# Problem Set 2

MACS 30100, Dr. Evans

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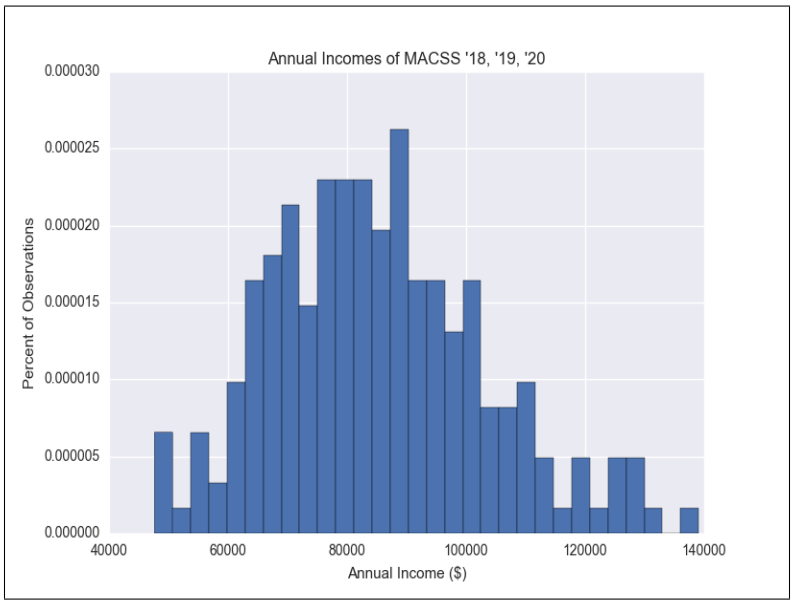
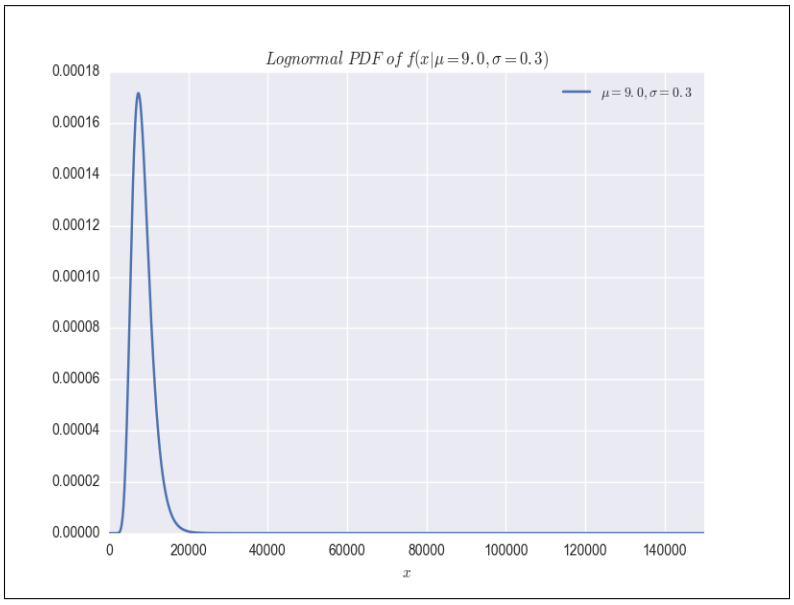
## Problem 1

### Part (a).

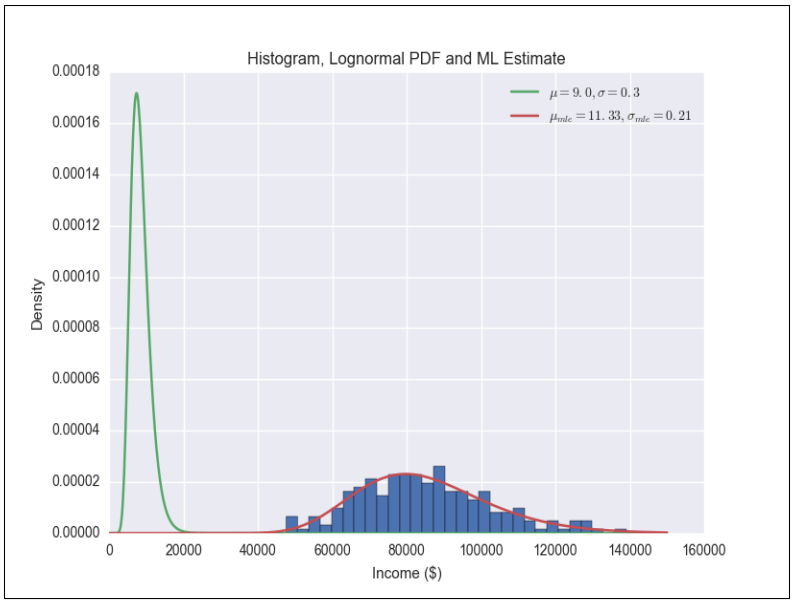



### Part (b).




Log likelihood value: -8298.64

### Part (c).




$\mu_{mle} = 11.33, \sigma_{mle} = 0.21$
The value of the likelihood function: -2239.53
VCV matrix:

$$\begin{bmatrix} 1.47800535e-04 & 1.23381775e-05 \\ 1.23381775e-05 & 1.15325561e-04 \end{bmatrix}$$

**Part (d).**

The probability that the data in incomes.txt came from the distribution in part (b) is less than 0.000

**Part (e).**

The probability that you will earn more than $100,000 is 0.1958.
The probability that you will earn less than $75,000 is 0.3077.

**Problem 2**

**Part (a).**

The ML estimates are:
$\beta_0 = 0.2516, \beta_1 = 0.0129, \beta_2 = 0.4005, \beta_3 = -0.0100, \sigma = 0.0030$
The value of the likelihood function: 876.87
VCV matrix:

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

**Part (b).**

The likelihood that age, number of children, and average winter temperature have no effect on the number of sick days is less than 0.000