or venture worth),*** substitutes the cost of capital at an interest rate **i** for the discounted-cash-flow rate of return.

The **net present worth** of the project is then the difference between the present value of the annual cash flows and the initial required investment.

NET PRESENT WORTH

To illustrate the method for determining net present worth, consider the example presented in Table 1 for the case where the value of capital to the company is at an interest rate of 15 percent.

Under these conditions, the present value of the cash flows is $127,000 and the initial investment is $110,000. Thus, the net present worth of the project is:

$$\$127,000 - \$110,000 = \$17,000$$

TABLE 1

Computation of discounted-cash-flow rate of return

Year (n')	Estimated cash flow to project, $	Trial for i = 0.15		Trial for i = 0.20		Trial for i = 0.25		Trial for i = 0.207†	
		Discount factor, $\frac{1}{(1+i)^{n'}}$	Present value, $	Discount factor, $\frac{1}{(1+i)^{n}}$	Present value, $	Discount factor, $\frac{1}{(1+i)^{n}}$	Present value, $	Discount factor, $\frac{1}{(1+i)^{n}}$	Present value, $
0	(110,000)								
1	30,000	0.8696	26,100	0.8333	25,000	0.8000	24,000	0.829	24,900
2	31,000	0.7561	23,400	0.6944	21,500	0.6400	19,800	0.687	21,200
3	36,000	0.6575	23,300	0.5787	20,700	0.5120	18,400	0.570	20,500
4	40,000	0.5718	22,900	0.4623	19,300	0.4096	16,400	0.472	18,800
5	43,000	0.4971	31,300	0.4019	25,300	0.3277	20,600	0.391	24,600
	+20,000								
	Total		127,000		111,800		99,200		110,000
Ratio = $\frac{\text{total present value}}{\text{initial investment}}$			1.155		1.016		0.902		1.000
								Trial is satisfactory	