RAMAKRISHNA MISSION VIDYAMANDIRA
(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. FOURTH SEMESTER EXAMINATION, MAY 2016
SECOND YEAR [BATCH 2014-17]
ECONOMICS (Honours)
Paper : IV

Date : 20/05/2016
Time : 11 am – 3 pm
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 estimated using OLS, the covariance between the estimated errors & the regressor is zero by construction." Justify your agreement or disagreement with this statement both in case of simple linear regression model with intercept and without intercept.

b) Consider the estimated regressions $Y_i^* = \hat{\beta}_1^* + \hat{\beta}_2^* X_i^* + \hat{u}_i^*$, and $Y_i = \hat{\beta}_1 + \hat{\beta}_2 X_i + \hat{u}_i$, where $Y_i^* = w_1 Y_i$ & $X_i^* = w_2 X_i$; w_1, w_2 are constants. Find the relation between the variances of $\hat{\beta}_2^*$ & $\hat{\beta}_2$.

c) Prove that total variation of the dependent variable in a linear regression model can be split up into two parts : Explained variation (ESS) & Unexplained or residual variation (RSS).

d) Consider the following regression through origin model : $Y_i = \beta x_i + u_i$, $i = 1, 2$.

You are told that $u_1 \sim N(0, \sigma^2)$ & $u_2 \sim N(0, 2\sigma^2)$ and they are statistically independent. If $X_1 = 1$ & $X_2 = -1$, obtain the weighted least square (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 & $u_2 \sim N(0, \sigma^2)$. [3+2]

e) Consider the least squares regression of Y on a single variable X. Show that the coefficient of determination R^2 is equal to the squared correlation coefficient between Y & X only if there is an intercept in the equation.

f) A researcher estimates the following two models using OLS.

Model A : $y_i = \beta_0 + \beta_1 S_i + \beta_2 A_i + \epsilon_i$

Model B : $y_i = \beta_0 + \beta_1 S_i + \epsilon_i$

where y_i refers to the marks (out of 100) that a student i gets in an examination, S_i refers to the number of hours spent studying for the examination by the student and A_i is an index of innate ability (varying continuously from a low ability score of 1 to a high ability score of 10). ϵ_i is the usual classical error. The estimated β_1 coefficient is 7·1 for model A, but 2·1 for model B; both are statistically significant. The estimated β_2 coefficient is 1·9 and is also significantly different from zero. Does this suggest that students with lower ability spend more time studying?

g) The estimated regression of y on x is $\hat{y} = 0 \cdot 399x + 6 \cdot 9$ and the estimated regression of x on y is $\hat{x} = 1 \cdot 212y - 2 \cdot 4$. What percentage of variation in y, on an average, is explained by x?

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

a) Consider a two variable linear model $Y = \alpha + \beta x + u$, where α, β are two parameters and u is the disturbance term. Calculate OLS estimators of $\alpha \& \beta$ & show that the OLS estimator of β is BLUE. State the reasons for the inclusion of the disturbance term u in the model. [12+3]

b) A production function is specified as $y_i = \alpha + \beta_1 x_{1i} + \beta_2 x_{2i} + u_i$; where u_i are iid $N(0, \sigma^2)$, y = output, x_1 = labour input & x_2 = capital input; i = 1, 2, ..., 23. The independent variables are nonstochastic. The following information are given : $\bar{x}_1 = 10$, $\bar{x}_2 = 5$, $\bar{y} = 12$, $\sum_i x_{1i}^2 = 2312$, $\sum_i x_{2i}^2 = 587$, $\sum_i y_i^2 = 3322$, $\sum_i x_{1i}x_{2i} = 1158$, $\sum_i x_{1i}y_i = 2770$ & $\sum_i x_{2i}y_i = 1388$.

i) Find the 95% confidence intervals for α, β_1 & β_2 and test the hypothesis $\beta_1 = 1$. [10]

ii) Find 95% confidence interval for σ^2. [5]

c) i) Describe the steps involved in white test for detection of heteroscedasticity. [7]

ii) Explain the method of weighted Least Square (WLS) for removing the presence of heteroscedasticity in a regression model. [5]

iii) State the consequences of heteroscedasticity. [3]

d) i) Given a simple of 50 observations & 4 explanatory variables, what can you say about auto correlation if computed D-W 'd' values are—

A) 1·05, B) 2·5 and C) 3·97? [4]

ii) Consider the following estimated demand for money function for India for the period 1978 – 1995. $\log(M_t) = 1\cdot6 - 0\cdot10\log(R_t) + 0\cdot68\log(Y_t) + 0\cdot52\log(M_{t-1})$. $R^2 = 0\cdot92$, d = 1·86,

Where M_t = Real Cash balance, R_t = long-term rate of interest & Y_t = aggregate real national in come.

State the reason why for this regression equation, the d-statistic is inappropriate. [3]

iii) Assume that the disturbance term in a regression model is auto-correlated (through first-order autoregressive scheme) but the value of auto-correlation coefficient (ρ) is unknown. Explain the steps involved in remedying the auto-correlation problem in such a situation. [8]

Group - B

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

a) Distinguish between Fixed rent contract and Share cropping contract.
b) Mention two examples of Government failure.
c) What do you mean by asymmetric information?
d) Define disguised unemployment.
e) Define Rent Seeking.
f) Define Nairobi Puzzle.
g) Mention three conditions of corruption.
h) Distinguish between Piece rate wage & Time rate wage.

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

a) Discuss in detail the efficiency criterion in different types of land rented contract.
b) Graphically explain equilibrium situation in rural labour market — equilibrium with full employment & equilibrium with unemployment.

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

a) What are the major assumptions of Lewis model. Discuss how economic development is achieved through migration in this model. Mention the major criticisms of this model. [3+7+5]

b) Define the concept of 'Surplus labour'. Discuss the implications of $MP_L = 0$ for the existence of surplus labour in the Sen's model.

Discuss the various causes of market failure. [3+7+5]

c) Discuss the Harris-Todaro Model with diagram. Discuss the various policy options emanating from this model. [8+7]

d) Discuss in detail the problems of rural credit market. State the Lender's risk hypothesis. Explain graphically the monopolistic structure of rural credit market. [5+3+7]

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 III χ^2-Distribution*

Values of $\chi^2_{\alpha,\nu}$

ν \ α	0·995	0·99	0·975	0·95	0·05	0·025	0·01	0·005
1	0·000	0·000	0·001	0·004	3·841	5·024	6·635	7·879
2	0·010	0·020	0·051	0·103	5·991	7·378	9·210	10·597
3	0·072	0·115	0·216	0·352	7·815	9·348	11·345	12·838
4	0·207	0·297	0·484	0·711	9·488	11·143	13·277	14·860
5	0·412	0·554	0·831	1·145	11·070	12·832	15·086	16·750
6	0·676	0·872	1·237	1·635	12·592	14·449	16·812	18·548
7	0·989	1·239	1·690	2·167	14·067	16·013	18·475	20·278
8	1·344	1·646	2·180	2·733	15·507	17·535	20·090	21·955
9	1·735	2·088	2·700	3·325	16·919	19·023	21·666	23·589
10	2·156	2·558	3·247	3·940	18·307	20·483	23·209	25·188
11	2·603	3·053	3·816	4·575	19·675	21·920	24·725	26·757
12	3·074	3·571	4·404	5·226	21·026	23·337	26·217	28·300
13	3·565	4·107	5·009	5·892	22·362	24·736	27·688	29·819
14	4·075	4·660	5·629	6·571	23·685	26·119	29·141	31·319
15	4·601	5·229	6·262	7·261	24·996	27·488	30·578	32·801
16	5·142	5·812	6·908	7·962	26·296	28·845	32·000	34·267
17	5·697	6·408	7·564	8·672	27·587	30·191	33·409	35·718
18	6·265	7·015	8·231	9·390	28·869	31·526	34·805	37·156
19	6·844	7·633	8·907	10·117	30·144	32·852	36·191	38·582
20	7·434	8·260	9·591	10·851	31·410	34·170	37·566	39·997
21	8·034	8·897	10·283	11·591	32·671	35·479	38·932	41·401
22	8·643	9·542	10·982	12·338	33·924	36·781	40·289	42·796
23	9·260	10·196	11·688	13·091	35·172	38·076	41·638	44·181
24	9·886	10·856	12·401	13·848	36·415	39·364	42·980	45·558
25	10·520	11·524	13·120	14·611	37·652	40·646	44·314	46·928
26	11·160	12·198	13·844	15·379	38·885	41·923	45·642	48·290
27	11·808	12·879	14·573	16·151	40·113	43·194	46·963	49·645
28	12·461	13·565	15·308	16·928	41·337	44·461	48·278	50·993
29	13·121	14·256	16·047	17·708	42·557	45·722	49·588	52·336
30	13·787	14·953	16·791	18·493	43·773	46·979	50·892	53·672
40	20·706	22·164	24·433	26·509	55·759	59·342	63·691	66·766
50	27·991	29·707	32·357	34·764	67·505	71·420	76·154	79·490
60	35·535	37·485	40·482	43·188	79·082	83·298	88·379	91·952
70	43·275	45·442	48·758	51·739	90·531	95·023	100·425	104·215
80	51·172	53·540	57·153	60·391	101·879	106·629	112·329	116·321
90	59·196	61·754	65·647	69·126	113·145	118·136	124·116	128·299
100	67·328	70·065	74·222	77·929	124·342	129·561	135·807	140·169

For larger values of ν, the variable $\sqrt{2\chi^2} - \sqrt{2\nu - 1}$ may be used as a standard normal variable.

*Abridged from Table 8 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

<u>excluding</u> the constant term.

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