SØK3001-V21-Frontpage

Department of Economics

Examination paper for SØK3001 – Advanced Econometrics

Examination date: 19.05.2021

Examination time (from-to): 09:00 – 12:00

Permitted examination support material: A / All support material is allowed

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OTHER INFORMATION

The exam consists of 2 questions and the questions are equally weighted when assessed

Make your own assumptions: If a question is unclear/vague, make your own assumptions and specify them in your answer. Only contact academic contact in case of errors or insufficiencies in the question set.

Saving: Answers written in Inspera Assessment are automatically saved every 15 seconds. If you are working in another program remember to save your answer regularly.

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1 SØK3001 V21

Exam Assignment - SØK3001 3-hour exam V21 - downloadable PDF

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Question 1
Attached

Question 1.

Ageing of the population due to declining fertility of females is a major challenge in modern societies. Declining fertility is often attributed to increased education of females. Several researchers have tried to establish a causal link between fertility and education. The questions below are connected to an analysis of the relationship between women's fertility and education level on Norwegian data. The authors use individual data from birth cohorts from 1947 to 1958 to estimate several versions of the following relationship:

(1)$y_i = \beta_0 + \beta_1 ED_i + \beta_2 COHORT_i + \beta_3 MUNICIPALITY_j + u_{ij}$

where y is fertility outcome (explained below), ED is the number of years of education obtained. COHORT refers to a full set of birth year dummy variables, $MUNICIPALITY$ refers to a full set of dummy variables for the municipalities where the women were born. u_{ij} is an error term. Subscript i refers to individual, while subscript j refers to municipality. All outcomes are measured in 2002, when the youngest of these women were 44 years old.

The following fertility outcome variables were used:

The number of children in total

The timing of births represented by the following dummy variables:

1 if first birth is at age 15-20, 0 otherwise

1 if first birth is at age 20-25, 0 otherwise

1 if first birth is at age 25-30, 0 otherwise

1 if first birth is at age 30-35, 0 otherwise

They also use an indicator for **childlessness** defined as the dummy variable

1 if childless, 0 otherwise

The authors are concerned that ED is an endogenous variable, and in addition to OLS, they estimate the model by 2SLS using the introduction of a compulsory school reform in Norway during the 1960's and early 1970's as an instrumental variable. Before the reform, the Norwegian school system required children to attend school through the 7'th grad, while after the reform, this was extended to the ninth grade, thus adding two years of required schooling. This reform was implemented at different points in time in different municipalities. They use as an instrument the dummy variable $REFORM_j$ equal to 1 if the individual born in municipality j was affected by the reform and zero otherwise

Table 1 reports the estimated β_1 coefficient, where each column shows the result for each outcome and thus the results from separate regressions. Estimated standard errors are in parenthesis. N is the number of observations.

a) Discuss why it is important to include the variables COHORT and MUNICIPAL in these regression equations. Discuss reasons why the education level may be endogenous in this type of regression model and the consequences for OLS estimation.

b) Interpret the estimated coefficients reported in Table 1 and comment on the difference between the OLS and 2SLS results.

c) Explain the identification assumptions behind the 2SLS estimations, and how the 2SLS estimations are conducted.

The authors report that the estimated coefficient in front of the variable REFORM in an OLS regression between EDU, REFORM and other variables equals 0.116 with an estimated standard error 0.017. Interpret this coefficient and explain what this result means for the credibility of the 2SLS results in Table 1. What other variables must be included in this regression? Explain.

d) What is your conclusion regarding the relationship between fertility and education based on these results?

e) A fellow student of you suggests enthusiastically that a similar analysis can be conducted in the future using the 6 year school-start reform that was introduced in all municipalities in Norway in 2004 and extended the required years of schooling from 9 to 10 years. Comment on this suggestion.

Table 1. Estimation results. Estimated standard errors in parenthesis. Additional control variables in the estimated equations are $COHORT_i$ *and* $MUNICIPALITY_j$

Outcome	Childless	Number of children	First birth age 15-20	First birth age 20-25	First birth age 25-30	First birth age 30-35	First birth 35-40
OLS	0.006 (0.001)	-0.013 (0.004)	-0.032 (0.001)	-0.024 (0.001)	0.030 (0.0001)	0.015 (0.0002)	0.005 (0.0001)
2SLS	0.011 (0.018)	-0.009 (0.087)	-0.080 (0.039)	0.044 (0.032)	0.012 (0.028)	-0.008 (0.018)	0.021 (0.009)
N	290 596	290 604	290 604	290 604	290 604	290 591	289 057

Question 2.

A real estate economist collects information on 1000 house price sales from two similar neighborhoods called "University Town" bordering a large public university and one neighborhood about three miles from the university.

He wants to quantify how house location relative to the university affects house prices and estimates a house price equation with results reported in Table 2 below.

The variable $PRICE$ is given in 1000 US$

House size $SQFT$ is measured in number of hundreds of square feet.

House age, AGE is measured in years.

Location is measured by dummy, $UTOWN$=1 for houses near the university.

Additional house characteristics are measured by dummy variables, $POOL$=1 if a pool is present, and $FPLACE$=1 if a fireplace is present.

Table 2. Estimated house price equation. Dependent variable is $PRICE$. Method: OLS

Variable	Coefficient	Estimated standard error
Constant	24.5000	6.1917
UTOWN	27.4530	8.4226
$SQFT$	7.6122	0.2452
$SQFT \times UTOWN$	1.2994	0.3320
AGE	-0.1901	0.0512
$POOL$	4.3772	1.1967
$FPLACE$	1.6492	0.9720

R-square=0.8706

a)Write down the equations for predicted house prices for houses located near the university and away from the university, respectively.

b)What is the change in expected price per additional square foot?

c) What is the depreciation in house prices per year? Construct a 90 percent confidence interval for the depreciation.

d) What is the expected price effect of a pool and a fireplace, respectively?

e) A commentator suggests that the variable AGE, the age of the house, contains large amount of measurement error. How would that likely affect the estimated house depreciation in c)? Explain.

f) Another commentator suggest that the house price depreciation is likely to depend on the location of the house and the size of the house. Suggest how you would change the house price equation to account for the commentator's proposal and how you could test his proposal.