

TEXAS

WHAT STARTS HERE CHANGES THE WORL

MLE Straight-Line Regression

• Our model: $E[Y|X] = \beta_0 + \beta_1 X$

$$\beta_{1} = \frac{cov(X,Y)}{var(X)}$$

$$\beta_{0} = E[Y] - \beta_{1}E[X]$$

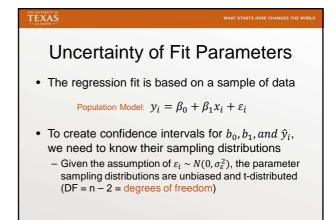
$$\rho = \frac{cov(X,Y)}{\sqrt{var(X)var(Y)}}$$

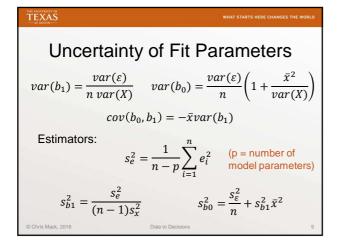
• Ordinary least squares (OLS) estimators:

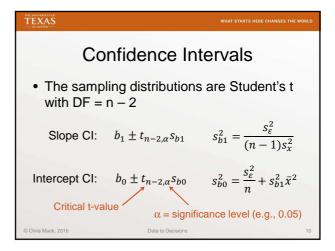
$$b_1 = \frac{\sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y})}{\sum_{i=1}^n (x_i - \bar{x})^2} \qquad b_0 = \bar{y} - b_1 \bar{x}$$

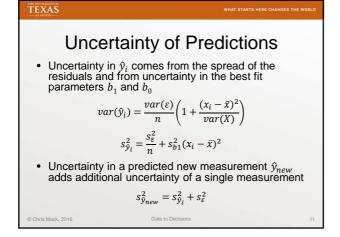
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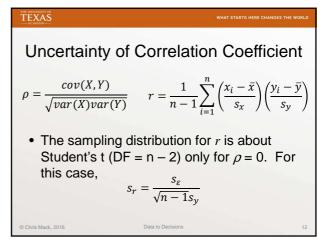
ata to Decisions











Uncertainty of Correlation Coefficient

- For $\rho \neq 0$, the sampling distribution is complicated
- We'll use the Fisher z-transformation:

$$z = \frac{1}{2} ln \left(\frac{1+r}{1-r} \right)$$

• When n > 25, z is about normal with

$$E[z] = rac{1}{2} ln igg(rac{1+
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ho}igg)$$
 Data to Decisi

Lecture 6: What have we learned?

- Why is the matrix formulation of OLS commonly used?
- What is the hat matrix? Why is it important?
- Be able to use the results of this lecture to calculate standard errors and confidence intervals for model parameters and predicted model values