

HANKEN SCHOOL OF ECONOMICS

RESEARCH METHODS FOR REAL ESTATE (17755b)

EXAM 25.2.2012

Time for the exam: 3 h

Allowed means: Hand calculator. Statistical tables (enclosed)

Answer all six questions!

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Appendix 1 and 2 contain estimation results based on a sample of 209 chief executive officers (CEOs), taken from Business Week (5/6/91) (Wooldridge Example 2.3, 2.8). We will utilize the following variables:

*salary* = CEO's salary 1990 in thousands \$

*roe* = return on equity for the CEO's firm (average for the three years 1988-1990)

*ros* = return on firm's stock, 1988-1990

*induce* = 1 if industrial firm

*finance* = 1 if financial firm

*utility* = 1 if firm handling transportation or utilities

*consprod* = 1 if consumer product firm

*sales* = firm's sales

Two of the variables are used in logarithmic form (natural logarithms):  $l\text{salary} = \ln(\text{salary})$ ,  $l\text{sales} = \ln(\text{sales})$ .

Appendix 1 reports results from a model, Model I, in which variation in *lsalary* is explained with six variables (*roe*, *ros*, *induce*, *finance*, *utility*, *lsales*).

Appendix 2 gives results for Model II containing only the three explanatory variables *roe*, *ros*, *lsales*.

Answer the following questions on basis of the output in the Appendixes.

1. For Model II (Appendix 2)
  - (i) write down the model in estimated form.
  - (ii) give interpretations of the estimated regression coefficients for each of the three explanatory variables *roe*, *ros*, *lsales*.
  
2. For Model II (Appendix 2) test the significance of each of the three explanatory variables *roe*, *ros* and *lsales* assuming that each of them can be expected to be positively related to the dependent variable. In each of the three cases, formulate hypotheses (null and alternative hypothesis) and perform a statistical test.

3. For Model I (Appendix 1), test the significance of the whole model. Formulate hypotheses (null and alternative hypothesis) and perform a statistical test of the overall significance of the model.
  
4. The data file contains data for firms from four different branches: (i) industrial firms, (ii) financial firms, (iii) transportation and utility firms and (iv) consumer product firms.
  - (i) Explain why these four branches are represented by only three dummy variables in Model I. I.e., why does the class of consumer product firms not have a dummy variable of its own in Model I?
  - (ii) Give interpretations of the estimated regression coefficients in Model I for the three dummy variables *induce*, *finance* and *utility*.
  
5. Would you preferred Model I or Model II? Answer this question in the following two ways.
  - (i) On the basis of the Adjusted R Square. Also explain the logic behind the Adjusted R Square.
  - (ii) By performing a test of Model II against Model I. Formulate hypotheses (null and alternative hypothesis) and perform the statistical test.  
 (Hint:  $F = \frac{(SSR_r - SSR_{ur})/q}{SSR_{ur}/(n-k-1)}$ ).
  
6. (a) It is noted that for each of the variables *roe* and *lsales* the estimated coefficient increases in going from Model I to Model II. What could be the reason? Explain!
  - (b) Describe briefly the concept *interaction*.

Good luck!