Homework 6: Net Worth Evaluations

1. (15 Points) A businessman is considering purchasing a delivery truck. He does not now provide delivery service. He feels that the service will bring in additional revenue of $7000 per year. The truck costs $11,000 and will last for 5 years. Its resale value at that time will be zero. A part-time driver for the truck will be hired for $2000 a year. Gas, oil and repairs for the truck will be $1000 in the first year, $1500 the second year, and continue to increase by $500 per year thereafter. If the minimum acceptable rate of return for the businessman is 10%, advise him whether or not he should buy the truck.

   a. Using equivalency factors, write the formula for the NPW of the investment.

   b. Using equivalency factors, write the formula for the NAW of the investment.

   c. Evaluate the NPW and NAW and determine whether the businessman should buy the truck.

   d. To what level would the annual income have to decrease before the project would become unacceptable?

2. (15 Points) An entrepreneur is considering purchasing a small business for $30,000. The net revenue for the business is seasonal as shown in the figure. In the spring and winter the business loses $1000, while in the summer the business makes $4000 and in the fall it makes $8000. Assume the minimum acceptable rate of return is nominally 16% per year; however, we use a quarterly compounding period. We assume the business will last five years with no salvage value. The quarterly cash flows have the same pattern in each of the five years. Is this an acceptable business opportunity?

   The periodic nature of the cash flow is easily represented with the add-in using the cycle parameter. Use the Multiple Compounds option for this problem.
3. (15 Points) A new car has a purchase price of $30,000. You are deciding whether to buy (with a loan) or lease the car. The two options are shown below. Assume end-of-month payments.

A. To purchase the car, you will pay $6000 down payment. You can arrange a 3-year loan (36 months) with a nominal annual interest rate of 6%. This results in monthly payments of $730. After the 3 years, you will sell the car.

B. The lease arrangement requires a $3000 down payment and 36 monthly payments of $400. At the end of the 36-month period the car will be returned to the dealer with no final cash payment.

Your MARR is nominally 12% a year or 1% per month. If you purchase the car using plan (a), you can sell the car after 36 months. What resale value will make the two plans equivalent?

4. (15 Points) A company must buy a heavy-duty earth-moving machine. It has three alternatives.

A. The first involves a $50,000 initial investment with no maintenance costs and a four-year life. The resale value of this machine after four years is $20,000.

B. The second alternative involves a $30,000 initial investment, a $20,000 overhaul expense after four years, and $2000 per year operating expense. The alternative is discarded with no salvage value after six years.

C. The third alternative involves renting the machine at $8000 per year, payable at the beginning of the year. The operating cost is $2500 per year. The machine can be rented for any number of years.

Use the add-in and construct models for all three cases. Compare the alternatives with using the company’s MARR of 8%. Make the end of the year assumption regarding operating costs. Rental or investment costs occur at the beginning of the year. The company has a need for the machine for an indefinite period. Rank the alternatives economically using the net annual cost criterion.
5. (20 Points) This problem is the same as Pedro’s problem considered in Event 6 except that demand is increasing with time. The problem is repeated here.

Pedro is thinking of starting a tree-trimming service. He plans to run the business for 5 years and then close it down.

**Truck Costs**
He will buy three new Ford F-150 trucks for the business, which can be purchased for $24,000 each. This cost includes taxes and fees at purchase. The resale value for a truck after 5 years is estimated at $8000.

The following describes the annual operating costs for a single truck. Annual insurance cost is $1200 and annual license and inspection fees are $100. Maintenance cost is $400 in the first year and increase by $200 in each subsequent year. The cost of repairs is zero for the first two years and will be $200 in the third year. In subsequent years the cost will grow by $200 per year.

**Fuel Costs**
Fuel costs are $0.15/mile. In addition to job mileage, each truck will drive 2,000 miles a year. The round trip to each job averages 20 miles.

**Shredders**
In addition to trucks he must purchase wood shredders. He needs one shredder that costs $5000. The shredder must be replaced at the beginning of the third year for a cost of $5000. Shredders have no resale value.

**Labor**
Each job requires two trimmers for an 8-hour day and $50 in supplies. Tree trimmers earn $15 an hour. The workers are hired hourly. Overhead (office, phone, secretary, etc.) for running the business is 40% of the trimmer labor cost. Pedro will be the manager with an annual salary $30,000.

**Demand**
The demand in the first year is 150 jobs. The number of jobs increases by 50 in each subsequent year (i.e., 200 for year 2, 250 for year 3, and so on). The revenue is $650 for each job. Note that the demand increases as a gradient. The model for the revised problem will require gradients for each variable cost.

**Problem**
If Pedro’s MARR is 15%, is this an acceptable business plan? Find the NPW and NAW. Show the cash flow in each year. For what MARR is the plan just acceptable?
6. (20 Points) Your company is considering an investment in equipment to manufacture a new product. The projected costs and revenues are described below. You are to do an economic analysis to justify the investment. The company's MARR is 18%.

Time 0 is defined as the time when the first expenditure occurs. Times are measured in years from the beginning of the project. The project ends at year 15. Revenue from sales will begin in year 3. Other financial aspects of the project are also listed below. All cash flows occur at the end of the appropriate year.

<table>
<thead>
<tr>
<th>Component</th>
<th>Costs and revenues</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Purchase the rights for the product design</td>
<td>@200 at time 0.</td>
</tr>
<tr>
<td>b. Purchase equipment</td>
<td>$250 at year 1.</td>
</tr>
<tr>
<td>c. Initial engineering and installation</td>
<td>$50 per year for years 1 and 2.</td>
</tr>
<tr>
<td>d. Income from sales</td>
<td>Revenue from sales starts in year 3 at $200. Revenue remains at $200 for years 4 and 5. Starting at year 6 revenues grow by $50 per year until year 11. ($250 in year 6, $300 in year 7…, $500 in year 11). Revenue stays constant at $500 for years 12 through 15.</td>
</tr>
<tr>
<td>e. Maintenance costs</td>
<td>$75 for each year starting in year 3 and continuing through year 15</td>
</tr>
<tr>
<td>f. Overhaul costs</td>
<td>$300 in years 8 and 12</td>
</tr>
<tr>
<td>g. Sell design and equipment at end of the project</td>
<td>$400 at year 15.</td>
</tr>
</tbody>
</table>

Analyze this investment with the Economics add-in. Use no more than 12 cash flow amounts in your model. Answer the numerical questions below. Include the Excel model and turn it in as part of your homework submission.

a. What is the NPW and do you accept or reject the project?

b. What is the IRR of the project?

c. What is the payback period?