

Problem Set 6
Math modeling of the atmosphere

Problem 1: Unbiasedness of sample variance

An estimate of the variance is given by

$$s^2 = \frac{1}{N-1} \sum_{i=1}^N (X_i - \hat{\mu})^2, \quad (1)$$

where

$$\hat{\mu} = \frac{1}{N} \sum_{i=1}^N X_i. \quad (2)$$

Show that s^2 is an unbiased estimate of the variance of the distribution, σ^2 . That is, show that $\mathbb{E}(s^2) = \sigma^2$.