Chapter 14: Notes

December 1, 2019

Section 14.1

y-Intercept and Slope

For a linear equation $y = b_0 + b_1 x$, the number b_0 is called the y-intercept and the number b_1 is called slope. The y-intercept of a line is where it intersects the y-axis. The slope of a line measures its steepness.

Graphical Interpretation of Slope

The graph of the linear equation $y = b_0 + b_1 x$ slopes upward if $b_1 > 0$, slopes downward if $b_1 < 0$, and is horizontal if $b_1 = 0$.

Section 14.2

Scatterplot

A scatter plot is a graph of data from two quantitative variables of a population. In a scatterplot, we use a horizontal axis for the observations of one variable and a vertical axis for the observations of the other variable. Each pair of observations is then plotted as a point.

Note:

Data from two quantitative variables of a population are called bivariate quantitative data.

Least-Squares Criterion

The least-squares criterion is that the line that best fits a set of data points is the one having the smallest possible sum of squared errors.

Regression Line and Regression Equation

Regression line: The line that best fits a set of data points according to the least-squares criterion.

Regression equation: The equation of the regression line.

Notation used in Regression and Correlation

For a set of n data points, the defining computing formulas for $S_x x$, $S_x y$, and $S_y y$ are as follows.

Quantity	Defining formula	Computing formula
$S_x x$	$\sum (x_i - \bar{x})^2$	$\sum x_i^2 - (\sum x_i)^2 / n$
$S_x y$	$\sum (x_i - \bar{x})(y_i - \bar{y})$	$\sum x_i y_i - (\sum x_i)(\sum y_i)/n$
$S_y y$	$\sum (y_i - \bar{y})^2$	$\sum y_i^2 - (\sum y_i)^2 / n$

Regression Equation

The regression equation for a set of n data points is $\hat{y} = b_0 - b_i \bar{x}$, where

$$b_1 = \frac{S_x y}{S_x x} \quad and \quad b_0 = \bar{y} - b_1 \bar{x} = \frac{1}{n}\left(\sum y_i - b_i \sum x_i\right),$$

These two equation give the slope and y-intercept of the regression line, respectively.

Response Variable and Predictor Variable

Response variable: The variable to be measured or observed.

Predictor vatiable: A variable used to predict or explain the value of the response variable.

Criterion for Finding a Regression Line

Before finding a regression line for a set of data points, draw a scatterplot. If the data points do not appear to be scattered about a line, do not determine a regression line.