

The International College of Economics and Finance
Econometrics - 2019. Mid-term exam, October 24

Part 1. (30 minutes). In each of 12 multiple choice tests indicate the correct answer.

1. In the model $Y_i = \beta_1 + u_i$, the OLS estimator of β_1 equals:

- 1) $b_1 = 0$ 2) $b_1 = \bar{u}$ 3) $b_1 = \sum Y_i^2 / \sum Y_i$ 4) $b_1 = \sum Y_i / (n-1)$ 5) none of the above.

2. For the Model $Y_i = \beta_1 + \beta_2 X_i + u$ (Model A assumptions satisfied) the estimator

$$b_2 = \frac{\sum (Y_i - \bar{Y})}{\sum (X_i - \bar{X})^2}$$
 is:

- 1) Equal to zero;
 2) Not equal to zero but has zero expected value;
 3) unbiased estimator of β_2 ;
 4) equal to the OLS estimator;
 5) cannot be calculated.

3. A demand for cinema admission ADM in the sample of 750 students depends on the personal income INC and the ticket price P . Two specifications below are estimated:

$$\log \hat{ADM} = \beta_{11} + \beta_{12} \log INC - \beta_{13} \log P \quad (1)$$

$$\log \frac{\hat{ADM}}{P} = \beta_{21} + \beta_{22} \log \frac{INC}{P} - \beta_{23} \log P \quad (2)$$

The following statement is **correct** about these models :

- 1) $b_{11} \neq b_{21}$; 2) $b_{13} = b_{23}$; 3) $b_{12} = b_{22}$; 4) $RSS_1 \neq RSS_2$; 5) $R^2_1 = R^2_2$.

4. Let $Y^* = \lambda_1 + \lambda_2 Y$. In a simple regression model, b^*_1 is the OLS estimator of the intercept in the regression of Y^* on X , and b_1 is the OLS estimator of the intercept in the regression of Y on X . Then the following is correct:

- 1) $b^*_1 = \lambda_1 + \lambda_2 b_1$; 2) $b^*_1 = b_1$; 3) $b^*_1 = b_1 * \lambda_2$; 4) $b^*_1 = \lambda_1 + b_1$; 5) none of the above.

5. There are unrestricted (1) and restricted (2) versions of the model:

$$Y = \beta_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + u \quad (1)$$

$$Y + X_3 = \beta_1 + \beta_2 (X_2 + X_4) + u \quad (2)$$

The restricted version includes the following 2 restrictions:

- 1) $\beta_2 = 0; \beta_4 = 0$; 2) $\beta_2 = \beta_3; \beta_4 = 1$; 3) $\beta_2 + \beta_4 = 1; \beta_3 = 1$; 4) $\beta_2 = \beta_4; \beta_3 = -1$;

5) none of the above.

6. In the Model $Y_i = \beta_2 X_i + u$ (Model A assumptions are satisfied), for two estimators of β_2 coefficient $b_{21} = \frac{\bar{Y}}{\bar{X}}$ (1) and $b_{22} = \frac{\sum (Y_i - \bar{Y})(X_i - \bar{X})}{\sum (X_i - \bar{X})^2}$ (2), the following is (generally speaking) correct:

- 1) estimator (1) is biased, while (2) is unbiased;
- 2) estimator (2) is biased, while (1) is unbiased;
- 3) **estimators (1) and (2) are both unbiased;**
- 4) estimators (1) and (2) are both biased;
- 5) (1) and (2) are not the estimators of b_2 .

7. A student added extra explanatory variable to the multiple linear regression model. As a result, the determination coefficient went up, and the adjusted determination coefficient went up also. What of the following can be definitely stated:

- 1) The new explanatory variable's coefficient is significant at the 1% level;
- 2) The new explanatory variable's coefficient is insignificant at the 1% level;
- 3) **The new explanatory variable's coefficient may be significant or insignificant at the 1% level;**
- 4) The absolute value of t-statistic of the new explanatory variable's coefficient is greater than 1.5;
- 5) The absolute value of t-statistic of the new explanatory variable's coefficient is less than 1.5.

8. In order to get the best unbiased estimators of the coefficients β_1 and β_2 , if the correct model specification is as follows: $y = \alpha + (\beta_1 + \beta_2)x_1 + 2\beta_2x_2 + 3\beta_1x_3 + u$, you have to:

- 1) Regress y on x_1 , x_2 and x_3 directly, and then take the coefficients of x_3 (divided by 3) and of x_2 (divided by 2);
- 2) Regress y on x_1 , x_2 and x_3 directly, and then solve the system of linear equations for the estimates of β_1 and β_2 ;
- 3) **Regress y on the new variables $(x_1 + 3x_3)$ and $(x_1 + 2x_2)$;**
- 4) Regress y on the new variables $(x_1 + 3x_2)$ and $(x_1 + 2x_3)$;
- 5) None of the above.

9. A student regressed $(Y - \bar{Y})$ on $(X - \bar{X})$, with the intercept, instead of regressing Y on X . For the new regression the following is in general **correct**:

- 1) The intercept is the same in both regressions;
- 2) The slope coefficient is not the same in both regressions;
- 3) The RSS is not the same in both regressions;
- 4) The R^2 is not the same in both regressions;
- 5) **The estimate of intercept is zero.**

10. Imposing two linear restrictions on parameters in a regression model, estimated using OLS

- 1) results in minor increase of the sum of squared residuals if at least one of the restrictions is valid;
- 2) results in significant increase of the sum of squared residuals if at least one of the restrictions is valid;
- 3) results in significant increase of the sum of squared residuals if at least one of the restrictions is invalid;
- 4) results in significant increase of the sum of squared residuals only if both restrictions are invalid;
- 5) always results in significant increase of the sum of squared residuals.

11. To estimate the Cobb-Douglas production function with neutral technical progress as a linear regression model, it is necessary to regress:

- 1) $\log Y$ on $\log K, \log L$ without intercept;
- 2) $\log Y$ on $\log K, \log L$, and t , without intercept;
- 3) $\log Y$ on $\log K, \log L$ with intercept;
- 4) $\log Y$ on $\log K, \log L$, and t , with intercept;
- 5) the model cannot be estimated as a linear regression equation.

12. If Theil Inequality coefficient $U_1 = \frac{\sqrt{\sum_{t=T+1}^{T+h} (\hat{y}_t - y_t)^2 / h}}{\sqrt{\sum_{t=T+1}^{T+h} \hat{y}_t^2 / h} + \sqrt{\sum_{t=T+1}^{T+h} y_t^2 / h}}$ is less than 1, then the

forecast \hat{y}_t for the period $(T+1; T+h)$ is:

- 1) Better than the "naïve" forecast $y_{T+p}^* = 0$;
- 2) Worse than the "naïve" forecast $y_{T+p}^* = 0$;
- 3) Better than the "naïve" forecast $y_{T+p}^* = y_{T+p-1}$;
- 4) Worse than the "naïve" forecast $y_{T+p}^* = y_{T+p-1}$;
- 5) Better than the "naïve" forecast $y_{T+p}^* = \bar{y}$.