Problem Set #2

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Problem 1

Part (a)

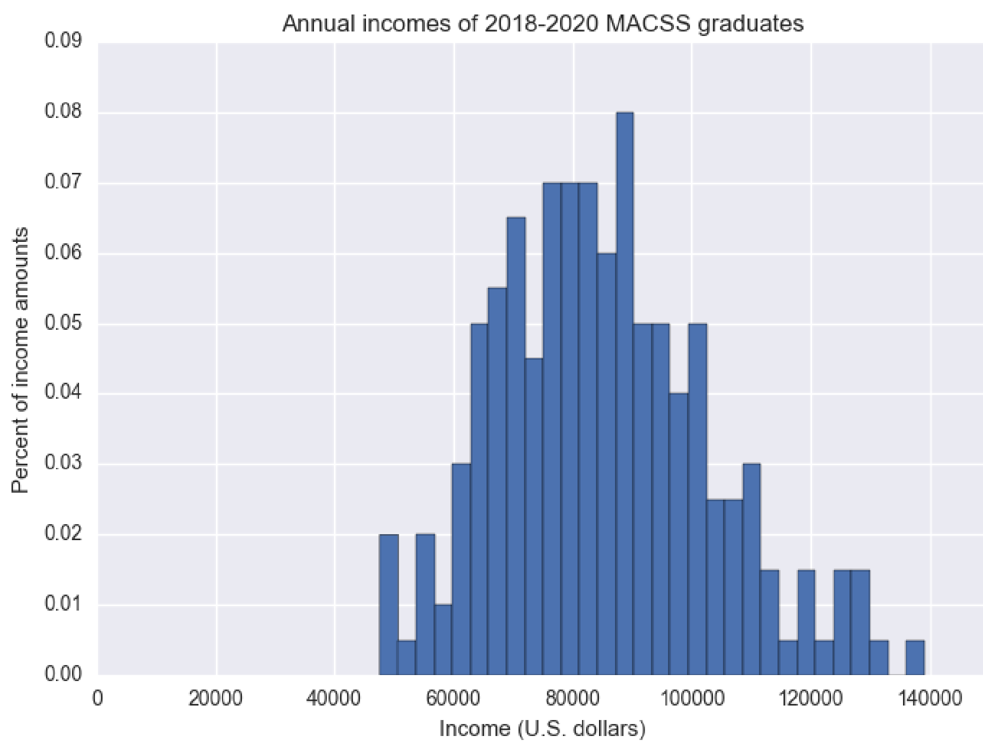

Figure 1: Histogram of percentages of the income.text data

Part (b)

Log likelihood value: -8298.63695601

Part (c).

μ MLE = 11.3314411636
σ MLE = 0.211674565363

Log likelihood value: -2239.534744
Variance-covariance matrix:

$$\begin{bmatrix} 2.22922149e-04 & 9.27073415e-06 \\ 9.27073415e-06 & 1.64466141e-04 \end{bmatrix}$$

Part (d).

The probability that the incomes data has $\mu = 9.0$ and $\sigma = 0.3$ is 0.

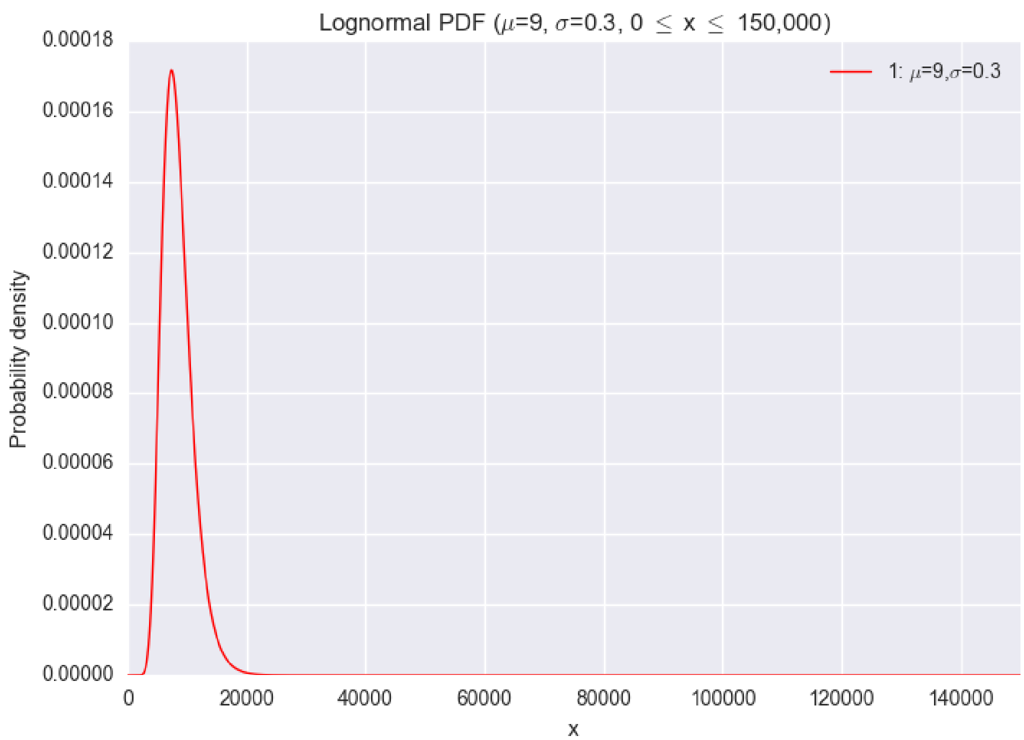

Figure 2: Lognormal PDF with $\mu = 9.0$ and $\sigma = 0.3$

Part (e).
The probability that I will learn more than \$100,000 is: 0.195766989696
The probability that I will learn less than \$75,000 is: 0.307687164314

Problem 2
Part (a).

β_0 MLE = 0.293418697526
β_1 MLE = 0.00763476963395
β_2 MLE = 0.444707732948
β_3 MLE = -0.00780350965027
σ MLE = 0.0230457171774

Log likelihood value: 477.537339914
Variance-covariance matrix:

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}$$

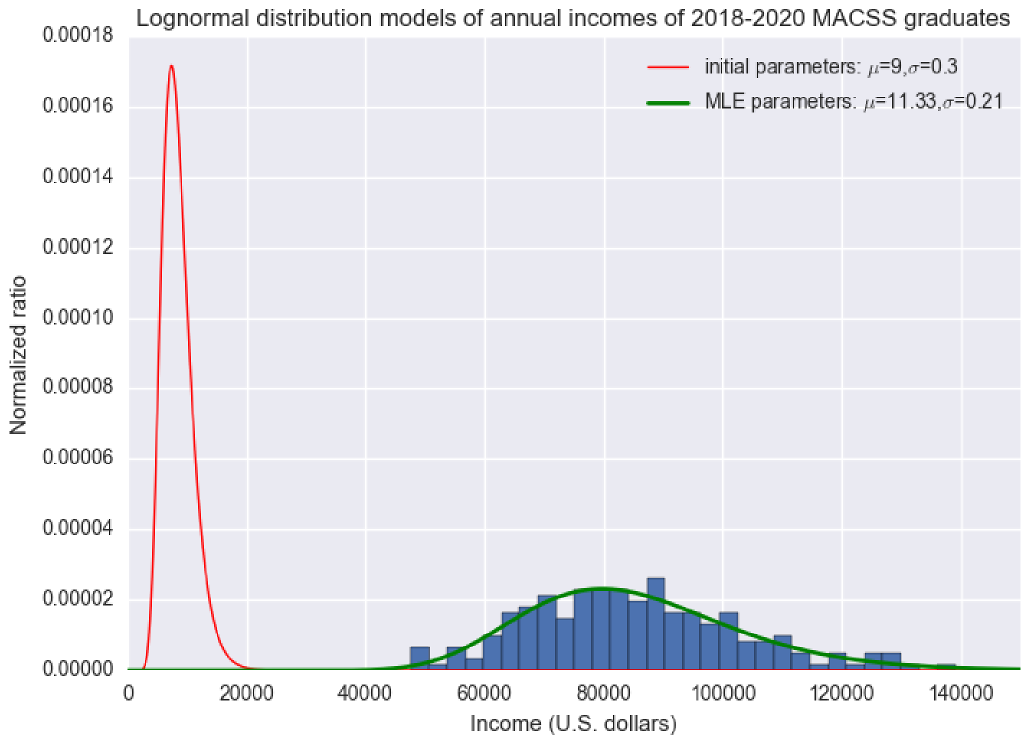

Figure 3: Lognormal PDF with MLE estimates for μ and σ

Part (b).
The probability that $\beta_0 = 1.0$, $\sigma^2 = 0.01$, and β_1, β_2, $\beta_3 = 0$ is 0.