

Homework 5 - Due Friday, Mar. 11

Homework should be written neatly and clearly explained. If it requires more than one sheet, the sheets must be stapled. Include your name and id number in the top right corner of your homework.

Problems 9.2, 9.3, 9.15, 9.18, 9.21, 9.26, 9.38 and the problem below

Problem 1. A statistician is interested in the relationship between the height and weight of a certain population, and want to estimate the correlation $\sigma_{HW} = \mathbb{E}[(H - \mathbb{E}[H])(W - \mathbb{E}[W])]$, where H denotes the random variable for the height of a person and W denotes the random variable for their weight.

The statistician measures the height and weight of N people, recording the height of the i^{th} person as H_i and the weight of the i^{th} person as W_i , and consider the estimator:

$$\hat{\sigma}_{HW} = \frac{1}{N-1} \sum_{i=1}^N (H_i - \bar{H})(W_i - \bar{W})$$

where $\bar{H} = \frac{1}{N} \sum_{i=1}^N H_i$ and $\bar{W} = \frac{1}{N} \sum_{i=1}^N W_i$.

Show that if $Var[H_i W_i]$, $Var[H_i]$, $Var[W_i]$ are each finite, then $\hat{\sigma}_{HW}$ is an unbiased, consistent estimator of σ_{HW} .