

MACS 40200 Problem Set 2

Alejandro Parraguez

January 17, 2017

(a)

We can see a set of summary statistics in the following table:

Mean	720.28
Median	172.21
Maximum	227967.25
Minimum	0.01
Standard Dev.	3972.66

Table 1: Summary Statistics of Data

We also plot two histograms. Figure 1 presents the entire dataset while Figure 2 only focuses on the claims ranging from 0 to 800.

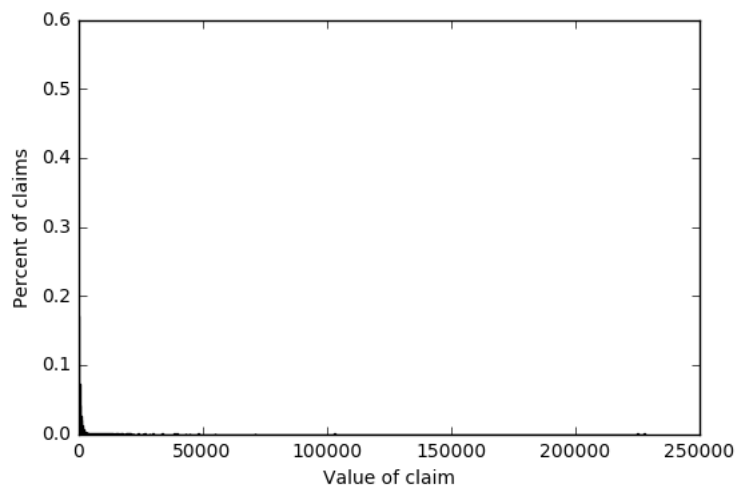


Figure 1: Histogram for all claim values

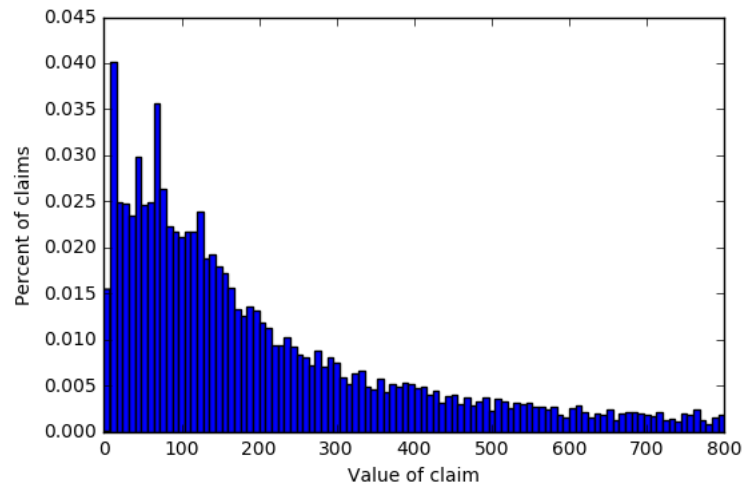


Figure 2: Histogram for claim values less than 800

We might prefer this second graph since it provides more insight into the possible shape of the distribution that is generating the data.

(b)

Using MLE to fit the Gamma distribution $GA(x; \alpha, \beta)$ we find $\hat{\alpha} \approx 0.22$, $\hat{\beta} \approx 21911.06$ and $\mathcal{L}(\hat{\theta}) \approx -82076.4516057$. The resulting graph is the following:

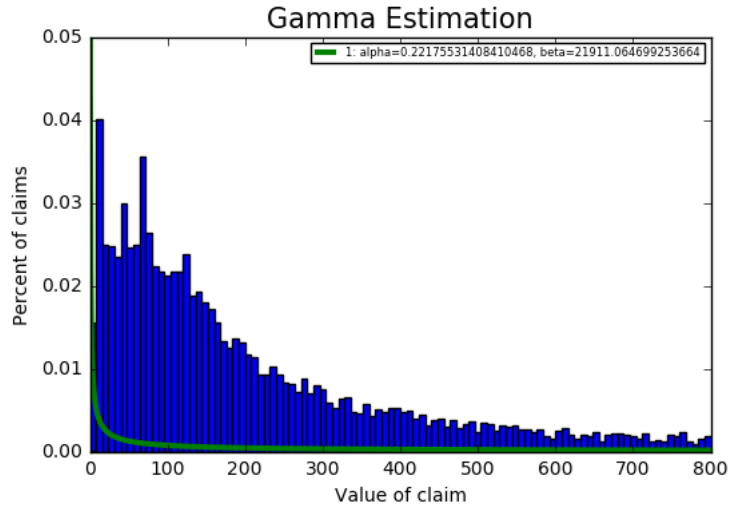


Figure 3: Histogram and fitted Gamma distribution

(c)

Using MLE to fit the Gamma distribution $GG(x; \alpha, \beta, m)$ we find $\hat{\alpha} \approx 0.222$, $\hat{\beta} \approx 21911.06$ and $\mathcal{L}(\hat{\theta}) \approx -82076.446472$. The estimates are very similar to the ones from part (c). The resulting graph is the following:

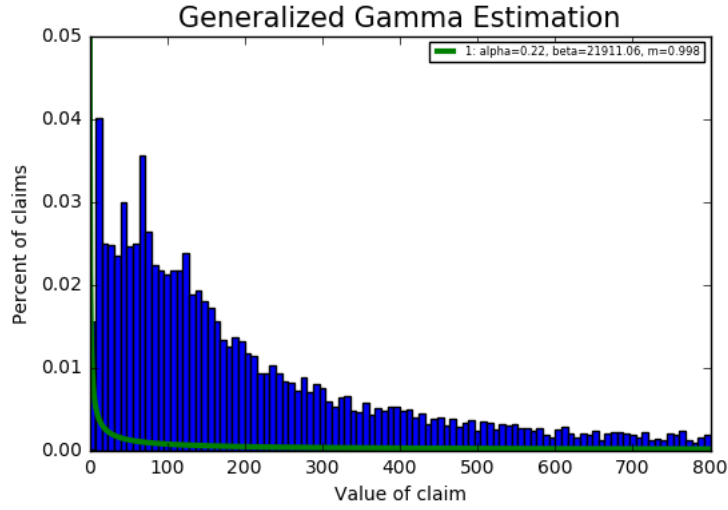


Figure 4: Histogram and fitted Generalized Gamma distribution

(d)

When we fit the Generalized Beta 2 $GB2(x; \alpha, b, p, q)$ we find $\hat{a} \approx 0.69$, $\hat{b} \approx 179043492.206$, $\hat{p} \approx 1.019$, $\hat{q} = 7989.436$ and $\mathcal{L}(\hat{\theta}) \approx -76432.327$. The graph we obtain is the following:

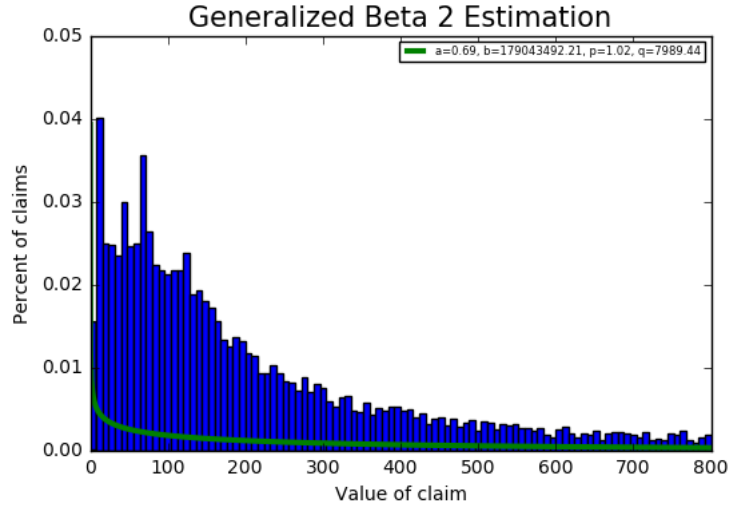


Figure 5: Histogram and fitted Generalized Beta 2 distribution

(e)

The $\chi^2(4)$ values for both likelihood tests are 0. Since the estimates from (b) and (c) are very similar, the LR is equivalent. This means it is highly unlikely the estimates from the Gamma and Generalized Gamma are the true parameters.

(f)

From the estimates we find that:

$$\begin{aligned} \mathbf{P}(\text{Claim} > 1000|\text{GA}) &\approx 0.45 \\ \mathbf{P}(\text{Claim} > 1000|\text{GB2}) &\approx 0.16 \end{aligned}$$