

مباراة ٢٠٠٨/٨/٧ لبعض الوظائف الشاغرة

في مجلس الإنماء والأعمار

لوظيفة اختصاصي فني رئيسي "اقتصاد" (لدائرة التخطيط الاقتصادي والاجتماعي في إدارة التخطيط والبرمجة)
مسابقة في الاقتصاد الكمي المدة: ساعتان

The two parts of the following problem are independent

Since the spring of the year 2008, apartment' prices have registered remarkable increasing in Lebanon. In order to analyze this phenomenon in a certain region of Lebanon, an economist selects a data concerning 10 apartments: The current new price (August 2008, Y in 1000\$), the old price (August 2007, X_1 in 1000\$), and the apartment area (X_2 in m^2) as shown in the following table:

Apartment	Y_i Price in August 2008 (10 ³ U.S.D)	X_{i1} Price in August 2007 (10 ³ U.S.D)	X_{i2} Area (m ²)
1	196	136	160
2	131	96	120
3	230	162	200
4	278	190	225
5	210	151	180
6	195	140	150
7	162	113	120
8	279	200	250
9	241	171	190
10	165	118	140

Part I:

We propose to explain the current apartment price (Y , August 2008) only by its constructed area (X_2). For this purpose we adopt a simple linear regression such that:

$$Y = A X_2 + B + \varepsilon \quad (\text{Var}(\varepsilon) = \sigma^2)$$

1)- We denote the adjusted (estimated) model by $Y_i = a X_{i2} + b$. Compute the estimates of A (a) and B (b) given the following results:

Apartment	Y_i	X_{i2}	Y_i^2	X_{i2}^2	$Y_i * X_{i2}$
1	196	160	38416	25600	31360
2	131	120	17161	14400	15720
3	230	200	52900	40000	46000
4	278	225	77284	50625	62550
5	210	180	44100	32400	37800
6	195	150	38025	22500	29250
7	162	120	26244	14400	19440
8	279	250	77841	62500	69750
9	241	190	58081	36100	45790
10	165	140	27225	19600	23100
SUM	2087	1735	457277	318125	380760

2)- Compute the linear correlation coefficient between current price (Y) and area (X_2) of an apartment.

3)- Give the estimate of the current price of an apartment with area of 235 m^2 .

4)- The Least Squares Method provides the following table:

Apartment	Observed current price	Predicted current price	Residual	Standardized residual
1	196	?	?	0.97
2	131	133.67	-2.67	-0.61
3	230	229.45	0.55	0.12
4	278	270.09	7.91	1.80
5	210	213.49	-3.49	-0.79
6	195	197.52	-2.52	-0.57
7	162	158.34	3.66	0.83
8	279	284.61	-5.61	-1.28
9	241	242.52	-1.52	-0.35
10	165	165.59	-0.59	-0.14

- a)- Complete the first row (?) of this table using your computed estimates in the first question.
b)- Give an estimate of the variance of the error σ^2 .
c)- What do we mean by an outlier value? Could we eliminate it? What would be its effect on the estimation of the model?
d)- Are there outliers in the apartments data? Justify your answer.

Part II:

We propose to explain the current price (Y) by both the old price (X_1) and the area (X_2) using a multiple linear regression such that:

$$Y = A_1 X_1 + A_2 X_2 + A_3 + \varepsilon \quad (\text{Var}(\varepsilon) = \sigma^2)$$

The adjusted model is denoted by $Y_i = a_1 X_{1i} + a_2 X_{2i} + a_3$.

- 1)- The matrix of the simple linear correlation coefficients between the three variables are computed and given as follows:

	Current price	Old price	Area
Current price	1	0.996	0.968
Old price	0.996	1.000	0.976
Area	0.968	0.976	1

Give your comments regarding these simple correlations.

- 2)- The partial correlations between the dependent variable (Y) and each one of the dependent variables, when the other independent variable is controlled, are computed and given as follows:

Controlled variable	Partial correlation between		Value of the partial correlation
Old price	Current price	Area	-0.2473
Area	Current price	Old price	0.994

Give your comments regarding these partial correlations.

- 3)- The Least Squares Estimation leads to the following results:

Coefficient	Estimate	Corresponding standard error	T value
a_1	1.589	.208	7.627
a_2	-.109	.161	-.675
a_3	-7.068	7.105	-.995

- a)- Establish the confidence interval (at 95%) of the three coefficients.
b)- Test the nullity of each one of these coefficients (at 95%).
c)- Compare the area regression estimated coefficient (a_2) with the simple and partial correlations and give your comments.
d)- What model do you propose for explaining the current apartment prices?

Student Table



α d.f.	0.99	0.95	0.90	0.85	0.80	0.20	0.15	0.10	0.05	0.01
1	0.02	0.08	0.16	0.24	0.32	3.08	4.17	6.31	12.71	63.66
2	0.01	0.07	0.14	0.21	0.29	1.89	2.28	2.92	4.30	9.92
3	0.01	0.07	0.14	0.21	0.28	1.64	1.92	2.35	3.18	5.84
4	0.01	0.07	0.13	0.20	0.27	1.53	1.78	2.13	2.78	4.60
5	0.01	0.07	0.13	0.20	0.27	1.48	1.70	2.02	2.57	4.03
6	0.01	0.07	0.13	0.20	0.26	1.44	1.65	1.94	2.45	3.71
7	0.01	0.06	0.13	0.20	0.26	1.41	1.62	1.89	2.36	3.50
8	0.01	0.06	0.13	0.20	0.26	1.40	1.59	1.86	2.31	3.36
9	0.01	0.06	0.13	0.19	0.26	1.38	1.57	1.83	2.26	3.25
10	0.01	0.06	0.13	0.19	0.26	1.37	1.56	1.81	2.23	3.17
11	0.01	0.06	0.13	0.19	0.26	1.36	1.55	1.80	2.20	3.11
12	0.01	0.06	0.13	0.19	0.26	1.36	1.54	1.78	2.18	3.05
13	0.01	0.06	0.13	0.19	0.26	1.35	1.53	1.77	2.16	3.01
14	0.01	0.06	0.13	0.19	0.26	1.35	1.52	1.76	2.14	2.98
15	0.01	0.06	0.13	0.19	0.26	1.34	1.52	1.75	2.13	2.95
16	0.01	0.06	0.13	0.19	0.26	1.34	1.51	1.75	2.12	2.92
17	0.01	0.06	0.13	0.19	0.26	1.33	1.51	1.74	2.11	2.90
18	0.01	0.06	0.13	0.19	0.26	1.33	1.50	1.73	2.10	2.88
19	0.01	0.06	0.13	0.19	0.26	1.33	1.50	1.73	2.09	2.86
20	0.01	0.06	0.13	0.19	0.26	1.33	1.50	1.72	2.09	2.85
21	0.01	0.06	0.13	0.19	0.26	1.32	1.49	1.72	2.08	2.83
22	0.01	0.06	0.13	0.19	0.26	1.32	1.49	1.72	2.07	2.82
23	0.01	0.06	0.13	0.19	0.26	1.32	1.49	1.71	2.07	2.81
24	0.01	0.06	0.13	0.19	0.26	1.32	1.49	1.71	2.06	2.80
25	0.01	0.06	0.13	0.19	0.26	1.32	1.49	1.71	2.06	2.79
26	0.01	0.06	0.13	0.19	0.26	1.31	1.48	1.71	2.06	2.78
27	0.01	0.06	0.13	0.19	0.26	1.31	1.48	1.70	2.05	2.77
28	0.01	0.06	0.13	0.19	0.26	1.31	1.48	1.70	2.05	2.76
29	0.01	0.06	0.13	0.19	0.26	1.31	1.48	1.70	2.05	2.76
30	0.01	0.06	0.13	0.19	0.26	1.31	1.48	1.70	2.04	2.75