Badeaux Company

Shipping Packages

Cost vs. Weight

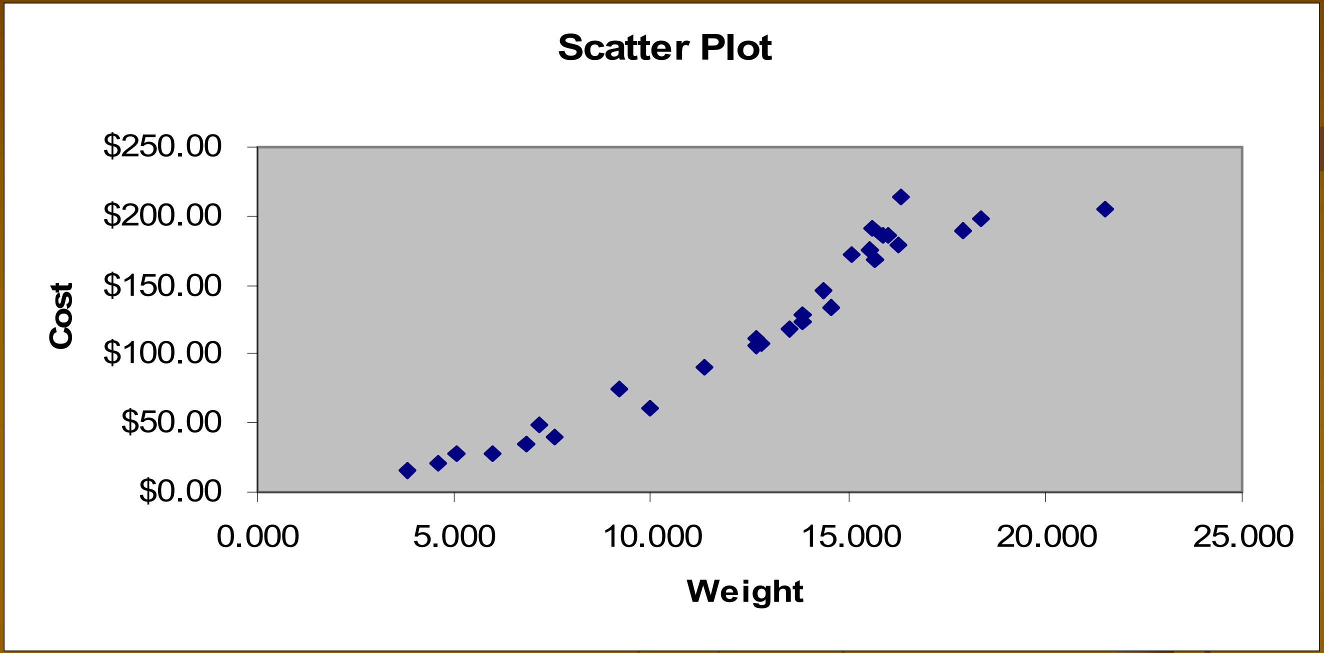
Study of Shipping Costs

- Sample of 29 shipping incidents have been reviewed
- Data indicates the weight of each package and the cost to ship each one
- Data has been analyzed to see if there is a direct relationship between the weight and cost of shipping

Basic Statistics

	Weight (lbs)	Cost ($)
Count	29	29
Sum	363.93	3476.08
Minimum	3.79	15.3
Maximum	21.5	214.38
Mean	12.55	119.86
Median	13.82	122.99
Standard Deviation	4.58	64.47

Scatter Plot



- Weight is the Independent Variable
- Cost is the Dependent Variable
- Based on the Scatter Plot, it appears that the cost vs. weight has a positive linear relationship

Correlation between Data

- The correlation coefficient is .96485
  - This indicates that there is a positive relationship, that is close to being perfectly linear, between the cost and weight

Testing the Correlation

- The correlation is tested to determine if there is a statistically significant correlation between the cost and weight
  - Using $\alpha = .05$, we have $t_{.025} = 2.228$
  - H_O: $\rho = 0$ (no correlation); H_A: $\rho \neq 0$
  - If $t > 2.228$, reject H_O
  - If $t < -2.228$, reject H_O, otherwise do not reject H_O
  - $t = .96485/ \sqrt{(1-.93094)/27} = 19.077$
  - Since 19.077 > 2.228, we reject HO and conclude that there is a positive linear relationship between the weight and cost of shipping

Regression

- Based on the data collected, the Estimated Regression Equation is:

  $$y = -50.94 + 13.607\,x$$

- The y-intercept of the regression line is

  -50.94
- The slope of the regression line is 13.607

Testing the Regression Coefficient

- We test the regression coefficient to determine whether the regression model is statistically significant or whether the slope is equal to zero
  - Using $\alpha = .05$, we have $t_{.025} = 2.228$
  - H_O: $\beta1 = 0$; H_A: $\beta1 \neq 0$
  - If $t > 2.228$, reject H_O
  - If $t < -2.228$, reject H_O, otherwise do not reject H_O

  - $t = (13.607 – 0)/ .7455 = 18.25$

  - Since $18.25 > 2.228$, we reject H_O and conclude that the true slope does not equal zero

Regression Coefficient

- Conducting a 95% Confidence interval for the Regression Coefficient:

  $13.607 \pm 2.228(.7455)$

  We find that the we can be 95% confident that the slope will be between 11.946 and 15.268

Linear Regression

- Looking again at our regression equation:

  y = -50.94 + 13.607 x

We find $R^2 = .96485^2 = .9309$

93% of the relationships between the weight and cost of the packages we ship can be determined using the regression equation

Regression Model Examples

- Using y = -50.94 + 13.607 x

- Predict the cost for a package weighing 12.5 lbs:
  - y = -50.942 + 13.607 (12.5) = $119.15

- Predict the weight of a package costing $120:
  - 120 = -50.942 + 13.607 x
  - 170.942 / 13.607 = 12.563 lbs

Data Summary

- By looking at the data and statistics we have calculated, we conclude that there is a positive, linear relationship between the weight of packages and the cost to ship them.
- For each increase in weight, there is an increase in the shipping cost.

Data Summary

- About 93% of the data from the items we ship will fall on regression line that we have calculated with a y-intercept of

  -50.94 and a slope of 13.607

- We can use the regression equation

  $y = -50.942 + 13.607\,x$

  to predict with weight or cost for shipping, when at least one of two is known

  (x being the weight, y being the cost)

Cost-Saving Strategies

- By using the equation to predict what shipping costs will be, based on the weight of our products, we can make sure our currently shipping and handling charges to customers are, on average, covering our costs to ship

Cost-Saving Strategies

- We can look into how we package our products to see if we can using light-weight packing materials to decrease the weight of each package, decreasing the shipping costs