PSTAT 174 Lab 1

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1 Given X~U(-1,1) fx(X) = { 1/2 , -1<x<1 0 , o.w. E[x] = Integral from -1 to 1 xf(x)dx E[x] = 0

```r
sample <- runif(1000, min= -1, max =1 )
mean(sample)
```

```
## [1] 0.01419148
```

X and Y are dependent by non linear quadratic dependence but X and Y are uncorrelated by def if Cov(X,Y)= 0 then the variables X and Y are uncorrelated. In this case, Cov(X,Y) = E(XY) - E(X)E(Y) = E(X63) - 0 *EY = Integral from -1 to 1 (x^3)(1/2)dx = 0 Covariance is a guide to mutual dependence

2

```r
a <- runif(10, min = -1, max = 1)
b <- runif(100, min = -1, max = 1)
c <- runif(1000, min = -1, max = 1)

mean(a)
```

```
## [1] -0.003431676
```

```r
mean(b)
```

```
## [1] -0.09577636
```

```r
mean(c)
```

```
## [1] -0.04482145
```

True mean = 0 As sample sizes increase the sample means get closer to true mean of 0.

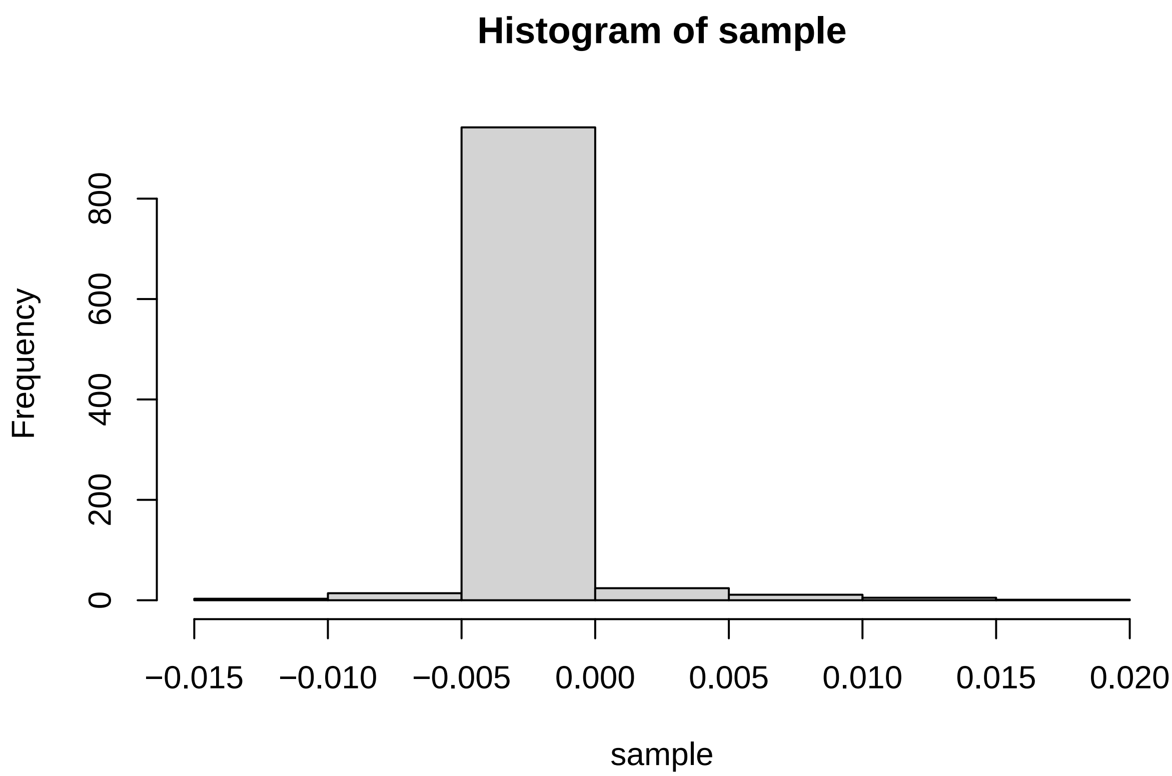
3

```r
sample=rep(0,1000)
x1=0
for(i in 1:100)
{
  x1=runif(10000,-1,1)
  sample[i]=mean(x1)
  x1=0
}

means_of_means=mean(sample)
means_of_means
```

```
## [1] -1.314483e-05
```

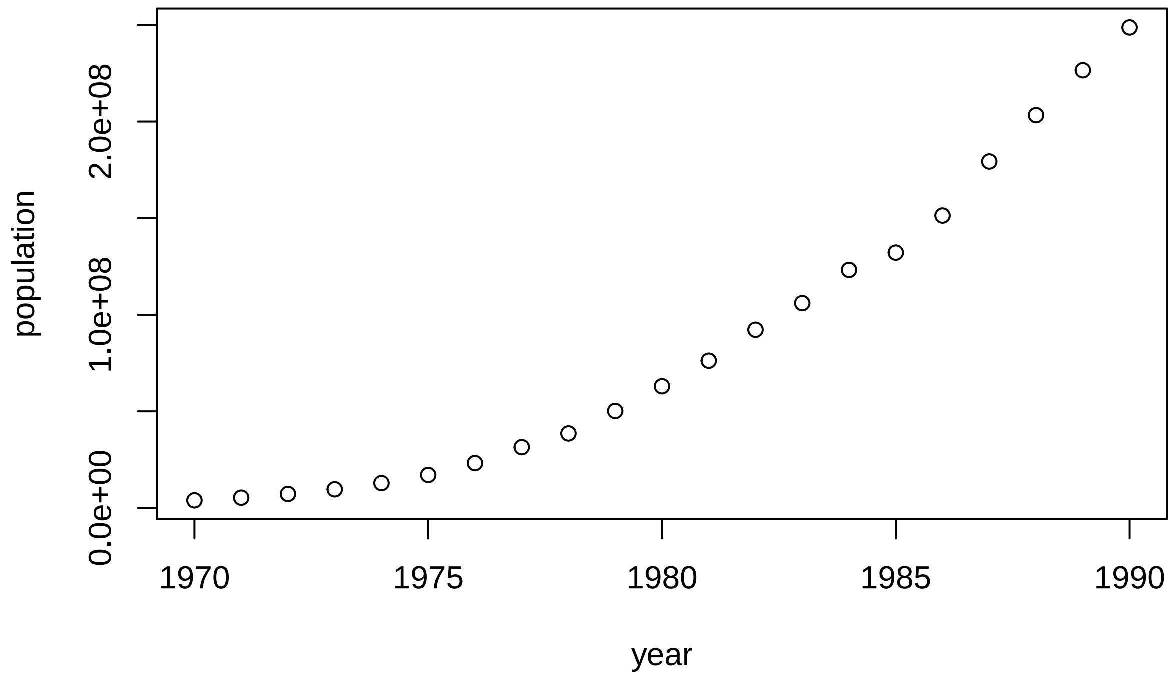
```r
hist(sample)
```



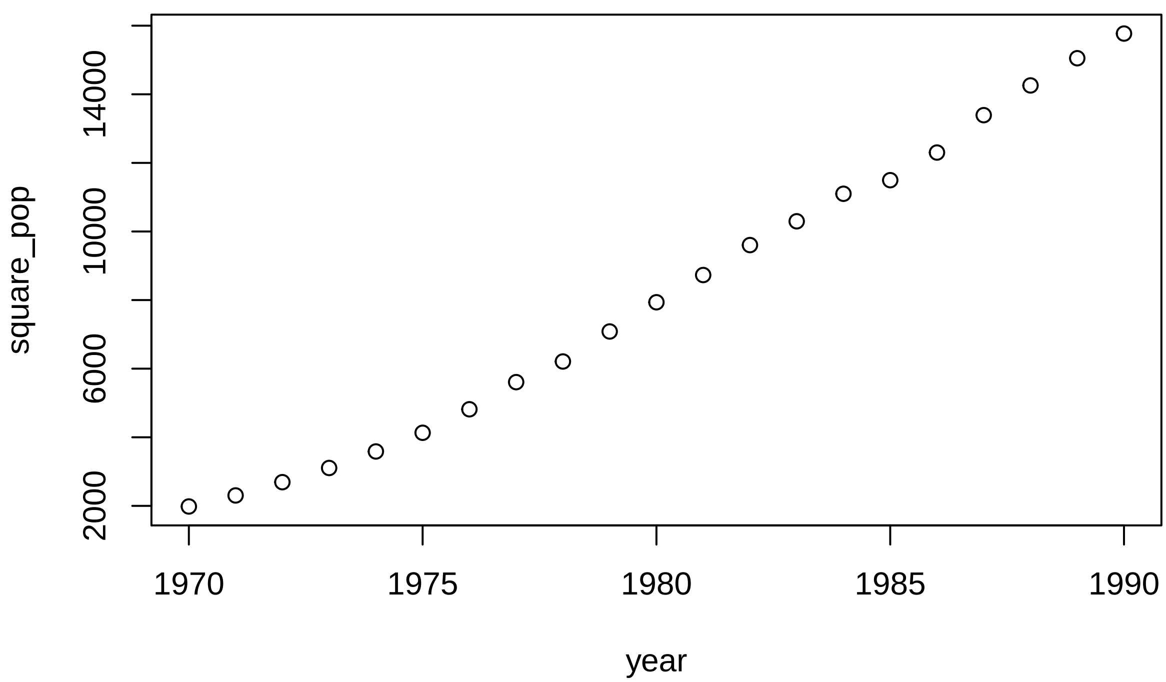
This has an asymptotic distribution of the sample means where i is from 0 to 1000 and Zi = 0, as i approaches infinity it converges corresponding to the value zero

4

```
year = c(1970,1971,1972,1973,1974,1975,1976,1977,1978,1979,1980,
         1981,1982,1983,1984,1985,1986,1987,1988,1989,1990)
population = c(3929214, 5308483, 7239881, 9638453, 12860702, 17063353,
               23191876, 31443321, 38558371, 50189209, 62979766, 76212168,
               92228496, 106021537, 123202624, 132164569, 151325798, 179323175,
               203302031, 226542203, 248709873
               )
plot(year, population)
```




```
square_pop=sqrt(population)
plot(year,square_pop)
```



The first graph of population vs. year has more of a curve while the second graph of the squared population vs. year looks more linear.