

# Problem Set 2

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January 22, 2017

## 1 Question 1

### 2 Part (a)

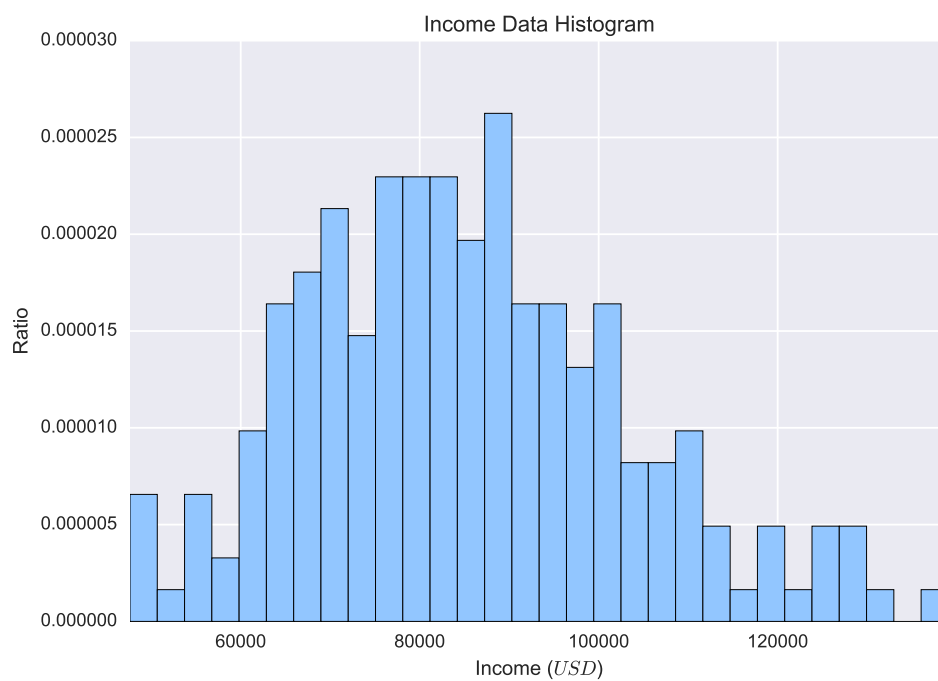
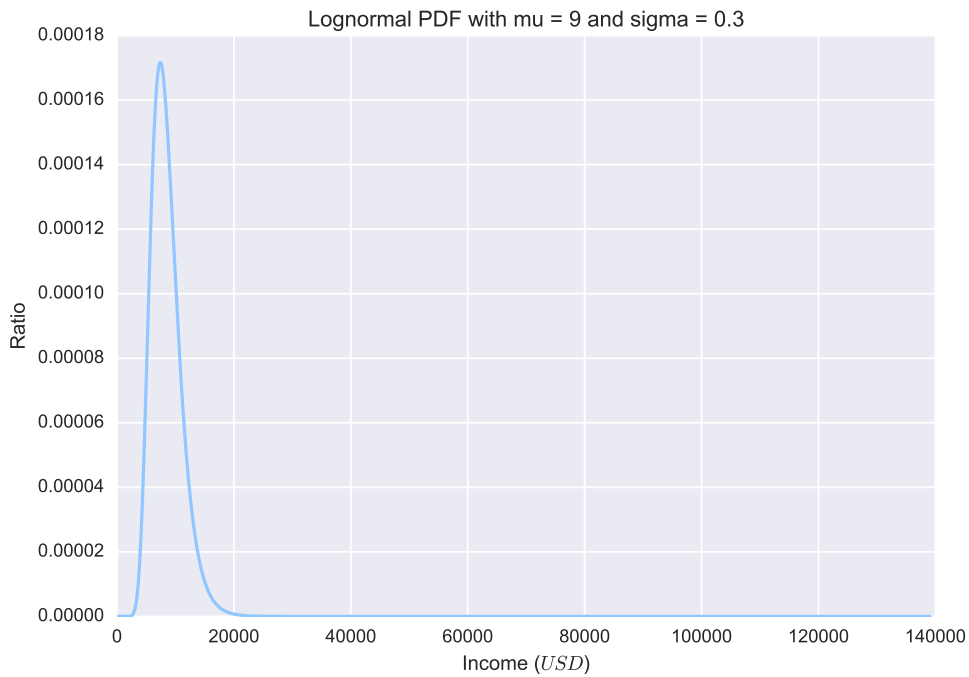


Figure 1: Question 1 (a) histogram

### 3 Part (b)

The Log-likelihood of  $\mu = 9.00$  and  $\sigma = 0.30$ , is -8298.64



**Figure 2:** Question 1 (c) histogram

## 4 Part (c)

The optimizer gives  $\mu = 11.33$  and  $\sigma = 0.21$ , with a log-likelihood of -2239.53. The associated var-covar matrix is:

```
[ 2.22922149e-04  9.27073415e-06]
[ 9.27073415e-06  1.64466141e-04]
```

## 5 Part (d)

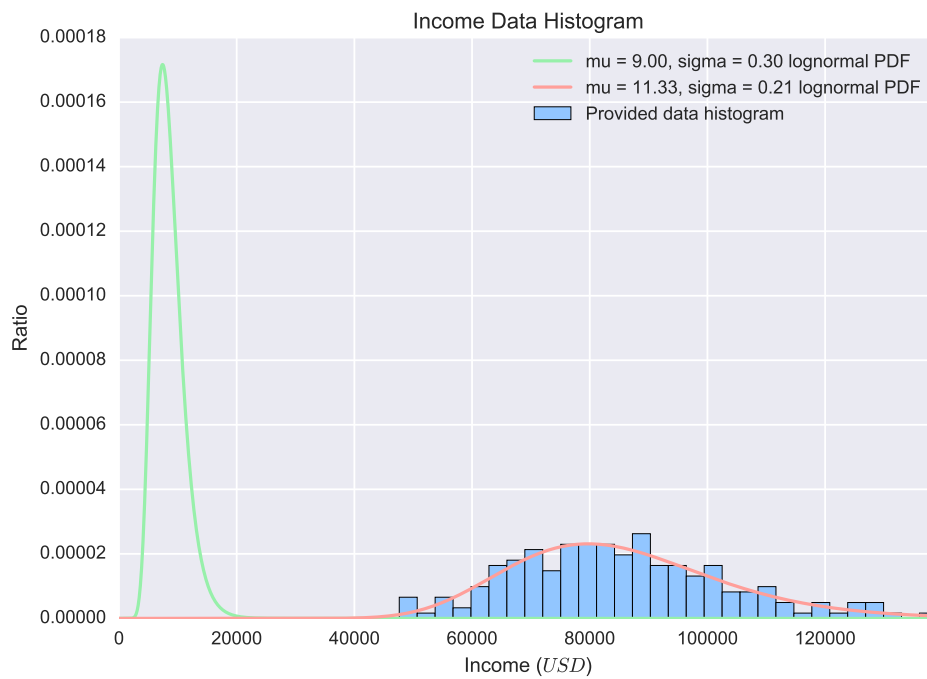
The probability that the data came from the distribution in Part (b) is: 0.0000000000

## 6 Part (d)

The probability that I will earn more than 100000 USD is 0.196 and that I will earn less than 75000 USD is 0.308

## 7 Part (a)

The estimated values with a log-likelihood of 876.865 are:



**Figure 3:** Question 1 (c) histogram

```
Beta_0 = 0.252
Beta_1 = 0.013
Beta_2 = 0.401
Beta_3 = -0.010
sigma = 0.003
```

The var-covar matrix is:

```
[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]
```

The probability that Beta\_0 is 1, Beta\_1, Beta\_2 and Beta\_3 are 0 and sigma is .1, is: 0.0000000000