SOLUTIONS TO SELECTED PROBLEMS

Student: You should work the problem completely before referring to the solution.

CHAPTER 7

Solutions included for problems 1, 4, 7, 10, 13, 16, 19, 22, 25, 28, 31, 34, 37, 40, 43, 46, 49, 52, and 55

7.1 A rate of return of –100% means that the entire investment is lost.

7.4 Monthly pmt = 100,000(A/P,0.5%,360)
= 100,000(0.00600)
= $600

Balloon pmt = 100,000(F/P,0.5%,60) – 600(F/A,0.5%,60)
= 100,000(1.3489) – 600(69.7700)
= $93,028

7.7 0 = -30,000 + (27,000 – 18,000)(P/A,i%,5) + 4000(P/F,i%,5)
Solve by trial and error or Excel
i = 17.9%  (Excel)

7.10 0 = -10 – 4(P/A,i%,3) - 3(P/A,i%,3)(P/F,i%,3) + 2(P/F,i%,1) + 3(P/F,i%,2)
+ 9(P/A,i%,4)(P/F,i%,2)
Solve by trial and error or Excel
i = 14.6%  (Excel)

7.13 (a) 0 = -41,000,000 + 55,000(60)(P/A,i%,30)
Solve by trial and error or Excel
i = 7.0% per year  (Excel)

(b) 0 = -41,000,000 + [55,000(60) + 12,000(90)](P/A,i%,30)
0 = -41,000,000 + (4,380,000)(P/A,i%,30)
Solve by trial and error or Excel
i = 10.1% per year  (Excel)

7.16 0 = -110,000 + 4800(P/A,i%,60)
(P/A,i%,60) = 22.9167
Use tables or Excel
i = 3.93% per month  (Excel)

Chapter 7
7.19 \[ 0 = -950,000 + [450,000(P/A, i\%, 5) + 50,000(P/G, i\%, 5)](P/F, i\%, 10) \]

Solve by trial and error or Excel
\[ i = 8.45\% \text{ per year} \quad (Excel) \]

7.22 In a conventional cash flow series, there is only one sign change in the net cash flow. A nonconventional series has more than one sign change.

7.25 Tabulate net cash flows and cumulative cash flows.

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Expenses</th>
<th>Revenue</th>
<th>Net Cash Flow</th>
<th>Cumulative</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-20</td>
<td>0</td>
<td>-20</td>
<td>-20</td>
</tr>
<tr>
<td>1</td>
<td>-20</td>
<td>5</td>
<td>-15</td>
<td>-35</td>
</tr>
<tr>
<td>2</td>
<td>-10</td>
<td>10</td>
<td>0</td>
<td>-35</td>
</tr>
<tr>
<td>3</td>
<td>-10</td>
<td>25</td>
<td>15</td>
<td>-20</td>
</tr>
<tr>
<td>4</td>
<td>-10</td>
<td>26</td>
<td>16</td>
<td>-4</td>
</tr>
<tr>
<td>5</td>
<td>-10</td>
<td>20</td>
<td>10</td>
<td>+6</td>
</tr>
<tr>
<td>6</td>
<td>-15</td>
<td>17</td>
<td>2</td>
<td>+8</td>
</tr>
<tr>
<td>7</td>
<td>-12</td>
<td>15</td>
<td>3</td>
<td>+11</td>
</tr>
<tr>
<td>8</td>
<td>-15</td>
<td>2</td>
<td>-13</td>
<td>-2</td>
</tr>
</tbody>
</table>

(a) From net cash flow column, there are two possible \( i^* \) values

(b) In cumulative cash flow column, sign starts negative but it changes twice. Therefore, Norstrom’s criterion is not satisfied. Thus, there may be up to two \( i^* \) values. However, in this case, since the cumulative cash flow is negative, there is no positive rate of return value.

7.28 The net cash flow and cumulative cash flow are shown below.

<table>
<thead>
<tr>
<th>Year</th>
<th>Expenses, $</th>
<th>Savings, $</th>
<th>Net Cash Flow, $</th>
<th>Cumulative, $</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-33,000</td>
<td>0</td>
<td>-33,000</td>
<td>-33,000</td>
</tr>
<tr>
<td>1</td>
<td>-15,000</td>
<td>18,000</td>
<td>+3,000</td>
<td>-30,000</td>
</tr>
<tr>
<td>2</td>
<td>-40,000</td>
<td>38,000</td>
<td>-2000</td>
<td>-32,000</td>
</tr>
<tr>
<td>3</td>
<td>-20,000</td>
<td>55,000</td>
<td>+35,000</td>
<td>+3000</td>
</tr>
<tr>
<td>4</td>
<td>-13,000</td>
<td>12,000</td>
<td>-1000</td>
<td>+2000</td>
</tr>
</tbody>
</table>

(a) There are four sign changes in net cash flow, so, there are four possible \( i^* \) values.
7.28 (cont) (b) Cumulative cash flow starts negative and changes only once. Therefore, there is only one positive, real solution.

\[ 0 = -33,000 + 3000(P/F,i\%,1) - 2000(P/F,i\%,2) + 35,000(P/F,i\%,3) -1000(P/F,i\%,4) \]

Solve by trial and error or Excel
\[ i = 2.1\% \text{ per year} \quad \text{(Excel)} \]

7.31 Tabulate net cash flow and cumulative cash flow values.

<table>
<thead>
<tr>
<th>Year</th>
<th>Cash Flow, $</th>
<th>Cumulative, $</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-5000</td>
<td>-5,000</td>
</tr>
<tr>
<td>2</td>
<td>-5000</td>
<td>-10,000</td>
</tr>
<tr>
<td>3</td>
<td>-5000</td>
<td>-15,000</td>
</tr>
<tr>
<td>4</td>
<td>-5000</td>
<td>-20,000</td>
</tr>
<tr>
<td>5</td>
<td>-5000</td>
<td>-25,000</td>
</tr>
<tr>
<td>6</td>
<td>-5000</td>
<td>-30,000</td>
</tr>
<tr>
<td>7</td>
<td>+9000</td>
<td>-21,000</td>
</tr>
<tr>
<td>8</td>
<td>-5000</td>
<td>-26,000</td>
</tr>
<tr>
<td>9</td>
<td>-5000</td>
<td>-31,000</td>
</tr>
<tr>
<td>10</td>
<td>-5000 + 50,000</td>
<td>+14,000</td>
</tr>
</tbody>
</table>

(a) There are three changes in sign in the net cash flow series, so there are three possible ROR values. However, according to Norstrom’s criterion regarding cumulative cash flow, there is only one ROR value.

(b) Move all cash flows to year 10.
\[ 0 = -5000(F/A,i,10) + 14,000(F/P,i,3) + 50,000 \]

Solve for \( i \) by trial and error or Excel
\[ i = 6.3\% \quad \text{(Excel)} \]

(c) If Equation [7.6] is applied, all F values are negative except the last one. Therefore, \( i' \) is used in all equations. The composite ROR \( (i') \) is the same as the internal ROR value \( (i^*) \) of 6.3% per year.
7.34 Apply net reinvestment procedure because reinvestment rate, \( c \), is not equal to \( i^* \) rate of 44.1% per year (from problem 7.29):

\[
F_0 = -5000\quad F_0 < 0; \text{ use } i'
\]

\[
F_1 = -5000(1 + i') + 4000 = -5000 - 5000i' + 4000 = -1000 - 5000i'\quad F_1 < 0; \text{ use } i'
\]

\[
F_2 = (-1000 - 5000i')(1 + i') = -1000 - 5000i' - 1000i' - 5000i'^2 = -1000 - 6000i' - 5000i'^2\quad F_2 < 0; \text{ use } i'
\]

\[
F_3 = (-1000 - 6000i' - 5000i'^2)(1 + i') = -1000 - 6000i' - 5000i'^2 - 1000i' - 6000i'^2 - 5000i'^3 = -1000 - 7000i' - 11,000i'^2 - 5000i'^3\quad F_3 < 0; \text{ use } i'
\]

\[
F_4 = (-1000 - 7000i' - 11,000i'^2 - 5000i'^3)(1 + i') + 20,000 = 19,000 - 8000i' - 18,000i'^2 - 16,000i'^3 - 5,000i'^4\quad F_4 > 0; \text{ use } c
\]

\[
F_5 = (19,000 - 8000i' - 18,000i'^2 - 16,000i'^3 - 5,000i'^4)(1.15) - 15,000 = 6850 - 9200i' - 20,700i'^2 - 18,400i'^3 - 5,750i'^4
\]

Set \( F_5 = 0 \) and solve for \( i' \) by trial and error or spreadsheet.

\( i' = 35.7\% \text{ per year} \)

7.37 (a) \( i = 5,000,000(0.06)/4 = $75,000 \text{ per quarter} \)

After brokerage fees, the City got $4,500,000. However, before brokerage fees, the ROR equation from the City’s standpoint is:

\[
0 = 4,600,000 - 75,000(P/A,i%,120) - 5,000,000(P/F,i%,120)
\]

Solve for \( i \) by trial and error or Excel

\( i = 1.65\% \text{ per quarter} \quad (\text{Excel}) \)

(b) Nominal \( i \) per year = \( 1.65(4) = 6.6\% \text{ per year} \)

Effective \( i \) per year = \( (1 + 0.066/4)^4 - 1 = 6.77\% \text{ per year} \)
7.40 \[ i = \frac{5000(0.10)}{2} \]
\[ = $250 \text{ per six months} \]

\[ 0 = -5000 + 250(P/A,i\%,8) + 5,500(P/F,i\%,8) \]

Solve for \( i \) by trial and error or Excel

\[ i = 6.0\% \text{ per six months} \quad \text{(Excel)} \]

7.43 Answer is (c)

7.46 \[ 0 = -60,000 + 10,000(P/A,i,10) \]
\[ (P/A,i,10) = 6.0000 \]

From tables, \( i \) is between 10\% and 11\%

Answer is (a)

7.49 \[ 0 = -100,000 + \frac{10,000}{i}(P/F,i,4) \]
Solve for \( i \) by trial and error or Excel

\[ i = 9.99\% \text{ per year} \quad \text{(Excel)} \]

Answer is (a)

7.52 \[ 250 = \frac{(10,000)(b)}{2} \]
\[ b = 5\% \text{ per year payable semiannually} \]

Answer is (c)

7.55 Since the bond was purchased for its face value, the interest rate received by the purchaser is the bond interest rate of 10\% per year payable quarterly. Answers (a) and (b) are correct. Therefore, the best answer is (c).