Lecture 9: Decision Making under Risk & Uncertainty

1. An investor is considering 4 investments, W, X, Y, and Z. The payoff from each investment is a function of the economic climate over the next 2 years. The economy can expand or decline. The following payoff matrix has been developed for the decision problem.

	A	B	C	D	E
1		Payoff Matrix			
2					
3		Economy			
4	Investment	Decline	Expand		Choice
5	W	0	80		
6	X	30	70		
7	Y	50	35		
8	Z	20	20		

a) What decision should be made according to the maximax decision rule?

b) What decision should be made according to the maximin decision rule?

c) What decision should be made according to the minimax regret decision rule?

d) What formula should go in cell D5 and get copied to D6:D8 to implement the maximax decision rule?

e) What formula should go in cell D5 and get copied to D6:D8 to implement the maximin decision rule?

2. Complete the following table to determine the expected value of perfect information for the investor?

	A	B	C	D	E
1		Payoff Matrix			
2					
3		Economy			
4	Investment	Decline	Expand	EMV	
5	W	10	60		
6	X	20	80		
7	Y	40	30		
8	Z	35	25		
9					
10	Probability	0.8	0.2		
11					
12	Payoff of decision made with perfect information:				
13					
14			EVPI:		

3. An investor is considering 4 investments, A, B, C, D. The payoff from each investment is a function of the economic climate over the next 2 years. The economy can be weak or strong. The investor has estimated the probability of a declining economy at 30% and an expanding economy at 70%. Draw the decision tree for this problem and determine the correct decision for this investor based on the expected monetary value criteria.

	Payoff Matrix	
	Economy	
Investment	Weak	Strong
A	-30	120
B	20	60
C	30	35
D	15	30

4. An investor is considering 2 investments, A, B, which can be purchased now for $10. There is a 40% chance that investment A will grow rapidly in value and a 60% chance that it will grow slowly. If A grows rapidly the investor can cash it in for $80 or trade it for investment C which has a 25% chance of growing to $100 and a 75% chance of reaching $80. If A grows slowly it is sold for $50. There is a 70% chance that investment B will grow rapidly in value and a 30% chance that it will grow slowly. If B grows rapidly the investor can cash it in for $100 or trade it for investment D which has a 20% chance of growing to $95 and an 80% chance of reaching $80. If B grows slowly it is sold for $45.

a) Draw the decision tree for this problem?

b) What is the decision for this investor and what is the EMV for this decision?

5. Eagle Credit Union (ECU) has experienced a 10% default rate with its commercial loan customers (i.e. 90% of commercial loan customers pay back their loans). ECU has developed a statistical test to assist in predicting which commercial loan customers will default. The test assignseither a rating of 'Approve' or 'Reject' to each loan applicant. When applied to recent loan commercial customers who paid their loans, the test gave an 'Approve' rating in 80% of the cases examined. When applied to recent loan commercial customers who defaulted, it gave a 'Reject' rating in 70% of the cases examined.

a) Use this data to construct a joint probability table.

b) What is the conditional probability of a 'Reject' rating given that the customer defaulted?

c) What is the conditional probability of an 'Approve' rating given that the customer defaulted?

d) Suppose a new customer receives a 'Reject' rating. If that customer gets the loan anyway, what is the prob. of default?