Problem Set #4

MACS 30100, Dr. Evans

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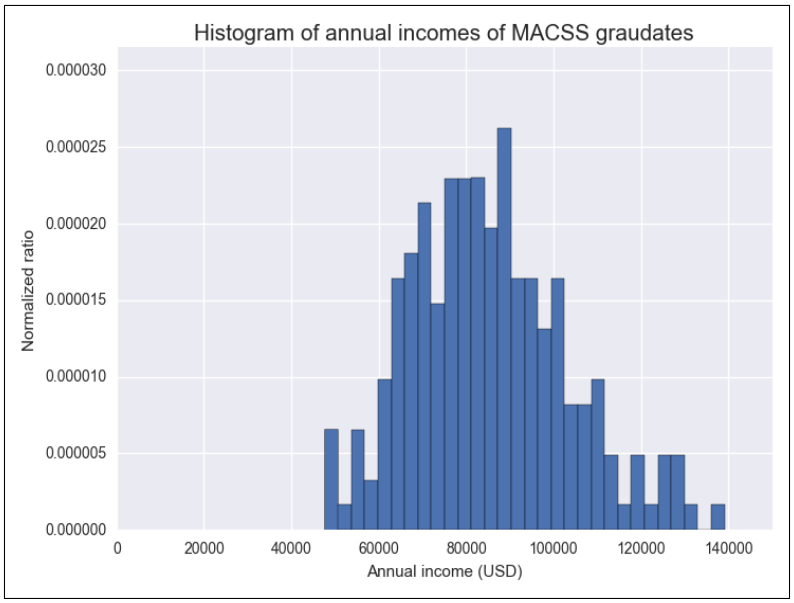
1. **Some income data, lognormal distribution, and GMM.**

   (a) Plot a histogram of percentages of the `income.txt` data with 30 bins. Make sure that the bins are weighted using the 'normed=True' option. Make sure your plot has correct x-axis and y-axis labels as well as a plot title.



   (b) Write your own function for the lognormal PDF above called `LN pdf()`. Test your function by inputting the matrix `xvals = np.array([[200.0, 270.0], [180.0, 195.5]])` with parameter values $\mu = 5.0$ and $\sigma = 1.0$.

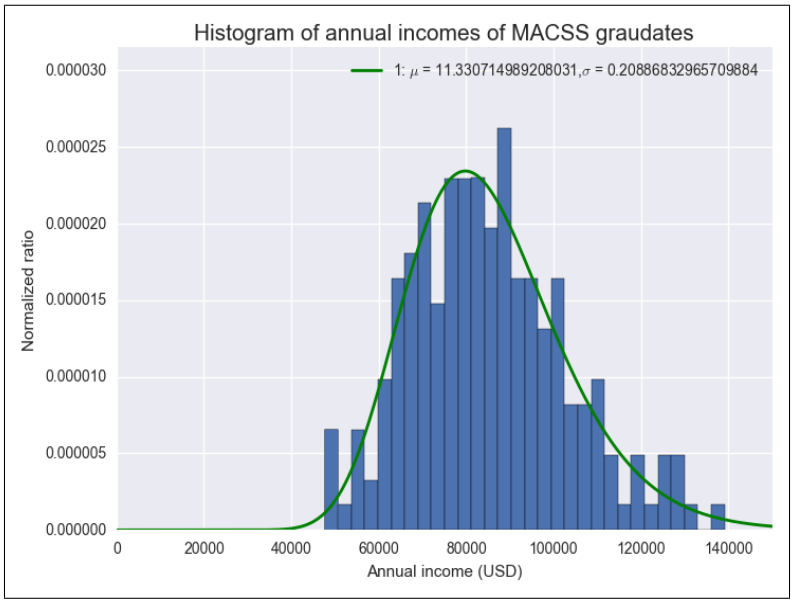
   Test value: `[[ 0.0019079, 0.00123533], [ 0.00217547, 0.0019646 ]]`

   (c) Estimate the parameters of the lognormal distribution by generalized method of moments. Plot your estimated lognormal PDF against the histogram from part (a). Report the value of your GMM criterion function at the estimated parameter values. Report and compare your two data moments against your two model moments at the estimated parameter values.

   SMM crietron function value = 7.20159817e-14

   SMM estimate for $\mu = 11.3307149892$

SMM estimate for $\sigma = 0.208868329658$



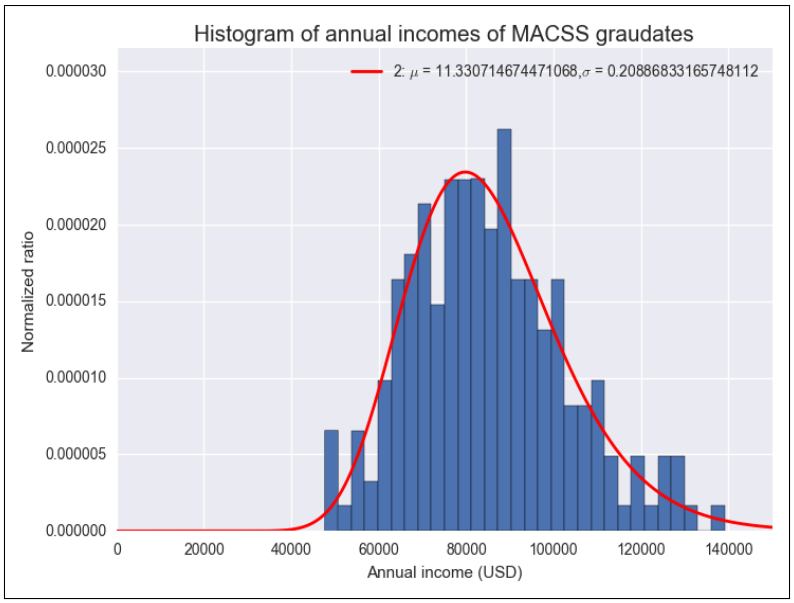
	Mean	Variance
Data	85276.8236063	323731572.23
Model	85276.8464225	323731565.512
% diff.	2.67554603768e-05	-2.07488713319e-06

(d) Perform the two-step SMM estimator by using your estimates from part (c) with two moments to generate an estimator for the variance covariance matrix. Report your estimates as well as the criterion function value at these estimates. Plot your estimated lognormal PDF against the histogram from part (a) and the estimated PDF from part (c). Report and compare your two data moments against your two model moments at the estimated parameter values.

SMM crietron function value = 0.01202398

SMM estimate for $\mu = 11.3307146745$

SMM estimate for $\sigma = 0.208868331657$



	Mean	Variance
Data	85276.8236063	323731572.23
Model	85276.8196196	323731368.346
% diff.	-4.67498781548e-06	-6.2979110409e-05