Problem Set #3

MACSS 30100
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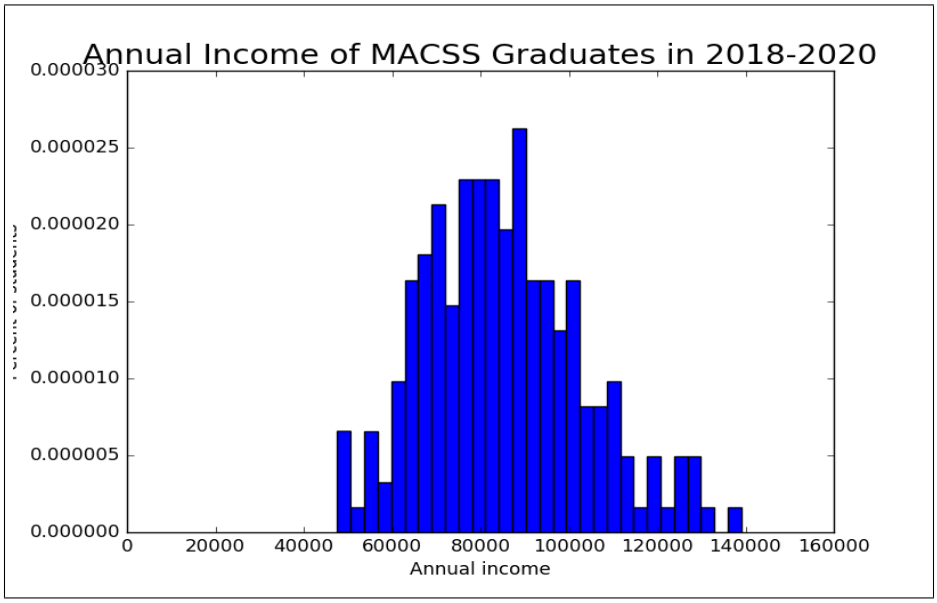
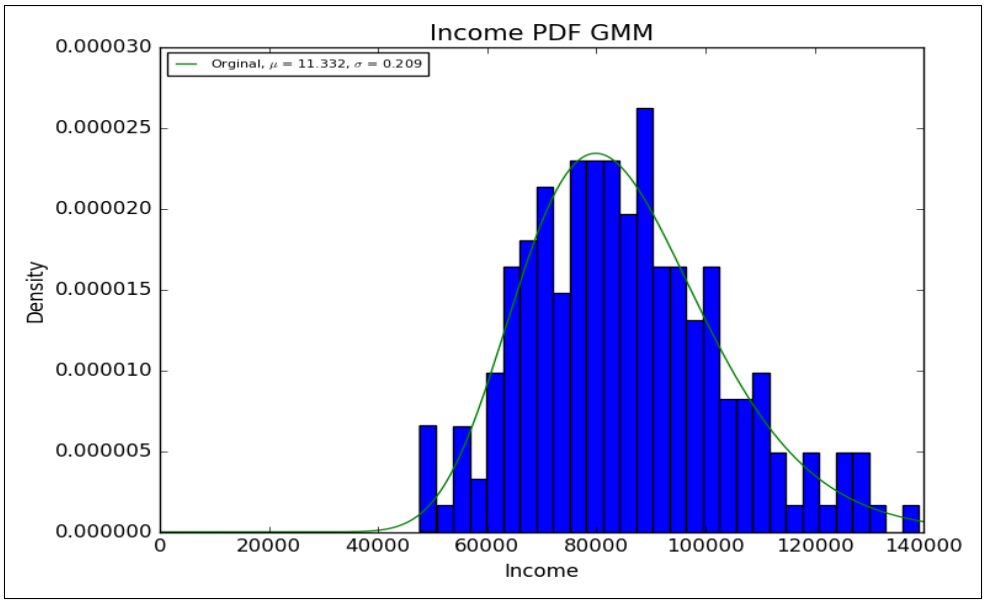
Problem 1

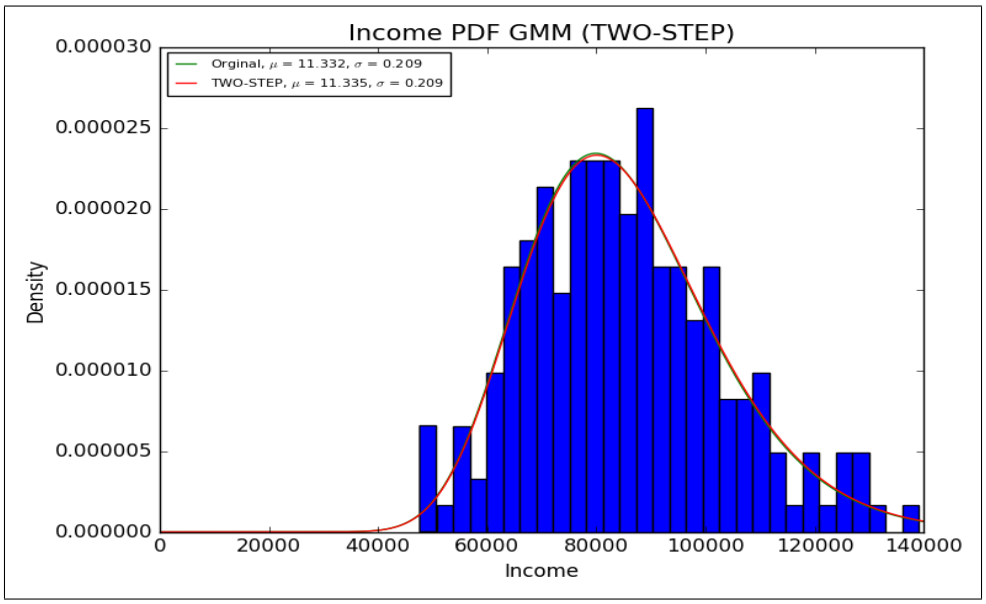
(a) The following graph is the histogram for the income of the MACSS Graduates:



(b) The GMM estimator of two moment conditions: the log normal parameters are: $\mu = 11.3317738625$, $\sigma = 0.209209064254$.
Mean of data is 85276.82360625808, Variance of data is 325358364.0497777.
Mean of model is 85276.8309999, Variance of model is 325358351.628.
Difference in mean is -0.00739366149355, Difference in variance = 12.4213916063.
The value of the criterion function is $8.97474397e-15$.



(c) The 2-step GMM estimator of two moment conditions: $\mu = 11.1073612917$, $\sigma = 0.192927205803$.
The GMM estimator of two moment conditions: the log normal parameters are: $\mu = 11.332$, $\sigma = 0.209$.
Mean of data is 85276.82360625808, Variance of data is 325358364.0497777.
Mean of model is 85277.076, Variance of model is 323732317.170.
The value of the criterion function is 0.00192164



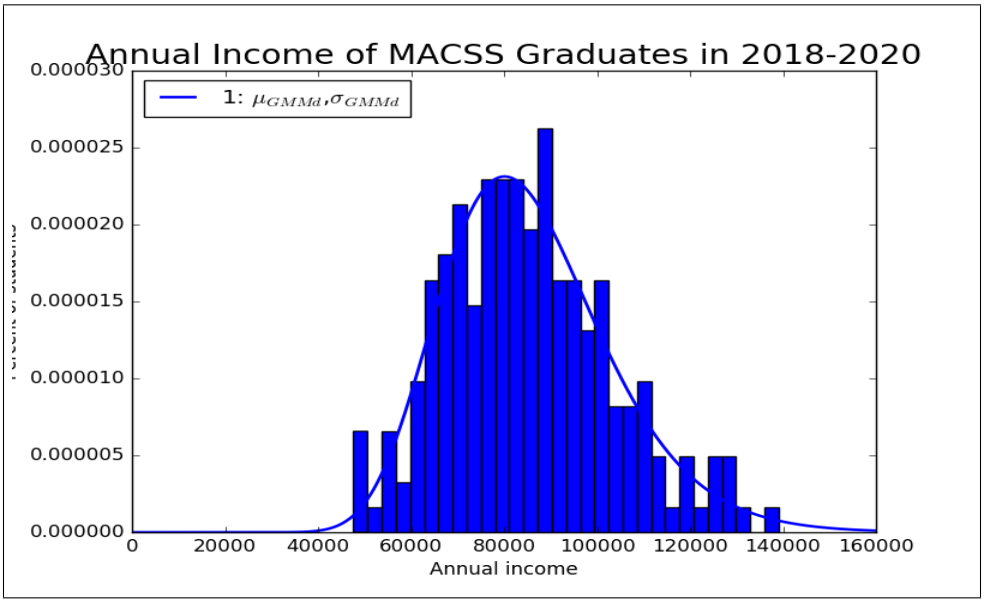
(d) The data and model moments are reported as below:
Data moment:
The proportion of students whose income is below \$75000 is: 0.3
The proportion of students whose income is between \$75000 and \$100000 is: 0.5

The proportion of students whose income is above $100000 is: 0.2

Model Moment:
The proportion of students whose income is below $75000 is: 0.30000000416846334
The proportion of students whose income is between $75000 and $100000 is: 0.4999999996659355
The proportion of students whose income is above $100000 is: 0.1999999961656011

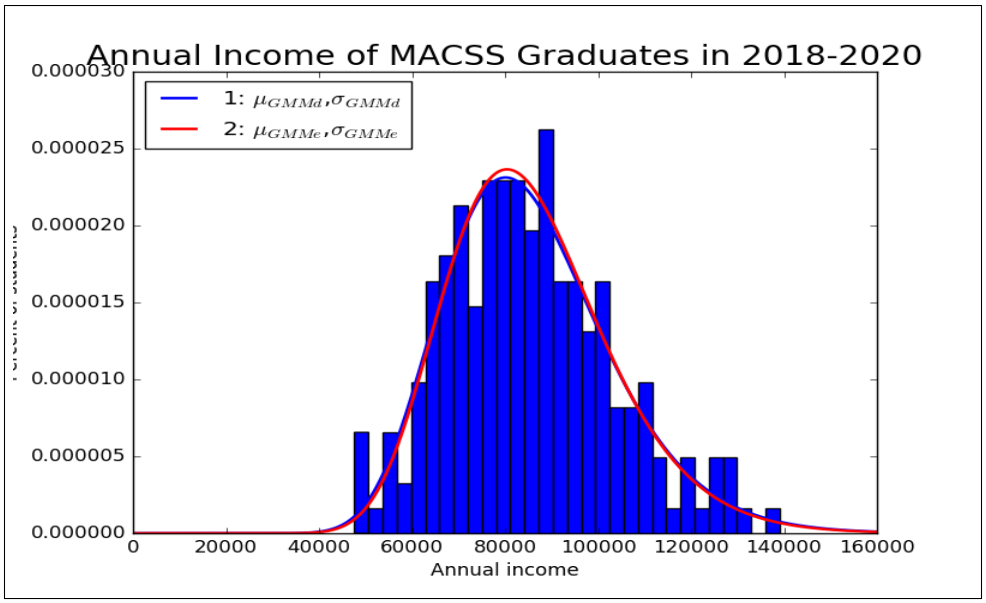
The value of the criterion function is 5.61079401e-12

Difference:
Difference in the proportion of students whose income is below $75000 is: -4.168463352272056e-09
Difference in the proportion of students whose income is between $75000 and $100000 is: 3.340644982863239e-10
Difference in the proportion of students whose income is above $100000 is: 3.834398909496883e-09



(e) The model moments using the variance covariance weighting matrix is as following:
Model Moment:
The proportion of students whose income is below $75000 is: 0.292516113274555
The proportion of students whose income is between $75000 and $100000 is: 0.511256749899994
The proportion of students whose income is above $100000 is: 0.19622713682545068

The value of the criterion function is 635.79992077
Difference:
Difference in the proportion of students whose income is below $75000 is: 0.0074838867254446995
Difference in the proportion of students whose income is between $75000 and $100000 is: -0.011256749899994034
Difference in the proportion of students whose income is above $100000 is: 0.0037728631745493346



(f) The model that best fits the data is the one generated using the 3 data quantiles and the inverse of the variance-covariance matrix as a weighting matrix. In other words, the model in (e).

Visually, all of the models look incredibly similar and they all appear to fit the data well. The models from part B and C actually seem quite identical and the models from parts D and E are only very slightly different.

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 last had the lowest criterion function value, and since the models are almost identical otherwise, I used this value to judge which is best.

Problem 2

The estimators are:

$$\begin{aligned}\beta_0 &= 0.2516448071\\ \beta_1 &= 0.0129334339724\\ \beta_2 &= 0.400501320985\\ \beta_3 &= -0.00999168730293\end{aligned}$$

The value of the criterion function is 0.00182128984298.