AAEC6311 – Applied Econometrics II

Spring 2010

Instructor: Eric Belasco

Final Exam

Name: _____

You have two hours and 30 minutes to complete the exam. There are four questions. Point values will sum to 70, with points associated with each question as denoted. **USE YOUR TIME WISELY**. Also, I will address clarifying questions, but not substantive questions. You are allowed to use two 3x5 note sheets (front and back), a calculator, and a pencil/pen. Good luck!

Question 1 (19 points). The following questions consider the difficulties associated with modeling commodity prices.

(a) **(4 points)** Commodity prices have been argued to follow either a random walk or a stationary process. Discuss the difference. How can you test which is present in the data?

(b) **(3 points)** Assume you wanted to fit an ARMA(p,q) model to characterize corn prices. Write out a generalized ARMA model and describe its components. How would you choose an appropriate p and q?

(c) **(3 points)** Why might an ARCH model be more appropriate when modeling commodity prices?

(d) **(3 points)** Rather than modeling corn prices independently, you decide to characterize it as part of a system, along with soybeans and cattle prices. Under which circumstances would you expect the proposed VAR model to improve upon the previously mentioned AR model? Explain.

(e) **(3 points)** Specifically show or explain how the VAR model assumes "all things are endogenous."

(f) **(3 points)** You are interested in testing the impact of corn prices on future live cattle prices. Specifically explain any tests or tools you might use to evaluate this question and what you might be able to infer.

Question 2 (18 points). For this question, assume that you have a panel series with

$$y_{it} = X_{it}\beta + e_{it}$$

such that $i = 1,2,\dots,n$ and $t = 1,2,\dots,T$. Further, e_{it} is the observed residual for individual i in time t.

(a) **(6 points)** Under what conditions (if any) are Pooled OLS estimators inconsistent? Inefficient?

(b) **(6 points)** Under what conditions (if any) are the Fixed Effects estimators inconsistent? Inefficient?

(c) **(6 points)** Under what conditions (if any) are Random Effects estimators inconsistent? Inefficient?

Question 3 (18 points). You take a coin out of your pocket and want to estimate the probability of heads when it is flipped. You are only able to flip the coin 10 times. You decide to use a binomial distribution to characterize these flips, which can be written as:

$$f(y_i|\rho) = \rho^{y_i}(1-\rho)^{1-y_i}$$

where y_i equals 1 when coin is heads and 0 when tails; and ρ is the probability of heads.

(a) **(6 points)** Estimate ρ using maximum likelihood estimation.

(b) **(6 points)** Estimate ρ using Bayesian methods and assuming the sampling distribution in part (a) and a Beta(5,5) for the prior distribution.
Note: Beta(a,b) can be written as

$$f(p) \ \alpha \ \ \rho^{a-1}(1-\rho)^{b-1}$$

where the $mean = {}^{a}/_{(a+b)}$

(c) **(6 points)** Discuss some of the differences between Bayesian and classical estimation. What do you expect would happen if you used 100 flips and 70 heads under methods in (a) and (b).

Question 4 (15 points). You are asked to consult the Texas State Legislature on a bill intended to decrease the amount of prisoners who return to prison within 70 months through a worker program. You collect data from a Texas prison and specify the following model

$$Ret_i = X_i\beta + \varepsilon_i,$$

which includes 1,445 observations where *Ret* is equal to 1 if inmate returns to prison after 70 months, 0 otherwise. In addition to other variables, the following variables are included in X:

WP (equal to 1 if inmate participated in worker program, 0 otherwise),
Drugs (equal to 1 if inmate has a history of drug use, 0 otherwise),
Alcoh (equal to 1 if inmate has a history of alcohol abuse, 0 otherwise),
Age (in months)

Results are shown below where φ(.) is the pdf of a standard normal and the standard errors are reported (in parentheses) below the associated parameter estimates for the Linear Probability Model (LPM) and Probit model.

	LPM	Probit
WP	0.0139	0.0542
	(0.0258)	(0.0740)
Drugs	0.0737	0.2062
	(0.0290)	(0.0823)
Alcoh	0.1140	0.3310
	(0.0316)	(0.0900)
Age	-0.0008	-0.0023
	(0.0001)	(0.0004)
$\varphi(\bar{x}\,\beta)$		0.3674

(a) **(5 points)** Using the results in the above table, carefully interpret your parameter estimates regarding *WP* for each model at the mean levels of x.

(b) **(5 points)** Using the results in the above table, carefully interpret the influence of age on the likelihood inmates return to prison.

(c) **(5 points)** What information would you need in order to evaluate the marginal impact of Age, for an observation with x_1, where x_1 is not $\overline{X}$? What is the marginal impact with this new information?