Capital Budgeting

Answer Keys

Project Evaluation Methods at Topley

1. Payback period

 $\frac{220,000}{50,000}$ = 4.4 years

1. Discounted payback period

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Year** | **Cash Flow** | **Discount Factor** | **Present Value** | **Cumulative Present Value** |
| 0 | -220,000 | (1+.16)^0 | -220,000.00 | -220,000.00 |
| 1 | 50,000 | (1+.16)^1 | 43,103.45 | -176,896.55 |
| 2 | 50,000 | (1+.16)^2 | 37,158.15 | -139,738.40 |
| 3 | 50,000 | (1+.16)^3 | 32,032.88 | -107,705.52 |
| 4 | 50,000 | (1+.16)^4 | 27,614.55 | -80,090.97 |
| 5 | 50,000 | (1+.16)^5 | 23,805.65 | -56,285.32 |
| 6 | 50,000 | (1+.16)^6 | 20,522.11 | -35,763.21 |
| 7 | 50,000 | (1+.16)^7 | 17,691.48 | -18,071.73 |
| 8 | 50,000 | (1+.16)^8 | 15,251.27 | -2,820.46 |
| 9 | 50,000 | (1+.16)^9 | 13,147.65 | 10,327.19 |
| 10 | 50,000 | (1+.16)^10 | 11,334.18 | 21,661.37 |

Discounted payback period = 8 + $\frac{2,820.46}{13,147.65}$ = 8.21 years

1. NPV

50,000 ($\frac{1-(1+.16)^{-10}}{.16}$) = 241,661.37

241,661.37 – 220,000 = 21,661.37

NPV is what remains after compensating investors for the RRR of 16%. This is the excess profit of the project in dollar terms and is equivalent to 2.60% in Part 4.

1. IRR

 220,000 = 50,000 ($\frac{1-(1+i)^{-10}}{i}$)

 i = .1860 or 18.60%

The RRR of the project is 16.00%, so the project is earning 2.60% more than required. This is the excess profit of the project in percentage terms.

Note: The IRR function in Excel can be used to solve for i.

1. Modified IRR

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Year | Cash Flow | FV Factor | FV (16%) | FV (18.6%) |
| 1 | 50,000 | (1+i)9 | 190,148.07 | 232,130.50 |
| 2 | 50,000 | (1+i)8 | 163,920.75 | 195,725.55 |
| 3 | 50,000 | (1+i)7 | 141,310.99 | 165,029.97 |
| 4 | 50,000 | (1+i)6 | 121,819.82 | 139,148.38 |
| 5 | 50,000 | (1+i)5 | 105,017.09 | 117,325.78 |
| 6 | 50,000 | (1+i)4 | 90,531.97 | 98,925.62 |
| 7 | 50,000 | (1+i)3 | 78,044.80 | 83,411.15 |
| 8 | 50,000 | (1+i)2 | 67,280.00 | 70,329.80 |
| 9 | 50,000 | (1+i)1 | 58,000.00 | 59,300.00 |
| 10 | 50,000 | (1+i)0 |   50,000.00 |   50,000.00 |
|  |  |  | 1 1,066,073.50 | 2  1,211,326.80 |



 MIRR is 17.09%

1. PI

$ \frac{241,661.37}{220,000}$ = 1.10

**Project Evaluation Methods at Cott Beverages**

1. Payback period

|  |  |
| --- | --- |
| **Year** | **Cumulative** **Cash Flows** |
| 1 | 10,000 |
| 2 | 18,000 |
| 3 | 24,000 |
| 4 | 29,000 |
| 5 | 33,000 |
| 6 | 36,000 |
| 7 | 39,000 |

3 + ($\frac{28,000-24,000}{\begin{array}{c}29,000-24,000\\\end{array}}$) (1) = 3.8 years

1. Discounted payback period

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Year** | **Cash Flow** | **Discount Factor** | **Present Value** | **Cumulative Present Value** |
| 0 | (28,000) | (1+.16)^0 | -28,000.00 | -28,000.00 |
| 1 | 10,000 | (1+.16)^1 | 8,620.69 | -19,379.31 |
| 2 | 8,000 | (1+.16)^2 | 5,945.30 | -13,434.01 |
| 3 | 6,000 | (1+.16)^3 | 3,843.95 | -9,590.06 |
| 4 | 5,000 | (1+.16)^4 | 2,761.46 | -6,828.60 |
| 5 | 4,000 | (1+.16)^5 | 1,904.45 | -4,924.15 |
| 6 | 3,000 | (1+.16)^6 | 1,231.33 | -3,692.82 |
| 7 | 3,000 | (1+.16)^7 | 1,061.49 | -2,631.33 |

 The project does not break even on a present value basis.

1. NPV

|  |  |  |  |
| --- | --- | --- | --- |
| **Year** | **Cash Flow** | **Discount Factor** | **Present Value** |
| 1 | 10,000 | (1+.16)^1 | 8,620.69 |
| 2 | 8,000 | (1+.16)^2 | 5,945.30 |
| 3 | 6,000 | (1+.16)^3 | 3,843.95 |
| 4 | 5,000 | (1+.16)^4 | 2,761.46 |
| 5 | 4,000 | (1+.16)^5 | 1,904.45 |
| 6 | 3,000 | (1+.16)^6 | 1,231.33 |
| 7 | 3,000 | (1+.16)^7 | 1,061.49 |
| Total | 25,368.67 |

25,368.67 – 28,000.00 = <2,631.33>

The project is not earning its RRR of 16% as the NPV is negative.

1. IRR

28,000 = ($\frac{10,000}{(1+i)^{1}}$) + ($\frac{8,000}{(1+i)^{2}}$) + ($\frac{6,000}{(1+i)^{3}}$) + ($\frac{5,000}{(1+i)^{4}}$) + ($\frac{4,000}{(1+i)^{5}}$) + ($\frac{3,000}{(1+i)^{6}}$) + ($\frac{3,000}{(1+i)^{7}}$)

 i = .1186 or 11.86%

 The project is not earning the RRR of 16%.

 Note: The IRR function in Excel can be used to solve for i.

1. PI

$\frac{25,368.67}{28,000.00}$ = .91

**Standalone Decision at Rogers**

1. No

|  |  |
| --- | --- |
| Initial investment  | -120,000.00 |
| Tax Shield (120,000) (.45) ($\frac{.25}{.25+.12}$) ($\frac{2+.12}{2(1+.12)}$) | 34,531.85 |
| Increase in working capital | -5,000.00 |
| 1Annual savings | 71,332.15 |
| Salvage value (10,000) / (1+.12)4 | 6,355.18 |
| Lost tax shield (100,000) (.45) ($\frac{.25}{.25+.12}$) ($\frac{2+.12}{2(1+.12)}$) / (1+.12)4 | -1,828.80 |
| Decrease in working capital (5,000) / (1+.12)4 | 3,177.59 |
| NPV | -11,432.03 |

190,000 – 22,000 – 6,000 – 3,300 – 7,000 – 9,000 = 42,700

(42,700) (1 - .45) ($\frac{1-(1+.12)^{-4}}{.12}$) = 71,332.15

1. Yes

(200) (90,000/450) – (22,000) – (200) (6,000/450) – (200) (7,000/450) – (200) (9,000/450) = 8,222.22

(8,222.22) (1 - .45) ($\frac{1-(1+.12)^{-4}}{.12}$) = 13,735.57

-11,432.03 + 13,735.57 = 2,303.54

**Replacement Decision at Ruby**

1. Yes

|  |  |
| --- | --- |
| Net investment (500,000 – 50,000) | -450,000.00 |
| Tax shield (450,000) (.35) ($\frac{.2}{.2+.10}$)($\frac{2+.10}{2(1+.10)}$) | 100,277.27 |
| Increase in net working capital | -10,000.00 |
| Annual saving(200,000) (2) (1-.35) ($\frac{1-(1+.10)^{-8}}{.10}$) + (20,000) (4 + 2) (1-.35)) ($\frac{1-(1+.10)^{-8}}{.10}$) | 1,803,205.05 |
| Salvage value (80,000-10,000) / (1+.10)8 | 32,655.52 |
| Lost tax shield (80,000-10,000) (.35) ($\frac{.2}{.2+.10}$)($\frac{2+.10}{2(1+.10)}$) / (1+.10)8 | -7,273.27 |
| Decrease in net working capital (10,000) / (1+.10)8 | 4,655.07 |
| NPV | 1,473,469.64 |

**Replacement Decision at Zebra**

1. Yes

|  |  |
| --- | --- |
| Net investment (141,000 – 10,000) | -131,000.00 |
| Tax shield (131,000) (.31) ($\frac{.2}{.2+.115}$) ($\frac{2+.115}{2(1+.115)}$) | 24,454.45 |
| Decrease in net working capital | 30,000.00 |
| 1Annual savings (191,250) (1-.31) ($\frac{1-(1+.115)^{-6}}{.115}$) | 550,322.43 |
| Salvage value (18,000) / (1 + .115)6 | 9,367.49 |
| Lost tax shield (18,000) (.31) ($\frac{.2}{.2+.115}$) ($\frac{2+.115}{2(1+.115)}$) / (1+.115)6 | -1,748.68 |
| Increase in net working capital (30,000) / (1+.115)6 | -15,612.49 |
| NPV | 465,783.20 |

1

|  |  |
| --- | --- |
| Additional units (12.00-5.75) (15,000) | 93,750 |
| Savings – VC (7.50-5.75) (50,000) | 87,500 |
| Savings – FC | 10,000 |
| Total | 191,250 |