

## Homework 8: Due Wednesday April 13

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1. Show that if  $Y_i$  are i.i.d. random variables (that is set  $\beta = 0$ ), the method of least squares reduces to the method of moments.
2. Show that if we assume our data comes from a normal population with constant variance, then the method of least squares is equivalent to the method of maximum likelihood.
3. Suppose that  $\mathbb{E}(Y|x) = \beta x$  and  $\text{Var}(Y|x) = \sigma^2$ , and we have observations  $(x_i, y_i), i = 1, 2, \dots, n$ . Find the least squares estimator  $\hat{B}$  for  $\beta$ . Show that it is unbiased and derive an expression for its variance.
4. Given the following data

x	2	4	6	8	10
y	5	9	12	18	21

- (a) Plot the data.
  - (b) Calculate the least squares linear regression line. (by hand)
  - (c) Add the least squares regression line to your plot, and identify on your plot exactly what quantity has been minimised by the least squares procedure.
5. Problems from the textbook: 9.6.3, 9.6.4, 9.6.6, 9.6.10, 9.6.12.