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1 Problem Set 4

1.1 Problem 1

1.a

For a histogram of the income distribution, please see figure 1.

1.b

Testing the `LN_pdf()` function with the given values, we obtain the results shown in figure 2.

For a histogram of the income distribution along with the estimated PDF, please see figure 2.

Figure 1: Histogram of Incomes of MACSS Graduates (2018–2020)

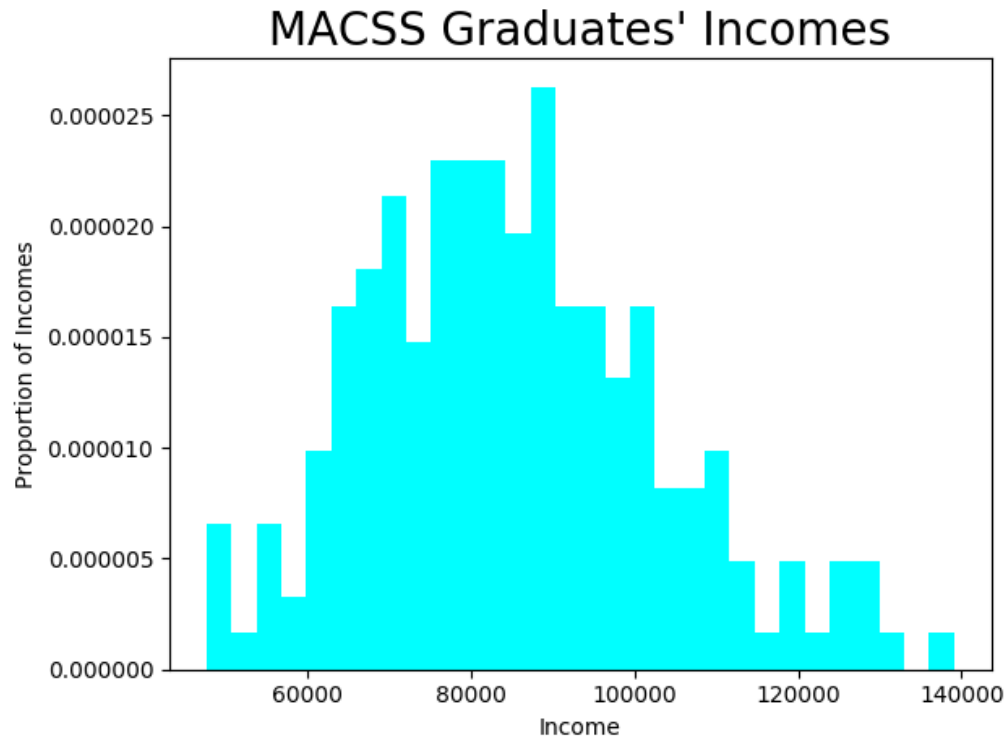
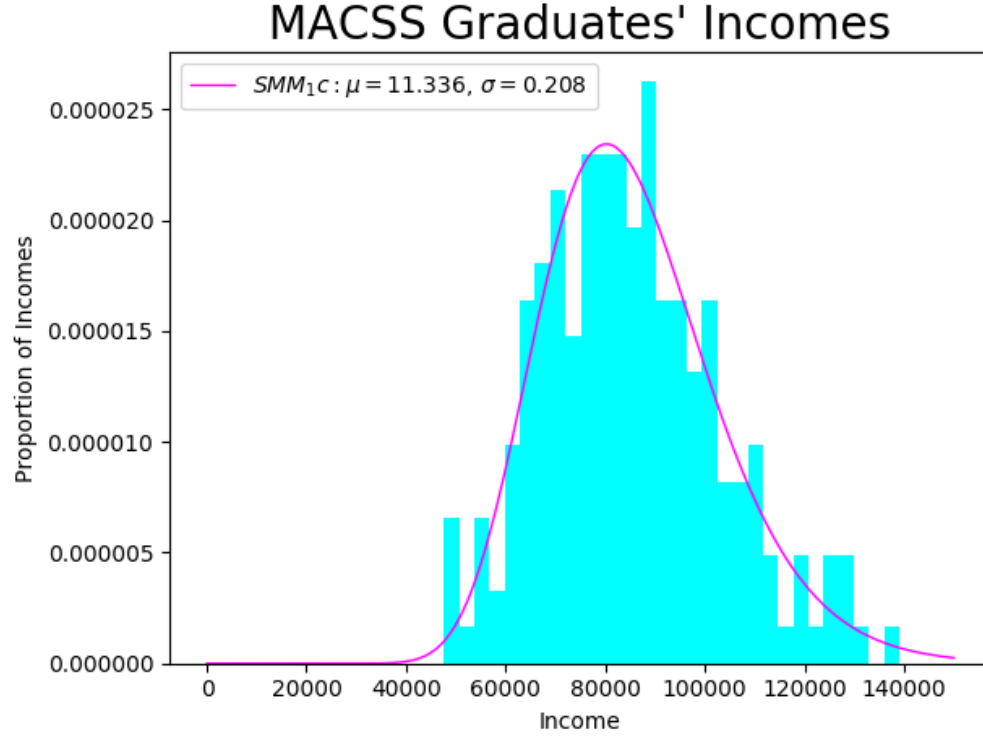


Figure 2: Results from testing the LN_pdf() function with the given array

```
[[ 0.0019079  0.00123533]
 [ 0.00217547 0.0019646 ]]
```

Figure 3: Histogram of Incomes of MACSS Graduates (2018–2020) with SMM Estimation Based on μ and σ



1.c

Using SMM estimation based on μ and σ , the parameter estimates are:

$$\mu_{SMM_{1c}} = 11.336$$

$$\sigma_{SMM_{1c}} = 0.208$$

The value of SMM criterion function with those values is 5.56611447515e-05.

Mean of incomes = 85276.824

Mean of model = 85598.998

SD of incomes = 17992.542

SD of model = 17815.907

For a histogram of the income distribution along with the estimated PDF, please see figure 3.

1.d

We find the variance-covariance matrix shown in figure 4.

We find \hat{W}_{2-step} as shown in figure 5.

Figure 4: Variance–covariance Matrix

```
[ 7.13657337e-08 -1.85444822e-07]
[-1.85444822e-07  4.81880874e-07]
```

Figure 5: Variance–covariance Matrix

```
[ 233159.01694507 -605866.85292004]
[-605866.85292004 1574353.19584363]
```

Using two-step SMM estimation based on μ and σ , the parameter estimates are:
 $\mu_{SMM1d} = 11.340$
 $\sigma_{SMM1d} = 0.208$
The value of GMM criterion function with those values is 2.09266889363.

Mean of incomes = 85276.824
Mean of model = 86084.645
SD of incomes = 17992.542
SD of model = 17919.145

For a histogram of the income distribution, along with the estimated PDFs, please see figure [6](#).

Figure 6: Histogram of Incomes of MACSS Graduates (2018–2020) with SMM Estimation and Two-step SMM Estimation Based on μ and σ

