12.1

mean(Y_t) = 0.478790919848
mean(c_t)= 0.289053260303
var(Y_t) = 0.000118971936416
var(c_t) = 4.33619219953e-05
corr(k_t, Y_t) = 0.770254601008
corr(k_t, k_{t+1}) = 0.776769702307

Parameters are as follows:

$$\alpha = 0.414999996868$$

$$\beta = 0.954849795539$$

$$\rho = 0.596119118343$$

$$\mu = -0.0469562926534$$

$$\sigma = 0.0137100107631$$

Computation time = 93.0396201611 seconds.

Criterion functional value = 3.55×10^{-5}

Included moments:

mean(Y_t)	mean(c_t)	var(Y_t)	var(c_t)	corr(k_t, Y_t)	corr(k_t, k_{t+1})
0.478754	0.289042	0.000118968	4.33636e-05	0.773421	0.773421
0.478791	0.289053	0.000118972	4.33619e-05	0.770255	0.77677

Outside moments:

mean(k_t)	var(k_t)	corr(k_t, c_t)	corr(y_t, c_t)	corr(c_t, c_{t+1})
0.189713	1.84274e-05	0.773421	1	0.773061
0.18977	1.89667e-05	0.770255	1	0.763796

14.1

mean = 720.277975327
median = 172.21
max = 227967.25
min = 0.01
standard deviation = 3972.66375639

Data is skewed in second graph, so we see the more relevant part of the data. For this reason it might be preferred.

Figure 1: Histogram

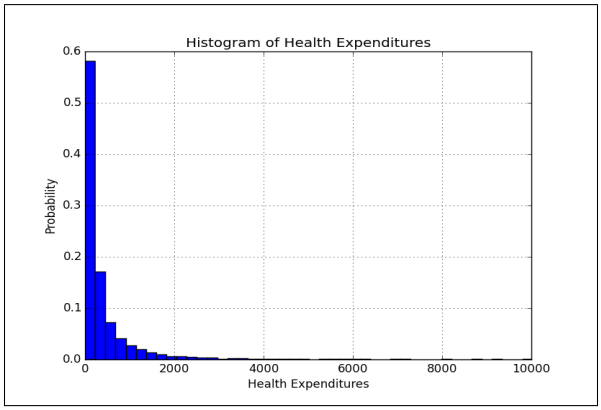
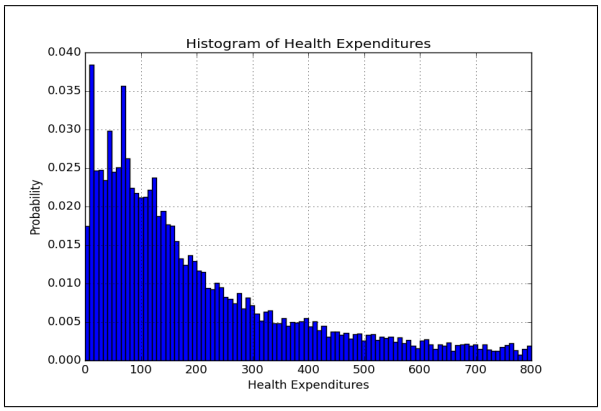


Figure 2: Histogram



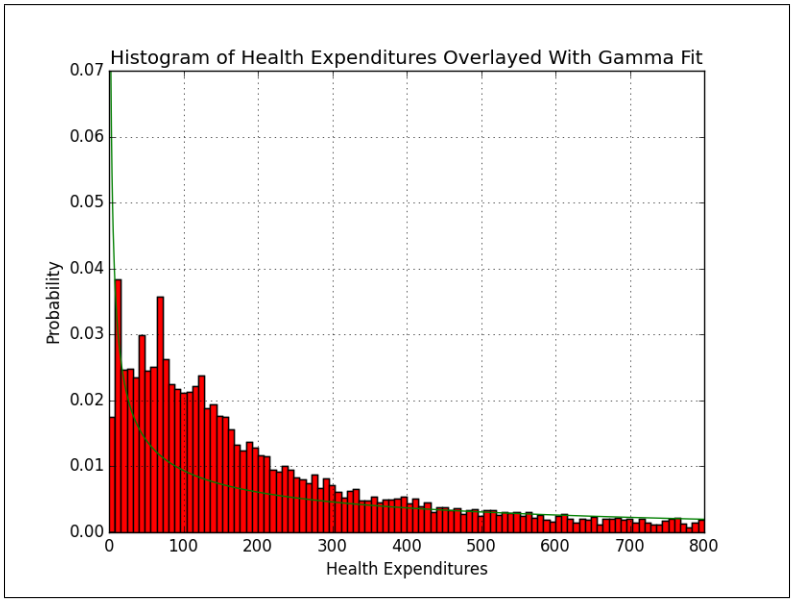
14.2

$$\hat{\alpha} = 0.472506084871$$

$$\hat{\beta} = 1524.4132857$$

Value of maximized log likelihood function $= -77723.4734271$

Figure 3: Histogram with γ distribution



14.3

We got the estimated values

$$\hat{\alpha} = 2.15224965$$

$$\hat{\beta} = 0.00205435987$$

$$\hat{m} = 0.202900153$$

Value of the maximized log likelihood function = 75047 : 640676131472

14.4

$$\text{Log likelihood} = -74892.9454288$$

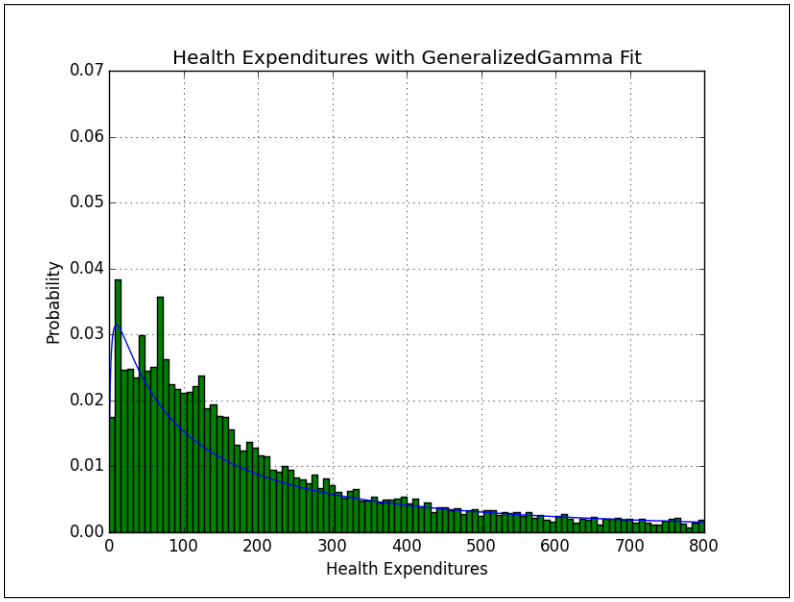
$$\hat{a} = 0.0986012857732$$

$$\hat{b} = 13299499492.2$$

$$\hat{p} = 52.1244834389$$

$$\hat{q} = 307.688083445$$

Figure 4: Histogram fitted with generalized γ



14.5

The GB2 appears to have the best fit, but the likelihood ratio test will give us a surefire way to tell. We have that
Gamma likelihood: -77723.4734271
Generalized Gamma likelihood: -75042.2927752
GB2 likelihood: -74892.9454288

$$\implies \text{GB2 has best fit}$$

Figure 5: Histogram fitted with generalized β GB2

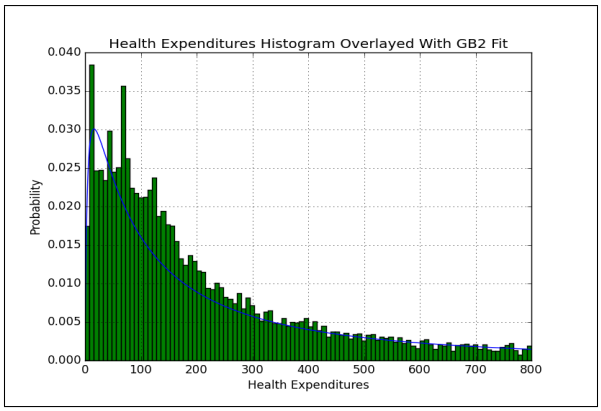
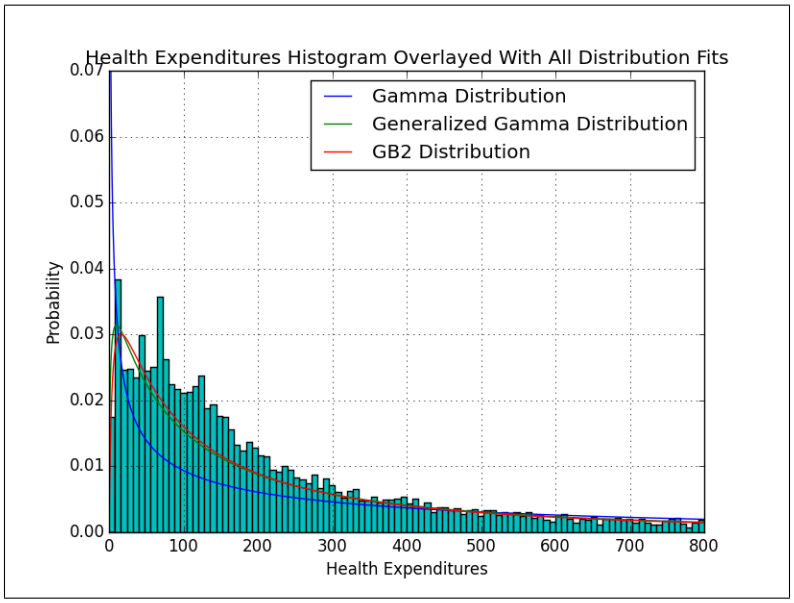


Figure 6: Histogram fitted with GA, GG and GB2 distributions



14.6

14.7

$$\hat{\mu} = 3.97691922$$

$$\hat{\sigma} = 1.0466081$$

Value of the miminized criterion function = 0.000042503325515859232.

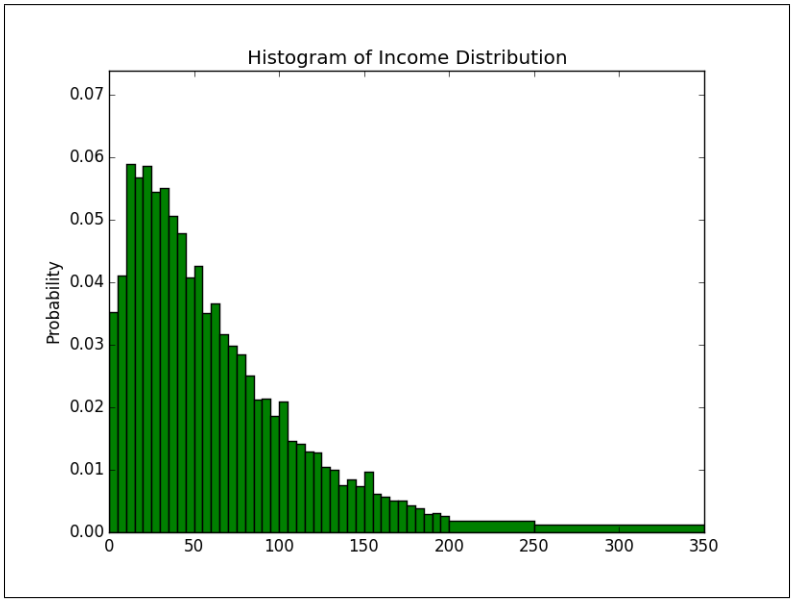
14.8

$$\hat{\alpha} = 1.43059137$$

$$\hat{\beta} = 44.43445121$$

Value of the miminized criiterion function = 0.00000066226533019988027

Figure 7: Histogram with income distribution



14.9

By examining the following values we can determine which is a more precise fit

Log-normal mean = 99641.2728153

Log-normal median = 51901.0294037

Gamma mean = 65008.2095102

Gamma median = 50218.0027898

Empirical mean = 69677

Empirical median = 50504

Gamma more closely resembles empirical and thus we have that it is the most precise fit.

Figure 8: Histogram with income distribution with lognormal fit

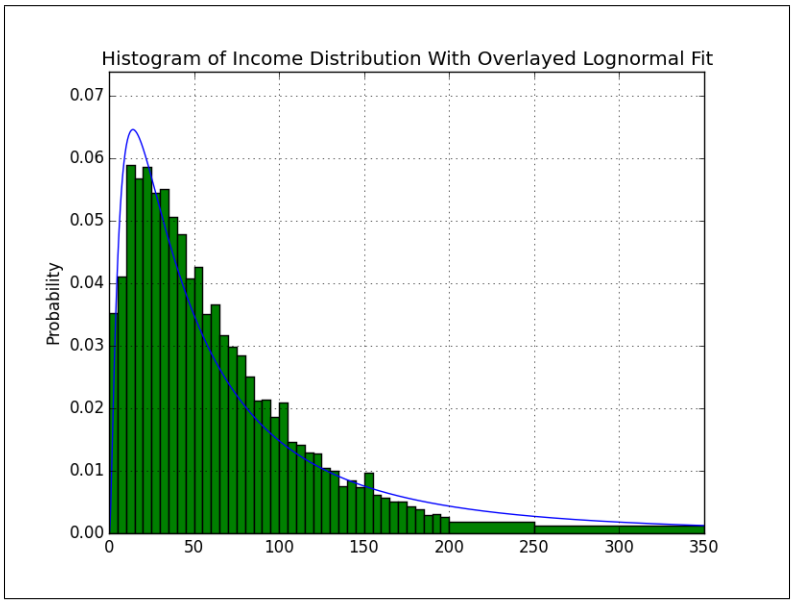


Figure 9: Histogram with income distribution with γ distributional fit

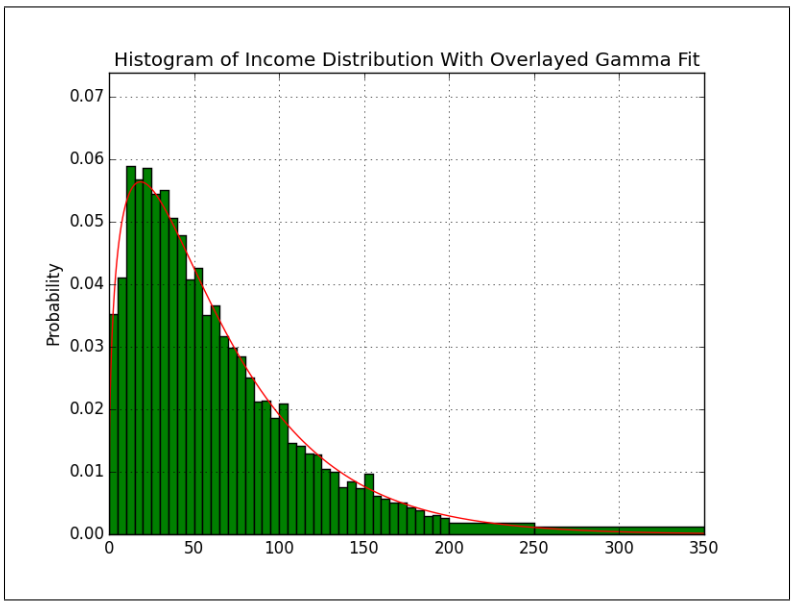


Figure 10: Histogram with income distribution with both distributions