Suggested Answers to Discussion Questions

Answers will vary according to student’s selections, tastes, and preferences.

Solutions to Problems

1. The investor would earn $8.25 on a stock that paid $3.75 in income and sold for $67.50. Part of the total dollar return includes a $4.50 capital gain, which is the difference between the proceeds of the sale and the original purchase price ($67.50 – $63.00) of the stock.

3. (a) Income: $2.70
   (b) Capital gain: $60 – $50 = $10
   (c) Total return:
   (1) In dollars: $2.70 + $10.00 = $12.70
   (2) As a percentage of the initial investment: $12.70 = 0.25 or 25%.

5. (a) Total return = Income + Capital gains (or losses) where:
   Capital gains (or losses) = Ending price – Beginning price.

<table>
<thead>
<tr>
<th>Year</th>
<th>Ending Price</th>
<th>Beginning Price</th>
<th>(1) – (2) Capital Gain</th>
<th>Current Income</th>
<th>(3) + (4) Total Return</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>$32.50</td>
<td>$30.00</td>
<td>$2.50</td>
<td>$1.00</td>
<td>$3.50</td>
</tr>
<tr>
<td>2008</td>
<td>35.00</td>
<td>32.50</td>
<td>2.50</td>
<td>1.20</td>
<td>3.70</td>
</tr>
<tr>
<td>2009</td>
<td>33.00</td>
<td>35.00</td>
<td>–2.00</td>
<td>1.30</td>
<td>–0.70</td>
</tr>
<tr>
<td>2010</td>
<td>40.00</td>
<td>33.00</td>
<td>7.00</td>
<td>1.60</td>
<td>8.60</td>
</tr>
<tr>
<td>2011</td>
<td>45.00</td>
<td>40.00</td>
<td>5.00</td>
<td>1.75</td>
<td>6.75</td>
</tr>
</tbody>
</table>

(b) Of course, there is no correct answer here, but one might forecast using the arithmetic average or the average one-year holding period return.

(i) The arithmetic average: \( \frac{3.50 + 3.70 - 0.70 + 8.60 + 6.75}{5} = 4.37 \)

(ii) The average holding period return (HPR):

\[
HPR = \frac{\text{Ending price} - \text{Beginning price} + \text{Current income}}{\text{Beginning price}} = \frac{\text{Total Return}}{\text{Beginning Price}}
\]

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Return*</th>
<th>Beginning Price</th>
<th>(1) + (2) HPR</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>$3.50</td>
<td>$30.00</td>
<td>11.7%</td>
</tr>
<tr>
<td>2008</td>
<td>3.70</td>
<td>32.50</td>
<td>11.4</td>
</tr>
<tr>
<td>2009</td>
<td>–0.70</td>
<td>35.00</td>
<td>–2.0</td>
</tr>
<tr>
<td>2010</td>
<td>8.60</td>
<td>33.00</td>
<td>26.1</td>
</tr>
</tbody>
</table>
**Average HPR**

\[
\text{Average HPR} = \frac{11.7 + 11.4 - 2.0 + 26.1 + 16.9}{5} = 12.8\%
\]

<table>
<thead>
<tr>
<th>(i)</th>
<th>(ii)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forecasts for:</td>
<td>Based on Arithmetic Average</td>
</tr>
<tr>
<td>2012</td>
<td>$4.37</td>
</tr>
<tr>
<td>2013</td>
<td>$4.37</td>
</tr>
</tbody>
</table>

*End of 2005 price gain in original data.
**For lack of information, we are assuming the 2006 return is $4.00 from capital gains and $1.76 from income.

(c) Students should be made aware of the fact that many other forecasts are possible. Other factors may be relevant here: Will the pattern of two good years followed by a bad one continue? Do future prospects seem bright? (We will discuss forecasting returns on specific investments in later chapters.)

7. (a) Using the notation given in the chapter, the risk-free rate of interest for both investments is:

\[
R = r^* + IP
\]

\[
= 3\% + 5\%
\]

\[
= 8\%
\]

(b) The required returns for each investment are calculated as follows:

\[
r_I = r^* + IP + R_P, \quad R_F + R_P
\]

\[
r_A = 3\% + 5\% + 3\% = 11\%
\]

\[
r_B = 3\% + 5\% + 5\% = 13\%
\]

9. Holding period return (HPR) = \[
\frac{\text{Current income} + \text{Ending price} - \text{Beginning price}}{\text{Beginning price}}
\]

\[
\begin{align*}
\text{HPR}_X &= \frac{\$1.00 + \$1.20 + \$0 + \$2.30 + \$29.00 - \$30.00}{\$30.00} = \frac{\$3.50}{\$30.00} \\
&= 11.67\%
\end{align*}
\]

\[
\begin{align*}
\text{HPR}_Y &= \frac{\$0 + \$0 + \$2.00 + \$56.00 - \$50.00}{50.00} = \frac{\$8.00}{\$50.00} \\
&= 16.0\%
\end{align*}
\]

If the investments are held beyond a year, the capital gain (loss) component would not be realized and would likely change. Assuming they are of equal risk, Investment Y would be preferred since it offers the higher return (16.0% for Y versus 11.67% for X).

11. \[
\text{HPR} = \frac{\$50 + (\$1,000 - \$950))}{\$950} = \frac{\$100}{\$950} = 10.5\%.
\]
13. Using a present value interest factor of 4%:

\[
\begin{align*}
$65 \times 0.962 &= $62.53 \\
$70 \times 0.925 &= $64.75 \\
$70 \times 0.889 &= $62.23 \\
$7,965 \times 0.855 &= $6,810.08 \\
$6,999.59
\end{align*}
\]

15.

<table>
<thead>
<tr>
<th>Investment</th>
<th>Initial Investment</th>
<th>Future Investment Value</th>
<th>Years</th>
<th>Calculator Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>$1,000</td>
<td>$1,200</td>
<td>5</td>
<td>3.71%</td>
</tr>
<tr>
<td>B</td>
<td>10,000</td>
<td>20,000</td>
<td>7</td>
<td>10.41%</td>
</tr>
<tr>
<td>C</td>
<td>400</td>
<td>2,000</td>
<td>20</td>
<td>8.38%</td>
</tr>
<tr>
<td>D</td>
<td>3,000</td>
<td>4,000</td>
<td>6</td>
<td>4.91%</td>
</tr>
<tr>
<td>E</td>
<td>5,500</td>
<td>25,000</td>
<td>30</td>
<td>5.18%</td>
</tr>
</tbody>
</table>

17. The yield for these investments is the discount rate that results in the stream of income equaling the initial investment.

**Investment A:** Using the present value of an annuity formula:

\[
PVA = \text{Annual deposit} \times PVIFA_{k\%,5\text{ yrs.}}
\]

\[
\begin{align*}
$8,500 &= $2,500 \times PVIFA_{k\%,5\text{ yrs.}} \\
\frac{$8,500}{2,500} &= PVIFA_{k\%,5\text{ yrs.}} \\
3.4 &= PVIFA_{k\%,5\text{ yrs.}}
\end{align*}
\]

Looking at Table A.4, Appendix A, the closest factor for five years occurs at 14% (3.433); therefore, this investment yields about 14%.

**Investment B:** It is necessary to try several different discount rates to determine the yield for Investment B. One way to estimate a starting point is to use the average annual income in the formula used in Part A and adjusting it based on whether the larger cash flows are received in the earlier or later years. The Internal Rate of Return (IRR) function on a business calculator makes the task easier.

\[
PVA = \text{Annual deposit} \times PVIFA_{k\%,5\text{ yrs.}}
\]

\[
\begin{align*}
$9,500 &= $3,000 \times PVIFA_{k\%,5\text{ yrs.}} \\
\frac{$9,500}{3,000} &= PVIFA_{k\%,5\text{ yrs.}} \\
3.167 &= PVIFA_{k\%,5\text{ yrs.}}
\end{align*}
\]

The closest interest rate to 3.167 in Table A.4, Appendix A, is 17%. Because the larger cash flows are received in the later years, 16% is a good starting point.

<table>
<thead>
<tr>
<th>Year</th>
<th>Income</th>
<th>PVIF, 16%</th>
<th>PV at 16%</th>
<th>PVIF, 15%</th>
<th>PV at 15%</th>
<th>(1) × (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The discount rate that results in a present value closest to $9,500 is 15%.
Calculator solution for IRR = 15.36%

19.

<table>
<thead>
<tr>
<th>Year</th>
<th>Income</th>
<th>9% PVIF</th>
<th>PV at 9%</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>140</td>
<td>0.917</td>
<td>128.38</td>
</tr>
<tr>
<td>2012</td>
<td>120</td>
<td>0.842</td>
<td>101.04</td>
</tr>
<tr>
<td>2013</td>
<td>100</td>
<td>0.772</td>
<td>77.20</td>
</tr>
<tr>
<td>2014</td>
<td>80</td>
<td>0.708</td>
<td>56.64</td>
</tr>
<tr>
<td>2015</td>
<td>60</td>
<td>0.650</td>
<td>39.00</td>
</tr>
<tr>
<td>2016</td>
<td>40</td>
<td>0.596</td>
<td>23.84</td>
</tr>
<tr>
<td>2017</td>
<td>1220</td>
<td>0.547</td>
<td>667.34</td>
</tr>
</tbody>
</table>

PV of Income = $93.44

The yield is very close to 11% on this investment.
Since the yield of 11% is greater than the minimum required return of 9.0%, the investment is recommended. This project would result in positive Net Present Value to the investor.

21. 2010 – 2003 = 7 years
$1 \times \text{FVIF} \% \text{%, 7 years} = 2.21
\text{FVIF} = 2.21/1 = 2.21
\text{FVIF} 12\%, 7 \text{ years} = 2.211, \text{so the yield is about } 12\%

23. (a) Investment A, with returns that vary widely—from 1% to 26%—appears to be more risky than Investment B, whose returns vary from 8% to 16%.

(b) $s = \sum_{i=1}^{n} (r - r_{i})^{2}$

\[ CV = \frac{\text{Standard deviation}}{\text{Average return}} \]

Investment A:

<table>
<thead>
<tr>
<th>Year</th>
<th>Return</th>
<th>Average Return, ( r )</th>
<th>(1) ( r_{i} ) – (2) ( r )</th>
<th>(3) ( (r_{i} - r)^{2} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>19%</td>
<td>12%</td>
<td>7%</td>
<td>49%</td>
</tr>
<tr>
<td>2007</td>
<td>1</td>
<td>12</td>
<td>-11</td>
<td>121</td>
</tr>
<tr>
<td>Year</td>
<td>Investment A</td>
<td>Investment B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>--------------</td>
<td>--------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>10%</td>
<td>8%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>12%</td>
<td>12%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>14%</td>
<td>12%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>16%</td>
<td>12%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[
S_A = \sqrt{\frac{434}{5-1}} = \sqrt{108.5} = 10.42\%
\]

\[
CV = \frac{10.42\%}{12.00\%} = 0.87
\]

(c) Investment A, with a standard deviation of 10.42, is considerably more risky than Investment B, whose standard deviation is 3.16. This confirms the conclusions reached in Part A.