Practice Exam 3, Econ 311

Total points are 100. But it counts 20% toward your final grade. So the effective total points are 20

Note: (i) show me your work in details in order to get partial credits; (ii) round your answer to 2 decimal spaces

`Last Name` `First Name`

You may use the following facts to answer some questions. Let $Z \sim N(0,1)$ then

$$P(Z < 1.96) = 0.975 \quad P(Z < 1.645) = 0.950 \quad P(Z < 1.28) = 0.900$$

Q1 (5 points). What is heteroskedasticity? How to define heteroskedasticity mathematically?

Q2 (10 points). What is the null hypothesis of the Breusch-Pagan (BP) test? Please discuss fully how to proceed if we reject the null hypothesis of the BP test.

Q3 (5 points). Suppose a sample contains two independent observations (X_1, X_2) with $E(X_1) = 8, \texttt{var}(X_1) = 4, E(X_2) = 8, \texttt{var}(X_2) = 1, \texttt{cov}(X_1, X_2) = 0$. Consider the weighted mean that uses unequal weights $\tilde{X} = \frac{1}{3}X_1 + \frac{2}{3}X_2$. Please find $E(\tilde{X})$ and $var(\tilde{X})$

Q4 (5 points). (True or False, Why). The coefficient estimate reported by R function lm will change after heteroskedasticity robust standard error and t value are reported

Q5 (5 points). What is the difference between time series data and cross sectional data?

Q6 (10 points). Please describe in detail how to test the hypothesis that the long run propensity of money supply on real GDP is zero. You need to specify the regression, the null hypothesis and the test statistic explicitly.

Q7, 8, 9, 10 are based on the following time series regression. The dependent variable room is the number of room booked in a hotel; d1, d2 and d3 are dummy variables for the first, second, and third quarter, respectively; trend is a linear trend. In total there are 168 monthly observations

```
> summary(lm(room~trend+d1+d2+d3))$coef
Estimate  Std. Error   t value     Pr(>|t|)
(Intercept) 503.821722 12.91715287 39.004084 1.434545e-84
trend         1.947161  0.09825369 19.817688 2.855473e-45
d1          -36.142218 13.47413589 -2.682340 8.064064e-03
d2           63.659156 13.45800571  4.730207 4.831024e-06
d3          188.246245 13.44831831 13.997754 9.633007e-30
```

Q7 (5 points). Is room trending? Why?

Q8 (5 points). Interpret the coefficient of d3, 188.246245

Q9 (5 points) Suppose the sample ends in December 2013. Please forecast the room in January 2014. You need to find the predicted value explicitly.

Q10 (10 points). Please mathematically specify the regression that imposes the restriction that the first, second, and fourth quarters have equal average room

Q11, 12, 13, 14, 15 are based on the following within regression applied to fatality data

```
> summary(plm(y~beertax, data = data_panel, model = "within"))$coef
 Estimate Std. Error  t-value     Pr(>|t|)
beertax -0.6558745  0.1878511 -3.49146 0.0005560018
```

Q11 (5 points). Please interpret the coefficient of beertax -0.6558745

Q12 (5 points). Find 90 percent confidence interval for the coefficient of beertax

Q13 (10 points). Please discuss in detail how to evaluate the statistical and economic significance of the state fixed effect

Q14 (5 points). Please modify the plm function in order to estimate the two way fixed effect regression

Q15 (5 points). Is the t value -3.49146 correct? Why

Q16 (5 points). Please use math to explain why the within regression of panel data is desirable for causal study