Simple Notesale.co.uk Preview page 4 on Sar Regression (SLR)

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Linear Regression and Correlation

 Linear regression and correlation are aimedian understanding how two variables
predice related

- The variables are called Y and X
- Y is called the <u>dependent variable</u>
- X is called the independent variable
- We want to know how, and whether, X influences Y

Simple Linear Regression Model Prediction Equationesale.co.uk preview from x 2 of 57 **Sample Slope** $\hat{\beta}_1 = \frac{S_{xy}}{S_{xx}} = \frac{\sum (x_i - \overline{x})(y_i - \overline{y})}{\sum (x_i - \overline{x})^2}$ where

Sample Y-intercept

$$\hat{\beta}_0 = \overline{y} - \hat{\beta}_1 \overline{x}$$

 $S_{XY} = \sum x_i y_i - \frac{\sum x_i \sum y_i}{n}$

$$S_{XX} = \sum x_i^2 - \frac{(\sum x_i)^2}{n}$$

Simple Linear Regression Model (Example) Parameter Estimation Solution Table

previe	W Xi	10 ⁰	X_i^2	Y_i^2	$X_i Y_i$
PIO	4	3.0	16	9.00	12
	6	5.5	36	30.25	33
	10	6.5	100	42.25	65
	12	9.0	144	81.00	108
	32	24.0	296	162.50	218



negative correlation

Correlation analysis Testing the Coefficient of Correlation Here's There's to correlation between x and y. H₁: $\rho \neq 0$ There is a correlation between x and y. Reject H₀ if: $t > t_{\alpha/2,n-2}$ or $t < -t_{\alpha/2,n-2}$

Test Statistic:

$$t = \frac{r\sqrt{(n-2)}}{\sqrt{(1-r^2)}}$$

follows a Student's t Distribution with (n-2) degrees of freedom. (why d.f.=n-2?)

COEFFICIENT OF DETERMINATION

This coefficient represents the percentage change in the dependent variable explained by the independent variable. The formula for A shown below:

$R^2 = r^2 x 100$

For this example this would be calculated as follows:

 $R^{2} = 0.82^{2} x100$ = 67.24%

Based on the coefficient of determination approximately 67.24% of the number of buns sold can be explained by the number of raisins per bun.

Multiple Regression (MINITAB)



