Determination of rate of return on investment consideration of income-tax effects.

Example 1 A proposed manufacturing plant requires an initial fixed- capital investment of $900,000 and $100,000 of working capital. It is estimated that the annual income will be $800,000 and the annual expenses including depreciation will be $520,000 before income taxes. A minimum annual return of 15 percent before income taxes is required before the investment will be worthwhile. Income taxes amount to 34 percent of all pre-tax profits.

Determine the following:

a) The annual percent return on the total initial investment before income taxes.
b) The annual percent return on the total initial investment after income taxes.
c) The annual percent return on the total initial investment before income taxes based on capital recovery with minimum profit.
d) The annual percent return on the average investment before income taxes assuming straight-line depreciation and zero salvage value.

RATE OF RETURN ON INVESTMENT

The methods for determining rate of return, as presented in the preceding sections, give *"point values"* which are either applicable for one particular year or for some sort of *"average"* year.

They do not consider the time value of money, and they do not account for the fact that profits and costs may vary significantly over the life of the project.

One example of a cost that can vary during the life of a project is depreciation cost.

DISCOUNTED CASH FLOW

Rate of Return Based on Discounted Cash Flow

The method of approach for a profitability evaluation by discounted cash flow takes into account the time value of money.

A trial-and-error procedure is used to establish a rate of return which can be applied to yearly cash flow so that the original investment is reduced to zero (or to salvage and land value plus working-capital investment) during the project life.

Consider the case of a proposed project for which the following data apply:

DISCOUNTED CASH FLOW

consider the case of a proposed project for which the following data apply:

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

Year	Predicted after-tax cash flow to project based on total income minus all costs except depreciation, $ (expressed as end-of-year situation)
0	(110,000)
1	30,000
2	31,000
3	36,000
4	40,000
5	43,000

DISCOUNTED CASH FLOW

At the end of five years, the cash flow to the project, compounded on the basis of end-of-year income, will be

$$(\$30{,}000)(1+i)^4 + (\$31{,}000)(1+i)^3 + (\$36{,}000)(1+i)' + (\$40{,}000)(1+i) + \$43{,}000 = S \quad (1)$$

The symbol S represents the future worth of the proceeds to the project and must just equal the future worth of the initial investment compounded at an interest rate *i corrected for salvage value and working capital*.

$$S = (\$110{,}000)(1+i)^5 - \$10{,}000 - \$10{,}000 \quad (2)$$

DISCOUNTED CASH FLOW

Setting Eq. (1) equal to Eq. (2) and solving by trial and error for i gives i = 0.207, or the discounted-cash-flow rate of return is 20.7 percent.

The discount factor (to get a present value) for end-of year payments and annual compounding is

- ***i = rate of return***
- ***n' = year of project life to which cash flow applies***

$$d_{n'} = \frac{1}{(1 + i)^{n'}} = \text{discount factor}$$

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	