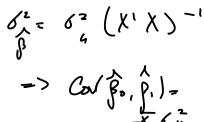
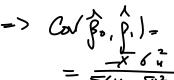
## The International College of Economics and Finance Econometrics - 2020. Mid-term exam, October 22

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

- 1. In the Simple Linear Regression Model  $Y_i = \beta_1 + \beta_2 X_i + u_i$  the population covariance of the OLS estimators of the intercept and slope coefficient  $cov(b_1, b_2)$  is
- 1) positive if the mean value of X is positive;
- (2) negative if the mean value of X is positive;
  - 3) may be positive or negative if the mean value of X is positive;
  - 4) may be positive or negative if the mean value of X is negative;
  - 5) does not depend on the mean value of X.





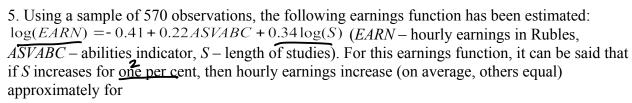
- 2. For the Model  $Y_i = \beta_2 X_i + u$  (Model A assumptions satisfied, i=1,  $b_2 = \frac{((Y_1 + Y_2 + Y_3)/3) - \overline{Y}}{((X_1 + X_2 + X_3)/3) - \overline{X}}$  is:
  - 1) non-linear estimator of  $\beta_2$ ; (2) unbiased estimator of  $\beta_2$ ; 2) efficient estimator of  $\beta_2$ ; (3) biased estimator of  $\beta_2$ ; (5) not an estimator of  $\beta_2$ .
- 3. In a simple regression with an intercept  $\ddot{Y} = b_1 + b_2 X$ , the estimated slope coefficient  $b_2$  is equal to zero. Then the determination coefficient  $R^2$  is
- 1) Equal to one;
- 2) Not equal to 1 or 0;
- 3) In some situations can be negative:
- (4) Equal to zero
  - 5) Can not be calculated for the model due to violation of assumptions.
  - 4. If a new observation and a new explanatory variable are added in the Linear Regression Model, then for OLS-estimation, the following is true:
    - 1) The Residual Sum of Squares (RSS) decreases; the Determination Coefficient  $R^2$  may increase, decrease or stay the same;
    - 2) The Residual Sum of Squares (RSS) increases; the Determination Coefficient  $R^2$  may increase, decrease or stay the same;
  - 3) Both the Determination Coefficient  $R^2$  and the Residual Sum of Squares (RSS) may increase, decrease or stay the same;
    - 4) The Determination Coefficient  $R^2$  increases; the Residual Sum of Squares (RSS) may increase, decrease or stay the same;
    - 5) The Determination Coefficient  $R^2$  decreases; the Residual Sum of Squares (RSS) may increase, decrease or stay the same;

HW: 
$$tss$$
,  $Ess$ ,  $Pss$ ,  $Pss$ ,  $P^2$  =>  $Ess$ ,  $P^2$ 

is a new ods: is acced

$$y' = \frac{h}{h+1} y + \frac{1}{h+1} y_{n+1}$$

$$tss' = \sum (y_1 - y')^2 = \frac{h}{h+1} (y_1 - y')^2 = \frac{h}{h+1} (y_2 - y') + \frac{h}{h+1} (y_3 + (-y')^2) + \frac{h}{h+1} (y_3 + (-y')^2) + \frac{h}{h+1} (y_3 + (-y')^2) = \frac{h$$



- 0.34 Rubles; (2) 0.34%; (3) 34%; 4) 0.0034%; 5) 34 Ruble 6. For the Model (3) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4)5) 34 Rubles.
- estimator

$$b_2 = \frac{\sum (Y_i - \overline{Y})}{\sum (X_i - \overline{X})}$$
 is, generally speaking:

- 1) biased and inconsistent estimator of  $\beta_2$ ;
- 2) biased but consistent estimator of  $\beta_2$ ;
- 3) unbiased but inefficient estimator of  $\beta_2$ ;
- 4) equal to the OLS estimator;
- (5) can not be calculated;
- 7. Introduction of two linear restrictions on parameters in a regression model, estimated using OLS
  - 1) results in minor increase of the sum of squared errors if at least one of the restrictions is not valid;
  - 2) results in significant increase of the sum of squared errors if at least one of the restrictions is valid;
  - results in minor increase of the sum of squared errors if both restrictions are valid;
    - 4) results in significant increase of the sum of squared errors only if both restrictions are valid:
    - 5) all the above is incorrect.
- 8. 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:

 $10 b^*_{l} = \lambda_{l} + \lambda_{2} b_{l}; \quad 2) \quad b^*_{l} = b_{l}; \quad 3) \quad b^*_{l} = b_{l} * \lambda_{2}; \quad 4) \quad b^*_{l} = \lambda_{l} + b_{l}; \quad 5) \quad \text{none of the above.}$ 

9. There are (1) and (2) versions of the Multiple Regression Model:

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

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

The Model (2) is the Model (1) with the following restrictions:

$$\beta_3=0; \beta_4=0; (2)\beta_2=\beta_3; \beta_4=1; \beta_2=\beta_3=1; \beta_4=1; \beta_4=1$$

- 10. A student regressed Y and log(Y) on X, with the intercept (regressions 1 and 2 respectively). Then he did Zarembka scaling  $Y^*=Y/geometric$  mean of Y, and regressed  $Y^*$  and  $log(Y^*)$  on X (regressions 3 and 4). Then the following is correct:
  - 1) All the coefficients' estimates, including the intercept, are the same in regression 3 as in regression 1;
  - 2) All the coefficients' estimates, including the intercept, are the same in regression 4 as in regression 2;
  - 3) All the coefficients' estimates, except the intercept, are the same in regression 3 as in regression 1;
  - 4) All the coefficients' estimates, except the intercept, are the same in regression 4 as in regression 2;
    - 5) None of the above.
- 11. The population variance of prediction error  $\sigma_{PE}^2 = \left(\frac{1}{2}\right) \cdot \left(\frac{1}{1}\right)^{\frac{1}{2}} + \frac{\left(\frac{1}{2}\right)^{\frac{1}{2}}}{\sum_{i=1}^{2}\left(\frac{1}{2}\right)^{\frac{1}{2}}}$ 2) is always less than the population variance of disturbance term  $\sigma_u^2$ ;

  - 3) can be greater, less then or equal to the population variance of disturbance term  $\sigma_u^2$ ;
  - 4) is always equal to the population variance of disturbance term  $\sigma_u^2$ ;
  - 5) is not related to the population variance of disturbance term  $\sigma_u^2$ .
- 12. Root mean squared error of prediction  $\sqrt{\sum_{t=1}^{T+h} (\hat{y}_t y_t)^2 / h}$  is always
  - $\sum_{t=1}^{T+h} |\hat{y}_t y_t| / h$ 1) Greater or equal to the Mean absolute error of prediction 2) Less or equal to the Mean absolute error of prediction;
    - 3) May be greater or less than the Mean absolute error of prediction;
    - 4) Equal to the Mean absolute error of prediction;
    - 5) Can not be compared with the Mean absolute error of prediction since it has different dimensity.