

Name: _____

1.011 Project Evaluation
April 23, 2003

Quiz #3

Problem 1 (30 points total; 10 points each part)

You have been asked to evaluate 4 projects. The NPV of the investment and the equivalent uniform annual net benefits (not including the investment) are given. You are trying to decide if the annual net benefits are large enough to justify any of the investments. The minimum acceptable rate of return for your firm is 10%.

Table 1.1 Investment and Benefit Data for Four Projects

Project	Investment (NPV as of time zero)	Equivalent Annual Net Benefits	NPV (Using capital worth method)	IRR
A	\$1 million	\$90,000		
B	\$2 million	\$440,000		
C	\$3 million	\$600,000		
D	\$4 million	\$480,000		

- a. Calculate the NPV and the IRR for each project and fill in Table 1.1. In calculating the NPV, assume the annual net benefits continue forever, so that you can use the capital worth method.
- b. Assume that these projects are independent, so that the firm could carry out any or all of them. Which projects are justified using the NPV method? Which are justified using the IRR method?

NPV: _____ (indicate A, B, C, and/or D)

IRR: _____ (indicate A, B, C, and/or D)

- c. Assume that these projects are mutually exclusive alternatives for developing a specific site. Which project is best? Why?

Best Project: _____ (indicate A, B, C, or D)

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Problem 2 (20 points total; 10 points each part)

You plan to construct an apartment building at a cost of \$33 million.

- a. You plan to depreciate the building over 33 years, using straight line depreciation and 10% salvage value for the building. What is the annual depreciation?

- b. Assume that your federal tax rate is 28% and your state tax rate is 8%. What is your annual tax savings as a result of the depreciation?

Problem 3 (20 points; 10 points each part)

Hundreds of people are killed each year in grade crossing accidents. Most of these accidents are caused by people who do not respond to the warnings and drive into the path of the train. Accident rates can be reduced by installing flashing lights, putting in crossing gates (arms that automatically come down and block the travel lane when a train approaches), by installing 4-quadrant gates (4 arms block the entire road, so that motorists cannot run around the gate), or by building a bridge. Table 3.1 shows the cost of installing (or upgrading) to each level of protection along with typical accident rates achieved with this type of protection. Note that the accident rate is driven (in this simplified model, but also in reality) by train traffic, NOT by highway traffic.

- a. You are the safety officer in a state Department of Transportation, and you have a budget for improving highway safety. You would like to use some of this budget to reduce crossing accidents. You have categorized crossings into the categories shown in Table 3.2. Given the information shown in the table, calculate the cost effectiveness for each strategy in reducing accidents and identify the three most cost effective strategies to pursue. (Be sure to give the equation you are using for cost effectiveness, to calculate measures of cost effectiveness for each strategy, and to indicate in Table 3.2 the three best).

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Table 3.1 Types of Crossing Protection

Protection	Cost/crossing	Accident Rate (per million trains)
Signs only	\$500	10
Flashing lights	\$20,000	2
Gates	\$100,000	1
4-quadrant gates	\$200,000	0.2
Bridge	\$2,000,000	0

Table 3.2 Possible Upgrades

Highway Traffic per year	Trains per Year	Base Acc. /year	Current Protection	Possible Upgrade	Cost Effectiveness	Recommen- dation
20 million	100,000	0.1	Gates	Bridge		
20 million	100,000	0.1	Gates	4-quadrant		
2 million	50,000	0.05	Gates	4-quadrant		
200,000	50,000	0.1	Flashing lights	Gates		
20 million	5,000	0.01	Flashing lights	Gates		
20,000	2,000	0.02	Signs	Flashing lights		
20,000	200	0.002	Signs	Flashing lights		

- b. How do you decide how much to invest in improving grade crossing safety as opposed to other projects that could improve highway safety?

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Problem 4. Prepare a 1-2 page essay addressing one of the following topics (30 points):

- a. Some environmentalists have argued strongly that the traditional approach to project evaluation, which they often call “cost/benefit analysis”, fails to deal with many important issues because of its emphasis on financial matters and its use of discounting. Others call for new approaches, such as sustainability assessment, in order to ensure better consideration of environmental matters. Discuss how cost/benefit analysis, environmental impact analysis, and sustainability assessment relate to each other and to overall project evaluation. You may want to consider the extent to which these are complementary methods or incompatible approaches.
- b. If urban sprawl is so bad, why do we have so much of it? When you fly across the country, why is so much of it empty? What is the marginal value of farmland, why are farmers going broke, and what happens to all the chemicals in that fertilizer? Is suburbia worse than a forest or another corn field? Comment on the nature of urban/suburban development and the types of projects that might produce better places for us to live – with each other and with nature.
- c. The 21st century is viewed by some as the century when we begin to fight wars over access to water. Hundreds of millions of people worldwide lack easy access to clean water. LA and many other large cities seek further and further for water, with severe consequences for the environment. The “Three Gorges Dam” in China is billed by many as an environmental disaster that will displace a million people. Boston has completed a multi-billion dollar cleanup of Boston Harbor that caused water & sewer bills to quintuple in the 1990s, causing great public consternation. My family’s water bill in Boston averages about 25 cents per day. Comment on the nature of the crisis and the types of projects that might be most relevant.