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

1) Equal to zero;
2) 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:

$$\log \widehat{ADM} = \beta_{11} + \beta_{12} logINC - \beta_{13} log\, P \quad (1)$$

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

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 $b_{21} = \frac{\overline{Y}}{\overline{X}}$ (1) and $b_{22} = \frac{\sum (Y_i - \overline{Y})(X_i - \overline{X})}{\sum (X_i - \overline{X})^2}$ (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: $y = \alpha + (\beta_1 + \beta_2)x_1 + 2\beta_2 x_2 + 3\beta_1 x_3 + u$,
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 $(Y - \overline{Y})$ on $(X - \overline{X})$, 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 $U_1 = \dfrac{\sqrt{\sum_{t=T+1}^{T+h} (\hat{y}_t - y_t)^2 / h}}{\sqrt{\sum_{t=T+1}^{T+h} \hat{y}_t^2 / h} + \sqrt{\sum_{t=T+1}^{T+h} y_t^2 / h}}$ 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 $y^*_{T+p}= \bar{y}$.