Eastern University, Sri Lanka

Faculty of Commerce and Management

THIRD YEAR FIRST SEMESTER EXAMINATION IN BACHELOR OF COMMERCE

(SPECIALIZATION IN BUSINESS ECONOMICS) 2017/2018

(Proper -July 2019)

ECN 3053 ECONOMETRICS

'er all Questions
ılator Allowed

Time: 3 hours

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i. What is the contribution of Econometrics in the field of Business Economics?

(05 Marks)

ii. Distinguish between Time Series data, and Cross sectional data

(04 Marks)

iii. Explain the different types of scales/ nature of the dependent variable (Y) with examples

(05 Marks)

iv. Describe the assumptions of Simple Linear Regression analysis.

(06 Marks)

(Total 20 Marks)

i. Suppose that you have been assigned to select a best project with the following information of Project A and Project B.

Condition/ Result	Projects			
	A	Probability	B	Probability
Loss	26,000	0.30	71,000	0.20
Break Even	0	0.50	0	0.65
Profit	68,000	0.20	143,000	0.15

Select the best project for investment

(05 Marks)

ii. Suppose X is a continuous random variable with the probability density function.

$$\int_0^3 f_x(x) = \frac{1}{9} X^2 \quad for\ 0 \leq x \leq 3$$

Find the E(x) and Var (X) and SD of the variable.

(05 Marks)

iii. Family incomes of an area are normally distributed with μ=16,000/- and σ = 2
What is the probability that a family picked at random will have an income
a. Between 15,000/- and 18,000/-
b. Above 18,000/-

(05

iv. Define the various types of relationship of two variables with Simple Corr
Coefficient and scatter diagram

(05

(Total 20

3. i. A business Economist wishes to estimate the demand function of Commodity
some information.

The following calculation were obtained from **15 observations** on quantity dem
(Y) of a certain commodity, its price (X_1) and consumer's income (X_2).

$\sum_{t=1}^{n} Y_t = 1050$ $\sum_{t=1}^{n} X_1 = 90$ $\sum_{t=1}^{n} X_2 = 16{,}500$ $\sum_{t=1}^{n} x_1 y = -505$

$\sum_{t=1}^{n} x_2 y = 107{,}500$ $\sum_{t=1}^{n} x_1 x_2 = -11{,}900$ $\sum_{t=1}^{n} y^2 = 4600$

$\sum_{t=1}^{n} x_1^2 = 60$ $\sum_{t=1}^{n} x_2^2 = 2{,}800{,}000$ $\sum_{t=1}^{n} e^2 = 226.32$

i. Estimate the OLS regression equation of Y on X_1 and X_2 and interpret the coefficients

ii. Find $s^2_{\beta_1}$, $s^2_{\beta 2}$

iii. Calculate R^2 and Ajd. R^2

iv. Test β_1 and β_2 are statistically significant 5% level

v. Find the F value of the model and test the overall significant of the model

(Total 20

i. Explain each part of the following linear regression model

$$Y_i = B_1 + B_2 X_{2i} + B_3 X_{3i} + \ldots + B_k X_{ki} + u_i$$

(04 Marks)

ii. The following multiple regression output shows the factors that determine hourly wage of 1289 workers.

Explanatory variables are

Gender (1 for female, 0 for male).
Race (1 for Nonwhite, 0 for white),
Union status (1 for union member, 0 for otherwise),
Education (in Years) and
Work Experience (in Years)

Using the tables answer the questions below

Dependent Variable: WAGE
Method: Least Squares
Sample: 1289
Included observations: 1289

	Coefficient	Std. Error	t-Statistic	Prob.
C	-7.183338	1.015788	-7.071691	0.0000
FEMALE	-3.074875	0.364616	-8.433184	0.0000
NONWHITE	-1.565313	0.509188	-3.074139	0.0022
UNION	1.095976	0.506078	2.165626	0.0305
EDUCATION	1.370301	0.065904	20.79231	0.0000
EXPER	0.166607	0.016048	10.38205	0.0000

Source	SS	df	MS
Model	25967.2805	5	5193.45611
Residual	54342.5442	1283	42.3558411
Total	80309.8247	1288	62.3523484

Number of obs = 1289
F(5, 1283) = 122.61
Prob > F = 0.0000
R-squared = 0.3233
Adj R-squared = 0.3207
Root MSE = 6.5081

a. Write the regression equation
b. Interpret the coefficient values
c. What is the wage difference between Male and female?
d. Test the significance of each coefficient at 5% level
e. Calculate and explain the goodness of fit of the model using the value of R^2
f. Describe the overall significance of the model.

(16 Marks)
(Total 20 Marks)

5. i. Define the econometric function of the following

a. The log-linear model
b. Semi log models
c. Reciprocal models
d. The logarithmic reciprocal model

(08

ii. Suppose the OLS regression generated the following results

Coefficient Value	Standard Error
β_1 = -0.5046	0.1107
β_2 =0.1485	0.0997
β_3=0.0911	0.1007
β_4 =0.3425	0.0833

N= 23 and F = 249.7373

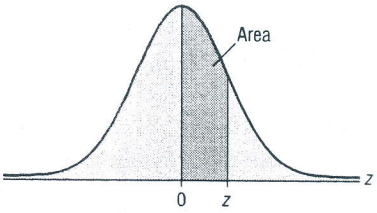
a. Test the significance of coefficients at 5% level

(12

(Total 20

Standard Normal Distribution

ical entries represent the probability that a standard normal random variable
een 0 and z where $z = \frac{x-\mu}{\sigma}$.



z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990
3.1	0.4990	0.4991	0.4991	0.4991	0.4992	0.4992	0.4992	0.4992	0.4993	0.4993
3.2	0.4993	0.4993	0.4994	0.4994	0.4994	0.4994	0.4994	0.4995	0.4995	0.4995
3.3	0.4995	0.4995	0.4995	0.4996	0.4996	0.4996	0.4996	0.4996	0.4996	0.4997
3.4	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4998

TABLE D.2
Percentage Points of the *t* Distribution

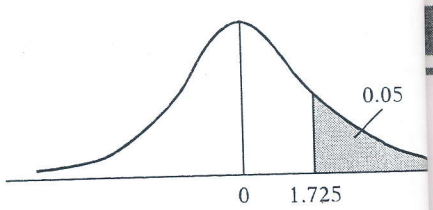
Source: From E. S. Pearson and H. O. Hartley, eds., *Biometrika Tables for Statisticians*, vol. 1, 3d ed., table 12, Cambridge University Press, New York, 1966. Reproduced by permission of the editors and trustees of *Biometrika*.

Example

$\Pr(t > 2.086) = 0.025$

$\Pr(t > 1.725) = 0.05$ for df = 20

$\Pr(|t| > 1.725) = 0.10$



Pr / df	0.25 0.50	0.10 0.20	0.05 0.10	0.025 0.05	0.01 0.02	0.005 0.010
1	1.000	3.078	6.314	12.706	31.821	63.657
2	0.816	1.886	2.920	4.303	6.965	9.925
3	0.765	1.638	2.353	3.182	4.541	5.841
4	0.741	1.533	2.132	2.776	3.747	4.604
5	0.727	1.476	2.015	2.571	3.365	4.032
6	0.718	1.440	1.943	2.447	3.143	3.707
7	0.711	1.415	1.895	2.365	2.998	3.499
8	0.706	1.397	1.860	2.306	2.896	3.355
9	0.703	1.383	1.833	2.262	2.821	3.250
10	0.700	1.372	1.812	2.228	2.764	3.169
11	0.697	1.363	1.796	2.201	2.718	3.106
12	0.695	1.356	1.782	2.179	2.681	3.055
13	0.694	1.350	1.771	2.160	2.650	3.012
14	0.692	1.345	1.761	2.145	2.624	2.977
15	0.691	1.341	1.753	2.131	2.602	2.947
16	0.690	1.337	1.746	2.120	2.583	2.921
17	0.689	1.333	1.740	2.110	2.567	2.898
18	0.688	1.330	1.734	2.101	2.552	2.878
19	0.688	1.328	1.729	2.093	2.539	2.861
20	0.687	1.325	1.725	2.086	2.528	2.845
21	0.686	1.323	1.721	2.080	2.518	2.831
22	0.686	1.321	1.717	2.074	2.508	2.819
23	0.685	1.319	1.714	2.069	2.500	2.807
24	0.685	1.318	1.711	2.064	2.492	2.797
25	0.684	1.316	1.708	2.060	2.485	2.787
26	0.684	1.315	1.706	2.056	2.479	2.779
27	0.684	1.314	1.703	2.052	2.473	2.771
28	0.683	1.313	1.701	2.048	2.467	2.763
29	0.683	1.311	1.699	2.045	2.462	2.756
30	0.683	1.310	1.697	2.042	2.457	2.750
40	0.681	1.303	1.684	2.021	2.423	2.704
60	0.679	1.296	1.671	2.000	2.390	2.660
120	0.677	1.289	1.658	1.980	2.358	2.617
∞	0.674	1.282	1.645	1.960	2.326	2.576

Note: The smaller probability shown at the head of each column is the area in one tail; the larger probability is the both tails.

Critical Values of F (Area = 0.050)

Denominator Degrees of Freedom	Numerator Degrees of Freedom								
	1	2	3	4	5	6	7	8	9
1	161.4476	199.5000	215.7073	224.5832	230.1619	233.9860	236.7684	238.8827	240.5433
2	18.5128	19.0000	19.1643	19.2468	19.2964	19.3295	19.3532	19.3710	19.3848
3	10.1280	9.5521	9.2766	9.1172	9.0135	8.9406	8.8867	8.8452	8.8123
4	7.7086	6.9443	6.5914	6.3882	6.2561	6.1631	6.0942	6.0410	5.9988
5	6.6079	5.7861	5.4095	5.1922	5.0503	4.9503	4.8759	4.8183	4.7725
6	5.9874	5.1433	4.7571	4.5337	4.3874	4.2839	4.2067	4.1468	4.0990
7	5.5914	4.7374	4.3468	4.1203	3.9715	3.8660	3.7870	3.7257	3.6767
8	5.3177	4.4590	4.0662	3.8379	3.6875	3.5806	3.5005	3.4381	3.3881
9	5.1174	4.2565	3.8625	3.6331	3.4817	3.3738	3.2927	3.2296	3.1789
10	4.9646	4.1028	3.7083	3.4780	3.3258	3.2172	3.1355	3.0717	3.0204
11	4.8443	3.9823	3.5874	3.3567	3.2039	3.0946	3.0123	2.9480	2.8962
12	4.7472	3.8853	3.4903	3.2592	3.1059	2.9961	2.9134	2.8486	2.7964
13	4.6672	3.8056	3.4105	3.1791	3.0254	2.9153	2.8321	2.7669	2.7144
14	4.6001	3.7389	3.3439	3.1122	2.9582	2.8477	2.7642	2.6987	2.6458
15	4.5431	3.6823	3.2874	3.0556	2.9013	2.7905	2.7066	2.6408	2.5876
16	4.4940	3.6337	3.2389	3.0069	2.8524	2.7413	2.6572	2.5911	2.5377
17	4.4513	3.5915	3.1968	2.9647	2.8100	2.6987	2.6143	2.5480	2.4943
18	4.4139	3.5546	3.1599	2.9277	2.7729	2.6613	2.5767	2.5102	2.4563
19	4.3807	3.5219	3.1274	2.8951	2.7401	2.6283	2.5435	2.4768	2.4227
20	4.3512	3.4928	3.0984	2.8661	2.7109	2.5990	2.5140	2.4471	2.3928
21	4.3248	3.4668	3.0725	2.8401	2.6848	2.5727	2.4876	2.4205	2.3660
22	4.3009	3.4434	3.0491	2.8167	2.6613	2.5491	2.4638	2.3965	2.3419
23	4.2793	3.4221	3.0280	2.7955	2.6400	2.5277	2.4422	2.3748	2.3201
24	4.2597	3.4028	3.0088	2.7763	2.6207	2.5082	2.4226	2.3551	2.3002
25	4.2417	3.3852	2.9912	2.7587	2.6030	2.4904	2.4047	2.3371	2.2821
26	4.2252	3.3690	2.9752	2.7426	2.5868	2.4741	2.3883	2.3205	2.2655
27	4.2100	3.3541	2.9604	2.7278	2.5719	2.4591	2.3732	2.3053	2.2501
28	4.1960	3.3404	2.9467	2.7141	2.5581	2.4453	2.3593	2.2913	2.2360
29	4.1830	3.3277	2.9340	2.7014	2.5454	2.4324	2.3463	2.2783	2.2229
30	4.1709	3.3158	2.9223	2.6896	2.5336	2.4205	2.3343	2.2662	2.2107
40	4.0847	3.2317	2.8387	2.6060	2.4495	2.3359	2.2490	2.1802	2.1240
60	4.0012	3.1504	2.7581	2.5252	2.3683	2.2541	2.1665	2.0970	2.0401
120	3.9201	3.0718	2.6802	2.4472	2.2899	2.1750	2.0868	2.0164	1.9588
∞	3.8415	2.9957	2.6049	2.3719	2.2141	2.0986	2.0096	1.9384	1.8799

Critical Values of F (Area = 0.050) (cont.)

Denominator Degrees of Freedom	Numerator Degrees of Freedom								
	10	11	12	13	14	15	16	17	18
1	241.8817	242.9835	243.9060	244.6898	245.3640	245.9499	246.4639	246.9184	247.323
2	19.3959	19.4050	19.4125	19.4189	19.4244	19.4291	19.4333	19.4370	19.4402
3	8.7855	8.7633	8.7446	8.7287	8.7149	8.7029	8.6923	8.6829	8.6745
4	5.9644	5.9358	5.9117	5.8911	5.8733	5.8578	5.8441	5.8320	5.8211
5	4.7351	4.7040	4.6777	4.6552	4.6358	4.6188	4.6038	4.5904	4.5785
6	4.0600	4.0274	3.9999	3.9764	3.9559	3.9381	3.9223	3.9083	3.8957
7	3.6365	3.6030	3.5747	3.5503	3.5292	3.5107	3.4944	3.4799	3.4669
8	3.3472	3.3130	3.2839	3.2590	3.2374	3.2184	3.2016	3.1867	3.1733
9	3.1373	3.1025	3.0729	3.0475	3.0255	3.0061	2.9890	2.9737	2.9600
10	2.9782	2.9430	2.9130	2.8872	2.8647	2.8450	2.8276	2.8120	2.7980
11	2.8536	2.8179	2.7876	2.7614	2.7386	2.7186	2.7009	2.6851	2.6709
12	2.7534	2.7173	2.6866	2.6602	2.6371	2.6169	2.5989	2.5828	2.5684
13	2.6710	2.6347	2.6037	2.5769	2.5536	2.5331	2.5149	2.4987	2.4841
14	2.6022	2.5655	2.5342	2.5073	2.4837	2.4630	2.4446	2.4282	2.4134
15	2.5437	2.5068	2.4753	2.4481	2.4244	2.4034	2.3849	2.3683	2.3533
16	2.4935	2.4564	2.4247	2.3973	2.3733	2.3522	2.3335	2.3167	2.3016
17	2.4499	2.4126	2.3807	2.3531	2.3290	2.3077	2.2888	2.2719	2.2567
18	2.4117	2.3742	2.3421	2.3143	2.2900	2.2686	2.2496	2.2325	2.2172
19	2.3779	2.3402	2.3080	2.2800	2.2556	2.2341	2.2149	2.1977	2.1823
20	2.3479	2.3100	2.2776	2.2495	2.2250	2.2033	2.1840	2.1667	2.1511
21	2.3210	2.2829	2.2504	2.2222	2.1975	2.1757	2.1563	2.1389	2.1232
22	2.2967	2.2585	2.2258	2.1975	2.1727	2.1508	2.1313	2.1138	2.0980
23	2.2747	2.2364	2.2036	2.1752	2.1502	2.1282	2.1086	2.0910	2.0751
24	2.2547	2.2163	2.1834	2.1548	2.1298	2.1077	2.0880	2.0703	2.0543
25	2.2365	2.1979	2.1649	2.1362	2.1111	2.0889	2.0691	2.0513	2.0353
26	2.2197	2.1811	2.1479	2.1192	2.0939	2.0716	2.0518	2.0339	2.0178
27	2.2043	2.1655	2.1323	2.1035	2.0781	2.0558	2.0358	2.0179	2.0017
28	2.1900	2.1512	2.1179	2.0889	2.0635	2.0411	2.0210	2.0030	1.9868
29	2.1768	2.1379	2.1045	2.0755	2.0500	2.0275	2.0073	1.9893	1.9730
30	2.1646	2.1256	2.0921	2.0630	2.0374	2.0148	1.9946	1.9765	1.9601
40	2.0772	2.0376	2.0035	1.9738	1.9476	1.9245	1.9037	1.8851	1.8682
60	1.9926	1.9522	1.9174	1.8870	1.8602	1.8364	1.8151	1.7959	1.7784
120	1.9105	1.8693	1.8337	1.8026	1.7750	1.7505	1.7285	1.7085	1.6904
∞	1.8307	1.7887	1.7522	1.7202	1.6918	1.6664	1.6435	1.6228	1.6039

Critical Values of *F* (Area = 0.050) (cont.)

Denominator Degrees of Freedom	Numerator Degrees of Freedom						
	19	20	24	30	40	60	120
1	247.6861	248.0131	249.0518	250.0951	251.1432	252.1957	253.2529
2	19.4431	19.4458	19.4541	19.4624	19.4707	19.4791	19.4874
3	8.6670	8.6602	8.6385	8.6166	8.5944	8.5720	8.5494
4	5.8114	5.8025	5.7744	5.7459	5.7170	5.6877	5.6581
5	4.5678	4.5581	4.5272	4.4957	4.4638	4.4314	4.3985
6	3.8844	3.8742	3.8415	3.8082	3.7743	3.7398	3.7047
7	3.4551	3.4445	3.4105	3.3758	3.3404	3.3043	3.2674
8	3.1613	3.1503	3.1152	3.0794	3.0428	3.0053	2.9669
9	2.9477	2.9365	2.9005	2.8637	2.8259	2.7872	2.7475
10	2.7854	2.7740	2.7372	2.6996	2.6609	2.6211	2.5801
11	2.6581	2.6464	2.6090	2.5705	2.5309	2.4901	2.4480
12	2.5554	2.5436	2.5055	2.4663	2.4259	2.3842	2.3410
13	2.4709	2.4589	2.4202	2.3803	2.3392	2.2966	2.2524
14	2.4000	2.3879	2.3487	2.3082	2.2664	2.2229	2.1778
15	2.3398	2.3275	2.2878	2.2468	2.2043	2.1601	2.1141
16	2.2880	2.2756	2.2354	2.1938	2.1507	2.1058	2.0589
17	2.2429	2.2304	2.1898	2.1477	2.1040	2.0584	2.0107
18	2.2033	2.1906	2.1497	2.1071	2.0629	2.0166	1.9681
19	2.1683	2.1555	2.1141	2.0712	2.0264	1.9795	1.9302
20	2.1370	2.1242	2.0825	2.0391	1.9938	1.9464	1.8963
21	2.1090	2.0960	2.0540	2.0102	1.9645	1.9165	1.8657
22	2.0837	2.0707	2.0283	1.9842	1.9380	1.8894	1.8380
23	2.0608	2.0476	2.0050	1.9605	1.9139	1.8648	1.8128
24	2.0399	2.0267	1.9838	1.9390	1.8920	1.8424	1.7896
25	2.0207	2.0075	1.9643	1.9192	1.8718	1.8217	1.7684
26	2.0032	1.9898	1.9464	1.9010	1.8533	1.8027	1.7488
27	1.9870	1.9736	1.9299	1.8842	1.8361	1.7851	1.7306
28	1.9720	1.9586	1.9147	1.8687	1.8203	1.7689	1.7138
29	1.9581	1.9446	1.9005	1.8543	1.8055	1.7537	1.6981
30	1.9452	1.9317	1.8874	1.8409	1.7918	1.7396	1.6835
40	1.8529	1.8389	1.7929	1.7444	1.6928	1.6373	1.5766
60	1.7625	1.7480	1.7001	1.6491	1.5943	1.5343	1.4673
120	1.6739	1.6587	1.6084	1.5543	1.4952	1.4290	1.3519
∞	1.5865	1.5705	1.5173	1.4591	1.3940	1.3180	1.2214