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FEEDBACK TUTORIAL LETTER
SEMEMSTER 1: (2023)

ECONOMETRICS
ECM712S

ASSIGNMENT 1& 2

ASSIGNMENT 01 **[70 marks]**

QUESTION 1 **[25 marks]**

a) With clear examples, discuss in detail what differentiate econometrics from statistics and mathematics. **[10 marks]**

Economic theory makes statements or hypotheses that are mostly qualitative in nature. For example, microeconomic theory states that, other things remaining the same, a reduction in the price of a commodity is expected to increase the quantity demanded of that commodity.

It is the job of the econometrician to provide such numerical estimates. The main concern of mathematical economics is to express economic theory in mathematical form (equations) without regard to measurability or empirical verification of the theory. Economic statistics is mainly concerned with collecting, processing, and presenting economic data in the form of charts and tables. It does not go any further. The one who does that is the econometrician.

b) Use individual example different from the one in the study guide to demonstrate your understanding of the following methodology steps in econometrics. **[15 marks]**

1. *Statement of theory or hypothesis.*

Men or women increase their consumption as their income increases, but not as much as the increase in their income.

2. *Specification of the mathematical model of the theory*

$Y = \beta_1 + \beta_2 X \qquad 0 < \beta_2 < 1$

where Y = consumption expenditure and X = income, and where β1 and β2, known as the parameters of the model, are, respectively, the intercept and slope coefficients. This is a single equation model

Y is dependent variable and X is independent or explanatory

3. *Specification of the mathematical and statistical, or econometric, model*

$\boldsymbol{Y} = \beta_1 + \beta_2 X$, The purely mathematical model of the consumption function given above is of limited interest to the econometrician, for it assumes that there is an exact or deterministic relationship between consumption and income.

$Y = \beta_1 + \beta_2 X + u$, where u, known as the disturbance, or error, term, is a random (stochastic) variable that has well-defined probabilistic properties. The disturbance term u may well represent all those factors that affect consumption but are not taken into account explicitly.

4. *Obtaining the data*

Year	*Y*	*X*
1982	*3081.5*	*4620.3*
1983	*3240.6*	*4803.7*
1984	*3407.6*	*5140.1*
1985	*3566.5*	*5323.5*
1986	*3708.7*	*5487.7*
1987	*3822.3*	*5649.5*
1988	*3972.7*	*5865.2*
1989	*4064.6*	*6062.0*
1990	*4132.2*	*6136.3*
1991	*4105.8*	*6079.4*
1992	*4219.8*	*6244.4*
1993	*4343.6*	*6389.6*
1994	*4486.0*	*6610.7*
1995	*4595.3*	*6742.1*

Question Two **[20 marks]**

Use relevant examples to explain why in econometrics we prefer conditional mean over unconditional mean. In your analysis highlights also where unconditional mean is applicable.

NOTE:

Make sure your example is different from others, if not, you will get a zero.

Each students is expected to use his or her own example

Question Three **[25 marks]**

A researcher is using data for a sample of 10 consumers to investigate the relationship between the annual consumption C_i and annual income I_i.

Year	**Income, I_i**	**Consumption, C_i**
2010	12003	10810
2011	13307	11000
2012	14001	13706
2013	15305	14605

2014	18707	16807
2015	19905	18203
2016	21502	20207
2017	23202	22406
2018	25603	24202
2019	27904	25508

2.1 Use the information in the table above to compute the following:

a) $\sum_{i=1}^{N} i^2{}_i =$; 267506718.9 [5 marks]

Income, Ii	i = I - meanof I	i^2
12003	-7140.9	50992452.81
13307	-5836.9	34069401.61
14001	-5142.9	26449420.41
15305	-3838.9	14737153.21
18707	-436.9	190881.61
19905	761.1	579273.21
21502	2358.1	5560635.61
23202	4058.1	16468175.61
25603	6459.1	41719972.81
27904	8760.1	76739352.01
19143.9	**-1.45519E-11**	**267506718.9**

b) $\sum_{i=1}^{N} c_i{}^2 = 250595360.4$ [5 marks]

Consumption, Ci	i = I - meanof I	i^2
10810	-6935.4	48099773.16
11000	-6745.4	45500421.16
13706	-4039.4	16316752.36
14605	-3140.4	9862112.16
16807	-938.4	880594.56
18203	457.6	209397.76
20207	2461.6	6059474.56
22406	4660.6	21721192.36

24202	6456.6	41687683.56
25508	7762.6	60257958.76
17745.4	**-1.45519E-11**	**250595360.4**

c) $\sum_{i=1}^{N} \hat{c}_i^2$=3395721914 [15 marks]

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.992257076
R Square	0.984574105
Adjusted R Square	0.982645868
Standard Error	695.1310725
Observations	10

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	246729702.7	2.47E+08	510.6085	1.56E-08
Residual	8	3865657.664	483207.2		
Total	9	250595360.4			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-640.0298247	842.806674	-0.7594	0.469395	-2583.55	1303.486	-2583.55	1303.48
Income, Ii	0.960380582	0.04250102	22.59665	1.56E-08	0.862373	1.058388	0.862373	1.05838

RESIDUAL OUTPUT

Observation	***Est Ci***	***(Est Ci)^2***
1	10887.4183	118535877.3
2	12139.75458	147373641.3
3	12806.2587	164000262

4	14058.59498	197644092.9
5	17325.80972	300183682.6
6	18476.34566	341375349
7	20010.07345	400403039.5
8	21642.72044	468407348
9	23948.59422	573535165
10	26158.42994	684263456.8
		3395721914

Assignment two Solution

Question One

a) Summary output table of $\hat{Y}_i = \hat{\beta}_1 + \hat{\beta}_2 X_i$ where y hat is the estimated consumption and x is consumer level of income

Multiple R	0.998906
R Square	**i)**
Adjusted R Square	**ii)**
Standard Error	21.14699
Observations	13

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	2244134	2244134	5018.24	5.51E-16
Residual	11	**iv)**	447.1954		
Total	12	2254134			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*
Intercept	-158.409	56.99757	**v)**	0.017929	-283.86
X(Income)	**iii)**	0.009905	70.83953	5.51E-16	0.679847

Use the information above to answer the following questions:

i) Calculate R^2 of this model [3 marks]
R square = 2244134/2254134 = 0.995564

ii) Calculate adjusted R^2 of this model [3 marks]
Adj R square = 1 –[(1- R square)(n-1)/n-k-1)

iii) Calculate slope coefficient or income parameter [3 marks]
Income parameter = standard error x t stat = 0.009905*70.83953 = 0.7

iv) Calculate residual sum of square (RSS) [3 marks]
RSS = 2254134 – 2244134 =10000

v) Calculate the t statistics of the intercept [3 marks]
T stat for intercept = intercept coefficient / standard error= -158.409/56.99757 = -2.779

vi) Is this model supposed to be an intercept present model or intercept absent model if adjusted R^2 =0.916624 of the absent intercept model? [5 marks]

The model supposed to include intercept because the intercept coefficient is statistically significant .

b) Given the following two summary output tables
Summary output table 1 [$\hat{Y}_i = \hat{\beta}_1 + \hat{\beta}_2 X_i + \hat{\beta}_3 GD_i$]

Regression Statistics	
Multiple R	0.999074
R Square	0.998149
Adjusted R Square	0.987779
Standard Error	20.40407
Observations	13

	df	*SS*	*MS*	*Significance F*
Regression	2	2244890	1122445	2.17E-14
Residual	10	4163.263	416.3263	
Total	12	2249053		

	Coefficients	*Standard Error*	*t Stat*	*Lower 95%*	*Upper 95%*
Intercept	-155.853	55.02788	-2.83226	-278.463	-33.2437
Xi	0.700197	0.009617	72.80746	0.678769	0.721626
GDi	0.000272	0.000202	1.347446	-0.00018	0.000723

Summary output table 2 [$\hat{Y}_i = \hat{\beta}_1 + \hat{\beta}_2 X_i$]

Multiple R	0.998906
R Square	0.997813
Adjusted R Square	0.999914
Standard Error	21.14699
Observations	13

	df	*SS*	*MS*	*Significance F*
Regression	1	2244134	2244134	5.5104E-16
Residual	11	4919.149	447.1954	
Total	12	2249053		

	Coefficients	Standard Error	t Stat	Lower 95%	Upper 95%
Intercept	-158.409	56.99757	-2.77923	-283.86022	-32.9586
Xi	0.701647	0.009905	70.83953	0.67984663	0.723447

Did we make a mistake by including government debt (GD) in the model? Use evidence from the two summaries out tables to justify your answer.
[15 marks]

Yes we made a mistake by including GD in the model because the coefficient for GD is statistical insignificant and the adjusted r square improved as we remove GD from the model.

Question Two **[30 marks]**

Income, I_i	**Consumption, C_i**
462003	308105
480307	324006
514001	340706
532305	356605
548707	370807
564905	382203
586502	397207
606202	406406
613603	413202
607904	410508
624404	421908
638906	434306

a) State the null and alternative hypothesis associated with MWD test [1 mark]

Ho: Consumption is a linear model of Income

H1: Consumption is a log linear model of income

b) If the estimated linear regression model is $\hat{C_i} = -14989.7 + 0.7I_i$, calculate the value of $\hat{C_i}$ associated with each level of income. [6 marks]

Estimated values of Ci
308413.8358
321226.6931

344812.5986
357625.456
369106.9074
380445.5581
395563.5258
409353.5875
414534.3106
410544.9928
422095.0445
432246.4899

c) If the estimated log-linear model is $\widehat{logC_i} = 5.11 + 0.000000824I_i$, calculate the value of $\widehat{logC_i}$ associated with each level of income. [6 marks]

Estamated values of LnCi
5.490690472
5.505772968
5.533536824
5.54861932
5.562134568
5.57548172
5.593277648
5.609510448
5.615608872
5.610912896
5.624508896
5.636458544

d) Obtain the values of Z_{1i} [12 marks]

Z1i
7.148507311
7.174129394
7.217219532
7.238622185
7.256707035
7.273616646
7.294789027
7.312824131
7.319302154
7.314327911
7.328476896
7.340292739

e) The linear regression model which came from regressing consumption on income and Z1i is $\hat{C}_i = -15023.5 + 0.700064I_i - 125428Z_{1i}$, standard error for Z_{1i} is

317372.1. Use t – statistic and t – critical to reject the null hypothesis. [5 marks]

First we need to calculate t stat for Z1i = $\frac{\mathbf{125428}}{\mathbf{317372}}. = \mathbf{0.39}$ ***which indicate that Z1i coefficient is statistically insignificant so therefore we fail to reject the null hypothesis and conclude that the model is a linear model.***