EE 325 ☺☺ **STATA Session (Answer)**

1. The demand for roses. Table 7.6 gives quarterly data on these variables:

$$Y = quantity\ of\ roses\ sold,\ dozens$$
$$X_2 = average\ wholesale\ price\ of\ roses, \$/dozen$$
$$X_3 = average\ wholesale\ price\ of\ carnations, \$/dozen$$
$$X_4 = average\ weekly\ family\ disposable\ income, \$/week$$
$$X_5 = the\ trend\ Variable\ taking\ values\ of\ 1,\ 2, and\ so\ on,, for\ the\ period\ 1971-III\ to\ 1975-II\ \text{in}\ the\ Detroit\ Metropolitian\ area$$

You are asked to consider the following demand functions:

$$Y_t = \alpha_1 + \alpha_2 X_{2t} + \alpha_3 X_{3t} + \alpha_4 X_{4t} + \alpha_5 X_{5t} + u_t$$

$$\ln Y_t = \beta_1 + \beta_2 \ln X_{2t} + \beta_3 \ln X_{3t} + \beta_4 \ln X_{4t} + \beta_5 X_{5t} + u_t$$

a. Estimate the parameters of the linear model and interpret the results.

Source	SS	df	MS
Model	52249133.2	4	13062283.3
Residual	10347222.8	11	940656.615
Total	62596356	15	4173090.4

Number of obs	16
F(4, 11)	13.89
Prob > F	0.0003
R-squared	0.8347
Adj R-squared	0.7746
Root MSE	969.87

y	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
x2	-2227.704	920.4659	-2.42	0.034	-4253.636	-201.772
x3	1251.141	1157.021	1.08	0.303	-1295.445	3797.726
x4	6.283002	30.62166	0.21	0.841	-61.11482	73.68083
x5	-197.4	101.5612	-1.94	0.078	-420.9348	26.13479
_cons	10816.04	5988.35	1.81	0.098	-2364.229	23996.31

$$\hat{Y}_t = 10816.04 - 2227.704 X_{2t} + 1251.141 X_{3t} + 6.283 X_{4t} - 197.4 X_{5t}$$
$$se = (5988.35)\quad (920.465)\qquad (1157.021)\qquad (30.6217)\qquad (101.156)$$

In this model the slope coefficients measure the rate of change of Y with respect to the relevant variable.

b. Estimate the parameters of the log-linear model and interpret the results.

Source	SS	df	MS
Model	1.12835383	4	.282088457
Residual	.284245018	11	.025840456
Total	1.41259884	15	.094173256

Number of obs	16
F(4, 11)	10.92
Prob > F	0.0008
R-squared	0.7988
Adj R-squared	0.7256
Root MSE	.16075

lny	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lnx2	-1.170727	.4883241	-2.40	0.035	-2.245521	-.0959329
lnx3	.7379375	.6528623	1.13	0.282	-.6990027	2.174878
lnx4	1.153217	.9019901	1.28	0.227	-.8320496	3.138484
x5	-.0301109	.0164188	-1.83	0.094	-.0662484	.0060266
_cons	3.572134	4.695165	0.76	0.463	-6.761856	13.90612

$$\ln Y_t = 3.5721 - 1.1707 \ln X_{2t} + 0.7379 \ln X_{3t} + 1.1532 \ln X_{4t} - 0.0301 X_{5t}$$
$$se = (4.6952)\quad (0.4883)\quad (0.6529)\qquad (0.9020)\qquad (0.0164)$$

In this model all the partial slope coefficients are partial elasticities of Y with respect to the relevant variable.

c. $\beta_2, \beta_3, and\ \beta_4$ give, respectively, the own-price, cross-price, and income elasticities of demand. What are their a priori signs? Do the results concur with the a priori expectations?

The own-price elasticity is expected to be negative, the cross price elasticity is expected to be positive for substitute goods and negative for complimentary goods, and the income elasticity is expected to be positive, since roses are a normal good.

2. Table 7.11 gives data for the manufacturing sector of the Greek economy for the period 1961-1987.

a. See if the Cobb-Douglas production function fits the data given in the table and interpret the results. What general conclusion do you draw?

Source	SS	df	MS
Model	5.37753949	2	2.68876975
Residual	.158356562	24	.00659819
Total	5.53589605	26	.212919079

Number of obs =	27
F(2, 24) =	407.50
Prob > F =	0.0000
R-squared =	0.9714
Adj R-squared =	0.9690
Root MSE =	.08123

lnoutput	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lncapital	.1398108	.1653906	0.85	0.406	-.2015386	.4811603
lnlabor	2.328398	.5994894	3.88	0.001	1.091112	3.565683
_cons	-11.93657	3.211061	-3.72	0.001	-18.56388	-5.30927

The estimated output/labor and output/capital elasticities are positive, as one would expect. But as we will see in the next chapter, the results do not make economic sense in that the capital input has no bearing on output, which, if true, would be very surprising. As we will see, perhaps collinearity may be the problem with the data.

b. Now consider the following model:

$$Output\,/\,labor = A(K\,/\,L)^{\beta}e^{u}$$

where the regressand represents labor productivity and the regressor represents the capital labor ratio. What is the economic significance of such a relationship, if any? Estimate the parameters of this model and interpret your results.

Source	SS	df	MS
Model	2.17537967	1	2.17537967
Residual	.232757738	25	.00931031
Total	2.40813741	26	.09262067

Number of obs =	27
F(1, 25) =	233.65
Prob > F =	0.0000
R-squared =	0.9033
Adj R-squared =	0.8995
Root MSE =	.09649

lnoutputla~r	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lnclratio	.6807562	.0445355	15.29	0.000	.5890337	.7724788
_cons	-1.155956	.0742171	-15.58	0.000	-1.308809	-1.003103

The elasticity of output/labor ratio (i.e., labor productivity) with respect to capital/labor ratio is about 0.68, meaning that if the latter increases by 1%, labor productivity, on average, goes up by about 0.68%. A key characteristic of developed economies is a relatively high capital/labor ratio.

3. Table 7.12 gives data for real consumption expenditure, real income, real wealth, and real interest rates for the U.S. for the years 1947-2000.

a. Given the data in the table, estimate the linear consumption function using income, wealth, and interest rate. What is the fitted equation?

$$C_t = \alpha_1 + \alpha_2 Y_d + \alpha_3 Wealth + \alpha_4 Interest + u_t$$

Source	SS	df	MS
Model	119322125	3	39774041.8
Residual	71437.3791	50	1428.74758
Total	119393563	53	2252708.73

Number of obs	= 54
F(3, 50)	=27838.40
Prob > F	= 0.0000
R-squared	= 0.9994
Adj R-squared	= 0.9994
Root MSE	= 37.799

c	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
yd	.7340283	.0137519	53.38	0.000	.7064068	.7616497
wealth	.0359756	.0024831	14.49	0.000	.0309881	.040963
interest	-5.521116	2.306643	-2.39	0.020	-10.15415	-.8880871
_cons	-20.63328	12.82697	-1.61	0.114	-46.397	5.130442

b. What do you estimated coefficients indicate about the variables' relationships to consumption expenditure?

The three independent variables are statistically significant at the 5% level. It seems that increases in Income (Y_d) and Wealth are related to increases in Consumption, whereas an increase in the Interest rate corresponds to a decrease in the Consumption level.

4. Table 8.9 Savings and Personal Disposable income (billions of dollars), United States, 1970-1995.

a. Given the data in the table, estimate the following linear savings function using personal disposable income

Time period 1970-1981: $Y_t = \lambda_1 + \lambda_2 X_t + u_{1t} \quad n_1 = 12$

Source	SS	df	MS		
Model	16456.2587	1	16456.2587	Number of obs =	12
Residual	1785.03254	10	178.503254	F(1, 10) =	92.19
				Prob > F =	0.0000
Total	18241.2912	11	1658.2992	R-squared =	0.9021
				Adj R-squared =	0.8924
				Root MSE =	13.361

savings	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
income	.0803319	.0083665	9.60	0.000	.0616901	.0989737
_cons	1.016115	11.63771	0.09	0.932	-24.91432	26.94655

Time period 1982-1995: $Y_t = \gamma_1 + \gamma_2 X_t + u_{2t} \quad n_2 = 14$

Source	SS	df	MS		
Model	2614.39647	1	2614.39647	Number of obs =	14
Residual	10005.2214	12	833.768451	F(1, 12) =	3.14
				Prob > F =	0.1020
Total	12619.6179	13	970.739837	R-squared =	0.2072
				Adj R-squared =	0.1411
				Root MSE =	28.875

savings	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
income	.0148624	.0083932	1.77	0.102	-.0034248	.0331496
_cons	153.4947	32.71227	4.69	0.001	82.22075	224.7686

Time period 1970-1995: $Y_t = \alpha_1 + \alpha_2 X_t + u_{3t} \quad n_1 + n_2 = 26$

Source	SS	df	MS		
Model	76621.7867	1	76621.7867	Number of obs =	26
Residual	23248.3	24	968.679166	F(1, 24) =	79.10
				Prob > F =	0.0000
Total	99870.0867	25	3994.80347	R-squared =	0.7672
				Adj R-squared =	0.7575
				Root MSE =	31.124

savings	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
income	.0376791	.0042366	8.89	0.000	.0289353	.046423
_cons	62.42267	12.76075	4.89	0.000	36.08578	88.75957

b. On the basis of the Chow test that there was a difference in the regression of savings on income between the two periods. Consider and estimate the following model with the dummy variable:

$$Y_t = \alpha_1 + \alpha_2 D_t + \beta_1 X_t + \beta_2 (D_t X_t) + u_t$$

Where Y = Savings

X= Personal disposable income

t = time

D = 1 for observations in 1982-1995

= 0 otherwise

Source	SS	df	MS		
Model	88079.8327	3	29359.9442	Number of obs =	26
Residual	11790.2539	22	535.920634	F(3, 22) =	54.78
				Prob > F =	0.0000
Total	99870.0867	25	3994.80347	R-squared =	0.8819
				Adj R-squared =	0.8658
				Root MSE =	23.15

savings	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
d	152.4786	33.08237	4.61	0.000	83.86992	221.0872
income	.0803319	.0144968	5.54	0.000	.0502673	.1103964
dx	-.0654694	.0159824	-4.10	0.000	-.098615	-.0323239
_cons	1.016115	20.16483	0.05	0.960	-40.80319	42.83542

i. Test the coefficients individually statistically significant at the 5 percent level? From this test, how would you describe the difference in the two regressions (coincident regression, parallel regression, concurrent regression, or dissimilar regression)?

$H_0: \alpha_2 = 0$	$H_0: \beta_2 = 0$
$H_1: \alpha_2 \neq 0$	$H_1: \beta_2 \neq 0$
$P-value = 0.000$	$P-value = 0.000$
$reject\ H_0$	$reject\ H_0$

There is enough evidence suggest that the coefficients individually statistically significant at the 5 percent level.

The two regressions are dissimilar regressions.

ii. Write down the mean personal savings function for 1970-1981 and the mean personal savings function for 1982-2005.

Mean savings function for 1970-1981

$$E(Y_t \mid D_t = 0, X_t) = 1.1061 + 0.0803X_t$$

Mean savings function for 1982-1995

$$E(Y_t \mid D_t = 1, X_t) = (1.0161 + 152.4786) + (0.0803 - 0.0655)X_t = 153.4947 + 0.0148X_t$$