

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		

- What decision should be made according to the maximax decision rule?
 - What decision should be made according to the maximin decision rule?
 - What decision should be made according to the minimax regret decision rule?
 - What formula should go in cell D5 and get copied to D6:D8 to implement the maximax decision rule?
 - 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.

Investment	Payoff Matrix	
	Economy	
	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 assigns either 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?