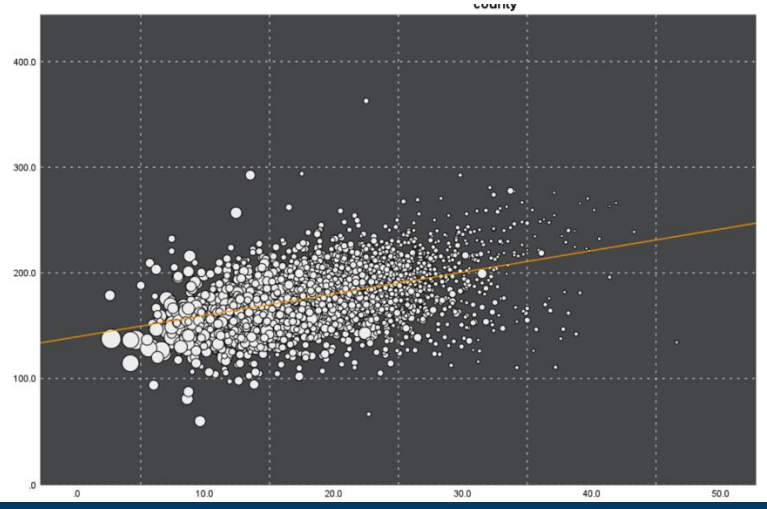

Getting started with regression techniques in SPSS

Jarlath Quinn

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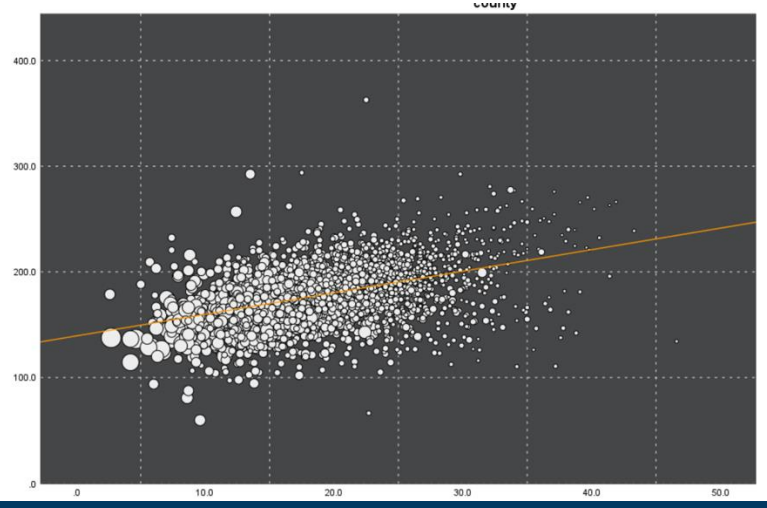


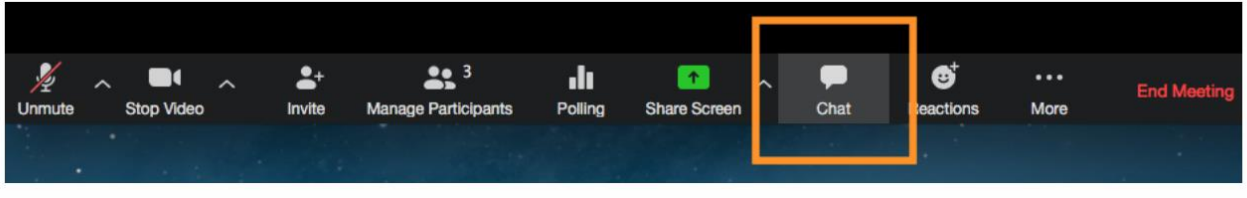
Just waiting for all attendees to join…

Getting started with regression techniques in SPSS

Jarlath Quinn

FAQ's

- Is this session being recorded? Yes
- Can I get a copy of the slides? Yes, we'll email links to download materials after the session has ended.
- Can we arrange a re-run for colleagues? Yes, just ask us.
- How can I ask questions? All lines are muted so please use the chat panel – if we run out of time we will follow up with you.



- Gold accredited partner to IBM, Predictive Solutions and DataRobot specialising in advanced analytics & big data technologies
- Work with open source technologies (R, Python, Spark etc.)
- Team each has 15 to 30 years of experience working in the advanced and predictive analytics industry

- Deep experience of applied advanced analytics applications across sectors
  - Retail
  - Gaming
  - Utilities
  - Insurance
  - Telecommunications
  - Media
  - FMCG

Agenda

- Overview of regression techniques and linear relationships
- Performing a Simple Linear Regression
- Using Multiple Linear Regression to make predictions
- Predicting response *probability* with Logistic Regression

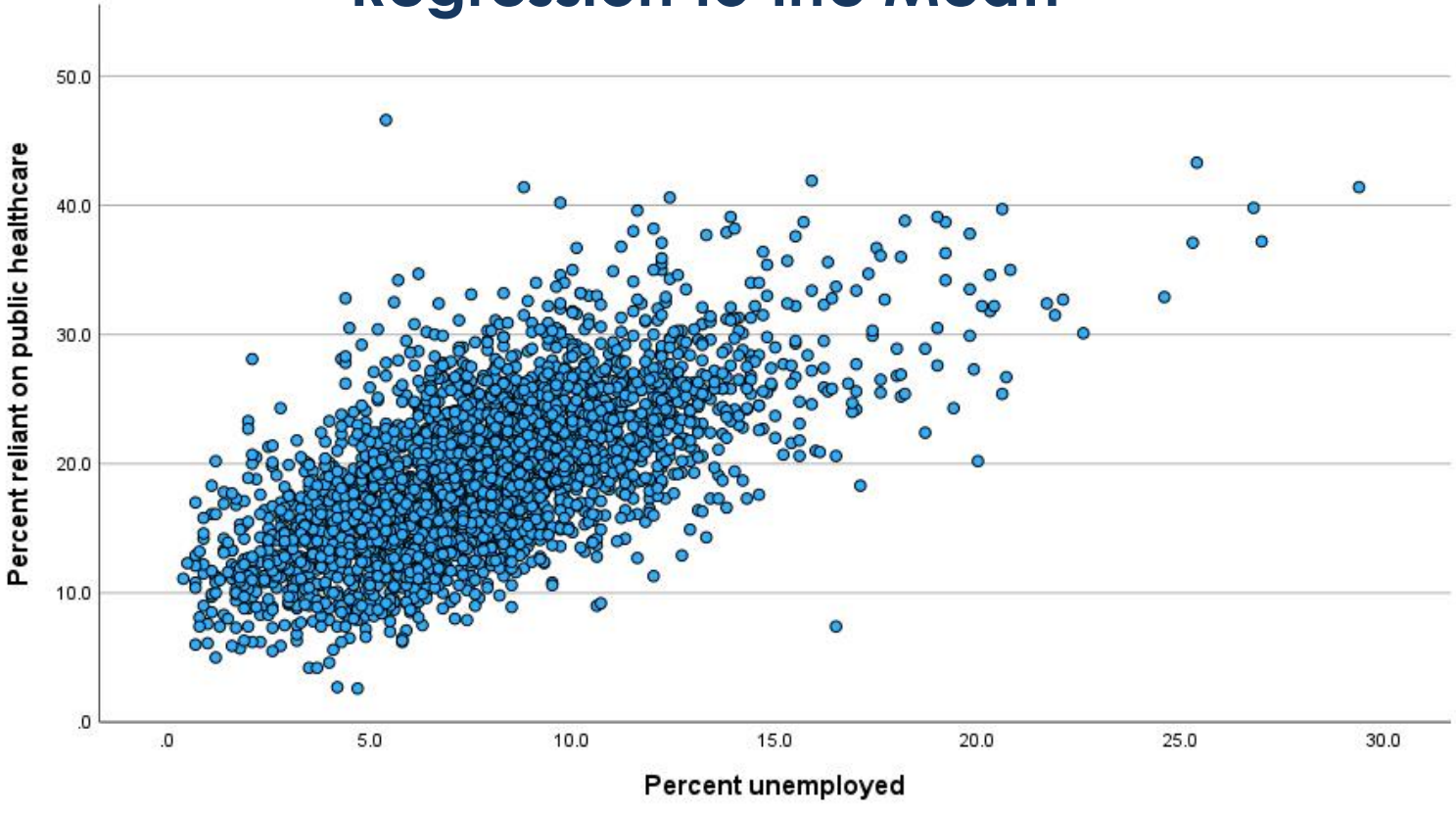
What do we mean by ‘Regression’?

- A family of statistical techniques used to predict outcomes and generate estimates for hundreds of applications
- Linear Regression is used
  - when the outcome is continuous (or scale) data
  - the relationships between the fields can be described using straight lines
- Quadratic Regression
  - Is a variant of Linear Regression when the outcome is continuous
  - the relationship with the dependent variable is curvilinear
- Logistic Regression is used
  - When the outcome consists or 2 (or more) categories
- Poisson regression
  - is commonly used when the dependent variable records counts of events

Where are Regression Techniques Used

- Modelling the relationship between promotion spend and revenue
- Estimating pollution levels following heavy rainfall
- Predicting tourism revenue based on exchange rates and air travel costs
- Predicting student test scores based on previous test results and peer-group performance
- Estimating website hits based on re-tweets and follower numbers
- Predicting sales of barbeques based on temperature forecasts

“Regression to the Mean”



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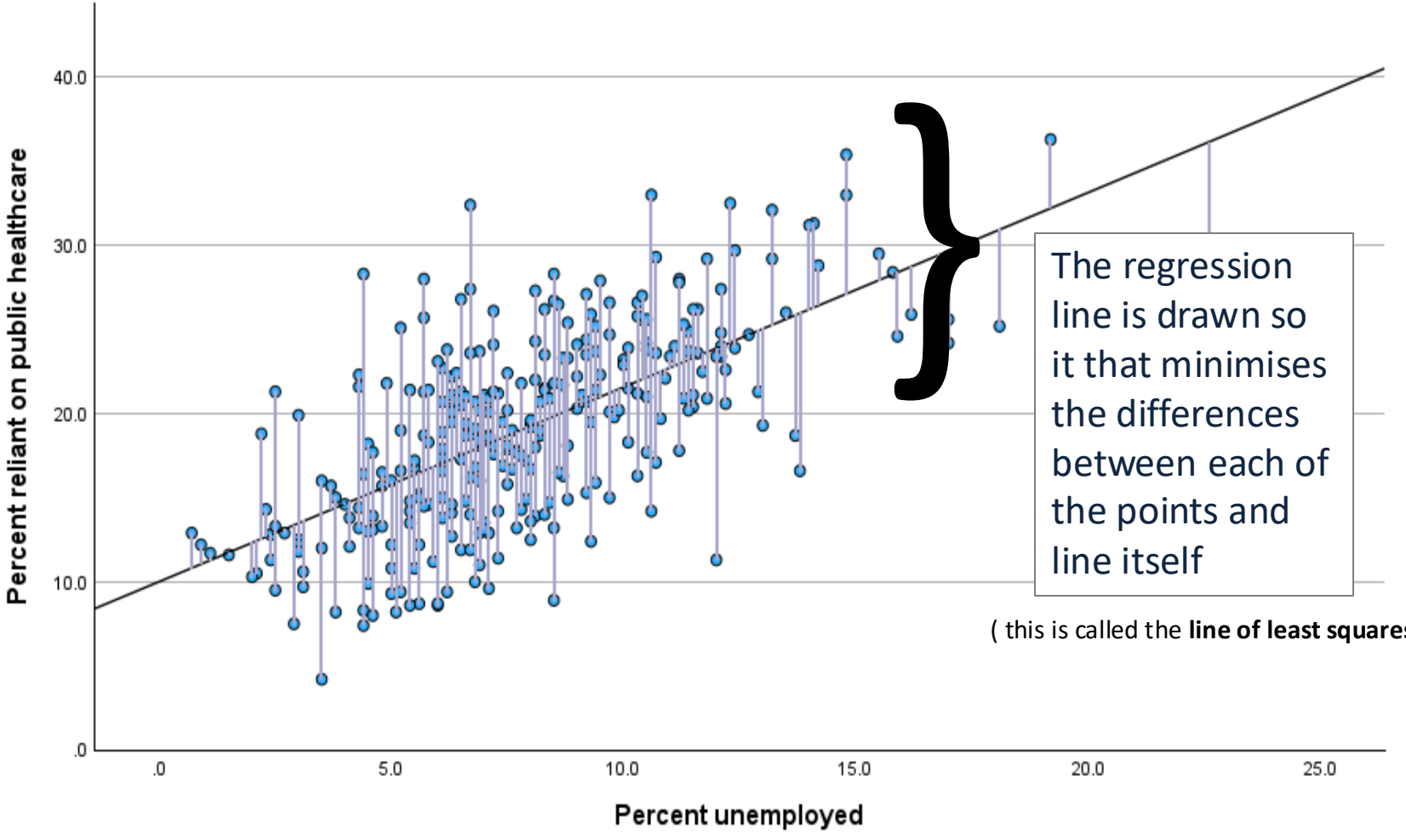
"Regression to the Mean"

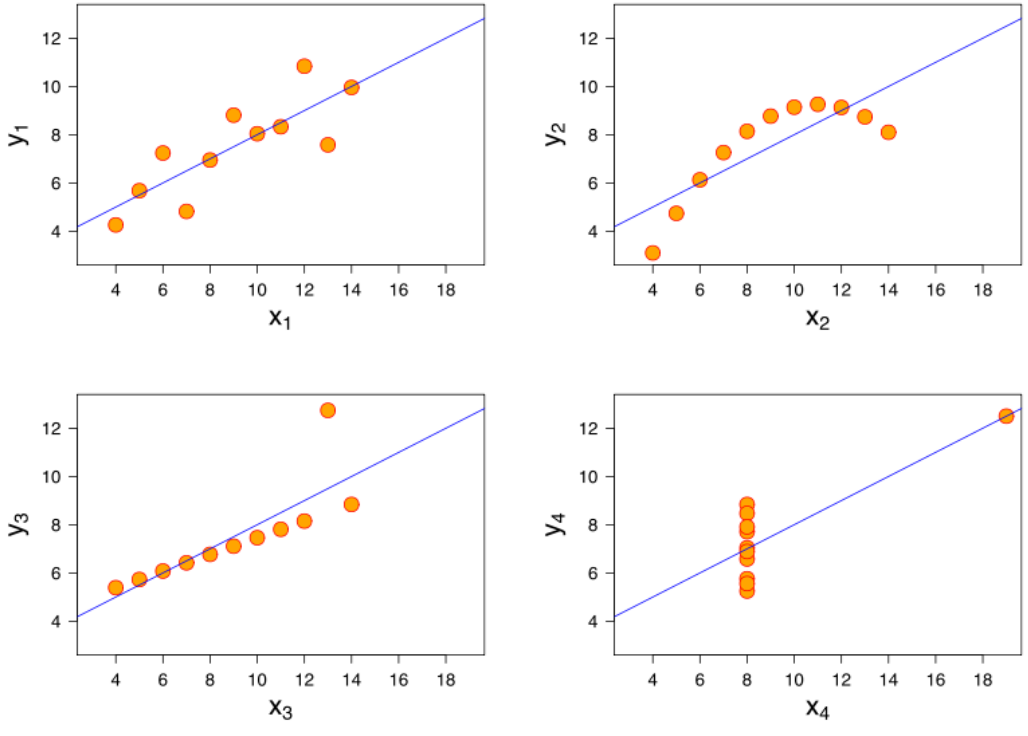


The regression line is drawn so it that minimises the differences between each of the points and line itself

(this is called the **line of least squares**)

Regression to the Mean

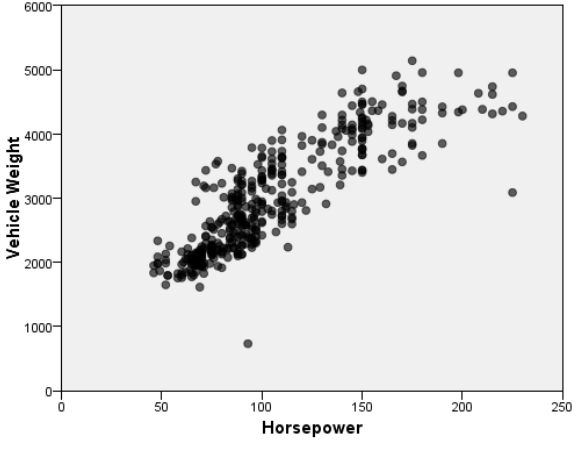
*

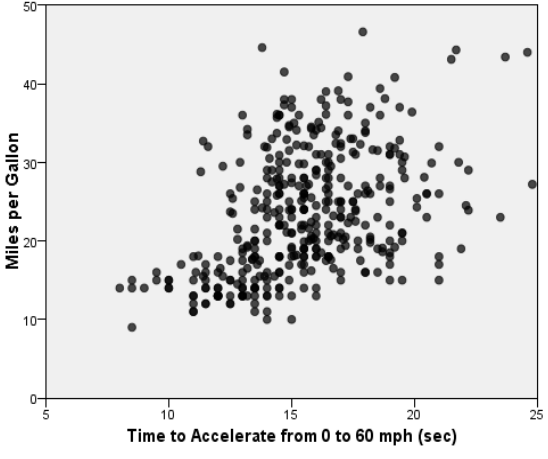


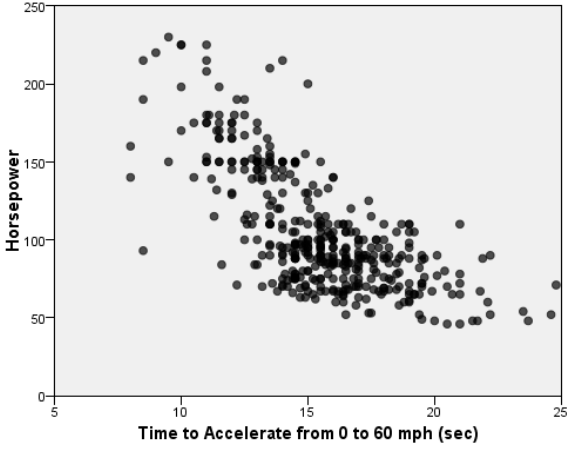
- But be careful…
- It is just an average after all…

**Anscombe's Quartet*

Measuring Linear Relationships







0.859

0.434

-.701

Pearson Correlation Values

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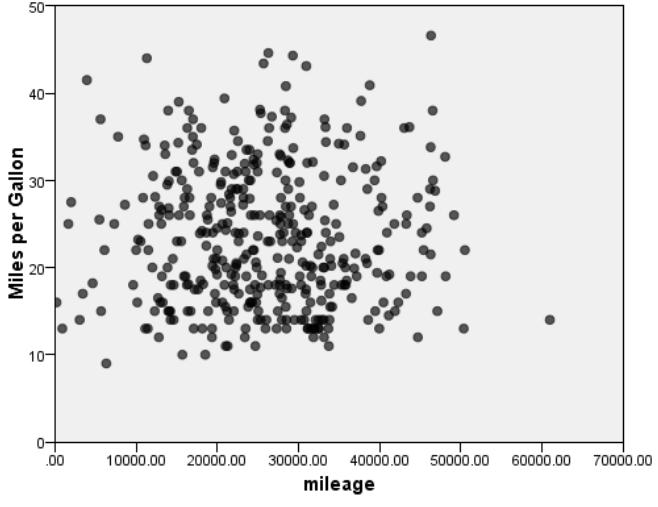
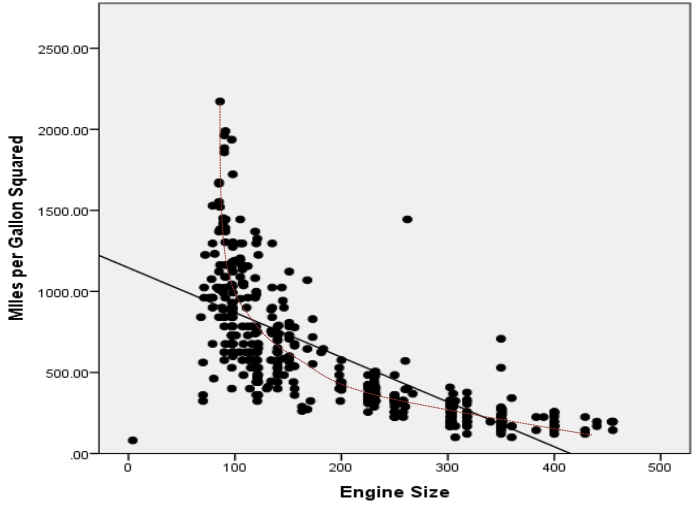
Non-Linear Relationships





-0.005

-.671

Pearson Correlation Values

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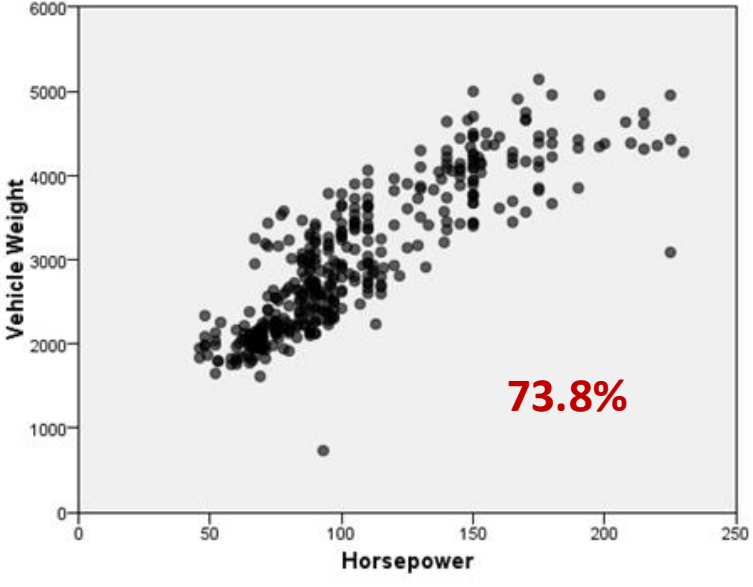
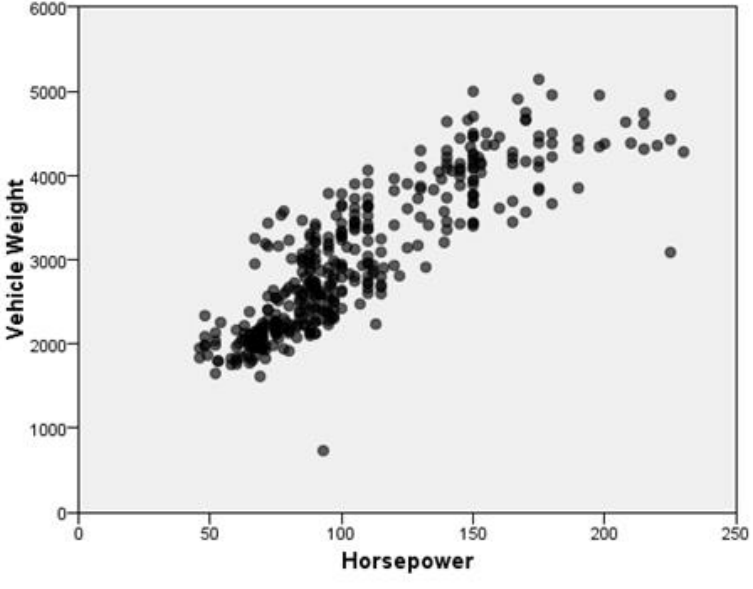
Correlations as Percentages

- Correlation = 0.859
- 0.859 x 0.859 = 0.738
- 0.738 = 73.8 %
- Correlation Squared = ‘R Square’



From Correlation to Prediction

How can we express linear relationships as predictive models?



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How long does it take to cook a chicken?

How long does it take to cook a chicken?

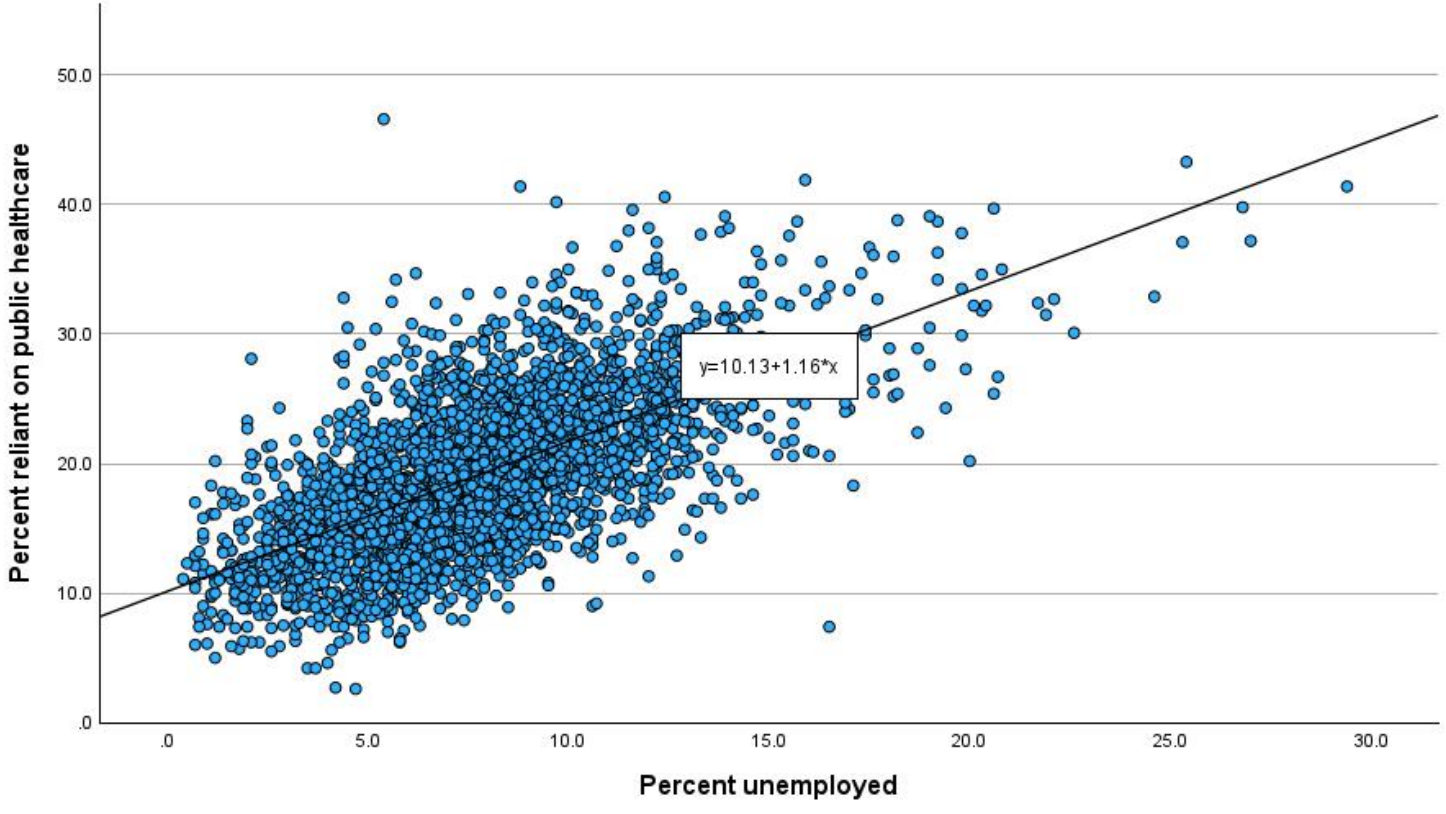
- 7 minutes per pound plus 45 minutes

$$y = mx + c$$

or

- 20 minutes per pound plus 20 minutes

$$y = a + bx$$



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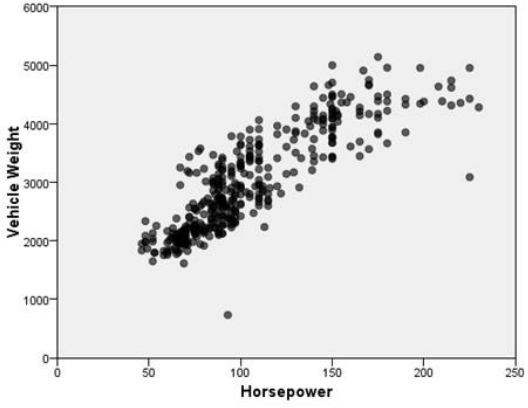

Lets look at a demo of Linear Regression in IBM SPSS Statistics

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How can we predict category outcomes?

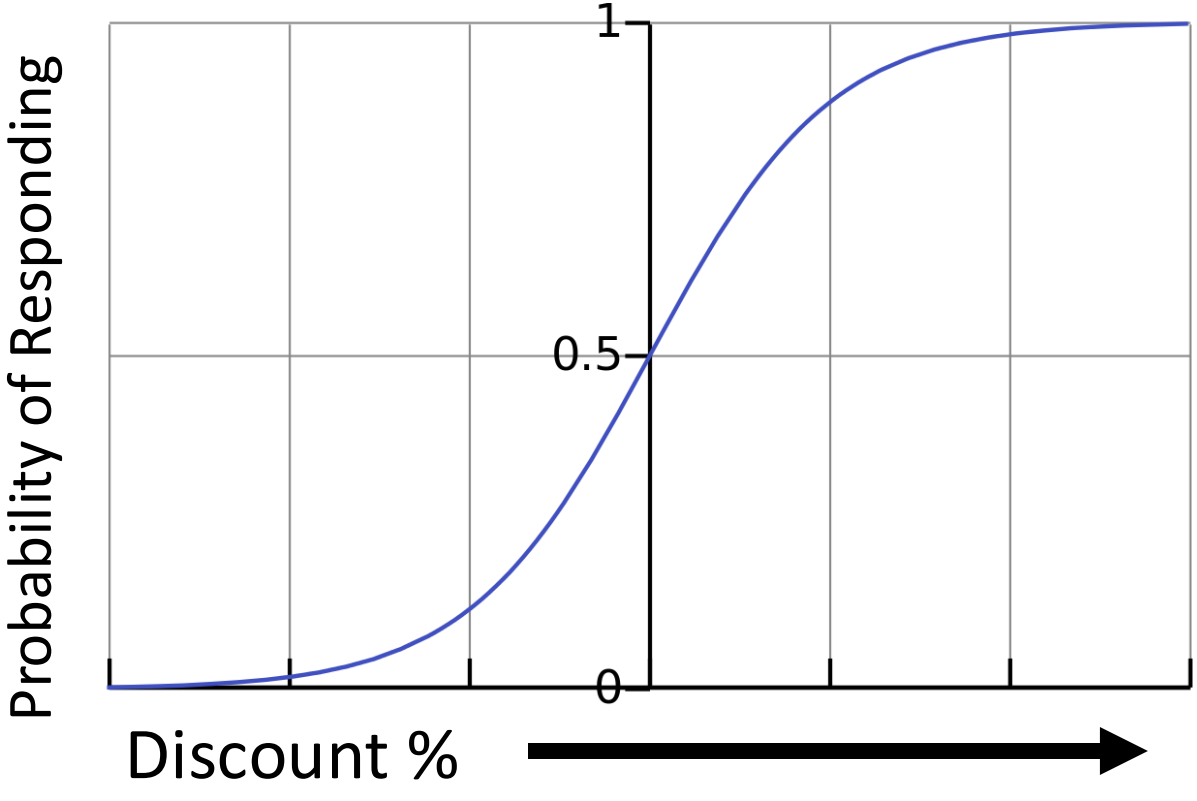
Logistic Regression

- Allows us to predict things that linear regression can't
- Such as…
  - Response to a marketing campaign
  - Credit risk
  - Whether a subscriber is likely to renew a service
  - Risk of equipment failure
  - How likely is it that a particular patient will be readmitted to hospital
  - Whether a charity donor will switch to Direct Debit

Logistic Regression

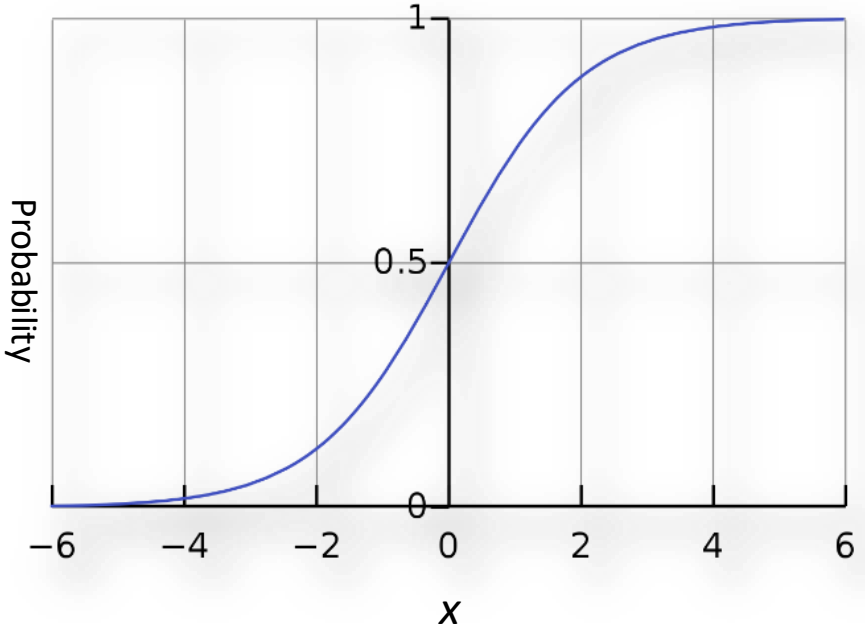
- But….
- These outcomes are not *continuous numbers* so standard linear regression won't work
- When the outcome consists of two categories we use *Binary* Logistic Regression
- When the outcome has three or more categories we use *Multinomial* Logistic Regression
- Logistic gets around the limitations of describing relationships with straight lines by using a special *sigmoid* curve

Logistic Regression



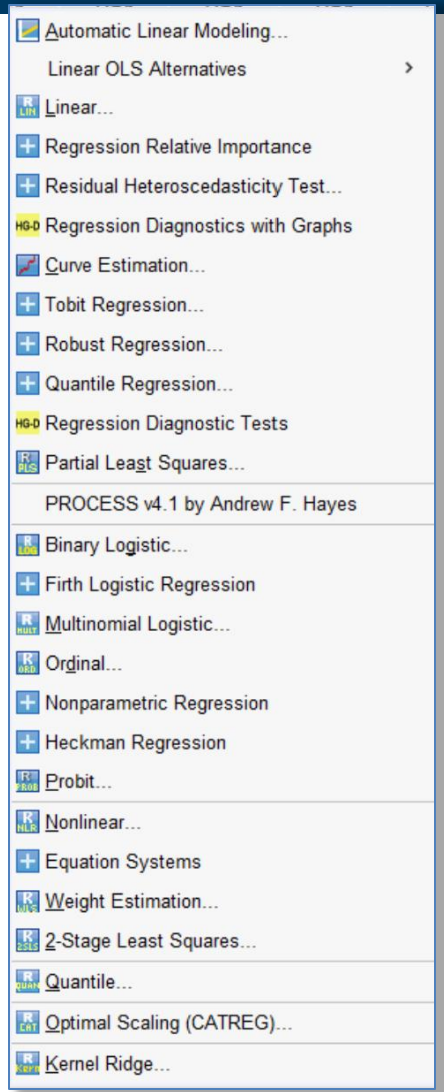
Logistic Regression

- There is a special formula that converts the values of the predictor coefficients on the x axis to the values on predicted probabilities on the y-axis
- But what *are* these numbers on the x-axis?



IBM SPSS Regression Methods

- SPSS Statistics has a **lot** of regression methods
- The **Regression Models** module adds several key methods like **Logistic Regression**
- Many additional methods are made available through SPSS' integration with **R** and **Python**



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Additional Resources

- How to model non-linear relationships
- Introduction to Moderation Analysis
- Introduction to Mediation Analysis

- Check what version / modules of SPSS you have installed
- See exactly what is included in the Regression Module

- Choosing the correct statistical test
- How to interpret significance tests
- Eat your greens blog series on statistical testing and procedures

Smart Vision provides a portfolio of online training materials **free** to existing customers or available for purchase

Factor and Cluster Analysis with IBM SPSS Statistics

£75.00
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Introduction to Time Series Forecasting with IBM SPSS Statistics

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Understanding and applying logistic regression techniques in SPSS Statistics

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Understanding and Applying Linear Regression Techniques in SPSS Statistics

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Building predictive models in SPSS Modeler

£75.00
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Statistical and significance testing in SPSS Statistics

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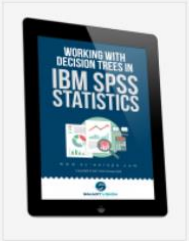

Working with decision trees in SPSS Statistics

Introduction to SPSS Modeler course

Introduction to IBM SPSS Statistics course

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  - Assist with selection, pilot, implementation & support of analytical tools
  - http://www.sv-europe.com/buy-spss-online/
- **Training and Consulting Services**
  - Guided consulting & training to develop in house skills
  - Delivery of classroom training courses / side by side training support
  - Identification & recruitment of analytical skills into your organisation
- **Advice and Support**
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Thank you