The University of Kansas

Department of Economics

Quiz 6 **Apr/15/2019**

Econ 526 - Introduction to Econometrics **Instructor: Caio Vigo Pereira**

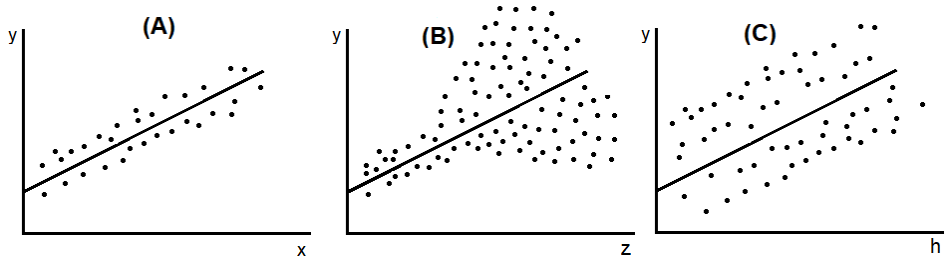
Name:

SECTION A - MULTIPLE CHOICE

Consider the following simple linear regression models, where x, z and h are different independent variables.

$$\begin{aligned} \text{Model (A):} \quad & y = \beta_0 + \beta_1 x + u \\ \text{Model (B):} \quad & y = \beta_0 + \beta_1 z + u \\ \text{Model (C):} \quad & y = \beta_0 + \beta_1 h + u \end{aligned}$$

Assuming you have a random sample, below are the scatter plots of your sample:



10% 1. Which models present heteroskedastic errors?
   A. (A) and (B)
   B. (B) and (C)
   C. (A) and (C)
   D. Only (B)

10% 2. Assuming that $E(u|x) = E(u|z) = E(u|h) = 0$ hold, for which models the OLS estimator will be unbiased?
   A. (A), (B) and (C)
   B. (A) and (C) only
   C. Only (B)
   D. Only (A)

10% 3. Assuming that $E(u|x) = E(u|z) = E(u|h) = 0$ hold, for which models the OLS estimator is more likely to be BLUE?
   A. (A), (B) and (C)
   B. (A) and (C) only
   C. Only (B)
   D. Only (A)

SECTION C - SHORT ANSWER

Consider a model relating the annual number of crimes on college campuses to the number of police officers and student enrollment. The econometric model is:

$$log(crime) = \beta_0 + \beta_1 police + \beta_2 log(enroll) + u$$

where *crime* is total campus crimes, *police* is the number of employed officers and *enroll* is the total enrollment. The R output is:

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                         Dependent variable:
                     ---------------------------
                              log(crime)
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police                         0.0240***
                               (0.0073)

log(enroll)                    0.9767***
                               (0.1373)

Constant                      -4.3758***
                               (1.1990)

------------------------------------------------
Observations                      97
R2                               0.6277
Adjusted R2                      0.6198
Residual Std. Error          [redacted]
F Statistic                79.2389*** [redacted]
================================================
Note:                *p<0.1; **p<0.05; ***p<0.01
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1. Below you can find additional information about this regression:

$$x_1 = \text{police}$$

$$x_2 = \log(\text{crime})$$

$$\sum_{i=1}^{97}(y_i - \hat{y}_i)^2 = 68.18$$

$$\sum_{i=1}^{97}(x_{i1} - \bar{x}_{i1})^2 = 23,454.25$$

10% (a) Under the assumption of homoskedastic errors, what is the variance of $\hat{\beta}_{police}$, i.e., what is the formula of $Var(\hat{\beta}_{police})$? [One line answer]

10% (b) What is the estimator of the variance of u given x_1, x_2, i.e., the estimator of $Var(u|x_1, x_2)$? [One line answer]

20% (c) Based on your answer above, find $\hat{\sigma}^2$.

10% (d) Based on your answer above, find $\hat{\sigma}$, i.e., the Residual Standard Error.

20% (e) Consider the following (additional) regression:

$$\widehat{police} = -93.798 + 12.187\ log(enroll)$$
$$n = 97,\ R^2 = 0.4206$$

What is the $se(\hat{\beta}_{police})$? Is the $se(\hat{\beta}_{police})$ presented in the regression output table correct?