Visualizations for CDC 2024

2024-09-28

Import Libraries

Read in Cleaned Data

```
DT <- read_csv("Datasets/Death_And_Trips_Per_State.csv")
```

```
## Rows: 282 Columns: 12
## -- Column specification --------------------------------------------------------
## Delimiter: ","
## chr  (1): Jurisdiction
## dbl (11): Year, Month, Covid_Deaths, Total_Deaths, Pneumonia_Deaths, Influen...
##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

```
head(DT)
```

```
## # A tibble: 6 x 12
##    Year Month Jurisdiction   Covid_Deaths Total_Deaths Pneumonia_Deaths
##   <dbl> <dbl> <chr>                 <dbl>        <dbl>            <dbl>
## 1  2019    12 California                0        11730             1227
## 2  2019    12 Florida                   0         8480              492
## 3  2019    12 Georgia                   0         3626              224
## 4  2019    12 New York                  0         6638              686
## 5  2019    12 North Carolina            0         3960              250
## 6  2019    12 Wyoming                   0          374               33
## # i 6 more variables: Influenza_Deaths <dbl>, Pneumonia_Influenza_Deaths <dbl>,
## #   Pneumonia_Influenza_Covid <dbl>, Local_Trips <dbl>, Interstate_Trips <dbl>,
## #   Long_Distance_Trips <dbl>
```

California Stats

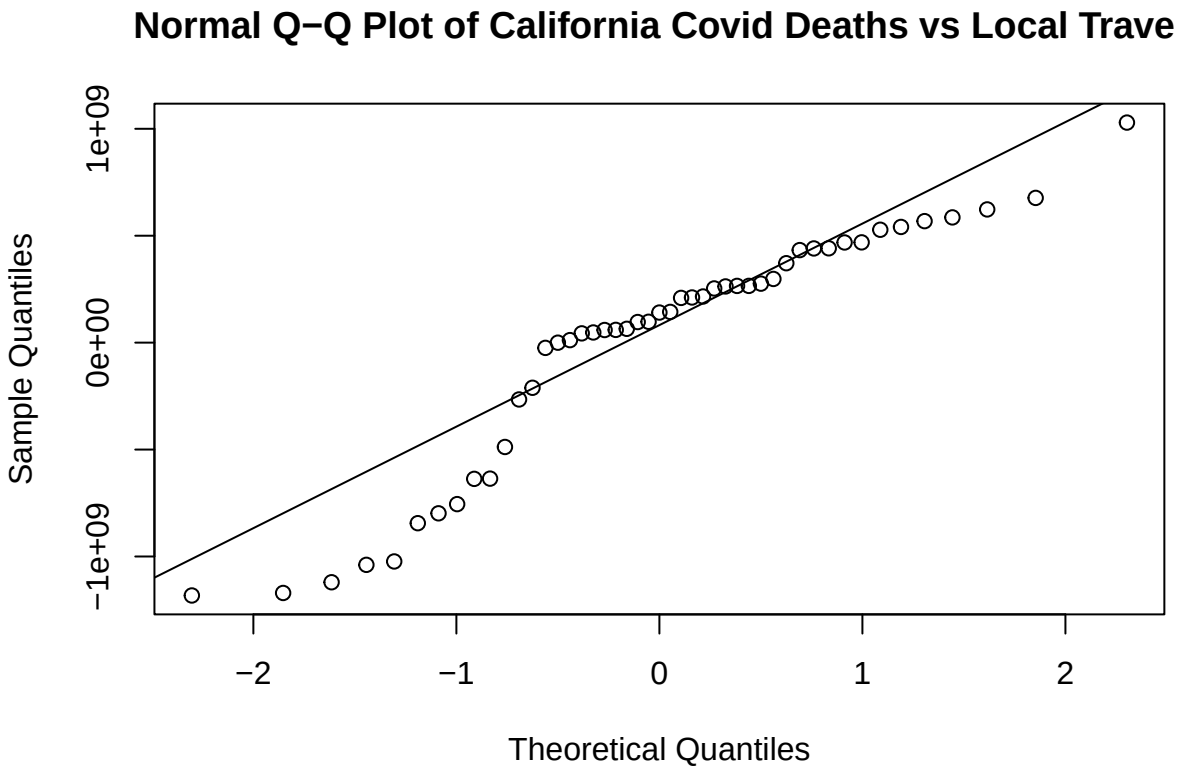
California Covid Deaths vs Local Travel

```
CA = DT[DT$Jurisdiction == 'California',]
head(CA)
```

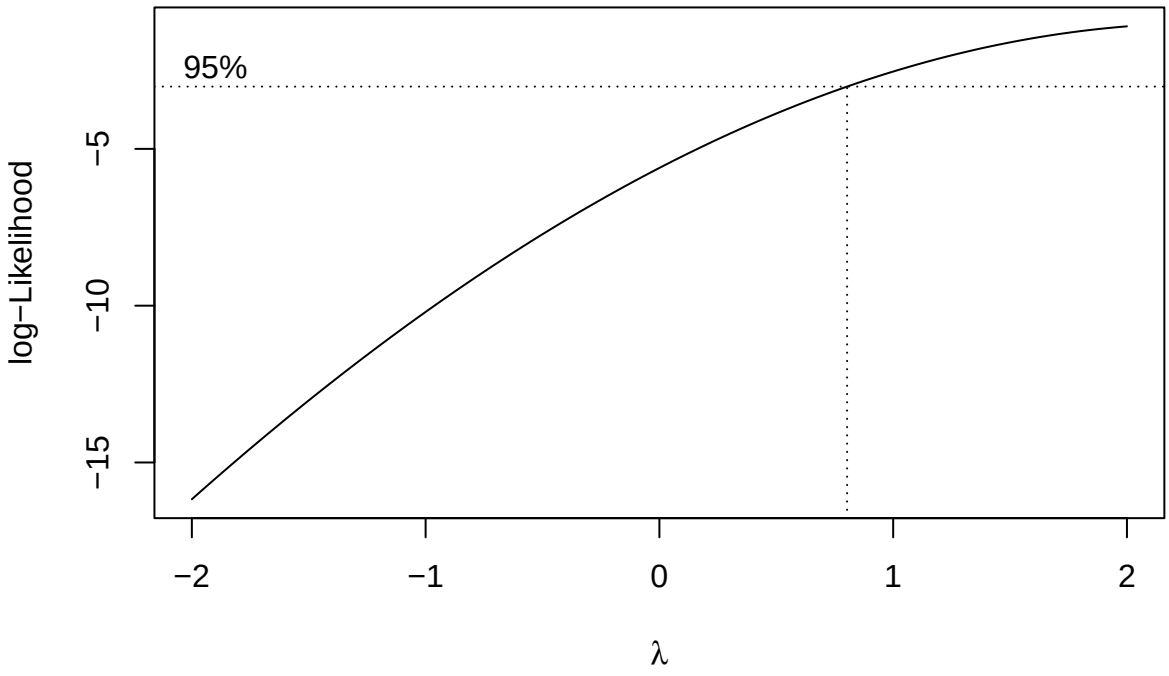
```
## # A tibble: 6 x 12
##    Year Month Jurisdiction Covid_Deaths Total_Deaths Pneumonia_Deaths
##   <dbl> <dbl> <chr>              <dbl>        <dbl>            <dbl>
## 1  2019    12 California             0        11730             1227
## 2  2020     1 California           456        46204             4788
## 3  2020     2 California           912        45776             4745
```

```
## 4  2020     3 California           2078        56890             6405
## 5  2020     4 California           3998        47496             5962
## 6  2020     5 California           4896        55824             6633
## # i 6 more variables: Influenza_Deaths <dbl>, Pneumonia_Influenza_Deaths <dbl>,
## #   Pneumonia_Influenza_Covid <dbl>, Local_Trips <dbl>, Interstate_Trips <dbl>,
## #   Long_Distance_Trips <dbl>
```

```r
model <- lm(CA$Local_Trips ~ CA$Covid_Deaths)
qqnorm(model$residuals, main = "Normal Q-Q Plot of California Covid Deaths vs Local Travel")
qqline(model$residuals)
```



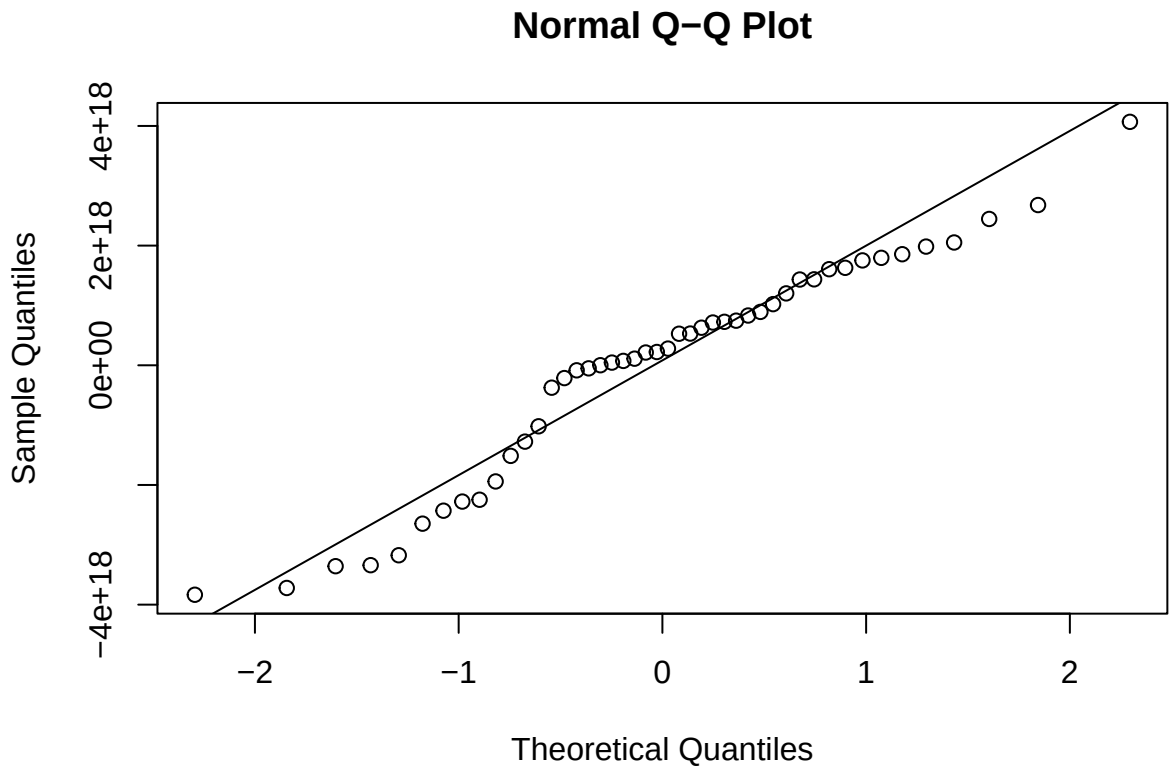

```r
CA$CookD = cooks.distance(model)
CAC <- CA[which(CA$CookD < 0.5),]
bc <- boxcox(CAC$Local_Trips ~ CAC$Covid_Deaths)
```



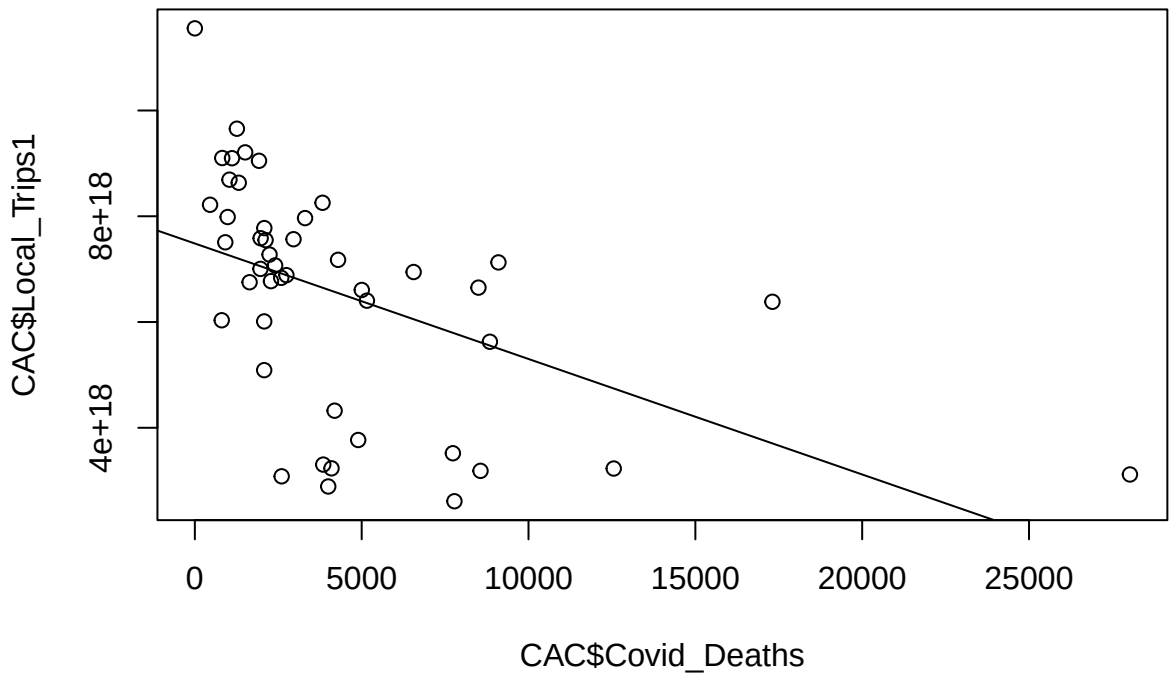

```
lambda <- bc$x[which.max(bc$y)]
CAC$Local_Trips1 <- (((CAC$Local_Trips)^lambda - 1) / lambda)
new_model <- lm(CAC$Local_Trips1 ~ CAC$Covid_Deaths)
summary(new_model)
```

```
##
## Call:
## lm(formula = CAC$Local_Trips1 ~ CAC$Covid_Deaths)
##
## Residuals:
##        Min         1Q     Median         3Q        Max
## -3.835e+18 -1.212e+18  2.507e+17  1.375e+18  4.068e+18
##
## Coefficients:
##                    Estimate Std. Error t value Pr(>|t|)
## (Intercept)       7.485e+18  3.734e+17  20.047  < 2e-16 ***
## CAC$Covid_Deaths -2.184e+14  5.683e+13  -3.843 0.000387 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.888e+18 on 44 degrees of freedom
## Multiple R-squared:  0.2513, Adjusted R-squared:  0.2343
## F-statistic: 14.77 on 1 and 44 DF,  p-value: 0.000387
```

```r
qqnorm(new_model$residuals)
qqline(new_model$residuals)
```




```r
plot(CAC$Local_Trips1 ~ CAC$Covid_Deaths)
abline(new_model)
```

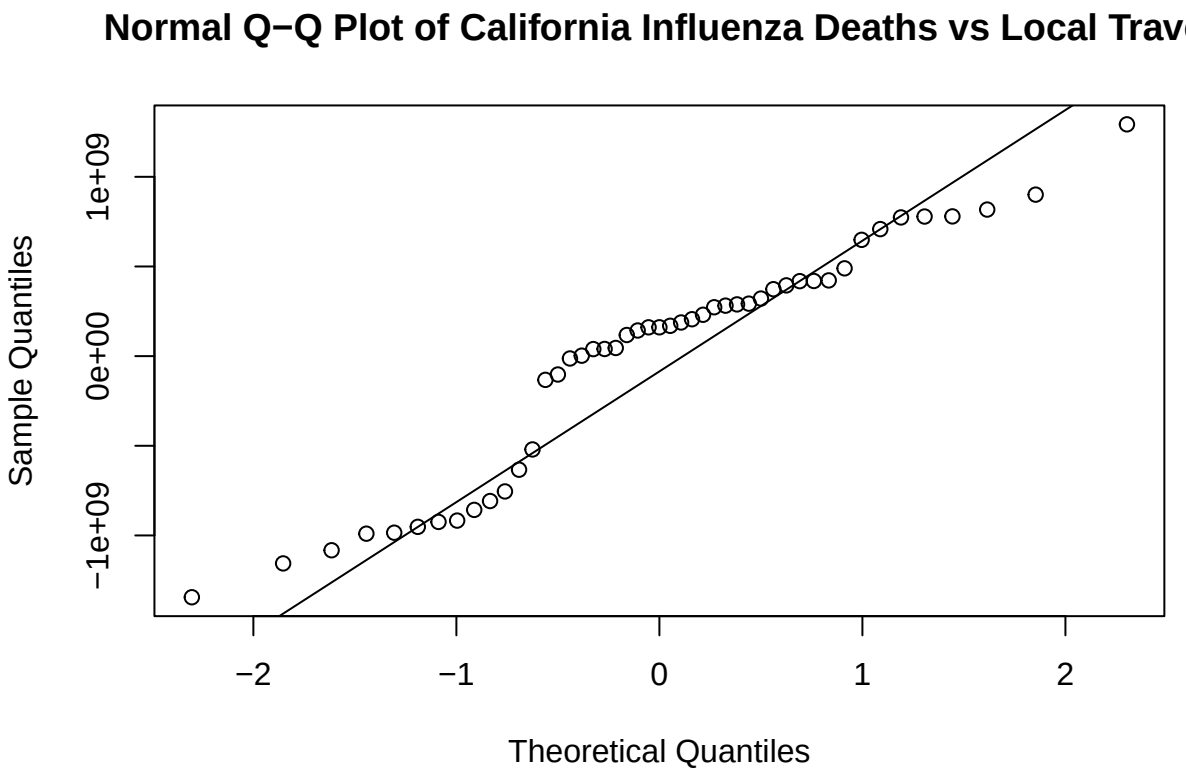



```
conf_intervals <- confint(new_model, level = 0.95)
print(conf_intervals)
```

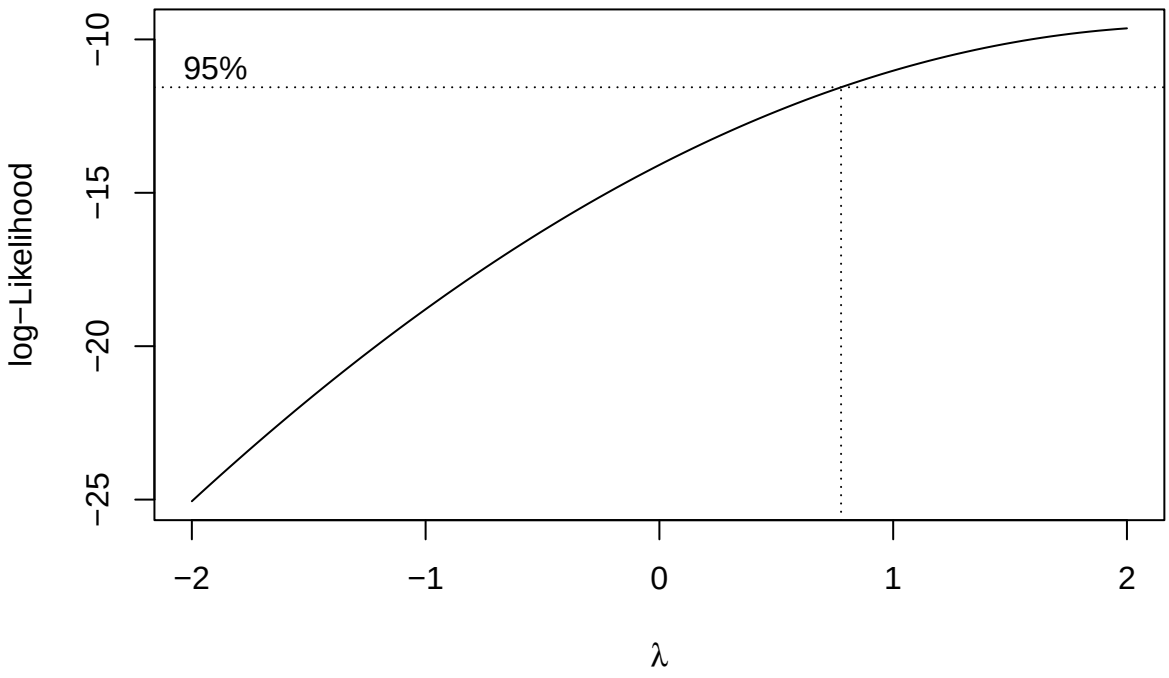
```
##                           2.5 %        97.5 %
## (Intercept)       6.732428e+18  8.237407e+18
## CAC$Covid_Deaths -3.329148e+14 -1.038586e+14
```

California Influenza Deaths vs Local Travel

```
model <- lm(CA$Local_Trips ~ CA$Influenza_Deaths)
qqnorm(model$residuals, main = "Normal Q-Q Plot of California Influenza Deaths vs Local Travel")
qqline(model$residuals)
```



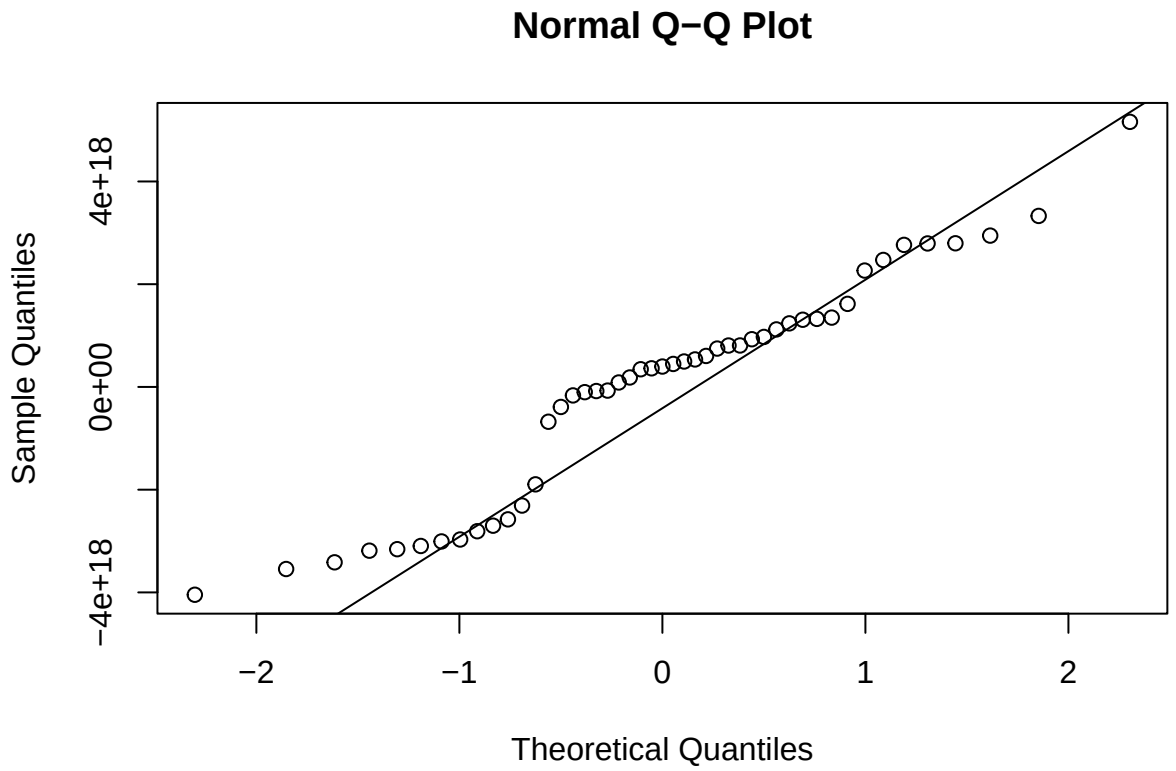

```
CA$CookD = cooks.distance(model)
CAI <- CA[which(CA$CookD < 0.5),]
bc <- boxcox(CAI$Local_Trips ~ CAI$Influenza_Deaths)
```



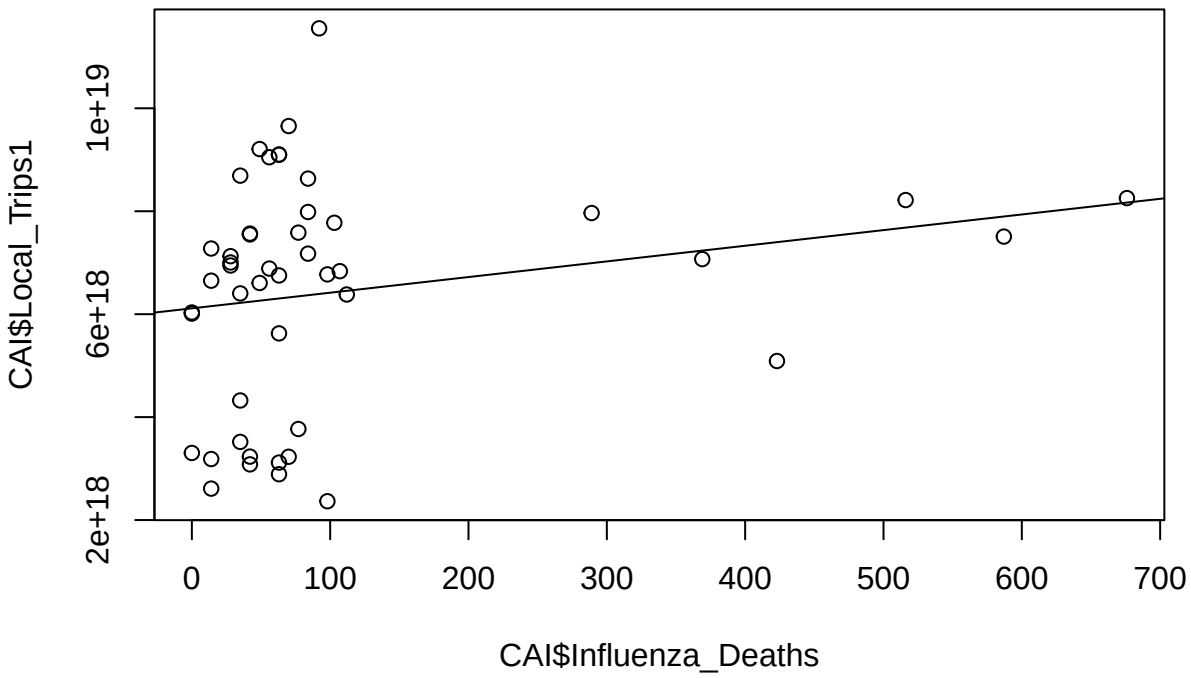

```
lambda <- bc$x[which.max(bc$y)]
CAI$Local_Trips1 <- (((CAI$Local_Trips)^lambda - 1) / lambda)
new_model <- lm(CAI$Local_Trips1 ~ CAI$Influenza_Deaths)
summary(new_model)
```

```
##
## Call:
## lm(formula = CAI$Local_Trips1 ~ CAI$Influenza_Deaths)
##
## Residuals:
##        Min         1Q     Median         3Q        Max
## -4.045e+18 -2.103e+18  3.970e+17  1.273e+18  5.160e+18
##
## Coefficients:
##                       Estimate Std. Error t value Pr(>|t|)
## (Intercept)          6.113e+18  3.922e+17   15.59   <2e-16 ***
## CAI$Influenza_Deaths 3.040e+15  2.112e+15    1.44    0.157
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.193e+18 on 45 degrees of freedom
## Multiple R-squared:  0.04404,    Adjusted R-squared:  0.0228
## F-statistic: 2.073 on 1 and 45 DF,  p-value: 0.1568
```

```
qqnorm(new_model$residuals)
qqline(new_model$residuals)
```




```
plot(CAI$Local_Trips1 ~ CAI$Influenza_Deaths)
abline(new_model)
```

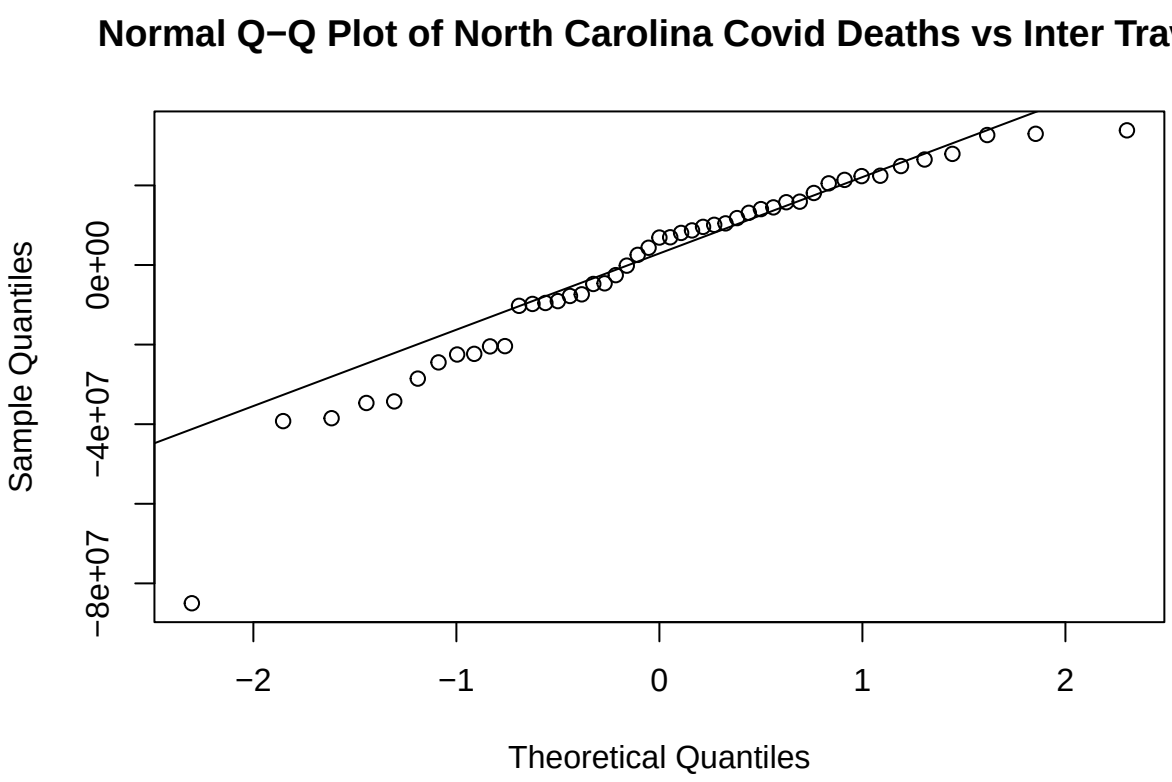



```
conf_intervals <- confint(new_model, level = 0.95)
print(conf_intervals)
```

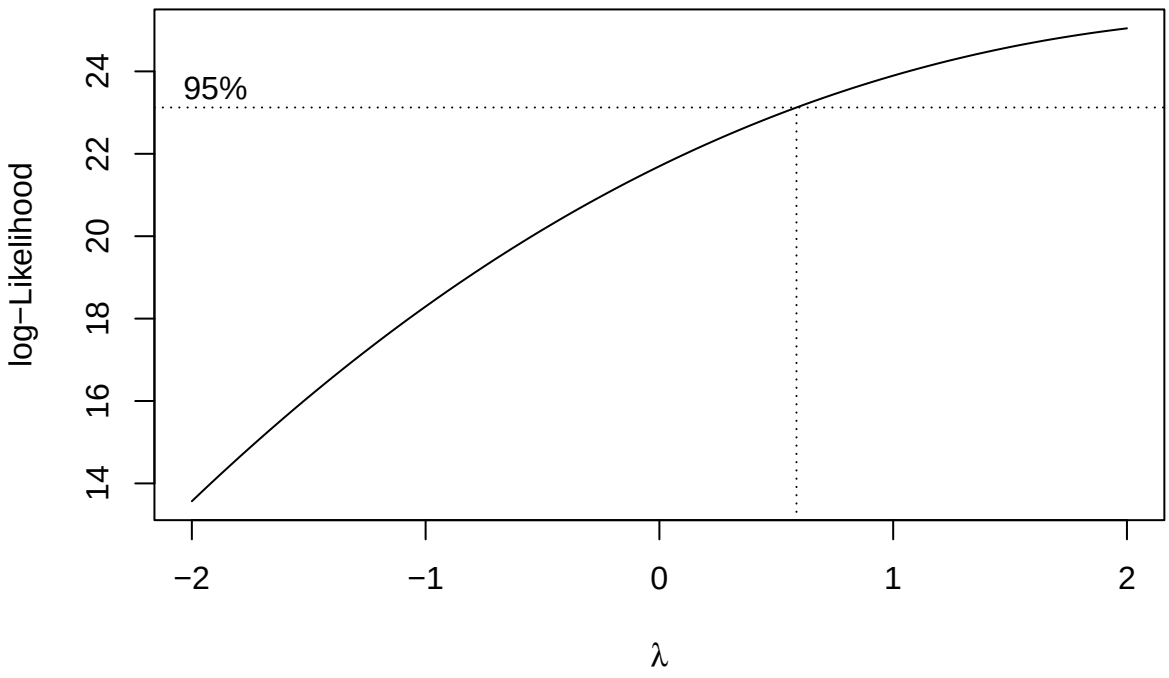
```
##                              2.5 %       97.5 %
## (Intercept)           5.323084e+18 6.903048e+18
## CAI$Influenza_Deaths -1.212697e+15 7.293562e+15
```

California Covid Deaths vs Interstate Travel

```
model <- lm(CA$Interstate_Trips ~ CA$Covid_Deaths)
qqnorm(model$residuals, main = "Normal Q-Q Plot of North Carolina Covid Deaths vs Inter Travel")
qqline(model$residuals)
```



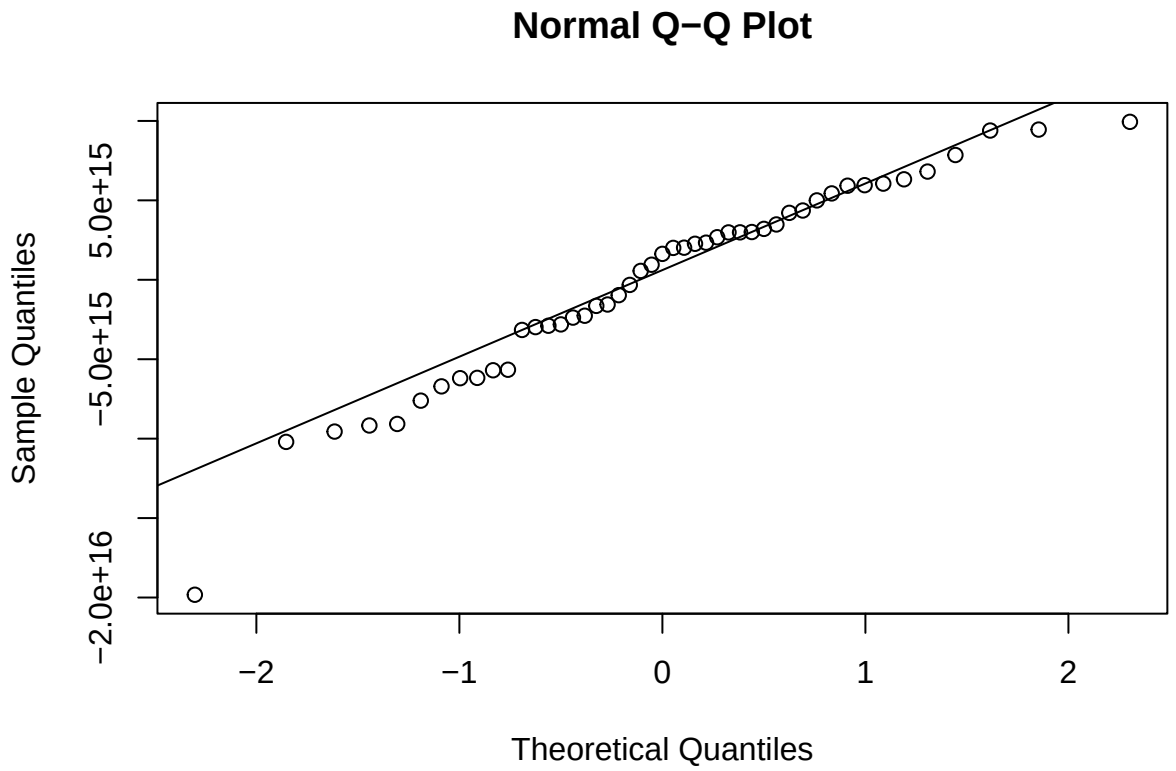

```
CA$CookD = cooks.distance(model)
CAC <- CA[which(CA$CookD < 0.5),]
bc <- boxcox(CAC$Interstate_Trips ~ CAC$Covid_Deaths)
```



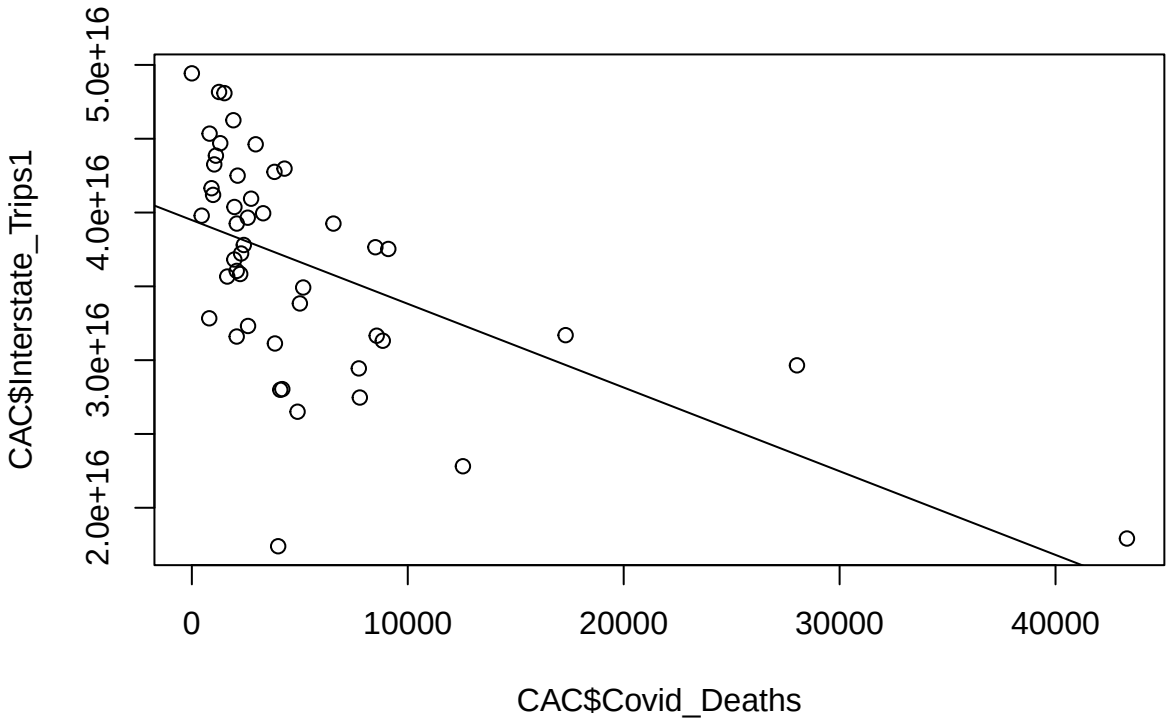

```
lambda <- bc$x[which.max(bc$y)]
CAC$Interstate_Trips1 <- (((CAC$Interstate_Trips)^lambda - 1) / lambda)
new_model <- lm(CAC$Interstate_Trips1 ~ CAC$Covid_Deaths)
summary(new_model)
```

```
##
## Call:
## lm(formula = CAC$Interstate_Trips1 ~ CAC$Covid_Deaths)
##
## Residuals:
##        Min         1Q     Median         3Q        Max
## -1.983e+16 -3.067e+15  1.632e+15  4.288e+15  9.942e+15
##
## Coefficients:
##                    Estimate Std. Error t value Pr(>|t|)
## (Intercept)       3.949e+16  1.112e+15   35.50  < 2e-16 ***
## CAC$Covid_Deaths -5.670e+11  1.227e+11   -4.62 3.22e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 6.241e+15 on 45 degrees of freedom
## Multiple R-squared:  0.3217, Adjusted R-squared:  0.3067
## F-statistic: 21.35 on 1 and 45 DF,  p-value: 3.219e-05
```

```r
qqnorm(new_model$residuals)
qqline(new_model$residuals)
```




```r
plot(CAC$Interstate_Trips1 ~ CAC$Covid_Deaths)
abline(new_model)
```

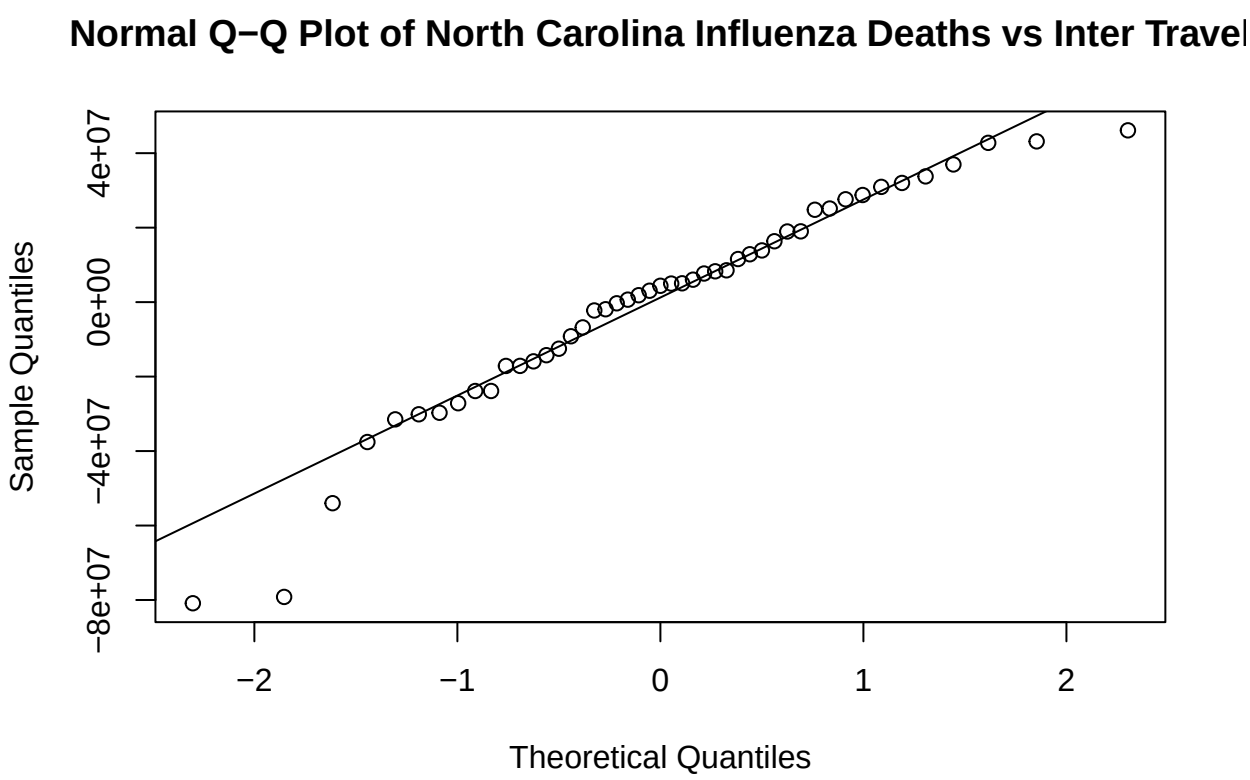



```
conf_intervals <- confint(new_model, level = 0.95)
print(conf_intervals)
```

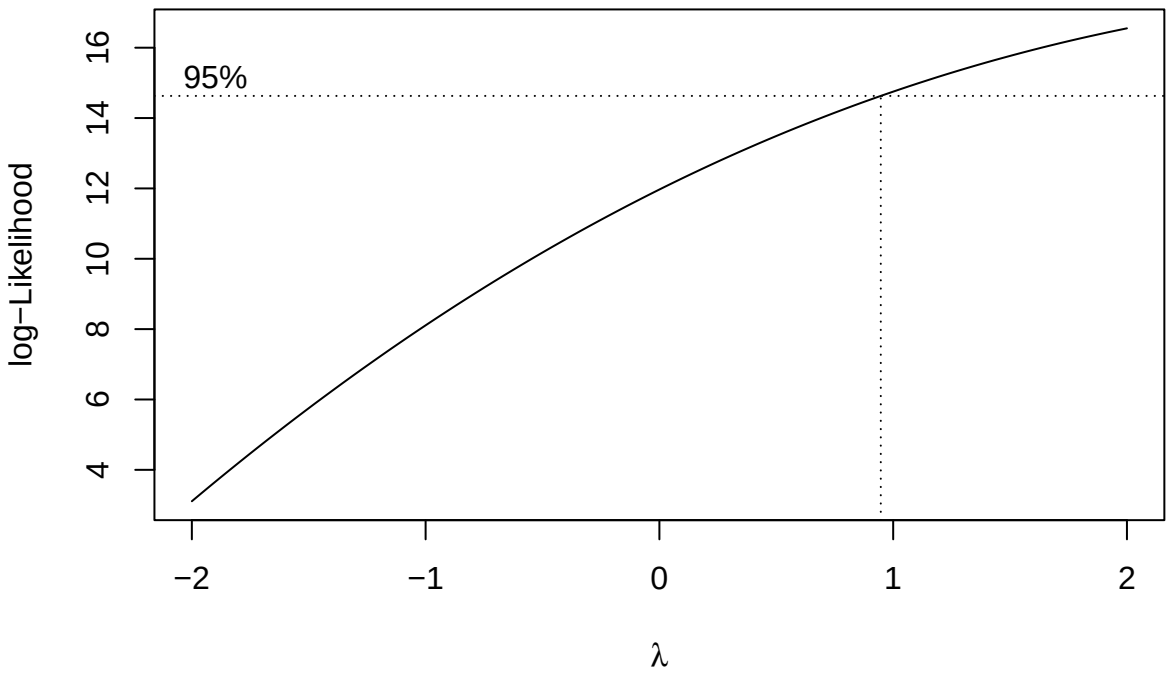
```
##                           2.5 %        97.5 %
## (Intercept)       3.724632e+16  4.172704e+16
## CAC$Covid_Deaths -8.141648e+11 -3.198252e+11
```

California Influenza Deaths vs Interstate Travel

```
model <- lm(CA$Interstate_Trips ~ CA$Influenza_Deaths)
qqnorm(model$residuals, main = "Normal Q-Q Plot of North Carolina Influenza Deaths vs Inter Travel")
qqline(model$residuals)
```



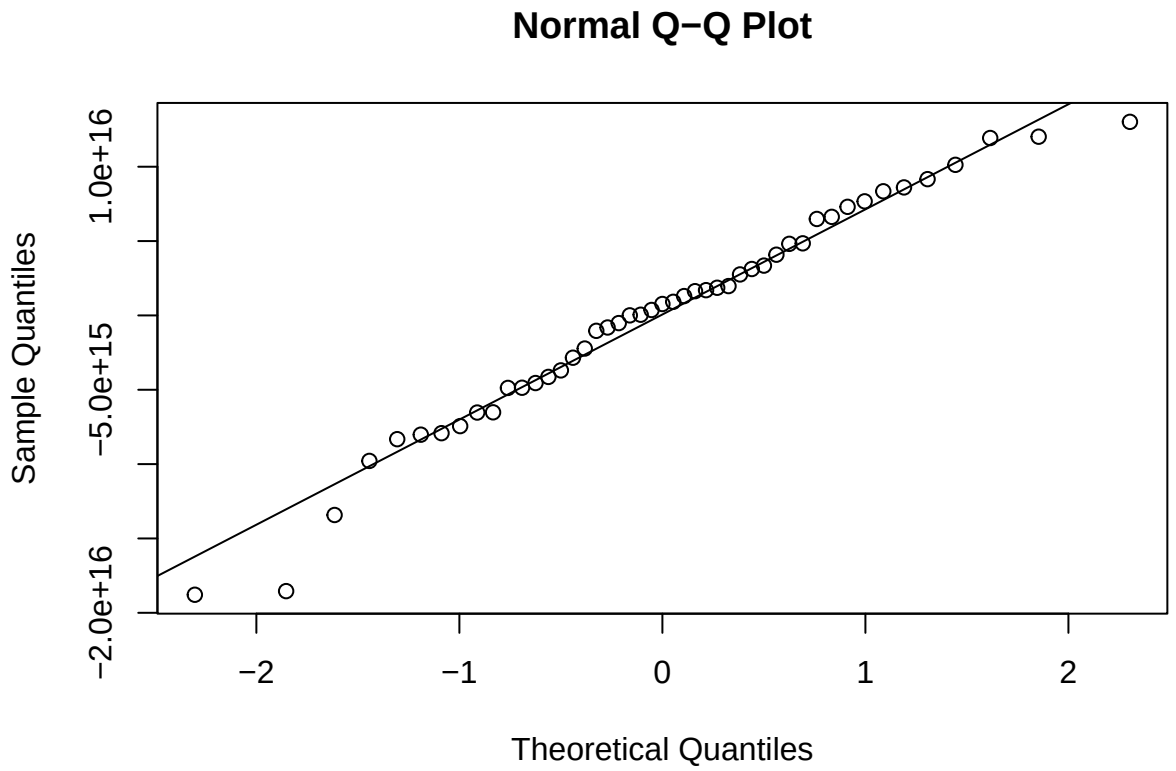

```
CA$CookD = cooks.distance(model)
CAI <- CA[which(CA$CookD < 0.5),]
bc <- boxcox(CAI$Interstate_Trips ~ CAI$Influenza_Deaths)
```



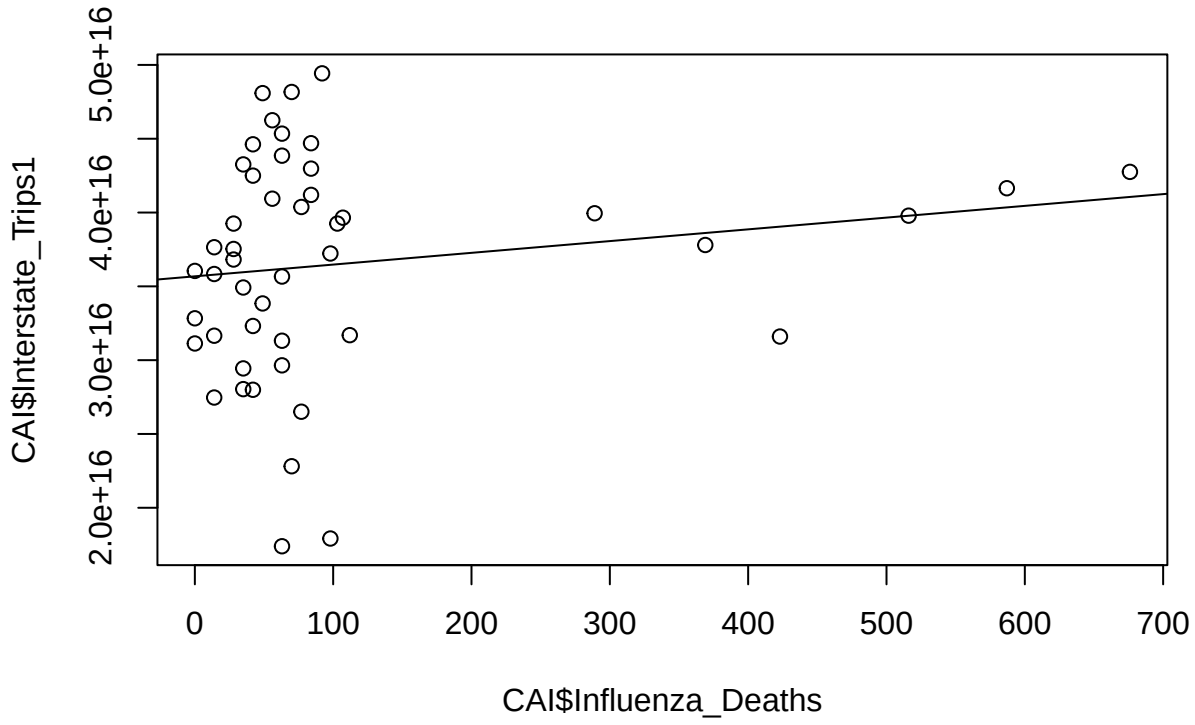

```
lambda <- bc$x[which.max(bc$y)]
CAI$Interstate_Trips1 <- (((CAI$Interstate_Trips)^lambda - 1) / lambda)
new_model <- lm(CAI$Interstate_Trips1 ~ CAI$Influenza_Deaths)
summary(new_model)
```

```
##
## Call:
## lm(formula = CAI$Interstate_Trips1 ~ CAI$Influenza_Deaths)
##
## Residuals:
##        Min         1Q     Median         3Q        Max
## -1.879e+16 -4.706e+15  7.675e+14  4.831e+15  1.302e+16
##
## Coefficients:
##                       Estimate Std. Error t value Pr(>|t|)
## (Intercept)          3.568e+16  1.337e+15  26.677   <2e-16 ***
## CAI$Influenza_Deaths 7.955e+12  7.201e+12   1.105    0.275
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 7.478e+15 on 45 degrees of freedom
## Multiple R-squared:  0.02641,    Adjusted R-squared:  0.004772
## F-statistic: 1.221 on 1 and 45 DF,  p-value: 0.2751
```

```
qqnorm(new_model$residuals)
qqline(new_model$residuals)
```




```
plot(CAI$Interstate_Trips1 ~ CAI$Influenza_Deaths)
abline(new_model)
```

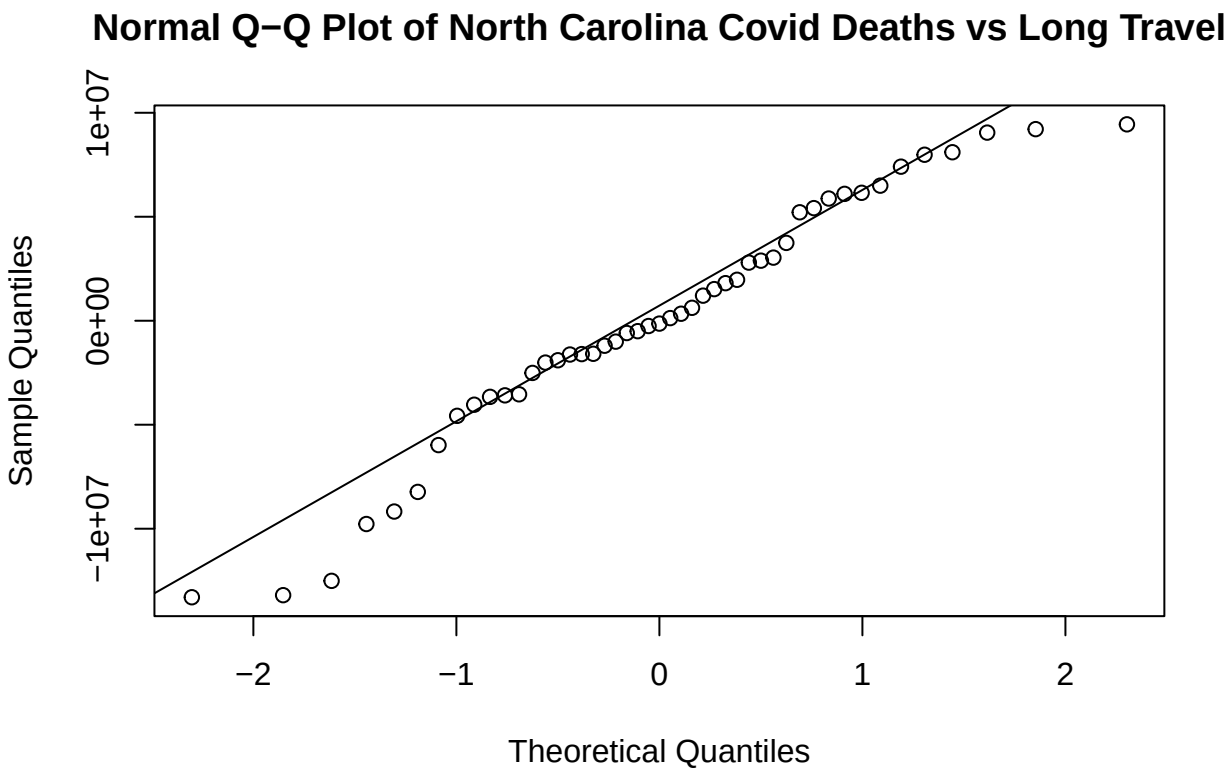



```
conf_intervals <- confint(new_model, level = 0.95)
print(conf_intervals)
```

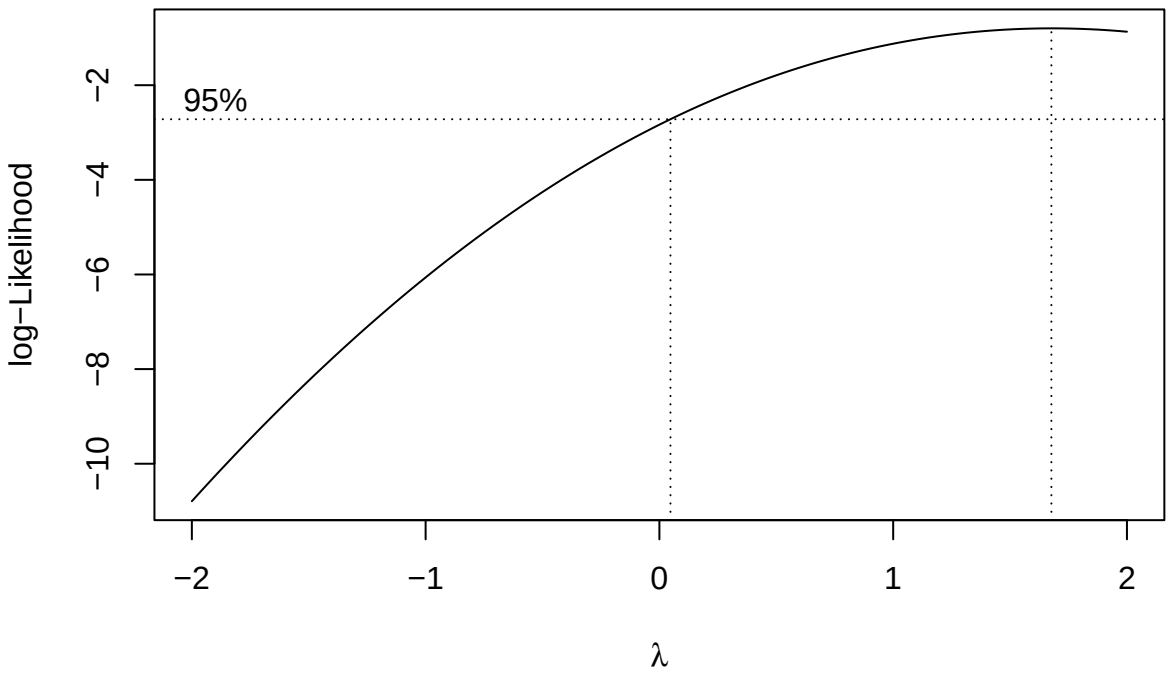
```
##                               2.5 %       97.5 %
## (Intercept)           3.298493e+16 3.837246e+16
## CAI$Influenza_Deaths -6.547580e+12 2.245799e+13
```

California Covid Deaths vs Long Distance Trips

```
model <- lm(CA$Long_Distance_Trips ~ CA$Covid_Deaths)
qqnorm(model$residuals, main = "Normal Q-Q Plot of North Carolina Covid Deaths vs Long Travel")
qqline(model$residuals)
```



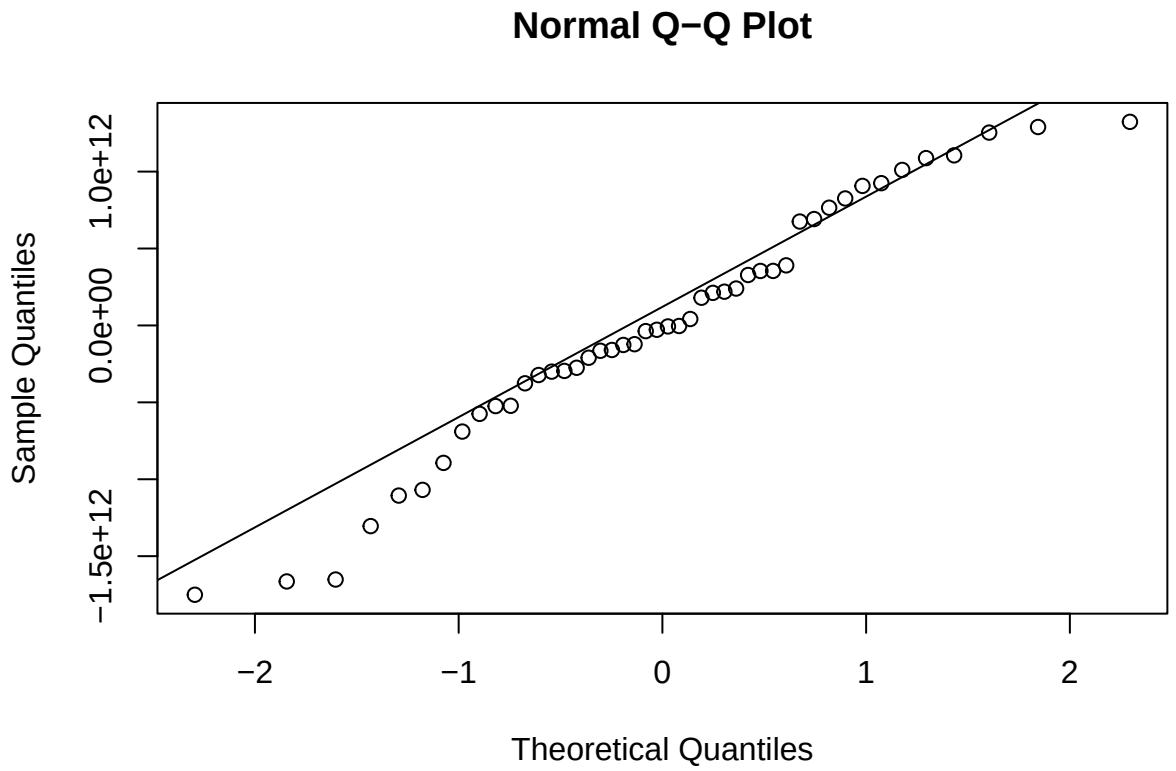

```
CA$CookD = cooks.distance(model)
CAC <- CA[which(CA$CookD < 0.5),]
bc <- boxcox(CAC$Long_Distance_Trips ~ CAC$Covid_Deaths)
```



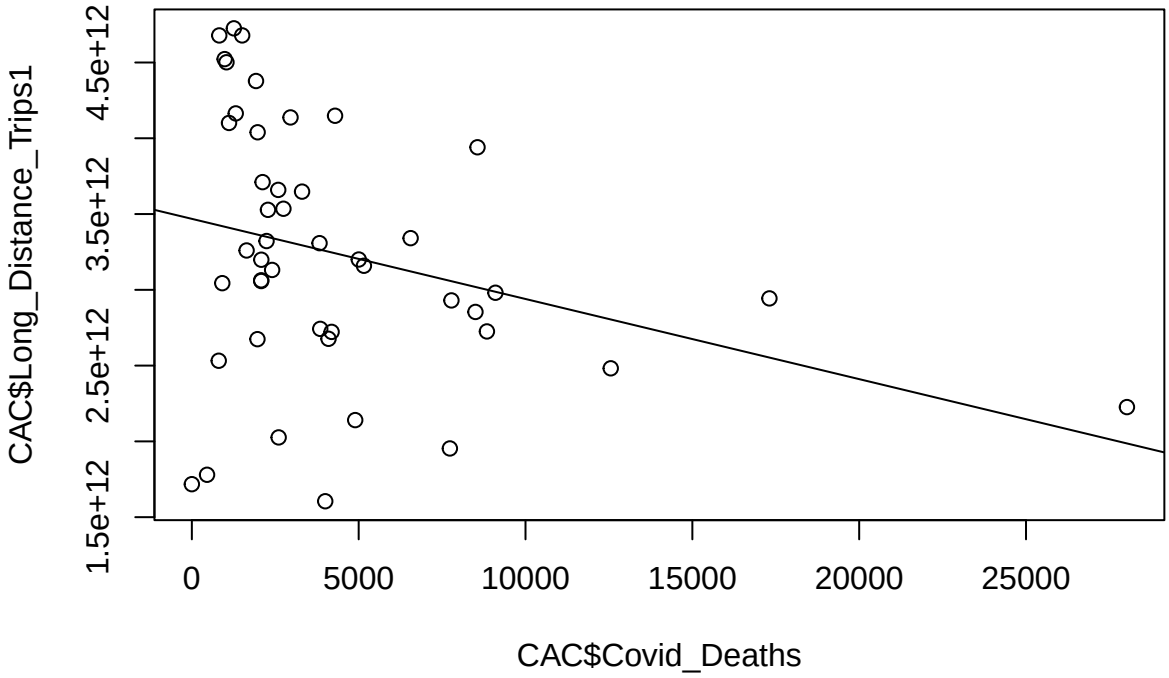

```
lambda <- bc$x[which.max(bc$y)]
CAC$Long_Distance_Trips1 <- (((CAC$Long_Distance_Trips)^lambda - 1) / lambda)
new_model <- lm(CAC$Long_Distance_Trips1 ~ CAC$Covid_Deaths)
summary(new_model)
```

```
##
## Call:
## lm(formula = CAC$Long_Distance_Trips1 ~ CAC$Covid_Deaths)
##
## Residuals:
##        Min         1Q     Median         3Q        Max
## -1.751e+12 -3.628e+11 -1.733e+10  6.042e+11  1.324e+12
##
## Coefficients:
##                    Estimate Std. Error t value Pr(>|t|)
## (Intercept)       3.468e+12  1.589e+11  21.824   <2e-16 ***
## CAC$Covid_Deaths -5.288e+07  2.419e+07  -2.186   0.0342 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 8.035e+11 on 44 degrees of freedom
## Multiple R-squared:  0.09798,    Adjusted R-squared:  0.07748
## F-statistic: 4.779 on 1 and 44 DF,  p-value: 0.03417
```

```r
qqnorm(new_model$residuals)
qqline(new_model$residuals)
```




```r
plot(CAC$Long_Distance_Trips1 ~ CAC$Covid_Deaths)
abline(new_model)
```

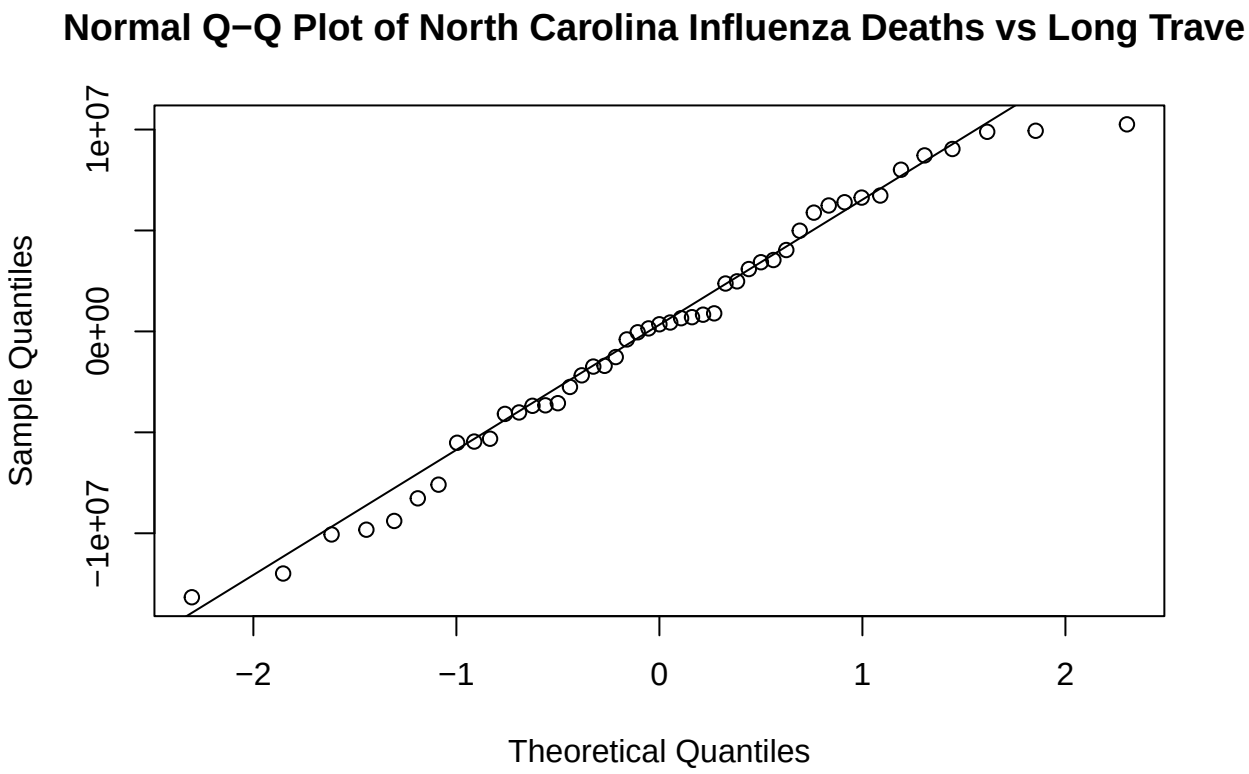



```
conf_intervals <- confint(new_model, level = 0.95)
print(conf_intervals)
```

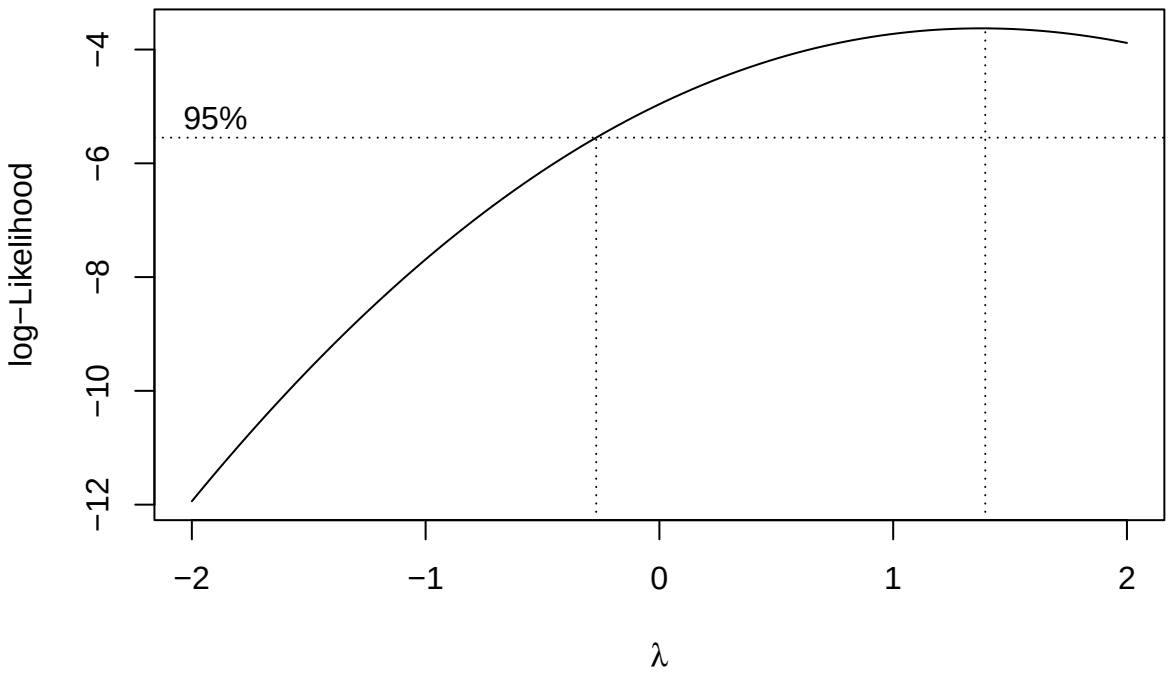
```
##                          2.5 %        97.5 %
## (Intercept)      3148066746944 3788661451360
## CAC$Covid_Deaths    -101628600      -4130768
```

California Influenza Deaths vs Long Distance Trips

```
model <- lm(CA$Long_Distance_Trips ~ CA$Influenza_Deaths)
qqnorm(model$residuals, main = "Normal Q-Q Plot of North Carolina Influenza Deaths vs Long Travel")
qqline(model$residuals)
```



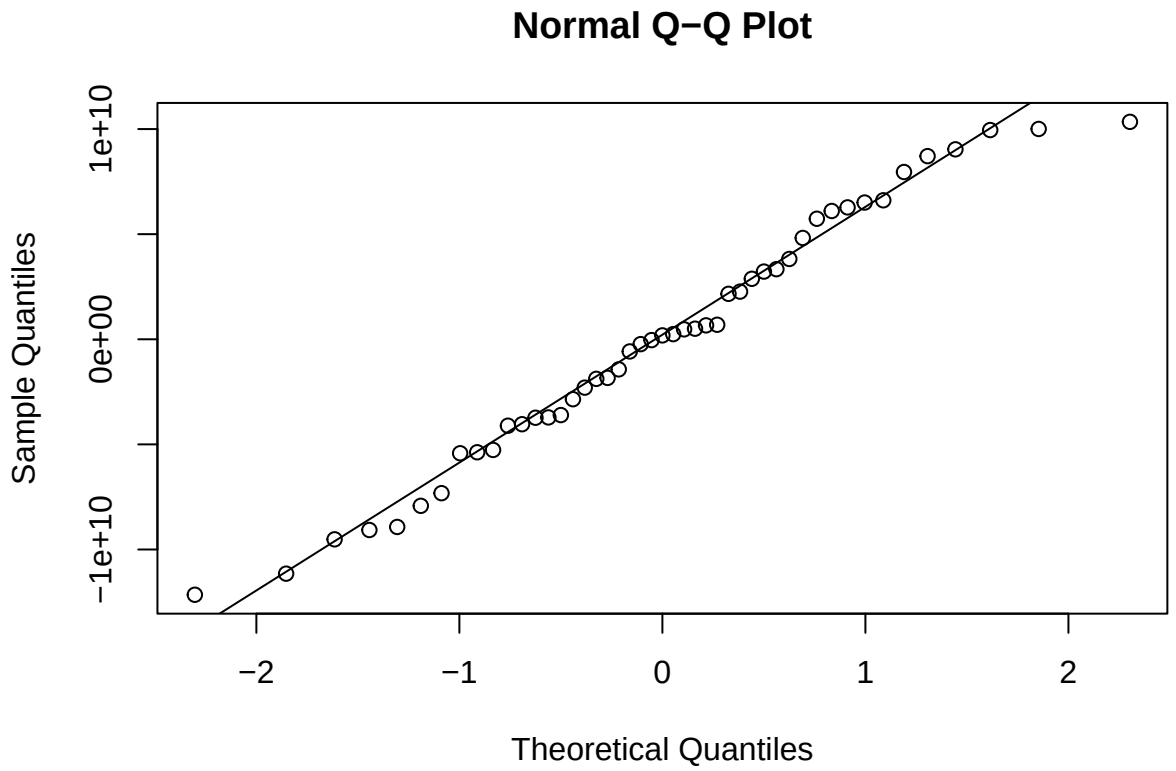

```
CA$CookD = cooks.distance(model)
CAI <- CA[which(CA$CookD < 0.5),]
bc <- boxcox(CAI$Long_Distance_Trips ~ CAI$Influenza_Deaths)
```



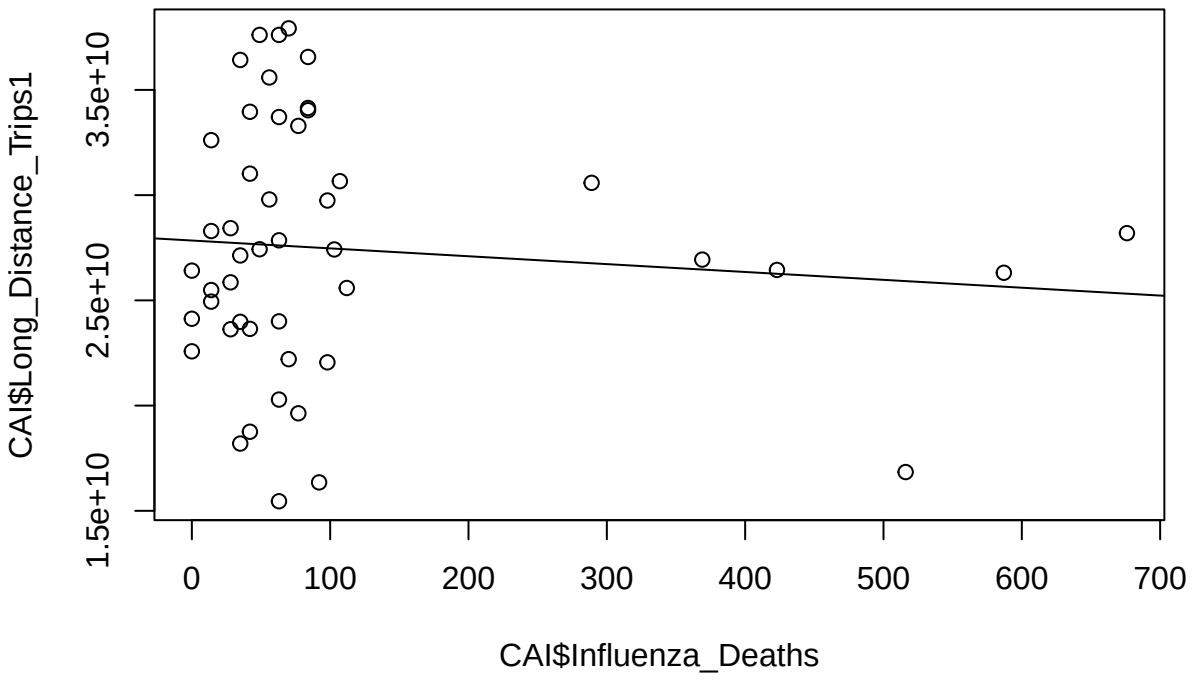

```
lambda <- bc$x[which.max(bc$y)]
CAI$Long_Distance_Trips1 <- (((CAI$Long_Distance_Trips)^lambda - 1) / lambda)
new_model <- lm(CAI$Long_Distance_Trips1 ~ CAI$Influenza_Deaths)
summary(new_model)
```

```
##
## Call:
## lm(formula = CAI$Long_Distance_Trips1 ~ CAI$Influenza_Deaths)
##
## Residuals:
##        Min         1Q     Median         3Q        Max
## -1.215e+10 -3.887e+09  1.845e+08  4.320e+09  1.034e+10
##
## Coefficients:
##                         Estimate Std. Error t value Pr(>|t|)
## (Intercept)           2.784e+10  1.075e+09  25.905   <2e-16 ***
## CAI$Influenza_Deaths -3.737e+06  5.787e+06  -0.646    0.522
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 6.01e+09 on 45 degrees of freedom
## Multiple R-squared:  0.009181,   Adjusted R-squared:  -0.01284
## F-statistic: 0.417 on 1 and 45 DF,  p-value: 0.5217
```

```
qqnorm(new_model$residuals)
qqline(new_model$residuals)
```




```
plot(CAI$Long_Distance_Trips1 ~ CAI$Influenza_Deaths)
abline(new_model)
```




```
conf_intervals <- confint(new_model, level = 0.95)
print(conf_intervals)
```

```
##                             2.5 %      97.5 %
## (Intercept)          25679400277 30009199525
## CAI$Influenza_Deaths   -15392301     7918612
```

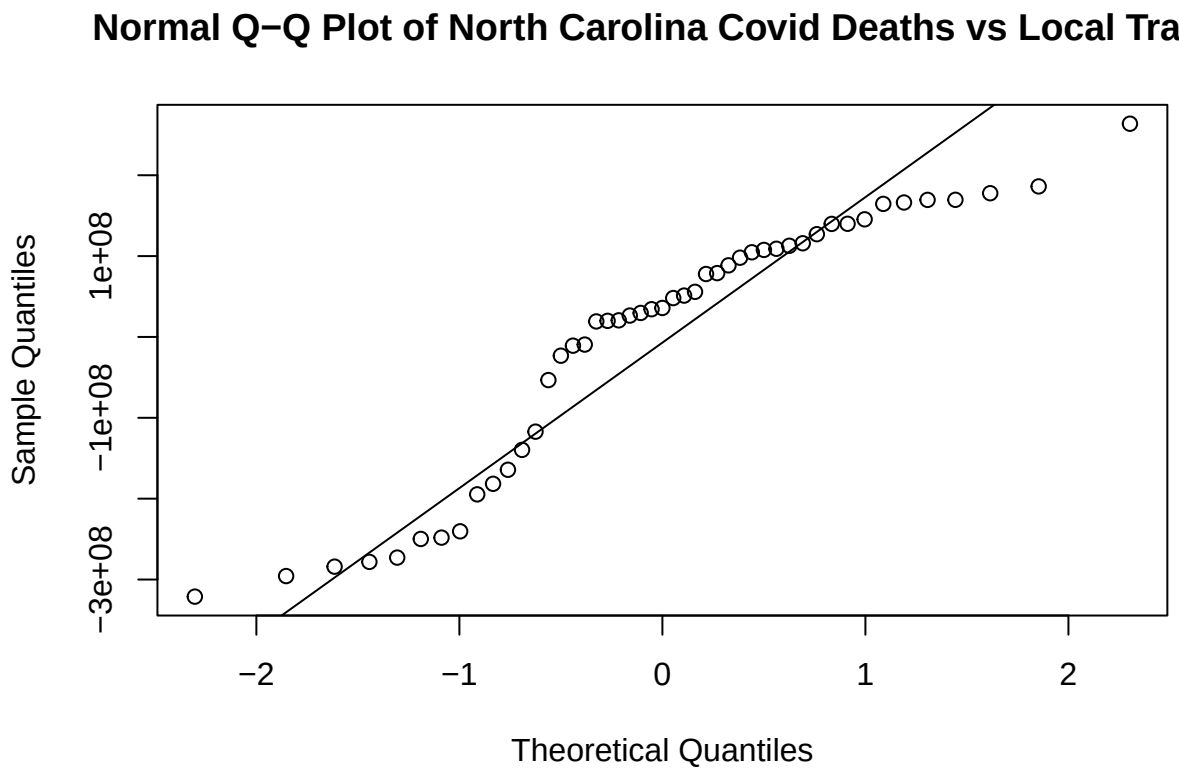
North Carolina Stats

North Carolina Covid Deaths vs Local Trips

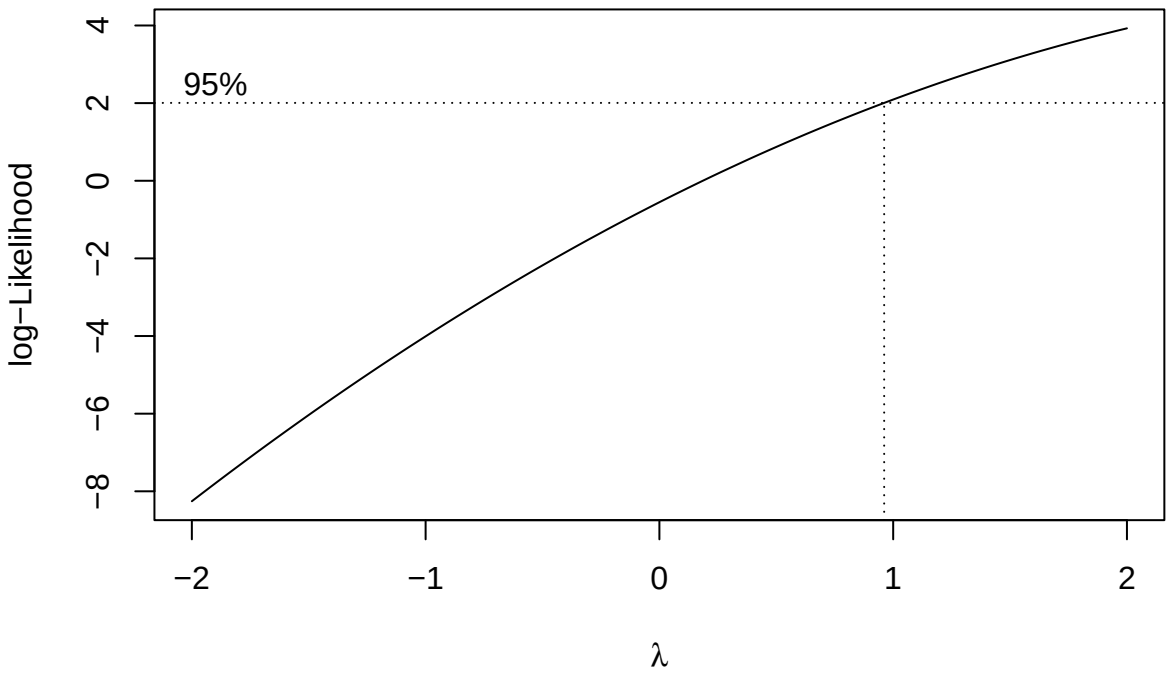
```
NC = DT[DT$Jurisdiction == 'North Carolina',]
head(NC)
```

```
## # A tibble: 6 x 12
##    Year Month Jurisdiction   Covid_Deaths Total_Deaths Pneumonia_Deaths
##   <dbl> <dbl> <chr>                 <dbl>        <dbl>            <dbl>
## 1  2019    12 North Carolina            0         3960              250
## 2  2020     1 North Carolina            0        15590             1431
## 3  2020     2 North Carolina          178        15944             1184
## 4  2020     3 North Carolina          906        19874             1375
## 5  2020     4 North Carolina          888        16142             1264
## 6  2020     5 North Carolina         1244        20160             1456
## # i 6 more variables: Influenza_Deaths <dbl>, Pneumonia_Influenza_Deaths <dbl>,
## #   Pneumonia_Influenza_Covid <dbl>, Local_Trips <dbl>, Interstate_Trips <dbl>,
## #   Long_Distance_Trips <dbl>
```

```r
model <- lm(NC$Local_Trips ~ NC$Covid_Deaths)
qqnorm(model$residuals, main = "Normal Q-Q Plot of North Carolina Covid Deaths vs Local Travel")
qqline(model$residuals)
```



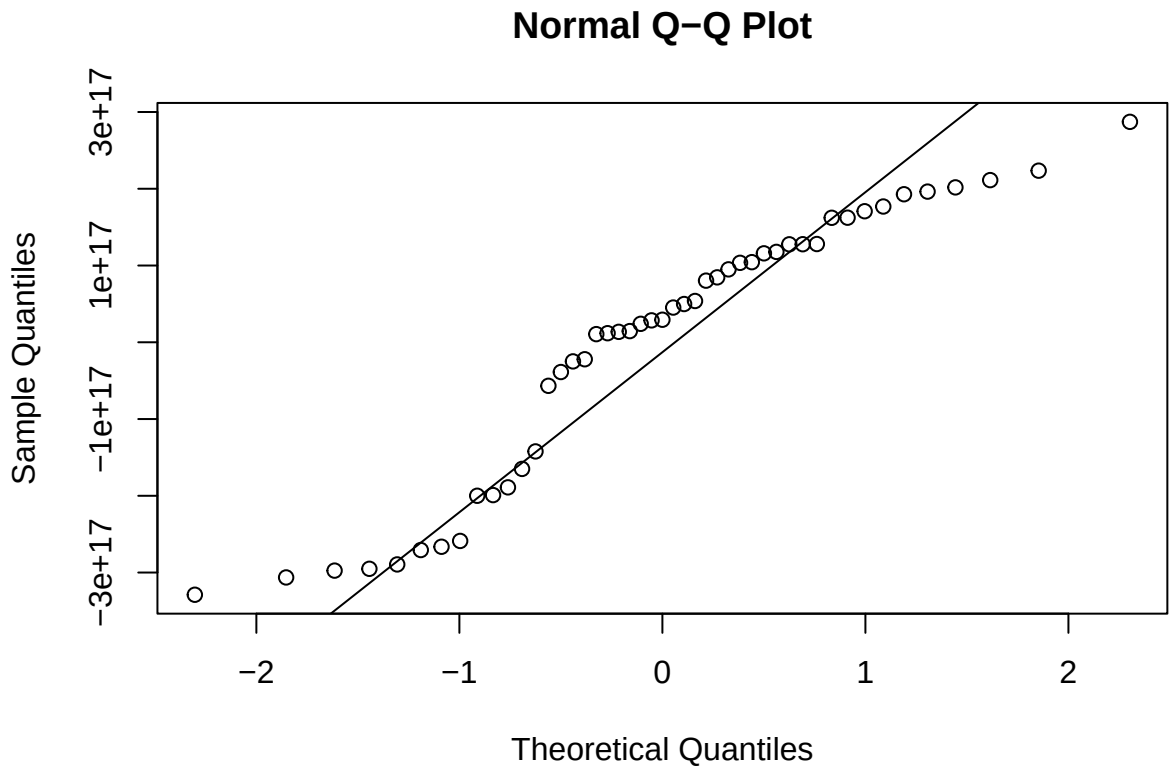

```r
NC$CookD = cooks.distance(model)
NCC <- NC[which(NC$CookD < 0.5),]
bc <- boxcox(NCC$Local_Trips ~ NCC$Covid_Deaths)
```



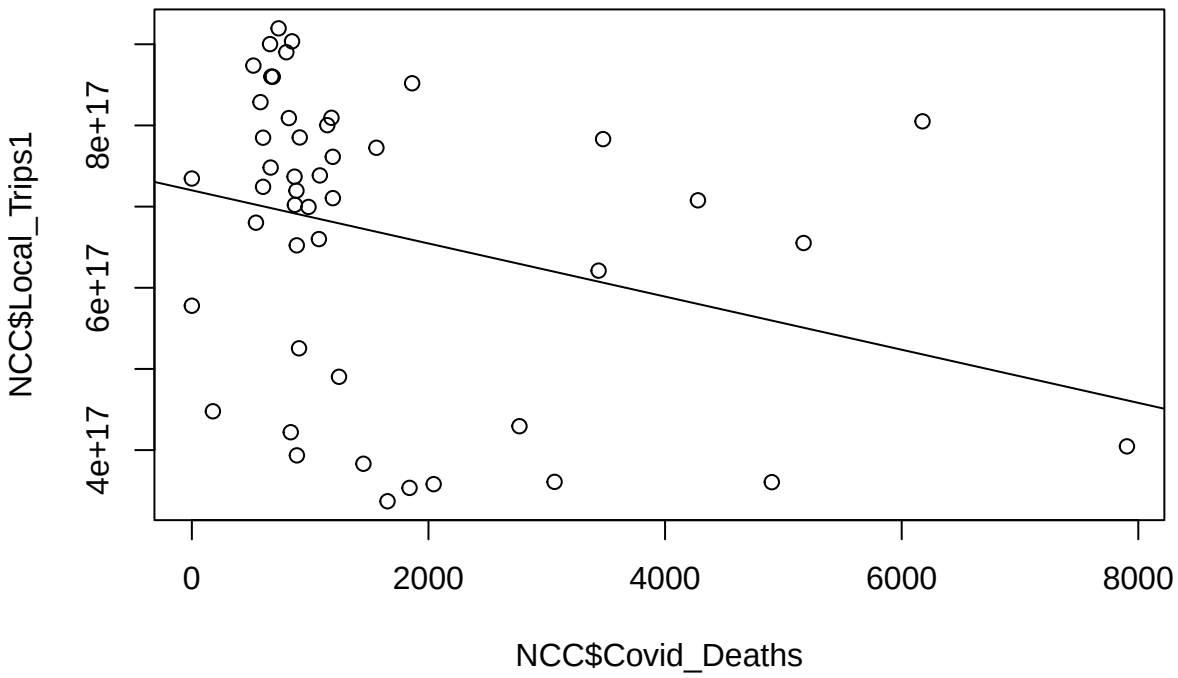

```
lambda <- bc$x[which.max(bc$y)]
NCC$Local_Trips1 <- (((NCC$Local_Trips)^lambda - 1) / lambda)
new_model <- lm(NCC$Local_Trips1 ~ NCC$Covid_Deaths)
summary(new_model)
```

```
##
## Call:
## lm(formula = NCC$Local_Trips1 ~ NCC$Covid_Deaths)
##
## Residuals:
##        Min         1Q     Median         3Q        Max
## -3.289e+17 -1.536e+17  2.936e+16  1.277e+17  2.872e+17
##
## Coefficients:
##                    Estimate Std. Error t value Pr(>|t|)
## (Intercept)       7.201e+17  3.599e+16  20.007   <2e-16 ***
## NCC$Covid_Deaths -3.273e+13  1.556e+13  -2.104    0.041 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.75e+17 on 45 degrees of freedom
## Multiple R-squared:  0.08959,    Adjusted R-squared:  0.06935
## F-statistic: 4.428 on 1 and 45 DF,  p-value: 0.04097
```

```
qqnorm(new_model$residuals)
qqline(new_model$residuals)
```




```
plot(NCC$Local_Trips1 ~ NCC$Covid_Deaths)
abline(new_model)
```

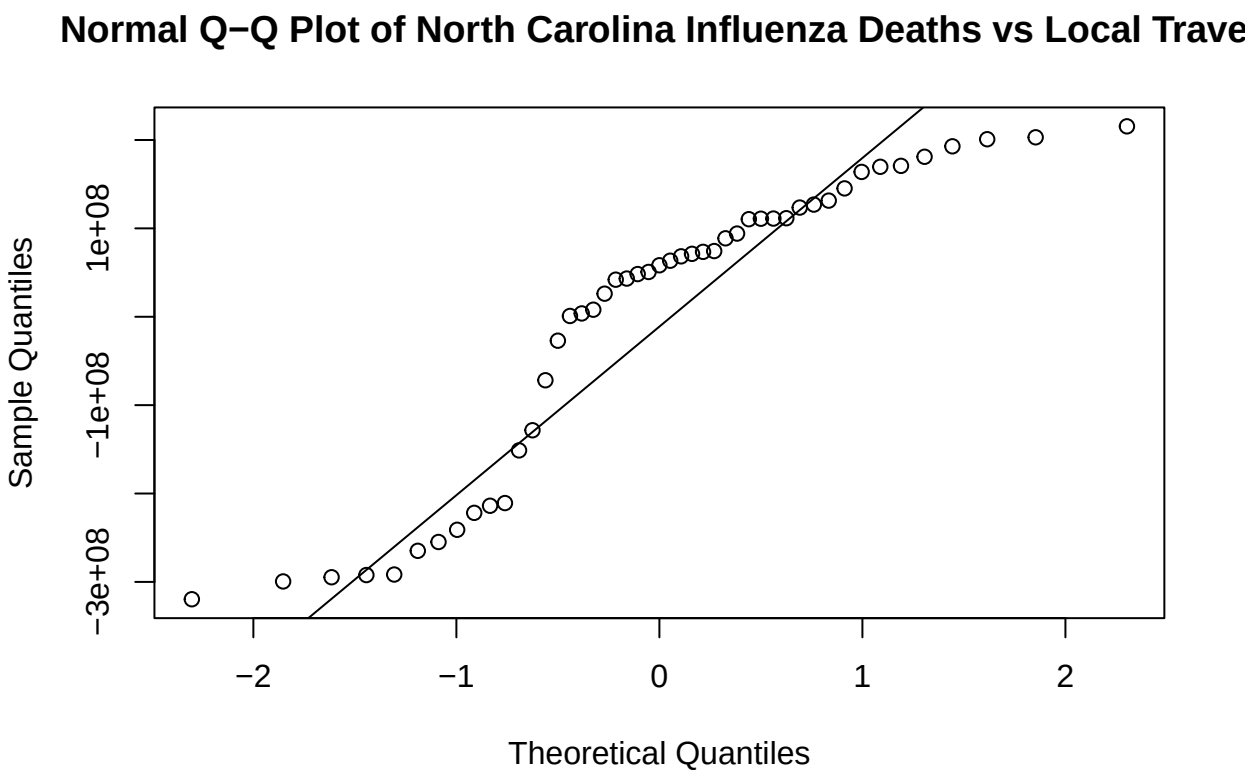



```
conf_intervals <- confint(new_model, level = 0.95)
print(conf_intervals)
```

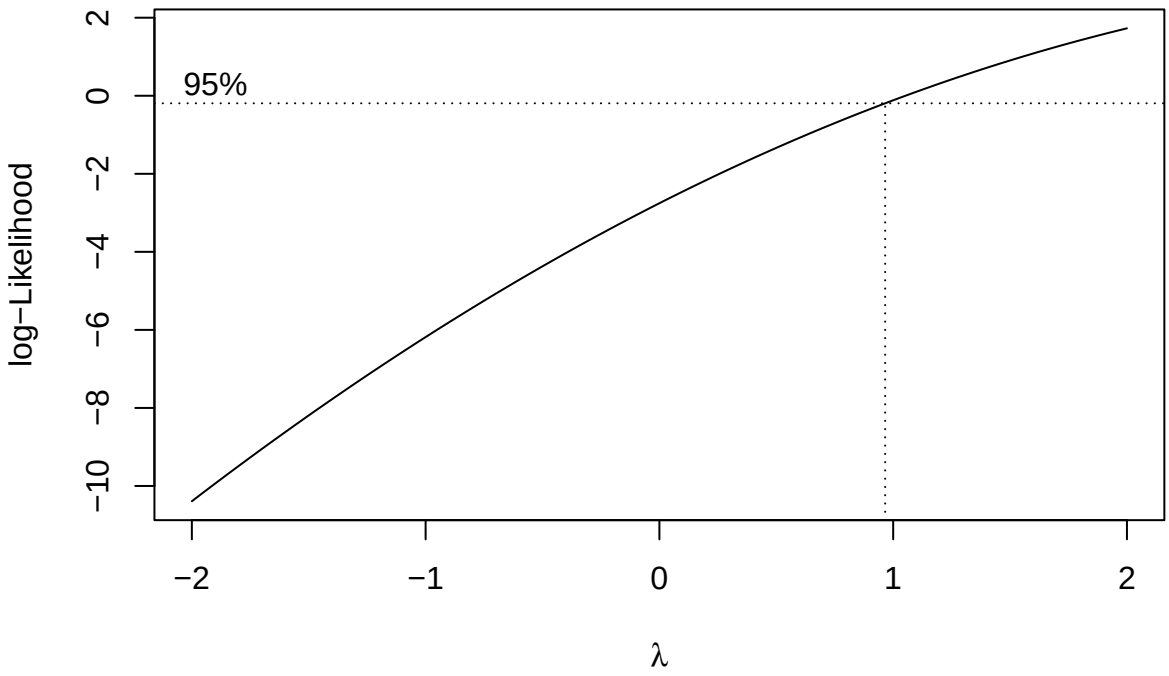
```
##                          2.5 %        97.5 %
## (Intercept)       6.475643e+17  7.925421e+17
## NCC$Covid_Deaths -6.406522e+13 -1.403058e+12
```

North Carolina Influenza Deaths vs Local Trips

```
model <- lm(NC$Local_Trips ~ NC$Influenza_Deaths)
qqnorm(model$residuals, main = "Normal Q-Q Plot of North Carolina Influenza Deaths vs Local Travel")
qqline(model$residuals)
```



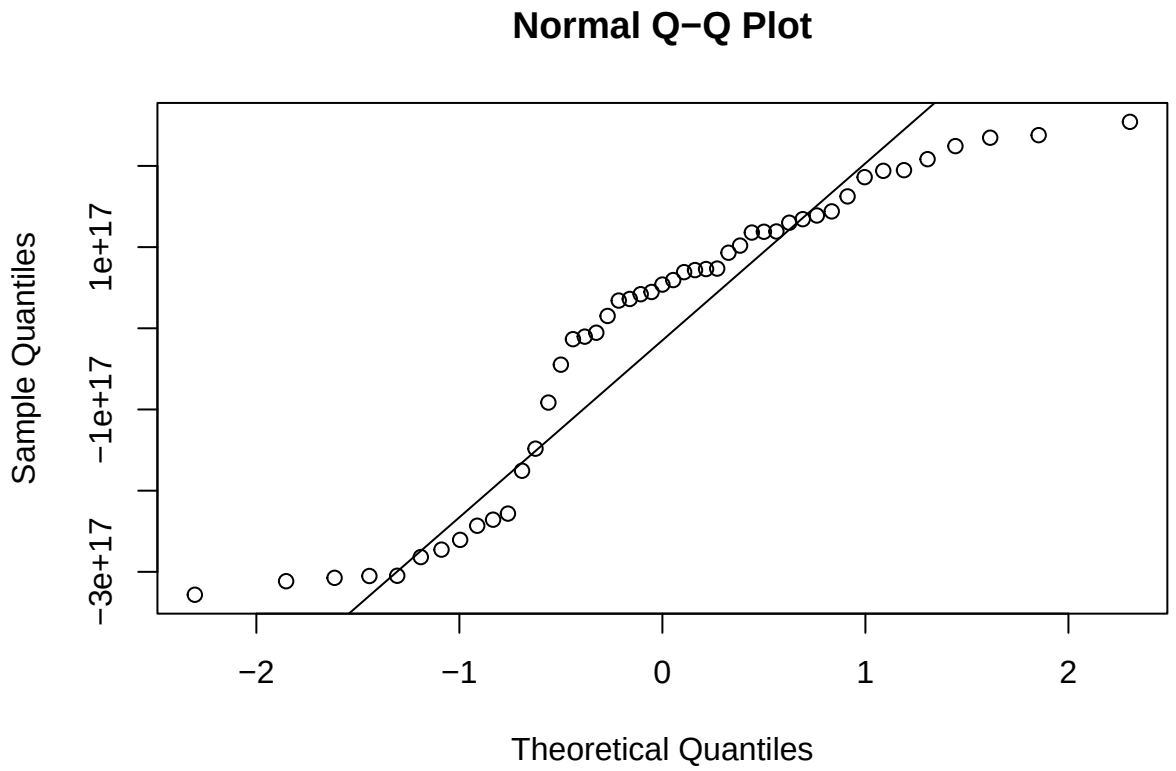

```
NC$CookD = cooks.distance(model)
NCI <- NC[which(NC$CookD < 0.5),]
bc <- boxcox(NCI$Local_Trips ~ NCI$Influenza_Deaths)
```



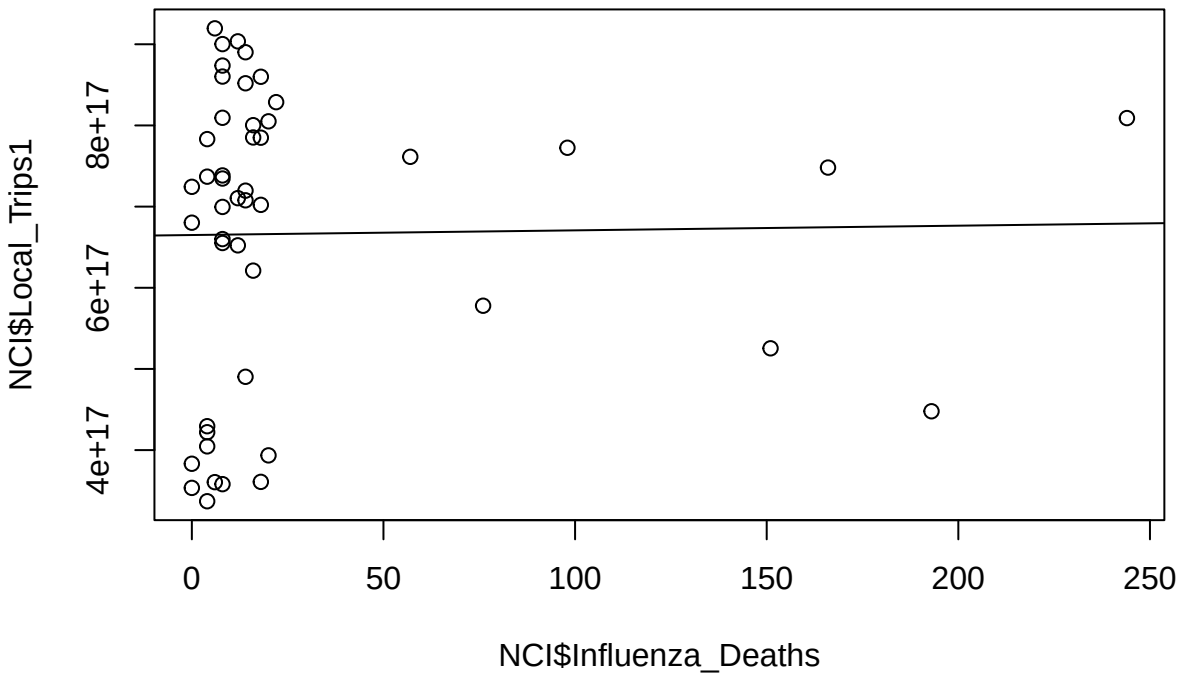

```
lambda <- bc$x[which.max(bc$y)]
NCI$Local_Trips1 <- (((NCI$Local_Trips)^lambda - 1) / lambda)
new_model <- lm(NCI$Local_Trips1 ~ NCI$Influenza_Deaths)
summary(new_model)
```

```
##
## Call:
## lm(formula = NCI$Local_Trips1 ~ NCI$Influenza_Deaths)
##
## Residuals:
##        Min         1Q     Median         3Q        Max
## -3.282e+17 -1.619e+17  5.388e+16  1.322e+17  2.543e+17
##
## Coefficients:
##                       Estimate Std. Error t value Pr(>|t|)
## (Intercept)          6.650e+17  3.068e+16  21.674   <2e-16 ***
## NCI$Influenza_Deaths 5.759e+13  5.081e+14   0.113     0.91
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.834e+17 on 45 degrees of freedom
## Multiple R-squared:  0.0002853,  Adjusted R-squared:  -0.02193
## F-statistic: 0.01284 on 1 and 45 DF,  p-value: 0.9103
```

```r
qqnorm(new_model$residuals)
qqline(new_model$residuals)
```




```r
plot(NCI$Local_Trips1 ~ NCI$Influenza_Deaths)
abline(new_model)
```

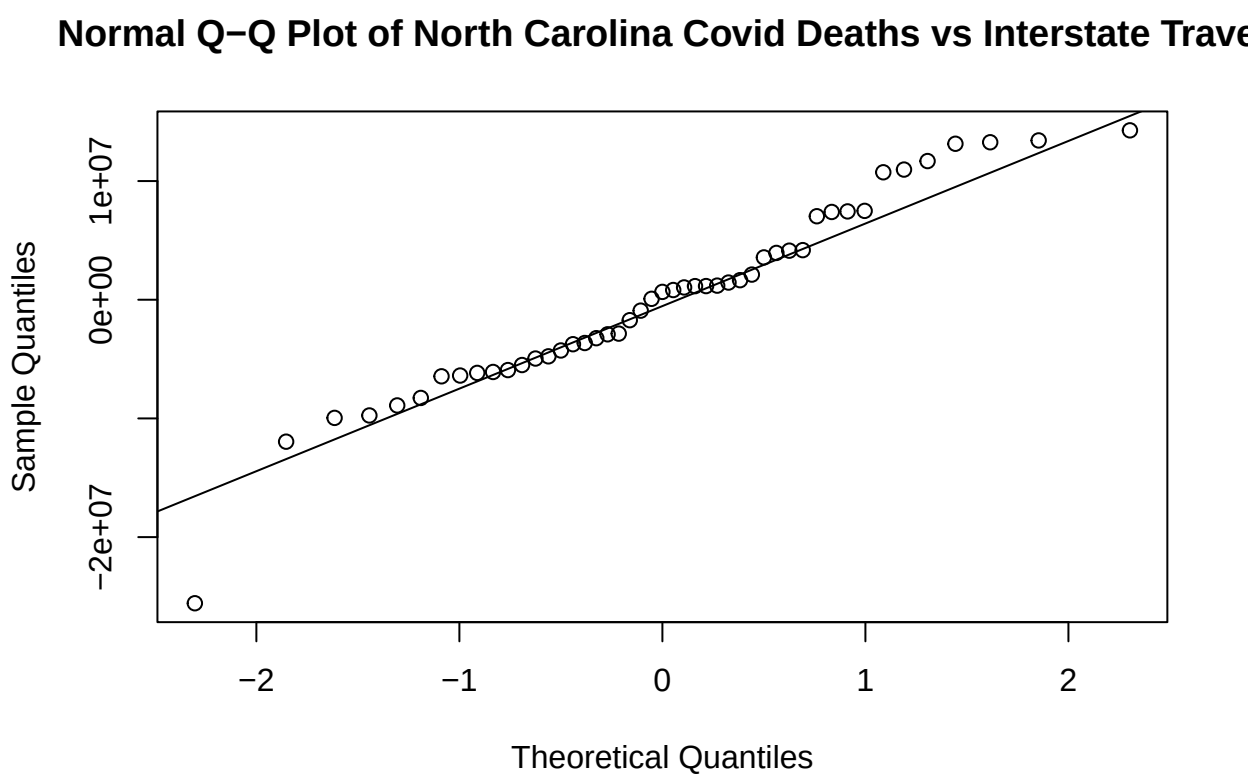



```
conf_intervals <- confint(new_model, level = 0.95)
print(conf_intervals)
```

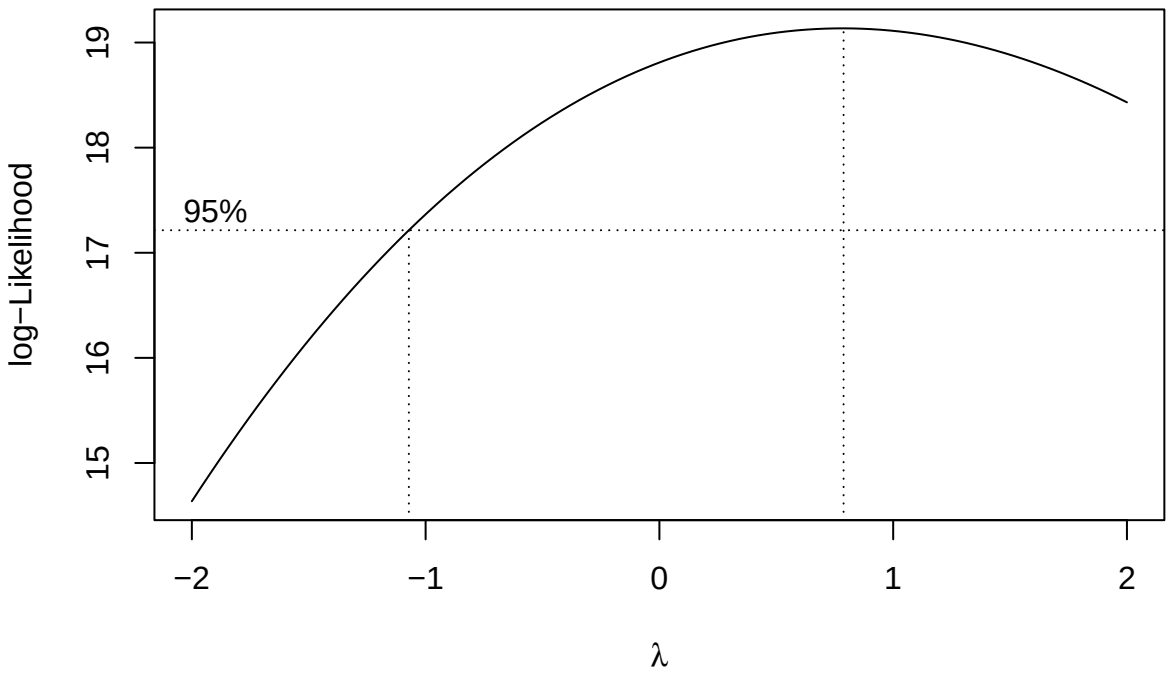
```
##                              2.5 %       97.5 %
## (Intercept)           6.031775e+17 7.267671e+17
## NCI$Influenza_Deaths -9.658750e+14 1.081053e+15
```

North Carolina Covid Deaths vs Interstate Trips

```
model <- lm(NC$Interstate_Trips ~ NC$Covid_Deaths)
qqnorm(model$residuals, main = "Normal Q-Q Plot of North Carolina Covid Deaths vs Interstate Travel")
qqline(model$residuals)
```



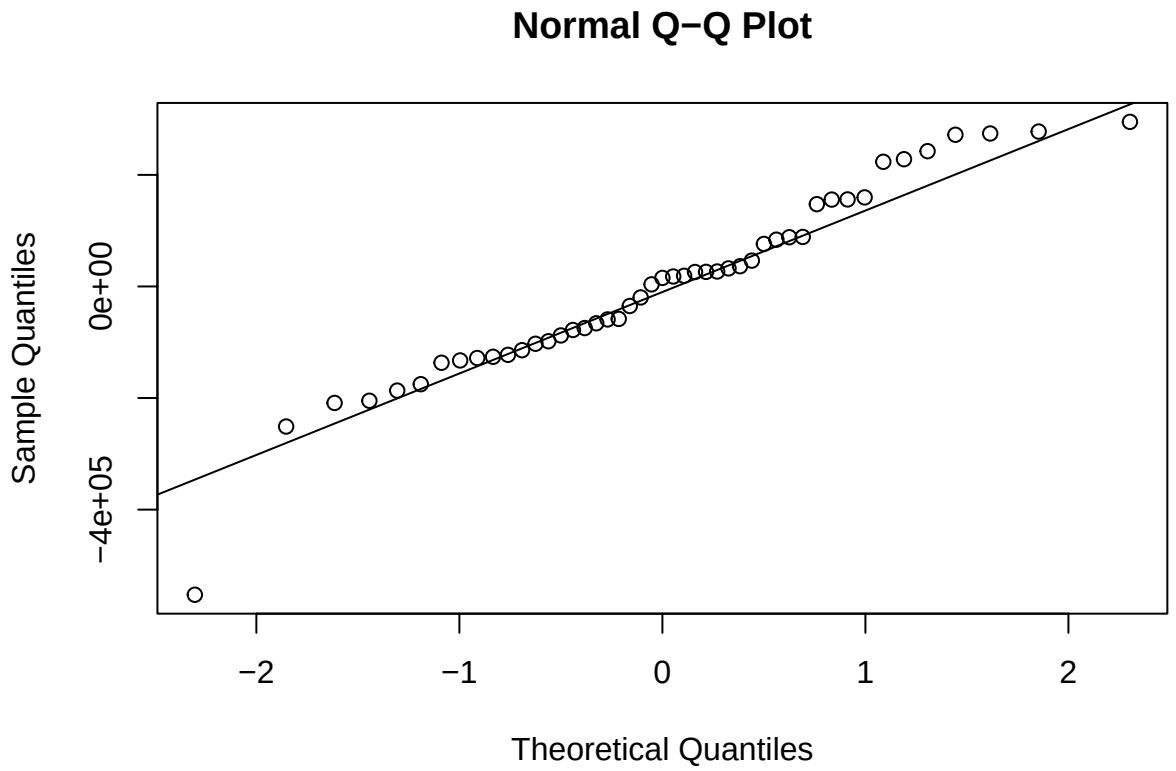

```
NC$CookD = cooks.distance(model)
NCC <- NC[which(NC$CookD < 0.5),]
bc <- boxcox(NCC$Interstate_Trips ~ NCC$Covid_Deaths)
```



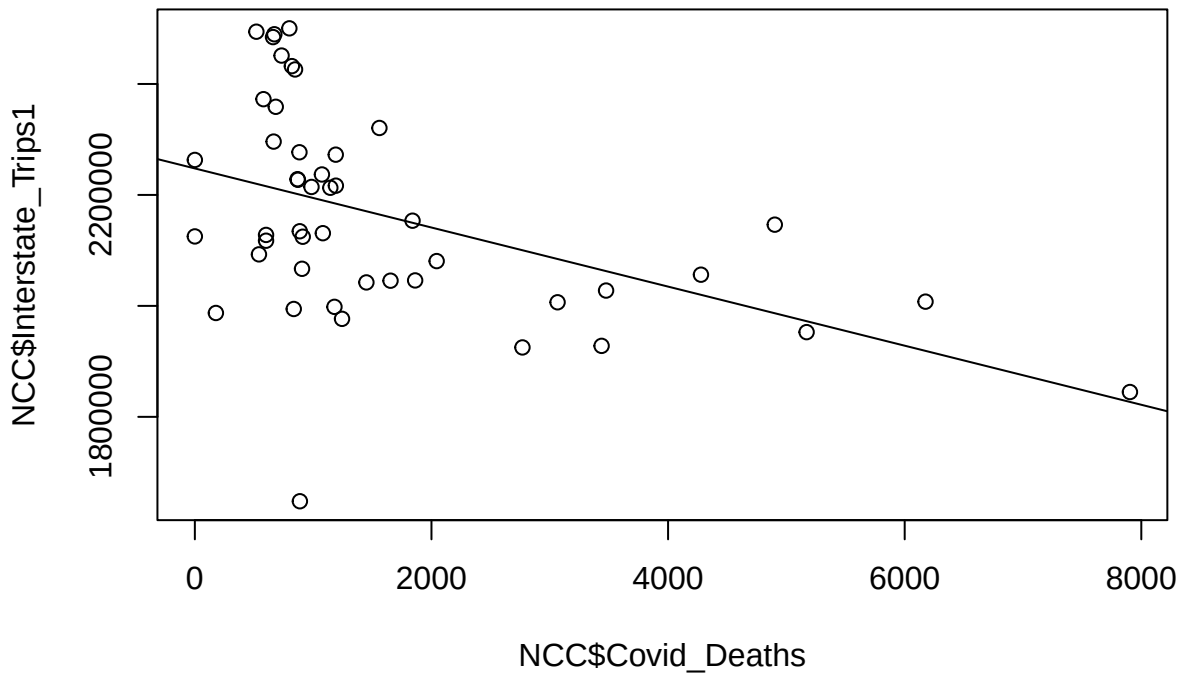

```
lambda <- bc$x[which.max(bc$y)]
NCC$Interstate_Trips1 <- (((NCC$Interstate_Trips)^lambda - 1) / lambda)
new_model <- lm(NCC$Interstate_Trips1 ~ NCC$Covid_Deaths)
summary(new_model)
```

```
##
## Call:
## lm(formula = NCC$Interstate_Trips1 ~ NCC$Covid_Deaths)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -552564 -108470   15307   88497  295039
##
## Coefficients:
##                   Estimate Std. Error t value Pr(>|t|)
## (Intercept)      2247736.65   34602.27   64.96  < 2e-16 ***
## NCC$Covid_Deaths     -53.25      14.96   -3.56 0.000888 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 168300 on 45 degrees of freedom
## Multiple R-squared:  0.2198, Adjusted R-squared:  0.2024
## F-statistic: 12.68 on 1 and 45 DF,  p-value: 0.0008885
```

```
qqnorm(new_model$residuals)
qqline(new_model$residuals)
```




```
plot(NCC$Interstate_Trips1 ~ NCC$Covid_Deaths)
abline(new_model)
```

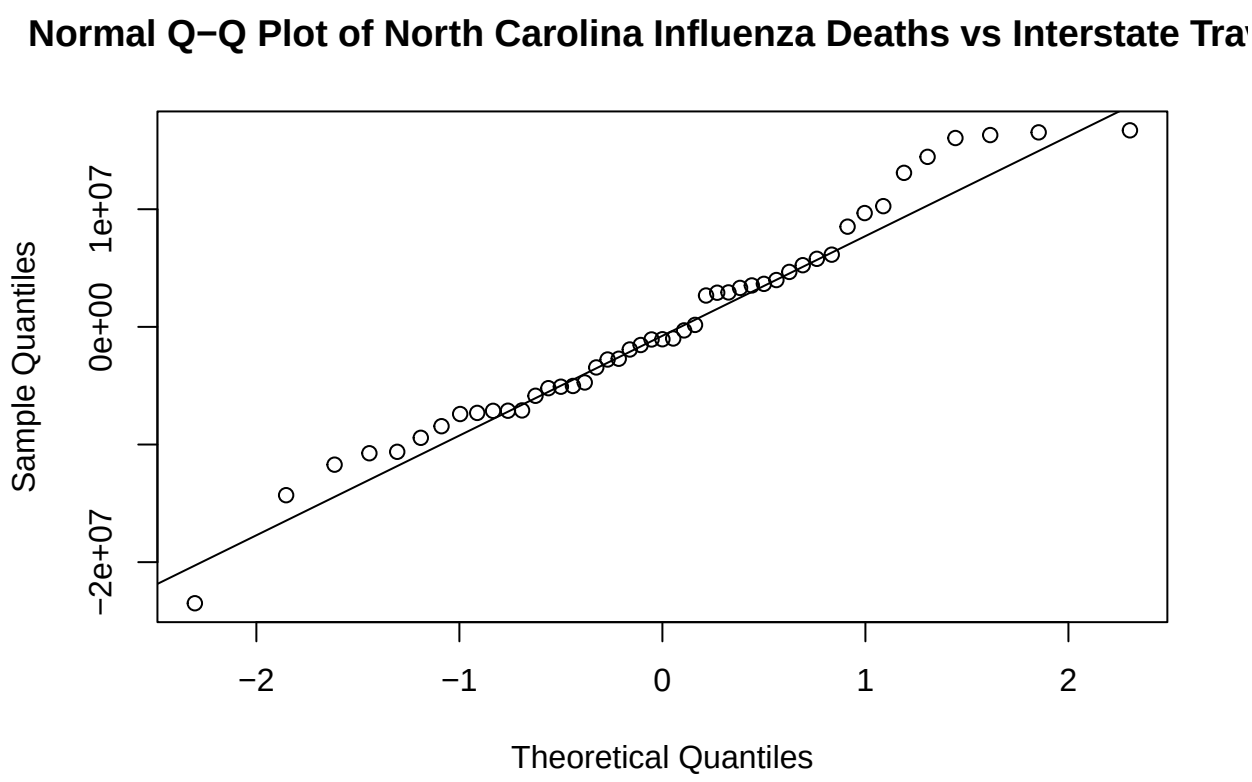



```
conf_intervals <- confint(new_model, level = 0.95)
print(conf_intervals)
```

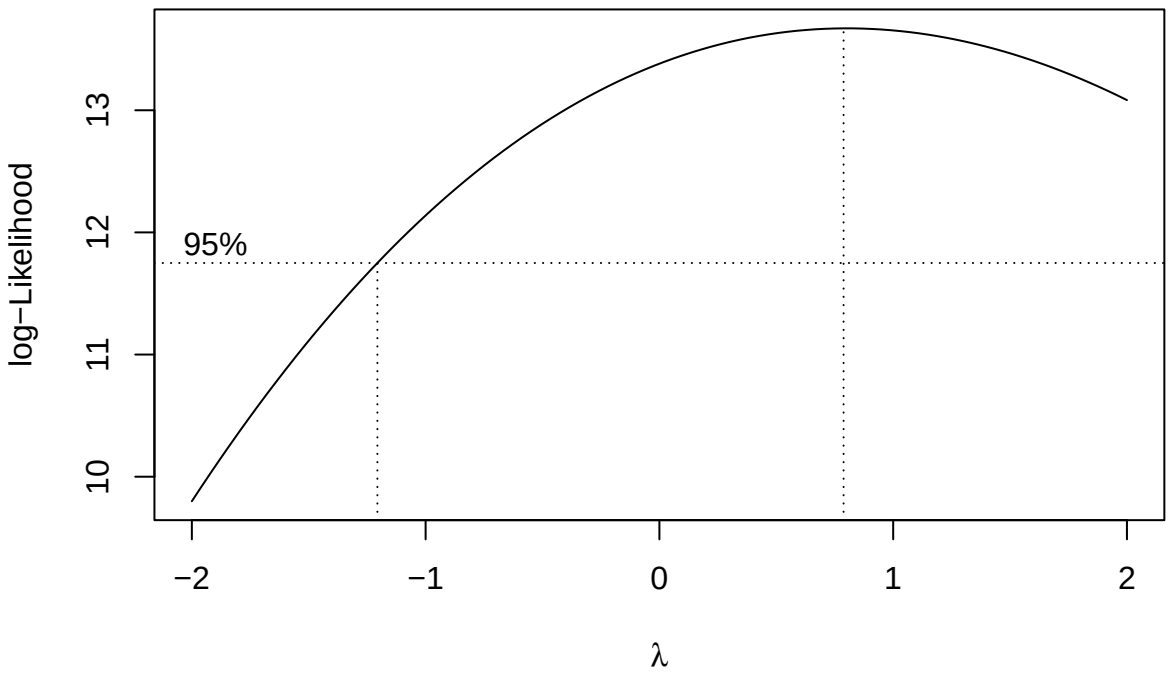
```
##                           2.5 %        97.5 %
## (Intercept)      2178044.10036 2317429.20306
## NCC$Covid_Deaths     -83.36854     -23.12368
```

North Carolina Influenza Deaths vs Interstate Trips

```
model <- lm(NC$Interstate_Trips ~ NC$Influenza_Deaths)
qqnorm(model$residuals, main = "Normal Q-Q Plot of North Carolina Influenza Deaths vs Interstate Travel
qqline(model$residuals)
```



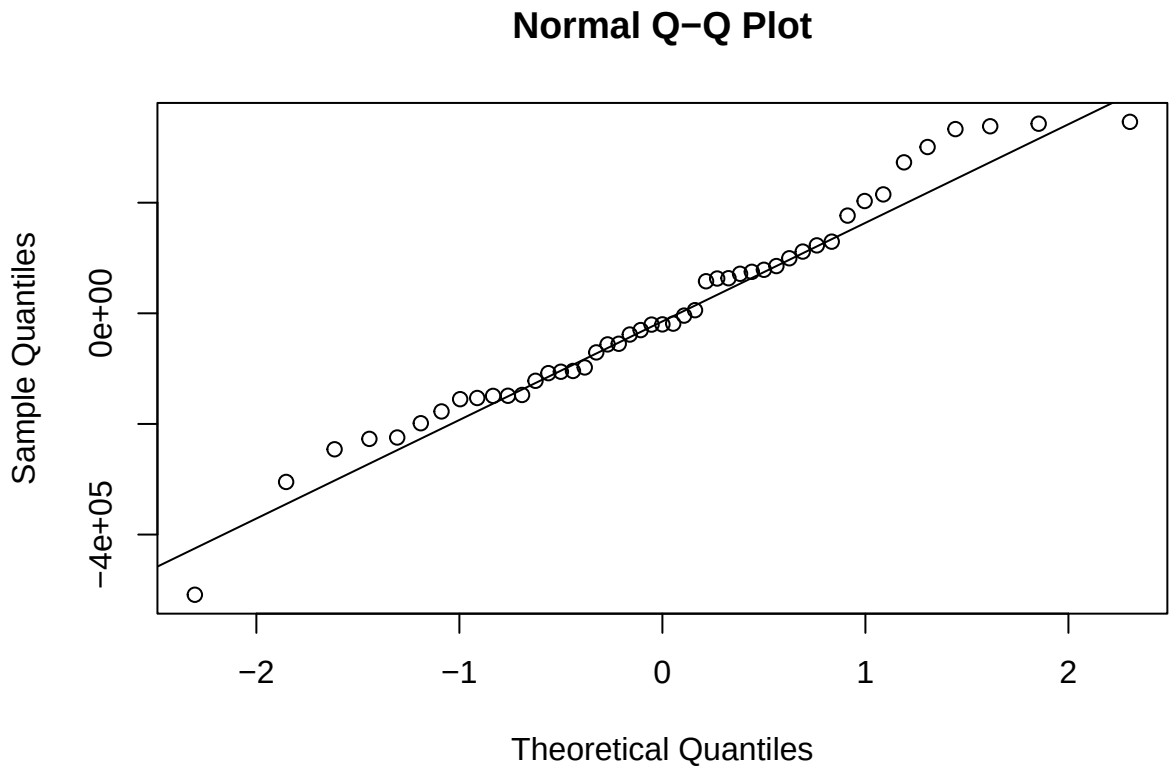

```
NC$CookD = cooks.distance(model)
NCI <- NC[which(NC$CookD < 0.5),]
bc <- boxcox(NCI$Interstate_Trips ~ NCI$Influenza_Deaths)
```



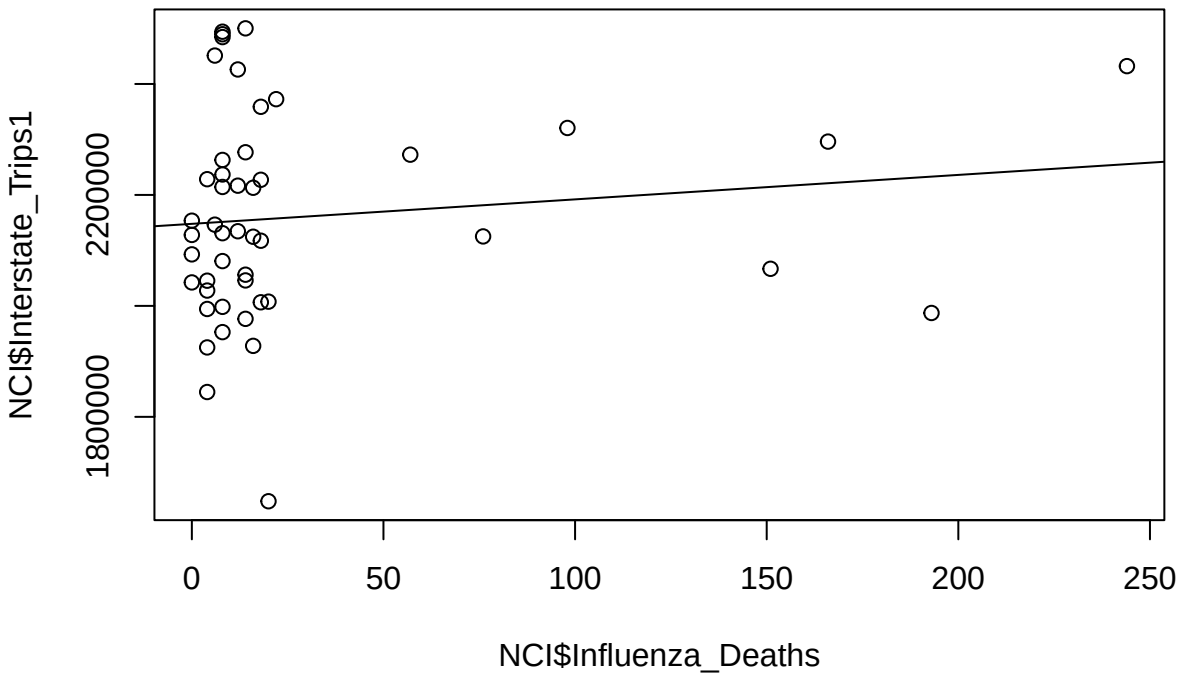

```
lambda <- bc$x[which.max(bc$y)]
NCI$Interstate_Trips1 <- (((NCI$Interstate_Trips)^lambda - 1) / lambda)
new_model <- lm(NCI$Interstate_Trips1 ~ NCI$Influenza_Deaths)
summary(new_model)
```

```
##
## Call:
## lm(formula = NCI$Interstate_Trips1 ~ NCI$Influenza_Deaths)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -508807 -134797  -19983  105591  346181
##
## Coefficients:
##                       Estimate Std. Error t value Pr(>|t|)
## (Intercept)          2147877.1    31619.9  67.928   <2e-16 ***
## NCI$Influenza_Deaths     441.0      523.7   0.842    0.404
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 189000 on 45 degrees of freedom
## Multiple R-squared:  0.01551,    Adjusted R-squared:  -0.006366
## F-statistic: 0.709 on 1 and 45 DF,  p-value: 0.4042
```

```
qqnorm(new_model$residuals)
qqline(new_model$residuals)
```




```
plot(NCI$Interstate_Trips1 ~ NCI$Influenza_Deaths)
abline(new_model)
```

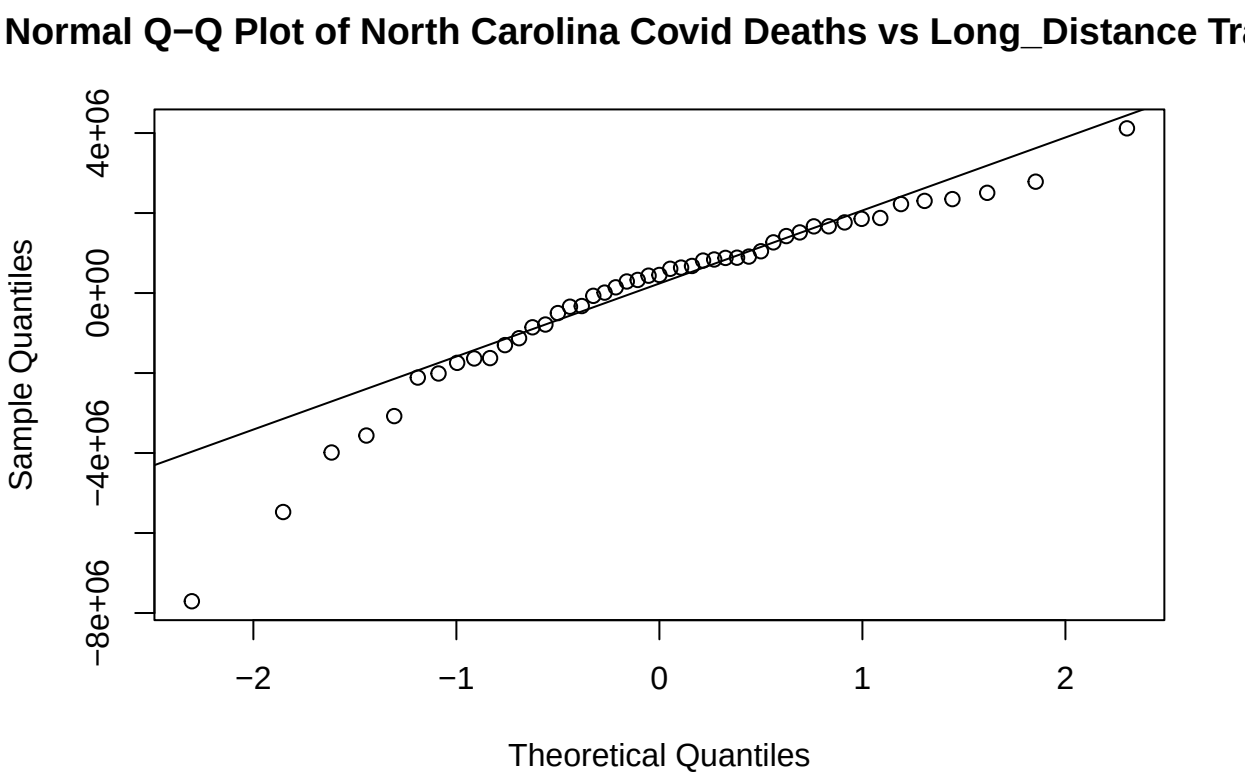



```
conf_intervals <- confint(new_model, level = 0.95)
print(conf_intervals)
```

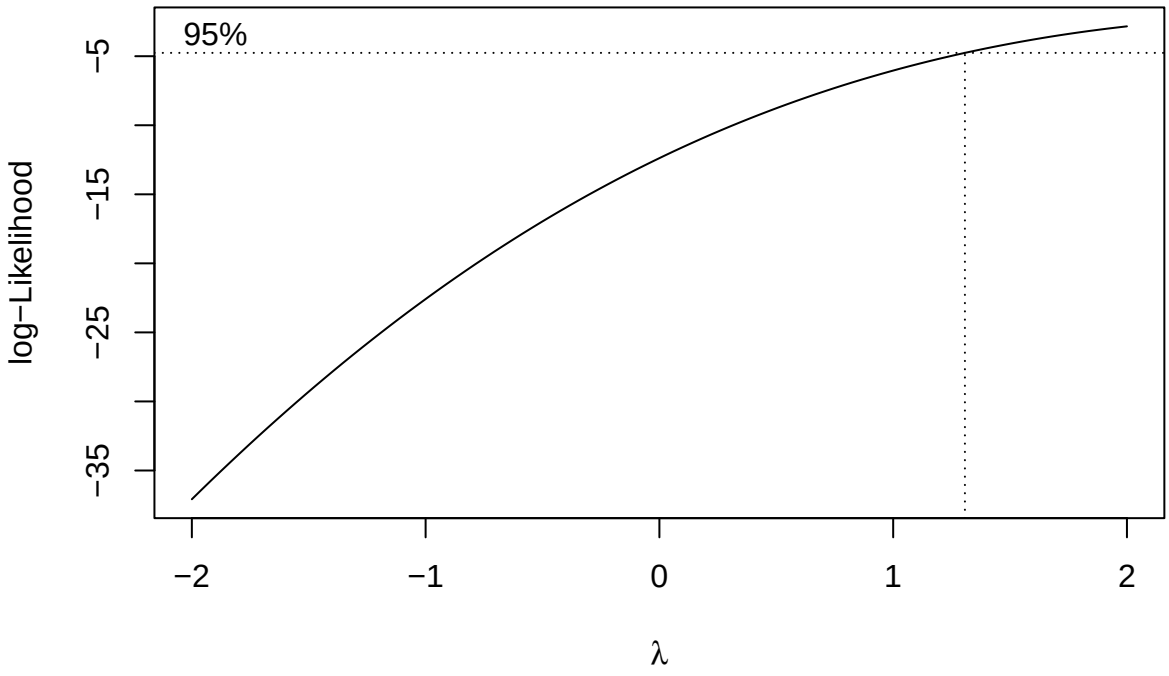
```
##                              2.5 %      97.5 %
## (Intercept)          2084191.3734 2211562.750
## NCI$Influenza_Deaths    -613.8083    1495.756
```

North Carolina Covid Deaths vs Long Distance Trips

```
model <- lm(NC$Long_Distance_Trips ~ NC$Covid_Deaths)
qqnorm(model$residuals, main = "Normal Q-Q Plot of North Carolina Covid Deaths vs Long_Distance Travel"
qqline(model$residuals)
```



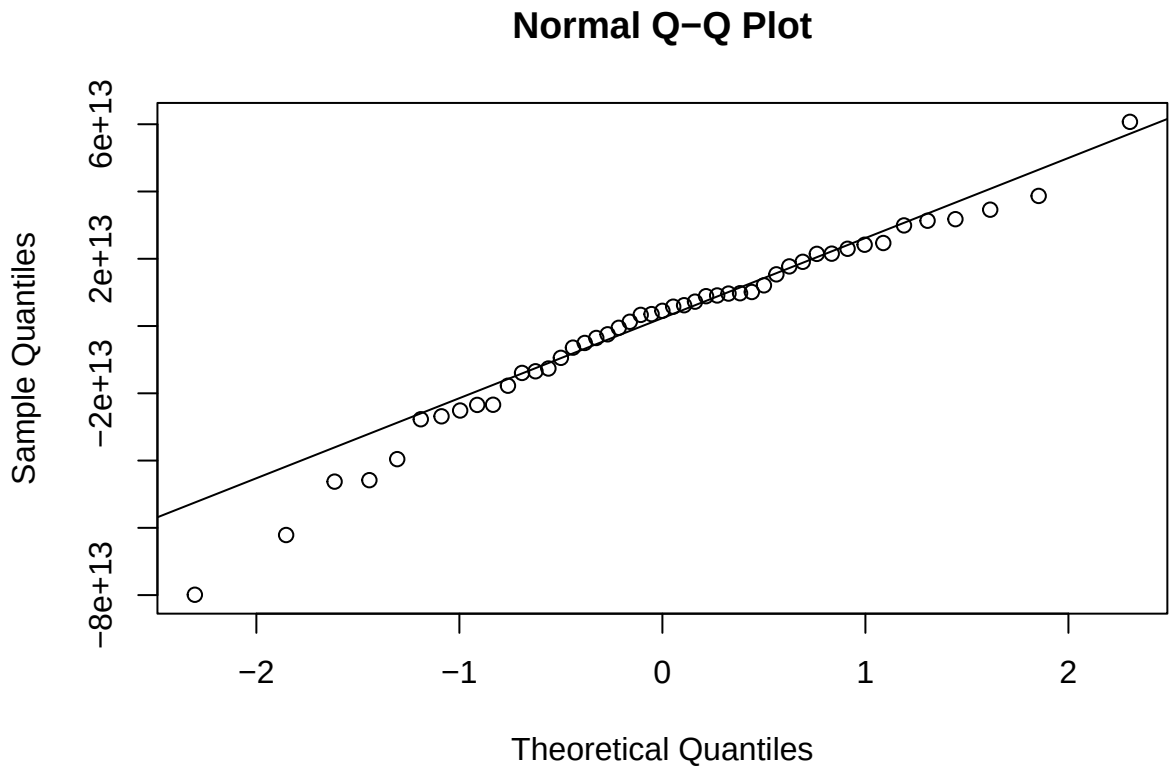

```
NC$CookD = cooks.distance(model)
NCC <- NC[which(NC$CookD < 0.5),]
bc <- boxcox(NCC$Long_Distance_Trips ~ NCC$Covid_Deaths)
```



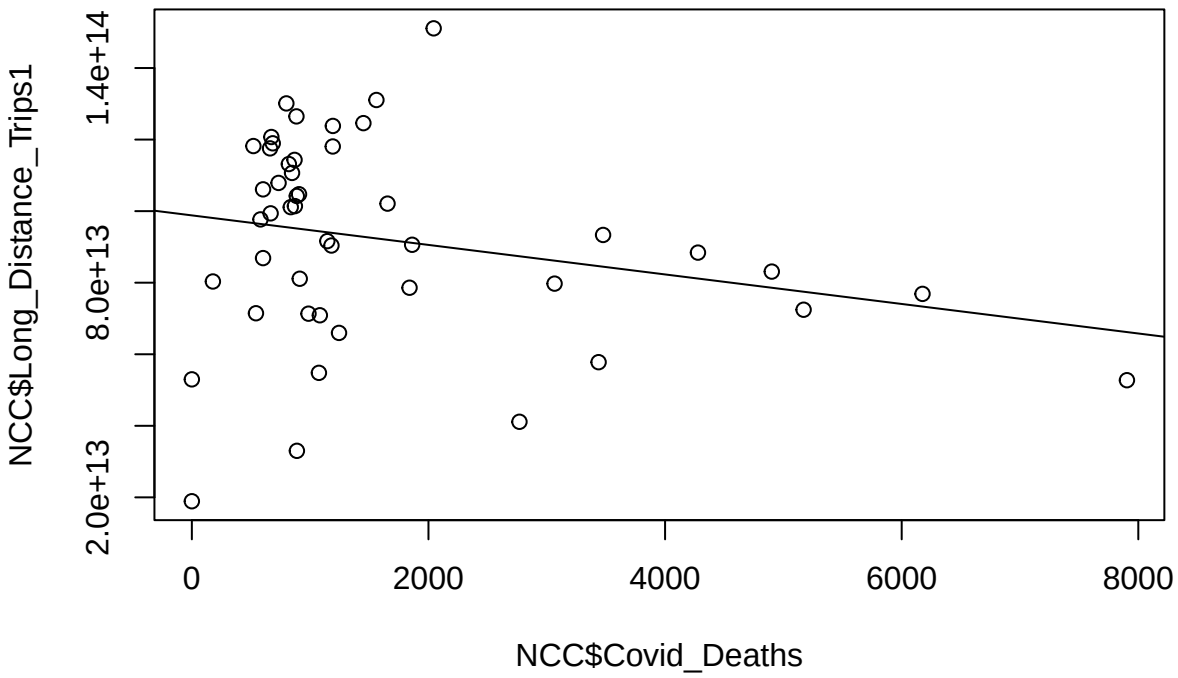

```
lambda <- bc$x[which.max(bc$y)]
NCC$Long_Distance_Trips1 <- (((NCC$Long_Distance_Trips)^lambda - 1) / lambda)
new_model <- lm(NCC$Long_Distance_Trips1 ~ NCC$Covid_Deaths)
summary(new_model)
```

```
##
## Call:
## lm(formula = NCC$Long_Distance_Trips1 ~ NCC$Covid_Deaths)
##
## Residuals:
##        Min         1Q     Median         3Q        Max
## -7.989e+13 -1.370e+13  4.520e+12  1.841e+13  6.071e+13
##
## Coefficients:
##                    Estimate Std. Error t value Pr(>|t|)
## (Intercept)       9.881e+13  5.642e+12  17.513   <2e-16 ***
## NCC$Covid_Deaths -4.126e+09  2.439e+09  -1.692   0.0976 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.744e+13 on 45 degrees of freedom
## Multiple R-squared:  0.0598, Adjusted R-squared:  0.03891
## F-statistic: 2.862 on 1 and 45 DF,  p-value: 0.09759
```

```r
qqnorm(new_model$residuals)
qqline(new_model$residuals)
```




```r
plot(NCC$Long_Distance_Trips1 ~ NCC$Covid_Deaths)
abline(new_model)
```

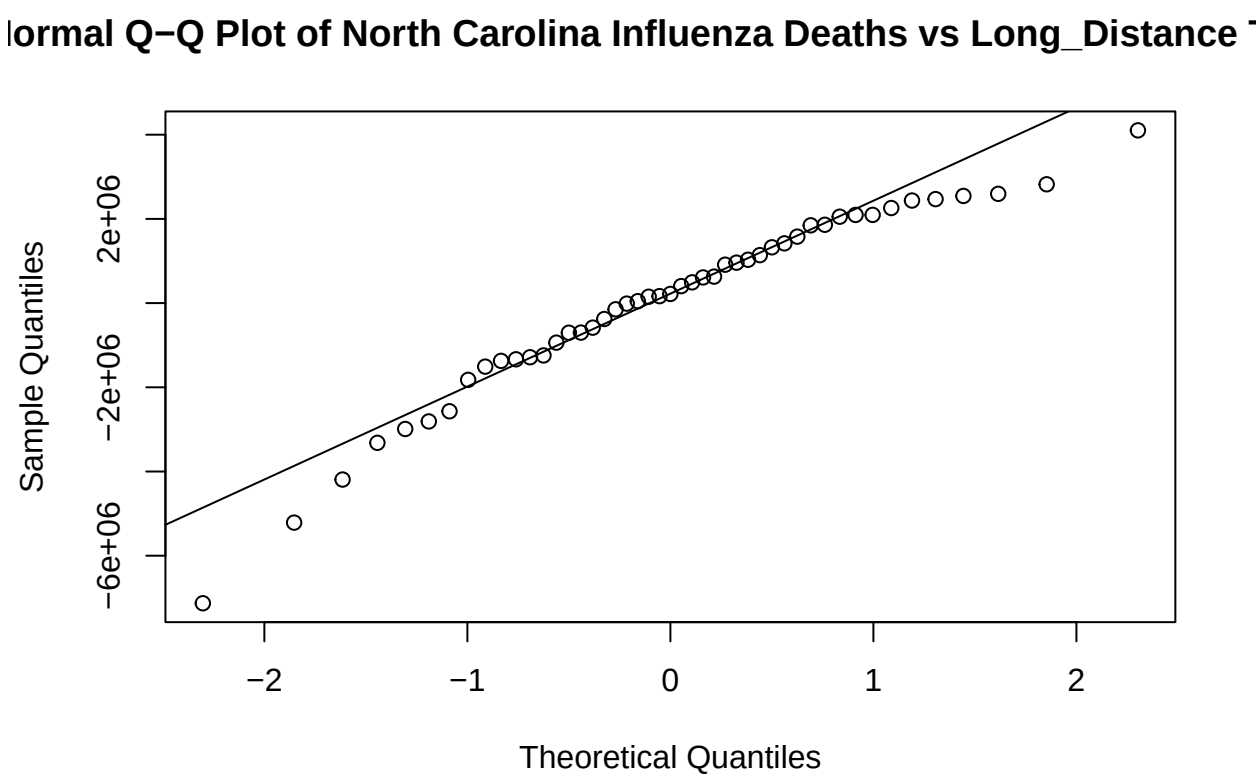



```
conf_intervals <- confint(new_model, level = 0.95)
print(conf_intervals)
```

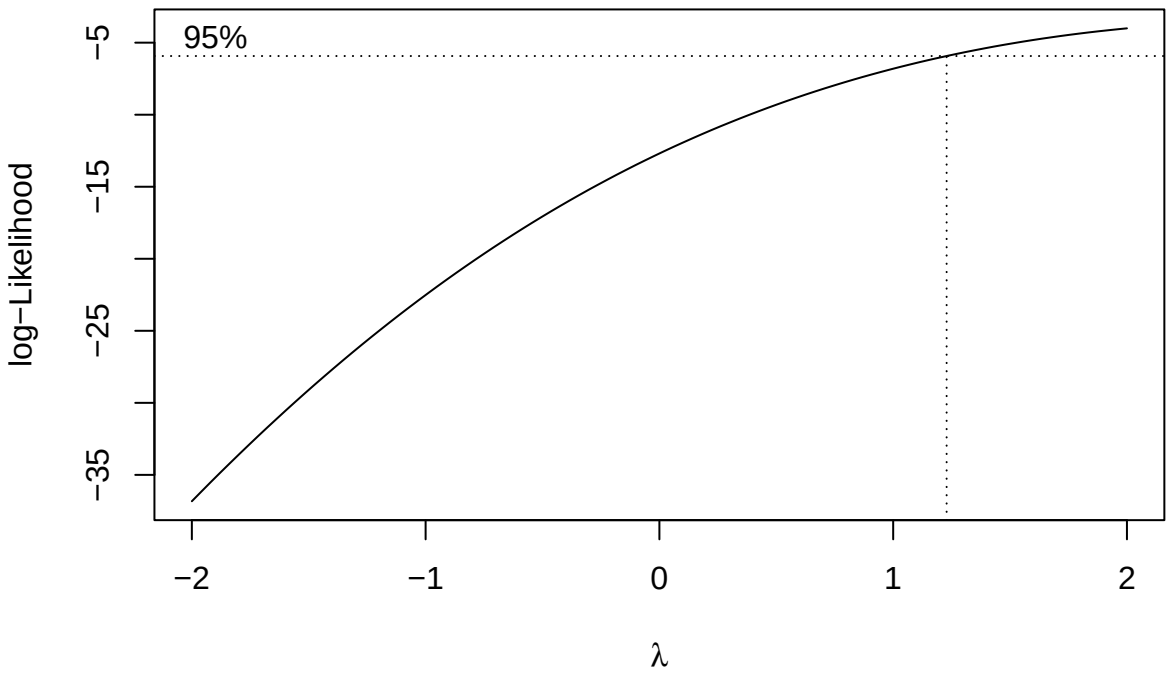
```
##                           2.5 %       97.5 %
## (Intercept)       8.744630e+13 1.101744e+14
## NCC$Covid_Deaths -9.037677e+09 7.858470e+08
```

North Carolina Influenza Deaths vs Long Distance Trips

```
model <- lm(NC$Long_Distance_Trips ~ NC$Influenza_Deaths)
qqnorm(model$residuals, main = "Normal Q-Q Plot of North Carolina Influenza Deaths vs Long_Distance Trav
qqline(model$residuals)
```



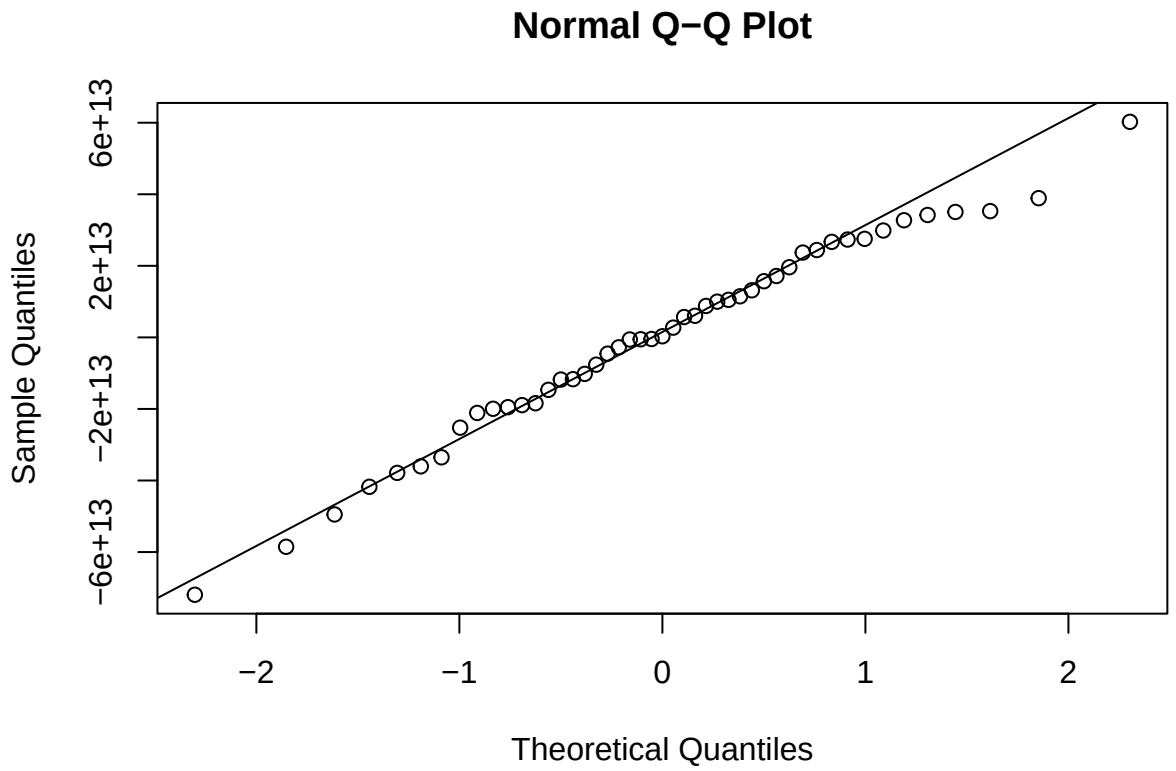

```r
NC$CookD = cooks.distance(model)
NCI <- NC[which(NC$CookD < 0.5),]
bc <- boxcox(NCI$Long_Distance_Trips ~ NCI$Influenza_Deaths)
```



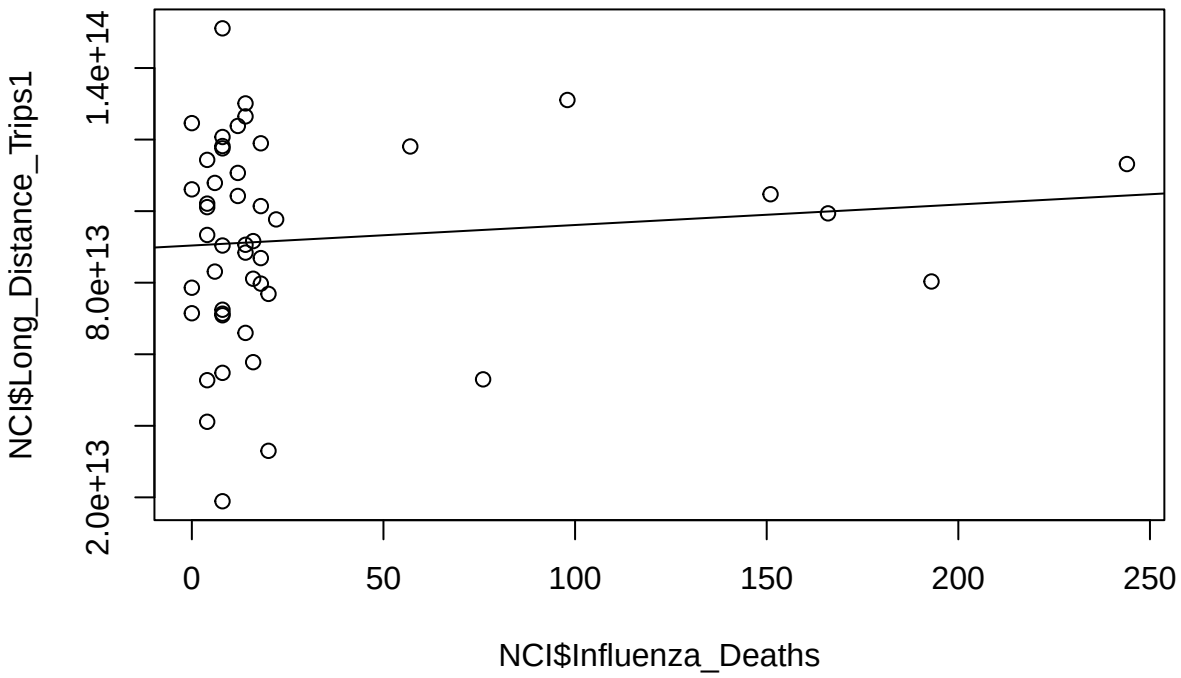

```
lambda <- bc$x[which.max(bc$y)]
NCI$Long_Distance_Trips1 <- (((NCI$Long_Distance_Trips)^lambda - 1) / lambda)
new_model <- lm(NCI$Long_Distance_Trips1 ~ NCI$Influenza_Deaths)
summary(new_model)
```

```
##
## Call:
## lm(formula = NCI$Long_Distance_Trips1 ~ NCI$Influenza_Deaths)
##
## Residuals:
##        Min         1Q     Median         3Q        Max
## -7.193e+13 -1.867e+13  3.137e+11  2.166e+13  6.024e+13
##
## Coefficients:
##                       Estimate Std. Error t value Pr(>|t|)
## (Intercept)          9.039e+13  4.706e+12  19.209   <2e-16 ***
## NCI$Influenza_Deaths 5.731e+10  7.793e+10   0.735    0.466
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.813e+13 on 45 degrees of freedom
## Multiple R-squared:  0.01188,    Adjusted R-squared:  -0.01008
## F-statistic: 0.5408 on 1 and 45 DF,  p-value: 0.4659
```

```r
qqnorm(new_model$residuals)
qqline(new_model$residuals)
```




```r
plot(NCI$Long_Distance_Trips1 ~ NCI$Influenza_Deaths)
abline(new_model)
```




```
conf_intervals <- confint(new_model, level = 0.95)
print(conf_intervals)
```

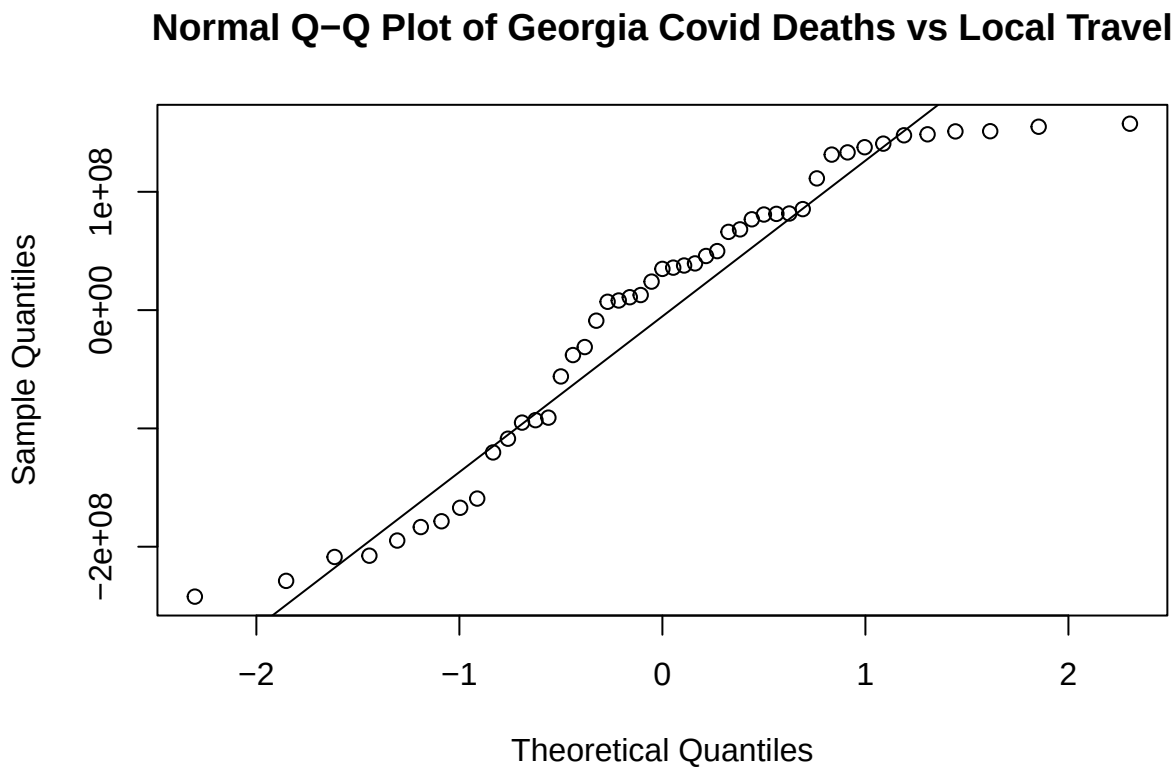
```
##                              2.5 %       97.5 %
## (Intercept)           8.091108e+13 9.986600e+13
## NCI$Influenza_Deaths -9.965566e+10 2.142815e+11
```

Georgia Covid Deaths vs Local Trips

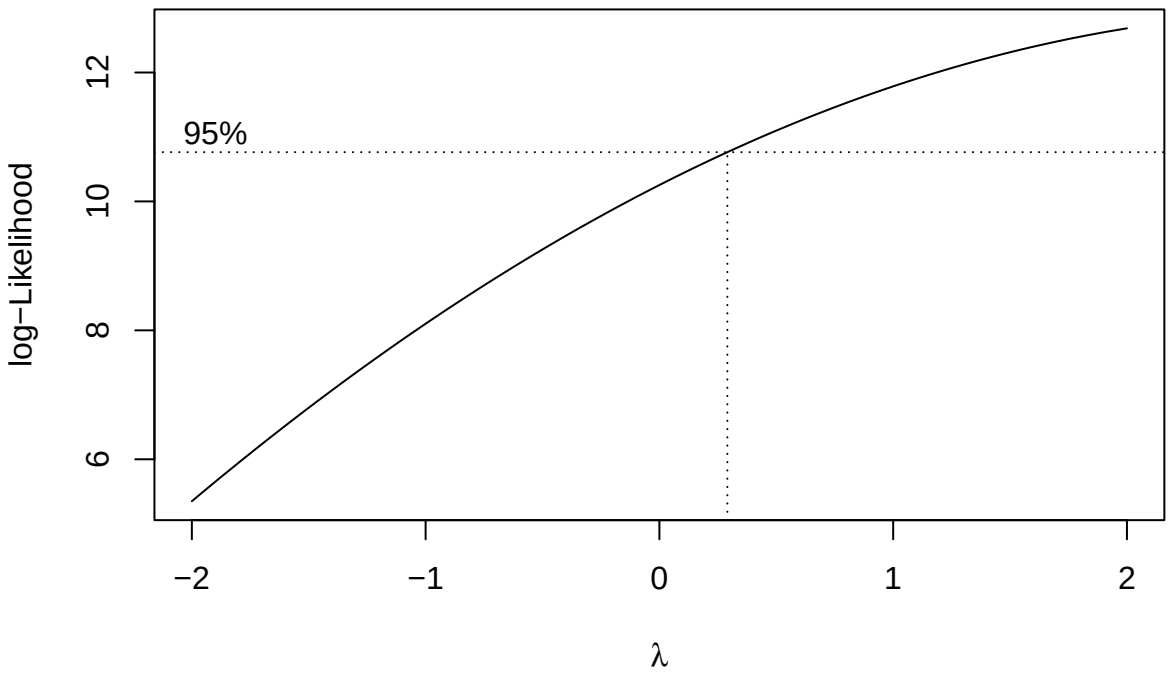
```
GA = DT[DT$Jurisdiction == 'Georgia',]
head(GA)
```

```
## # A tibble: 6 x 12
##    Year Month Jurisdiction Covid_Deaths Total_Deaths Pneumonia_Deaths
##   <dbl> <dbl> <chr>               <dbl>        <dbl>            <dbl>
## 1  2019    12 Georgia                 0         3626              224
## 2  2020     1 Georgia                 0        14298              874
## 3  2020     2 Georgia               174        14272              872
## 4  2020     3 Georgia              1167        18266             1459
## 5  2020     4 Georgia              2026        16102             1858
## 6  2020     5 Georgia              1668        18796             1642
## # i 6 more variables: Influenza_Deaths <dbl>, Pneumonia_Influenza_Deaths <dbl>,
## #   Pneumonia_Influenza_Covid <dbl>, Local_Trips <dbl>, Interstate_Trips <dbl>,
## #   Long_Distance_Trips <dbl>
```

```r
model <- lm(GA$Local_Trips ~ GA$Covid_Deaths)
qqnorm(model$residuals, main = "Normal Q-Q Plot of Georgia Covid Deaths vs Local Travel")
qqline(model$residuals)
```



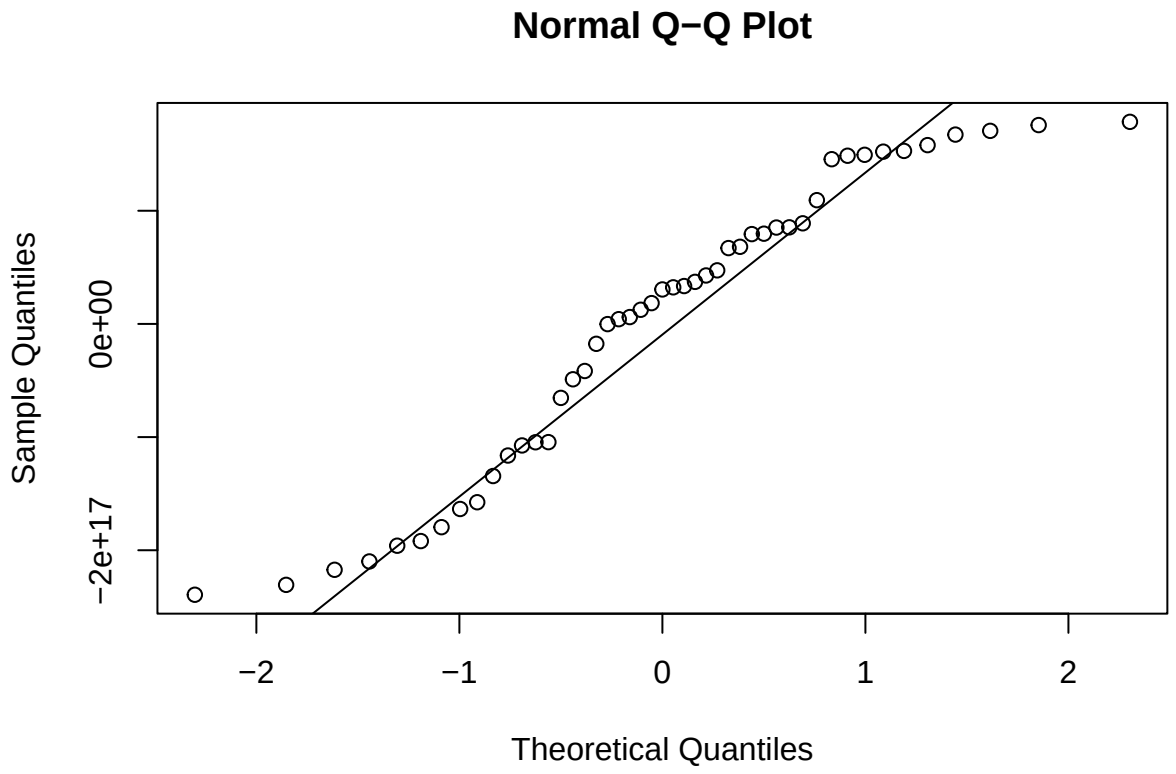

```r
GA$CookD = cooks.distance(model)
GAC <- GA[which(GA$CookD < 0.5),]
bc <- boxcox(GAC$Local_Trips ~ GAC$Covid_Deaths)
```



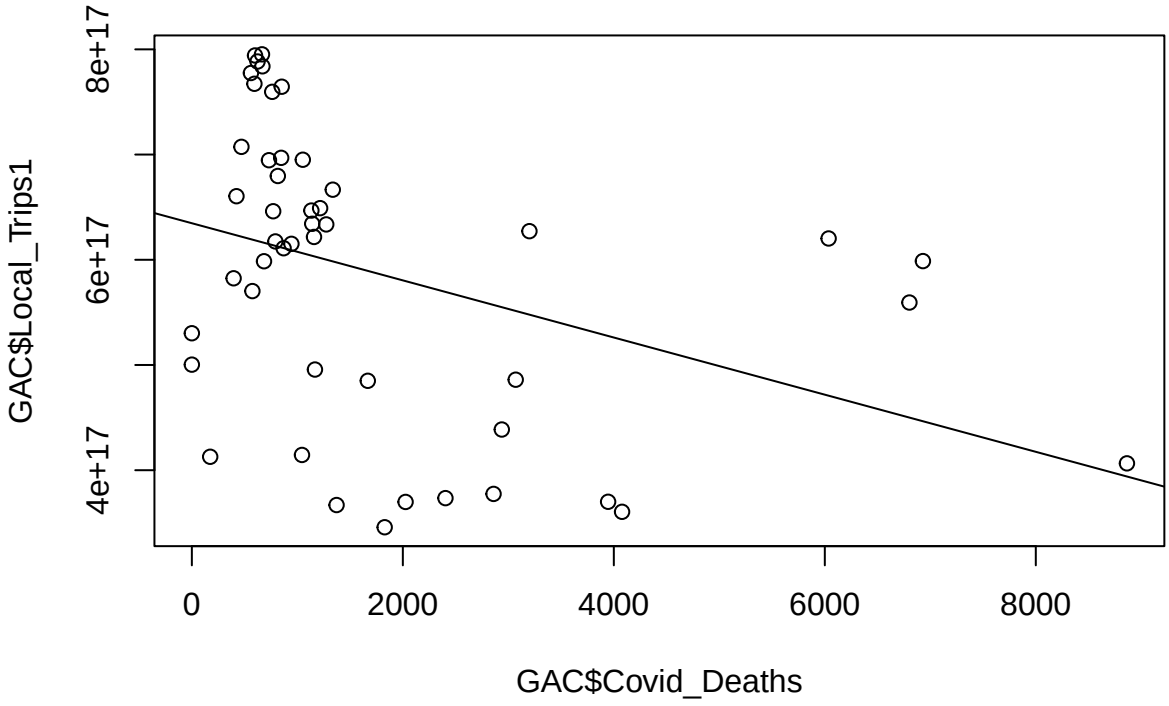

```
lambda <- bc$x[which.max(bc$y)]
GAC$Local_Trips1 <- (((GAC$Local_Trips)^lambda - 1) / lambda)
new_model <- lm(GAC$Local_Trips1 ~ GAC$Covid_Deaths)
summary(new_model)
```

```
##
## Call:
## lm(formula = GAC$Local_Trips1 ~ GAC$Covid_Deaths)
##
## Residuals:
##        Min         1Q     Median         3Q        Max
## -2.393e+17 -1.060e+17  3.046e+16  8.712e+16  1.786e+17
##
## Coefficients:
##                    Estimate Std. Error t value Pr(>|t|)
## (Intercept)       6.348e+17  2.559e+16  24.802  < 2e-16 ***
## GAC$Covid_Deaths -2.716e+13  9.839e+12  -2.761  0.00832 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.297e+17 on 45 degrees of freedom
## Multiple R-squared:  0.1448, Adjusted R-squared:  0.1258
## F-statistic: 7.621 on 1 and 45 DF,  p-value: 0.00832
```

```
qqnorm(new_model$residuals)
qqline(new_model$residuals)
```



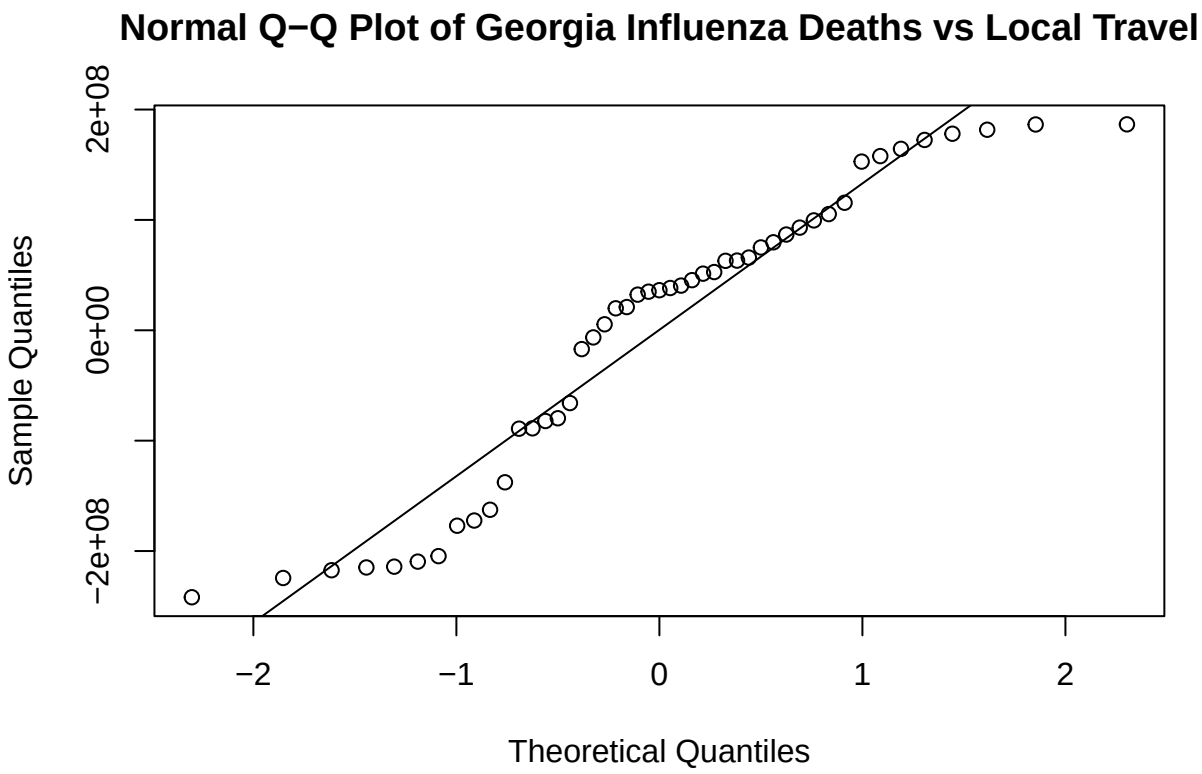

```
plot(GAC$Local_Trips1 ~ GAC$Covid_Deaths)
abline(new_model)
```



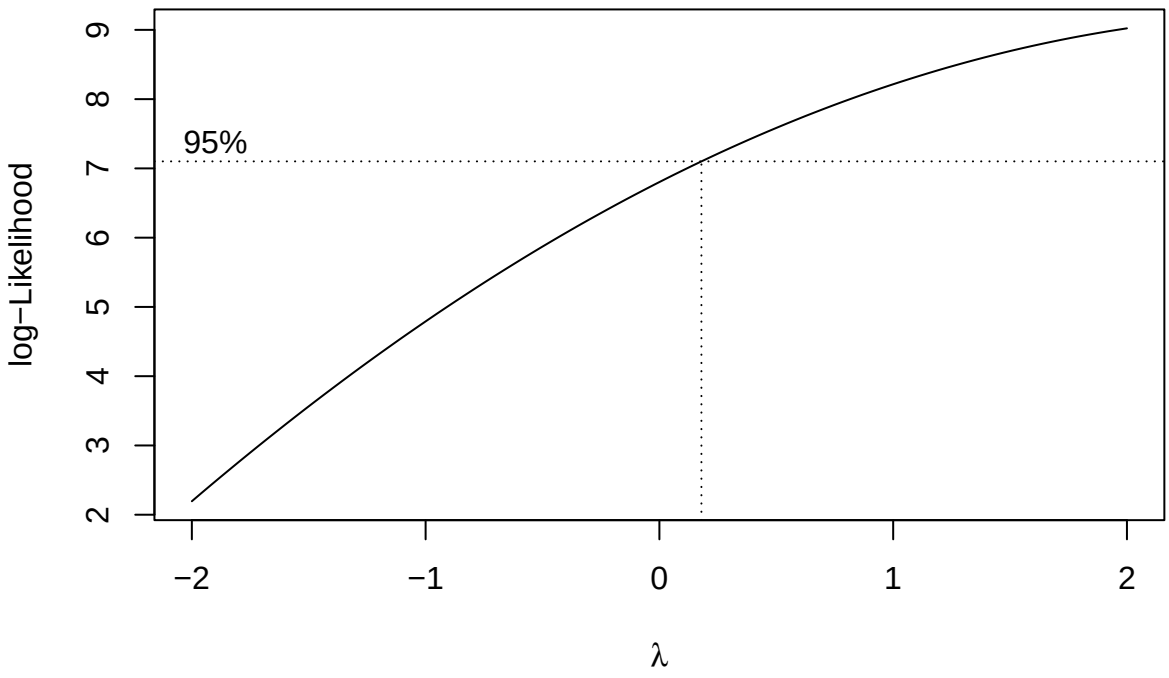

```
conf_intervals <- confint(new_model, level = 0.95)
print(conf_intervals)
```

```
##                          2.5 %        97.5 %
## (Intercept)       5.832099e+17  6.863035e+17
## GAC$Covid_Deaths -4.697708e+13 -7.344002e+12
```

```
model <- lm(GA$Local_Trips ~ GA$Influenza_Deaths)
qqnorm(model$residuals, main = "Normal Q-Q Plot of Georgia Influenza Deaths vs Local Travel")
qqline(model$residuals)
```



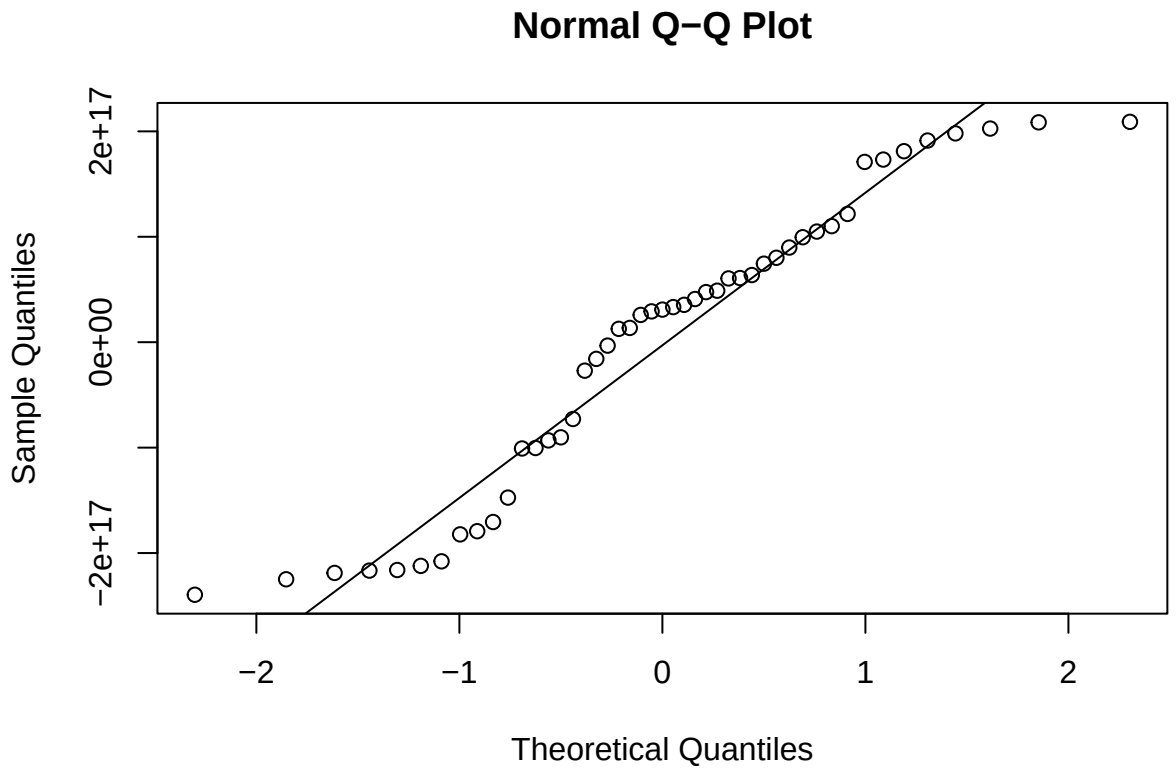

```
GA$CookD = cooks.distance(model)
GAI <- GA[which(GA$CookD < 0.5),]
bc <- boxcox(GAI$Local_Trips ~ GAI$Influenza_Deaths)
```



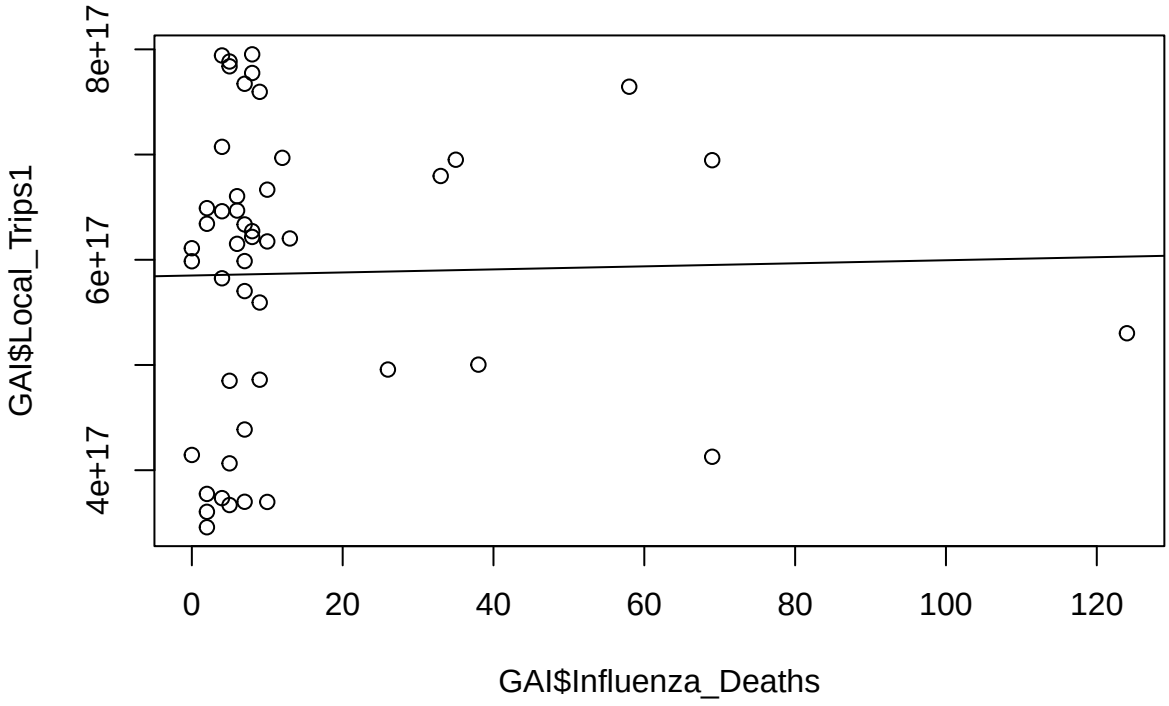

```
lambda <- bc$x[which.max(bc$y)]
GAI$Local_Trips1 <- ((GAI$Local_Trips^lambda - 1) / lambda)
new_model <- lm(GAI$Local_Trips1 ~ GAI$Influenza_Deaths)
summary(new_model)
```

```
##
## Call:
## lm(formula = GAI$Local_Trips1 ~ GAI$Influenza_Deaths)
##
## Residuals:
##        Min         1Q     Median         3Q        Max
## -2.396e+17 -1.006e+17  3.092e+16  9.469e+16  2.090e+17
##
## Coefficients:
##                       Estimate Std. Error t value Pr(>|t|)
## (Intercept)          5.851e+17  2.421e+16  24.168   <2e-16 ***
## GAI$Influenza_Deaths 1.449e+14  8.944e+14   0.162    0.872
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.402e+17 on 45 degrees of freedom
## Multiple R-squared:  0.0005827,  Adjusted R-squared:  -0.02163
## F-statistic: 0.02624 on 1 and 45 DF,  p-value: 0.8721
```

```
qqnorm(new_model$residuals)
qqline(new_model$residuals)
```




```
plot(GAI$Local_Trips1 ~ GAI$Influenza_Deaths)
abline(new_model)
```



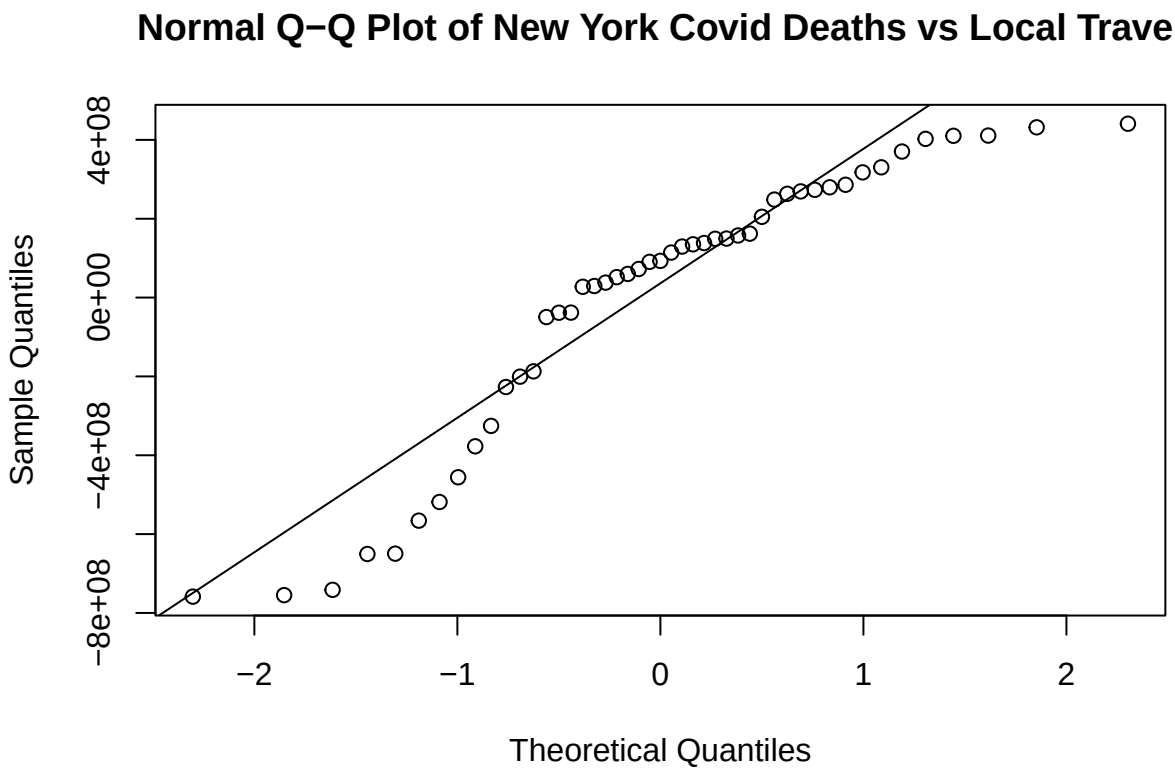

```
conf_intervals <- confint(new_model, level = 0.95)
print(conf_intervals)
```

```
##                              2.5 %       97.5 %
## (Intercept)           5.363074e+17 6.338226e+17
## GAI$Influenza_Deaths -1.656460e+15 1.946184e+15
```

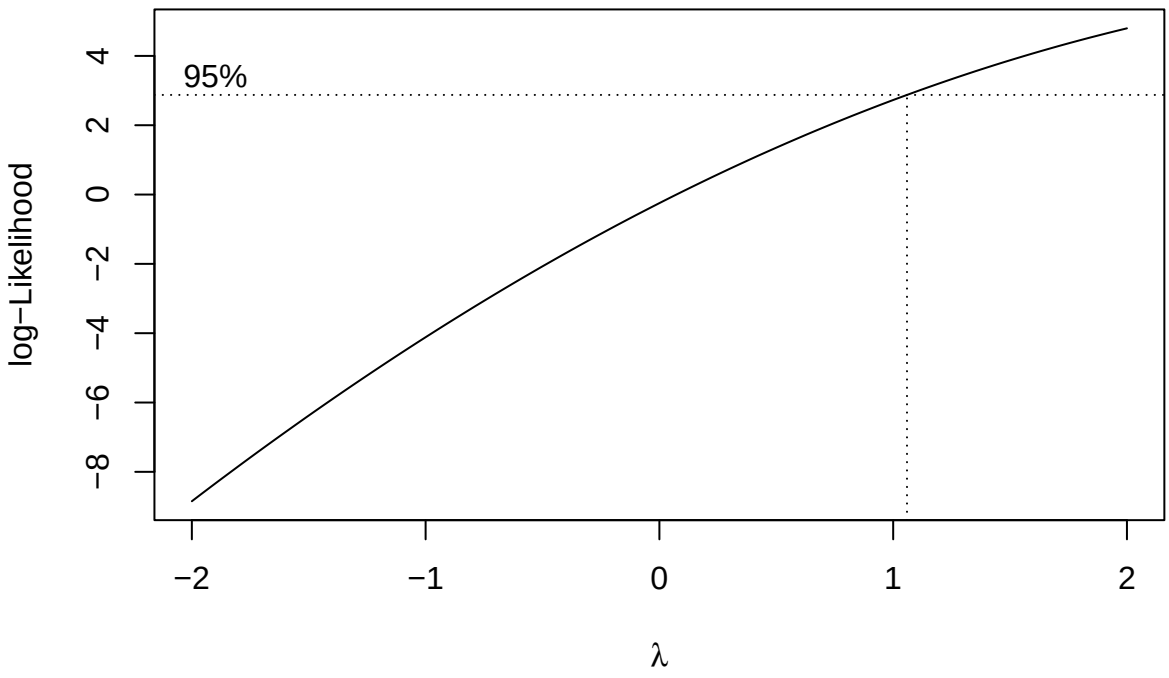
```
NY = DT[DT$Jurisdiction == 'New York',]
head(NY)
```

```
## # A tibble: 6 x 12
##    Year Month Jurisdiction Covid_Deaths Total_Deaths Pneumonia_Deaths
##   <dbl> <dbl> <chr>               <dbl>        <dbl>            <dbl>
## 1  2019    12 New York                0         6638              686
## 2  2020     1 New York              244        27028             2605
## 3  2020     2 New York              854        25816             2553
## 4  2020     3 New York            13156        55658             9877
## 5  2020     4 New York            40567        75640            20088
## 6  2020     5 New York            11070        40153             6270
## # i 6 more variables: Influenza_Deaths <dbl>, Pneumonia_Influenza_Deaths <dbl>,
## #   Pneumonia_Influenza_Covid <dbl>, Local_Trips <dbl>, Interstate_Trips <dbl>,
## #   Long_Distance_Trips <dbl>
```

```r
model <- lm(NY$Local_Trips ~ NY$Covid_Deaths)
qqnorm(model$residuals, main = "Normal Q-Q Plot of New York Covid Deaths vs Local Travel")
qqline(model$residuals)
```



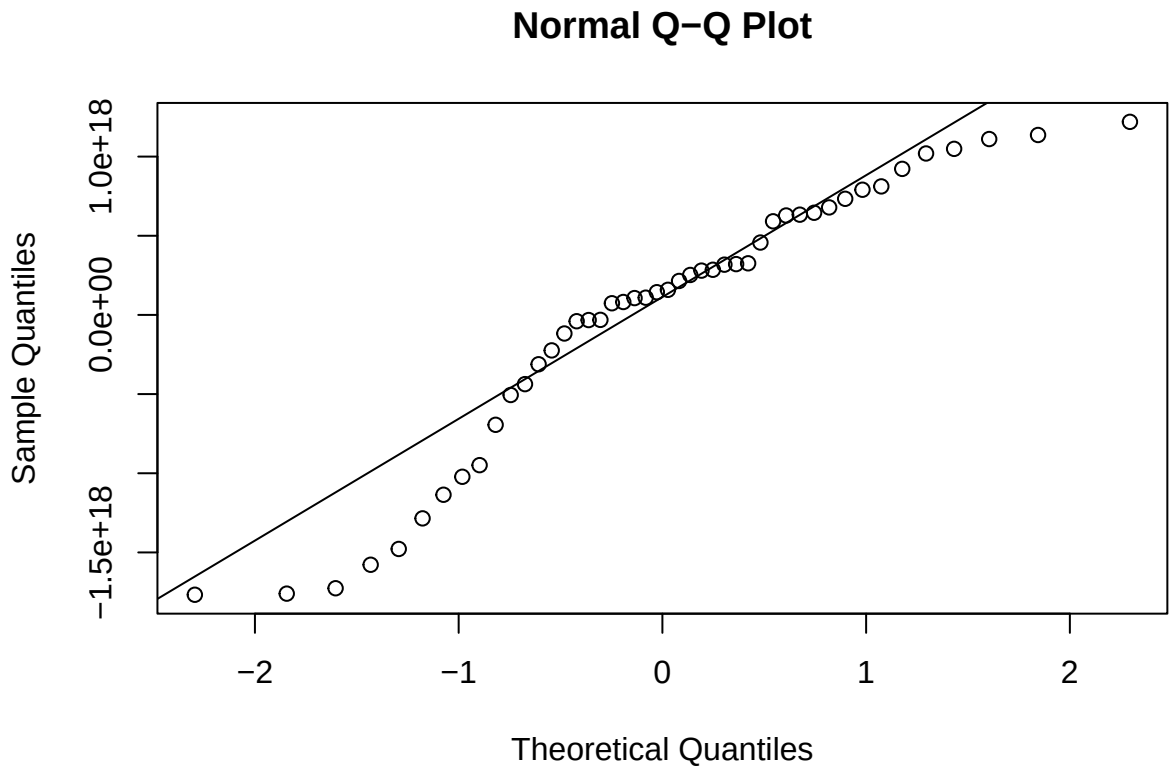

```r
NY$CookD = cooks.distance(model)
NYC <- NY[which(NY$CookD < 0.5),]
bc <- boxcox(NYC$Local_Trips ~ NYC$Covid_Deaths)
```



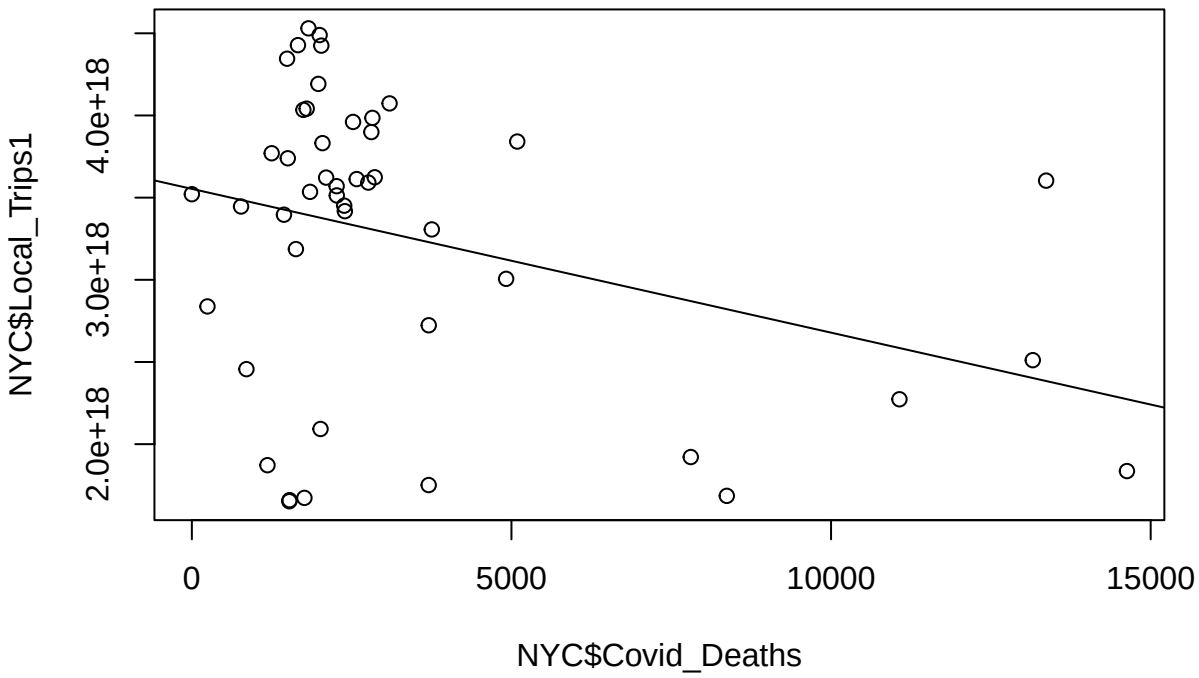

```
lambda <- bc$x[which.max(bc$y)]
NYC$Local_Trips1 <- (((NYC$Local_Trips)^lambda - 1) / lambda)
new_model <- lm(NYC$Local_Trips1 ~ NYC$Covid_Deaths)
summary(new_model)
```

```
##
## Call:
## lm(formula = NYC$Local_Trips1 ~ NYC$Covid_Deaths)
##
## Residuals:
##        Min         1Q     Median         3Q        Max
## -1.767e+18 -4.057e+17  1.510e+17  6.319e+17  1.219e+18
##
## Coefficients:
##                    Estimate Std. Error t value Pr(>|t|)
## (Intercept)       3.553e+18  1.758e+17  20.216   <2e-16 ***
## NYC$Covid_Deaths -8.749e+13  3.682e+13  -2.376   0.0219 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 8.471e+17 on 44 degrees of freedom
## Multiple R-squared:  0.1138, Adjusted R-squared:  0.09361
## F-statistic: 5.648 on 1 and 44 DF,  p-value: 0.0219
```

```
qqnorm(new_model$residuals)
qqline(new_model$residuals)
```



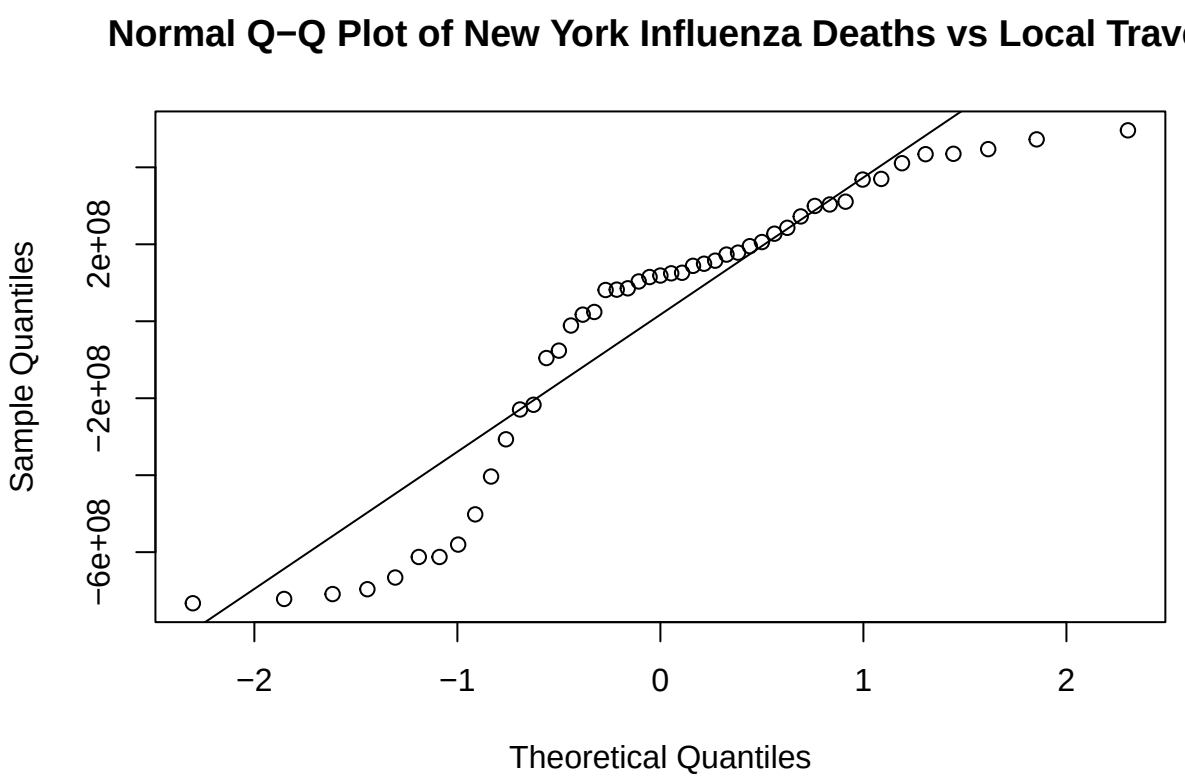

```
plot(NYC$Local_Trips1 ~ NYC$Covid_Deaths)
abline(new_model)
```



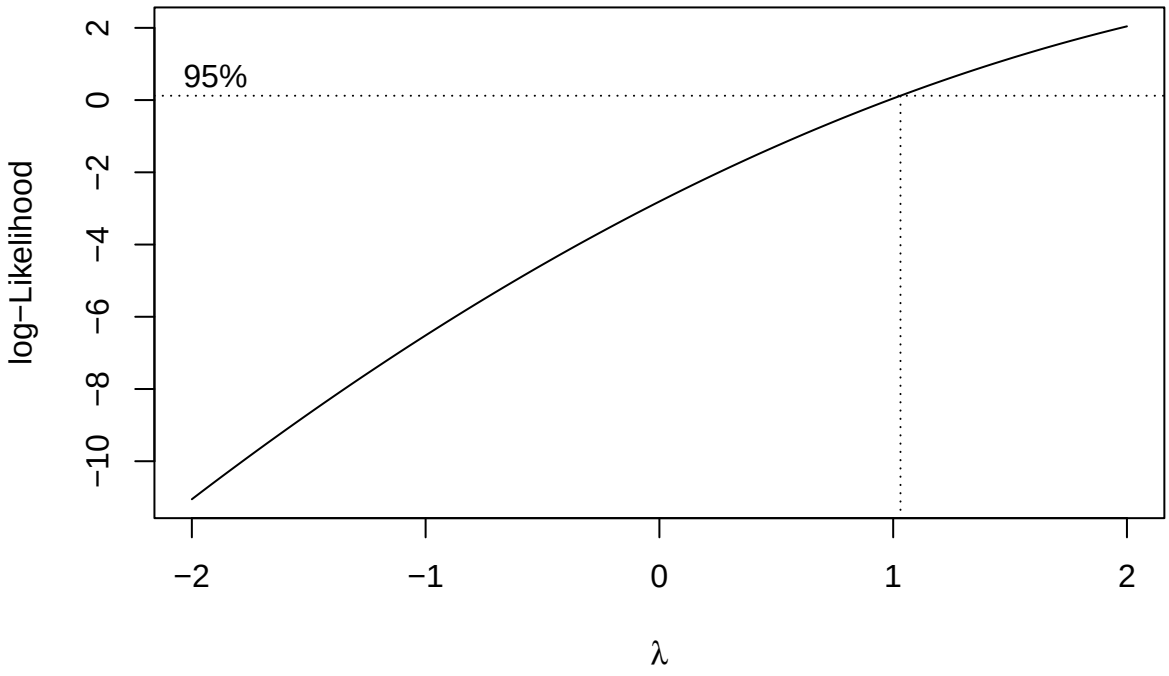

```
conf_intervals <- confint(new_model, level = 0.95)
print(conf_intervals)
```

```
##                           2.5 %        97.5 %
## (Intercept)       3.199144e+18  3.907637e+18
## NYC$Covid_Deaths -1.616902e+14 -1.329457e+13
```

```
model <- lm(NY$Local_Trips ~ NY$Influenza_Deaths)
qqnorm(model$residuals, main = "Normal Q-Q Plot of New York Influenza Deaths vs Local Travel")
qqline(model$residuals)
```



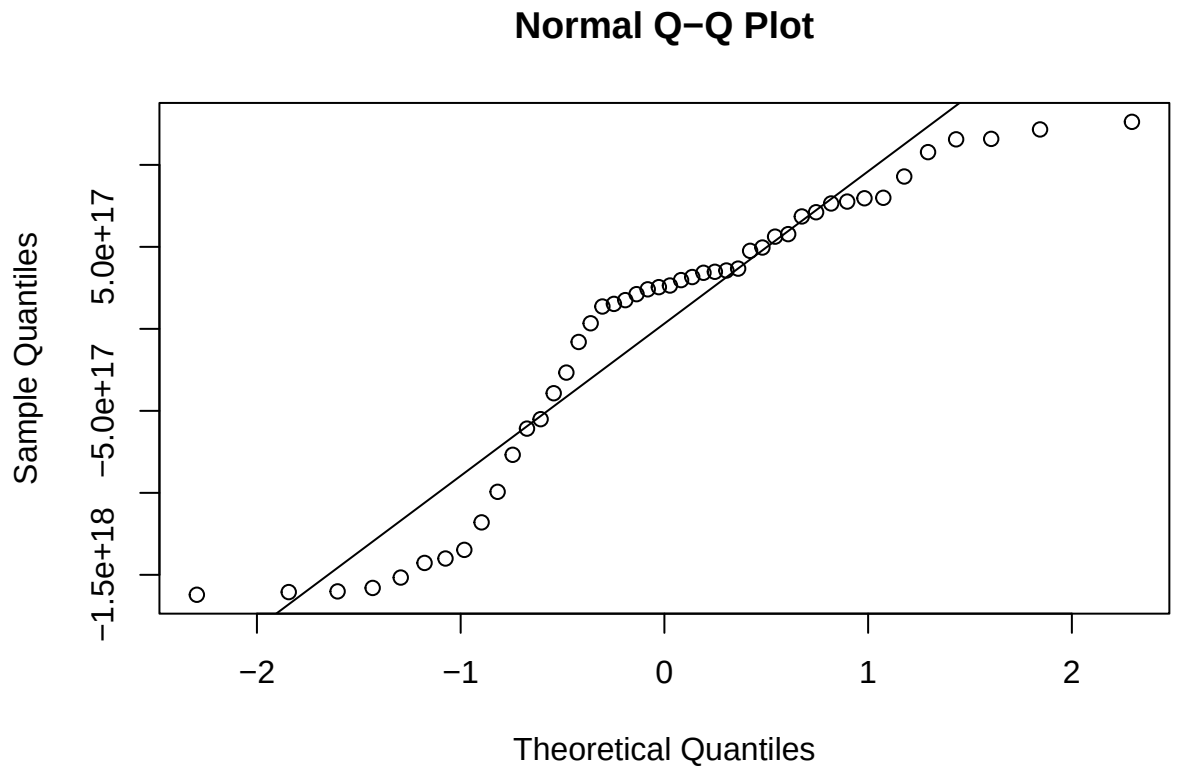

```
NY$CookD = cooks.distance(model)
NYI <- NY[which(NY$CookD < 0.5),]
bc <- boxcox(NYI$Local_Trips ~ NYI$Influenza_Deaths)
```



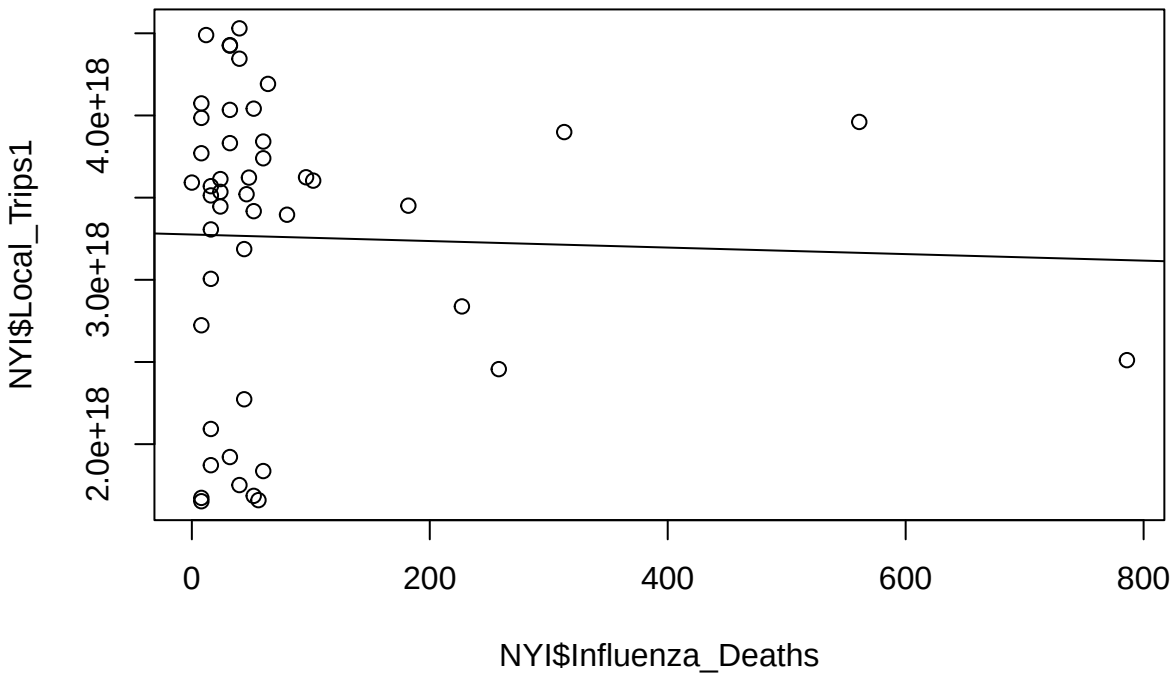

```
lambda <- bc$x[which.max(bc$y)]
NYI$Local_Trips1 <- (((NYI$Local_Trips)^lambda - 1) / lambda)
new_model <- lm(NYI$Local_Trips1 ~ NYI$Influenza_Deaths)
summary(new_model)
```

```
##
## Call:
## lm(formula = NYI$Local_Trips1 ~ NYI$Influenza_Deaths)
##
## Residuals:
##        Min         1Q     Median         3Q        Max
## -1.621e+18 -5.940e+17  2.593e+17  6.585e+17  1.262e+18
##
## Coefficients:
##                          Estimate Std. Error t value Pr(>|t|)
## (Intercept)             3.276e+18  1.525e+17  21.486   <2e-16 ***
## NYI$Influenza_Deaths -1.986e+14  9.227e+14  -0.215    0.831
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 8.993e+17 on 44 degrees of freedom
## Multiple R-squared:  0.001052,   Adjusted R-squared:  -0.02165
## F-statistic: 0.04634 on 1 and 44 DF,  p-value: 0.8306
```

```
qqnorm(new_model$residuals)
qqline(new_model$residuals)
```




```
plot(NYI$Local_Trips1 ~ NYI$Influenza_Deaths)
abline(new_model)
```



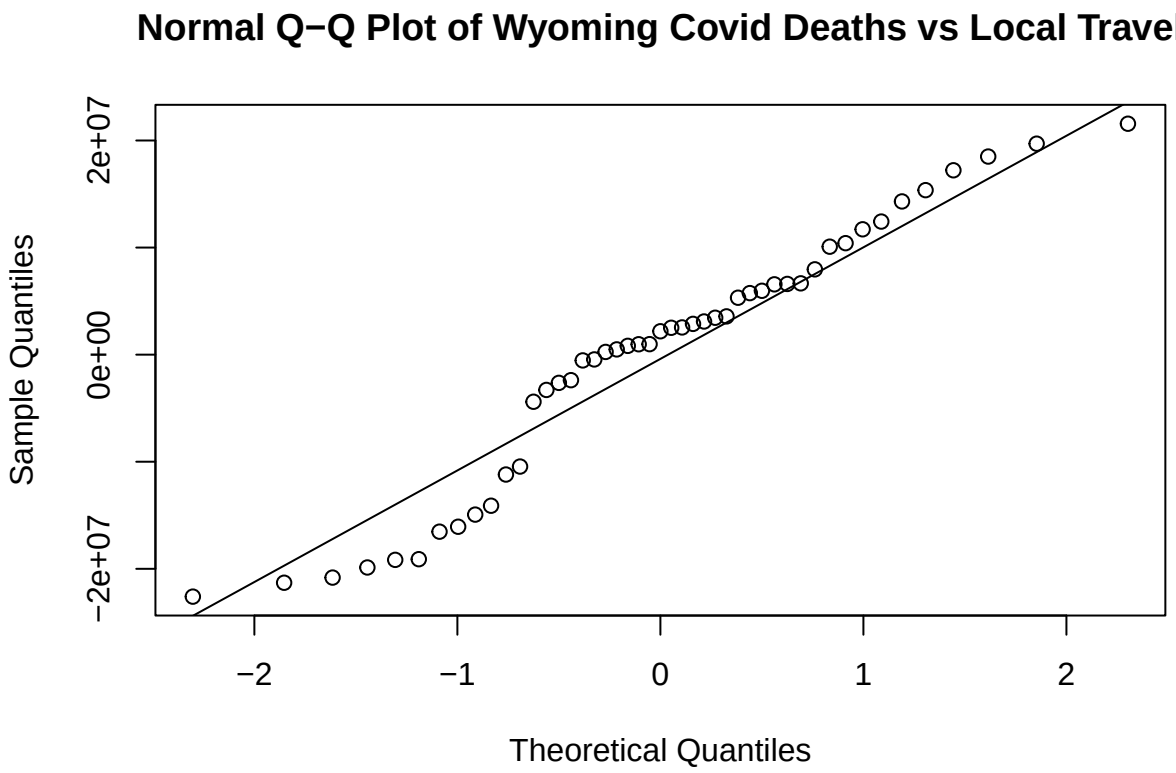

```
conf_intervals <- confint(new_model, level = 0.95)
print(conf_intervals)
```

```
##                              2.5 %       97.5 %
## (Intercept)           2.968402e+18 3.582908e+18
## NYI$Influenza_Deaths -2.058152e+15 1.660901e+15
```

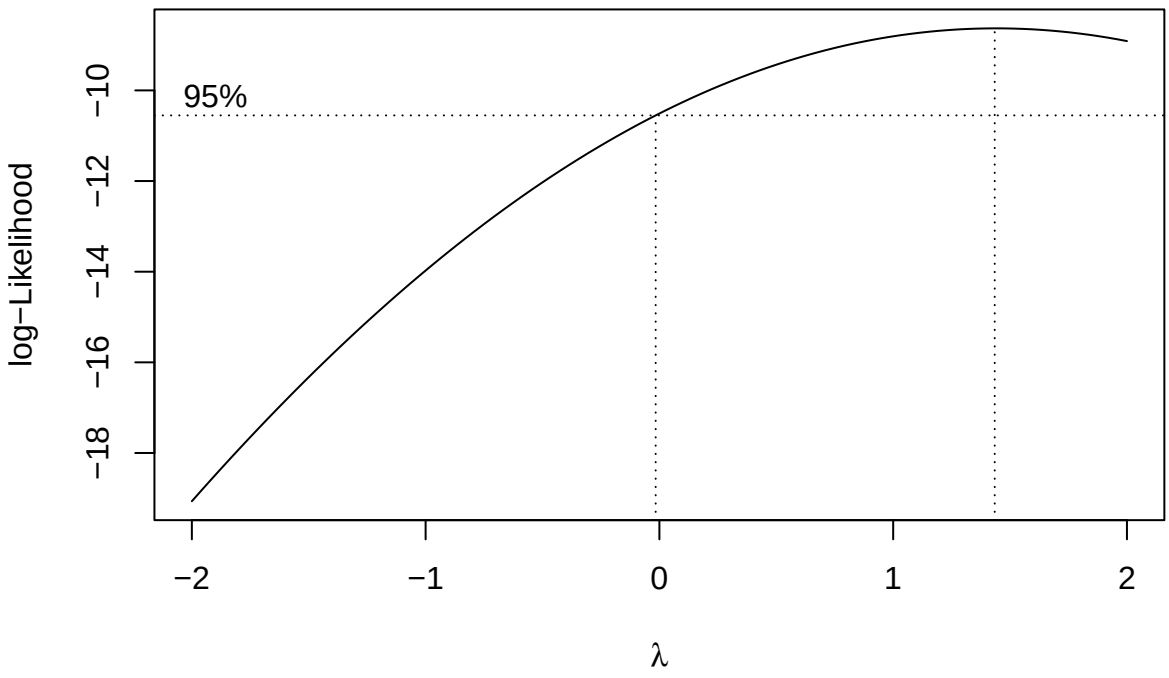
```
WY = DT[DT$Jurisdiction == 'Wyoming',]
head(WY)
```

```
## # A tibble: 6 x 12
##    Year Month Jurisdiction Covid_Deaths Total_Deaths Pneumonia_Deaths
##   <dbl> <dbl> <chr>               <dbl>        <dbl>            <dbl>
## 1  2019    12 Wyoming                 0          374               33
## 2  2020     1 Wyoming                 0          950              120
## 3  2020     2 Wyoming                 0         1019              123
## 4  2020     3 Wyoming                32         1391              170
## 5  2020     4 Wyoming               144          948              132
## 6  2020     5 Wyoming               144         1210              143
## # i 6 more variables: Influenza_Deaths <dbl>, Pneumonia_Influenza_Deaths <dbl>,
## #   Pneumonia_Influenza_Covid <dbl>, Local_Trips <dbl>, Interstate_Trips <dbl>,
## #   Long_Distance_Trips <dbl>
```

```
model <- lm(WY$Local_Trips ~ WY$Covid_Deaths)
qqnorm(model$residuals, main = "Normal Q-Q Plot of Wyoming Covid Deaths vs Local Travel")
qqline(model$residuals)
```



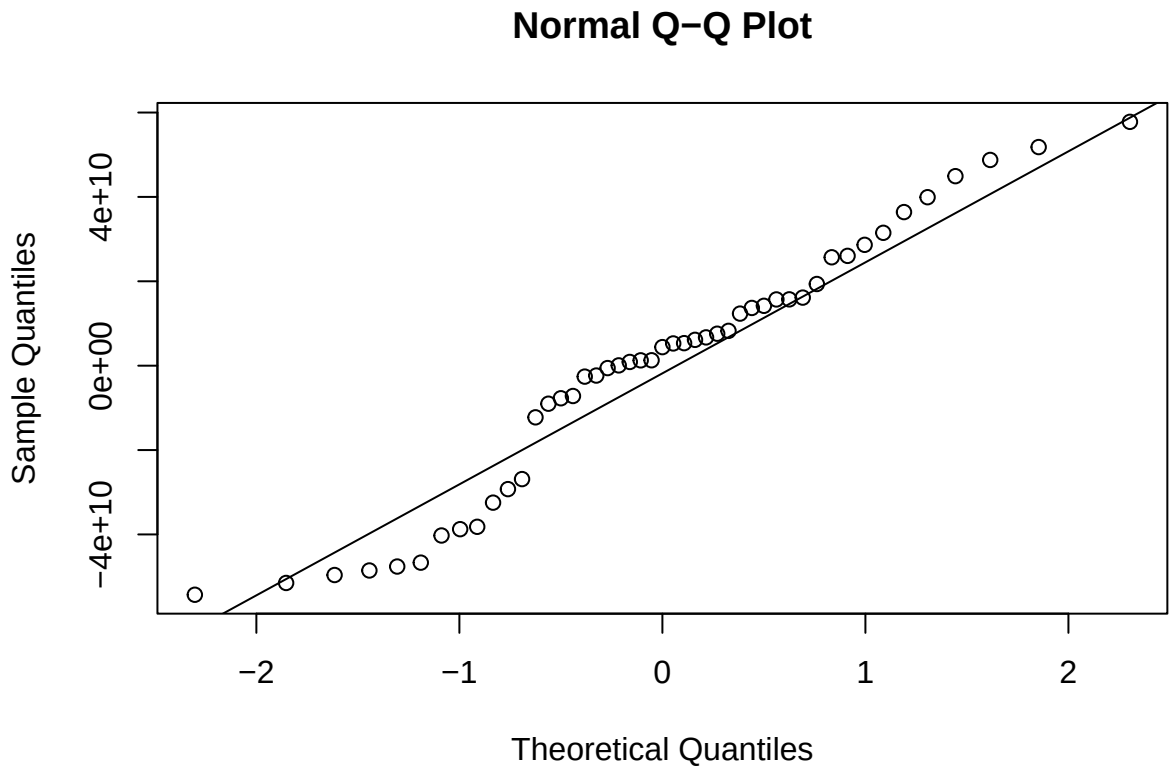

```
WY$CookD = cooks.distance(model)
WYC <- WY[which(WY$CookD < 0.5),]
bc <- boxcox(WYC$Local_Trips ~ WYC$Covid_Deaths)
```



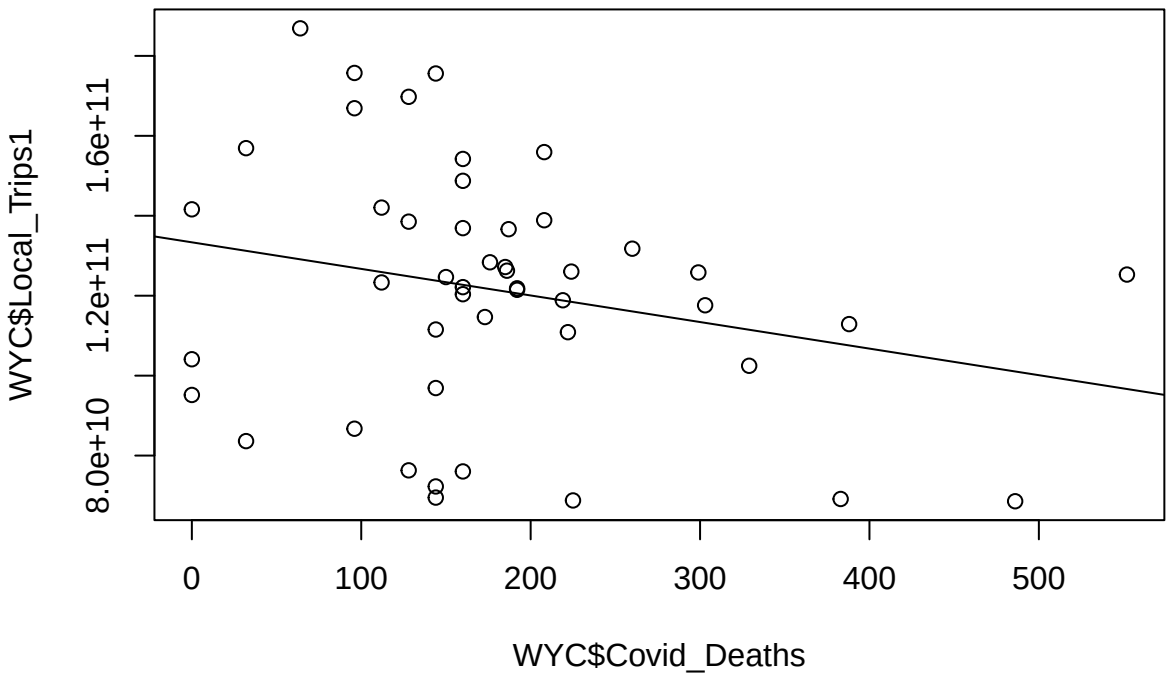

```
lambda <- bc$x[which.max(bc$y)]
WYC$Local_Trips1 <- (((WYC$Local_Trips)^lambda - 1) / lambda)
new_model <- lm(WYC$Local_Trips1 ~ WYC$Covid_Deaths)
summary(new_model)
```

```
##
## Call:
## lm(formula = WYC$Local_Trips1 ~ WYC$Covid_Deaths)
##
## Residuals:
##        Min         1Q     Median         3Q        Max
## -5.429e+10 -1.956e+10  4.397e+09  1.593e+10  5.779e+10
##
## Coefficients:
##                    Estimate Std. Error t value Pr(>|t|)
## (Intercept)       1.334e+11  8.331e+09  16.006   <2e-16 ***
## WYC$Covid_Deaths -6.649e+07  3.936e+07  -1.689   0.0981 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.014e+10 on 45 degrees of freedom
## Multiple R-squared:  0.05964,    Adjusted R-squared:  0.03874
## F-statistic: 2.854 on 1 and 45 DF,  p-value: 0.09807
```

```
qqnorm(new_model$residuals)
qqline(new_model$residuals)
```




```
plot(WYC$Local_Trips1 ~ WYC$Covid_Deaths)
abline(new_model)
```




```
conf_intervals <- confint(new_model, level = 0.95)
print(conf_intervals)
```

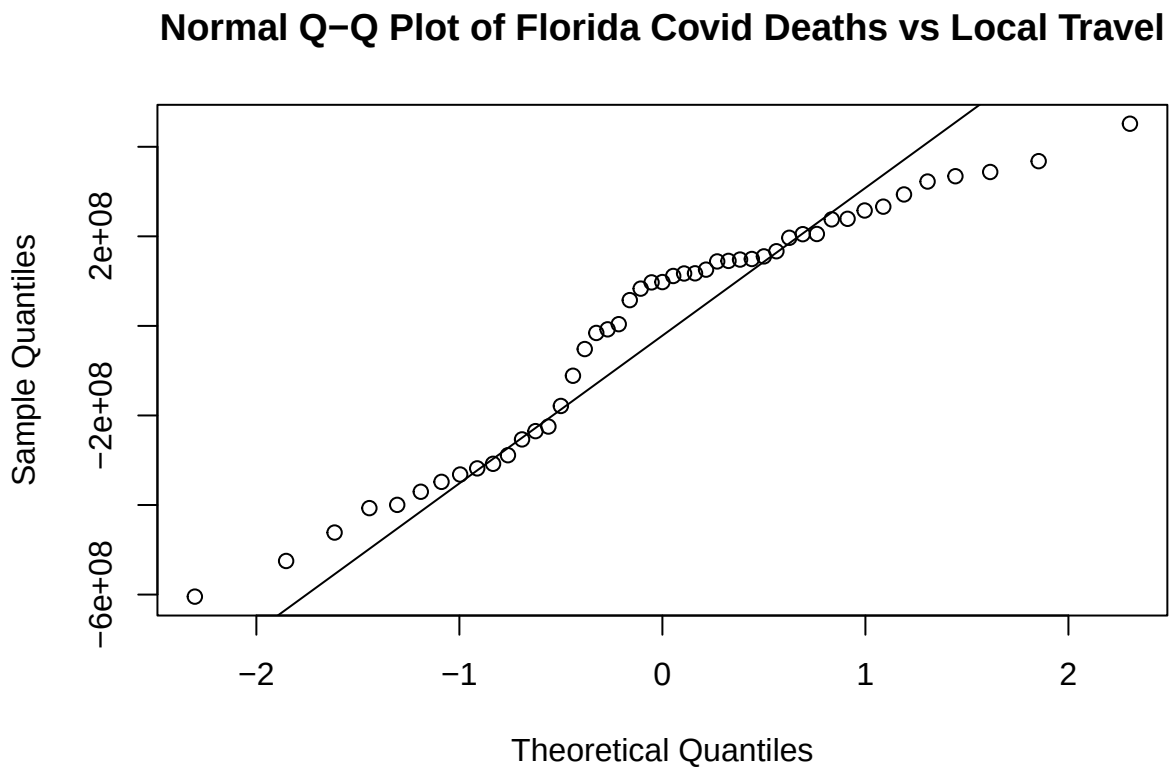
```
##                         2.5 %       97.5 %
## (Intercept)      116574411633 150134988516
## WYC$Covid_Deaths   -145763032     12780995
```

```
# No one is Wyoming died from Influenza
```

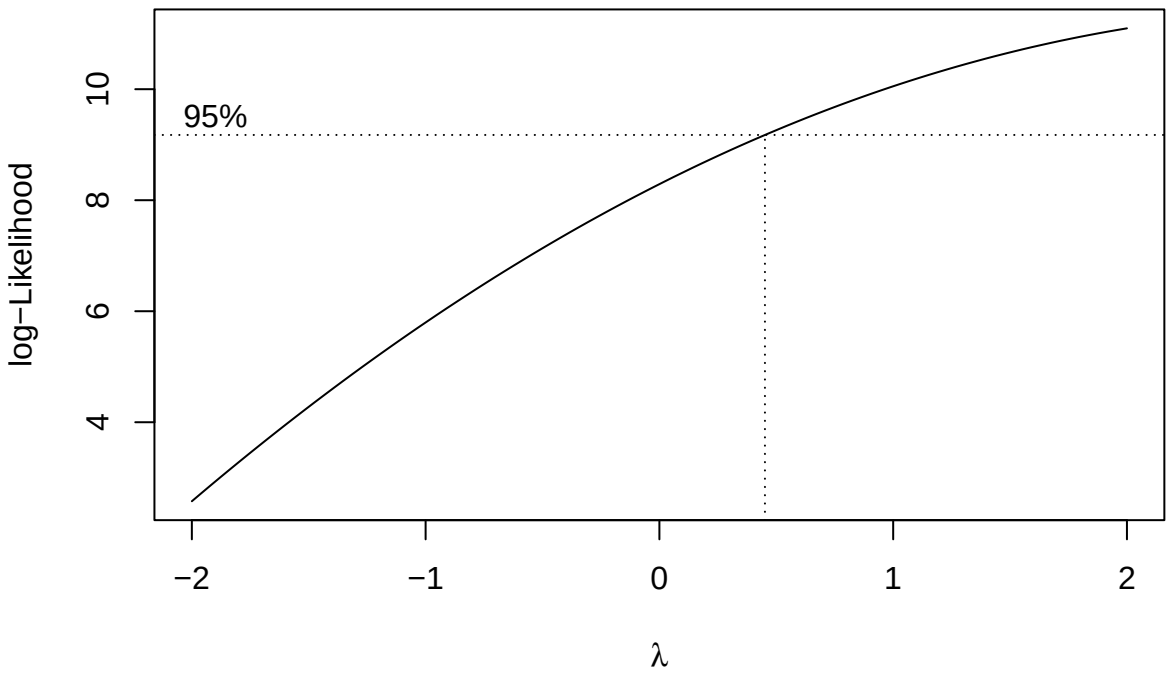
```
FL = DT[DT$Jurisdiction == 'Florida',]
head(FL)
```

```
## # A tibble: 6 x 12
##    Year Month Jurisdiction Covid_Deaths Total_Deaths Pneumonia_Deaths
##   <dbl> <dbl> <chr>               <dbl>        <dbl>            <dbl>
## 1  2019    12 Florida                 0         8480              492
## 2  2020     1 Florida                 0        34304             2541
## 3  2020     2 Florida                 0        33944             2652
## 4  2020     3 Florida              1283        43164             4400
## 5  2020     4 Florida              2502        35160             3623
## 6  2020     5 Florida              2490        42388             3838
## # i 6 more variables: Influenza_Deaths <dbl>, Pneumonia_Influenza_Deaths <dbl>,
## #   Pneumonia_Influenza_Covid <dbl>, Local_Trips <dbl>, Interstate_Trips <dbl>,
## #   Long_Distance_Trips <dbl>
```

```r
model <- lm(FL$Local_Trips ~ FL$Covid_Deaths)
qqnorm(model$residuals, main = "Normal Q-Q Plot of Florida Covid Deaths vs Local Travel")
qqline(model$residuals)
```



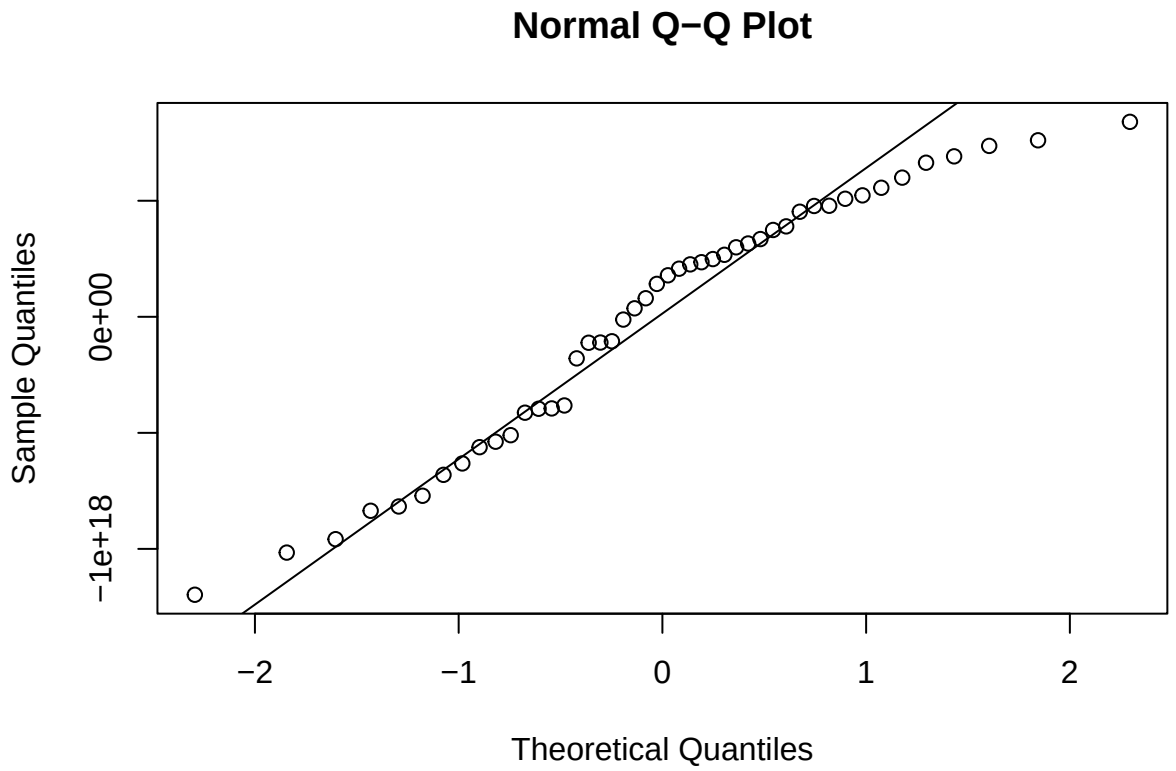

```r
FL$CookD = cooks.distance(model)
FLC <- FL[which(FL$CookD < 0.5),]
bc <- boxcox(FLC$Local_Trips ~ FLC$Covid_Deaths)
```



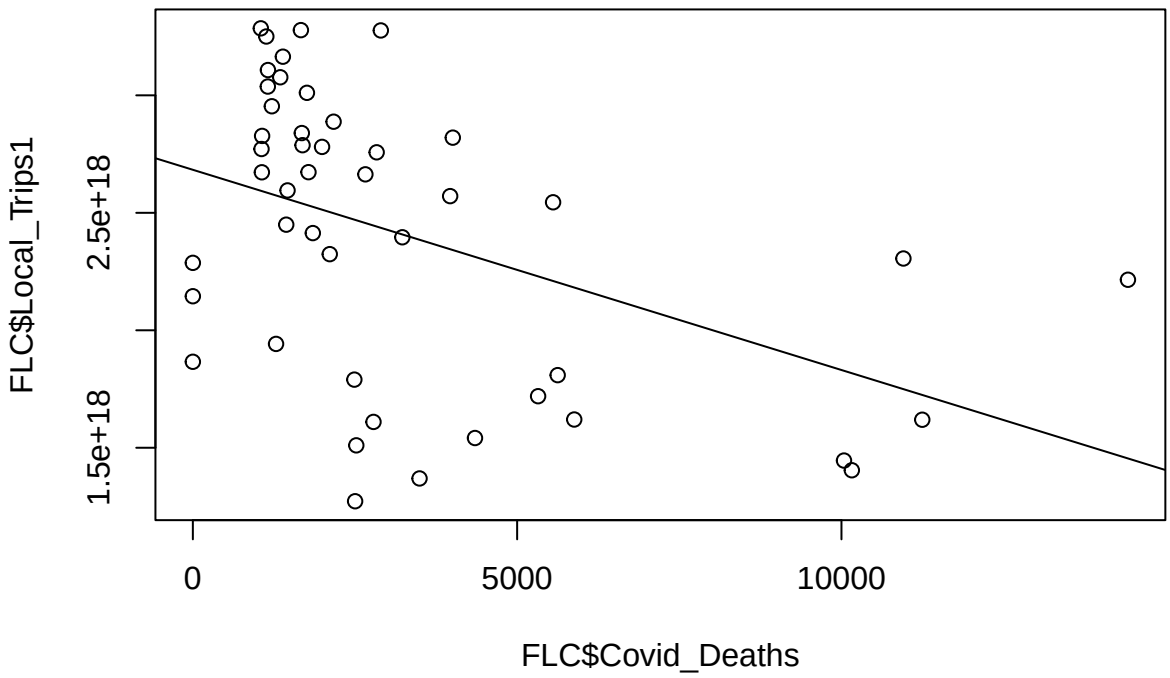

```
lambda <- bc$x[which.max(bc$y)]
FLC$Local_Trips1 <- (((FLC$Local_Trips)^lambda - 1) / lambda)
new_model <- lm(FLC$Local_Trips1 ~ FLC$Covid_Deaths)
summary(new_model)
```

```
##
## Call:
## lm(formula = FLC$Local_Trips1 ~ FLC$Covid_Deaths)
##
## Residuals:
##        Min         1Q     Median         3Q        Max
## -1.198e+18 -4.089e+17  1.602e+17  4.370e+17  8.400e+17
##
## Coefficients:
##                    Estimate Std. Error t value Pr(>|t|)
## (Intercept)       2.683e+18  1.155e+17  23.229  < 2e-16 ***
## FLC$Covid_Deaths -8.522e+13  2.531e+13  -3.367  0.00159 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.501e+17 on 44 degrees of freedom
## Multiple R-squared:  0.2049, Adjusted R-squared:  0.1868
## F-statistic: 11.34 on 1 and 44 DF,  p-value: 0.001586
```

```
qqnorm(new_model$residuals)
qqline(new_model$residuals)
```



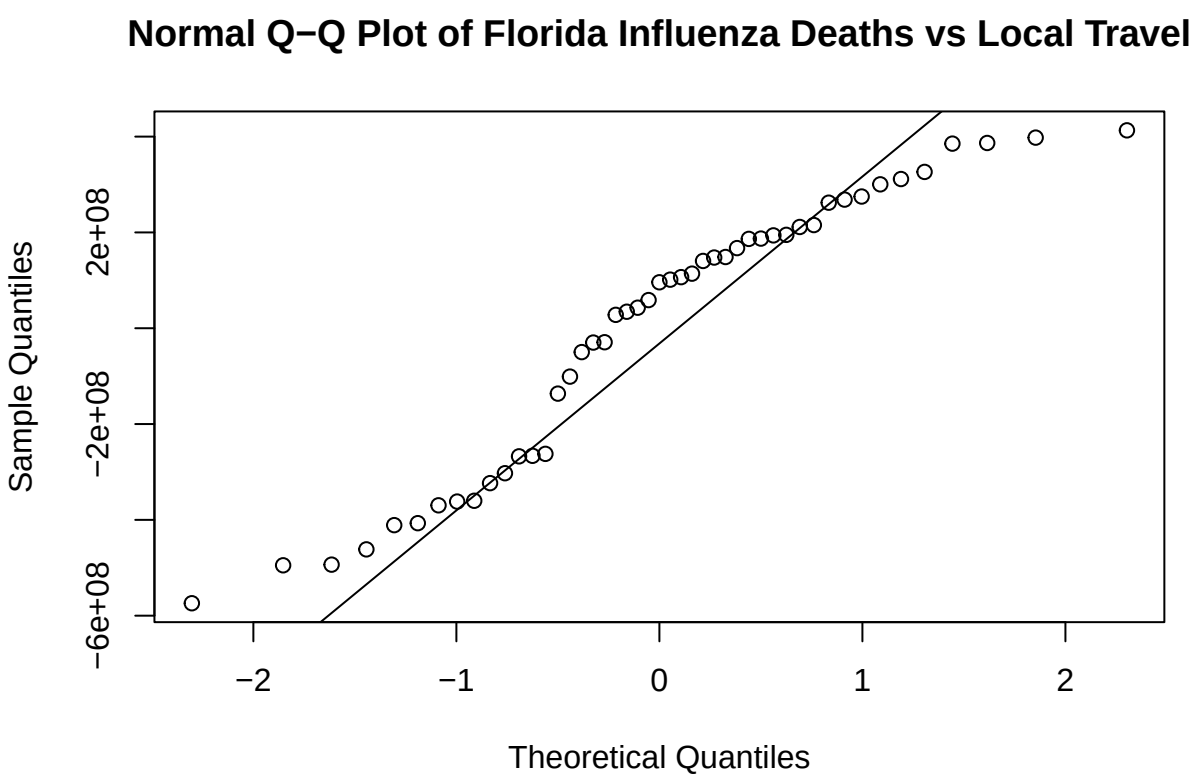

```
plot(FLC$Local_Trips1 ~ FLC$Covid_Deaths)
abline(new_model)
```



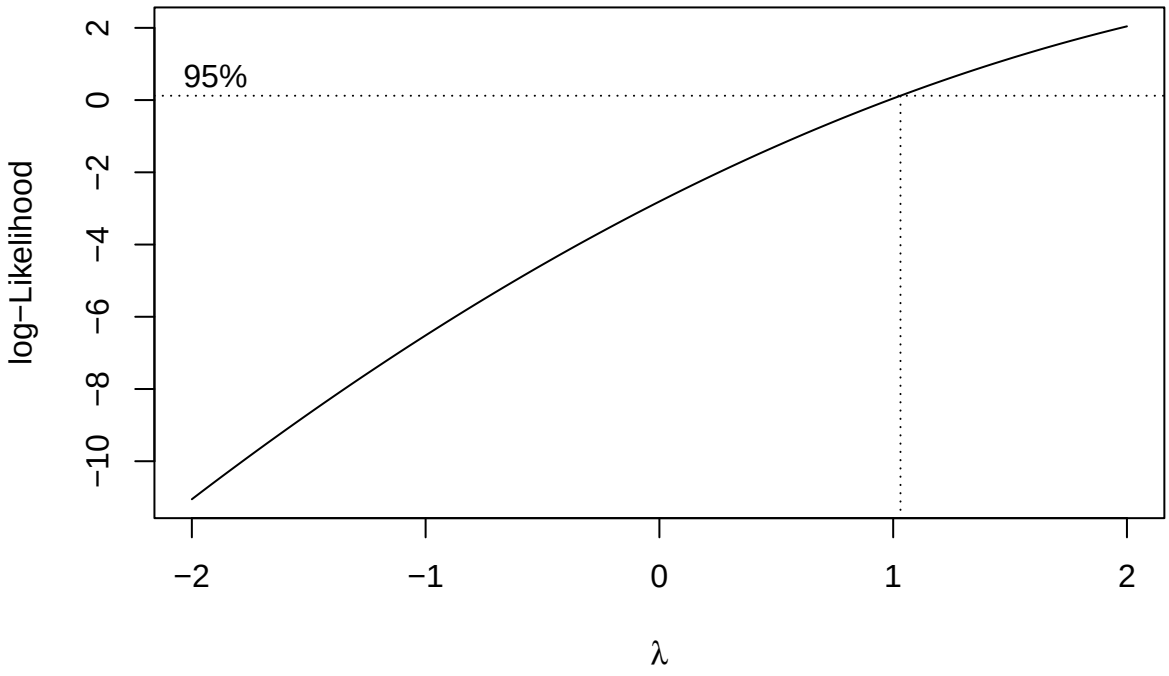

```
conf_intervals <- confint(new_model, level = 0.95)
print(conf_intervals)
```

```
##                          2.5 %        97.5 %
## (Intercept)       2.450338e+18  2.915917e+18
## FLC$Covid_Deaths -1.362337e+14 -3.421269e+13
```

```
model <- lm(FL$Local_Trips ~ FL$Influenza_Deaths)
qqnorm(model$residuals, main = "Normal Q-Q Plot of Florida Influenza Deaths vs Local Travel")
qqline(model$residuals)
```



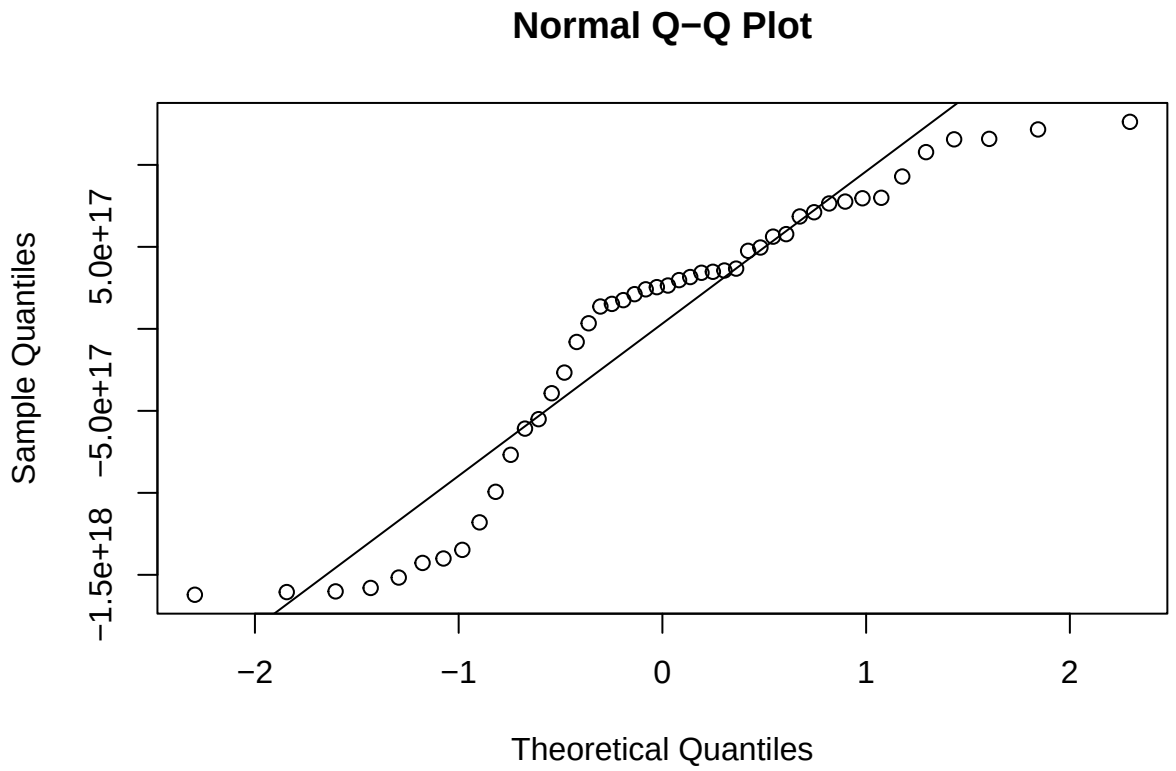

```
FL$CookD = cooks.distance(model)
FLI <- NY[which(NY$CookD < 0.5),]
bc <- boxcox(FLI$Local_Trips ~ FLI$Influenza_Deaths)
```



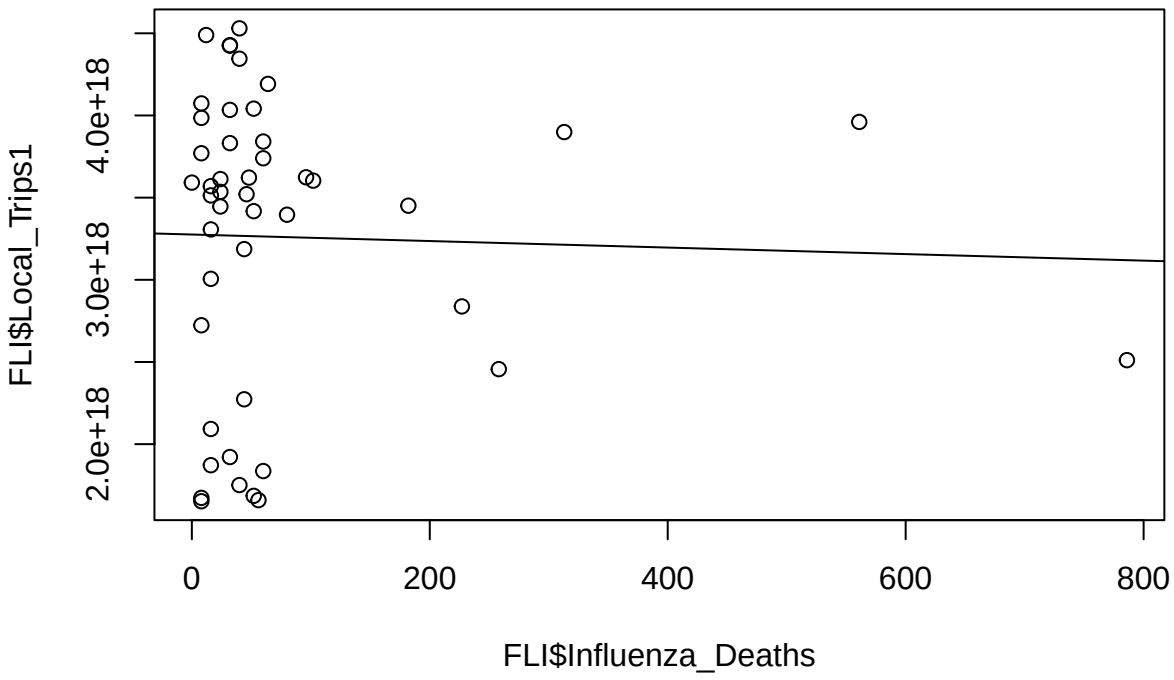

```
lambda <- bc$x[which.max(bc$y)]
FLI$Local_Trips1 <- (((FLI$Local_Trips)^lambda - 1) / lambda)
new_model <- lm(FLI$Local_Trips1 ~ FLI$Influenza_Deaths)
summary(new_model)
```

```
##
## Call:
## lm(formula = FLI$Local_Trips1 ~ FLI$Influenza_Deaths)
##
## Residuals:
##        Min         1Q     Median         3Q        Max
## -1.621e+18 -5.940e+17  2.593e+17  6.585e+17  1.262e+18
##
## Coefficients:
##                         Estimate Std. Error t value Pr(>|t|)
## (Intercept)            3.276e+18  1.525e+17  21.486   <2e-16 ***
## FLI$Influenza_Deaths -1.986e+14  9.227e+14  -0.215    0.831
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 8.993e+17 on 44 degrees of freedom
## Multiple R-squared:  0.001052,   Adjusted R-squared:  -0.02165
## F-statistic: 0.04634 on 1 and 44 DF,  p-value: 0.8306
```

```
qqnorm(new_model$residuals)
qqline(new_model$residuals)
```




```
plot(FLI$Local_Trips1 ~ FLI$Influenza_Deaths)
abline(new_model)
```




```
conf_intervals <- confint(new_model, level = 0.95)
print(conf_intervals)
```

```
##                              2.5 %       97.5 %
## (Intercept)           2.968402e+18 3.582908e+18
## FLI$Influenza_Deaths -2.058152e+15 1.660901e+15
```