CE 385S – Stochastic Hydrology – Fall 2016

Homework Assignment #3 – Due Thursday 10/06/2016

All the data sets used in this homework assignment are posted on Canvas on Files -> Homework

Where possible, report all your test results both in terms of the test statistics as well as in terms of the p-value.

Problem 1 – Chi-square and Kolmogorov Smirnov tests

Given are January precipitation data measured in Ithaca. Looking at the histogram of the data, we see that the Gamma distribution could be a good model. We want to test the goodness of fit of the Gamma distribution as well as the goodness of fit of the Normal distribution (although from the histogram, the precipitation does not seem to follow a Normal distribution!)

The parameters of the fitted distributions are:

- Gamma: k = 3.76 (dimensionless; shape parameter); λ = 1.923 in^{-1} (scale parameter; when you use a software, check the definition of the Gamma, sometimes the location parameter can be found inverted; e.g. MATLAB and Excel, so you would input the inverse of the λ value provided here = 0.52). You can always check by reproducing the plot below.
- Normal: μ = 1.96 in (mean); σ = 1.12 in (standard deviation) (again check whether the software reads the variance or the standard deviation as input)
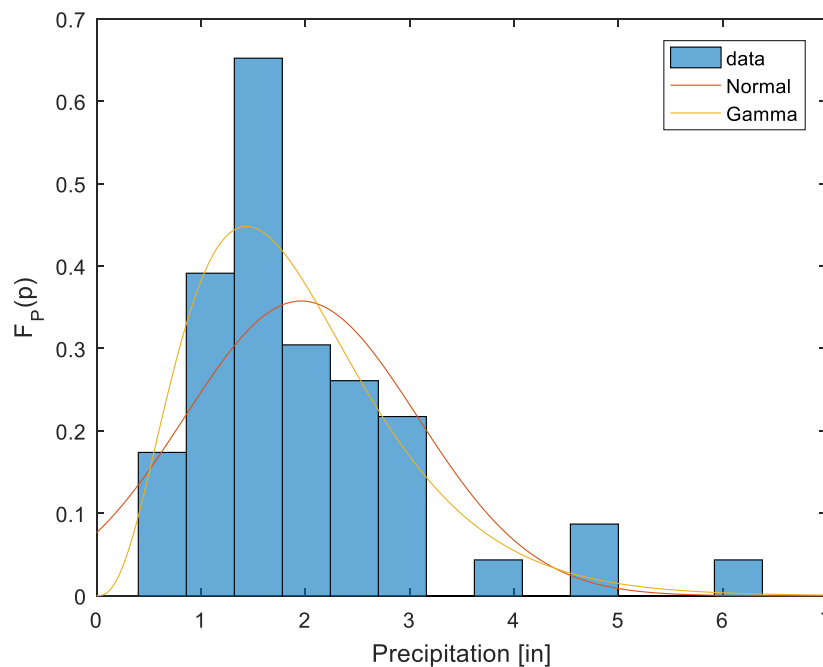
(a) Perform a chi-square test to test the goodness of fit of the Gamma distribution at the 5% significance level. Use 6 classes: < 1 in; 1-1.5 in; 1.5-2 in; 2-2.5 in; 2.5-3 in; ≥3 in.

(b) Repeat the chi-square test (same classes and same significance level) for the Normal distribution.

(c) Perform a Kolmogorov-Smirnov test for the Gamma distribution at the 5% significance level.

(d) Repeat the Kolmogorov-Smirnov test for the Normal distribution at the 5% significance level.

Problem 2 – Probability plot and PPCC test

Let's go back to the max annual flows of the Mississippi River near Vicksburg, Mississippi which we used in Homework 1.

(a) Graphically evaluate the adequacy of the EV1 distribution fitted with the Method of Moments on a probability plot and perform a Probability Plot Correlation Coefficient (PPCC) test to see if the EV1 distribution is acceptable for this data set at the 5% significance level. Use the Gringorten's plotting position.

(b) Graphically evaluate the adequacy of the LP3 distribution on a probability plot and perform a Probability Plot Correlation Coefficient (PPCC) test to see if the LP3 distribution is acceptable for this data set at the 5% significance level. Use Blom's plotting position.

Problem 3 – Estimation of T-year event magnitude and confidence interval

Using the same data and same distributions that we have fitted and tested in Problem 2, we now want to estimate the T-year flood and its confidence level:

(a) Estimate the magnitude of the 100-year flood, its standard error of estimate, and the 90% confidence interval for the EVI fitted with the Method of Moments (MOM).

(b) Repeat (a) but using the LP3 distribution.

Problem 4 – Data Analysis – Step 3!

I returned your second hw so you should have received some comments from me on your data analysis. This is the last hw assignment before the proposal assignment. I suggest starting/continuing the analysis you have described in the previous hw and if you haven't done so yet, provide research questions and hypotheses. You can use the tools seen in class to test the goodness of fit of possible distributions to your own data. If I had specific questions for you in the previous homework, please answer them as part of this homework. As usual, you can also take this homework for asking me any specific question you have on your data.