Statistics 3858b Suggested Problems

January 11, 2017

1. Consider data $X_i, i = 1, \ldots, n$ iid Poisson θ. The MLE and the method of moments estimator is $\hat{\theta}_n = \bar{X}_n$. Consider $h(y) = e^{-y}$. Then $h(\theta)$ is the probability that a Poisson, θ r.v. takes the value 0.

   Show that $h(\hat{\theta}_n)$ is a consider estimator of $h(\theta)$.

   Show that
   $$\sqrt{n}(h(\hat{\theta}_n) - h(\theta))$$
   converges in distribution to a normal distribution. Find the variance for this limit normal distribution.

   Find a consistent estimator of this limit variance.

   Use this to obtain a formula for the confidence interval of $h(\theta)$.

2. Question 3 from the 2016 February term test.

3. Section 8.10 : 7 (a), (b). 17 (a)-(d). 18 (a)-(c).

4. For example 8.5.1 A (Hardy Weinberg model), derive the MLE. Calculate Fisher's information. Using the data provided give the observed value of the MLE and the observed Fisher's information. Use this to give the (approximate) 95% confeidence interval for θ.