Assignment III.

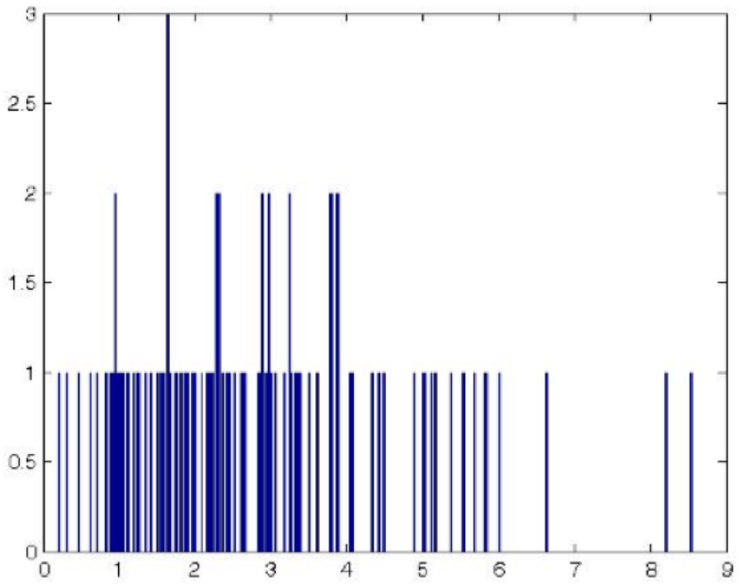
Bootstrap and Jackknife

due: December 6, 2017

problem 1 PHYS 139/239

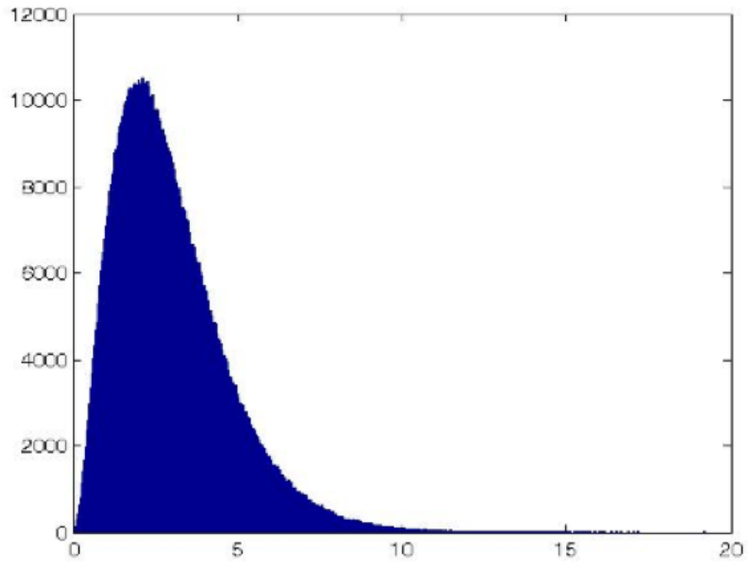
(A) Create the visible data set with 100 data, like on the left plot, from the Gamma distribution Gamma(4,1). Your sampling will look different. Also create the histogram of the invisible Gamma distribution on the right side plot. Your distribution will look different. Calculate the mean and the variance of the data and compare with the analytic values.

Visible side (sample):



These happen to be drawn from a Gamma distribution.

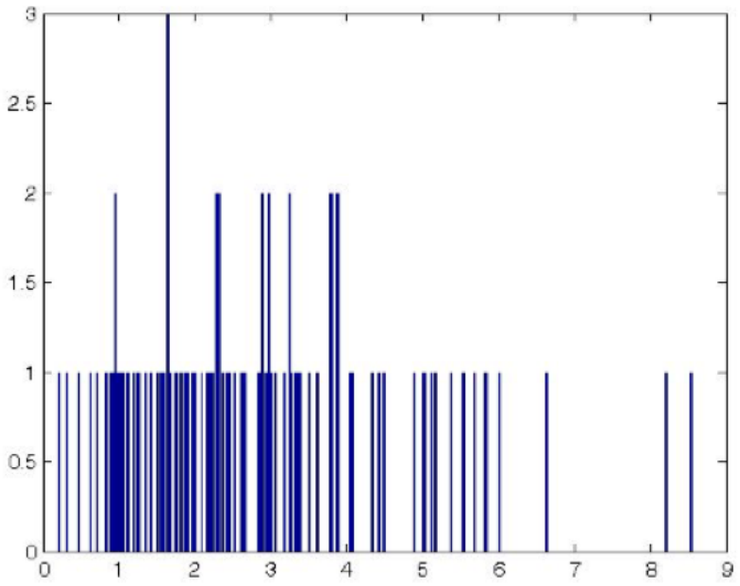
Hidden side (population):



problem 1 PHYS 139/239

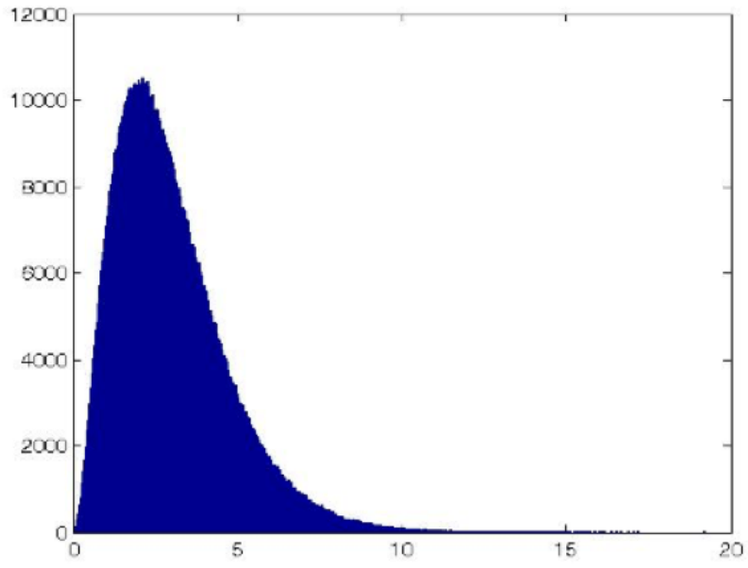
(B) Compare the ratio (mean of x^2 in the sample)/(mean of x^4 in the sample) and its error with what you obtained accurately with large sampling on the “invisible” right side of the sampling and compare with jackknife sampling of the visible 100 data.

Visible side (sample):



These happen to be drawn from a Gamma distribution.

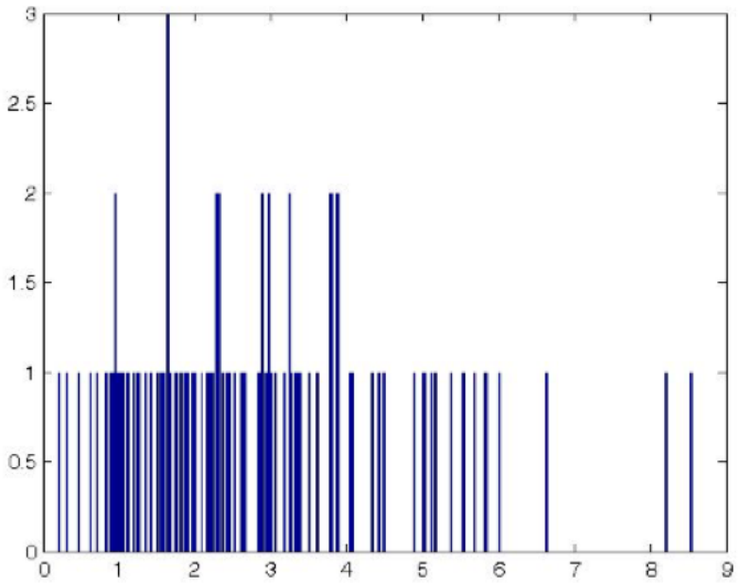
Hidden side (population):



problem 2 PHYS 139/239

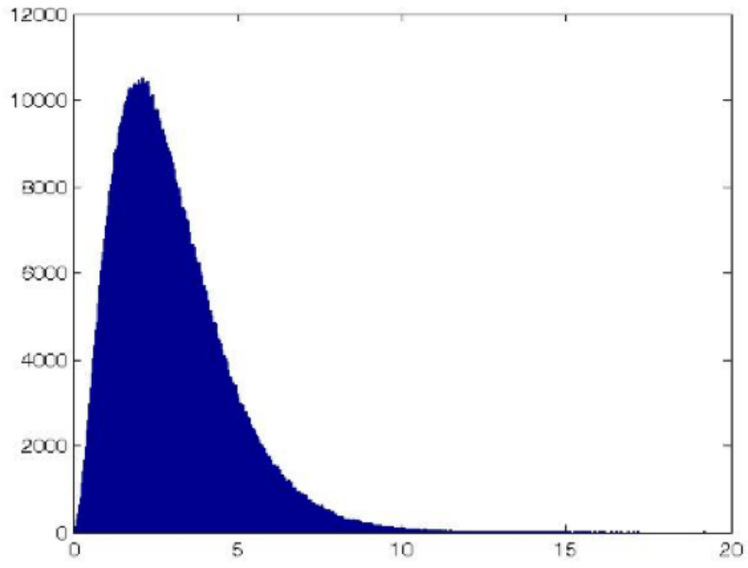
Compare the ratio (mean of x^2 in the sample)/(mean of x^4 in the sample) and its error with what you obtained accurately with large sampling on the “invisible” right side of the sampling and compare with bootstrap sampling of the visible 100 data.

Visible side (sample):



These happen to be drawn from a Gamma distribution.

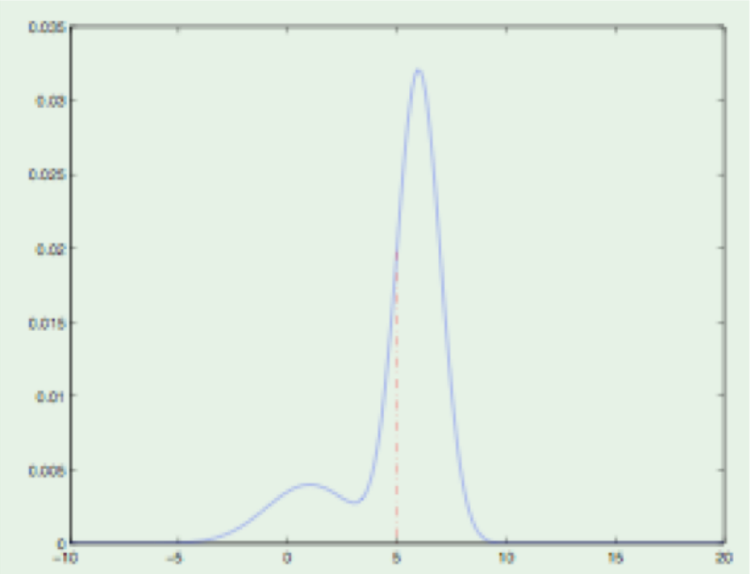
Hidden side (population):



problem 3 PHYS 239

Jackknife and bootstrap analysis with the superposition of two normal distributions for the ratio (mean of x^2 in the sample)/(mean of x^4 in the sample) and its error:

$F(x) = 0.3 \cdot N(\mu=1,\sigma=2) + 0.7 \cdot N(\mu=4,\sigma=1)$. Your distribution is expected to be similar to the plot.



problem 4 PHYS 139/239

We measure in an experiment at 23 values of x_i the outcome y_i from normal distributions where the results are listed in the data.txt file:

x	y	y error
0.100000000000000	1.955692474636036	0.166896282383792
0.400000000000000	1.183586547503424	0.158551780782385
0.700000000000000	1.022128862295741	0.102145122199102
1.000000000000000	0.746134082944572	0.060820536337125
1.300000000000000	0.916188421395087	0.139506053368529
1.600000000000000	0.724682156536752	0.081793212333357
1.900000000000000	0.739127499035786	0.096894347069944
2.200000000000000	0.786742524422711	0.034353661707974
2.500000000000000	0.972558512530457	0.121213729440151
2.800000000000000	1.039776955766267	0.183845107945299
3.100000000000000	1.087705062846587	0.152064123528747
3.400000000000000	0.896727858969629	0.088835443972525
3.699999999999999	1.139381591276074	0.128022842446142
4.000000000000000	1.294829163615035	0.155588445889791
4.299999999999999	1.502261299770580	0.143493932937373
4.600000000000000	1.043529911555928	0.219186627495748
4.899999999999999	0.956827376670183	0.142469078945670
5.199999999999999	1.147387265711086	0.116683264235504
5.499999999999999	0.909994065501967	0.060876724854546
5.799999999999999	0.698671186235582	0.076323301379691
6.100000000000000	0.553227945238010	0.082132016628130
6.399999999999999	0.576371045690540	0.085922021448737
6.699999999999999	0.427880507687987	0.044877728959367

problem 4 PHYS 139/239

Calculate from the jackknife and bootstrap procedures of your data the mean value of $b_3 b_5$ and calculate the jackknife and bootstrap errors.

$$f(x) = b_1 \exp(-b_2 x) + b_3 \exp\left(-\frac{1}{2}\frac{(x-b_4)^2}{b_5^2}\right)$$