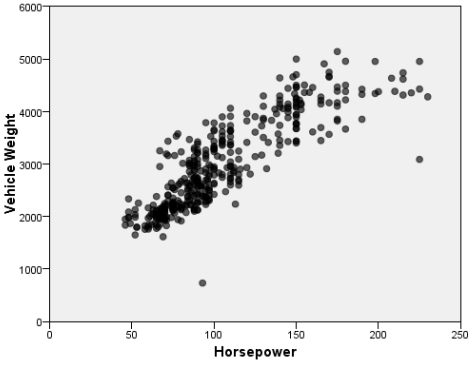
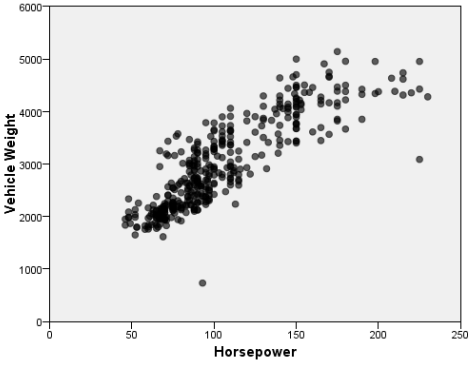


Getting started with regression techniques in SPSS

Jarlath Quinn



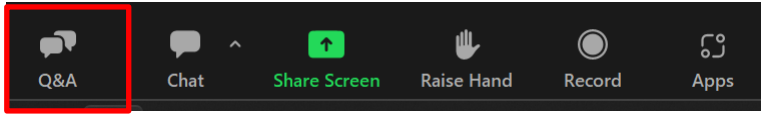
Just waiting for all attendees to join…

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 Q&A panel – if we run out of time we will follow up with you.



- Premier 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

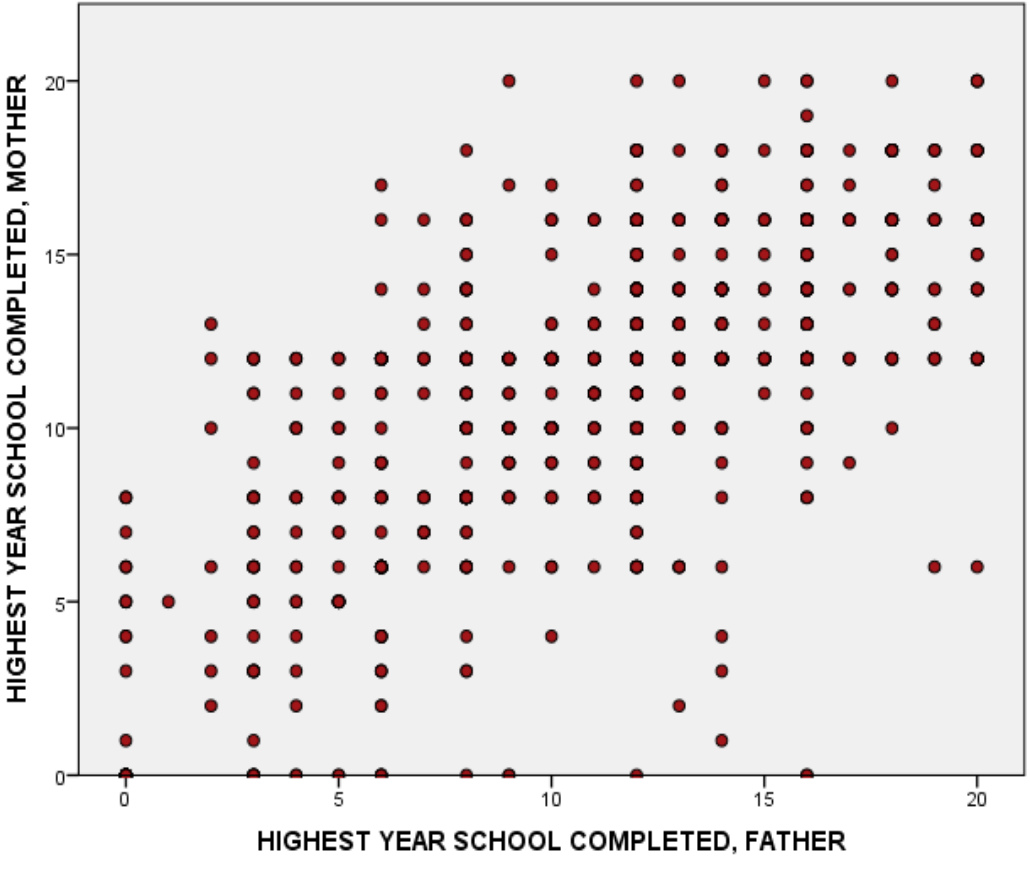
What do we mean by ‘Regression’?

- 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
- Non-Linear regression
  - is commonly used when the target relates to growth or a power law

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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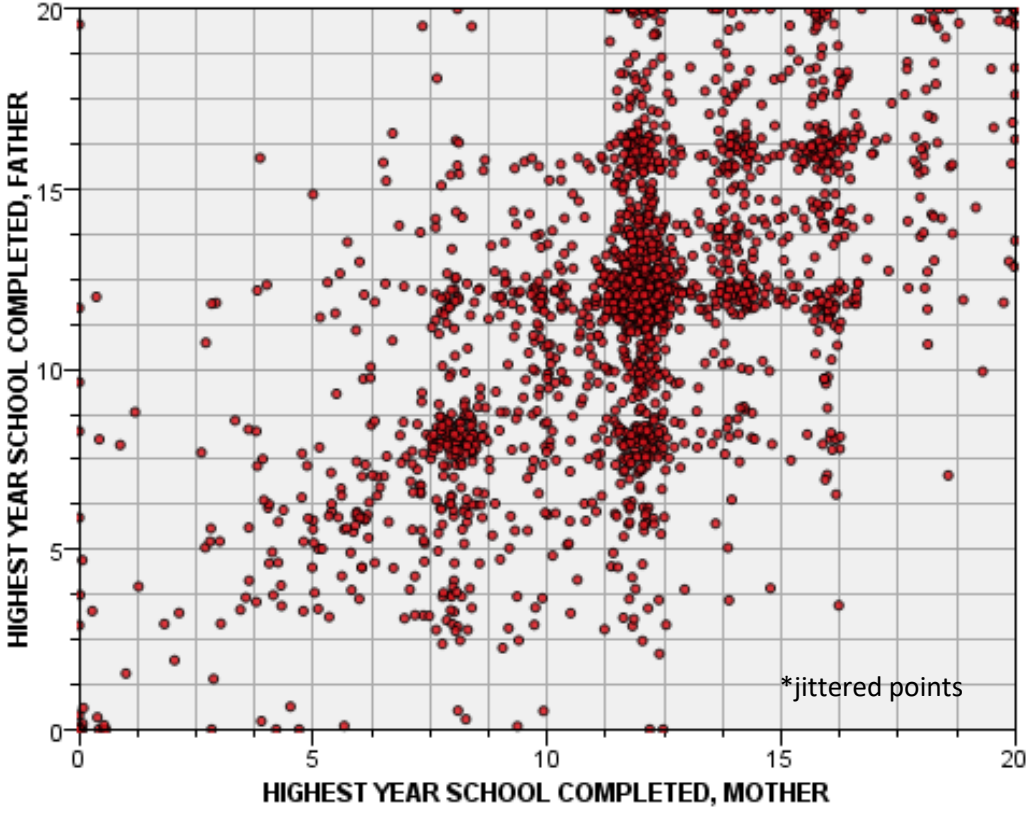
Regression to the Mean



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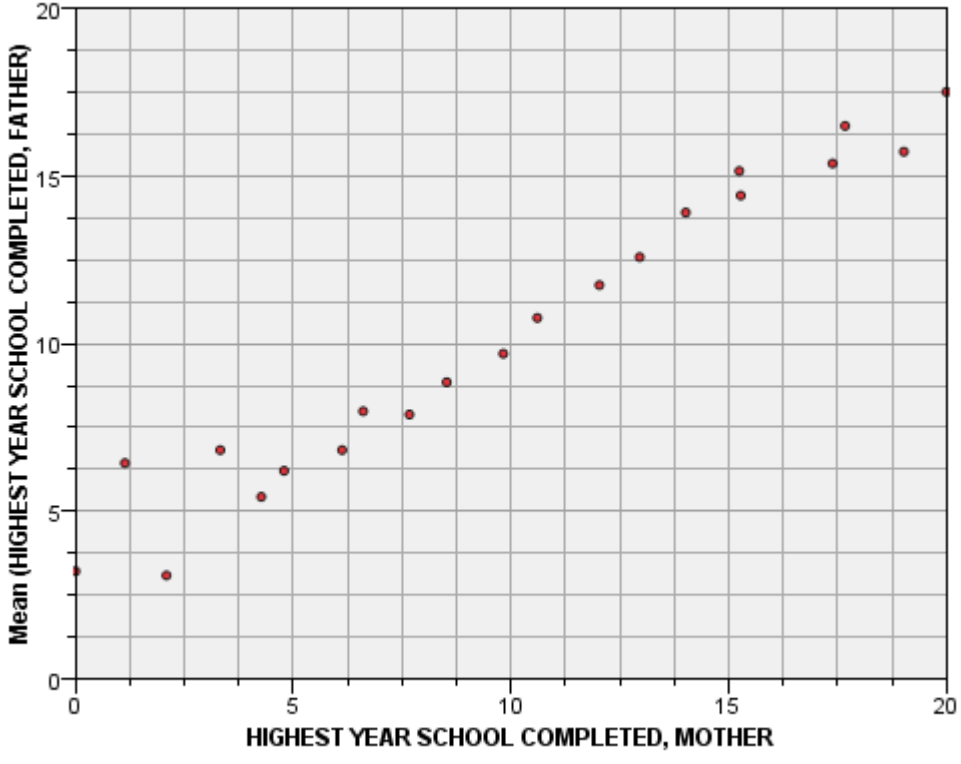
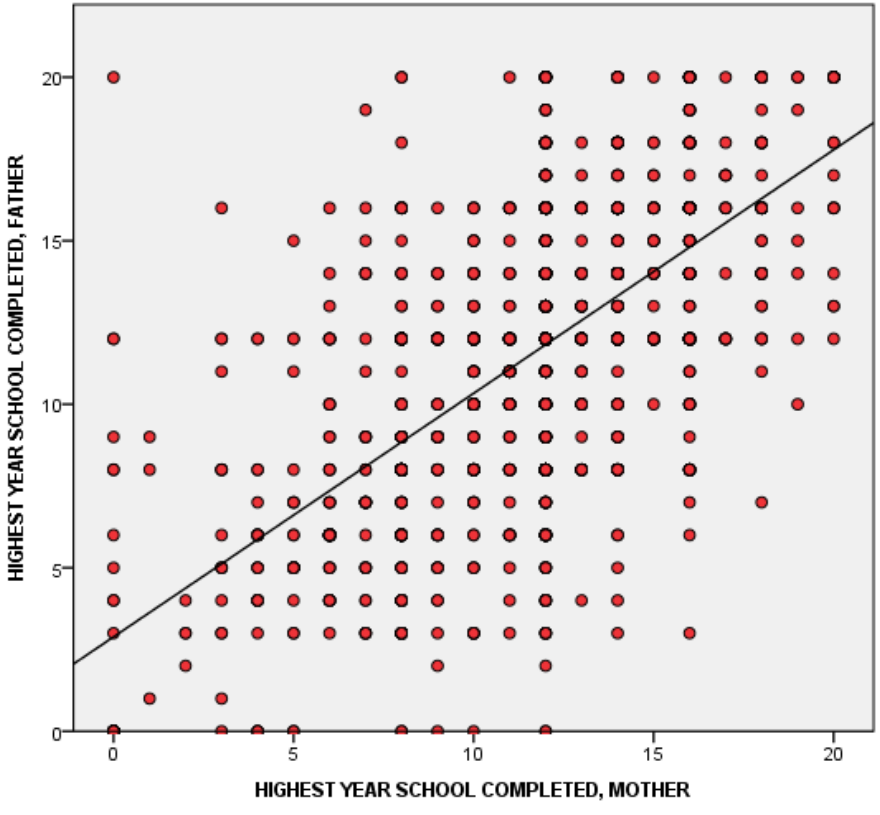
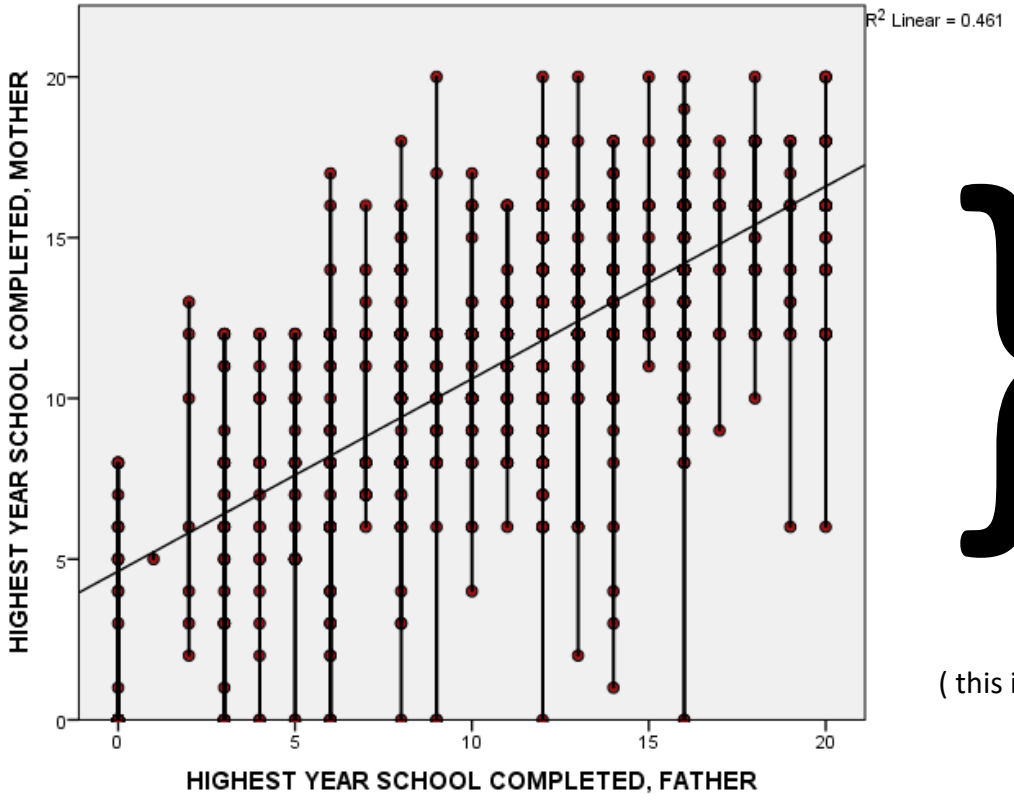
Regression to the Mean



Regression to the Mean



Regression to the Mean

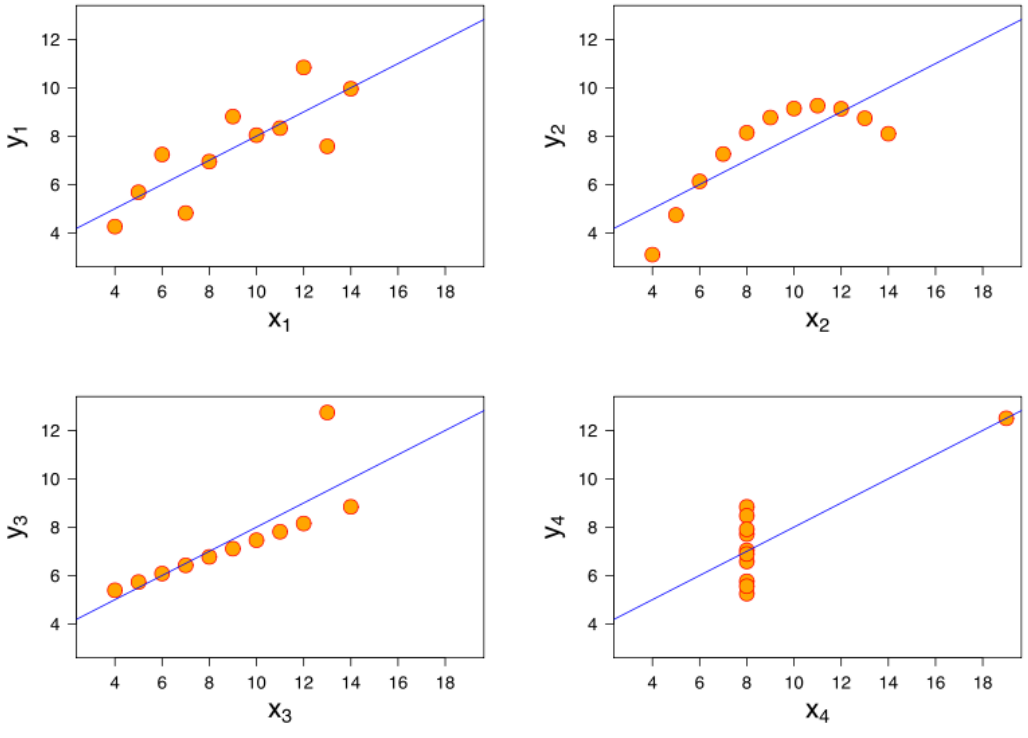


The regression line is drawn so it that minimises the differences between the points and line itself

(this is called the line of least squares)

Regression to the Mean

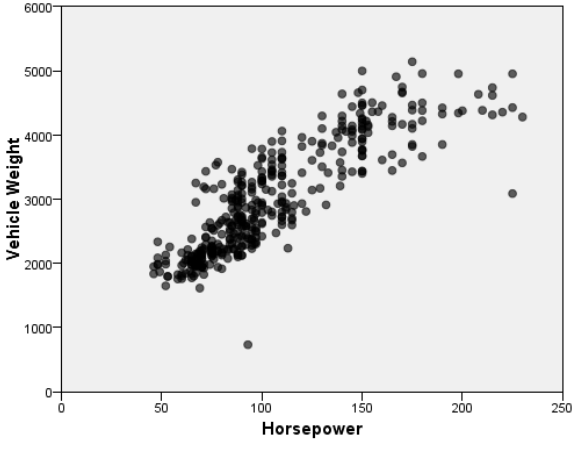
*

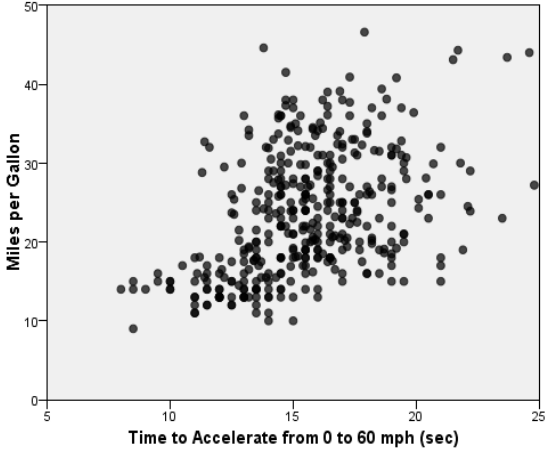


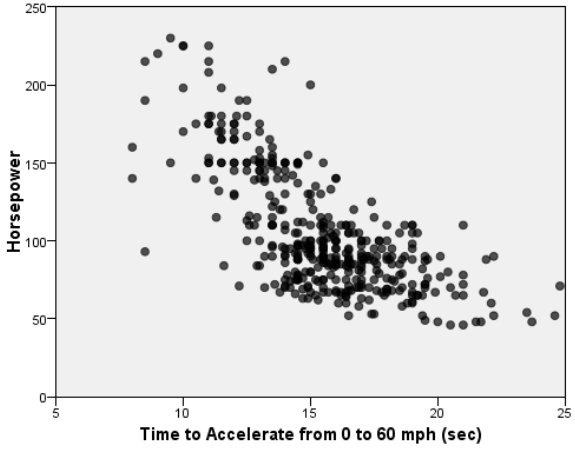
- But be careful…
- It is just an average after all…

**Anscombe's Quartet*

Measuring Linear Relationships







0.859

0.434

-.701

Pearson Correlation Values

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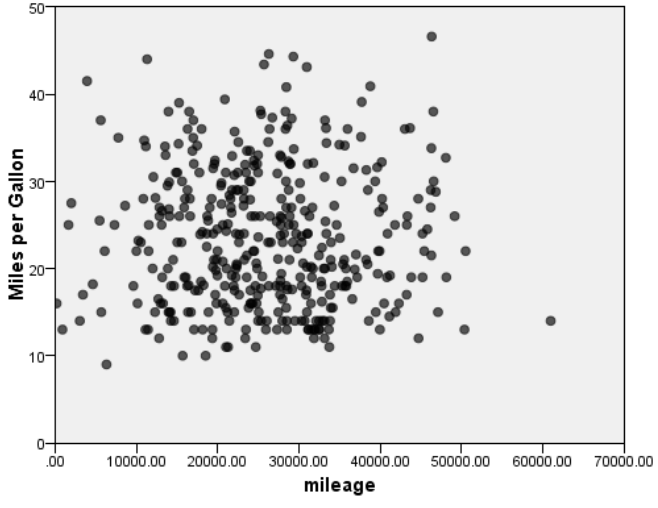
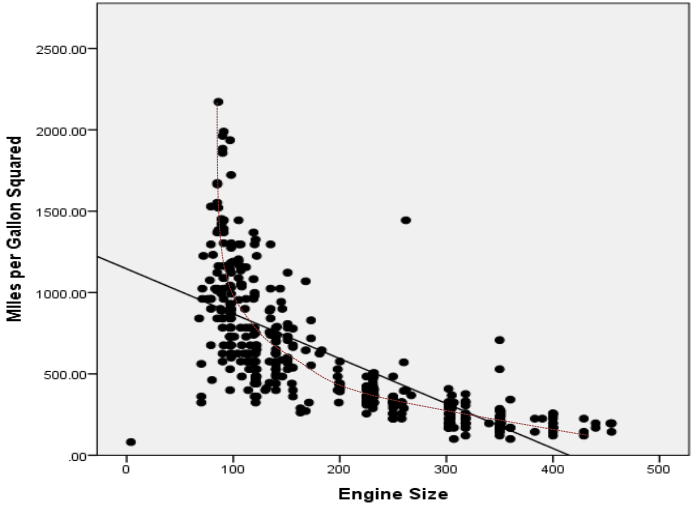
Non-Linear Relationships





-0.005

-.671

Pearson Correlation Values

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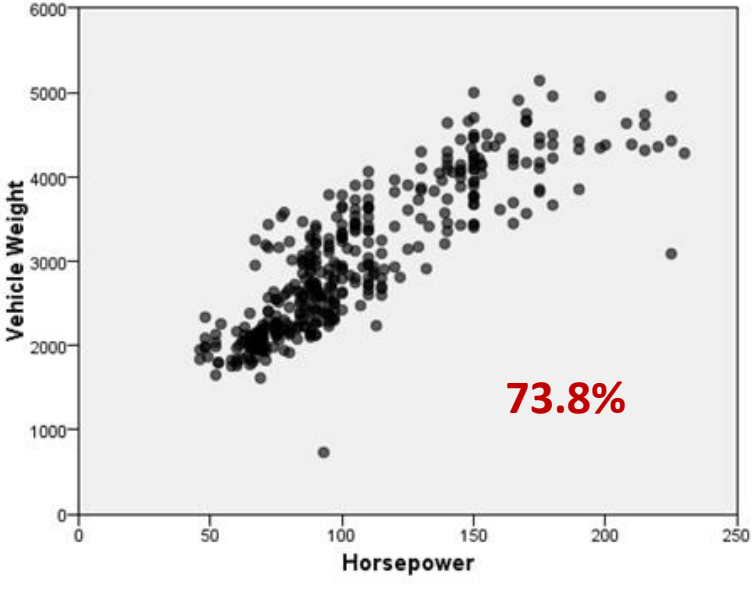
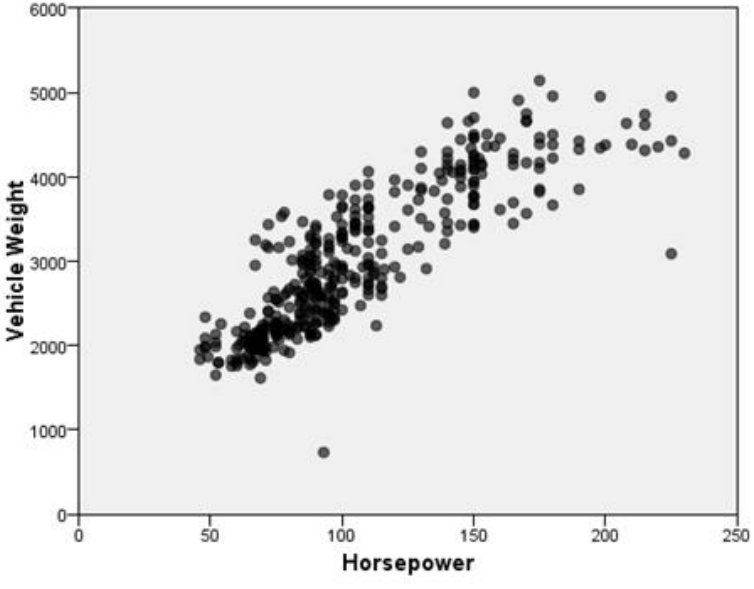
Correlations as Percentages

- 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?

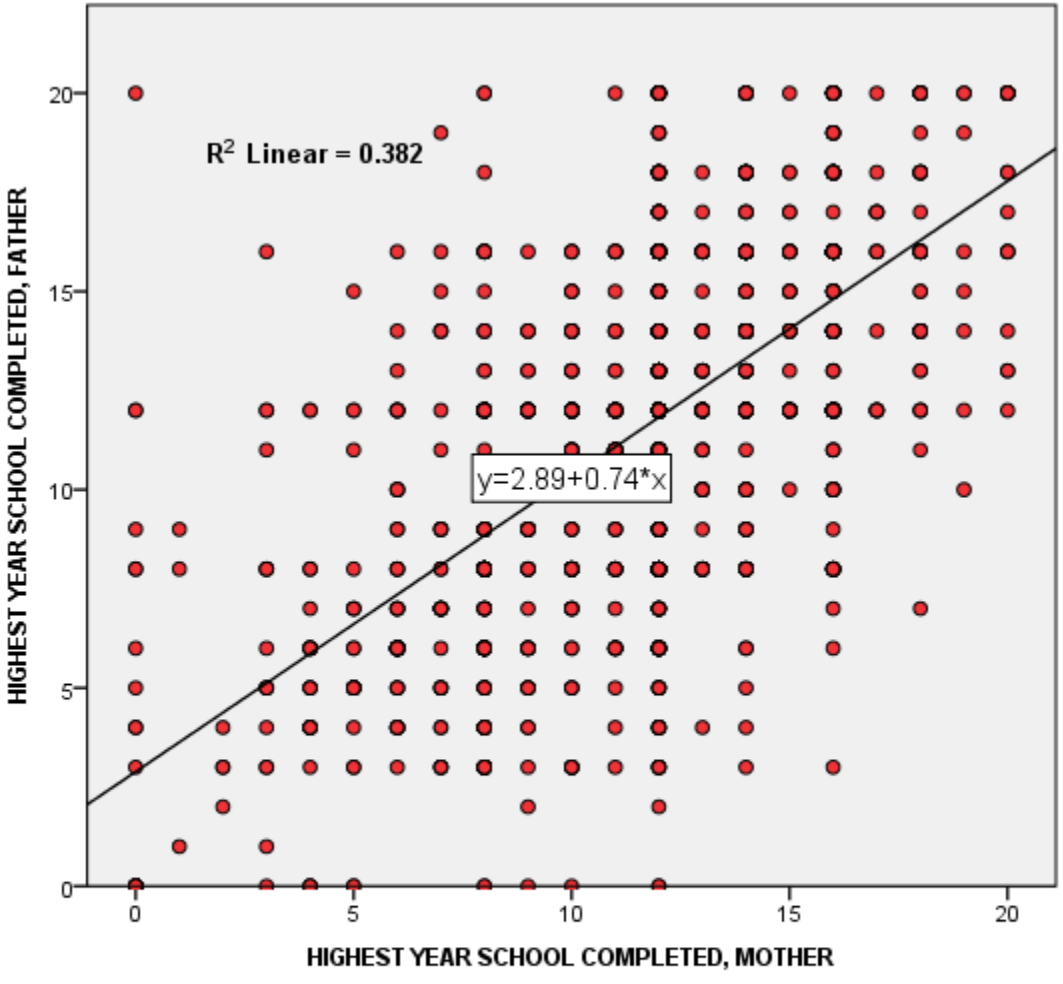
- 7 minutes per pound plus 45 minutes

$$y = mx + c$$

or

- 20 minutes per pound plus 20 minutes

$$y = a + bx$$



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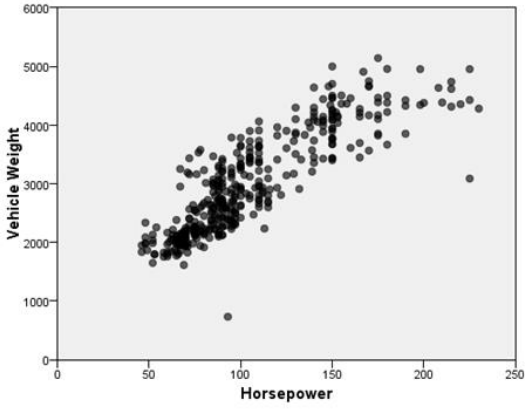

Lets look at a demo of Linear Regression in IBM SPSS Statistics

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How can we predict category outcomes?

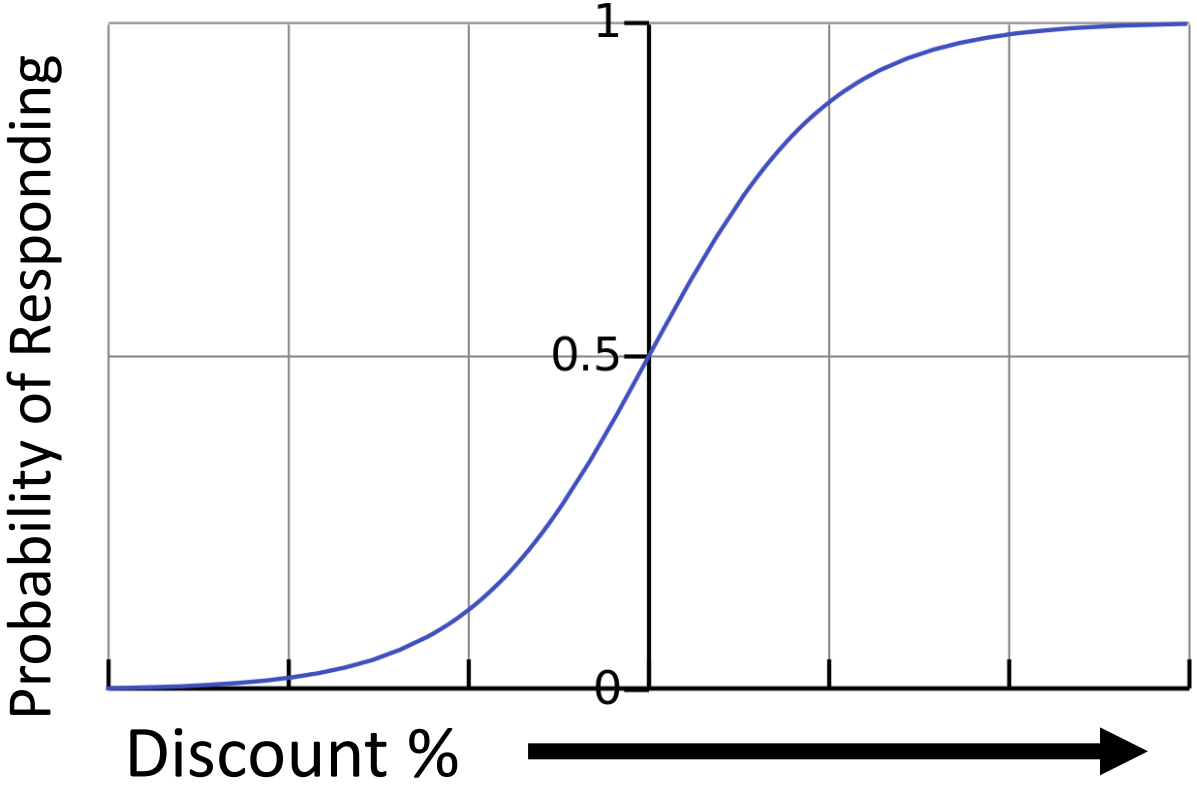
Logistic Regression

- 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

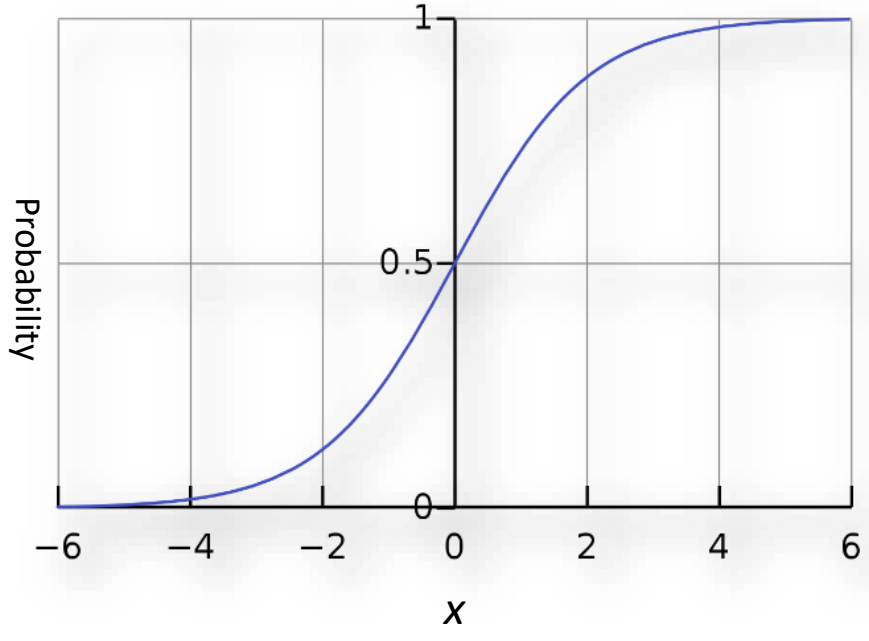
- But….
- These outcomes are not *continuous numbers* so standard linear regression won't work
- When the outcome consists of two categories we use *Binary* Logistic Regression
- When the outcome has three or more categories we use *Multinomial* Logistic Regression
- Logistic gets around the limitations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

Logistic Regression



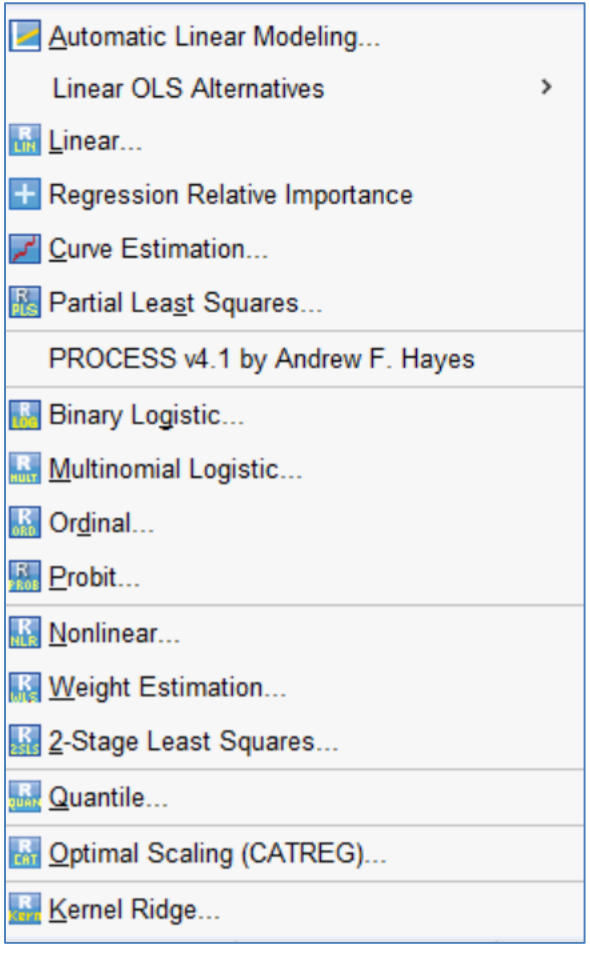
Logistic Regression

- 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 with R & Python integration

- Using the SPSS Regression module, we can go beyond Linear Regression and unlock many other types of Regression functionality



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Additional Resources

- How to model non-linear relationships
- Check what version / modules of SPSS you have installed
- See exactly what is included in the Regression Module
- Video Guides a wide range of SPSS “how to” topics with mini demos
- Choosing the correct statistical test
- How to interpret significance tests
- Eat your greens blog series on statistical testing and procedures

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- **Sourcing Software**
  - You can buy your analytical software from us often with discounts
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  - Guided consulting & training to develop in house skills
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Thank you