Final Examination: 20298

Advanced Methods in International Marketing

Winter Semester 2012 / 2013

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You are allowed to use a non-programmable calculator (in accordance with the instructions given by the examination office) and a translating dictionary from your native language to English (without any notes written into it). **All** of the **six** (6) examination questions must be answered. This examination consists of **three** (3) pages and must be completed within 60 minutes.

Question 1: NOTE: This problem MUST be solved using the table approach presented in this lecture course. Other solution methods will not be accepted.

The strategic planning department of a major oil company in London is studying the relationship between crude oil prices and the political situation in the Middle East. The discrete stochastic variable $Y = y_j$, $j = 1, 2$, indicates the crude oil price level, y_1 = high and y_2 = moderate. The discrete stochastic variable $X = x_i$, $i = 1, 2$, indicates the political climate, x_1 = war and x_2 = peace. The likelihood of high crude oil prices in the future is considered to be 40%. If a war does happen, then there will be a 75% chance of high oil prices. If moderate oil prices occur, then the likelihood of a peaceful political climate is thought to be 95%.

Situation

		X		
		War	Peace	
Y	High			
	Moderate			
				1.0

Two Scenarios ($X \mid Y = y_j$)

X		
War	Peace	
		1.0
		1.0

Two Scenarios ($Y \mid X = x_i$)

Y	High		
	Moderate		
		1.0	1.0

Bayesian Multiple Table

		X	
		War	Peace
Y	High		
	Moderate		

a. What is the likelihood of a situation where there is a high oil price and the political situation is that of peace?

b. Considering the peace scenario, what is the likelihood of moderate oil prices?

c. Under the high oil price scenario, what is the likelihood of war?

d. Calculate the number in the Bayesian Multiple Table for $X = x_1$ and $Y = y_1$.

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Question 2: Bayes' Theorem provides a logical framework for analyzing the human thought process and shows the usefulness of information in the assessment of future outcomes.

$$\Pr(Y = y_j \mid X = x_i) = \delta \Pr(Y = y_j), \text{ where } \delta = \Pr(X = x_i \mid Y = y_j) / \Pr(X = x_i).$$

a. Using Question 1 as an example: What are the two prior probabilities?

b. Again using Question 1: What are the posterior probabilities for $X = x_i$?

c. Explain in detail when the Bayesian Multiple is equal to one, $\delta = 1$.

Question 3: Below is the situation for a pair of stochastic concepts $Y = y_j$, $j = 1, 2, 3$, and $X = x_i$, for $i = 1, 2, 3$. This situation has nine (9) possibilities and the numbers in the matrix indicate the likelihood of these occurrences.

Y \ X	**$x_1 = 1.5$**	**$x_2 = 3.5$**	**$x_3 = 5.5$**
$y_1 = 0.4$	0.045	0.080	0.045
$y_2 = 0.6$	0.120	0.120	0.120
$y_3 = 0.8$	0.085	0.300	0.085

a. Compute E(Y).

b. Compute $E(X \mid Y = y_2)$.

c. Compute C(X, Y).

d. Are the concepts X and Y stochastically independent?

Question 4: When the range of a stochastic variable, $Y = y_j$, where $y_j \geq a$, is restricted, we say that the random variable is truncated at point a. Consider a discrete random variable, $Y = y_j$, $j = 1, 2, 3$.

$Y = y_j$	$y_1 = 2$	$y_2 = 4$	$y_3 = 6$	$y_4 = 8$
Likelihood	1/4	1/4	1/4	1/4

a. If this stochastic variable is truncated at $a = 4$ (therefore, $y_j > 4$), what are the truncated probabilities that $y_1 = 2$ and that $y_4 = 8$?

b. Compute the un-truncated E (Y).

c. Compute the truncated $E(Y \mid Y = y_j > 4)$.

d. Compute the truncated variance $V(Y \mid Y = y_j > 4)$.

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Question 5: A negative number can be considered to be a distance to the left from zero.

a. Is it possible to have a negative covariance? If so, what would it indicate?

b. Is it possible to have a negative variance? If so, what would it indicate?

c. Is it possible to have a negative skew coefficient? If so, what would it indicate?

Question 6: Consider a student who is applying for admission at two German universities: the O-v-G-Universität Magdeburg, $M = m_i$, $i = 1, 2$, with m_1 = Accepted and m_2 = Rejected, and at the Martin Luther Universität Halle, $H = h_j$, $j = 1, 2$, where h_1 = Accepted and h_2 = Rejected. The student believes that there is a likelihood of 60% of being accepted in Halle. There is a 30% likelihood of being accepted in Magdeburg. Given that he/she is rejected by Halle, there is an 80% chance of being rejected by Magdeburg.

		M		
		Accept	Reject	$f_2(h_j)$
H	Accept			
	Reject			
	$f_1(m_i)$			1.0

Conditional $(M \mid H = h_j)$

		M		
		Accept	Reject	
H	Accept			1.0
	Reject			1.0

Conditional $(H \mid M = m_i)$

		M	
		Accept	Reject
H	Accept		
	Reject		
		1.0	1.0

Bayesian Multiple Table

		M	
		Accept	Reject
H	Accept		
	Reject		

a. Given that the student has been accepted in Magdeburg, What is the probability that this student will be rejected in Halle?

b. What is the likelihood of an acceptance at both universities?

c. Is the event "accepted in Magdeburg" independent from the event "accepted in Halle"? Explain your answer.

This is the End of the Examination
GOOD LUCK !