Agricultural Economics 330  
Fall 2007  
Exam II

1. You have been approached by a friend to invest in a business he started about 4 years ago. The business has been profitable and he wants to expand into several new markets. It would require an initial investment of $250,000. Based on a 5 year planning horizon, the expected annual net after tax cash flows are listed below:

<table>
<thead>
<tr>
<th>Year</th>
<th>Cash Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$10,000</td>
</tr>
<tr>
<td>2</td>
<td>20,000</td>
</tr>
<tr>
<td>3</td>
<td>30,000</td>
</tr>
<tr>
<td>4</td>
<td>40,000</td>
</tr>
<tr>
<td>5</td>
<td>50,000</td>
</tr>
</tbody>
</table>

At the end of the fifth year, the intent is to take the company public. The expected net after tax sales price at the end of the fifth year is $400,000. If your required rate of return is 15 percent, should you make this investment? Use the net present value method to analyze the investment. (20 points)

\[
\begin{array}{cccc}
0 & -250,000 & 1 & -250,000 \\
1 & 10,000 & .8696 & 8,696 \\
2 & 20,000 & .7561 & 15,122 \\
3 & 30,000 & .6575 & 19,725 \\
4 & 40,000 & .5718 & 22,872 \\
5 & 50,000 & .9972 & 24,731 \\
 & +400,000 & & \\
\hline 
\text{NPV} & & & 40,155 \\
\end{array}
\]

\[40,155 > 0\]
2. Given the following information, which of the investments should you choose if your required rate of return is 12 percent? (20 points)

<table>
<thead>
<tr>
<th></th>
<th>X</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Original cash outlay</td>
<td>$100,000</td>
<td>$50,000</td>
</tr>
<tr>
<td>Investment period</td>
<td>4 years</td>
<td>5 years</td>
</tr>
<tr>
<td>Net after tax terminal value</td>
<td>$125,000</td>
<td>$100,000</td>
</tr>
</tbody>
</table>

Net annual after tax cash flows

<table>
<thead>
<tr>
<th>Year</th>
<th>X</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$6,000</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>$8,000</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>$10,000</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>$12,000</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>-</td>
<td>0</td>
</tr>
</tbody>
</table>

\[
x_e = \frac{5916.50}{3.0373} = 1947.95
\]

\[
y_e = \frac{6790}{3.6098} = 1869.73
\]

1947.95 > 1869.73 choose X
3. What is the internal rate of return for investment X in problem #2? (20 points)

<table>
<thead>
<tr>
<th></th>
<th>15%</th>
<th>19%</th>
<th>13%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-100,000</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>6000</td>
<td>.8696</td>
<td>.8772</td>
</tr>
<tr>
<td>2</td>
<td>8000</td>
<td>.7561</td>
<td>.7695</td>
</tr>
<tr>
<td>3</td>
<td>10,000</td>
<td>.6575</td>
<td>.6750</td>
</tr>
<tr>
<td>4</td>
<td>12,000</td>
<td>.5718</td>
<td>.5921</td>
</tr>
</tbody>
</table>

DF 15%: 1, 1, 1, 1
DF 19%: 1, .8696, .8772, .8850
DF 13%: 1, .7561, .7695, .7831

PV 15%: -100,000, 5217.60, 6098.90, 6575
PV 19%: -100,000, 5263.20, 6156
PV 13%: -100,000, 5310, 6264.80, 6931

IRR = 13% + \left( \frac{2527.90}{3241} \right) \times 13% = 13.78%
4. A) Assume you just had your first child and want to get started saving for college. If in today's dollars, four years of college would cost $50,000 and costs are expected to increase at a rate of 8 percent per year, how much will college cost in 18 years? (10 points)

\[ V_n = 50,000 \left( 5_{18.8}\% \right) = 50,000 \left( 3.9960 \right) \]
\[ = 199,800 \]

B) Given what you found in part (A), how much would you need to save each year if you could earn an annual return of 10 percent on the amount you save and assuming you want to have the entire amount saved by the end of 18 years? (10 points)

\[ y_n = 199,800 = p \left( 5_{18.10}\% \right) = p \left( 95.5992 \right) \]

\[ p = \frac{199,800}{95.5992} = 4381.66 \]
5. Assume you are considering investing in a piece of equipment that would require you to make an initial cash investment of $25,000 and borrow an additional $75,000. The loan is to be repaid in 10 equal annual payments, including principal and interest, at an annual interest rate of 9 percent. Assume a zero salvage value and 8 year straight line depreciation based on the original $100,000 investment. The net annual before tax cash flows are expected to be $30,000 per year in years 1 - 10, before including debt servicing requirements. If your marginal income tax bracket is 28 percent, what would the net after tax cash flows be for years 1 and 2? (20 points)

\[
\text{Depreciation} = \frac{100,000}{8} = 12,500
\]

\[
75,000 = P \left( \frac{\text{NPV}}{10.97} \right) = P \left( 6.4177 \right)
\]

\[
P = \frac{75,000}{6.4177} = 11,686.93
\]

<table>
<thead>
<tr>
<th>Time</th>
<th>Beginning Balance</th>
<th>Payment</th>
<th>Interest</th>
<th>Ending Balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>75,000</td>
<td>11,686.93</td>
<td>6750</td>
<td>49,369.3</td>
</tr>
<tr>
<td>2</td>
<td>70,063.57</td>
<td>11,686.93</td>
<td>6305.72</td>
<td>5380.71</td>
</tr>
</tbody>
</table>

\[
\text{Year 1} \quad \text{NBTCF} = 30,000
\]

\[
\text{TCF} = 30,000 - 12,500 - 6750 = 10,750
\]

\[
\text{Tax} = 10,750 \times 0.28 = 3010
\]

\[
\text{NATCF} = 30,000 - 6750 - 49,369.3 - 3010 = 15,303.57
\]

\[
\text{Year 2} \quad \text{NBTCF} = 30,000
\]

\[
\text{TCF} = 30,000 - 12,500 - 6305.72 = 11,194.28
\]

\[
\text{Tax} = 11,194.28 \times 0.28 = 3134.40
\]

\[
\text{NATCF} = 30,000 - 6305.72 - 5380.71 - 3134.40 = 15,179.17
\]
Agricultural Economics 330  
Fall 2006  
Exam II

1. Given the following information, which of the two investments listed below should you choose if your required rate of return is 12 percent? (20 points)

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$100,000</td>
<td>$50,000</td>
</tr>
<tr>
<td></td>
<td>5 years</td>
<td>7 years</td>
</tr>
<tr>
<td></td>
<td>$150,000</td>
<td>$140,000</td>
</tr>
<tr>
<td>Net annual after tax cash flows:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 1</td>
<td>$6,000</td>
<td>0</td>
</tr>
<tr>
<td>Year 2</td>
<td>$6,600</td>
<td>0</td>
</tr>
<tr>
<td>Year 3</td>
<td>$7,260</td>
<td>0</td>
</tr>
<tr>
<td>Year 4</td>
<td>$7,986</td>
<td>0</td>
</tr>
<tr>
<td>Year 5</td>
<td>$8,785</td>
<td>0</td>
</tr>
<tr>
<td>Year 6</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>Year 7</td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

\[ A_{e} = \frac{10,956.30}{5,129.3} = 2.129 \]
\[ B_{e} = \frac{13,322}{3,604.8} = 3.393.6 \]

\[ A_{e} > B_{e} \text{ choose A} \]
What is the internal rate of return on investment A in problem #1? (20 points)

<table>
<thead>
<tr>
<th></th>
<th>DF 15%</th>
<th>PV 15%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>-100,000</td>
</tr>
<tr>
<td>1</td>
<td>0.8696</td>
<td>5217.60</td>
</tr>
<tr>
<td>2</td>
<td>0.7561</td>
<td>4990.26</td>
</tr>
<tr>
<td>3</td>
<td>0.6575</td>
<td>4773.95</td>
</tr>
<tr>
<td>4</td>
<td>0.5718</td>
<td>4566.39</td>
</tr>
<tr>
<td>5</td>
<td>0.4972</td>
<td>4372.83</td>
</tr>
</tbody>
</table>

\[
\text{IRR} = 14\% + \left( \frac{2443.83}{3948.23} \right) \% = 14.619\%
\]
3. Assume you have just graduated and are 22 years old. You have just gotten married and you and your spouse plan on putting $2,500 each (i.e. $5,000) into IRA accounts at the end of each year for the next 40 years to supplement your retirement income. At that time you will be 62 and your spouse 56.

a. If the funds earn a 10 percent annual rate of return, how much will the two of you have accumulated in your IRAs by the time you retire? (10 points)

\[
V_n = 5000 \left(\frac{1.10^n - 1}{.10}\right) = 5000 \left( 492.593 \right) \approx 2,462,965
\]

b. Assume you hope to have a retirement income that gives you the same standard of living that $100,000 per year would provide today. What would the equivalent annual income be at the time you retire if inflation averaged 5 percent per year over the next 40 years? (10 points)

\[
V_n = 100,000 \left(\frac{1.05^n - 1}{.05}\right) = 100,000 \left( 7.04000 \right) \approx 704,000
\]
4. You have the opportunity to become an investor in a specialty farm equipment dealership. It would require you to make an initial investment of $75,000. Based on a 5 year planning horizon, the expected annual net after tax cash flows would be as follows:

<table>
<thead>
<tr>
<th>Year</th>
<th>Cash Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$10,000</td>
</tr>
<tr>
<td>2</td>
<td>$20,000</td>
</tr>
<tr>
<td>3</td>
<td>$30,000</td>
</tr>
<tr>
<td>4</td>
<td>$40,000</td>
</tr>
<tr>
<td>5</td>
<td>$50,000</td>
</tr>
</tbody>
</table>

At the end of the fifth year, the next after tax terminal value is projected to be $100,000. Using the net present value approach, if your required rate of return is 15 percent, should you make this investment? (20 points)

\[
\begin{array}{cccc}
0 & -75,000 & 1 & -75,000 \\
1 & 10,000 & .8696 & 8,696 \\
2 & 20,000 & .7561 & 15,122 \\
3 & 30,000 & .6575 & 19,725 \\
4 & 40,000 & .5718 & 22,872 \\
5 & 50,000 & .9972 & 74,850 \\
& +100,000 & & \underline{65,995} \\
\end{array}
\]

\[ 65,995 \geq 0 \quad \text{yes} \]
5. Consider an investment in a piece of equipment which would require you to make an initial cash investment of $100,000 and borrow an additional $200,000. The loan would be required to be repaid in 5 equal annual principal payments, plus interest on the remaining balance. The interest rate of the loan would be 9 percent. Assume a zero salvage value and 10 year straight line depreciation based on the original cost of $300,000. The annual net before tax cash flows are expected to be $75,000 per year in years 1 - 10, before considering the debt service requirements. If your income tax rate was 28 percent, what would be the annual net after tax cash flows for years 1 and 2?

<table>
<thead>
<tr>
<th>Year</th>
<th>Dep Bal</th>
<th>Pmt Inv</th>
<th>Int &amp; Bal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>200,000</td>
<td>30,000</td>
<td>18,000</td>
</tr>
<tr>
<td>2</td>
<td>160,000</td>
<td>50,000</td>
<td>19,400</td>
</tr>
</tbody>
</table>

**Year 1**

\[
\text{NATCF} = 75,000
\]

\[
\text{TCF} = 75,000 - 30,000 - 18,000 = 27,000
\]

\[
\text{Tax} = 27,000 \times .28 = 7560
\]

\[
\text{NATCF} = 75,000 - 40,000 - 18,000 - 7560 = 9940
\]

**Year 2**

\[
\text{NATCF} = 75,000
\]

\[
\text{TCF} = 75,000 - 30,000 - 19,400 = 30,600
\]

\[
\text{Tax} = 30,600 \times .28 = 8568
\]

\[
\text{NATCF} = 75,000 - 40,000 - 19,400 - 8568 = 12,032
\]
1. A. If it costs $60,000 to put a student through Texas A&M today, how much will it cost in 12 years if costs increase at an annual rate of 6 percent? (10 points)

\[
60,000(\text{SPFY}) = 60,000(2.0122) = 120,732
\]

B. Given your answer to part(a), how much would you have to save each year for the next 12 years in order to accumulate that amount if you earned an 8 percent rate of return on the funds invested? (10 points)

\[
120,732 = P(\text{USFV}) = P\left(\frac{18.9771}{18.9771}\right)
\]

\[
P = \frac{120,732}{18.9771} = 6361.98
\]
2. Given the following information, which of the investments should you choose if your required rate of return is 12 percent? (20 points)

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>initial cash outlay</td>
<td>$50,000</td>
<td>$50,000</td>
</tr>
<tr>
<td>investment life</td>
<td>4 years</td>
<td>6 years</td>
</tr>
<tr>
<td>net after tax terminal value</td>
<td>0</td>
<td>$75,000</td>
</tr>
</tbody>
</table>

**net after tax cash flows:**

<table>
<thead>
<tr>
<th>Year</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$17,000</td>
<td>$5,000</td>
</tr>
<tr>
<td>2</td>
<td>$18,000</td>
<td>$5,000</td>
</tr>
<tr>
<td>3</td>
<td>$19,000</td>
<td>$5,000</td>
</tr>
<tr>
<td>4</td>
<td>$20,000</td>
<td>$5,000</td>
</tr>
<tr>
<td>5</td>
<td>-</td>
<td>$5,000</td>
</tr>
<tr>
<td>6</td>
<td>-</td>
<td>$5,000</td>
</tr>
</tbody>
</table>

\[
A_e = \frac{5,763.10}{1 + 4.12\%} = 5,763.10
\]

\[
B_e = \frac{8,552}{1 + 6.12\%} = 8,552
\]

\[
2080.07 > 1897.49 \text{ choose } B
\]
3. What is the internal rate of return for investment B in Problem #2? (20 points)

<table>
<thead>
<tr>
<th></th>
<th>DF 15%</th>
<th>16%</th>
<th>PV 15%</th>
<th>16%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-50,000</td>
<td>1</td>
<td>-50,000</td>
<td>-50,000</td>
</tr>
<tr>
<td>6</td>
<td>50,000</td>
<td>3.7845</td>
<td>3.6847</td>
<td>18,922.50</td>
</tr>
<tr>
<td>6</td>
<td>75,000</td>
<td>0.4323</td>
<td>0.4109</td>
<td>32,422.50</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>13,45</td>
</tr>
</tbody>
</table>

15% 13,45 0 21,41.50

16% - 796.50

\[ IRR = 15\% + \left( \frac{13,45}{21,41.50} \right)\% = 15.628\% \]
4. Consider an investment that would require you to buy a piece of equipment that would involve an initial cash down payment of $50,000 and borrowing an additional $200,000. The loan would be repaid in 10 equal annual payments, including principal and interest, at an annual interest rate of 8 percent. Assume a zero salvage/terminal value and 10 year straight line depreciation. The net annual before tax cash flows are expected to be $75,000 for years 1-10, before including debt service. If your marginal income tax rate is 30 percent, what would be the net after tax cash flows for years 1 and 2? (20 points)

\[ \text{depreciation} = \frac{250,000}{10} = 25,000 \]

\[ 200,000 = P \left( \frac{u$5 PV}{10.8\%} \right) \]

\[ P = \frac{200,000}{6.7101} = 29,805.82 \]

\[ \begin{array}{cccccc}
\text{Time} & \text{Loan payment with prin and int} & \text{Dep rec'd and bal} \\
1 & 200,000 & 29,805.82 & 16,000 & 13,805.82 & 186,194.18 \\
2 & 186,194.18 & 29,805.82 & 14,895.53 & 19,910.29 & 171,283.89 \\
\end{array} \]

\[ \text{Yr 1} \]

\[ \text{NBTCF} = 75,000 \]

\[ \text{TCF} = 75,000 - 25,000 - 16,000 = 34,000 \]

\[ \text{Tax} = 34,000 \times .3 = 10,200 \]

\[ \text{NATCF} = 75,000 - 16,000 - 13,805.82 - 10,200 = 34,994.18 \]

\[ \text{Yr 2} \]

\[ \text{NBTCF} = 75,000 \]

\[ \text{TCF} = 75,000 - 25,000 - 14,895.53 = 35,104.47 \]

\[ \text{Tax} = 35,104.47 \times .3 = 10,531.34 \]

\[ \text{NATCF} = 75,000 - 14,895.53 - 19,910.29 - 10,531.34 = 39,662.84 \]
5. Assume you have the opportunity to buy several older rental properties. The initial cash investment would be $30,000. Based on a 5 year planning horizon the annual net after tax cash flows would be $7,200 for years 1-5. At the end of the fifth year, your expected net after tax terminal value is $48,000. Using the net present value method of analysis, if your required rate of return is 15 percent, should you make the investment? (20 points)

\[
\begin{array}{ccc}
0 & -30,000 & 1 \\
1.5 & 7200 & 3.3522 \\
5 & 48,000 & .9772 \\
\hline
& -30,000 & 24,135.84 \\
& 23,865.60 & \\
\hline
& 18,001.44 & \geq 0 \\
\end{array}
\]