Examination: 20052

International Marketing

Summer Semester 2009

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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 **eight** (8) examination questions must be answered. This examination consists of **three** (3) pages and must be completed within 60 minutes.

Question 1 (10 Minutes) NOTE: This problem MUST be solved using the table method taught in this lecture course and NOT by some other method!

A group of middle-aged men have participated in a test designed to determine if they have a particular form of cancer. The random variable Y= y indicates the presence of cancer, y = 1, or absence thereof, y = 0. Within this group, 3.8% actually have cancer. A blood test is used and 88% of the test subjects who actually have cancer will test positive. The random variable X= x is the test result, x = 1 positive and x = 0 negative. Unfortunately, the test is not perfect. Consequently, 5.6% of those who do not have cancer, the blood test will give a positive result.

$f(x, y)$

		X		
		1	0	$f_2(y)$
Y	1			
	0			
	$f_1(x)$			1.0

$(X \mid Y= y)$

		X		
		1	0	
Y	1			1.0
	0			1.0

$(Y \mid X= x)$

		X	
		1	0
Y	1		
	0		
		1.0	1.0

Bayesian Multiple Table

		X	
		1	0
Y	1		
	0		

a. What is the probability that a man who tests positive does not have cancer?

b. What is the probability that a man that has a negative test actually has cancer?

c. What information is contained in the conditional distributions: "track-record"?

d. Calculate the number in Bayesian Multiple Table for x = 1 and y = 1?

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Question 2 (10 Minutes) Marketing Managers use information in their decision-making process. Bayes' Theorem gives us a logical framework for analyzing the human thought process involved in this decision process and shows the usefulness of information.

$$\Pr(Y \mid X = x) = \delta \Pr(Y),$$

where the multiple δ is:

$$\delta = \Pr(X \mid Y = y) / \Pr(X).$$

a. Explain the idea of before (prior) probabilities and after (posterior) probabilities. If these probabilities differ from each other, explain why?

b. Explain in detail under what conditions the information contained in the random variable $X = x$ is of no use in the decision model, when is $\Pr(X \mid Y = y) = \Pr(X)$.

Question 3 (10 Minutes) Consider a decision-maker who must make a yes / no type decision. This decision can be modeled using the dichotomous random variable, $Y = y$ where $y = \{0, 1\}$. Furthermore, assume that this decision-maker has been provided with some highly relevant information, $X = x$, with the random pair $(X, Y) \sim f(x, y)$.

a. The Linear Probability Decision Model is $E(Y \mid X = x) = \alpha + \beta x$. What are the shortcomings of this model and the number $E(Y \mid X = x)$ equals what?

b. What advantages do the LOGIT and PROBIT models exhibit.

Question 4 (10 Minutes) Consider the two random variables $X = x$ and $Y = y$, $(X, Y) \sim f(x, y)$.

a. Explain how the univariate marginal distributions are derived (discrete as well as continuous) simply by "summing" the rows or columns of the joint distribution.

b. Explain how the univariate conditional distributions are derived by "normalizing" columns or rows of the joint probability distribution.

Question 5 (10 Minutes) A joint bivariate population pmf for $X = x_i$ and $Y = y_j$, $f(x_i, y_j)$:

$Y = y_j$ \ $X = x_i$	3	4	5
1.2	0.15	0.10	0.05
2.4	0.10	0.15	0.10
3.6	0.05	0.15	0.15

a. Compute $E(Y)$ and $E(Y \mid X = 4)$

b. Compute $C(X, Y)$

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Question 6 (10 Minutes) When the range of a random variable, Y= y $\{-\infty \leq y \leq \infty\}$ is restricted, $y \geq a$, we say that the random variable is truncated at point a.

a. Explain why truncated random variables become conditional random variables.
b. If the continuous random variable Y= y that can range over the complete set of real numbers, $Y \sim f_2(y)$, is truncated at the point – 2.5 (therefore $y \geq -2.5$), how do we calculate the probability that Y= y is between + 1.0 and + 1.5?

Question 7 (10 Minutes) Consider the concept of the Conditional Variance Function, CVF.

a. Does it produce the same number for all values of X= x, CVF = $V(Y|X= x)$?
b. What sort of marketing information do we gain from the CVF?

Question 8 (10 Minutes) Consider the random variables Y= y and X= x with joint pdf: $(X, Y) \sim f(x, y)$.

a. Explain in detail how the univariate random variable Y differs from the univariate conditional random variable $(Y|X= x)$.
b. Under what conditions will these two random variables be the same?

This is the end of the examination
GOOD LUCK !