The International College of Economics and Finance

Econometrics - 2021. First Semester Exam, December 23

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

1. 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 $y-l+2=\lambda+\rho(k-l)+u$ (2) considering it as a restricted version of (1). Then:

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

2. For the Model $Y_i = \beta_2 X_i + u$ (Model B assumptions are satisfied: the variable X is stochastic), the following 3 estimators of β_2 are proposed: $b^1 = \dfrac{\bar{Y}}{\bar{X}}$, $b^2 = \dfrac{\sum(X_i - \bar{X})(Y_i - \bar{Y})}{\sum(X_i - \bar{X})^2}$, $b^3 = \dfrac{\sum X_i Y_i}{\sum X_i^2}$.

The following is correct in general for these estimators:

1) The estimators b^1 and b^3 are consistent, while b_2 is inconsistent;
2) The estimators b^1 and b^2 are consistent, while b^3 is inconsistent;
3) The estimators b^2 and b^3 are consistent, while b^1 is inconsistent;
4) All the estimators b^1, b^2 and b^3 are consistent;
5) All the estimators b^1, b^2 and b^3 are inconsistent.

3. For the sample of 33 observations, functions (1) and (2) were estimated:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + u \qquad (1)$$

$$Y = \beta_0 + \beta_1(X_1 + X_2) + u \qquad (2)$$

The R^2 (determination coefficients) for these models are 0.9 in (1) and 0.7 in (2) respectively. F – statistic for testing the hypothesis $\beta_1=\beta_2$ in (1) equals

1) 60; 2) 30; 3) 20; 4) 6.7; 5) None of the above.

4. The double logarithmic function of expenditures for souvenirs depending on disposable personal income has been estimated using OLS for a representative sample of people:

$$\log(Y) = \beta_0 + \beta_1 LXD_1 + \beta_2 LXD_2 + \beta_3 D_1 + u$$

where Y is expenditure for souvenirs, X is disposable personal income,
D_1 = 1 for females and 0 for males,
D_2 = 1 for males and 0 for females;

$LXD_1=\log(X)\times D_1$; $LXD_2=\log(X)\times D_2$.

For this regression the following is correct:

1) The estimates of intercept are the same for male and female subsamples, the estimates of the slope coefficients differ;
2) The estimates of slope coefficients are the same for male and female subsamples, the estimates of the intercept differ;
3) Both intercepts' and slope coefficients' estimates are the same for male and female subsamples;
4) Both intercepts' and slope coefficients' estimates differ for male and female subsamples;
5) There is perfect multicollinearity and the estimation can not be done.

5. The Durbin–Wu–Hausman can be used for detection of the following:

I. Heteroscedasticity;
II. Measurement errors;
III. Simultaneous equations bias;
IV. Endogeneity of explanatory variables.

1). III and IV only.
2). II and IV only.
3). I, II and III only.
4). II, III and IV only.
5). All I-IV.

6. If you have estimated the parameters of the following model using the OLS (Model B assumptions are satisfied): $y = \alpha + \beta_1 X_1 + 2\beta_2 X_2 + (\beta_2/\beta_3) X_3 + u,$ then:

1) you can get an unbiased estimate of β_3;
2) the model is nonlinear in parameters, and you can not estimate them;
3) you can not get an unbiased estimate of β_3, but can get a consistent estimate of it;
4) you can not get an unbiased, or biased but consistent estimate of β_3;
5) the model includes a restriction, and hence its parameters can not be estimated.

7. Multiple linear regression model with 11 explanatory variables is estimated for a sample with 120 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) may be applied in this case?:

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

8. 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), ($\beta<0$). In this case, when estimating the model using OLS, for large samples

1) the direction of bias of the estimate of α depends on the sign of its true value;
2) the estimate of α will be always biased upwards;
3) the estimate of α will be always biased downwards;
4) the estimate of α will be biased upwards if the values of x are positive and biased downwards if the values of x are negative;
5) the estimate of α will be biased upwards if the values of x are negative and biased downwards if the values of x are positive.

9. For the simultaneous equations model with 12 equations, 12 endogenous variables and 10 exogenous variables, the following statement is true for any equation:

1) an equation is likely to be overidentified if 11 variables are missing from it;
2) an equation is likely to be exactly identified if 12 variables are missing from it;
3) an equation is likely to be underidentified if 10 variables are missing from it;
4) an equation is likely to be exactly identified if 10 variables are missing from it;
5) an equation is likely to be underidentified if 11 variables are missing from it.

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

(1) $y_1 = \alpha + \gamma y_2 + \varphi x_1 + \pi x_2 + \mu x_3 + u_1$

(2) $y_2 = \delta + \tau y_1 + \lambda x_1 + \beta x_2 + u_2$

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

1) Two Stage Least Squares estimates of (2) coefficients will be biased but consistent;
2) Two Stage Least Squares estimates of (1) coefficients will be biased but consistent;
3) Two Stage Least Squares estimates of (1) coefficients will be unbiased and consistent;
4) Two Stage Least Squares estimates of (2) coefficients will be unbiased and consistent;
5) Two Stage Least Squares will not provide any estimates of both (1) and (2).

11. Logit estimation of the model describing the probability to pass the exam $F(Z_i)=p(Pass_i=1|\,X_i,\beta)$ has given the result $Z=-7.4+0.03\cdot X$, where X is the number of hours devoted to studying the subject. Increase of the probability $p(Degree_i=1)$ under one point increase of X, for $X=86$ approximately equals:

1) $\dfrac{\exp(7.4-0.03\cdot 86)}{(1+\exp(7.4-0.03\cdot 86))^2}$; 2) $\dfrac{0.03}{1+\exp(7.4-0.03\cdot 86)}$;

3) $\frac{\exp(7.4-0.03\cdot 86)}{(1+\exp(7.4-0.03\cdot 86))^2}\cdot 0.03$;   4) $\frac{1}{1+\exp(7.4-0.03\cdot 86)}$;

5) None of the above.

12. If U_0 coefficient $U_0=\sqrt{\frac{\frac{1}{h}\sum(\hat{Y}_{T+p}-Y_{T+p-1})^2}{\frac{1}{h}\sum(Y_{T+p}-Y_{T+p-1})^2}}$ is greater than 1, then the forecast $\hat{Y}_t$ for the period from $t=T+1$ to $t=T+h$, where $t=T+p$, is:

1) This is neither Theil U_2 nor the Theil Inequality coefficient;
2) Better than the "naïve" forecast $Y^*_{T+p}=0$;
3) Worse than the "naïve" forecast $Y^*_{T+p}=0$;
4) Better than the "naïve" forecast $Y^{**}_{T+p}=Y_{T+p-1}$;
5) Worse than the "naïve" forecast $Y^{**}_{T+p}=Y_{T+p-1}$.