EXERCISE 2.6

(a) The intercept estimate $b_1 = -240$ is an estimate of the number of sodas sold when the temperature is 0 degrees Fahrenheit. A common problem when interpreting the estimated intercept is that we often do not have any data points near $x = 0$. If we have no observations in the region where temperature is 0, then the estimated relationship may not be a good approximation to reality in that region. Clearly, it is impossible to sell –240 sodas and so this estimate should not be accepted as a sensible one.

The slope estimate $b_2 = 8$ is an estimate of the increase in sodas sold when temperature increases by 1 Fahrenheit degree. This estimate does make sense. One would expect the number of sodas sold to increase as temperature increases.

(b) If temperature is 80°F, the predicted number of sodas sold is

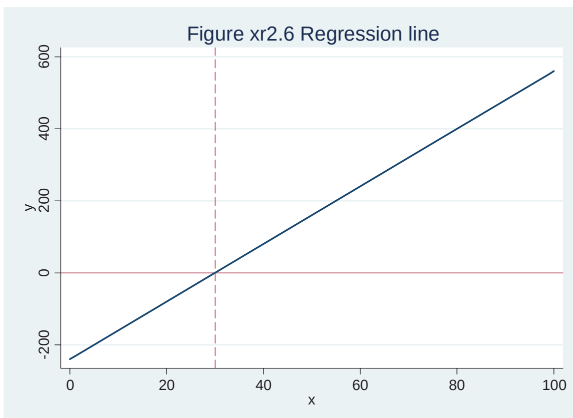
$$\hat{y} = -240 + 8 \times 80 = 400$$

(c) If no sodas are sold, $y = 0$, and

$$0 = -240 + 8x \quad \text{or} \quad x = 30$$

Thus, she predicts no sodas will be sold below 30°F.

(d) A graph of the estimated regression line:



EXERCISE 2.7

(a) Since

$$\hat{\sigma}^2 = \frac{\sum \hat{e}_i^2}{N-2} = 2.04672$$

it follows that

$$\sum \hat{e}_i^2 = 2.04672\,(N-2) = 2.04672 \times 49 = 100.29$$

(b) The standard error for b_2 is

$$\text{se}(b_2) = \sqrt{\widehat{\text{var}}(b_2)} = \sqrt{0.00098} = 0.031305$$

Also,

$$\widehat{\text{var}}(b_2) = \frac{\hat{\sigma}^2}{\sum (x_i - \bar{x})^2}$$

Thus,

$$\sum \left(x_i - \bar{x}\right)^2 = \frac{\hat{\sigma}^2}{\widehat{\text{var}}\left(b_2\right)} = \frac{2.04672}{0.00098} = 2088.5$$

(c) The value $b_2 = 0.18$ suggests that a 1% increase in the percentage of males 18 years or older who are high school graduates will lead to an increase of \$180 in the mean income of males who are 18 years or older.

(d) $$b_1 = \bar{y} - b_2\bar{x} = 15.187 - 0.18 \times 69.139 = 2.742$$

(e) Since $\sum \left(x_i - \bar{x}\right)^2 = \sum x_i^2 - N\,\bar{x}^2$, we have

$$\sum x_i^2 = \sum \left(x_i - \bar{x}\right)^2 + N\,\bar{x}^2 = 2088.5 + 51 \times 69.139^2 = 245{,}879$$

(f) For Arkansas

$$\hat{e}_i = y_i - \hat{y}_i = y_i - b_1 - b_2 x_i = 12.274 - 2.742 - 0.18 \times 58.3 = -0.962$$

EXERCISE 2.10

(a) The model is a simple regression model because it can be written as $y = \beta_1 + \beta_2 x + e$ where $y = r_j - r_f$, $x = r_m - r_f$, $\beta_1 = \alpha_j$ and $\beta_2 = \beta_j$.

(b)

Firm	Microsoft	General Electric	General Motors	IBM	Disney	Exxon-Mobil
$b_2 = \hat{\beta}_j$	1.3189	0.8993	1.2614	1.1882	0.8978	0.4140

The stocks Microsoft, General Motors and IBM are aggressive with Microsoft being the most aggressive with a beta value of $b_2 = 1.3189$. General Electric, Disney and Exxon-Mobil are defensive with Exxon-Mobil being the most defensive with a beta value of $b_2 = 0.4140$.

(c)

Firm	Microsoft	General Electric	General Motors	IBM	Disney	Exxon-Mobil
$b_1 = \hat{\alpha}_j$	0.0061	−0.0012	−0.0116	0.0059	−0.0011	0.0079

All estimates of the α_j are close to zero and are therefore consistent with finance theory. The fitted regression line and data scatter for Microsoft are plotted in Figure xr2.10.

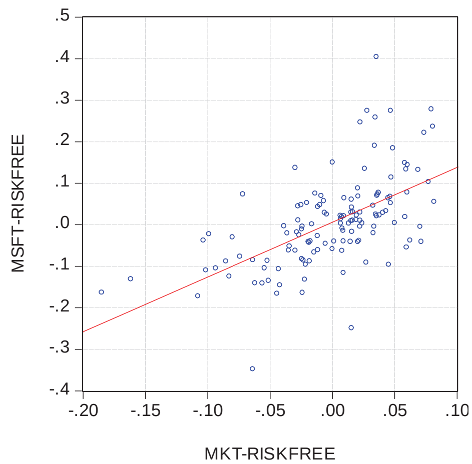


Fig. xr2.10 Scatter plot of Microsoft and market rate

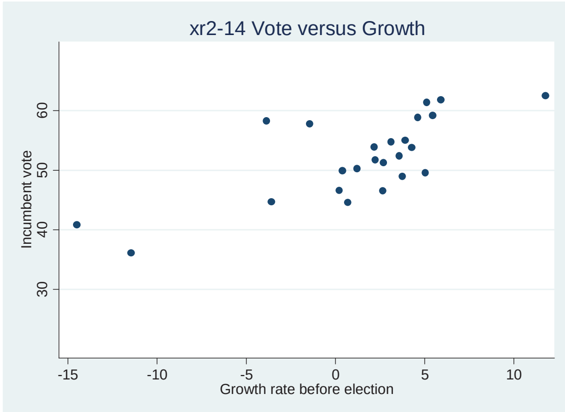
(d) The estimates for β_j given $\alpha_j = 0$ are as follows.

Firm	Microsoft	General Electric	General Motors	IBM	Disney	Exxon-Mobil
$\hat{\beta}_j$	1.3185	0.8993	1.2622	1.1878	0.8979	0.4134

The restriction $\alpha_j = 0$ has led to small changes in the $\hat{\beta}_j$; it has not changed the aggressive or defensive nature of the stock.

EXERCISE 2.14

(a)



There appears to be a positive association between *VOTE* and *GROWTH*.

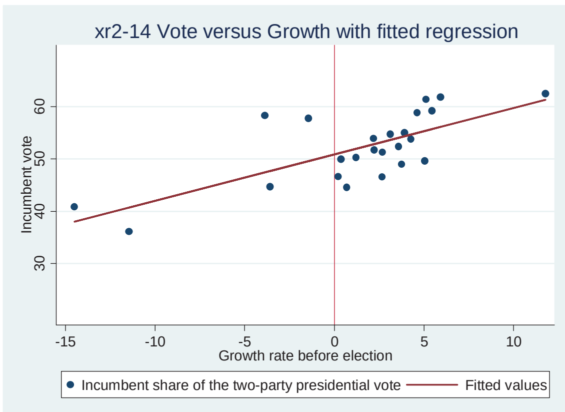
(b) The estimated equation for 1916 to 2008 is

$$\widehat{VOTE} = 50.848 + 0.88595GROWTH$$

The coefficient 0.88595 suggests that for a 1 percentage point increase in the growth rate of *GDP* in the 3 quarters before the election there is an estimated increase in the share of votes of the incumbent party of 0.88595 percentage points.

We estimate, based on the fitted regression intercept, that that the incumbent party's expected vote is 50.848% when the growth rate in *GDP* is zero. This suggests that when there is no real *GDP* growth, the incumbent party will still maintain the majority vote.

A graph of the fitted line and data is shown in the following figure.



(c) The estimated equation for 1916 - 2004 is

$$\widehat{VOTE} = 51.053 + 0.877982GROWTH$$

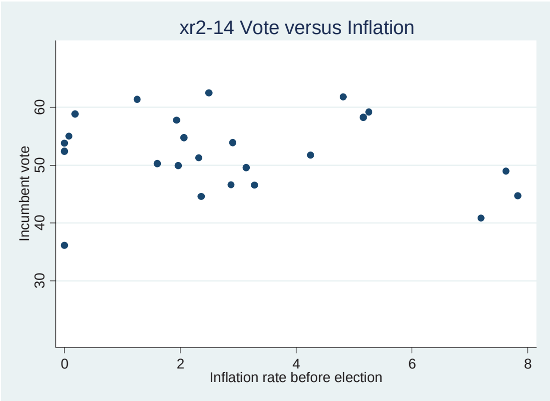
The actual 2008 value for growth is 0.220. Putting this into the estimated equation, we obtain the predicted vote share for the incumbent party:

Exercise 2.14(c) (continued)

$$\widehat{VOTE}_{2008} = 51.053 + 0.877982 GROWTH_{2008} = 51.053 + 0.877982(0.220) = 51.246$$

This suggests that the incumbent party will maintain the majority vote in 2008. However, the actual vote share for the incumbent party for 2008 was 46.60, which is a long way short of the prediction; the incumbent party did not maintain the majority vote.

(d) The figure below shows a plot of *VOTE* against *INFLATION*. There appears to be a negative association between the two variables.



The estimated equation (plotted in the figure below) is:

$$\widehat{VOTE} = 53.408 - 0.444312 INFLATION$$

We estimate that a 1 percentage point increase in inflation during the incumbent party's first 15 quarters reduces the share of incumbent party's vote by 0.444 percentage points.

The estimated intercept suggests that when inflation is at 0% for that party's first 15 quarters, the expected share of votes won by the incumbent party is 53.4%; the incumbent party is predicted to maintain the majority vote when inflation, during its first 15 quarters, is at 0%.