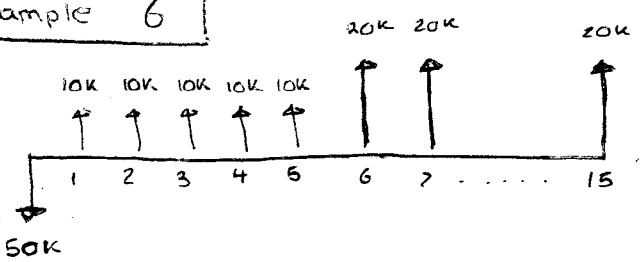
Example 6



MARR = 9%
AE = ?

$$PW(9\%) = -5000 + 10000(P/A, 9\%, 5) + 20000(P/A, 9\%, 10)(P/F, 9\%, 5)$$
$$= 73318$$
$$AE(9\%) = PW(A/P, i, N)$$
$$= 73318(A/P, 9\%, 15)$$
$$= 9096$$

AE > 0 (accept or recommend)

Example 7

First cycle ↳ MARR = 12% (not given in question)

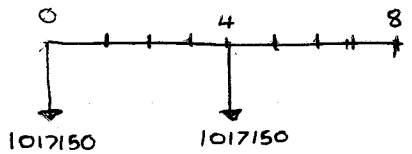
$$PW(12\%) = -1000000 + 800000(P/A, 12\%, 4) - 100000(P/G, 12\%, 4)$$
$$= 1017150$$
$$AE(12\%) = PW(A/P, 12\%, 4)$$
$$= 1017150(A/P, 12\%, 4)$$
$$= 334880$$

Two cycles

$$PW(12\%) = -1000000 - 1000000(P/F, 12\%, 4) \ldots$$
$$\ldots + 800000(P/A, 12\%, 8) - 100000(P/G, 12\%, 4) \ldots$$
$$\ldots - 100000(P/G, 12\%, 4)(P/F, 12\%, 4)$$
$$PW(12\%) = 1663560$$
$$AE(12\%) = 1663560(A/P, 12\%, 8)$$
$$= 334880 \quad \text{(Same as one cycle)}$$

Simplify:

→ 2 cycles



Example 8

Capital cost

$CR(10\%) = (P-S)(A/P, 10\%, 5) + Si$

$= (20000 - 4000)(A/P, 10\%, 5) + (4000)(0.10)$

$= 4620.76$

Total Annual Cost = Cap. cost + Oper. cost

$= 4620.76 + 500$

$= 5120.76$

→ Compare to 5000 per year

Example 9

$PW(15\%) = 3553$

$AW(15\%) = 3553(A/P, 15\%, 3)$

$= 1556$

Savings per machine hour

$\Rightarrow \frac{1556}{2000} = 0.78 /hr$

START CLASS NOTES 6

Break-even interest rate : i^*

Simple investments change sign once

Example 3

$PW(i^*) = -1250000 + 731500(P/A, i^*, 15) + 80000(P/F, i^*, 15) = 0$

$i^* = 58.71\%$ (from software)

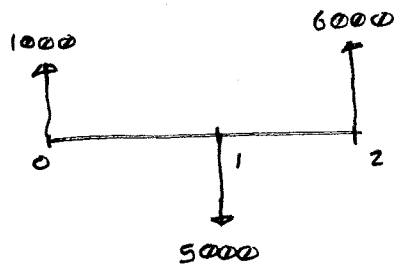
MARR = 18 %.

IRR > MARR (accept or recommend)

$PW(18\%) = -1250000 + 731500(P/A, 18\%, 15) + 80000(P/F, 18\%, 15)$

$\rightarrow > 0$; so IRR > MARR

Example 5



MARR = 25 %.

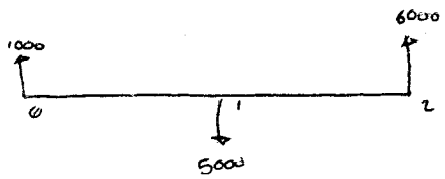
Non-simple inv.

ERR

Example 5

→ Exact ERR

End of year 1 :



→ non-simple, more than one sign change, apply ERR (otherwise use IRR)

$FW = 1000(F/P, 25\%, 1) - 5000 = -3750$

End of year 2

$FW = -3750(F/P, ERR, 1) + 6000 = 0$

(Somehow) → Trial and error, $ERR = 60\%$

$ERR > MARR$ (accept or recommend)

→ Approximate ERR

$FW(rec) = 1000(F/P, 25\%, 2) + 6000$

$FW(dist) = 5000(F/P, ERR, 1)$

$FW(rec) = FW(dist)$

$1000(F/P, 25\%, 2) + 6000 = 5000(F/P, ERR, 1)$

app ERR = 61.25 %

app ERR > MARR (accept or recommend)

→ **BEGIN CLASS NOTES 7**

Example 1

(M.) $PW(12\%) = -209000 + 55000(P/A, 12\%, 5) + 80000(P/F, 12\%, 5)$

$PW(12\%) = 34657$

M_2

$PW(12\%) = -294600 + 74000(P/A, 12\%, 5) + 120000(P/F, 12\%, 5)$

$PW(12\%) = 40245$

M_3

$PW(12\%) = -294600 + 58000(P/A, 13\%, 12\%, 5) \cdots$

$\cdots + 120000(P/F, 12\%, 5)$

$PW(12\%) = 37085$

$\therefore$ M_2 is the recommended machine

Example 2

→ $B_2 - B_1$

0	-9000
1	2850
2	4425
3	4830

Simple

IRR

$PW(IRR) = -9000 + (2850)(P/F, IRR, 1) + (4425)(P/F, IRR, 2) \cdots$

$\cdots + (4830)(P/F, IRR, 3) = 0$

→ IRR = 15%.

IRR > MARR → The inves is good

15 10 B2 is best

Example 4

Analysis period = 2 years

MARR = 15%

→ Model A

$PW(15\%) = -300000 - 80000(P/A, 15\%, 2) + 90000(P/F, 15\%, 2)$

$= -362000$

→ Model B

$PW(15\%) = -480000 - 45000(P/A, 15\%, 2) + 250000(P/F, 15\%, 2)$

$= -364000$

↳ Model A > Model B, recommend Model A

Example 5

Model A → $PW(15\%) = -12500 - (5000)(P/A, 15\%, 5) - (11000)(P/A, 15\%, 2)(P/F, 15\%, 3) \cdots$

$\cdots + (2000)(P/F, 15\%, 3) = -34359$

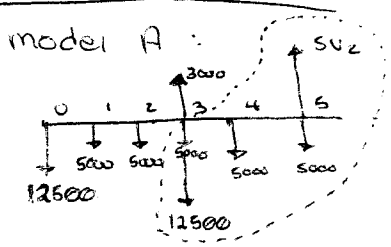
Model B → $PW(15\%) = -15000 - 4000(P/A, 15\%, 4) - (5000 + 11000)(P/F, 15\%, 5) \cdots$

$\cdots + (1500)(P/F, 15\%, 4) = -31031$

↳ Model B > Model A, recommend Model B

Second approach

model A :



model B :