- Net profit takes no account on timing of cash flows
- With a same investment
  - B is giving higher profit
- With little higher investment
  - C is giving higher profit

Year	Project A	Project B	Project C
0	-8000	-8000	-10000
1	4000	1000	2000
2	4000	2000	2000
3	2000	4000	6000
4	1000	3000	2000
5	500	9000	2000
6	500	-6000	2000
Net profit	4000	5000	6000

- Payback period:
- The time taken to break even or pay back the initial investment.

Year	Project A	Project B	Project C
0	-8000	-8000	-10000
1	4000	1000	2000
2	4000	2000	2000
3	2000	4000	6000
4	1000	3000	2000
5	500	9000	2000
6	500	-6000	2000
Net profit	4000	5000	6000

- PBP(Project A) = **2 years**
- PBP(Project B) = **4 years**
- PBP(Project C) = **3 years**

- Pay back period is
  - Simple to calculate
  - Not sensitive to small forecasting errors
  - But,
    - Ignores the overall profitability of the project

- Return on investment (ROI):
- Also known as the accounting rate of return (ARR), provides a way of comparing the net profitability to the investment required.

Year	Project A	Project B	Project C
0	-8000	-8000	-10000
1	4000	1000	2000
2	4000	2000	2000
3	2000	4000	6000
4	1000	3000	2000
5	500	9000	2000
6	500	-6000	2000
Net profit	4000	5000	6000

$$ROI = \frac{\text{average annual profit}}{\text{total investment}} \times 100$$

- ROI(Project A) = (4000/6) / 8000 x 100 = **8.33%**
- ROI(Project B) = (5000/6) / 14000 x 100 = **5.95%**
- ROI(Project C) = (6000/6) / 10000 x 100 = **10%**

- Project C gives higher ROI...
- ROI is ...
  - Simple and easy to calculate
  - But,
    - Similar to Net profitability, it takes no account of timing of cash flows...
    - The ROI bears no relationship with the interest rates offered by banks...as it is not considering the timing of cash flows...to relate with compound interest and all...

- Net Present value (NPV):
- The calculation of net present value is a project evaluation technique that takes into account the profitability of a project and the timing of cash flows that are produced.

$$\text{Present value} = \frac{\text{value in year } t}{(1 + r)^t}$$

- Discount factor = $1 / (1+ r)^t$
- Hence, NPV = discount factor x value in year t

- Receiving Rs.100 today is better than receiving the same amount next year.
- Or...
- Invest Rs.100 today and have Rs.100 + interest next year
- So, the present value of Rs. 100 in a years time is equivalent to Rs.91...with a discounted rate 10% (similar to investing Rs.100 and getting back Rs.110 in next year)

- Net Present value (NPV):
- The calculation of net present value is a project evaluation technique that takes into account the profitability of a project and the timing of cash flows that are produced.

$$\text{Present value} = \frac{\text{value in year } t}{(1 + r)^t}$$

- Discount factor = $1 / (1+ r)^t$
- Hence, NPV = discount factor x value in year t

NPV(Project A) : Discount factor = $1 / (1+ r)^t$

NPV = discount factor x value in year t

Year	Project A	Discount factor @8%	Discounted cash flow
0	-8000	1.0000	-8000
1	4000	0.9259	3703.6
2	4000	0.8573	3429.2
3	2000	0.7938	1587.6
4	1000	0.7350	735
5	500	0.6806	340.3
6	500	0.6302	315.1
Net Profit	**4,000**	**NPV**	**2110.8**

NPV(Project B) :

Discount factor = $1 / (1+ r)^t$

NPV = discount factor x value in year t

Year	Project B	Discount factor @10%	Discounted cash flow
0	-8000	1.0000	-8000
1	1000	0.9091	909.1
2	2000	0.8264	1652.8
3	4000	0.7513	3005.2
4	3000	0.6830	2049
5	9000	0.6209	5588.1
6	-6000	0.5645	3387
Net Profit	**5,000**	**NPV**	**1817.2**

NPV(Project C) :

Discount factor = $1 / (1+ r)^t$

NPV = discount factor x value in year t

Year	Project C	Discount factor @12%	Discounted cash flow
0	-10000	1.0000	-10000
1	2000	0.8929	1785.8
2	2000	0.7972	1594.4
3	6000	0.7118	4270.8
4	2000	0.6355	1271
5	2000	0.5674	1134.8
6	2000	0.5066	1013.2
Net Profit	**6,000**	**NPV**	**1070**

- Based on Net profit...
  - C>B>A
- Based on Pay back period...
  - A>C>B
- Based on Return on Investment...
  - C>A>B
- Based on NPV...
  - C>B>A

Answers

1. What is NPV good for?

3. When does a project manager use NPV?
4. What project documents (or artefacts) would you find NPV calculations in?
5. How does NPV help in decision making?
6. When is NPV not so useful?

10. What impact does (would) NPV have on your project?

1. Understanding the future value of money in today's terms
2. In presenting the cost-benefit analysis, or justification for a project
3. Business cases, project plans, and project portfolio reports

5. It helps compare the value of different projects against investment targets
6. If a project and it's benefits are only going to run for a short period (e.g. less than a year) or if a project's benefits are non financial
7. Reflect on your project's costs and forecast benefits