STAT 328

Lab 3 Solutions

Estimation of a Population Standard Deviation

$n = 40$

$s = 0.2564$

$df = 39$

$L = \chi^2_{(39, .95)} = 25.695$

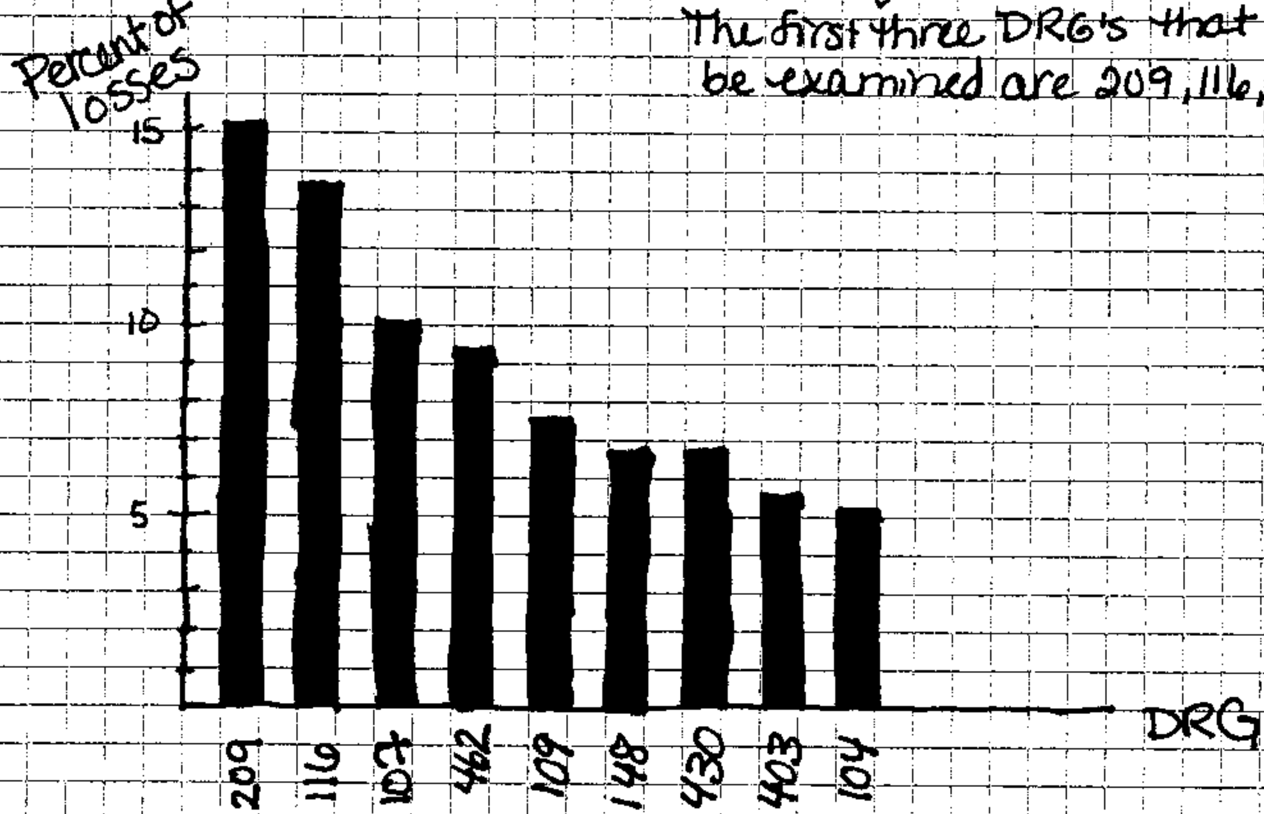
$U = \chi^2_{(39, .05)} = 54.572$

90% CI for σ

$$\left(\sqrt{\frac{(n-1)s^2}{U}}, \sqrt{\frac{(n-1)s^2}{L}} \right)$$

$(0.217, 0.316)$

12.3



These nine DRGs account for 80.5% of the total losses. The first three DRG's that should be examined are 209, 116, + 107.

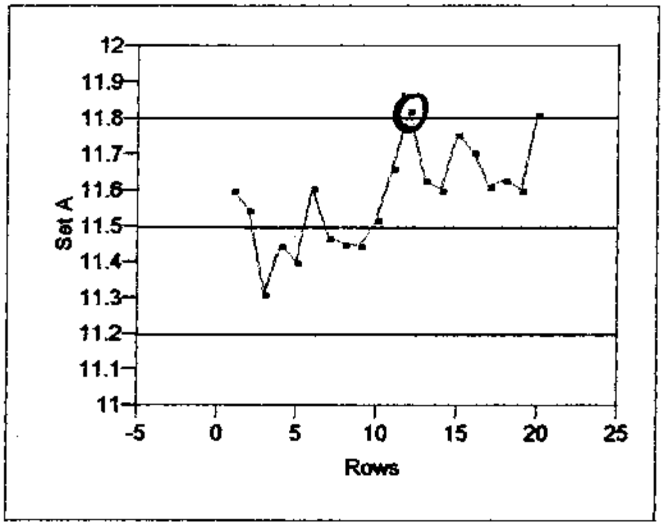
12.7 (a) CL : $\mu = 11.5$

UCL : $\mu + 3\sigma/\sqrt{n} = 11.8$

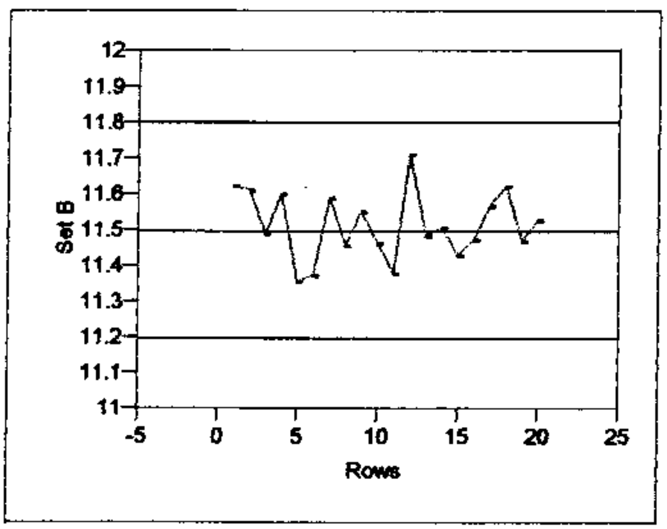
LCL : $\mu - 3\sigma/\sqrt{n} = 11.2$

12.7 (b)

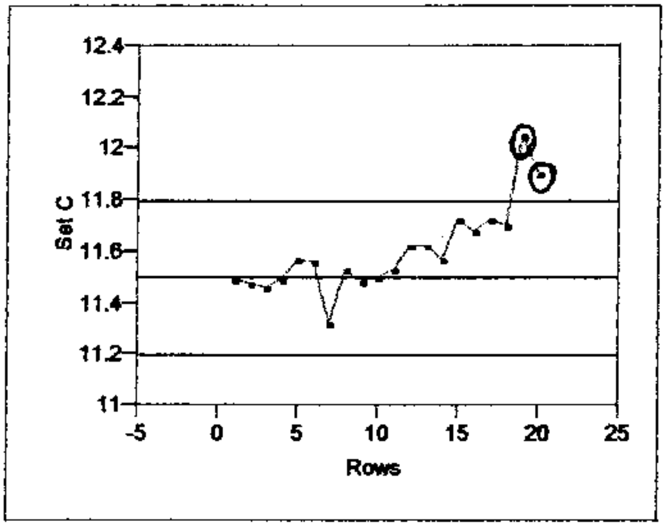
Set A



Set B



Set C



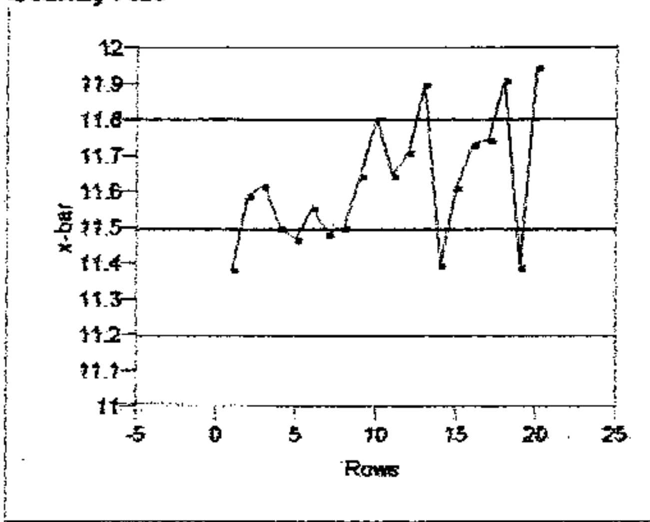
(c) Looking at the control charts, we see that Set B comes from a process that is in control. Set A shows a sudden shift in the mean around the 12th time point. Set C shows a gradual increase in the process mean.

12.10(a)

X-bar Chart

Overlay Plot

Overlay Plot



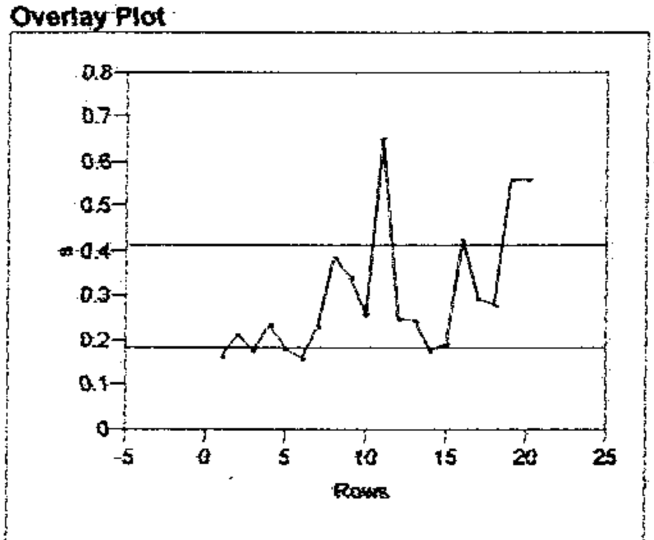
CL : $\mu = 11.5$

UCL : $\mu + 3\sigma/\sqrt{n} = 11.8$

LCL : $\mu - 3\sigma/\sqrt{n} = 11.2$

s chart

Overlay Plot



CL : $c_4\sigma = 0.18426$

UCL : $B_6\sigma = 0.4176$

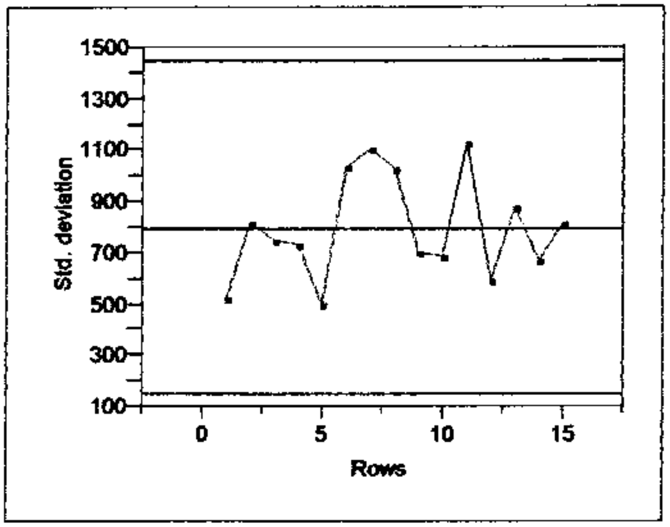
No LCL

(b) I would estimate the change of σ from 0.2 to 0.4 occured around the 8th sample. This affects the s chart by points falling outside the control limits. On the $\bar{x}$ chart we see more variation in the observation

(c) The mean changing has no effect on the s chart since this deals with within sample variation, but we see an upward shift in the $\bar{X}$ chart.

12.26 (a)

s-chart



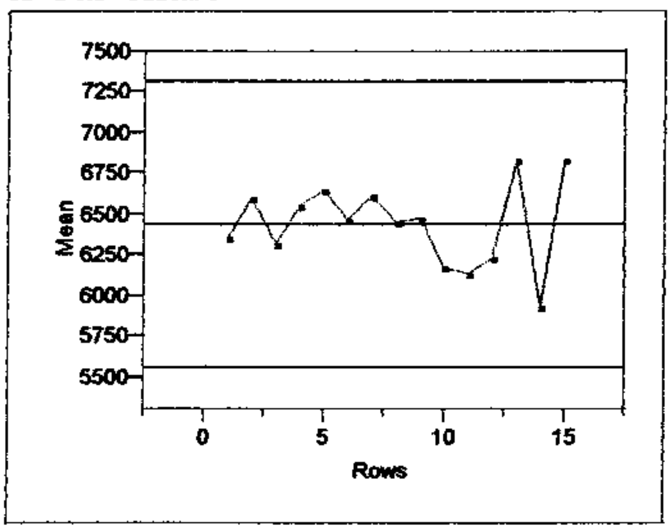
$CL = c_4\hat{\sigma} = \bar{s} = 799.13$

$UCL = 1450.03$

$LCL = 148.23$

(b)

x-bar chart



$CL = \hat{\mu} = \bar{\bar{x}} = 6442.43$

$UCL = 7320.78$

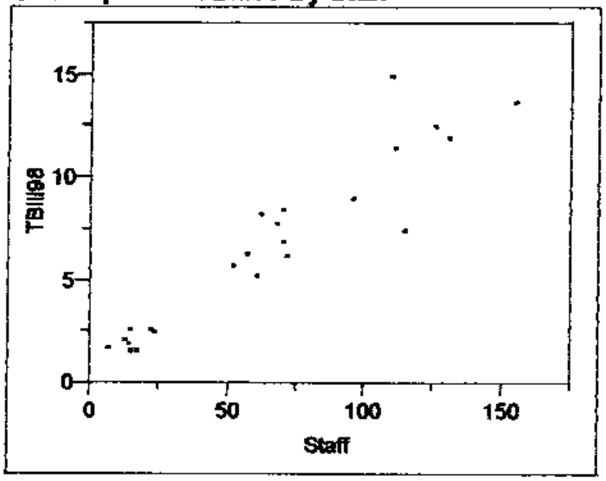
$LCL = 5564.08$

This chart shows that the process mean is in control.

2.4 (a) Staff

2.4 (b)

Scatterplot of TBill98 By Staff



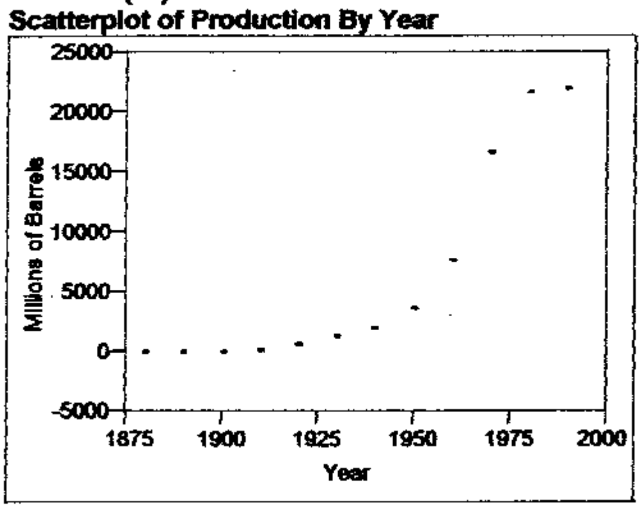
We see a linear relationship between Staff and billings.

2.6 (a) positive

(b) yes- linear relationship

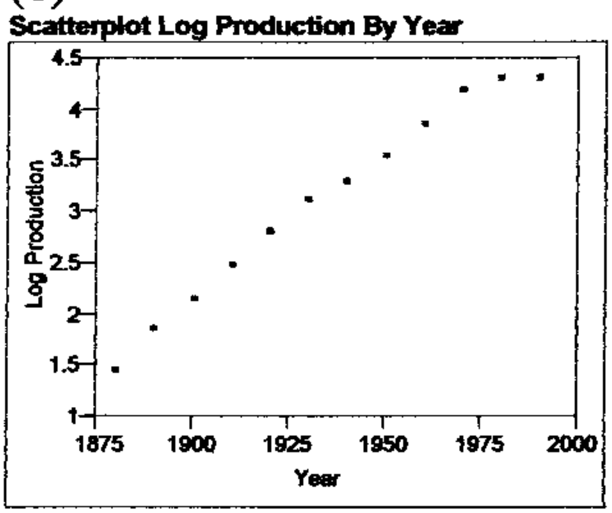
(c) yes. billings can be predicted from Staff levels, although there appears to be more variation in billings as staff levels increase. With a staff level of 75 members, I would predict the billings to be approx $7 million.

2.16 (a)



We see an increasing trend in oil production as the years go by, but the trend is not linear.

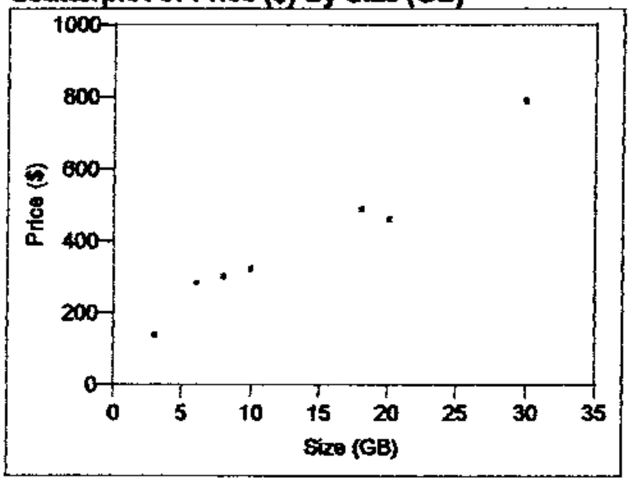
(b)



The overall pattern here is much more linear again with a positive trend.

2.20 (a)

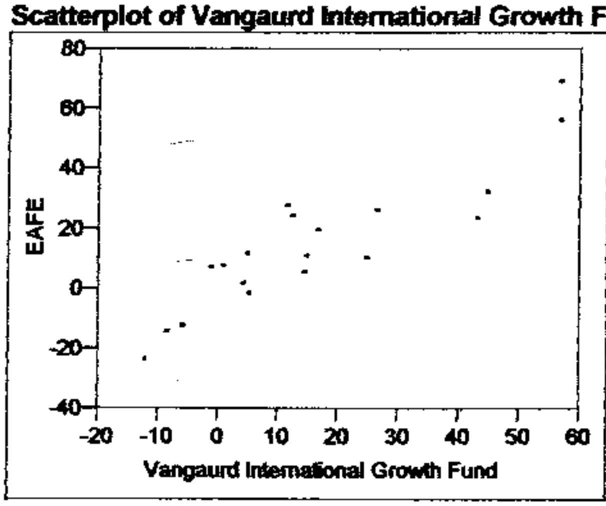
Scatterplot of Price ($) By Size (GB)



(a) The relationship appears to be linear, positive and fairly.

(b) $r = .9792$

2.25



The scatterplot shows a clear positive linear relationship with no extreme outliers.
The correlation coefficient, r = 0.898, which indicates a strong linear relationship.

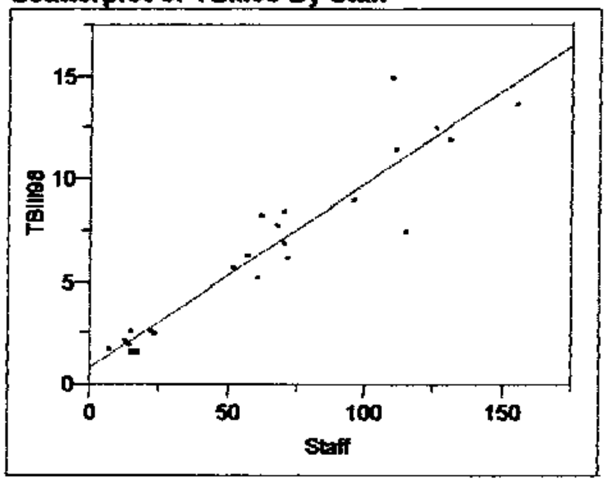
2.30

(a) Rachel should choose small-cap stocks because that has a much smaller correlation with municipal bonds than large-cap stocks.

(b) She should look for a negative correlation.

226 (a)

Scatterplot of TBill98 By Staff



billings = 0.8334 + (0.0902 × 111)

= 10.8456

(b) prediction error = observed y − predicted y

= 11.5 − 10.8456

= .6544

2.37

(a) $R^2 = (r)^2 = 35.5\%$ of the variation in yearly changes is explained by the January change

(b) $b = r \cdot \frac{S_y}{S_x} = 1.707$

$a = \bar{y} - b\bar{x} = 6.08$

$\hat{y} = 6.08 + 1.707x$

(c) $\hat{y} = 6.08 + (1.707)(1.75)$
$= 9.07$
We know that this is the correct answer since the point $(\bar{x}, \bar{y})$ will always fall on the regression line.

2.102
(a) $b = r \cdot \frac{S_y}{S_x} = 1.169$

$a = \bar{y} - b\bar{x} = .354$

$\hat{y} = .354 + 1.169x$

$R^2 = (r)^2 = 27.6\%$ of the change in Phillip Morris stock is explained by the S+P index.

(b) For every one unit change in the S+P index, Phillip Morris returns increase by 1.169.

2.102 (cont)

(c) We want our individual stocks to rise faster than the market rises, but we want our stocks to drop more slowly than the market drops.

2.109

(a) $\hat{y} = 189225.68 - 1334.49x$

(b) \$189,225.68
\$187,891.19
\$186,556.70
\$185,222.21
Each year that the house ages drops the average selling price by \$1334.49.

(c) The regression line should not be used to predict the selling price of a home built before 1990 because of extrapolation. It could produce results that are unreliable.

(c) $R^2 = .464834$ (from JMP)
$r = -.682$

The correlation coefficient can be found by taking the square root of R^2. You need to take the negative value since there is a negative relationship between age and selling price.