Chapter 9 Solutions to Problems

1. a. Payback period = $250,000/$70,000 = 3.57 years

Net Present Value Using Cash Flow Worksheet on Calculator:
CFo = -250,000
C01 = 70,000
F01 = 8
NPV
I = 20
?
Compute NPV
NPV = $18,601

Profitability Index Using Cash Flow Worksheet on Calculator:
CFo = 0
C01 = 70,000
F01 = 8
NPV
I = 20
?
Compute NPV
NPV = $268,601.1862
PI = $268,601.1862/$250,000 = 1.074

Internal Rate of Return Using Cash Flow Worksheet on Calculator:
CFo = -250,000
C01 = 70,000
F01 = 8
IRR
Compute IRR
IRR = 22.47%

b. Mr. Waldron should accept this project:
Payback < 4 years
NPV > 0
PI > 1.0
IRR > 20% required rate of return

2. a. NICO = $2,000,000 + $60,000 = $2,060,000

Disposal Cash Flow = $60,000 recovery of net working capital

b. OCF = ($2,920,000 – 1,360,000 – 760,000 – 400,000)(1 – 0.40) + 400,000 = $640,000

c. Payback period = $2,060,000/$640,000 = 3.22 years
Payback period > 3 year cutoff so do not accept project based on payback period.

d. Net Present Value Using Cash Flow Worksheet on Calculator:
\[
\begin{align*}
\text{CF}_0 &= -2,060,000 \\
\text{C}_01 &= 640,000 \\
F_01 &= 4 \\
\text{C}_02 &= 640,000 + 60,000 = 700,000 \\
F_02 &= 1 \\
\text{NPV} \\
I &= 14 \\
? \\
\text{Compute NPV} \\
\text{NPV} &= 168,334
\end{align*}
\]

NPV > 0 so project should be accepted.

5. a. Net Present Value Using Cash Flow Worksheet on Calculator:
\[
\begin{align*}
\text{CF}_0 &= -500,000 \\
\text{C}_01 &= 120,000 \\
F_01 &= 10 \\
\text{NPV} \\
I &= 15 \\
? \\
\text{Compute NPV} \\
\text{NPV} &= 102,252
\end{align*}
\]

b. (1) 15% represents the average cost of raising capital to invest in projects like this. The
project must provide at least a 15% rate of return in order to cover financing costs.
(2) Yes, NPV > 0, so we should invest in the project.
(3) NPV = $2,252 when NICO = $600,000, so we would still invest in the project. The
most we can pay for the project is just under the PV of the future cash flows, which is
$602,252.

8. a. Fast Payoff:

Net Present Value Using Cash Flow Worksheet on Calculator:
\[
\begin{align*}
\text{CF}_0 &= -220,000 \\
\text{C}_01 &= 100,000 \\
F_01 &= 3 \\
\text{NPV} \\
I &= 10 \\
? \\
\text{Compute NPV} \\
\text{NPV} &= 28,685
\end{align*}
\]
Slow Payoff:

Net Present Value Using Cash Flow Worksheet on Calculator:
CFo = -220,000
C01 = 0
F01 = 2
C02 = 334,593
F02 = 1
NPV
I = 10
?
Compute NPV
NPV = $31,385

The slow payoff has the higher NPV so it is preferred.

b. Fast Payoff:

Internal Rate of Return Using Cash Flow Worksheet on Calculator:
CFo = -220,000
C01 = 100,000
F01 = 3
IRR
Compute IRR
IRR = 17.27%

Slow Payoff:

Internal Rate of Return Using Cash Flow Worksheet on Calculator:
CFo = -220,000
C01 = 0
F01 = 2
C02 = 334,593
F02 = 1
IRR
Compute IRR
IRR = 15.00%

c. NPV profiles:

At zero discount rate:

Fast Payoff: NPV = $300,000 – 220,000 = $80,000
Slow Payoff: NPV = $334,593 – 220,000 = $114,593
At infinite discount rate:

Fast Payoff: NPV = -$220,000

Slow Payoff: NPV = -$220,000

At IRR:

Fast Payoff: NPV = Zero at 17.27%

Slow Payoff: NPV = Zero at 15%

Crossover rate:

Calculate the differences in annual cash flows; then find the IRR of the differences:

<table>
<thead>
<tr>
<th>Year-End</th>
<th>Fast Payoff</th>
<th>Slow Payoff</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-$220,000</td>
<td>-$220,000</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>+$100,000</td>
<td>0</td>
<td>+$100,000</td>
</tr>
<tr>
<td>2</td>
<td>+$100,000</td>
<td>0</td>
<td>+$100,000</td>
</tr>
<tr>
<td>3</td>
<td>+$100,000</td>
<td>+334,593</td>
<td>-$234,593</td>
</tr>
</tbody>
</table>

Internal Rate of Return Using Cash Flow Worksheet on Calculator:

CFo = 0
C01 = 100,000
F01 = 2
C02 = -234,593
F02 = 1
IRR
Compute IRR
IRR = 11.12% = crossover rate where the 2 NPV profiles intersect on a graph.

(Note that the IRR is the same regardless of which direction you subtract the cash flows.)

NPV leads to the selection of Slow Payoff ($31,380 > $28,690) but IRR leads to the selection of Fast Payoff (17.27% > 15.00%). The conflict in ranking occurs because the discount rate (10%) falls within the zone of ranking conflict (10% < 11.12%).

Decision:

If the intermediate cash inflows of Fast Payoff can be reinvested at a rate greater than 11.12%, then select the Fast Payoff. Otherwise, select the Slow Payoff.