UNIVERSITY OF OSLO
DEPARTMENT OF ECONOMICS

Exam: **ECON3150/4150 – Introductory econometrics**

Date of exam: Friday, May 28, 2010 **Grades will be given: 16. June 2010**

Time for exam: 2:30 p.m. – 5:30 p.m.

The problem set covers 5 pages (incl. cover sheet)

Resources allowed:

- All written and printed resources, as well as calculator, is allowed.

The grades given: A-F, with A as the best and E as the weakest passing grade. F is fail.

Introduction to Econometrics- Econ 4150
Final Exam, Spring 2010

The exam consists of 100 points. Please allocate your time to each problem accordingly.

Problem 1 (40 points)

We want to analyse a person's net financial wealth in 1000 \$ ($nettfa$), and its association with age (age), annual family income in 1000 \$ (inc), family size ($fsize$), a dummy variable indicating whether the person is married (mar), and a dummy variable indicating whether the person is a man ($male$). Moreover, $agesq$ and $incsq$ are squared values of variables age and inc, respectively. We have data for 9275 adult individuals.

Ordinary Least Squares estimation of the model

$$nettfa_i = \beta_0 + \beta_1 Inc_i + \beta_2 marr_i + \beta_3 male_i + \beta_4 age_i + \beta_5 fsize_i + u_i$$

resulted in the following Stata output:

```
      Source |       SS       df       MS              Number of obs =    9275
-------------+------------------------------           F(  5,  9269) =  393.14
       Model |  6638884.02     5   1327776.8           Prob > F      =  0.0000
    Residual |  31304505.5  9269  3377.33364           R-squared     =  0.1750
-------------+------------------------------           Adj R-squared =  0.1745
       Total |  37943389.5  9274   4091.3726           Root MSE      =  58.115

------------------------------------------------------------------------------
      nettfa |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         inc |   1.014132   .0272252    37.25   0.000     .9607642    1.067499
        marr |  -6.774032   1.674119    -4.05   0.000    -10.05567    -3.49239
        male |  -.5198554   1.639976    -0.32   0.751    -3.734569    2.694858
         age |    1.02436   .0595339    17.21   0.000     .9076606     1.14106
       fsize |  -1.705965   .4896489    -3.48   0.000    -2.665785   -.7461455
       _cons |  -53.53258   3.022493   -17.71   0.000    -59.45733   -47.60783
------------------------------------------------------------------------------
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Answer the following questions.

(i) What is the expected wealth for an unmarried woman aged 40 who lives alone and whose income is 30,000 \$ a year?

(ii) The constant β_0 is estimated to be -53.5. Does this constant have a meaningful interpretation?

(iii) What does "Root MSE" (here equal to 58.115) represent? What is its unit of measurement?

(iv) Assume that "Root MSE" were omitted from the Stata output. How could you compute its value based on other output results? You do not have to show that 58.115 is correct.

We want to test whether *age* and *inc* have non-linear effects on wealth. Therefore, the squared values of these variables are added to the model. The OLS results are as follows.

Source	SS	df	MS
Model	7561922.99	7	1080274.71
Residual	30381466.5	9267	3278.45759
Total	37943389.5	9274	4091.3726

Number of obs	= 9275
F(7, 9267)	= 329.51
Prob > F	= 0.0000
R-squared	= 0.1993
Adj R-squared	= 0.1987
Root MSE	= 57.258

nettfa	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
inc	-.0791284	.0771413	-1.03	0.305	-.2303423	.0720855
marr	-3.254415	1.702785	-1.91	0.056	-6.592248	.0834176
male	.3559948	1.616634	0.22	0.826	-2.812964	3.524954
age	-1.427179	.4989408	-2.86	0.004	-2.405213	-.4491456
agesq	.0284311	.0057425	4.95	0.000	.0171745	.0396876
fsize	-1.381378	.4995908	-2.77	0.006	-2.360685	-.4020695
incsq	.0092617	.0005951	15.56	0.000	.0080951	.0104282
_cons	16.12359	10.09583	1.60	0.110	-3.66646	35.91364

Answer the following questions

(v) Use the R^2-form of the F-test to test whether the new model performs significantly better than the original model . Select $\alpha = 1\%$. State your conclusion.

(vi) The individuals in the data set are between 25 and 64 years of age. At which age do they have lowest expected net financial wealth? Comment on your finding.

(vii) The annual income in linear form was extremely significant in the original model (t=37.25), but it is no longer significant in the new model (t=-1.03). Can you think of any reason?

(viii) The dummy variable for sex (*male*) has a negative value in the original model (-0.520), but a positive sign the new model (0.356). Can you draw any conclusion from these results?

Problem 2 (30 points)

Consider the following partial adjustment model for wheat production based on Nerlove (1958)

$$q_t^* = \gamma_0 + \gamma_1 p_t + \gamma_2 x_{t-1} + e_t$$

where q_t^* is the long run (or desired) level of output, q_t is the observed output level, p_t is the price level and x_{t-1} is a lagged variable related to technology. Because of adjustment costs and fixed assets, the output adjustment achieved in any period is assumed to be a constant fraction of the difference between desired output and previous output

$$q_t = q_{t-1} + \delta(q_t^* - q_{t-1}) + a_t$$

Finally, e_t and a_t are the error terms.

(i) Show that you can rewrite the above system in the following form

$$q_t = \beta_0 + \beta_1 q_{t-1} + \beta_2 p_t + \beta_3 x_{t-1} + u_t$$

(ii) If $E(e_t|p_t, q_{t-1}, p_{t-1}, x_{t-1}...) = E(a_t|p_t, q_{t-1}, p_{t-1}, x_{t-1}, ...) = 0$ and all series are weakly dependent, how would you estimate $\beta_j' s$? Would the estimator be consistent?.

(iii) If $\widehat{\beta}_1 = 0.5$, $\widehat{\beta}_2 = 0.2$, and $\widehat{\beta}_3 = 0.4$ what are the values for γ_1, γ_2 and δ?

For the rest of the problem suppose that you suspect that the error in the adjustment equation follows an AR(2) process, ie

$$a_t = \rho_0 a_{t-1} + \rho_1 a_{t-2} + \varepsilon_t$$

where ε_t is an independent and identically distributed random variable with zero mean and variance σ_ε^2.

(iv) Can you estimate the speed of adjustment parameter δ consistently by OLS?

(v) Explain how you would detect serial correlation in this model.

(vi) Now assume that $|\rho_0| < 1$ and $\rho_1 = 0$. You are interested in making inference about the parameters of the model. How would you correct for serial correlation under these assumptions? Make sure you state clearly the assumptions in your argument.

Problem 3 (30 points)

Decide if you agree or disagree with the following statements and provide a brief explanation to your answer.

(i) Like cross section observations, we can assume that most time series observations are indepently distributed.

(ii) The OLS estimator in a time series regression is unbiased under the first three Gauss Markov assumptions.

(iii) OLS is inconsistent in the presence of lagged dependent variables and serially correlated errors.

(iv) If the errors are not heteroskedastic then the usual F statistic no longer has a F distribution.