STOCHASTIC HYDROLOGY

/ TOPIC 2 /

Fitting Distributions

Due
28 May 2023

The purpose of this exercise is to get a feel for fitting models to data and to estimate parameters.

Two datasets will be used in this exercise. One is a fifty year, monthly averaged soil moisture, (`'ts_monthly_smwetness_1950-1999.dat'`). The other data set is minimum river discharges at eight sites across the SE US as reported by the US Geological Survey (USGS). The station details are in Table 1, and the area is in sq miles.

Task 1 – Using the soil moisture data, divide the data set into months so all the January, February, (etc) are concatenated together. You should have a 50×12 data set with the columns being the 12 months. Fit using L-moments and assuming a Beta distribution. Details on fitting a Beta distribution can be found in Ref[1]. This will assure you that you understand L-Moment calculations.

Task 2 – Another dataset includes eight streamflow stations (see details below). The data are daily streamflow from January 1, 1981 through December 31, 2010 (30 years of data.) Pick a station (please don't all pick the same station!) and extract the annual 5-day low flow.

(*Hint: The easiest way to do this is to use Python, bring in the daily data and apply a 5-day moving window through the data and extract the lowest value per year. This will result in a data set of 30 values – one per year.*)

Fit a Generalized Extreme Value (GEV) distribution to the data set (i.e. estimate the GEV parameters) using:

- Maximum Likelihood
- L-Moments

Table 1. The station specs

Stn number	Latitude	Longitude	Area	USGS Station Name	State
2408540	32.91679764	-86.27026367	263	HATCHET CREEK BELOW ROCKFORD	AL
2331600	34.54072952	-83.62277222	315	CHATTAHOOCHEE RIVER NEAR CORNELIA	GA
2450250	34.28538513	-87.39892578	92.1	SIPSEY FORK NEAR GRAYSON	AL
2398000	34.46639633	-85.33612061	192	CHATTOOGA RIVER AT SUMMERVILLE	GA
2342500	32.31682205	-85.01495361	322	UCHEE CREEK NEAR FORT MITCHELL	AL
2338660	33.23540497	-84.98773193	127	NEW RIVER AT GA 100, NEAR CORINTH	GA
2401390	33.83982849	-86.26275635	141	BIG CANOE CREEK AT ASHVILLE	AL
2221525	33.25236130	-83.48126221	190	MURDER CREEK BELOW EATONTON	GA

Suggested Readings

1. J. Sheffield, G. Goteti, F. Wen, and E. F. Wood. “A simulated soil moisture based drought analysis for the United States.” In: **Journal of Geophysical Research: Atmospheres** 109.D24 (2004).