

Elements of Econometrics - II  
Spring 2019.

Homework 1 (Due on 01-29-2019, next Tuesday).

Notice that this is an individual assignment. No teamwork is either required or requested.

The aim of this HW is to teach you how to generate random numbers in stata and use it to verify the Central Limit Theorem in practice. I am providing the STATA codes to you, but you are responsible to fix some "typos" in case you find them.

Good Luck !

Question 1. Draw a single sample of size 30 of the random variable  $x$  that is uniformly distributed on  $(0, 1)$ . To ensure that the same results are obtained in future runs of the same code, we need to set a seed. In other words, run the following code in stata

```
. * Draw 1 sample of size 30 from uniform distribution
. quietly set obs 30
. set seed 10101
. generate x=runiform()
```

To see the results, you have to use the command **summarize** and **histogram**. In other words, type the following code

```
. * Summarize  $x$  and produce a histogram
. summarize  $x$ 
```

At this part, you are supposed to show a table with the summary results. What is the value of the sample mean  $\bar{x}$  ?

Next, type the following code

```
. quietly histogram  $x$ , width(0.1) xtitle(" $x$  from one sample")
```

At this part you are supposed to show your histogram. Does it look like a bell-shaped curve of a normal distribution.

Question 2 (the central limit theorem)

First you need to generate 10,000 samples and compute the sample mean from each of these 10,000 sample. To do so, you need to type the following program (set of codes)

```
. * Program to draw 1 sample of size 30 from uniform distribution and return sample mean
```

```
. program onesample, rclass
1. drop_all
2. quietly set obs 30
3. generate  $x = runiform()$ 
4. summarize  $x$ 
5. end
```

Now you need to use the `simulate` command to run the above program 10,000 times. Type the following code.

```

.* run program onesample 10,000 times to get 10,000 sample means
. simulate  $\bar{x} = r(\text{meanforonesample})$ , seed(10101) reps(10000) nodots :
j, onesample

```

```

    command: onesample
    xbar: r(meanforonesample)

```

Therefore, the result from each sample, `r(meanforonesample)`, is stored as the variable `xbar`.

Next, we use the command `summarize`. What is the value of the mean and variance ? Remember, you need to type this code

```

.*summarize the 10,000 sample means and draw histograms
. summarize xbar

```

Next, report the histogram. Do you remember the code?

```

. quietly histogram xbar, normal xtitle("xbar from many samples").

```

Does it look like a normal distribution? How do explain this result?