Taylor Lange
Teaching Assistant

Email: taylor.z.lange@maine.edu

Econ Lab Hours:
Mondays 2pm-3pm
Tuesdays 11am- 12pm
Thursdays 11am-12pm

Preview Of Regression

So Far...

So Far...

Data Description:

So Far...

Data Description:

- Mean, Median, Mode

So Far...

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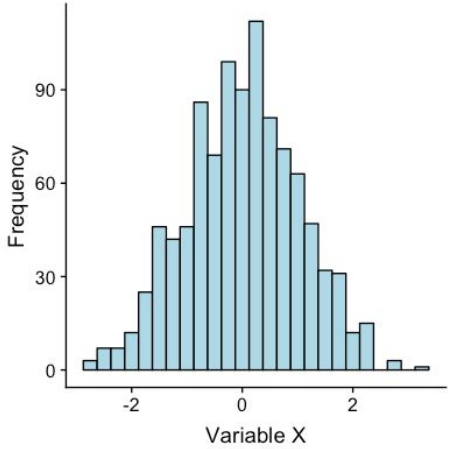
- Mean, Median, Mode
- Standard Deviation, Variance

So Far...

Data Description:

- Mean, Median, Mode
- Standard Deviation, Variance

- Histograms



Measuring Relationships

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How do two variables relate to each other?

Correlation - how strongly 2 variables covary

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Economics:

Supply & Demand - Price & Quantity Demanded

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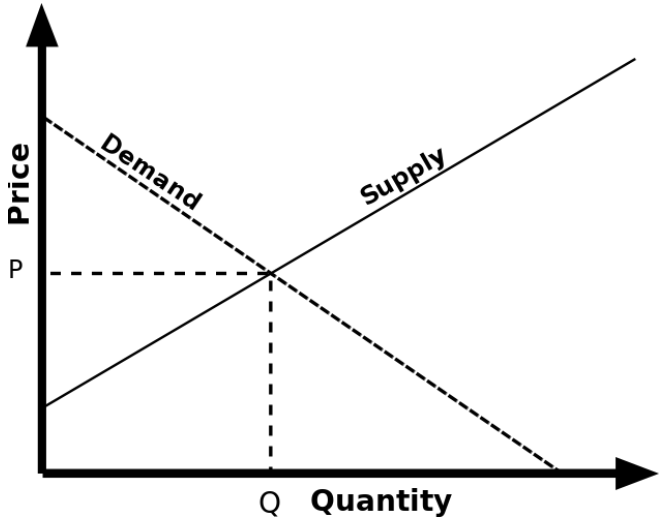

Regression Analysis

Regression Analysis

Economics’ Prefered Method

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A different type of correlation

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What is the relationship between

- Dependant Variable - y

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What is the relationship between

- Dependent Variable - y
- Explanatory Variable(s) - x_1, x_2, …

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Measures:

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- Direction (+ / -) (same as Correlation)

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A different type of correlation

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- Strength (Predictability) (same as Correlation)
- Magnitude

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What is the relationship between

- Dependant Variable - y
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Measures:

- Direction (+ / -)
- Magnitude

Regression Analysis Step-by-Step

1. Question
2. Scatter plot
3. Fit the Line

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What are you trying to investigate?

Regression Analysis Step-by-Step

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What are you trying to investigate?

How much does the weight of a car influence its fuel efficiency?

Regression Analysis Step-by-Step

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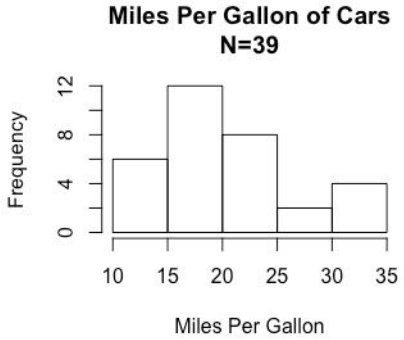

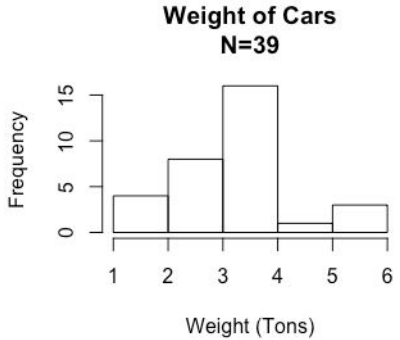

Mean	20.09	3.21

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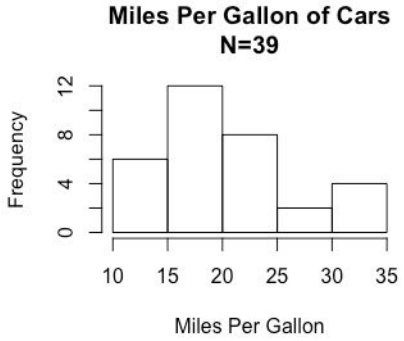

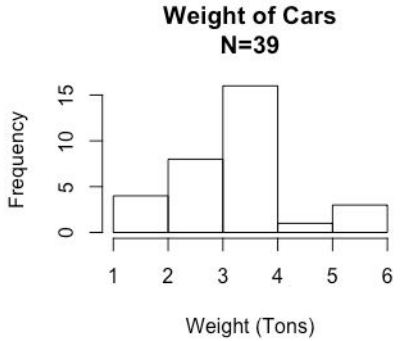

Mean	20.09	3.21
Variance	36.32	0.96

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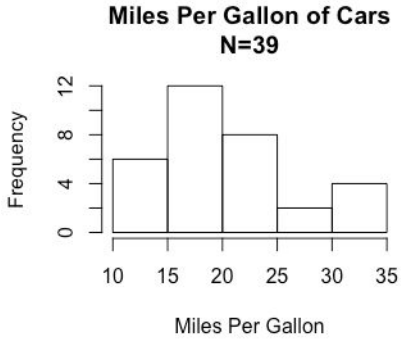

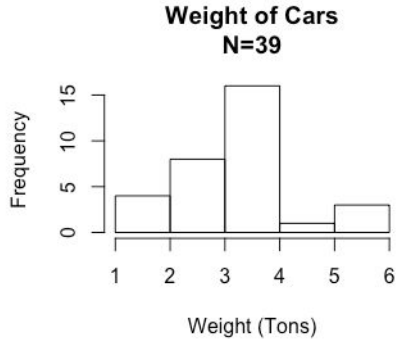

Mean	20.09		3.21
Variance	36.32		0.96
Covariance:		-5.11	

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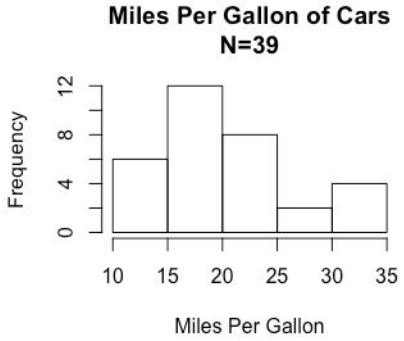

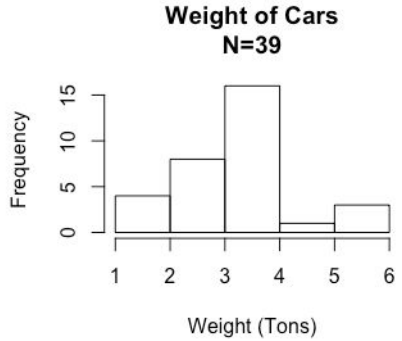

Mean	20.09		3.21
Variance	36.32		0.96
Covariance:		-5.11	
Correlation:		-0.86	

Regression Analysis Step-by-Step

1. Question
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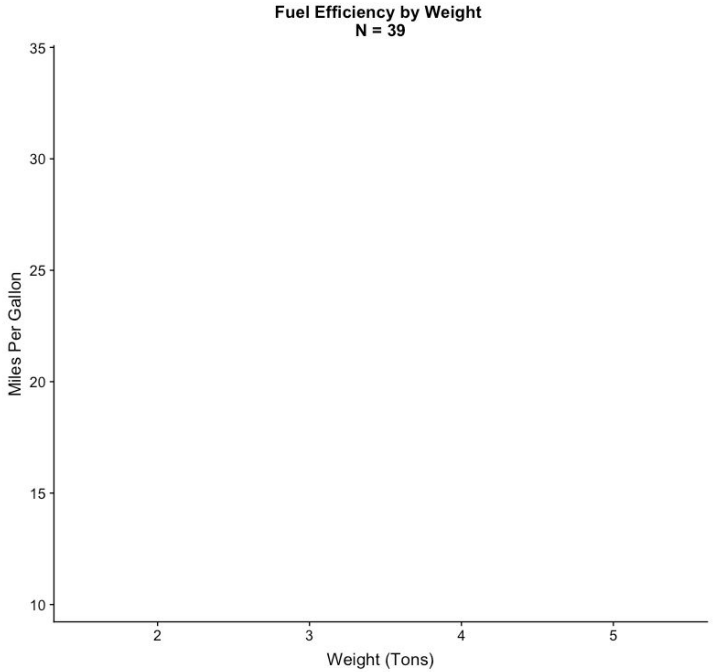
How much does the weight of a car influence its fuel efficiency?

Explanatory Variable - x axis

Dependent Variable - y axis



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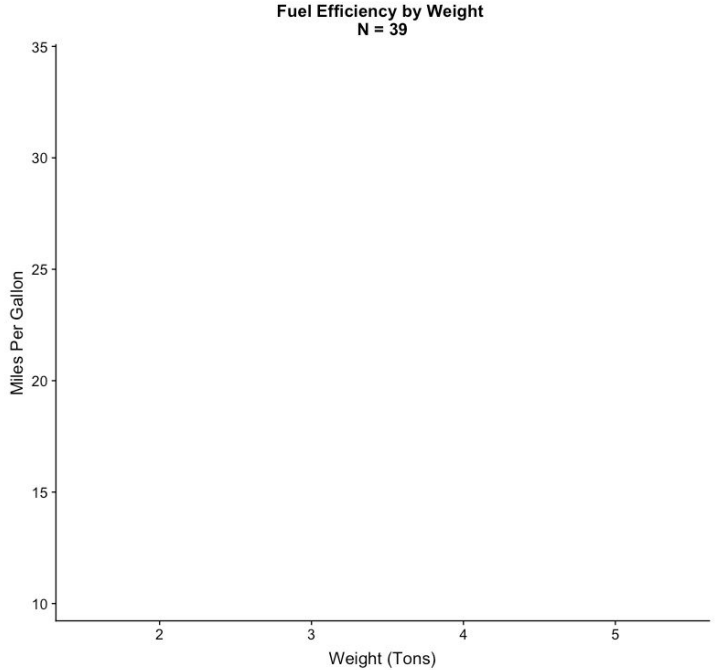
Mazda RX4



Regression Analysis Step-by-Step

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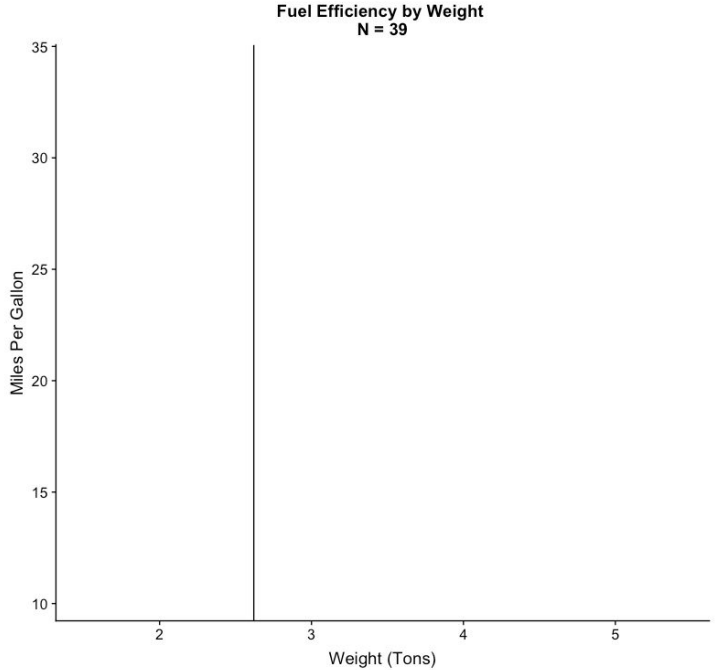
Mazda RX4
Weight: 2.62 Tons



Regression Analysis Step-by-Step

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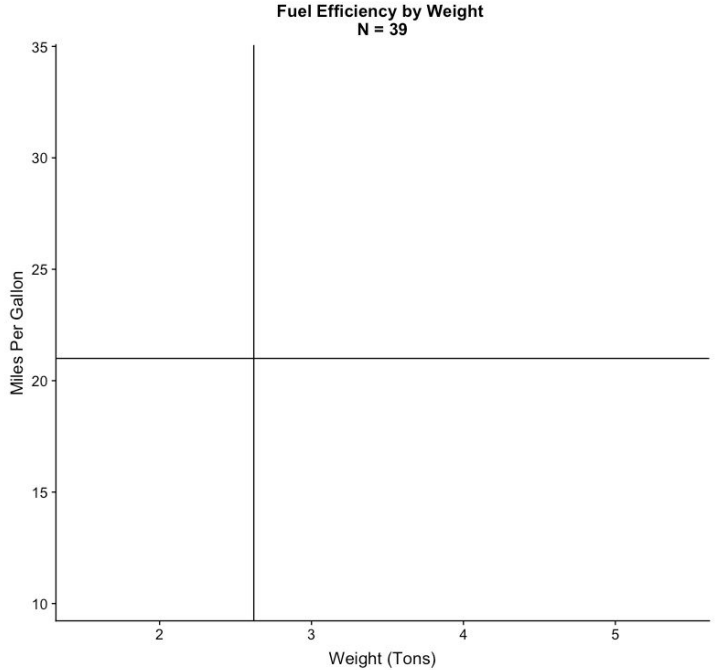
Mazda RX4
Weight: 2.62 Tons
Miles Per Gallon: 21



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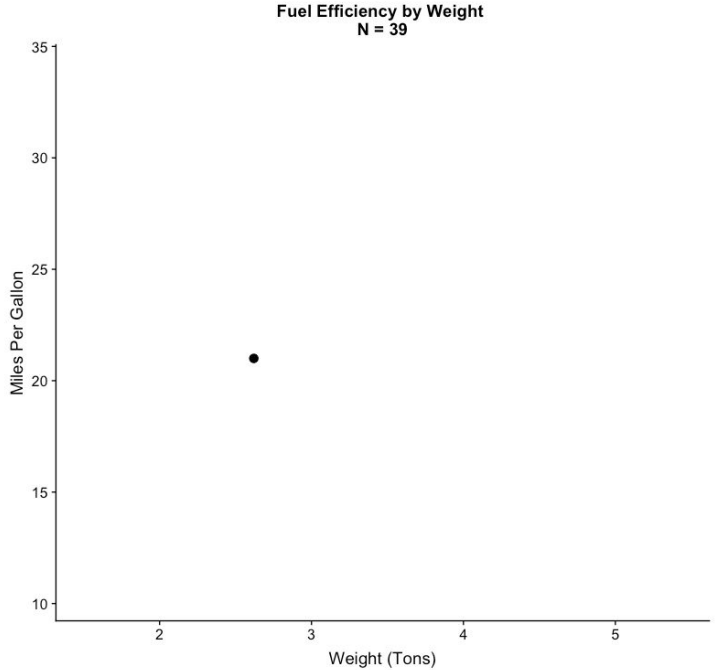

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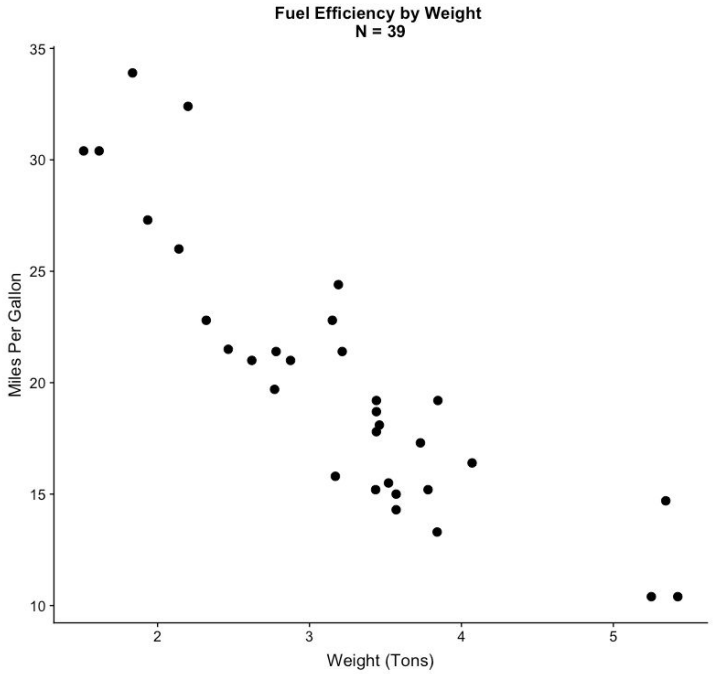

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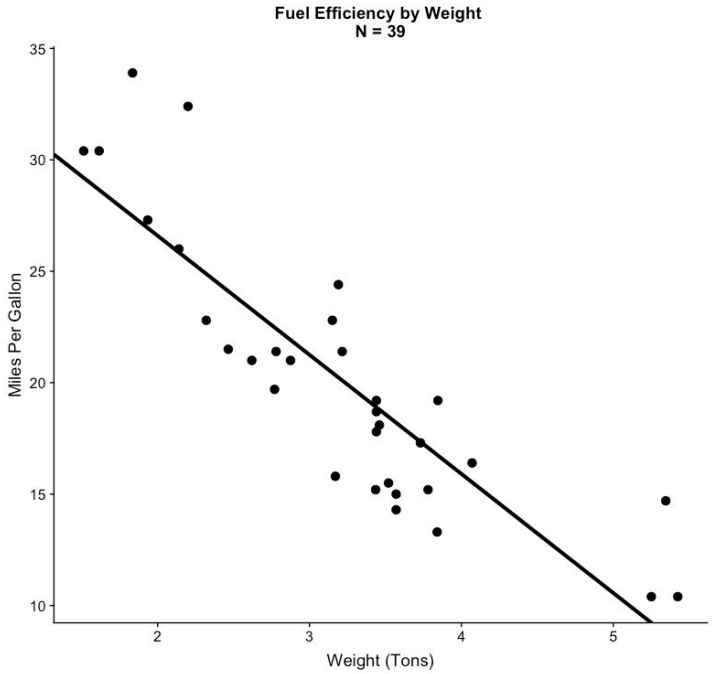

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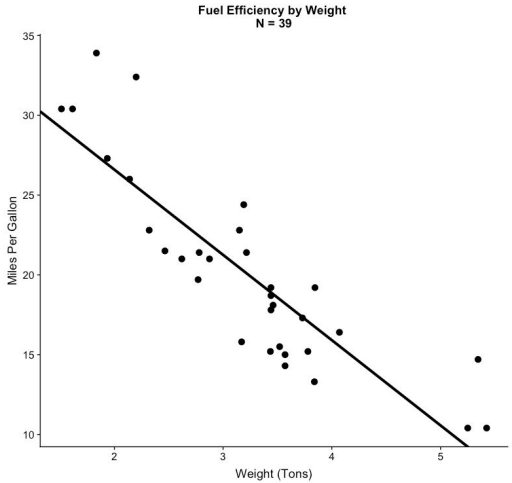

Math Notation

Y = mx + b

m = slope

b = intercept

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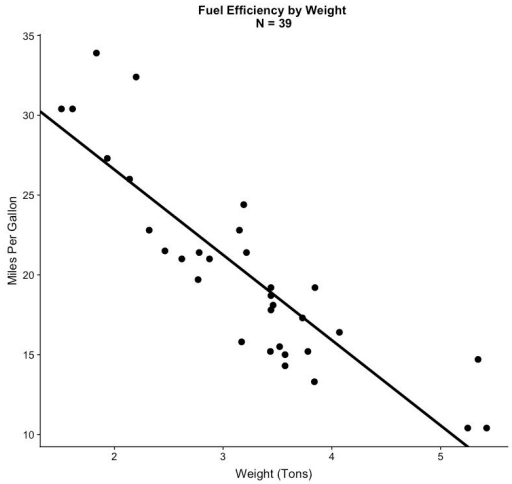

Math Notation

$Y = mx + b$

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Econometric Notation:

$Y = \beta_0 + \beta_1 x_1$

β_1 = slope

β_0 = intercept

Regression Analysis Step-by-Step

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How much does the weight of a car influence its fuel efficiency?

Econometric Model/Equation

$$Y = \beta_0 + \beta_1 x_1$$

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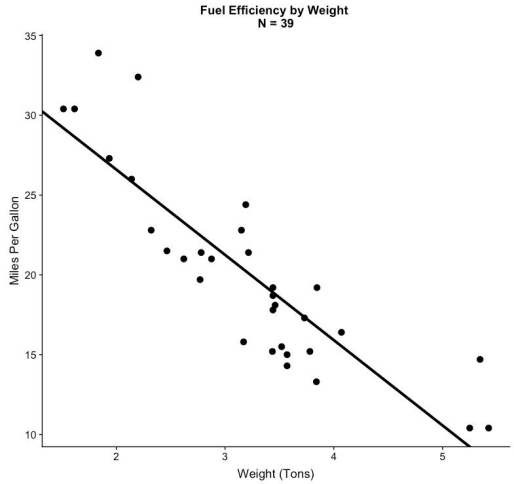

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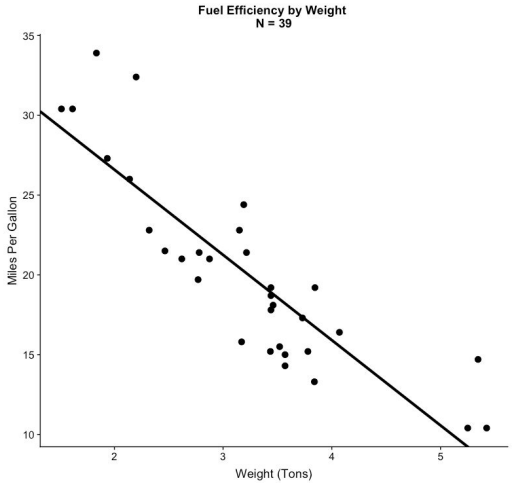

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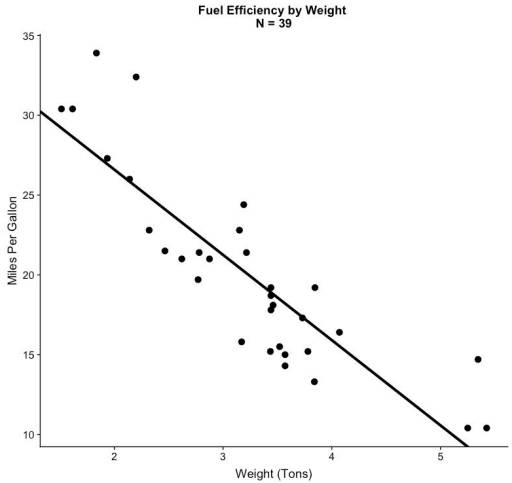

$Y = \beta_0 + \beta_1 x_1$

$Y = 37.2 - 5.3x_1$

How to get the line?

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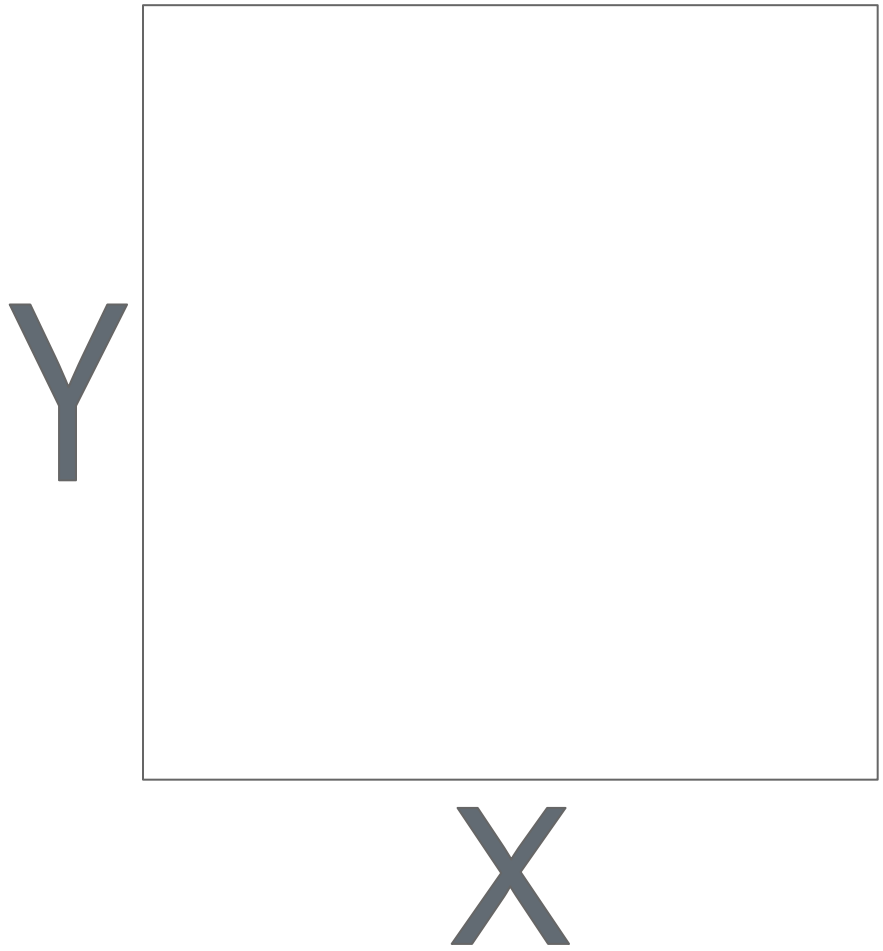

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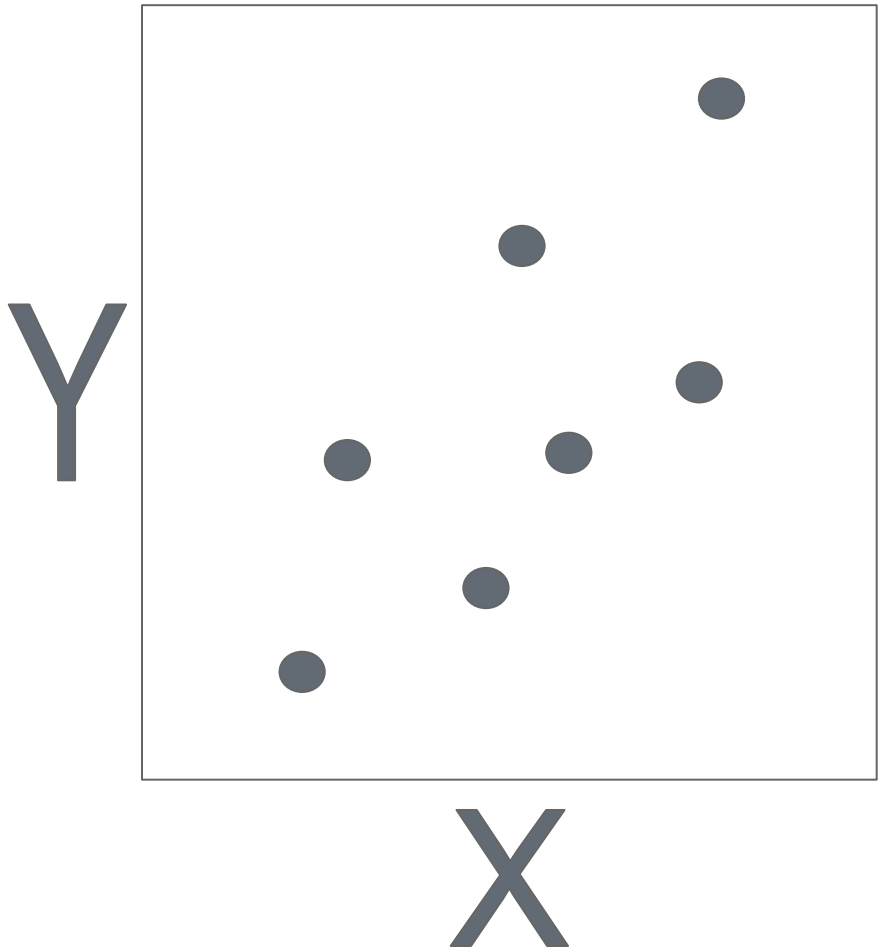

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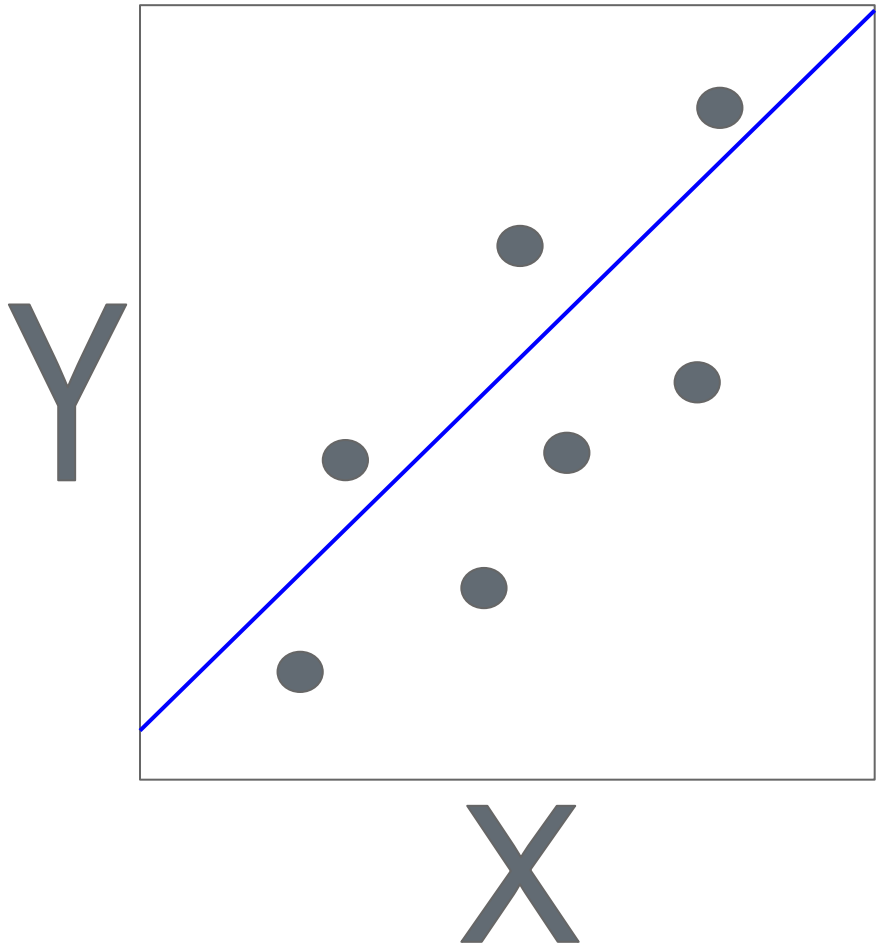

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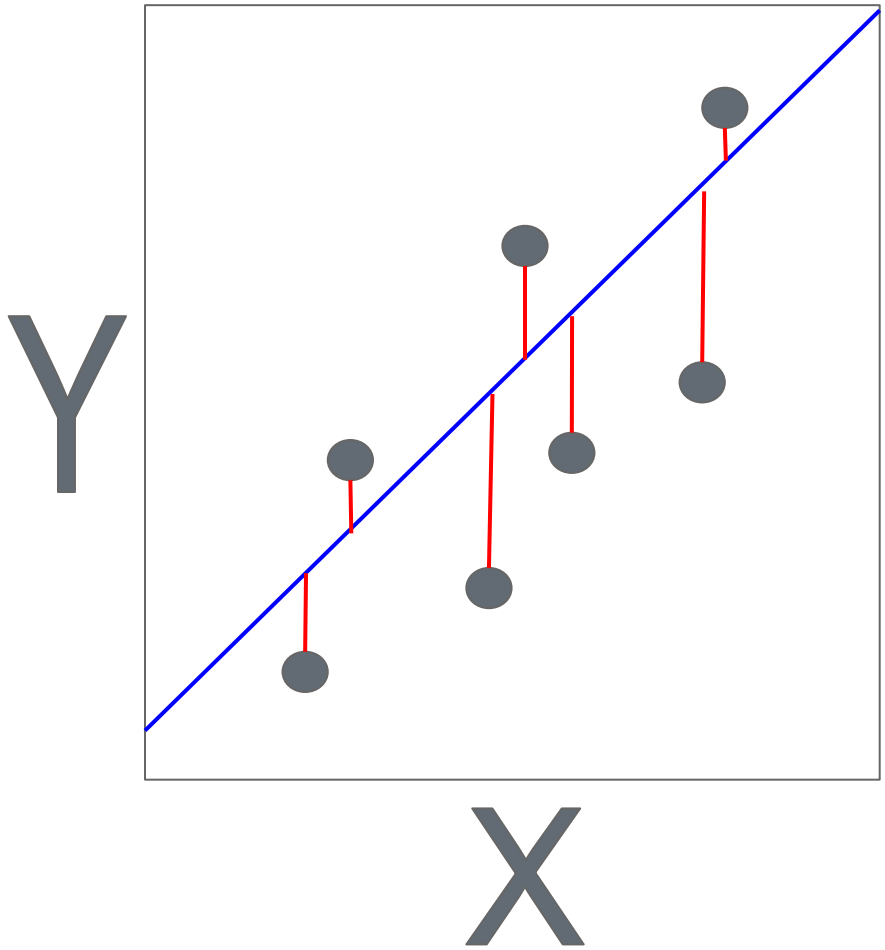

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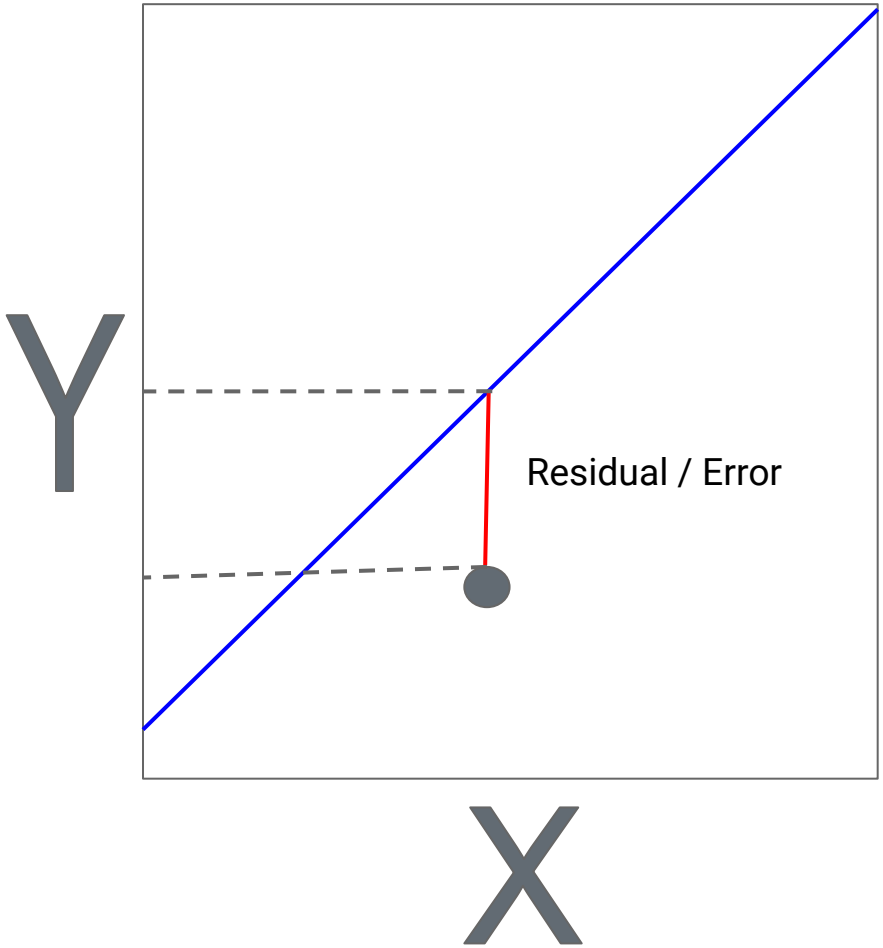

How to get the line

Econometric Model/Equation

$$Y = \beta_0 + \beta_1 x_1$$

Y = Dependant Variable

X_1 = Explanatory Variable

β_0 = Intercept Parameter

β_1 = Slope Parameter

How to get the line

Econometric Model/Equation

$$Y = \beta_0 + \beta_1 x_1 + \varepsilon$$

Y = Dependant Variable

X_1 = Explanatory Variable

β_0 = Intercept Parameter

β_1 = Slope Parameter

ε = Error

How to get the line

Econometric Model/Equation

$$Y = \beta_0 + \beta_1 x_1 + \varepsilon$$

Y = Dependant Variable
X_1 = Explanatory Variable
β_0 = Intercept Parameter
β_1 = Slope Parameter
ε = Error

The Best Fit Regression Line is the one that creates the smallest distances between the data and the prediction line

Multiple Explanatory Variables

How much does the weight of a car influence its fuel efficiency?

Econometric Model/Equation

$$Y = \beta_0 + \beta_1 x_1 + \varepsilon$$

Y= Miles Per Gallon

x_1 = Weight (Tons)

ε = Error

Multiple Explanatory Variables

How much does the weight of a car influence its fuel efficiency?

Econometric Model/Equation

$$Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \varepsilon$$

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$$Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \varepsilon$$

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x_2 = Horsepower (horses)

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Results

$$Y = 37.22 - 3.88x_1 - 0.03x_2$$

Interpreting Results

How much does the weight of a car influence its fuel efficiency?

Econometric Model/Equation

$Y = 37.22 - 3.88x_1 - 0.03x_2$

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A 1 unit (Ton) increase in the weight of a car decreases its fuel efficiency by 3.88 miles per hour

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$Y = 37.22 - 3.88x_1 - 0.03x_2$

Y= Miles Per Gallon

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x_2 = Horsepower (horses)

A 1 unit (Ton) increase in the weight of a car decreases its fuel efficiency by 3.88 miles per hour

A 1 unit (Horse) increase in the horsepower of a car decreases its fuel efficiency by 0.03 miles per hour