Math 324 Fall 2004
Assignment 2
Due: Oct 11, 2004

Dr Ben Bolstad
bolstad_math324@bmbolstad.com
http://math324sfsu.bmbolstad.com

This assignment is to help you gain more familiarity with some commonly used probability distributions. You should submit your solutions to this assignment as a written report. In other words, it is not enough to submit pages of computer output with no interpretation. If you wish to submit your analysis code, please attach it as an appendix to your report.

Part I - Discrete Distributions

1. Simulate 10, 50, 100, 1000, 10000 and 100000 random numbers from a Binomial distribution with $n = 15$ and $p = 0.5$. For each sample

   Plot the empirical pdf of the data.

   Compare the empirical estimates of the probabilities with the theoretical values. (report your results as a table).

   Plot the empirical cdf of the data

   Compare the empirical estimates of the cdf with the theoretical values (report your results as a table).

   Plot all the empirical cdf estimates on the same set of axes

2. Simulate random samples from the Binomial distribution of size 10000 with $n = 15$ and $p = 0.1, 0.2, 0.3.0.4.0.5.0.6, 0.7, 0.8, 0.9$. For each sample

   Plot the empirical pdf

   Plot the empirical cdf

3. Discuss your results.

4. Simulate 10, 50, 100, 1000, 10000 and 100000 random numbers from a Poisson distribution with $\lambda = 3$. For each sample

Plot the empirical pdf of the data.

Compare the empirical estimates of the probabilities with the theoretical values. (report your results as a table, you need not go higher than 10).

Plot the empirical cdf of the data

Compare the empirical estimates of the cdf with the theoretical values (report your results as a table, you need not go higher than 10).

Plot all the empirical cdf estimates on the same set of axes

5. Simulate random samples from the Poisson distribution of size 10000 with $\lambda = 0.5, 1.0, 2.5, 5.0, 10.0$. For each sample

   Plot the empirical pdf

   Plot the empirical cdf

6. Discuss your results.

Part II - Continuous Distributions

1. Simulate 10, 50, 100, 1000, 10000 and 100000 random numbers from the Uniform distribution (on 0 to 1). For each sample

   Plot the empirical pdf of the data (using a histogram). Add a smoother of some kind to the plot.

   Plot the empirical cdf.

2. Simulate 10, 50, 100, 1000, 10000 and 100000 random numbers from the Normal distribution with mean 0 and standard deviation 1. For each sample

   Plot the empirical pdf of the data (using a histogram). Add a smoother of some kind to the plot.

   Plot the empirical cdf.

3. Simulate 10, 50, 100, 1000, 10000 and 100000 random numbers from the Exponential distribution with $\lambda = 1$. For each sample

   Plot the empirical pdf of the data (using a histogram). Add a smoother of some kind to the plot.

   Plot the empirical cdf.

4. Discuss your results

5. Simulate 10000 random numbers from the the Gamma distribution With ($\alpha = 3$, $\beta = 1/2$),($\alpha = 2$,$\beta = 2$), ($\alpha = 5$,$\beta = 1$). For each sample

Plot the empirical pdf of the data (using a histogram). Add a smoother of some kind to the plot.

Plot the empirical cdf.

Discuss your results.

Writing your report

Make sure you clearly interpret your plots in your final report. Do not put smoothers on the plots for the discrete distributions. In your tables (from part I) you might like to put an error column (ie difference between empirical probability and theoretical probability).