Lab 1

Jordan Garrett

1/4/2022

About me


CUCAMONGA
8859 Ft.

Purpose of labs

- Facilitate learning theoretical concepts covered in lecture
- Answer questions about homework
- Review for midterms and the final
- Implement statistical analyses from lecture in RStudio

Lab 1 Outline

- Cover preliminary statistics and probability concepts
- Intro to R and setup

Random Variable

- A variable that takes on specific values with specific probabilities.

Random Variable

- A variable that takes on specific values with specific probabilities.
- Measurable functions that map outcomes of a stochastic process to a measurable space.

Random Variable

- A variable that takes on specific values with specific probabilities.
- Measurable functions that map outcomes of a stochastic process to a measurable space.
- Typically denoted by a capital letter (e.g., X, Y, Z).

Random Variable

- A variable that takes on specific values with specific probabilities.
- Measurable functions that map outcomes of a stochastic process to a measurable space.
- Typically denoted by a capital letter (e.g., X, Y, Z).
- Denote the outcome of a coin flip as Y

Random Variable

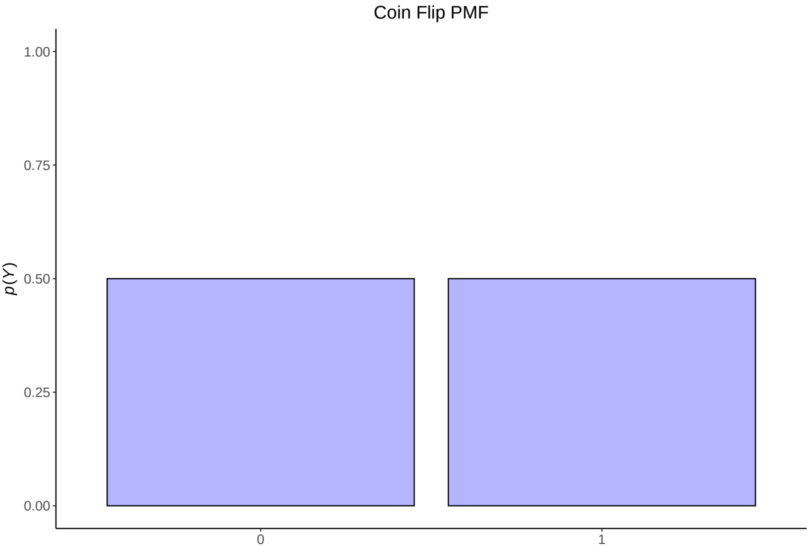
- A variable that takes on specific values with specific probabilities.
- Measurable functions that map outcomes of a stochastic process to a measurable space.
- Typically denoted by a capital letter (e.g., X, Y, Z).
- Denote the outcome of a coin flip as Y
  - $Y = 1$ if Heads, else $Y = 0$

Random Variable

- A variable that takes on specific values with specific probabilities.
- Measurable functions that map outcomes of a stochastic process to a measurable space.
- Typically denoted by a capital letter (e.g., X, Y, Z).
- Denote the outcome of a coin flip as Y
  - $Y = 1$ if Heads, else $Y = 0$
  - $p(Y{=}1) = 0.5$

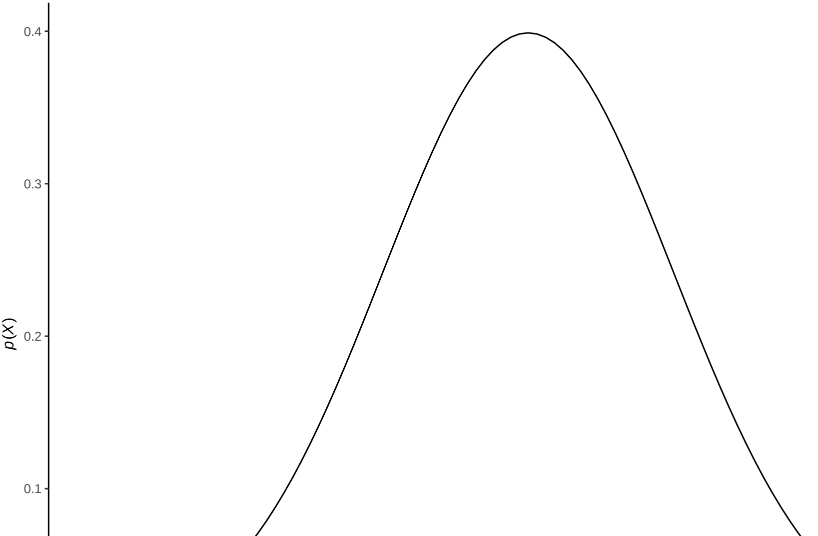
Probability distribution

- Probability **mass** function (PMF)
    - Assigns probabilities to individual values of a *discrete* random variable



Probablity distribution

- Probability **density** function (PDF)
  - Similar to a PMF, but instead specifies the probability that a *continuous* variable takes on a range of values.



Expected value

- The expected value of a random variable Y is denoted as $E(Y)$.
  - Probability weighted average of all possible values.

```
y <- c(70,80,85,90,100)
p.y <- c(0.18,0.34,0.35,0.11,0.02)

E.y <- sum(y*p.y)
E.y
```

```
## [1] 81.45
```

Variance

- A measure of how disperse all possible values of a random variable are from the expected value (i.e. population or sample mean)

```
sum(p.y*y^2) - E.y^2
```

```
## [1] 43.6475
```

Variance

- A measure of how disperse all possible values of a random variable are from the expected value (i.e. population or sample mean)
- $\text{Var}(Y) = E[(Y\text{-}\mu)^2] = E(Y^2)$ - $E(Y)^2$

```
sum(p.y*y^2) - E.y^2
```

```
## [1] 43.6475
```

Variance

- A measure of how disperse all possible values of a random variable are from the expected value (i.e. population or sample mean)
- $\text{Var}(Y) = E[(Y\text{-}\mu)^2] = E(Y^2)$ - $E(Y)^2$

```
sum(p.y*y^2) - E.y^2
```

```
## [1] 43.6475
```

- You might notice that this result is different than what the `var()` function outputs, but that is because the function computes an estimator of the population variance (i.e., s^2)