# Tutorial 6 - Catastrophe Modeling

1. What are the four modules in a catastrophe model?

2. Briefly explain the four modules in a catastrophe model.

3. You are given the following frequency and severity for non-hurricane weather for insurer ABC.

| Accident Year | Ultimate Frequency per 100 Earned House Years | Ultimate Severity |
|---|---|---|
| 2014 | 1.21 | 5,886 |
| 2015 | 1.11 | 6,320 |
| 2016 | 1.31 | 6,059 |
| 2017 | 1.40 | 6,204 |

   Compute the trended pure premium per 100 earned house years if

   - The pure premium trend is 7.8% per year
   - New rate will be in effect for a year, starting from April 1, 2018
   - All policies are annual

4. The following is the earned premium information for insurer ABC.

| Calendar Year | Earned Prem (000) | Premium On-Level Factors |
|---|---|---|
| 2014 | 8,701 | 1.2170 |
| 2015 | 9,400 | 1.1180 |
| 2016 | 10,550 | 1.0190 |
| 2017 | 11,326 | 0.9660 |

   Compute the trended earned premium for each accident year if the premium trend is 1.8% and projected period is the same as previous question.

5. From previous two questions, calculate the catastrophe loading for non-hurricane weather if the CY2017 earned house years 14,169.

6. (DIY) To understand more about **Occurrence Exceedance Probability** and **Aggregate Exceedance Probability**. Try the following:

   (a) Simulate a natural number $n$ from Poisson distribution (this represents loss frequency), with mean $\lambda = 5$

   (b) Simulate $n$ number from Lognormal distribution (this represents loss severity), with $\mu = 5$ and $\sigma = 2$

   (c) Repeat above steps for 100 times

   (d) Find the maximum loss amount for each iteration of $n$ and compute the OEP of *1 in 100 year*, *1 in 10 year* losses

   (e) Find the total loss amount for each iteration of $n$ and compute the AEP of *1 in 100 year*, *1 in 10 year* losses