Diamond Data Analysis

Contents

Libraries & Data

```
library(tidyverse)
```

```
## -- Attaching packages --------------------------------------- tidyverse 1.3.2 --
## v ggplot2 3.3.6      v purrr   0.3.5
## v tibble  3.1.8      v dplyr   1.0.10
## v tidyr   1.2.1      v stringr 1.4.1
## v readr   2.1.3      v forcats 0.5.2
## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

```
library(dplyr)
library(cowplot)
library(ggcorrplot)
library(Metrics)
set.seed(999)

df <- read.csv("diamond_data.csv")
```

Data Cleaning

Count N/A Values

```
colSums(is.na(df))
```

```
##   carat     cut   color clarity   depth   table   price       x       y       z
##       0       0       0       0       0       0       0       0       0       0
```

Remove Wrong Entries

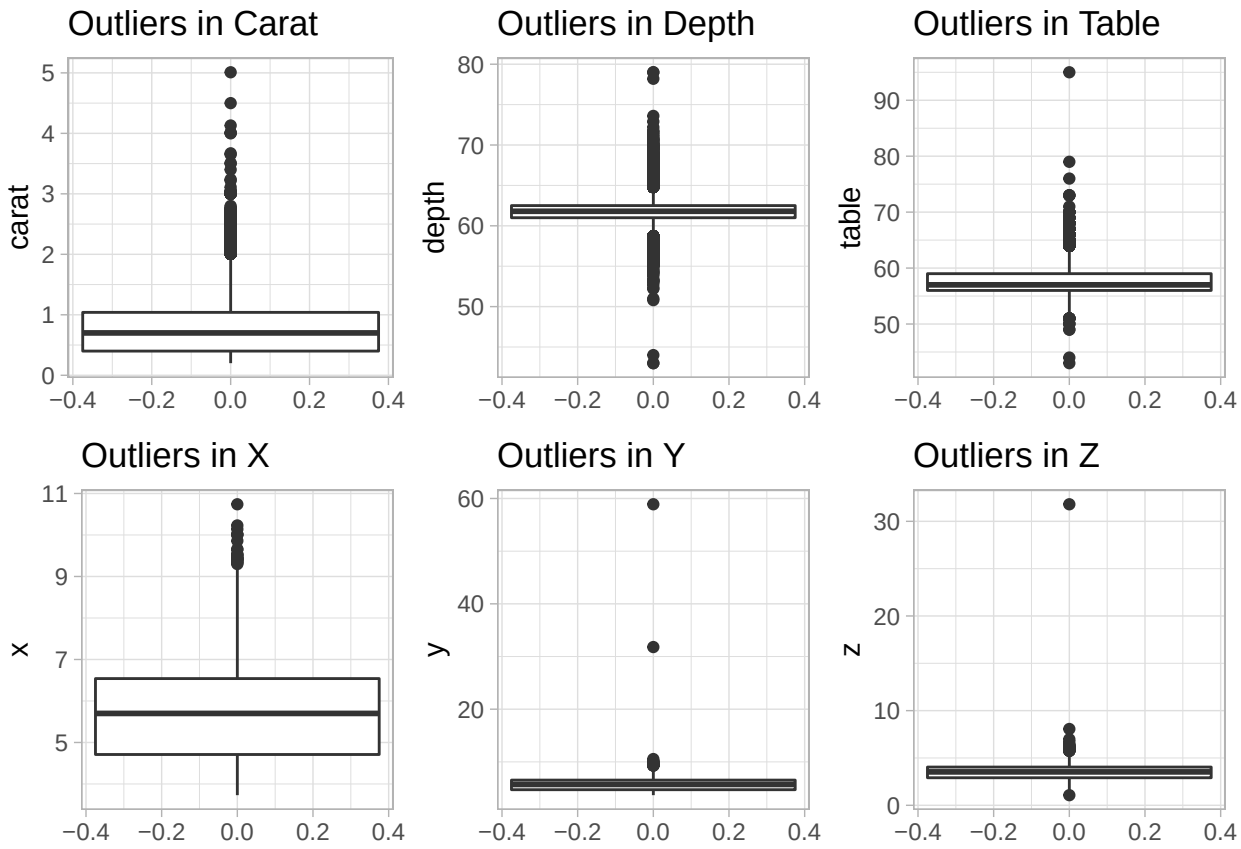
```
df %>%
  summarise(x_zero = sum(x==0), y_zero = sum(y==0), z_zero = sum(z==0))
```

```
##   x_zero y_zero z_zero
## 1      8      7     20
```

```
df <- df %>%
  subset(x != 0 & y != 0 & z != 0)
```

Plotting Outliers

```
out_carat <- ggplot(data = df, aes(y = carat)) +
  ggtitle("Outliers in Carat") +
  geom_boxplot() +
  theme_light()

out_depth <- ggplot(data = df, aes(y = depth)) +
  ggtitle("Outliers in Depth") +
  geom_boxplot() +
  theme_light()

out_table <- ggplot(data = df, aes(y = table)) +
  ggtitle("Outliers in Table") +
  geom_boxplot() +
  theme_light()

out_x <- ggplot(data = df, aes(y = x)) +
  ggtitle("Outliers in X") +
  geom_boxplot() +
  theme_light()

out_y <- ggplot(data = df, aes(y = y)) +
  ggtitle("Outliers in Y") +
  geom_boxplot() +
  theme_light()

out_z <- ggplot(data = df, aes(y = z)) +
  ggtitle("Outliers in Z") +
  geom_boxplot() +
  theme_light()

out_price <- ggplot(data = df, aes(y = price)) +
  ggtitle("Outliers in Price") +
  geom_boxplot() +
  theme_light()


plot_grid(out_carat, out_depth, out_table, out_x, out_y, out_z)
```



Exploratory Data Analysis

Summary Stats

```
numerical_features <- select_if(df, is.numeric)
categorical_features <- select_if(df,is.character)

summary(numerical_features)
```

```
##      carat            depth           table           price
##  Min.   :0.2000   Min.   :43.00   Min.   :43.00   Min.   :  326
##  1st Qu.:0.4000   1st Qu.:61.00   1st Qu.:56.00   1st Qu.:  949
##  Median :0.7000   Median :61.80   Median :57.00   Median : 2401
##  Mean   :0.7977   Mean   :61.75   Mean   :57.46   Mean   : 3931
##  3rd Qu.:1.0400   3rd Qu.:62.50   3rd Qu.:59.00   3rd Qu.: 5323
##  Max.   :5.0100   Max.   :79.00   Max.   :95.00   Max.   :18823
##        x                y               z
##  Min.   : 3.730   Min.   : 3.680   Min.   : 1.07
##  1st Qu.: 4.710   1st Qu.: 4.720   1st Qu.: 2.91
##  Median : 5.700   Median : 5.710   Median : 3.53
##  Mean   : 5.732   Mean   : 5.735   Mean   : 3.54
##  3rd Qu.: 6.540   3rd Qu.: 6.540   3rd Qu.: 4.04
##  Max.   :10.740   Max.   :58.900   Max.   :31.80
```

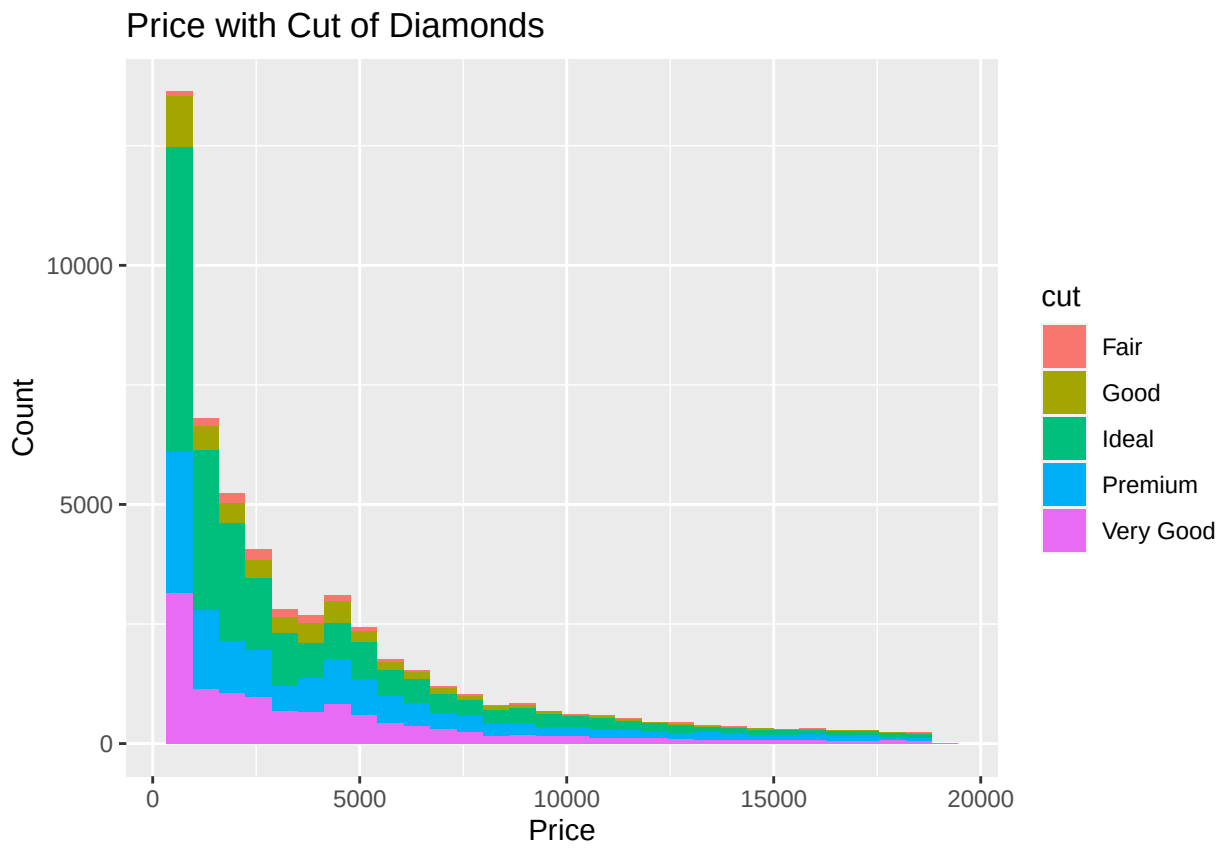
```
summary(categorical_features)
```

```
##       cut               color             clarity
##  Length:53920       Length:53920       Length:53920
##  Class :character   Class :character   Class :character
##  Mode  :character   Mode  :character   Mode  :character
```

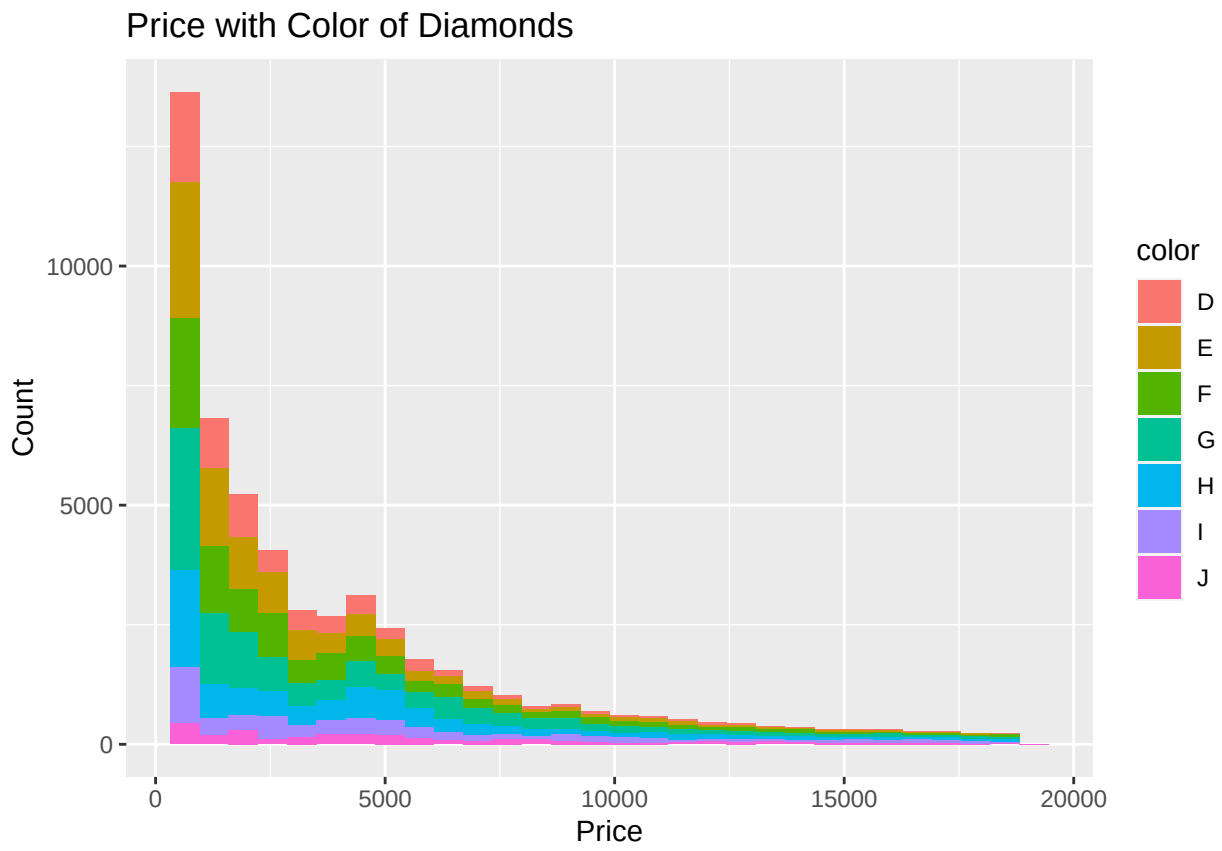
```
# shows proportion for each feature but better as visual
# sapply(categorical_features, function(x) prop.table(table(x)))
```

Price Plots

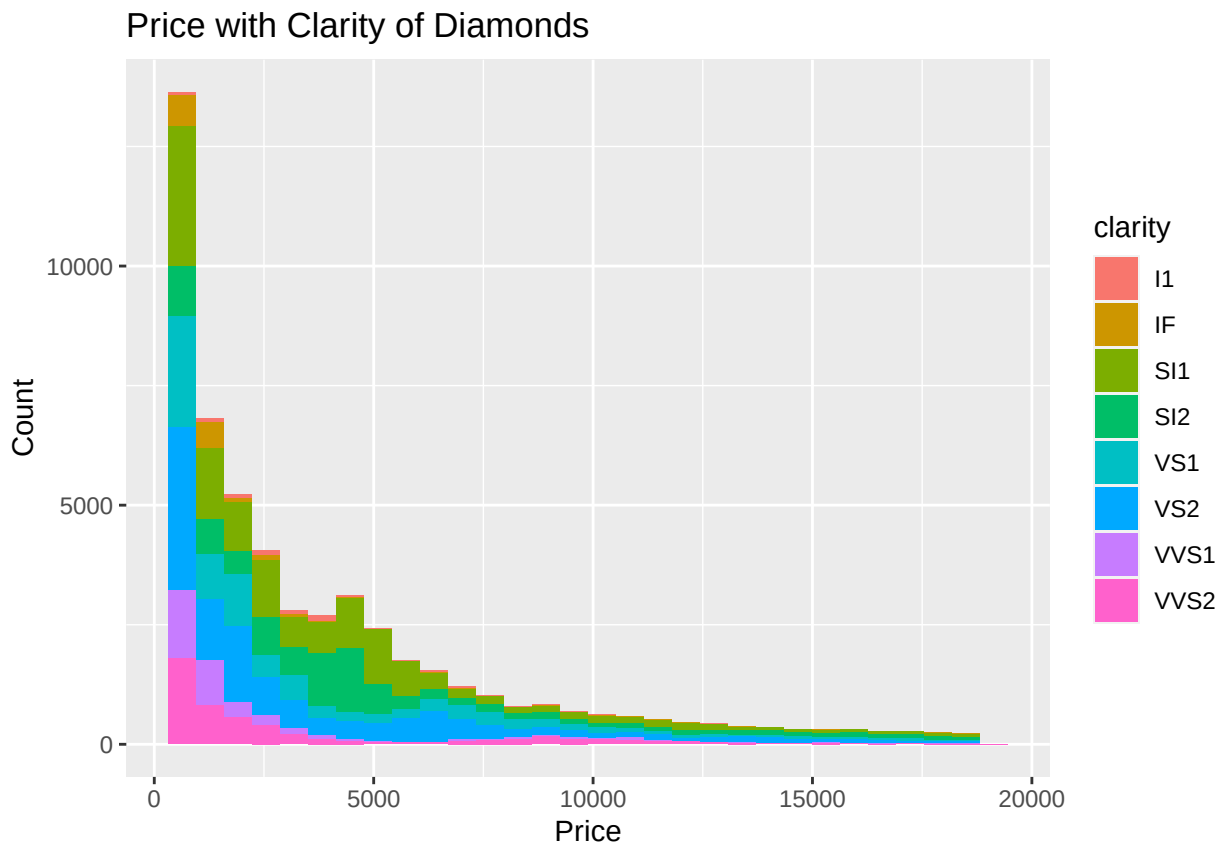
```
ggplot(data = df, aes(x=price, fill=cut)) +
  geom_histogram(bins = 30) +
  labs(y="Count", x="Price", title="Price with Cut of Diamonds")
```



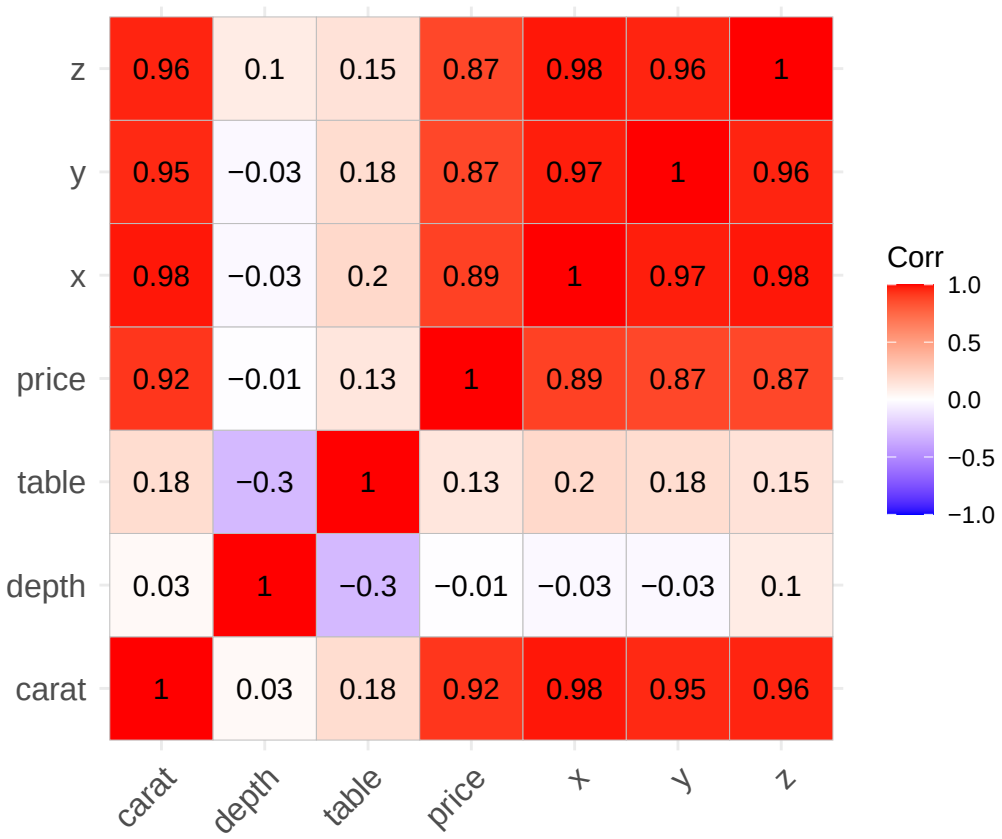

```
ggplot(data = df, aes(x=price, fill=color)) +
  geom_histogram(bins = 30) +
  labs(y="Count", x="Price", title="Price with Color of Diamonds")
```




```
ggplot(data = df, aes(x=price, fill=clarity)) +
  geom_histogram(bins = 30) +
  labs(y="Count", x="Price", title="Price with Clarity of Diamonds")
```




```
ggcorrplot(cor(numerical_features), lab = TRUE)
```



Predict Price

Spliting Data

```
sample <- sample(c(TRUE, FALSE), nrow(df), replace=TRUE, prob=c(0.7,0.3))

train  <- df[sample, ]
test   <- df[!sample, ]
```

Train and Pred Linear Reg

```
lin_model <- lm(data = train, formula = price ~ carat + as.factor(cut) + as.factor(color) +
                  as.factor(clarity))

summary(lin_model)
```

```
##
## Call:
## lm(formula = price ~ carat + as.factor(cut) + as.factor(color) +
##     as.factor(clarity), data = train)
##
```

```
## Residuals:
##      Min       1Q   Median       3Q      Max
## -12626.4   -675.0   -194.5    466.0  10400.5
##
## Coefficients:
##                           Estimate Std. Error  t value Pr(>|t|)
## (Intercept)              -7317.62      61.07 -119.820   <2e-16 ***
## carat                     8874.19      14.42  615.288   <2e-16 ***
## as.factor(cut)Good         632.73      40.16   15.755   <2e-16 ***
## as.factor(cut)Ideal        965.95      36.58   26.408   <2e-16 ***
## as.factor(cut)Premium      853.88      36.93   23.121   <2e-16 ***
## as.factor(cut)Very Good    810.98      37.33   21.726   <2e-16 ***
## as.factor(color)E         -205.56      21.87   -9.397   <2e-16 ***
## as.factor(color)F         -302.83      22.13  -13.683   <2e-16 ***
## as.factor(color)G         -500.07      21.65  -23.100   <2e-16 ***
## as.factor(color)H         -977.54      23.10  -42.319   <2e-16 ***
## as.factor(color)I        -1436.65      25.90  -55.477   <2e-16 ***
## as.factor(color)J        -2347.21      32.10  -73.115   <2e-16 ***
## as.factor(clarity)IF      5418.97      61.04   88.783   <2e-16 ***
## as.factor(clarity)SI1     3562.75      52.00   68.516   <2e-16 ***
## as.factor(clarity)SI2     2606.53      52.22   49.915   <2e-16 ***
## as.factor(clarity)VS1     4533.21      53.16   85.274   <2e-16 ***
## as.factor(clarity)VS2     4198.17      52.30   80.275   <2e-16 ***
## as.factor(clarity)VVS1    5039.41      56.46   89.256   <2e-16 ***
## as.factor(clarity)VVS2    4961.02      54.77   90.584   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1158 on 37756 degrees of freedom
## Multiple R-squared:  0.9155, Adjusted R-squared:  0.9155
## F-statistic: 2.272e+04 on 18 and 37756 DF,  p-value: < 2.2e-16
```

Results

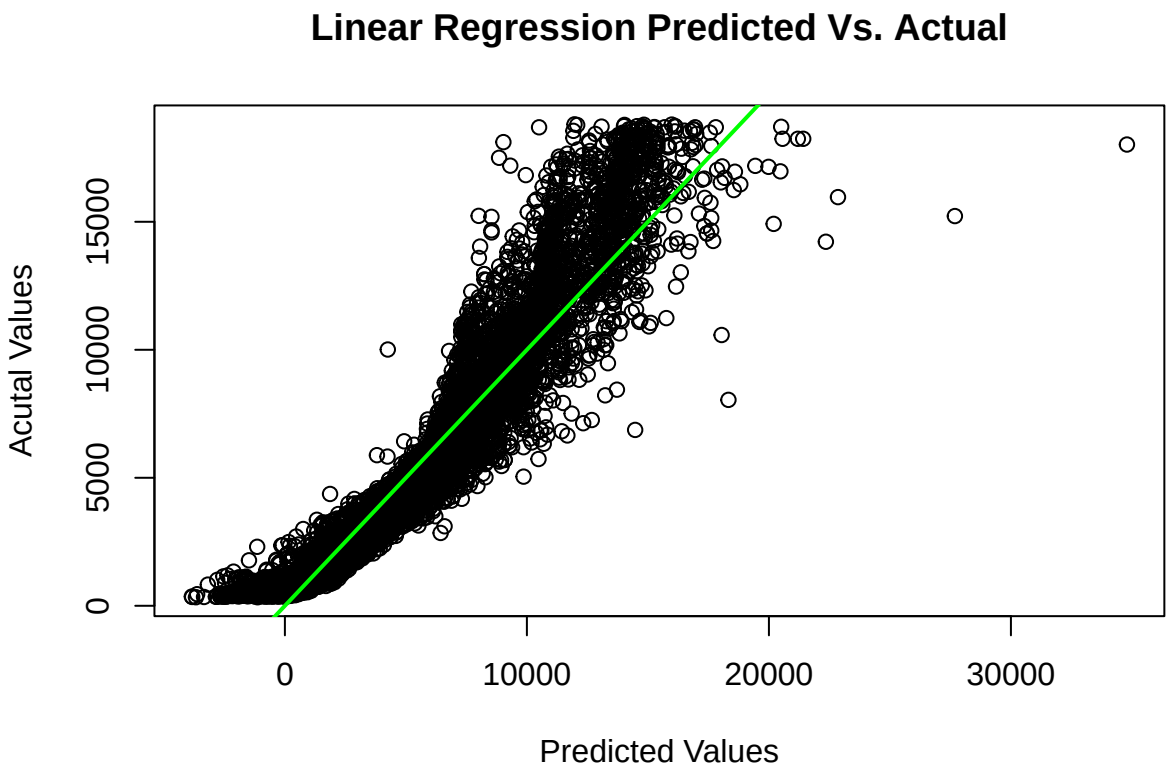
```
y_pred <- predict(lin_model, newdata = test[, colnames(test)[colnames(test) != 'price']])

rmse(test$price,y_pred)
```

```
## [1] 1153.436
```

```
mae(test$price,y_pred)
```

```
## [1] 805.1717
```

```
plot(y_pred, test$price,
     xlab = "Predicted Values"
     , ylab = "Acutal Values"
     , main = 'Linear Regression Predicted Vs. Actual')

abline(a = 0, b = 1, lwd=2,
       col = "green")
```


Linear Regression Predicted Vs. Actual
Acutal Values
0
5000
10000
15000
0
10000
20000
30000
Predicted Values