RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. FOURTH SEMESTER EXAMINATION, MAY 2018

SECOND YEAR (BATCH 2016-19)

Date : 19/05/2018 **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 the regression model $y_i = \alpha + \beta x_i + u_i$, if the sample mean $\bar{x}$ (of x) is zero, show that $\text{cov}(\hat{\alpha}, \hat{\beta}) = 0$, where $\hat{\alpha}$ & $\hat{\beta}$ are the least squares estimators of α and β.

b) Given data on y and x, explain what functional form you would use and how you will estimate the parameters if you're interested in estimating a constant elasticity of demand function.

c) In the simple linear regression model $y = \alpha + \beta x + u$, since the variance of the estimated regression coefficient $\hat{\beta}$ varies inversely with the variance of x, it is often suggested that we should drop all the observations in the middle range of x and use only the extreme observations of x in the calculation of $\hat{\beta}$. Give your reasons as to whether it's a desirable procedure or not.

d) Consider the regression model

$$y_i = \alpha + \beta x_i + u_i$$

$$u_i \overset{iid}{\sim} N(0,1);\ i = 1, 2, ..., T$$

Suppose the model refers to semi-annual data, but the data available are either A. Annual data i.e. $\bar{y}_1 = y_1 + y_2$; $\bar{y}_2 = y_3 + y_4$ etc. with $\bar{x}_1, \bar{x}_2$ etc. analogously defined (assuming that T is even); or, B. Moving average data, i.e $y_1^* = \frac{(y_1 + y_2)}{2}$, $y_2^* = \frac{(y_2 + y_3)}{2}$; etc. with $x_1^*, x_2^*, ...$ being defined analogously.

i) What are the properties of the error term in the regression model with each set of data $(\bar{y}_i, \bar{x}_i)$ and (y_i^*, x_i^*)?

ii) How would you estimate β in the case of annual data?

iii) How would you estimate β in the case of moving average data? [2+1+2]

e) 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]

f) The estimated regression of y on x is $\hat{y} = 0{\cdot}39x + 6{\cdot}9$ and the estimated regression of x on y is $\hat{x} = 1{\cdot}2y - 2{\cdot}4$. What is the percentage of the variation in y, on an average, explained by x?

g) Given a sample of 50 observations & 4 explanatory variables, what can you say about the auto-correlation if the computed Durbin-Watson 'd' values are

i) 1·05 ii) 2·5 iii) 3·97 [2+1·5+1·5]

Answer **any two** questions from **Question Nos. 2 to 5** : [2×15]

2. Suppose that in the model $y_i = \beta_0 + \beta_1 x_i + \varepsilon_i$, the errors ε_i have mean 0 and are independent, but $\text{Var}(\varepsilon_i) = K_i^2 \sigma^2$, where K_i are known constants.

a) Suitably transform this model to make it conform to the CLRM assumptions.

b) Find the least square estimates of β_0 & β_1 for the transformed model.

c) Find the variance of the least square estimate of β_1 for this transformed model. [3+7+5]

3. a) Suppose that a line is fitted by the method of least squares to n points, that the standard statistical model holds, and that we wish to predict the population regression function (PRF) at a new point, x_0. Denoting the value on the line by μ_0, the estimate is $\hat{\mu}_0 = \hat{\beta}_0 + \hat{\beta}_1 x_0$.

i) Derive an expression for the variance of $\hat{\mu}_0$.

ii) Derive a $100(1-\alpha)\%$ confidence interval for $\mu_0 = \beta_0 + \beta_1 x_0$ under an assumption of normality. [3+4]

b) Further suppose that we wish to predict the value of a new observation, Y_0 at x_0, i.e $Y_0 = \beta_0 + \beta_1 x_0 + \varepsilon_0$ by the estimate $\hat{Y}_0 = \hat{\beta}_0 + \hat{\beta}_1 x_0$.

iii) Find an expression for the variance of $\hat{Y}_0 - Y_0$. Assume that ε_0 is independent of the original observations and has the variance σ^2.

iv) Assuming ε_0 is normally distributed, find the distribution of $\hat{Y}_0 - Y_0$. Use this result to find an interval I such that $P(Y_0 \in I) = 1-\alpha$. [4+4]

4. a) Explain the concept of Heteroscedasticity in the context of simple linear regression model. [3]

b) How can Goldfeld-Quandt test be used to test the presence of heteroscedasticity in a regression model? [7]

c) What are the (if any) limitations of the Goldfeld-Quandt Test? [2]

d) Briefly describe White's test to detect the presence of heteroscedasticity. [3]

5. a) Explain the consequence of presence of Autocorrelation on the estimated value of the parameters in a simple linear regression model. [5]

b) Explain Durbin-Watson test for detecting the presence of Autocorrelation in a regression model. [5]

c) State the limitations of the Durbin Watson test. [3]

d) Briefly provide a remedial measure for the Autocorrelation issue. [2]

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.

Group - B

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

a) What do you mean by asymmetric information?

b) Explain the concept of government failure.

c) Discuss the role of institutions and their impact.

d) Briefly discuss about the problems of labour markets in developing nations. Can you argue why land or labour market alone cannot solve the problems of rural economy in developing nations? So to speak, why does the substitutability between land and labour market fail and there exists a complementarity between the two, instead? [1·5+1·5]

e) i) Suppose there is an institutional lender in a rural credit market that offers any loan to its potential borrower at the rate 10% p.a. Now a borrower submits two project appraisals, each worth Rs. 200000 where the first one pays her off 15% and the second one 20% with certainty. Which project will be sanctioned by the institutional lender to its borrower? How will the parties (the lender and the borrower) rank them?

ii) Suppose instead of a certain return, the first one pays her off Rs. 460000 with 50% chance and the second one pays off 20% with perfect certainty. How will the borrower and lender rank these projects in this new situation? Do you think the borrower to have a tendency to select the riskier project in a world where the borrower pays off the lender if her project is successful and nothing at all if it fails (i.e. complete bailout of default is guaranteed)? [1·5+1·5]

f) What is the double incentive and the limited problem in a tenancy contract? [1·5+1·5]

g) Distinguish between different definitions of surplus labor.

h) What is microfinance?

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

a) A lending organisation, inspired by the Grameen bank, is attempting to provide loans to small farmers. It is lending to farmers in groups of two, say.

i) Provide at least two reasons why a strategy of group lending may be better than a strategy of lending to individuals. Provide at least two reasons why it may be worse. [4]

ii) A sequential lending strategy is one in which group members are given loans in some order, with the next member receiving a loan only after the earlier member has repaid. A simultaneous lending strategy is one in which all group members are given loans at the same time. In both the cases, assume that default by any one member blacklists the whole group. Compare and contrasts these two strategies. [4]

b) i) Show in the context of rural market, that when the action of an agent is observable and is costless to supervise, an agent will be paid the same return in both good and bad situations. [4]

ii) Show that, in a market for tenancy, when action is costly to monitor an agent should be provided with higher return in good situation than in bad situation in order to induce his best effort. [4]

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

a) i) Explain the concept of market failure. What role can the Government play in case of market failure? [4+5]

ii) What do you mean by rent-seeking activities? Point out when such activities are classified as forms of corruption. [3+3]

b) i) What is the Marshallian efficiency argument in a tenancy contract? [2·5]

ii) Why is the share cropping practice inefficient? [2·5]

iii) Argue why even more than 100% retention of output in fixed rent tenancy contract is considered to be inefficient even though the tenant has a 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 is a better option from 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]

c) i) Use a nutrition based model of labour market analysis to show the co-existence of voluntary and involuntary unemployment at equilibrium which the formal labour market analysis fails to address. Why do you think this happens? [7]

ii) Discuss the effect of inequality of asset holding (in terms of asymmetric land distribution that works as a source of non-wage income) on rural labour market for casual labourers. [5]

iii) What do you mean by credit rationing? [3]

d) Discuss the dynamics of the Harris-Todaro model of rural-urban migration. Mention the major criticisms of the Harris-Todaro model. [10+5]

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