Problem Set #3

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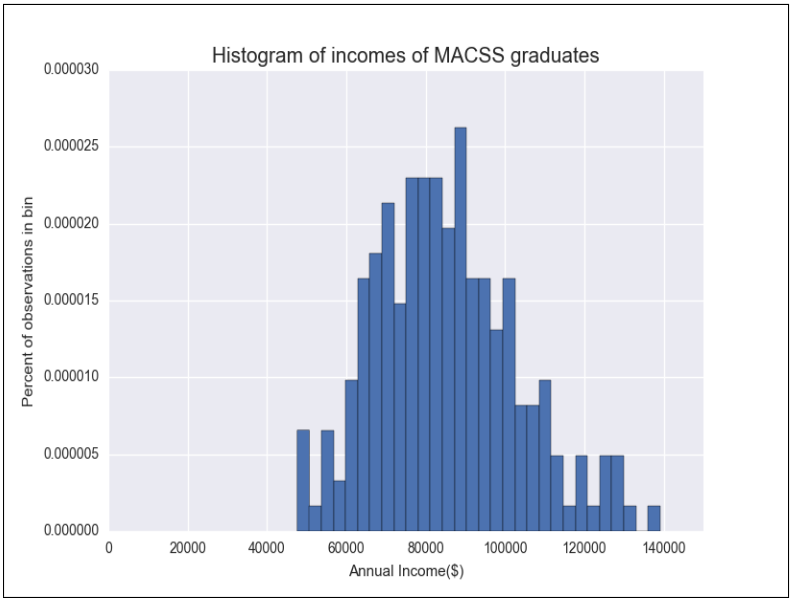
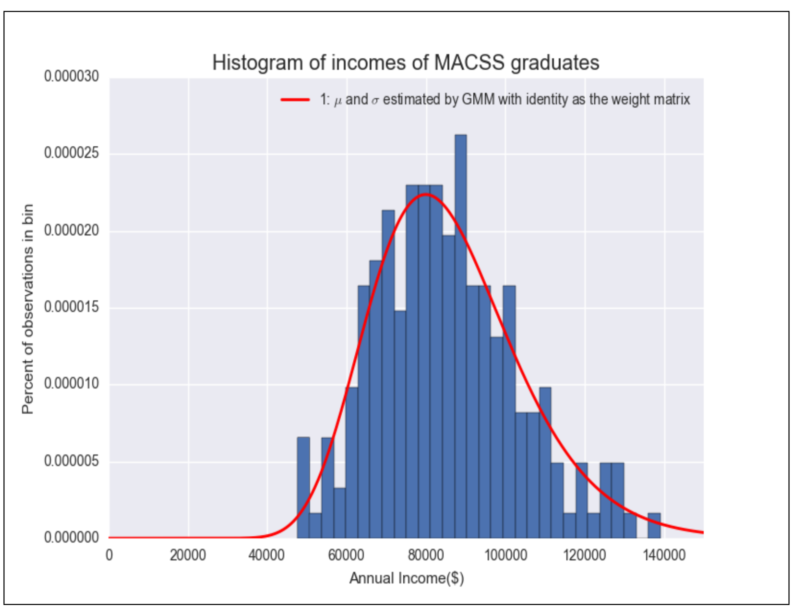
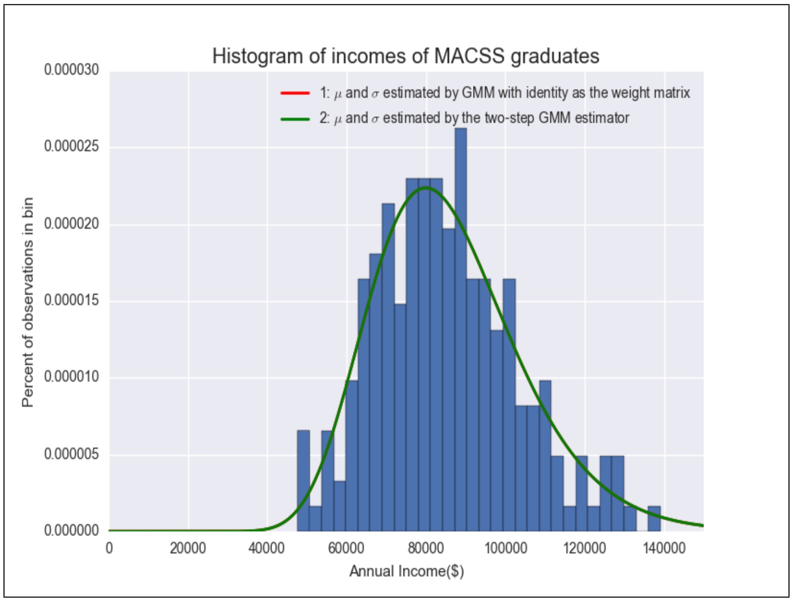
Problem 1
Part (a).



Part (b).GMM estimate of μ: 11.3376807857, GMM estimate of σ: 0.220117356107
Value of the GMM criterion function at the estimated parameter values: 1.09144255e-13.
Mean of points = 85276.8236063 , Variance of points = 323731572.23
Mean of model = 85276.7999618349 , Variance of model = 323731514.07717896
Error of mean = -2.77266697e-07, Error of variance = -1.79631383e-07

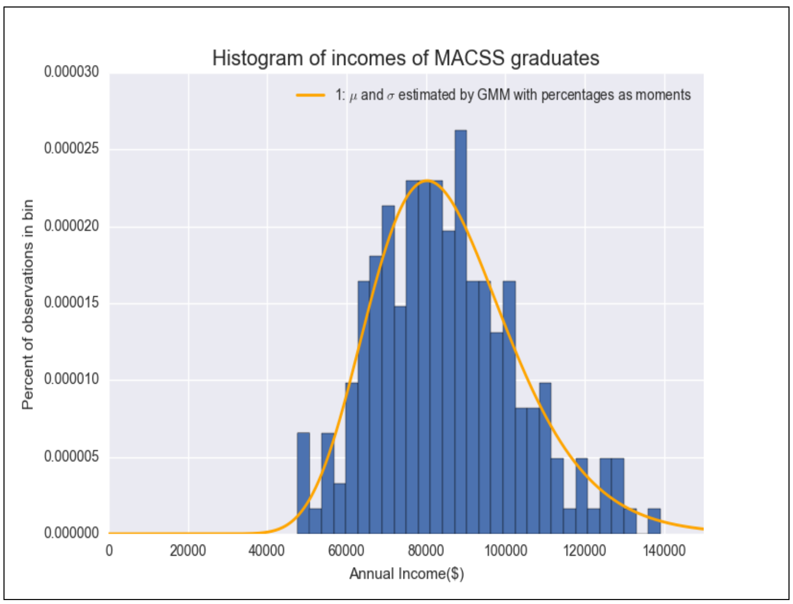


Part (c). GMM two-step estimate of μ: 11.337680813, GMM two-step estimate of σ: 0.220117433551
Value of the GMM criterion function at the estimated parameter values: 0.0002359
Mean of points = 85276.8236063 , Variance of points = 323731572.23
Mean of model = 85276.80197803094 , Variance of model = 323731698.74912083
Error of mean = -2.53623743e-07, Error of variance = 3.90816352e-07



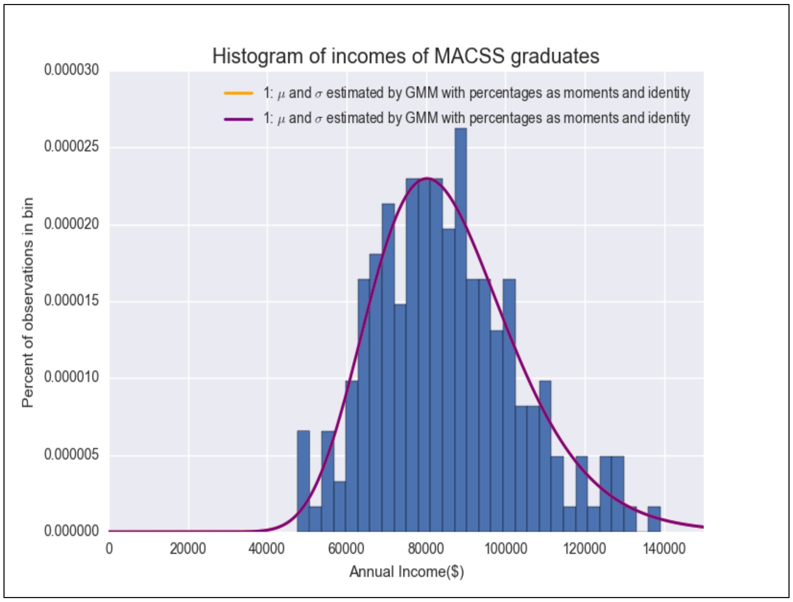
Part (d). GMM estimate of μ: 11.3388204874, GMM estimate of σ: 0.213385023901
Value of the GMM criterion function at the estimated parameter values: 2.35631013e-10.
Probability that income is less than $\$75,000$ in the data = 0.3
Probability that income is between $\$75,000$ and $\$100,000$ in the data = 0.5
Probability that income is larger than $\$100,000$ in the data = 0.2

Probability that income is less than $\$75,000$ in the model = 0.30000226708167166
Probability that income is between $\$75,000$ and $\$100,000$ in the model = 0.5000061527862022
Probability that income is larger than $\$100,000$ in the model = 0.20000104108742017
Error of first probability = 7.55693891e-06, Error of second probability = 1.23055724e-05, Error of third probability 5.20543710e-06



Part (e). GMM estimate of μ: 11.3385563394, GMM estimate of σ: 0.213380050024
Value of the GMM criterion function at the estimated parameter values: 1.55539687e-08.
Probability that income is less than $\$75,000$ in the data = 0.3
Probability that income is between $\$75,000$ and $\$100,000$ in the data = 0.5
Probability that income is larger than $\$100,000$ in the data = 0.2

Probability that income is less than $\$75,000$ in the model = 0.3004210326521616
Probability that income is between $\$75,000$ and $\$100,000$ in the model = 0.49992437867395545
Probability that income is larger than $\$100,000$ in the model = 0.19966402047436835
Error of first probability = 0.00140344, Error of second probability = -0.00015124, Error of third probability -0.0016799



Part (f). Comparing between plots generated by the four models, I believe that the third model - GMM with percentages as three moments [part d] fits data best. Comparing the first two models with the third one, the third covers more data points in the middle. In other words, the third model corresponds more to the histogram at the peak. The last two models appear to be almost identical, but since the third one has a lower value for its criterion function, I believe that it's better than the last one.

Note, I set different initial values for part b and part d. This is because when I used the initial values of part b for part d, I got very poor estimates. Thus, I would have poorer estimates from last two models if I use the same initial value as before; however, after I change my initial values, I get better estimates from the last two models than the first two. Due to this discovery, I think models themselves are not determined to be better or worse than the others. Initial values that we put in could change a lot of performances of models.

Problem 2
GMM estimate of β_0 is 0.251644863658.
GMM estimate of β_1 is 0.0129334709626.
GMM estimate of β_2 is 0.400500984735.
GMM estimate of β_3 is -0.00999170970966.
Criterion function value with GMM estimates: 0.0018212898060816906