UNIVERSIDAD CARLOS III DE MADRID
ECONOMETRICS I
Academic year 2008/09
FINAL EXAM (Second call)

September, 1, 2009

Very important: Take into account that:

1. Each question, unless stated, requires a complete analysis of all the outputs shown in the corresponding problem.
   For example, to answer those questions referring to “appropriate estimates”, or “given the estimates” or “given the problem conditions”, the results based on the consistent and more efficient among the listed outputs, must be used.

2. Each output includes all the explanatory variables used in the corresponding estimation.

3. Some results in the outputs listed may have been omitted.

4. The dependent variable can vary across outputs within the same problem.

5. For the sake of brevity, we will say that a model is well specified if it is linear in the conditioning variables (as they appear in the model) and its error term is mean-independent of such variables.

6. OLS and 2SLS are the corresponding abreviations of ordinary least squares and two stage least squares, respectively.

7. Statistical tables are included at the end of this document.

PROBLEM TEXT

PROBLEM 1: Nutritional level of enfants.

Nutritionists argue that height is a good measure of the HEALTH STATUS of enfants, conditional on age and gender. The economic model we have in mind suggests that enfant's height, given age and gender, depends on household resources, and on a efficiency level at which each enfant's household turn such resources in a better health status of their members. In this example, we propose that household income and parents' education to approximate household resources, and mother's age to approximate her experience in the use of household resources.

The proposed model is as follows:

$$\begin{aligned}\texttt{ALTED} = \beta_0 + \beta_1\texttt{RENTAH} + \beta_2\texttt{EDADM} + \beta_3\texttt{EDUCM} + \\ \beta_4\texttt{FEM} + \beta_5\texttt{RENTAFEM} + u\end{aligned} \qquad (*)$$

where:

`ALTED` = enfant's height (in cm) comapred with the height of a healthy enfant with the same age and gender.

`RENTAH` = household income, in thousand euros.

`EDADM` = mother's age (in years).

`EDUCM` = mother's years of education.

`FEM` = binary variable binaria taking value one if the enfant is a girl and zero otherwise;

`RENTAFEM` = `RENTAH` $\times$ `FEM` = interaction between `RENTAH` and `FEM`.

Using a random sample of male and female enfants (aged 6 and under), we obtained the following estimates:

Output 1: OLS estimations using the 269 observations 1–269
Dependent variable: `ALTED`

Variable	Coefficient	Std. error	t-Statistic	p-value
`const`	33.31	6.62	5.03	0.0000
`RENTAH`	2.30	0.89	2.59	0.0101
`EDADM`	−1.15	0.29	−3.95	0.0001
`EDUCM`	1.34	0.29	4.68	0.0000
`FEM`	0.20	0.92	0.22	0.8244
`RENTAFEM`	0.21	0.13	1.60	0.1106

Sum of squared residuals	7566.77
R^2	
Adjusted $\bar{R}^2$	0.1662
$F(5, 263)$	11.6874

(NOTE: The residual sum of squares in a regression like *Output 1*, but omitting jointly `FEM` and `RENTAFEM`, is 7715.57).

Output 2: OLS estimations using the 269 observations 1–269
Dependent variable: `ALTED`

Variable	Coefficient	Std. error	t-Statistic	p-value
`const`	7.29	0.77	9.47	0.0000
`RENTAH`	2.51	0.91	2.75	0.0064
`EDUCM`	0.28	0.11	2.68	0.0077
`FEM`	−0.29	0.94	−0.30	0.7607
`RENTAFEM`	0.21	0.14	1.51	0.1333

Sum of squared residuals	8016.53
R^2	0.1332
Adjusted $\bar{R}^2$	0.1200
$F(4, 264)$	10.1392

Output 3: Correlation matrix for selected variables using the 269 observations 1–269

	`EDADM`	`EDUCM`	`RENTAH`
`EDADM`	1.00		0.03
`EDUCM`		1.00	0.01
`RENTAH`			1.00

PROBLEM 2: Family structure and female labor market behavior

We are interested to estimate the impact of family arrangement on labor behavior of women with children. We establish the following model,

$$\begin{aligned} \text{hourswork} &= \beta_0 + \beta_1 \text{age} + \beta_2 \text{age2} + \beta_3 \text{educ} \\ &\quad + \beta_4 \text{educ2} + \beta_5 \text{Marr} + \beta_6 \text{nchild} + u, \end{aligned}$$

where
hourswork = number of hours during the last week;
age = age (in years);
age2 = $(\text{age})^2$ = squared age (in years);
educ = years of education (the maximum number of years of education is 24);
educ2 = squared years of education;
Marr = binary variable taking value 1 if currently married and 0 otherwise;
nchild = number of children at home.

We suspect that $C(\text{Marr}, u) \neq 0$ and $C(\text{nchild}, u) \neq 0$. In order to address the potential omitted variable bias we come across with the binary variable boy1, taking the value one in case the first child of the woman is a boy and zero otherwise, and the binary variable $mb1$, taking value 1 if a mother experience a multiple birth in her first pregnancy, and 0 otherwise.

Output 1: OLS estimates using the 662829 observations 1–662829
Dependent variable: hourswork

Variable	Coefficient	Std. Error	t-statistic	p-value
const	3.3660	1.3668	2.46	0.0140
age	1.4447	0.0864	16.73	0.0000
age2	−0.0246	0.0013	−18.38	0.0000
educ	1.3966	0.0216	64.73	0.0000
educ2	−0.0204	0.0017	−12.28	0.0000
Marr	−5.6990	0.0514	−110.81	0.0000
nchild	−4.7962	0.0264	−181.77	0.0000

Mean of dependent variable	16.8049
S.D. of dependent variable	19.0319
Sum of squared residuals	2.18125e+08
Standard error of residuals ($\hat{\sigma}$)	18.1407
Unadjusted R^2	0.0914697
Adjusted $\bar{R}^2$	0.0914615
$F(6, 662822)$	11122.0

Output 2: OLS estimates using the 662829 observations 1–662829
Dependent variable: Marr
Heteroskedasticity-robust standard errors, variant HC1

Variable	Coefficient	Std. Error	t-statistic	p-value
const	0.28190	0.0333	8.46	0.0000
age	0.0267	0.0021	12.63	0.0000
age2	−0.00026	0.00003	−7.95	0.0000
educ	−0.0344	0.0005	−69.07	0.0000
educ2	0.0013	0.00004	31.37	0.0000
mb1	−0.0313	0.0045	−6.91	0.0000
boy1	0.0095	0.0011	8.86	0.0000

Mean of dependent variable	0.732848
S.D. of dependent variable	0.442473
Sum of squared residuals	127184.
Unadjusted R^2	0.0199276
Adjusted $\bar{R}^2$	0.0199187
$F(6, 662822)$	2264.04

Output 3: OLS estimates using the 662829 observations 1–662829
Dependent variable: Marr
Heteroskedasticity-robust standard errors, variant HC1

Variable	Coefficient	Std. Error	t-statistic	p-value
const	0.2875	0.0333	8.62	0.0000
age	0.0266	0.0021	12.60	0.0000
age2	−0.00026	0.00003	−7.93	0.0000
educ	−0.0343	0.0005	−68.94	0.0000
educ2	0.00125	0.00004	31.24	0.0000

Sum of squared residuals	127209.
Unadjusted R^2	0.0197302
Adjusted $\bar{R}^2$	0.0197243
$F(4, 662824)$	3365.33

Output 4: OLS estimates using the 662829 observations 1–662829
Dependent variable: nchild

Variable	Coefficient	Std. Error	t-statistic	p-value
const	−0.67952	0.0640	−10.61	0.0000
age	0.1512	0.0040	37.39	0.0000
age2	−0.00277	0.00006	−44.26	0.0000
educ	0.1909	0.0010	195.41	0.0000
educ2	−0.00633	0.00008	−81.00	0.0000
mb1	0.6616	0.0086	76.71	0.0000
boy1	0.0073	0.0021	3.51	0.0004

Mean of dependent variable	2.06760
S.D. of dependent variable	0.949626
Sum of squared residuals	479046.
Unadjusted R^2	0.198561
Adjusted $\bar{R}^2$	0.198553
$F(6, 662822)$	27369.6

Output 5: OLS estimates using the 662829 observations 1–662829
Dependent variable: nchild

Variable	Coefficient	Std. Error	t-statistic	p-value
const	−0.6882	0.0643	−10.70	0.0000
age	0.1522	0.0041	37.47	0.0000
age2	−0.00278	0.00006	−44.15	0.0000
educ	0.1901	0.0001	193.68	0.0000
educ2	−0.0063	0.00008	−80.40	0.0000

Sum of squared residuals	483299.
Unadjusted R^2	0.191445
Adjusted $\bar{R}^2$	0.191440
$F(4, 662824)$	39235.0

Output 6: TSLS estimates using the 662829 observations 1–662829
Dependent variable: hourswork

Instruments: mb1 boy1

Variable	Coefficient	Std. Error	t-statistic	p-value
const	9.0637	1.8731	4.84	0.0000
age	1.1823	0.1876	6.30	0.0000
age2	−0.0173	0.00241	−7.09	0.0000
educ	0.3205	0.1333	2.40	0.0162
educ2	0.01641	0.0052	3.17	0.0015
Marr	−16.7750	4.6990	−3.57	0.0004
nchild	−1.1354	0.3646	−3.11	0.0018

Sum of squared residuals 2.37224e+08
Standard error of residuals ($\hat{\sigma}$) 18.9183
$F(6, 662822)$ 5867.88

Hausman test –
Asymptotic test statistic: $\chi^2_2 = 234.234$
with p-value = 1.37037e-051

Output 7: OLS estimates using the 662829 observations 1–662829
Dependent variable: hourswork
(NOTE: u_Marr and u_nchild are the residuals from *Outputs 2* and *4*, respectively)

Variable	Coefficient	Std. Error	t-statistic	p-value
const	9.0637	1.7958	5.05	0.0000
age	1.1823	0.1799	6.57	0.0000
age2	−0.0173	0.0023	−7.40	0.0000
educ	0.3205	0.1278	2.51	0.0121
educ2	0.01641	0.0050	3.31	0.0009
Marr	−16.7750	4.50511	−3.72	0.0002
nchild	−1.1354	0.3496	−3.25	0.0012
u_Marr	11.0956	4.50541	2.46	0.0138
u_nchild	−3.6993	0.3506	−10.55	0.0000

Sum of squared residuals 2.18048e+08
Standard error of residuals ($\hat{\sigma}$) 18.1375
Unadjusted R^2 0.0917907
Adjusted $\bar{R}^2$ 0.0917797
$F(8, 662820)$ 8373.72

Universidad Carlos III de Madrid
<u>ECONOMETRICS I</u>
Academic year 2008/09
FINAL EXAM (2nd call)
September, 1, 2009

Exam type: $\boxed{1}$

TIME: 2 HOURS 30 MINUTES

Directions:

- BEFORE YOU START TO ANSWER THE EXAM:
  - Fill in your personal data in the optical reading form, which will be the only valid answering document. Remember that you must complete all your identifiying data (name and surname(s), and **NIU**, which has 9 digit and always begins by 1000) both in letters and in the corresponding optical reading boxes.
  - Fill in, both in letters and in the corresponding optical reading boxes, the course code (10188) and your group (65 or 75).
- **Check that this document contains 60 questions sequentially numbered.**
- Check that the number of exam type that appears in the questionnaire matches the number indicated in the optical reading form.
- Read the problem text and the questions carefully.
  The first 25 questions are referred to Problem 1, and the remaining questions correspond to Problem 2
- For each row regarding the number of each question, fill the box which corresponds with your chosen option in the optical reading form (A, B, C or D).
- **Each question only has one correct answer.**
  Any question in which more than one answer is selected will be considered incorrect and its score will be zero.
- All the questions correctly answered have the same score. Any incorrect answer will score as zero. To obtain a pass (at least 5 over 10) you must correctly answer **35** questions. In the 2nd call (september), no complementary grades obtained during the course are considered.
- If you wish, you may use the answer table as a draft, although such table does not have any official validity.
- You can use the back side of the problem text as a draft (no additional sheets will be handed out).
- **Any student who were found talking or sharing any sort of material during the exam will be expelled out inmediately and his/her overall score will be zero, independently of any other measure that could be undertaken.**

- **Dates of grades publication:** Friday, September, 4.
- **Date of exam revision:** Monday, September, 6 at 15 h (the place will be announced in Aula Global).
- **Rules for exam revision:**
  - Its only purpose will be that each student:
    - check the number of correct answers;
    - handout in writing, if (s)he wants, the possible claims about the problem text and the questions, that will be attended by writing in the next 10 days since the revision date.
  - To be entitled for revision, the student *should bring a printed copy of the exam solutions*, which will be available in Aula Global from the date of grade publication.

ANSWER Draft														
	A.	**B.**		**A.**	**B.**		**A.**	**B.**		**A.**	**B.**		**A.**	**B.**
1.			**13.**			**25.**			**37.**			**49.**		
2.			**14.**			**26.**			**38.**			**50.**		
3.			**15.**			**27.**			**39.**			**51.**		
4.			**16.**			**28.**			**40.**			**52.**		
5.			**17.**			**29.**			**41.**			**53.**		
6.			**18.**			**30.**			**42.**			**54.**		
7.			**19.**			**31.**			**43.**			**55.**		
8.			**20.**			**32.**			**44.**			**56.**		
9.			**21.**			**33.**			**45.**			**57.**		
10.			**22.**			**34.**			**46.**			**58.**		
11.			**23.**			**35.**			**47.**			**59.**		
12.			**24.**			**36.**			**48.**			**60.**		

Problem 1

1. Assume that model (*) satisfies all the assumptions of the classical regression model. The null hypothesis that in households with the same income the enfant's height is independent of the gender is $H_0 : \beta_4 = 0$.

   A. True.

   B. False.

2. Assume that model (*) satisfies all the assumptions of the classical regression model. The null hypothesis that the enfant's height is independent of the gender is rejected at the 10%, but not at the 5%.

   A. True.

   B. False.

3. Assume that model (*) satisfies all the assumptions of the classical regression model. If we estimate model (*) without the variable `EDADM`, the OLS estimator of β_3 will be inconsistent.

   A. True.

   B. False.

4. Assume that model (*) satisfies all the assumptions of the classical regression model. If we exclude the variable `RENTAH` from model (*), the estimated values of the coefficients of the included variables will change in accordance with the correlation of the corresponding variable with the omitted variable `RENTAH`.

   A. True.

   B. False.

5. If household income were measured with error, only the estimators of β_1 and β_5 would be inconsistent.

   A. True.

   B. False.

6. If household income were measured in euros, instead of thousand euros, the R^2 would be unchanged.

   A. True.

   B. False.

7. It could be argued that model (*) omits father's education. Assume that both father's and mother's education have a positive effect on enfants' height, and that spouses tend to exhibit similar education levels. If we consider a model including the variable `EDUCP` (Father's education), in addition to the variables already included in *Output 1*, we would expect the estimated coefficient of `EDUCM` to be even higher than the one obtained in *Output 1*.

   A. True.

   B. False.

8. Assume that model (*) satisfies all the assumptions of the classical regression model. The null hypothesis that the effect of mother's education is independent of the enfant's gender is $H_0 : \beta_4 = 0$.

   A. True.

   B. False.

9. Assume that model (*) satisfies all the assumptions of the classical regression model. The test statistic for the null hypothesis that the enfant's height is independent of the gender is $W^0 \simeq \dfrac{(7715.57 - 7566.77)}{7566.77} \times (269 - 5 - 1)$.

   A. True.

   B. False.

10. Assume that model (*) satisfies all the assumptions of the classical regression model, except conditional homoskedasticity. Then, the conventional estimators of the variances of the OLS estimators will be incorrect.

    A. True.

    B. False.

11. Assume that model (*) satisfies all the assumptions of the classical regression model. If we exclude the variable `RENTAH` from model (*), the estimated values of the coefficients of the included variables would not change substantially, since `RENTAH` is not a relevant variable.

    A. True.

    B. False.

12. The model (*) provides the same estimator, for two siblings with different gender, of the impact of a rise in household income on the mean height.

    A. True.

    B. False.

13. Assume that model (*) satisfies all the assumptions of the classical regression model. Using the appropriate estimates, everything else constant, for a 5-year old girl, the mean height difference if she belongs to a household whose income is 11000 euros in comparison with another household whose income is 10000 euros, is approximately 2.51 cm.

    A. True.

    B. False.

14. If household income were measured with error, the inconsistency bias of the estimators of the coefficients affected will be higher the higher the variance of the measurement error, relative to the variance of income.

    A. True.

    B. False.

15. Assuming that the variables `RENTAFEM` and `RENTAH` are strongly correlated, if we estimate model (*) omitting any of them, the numerical value of the F statistic of joint significance would drop substantially.

    A. True.

    B. False.

16. Assume that model (*) satisfies all the assumptions of the classical regression model. The null hypothesis that the effect of household income is independent of the enfant's gender is $H_0 : \beta_5 = 0$.

    A. True.

    B. False.

17. Assume that model (*) satisfies all the assumptions of the classical regression model. If we estimate model (*) without the variable `EDADM`, it holds that $E\left(u \mid \texttt{RENTAH}, \texttt{EDUCM}, \texttt{FEM}\right) = 0$.

    A. True.

    B. False.

18. Given that 1 centimeter is about 0.4 inches, if instead of using height in centimeters, we used height in inches, the coefficients and their standard errors would be rescaled by a factor of 0.4.

    A. True.

    B. False.

19. Assume that model (*) satisfies all the assumptions of the classical regression model, except conditional homoskedasticity. Then, the conventional OLS estimators of the model parameters will be incorrect.

    A. True.

    B. False.

20. If household income were measured in euros, instead of thousand euros, the OLS estimators of all the coefficients would become transformed.

    A. True.

    B. False.

21. It could be argued that model (*) omits father's education. Assume that both father's and mother's education have a positive effect on enfants' height, and that spouses tend to exhibit similar education levels. Besides, suppose that, when estimating the model with the variable `EDUCP` (Father's education), in addition to the variables already included in *Output 1*, the t statistics of `EDUCP` and `EDUCM` are, respectively, 0.8 and 0.9. Then, we can assert that father's and mother's education are not relevant for enfant height.

    A. True.

    B. False.

22. Assume that model (*) satisfies all the assumptions of the classical regression model, including conditional homoskedasticity, but we use standard errors robust to heteroskedasticity. Then, inference will be incorrect, because such standard errors are inconsistent under homoskedasticity.

    A. True.

    B. False.

23. Given the coefficients for the variable `EDUCM` in *Outputs 1* and *2*, if we ran a simple regression of the variable `EDUCM` on `EDADM`, the coefficient of `EDADM` would be positive.

    A. True.

    B. False.

24. To complement the specification of model (*), we should also include the interaction variable `RENTAMAS` = `RENTAH` $\times$ `MAS`, where `MAS` is a binary variable which equals 1 if the enfant is a boy and 0 if the enfant is a girl.

    A. True.

    B. False.

25. Assume that model (*) satisfies all the assumptions of the classical regression model. The null hypothesis that in households with the same income the enfant's height is independent of the gender is $H_0 : \beta_4 = \beta_5 = 0$.

    A. True.

    B. False.

Problem 2

26. According to the information provided, the OLS estimators of `Marr` and `nchild` will be biased estimators of β_5 and β_6, and therefore we should calculate their corresponding heteroskedasticity-robust standard errors.

    A. True.

    B. False.

27. Using the appropriate output, and keeping everything else constant, a 20 year-old married mother works, on average, about 5.1 hours per week less than a 40 year-old unmarried mother.

    A. True.

    B. False.

28. In case $C(\texttt{mb1}, u) = C(\texttt{boy1}, u) = 0$, $C(\texttt{Marr}, u) \neq 0$ and $C(\texttt{nchild}, u) \neq 0$, to have an over-identified equation it is sufficient to have that $C(\texttt{mb1},\ \texttt{Marr}) \neq 0$ and $C(\texttt{mb1},\ \texttt{nchild}) \neq 0$ simultaneously, or either $C(\texttt{boy1},\ \texttt{Marr}) \neq 0$ and $C(\texttt{boy1},\ \texttt{nchild}) \neq 0$ simultaneously.

    A. True.

    B. False.

29. Using the appropriate output, we can assert that, other things equal, a 31-year old woman works, on average, about 1.18 hours less per week than a 30-year old woman.

    A. True.

    B. False.

30. In case $C(\texttt{mb1}, u) = 0$, $C(\texttt{boy1}, u) \neq 0$, $C(\texttt{Marr}, u) \neq 0$ and $C(\texttt{nchild}, u) \neq 0$, the equation is under–identified, then it should be appropriately estimated by OLS.

    A. True.

    B. False.

31. The null hypothesis that the model is linear in mother's years of education and mother's age is $H_0 : \beta_2 = \beta_4 = 0$.

    A. True.

    B. False.

32. Using the appropriate output, the number of hours worked is increasing with age, for women until the age of 29, whereas for women older than 29, age increases tend to reduce the amount of hours worked.

    A. True.

    B. False.

33. In case $C(\texttt{mb1}, u) = C(\texttt{boy1}, u) = 0$, $C(\texttt{Marr}, u) \neq 0$ and $C(\texttt{nchild}, u) \neq 0$, we will require an additional instrument per endogenous variable to have an over–identified equation.

    A. True.

    B. False.

34. Using the appropriate output, a married mother, 20 years old, with one child, and with 12 years of education, will work, on average, about 14.1 hours per week.

    A. True.

    B. False.

35. Using the appropriate output, we can assert that an increase in education increases the amount of working hours at a decreasing rate.

    A. True.

    B. False.

36. In case $C(\texttt{mb1}, u) = C(\texttt{boy1}, u) = 0$, $C(\texttt{Marr}, u) \neq 0$ and $C(\texttt{nchild}, u) \neq 0$, the equation is identified, everything equal, even if `mb1` were not significant in *Output 4* and `boy1` not significant in *Output 2*.

    A. True.

    B. False.

37. In case $C(\texttt{mb1}, u) = C(\texttt{boy1}, u) = 0$, $C(\texttt{Marr}, u) \neq 0$ and $C(\texttt{nchild}, u) \neq 0$, we will require an additional instrument to have an over–identified equation.

    A. True.

    B. False.

38. In case $C(\texttt{mb1}, u) = C(\texttt{boy1}, u) = C(\texttt{Marr}, u) = 0$ and $C(\texttt{nchild}, u) \neq 0$, we could consistently estimate the model using only one of the instruments. Nevertheless, the resulting estimates would be less efficient than the one that would use both instruments.

    A. True.

    B. False.

39. In case $C(\texttt{mb1}, u) = C(\texttt{boy1}, u) = 0$, $C(\texttt{Marr}, u) \neq 0$ and $C(\texttt{nchild}, u) \neq 0$, the equation is identified, everything equal, even if `mb1` were not significant in *Output 4*.

    A. True.

    B. False.

40. Using the appropriate output, a married mother, 25 years old, with one child, and with 12 years of education, will work, on average, about 27.4 hours per week.

    A. True.

    B. False.

41. Using the appropriate output, and keeping everything else constant, a 20 year-old unmarried mother works, on average, about 13.9 hours per week more than a 40 year-old married mother.

    A. True.

    B. False.

42. If we estimated the same equation as in *Output 6* by OLS, using `Marr` but substituting `nchild` by its corresponding prediction based on the estimates from *Output 4*, the numerical estimation of β_6 would be the same as in *Output 6*, but the numerical estimation of β_5 would differ from the one in *Output 6*.

    A. True.

    B. False.

43. In case $C(\texttt{Marr}, u) = C(\texttt{nchild}, u) = 0$, we could say that the hours worked during the week tend to increase with the years of education, but at a decreasing rate. Nevertheless, the number of hours worked does not decrease with any relevant level of education (less than twenty years).

    A. True.

    B. False.

44. The same 2SLS estimates of the coefficients in *Output 6* could also be obtained estimating the same equation by 2SLS, but using as instruments the corresponding predictions of `Marr` and `nchild` based on *Output 2* and *Output 4*, respectively.

    A. True.

    B. False.

45. If we would want to test for the exogeneity of `Marr` only, we should proceed as in *Output 7*, but excluding `u_nchild`, and use the $t-$statistic of `u_Marr` to implement the exogeneity test.

    A. True.

    B. False.

46. In case $C(\texttt{mb1}, u) = C(\texttt{boy1}, u) = C(\texttt{Marr}, u) = 0$ and $C(\texttt{nchild}, u) \neq 0$, we will have an exactly identified equation, which can be appropriately estimated by OLS.

    A. True.

    B. False.

47. In case $C(\texttt{mb1}, u) = C(\texttt{boy1}, u) = 0$, from *Output 2* to *Output 5*, we conclude from the corresponding statistics values, which are approximately 130.3 and 5884.6, and at the 5% significance level, that `mb1` and `boy1` are valid instruments.

    A. True.

    B. False.

48. According to the information provided, we can equivalently implement the exogeneity test (with a similar value) of `nchild` and `Marr` using *Output 7* and *Output 1*.

    A. True.

    B. False.

49. In case $C(\texttt{mb1}, u) = C(\texttt{boy1}, u) = 0$, from *Output 2* to *Output 5*, we conclude from the corresponding statistics values, which are approximately 2264.0 and 27369.6, and at the 5% significance level, that `mb1` and `boy1` are valid instruments.

    A. True.

    B. False.

50. In case $C(\texttt{Marr}, u) = 0$ but $C(\texttt{nchild}, u) \neq 0$ all parameter estimates from *Output 1* will in general be biased and inconsistent.

    A. True.

    B. False.

51. In case $C(\texttt{Marr}, u) = 0$ but $C(\texttt{nchild}, u) \neq 0$ we can say from *Output 1* that a married woman works on average 5.7 hours less per week than an unmarried woman. Nevertheless, nothing can be said about the impact of the number of children, since its estimated coefficient is inconsistent.

    A. True.

    B. False.

52. According to the information provided, we reject the exogeneity of `nchild` and `Marr` at the 5% significance level, given the value 234 of the χ^2 statistic.

    A. True.

    B. False.

53. In case $C(\texttt{Marr}, u) = C(\texttt{nchild}, u) = 0$, we could say that an increase in the age of the mother, increases the hours worked during the last week but a decreasing rate. Nevertheless, it will not reduce the number of hours at any relevant age (less than sixty five years old).

    A. True.

    B. False.

54. In case $C(\texttt{Marr}, u) \neq 0$ and $C(\texttt{nchild}, u) \neq 0$ but both `Marr` and `nchild` had zero mean and were uncorrelated with all other regressors, which are exogenous, the OLS estimates of β_1, β_2, β_3 and β_4 would be consistent, but not those of β_5 and β_6.

    A. True.

    B. False.

55. Given the information available, we cannot test for the exogeneity of the instruments `mb1` and `boy1`.

    A. True.

    B. False.

56. With the information available, to test that `mb1` is not correlated with u, we would need an additional instrument and perform the usual over-identification test.

    A. True.

    B. False.

57. The null hypothesis that the model is linear in mother's years of education and mother's age is $H_0 : \beta_2 = \beta_4 = 1$.

    A. True.

    B. False.

58. In order to test that `nchild` is not correlated with u, we could eliminate `Marr` from the regression and, since we have two instruments for `nchild`, we could proceed as usual with the over-identification test.

   A. True.

   B. False.

59. The same 2SLS estimates of the coefficients in *Output 6* could also be obtained estimating the same equation by OLS, but substituting `Marr` and `nchild` by their corresponding predictions based on *Output 2* and *Output 4*, respectively.

   A. True.

   B. False.

60. In case $C(\texttt{mb1}, u) = 0$, $C(\texttt{boy1}, u) \neq 0$, $C(\texttt{Marr}, u) \neq 0$ and $C(\texttt{nchild}, u) \neq 0$, independently on the partial correlation of the instruments with `Marr` and `nchild`, neither OLS nor 2SLS will provide consistent estimators.

   A. True.

   B. False.