

**GB704 - Homework 3**  
**Due : October 10, 2016**

**Problem 1 (25pts)**

Consider the following probability space and random variable.

$S$	$s_1$	$s_2$	$s_3$
$p$	0.1	0.5	0.4
$X$	90	110	100

1. What are the expectation, the variance and the standard deviation of  $X$ ?
2. Find a random variable  $Y$  whose coefficient of correlation with  $X$  is roughly 0.5.
3. Download data2D2D.xlsx from my webpage. Design and perform a Chi-squared test that provides strong evidence that these data are **NOT** random draws from  $X$ . (Hint: Use the CHISQ.TEST function in Excel.)

**Problem 1 (25pts, CLT in action, Monte-Carlo)**

Use Excel's random number generator to generate 500 samples of 100 draws from the random variable  $X$  defined in the previous problem. Compute the mean of each of these samples. This gives you 500 different estimates of the expected value of  $X$ . According to the CLT, these estimates should be approximately normally distributed around  $X$ 's true expected value.

1. What is the mean of your 500 estimates? How does that compare to  $X$ 's expected value?
2. What, approximately, should be the standard deviation of these estimates, according to the CLT? How does this compare to the actual standard deviation in your 500 samples?
3. Use a histogram to see whether or not your estimates look roughly normally distributed around  $X$ 's expected value.