أسئلة الأمتحانات النهائية

الدور الثاني

الدراسات العليا / الماجستير

قسم الإحصاء

العام الدراسي ٢٠٢٢-٢٠٢٣

Republic of Iraq
Ministry of Higher Education and Scientific Research
University of Basra
College of Administration & Economics
Department of statistics

Subject: Advanced probability \ M.S \ Date: 14/9/ 2023
Final exam : the Second semester 2022/2023

Q1) A) A man is dealt 4 spade cards from an ordinary deck of 52 cards. If he is given three more cards, find the probability that at least one of the additional cards is also a spade. (7 degree)

Q1) B) Let F be the distribution function of an arbitrary random variable R . Proof that $\lim_{x \to x_0^+} F(x) = F\{x_0\}$ (7 degree)

****

Q2) A) Suppose that 16% of an insurance company's automobile policyholders are male and under the age of 25, while 12% are female and under the age of 25. The following table lists the percentages of various groups of policyholders who were involved in a car accident last a year.

Group	Male Under 25	Female Under 25	Between 25 and 65	Over 65
Percentage of Accidents	20%	8%	5%	10%

Find the range of the percentages of this company's policyholders who got involved in a car accident during the previous year. (7 degree)

Q2) B) Let {A1,A2, . . . ,An} is a sequence of mutually exclusive events.Proof that $P(\cup_{i=1}^{n} A_i) = \sum_{i=1}^{n} P(A_i)$ (7 degree)

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Q3) A) in a game, Emily gives Harry three well-balanced quarters to flip. Harry will get to keep all the ones that will land heads. He will return those landing tails. However, if all three coins land tails, Harry must pay Emily two dollars. Find the expected value and the variance of Harry's net gain.

(7 degree)

Q3) B) Let F be the distribution function of an arbitrary random variable R . Proof that $\lim_{x \to \infty} F(x) = 1$ (7 degree)

يتبع لطفاً ←

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Subject: Advanced probability \ M.S \ Date: 14/ 9/ 2023
Final exam : the Second semester 2022/2023

Q4) A) A company has 450 ships, if on average one ships is lost in the sea for every 150 ships, what is the probability that at least two ships are lost to the company? (7 degree)

Q4) B) Let F be the distribution function of an arbitrary random variable R . Proof that $\lim_{x \to -\infty} F(x) = 0$ (7 degree)

****

Q5) A) Urns I, II, and III contain three pennies and four dimes, two pennies and five dimes, three pennies and one dime, respectively. One coin is selected at random from each urn. If two of the three coins are dimes, what is the probability that the coin selected from urn I is a dime. (7 degree)

Q5) B) suppose that there exist N families on the earth and that the maximum number of children a family has is c. For j = 0, 1, 2, . . . , c, let α_j be the fraction of families with j children $\left(\sum_{j=0}^{c} \alpha_j = 1\right)$. *A child* is selected at random from the set of all children in the world. Let this child be the K th born of his or her family; then K is a random variable. Find E(K). (7 degree)

****

Good Luck

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Prof.ASS. Dr.DURAID.H. BADR

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Prof. ASS. Dr. Bahaa A.

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

Subject : Econometrics
Time: 3 hrs.
Date: / / 2022
Exam: one semester exam
Academic Year: 2022/2023

Q1 / (12 Marks)

A / Consider the model given by:

Y1 = 3Y2 – 2X1 + X2 + U1 ..... (1)

Y2 = Y3 + X3 + U2 .....(2)

Y3 = Y1 + Y2 -2X3 +U3 .....(3)

Find Identification for first and second equations .

What is the procedure of Glejser test indictor of hetroscdasticity problem . /B

Q 2 / Chose the correct answer . (13 Marks)

1- The effect of perfect multicollinearity problem is :

(a) parameters unbiased but not efficiency . (b) Biased and not efficiency.

(c) you can determine the effect of explanotary variables on dependent variable Y

2 - In sample of 50 data , with 4 explanatory variables and durbin- watson = 1.05 when d_L = 1.285 $d_u = 1.721$ the model have :

(a) positive autocorrelation . (b) negative autocorrelation .

(c) durbin - watson test is failing .

3 - 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 :

(a) multicollinearity . (b) hetroscedastisty .

4 - Farrar- Glauber - test depend on $\chi 2$ with ( ) to detecting multicollinearity .

(a) (n – K) / 2 degree of freedom. (b) K (K-1) / 2 degree of freedom.

(c) (K-1)/2 degree of freedom .

5 - We say that B1 is significant and we accepted Ho : B1 = 0 when ;

(a) t $B_1 > t_c$ (b) t $B_1 < t_c$.

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6 – For this information, $\sum d^2 = 23.5$, n = 5 , Spearman Rank Correlation (r_s) =?

(a) = - 0.175 (b) = - 1.175 (c) = 0.175

7 – If this hypothesis $E(u_i\ u_j) \neq 0$; the problem is :

(a) Multicollinearity. (b) Hetroscdastisty . (c) Autocorrelation .

8 - The expected value of error term equal zero when :

(a) mean did not correlated with the values of independent variable .

(b) mean that no correlation between $u_i u_j$.

(c) mean some values negative ,some positive and other zero values .

9 – The equation may be at over identification if :

(a) (K – G) ≥ (M-1) (b) (K – M) ≥ (G -1) (c) (M– K) ≥ (G – 1)

10 - If you have this model Y = 1506 + 229 D + 0.6 X , Where X : Years of experience , D = 0 (a local university graduate) and D = 1 (for American university) , it's clear that a person from American university get income ( ) a local university graduate .

(a) less than (b) biggest (c) the model does not give the information

Q 3 / (15 Marks)

A / What is the meant of seemingly unrelated regression .

B / What is the meant of robust regression , explain .

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

Q 4 / (15 Marks)

Consider the Keynesian model given by: /A

$C_t = a_1 + a_2 Y_t$ +U1

$I_t = b_1 + b_2 Y_t + b_3 G_{t-1}$ + U2

$Y_t = C_t + I_t + G_t$

Where : C : consumption

Y : Income , I : Investment

G : government expenditures

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Find reduced form for this model and define the structural equations .

B / Explain , What are the reasons for the deviation of the real value from the estimated value of the dependent variable adopted with the graph .

(15 Marks)

Q 5 /

Given this information : $\hat{Y} = 0.98 + 0.39\ X1 + 0.91\ X2$, N =25 / A

S.e (0.09) (0.24) , F= 12.5 , $R^2 = 0.85$

$\sum e_t^2 = 4.1$, $\sum \Delta e_t^2 = 0.54$, du = 1.31 , dl = 1.2

Testing this results , and discus the results about using for Prediction , and then compute Predictions for X1 = 3.1 , X 2 = 7 .

When to use two – stage least squares method and what is the mechanism of its /B application .

GOOD LUCK

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Teacher

Dr. Resan abd alemaam
Head of statistic Dept.

Dr. Bahaa A. Qasim

Republic of Iraq
Ministry of Higher Education and Scientific Research
University of Basra
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Department of statistics

Subject: Research Methodology \ M.S \ Date: 12/ 9/ 2023
Final Exam : The Second semester 2022/2023

س1/ ما هي الخصائص الأساسية للبحث العلمي اذكر ذلك (15 درجة)

.....

س2/ اذكر مستلزمات البحث الجيد. (15 درجة)

.....

س2/ وضح كيفية التعامل مع الأسئلة التي تركت دون إجابة في الاستبيان . (15 درجة)

.....

س3/ ما هي خصائص الفرضية الجيدة (10درجات)

.....

س4/ اختر الإجابة الصحيحة لما يأتي : (15 درجات)

1- في البحوث .....يكون حجم العينة 30 فردا لكل متغير في البحث.

a- البحوث التجريبية b- البحوث الارتباطية c- البحوث المسحية

2-..... هو الطريقة التي يسلكها الباحث في الإجابة عن الأسئلة .

a- فرضية البحث b- منهجية البحث c- الاستبيان

3- من صفات ..... القدرة على التثبت من صحة الفروض.

a- البحث b- الباحث c- الاستبيان

4- من مواصفات ..... ان يكون جديدا.

a-الاستبيان b- الباحث c- البحث العلمي

5- من مقومات المشكلة البحثية الجيدة ان تكون :

a- دقيقة b- جديدة c- متكررة

6- عندما يقوم الباحث باقتباس المعلومات نصاً يسمى هذا الاقتباس :

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a-اقتباس غير مباشر b- اقتباس مباشر c- اقتباس جزئي

7- من العوامل التي تساعد في تحديد حجم العينة هو :

a-فروض البحث b- منهجية البحث c- استبيان البحث

8- عند تقسيم العينة الى أجزاء مثل (ذكور , اناث) فان .الحد الأدنى لحجم العينة هو ..... لكل فئة من الفئات.

a-10 b- 20 c- 30

9- عندما تعطى الحرية للمستجيب في الاستبيان بان يصوغ الإجابة التي يريد على سؤال ما فان هذا السؤال يعتبر من من نوع :

a-السؤال المفتوح b- السؤال المغلق c- السؤال المغلق المفتوح

10- في قواعد الاقتباس فان ..... تعني ضرورة الإشارة الى المصادر التي تم الاقتباس منها.

a-الدقة b- الأمانة العلمية c- الاعتدال

Good Luck

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M.sc of statistic
Experiment Design , First Attempt

Note: Choose only 7; for each question 10 marks

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 observation s. complete the ANOVA table

s.o.v	d.f	S.S	M.S	F
treatments				
Exp. error				33
S. error	18			
Total	26			

Q2/ 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- Let $y_{ij} = \mu + \alpha_i + \tau_j + \beta_k + \epsilon_{ijk}$ prove that

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

Q3/ 2^5 **experiment factorial in block of size 4 Give the suitable system to complete confounding and comment on it.**

Q4/ a) write the true response of the t.c. $a_i b_j c_k$ **in terms of the main effects and interaction, and give the estimate of** $a_0 b_0 c_0 - a_0 b_0 c_1$ **and its variance.**

b) prove that for the 2^n **system in CRD** $E(SS_x) = \sigma^2 + r2^{n-2}x^2$ **where x is any of the** 2^{n-1} **effects or interaction**

Q5/ An experiment of a 2^3 **factorial in blocks of size 2 . A suitable system of confounding will consist of 4 repetitions of the following types of replicates:**

Type I: confounded AB, AC, BC **- Type II : confounded AB,C,ABC**

Type III: confounded A, BC, ABC **- Type IV confounded** B, AC, ABC

Type V confounded C, AB, ABC

i- How many blocks are requires?

ii- What are the amounts of information that this design yield as compared to the un confounded design

iii- Write the [illegible]

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Experiment Design , First Attempt

Q6/ 2^3 factorial in 2 replicate with 2 blocks per replicate (10 Marks)

b_1	abc	(1)	bc	a
b_2	b	c	ab	ac

Rep I

b_1	(1)	ab	c	abc
b_2	b	ac	bc	a

Rep II

i- What effect is confounded with blocks in each replicate
ii- D.f of errer
iii- Without losing any observation on main effect modify, the replicate above to make blocks of two E.U each, show your allocation of t.c.

Q7/ for the experiment design below

Block1	b	ab	Block1	(1)	ab	Block1	a	ab
Block 2	(1)	a	Block 2	a	b	Block 2	(1)	b
	Rep I			Rep II			Rep III	

Use of intra- and interblock information to solve the following

i. The variance of main and interaction effect in each replicate
ii. Key out of anova given sources of variation, degree of freedom, ss and MSE

Q8/ for the experiment design

Block1	Block2	Block3	Block4	Block5	Block6	Block7	Block8
(1)	a	b	c	d	ab	bc	bd
abcd	bcd	acd	abd	abc	cd	ad	ac

i- What effect is confounded with blocks
ii- Give an outline of the ANOVA table assuming that each t.c is repeated 3 times .

With best wishes

Examiner

Ali-NASSR

Head of Dep.

Bahaa A. Qasim

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

Subject :Operation Research
Time: 3 hrs.
Date: 12/9/2023
Exam: second semester exam
Academic Year: 2022/2023

*Remark : Answer 5 questions only

Q1/Solve the following LPs by the revised simplex method:

Maximize $z = 6x1 - 2x2 + 3x3$
subject to
$2x1 - x2 + 2x3 \leq 2$
$x1 + 4x3 \leq 4$
$x1, x2, x3 \geq 0$

(14 degree)

Q2/ Find the optimum solution for the following L.P. Model
Maximize $z = 3x1 + 2x2$
subject to
$2x1 + 5x2 \leq 18$
$4x1 + 2x2 \leq 18$
$x1, x2 \geq 0$ and integer

(14 degree)

Q3/ Consider the following single-server queue: the inter-arrival time is exponentially distributed with a mean of 10 minutes and the service time is also exponentially distributed with a mean of 8 minutes, find the

(i) mean wait in the queue,
(ii) mean number in the queue
(iii) the mean wait in the system
(iv) mean number in the system
(v) proportion of time the server is idle

(14 degree)

Q4/ Solve the following LP model by the upper-bounding algorithm
Maximize $z = 3x1 + 5y + 2x3$
subject to
$x1 + y + 2x3 \leq 14$
$2x1 + 4y + 3x3 \leq 43$
$0 \leq x1 \leq 4, 7 \leq y \leq 10, 0 \leq x3 \leq 3$ (14 degree)

Q5/(A) Explain your understanding of the relationship between the arrival rate and the average interarrival time. What are the units describing each parameter?
(B) In each of the following cases, determine the average arrival rate per hour and the average interarrival time in hours.
- One arrival occurs every 20 minutes.

- Two arrivals occur every 6 minutes.

(C) In each of the following cases, determine the average service rate per hour and the average service time in hours.

- One service is completed every 15 minutes.
- Two departures occur every 15 minutes.

Q6/Consider the following LP model:

Maximize $z = 5x_1 + 2x_2 + 3x_3$

subject to

$x_1 + 5x_2 + 2x_3 \leq b_1$

$x_1 - 5x_2 - 6x_3 \leq b_2$

$x_1, x_2, x_3 \geq 0$

The following optimal tableau corresponds to specific values of b_1 and b_2:

b.v.	x1	x2	x3	x4	x5	b
z	0	a	7	d	e	f
x1	1	b	2	1	0	3
x5	0	c	-8	-1	1	1

Determine the following:

(a) The right-hand-side values, b1 and b2.

(b) The optimal dual solution.

(c) The elements a, b, c, d,e and f.

(d) Determine the status of each resource.

(14 degree)

GOOD LUCK

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Republic of Iraq
Ministry of Higher Education and Scientific Research
University of Basra
College of Administration & Economics
Department of statistics

Subject: Linear Model\ M.S \ Date: 19/ 2023
Final exam : the first semester 2022/2023

Note: Answer only five questions. For each question (14 marks)

Q1: Correct the wrong statements if any?

1. If $y'Ay$ is a linear function of y, $E(y'Ay) \neq E(y')AE(y)$

2. Let A be a pxp positive definite matrix and let B be a k x p matrix of rank k = p. Then BAB' is positive semidefinite.

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

4. If $\beta_1 \neq 0$, then $E(SSR/k) > \sigma^2$ since $X_c'X_c$ is positive definite, and we expect F to near 1.

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

6. If A be an $n \times n$ positive define matrix. Then $\frac{\partial \log|A|}{\partial x} = tr(A' \frac{\partial A}{\partial X})$

7. If A is an n x n idempotent matrix , P & C is an n x n nonsingular matrix then $C'AC$ is idempotent

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

1. If y is $N_n(X\beta, \sigma^2 I)$, then $SSR/\sigma^2 = \hat{\beta}_1' X_c' X_c \hat{\beta}_1' / \sigma^2$ So the SSR/σ^2 has a distribution is

a. $\chi^2(n-k-1)$ b. $\chi^2(k, n-k-1, \lambda_1)$ c. $\chi^2(k, \lambda_1)$

2. If two random vectors have the .....moment generating function, they have the same density
a. same b. different c. definite

3. When A is $n \times p$, and X is $p \times 1$, and C is $n \times 1$, in which x and c are of different sizes. If $n \rangle p$ so that A has ..... rows than columns, then $Ax = c$ typically has no solution.
a. more b. fewer c. equal

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

a. far b. close c. symmetric

5. If A is nxp & B is pxn then.....

a. tr(AB)> tr(BA) b. tr(AB)< tr(BA) c. tr(AB)= tr(BA)

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

a. $\chi^2(\mu'A\mu/r\sigma^2)$ b. $\chi^2(r, \mu'A\mu/2\sigma^2)$ c. $\chi^2(\mu'A\mu/2\sigma^r)$

7. If A, B, and C are .....definite, then $(ABC)' = A'B'C'$.

a. positive b. conformal c. nonsingular

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

(1) : If each I $n\times n$ **, and A = I - (1/n) J,** $\Sigma_{yx}=\sigma_{xy}\mathrm{I}$, $\mu_x=\mu_x\, j$ **and** $\mu_y=\mu_y\, j$ **Hence**

$$a:\mathrm{E}\left[x'\left(\mathrm{I}-\frac{1}{n}J\right)y\right]=\sigma_{xy}(n-1) \qquad b:\mathrm{E}\left[x'\left(\mathrm{I}-\frac{1}{n}J\right)y\right]=\Sigma_{yx}\mu_x(n-1)\mu_y \qquad c:\mathrm{E}\left[x'\left(\mathrm{I}-\frac{1}{n}J\right)y\right]=\Sigma_{yx}(n-1)\mu'_{yx}\mu_{yx}$$

(2). If $u=(y,x_1,x_2,\cdots,x_k)$, $\mu=\begin{pmatrix}4\\6\end{pmatrix}$, $\Sigma=\begin{pmatrix}12 & 4\\4 & 20\end{pmatrix}$ **then**

a. $\mathrm{var}(y/x)\geq\mathrm{var}(y)$ *b.* $\mathrm{var}(y/x)\leq\mathrm{var}(y)$ *c.* $\mathrm{var}(y/x)\approx\mathrm{var}(y)$

(3). Let $\hat{y}_{01}=x'_{01}\hat{\beta}_1^*$ **where** $\hat{\beta}_1^*=(X'_1X_1)^{-1}X'_1y$ **and** $\beta_2\neq0$ **. Then**

a. $\mathrm{E}(x'_{01}\hat{\beta}_1^*)=x'_0\beta_1$ *b.* $\mathrm{E}(x'_{01}\hat{\beta}_1^*)=x'_0\beta$ *c.* $\mathrm{E}(x'_{01}\hat{\beta}_1^*)\neq x'_0\beta$ **d. Not from the above**

(4). If y is distributed as $N_p(\mu,\Sigma)$ **then** $\mathrm{cov}(y,y'Ay)$ **is**

a. $2tr\left[(A\Sigma)^2\right]+4\mu'A\Sigma A\mu$ *b.* $2tr(A\Sigma)^2+\mu'A\mu$ *c.* $2\Sigma A\mu$

Q4: If y is distributed as $N_p(\mu,\Sigma)$**, its moment generating function is given by** $M_y(t)=e^{t'\mu+t'\Sigma t/2}$

Q5: If y is $N_n(X\beta,\sigma^2I)$**, then the F test for** $H_0: C\beta=0$ **is equivalent to the likelihood ratio test. Prove that?**

Q6: Explain the correlation coefficient mathematically and geometrically.

Good Luck

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Ministry of Higher Education and Scientific Research
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College of Administration & Economics
Department of statistics

Subject: Time Series \ M.S \ Date: / / 2023
Final exam : the Second semester 2022/2023

Note: Answer only five questions. For each question (14 marks)

Q1: Correct the wrong statements if any?

1. Filters that eliminate high frequency cycles are known as high-pass filters.

2. The system is divergent if one of the roots is greater than 1 in absolute terms.

3. Autocovariance in Moving Average Processes is are zero $\gamma_s = 0 \quad for \quad |s| \rangle Q$.

4. In the model ARMA the variance only be Larger if ϕ_1 and θ_1 have opposite signs and $2\phi_1\theta_1 \langle \theta_1^2$.

5. Of properties of a random walk process is the autocorrelations virtually different at 1 with only a small decline at large lags

6. The state in SETAR is determined by Static values of the dependent variable.

7. If the partial autocovariances after a certain lag are zero p, it may be appropriate to fit an AR(p) model to the time series.On the other hand, the partial covariances of any AR(p) process will only decay to zero as the lag increases.

Q2: Choose the correct answer with clarification when choosing:

1. Newey-West variance estimator is

$$(a) \quad = \hat{\gamma}_0 - 2\sum_{l=l}^{T} L+1-l/L+1\hat{\gamma}_1$$

$$(b) = \hat{\gamma}_0 + 2\sum_{l=l+1}^{T} L-1+l/L+1\hat{\gamma}_1$$

$$(b) = \hat{\gamma}_0 + 2\sum_{l=1}^{L} L+1-l/L+1\gamma_0$$

2. . Deviations around the long-run mean, $\Delta\widetilde{y}_t = \Delta y_{t-1} - \phi_0/(1-\phi_1)$ as

$$(a)\ \Delta\widetilde{y}_t = \phi_1 \Delta\widetilde{y}_{t-1} + \varepsilon_t \quad , \quad (b)\ \Delta\hat{\widetilde{y}}_t = \phi_1 \Delta\hat{y}_{t-1} + \varepsilon_t \quad , \quad (b)\ \Delta\hat{y}_t = \phi_0 \Delta\hat{y}_{t-1} + \varepsilon_t$$

3. In first order autoregressive processes and assuming covariance stationarity, v[y_t] = v[y_{t-1}], the variance be

$$(a)\ \phi^s \frac{\sigma^2}{1-\phi_1^2} \quad , \quad (b)\ \sigma_t^2 \quad , \quad (b)\ \frac{\sigma^2}{1-\phi_1^2}$$

4. If you know that φ_0=1.2 , φ_1=0.14 , σ^2=0.125 and t=3, then the variance of the random walk is

$$(a) \quad = 0.412 \qquad (b) \quad = 0.667 \qquad (c) \quad = 0.375$$

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Subject: Time Series \ M.S \ Date: / / 2023
Final exam : the Second semester 2022/2023

Q3\\ Choose the correct answer to fill in the blanks the following

1. An ARMA process is said to have .....phase when the roots of $\phi(z)$ and $\theta(z)$ both lie outside of the unit circle.

a. minimum b. maximum c. not from the above

2. The optimal weights for a low-pass filter at particular frequency f , satisfy.....

(a) $c_t = \sum_{i=-k}^{k}(v_i - w_i)y_{t-i}$ (b) $c_t = \sum_{i=-k}^{k}(v_k - w_k)y_{t-i}$ (c) $c_t = \sum_{i=-k}^{k}(v_i - w_i)y_{t-k}$

3. If $\lim_{s\to\infty}\phi_1^s y_{t-s}$ does not converge to ..... then observations arbitrarily far in the past have influence on the value of y current

a. 0 b. 1 c. -1

4. Quasi Maximum Likelihood estimator is the estimator Consists of when one likelihood is specified for the data they actually have a ..... distribution

a. Symmetrical b. different c. almost symmetrical

5. ICs are often applied by estimating the largest model which is thought to correctly capture the dynamics and then dropping lags until the AIC or S/BIC fail to .....

a. increase b. decrease c. constancy

6. Taken on the Beveridge-Nelson decomposition is that the trend and the cyclic component are perfectly ..... correlation

a. negatively b. positively c. high

7. if the predictable part of the long-run component expects that the long run component should trend ..... then the cyclic component should be positive.

(a) Lower (b) to up (c) balanced

Q4: Describe the stages of data generation in a Markov Switching process.

Q5: Given the covariances c(k) $(with\ \sum_k |c(k)|^2 < \infty)$, prove spectral density of AR process.

Q6: Mention are a few recommendations regarding unit root tests.

Good Luck

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Final exam : first semester 2022/2023

Subject: multivariate analysis \ M.S \ Date: 21/9/2023

Note : answer all question

Q1: a. Write $\sum yi^2 - \frac{(\Sigma yi)^2}{n}$ in quadratic form

b: by using MLE method estimate the Mean and variance of a Multivariate Normal Distribution

q2 : for two variable normal dist. Is specified by

$$f(x) = b\, e^{(-\frac{Q}{2})}$$

Where $Q = 3y_1^2 + 2y_2^2 - 2y_1y_2 - 32y_1 + 4y_2 + 92$

Answer the question by choosing coerced answer

1. The mean vector is
   a. (6 2) b. (5 4) c. (-3 6)
2. The var-cov matrix is
   a. $\begin{pmatrix} \frac{3}{5} & \frac{1}{5} \\ \frac{1}{5} & \frac{6}{5} \end{pmatrix}$ b. $\begin{pmatrix} \frac{2}{3} & \frac{-1}{3} \\ \frac{-1}{3} & \frac{3}{3} \end{pmatrix}$ c. $\begin{pmatrix} \frac{2}{5} & \frac{1}{5} \\ \frac{1}{5} & \frac{3}{5} \end{pmatrix}$
3. The value of b is
   a. 1/ 2.54 b. 1/2.811 c. 1/3.54

q3: show that Hotelling T^2 statistics is invariant under all offline transformation X=AY:C of the observation , where A is non-singular matrix and C is a vector of constant .(10 MARKS

q4: : a 3- component vector X has MVN dist. With mean vector m=0 and var- cov matrix

$$\Sigma = \begin{pmatrix} 1 & 0.8 & -0.4 \\ 0.8 & 1 & -0.56 \\ -0.4 & -0.56 & 1 \end{pmatrix}$$

1. Find the conditional of x1 and x3 given x2
2. What is the partial correlation between x1 and x3 given x2
3. Find the multiple correlation between x1 and set of x2,x3

Q5: prove that $\mu'\Sigma^{-1}\mu$ is larger for $\mu' = (\mu 1, \mu 2)$than for $\mu = \mu 1$ give a condition for strict inequality to hold .

Q6: if the random vector Z is dist bivariate normal with mean vector $\mu' = [0\ 0\ 0]$ and var-cov matrix is $\Sigma = \begin{pmatrix} 4 & 1 & 1 \\ 1 & 4 & 1 \\ 1 & 1 & 4 \end{pmatrix}$ find the first principle axis and find the length of axis

Q7:define the following and what is the deferent between of them

1. Discernment analysis
2. Factor analysis
3. Cluster analysis

With best wishes

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Subject: statistical inference \ M.S \ Date: / / 2023
Final exam : the Second semester 2022/2023

Note: The answer to five questions for each question is (14) marks

Q1)a- Is a moment estimator equal to the maximum likelihood estimator of the same distribution and same parameter? Give example

b- Assume that Let x_1, x_2 be a random sample of size n=2 having p.d.f.

$$f(x,\lambda)=\frac{1}{\lambda}e^{-x/\lambda}\ .\ 0<x<\infty$$

we reject $H_0:\lambda=2$ and accept $H_1:\lambda=1$

if $\frac{f(x_1.2)f(x_2.2)}{f(x_1.1)f(x_2.1)}\le\frac{1}{2}$

Find the significant level of the test and the powe of the test when H_0 is true.

Q2) Suppose that $x_1, x_2, \ldots, x_n$ be a random sample of size n having p.d.f.

$$f(x.p,\theta)=(1-p)p^{x-\theta}\quad, x=\theta,\theta+1,\theta+2,\ldots$$

if θ Is known find(1) a sufficient estimator of p

(2) what is MVUE of $\frac{p}{1-p}$

Q3)Assume that $x_1, x_2, \ldots, x_n$ be a random sample of size n having p.d.f.

$$f(x,\theta)=\frac{\theta-x}{(n+1)\theta^2}\quad, 0<x<\theta$$

Find an unbiased estimator of θ ?

Q4) Let $x_1, x_2, \ldots, x_{25}$ be a random sample of size n from $N(\theta,100)$

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find the (UMPCR) of size $\alpha = 0.10$ for testing $H_0 : \theta = 75$ against $H_1 : \theta < 75$

Q5)Let $f(x,\theta) = C_x^2 \dfrac{\theta^x (1-\theta)^{2-x}}{1-(1-\theta)^2}$, $x = 1,2$, $0 < \theta < 1$

Find the estimator of θ by using maximum likelihood method.

Q6) If $x_1, x_2, \ldots, x_n$ be a random sample from a Poisson distribution with mean θ Find Sequential probability ratio test for testing

$H_0 : \theta = 0.02$ *against* $H1 : \theta = 0.07$

Given that $\alpha = 0.20$ *and* $\beta = 0.10$

Where $N(1.282) = 0.90$

مع الامنيات بالنجاح

رئيس القسم

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مدرسة المادة

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