

Homework 10. Decision Analysis

P1.

A company is considering an engineering improvement project with uncertain outcomes. The best present estimates, including prior probabilities of success are as follows.

Success Category	Probability of Success	Net Annual Benefits
A	0.35	\$200,000
B	0.35	100,000
C	0.3	20,000

The estimated net annual benefits are relative to current operations. Assume the project's initial investment is \$280,000, the MARR is 15%, and the project life is six-years. Construct a decision tree that describes the situation and the two alternatives to invest or not invest.

P2.

Due to uncertain outcomes, the responsible manager has directed that a potential test experiment be evaluated prior to further consideration of the project. The test has two possible outcomes, Good(G) and Poor(P). The conditional probabilities of the test outcome given the success category of the project are given below.

Test Outcome	Conditional probabilities		
	A	B	C
Good (G)	0.90	0.25	0.05
Poor (P)	0.10	0.75	0.95
Prior Probability	0.35	0.35	0.30

Find the joint and marginal probabilities.

Test Outcome	Joint Probabilities			Marginal Probability
	A	B	C	
Good (G)				
Poor (P)				

Find the Posterior Probabilities

Test Outcome	Posterior Probabilities		
	A	B	C
Good (G)			
Poor (P)			

Assume you can decide to invest or not after performing the test. Construct a decision tree that describes this process and find the optimum decisions.

P3. In the following all dollar figures are in millions of dollars. An investor has an opportunity to purchase a company for the initial cost of \$1.

During the first year of operation, there is a 75% chance that the company will earn \$0.5 and a 25% chance that the company will go broke. If the company goes broke, debts in the amount of \$0.5 will have to be paid. If the company still exists after one year of operation the investor can either sell it for \$0.6 or operate the company for another year.

In the second year of operation, there is a 75% chance that the company will earn \$0.5 and a 25% chance that the company will go broke. If the company goes broke, debts in the amount of \$0.5 will have to be paid. If the company still exists after two years of operation the investor can either sell it for \$0.8 or operate the company for another year.

In the third year of operation, there is a 75% chance that the company will earn \$0.5 and a 25% chance that the company will go broke. If the company goes broke, debts in the amount of \$0.5 will have to be paid. If the company still exists after three years of operation the investor will sell it for \$1.

Should the investor buy the company? Use the present worth as a criterion with an MARR of 10%.