Problem Set #[3]
MACS 30100, Dr. Evans
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1 Problem 1

1.1 part (a)

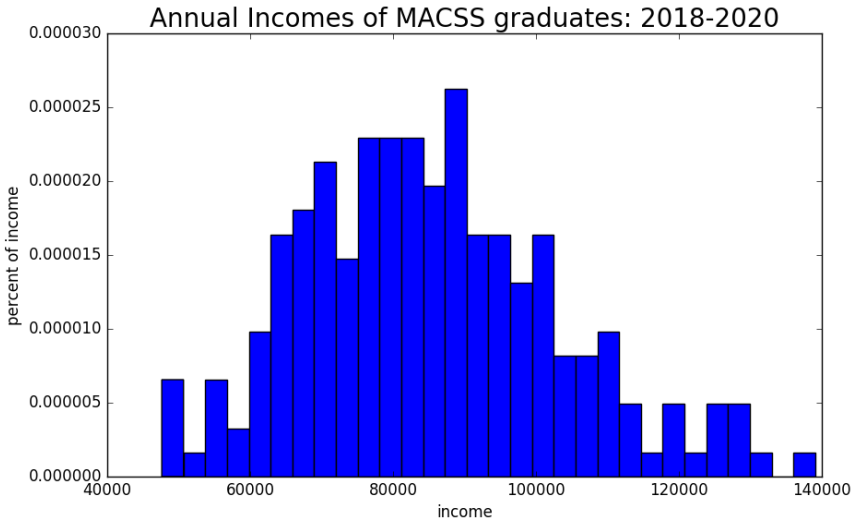

Figure 1: Figure 1a

1.2 part (b)

Minimisation method used: Nelder-Mead, succeeded.

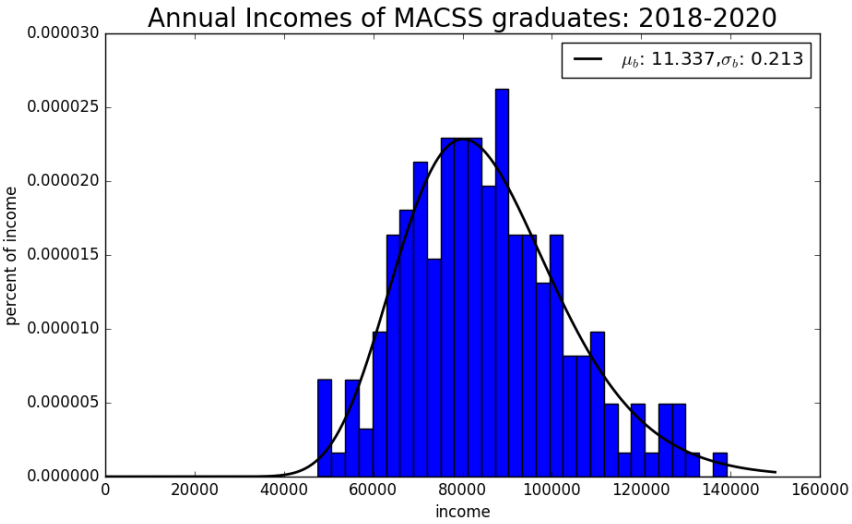

Figure 2: Figure 1b

Estimated parameter values: $\mu_{GMM1} = 11.3369039349$, $\sigma_{GMM1} = 0.213018976968$. The value of the GMM criterion function at the estimated parameter values is 1.49606740585e-09. Mean of data is 85276.8236063. Standard deviation of data is 17992.542128. Mean of model is 85276.33454329282. Standard deviation of model is 17991.8538864. My two data moments are quite close to my two model moments at the estimated parameter values. At least not as close as those from part b.

1.3 part (c)

Minimisation method used: Nelder-Mead, succeeded

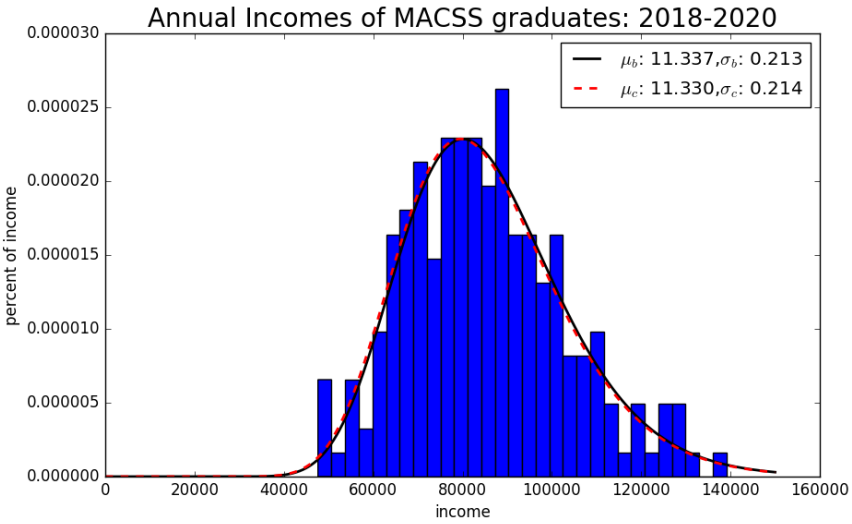

Figure 3: Figure 1c

Estimated parameter values: $\mu_{GMM2} = 11.3301351636$, $\sigma_{GMM2} = 0.214423264256$. The value of the GMM criterion function at the estimated parameter values is 2.79832324313e-06. Mean of data is 85276.8236063. Standard deviation of data is 17992.542128. Mean of model is 84743.82295686705. Standard deviation of model is 18009.4027044. My two model moments are not close to my two data moments at the estimated parameter values.

1.4 part (d)

Minimisation method used: Nelder-Mead, succeeded

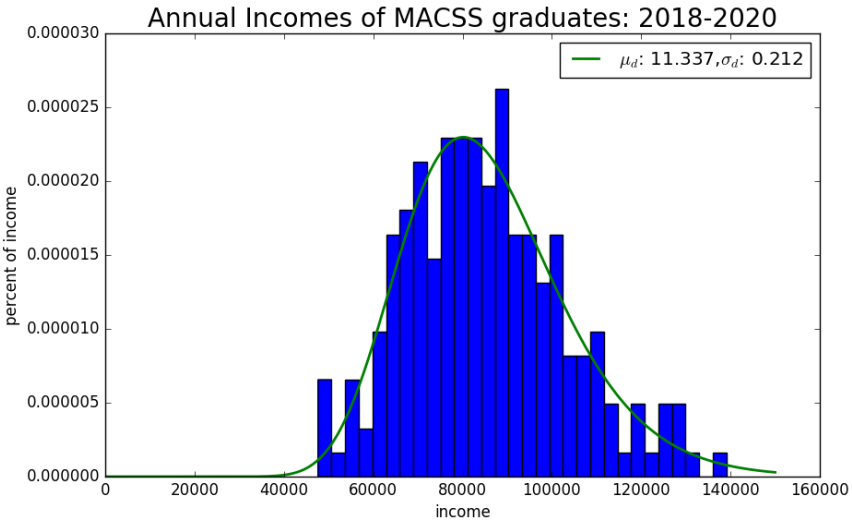

Figure 4: Figure 1d

Estimated parameter values: $\mu_{GMM1_3} = 11.33671188$, $\sigma_{GMM1_3} = 0.21175846611$. The value of the GMM criterion function at the estimated parameter values is 0.238359648539.
$Data\ moment1_{percent\ of\ individuals\ who\ earn\ less\ than\ \$75{,}000} = 0.3$.
$Data\ moment2_{percent\ of\ individuals\ who\ earn\ between\ \$75{,}000 and \$100{,}000} = 0.5$.
$Data\ moment3_{percent\ of\ individuals\ who\ earn\ more\ than\ \$100{,}000} = 0.2$.
$Model\ moment1_{percent\ of\ individuals\ who\ earn\ less\ than\ \$75{,}000} = 0.2993070737979329$.
$Model\ moment2_{percent\ of\ individuals\ who\ earn\ between\ \$75{,}000\ and\ \$100{,}000} = 0.49802915452919644$.
$Model\ moment3_{percent\ of\ individuals\ who\ earn\ between\ \$75{,}000\ and\ \$100{,}00} = 0.19965567028577863$.
My three data moments are super close to my three model moments at the estimated parameter values.

1.5 part (e)

Minimisation method used: Nelder-Mead, succeeded

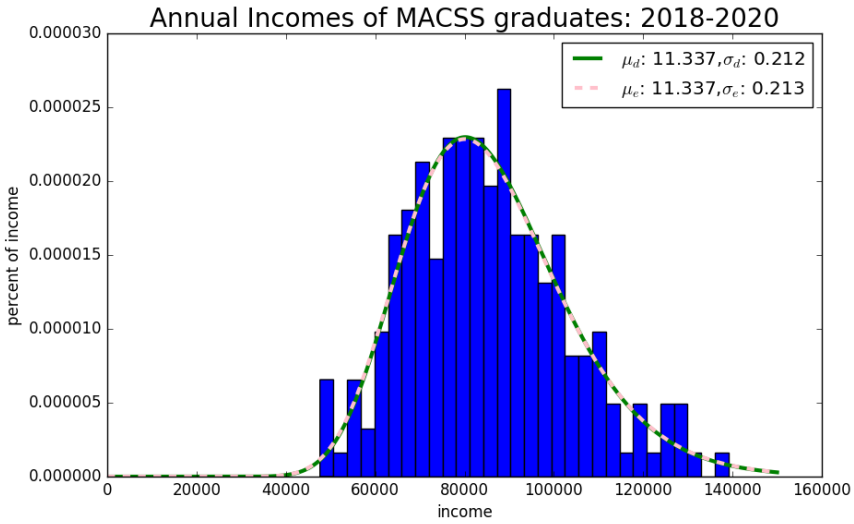

Figure 5: Figure 1d

Estimated parameter values: $\mu_{GMM2_3} = 11.3361529822$, $\sigma_{GMM2_3} = 0.213162154929$.
The value of the GMM criterion function at the estimated parameter values is $9.66702663811 \cdot 10^{-9}$.
$Data\ moment1_{percent\ of\ individuals\ who\ earn\ less\ than\ \$75{,}000} = 0.3$.
$Data\ moment2_{percent\ of\ individuals\ who\ earn\ between\ \$75{,}000 and \$100{,}000} = 0.5$.
$Data\ moment3_{percent\ of\ individuals\ who\ earn\ more\ than\ \$100{,}000} = 0.2$.
$Model\ moment1_{percent\ of\ individuals\ who\ earn\ less\ than\ \$75{,}000} = 0.30142508945944446$.
$Model\ moment2_{percent\ of\ individuals\ who\ earn\ between\ \$75{,}000\ and\ \$100{,}000} = 0.4951037370510544$.
$Model\ moment3_{percent\ of\ individuals\ who\ earn\ between\ \$75{,}000\ and\ \$100{,}00} = 0.200318170580465$.
My three data moments are super close to my three model moments at the estimated parameter values. Although my three data moments in part d are closer to my three model moments in part d.

1.6 part (f)

In my opinion, part b) and e) fit the data best. Visually, part b), c), d), and e) all fit the data really similarly because when plotted together, they overlap one another quite a lot. Although part b) has the least criterion value, I personally think that since the weight matrices were different, the least criterion value itself does not necessarily suggest the best fit. For instance, the criterion value in part c) seems considerably larger than that in part b), but the weight matrix is also bigger in part c). So, I compared the value of the model moments with the value of the data moments and found that part b) performed better than part c) and part d) performed better than part e). Then, I noticed that both part b) and e) have really close criterion values and they are all considerably smaller than that in part d). From what I could tell the pdfs in part b) and e) are almost identical. If I have to pick a better one from part

b) and e), I would pick part b) because I like using mean and standard deviation as my data moments.

2 Problem 2

2.1 part (a)

$$\beta 0_{GMM} = 0.251614223555$$

$$\beta 1_{GMM} = 0.0129357639894$$

$$\beta 2_{GMM} = 0.400486925026$$

$$\beta 3_{GMM} = -0.00999253627099$$

The value of GMM criterion function at the estimated parameter values is: 0.0018213142432.