UNIVERSIDAD CARLOS III DE MADRID
ECONOMETRÍA
FINAL EXAM (Type A)

DURATION: 2 HOURS

Directions:

1. This is an example of a exam that you can use to self-evaluate about the contents of the course Econometrics in OCW, Universidad Carlos III de Madrid, except the two last topics (Heterokedasticity and Autocorrelation).
2. This document is self contained. Your are not allowed to use any other material.
3. Read the problem text and the questions carefully. Each question, unless otherwise 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 outputs, must be used.
4. Each output includes all the explanatory variables used in the corresponding estimation.
5. Some results in the output shown may have been omitted.
6. The dependent variable can vary among outputs within the same problem.
7. 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.
8. OLS, and 2SLS or TSLS, are the corresponding abbreviations of ordinary least squares and two stage least squares, respectively.
9. Statistical tables are included at the end of the problem, before the questions.
10. Each question only has one correct answer.
11. At the end of this document you will find the answer keys of this exam type. Do the exam as if you were sitting it for grade. After that check your answers with the keys given at the end. Do obtain your grade use the following formula:

$$[0{,}21 \times (\#\text{ correct answers}) - 0{,}07 \times (\#\text{ incorrect answers})] + 0{,}34$$

YOUR ANSWERS															
	(a)	(b)	(c)		(a)	(b)	(c)		(a)	(b)	(c)		(a)	(b)	(c)
1.				**13.**				**25.**				**37.**			
2.				**14.**				**26.**				**38.**			
3.				**15.**				**27.**				**39.**			
4.				**16.**				**28.**				**40.**			
5.				**17.**				**29.**				**41.**			
6.				**18.**				**30.**				**42.**			
7.				**19.**				**31.**				**43.**			
8.				**20.**				**32.**				**44.**			
9.				**21.**				**33.**				**45.**			
10.				**22.**				**34.**				**46.**			
11.				**23.**				**35.**							
12.				**24.**				**36.**							

Problem: Determinants of fertility.

We would like to study the determinants of the total number of children a woman has ($KIDS$) at specific moment in time. We are interested in knowing if fertility rates (meaning the average number of children per woman) have changed over time. We have a sample of 476 women from the *General Social Survey* of the National Opinion Research Center (NORC) in the USA for the years 1972, 1978 and 1984.

The characteristics of the woman we are interested in are $EDUC$ (Years of education), AGE (Age, in years), AGE^2 (Age squared), $BLACK$ (Binary variable that takes the value of 1 if the woman is black and 0 otherwise).

Moreover, in order to consider the possibility that fertility rates change over time, we have the variables $YEAR$ (The year corresponding to the observation; this variable takes three possible values: 72, 78 or 84); $Y72$ (Binary variable that takes the value of 1 if the observation corresponds to the year 1972 and 0 otherwise); $Y78$ (Binary variable that takes the value of 1 if the observation corresponds to the year 1978 and 0 otherwise); $Y84$ (Binary variable that takes the value of 1 if the observation corresponds to the year 1984 and 0 otherwise).

Also, we take into account the possibility that there are interactions between $Y78$ and $Y84$ with education, $Y78 \times EDUC$ and $Y84 \times EDUC$, respectively.

The following models are considered to analyze the determinants of the number of children:

$$KIDS = \beta_0 + \beta_1 AGE + \beta_2 AGE^2 + \beta_3 BLACK + \beta_4 EDUC + \beta_5 YEAR + \varepsilon_1 \quad \text{(I)}$$

$$KIDS = \delta_0 + \delta_1 AGE + \delta_2 AGE^2 + \delta_3 BLACK + \delta_4 EDUC + \delta_5 Y78 + \delta_6 Y84 + \varepsilon_2 \quad \text{(II)}$$

$$\begin{aligned} KIDS = \delta_0 &+ \delta_1 AGE + \delta_2 AGE^2 + \delta_3 BLACK + \delta_4 EDUC + \delta_5 Y78 + \delta_6 Y84 \\ &+ \delta_7 Y78 \times EDUC + \delta_8 Y84 \times EDUC + \varepsilon_3 \end{aligned} \quad \text{(III)}$$

We also have two additional variables about the years of education of the father ($FEDUC$) and the mother ($MEDUC$), respectively. Moreover, we know that these variables are not correlated with the errors of the three models considered.

The results of the various estimations are presented below:

Output 1: OLS, using observations 1–476
Dependent variable: $KIDS$

	Coefficient	Std. Error	t-ratio	p-value
const	−2,1966	5.0370	−0,4361	0.6630
AGE	0,4788	0.2178	2,1982	0.0284
AGE^2	−0,0054	0.0025	−2,1862	0.0293
$BLACK$	0,3640	0.2929	1,2429	0.2145
$EDUC$	−0,1381	0.0298	−4,6403	0.0000
$YEAR$	−0,0489	0.0152	−3,2135	0.0014

Mean dependent var	2.67	S.D. dependent var	1.67
Sum squared resid	1197.9	S.E. of regression	1.60
R^2	0.0993	Adjusted R^2	0.0897
$F(5, 470)$	10.36	P-value(F)	1.93e–09

Output 2: OLS, using observations 1–476
Dependent variable: $KIDS$

	Coefficient	Std. Error	t-ratio	p-value
const	−6,0500	4.8054	−1,2590	0.2087
AGE	0,4908	0.2179	2,2518	0.0248
AGE^2	−0,0055	0.0025	−2,2398	0.0256
$BLACK$	0,3814	0.2931	1,3014	0.1938
$EDUC$	−0,1374	0.0298	−4,6184	0.0000
$Y78$	−0,1001	0.1871	−0,5351	0.5929
$Y84$	−0,5794	0.1827	−3,1706	0.0016

Mean dependent var	2.67	S.D. dependent var	1.67
Sum squared resid	1194.3	S.E. of regression	1.60
R^2	0.1020	Adjusted R^2	0.0905
$F(6, 469)$	8.87	P-value(F)	3.48e–09

Coefficient covariance matrix (Output 2)

AGE	AGE^2	$BLACK$	$EDUC$	$Y78$	$Y84$	
0.048	−0.0005	0.0013	0.0007	0.0034	0.0036	AGE
	6×10^{-6}	-1.4×10^{-5}	-7.4×10^{-6}	-3.6×10^{-5}	-3.6×10^{-5}	AGE^2
		0.0859	0	0.0030	0.0012	$BLACK$
			0.0009	−0.0003	−0.0008	$EDUC$
				0.0350	0.0177	$Y78$
					0.0334	$Y84$

Output 3: OLS, using observations 1–476
Dependent variable: $KIDS$

	Coefficient	Std. Error	t-ratio	p-value
const	−6,6862	4.8266	−1,3853	0.1666
AGE	0,4597	0.2182	2,1070	0.0357
AGE^2	−0,0052	0.0025	−2,0936	0.0368
$BLACK$	0,4199	0.2926	1,4349	0.1520
$EDUC$	−0,0308	0.0548	−0,5609	0.5751
$Y78$	1,4262	0.9752	1,4625	0.1443
$Y84$	1,5355	0.9166	1,6752	0.0946
$Y78 \times EDUC$	−0,1249	0.0770	−1,6209	0.1057
$Y84 \times EDUC$	−0,1684	0.0713	−2,3624	0.0186

Mean dependent var	2.67	S.D. dependent var	1.67
Sum squared resid	1179.8	S.E. of regression	1.59
R^2	0.1129	Adjusted R^2	0.0977
$F(8, 467)$	7.43	P-value(F)	2.48e–09

Coefficient covariance matrix (Output 3)

AGE	AGE^2	*BLACK*	*EDUC*	*Y78*	*Y84*	*Y78×EDUC*	*Y84×EDUC*	
−1.04	0.0117	−0.0546	−0.0449	0.008	−0.011	−0.0003	0.0011	*AGE*
0.05	−0.0005	0.0013	0.0003	-8×10^{-5}	1.3×10^{-4}	3.2×10^{-6}	-1.3×10^{-5}	AGE^2
	6×10^{-6}	-1.3×10^{-5}	-3×10^{-5}	0.022	0.0134	−0.0015	−0.0010	*BLACK*
		0.085626	0.0013	0.037	0.0364	−0.0030	−0.0030	*EDUC*
			0.0030	0.951	0.4595	−0.0737	−0.0362	*Y78*
					0.8402	−0.0364	−0.0640	*Y84*
						0.0059	0.0030	*Y78×EDU*
							0.0051	*Y84×EDU*

Output 4: TSLS, using observations 1–476
Dependent variable: *KIDS*
Instrumented: *EDUC*
Instruments: const *AGE* AGE^2 *BLACK* *Y*78 *Y*84 *MEDUC* *FEDUC*

	Coefficient	Std. Error	*z*-stat	p-value
const	−6,1390	5.0506	−1,2155	0.2242
AGE	0,4931	0.2216	2,2247	0.0261
AGE^2	−0,0056	0.0025	−2,2157	0.0267
BLACK	0,3831	0.2946	1,3006	0.1934
EDUC	−0,1344	0.0600	−2,2385	0.0252
*Y*78	−0,1012	0.1880	−0,5381	0.5905
*Y*84	−0,5822	0.1891	−3,0791	0.0021

Mean dependent var	2.67	S.D. dependent var	1.67
Sum squared resid	1194.3	S.E. of regression	1.60
R^2	0.1019	Adjusted R^2	0.0905
$F(6, 469)$	6.15	P-value(F)	3.16e–06

Coefficient covariance matrix (Output 4)

AGE	AGE^2	*BLACK*	*EDUC*	*Y*78	*Y*84	
0.049	−0.0006	0.0025	0.0028	0.0027	0.0017	*AGE*
	6.3×10^{-6}	-2.6×10^{-5}	-3.0×10^{-5}	-2.8×10^{-5}	-1.4×10^{-5}	AGE^2
		0.0868	0.002	0.0024	−0.0002	*BLACK*
			0.0036	−0.0013	−0.0033	*EDUC*
				0.0353	0.0186	*Y*78
					0.0357	*Y*84

Output 5: OLS, using observations 1–476
Dependent variable: $EDUC$

	Coefficient	Std. Error	t-ratio	p-value
const	20,9667	6.4290	3,2613	0.0012
AGE	−0,5603	0.2936	−1,9083	0.0570
AGE^2	0,0063	0.0033	1,8922	0.0591
$BLACK$	0,2407	0.4003	0,6012	0.5480
$Y78$	0,1169	0.2529	0,4621	0.6442
$Y84$	0,3342	0.2485	1,3447	0.1794
$MEDUC$	0,1524	0.0333	4,5704	0.0000
$FEDUC$	0,2436	0.0371	6,5672	0.0000

Mean dependent var	12.71	S.D. dependent var	2.53
Sum squared resid	2170.8	S.E. of regression	2.15
R^2	0.2857	Adjusted R^2	0.2750
$F(7, 468)$	26.74	P-value(F)	7.37e–31

Output 5B: OLS, using observations 1–476
Dependent variable: $EDUC$

	Coefficient	Std. Error	t-ratio	p-value
const	29,7970	7.3227	4,0691	0.0001
AGE	−0,7726	0.3360	−2,2994	0.0219
AGE^2	0,0084	0.0038	2,1926	0.0288
$BLACK$	−0,5606	0.4537	−1,2356	0.2172
$Y78$	0,3604	0.2896	1,2445	0.2139
$Y84$	0,9302	0.2801	3,3214	0.0010

Mean dependent var	12.71	S.D. dependent var	2.53
Sum squared resid	2877.1	S.E. of regression	2.47
R^2	0.0533	Adjusted R^2	0.0433
$F(5, 470)$	5.30	P-value(F)	0.000096

Output 6: OLS, using observations 1–476
Dependent variable: $KIDS$

	Coefficient	Std. Error	t-ratio	p-value
const	−6,1390	5.0559	−1,2142	0.2253
AGE	0,4931	0.2219	2,2223	0.0267
AGE^2	−0,0056	0.0025	−2,2134	0.0274
$BLACK$	0,3831	0.2949	1,2993	0.1945
$EDUC$	−0,1344	0.0601	−2,2361	0.0258
$Y78$	−0,1012	0.1882	−0,5375	0.5912
$Y84$	−0,5822	0.1893	−3,0759	0.0022
$RES5$	−0,0040	0.0692	−0,0572	0.9544

NOTE: $RES5$ are the residuals of Output 5

Mean dependent var	2.67	S.D. dependent var	1.67
Sum squared resid	1194.3	S.E. of regression	1.60
R^2	0.1020	Adjusted R^2	0.0885
$F(7, 468)$	7.59	P-value(F)	1.10e–08

Statistical Tables:

Critical Values $N(0,1)$	
	Acumulated Probability
99,5 %	$2,576$
99 %	$2,326$
97,5 %	$1,960$
95 %	$1,645$
90 %	$1,282$

Critical Values χ^2_m				
		Acumulated Probability		
	m	90 %	95 %	99 %
	1	2,7	3,8	6,6
	2	4,6	6,0	9,2
	3	6,2	7,8	11,3
	4	7,8	9,5	13,3
	5	9,2	11,1	15,1

1. If you only had information about the number of children, the best prediction you can give about the value of this variable (rounding up to two decimals) is:

   a) 2,67.
   b) 1,67.
   c) 2,20.

2. Assume that model (I) verifies the assumptions of the classical regression model. An appropriate estimation of the unconditional variance of the dependent variable is:

   a) 2,79.
   b) 2,56.
   c) 1,60.

3. Assume that model (I) verifies the assumptions of the classical regression model. An appropriate estimation of the variance of the dependent variable (rounding to two decimals), conditional on the explanatory variables is:

   a) 2,79.
   b) 2,56.
   c) 1,60.

4. Assume that model (I) verifies the assumptions of the classical regression model. If the variable $KIDS$ was measured with error, estimates in the Output 1 will be in general:

   a) Consistent.
   b) Less efficient that the ones obtained if the variable $KIDS$ was not measured with error.
   c) None of the other statements are correct.

5. Assume that model (I) verifies the assumptions of the classical regression model. If the variable $KIDS$ was measured with some error, and that error was correlated with some of the explanatory variables, estimations in Output 1 would be:

   a) Inconsistent.
   b) As efficient as the ones obtained if the variable $KIDS$ was not measured with error.
   c) None of the other statements are correct.

6. Assume that model (I) verifies the assumptions of the classical regression model. Consider two women interviewed in the same year, both of them are white and have the same level of education, but one is 40 years old and the other one is 30 years old. The first one will have on average (rounding to the closest integer number):

   a) 5 children more than the second woman.
   b) The same number of children as the second woman.
   c) 1 child more than the second woman.

7. Assume that model (I) verifies the assumptions of the classical regression model. Under the evidence of Output 1, the effect of age on the number of children is:

   a) Constant.

b) Negative for women older than 35 years old.

c) Positive, but marginally decreasing in age for women who are younger than 40.

8. Assume that model (I) verifies the assumptions of the classical regression model. Given the results in Output 1, we can say that fertility rates:

   a) Have remained constant over time.

   b) Have decreased over time.

   c) We do not have enough information to conclude anything.

9. Assume that model (I) verifies the assumptions of the classical regression model. Given the results in Output 1 and keeping all the other factors constant, which of the following statements is FALSE:

   a) A woman in 1978 had on average 0,29 less children than a woman in 1972.

   b) A woman in 1978 had on average 0,05 less children than a woman in 1972.

   c) A woman in 1978 had on average 0,29 more children than a woman in 1984.

10. Comparing the models (I) and (II):

    a) Model (I) is more restrictive, because it imposes that in year 1972 education does not have an impact on the number of children.

    b) Model (II) is less restrictive, because it allows for a given race, age and education, that fertility rates change differently over time.

    c) None of the other statements are correct.

11. Comparing the models (I) and (II):

    a) The models (I) and (II) are different models because none of them is a particular case of the other.

    b) Model (I) imposes the restriction that the coefficients of $Y78$ and $Y84$ are both equal to zero.

    c) Model (I) imposes the restriction that the coefficient of $Y84$ is exactly the double of the coefficient of $Y78$.

12. Using $KIDS$ as dependent variable, consider the models that include a constant, AGE, AGE^2, $BLACK$ and $EDUC$. Indicate which of the following statements is FALSE:

    a) If we would also include $YEAR$ and $Y78$ as explanatory variables and we would estimate by OLS, the R^2 would coincide with the one of Output 2.

    b) If we would also include $YEAR$ and $Y78$ as explanatory variables and we would estimate by OLS, the estimated coefficients of AGE, AGE^2, $BLACK$ and $EDUC$ would coincide with those of Output 2.

    c) If we would also include $YEAR$ and $Y78$ as explanatory variables , the model would be more general than model (I), but it would not be comparable to model (II), because the models impose different restrictions.

13. Assume the error in the model (II) verifies $E\left(\varepsilon_2 \mid AGE, BLACK, EDUC, Y78, Y84\right) = 0$ for any combinations of the values of the explanatory variables, but the homoskedasticity assumption does not hold. Then:

a) The estimated OLS coefficients are inconsistent.
b) The estimated OLS coefficients are unbiased.
c) The Gauss-Markov Theorem is verified.

14. Assume that model (II) verifies the assumptions of the classical regression model. Given the estimated coefficients and for a given race, age and education:

    a) For every 100 women, there are around 58 less children in 1984 than in 1972.
    b) A woman in 1978 has 10 % more children than a woman in 1972.
    c) A woman in 1984 has 58 % less children than a woman in 1972.

15. Assume that model (II) verifies the assumptions of the classical regression model. Given the estimated coefficients, in the year 1972, the mean difference in the number of children between a black woman and a white woman with the same age but with 5 years less of education than the first one is (rounding to one decimal):

    a) 0,4 more children.
    b) 0,3 less children.
    c) 1,1 more children.

16. Assume that model (II) verifies the assumptions of the classical regression model. Given the estimated coefficients, for a 20 year old black woman with 5 years of education, between 1978 and 1984, the mean number of children has decreased (rounding to two decimals) by:

    a) 0,48.
    b) 0,58.
    c) 0,68.

17. Assume that model (II) verifies the assumptions of the classical regression model. Given the estimated coefficients (and rounding to two decimals), for a 20 year old white woman with 10 years of education:

    a) The mean number of children was approximately 0,19 in 1972.
    b) There is not enough information to predict the mean number of children in 1972.
    c) The mean number of children is approximately 6,24.

18. Assume that model (II) verifies the assumptions of the classical regression model. Given the estimated coefficients, the mean difference in the number of children between two women with the same characteristics but one in 1972 and the other in 1978 is:

    a) Significantly different from zero.
    b) Statistically equal to zero.
    c) The question cannot be answered with the information provided in Output 2.

19. In model (II), if you wanted to test whether the mean number of children for a black woman in 1972 with 10 years of education is the same than a white woman in 1972 with the same age but with 12 years of education:

    a) The null hypothesis would be $H_0 : 2\delta_4 - \delta_3 = 0$.
    b) The null hypothesis would be $H_0 : 12\delta_4 - \delta_3 = 0$.

c) The null hypothesis would be $H_0 : 2\delta_4 + \delta_3 = 0$.

20. In model (II), if you wanted to test that the effect of age on the number of children is constant, the null hypothesis would be

    a) $H_0 : \delta_1 = \delta_2 = 0$.
    b) $H_0 : \delta_2 = 0$.
    c) $H_0 : \delta_1 + \delta_2 = 0$.

21. Assume that model (III) verifies the assumptions of the classical regression model. Given the results in Output 3, and taking into account only women younger than 40 years old, indicate which of the following statements is FALSE:

    a) In general, women with lower educational level have on average more children.
    b) Older women have on average more children.
    c) The casual effect of education is the same for all women considered.

22. Assume that model (III) verifies the assumptions of the classical regression model. Given the results in Output 3:

    a) The effect of education does not vary over time.
    b) The effect of education is more negative in 1984 than in 1972.
    c) The effect of education is not statistically different from zero.

23. Assume that model (III) verifies the assumptions of the classical regression model. If we wanted to test that education does not affect fertility:

    a) The null hypothesis would be $H_0 : \delta_4 = 0$.
    b) The null hypothesis would be $H_0 : \delta_4 = \delta_7 = \delta_8 = 0$.
    c) The null hypothesis would be $H_0 : \delta_4 - \delta_7 - \delta_8 = 0$.

24. Assume that model (III) verifies the assumptions of the classical regression model. If we wanted to test that the effect of education on the number of children does not depend on the year, the null hypothesis is:

    a) The null hypothesis is $H_0 : \delta_7 = \delta_8$.
    b) The null hypothesis is $H_0 : \delta_4 = \delta_7 + \delta_8$.
    c) The null hypothesis is $H_0 : \delta_7 = \delta_8 = 0$.

25. Assume that model (III) verifies the assumptions of the classical regression model. If we wanted to test that the year does not affect the number of children:

    a) The null hypothesis is $H_0 : \delta_5 = \delta_6 = 0$.
    b) The null hypothesis is $H_0 : \delta_5 = \delta_6 = \delta_7 = \delta_8 = 0$.
    c) The null hypothesis is $H_0 : \delta_5 = \delta_6 = \delta_7 = \delta_8$.

26. Assume that model (III) verifies the assumptions of the classical regression model. If we wanted to test the hypothesis that the year does not affect the number of children:

    a) It is not rejected, as the p-value of the corresponding statistic is equal to zero.

b) It is rejected given the value of the corresponding statistic obtained when comparing the unrestricted model and the model that imposes the restriction.

c) The question cannot be answered with the provided information.

27. Comparing the models (II) and (III), indicate which of the following statements is FALSE:

a) Model (II) is more restrictive, because it imposes that the effect of education does not depend on time (the year).

b) At the 5 % significance level we would choose Model (II).

c) When estimating model (III) by OLS, we see that education does not longer have a significant effect on fertility.

28. Assuming that models (I) and (II) verify the assumptions of the classical regression model, assume that the variable years of education ($EDUC$) is measured with error. Then

a) Output 1 will provide consistent estimates for the parameters of model (I).

b) Output 2 will provide inconsistent estimates for the parameters of model (II).

c) Output 1 and Output 2 will provide consistent estimates for the parameters of models (I) and (II), respectively.

29. Assume that model (II) verifies the assumptions of the classical regression model. If the education variable ($EDUC$) was measured with error, the inconsistency bias of the estimates of the affected coefficients would be larger:

a) The larger the variance of the measurement error with respect to the education variance.

b) The larger the education variance with respect to the variance of the measurement error.

c) The larger the expected value of education.

30. If education was an endogenous variable, then:

a) The estimated coefficients in Output 1 would be inconsistent for model (I), but those of Output 2 would not be inconsistent for model (II).

b) The estimated coefficients in Output 2 would be inconsistent for model (II), but those of Output 3 would not be inconsistent for model (III).

c) None of the other statements are correct.

31. If education was an endogenous variable, given the available information, we can say that

a) Only the father's education ($FEDUC$) is a valid instrument for $EDUC$.

b) Only the mother's education ($MEDUC$) is a valid instrument for $EDUC$.

c) It would be possible to obtain consistent estimates of the parameters by using only the father's education as instrument.

32. If education was an endogenous variable, in order to test whether two instruments, father's and mother's education, are valid instruments, we would have to:

a) In a regression of $EDUC$ on the exogenous variables of the model and on both instruments, test that these last two variables are jointly significant.

b) Test the hypothesis that the residual of the reduced form (the linear projection of $EDUC$ on the exogenous variables and both instruments) has a significant effect on education.

c) In a regression of $EDUC$ on the exogenous variables of the model and on both instruments, test that these two instruments are individually significant.

33. The 2SLS estimated coefficients in Output 4 could have been obtained in an equivalent way:

    a) Estimating by OLS a model with $KIDS$ as the dependent variable and including as regressors all the exogenous explanatory variables and the prediction of education based on the estimations in Output 5B.

    b) Estimating by OLS a model with $KIDS$ as the dependent variable and including as regressors all the exogenous explanatory variables and the instruments $MEDUC$ and $FEDUC$.

    c) Estimating by OLS a model with $KIDS$ as the dependent variable and including as regressors all the exogenous explanatory variables and the prediction of education based on the estimations in Output 5

34. The 2SLS estimated coefficients in Output 4 could have been obtained in an equivalent way:

    a) Estimating by 2SLS a model with $KIDS$ as the dependent variable and including as regressors all the exogenous explanatory variables and the education, using a prediction based on the estimations in Output 5B as an instrument for education.

    b) Estimating by 2SLS a model with $KIDS$ as the dependent variable and including as regressors all the exogenous explanatory variables and the education, using a prediction based on the estimations in Output 5 as an instrument for education.

    c) None of the other statements are correct.

35. If we want to test whether both father's and mother's education are valid instruments, the value of the test statistic would be

    a) 190,4.

    b) 26,8.

    c) 154,9.

36. If we are certain that all the explanatory variables of model (II), except $EDUC$, are exogenous, and we would have estimated model (II) by 2SLS but using only $MEDUC$ as an instrument for $EDUC$, the estimates obtained for the parameters of model (II):

    a) Would be inconsistent.

    b) Would be less efficient than the 2SLS estimates in Output 4.

    c) We cannot obtain consistent 2SLS estimates if we only have one instrument.

37. The information provided in Output 6 allow us to know whether:

    a) We can reject the null hypothesis that education is exogenous.

    b) We can reject the null hypothesis that the instruments are valid.

    c) None of the other statements are correct.

38. Given the results in Output 6:

    a) We do not reject that $EDUC$ is exogenous.

    b) We do not reject that the correlation between the instruments and $EDUC$ is zero.

c) We do not reject that the correlation of the instruments with the error of model (II) is zero.

39. Suppose that we are interested in model (II). Consider the following statement: "In 1972, the fertility rate of a 30 year old black woman is equal to the fertility rate of a white woman of the same age but with 8 years less of education". Given the results (rounding to one decimal):

    a) The test statistic is approximately $t = -1{,}2$.

    b) The test statistic is approximately $t = -1{,}9$.

    c) The test statistic is approximately $t = 3{,}9$.

40. Suppose that we are interested in model (II). Consider the following statement: "In 1972, the fertility rate of a 30 year old black woman is equal to the fertility rate of a white woman of the same age but with 8 years less of education". Given the results obtained:

    a) At the 1 % significance level, we can reject the above statement.

    b) We can reject the above statement at the 10 % significance level, but we cannot at the 5 % significance level.

    c) We cannot reject the above statement at the 10 % significance level.

41. Let's focus on model (II):

    a) The model is misspecified, as it omits the variable $Y72$.

    b) Model (I) is a particular case of model (II).

    c) None of the other statements are correct.

42. Suppose that we are interested in model (II). Consider the following conjecture: "For a given race and educational level, the decrease in the fertility rate is constant over time". Indicate which of the following statements is false:

    a) If the conjecture is true, model (II) could be represented as model (I).

    b) At the 5 % significance level, we cannot reject the above conjecture.

    c) We do not have enough information to evaluate the above conjecture.

43. Comparing the models (I) and (II), model (II) can be expressed as model (I) with the following restriction:

    a) $\delta_5 = \delta_6$.

    b) $\delta_6 = 2\delta_5$.

    c) $\delta_6 = 6\delta_5$.

44. Assume that model (III) verifies the assumptions of the classical regression model. If we wanted to test whether the effect of education for a women observed in 1978 is the same than the one observed in 1984, the null hypothesis would be:

    a) $\delta_7 = \delta_8 = 0$.

    b) $\delta_7 = \delta_8$.

    c) $\delta_4 = \delta_7 = \delta_8$.

45. Assume that model (III) verifies the assumptions of the classical regression model. If we wanted to test whether the effect of education on women observed in 1978 is the same as on women observed in 1984, the test statistic (rounding to one decimal) would be:

   a) $-1{,}6$.
   b) $-2{,}4$.
   c) 0,6.

46. Assume that model (III) verifies the assumptions of the classical regression model. If we wanted to test the null hypothesis that the effect of education on women observed in 1978 is the same as on women observed in 1984, we can conclude that:

   a) We reject the null hypothesis at the 5 % significance level.
   b) We reject the null hypothesis at the 10 %, but we do not reject it at the 5 % significance level.
   c) We do not reject the null hypothesis at the 10 % significance level.

Answer Keys to exam type A

1	A
2	A
3	B
4	B
5	A
6	C
7	C
8	B
9	B
10	B
11	C
12	C
13	B
14	A
15	B
16	A
17	A
18	B
19	A
20	B
21	C
22	B
23	B
24	C
25	B
26	C
27	C
28	B
29	A
30	C
31	C
32	A
33	C
34	B
35	C
36	B
37	A
38	A
39	B
40	B
41	B
42	C
43	B
44	B
45	C
46	C