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UCSD, Department of Economics
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ECONOMETRICS 220A

Course Description:
The course is designed to be an introduction to probability and statistical theory to prepare students for the remainder of the econometrics sequence. The emphasis of the course is to understand the basic principles of statistical theory.

Books
The text, which will be followed closely, is
Casella, G. and R. Berger, Statistical Inference, 2nd Edition, Duxbury.
This book covers all of the material of the course and in addition provides many problems for practice as well as excellent references.

Other books that you may find useful are
Ramanathan, R. Statistical Methods in Econometrics, Academic Press (1993).
> Similar in level to the text, but uses skills from 220A and has a more extensive coverage of multivariate distributions.

Gallant, A.R. An Introduction to Econometric Theory, Princeton University Press (1997).
> More rigorous especially in regards to asymptotic theory and related areas.

In addition undergraduate texts are useful in seeing applications in more detail than the class.

Course Outline
The course outline gives an estimate of the number of classes to cover the topic. In addition, general reading guides are suggested from the above books (CB = Casella and Berger etc.).

Probability
1. Basic theory, conditional probability and Bayes Rule. (1.5), CB ch1, R ch2, G ch1.
2. Random Variables, distributions, expectations (1.5), CB ch2.1-2.3, R ch3, G ch2.
3. Common distributions (1), CB ch3
4. Joint, marginal and conditional distributions, stochastic independence, multivariate dists (3) CB ch4, R ch5, G ch3.

Random Samples and Asymptotic Methods
1. Sampling and sums of random variables (1), CB 5.1-3, R ch6-7.
2. Laws of large numbers and central limit theorem (2), CB 5.5, R ch7, G ch4.

Statistical Theory
1. Point Estimation (2), CB ch7.2, 6.2.1,R ch8, G. ch5.
2. Evaluation of estimators: unbiasedness, sufficiency, consistency, Cramer-Rao theorem (3) CB ch 7.3, 6.1.1,6.1.2, R ch 8 .
3. Hypothesis tests, Neyman Pearson lemma, Likelihood Ratio and related tests (3) CB ch 8, R ch9, G. ch5.
4. Interval estimation (1), CB ch 9, R ch9.3.

Grading
There will be a midterm (28 October in class) and a final exam during exam week (worth 40% and 60% respectively). Problem sets and solutions will also be handed out but not graded. In addition I have the answer key to the problems in the book which is on reserve in the economics library. It is important to do problems in this course, and to try and solve those problems without having seen the answers.

Econometrics 220A : Problem Set 1, 2002

1. Question 1.11 (p39).

2. Questions 1.8 (p38 of text). Also draw the pmf and cdf of the distribution

3. Question 1.18 from text.

4. A fair coin is tossed until a head appears. On each toss, heads or tails are equally likely and each toss is an independent event.
a) What is the sample space
b) What is the probability that the head appears on the third toss
c) What is the probability that it takes x tosses for the head to appear.
d) Graph the pmf of X = number of tosses to get a head to appear.
e) Graph the cdf of this random variable

5. Show that two mutually exclusive sets cannot be independent (except for a trivial case, what is this trivial case?).

6. In example 1.3.4 from the text, the prisoner arrives at an answer which has the conditional probabilities of being pardoned (conditional on the guard saying B or alternatively C) both greater than the unconditional probability of being pardoned.
a) Without reference to the prisoners problem or math, is it logically feasible for the conditional probabilities to all be greater than the unconditional probability?
b) Prove it. i.e. Show whether or not $P(A|B)$ and $P(A|B^c)$ can both be greater than $P(A)$.

7. Two dice are thrown and three events are defined as follows
A means "odd face with first die",
B means "odd face with second die",
C means "one face even, one odd",
Show that these are pairwise independent but not mutually independent.