Problem Set #3

MACSS 30100
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Problem 1

(a) The histogram is the income distribution of MACSS students:

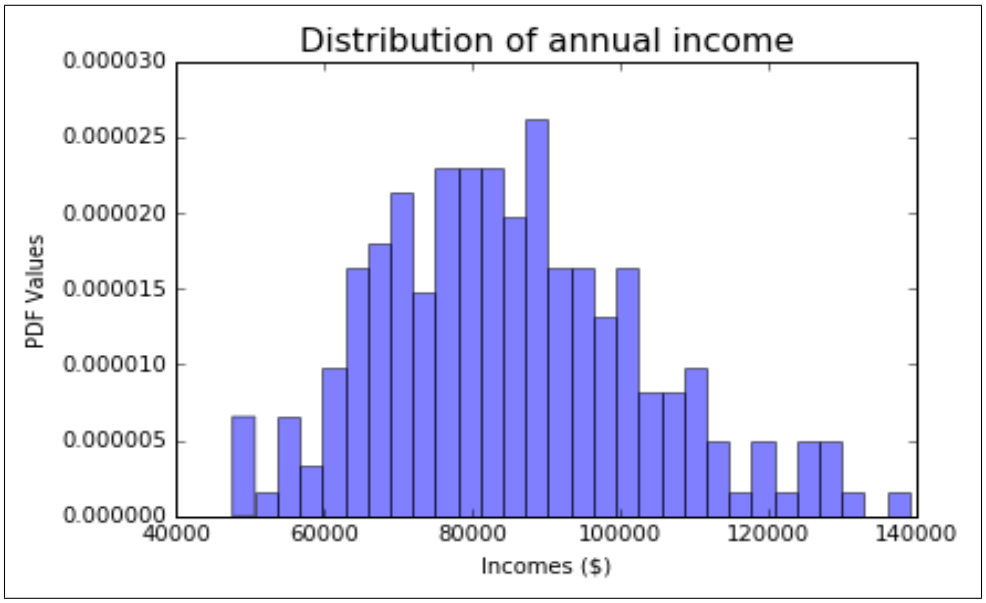


Figure 1: Histogram of Income for MACSS Students

(b) For the GMM estimator of two moment conditions, the lognormal parameters are $\mu = 11.3369$, $\sigma = 0.2130$.
The data moment is: $\mu_{data} = 85276.8236$, $\sigma_{model} = 17992.5421$.
The model moment is $\mu_{model} = 85276.7911$, $\sigma_{model} = 17992.5393$
The value of GMM criterion function at estimated parameters is $1.7094356618222634e-13$

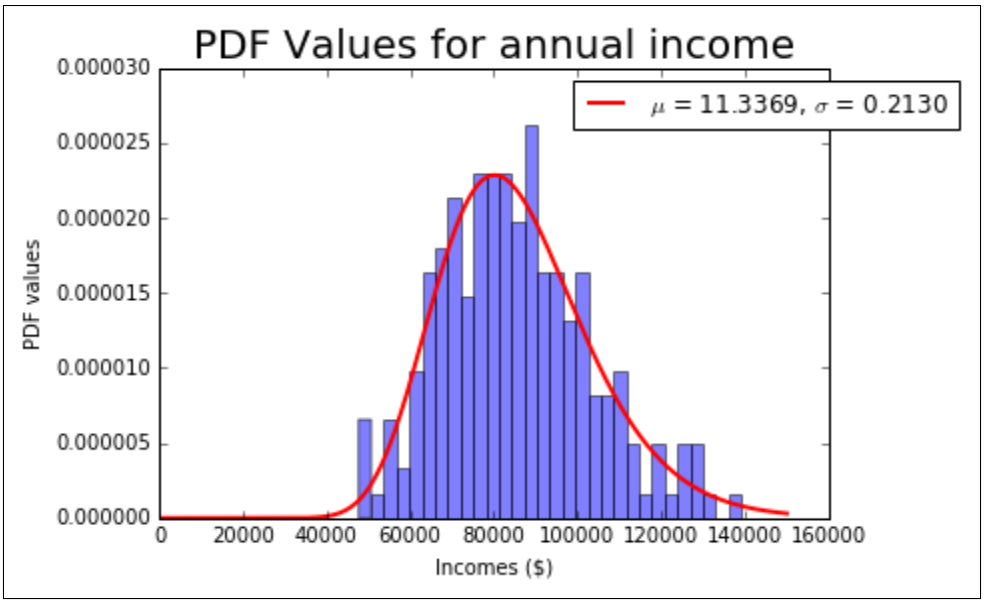


Figure 2: PDF of two moment conditions for incomes

(c) The GMM estimator now: the log normal parameters are: $\mu = 11.3369$, $\sigma = 0.2130$.
The model moment is $\mu_{model} = 85276.8255$, $\sigma_{model} = 17992.5423$
Value of GMM criterion function at the estimated parameter value is 0.0468604950841337

The graph is shown below:

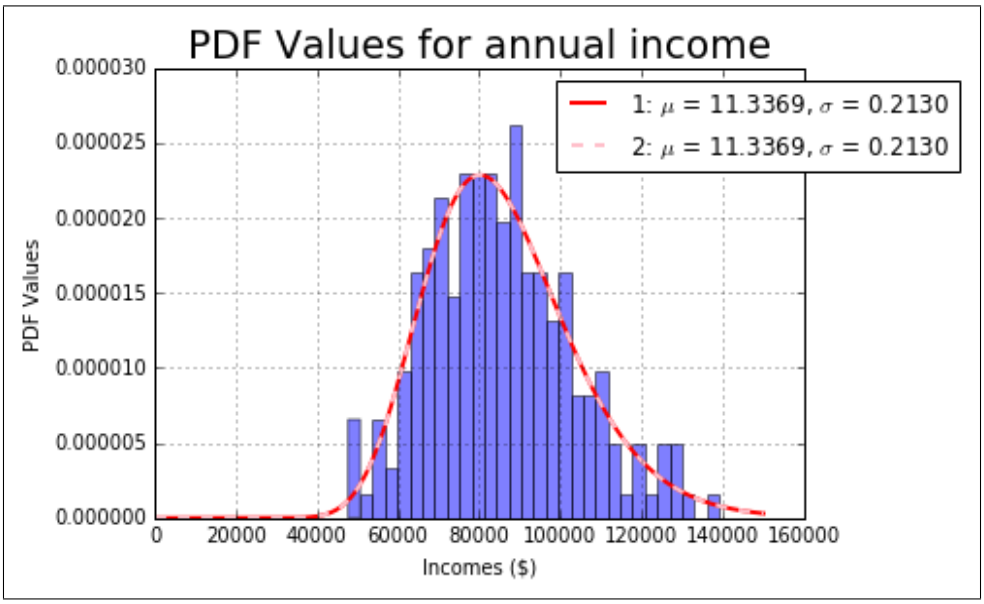


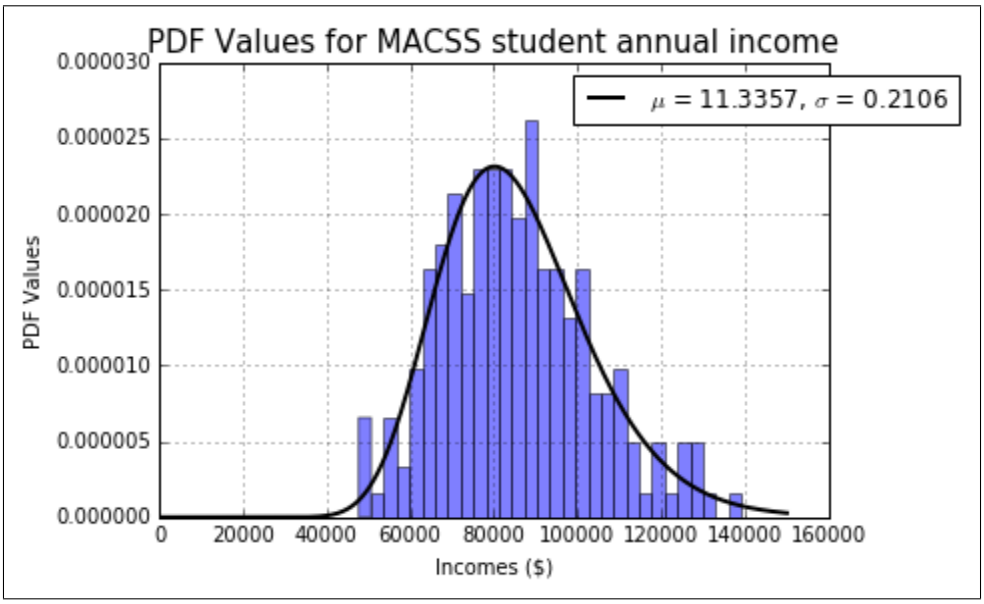
Figure 3: Income PDF (TWO-STEP)

(d) The value of GMM criterion function at the estimated parameter values: $2.5347860826274844e-11$.

Data moment:
The proportion of students who earn less than \$75000 is: 0.3
The proportion of students whose income is between \$75000 and \$100000 is: 0.5
The proportion of students who earn more than \$100000 is: 0.2

Model Moment:
The proportion of students who earn less than \$75000 is: 0.3000
The proportion of students whose income is between \$75000 and \$100000 is: 0.5000
The proportion of students who earn more than \$100000 is: 0.2000

The graph is shown below:



(e) Here are the results:
The proportion of students whose income is below \$75000 is: 0.2932
The proportion of students whose income is between \$75000 and \$100000 is: 0.5073
The proportion of students whose income is above \$100000 is: 0.1996

The value of the criterion function is 63.77177681867033
The graph is shown below:

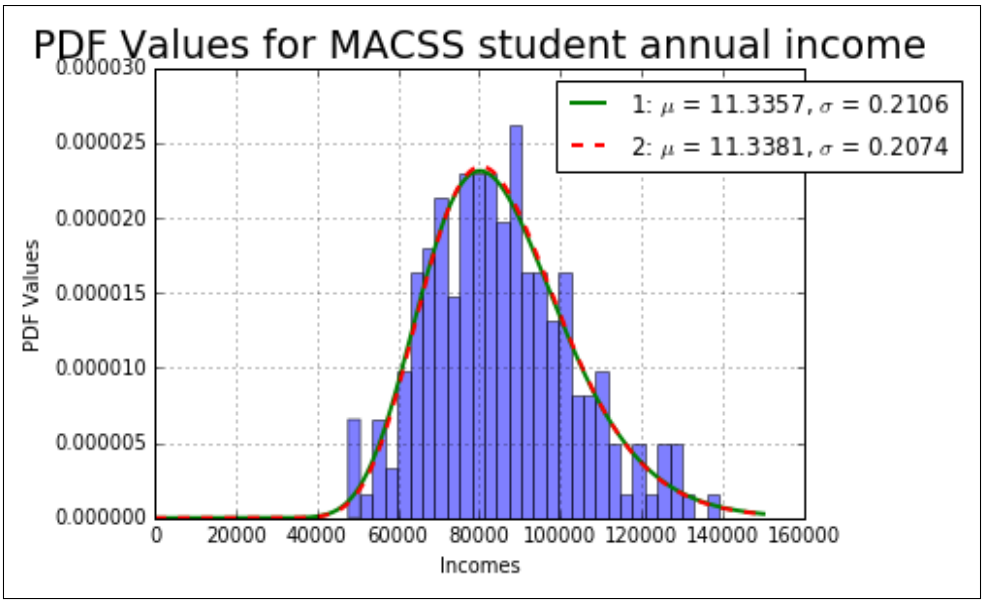


Figure 4: Income PDF of Three Moment Conditions

(f) Comparing all five figures above, apart from the model moments in part c, all seems to fit the actual data quite well, especially for the pdf generated from 2-step GMM with three data moments in part (e).

Problem 2

The estimators are:

$$\beta_0 = 0.252$$
$$\beta_1 = 0.013$$
$$\beta_2 = 0.401$$
$$\beta_3 = -0.010$$

The value of the criterion function is 0.001821.