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UNIVERSITY OF PETROLEUM & ENERGY STUDIES

DEHRADUN

End Semester Examination-May 2018

Program/course	**: MA Economics (EE)**	**Semester**	**: II**
Subject	**: Econometric Modeling**	**Max. Marks**	**: 100**
Code	**: ECON 7009**	**Duration**	**: 3 Hrs**
No. of page/s	**: 9**		

Section-A

Q1. Answer the questions: **10 X 2= 20**

I. Econometrics means **_____.**

a. Statistical measurement
c. Functional measurement
b. economic measurement
d. All the above

II. Which of the following statements is true concerning the population regression function (PRF) and sample regression function (SRF)?

a. The PRF is the estimated model

b. The PRF is used to infer likely values of the SRF

c. Whether the model is good can be determined by comparing the SRF and the PRF

d. The PRF is a description of the process thought to be generating the data.

III. When the estimated slop coefficient in the simple regression model $\hat{\beta}_2$, is zero, then

a. $r^2 = 0$

c. $0 \le r^2 \le 1$

b. $r^2 \le 1$

d. $r^2 \le 0$

IV. $E(Y|X_i)=f(X_i)$ is referred to as

a. Conditional expectation function

c. Population regression line

b. Intercept line

d. Linear regression line

V. For coefficient of determination r^2 for a regression model

a. $r^2 = 0$

c. $0 \le r^2 \le 1$

b. $r^2 \le 1$

d. $r^2 \le 0$

VI. If coefficient of determination $r^2 = 1$ for a regression model, then _____.

a. it is a perfect fit model

c. $X = Y$

b. $X \le Y$

d. $E(Y) = E(X)$

VII. $u_i = Y_i - E(Y \mid X_i)$ is known as _____.

a. deviation of an expected Y_i around its mean value

c. deviation of an individual X_i around its expected value

b. deviation of an individual Y_i around its maximum value

d. deviation of an individual Y_i around its expected value

VIII. Systematic component of the equation, $Y_i = E(Y \mid X_i) + u_i$ is _____.

a. u_i

c. $E(Y \mid X_i)$

b. Y_i

d. X_i

IX. In confidence interval estimation, $\alpha = 5\%$, this means that this interval includes the true β with probability of _____.

a. 5% c. 105%

b. 95% d. 100%

X. The least square estimators are

a. Point estimators c. Sample estimators

b. Population estimators d. Interval estimators

Section B

Attempt any four questions **4X5 = 20**

Q2. The VIF of regression considering Hydroelectricity Consumption (Million tonnes oil equivalent) as dependent variable is given. Analyses both VIF and TOL and discuss about presence of multicollinearity in the model.

Variable	VIF	1/VIF
GDP	260.14	0.003844
CO2	249.21	0.004013
COP	3.72	0.268896
FDI	3.44	0.290332
Mean VIF	129.13	

Q3. Prepare the table given below and state positive or negative relationship between OC and independent variables.

Sl.No.	OC	β Coeff.	Calculated t-Value	Critical t-Value (at 5%)	State positive or negative relationship between OC and independent variables
1	OE	0.018	-2.30	1.697	
2	RT	-0.030	4.70	1.697	
3	P	-0.070	2.56	1.697	
4	OP	-0.862	6.65	1.697	
5	PR	0.073	-1.33	1.697	
6	Const.	55.40	-4.44	1.697	

Q4. Formulate one Hydroelectricity Consumption function, write down its functional form and econometric specification for India using following variables:

HEC : Hydroelectricity Consumption (Million tonnes oil equivalent)

GDP : GDP (constant 2010 US$)

CO2 : Carbon Dioxide Emissions (Million tonnes carbon dioxide)

Q5. Consider the following regression output:

FDI : Foreign direct investment, net inflows (% of GDP)
CC : Coal Consumption (Million tonnes oil equivalent)
OC : Oil Consumption (Million tonnes)
GDP : GDP (constant 2010 US$)

Source	SS	df	MS		Number of obs =	40
					F(3, 36) =	32.14
Model	22.042701	3	7.34756699		Prob > F =	0.0000
Residual	8.22985362	36	.228607045		R-squared =	0.7281
					Adj R-squared =	0.7055
Total	30.2725546	39	.776219348		Root MSE =	.47813

FDI	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
CC	-.0131586	.008983	-1.46	0.152	-.031377	.0050598
OC	.0168128	.0073668	2.28	0.028	.0018723	.0317534
GDP	1.83e-12	1.42e-12	1.29	0.205	-1.04e-12	4.70e-12
_cons	-.3090215	.2600202	-1.19	0.242	-.836367	.2183239

a) Interpret coefficient of CC and OC.

b) Test the hypothesis that OC does not affect FDI. Which test do you use? And why?

Q6. The ANOVA table of one regression result is given below.

The critical value of F(1, 16) = 2.4904 and $\alpha = 5\%$.

Source	SS	Df	MSS
Model	326765512	1	
Residual	167697811	16	
Total	494463323	17	

Compute

(i) Mean sum of squares,

(ii) F- statistics

(iii) state the overall significance of the model.

Section C

Answer any two questions 2 X 15 = 30

Q7. Prepare the following table and fill the blank using the regression result given below:

i.	R^2 = _____.	vi.	Number of significant t-ratio = _____.
ii.	ESS = _____.	vii.	Adjusted R^2 = _____.
iii.	Dependent variable is _____.	viii.	TSS = _____.
iv.	RSS = _____.	ix.	Degree of freedom for RSS = _____.
v.	P-value for F = _____.	x.	Intercept of the model = _____.

Source	SS	df	MS		Number of obs =	40
					F(4, 35) =	97.64
Model	1330.5003	4	332.625074		Prob > F =	0.0000
Residual	119.230714	35	3.40659184		R-squared =	0.9178
					Adj R-squared =	0.9084
Total	1449.73101	39	37.17259		Root MSE =	1.8457

HEC	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
COP	.0163558	.0189821	0.86	0.395	-.0221799	.0548915
GDP	-1.39e-12	8.76e-12	-0.16	0.875	-1.92e-11	1.64e-11
FDI	1.11567	.6225693	1.79	0.082	-.1482133	2.379552
CO2	.0107857	.0091245	1.18	0.245	-.007738	.0293094
_cons	7.397092	1.948615	3.80	0.001	3.441193	11.35299

Q8. In the following multiple regression result, Hydroelectricity Consumption (Million tonnes oil equivalent) is estimated using factors such as Crude oil prices -US dollars per barrel (COP), GDP-constant 2010 US$ (GDP), Foreign direct investment, net inflows -% of GDP (FDI), and Carbon Dioxide Emissions -Million tonnes carbon dioxide (CO2).

Source	SS	df	MS		Number of obs =	40
					F(4, 35) =	97.64
Model	1330.5003	4	332.625074		Prob > F =	0.0000
Residual	119.230714	35	3.40659184		R-squared =	0.9178
					Adj R-squared =	0.9084
Total	1449.73101	39	37.17259		Root MSE =	1.8457

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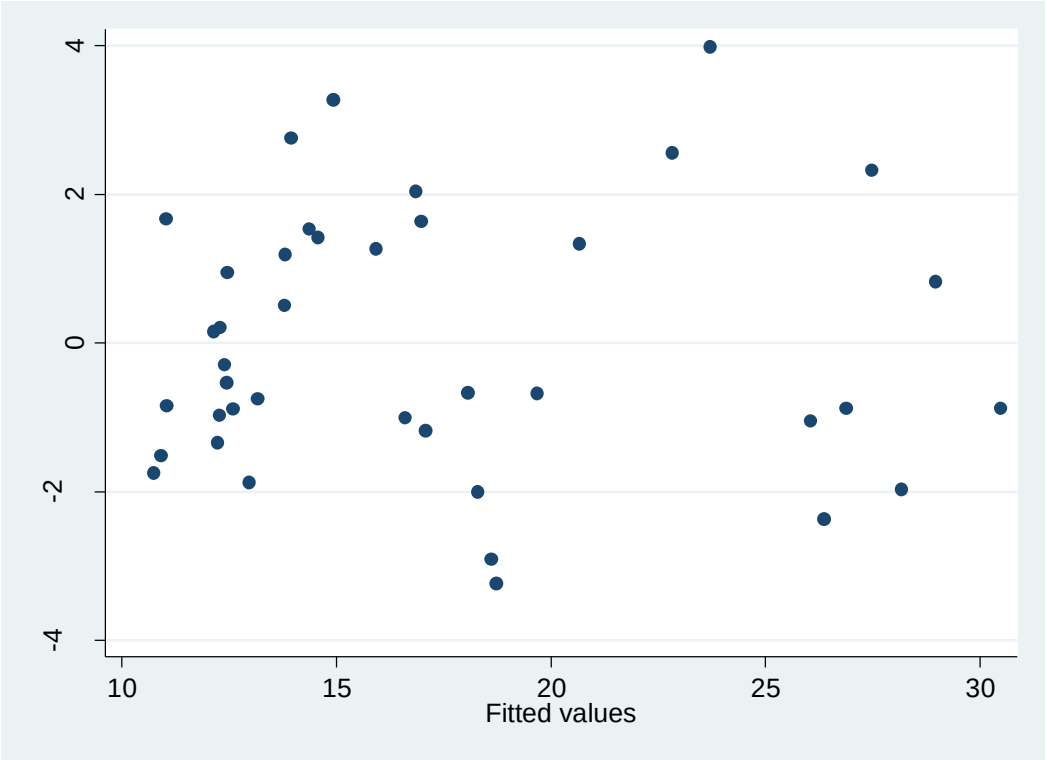
CO2	.0107857	.0091245	1.18	0.245	-.007738	.0293094
_cons	7.397092	1.948615	3.80	0.001	3.441193	11.35299

Using individual hypothesis testing find out relationship between HEC and its determinants.

Q9. Detect problems of heteroscedasticity for a regression model, where Hydroelectricity Consumption-Million tonnes oil equivalent (HEC) is estimated. The post estimation results are given below. Critically analyze and interpret the results.

i. Graphical Method



ii. Breusch-Pagan/ Cook-Weisberg test

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Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: HEC

         chi2(1)      =     2.42
         Prob > chi2  =   0.1196
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iii. Park Test: Park suggests that σ^2_i is some function of the explanatory variable X_i. The functional form he suggested was

$$\sigma^2_i = \sigma^2 X^{\beta}_i \, e^{vi}$$

Using this functional form suggest how to detect the heteroscedasticity.

Section D

Answer all questions **2 X 15 = 30**

Q10. In the following multiple regression result, Hydroelectricity Consumption (Million tonnes oil equivalent) is estimated using factors such as Crude oil prices -US dollars per barrel (COP), GDP-constant 2010 US$ (GDP), Foreign direct investment, net inflows -% of GDP (FDI), and Carbon Dioxide Emissions -Million tonnes carbon dioxide (CO2).

Source	SS	df	MS		
Model	1330.5003	4	332.625074		
Residual	119.230714	35	3.40659184		
Total	1449.73101	39	37.17259		

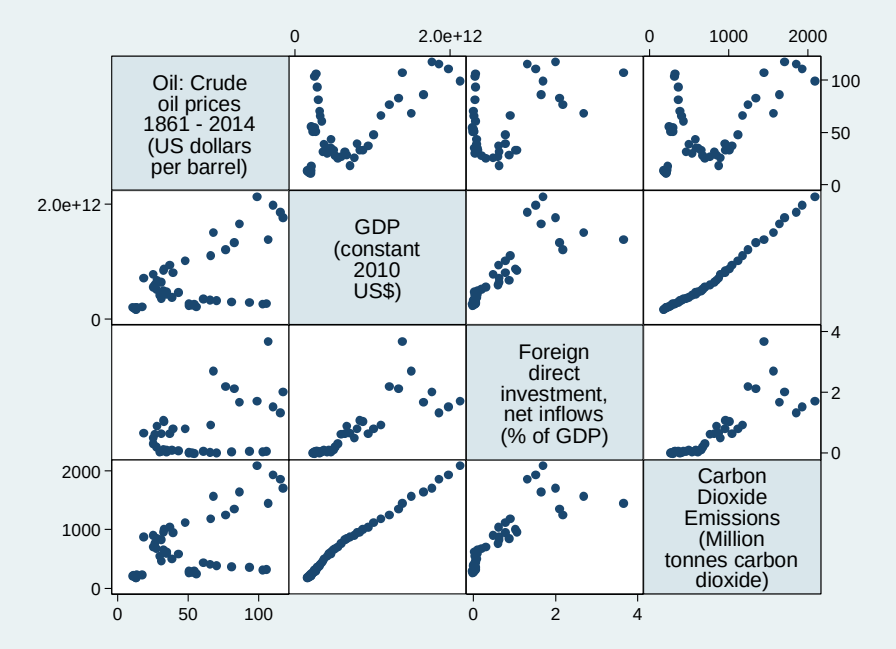
Number of obs	=	40			
F(4, 35)	=	97.64			
Prob > F	=	0.0000			
R-squared	=	0.9178			
Adj R-squared	=	0.9084			
Root MSE	=	1.8457			

HEC	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
COP	.0163558	.0189821	0.86	0.395	-.0221799	.0548915
GDP	-1.39e-12	8.76e-12	-0.16	0.875	-1.92e-11	1.64e-11
FDI	1.11567	.6225693	1.79	0.082	-.1482133	2.379552
CO2	.0107857	.0091245	1.18	0.245	-.007738	.0293094
_cons	7.397092	1.948615	3.80	0.001	3.441193	11.35299

Interpret the post estimation results and justify whether multicollinearity is present in the model or not.

Post Estimation Tests:

(i) Scatter Plot Matrix



(ii) Correlation Matrix

	COP	GDP	FDI	CO2
COP	1.0000			
GDP	0.5130	1.0000		
FDI	0.4598	0.8239	1.0000	
CO2	0.4398	0.9944	0.8271	1.0000

(iii) R-square and t-ratio comparison

Q11. In the following multiple regression result, Hydroelectricity Consumption (Million tonnes oil equivalent) is estimated using factors such as Crude oil prices -US dollars per barrel (COP), GDP-constant 2010 US$ (GDP), and Carbon Dioxide Emissions -Million tonnes carbon dioxide (CO2).

Source	SS	df	MS		Number of obs =	50
					F(3, 46) =	227.67
Model	2277.41479	3	759.138263		Prob > F =	0.0000
Residual	153.37901	46	3.33432629		R-squared =	0.9369
					Adj R-squared =	0.9328
Total	2430.7938	49	49.6080367		Root MSE =	1.826

HEC	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
COP	.0483365	.0109777	4.40	0.000	.0262395	.0704335
GDP	-1.67e-11	4.62e-12	-3.61	0.001	-2.60e-11	-7.37e-12
CO2	.028034	.0045904	6.11	0.000	.018794	.0372739
_cons	3.259869	.7111453	4.58	0.000	1.828408	4.69133

Interpret the post estimation results and justify whether autocorrelation is present in the HEC series or not.

Post-estimation tests:

(i) Durbin's Alternative Test

Durbin's alternative test for autocorrelation

lags(*p*)	F	df	Prob > F
1	6.335	(1, 45)	0.0155
2	3.359	(2, 44)	0.0439
3	2.559	(3, 43)	0.0674
4	1.949	(4, 42)	0.1200
5	1.745	(5, 41)	0.1459

H0: no serial correlation

(ii) Breusch-Godfrey LM test

Breusch-Godfrey LM test for autocorrelation

lags(*p*)	F	df	Prob > F
1	6.170	(1, 45)	0.0168
2	3.312	(2, 44)	0.0457
3	2.525	(3, 43)	0.0701
4	1.957	(4, 42)	0.1187
5	1.755	(5, 41)	0.1438

H0: no serial correlation

(iii) Graphical Method: