## **Tail Weight**

**₹** 5M

Actuaries are often interested in studying adverse outcomes, such as natural disasters, that would trigger massive insurance payouts because they may greatly impact an insurance company's solvency. To model those outcomes, actuaries consider the *tail weight* of loss distributions, which describes the likelihood of extreme losses occurring.

In this lesson, "tail" refers to the **right tail** of a distribution. Therefore, a heavier tail weight implies that large claims are more likely to occur, compared to a distribution with lighter tail weight.

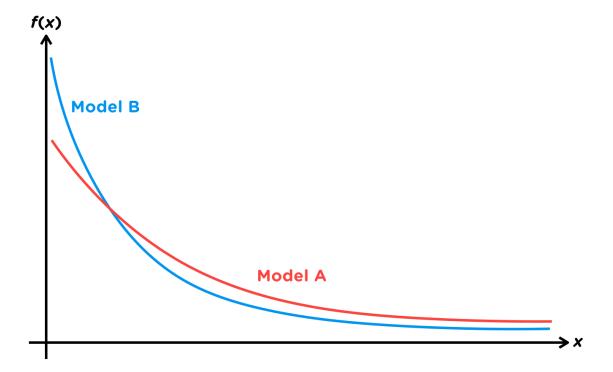
Consider the two models below:

Model A: Pareto (3, 60)

Model B: Exponential (30)

Determine which model has a heavier tail.

Evaluate the graph below:



According to the diagram, Model A (Pareto) is more likely to produce larger values than Model B (exponential) because it has a greater density function in its tail. Therefore, Model A has a heavier tail than Model B.

However, constructing every PDF by hand during the exam is impractical. Fortunately, the tails of distributions can be compared using the number of positive raw moments test. **The fewer positive raw moments that exist, the greater the tail weight.** As practice, let's apply the test on the models above.

## **Example S2.6.4.1**

Consider the following models:

- Model A: Pareto distribution with lpha=3 and heta=60.
- Model B: Exponential distribution with heta=30.

Determine the model with the heavier tail using the number of positive raw moments.

## **Solution**

From the exam table,

