

UST700: RESEARCH METHODS I

COMPUTER LAB #3

MEAN PREDICTION, CONFIDENCE INTERVAL

Runway work to illuminate safety hazard by Michael Sangiacomo, The Plain Dealer, 8/24/1997, Section B, pages 1 and 4, reports the number of incidents (accidents) at 10 airports in the USA and the number of arrivals and departures at those airports for the period 1990 to 1996. The Cleveland Hopkins has a disproportionately large number of incidents.

clevincid := 83

clevarrivdept := 1837061

INCIDENTS :=	$\begin{pmatrix} 63 \\ 50 \\ 62 \\ 47 \\ 53 \\ 48 \\ 44 \\ 44 \\ 40 \end{pmatrix}$	ARRIVDEPT :=	$\begin{pmatrix} 6020212 \\ 5633187 \\ 4886539 \\ 3655929 \\ 3292425 \\ 2966632 \\ 2187357 \\ 1757460 \\ 1750872 \end{pmatrix}$
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$r := \text{corr}(\text{ARRIVDEPT}, \text{INCIDENTS})$

$r = 0.826$

$r^2 = 0.682$

$\beta_1 := \text{intercept}(\text{ARRIVDEPT}, \text{INCIDENTS})$

$\beta_1 = 35.594$

$\beta_2 := \text{slope}(\text{ARRIVDEPT}, \text{INCIDENTS})$

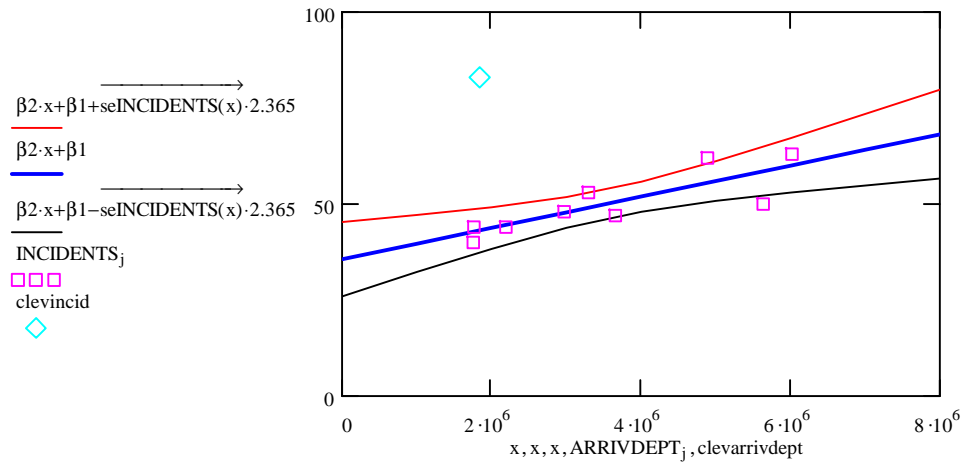
$\beta_2 = 4.064 \times 10^{-6}$

$$\sigma_{\text{hat}} := \sqrt{\frac{9}{7} \cdot \text{var}(\text{INCIDENTS}) \cdot (1 - r^2)} \quad \text{seINCIDENTS}(x) := \sqrt{\frac{\sigma_{\text{hat}}^2}{9} \left[1 + \frac{(x - \text{mean}(\text{ARRIVDEPT}))^2}{\text{var}(\text{ARRIVDEPT})} \right]}$$

$\sigma_{\text{hat}} = 4.795$

$x_j := j \cdot 10^6$

$j := 0..8$

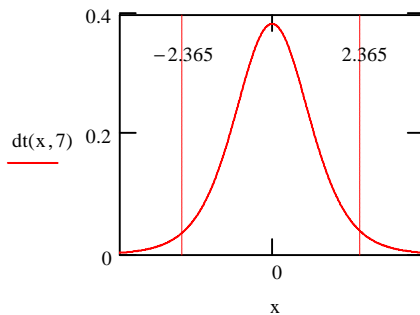


The critical t for 7df and 95% confidence is 2.365. You can read this value from the table in Gujarati's textbook. Mathcad computes this value by using the function qt.

$$qt(0.975, 7) = 2.365$$

$$x := -10, -9.99.. 10$$

Below you see the graph of the t distribution for 7df.



$$\int_{-2.365}^{2.365} dt(x, 7) dx = 0.95$$

Hypothesis test

H_0 : the number of accidents in Cleveland is in line with the national standards for similarly sized airports

H_1 : the number of accidents in Cleveland is larger than the number of accidents at similarly sized airports.

Since the number of accidents in Cleveland is outside the 95% confidence interval (see Figure) we reject the null hypothesis.