Problem Set #3

MACSS 30100
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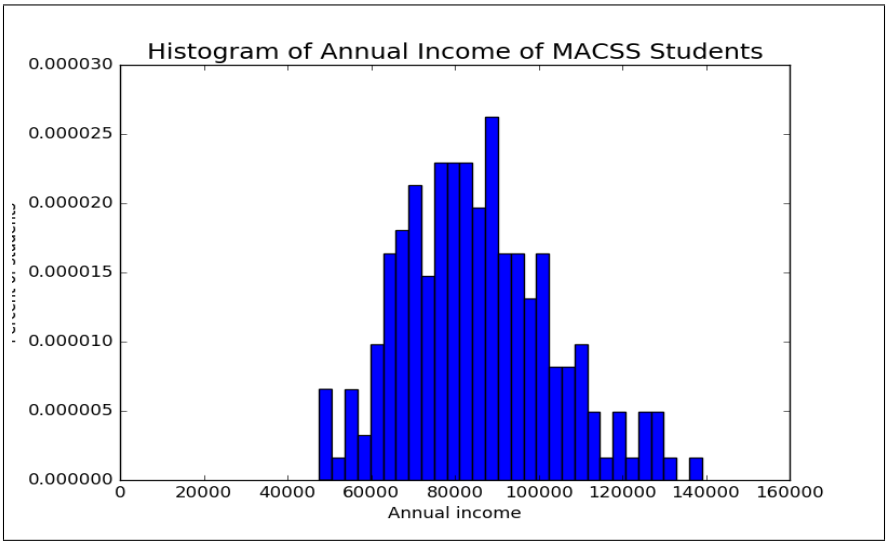
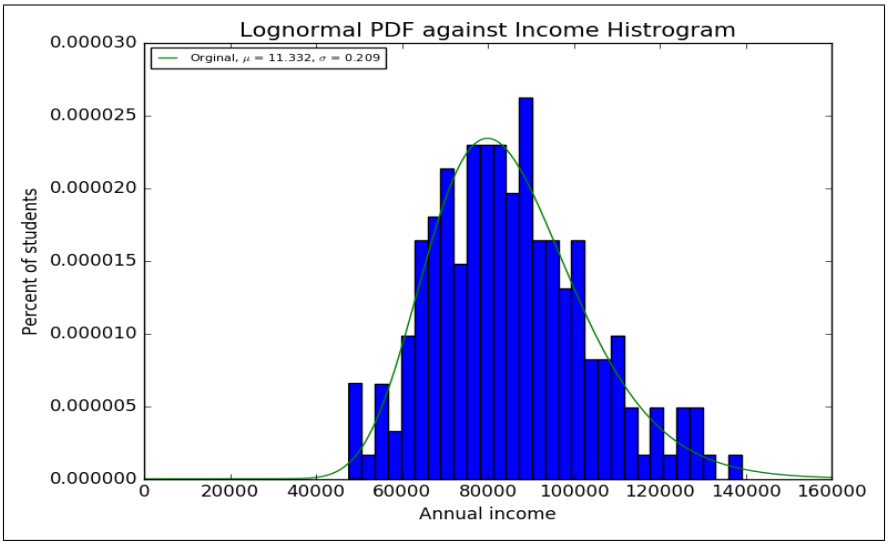
Problem 1

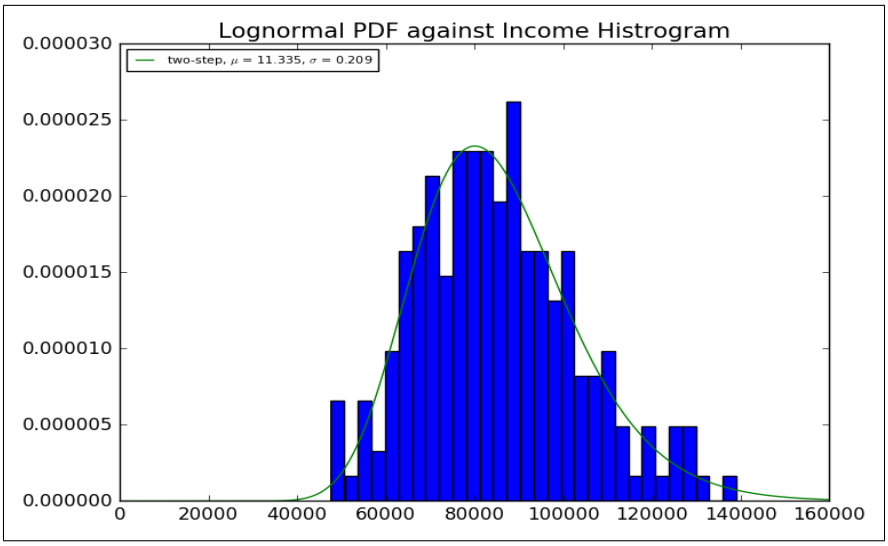
(a) The histogram for the income of the MACSS Graduates:



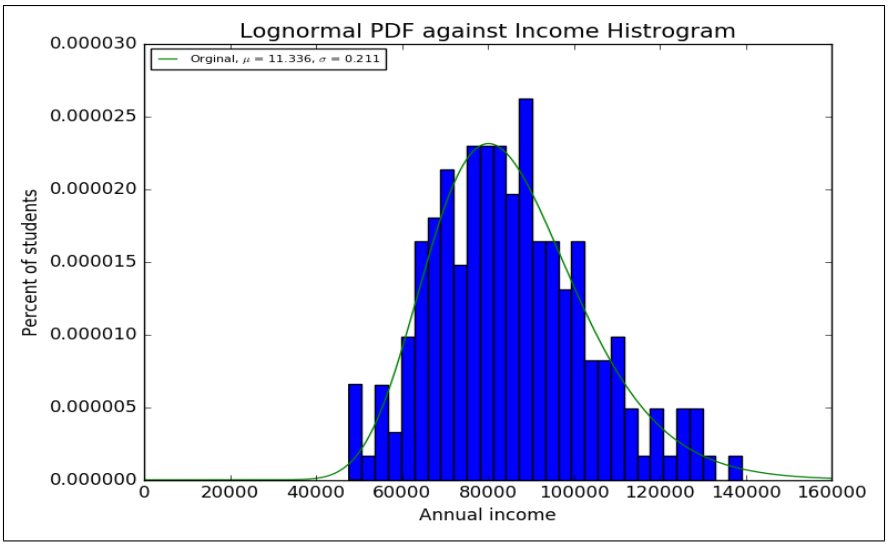
(b) The lognormal GMM estimator with two moment conditions are: $\mu = 11.331910701018806, \sigma = 0.2086900838101174$.
Mean of data is 85276.823606258113, Variance of data is 323731572.2295289.
Mean of model is 85279.25270823392, Variance of model is 323729159.89129305.
The value of the criterion function is $8.66916916e-10$.



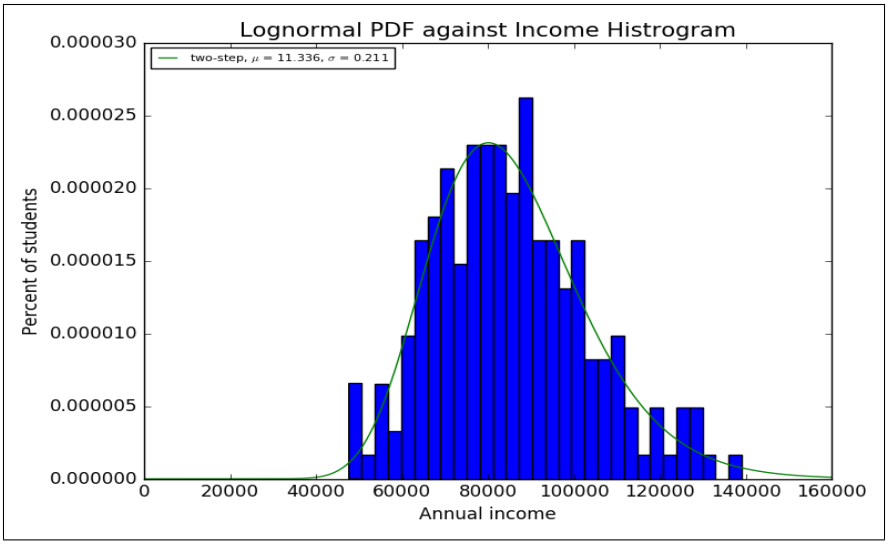
(c) The 2-step lognormal GMM estimator with two moment conditions are: $\mu = 11.334551529162342, \sigma = 0.2092102102988032$.
Mean of data is 85276.823606258113, Variance of data is 323731572.2295289.
Mean of model is 85514.0513937958, Variance of model is 327174675.99498296.
The value of the criterion function is 0.00042093



(d) The lognormal GMM estimator with three moment conditions are: $\mu = 11.33568129452145, \sigma = 0.2105983990551802$.
Data moment:
The proportion of students whose income is below \$75000 is: 0.3
The proportion of students whose income is between \$75000 and \$100000 is: 0.5
The proportion of students whose income is above \$100000 is: 0.2
Model Moment:
The proportion of students whose income is below \$75000 is: 0.30000001
The proportion of students whose income is between \$75000 and \$100000 is: 0.5000001
The proportion of students whose income is above \$100000 is: 0.19999989
The value of the criterion function is 3.71437920e-13



(e) The lognormal 2-step GMM estimator with three moment conditions are: $\mu = 11.335519986785286, \sigma = 0.21075740839082407$.
Model Moment:
The proportion of students whose income is below \$75000 is: 0.30040381
The proportion of students whose income is between \$75000 and \$100000 is: 0.49963281
The proportion of students whose income is above \$100000 is: 0.19996338
The value of the criterion function is 2.38464060e-06



(f) The model that best fits the data is the one generated using the 3 data quantiles and 1 set GMM. In other words, the model in (d).

Visually, all of the models look incredibly similar and they all appear to fit the data well. However, one thing that does change quite a bit from model to model is the value generated by the criterion function. This value gives added insight to the fit of

the model. Out of all the models I generated, the one in (d) had the lowest criterion function value.

In general, two-step GMM estimators all underperform the 1-step ones. This may be as the result that the original method is already close to the model moments. This may affect the usefulness of the weighting matrix.

All in all, the original GMM estimator using the three moment condition is the best.

Problem 2

The estimators are: $\beta_0 = 0.2516448071, \beta_1 = 0.0129334339724, \beta_2 = 0.400501320985$, $\beta_3 = -0.00999168730293$.
The value of the criterion function is 0.00182128984298.