

Oasis technical test – Python



Your task is to build a Python command line utility for Linux that invokes a simple mathematical model of hurricane losses and returns the expected annual economic loss. We are looking for a clear, well-structured solution, with logging, testing, input checking and error handling as you deem necessary. You should consider the performance of the model, and what techniques can be used to speed up the calculations especially when the number of simulations is large ($>> 10^6$). The solution should be delivered as a GitHub repository with instructions on how to build and run the utility. You are free to use any development tools or frameworks.

In this test example, a model of the economic losses due to a hurricane landfall is assumed to be as follows. (Note that the full models than run in Oasis are extremely complex, with very large input data sets and strict requirements on run-time and reliability.)

1. Assign the annual rate at which hurricanes make landfall in Florida, assuming a Poisson distribution.
2. Assign a lognormal distribution that describes the probability of economic loss of a hurricane that makes landfall in Florida.
3. Assign the annual rate at which hurricanes make landfall in Gulf states, assuming a Poisson distribution.
4. Assign a lognormal distribution that describes the economic loss of a hurricanes that makes landfall in the Gulf states.
5. Use a Monte-Carlo simulation to estimate the mean loss per year using the following algorithm:

```
Total loss = 0
For each simulation year
    Simulation loss = 0
    Sample number of Florida events
    For each Florida event
        Sample a Florida loss and add it to the simulation loss
    Sample number of Gulf events
    For each Gulf event
        Sample a Gulf loss and add it to the simulation loss
    Add the simulation loss to the total loss
Mean loss = total loss / number of simulation years
```

The following command structure should be implemented:

```
usage: gethurricane loss [options] florida_landfall_rate florida_mean florida_stddev
gulf_landfall_rate gulf_mean gulf_stddev
```

Calculates the average annual hurricane loss in \$Billions for a simple hurricane model. The model is parameterized by:

florida_landfall_rate – The annual rate of landfalling hurricanes in Florida
florida_mean, florida_stddev – The LogNormal parameters that describe the economic loss of a landfalling hurricane in Florida.

gulf_landfall_rate - The annual rate of landfalling hurricanes in the Gulf states
gulf_mean, gulf_stddev - The LogNormal parameters that describe the economic loss of a

options:

```
-n, --num_monte_carlo_samples    Number of samples (i.e. simulation years) to run
```