

Problem Set #3

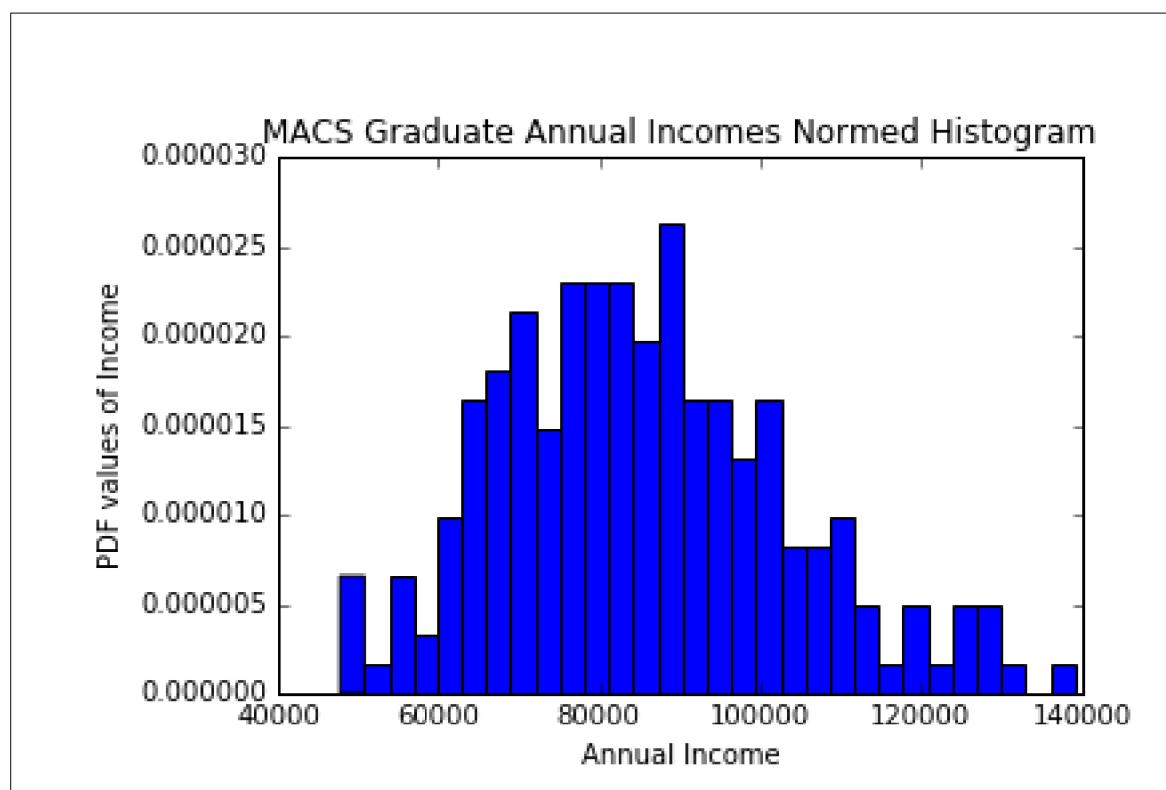
MACS 30100, Dr. Evans

Cheng Yee Lim

Problem 1

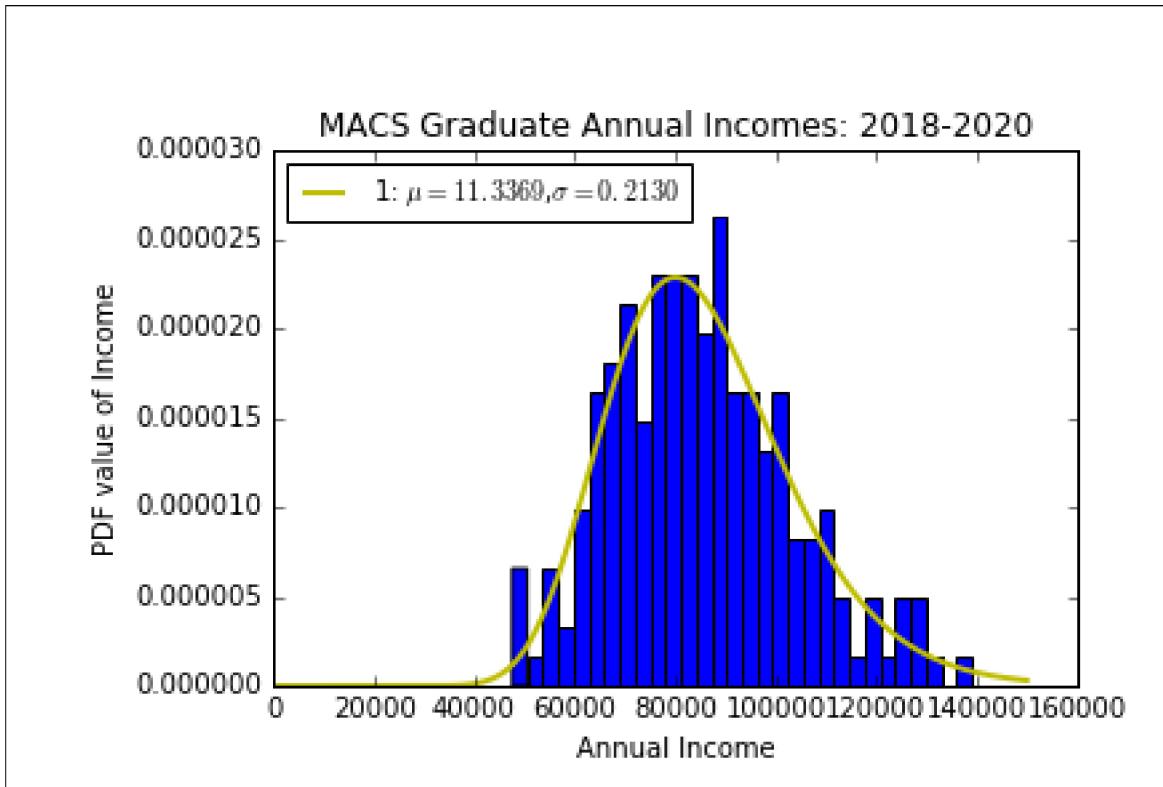
Part (a).

Figure 1: Normed Histogram of Percentages of income



Part (b).

Figure 2: Normed histogram of Annual Incomes of MACSS Graduates and the LogNormal PDF

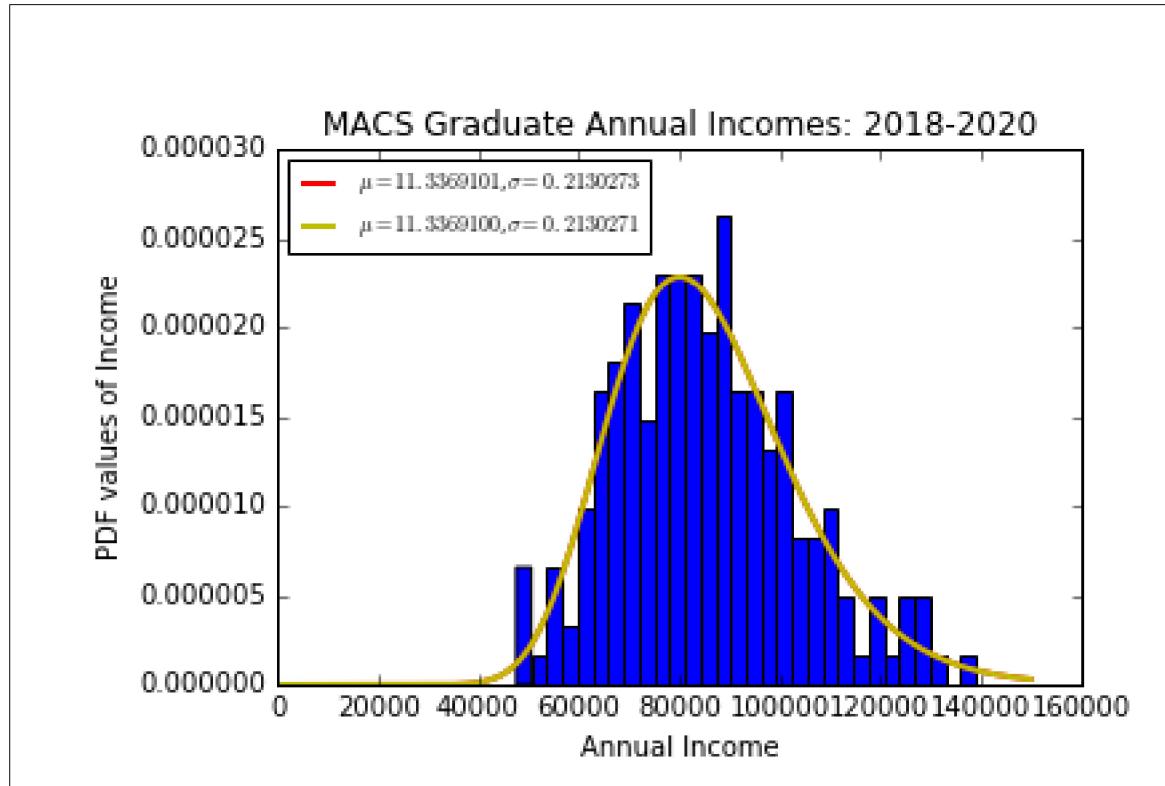


The estimated μ_{GMM_1} is 11.3369 and the estimated σ_{GMM_1} is 0.2130.
The GMM criterion function is 3.93977×10^{-13} .

Two data moments, *mu* and *sigma*, are 85276.824 and 17992.542. Two model moments, *mu* and *sigma*, are 85276.795 and 17992.533. The data and model moments are highly similar, in fact the mean data and model moment are identical to 5 significant factors and the standard deviation moment are identical to 6 significant factors. The highly similar data and model moments show that the GMM estimation was a good estimation.

Part (c).

Figure 3: Normed Histogram of MACSS Students Annual Income and Log PDFs



The GMM estimates for μ and σ are 11.3369101002 and 0.213027153205.

The GMM criterion function is $2.2371736191 \times 10^{-10}$.

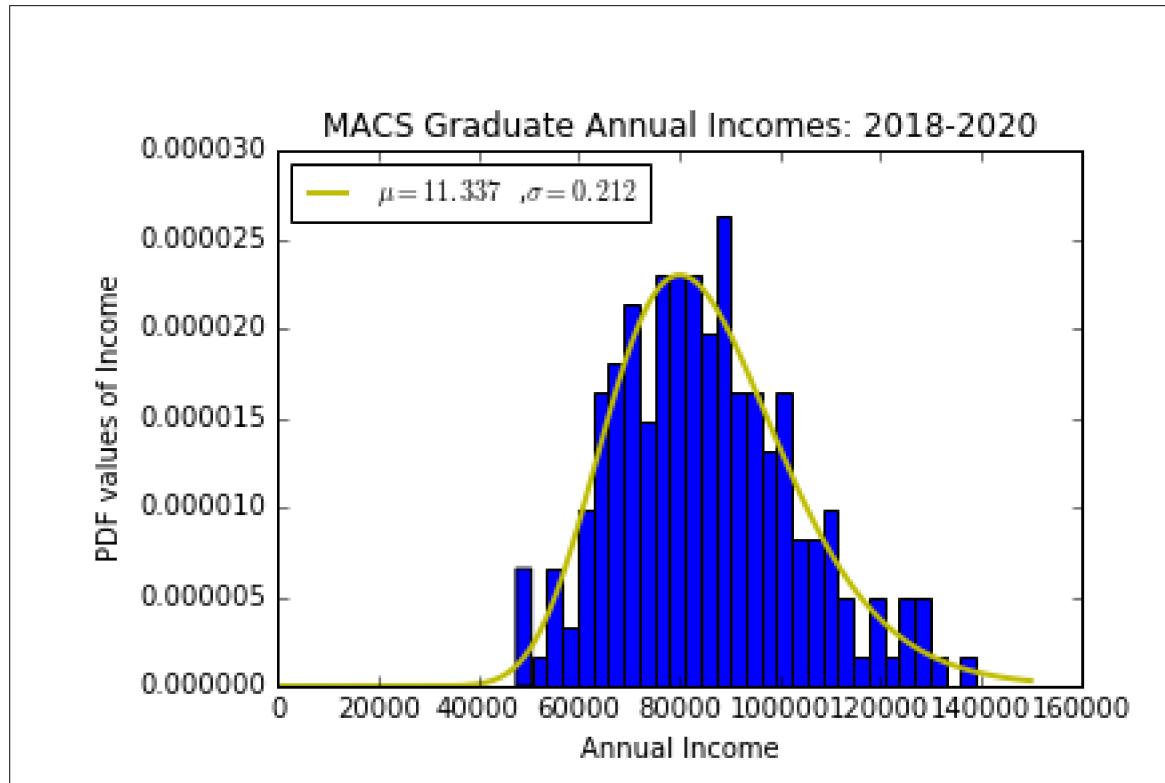
Two data moments, *mu* and *sigma*, are 85276.824 and 17992.542.

Two model moments, *mu* and *sigma*, are 85276.804 and 17992.545.

Expectedly, the results of the two step variance covariance weights matrix GMM estimation are highly similar to the data moments. However, since the estimation in part (b) was already close to perfect, a marked improvement could not be seen comparing part (c) to (b) as both estimations were good estimations.

Part (d).

Figure 4: Normed histogram of Annual Incomes of MACSS Graduates and the three moment LogNormal PDF



The estimated μ is 11.337 and the estimated σ is 0.212.

The GMM criterion function is 0.238.

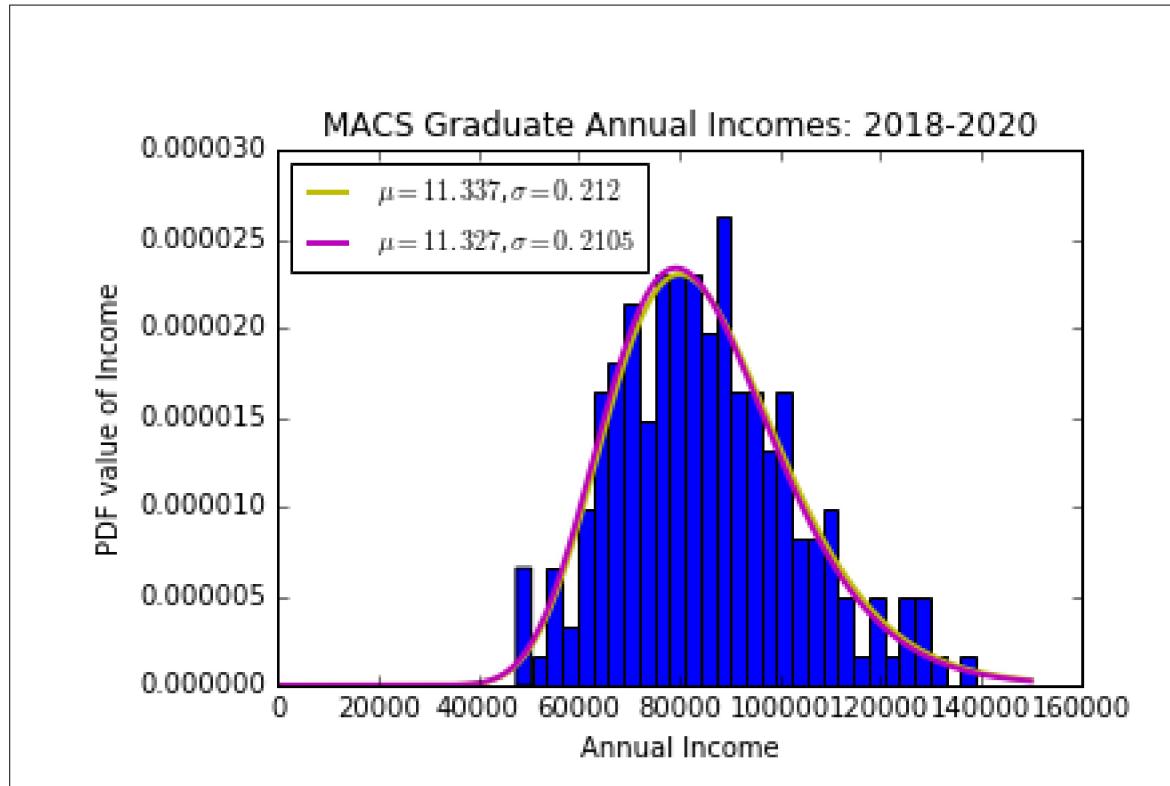
The three data moments are (0.3, 0.5, 0.2).

The three model moments are (0.2993, 0.4981, 0.199663).

Comparing the three data and model moments, we can see that the GMM estimated parameters gave very close estimations to the actual data. Thus, this was a good estimation as well.

Part (e).

Figure 5: Normed histogram of Annual Incomes of MACSS Graduates and the three moment LogNormal PDF



The estimated μ is 11.327 and the estimated σ is 0.2105.

The value of the GMM criterion is $2.93379037473 \times 10^{-5}$.

The three data moments are (0.3, 0.5, 0.2).

The three model moments are (0.3141, 0.4972, 0.1862).

In part (e), I used the inverse of the variance covariance matrix to obtain the weighting matrix and used the weighting matrix in the GMM estimation of the mean and standard deviation. The approximation in this case fared less well than part (d), where an identity matrix was used as the weighting matrix. There were larger deviations in data and model moments, for all three moments, when income was lesser than \$75,000, income was between \$75,000 and \$100,000, and when income was more than \$100,000. Thus, the estimation in part (e) fared worse in all three moments when compared to part (d).

Part (f).

Part (b), (c) and (d) fits the data equally well. The data and model moments were almost identical in all parts (b), (c) and (d), especially when rounded to 5 significant factors. The lognormal PDF graph captured the mean and the standard deviation of the data well. The PDF graph is especially good in fitting the data for income less than \$40,000, but less great in fitting the data for income more than \$120,000. Thus, if a fourth moment of more than \$125,000 was created, perhaps the GMM estimation with four moments could outdo the estimation in part (b) and (c).

Problem 2**Part (a).**

The estimates for the parameters of the model are as follows:

$$\beta_0 = 0.252, \beta_1 = 0.0129, \beta_2 = 0.401, \beta_3 = -0.010$$

The value of GMM criterion function at the estimated parameter values is 0.00182.