PSET 1 econ 21020

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Description

This RMarkdown file is meant to be a more readable equivalent to the R file by the same name. This corresponds with the first pset of Econometrics.

Here we open the ggplot2 library and set the seed for reproducibility.

```
library(ggplot2)
set.seed(1000)
```

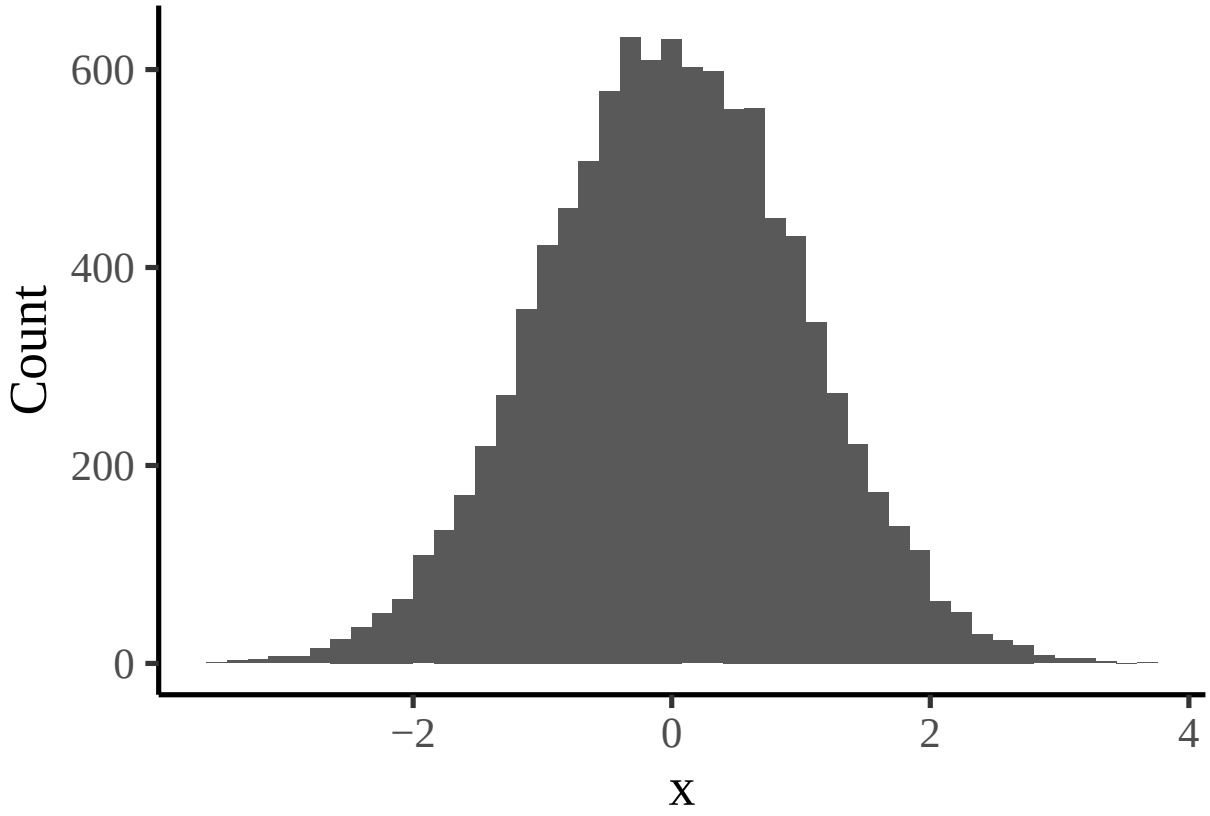
Problem 8

Part (a) Generate a vector of n draws from a standard normal rv

```
n <- 10000
mu <- 0
sigma <- 1
x <- rnorm(n, mu, sigma)
```

Plot a histogram of the draws using ggplot2

```
ggplot() +
  geom_histogram(aes(x = x), binwidth = 0.16) +
  ylab("Count") + xlab("x") +
  theme_classic(base_size = 20) +
  theme(text = element_text(size = 20,  family="serif"))
```

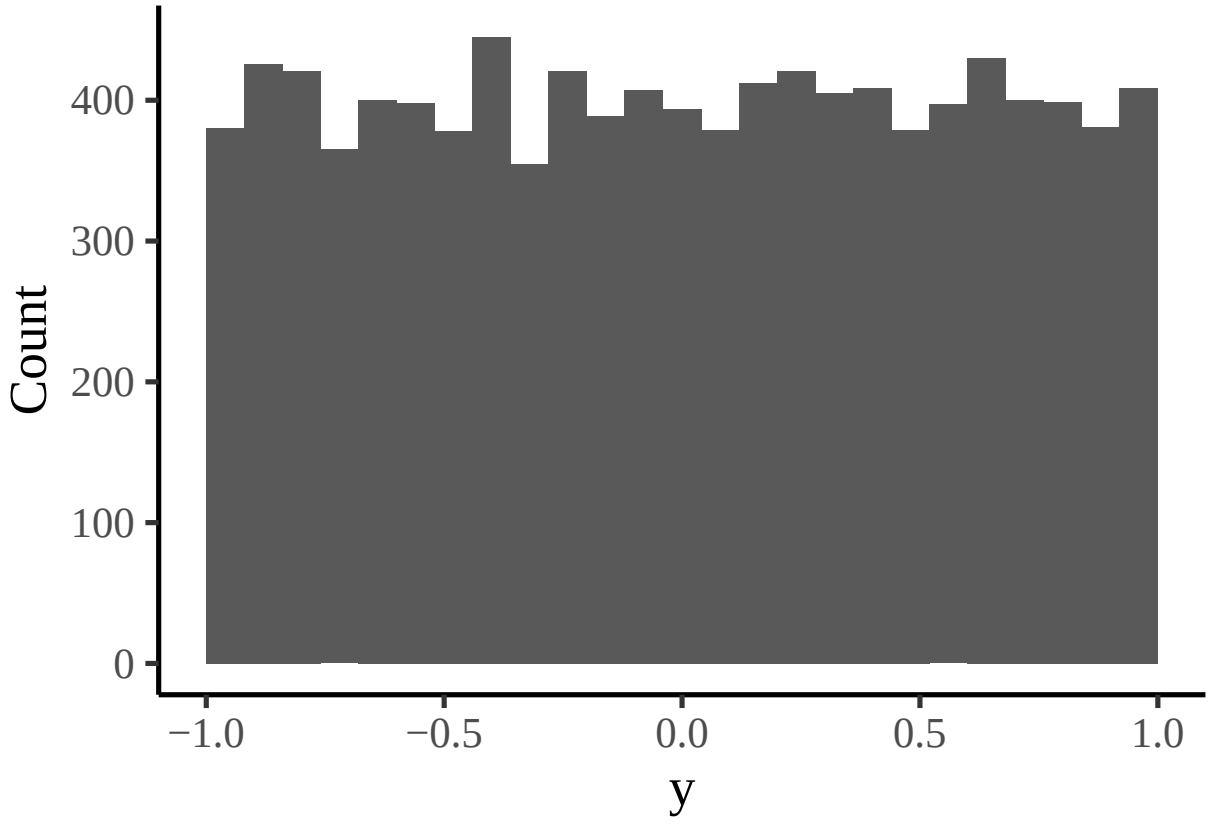


Part (b) Generate a vector of n draws from a uniform(-1, 1) rv

```
n <- 10000
min_y <- -1
max_y <- 1
y <- runif(n, min_y , max_y)
```

Plot a histogram of the draws using ggplot2

```
ggplot() +
  geom_histogram(aes(x = y), binwidth = 0.08) +
  ylab("Count") + xlab("y") +
  theme_classic(base_size = 20) +
  theme(text = element_text(size = 20,  family="serif"))
```



Problem 9

Part (a) Let X $\sim$ Bernoulli(p) and U $\sim U(0,1)$. Show that $P(1\{U \leq p\} = 1) = p$ and conclude that $1\{U \leq p\}$ and X are identically distributed.

$P(1\{U \leq p\} = 1) = P(U \leq p) = \frac{p-1}{1-0} = p$ (using the cdf of a uniform distribution)

$P(1\{U \leq p\} = 1) = P(X = 1)$ and since $supp1\{U \leq p\} = suppX = \{0,1\}$, U and X are identically distributed.

Part (b) Define a custom function that returns draws from a Bernoulli rv

```
my_rbernoulli <- function (n, p) {
  x <- ifelse(runif(n,0,1)<=p,0,1)
  return(x)
}
```

Test the custom Bernoulli generator function

```
set.seed(1000)
x <- my_rbernoulli(10000, 0.5)
length(x) == 10000 # should return TRUE
```

```
## [1] TRUE
```

```r
mean(x) # should be a number near 0.5
```

```
## [1] 0.4975
```

Part (c) Define a custom function that returns draws from a Binomial rv Test the custom Bernoulli generator function

```r
my_rbinomial <- function(n, p, m){
  for (y in 1:n) {
    ifelse(y==1,x <- as.vector(sum(my_rbernoulli(m,p))),
           x <- append(x,sum(my_rbernoulli(m,p))))
  }
  return(x)
}
```

Test the custom Binomial generator function

```r
set.seed(1000)
x <- my_rbinomial(10000, 0.5, 10)
length(x) == 10000 # should return TRUE
```

```
## [1] TRUE
```

```r
mean(x) # should be a number near 5
```

```
## [1] 4.9974
```