

Problem Set #3

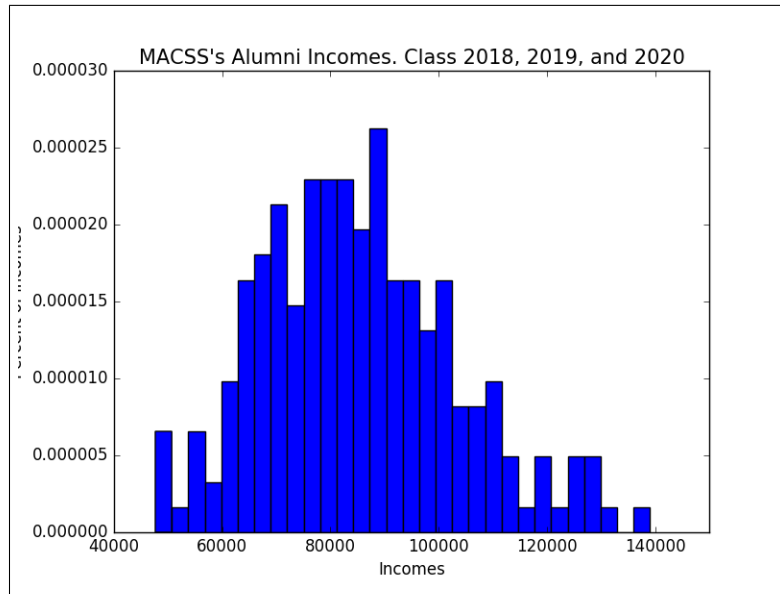
MACS 30000, Dr. Evans

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Problem 1 Some income data, lognormal distribution and GMM

Part (a). Initial plot.

Figure 1: Histogram of incomes



Part (b). GMM

Te value of the criterion function is 8.80853883068e-16

The parameter values are: mu: 11.3369103151 sigma: 0.213027084245

The data moments are: mu: 85276.8236063 sigma: 17992.542128

The model moments are: mu: 85276.82119810439 sigma: 17992.5422924

Part (c). GMM 2 step

Mu2step: 11.3369103333 Sigma2step: 0.213027070526

Te value of the criterion function is 0.000208321431347

The data moments are: mu: 85276.8236063 sigma: 17992.542128

The model moments are: mu: 85276.8226443209 sigma: 17992.5414987

Part (d). Three moments

The parameter values are: mu: 11.3367266466 sigma: 0.211746420352

Te value of the criterion function is 0.23818173309

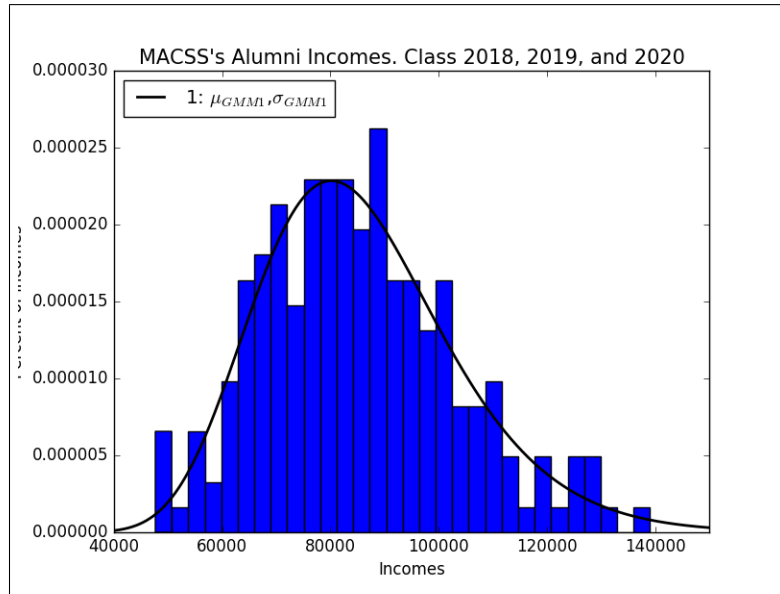
The data moments are: 0.3 0.5 0.2

The model moments are: 0.29927245367786354 0.4980574552151655 0.19966278324796635

Part (e). Three moments and two steps

The parameter values are: mu2step= 11.3369528172 sig2step= 0.213019528101

Figure 2: Histograms of Incomes and GMM



The value of the criterion function is 2.73587514754e-09

The data moments are: 0.3 0.5 0.2

The model moments are: 0.29999693968935226 0.4956256693423149 0.20120591158665632

Part (f). Evaluation

There are many ways to evaluate the models. On the one hand, one way is to select the value with the smallest criterion function. However, the last two model uses a different criterion function, then, the evaluation is not straightforward. The second step estimators have better properties than the only one-step estimator according to the theory. Consequently, from the b) and c), I will choose the c).

On the other hand, the estimations considering three different moments are very useful when you care more about those moments of the data. For example, if you care only about how many MACSS's student will earn more than 100k, I will choose the second step estimator e).

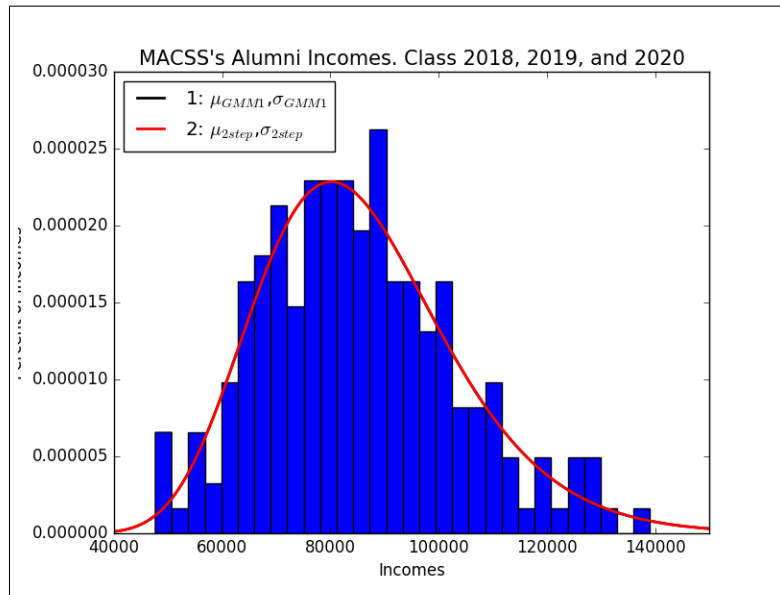
Finally, there is not an absolute answer to this question because it depends on the specific research question or prediction that you want to analyze. However, if I need to choose only one estimation from the former four, I will define a new criterion function with the moments that I care. Afterwards, I will evaluate the new criterion function on each of the four estimations. I will select the model with the lowest value of this new criterion function, that is homogeneous for all the models.

Problem 2 Linear regression and GMM

Part (a). Beta0: 0.252200183502

Beta1: 0.013022300596

Figure 3: Histograms of Incomes and GMM 2 steps



Beta2: 0.399781736997

Beta3: -0.0100594936065

Value of GMM criterion function: 0.014856824347

Figure 4: Histograms of Incomes and GMM - 3 moments

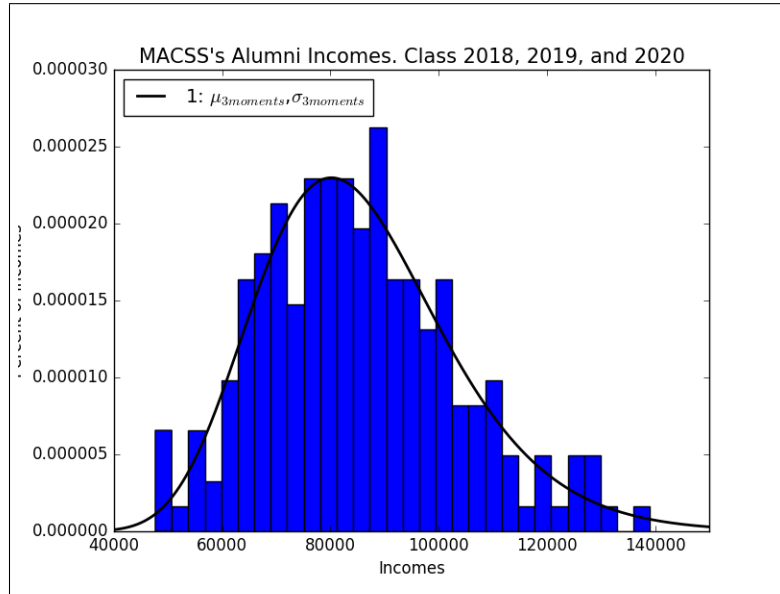


Figure 5: Histograms of Incomes and GMM - 3 moments - 2 steps

