

UBC, ECONOMICS 326 - 003

2011 MIDTERM EXAMINATION

You have 80 minutes. There are 3 question (100 points total). Answer all questions.

Question 1 (30 points) Consider a simple linear regression model $Y_i = \alpha + \beta X_i + U_i$, where $E(U_i|X_1, \dots, X_n) = 0$. Let $\tilde{\beta}$ be a conditionally unbiased estimator of β , i.e. $E(\tilde{\beta}|X_1, \dots, X_n) = \beta$. Define $\bar{Y} = n^{-1} \sum_{i=1}^n Y_i$ and $\bar{X} = n^{-1} \sum_{i=1}^n X_i$. Show that $\hat{\alpha} = \bar{Y} - \tilde{\beta} \bar{X}$ is an unbiased estimator of α .

Question 2 (40 points) Find A-D in the Stata output below if the number of observations is 23.

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              y |          Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
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              x |   .0910863          A           B    0.191           C           D
              _cons |   .3599422   .0241652    14.90   0.000   .3096879   .4101965
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Question 3 (30 points) Consider a regression of Y_i against a constant and X_i . Let $\hat{\beta}_0, \hat{\beta}_1$, and s^2 denote the estimated intercept, estimated slope parameter, and estimator of the variance of errors from that regression. Let T denote the t -statistic for testing H_0 that the slope parameter is zero in that regression, and let $pval$ be the corresponding p -value.

Now, let c_1 and c_2 be two constants ($c_2 \neq 0$). Define a new dependent variable and a new regressor as

$$Y_i^* = c_1 Y_i,$$

$$X_i^* = c_2 X_i.$$

Let $\hat{\beta}_0^*, \hat{\beta}_1^*$, and s_*^2 denote the estimated intercept, estimated slope parameter, and estimator of the variance of errors from the regression of Y_i^* against a constant and X_i^* . Let T^* denote the t -statistic for testing H_0 that the slope parameter in the regression of Y_i^* against a constant and X_i^* is zero. Let $pval^*$ be the corresponding p -value.

- (a) Find an expression for $\hat{\beta}_1^*$ in terms of $\hat{\beta}_1$, c_1 , and c_2 .
- (b) Find an expression for $\hat{\beta}_0^*$ in terms of $\hat{\beta}_0$ and c_1 .
- (c) Find an expression for s_*^2 in terms of s^2 and c_1 .
- (d) What is the relationship between T and T^* ?
- (e) What is the relationship between $pval$ and $pval^*$? How does rescaling of the dependent variable and regressor affect testing for the slope parameter significance?