

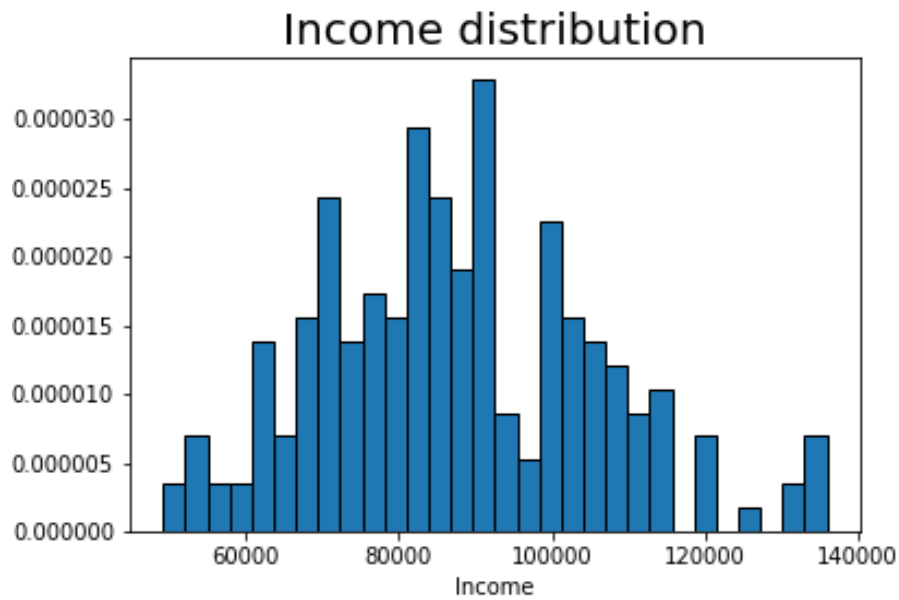
Problem Set #2

MACS 30100,

Dr. Evans Due Monday, Jan. 22 at 11:30am

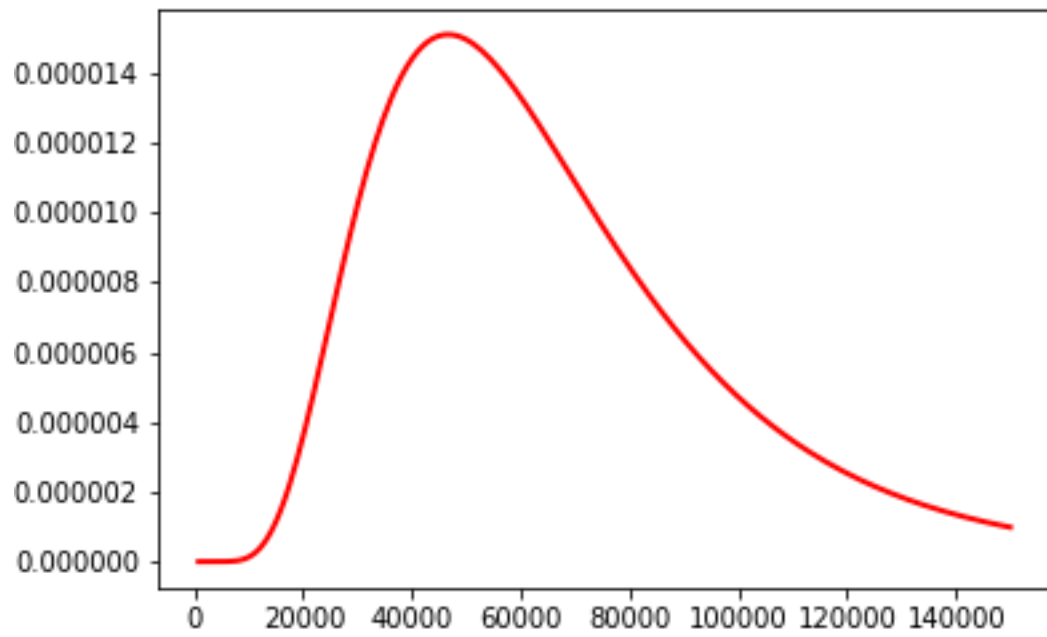
Q1: Some income data, lognormal distribution, and hypothesis testing (6 points)

a) Histogram of percentages of the income. Txt



b)

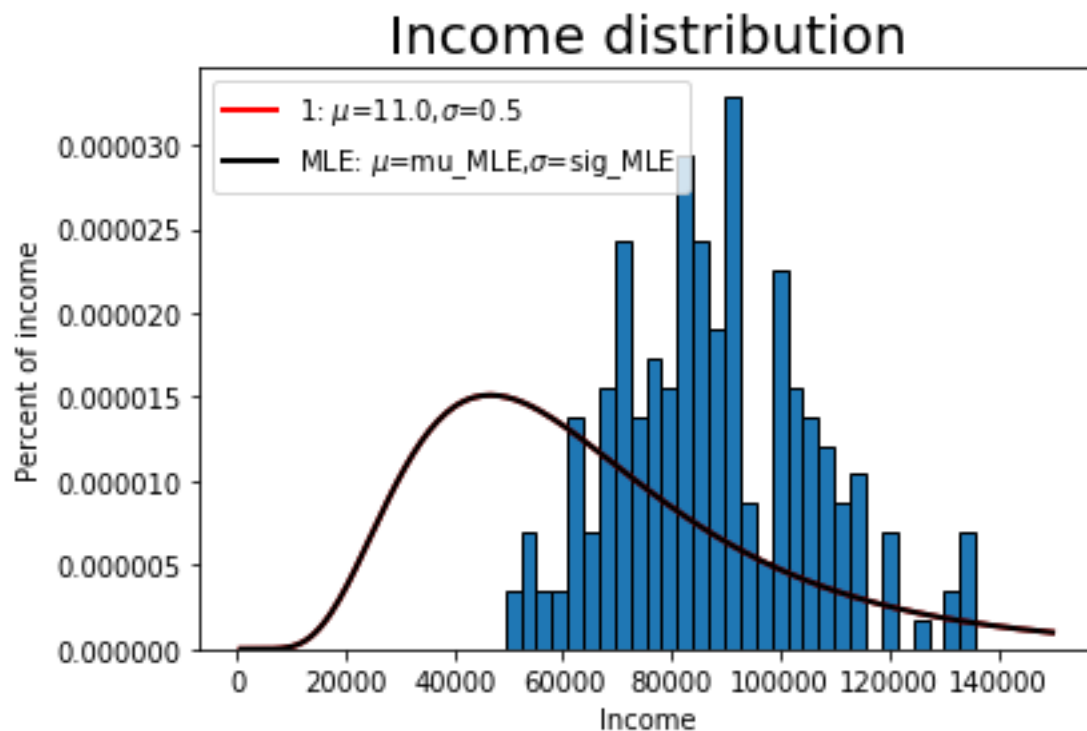
Log Likelihood: -2385.85699781



c)

Lognormal distribution parameters using ML: $\mu_{MLE} = 11.0$ $\sigma_{MLE} = 0.5$

MLE Log Likelihood: -2385.85699781



Variance Co-variance matrix:

$VCV(MLE) = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

Standard error for mu estimate = 1.0

Standard error for sigma estimate = 1.0

d) chi squared of H_0 with 2 degrees of freedom p-value = 1.0

Given the p value is high, it is highly likely that the null hypothesis is true

e)

The probability of earning more than 100,000 = $1 - p(\text{income} \leq 100,000) \sim 1 - .0000075 \sim .9999925$

Probability of earning less than \$ 75, 000 = $p(\text{income} \leq 75,000) \sim .0000012$

Ques 2: Linear Regression and MLE

a)

Estimates:

Sigma= 231.4878748826262

b[0] = -15.5

b[1] = 19.5

b[2] = -1.0

b[3] = 2

Log likelihood function: -inf

Estimated variance covariance matrix

```
hess_inv: array([[1, 0, 0, 0],  
                [0, 1, 0, 0],  
                [0, 0, 1, 0],  
                [0, 0, 0, 1]])
```

b)

The p value = 1, which means it's highly likely that the null hypothesis is true. Thus, indicating that age, # of children, and average winter temperature have no effect on the # of sick days.