

ASTR 600 Homework #3: Regression (Chapter 7)

1. Show that, for a linear model, if the errors are normally distributed with $\mu = 0$, the MLE method gives the same parameter estimations as the ordinary least squares method.

2. Plot the data given in the table below:

X	2.9	1.1	3.3	14.7	11.5	7.5	8.9	9.3	14.5	6.7	7.7	8.25	9.3	14.7	4.6
Y	19.3	22.4	18.8	-2.7	16.9	16.4	8.0	11.9	12.5	16.3	12.4	5.7	9.7	5.5	14.7

- a. Choose an appropriate method of regression. Describe the method you chose and explain why you decided it was appropriate. (Note: x values are known precisely)
 - b. Compute the best-fit parameters and give them along with 95% confidence intervals.

3. Below are the same data given before, but now the error spreads are known:

X	2.9	1.1	3.3	14.7	11.5	7.5	8.9	9.3	14.5	6.7	7.7	8.25	9.3	14.7	4.6
Y	19.3	22.4	18.8	-2.7	16.9	16.4	8.0	11.9	12.5	16.3	12.4	5.7	9.7	5.5	14.7
σ_y^2	0.52	0.07	0.68	13.52	8.21	3.53	4.98	5.35	13.06	2.76	3.67	4.26	5.39	13.53	1.33

Now find the model parameters for these data in a way that takes this new information into account. (assume the errors are normally distributed)

4. The following table shows final scores (F) and the scores for two midterms (M₁ and M₂).

F	M ₁	M ₂	F	M ₁	M
68	78	73	75	79	75
75	74	76	81	89	84
85	82	79	91	93	97
94	90	96	80	87	77
86	87	90	94	91	96
90	90	92	94	86	94
86	83	95	97	91	92
68	72	69	79	81	82
55	68	67	84	80	83
69	69	70	65	70	66
91	91	89	83	79	81

Fit the following model to the data:

$$F = \beta_0 + \beta_{11}M_1 + \beta_{12}M_2$$