

Stat 703 – Spring 2005 – Homework 1

1) Find the formula for the method of moment estimator for a geometric random variable.

Problems 2-4 deal with the beta distribution. Recall that the beta distribution takes values between 0 and 1 and has two parameters α and β . (Figure 15.6 on page 595 has pictures of several beta distributions).

It can be shown that $\mu = \frac{\alpha}{\alpha + \beta}$ and $\sigma^2 = \frac{\alpha\beta}{(\alpha + \beta)^2(\alpha + \beta + 1)}$.

and that the method of moment estimators are:

$$\hat{\alpha} = \left(\frac{\bar{x}}{\hat{\sigma}^2} \right) (\bar{x} - \bar{x}^2 - \hat{\sigma}^2) \quad \text{and} \quad \hat{\beta} = \left(\frac{1 - \bar{x}}{\hat{\sigma}^2} \right) (\bar{x} - \bar{x}^2 - \hat{\sigma}^2)$$

2) Use method of moments to estimate the beta distribution α and β parameters for column c of the data set at <http://www.stat.sc.edu/~habing/courses/703/itests.txt>.

3) Construct a q-q plot to verify if column c of the itests data seems to be from a beta distribution with the parameter estimates you found in (2)

4) Use the parametric bootstrap to estimate the bias and standard error of the method of moments estimators you found in (2).