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(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. FOURTH SEMESTER EXAMINATION, MAY 2019

SECOND YEAR (BATCH 2017-20)

Date : 16/05/2019 **ECONOMICS (Honours)**

Time : 11.00 am – 3.00 pm **Paper : IV** Full Marks : 100

[Use a separate Answer Book for each group]

Group - A

1. Answer **any four** questions : [4×5]

   a) In a simple linear regression model show that TSS = ESS + RSS.

   where TSS = Total sum of squares

   ESS = Explained sum of squares

   RSS = Residual sum of squares. [5]

   b) How would you estimate the slope parameter of a regression model without the intercept term? How will you settle for the suitable R^2 formula in this case? [2+3]

   c) In the classical linear regression model, explain the relationship between R^2 & F statistic.

   (where, R^2 = Coefficient of determination, F statistic is the statistic used for testing significance of all the parameters taken together.) [5]

   d) Explain how variation in the independent variable(s) can influence the estimated regression parameters. In this context, explain the role of outliers. [3+2]

   e) Distinguish between the economic interpretations of the coefficients of the two regression equations below:

   a) $Y_i = \alpha + \beta X_i + \varepsilon_i$

   b) $\ln Y_i = \alpha + \beta \ln X_i + \varepsilon_i$, where $\ln Y_i = \log_e (Y_i)$. [5]

   f) A researcher tried two specifications of a regression equation:

   $y = \alpha + \beta x + u$

   $y = \alpha' + \beta' x + \gamma' z + u'$

   Explain under what circumstances the following will be true (a "hat" over a parameter denotes its estimate):

   i) $\hat{\beta} = \hat{\beta}'$

   ii) If $\hat{u}_i$ and $\hat{u}_i'$ are the estimated residuals from the two equations respectively, $\sum \hat{u}_i^2 \geq \sum \hat{u}_i'^2$. [3+2]

Answer **any two** questions from **Question Nos. 2 to 4** : [2×15]

2. a) Sir Francis Galton, a cousin of James Darwin, examined the relationship between the height of children and their parents towards the end of the 19th century. It is from this

study that the name "regression" originated. You decide to update his findings by collecting data from 122 college students, and estimate the following relationship:

$$\text{Studenth} = 19.6 + 0.73 \times \text{Midparh}, \quad R^2 = 0.45$$

(7.2) (0.10)

where Studenth is the height of students in inches, and Midparh is the average of the parental heights. (Values in parentheses are estimated standard errors for the estimated intercept and slope coefficients.)

If children, on average, were expected to be of the same height as their parents, then this would imply two hypotheses, one for the slope and one for the intercept. (i) What should the null hypothesis be for the intercept? Calculate the relevant statistic and carry out the hypothesis test at the 1% level. (ii) What should the null hypothesis be for the slope? Calculate the relevant statistic and carry out the hypothesis test at the 5% level. [5+5]

b) Prove : $r_{XY} = \sqrt{\beta_{X,Y} \bullet \beta_{Y,X}}$

where, r_{XY} = Correlation Coefficient between X & Y

$\beta_{i,j}$ = Slope Coefficient of regression equation where i = dependent variable & j = independent variable. [5]

3. a) You are given the following information regarding the joint distribution of X (the age of a person) and Y (the number of days they choose to spend at a meditation camp) :

		Values of Y			
		0	1	2	3
Values of X	20	0.25	0.02	0	0
	40	0.25	0.06	0.02	0
	60	0.15	0.12	0.08	0.05

Considering X as the independent variable and Y as the dependent variable, find the PRF (Population Regression Function) values as X =20, 40 and 60. Looking at the calculated PRF values, do you find any trend? [10]

b) Distinguish between R^2 & adjusted R^2 in the context of multiple linear regression model. Justify why adjusted R^2 should be considered as a superior measure of goodness of fit relative to R^2. [3+2]

4. a) Consider the following regression-through origin model: $Y_i = \beta x_i + u_i$ for $i = 1, 2$. You're told that $u_1 \sim N(0, \sigma^2)$ and $u_2 \sim N(0, 2\sigma^2)$ and they are statiscally independent. If $x_1 = +1$ and $x_2 = -1$, obtain the weighted least squares (WLS) estimate of β and its variance. Is this variance better than the variance of the OLS estimator had you incorrectly assumed that both $u_1 \& u_2 \sim N(0, \sigma^2)$ [5+5]

b) In studying the movement in the production workers' share in the value added (i.e labour's share), the following models were considered, based on annual data for 1949 – 1964.

Model A : $Y_t = 0.4529 - 0.0041t;\ R^2 = 0.5284,\ d = 0.8252$

Model B : $Y_t = 0.4786 - 0.0127t + 0.0005t^2; R^2 = 0.6629,\ d = 1.82$

where Y_t = Labour's share and t = time. Find out whether there is serial correlation in both the models A & B. [5]

Group - B

5. Answer **any four** questions : [4×3]

a) Discuss the Lender's Risk Hypothesis to address the incidence of exorbitantly high rates on credit in rural economies of developing nations.

b) Why do you think a contract with eviction may be widely employed in the context of land markets in developing nations?

c) What do you mean by asymmetric information?

d) Distinguish between Fixed rent contract and Share cropping contract.

e) Define Rent Seeking.

f) Mention two limitations of the Lewis model.

g) What is Nairobi Puzzle?

h) Mention the key assertions in Sen's idea of surplus labour.

6. Answer **any one** question : [1×8]

a) Discuss, in detail, the efficiency criterion in different types of land rent contracts.

b) Define institutions. Why are institutions critical for economic development? Answer with suitable examples.

7. Answer **any two** questions : [2×15]

a) i) What is the Marshallian efficiency argument in a tenancy contract? [2.5]

ii) Why is share cropping inefficient? [2.5]

iii) Argue why even more than 100 % retention of output in fixed rent tenancy contract is considered to be inefficient even through the tenant has positive incentive to put in extra effort. [2.5]

iv) Argue why the practice of share cropping tenancy contract is predominant in rural land markets while the fixed rent contract is a better option form a societal point of view. [5]

v) What are the alternatives to the share cropping tenancy contract for a risk neutral landlord? What are the problems with those alternatives? [2.5]

b) What do you mean by the economic roles of the government in economic development? What are the major reasons behind government failure? Explain the emergence of rent-seeking activities in this context. When are such activities classified as forms of corruption? [5+4+3+3]

c) i) Use a nutrition-based model of labour market analysis to show the coexistence of voluntary and involuntary unemployment at equilibrium, which the formal labour market analysis fails to address. Why do you think this is the case? [8]

ii) Discuss the effect of inequality in asset holding (in terms of asymmetric land distribution that works as a source of non-wage income) on rural labour market for casual labourers. [7]

d) Show that zero marginal productivity of labour is neither necessary nor sufficient for the existence of surplus labour in Sen's model. [15]

TABLE IV *t*-DISTRIBUTION*

Values of $t_{\alpha,\nu}$

ν \ α	0·05	0·025	0·01	0·005
1	6·314	12·706	31·821	63·657
2	2·920	4·303	6·965	9·925
3	2·353	3·182	4·541	5·841
4	2·132	2·776	3·747	4·604
5	2·015	2·571	3·365	4·032
6	1·943	2·447	3·143	3·707
7	1·895	2·365	2·998	3·499
8	1·860	2·306	2·896	3·355
9	1·833	2·262	2·821	3·250
10	1·812	2·228	2·764	3·169
11	1·796	2·201	2·718	3·106
12	1·782	2·179	2·681	3·055
13	1·771	2·160	2·650	3·012
14	1·761	2·145	2·624	2·977
15	1·753	2·131	2·602	2·947
16	1·746	2·120	2·583	2·921
17	1·740	2·110	2·567	2·898
18	1·734	2·101	2·552	2·878
19	1·729	2·093	2·539	2·861
20	1·725	2·086	2·528	2·845
21	1·721	2·080	2·518	2·831
22	1·717	2·074	2·508	2·819
23	1·714	2·069	2·500	2·807
24	1·711	2·064	2·492	2·797
25	1·708	2·060	2·485	2·787
26	1·706	2·056	2·479	2·779
27	1·703	2·052	2·473	2·771
28	1·701	2·048	2·467	2·763
29	1·699	2·045	2·462	2·756
30	1·697	2·042	2·457	2·750
40	1·684	2·021	2·423	2·704
60	1·671	2·000	2·390	2·660
120	1·658	1·980	2·358	2·617
∞	1·645	1·960	2·326	2·576

*Abridged from Table 12 of *Biometrika Tables for Statisticians*, vol. I, with the kind permission of the Biometrika Trustees.

Table D.5A Durbin–Watson d Statistic: Significance Points of d_L and d_U at 0.05 Level of Significance

	$k'=1$		$k'=2$		$k'=3$		$k'=4$		$k'=5$		$k'=6$		$k'=7$		$k'=8$		$k'=9$		$k'=10$	
n	d_L	d_U	d_L	d_U	d_L	d_U	d_L	d_U	d_L	d_U	d_L	d_U	d_L	d_U	d_L	d_U	d_L	d_U	d_L	d_U
6	0.610	1.400	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
7	0.700	1.356	0.467	1.896	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
8	0.763	1.332	0.559	1.777	0.368	2.287	—	—	—	—	—	—	—	—	—	—	—	—	—	—
9	0.824	1.320	0.629	1.699	0.455	2.128	0.296	2.588	—	—	—	—	—	—	—	—	—	—	—	—
10	0.879	1.320	0.697	1.641	0.525	2.016	0.376	2.414	0.243	2.822	—	—	—	—	—	—	—	—	—	—
11	0.927	1.324	0.658	1.604	0.595	1.928	0.444	2.283	0.316	2.645	0.203	3.005	—	—	—	—	—	—	—	—
12	0.971	1.331	0.812	1.579	0.658	1.864	0.512	2.177	0.379	2.506	0.268	2.832	0.171	3.149	—	—	—	—	—	—
13	1.010	1.340	0.861	1.562	0.715	1.816	0.574	2.094	0.445	2.390	0.328	2.692	0.230	2.985	0.147	3.266	—	—	—	—
14	1.045	1.350	0.905	1.551	0.767	1.779	0.632	2.030	0.505	2.296	0.389	2.572	0.286	2.848	0.200	3.111	0.127	3.360	—	—
15	1.077	1.361	0.946	1.543	0.814	1.750	0.685	1.977	0.562	2.220	0.447	2.472	0.343	2.727	0.251	2.979	0.175	3.216	0.111	3.438
16	1.106	1.371	0.982	1.539	0.857	1.728	0.734	1.935	0.615	2.157	0.502	2.388	0.398	2.624	0.304	2.860	0.222	3.090	0.155	3.304
17	1.133	1.381	1.015	1.536	0.897	1.710	0.779	1.900	0.664	2.104	0.554	2.318	0.451	2.537	0.356	2.757	0.272	2.975	0.198	3.184
18	1.158	1.391	1.046	1.535	0.933	1.696	0.820	1.872	0.710	2.060	0.603	2.257	0.502	2.461	0.407	2.667	0.321	2.873	0.244	3.073
19	1.180	1.401	1.074	1.536	0.967	1.685	0.859	1.848	0.752	2.023	0.649	2.206	0.549	2.396	0.456	2.589	0.369	2.783	0.290	2.974
20	1.201	1.411	1.100	1.537	0.998	1.676	0.894	1.828	0.792	1.991	0.692	2.162	0.595	2.339	0.502	2.521	0.416	2.704	0.336	2.885
21	1.221	1.420	1.125	1.538	1.026	1.669	0.927	1.812	0.829	1.964	0.732	2.124	0.637	2.290	0.547	2.460	0.461	2.633	0.380	2.806
22	1.239	1.429	1.147	1.541	1.053	1.664	0.958	1.797	0.863	1.940	0.769	2.090	0.677	2.246	0.588	2.407	0.504	2.571	0.424	2.734
23	1.257	1.437	1.168	1.543	1.078	1.660	0.986	1.785	0.895	1.920	0.804	2.061	0.715	2.208	0.628	2.360	0.545	2.514	0.465	2.670
24	1.273	1.446	1.188	1.546	1.101	1.656	1.013	1.775	0.925	1.902	0.837	2.035	0.751	2.174	0.666	2.318	0.584	2.464	0.506	2.613
25	1.288	1.454	1.206	1.550	1.123	1.654	1.038	1.767	0.953	1.886	0.868	2.012	0.784	2.144	0.702	2.280	0.621	2.419	0.544	2.560
26	1.302	1.461	1.224	1.553	1.143	1.652	1.062	1.759	0.979	1.873	0.897	1.992	0.816	2.117	0.735	2.246	0.657	2.379	0.581	2.513
27	1.316	1.469	1.240	1.556	1.162	1.651	1.084	1.753	1.004	1.861	0.925	1.974	0.845	2.093	0.767	2.216	0.691	2.342	0.616	2.470
28	1.328	1.476	1.255	1.560	1.181	1.650	1.104	1.747	1.028	1.850	0.951	1.958	0.874	2.071	0.798	2.188	0.723	2.309	0.650	2.431
29	1.341	1.483	1.270	1.563	1.198	1.650	1.124	1.743	1.050	1.841	0.975	1.944	0.900	2.052	0.826	2.164	0.753	2.278	0.682	2.396
30	1.352	1.489	1.284	1.567	1.214	1.650	1.143	1.739	1.071	1.833	0.998	1.931	0.926	2.034	0.854	2.141	0.782	2.251	0.712	2.363
31	1.363	1.496	1.297	1.570	1.229	1.650	1.160	1.735	1.090	1.825	1.020	1.920	0.950	2.018	0.879	2.120	0.810	2.226	0.741	2.333
32	1.373	1.502	1.309	1.574	1.244	1.650	1.177	1.732	1.109	1.819	1.041	1.909	0.972	2.004	0.904	2.102	0.836	2.203	0.769	2.306
33	1.383	1.508	1.321	1.577	1.258	1.651	1.193	1.730	1.127	1.813	1.061	1.900	0.994	1.991	0.927	2.085	0.861	2.181	0.795	2.281
34	1.393	1.514	1.333	1.580	1.271	1.652	1.208	1.728	1.144	1.808	1.080	1.891	1.015	1.979	0.950	2.069	0.885	2.162	0.821	2.257
35	1.402	1.519	1.343	1.584	1.283	1.653	1.222	1.726	1.160	1.803	1.097	1.884	1.034	1.967	0.971	2.054	0.908	2.144	0.845	2.236
36	1.411	1.525	1.354	1.587	1.295	1.654	1.236	1.724	1.175	1.799	1.114	1.877	1.053	1.957	0.991	2.041	0.930	2.127	0.868	2.216
37	1.419	1.530	1.364	1.590	1.307	1.655	1.249	1.723	1.190	1.795	1.131	1.870	1.071	1.948	1.011	2.029	0.951	2.112	0.891	2.198
38	1.427	1.535	1.373	1.594	1.318	1.656	1.261	1.722	1.204	1.792	1.146	1.864	1.088	1.939	1.029	2.017	0.970	2.098	0.912	2.180
39	1.435	1.540	1.382	1.597	1.328	1.658	1.273	1.722	1.218	1.789	1.161	1.859	1.104	1.932	1.047	2.007	0.990	2.085	0.932	2.164
40	1.442	1.544	1.391	1.600	1.338	1.659	1.285	1.721	1.230	1.786	1.175	1.854	1.120	1.924	1.064	1.997	1.008	2.072	0.952	2.149
45	1.475	1.566	1.430	1.615	1.383	1.666	1.336	1.720	1.287	1.776	1.238	1.835	1.189	1.895	1.139	1.958	1.089	2.022	1.038	2.088
50	1.503	1.585	1.462	1.628	1.421	1.674	1.378	1.721	1.335	1.771	1.291	1.822	1.246	1.875	1.201	1.930	1.156	1.986	1.110	2.044
55	1.528	1.601	1.490	1.641	1.452	1.681	1.414	1.724	1.374	1.768	1.334	1.814	1.294	1.861	1.253	1.909	1.212	1.959	1.170	2.010
60	1.549	1.616	1.514	1.652	1.480	1.689	1.444	1.727	1.408	1.767	1.372	1.808	1.335	1.850	1.298	1.894	1.260	1.939	1.222	1.984
65	1.567	1.629	1.536	1.662	1.503	1.696	1.471	1.731	1.438	1.767	1.404	1.805	1.370	1.843	1.336	1.882	1.301	1.923	1.266	1.964
70	1.583	1.641	1.554	1.672	1.525	1.703	1.494	1.735	1.464	1.768	1.433	1.802	1.401	1.837	1.369	1.873	1.337	1.910	1.305	1.948
75	1.598	1.652	1.571	1.680	1.543	1.709	1.515	1.739	1.487	1.770	1.458	1.801	1.428	1.834	1.399	1.867	1.369	1.901	1.339	1.935
80	1.611	1.662	1.586	1.688	1.560	1.715	1.534	1.743	1.507	1.772	1.480	1.801	1.453	1.831	1.425	1.861	1.397	1.893	1.369	1.925
85	1.624	1.671	1.600	1.696	1.575	1.721	1.550	1.747	1.525	1.774	1.500	1.801	1.474	1.829	1.448	1.857	1.422	1.886	1.396	1.916
90	1.635	1.679	1.612	1.703	1.589	1.726	1.566	1.751	1.542	1.776	1.518	1.801	1.494	1.827	1.469	1.854	1.445	1.881	1.420	1.909
95	1.645	1.687	1.623	1.709	1.602	1.732	1.579	1.755	1.557	1.778	1.535	1.802	1.512	1.827	1.489	1.852	1.465	1.877	1.442	1.903
100	1.654	1.694	1.634	1.715	1.613	1.736	1.592	1.758	1.571	1.780	1.550	1.803	1.528	1.826	1.506	1.850	1.484	1.874	1.462	1.898
150	1.720	1.746	1.706	1.760	1.693	1.774	1.679	1.788	1.665	1.802	1.651	1.817	1.637	1.832	1.622	1.847	1.608	1.862	1.594	1.877
200	1.758	1.778	1.748	1.789	1.738	1.799	1.728	1.810	1.718	1.820	1.707	1.831	1.697	1.841	1.686	1.852	1.675	1.863	1.665	1.874

Note : n = number of observations

k' = number of explanatory variables excluding the constant term.