**Implementation of Cost benefit analysis**

Example:

The table below gives the estimated cash flow for three different projects:

* Calculate Net Profit for each project. Based on your answer select which project you would choose to develop.
* Using shortest payback method, identify which project you would select for development. Justify your answer referring to the projects payback period and possible profits in payback year.
* Calculate ROI of each project given in the table and select the project based on your ROI calculation.
* Calculate NPV using 10% discount rate.

|  |  |  |  |
| --- | --- | --- | --- |
| Year | Project-1 | Project-2 | Project-3 |
| 0 | -195000 | -160000 | -295000 |
| 1 | 15000 | 15000 | 30000 |
| 2 | 30000 | 15000 | 35000 |
| 3 | 55000 | 20000 | 50000 |
| 4 | 50000 | 35000 | 120000 |
| 5 | 55000 | 55000 | 110000 |
| 6 | 50000 | 90000 | 115000 |

**SOLUTION :**

**Payback period** = time taken to pay back the total investment

**ROI** = (Average Annual Profit / Total Investment ) \* 100 where

Average Annual Profit = Net Profit ÷ Project duration

**For Project 1 :**

**NET PROFIT = Rs 60000**

**Payback period =** time taken to pay back the total investment of Rs 195000

= 5 - (10/55) = **4.82 years**

Average Annual Profit = Net Profit ÷ Project duration = 60000÷ 6 = 10000

**So, ROI** = (average annual profit / total investment ) \* 100

= (10000/195000) \* 100 = **5.13 %**

**For Project 2 :**

**NET PROFIT = Rs 70000**

**Payback period** = time taken to pay back the total investment of Rs 160000

= 6 - (70/90) = **5.22 years**

Average Annual Profit = Net Profit ÷ Project duration = 70000÷ 6 = 11666.67

**ROI** = (average annual profit / total investment ) \* 100

= (11666.67 / 160000) \* 100 = **7.29 %**

**For Project 3 :**

**NET PROFIT = Rs 165000**

**Payback period** = time taken to pay back the total investment of Rs 295000

= 5 - (50000/110000) = **4.55 years**

Average Annual Profit = Net Profit ÷ Project duration = 165000÷ 6 = 27500

**ROI** = (average annual profit / total investment ) \* 100

= (27500) / 295000) \* 100 = **9.32 %**

**COMPUTATION OF NPV FOR EACH PROJECT**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **YEAR** | **Project1** | **Project2** | **Project3** | **D.F** | PV | PV | PV |
| 0 | -195000 | -160000 | -295000 | 1 | -195000 | -160000 | -295000 |
| 1 | 15000 | 15000 | 30000 | 0.9091 | 13636.5 | 13636.5 | 27273 |
| 2 | 30000 | 15000 | 35000 | 0.8264 | 24792 | 12396 | 28924 |
| 3 | 55000 | 20000 | 50000 | 0.7513 | 41321.5 | 15026 | 37565 |
| 4 | 50000 | 35000 | 120000 | 0.683 | 34150 | 23905 | 81960 |
| 5 | 55000 | 55000 | 110000 | 0.6209 | 34149.6 | 34149.5 | 68299 |
| 6 | 50000 | 90000 | 115000 | 0.5644 | 28220 | 50796 | 64906 |
| **NET**  **PROFIT** | **60000** | **70000** | **165000** |  | **-18730.5** | **-10091** | **13927** |
|  |  |  |  |  |  |  |  |
| **ROI** | **5.13** | **7.29** | **9.32** | **NPV**  **computed** | **-18730.5** | **-10091** | **13927** |
|  |  |  |  |  |  |  |  |
| **PBP** | **4.82** | **5.22** | **4.55** |  |  |  |  |

* In case of Net Profit, **Project 3 should be selected as it has the maximum Net Profit of Rs. 165000**
* In case of Payback, **Project 3 should be selected as it has the minimum Payback Period value of 4.55 years**
* In case of ROI, **Project 3 should be selected as it has the maximum ROI value of 9.32 %**
* In case of Net present value, **Project 3 should be selected as it has the maximum NPV of 13927.** Project1 and project 2 are not feasible as they have negative NPV.

**Example 2**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| A company projecting revenue of 64 lacs in first year and the revenue is going to increase by 25% every year for the next 3 years in succession, after which revenue decreases by 20 lacs in the fifth year and thus will be closed after 5 years. The fixed initial investment for the project is 120 lacs and working capital requirement is 60 lacs. Compute these for the project :   1. Payback Period b) ROI c) NPV assuming 12.5% discount rate   **SOLUTION:**  **Payback period** = time taken to pay back the total investment of 180 Lac  = 3 - (10.33/70.23) = **2.853 years = 2 years 10 months 7 days**  Average Annual Profit = Net Profit ÷ Project duration = 294 lacs / 5 = 58.8 Lacs  **ROI** = (average annual profit /total investment) x 100   = (58.8/180) x 100 = **32.67%**  **Computation of NPV :**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Year** | **Cash flow** | **Discount factor @12.5%** | **Discounted cash flow** | **Cumulative**  **Profit/revenue** | | 0 | -180 L | 1.0000 | -180 L | -180 L | | 1 | 64 L | 0.8889 | 56.89 L | -123.11 | | 2 | 80 L | 0.7901 | 63.21 L | - 59.9 L | | 3 | 100 L | 0.7023 | 70.23 L | 10.33 L | | 4 | 125 L | 0.6243 | 78.04 L | 88.37 L | | 5 | 105 L | 0.5549 | 58.26 L | 146.63 L | | **Net Profit :** | **RS 294Lacs** | **NPV :** | **RS. 14,663,000** | | |

**Example 3**

Project A with cashflows of -100000, 10000, 10000, 10000, 20000, 100000 and Project B with cashflows of -120000, 30000, 30000, 30000, 30000, 75000 for year 0, 1, 2, 3, 4 and 5 respectively are to be chosen. Which of these projects will be chosen on the basis of :   
a) Payback Period b)ROI c) NPV assuming 10% discount rate

**Project A computation of Payback, ROI and NPV for 10 % discount rate :**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Year** | **Cashflows** | **D.F.** | **PV** | **ROI** | **Payback Period** |
| 0 | -100K | 1 | -100K | ROI =  Average annual profit / Investment  =(10000/100000)\*100% = 10%  So, **ROI = 10%** | Payback =  5- (50/100) =  **4 ½ years** |
| 1 | 10K | 0.9091 | 9.091K |
| 2 | 10K | 0.8264 | 8.264K |
| 3 | 10K | 0.7513 | 7.513K |
| 4 | 20K | 0.6830 | 13.660K |
| 5 | 100K | 0.6209 | 62.09K |
| Net  Profit | 50,000 | **NPV =** | **Rs 618** |  |  |

**Project B computation of Payback, ROI and NPV for 10 % discount rate :**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Year** | **Cashflows** | **D.F.** | **PV** | **ROI** | **Payback Period** |
| 0 | -120K | 1 | -120K | ROI =  Average annual profit / Investment  =(15000/120000)\*100% = 12.5%  So, **ROI = 12.5%** | Payback =  **4 years** |
| 1 | 30K | 0.9091 | 27.273K |
| 2 | 30K | 0.8264 | 24.792K |
| 3 | 30K | 0.7513 | 22.539K |
| 4 | 30K | 0.6830 | 20.490K |
| 5 | 75K | 0.6209 | 46.5675K |
| Net Profit | 75,000 | **NPV= Rs** | **23661.50** |  |  |