Problem Set #3

MACS 30100, Dr. Evans
Soo Wan Kim

Problem 1

Part (a)

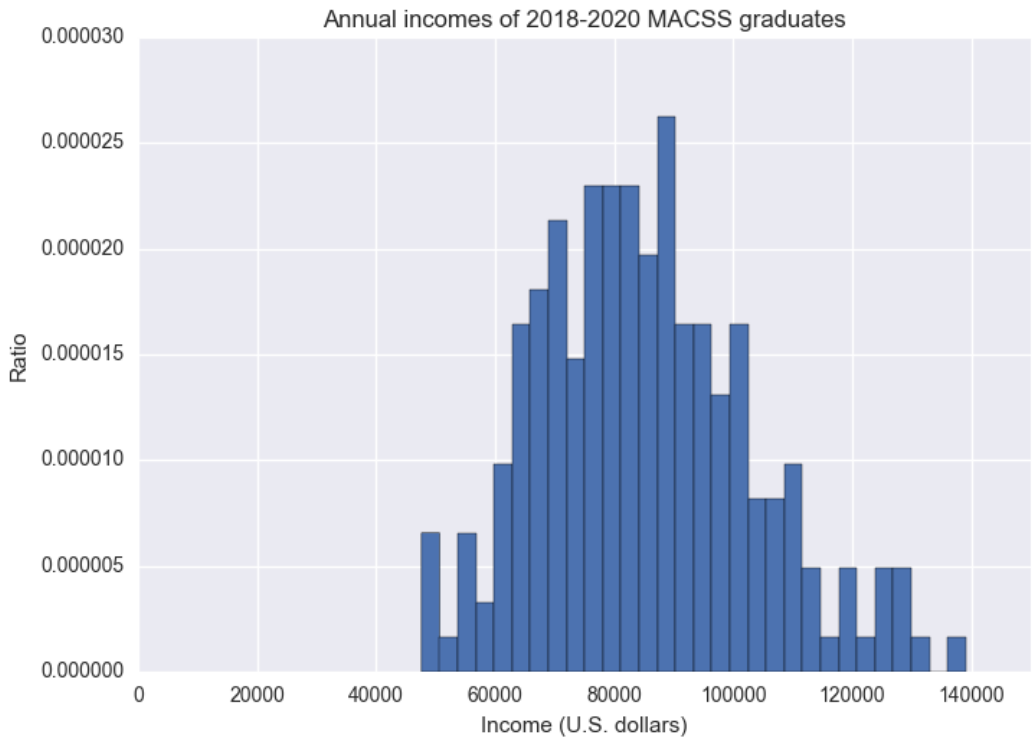

Figure 1: 1a: Histogram of percentages of the income.text data

Part (b)

With the estimated parameter values $\mu = 11.3369125379$ and $\sigma = 0.213026600841$, the value of the GMM criterion function is 4.28466184228e-12.

Data moments and model moments (at the estimated parameter values) compared:
Average, standard deviation of income data = (85276.8236063, 17992.542128)
Mean, standard deviation of model = (85276.99654884412, 17992.5346699)

The two sets of values are nearly the same, and as can be seen in figure 2 the model fits the data closely.

Part (c).

With the estimated parameter values $\mu = 11.3369118806$ and $\sigma = 0.213028443998$, the value of the GMM criterion function is 2.74916504846e-05.

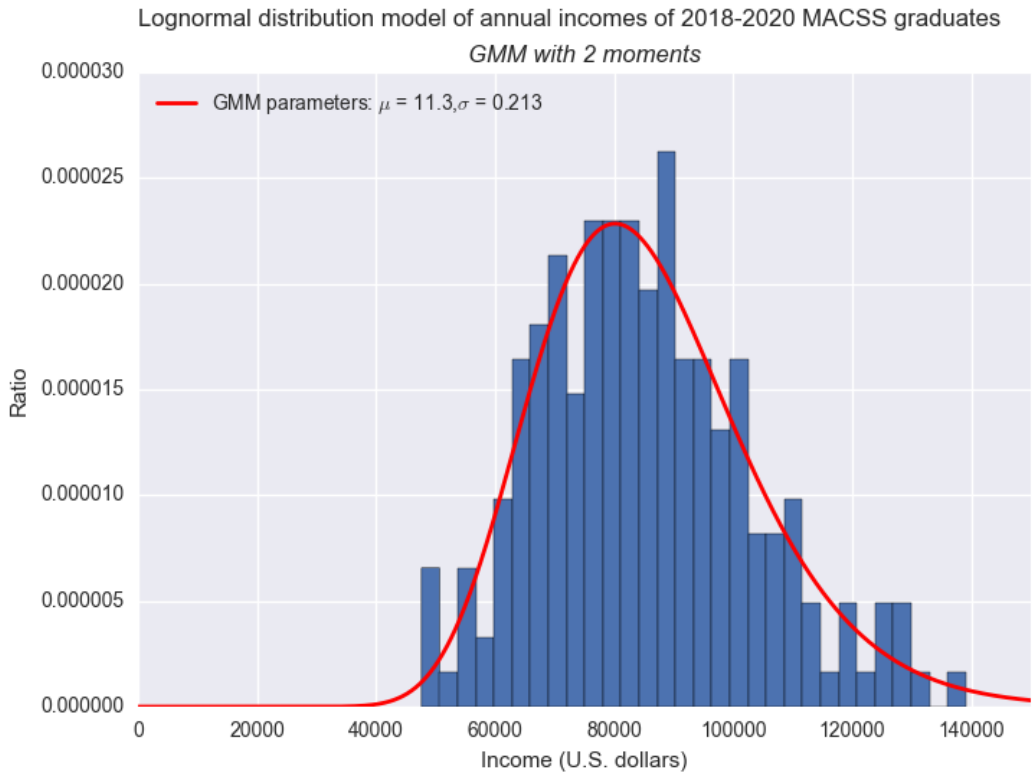

Figure 2: 1b

Data moments and model moments compared:
Average, standard deviation of income data = (85276.8236063, 17992.542128)
Mean, standard deviation of model (one step estimation) = (85276.99654884412, 17992.5346699)
Mean, standard deviation of model (two step estimation) = (85276.9417078091, 17992.6641098)

The data and model moments are nearly the same for both the one-step and two-step estimations, and again the PDFs are a good fit.

Part (d).

With the estimated parameter values $\mu = 11.3356813175$ and $\sigma = 0.210598459877$, the value of the GMM criterion function is 1.36717737432e-14.

Data moments and model moments compared:
Proportion of individuals earning less than \$75,000, between \$75,000 and \$100,000, and more than \$100,000 respectively: (0.3, 0.5, 0.2)
Model moments: (0.30000002529239217, 0.49999999045500304, 0.19999998425260479)

The data and model moments are almost identical, and the PDF is again a good fit.

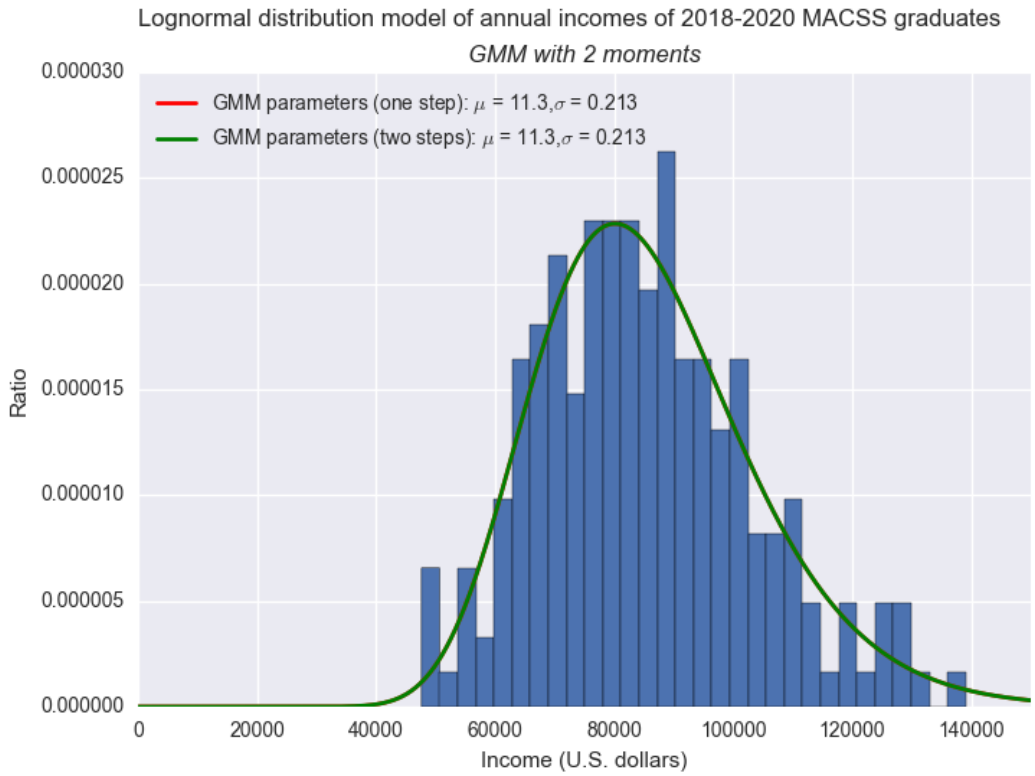

Figure 3: 1c

Part (e).

With the estimated parameter values $\mu = 11.3356813261$ and $\sigma = 0.210598496843$, the value of the GMM criterion function is 0.393000895268.

Data moments and model moments compared:
Proportion of individuals earning less than \$75,000, between \$75,000 and \$100,000, and more than \$100,000 respectively: (0.3, 0.5, 0.2)
Model moments (one step): (0.30000002529239217, 0.49999999045500304, 0.19999998425260479)
Model moments (two step): (0.30000004312708839, 0.49999991985400505, 0.20000003701890656)

Differences across the data and model moments are very small.

Part (f).

The criterion function value is the smallest at the parameterization in part d, which suggests that it fits the data best. However, looking across the figures we can see that all four estimations fit the data closely, with similarly good estimates for the moments chosen.

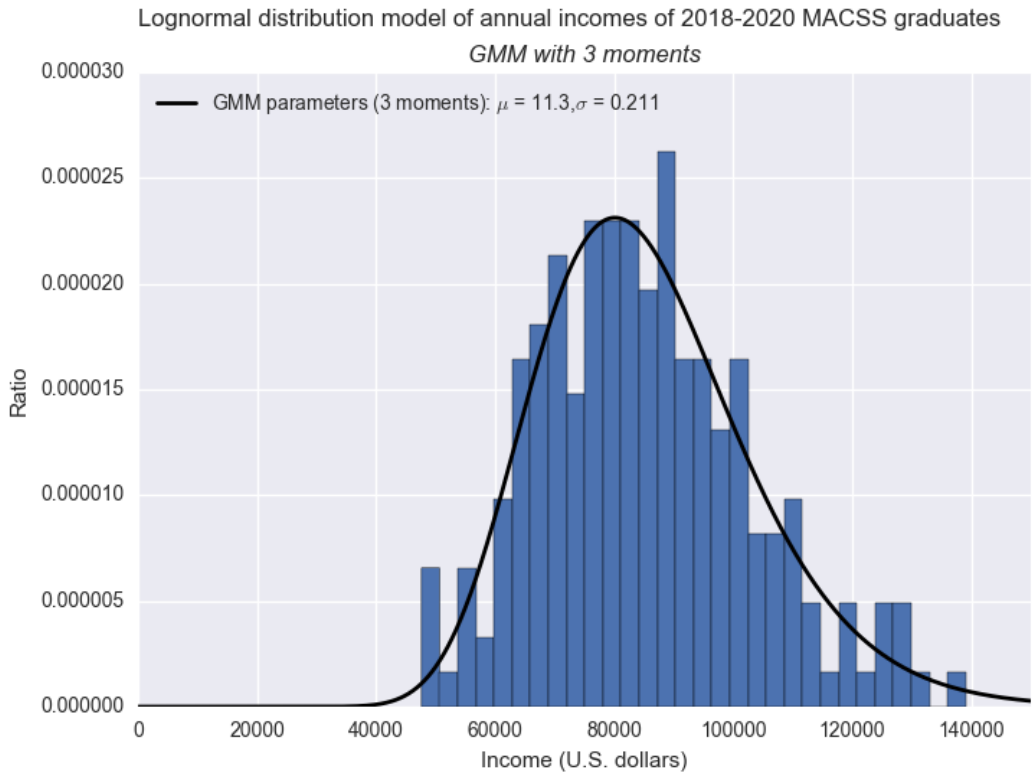

Figure 4: 1d

Problem 2
Part (a).

Parameter estimates:
β_0 GMM = 0.251645236361
β_1 GMM= 0.0129335385304
β_2 GMM = 0.400500461639
β_3 GMM = -0.00999176023593

GMM criterion function value = 0.00182128979591

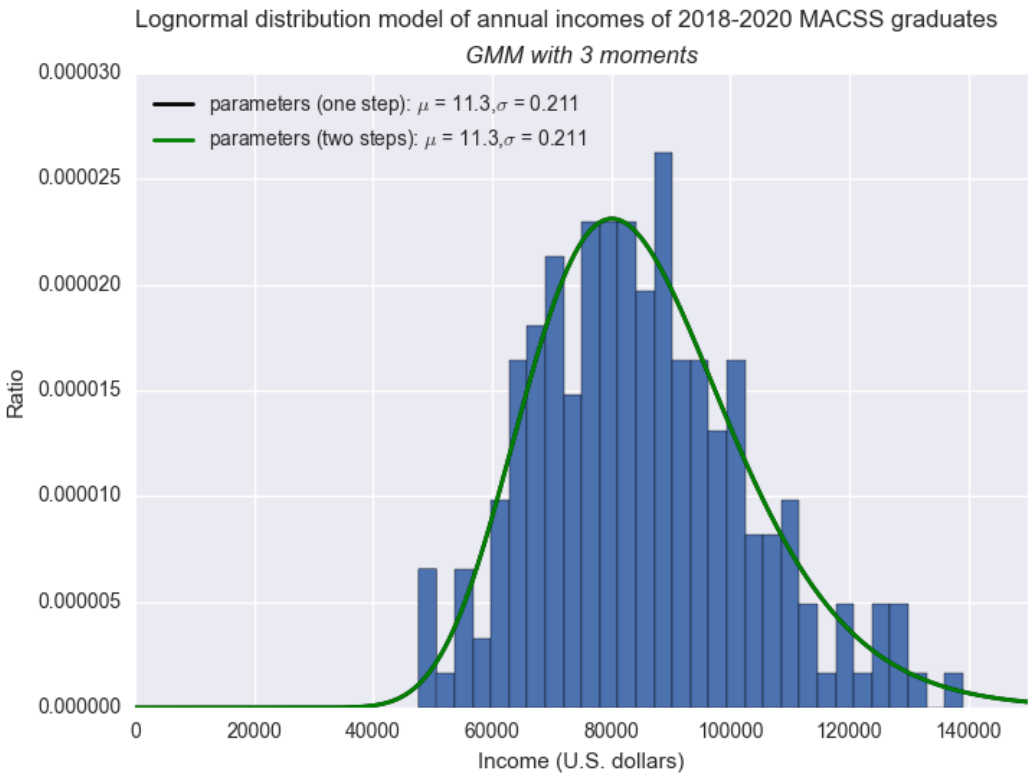
Lognormal distribution model of annual incomes of 2018-2020 MACSS graduates
GMM with 3 moments
parameters (one step): μ = 11.3,σ = 0.211
parameters (two steps): μ = 11.3,σ = 0.211
Ratio
0.000030
0.000025
0.000020
0.000015
0.000010
0.000005
0.000000
0
20000
40000
60000
80000
100000
120000
140000
Income (U.S. dollars)

Figure 5: 1e