BCR & PAYBACK PERIOD

BENEFIT COST RATIO

Benefit Cost Ratio

- A method for evaluating feasibility of investment
- Emphasizing the benefit and cost of project/investment
- It is commonly used for government project which the benefit can be directly tested by the community

Benefit Cost Ratio

- Benefit cost ratio is a comparison analysis of all benefit equivalence and all cost equivalence
- BCR formula:

$$\frac{B}{C} = \frac{PWbenefit}{PW\ cost} = \frac{FWbenefit}{FWcost} = \frac{AWbenefit}{AWcost}$$

Decision Criteria

For single alternative:

- Estimate the value of B/C
- Whether the value of B / C is greater than or less than one
  - *If **B/C ≥ 1** , then the alternative/ project is feasible (acceptable)*
  - *if **B/C < 1** , then the alternative/ project is NOT feasible*

Example : Single Alternative

- Baker co is considering to purchase new machine worth to **Rp.35.000.000.** the annual saving from this machine will gain up to **Rp.500.000 for 5 years**.
- At the end of year 5, Baker Co will sell the machine worth to Rp **40.000.000**.
- if the rate of return is **9%** per annum. Will be the machine purchasing proposal profitable?

Solution

- Using Present worth analysis first the continue to apply B/C method

$$\frac{B}{C} = \frac{500.000\left(\frac{P}{A}, 9\ \%, 5\right) + 40.000.000\ \left(\frac{P}{F}, 9\ \%, 5\right)}{35.000.000}$$

$$\frac{B}{C} = 0{,}79$$

  - *B/C < 1 so the machine proposal is rejected (not accepted)*

Example: More than one alternatives

- The calculation must be estimated **using incremental analysis** (see internal rate of return chapter)
- If two alternatives which being bench-marked is obtained **B / C ≥1**, then alternative with **larger benefits is selected.**
- If two alternatives which being bench-marked is obtained **B / C <1**, then alternative with **less cost is selected.**

Example

- Baker co has offered 2 machine with equal useful life 10 years.

machine	Initial investment (Rp.)	Annual profit (Rp.)	Salvage value (Rp.)
X	3.000.000	700.000	1.000.000
Y	3.500.000	800.000	1.500.000

- With MARR 15% per annum, which best decision for company to buy a machine?

Solution

- Sort all the alternatives ascendingly:

  Do Nothing (DN), Machine X, Machine Y

- Apply Present worth method first

→benchmark DN with machine X

Tahun	DN (1)	Mesin X (2)	Inkremental (3)=(2) – (1)
0	0	-3.000.000	-3.000.000
1-9	0	700.000	700.000
10	0	1.700.000	1.700.000

$$\frac{B}{C} = \frac{700.000\ (\frac{P}{A}, 15\%, 9) + 1.700.000\ (\frac{P}{F}, 15\%, 10)}{3.000.000}$$

Solution

$$\frac{B}{C} = 1{,}49$$

- B/C ≥ 1, machine X proposal is acceptable
- Machine X will be benchmarked with machine Y

→benchmark machine X with Y

Tahun	Mesin X (1)	Mesin Y (2)	Inkremental (3)=(2) – (1)
0	-3.000.000	-3.500.000	-500.000
1-9	700.000	800.000	100.000
10	1.700.000	2.300.000	600.000

$$\frac{B}{C} = \frac{100.000\ (\frac{P}{A}, 15\%, 9) + 600.000\ (\frac{P}{F}, 15\%, 10)}{500.000}$$

Solution

$$\frac{B}{C} = 1{,}45$$

B/C ≥ 1, machine Y proposal is more acceptable

Final decision is buying machine Y

Payback Period

- How fast can I recover my initial investment?
- *Payback Period* is a period which profit or benefit has the same amount of any cost incurred

Example

- There are 2 alternatives cash flow as follow:

year	A	B
0	-$1000	-$2783
1	$200	$1200
2	$200	$1200
3	$1200	$1200
4	$1200	$1200
5	$1200	$1200

Solution

- **Alternative A** :
  - *At the first and second years, the return only recover $400 of all investment cost ($1000)*
  - *Residual investment cost $600 can be recovered in the beginning of year 3 thus the back period for Alt A. is approximately* ***2,5*** *years*
- **Alternative B** :

  since the cash flow has annual benefit so the payback period for Alt. B is $2783 / $1200 = **2,3** years

Choose Alt. B

Payback Period

- Payback period is only prediction
- All *cost and benefit, will be included for the analysis without considering the period*
- Ignoring economic consequences
- Since it is only predictive result then the result is not always the best alternative

Example

- There are two alternatives:

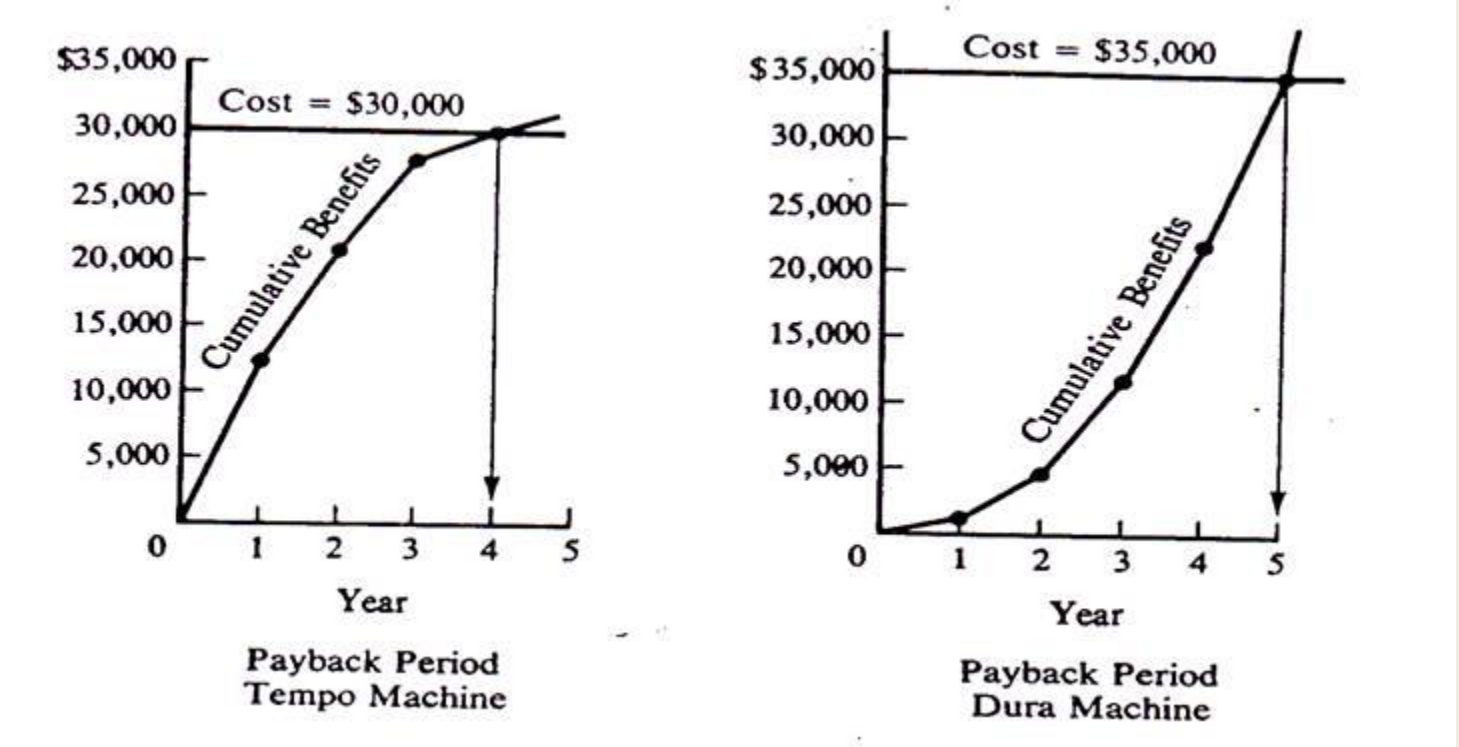
	Tempo machine	Dura Machine
Installment cost	$30.000	$35.000
Net income (income-operational cost)	$12.000 for the first year, and decreasing $3000/year	$1.000 for the first year, and increasing $3000/year
Useful life (year)	4	8

MARR = 10%

Solution

Year	Tempo Machine	Dura Machine
0	-$30000	-$35000
1	$12000	$1000
2	$9000	$4000
3	$6000	$7000
4	$3000	$10000
5		$13000
6		$16000
7		$19000
8		$22000
Total	0	$57000

Solution



- *Payback period for each alternative*:
  - *Tempo machine = 4 years*
  - *Dura machine = 5 years*

Solution

- Tempo machine :

  total *cash flow for* Tempo machine = 0,

  Then IRR is 0%

- Dura machine:

  $35000 =1000(**P/A**,i,8) + 3000 (**P/G**,i,8)

  IRR = 19%

- Conclusion : choose Dura Machine

Payback period and IRR sometime will gain different result. The most convincing result is IRR method because it depicts the real problem