أسئلة الأمتحانات النهائية
الفصل الاول

الدور الاول
الدراسات العليا / الماجستير

قسم الإحصاء
العام الدراسي ٢٠٢٣ - ٢٠٢٤

University of Basra
Collage of Management And Economic
Program: M. Sc. In statistics

Subject: Experiment Design
Time: 3 hrs.
Date: 7 / 1 / 2024
Exam: first semester exam
Academic Year: 2022/2023

***Remark : Answer 7 questions only**

Q1/ for the information

$$y_1.. = 305; y_2.. = 360; y_3.. = 415; \ y_{ijk}^2 = 45096$$

Suppose that for each experiment unit there are three observations. Complete the ANOVA table

s.o.v	d.f	S.S	M.S	F
	2	558		
	6	5		33
S. error	18			
Total	26			

Q2/ / Two drug each have two levels is injected into 12 randomly selected animals (have same age), 3 blood sample are taken from each animal

i. Give are appropriate linear model defining all terms?

ii. Key out of anova given sources of variation, degree of freedom, s.s and Mse.

Q3/ if you have the system of partial confounded

I		II		III		IV	
(1)	a	(1)	b	(1)	a	(1)	a
ab	b	bc	c	ac	c	ab	b
c	ac	a	ab	b	bc	ac	c
abc	bc	abc	ac	abc	ac	bc	abc

i- Gave an main effect or interaction which confounded

ii- Gave an compare of information if you have no confounded

iii- Gave the efficiency of the partially confounded

Q4/ For 2^7 experiment factorial,.Give the component of block

i. If you have block of size 2^6

ii. If you have block of size 2^4

Q5/ Consider the linear model for experiment contact by use CRD

$$y_{ijk} = \mu + t_i + \beta_j + (\tau\beta)_{ij} + \epsilon_{ijl} \quad i = 1,2 \ldots.,5; j = 1,2, \ldots,9; k = 1,2 \ldots,5$$

i- Give the variance of y_{184} observation.

ii- Give an outline to ANOVA table including $E(M.S)$

Q6/ set out schemes for running a 2^4 factorial design in

i) Two blocks of eight runs

ii) Four blocks of four runs

Mention any assumptions you make and then give the ANOVA table for (ii)

Q7/ answer on the following

i- Let $y_{ij} = \mu + t_i + \epsilon_{ij}$ prove that $\sum_{ij}[(y_{ij} - \bar{y}_{i\cdot})(\bar{y}_{i\cdot} - \bar{y}_{\cdot\cdot})] = 0$

ii- If $y_{ij} = \mu + \alpha_i + \tau_j + \beta_k + \epsilon_{ijk}$ prove that

$$SS_T = SS_{Row} + SS_{column} + SS_{treatment} + SS_E$$

Q8\ answer on the following

i- Write the true responses of the treatment combinations $a_i b_j c_k$ in term of main effects and infractions.

ii- Show that for the 2^4 factorial the main effects and interactions represent a complete set of orthogonal contrasts among the 16 treatment combinations.

GOOD LUCK

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University of Basra
Collage of Management And Economic
Program: M. Sc. In statistics

Subject: Linear Model
Time: 3 hrs.
Date: 2/3/2024
Exam: first semester exam
Academic Year: 2023/2024

*Remark : Answer only five questions, for each question (14) degrees

Q1\\ A: Correct the following statements.

1. If $H_0 : \beta_2 = 0$ is true, we would expect $SS(\beta_2 \backslash \beta_1)$ to be small so that SST is composed mostly of SSR(reduced) and SSE.

2. If the system of equations $Ax = c$ is consistent, then all possible solutions can be obtained when use all possible values of A^- in $x = A^-c$ if $c \neq 0$.

3. Assuming the x's stay constant if the estimate of the slope increases from one sample to another, the estimate of the intercept tends to decrease.

4. If $\lambda = 0$, then $(A - \lambda I)x = 0$ becomes $Ax = 0$, which has solutions for x because A is singular, and the columns are therefore linearly dependent.

5. If A and B are n x n or if A and B are p x n respectively, when x is an eigenvector of AB, then Bx is an eigenvector of BA.

6. Let A be a px p positive definite matrix and let B be a k xp matrix. of rank k > p or if rank(B) = r, where r < k and r < p, then BAB' is positive definite.

7. The distribution of u away for approaches normality very slowly as n increases.

B: If y is $N_p(\mu, \Sigma)$, then $\text{cov}(y, y'Ay) = 2\Sigma A\mu$

Q2\\ A: Choose the correct answer to fill in the following blanks.

1. If $\rho^2_{y/x} = 0$, the expected value of R^2 is given by.....

a. $E(R^2) = 1 - \frac{|R|}{|R_{xx}|}$ b. $E(R^2) = \frac{k}{n-1}$ c. $E(R^2) = 1 - \frac{1}{r^{yy}}$ d. Not from the above

2. If y is $Np(\mu, \sigma^2 I)$, then $y'Ay/\sigma^2$ is..... if and only if A is idempotent of rank r.

a. $\chi^2(r, \mu'A\mu/\sigma^2)$ b. $\chi^2(r, \mu'A\mu/2\sigma^2)$ c. $\chi^2(r, \mu'A\mu/\Sigma)$ d. Not from the above

3. If $\hat{r}_{yz}$ is close to r_{yz}, the contribution of z is ..... r^2_{yz}.

a. less than b. more than c. equle d. Not from the above

4. If $\beta_0 \neq 0$, then ..... since $X_c'X_c$ is positive definite, and we expect F to exceed.

a. $E(SSR/k) < \sigma^2$ b. $E(SSR/k) > \sigma^2$ c. $E(SSR/k) = \sigma^2$ d. Not from the above

5. If the side conditions are used only to obtain estimates and are not imposed on the parameters, then α_1 is ....., and does not estimate a parameter according .

a. not square b. not unique c. not symmetric d. Not from the above

6 . The predicted value $\hat{y}$ is ..... to a full-rank linear transformation on the $x's$

a. invariant b. variable c. fixed d. Not from the above

7. Then X_1 in the reduced model contains all the columns of X except the .....

a. first b. middle c. last d. Not from the above

B: Let $u = \ln|Z|$ where Z is a $p \times p$ positive definite matrix. Then $\frac{\partial \ln|Z|}{\partial Z} = 2Z^{-1} - diag\ Z^{-1}$

Q3\\ Choose the correct answer with clarification when choosing.

1. $Var(y/x)$ **can be expressed in terms of** $\rho^2_{y/x}$ **As follows:**

a. $\text{var}(y/x) = \sigma^2_{xy}(1-\rho^2_{y/x})$ b. $\text{var}(y/x) = \sigma^2_{yy}(1-\rho^2_{y/x})$ c. $\text{var}(y/x) = \sigma_{yy}(1-\rho^2_{y/x})$

2.The deleted vector $\hat{\beta}_{(i)}$ **can be found without actually deleting** (y_i, x_i') **since**

a. $\hat{\beta}_{(i)} = \hat{\beta} - (\hat{\varepsilon}_i/1-h_{ii})(X'_{(i)}X_{(i)})^{-1}x_i$

b. $\hat{\beta}_{(i)} = \hat{\beta} - (\hat{\varepsilon}_{(i)}/1-h_{ii})(X'_{(i)}X_{(i)})^{-1}x_i$

c. $\hat{\beta}_{(i)} = \hat{\beta} - (\hat{\varepsilon}_i/1-h_{ii})(X'X)^{-1}x_i$

3. If $\text{cov}(\hat{\beta}_1)$ **to the full model, be** $\text{cov}(\hat{\beta}_1^*)$ **to the estimator from the reduced model. Then** $\text{cov}(\hat{\beta}_1) - \text{cov}(\hat{\beta}_1^*)$ **equal**

a. $\sigma^2 ABA^{-1}$ b. $\sigma^2 A'B^{-1}A$ c. $\sigma^2 AB^{-1}A'$

4. Let $u = \mathbf{x}'\mathbf{A}\mathbf{x}$, where $\mathbf{A}$ is a symmetric matrix of constants. Then

a. $\frac{\partial u}{\partial X} = 2X'AX$ b. $\frac{\partial u}{\partial X} = 2AX$ c. $\frac{\partial u}{\partial X} = 2A'XA$

Q4\\ If y is $N_n(X\beta, \sigma^2 I)$, then the F test for H0 : $C\beta = 0$ in $F = \dfrac{SSH/q}{SSE/(n-k-1)}$ **is equivalent to the likelihood ratio test. Prove that?**

Q5\\ The matrix $H - H = X(X'X)^{-1}X' - X_1(X_1'X_1)^{-1}X_1'$ **is idempotent with rank h, where h is the number of elements in** β_2.

Q6\\ If $\mu_y = \begin{pmatrix} 1 \\ 2 \\ 3 \\ -2 \end{pmatrix}$, $\Sigma = \begin{bmatrix} 4 & 2 & -1 & 2 \\ 2 & 6 & 3 & -2 \\ -1 & 3 & 5 & -4 \\ 2 & -2 & -4 & 4 \end{bmatrix}$, **find the distribution of (y1/y2,y3,y4)**

GOOD LUCK

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University of Basra
Collage of Management And Economic
Program: M. Sc. In statistics

Subject : Statistical inference
Time: 3 hrs.
Date: 10/1/ 2024
Exam: first semester exam
Academic Year: 2023/2024

*Remark : Answer 5 questions only

Q1/ let $S_1^2, S_2^2, \dots, S_k^2$ denote k samples variances based on random sample of size $n_1, n_2, .., n_k$ respectively. How would you combine several sample variances to obtain a single unbiased estimate of population variances?

Q2/ let $X_1, X_2, \dots, X_n$ denote a r.s. from sample an exponential density $f(x,\theta) = \theta e^{-\theta x}\ ; x > 0\ , \theta > 0$. Show that the sample mean is a minimum variance estimator of the mean of the distribution $\frac{1}{\theta}$.

Q3/ let X be $N(0, \sigma^2)$ what is the probability that the random interval $(|x|, |10x|)$ includes the point σ and what is the expected value of the length of this random interval?

Q4/ let $X_1, X_2, \dots, X_n$ be i.i.d r.s. from $N(\theta, 100)$ to test $H_0: \theta = 100\ vs\ H_1: \theta = 105$. Assume $\alpha = 0.01\ , \beta = 0.05, Z(0.05) = 1.64\ and\ Z(0.01) = 2.33$ to determine the sample size n.

Q5/ Let $X_1, X_2, \dots, X_n$ be a r.s. of size n drawn from the density

$$f(x;\alpha,\beta) = \frac{\beta^\alpha}{\Gamma\alpha}\, x^{\alpha-1}\, e^{-x\beta}\ ; x > 0\ , \alpha, \beta > 0$$

Find the moment estimators for α, β .

Q6/ A- Explain the Bayesian method of estimation and explain the difference between it and traditional methods

B- what do you mean by Fisher Information $I(\theta)$,write its form.

C- Define Type I errors and type II errors

GOOD LUCK

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University of Basra
Collage of Management And Economic
Program: M. Sc. In statistics

Subject : Econometrics
Time: 3 hrs.
Date: 13/ / 2024
Exam: first semester exam
Academic Year: 2023/2024

*Remark : Answer all the questions

Q1 / (15 Marks)

A / What is the meant of seemingly unrelated regression , explain .

B / What is the meant of dummy variables , explain .

C / Discuss briefly the Rational Expectation used information report .

Q 2 / (10 Marks)

Define the prodution function , then State its most important conditions , indicting its first derivative , and what it means, then how can production be maximized ? And if you have the following regression equation is estimated as a production function :

Ln Q = 1.37 + 0.632 Ln K + 0.452 Ln L , $R^2 = 0.98$

s.e (0.257) (0.219) , cov (b1, b2) = 0.055

Test the following hypotheses . Note : The problem does not give the number of sample observation .

Q 3 / (10 Marks)

Consider the Keynesian model given by:

$C_t = a_0 + a_1 Y_t + a_2 C_{t-1} + U_1$ Where : C : consumption

$I_t = b_0 + b_1 R_t + b_2 I_{t-1} + U2$ Y : Income , I : Investment

$R_t = c_0 + c_1 Y_t + c_2 M_t + U3$ R : rate of interest , M : money supply

$Y_t = C_t + I_t + G_t$ G : government expenditures

(a) Find Identification for first and second equation .

(b) Find reduced form for this model .

Q 4 / (10 Marks)

If you have this information about this model :

$Yi = a_0 + a_1 Xi + Ui$, For estimating a_0 , a_1 taking this data

Yi = 0, -1 , 0 , 0
Xi = 0, 0, 0 , 1

Put this case in general linear model form and calculate the variance and covariance matrix using a sample variance equal to 2.25 .

Q 5 / (15 Marks)

A / Explain what the following terms mean ; when an estimator is consistent , unbiased , linear , and efficient .

B / Explain the types of lagged variables .

Q 6 / (10 Marks)

Answer (T) OR (F) and corrcted the F .

1 – The comparison between econometric models is to use the criterion of the best variance of the estimated parameters if the goal of the model is future prediction .

2 – The restricted least sguares method gives baised estimators , but it is efficient compared to the ordinary least squares method .

3 -If there are many variables omitted from the estimated model , they trend in the same direction as the varible included in the model and lead to the autocorrelation problem .

4- In sample of 50 data , with 4 explanatory variables and durbin- watson = 1 when d_L = 1.2 , $d_u = 1.4$ the model have negative autocorrelation .

5- If that R^2 is high and F - test is good but t - test for some parameters is not significant that's mean problem of multicollinearity .

6 - When we used Dummy variables (dependent or independent) in the model the effect explained on intercept only .

GOOD LUCK

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University of Basrah
Collage of Management And Economic
Program: M. Sc. In statistics

Subject : programing
Time: 3 hrs.
Date: 16 / 1 / 2024
Exam: first semester exam
Academic Year: 2022/2023

*Remark : Answer five questions only

Q1/ Write a program to estimate simple linear regression parameters according to the least squares method if you know that: (14 marks)

Xi	3	5	2	9	8	5	1
Yi	11	22	15	16	17	18	12

$$\widehat{B1} = \frac{\sum_{i=1}^{n} XiYi - \frac{\sum Xi \sum Yi}{n}}{\sum_{i=1}^{n} Xi^2 - \frac{(\sum Xi)^2}{n}} \quad , \quad \widehat{B0} = \overline{Y} - \widehat{B1}\overline{X}$$

Q2/ *If* $Y = (\frac{X-1}{X}) - \frac{1}{3}(\frac{X-1}{X})^3 + \frac{1}{5}(\frac{X-1}{X})^5 - \frac{1}{7}(\frac{X-1}{X})^7 + \frac{1}{9}(\frac{X-1}{X})^9 - \frac{1}{11}(\frac{X-1}{X})^{11}$

Write a program to compute Y and then find $\overline{X}$ and $\overline{Y}$ to 20 Values of X.

(14 marks)

Q3/ If $R \sim EXP(0.2)$ *and* $ui \sim N(0,1)$ *and let* $Xi = 3(1 - log(R))^{0.5}$ *then* : Write a program to compute Yi where : $Yi = log(Xi) + ui$ *and compute* $\overline{X}$ and $\overline{Y}$. (14 marks)

Q4/ let $xi \sim N(0,1)$ *and* $Yi = 2xi + 2$, $i = 1, 2, \dots, 30$ Write a program to plot (X,Y) With font size 5 . (14 marks)

Q5/ Write a program to compute y where: (14 marks)

$$y = \begin{cases} X & if \quad X = 1 \\ X + 1 & if \quad X = 2 \\ 2X + 2 & if \quad O.W \end{cases}$$

Q6/ *If* $X1 \sim EXP(0.1)$ *and* $X2 \sim EXP(0.2)$, $n1 = sample\ size\ of\ X1\ is\ 50$ $n2 = sample\ size\ of\ X2\ is\ 50$ then write a program to Test the hypothesis : $H0: \overline{\mu 1} = \overline{\mu 2}$ V.S. $H1: \overline{\mu 1} \neq \overline{\mu 2}$ by t- test where :

$$t = \frac{\overline{X1} - \overline{X2}}{\sqrt{\frac{\sum(X1-\overline{X1})^2 + \sum(X2-\overline{X2})^2}{n1+n2-2}(\frac{1}{n1}+\frac{1}{n2})}}$$ and t-table is 4.7 (14 marks)

GOOD LUCK

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University of Basra
Collage of Management And Economic
Program: M. Sc. In statistics

Subject : English
Time: 3 hrs.
Date: 18 /1 / 2024
Exam: first semester exam
Academic Year: 2022/2023

*Remark : Answer ALL questions

Q1/ Select the correct choice from each sentence below. ANSER ONLY 10. (10 MARKS):

1. The teacher _____ the students' assignments to evaluate their understanding of the topic. (**ASSESS**: Simple Present)

Has assessed	Is assessing
assesses	Has been assessing

2. The professor _____ the complex process of photosynthesis in detail to her students during the lecture. (**DESCRIBE**: Present Continuous)

Has been describing	has described
is describing	describes

3. The book _____ the historical events with detailed diagrams and maps, making them easier to comprehend. (**ILLUSTRATE**: Present Perfect)

has been illustrating	Illustrates
has illustrated	Is illustrating

4. Scientists _____ the samples from the archaeological site for several weeks to determine their age and origin. (**EXAMINE**: Present Perfect Continuous)

have examined	Is examining
examines	have been examining

5. We _____ several uncharted territories during our expedition last summer. (Simple Past)

explored	Had been exploring
Were exploring	Had explored

6. He _____ the main points of his presentation when the fire alarm started ringing, interrupting the meeting. (**SUMMARY**: Past Continuous)

was summarizing	Had been summarizing
Summarized	Had summarized

7. They _____ a new approach to the problem, which was later accepted, long before the deadline. (**PROPOSE**: Past Perfect)

had proposed	Was proposing
Proposed	Had been proposing

8. He _____ his decision with various reasons since the meeting concluded, trying to convince his colleagues of its validity. (**JUSTIFY**: Past Perfect Continuous)

had justified	had been justifying

is justifying	justified

9. She _____ on her ideas in the next chapter of her book. (**ELABORATE**: Simple Future)

will elaborate	will be elaborating
will have elaborated	will have been elaborating

10. In our next session, we _____ about potential outcomes based on the current trends in the data. (**HYPOTHESIZE**: Future Continuous)

will have been hypothesizing	will be hypothesizing
will have hypothesized	will hypothesize

11. By the end of the seminar, the speaker _____ the findings to apply them to broader contexts. (**GENERALIZE**: Future Perfect)

will have been generalizing	will generalize
will be generalizing	will have generalized

12. By the time the conference ends tomorrow, the scientist _____the outdated theory for several hours, presenting new evidence and arguments. (**RETURN**: Future Perfect Continuous)

Will return	Will have returned
will have been refuting	Will be returning

Q2/ Fill in the following spaces with a suitable word from your textbook (20 MARKS):

Wales is in northern Europe. It is **(i)** _____ of the United Kingdom. It **(ii)** _____ England to the east and has the Irish Sea on the west. Wales was **(iii)** _____ by England for many centuries, but in 1999 its own **(iv)** _____ Assembly was created. Farming and **(v)** _____ are important parts of its economy Tourists come to Wales to see its many **(vi)** _____ castles, to walk and **(vii)** _____ in its beautiful **(viii)** _____, or to walk along its wild **(ix)** _____. Although most people speak English, both Welsh and English are the official **(x)** _____

Q3/ Re-write the following sentence with the required verbs and tenses. <u>ANSER ONLY 10</u>. (20 MARKS):

A) By the end of the seminar next month, they _____ the proposed policy changes for over three hours, highlighting all possible drawbacks. (**CRICTRIZE**: Future Perfect Continuous).	**B)** By this time next week, I _____ the entire novel for our book club discussion. (**SYNOPSIZE:** Future Perfect).
C) Tomorrow at this time, I _____ the complex parts of our proposal to ensure everyone understands our objectives. (**CLARIFY**: Future Continuous).	**D)** I _____ the key terms at the beginning of my lecture tomorrow. (**DEFINE**: Simple Future).
E) She _____ the data for several hours before she finally understood the underlying patterns. (**INTERPRET**: Past Perfect Continuous).	**F)** By the time the meeting began, she _____ her argument with extensive statistical data.

	(**SUPPORT**: Past Perfect).
G) She _____ her theory by conducting a series of complex experiments when the power outage occurred. (**PROVE**: Past Continuous).	H) She _____ a new technique in her workshop yesterday that captivated the entire audience. (**DEMONSTRATE**: Simple Past).
I) We _____ the implications of climate change on marine biodiversity for the past two hours. (**DISCUSS**: Present Perfect Continuous).	J) The professor _____ the complex theory in such a way that even beginners can understand it. (**EXPLAIN**: Present Perfect).
K) I _____ the economic policies of two different countries to understand their impacts on global trade. (**COMPARE**: Present Continuous).	L) The scientist _____ the chemical composition of the sample to determine its properties. (**ANALYZE**: Simple Present).

Q4/ Select the correct choice from the words in the following table to fill in the spaces below (10 MARKS):

official.	*independent.*	*Equator.*	*often.*	*island.*
Ocean.	*historic.*	*Republic.*	*attractions.*	*Desert.*
business.	*Kingdom.*	*wonderful.*	*mining.*	*destination.*

The **(a)** _____ of Morocco is a country in North Africa. It has the Atlantic **(b)** _____ to the west, the Mediterranean Sea to the north, Algeria to the east, and Western Sahara to the south. It became an independent kingdom in 1956. Its economy depends on **(c)** _____ and tourism. Morocco's **(d)** _____ include the **(e)** _____ city of Fez, the **(f)** _____ beaches on the Atlantic and Mediterranean, and the Sahara **(g)** _____. Arabic is the **(h)** _____ language, although French is **(i)** _____ used for **(j)** _____.

Q5/ Write an 150 words essay about either A or B: (10 MARKS)

A- The Impact of Social Media on Modern Communication: Explore how social media platforms have changed the way we communicate and form relationships in the modern era.

B- Climate Change and Its Effects on Our Planet: Discuss the causes of climate change, its impact on the environment, and what can be done to mitigate these effects.

GOOD LUCK

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