Homework #2 Possible Solutions

Econ B2000, MA Econometrics
Kevin R Foster, CCNY

1. Experiment with the file, samples_for_polls.xls, to create at least 100 polls, each with 30 people in it. Show a histogram of the percent, in each poll, who support the candidate. What is the mean of all of the poll averages? What is the standard deviation of the averages? Does this seem reasonable? What if support for the candidate were just 10% -- what is now the histogram of 100 polls? What is its mean and standard deviation? [You can use a nicer program than Excel if you want. Just please make sure to include your work in the homework submission.]
   Answers will vary.
2. Experiment with the file, example_of_normal_distn_of_means.xls, to create a variable with a new distribution (as explained in the Excel sheet). Does its mean seem to have a normal distribution? Can you find a any that don't have a normal distribution?
   Answers will vary.
3. Please complete Exercise 2.6 in the textbook.

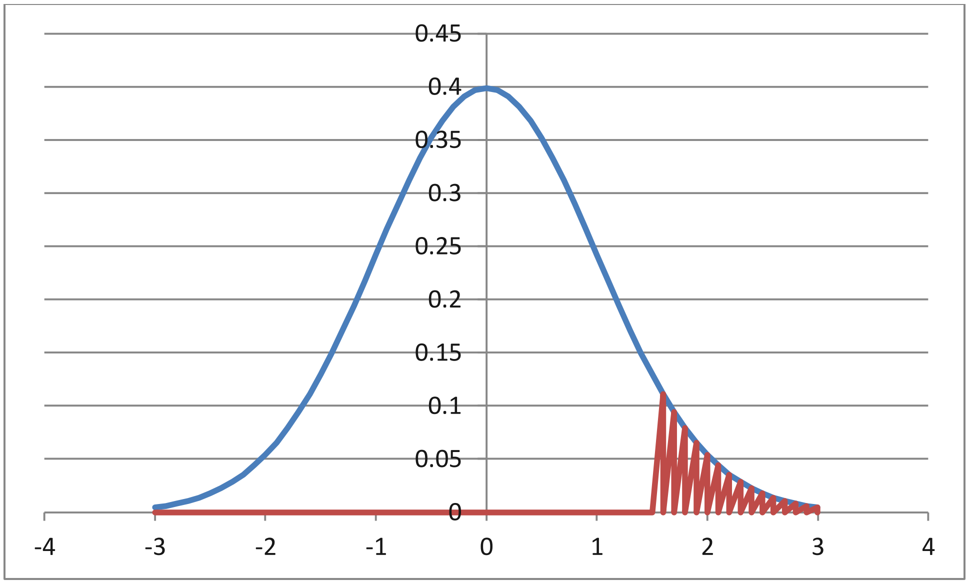
	Y=0	Y=1	marginal
X=0	0.037	0.622	0.659
X=1	0.009	0.332	0.341
marginal	0.046	0.954	

E(Y) = 0*.046 + 1*.954 = .954. The unemployment rate is the fraction who are unemployed (with Z = 1, where Z = 1 – Y) , so .046. The unemployment rate for the first row is the conditional mean, so .037/.659 = 5.61%; for the second row is .009/.341 = 2.64%. Then conditional on being unemployed (in column 1) what is the likelihood of being in the first row? This is .037/.046 so 80.4% of the unemployed are not college grads and .009/.046 = 19.6% are college grads. The rates are not independent – college grads make 34.1% of the labor force but 19.6% of the unemployed; these rates are not equal.

4. Please complete Exercise 2.22 in the textbook.

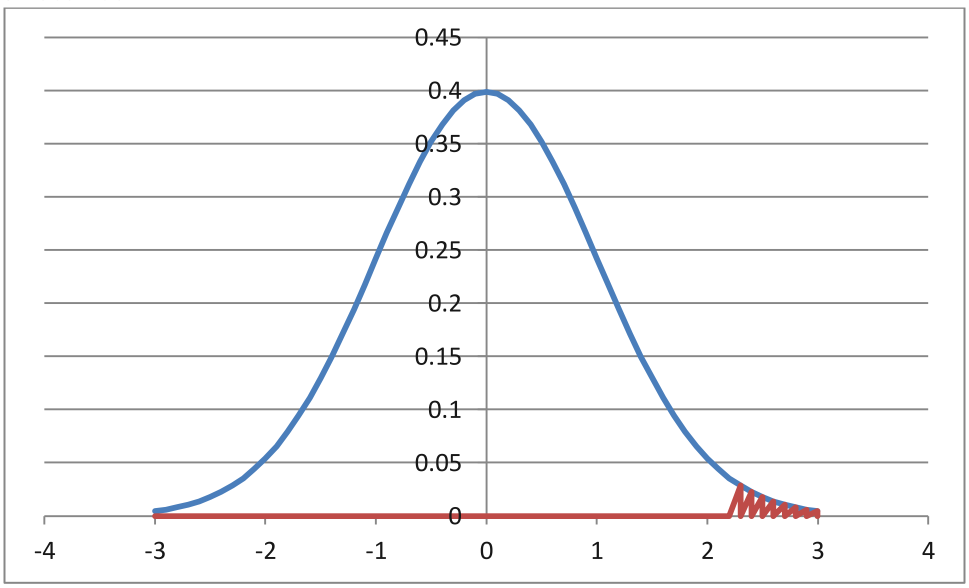
With R = wR_S + (1 – w)R_B, we know that the mean of R is a weighted average of the means of the stock and bond funds so R = .08w + .05(1 – w); if w=.5 then R=.065. Its standard deviation is $\sqrt{w^2\sigma_S^2+(1-w)^2\sigma_B^2+2w(1-w)\sigma_{S,B}}$ so, noting that we're given the correlation not the covariance so we must multiply the correlation times the two standard deviations, the portfolio stdev is $\sqrt{w^2(.07)^2+(1-w)^2(.04)^2+2w(1-w).25(.07)(.04)}$. With w=.5 this is .044. With w-.75 the mean is 7% with stdev of 5.58% -- higher return but riskier. If we wanted just to maximize the expected return then we would want as big a stock position as possible; either w=1 or even higher. Higher w means a negative weighting in bonds – this means taking a loan i.e. going short in bonds. Typically there is some limit to the amount of the available loan; if, say, (1 – w) ≥ -1 then w=2 and the expected return is 16%. But this is very risky (13.6% stdev); the minimal risk, where the stdev is lowest, is not to short the stock and buy all bonds but (because of the covariance), which is about .18 (find by experimentation or differentiating).

5. Calculate the probability in the following areas under the Standard Normal pdf with mean of zero and standard deviation of one. You might usefully draw pictures as well as making the calculations. For the calculations you can use either a computer or a table.
   a. For a Standard Normal Distribution, what is area to the right of 1.6?
      Can sketch this as



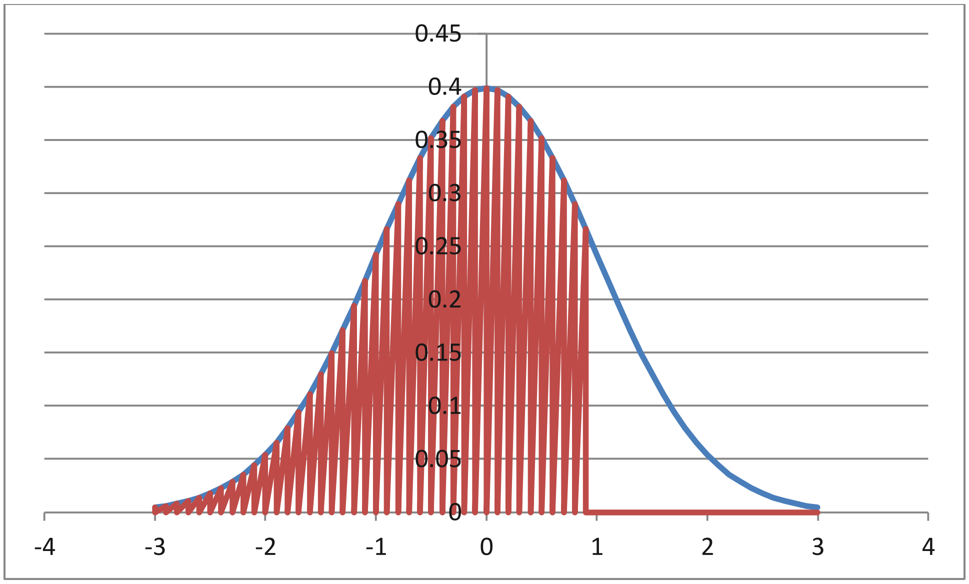
The area is calculated from NORMSDIST(1.6), which is .945 so the remaining area is .055 or 5.5%.

b. For a Standard Normal Distribution, what is area to the right of 2.3?
Sketch as



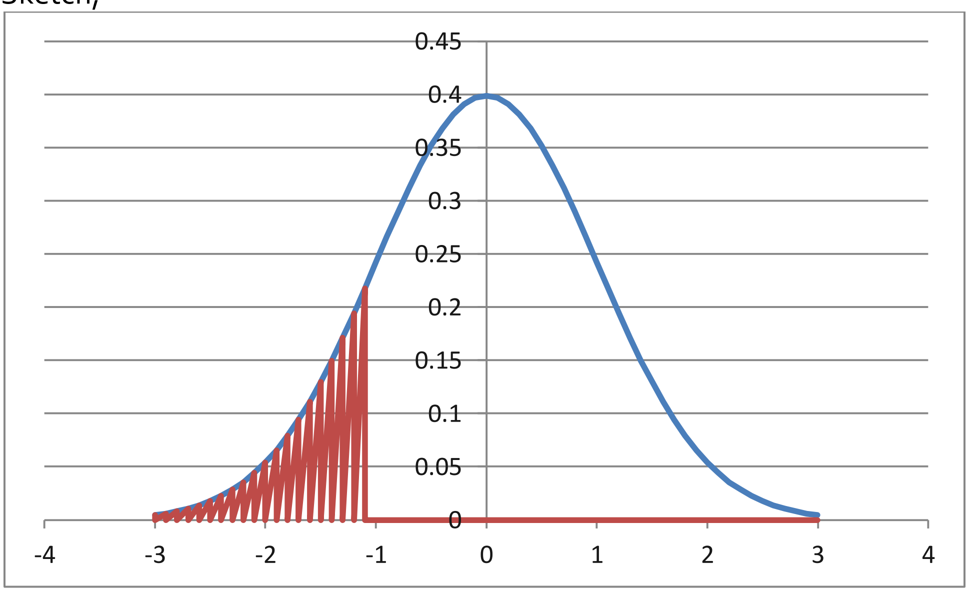
Calculate as NORMSDIST(2.3), the area to the left, which is 0.989, so the remaining area to the right is 0.011 or 1.1%.

c. For a Standard Normal Distribution, what is area to the left of 0.9?
Sketch as



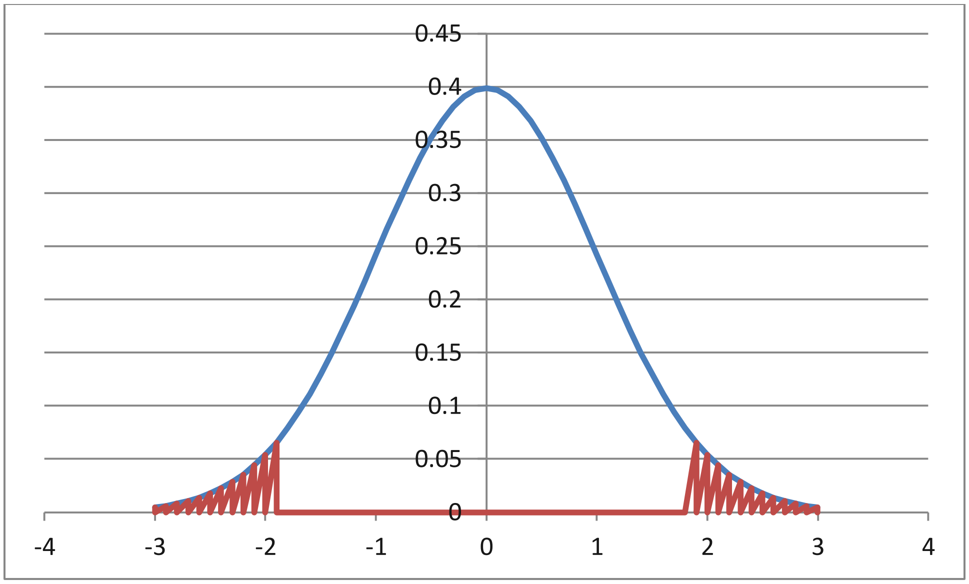
Calculate as simply NORMSDIST(0.9)= .816.

d. For a Standard Normal Distribution, what is area to the left of -1.1?
Sketch,



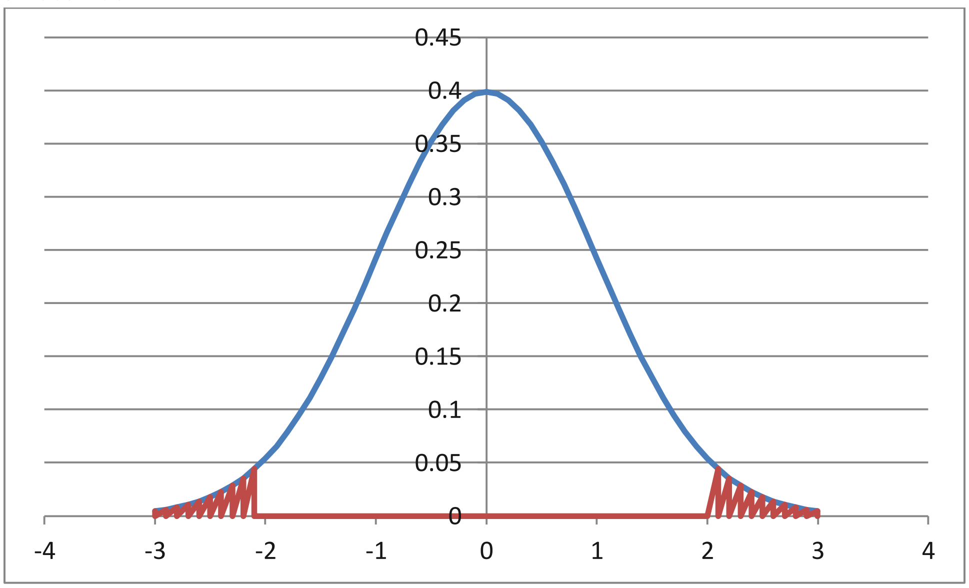
Calculate simply NORMSDIST(-1.1) = .136.

e. For a Standard Normal Distribution, what is area in both tails farther from the mean than -1.9?
Sketch,



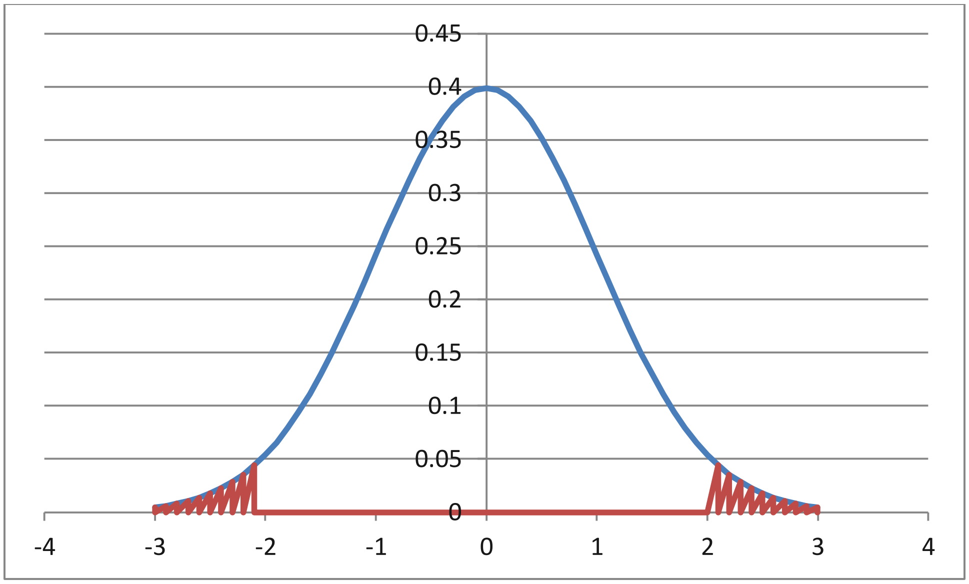
Now to calculate, NORMSDIST(-1.9) gives 0.029 but this is just the left tail; both tails have twice the area so 0.057.

f. For a Standard Normal Distribution, what is area in both tails farther from the mean than 2.1? Sketch as



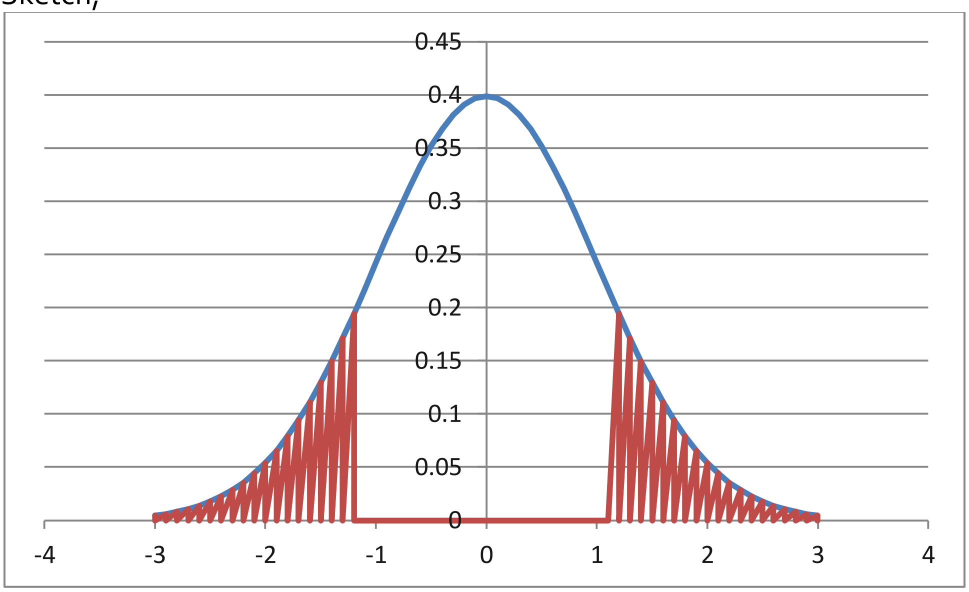
Then again calc NORMSDIST(2.1) = .982, then (1 - .982) = .018, which is the area of the right tail. Multiply by two to find area of both tails, 0.036.

g. For a Standard Normal Distribution, what values leave probability 0.041 in both tails? We know that the answer will be something of the form, ±Z, for some number Z. In the previous questions, we found that when Z is 1.9 the area is 5.7%; when Z is 2.1 the area is 3.6%. So we know that to get 4.1% we will want some number between 1.9 and 2.1. To figure it out we run our previous calculations backwards – first divide the probability by 2, so getting 2.05%. Then use NORMSINV(.0205), which gives -2.044; the area to the left of -2.044 is 2.05%. So the area in both tails beyond ±2.044 is 0.041.
Sketch,



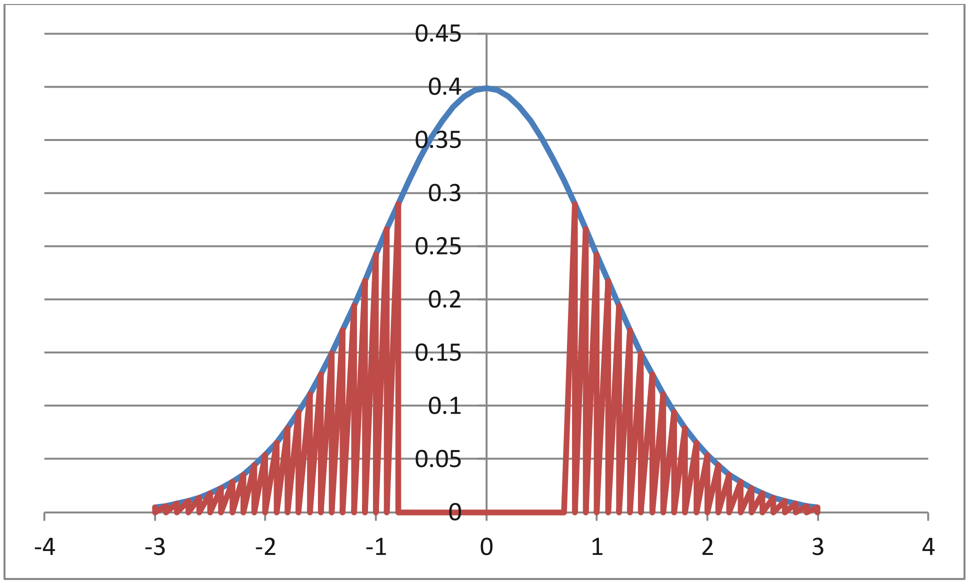
.

h. For a Standard Normal Distribution, what values leave probability 0.223 in both tails? Again, divide the probability by 2 so 0.1115. Then NORMSINV(.1115) = -1.219. Sketch,



.

i. For a Standard Normal Distribution, what values leave probability 0.469 in both tails? Divide the probability by 2 to find 0.2345, so NORMSINV(.2345) = -.724. Sketch,



0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
-4
-3
-2
-1
0
1
2
3
4

.