Problem Set #4
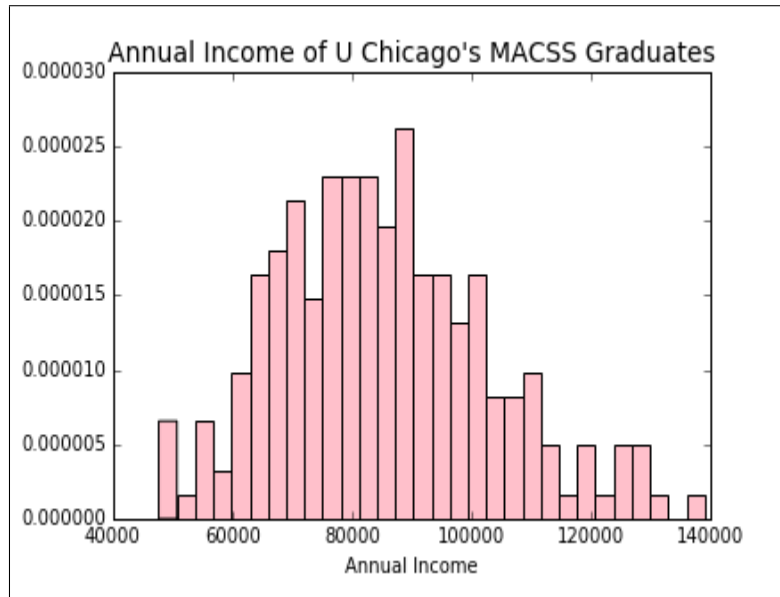
MACS 30000, Dr. Evans

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Problem 1: Some income data, lognormal distribution, and SMM.

Part (a). The histogram is shown in Figure 1.

Figure 1: Histogram of Percentages of the MACSS Graduates

Part (b). Testing my function by inputting the given matrix and parameter values: $\begin{bmatrix} 0.0019079 & 0.00123533 \\ 0.00217547 & 0.0019646 \end{bmatrix}$

Part (c). Figure 2 shows the PDF of lognormal distribution by one-step SMM estimation against the histogram from part(a).

The estimates are: mu = 11.3306370447, sigma = 0.209229359523

The value of SMM criterion function is: 5.80588645143e-14

The data moments are: mean = 85276.8236063, standard deviation = 17992.542128

The model moments are: mean = 85276.8115546, standard deviation = 17992.5386167

Using mu=9.0 and sigma=0.3 as the initial guess, the SMM estimation provide estimated mu and sigma as above. The model moments are very close to the data moments, which means the SMM estimation performs well.

Part (d). Figure 3 shows the PDF of lognormal distribution by two-step SMM estimation against the histogram from part(a) and the estimated PDF from part(c).

The estimates are: mu = 11.3306371028, sigma = 0.209229396992

The value of the two-step SMM criterion function at the estimated parameter values

Figure 2: Lognormal PDF of one-step estimation
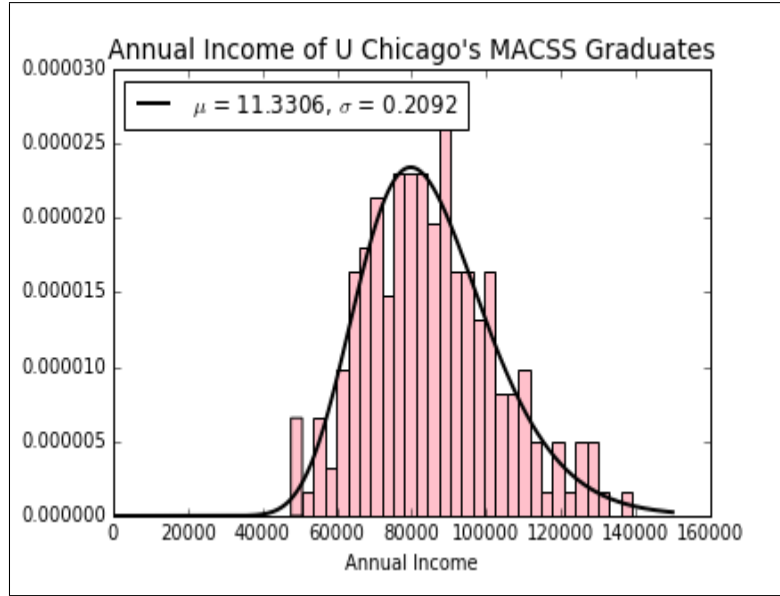
is: 0.000903894673886 (greater than 5.80588645143e-14)

The data moments are: mean = 85276.8236063, standard deviation = 17992.542128

The model moments of one-step estimation are: mean = 85276.8115546, standard deviation = 17992.5386167

The model moments of two-step estimation are: mean = 85276.8171949, standard deviation = 17992.5430962

Model moments of both one-step estimation and two-step estimation are very close to the data moments. The model moments of two-step estimation are closer to the data moments. But the value of the two-step SMM criterion function are greater than the value of the one-step SMM criterion function, which means the two-step estimation is actually producing more errors. So with comparison to data moments, the two-step estimation performs better than the one-step estimation, but it does not guarantee less estimation errors.

Please see the next page for Figure 3.

Figure 3: Lognormal PDF of two-step estimation