Normal approximation to the Gamma distribution

The Gamma(0, b, a) distribution returns the "time" we will have to wait before observing a independent Poisson events, where one has to wait on average b units of "time" between each event. The "time" to wait before a single event occurs is a Gamma(0, b, a) = Exponential(1/b) distribution, with mean b and standard deviation b too. The Gamma(0, b, a) is thus the sum of a independent Exponential(1/b) distributions, so Central Limit Theorem tells us for sufficiently large a (>30, for example), we can make the approximation:

\[ \text{Gamma}(0, b, a) \sim \text{Normal}(ab, \sqrt{ab}) \]

![Graphs comparing Normal and Gamma distributions](image)

The Gamma(0, b, a) distribution has mean and standard deviation equal to ab and \( ab/2b \) respectively, which provides a nice check to our approximation.