OBSERVATIONAL COSMOLOGY

Problem sheet 2 – due 16/04/2019

Consider a real-valued stochastic variable x with population mean μ and variance σ^2. An experiment performs N independent measurements of x that we denote with the symbols $x_1, \ldots, x_N$. As an estimator for the population mean of x, we use the statistic: $\hat{\theta} = \sum_{i=1}^{N} w_i x_i$ where the w_i are some real-valued weights that can be chosen freely.

1. Determine the condition that the weights need to satisfy so that $\hat{\theta}$ is an unbiased estimator for the population mean of x.

2. Among all estimators that satisfy the above condition, consider a particular subset in which $N - 1$ weights are equal. Determine the estimator in this subclass that has the lowest mean square error and write down its weights.