

grocery

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January 23, 2016

grocery

reference:

- Cannon, et al., Stat2, chapter 07, example 7.17-7.19

Import the data.

```
data <- read.csv("Grocery.csv", header=TRUE)
head(data)
```

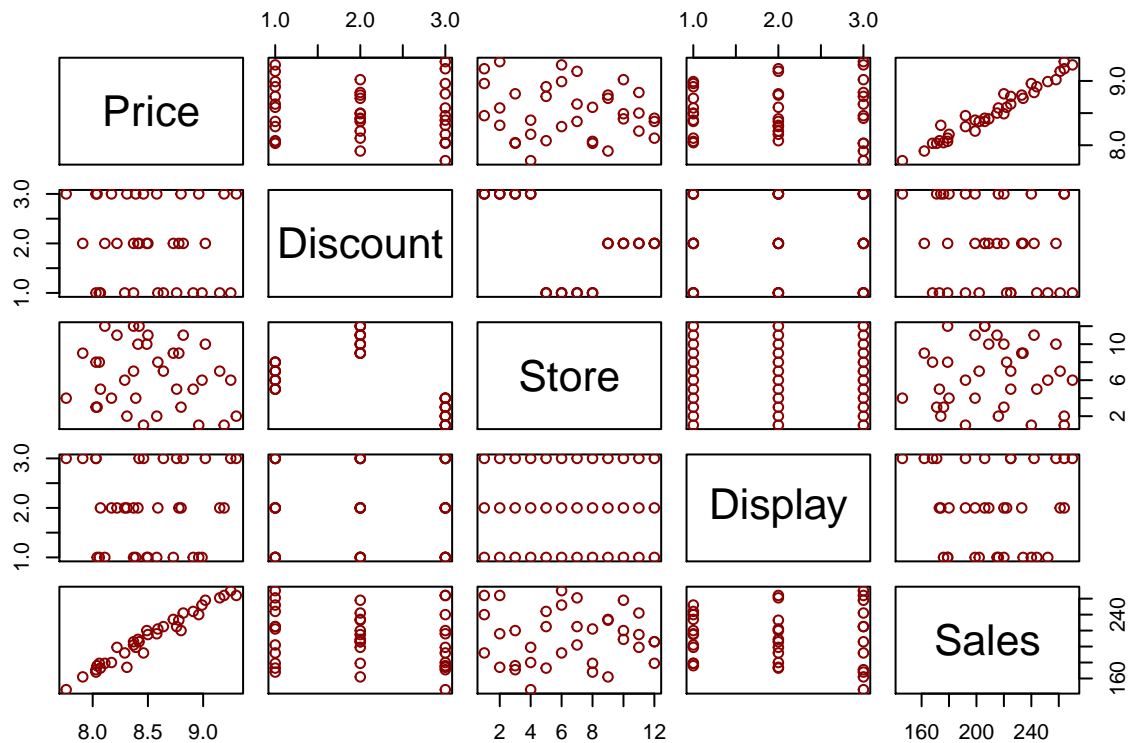
```
##   Discount Store      Display Sales Price
## 1   5.00%    1 Featured End of Aisl  240  8.96
## 2   5.00%    1 Featured Middle of A  264  9.19
## 3   5.00%    1      Not Featured    192  8.46
## 4   5.00%    2 Featured End of Aisl  216  8.58
## 5   5.00%    2 Featured Middle of A  174  8.31
## 6   5.00%    2      Not Featured    264  9.30
```

```
dim(data)
```

```
## [1] 36  5
```

Scatterplot matrix.

```
pairs(~ Price + Discount + Store + Display + Sales, data=data, col="darkred")
```



One-way ANOVA: Sales ~ Discount

```
grocery.aov <- aov(Sales ~ Discount, data=data)
options(show.signif.stars=FALSE)
summary(grocery.aov)
```

```
##           Df Sum Sq Mean Sq F value Pr(>F)
## Discount   2   1288    644.2   0.573  0.569
## Residuals 33  37074   1123.5
```

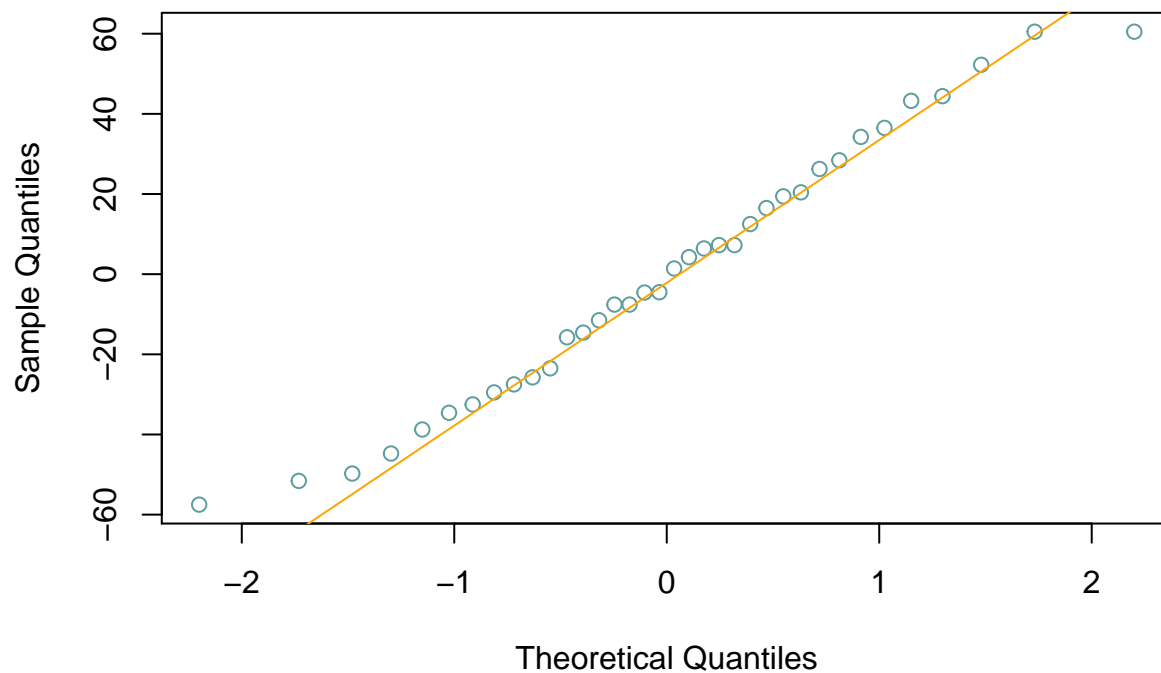
```
grocery.aov
```

```
## Call:
## aov(formula = Sales ~ Discount, data = data)
##
## Terms:
##           Discount Residuals
## Sum of Squares  1288.39  37074.17
## Deg. of Freedom      2       33
##
## Residual standard error: 33.51805
## Estimated effects may be unbalanced
```

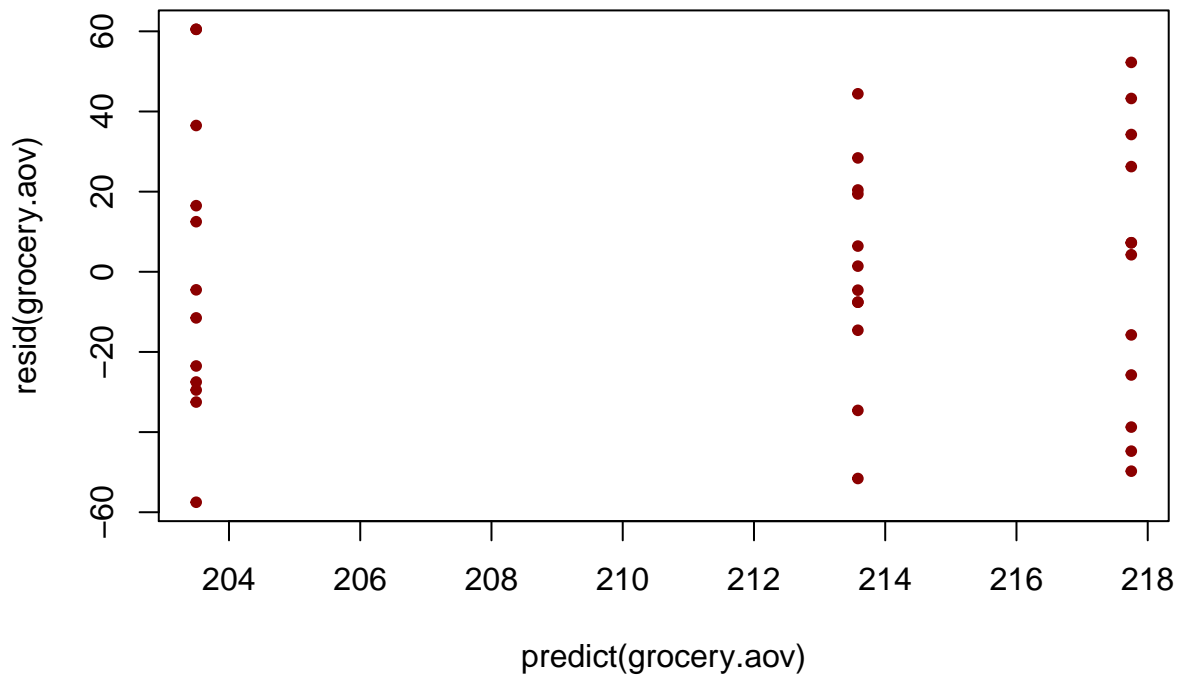
Residuals.

```
qqnorm(resid(grocery.aov), col="cadetblue")
qqline(resid(grocery.aov), col="orange")
```

Normal Q-Q Plot



```
plot(predict(grocery.aov), resid(grocery.aov),  
     pch=20, col="darkred")
```



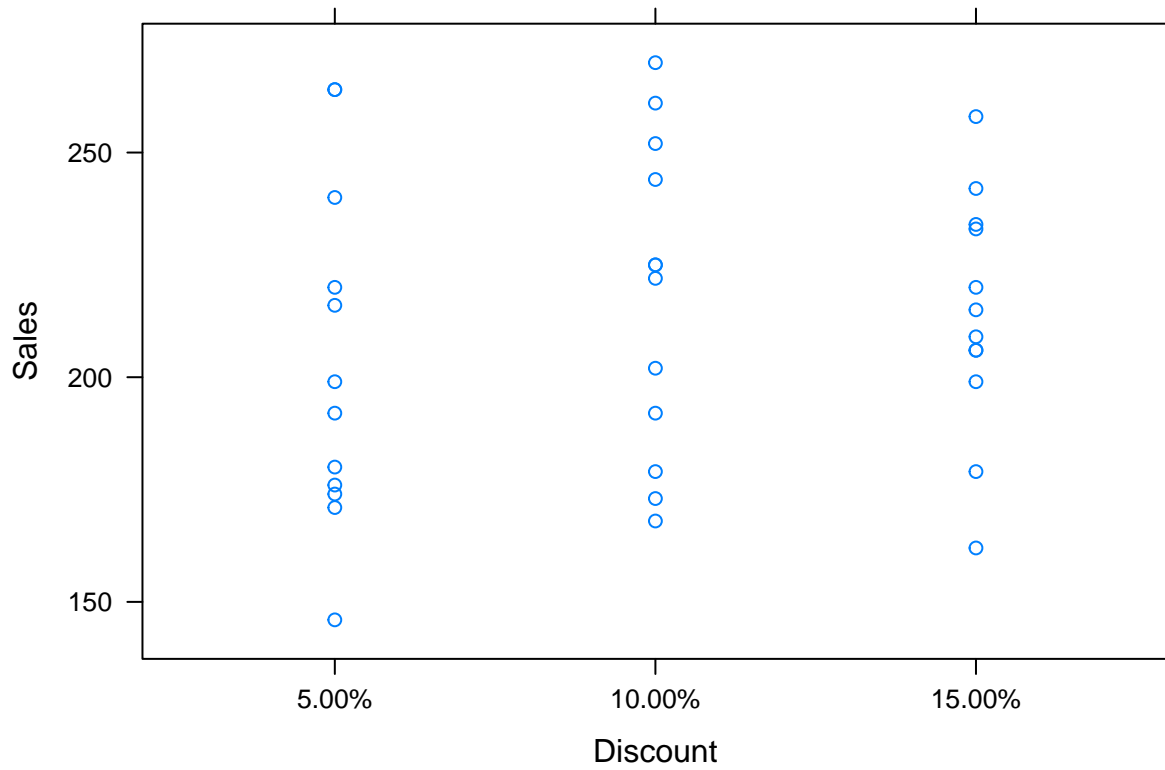
Levene's test.

```
library(car)  
leveneTest(Sales ~ Discount, data=data)
```

```
## Levene's Test for Homogeneity of Variance (center = median)  
##      Df F value Pr(>F)  
## group 2  0.9262 0.4061  
##      33
```

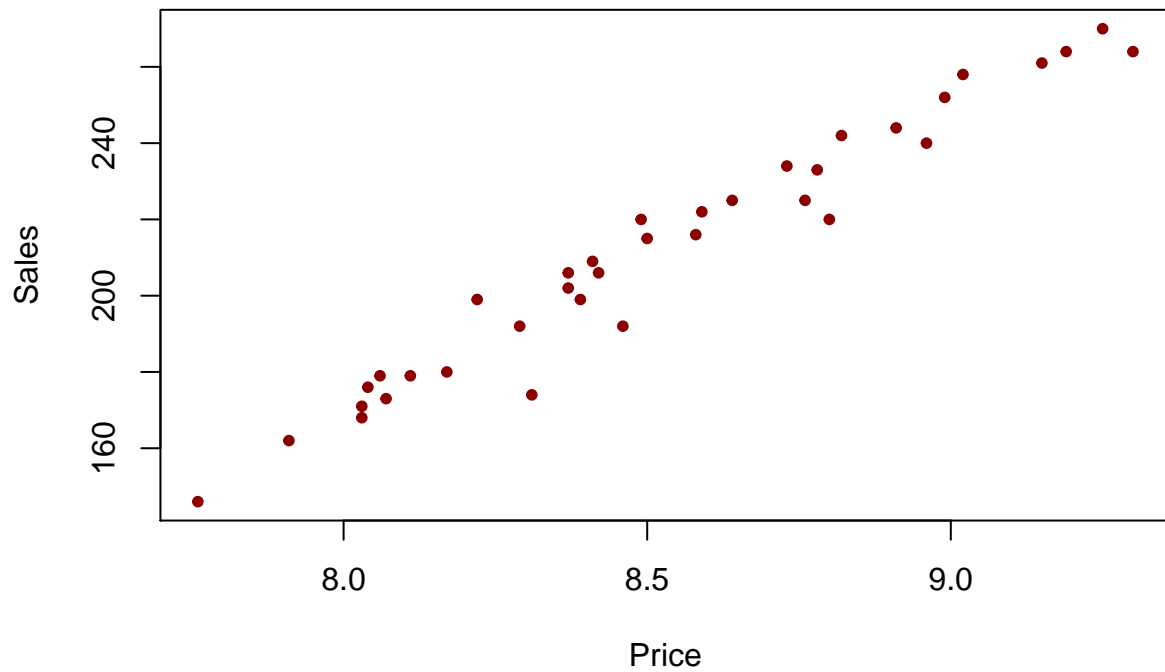
Dotplot of Sales ~ Discount.

```
data$Discount <- factor(data$Discount, levels=c("5.00%", "10.00%", "15.00%"))  
library(lattice)  
xyplot(Sales ~ Discount, data=data)
```



Scatterplot of Sales ~ Price.

```
plot(Sales ~ Price, data=data,
      xlab="Price", ylab="Sales", pch=20, col="darkred")
```



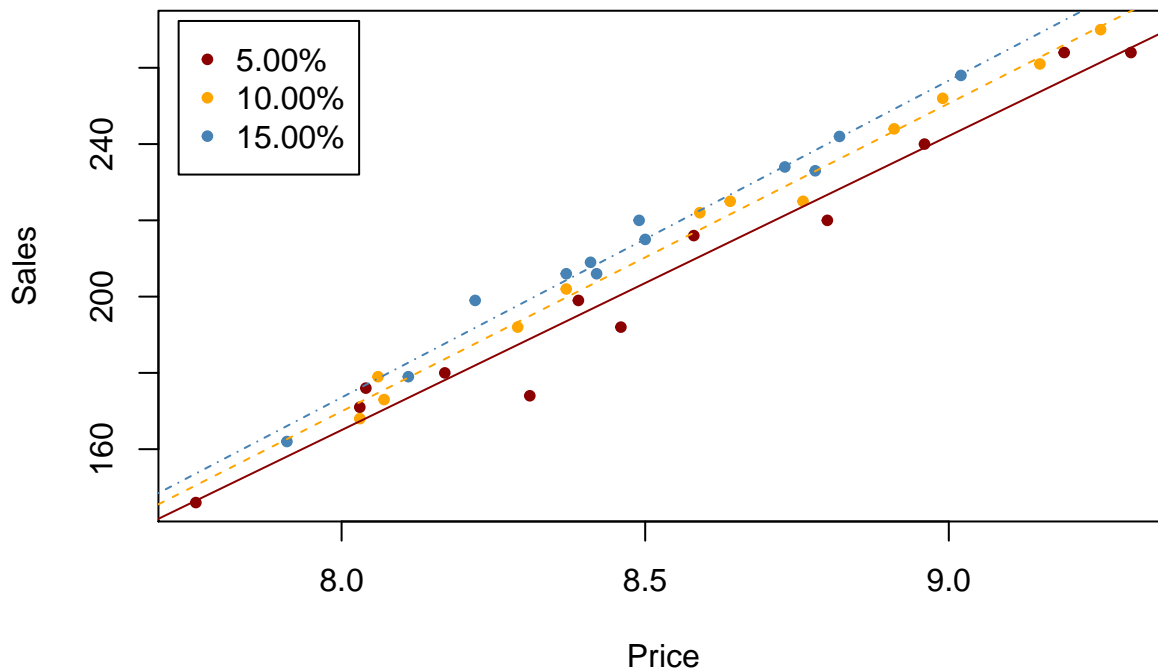
Does the size of the discount matter?

reference: Cannon, et al., R Student Manual, chapter 7.

```

plot(Sales ~ Price, data=data,
     xlab="Price", ylab="Sales", type="n")
sales5 <- with(data, Sales[Discount=="5.00%"])
price5 <- with(data, Price[Discount=="5.00%"])
sales10 <- with(data, Sales[Discount=="10.00%"])
price10 <- with(data, Price[Discount=="10.00%"])
sales15 <- with(data, Sales[Discount=="15.00%"])
price15 <- with(data, Price[Discount=="15.00%"])
points(price5, sales5, pch=20, col="darkred")
points(price10, sales10, pch=20, col="orange")
points(price15, sales15, pch=20, col="steelblue")
legend("topleft", c("5.00%", "10.00%", "15.00%"),
      pch=20, inset=0.02, col=c("darkred", "orange", "steelblue"))
abline(lm(sales5 ~ price5), lty=1, col="darkred")
abline(lm(sales10 ~ price10), lty=2, col="orange")
abline(lm(sales15 ~ price15), lty=4, col="steelblue")

```



ANCOVA with wholesale price as covariate.

```

grocery.lm <- lm(Sales ~ Price + Discount, data=data)
summary(grocery.lm)

```

```

##
## Call:
## lm(formula = Sales ~ Price + Discount, data = data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -14.444  -3.183   1.050   3.510   9.045
##
## Coefficients:

```

```
##           Estimate Std. Error t value Pr(>|t|)
## (Intercept)  -472.953    18.317  -25.820 < 2e-16
## Price        79.591     2.148   37.052 < 2e-16
## Discount10.00%  6.822     2.107    3.238 0.0028
## Discount15.00% 11.476     2.098    5.471 5.04e-06
##
## Residual standard error: 5.137 on 32 degrees of freedom
## Multiple R-squared:  0.978, Adjusted R-squared:  0.9759
## F-statistic: 473.9 on 3 and 32 DF,  p-value: < 2.2e-16
```

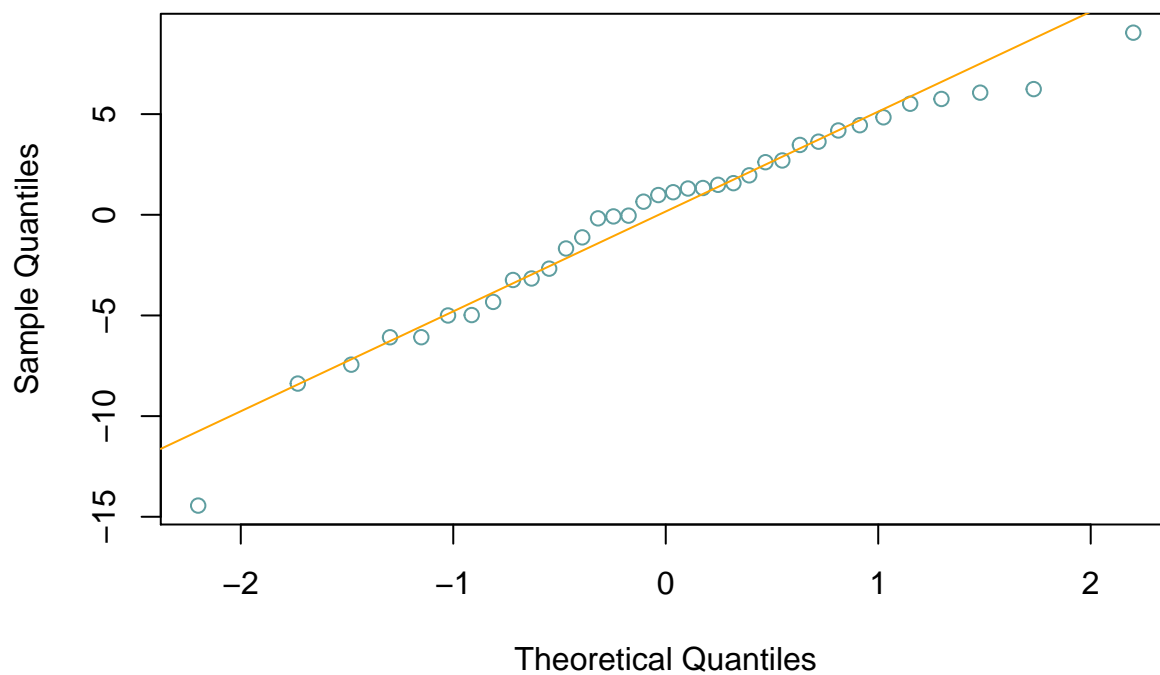
```
anova(grocery.lm)
```

```
## Analysis of Variance Table
##
## Response: Sales
##           Df Sum Sq Mean Sq F value    Pr(>F)
## Price      1  36718   36718 1391.366 < 2.2e-16
## Discount   2    800     400  15.149 2.348e-05
## Residuals 32    844     26
```

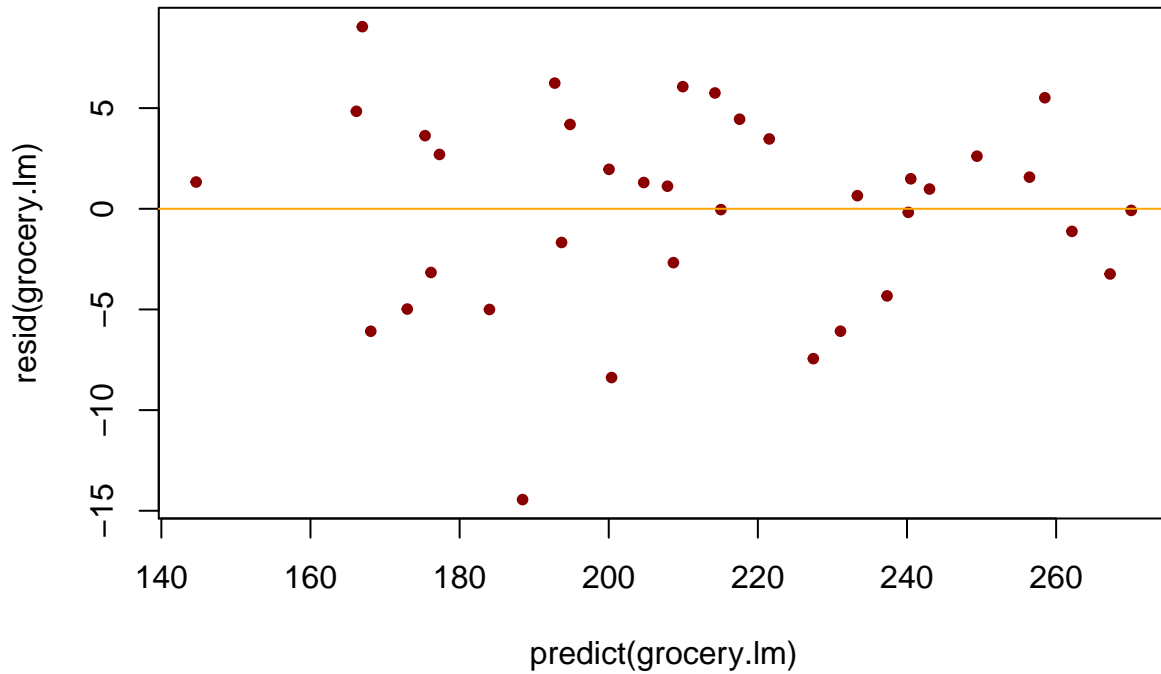
Residuals.

```
qqnorm(resid(grocery.lm), col="cadetblue")
qqline(resid(grocery.lm), col="orange")
```

Normal Q-Q Plot



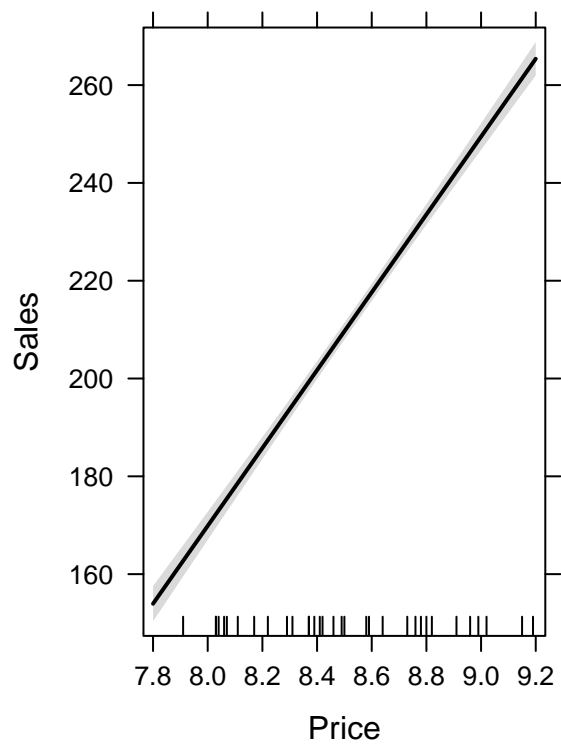
```
plot(predict(grocery.lm), resid(grocery.lm),
      pch=20, col="darkred")
abline(h=0, col="orange")
```



Main effects.

```
library(alr4)
plot(allEffects(grocery.lm))
```

Price effect plot



Discount effect plot

