Problem Set #4

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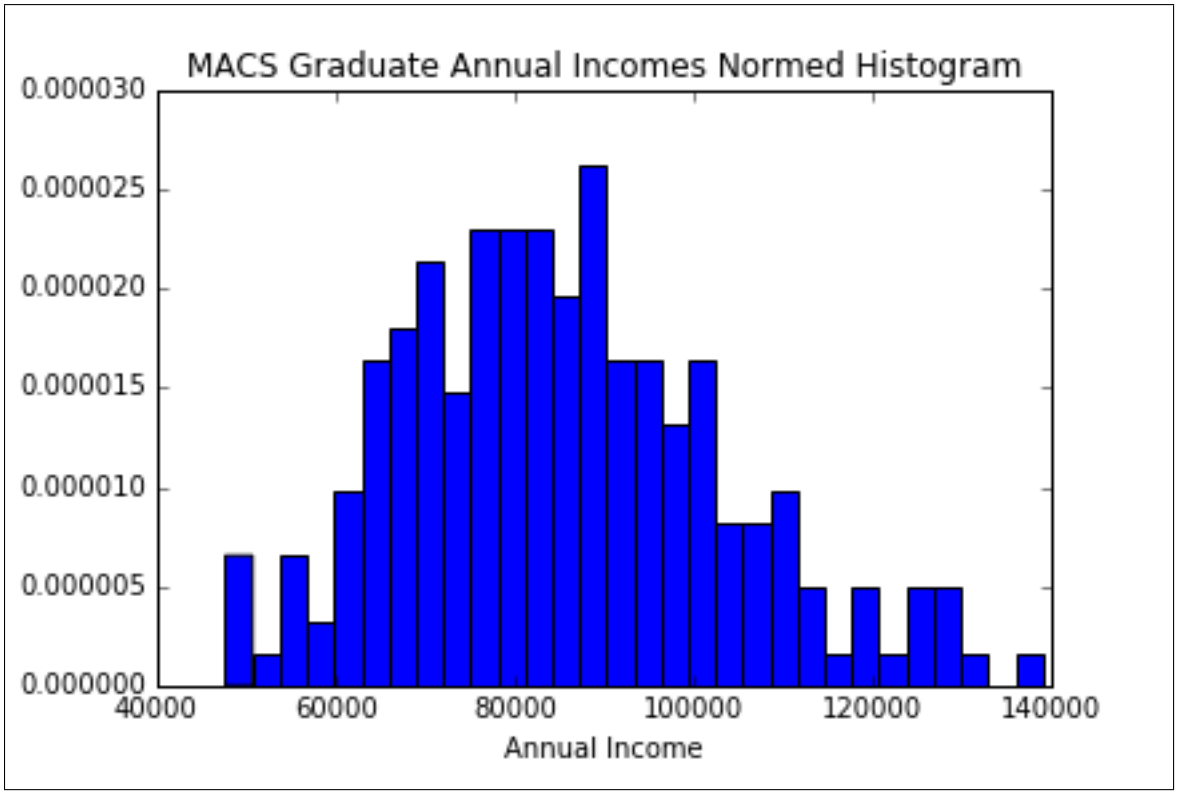
Problem 1

Part (a).

Figure 1: Normed Histogram of Percentages of income



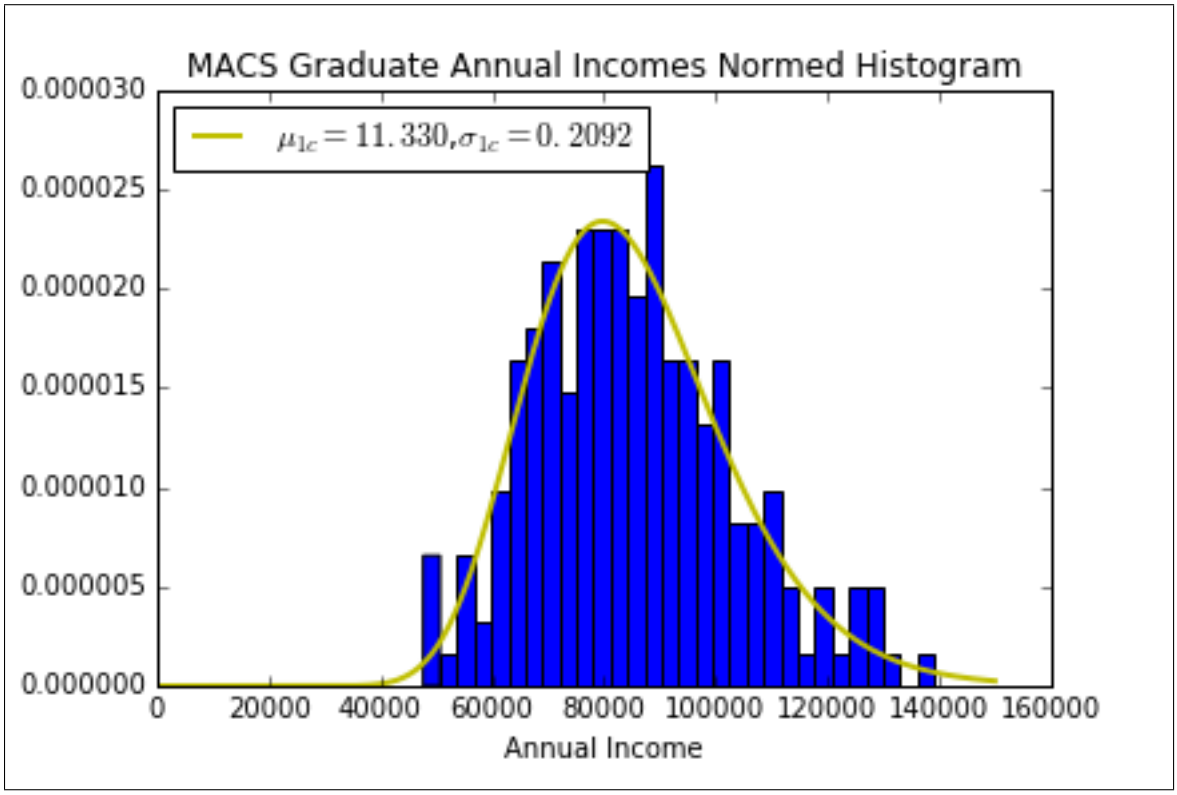
Part (b).

The function for the lognormal PDF is $LN\_pdf(xvals, \mu, \sigma)$.
The output of $LN\_pdf(np.array([200.0, 270.0], [180.0, 195.5]), 5.0, 1.0)$ is

$$M_1 = \begin{bmatrix} 0.0019079 & 0.00123533 \\ 0.00217547 & 0.0019646 \end{bmatrix}$$

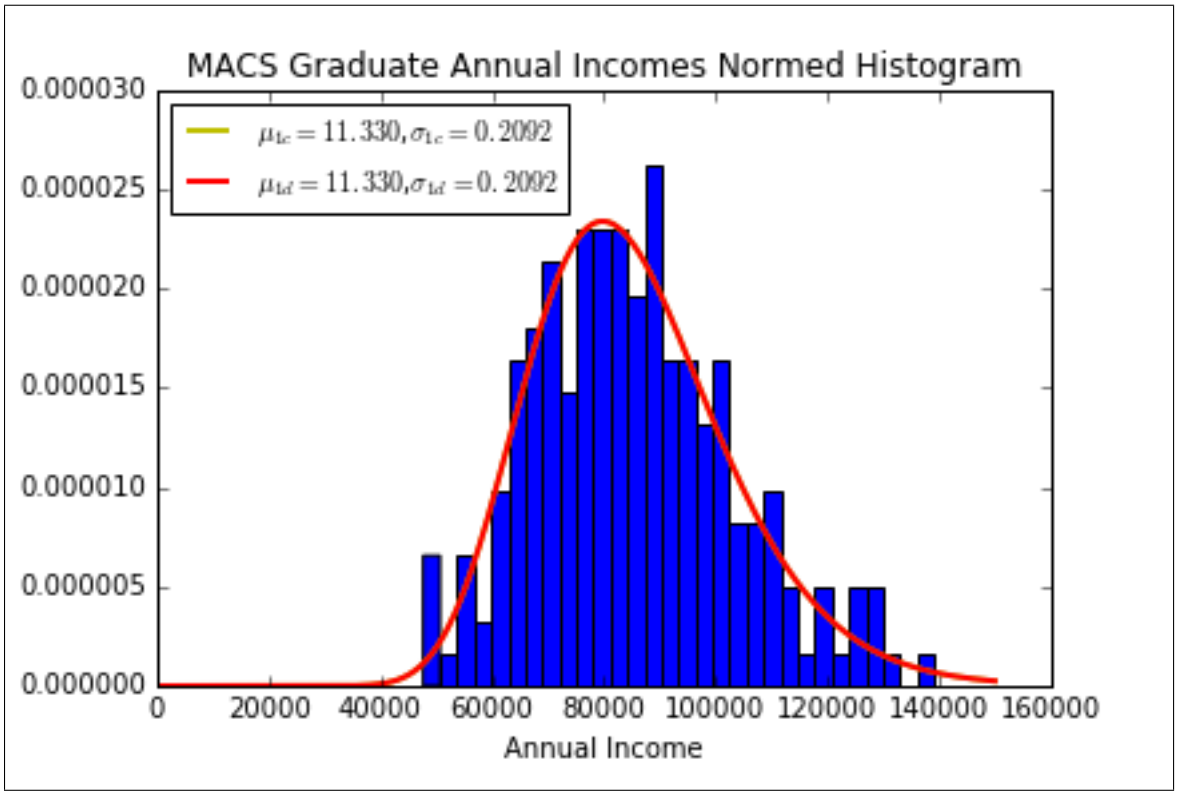
Part (c)
The estimated μ_{1c} is 11.3307606999 and the estimated σ_{1c} is 0.209202916466.
The SMM criterion function is $1.40124304 \times 10^{-8}$.
The mean and standard deviation of data moments are
85276.82360625811 and 17992.542128046523.
The mean and standard deviation of model moments are
85286.87240412165 and 17992.33953712455.
Despite using an identity matrix as the weighting matrix, the data and model moments are highly similar. In fact the mean data and model moment are identical to 3 significant factors and the standard deviation moment are identical to 5 significant factors. The highly similar data and model moments show that the SMM estimation was a good estimation.

Figure 2: Normed Histogram of MACSS Students Annual Income and the SMM Log PDF



Part (d).

Figure 3: Normed histogram of Annual Incomes of MACSS Graduates and 2-step Weight Matrix LogNormal PDF



The SMM estimates for μ_{1d} and σ_{1d} are 11.3307606999 and 0.209202916466.
The SMM criterion function is $1.40124304 \times 10^{-8}$.
The mean and standard deviation of data moments are
85276.82360625811 and 17992.542128046523.
The mean and standard deviation of modelled moments are
85286.87240412165 and 17992.33953712455.
Expectedly, the results of the two step variance covariance weights matrix SMM estimation are highly similar to the data moments. However, since the estimation in part (c) was already close to perfect, a marked improvement could not be seen comparing part (d) to (c) as both estimations were good estimations.