The International College of Economics and Finance

Econometrics - 2018. First Semester Exam, 27.12.18.

Part 1. (30 minutes). In each of 12 multiple choice tests indicate the correct answer. One point is given for the correct answer, penalty of 0.25 points is given for an incorrect one.

1. For the model $Y_i = \beta_1 + \beta_2 X_i + u$ (X_i are stochastic, the Gauss-Markov conditions are satisfied),

$$b = \frac{\sum_{i=2}^{n}(Y_i - Y_{i-1})}{\sum_{i=2}^{n}(X_i - X_{i-1})}$$ is generally speaking:

1) unbiased but inconsistent estimator of β_2;
2) biased but consistent estimator of β_2;
3) unbiased and consistent estimator of β_2;
4) biased and inconsistent estimator of β_2;
5) efficient estimator of β_2.

2. A student had estimated the production function $y=\gamma+\alpha k+\beta l+u$ (1), where y is the output growth rate, k is the capital growth rate, and l is the labour growth rate. Then he decided to estimate the function $y\text{-}l=\lambda+\rho(k\text{-}l)+u$ (2) considering it as a restricted version of (1). Then:

1) The model (2) is a restricted version of (1) with the restriction $\alpha = \beta$;
2) The model (2) is a restricted version of (1) with the restriction $\alpha = -\beta$;
3) The model (2) is a restricted version of (1) with the restriction $\alpha+\beta=1$;
4) The model (2) is a restricted version of (1) with the restriction $\alpha+\beta=2$;
5) The model (2) is not a restricted version of (1).

3. Using the method of instrumental variables allows to get
1) Unbiased estimates;
2) Consistent estimates, with an endogenous variable as an instrument;
3) Consistent estimates, with an exogenous variable as an instrument;
4) More efficient estimates than the OLS does;
5) None of the above.

4. Adding of an explanatory variable to linear regression model, estimated by OLS,
1) always results in reduction of p-value for F-statistic;
2) always results in increase of p-value for F-statistic;
3) does not change p-value for F-statistic in the model;
4) can increase or reduce the p-value for F-statistic in the model;
5) never results in reduction of p-value for F-statistic.

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

6. Multiple linear regression model with 3 explanatory variables is estimated for a sample with 540 observations. There is heteroscedasticity in the model, and the standard deviation of disturbance term is proportional to the variable x_1: $\sigma_{ui}=\gamma\, x_{1i}$. Which test(s) are appropriate for heteroscedasticity detection in this case:

1) Only Goldfeld-Quandt test may be applied here, White tests are invalid;
2) Only White test without cross terms may be applied here;
3) Only White test with cross terms may be applied here;
4) Only Goldfeld-Quandt test and White test without cross terms may be applied here;
5) Goldfeld-Quandt test and White test with or without cross terms may be applied here.

7. Using Weighted Least Squares instead of OLS in the case of heteroscedasticity allows to get

1) Unbiased estimates instead of biased ones;
2) Consistent estimates instead of inconsistent ones;
3) Efficient estimates instead of inefficient ones;
4) the same estimates as the OLS, but with correctly calculated standard errors;
5) the same estimates as the OLS with the same standard errors.

8. The cost of running a BSc programme at the University (*COST*) may depend on the number of students (*N*) and on the type of the programme (one diploma or two diplomas). Dummy variables *OD* and *TD* are equal to one for the programmes with one diploma and two diplomas respectively (zero otherwise). A student assumes that the fixed cost, but not the marginal cost of running a programme depends on its type. The following model corresponds to this assumption:

1) $COST=\beta_1+\delta_1 OD+\delta_2 TD+\beta_2 N+\lambda(N\cdot TD)+u;$
2) $COST=\beta_1+\beta_2 N+\lambda(N\cdot TD)+u$;
3) $COST=\beta_1+\delta_1 TD+\beta_2 N+\lambda(N\cdot TD)+u;$
4) $COST=\delta_1 OD+\delta_2 TD+\beta_2 N+u$;
5) No model from (1) - (4).

9. In the regression model $y = \alpha + \beta x + u$ (where the disturbance term u satisfies Gauss-Markov conditions and is normally distributed) the explanatory variable x includes random measurement errors (which are independent, normally distributed, homoscedastic, not autocorrelated, with zero expected values). It is known that $\beta>0$. In this case, when estimating the model using OLS, for large samples

1) the estimator of α will be biased upwards if $E(x)>0$, and biased downwards if $E(x)<0$;
2) the estimator of α will be biased upwards if $E(x)<0$ and biased downwards if $E(x)>0$;
3) the estimator of α will be biased upwards;
4) the estimator of α will be biased downwards;
5) the direction of bias of the estimator of α depends on the sign of its true value.

10. For the simultaneous equations model with 4 equations, 4 endogenous variables and 6 exogenous variables, the following statement is true for any equation:

1) an equation is likely to be underidentified if 7 variables are included in it;
2) an equation is likely to be exactly identified if 6 variables are included in it;
3) an equation is likely to be underidentified if 5 variables are included in it;
4) an equation is likely to be exactly identified if 8 variables are included in it;
5) an equation is likely to be overidentified if 5 variables are included in it.

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11. Economic model is described by the following simultaneous equations:

(1) $y_1=\alpha+\theta y_2+\gamma x_1+ \varphi x_3+u_1$

(2) $y_2=\delta+\tau y_1+\lambda x_2+u_2$

where y_1 and y_2 are endogenous variables, x_1, x_2 and x_3 are stochastic exogenous variables, u_1 and u_2 are disturbance terms satisfying Gauss-Markov conditions. Indicate the correct statement:

1) The Two Stage Least Squares method can be applied to the model, and it provides consistent estimates for the equation (1) only;
2) The Two Stage Least Squares method can be applied to the model, and it provides consistent estimates for the equation (2) only;
3) The Two Stage Least Squares method can be applied to the model, and it provides consistent estimates for both the equations (1) and (2);
4) The Two Stage Least Squares method can not be applied to the model;
5) There is no need to apply the Two Stage Least Squares method to the model since unbiased and consistent estimates for the coefficients of (1) and (2) can be received by the OLS.

12. The following simultaneous equations model is considered:

$$Y = \beta_1 + \beta_2 X + u; \qquad X = \alpha_2 Y + v$$

where X and Y are endogenous variables, and u and v are identically and independently distributed disturbance terms with zero means. The estimator of α_2 calculated as $\frac{\overline{X}}{\overline{Y}}$ (where $\overline{X}$ and $\overline{Y}$ are the sample means of X and Y) is generally speaking:

1) unbiased; 2) biased but consistent;

3) biased and inconsistent; 4) not a linear estimator; 5) this is an estimator of β_2, not of α_2 .