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Structural Estimation - Dr. Richard Evans
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Problem Set 2

1

1.

Mean: 7109650.8718756742187
Median: 8266575.7182817184366
Maximum: 18563678.22774336115
Minimum: 0.7621415290397538511
Standard Deviation: 4676045.6788980552733

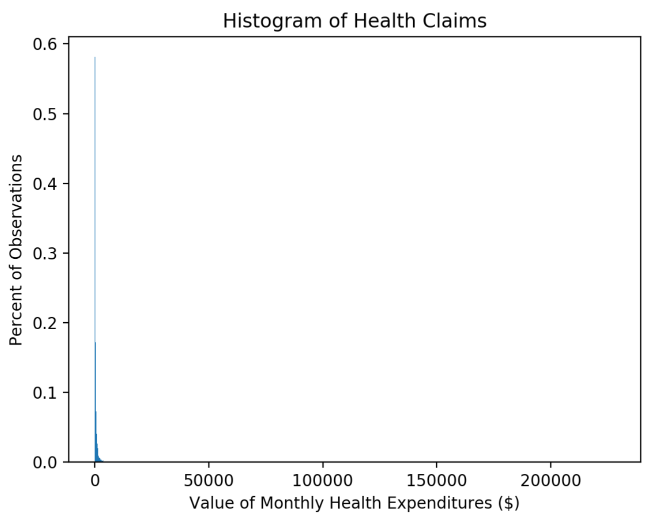

Figure 1-a-1

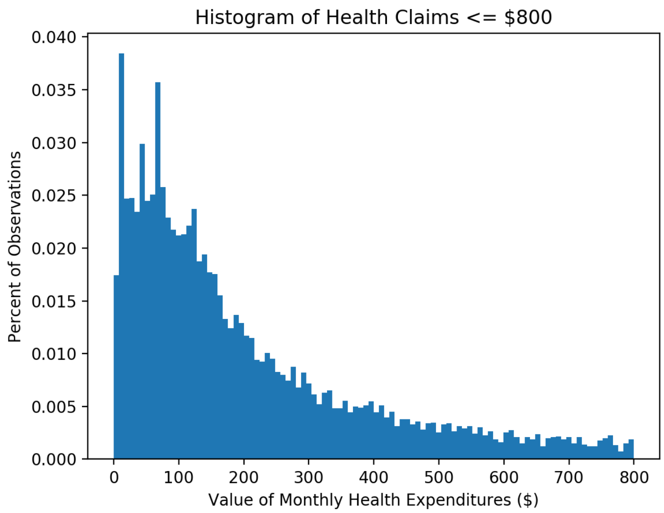

Figure 1-a-2

It might make sense to prefer the second histogram because most of the data is concentrated at costs $\leq$ \$800. While there is data beyond \$800, and costs can become very high relative to this, those are more of artefacts in the data and are therefore not necessarily as useful when modeling the data. However, in terms of predicting overall costs, those larger data are probably more important to be able to predict.

2.

$\hat{\alpha} =$ 0.2217553197716105
$\hat{\beta} =$ 21911.064699347084
$max_{\hat{\theta}} \mathcal{L}(\hat{\theta}) =$ -82076.451605671495734

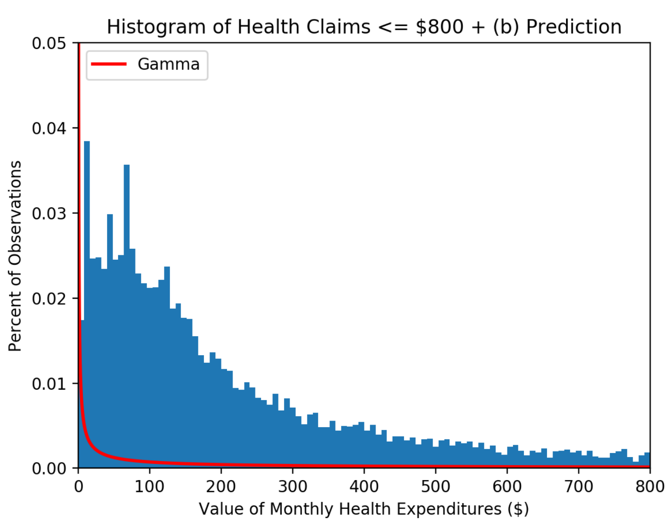

Figure 1-b

3.

$\hat{\alpha}$ = 0.22172866495375396
$\hat{\beta}$ = 21911.064430787832
$\hat{m}$ = 0.9972119125497293
$max_{\hat{\theta}}\mathcal{L}(\hat{\theta})$ = -82076.446720700603066

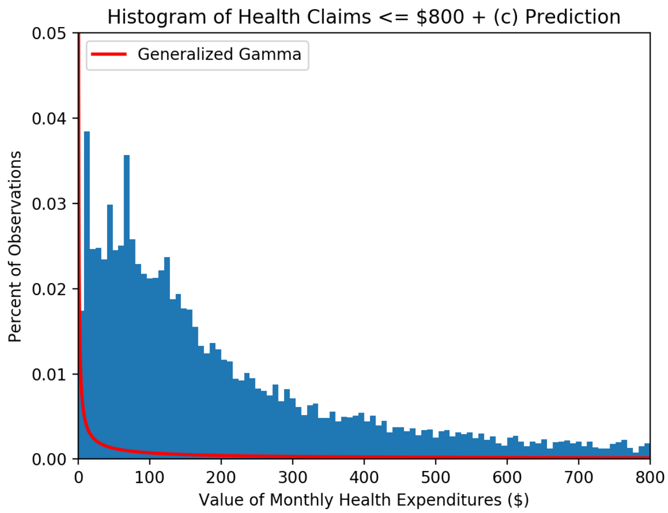

Figure 1-c

4.

$\hat{a}$ = 0.12428302113557904
$\hat{b}$ = 55027.478552815286
$\hat{p}$ = 43.06095624997855
$\hat{q}$ = 86.84968715399238
$max_{\hat{\theta}}\mathcal{L}(\hat{\theta})$ = -74868.10188401841392

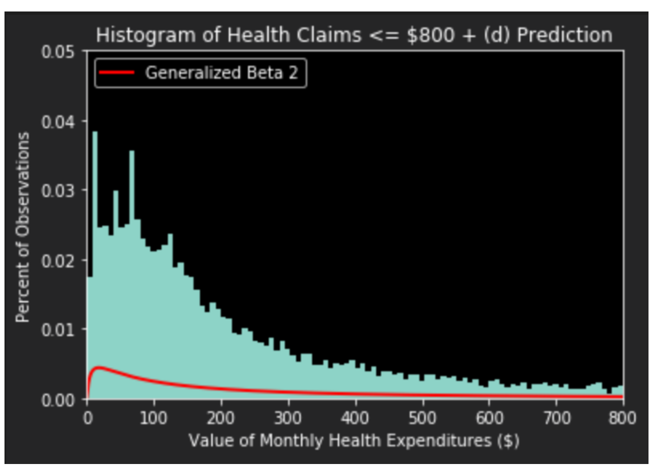

Figure 1-d

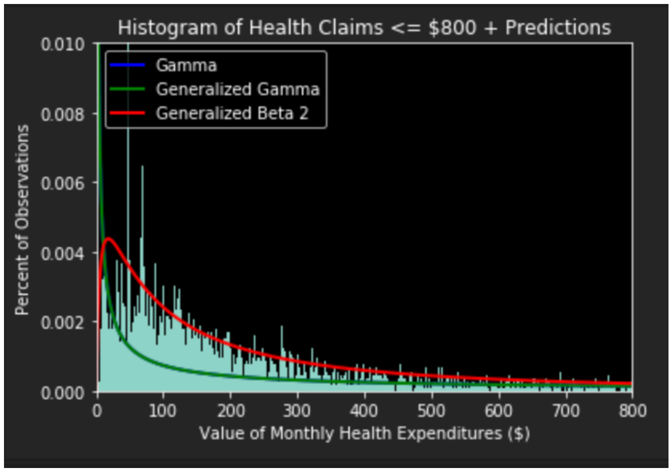

Figure 1-final

Note: Final figure includes 1000 bins to more accurately demonstrate fit of model.

5.

Likelihood ratio b-d: 14416.699443306163
P-val b-d: 0.0
Likelihood ratio c-d: 14416.689673364379
P-val c-d: 0.0

6.

Prob of $\geq$ \$1,000 from b: 0.451959739854622
Prob of $\geq$ \$1,000 from d: 0.130910311336637
Difference between b and d: 0.321049428517985

2

1.

$\hat{\alpha}$ = 0.4575090534944938
$\hat{\rho}$ = 0.7204919721946484
$\hat{\mu}$ = 9.52282047893551
$\hat{\sigma}$ = 0.09199627271616673
$max_{\hat{\theta}}\mathcal{L}(\hat{\theta})$ = 96.706908063468202084
Inverse Hessian Variance-Covariance Matrix = [[6.45670304e+02 -4.91962688e+02 -8.93337933e+03 -1.61088801e+01] [-4.91962688e+02 3.75706839e+02 6.80689659e+03 1.22365331e+01] [-8.93337933e+03 6.80689659e+03 1.23600688e+05 2.22871288e+02] [-1.61088801e+01 1.22365331e+01 2.22871288e+02 4.03620317e-01]]

2.

$\hat{\alpha} = 0.40841620518828853$
$\hat{\rho} = 0.6022479478368761$
$\hat{\mu} = 7.685765927568782$
$\hat{\sigma} = 0.09205655267281856$
$max_{\hat{\theta}}\mathcal{L}(\hat{\theta}) = 96.640365199025349136$
Inverse Hessian Variance-Covariance Matrix = [[0.11693435 0.22424833 1.44690741 0.02257294] [0.22424833 1.53630263 2.29512032 0.23775192] [1.44690741 2.29512032 18.11307977 0.19461734] [0.02257294 0.23775192 0.19461734 0.03874934]]

3.

Probability = 0.9999999667400057