KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2018/2019

SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF ECONOMICS

EES 400: FUNDAMENTALS OF ECONOMETRICS 1

DATE: Friday, 29th March 2019 **TIME:** 8.00 a.m. - 10.00 a.m.

INSTRUCTIONS: **Answer question one and any other two questions.**

QUESTION ONE

a) The following data represented total expenditure Y and its main four components for eleven years.

$$Y = 12.7302 + 1.9384X_1 + 1.6239X_2 - -2.3213X_3 + 1.1469X_4$$

(6.0635) (1.1680) (1.7295) (2.4648) (0.8841)

r^2=0.8551 where the values in the bracket represent the standard errors.

i. Estimate the total expenditure for X_1=2.5, X_2=1.5, X_3=30 and X_4=5.0 **[2 Marks]**

ii. Test the significance of overall model at 5% level of significance. **[3 Marks]**

iii. Test the significance of the regression coefficient B_4 at 5% level of significance and interpret your result **[3 Marks]**

b) The following data is given relating dependent variable Y_i and independent variable X_i, Ols estimators and the calculations for testing of significance of parameters.

Year	Y_i	X_i	$\hat{Y}_i$	e_i	e_i^2	X_i^2	x_i^2
1	102	114	100.34	1.66	2.7556	12,996	961
2	106	118	103.78	2.22	4.9284	13,924	729
3	108	126	110.66	-2.66	7.0756	15,876	361
4	110	130	114.10	-4.10	16.8100	16,900	225
5	122	136	119.26	2.74	7.5076	18,496	81
6	124	140	122.70	1.30	1.6900	19,600	25
7	128	148	129.58	-1.58	2.4964	21,904	9
8	130	156	136.46	-6.46	41.7316	24,336	121
9	142	160	139.90	2.10	4.4100	25,600	225
10	148	164	143.34	4.66	21.7156	26,896	361
11	130	170	148.50	1.50	2.2500	28,900	625
12	154	178	155.38	-1.38	1.9044	31,684	1089
				$\sum e_i$=0	$\sum e_i^2$ =115.2752	$\sum X_i^2$ =27,112	x_i^2 =4,812

Ols estimators are b_0 =15.529 and b_1=0.7572

Find the value of the following measures:

(i) Variance of the error term **[2 Marks]**

(ii) The standard error and t ratio for the intercept b_0 **[4 Marks]**

(iii) The standard error and t ratio of coefficient b_1 **[4 Marks]**

c) Explain what you understand by the term "perfect multicollinearity" and indicate its main drawbacks in econometric analysis **[6 Marks]**

d) Derive normal regression equations for a bivariate regression model given below and get ols estimators. $Y = b_0 + b_1X_1 + b_2X_2 + e_i$ **[6 Marks]**

QUESTION TWO

You estimate a regression in order to evaluate the effect of various firm specific factors on the returns of a sample of firms

$$r_i = \beta_0 + \beta_1 S_i + \beta_2 MB_i + \beta_3 PE_i + \beta_4 BETA_i + u_i$$

Where r_i is the percentage annual return for the stock, s_i is the size of firm i measured in sales revenue, MB_i is market to book ratio of the firm, PE_i is the price earnings (P/E)ratio of the firm and $BETA_i$ is the stock's capital asset pricing model (CAPM) beta coefficient. You run a cross-sectional regression with 200 firms. You obtain the following results (with standard errors in parenthesis):

$$\hat{r}_i = 0.08 + 0.801s_i + 0.321MB_i + 0.164PE_i - 0.084BETA_i$$

(0.064) (0.147) (0.136) (0.420) (0.120)

a) Calculate the t-ratios **[5 Marks]**

b) What do you conclude about the effect of each variable on the returns of the security? **[5 Marks]**

c) From the results, what variable(s) would you consider deleting from the regression? Give reasons for your answer. **[5Marks]**

d) If a stock's beta increased from 1.0 to 1.2, what would be the expected effect on the stock's return? **[2 Marks]**

e) Is the sign of beta as you would have expected? Explain your answer in each case **[3 Marks]**

QUESTION THREE

a) What five assumptions are usually made about unobservable error terms in the classical linear regression model (CLRM)? Briefly explain the meaning of each **[7 Marks]**

b) Explain five model specification errors. **[7 1/2 Marks]**

c) Describe briefly the three hypothesis testing procedures that are available under OLS estimation. **[5 1/2 Marks]**

QUESTION FOUR

The table below shows the data relating to amount of fertilizer (in kg) applied and the corresponding various output levels;

Amount of fertilizer (kg), x	100	125	146	150	187	206	260	300	322
Yield (£), y	5.0	10	14	15	19	27	30	37	40

a) Find the least-square regression line of y on x. **[6 Marks]**

b) Calculate the Pearson's product-moment correlation coefficient, r **[8 Marks]**

c) Find the Coefficient of determination in % and interpret your result **[3 Marks]**

d) Forecast the yield (£) when the amount of fertilizer is 400 kgs. **[3 Marks]**

QUESTION FIVE

a) Highlight any four remedies for heteroscedasticity problem **[4 Marks]**

b) Discuss how we can detect multicollinearity in a data set **[4 Marks]**

c) Autocorrelation is a key violation to OLS assumptions. Demonstrate how the following methods can be used to identify autocorrelation: Graphical method, The Durbin-Watson (DW) Test Statistics, Bruesh-Godfrey (BG) Test **[6 Marks]**

d) Explain how autocorrelation affect OLS estimation and recommend how it can be dealt with **[6 Marks]**

TABLE F The *t*-Distribution

	0.900	0.700	0.500	0.300	0.200	0.100	0.050	0.020	0.010	α value	two tailed-test
	0.100	0.300	0.500	0.700	0.800	0.900	0.950	0.980	0.990	CL	
	0.450	0.350	0.250	0.150	0.100	0.050	0.025	0.010	0.005	α value	one tailed-test
	0.550	0.650	0.750	0.850	0.900	0.950	0.975	0.990	0.995	CL	
d.f.	Values of *t*										
1	0.158	0.510	1.000	1.963	3.078	6.314	12.706	31.821	63.657		
2	0.142	0.445	0.816	1.386	1.886	2.920	4.303	6.965	9.925		
3	0.137	0.424	0.765	1.250	1.638	2.353	3.182	4.541	5.841		
4	0.134	0.414	0.741	1.190	1.533	2.132	2.776	3.747	4.604		
5	0.132	0.408	0.727	1.156	1.476	2.015	2.571	3.365	4.032		
6	0.131	0.404	0.718	1.134	1.440	1.943	2.447	3.143	3.707		
7	0.130	0.402	0.711	1.119	1.415	1.895	2.365	2.998	3.499		
8	0.130	0.399	0.706	1.108	1.397	1.860	2.306	2.896	3.355		
9	0.129	0.398	0.703	1.100	1.383	1.833	2.262	2.821	3.250		
10	0.129	0.397	0.700	1.093	1.372	1.812	2.228	2.764	3.169		
11	0.129	0.396	0.697	1.088	1.363	1.796	2.201	2.718	3.106		
12	0.128	0.395	0.695	1.083	1.356	1.782	2.179	2.681	3.055		
13	0.128	0.394	0.694	1.079	1.350	1.771	2.160	2.650	3.012		
14	0.128	0.393	0.692	1.076	1.345	1.761	2.145	2.624	2.977		
15	0.128	0.393	0.691	1.074	1.341	1.753	2.131	2.602	2.947		
16	0.128	0.392	0.690	1.071	1.337	1.746	2.120	2.583	2.921		
17	0.128	0.392	0.689	1.069	1.333	1.740	2.110	2.567	2.898		
18	0.127	0.392	0.688	1.067	1.330	1.734	2.101	2.552	2.878		
19	0.127	0.391	0.688	1.066	1.328	1.729	2.093	2.539	2.861		
20	0.127	0.391	0.687	1.064	1.325	1.725	2.086	2.528	2.845		
21	0.127	0.391	0.686	1.063	1.323	1.721	2.080	2.518	2.831		
22	0.127	0.390	0.686	1.061	1.321	1.717	2.074	2.508	2.819		
23	0.127	0.390	0.685	1.060	1.319	1.714	2.069	2.500	2.807		
24	0.127	0.390	0.685	1.059	1.318	1.711	2.064	2.492	2.797		
25	0.127	0.390	0.684	1.058	1.316	1.708	2.060	2.485	2.787		
26	0.127	0.390	0.684	1.058	1.315	1.706	2.056	2.479	2.779		
27	0.127	0.389	0.684	1.057	1.314	1.703	2.052	2.473	2.771		
28	0.127	0.389	0.683	1.056	1.313	1.701	2.048	2.467	2.763		
29	0.127	0.389	0.683	1.055	1.311	1.699	2.045	2.462	2.756		
30	0.127	0.389	0.683	1.055	1.310	1.697	2.042	2.457	2.750		
40	0.126	0.388	0.681	1.050	1.303	1.684	2.021	2.423	2.704		
60	0.126	0.387	0.679	1.045	1.296	1.671	2.000	2.390	2.660		
120	0.126	0.386	0.677	1.041	1.289	1.658	1.980	2.358	2.617		
∞	0.126	0.385	0.674	1.036	1.282	1.645	1.960	2.326	2.576		

TABLE E The Normal Distribution

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
3.5	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998
3.6	0.4998	0.4998	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.7	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.8	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.9	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000

TABLE G The F-Distribution (*continued*)

$F_{0.90}$; $\alpha = 0.10$

Denominator degrees of freedom	Numerator degrees of freedom								
	10	12	15	20	24	30	40	60	120	∞
28	1.84	1.79	1.74	1.69	1.66	1.63	1.59	1.56	1.52	1.48
29	1.83	1.78	1.73	1.68	1.65	1.62	1.58	1.55	1.51	1.47
30	1.82	1.77	1.72	1.67	1.64	1.61	1.57	1.54	1.50	1.46
40	1.76	1.71	1.66	1.61	1.57	1.54	1.51	1.47	1.42	1.38
60	1.71	1.66	1.60	1.54	1.51	1.48	1.44	1.40	1.35	1.29
120	1.65	1.60	1.55	1.48	1.45	1.41	1.37	1.32	1.26	1.19
∞	1.60	1.55	1.49	1.42	1.38	1.34	1.30	1.24	1.17	1.00

$F_{0.95}$; $\alpha = 0.05$

Denominator degrees of freedom	Numerator degrees of freedom								
	1	2	3	4	5	6	7	8	9
1	161.45	199.50	215.71	224.58	230.16	233.99	236.77	238.88	240.54
2	18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.38
3	10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81
4	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00
5	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77
6	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10
7	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68
8	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39
9	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18
10	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02
11	4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90
12	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80
13	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71
14	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65
15	4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59
16	4.49	3.63	3.24	3.01	2.85	2.74	2.66	2.59	2.54
17	4.45	3.59	3.20	2.96	2.81	2.70	2.61	2.55	2.49
18	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.46
19	4.38	3.52	3.13	2.90	2.74	2.63	2.54	2.48	2.42
20	4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.39
21	4.32	3.47	3.07	2.84	2.68	2.57	2.49	2.42	2.37
22	4.30	3.44	3.05	2.82	2.66	2.55	2.46	2.40	2.34
23	4.28	3.42	3.03	2.80	2.64	2.53	2.44	2.37	2.32
24	4.26	3.40	3.01	2.78	2.62	2.51	2.42	2.36	2.30

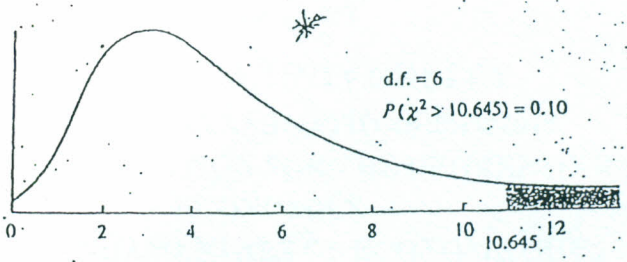

TABLE H Chi-Square Distribution

d.f.	$\chi^2_{0.995}$	$\chi^2_{0.990}$	$\chi^2_{0.975}$	$\chi^2_{0.950}$	$\chi^2_{0.500}$	$\chi^2_{0.700}$	$\chi^2_{0.500}$	$\chi^2_{0.300}$	$\chi^2_{0.200}$	$\chi^2_{0.100}$	$\chi^2_{0.050}$	$\chi^2_{0.020}$	$\chi^2_{0.010}$
1	0.000	0.000	0.001	0.004	0.016	0.148	0.455	1.074	1.642	2.706	3.841	5.412	6.635
2	0.010	0.020	0.051	0.103	0.211	0.713	1.386	2.408	3.219	4.605	5.991	7.824	9.210
3	0.072	0.115	0.216	0.352	0.584	1.424	2.366	3.665	4.642	6.251	7.815	9.837	11.345
4	0.207	0.297	0.484	0.711	1.064	2.195	3.357	4.878	5.989	7.779	9.488	11.668	13.277
5	0.412	0.554	0.831	1.145	1.610	3.000	4.351	6.064	7.289	9.236	11.070	13.388	15.086
6	0.676	0.872	1.237	1.635	2.204	3.828	5.348	7.231	8.558	10.645	12.592	15.033	16.812
7	0.989	1.239	1.690	2.167	2.833	4.671	6.346	8.383	9.803	12.017	14.067	16.622	18.475
8	1.344	1.646	2.180	2.733	3.490	5.527	7.344	9.524	11.030	13.362	15.507	18.168	20.090
9	1.735	2.088	2.700	3.325	4.168	6.393	8.343	10.656	12.242	14.684	16.919	19.679	21.666
10	2.156	2.558	3.247	3.940	4.865	7.267	9.342	11.781	13.442	15.987	18.307	21.161	23.209
11	2.603	3.053	3.816	4.575	5.578	8.148	10.341	12.899	14.631	17.275	19.675	22.618	24.725
12	3.074	3.571	4.404	5.226	6.304	9.034	11.340	14.011	15.812	18.549	21.026	24.054	26.217
13	3.565	4.107	5.009	5.892	7.042	9.926	12.340	15.119	16.985	19.812	22.362	25.472	27.688
14	4.075	4.660	5.629	6.571	7.790	10.821	13.339	16.222	18.151	21.064	23.685	26.873	29.141
15	4.601	5.229	6.262	7.261	8.547	11.721	14.339	17.322	19.311	22.307	24.996	28.259	30.578
16	5.142	5.812	6.908	7.962	9.312	12.624	15.338	18.418	20.465	23.542	26.296	29.633	32.000
17	5.697	6.408	7.564	8.672	10.085	13.531	16.338	19.511	21.615	24.769	27.587	30.995	33.409
18	6.265	7.015	8.231	9.390	10.865	14.440	17.338	20.601	22.760	25.989	28.869	32.346	34.805
19	6.844	7.633	8.907	10.117	11.651	15.352	18.338	21.689	23.900	27.204	30.144	33.687	36.191
20	7.434	8.260	9.591	10.851	12.443	16.266	19.337	22.775	25.038	28.412	31.410	35.020	37.566
21	8.034	8.897	10.283	11.591	13.240	17.182	20.337	23.858	26.171	29.615	32.671	36.343	38.932
22	8.643	9.542	10.982	12.338	14.041	18.101	21.337	24.939	27.301	30.813	33.924	37.659	40.289
23	9.260	10.196	11.689	13.091	14.848	19.021	22.337	26.018	28.429	32.007	35.172	38.968	41.638
24	9.886	10.856	12.401	13.848	15.659	19.943	23.337	27.096	29.553	33.196	36.415	40.270	42.980
25	10.520	11.524	13.120	14.611	16.473	20.867	24.337	28.172	30.675	34.382	37.652	41.566	44.314
26	11.160	12.198	13.844	15.379	17.292	21.792	25.336	29.246	31.795	35.563	38.885	42.856	45.642
27	11.808	12.879	14.573	16.151	18.114	22.719	26.336	30.319	32.912	36.741	40.113	44.140	46.963
28	12.461	13.565	15.308	16.928	18.939	23.647	27.336	31.391	34.027	37.916	41.337	45.419	48.278
29	13.121	14.256	16.047	17.708	19.768	24.577	28.336	32.461	35.139	39.087	42.557	46.693	49.588
30	13.787	14.953	16.791	18.493	20.599	25.508	29.336	33.530	36.250	40.256	43.773	47.962	50.892
40	20.707	22.164	24.433	26.509	29.051	34.872	39.335	44.165	47.269	51.805	55.758	60.436	63.691
50	27.991	29.707	32.357	34.764	37.689	44.313	49.335	54.723	58.164	63.167	67.505	72.613	76.154
60	35.534	37.485	40.482	43.188	46.459	53.809	59.335	65.227	68.972	74.397	79.082	84.580	88.379
70	43.275	45.442	48.758	51.739	55.329	63.346	69.334	75.689	79.715	85.527	90.531	96.388	100.425