

14.3 The Coefficient of Determination

The coefficient of determination, r^2 , tells us how much of the change in the dependent (response) variable is explained by the regression equation

The value of r^2 is always between 0 and 1 $0 \leq r^2 \leq 1$

- Values of r^2 near 0 (zero) mean the regression line is not useful to predict the y-value
- Values of r^2 near 1 mean the regression line is very useful to predict the y-value

Think: If $r^2 = 1$, then 100% of the variation in y is explained by the regression equation (using the x-variable)

ex corvette prices: x (age) y (price in \$100s)

L1 x | 6 6 6 2 2 5 4 5 1 4

L2 y | 290 280 295 425 384 315 355 328 425 325

$r^2 = .937$ 93.7% of the variation in corvette price is explained by the age $\rightarrow$ predictor response
The other 6.3% is due to other factors

ex x = height | 71 68 71 65 66 68 68 64 62 65

y = score | 87 96 66 71 71 55 83 67 86 60

LinRegTTest $r^2 = .008$ 0.8% of the change in final exam score is explained by the height of the student.
The other 99.2% is due to other factors

14.4 Linear Correlation

Two variables are correlated if they both increase or decrease together

Just because two variables are correlated does not mean one caused the other

Correlation does not mean Causation!

The correlation coefficient, r , measures how good a fit the scatter plot is to the regression equation $-1 \leq r \leq 1$

- Values near 0 mean the points are not in a linear pattern
- Values near -1 or 1 mean the points are in a linear pattern

The sign of r is the same sign as the slope of the line, b .

Note: If r is positive, then when x increases, y increases
If r is negative, then when x increases, y decreases

For corvette problem:

$r = -.968$ There is a strong, negative, linear correlation between age and price of a corvette

For positive r

$r > .7$ strong

$.4 \leq r \leq .7$ moderate

$r \leq .4$ weak

For negative r

strong

moderate

weak

ex	$x = \text{height}$ (inches)	71	68	71	65	66	68	68	64	62	65
	$y = \text{score}$	87	96	66	71	71	55	83	67	86	60

Lin Reg TTest $r = .087$ There is a weak, positive, linear correlation between height and final exam score