

Engineering Economics and Problem Solving, 4N4, 2012

Tutorial/Assignment 4

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AIM: To confirm your understanding of NPV and cash flows, depreciation, taxes and sensitivity analysis.

Question 1

In the [second assignment](#) we showed in the scenario below that it was a better deal for company X to accept the \$70,000 single payment than multiple royalty payments.

Company X owns a patent with 12 full years of remaining life. Company B pays royalties to company X to license the patent, in proportion to production levels at company B. Based on their forecasts, they expect to make payments of \$6,000 per year for the next 5 years, then payments of \$9,000 for 4 years after that, followed by \$13,000 for the last 3 years of that patent license. Company B is offering to prepay a license of \$70,000 since they have money available right now. If company X's minimum internal rate of return is 10%, should they accept the lump sum, or keep to the royalty payment schedule?

Now let's take a look at the problem from Company B's perspective. The Government of Canada requires companies who purchase a long-term royalty license to treat that license cost as a capital expense; i.e. they cannot deduct the full expense of the license in the year they acquire it. Find which CRA class these licenses fall in and which type of depreciation method and rate is required. Then assume Company B will have the following cash flows:

- Revenues from product sales of \$100,000 per year for the first 5 years, \$150,000 per year for the next 4 years, then \$220,000 per year in the last 3 years of the license
- Costs are about 25% of the revenues

Now prepare the NPV for the following 2 cases:

1. Company B acquires the license for a lump-sum of \$70,000 and depreciates it according CRA rules
2. Company B pays the annual license fees as stipulated in the original question.

Did Company B overpay for the lump-sum license fee? Why might Company B have decided to prepay the license?

Question 2

What would have been an estimate of the capital costs for the plant built in Brazil (assignment 3) using only the anticipated sales information?

Question 3

For a person the decision to buy or lease a car, for example, can be fairly complicated. But this age-old question on whether to buy *or* lease **capital equipment** has additional complications when considered from a company's depreciation and tax obligations.

Each group should construct a creative question that attempts to expose the implications of this important decision. Create a question **and answer**. One group's question will be selected for use in the midterm and another perhaps in the final exam.

Question 4

Return to your group's analysis on university education vs no university education [from assignment 2](#).

Perform a relevant sensitivity analysis on at least 4 variables and then rank the scenarios. Is the conclusion the same in all scenarios? At least one of the uncertainties in your analysis should be a discrete (happens/doesn't happen), single-occurrence event.

Question 5

This question is slightly modified from the final exam in 2008. The sensitivity analysis was not part of the exam: use a computer to solve that portion of the question.

You have been asked to evaluate the profitability for installing an automated, online pulp quality analyzer ([Kappa number](#)) on a Kraft digester.

You have collected the following information. Any other values that you need you must estimate based on your experience in the course; please state all assumptions clearly.

- Analyzer capital cost including installation = \$75,000
- Analyzer maintenance cost = \$5,000/year
- Increased profit due to improved pulp quality = \$30,000/year

You can depreciate the analyzer using the declining balance method. The analyzer has an expected serviceable life of 10 years without replacement. The salvage value is \$0.

The Kraft digester will be operated for the next 5 years, after which it will be shutdown permanently.

Your company is located in Ontario, Canada, and is profitable and expects to be so for all future years.

It is January 2010. Your company's year end is 31 December. Assume the equipment can be installed and put in service in January 2011.

The above parts should be completed by hand. Now you should use a computer to confirm your hand-calculations. Next use your spreadsheet and perform a sensitivity analysis on at least 3 uncertain parameters. Show your results visually and explain what the plot(s) are showing.

END