# Problem Set 3

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## 1 Problem Set 3

## 2 Question 1 part 1

incumbents-lm ¡- lm(voteshare $\sim difflog, data = incumbents$)
$summary(incumbents - lm)$

## 3 Question 1 part 2

ggplot(incumbents, aes(difflog, voteshare)) +
geom-point(alpha = 0.5) + geom-smooth(method = "lm")

These two functions geom-point and geom-smooth add a scatterplot and a regression line

## 4 Question 1 part 3

resids1 ¡- resid(incumbents-lm)
resids1
class(resids1)
returned 1 "Numeric"

# 5 Question 1 part 4

y = 0.041666 * x + 0.579031

$\beta_0 = 0.579031$ $\beta_1 = 0.041666$ $x_1 = difflog$ $y = voteshare$

$\hat{y} = \beta_0 + \beta_1 x_1$
$\hat{y} = 0.579031 + 0.041666 x_1$

# 6 Question 2 part 1

incumbents-lm2 ¡- lm(presvote $\sim difflog, data = incumbents$)
$summary(incumbentsl - m2)$

# 7 Question 2 part 2

ggplot(incumbents, aes(difflog, presvote)) +
geom-point(alpha = 0.5) +
geom-smooth(method = "lm")

# 8 Question 2 part 3

resids2 ¡- resid(incumbents-lm2)
resids2
class(resids2)
class numeric

# 9 Question 2 part 4

y = 0.023837 * x + 0.0507583

$\beta_0 = 0.507583$ $\beta_1 = 0.023837$ $x_1 = difflog$ $y = presvote$

$\hat{y} = \beta_0 + \beta_1 x_1$

$\hat{y} = 0.507583 + 0.023837 x_1$

## 10 Question 3 part 1

incumbents-lm3 ¡- lm(voteshare $\sim presvote, data = incumbents$)

$summary(incumbents - lm3)$

## 11 Question 3 part 2

ggplot(incumbents, aes(presvote, voteshare)) +
geom-point(alpha = 0.5) +
geom-smooth(method = "lm")

## 12 Question 3 part 3

y = 0.388018 * x + 0.441330

$\beta_0 = 0.441330$ $\beta_1 = 0.388018$ $x_1 = presvote$ $y = voteshare$

$\hat{y} = \beta_0 + \beta_1 x_1$

$\hat{y} = 0.441330 + 0.388018 x_1$

## 13 Question 4 part 1

incumbents-lm4 ¡- lm(resids1 $\sim resids2, data = incumbents$)
$summary(incumbents - lm4)$

## 14 Question 4 part 2

ggplot(incumbents, aes(resids2, resids1)) +
geom-point(alpha = 0.5) +
geom-smooth(method = "lm")

## 15 Question 4 part 3

y = -0.00000000000000000486 * x + 0.25687701270009788423

$\beta_0 = 0.25687701270009788423$

$\beta_1 = -0.00000000000000000486$

$x_1 = resids2$ $y = resids1$

$\hat{y} = \beta_0 + \beta_1 x_1$
$\hat{y} = 0.25687701270009788423 + -0.00000000000000000486 x_1$

## 16 Question 5 part 1

incumbents-lm5 ¡- lm(voteshare $\sim difflog + presvote, data = incumbents$)

$summary(incumbents - lm5)$

## 17 Question 5 part 2

x1 = difflog x2 = presvote

y = 0.0355431 * x1 + 0.2568770 * x2 + 0.4486442

$\beta_0 = 0.4486442$ $\beta_1 = 0.0355431$ $\beta_2 = 0.2568770$
$x_1 = difflog$ $x_2 = presvote$ $y = voteshare$

$\hat{y} = \beta_0 + \beta_1 x_1 + \beta_2 x_2$

$\hat{y} = 0.4486442 + 0.0355431x_1 + 0.2568770x_2$

## 18 Question 5 part 3

The residuals for the output of the lm of incumbents-lm4 and the residuals for the out of the lm of incumbents-lm5 returns the same values for min -0.25928, 1q -0.04737 median -0.00121, 3q 0.04618, max 0.33126.