Simple Regression Model

Thach Pham

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The analysis uses R Core Team (2018) and some packages developed by Wickham et al. (2018), Allaire et al. (2018), Hothorn et al. (2018), Hlavac (2018), Wickham (2017), and Shea (2018).

```
library(wooldridge)
library(tidyverse)
library(stargazer)
library(lmtest)
```

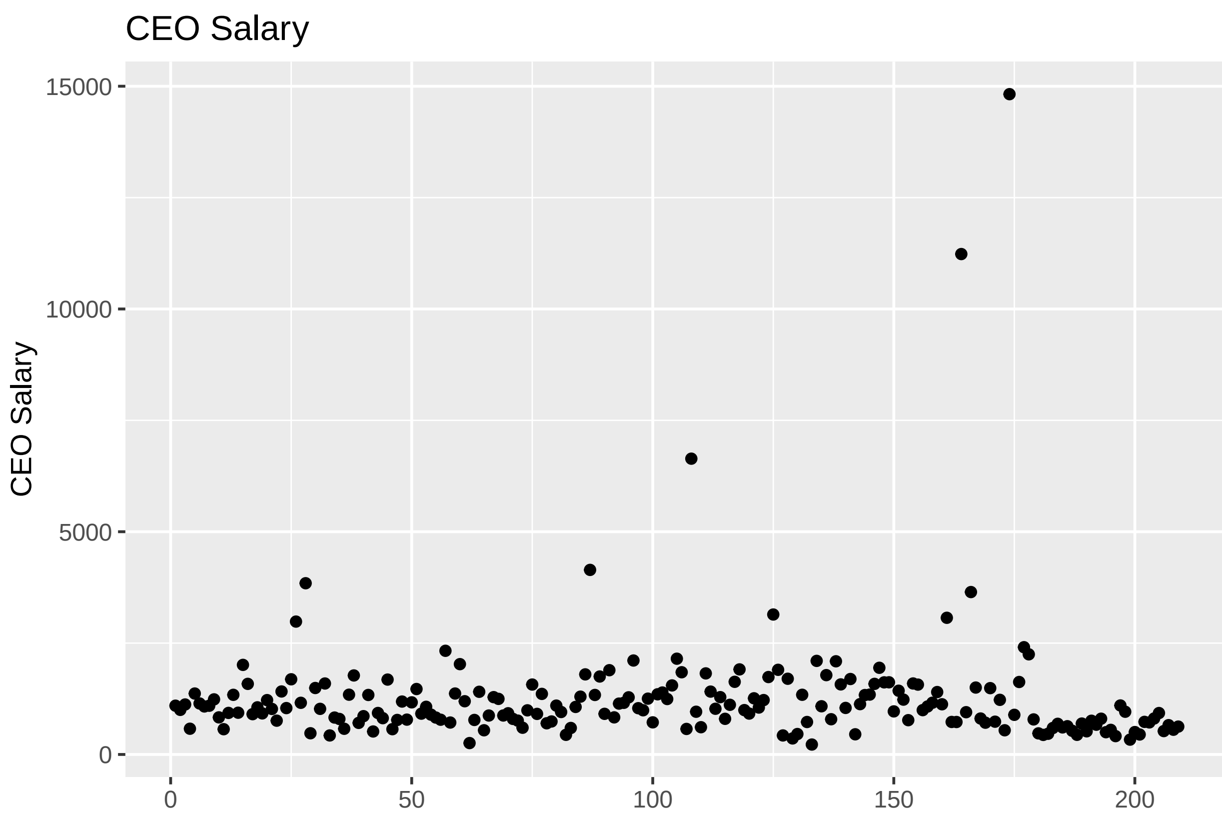
Descriptive Statistics of ceosal1 data

```
# Descriptive Statistics
data("ceosal1")
desc.ceosal1 <- select(ceosal1, -c(indus, finance, consprod, utility))
stargazer(desc.ceosal1, type = "text", style = "qje", title = "Descriptive Statistics",
          digits = 4, out = "SRO/ceosal1-sum.doc")
```

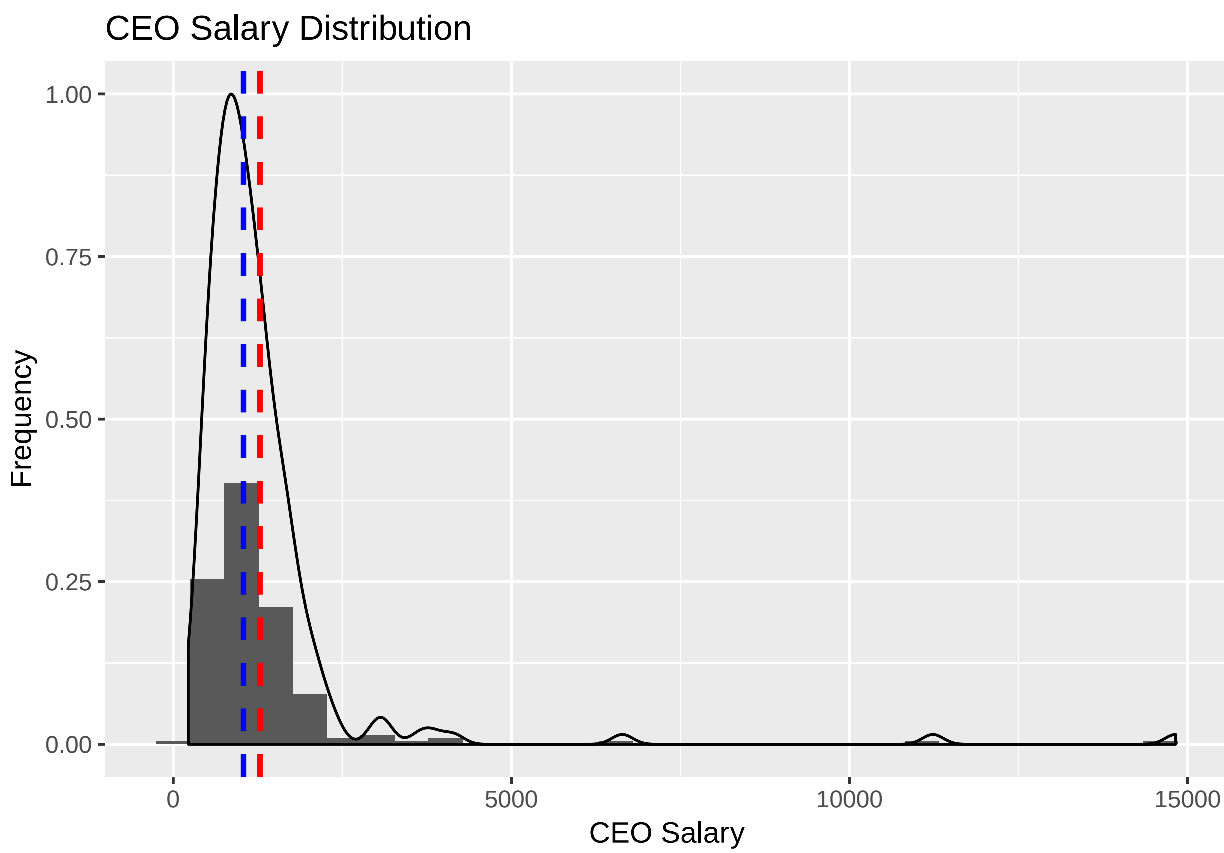
```
##
## Descriptive Statistics
## ------------------------------------------------------------------------
## Statistic  N     Mean     St. Dev.     Min    Pctl(25) Pctl(75)   Max
## ========================================================================
## salary    209 1,281.1200 1,372.3450    223      736     1,407    14,822
## pcsalary  209  13.2823     32.6339     -61      -1       20       212
## sales     209 6,923.7930 10,633.2700   175    2,210.3   7,177    97,650
## roe       209  17.1842     8.5185     0.5000  12.4000  20.0000  56.3000
## pcroe     209  10.8005     97.2194   -98.9000 -21.2000 19.5000  977.0000
## ros       209  61.8038     68.1771     -58      21       81       418
## lsalary   209   6.9504     0.5664     5.4072   6.6012   7.2492   9.6039
## lsales    209   8.2923     1.0132     5.1659   7.7009   8.8786  11.4891
## ========================================================================
```

Salary Plot and Distribution

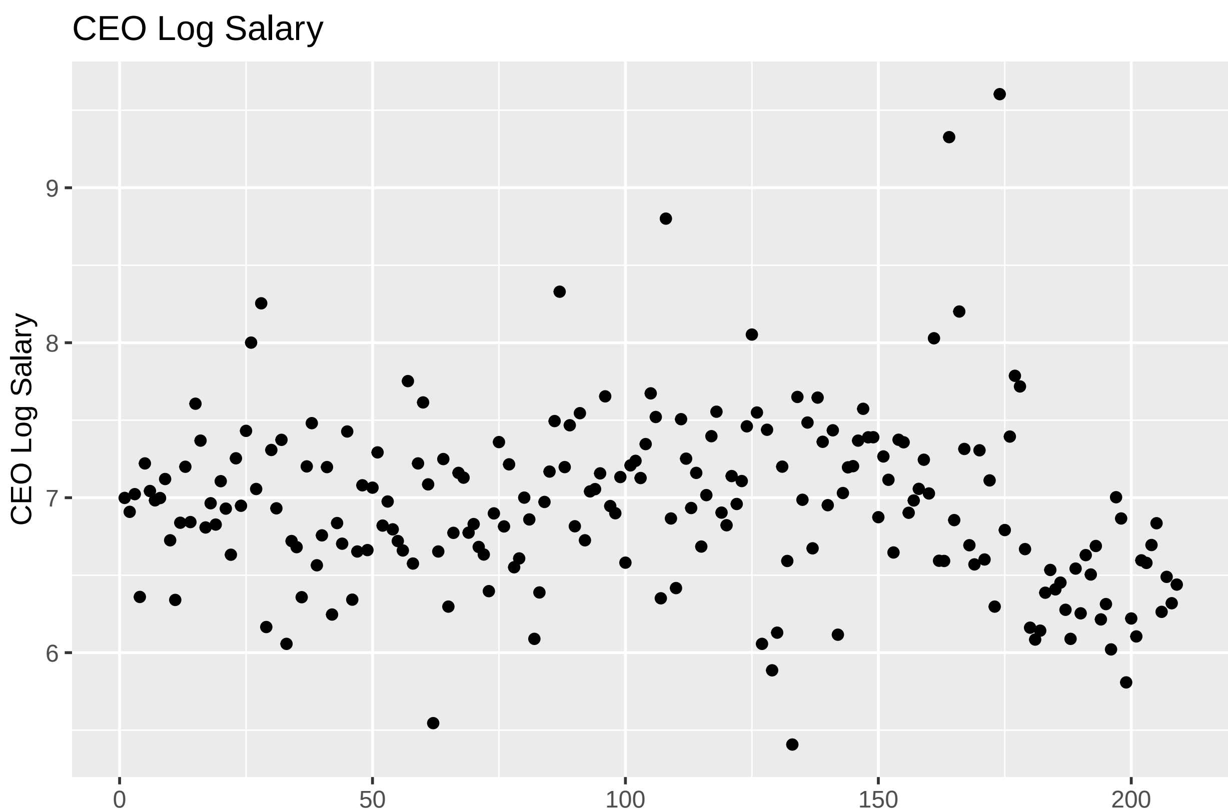
```
# Salary Plot
(salary <- ggplot(desc.ceosal1, aes(x = 1:nrow(desc.ceosal1), y = salary)) +
  geom_point() +
  theme(legend.position = "none") +
  labs(x = "", y = "CEO Salary", title = "CEO Salary"))
```



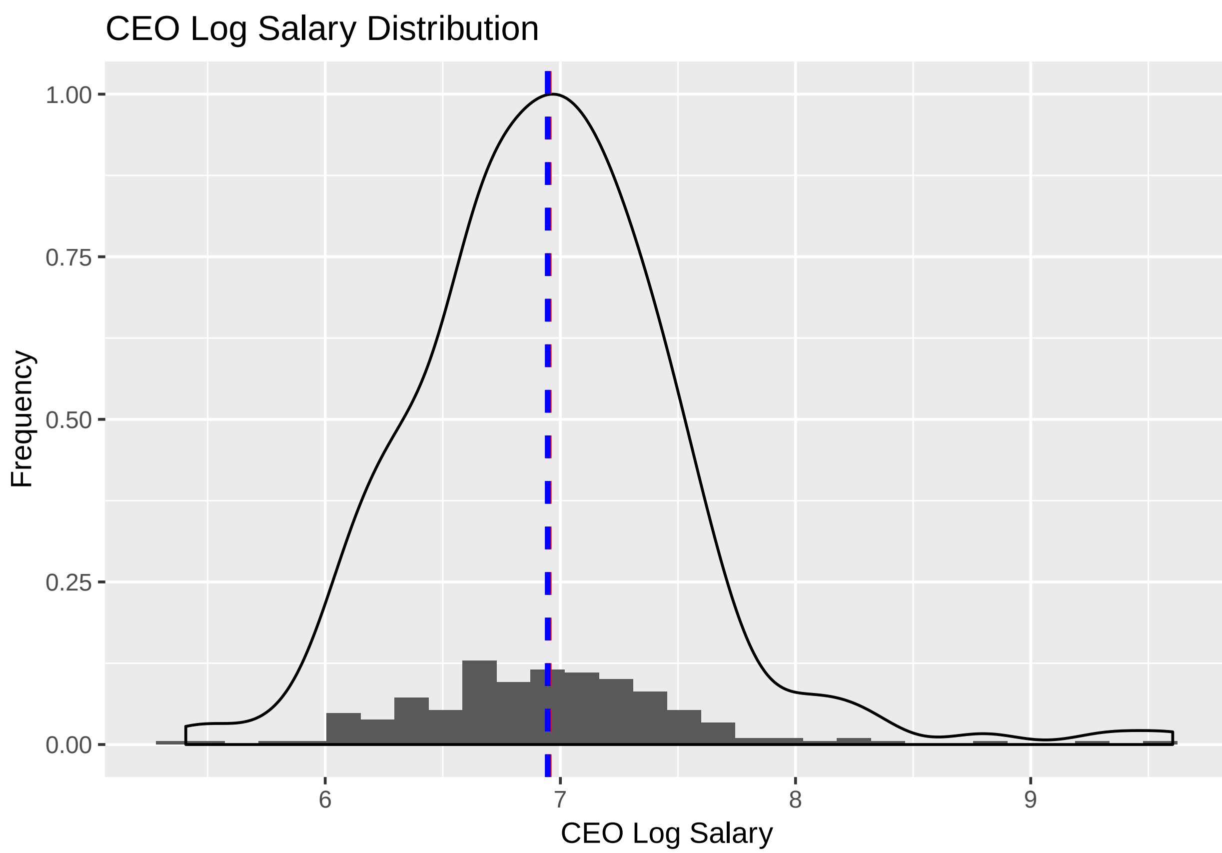

```
ggsave("SRO/CEO Salary.png", salary)

# Salary Distribution
(salary.dist <- ggplot(desc.ceosal1, aes(salary)) +
  geom_histogram(aes(y = ..count../sum(..count..))) +
  theme(legend.position = "none") +
  labs(x = "CEO Salary", y = "Frequency", title = "CEO Salary Distribution") +
  geom_density(aes(y = ..scaled..)) +
  geom_vline(aes(xintercept = mean(salary)), color = "red", linetype = "dashed", size = 1) +
  geom_vline(aes(xintercept = median(salary)), color = "blue", linetype = "dashed", size = 1))
```




```
ggsave("SRO/CEO Salary Distribution.png", salary.dist)

# Logarithm of Salary
(log.salary <- ggplot(desc.ceosal1, aes(x = 1:nrow(desc.ceosal1), y = lsalary)) +
  geom_point() +
  theme(legend.position = "none") +
  labs(x = "", y = "CEO Log Salary", title = "CEO Log Salary"))
```



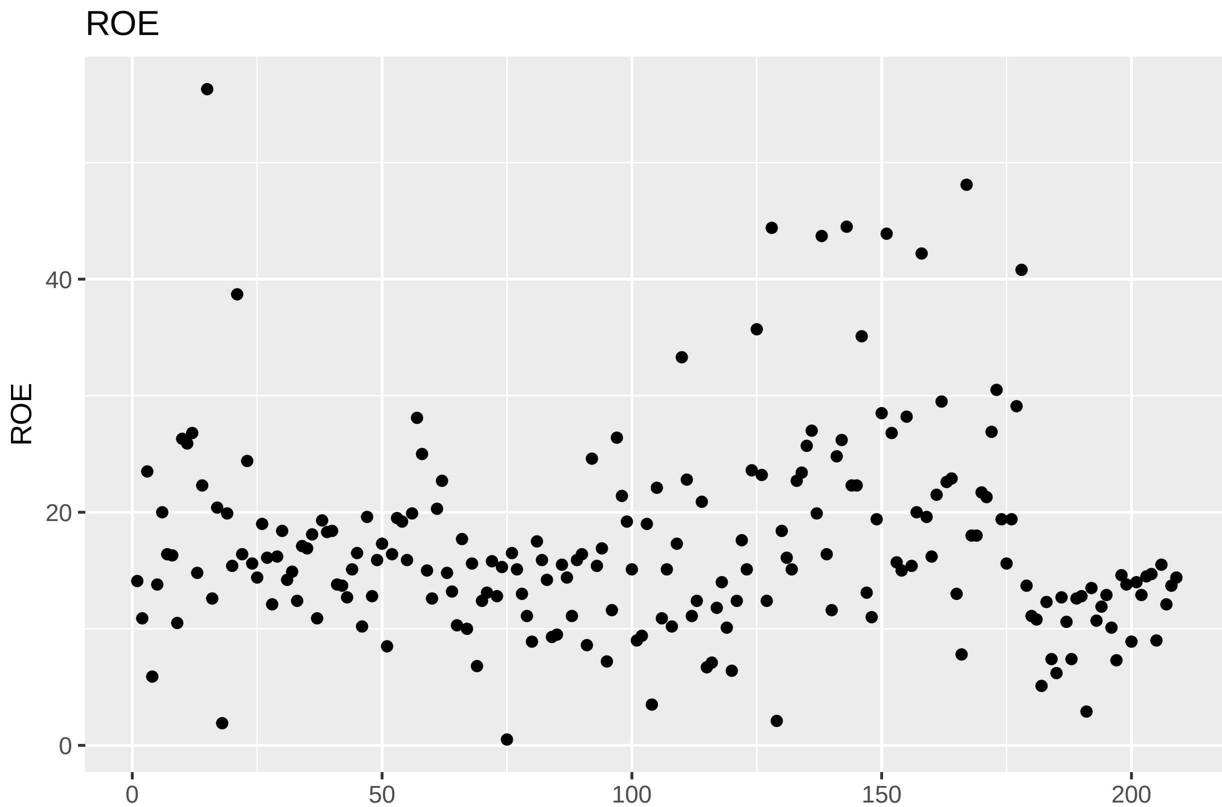

```r
ggsave("SRO/Log CEO Salary.png", log.salary)

# Log Salary Distribution
(log.salary.dist <- ggplot(desc.ceosal1, aes(lsalary)) +
  geom_histogram(aes(y = ..count../sum(..count..))) +
  theme(legend.position = "none") +
  labs(x = "CEO Log Salary", y = "Frequency", title = "CEO Log Salary Distribution") +
  geom_density(aes(y = ..scaled..)) +
  geom_vline(aes(xintercept = mean(lsalary)), color = "red", linetype = "dashed", size = 1) +
  geom_vline(aes(xintercept = median(lsalary)), color = "blue", linetype = "dashed", size = 1))
```



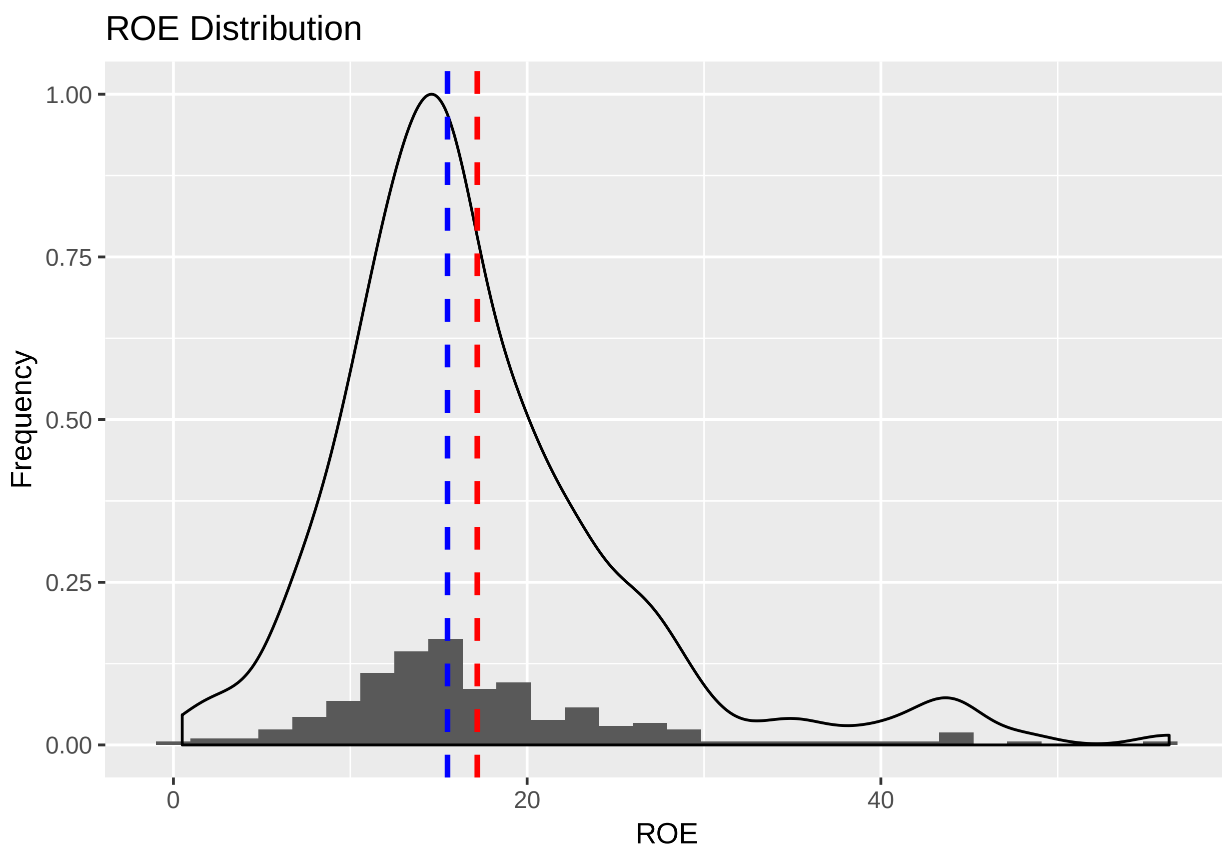

```
ggsave("SRO/CEO Log Salary Distribution.png", log.salary.dist)
```

ROE Plot and Distribution

```
# ROE Plot
(roe <- ggplot(desc.ceosal1, aes(x = 1:nrow(desc.ceosal1), y = roe)) +
  geom_point() +
  theme(legend.position = "none") +
  labs(x = "", y = "ROE", title = "ROE"))
```




```r
ggsave("SRO/roe.png", roe)

# ROE Distribution
(roe.dist <- ggplot(desc.ceosal1, aes(roe)) +
  geom_histogram(aes(y = ..count../sum(..count..))) +
  theme(legend.position = "none") +
  labs(x = "ROE", y = "Frequency", title = "ROE Distribution") +
  geom_density(aes(y = ..scaled..)) +
  geom_vline(aes(xintercept = mean(roe)), color = "red", linetype = "dashed", size = 1) +
  geom_vline(aes(xintercept = median(roe)), color = "blue", linetype = "dashed", size = 1))
```




```
ggsave("SRO/ROE Distribution.png", roe.dist)
```

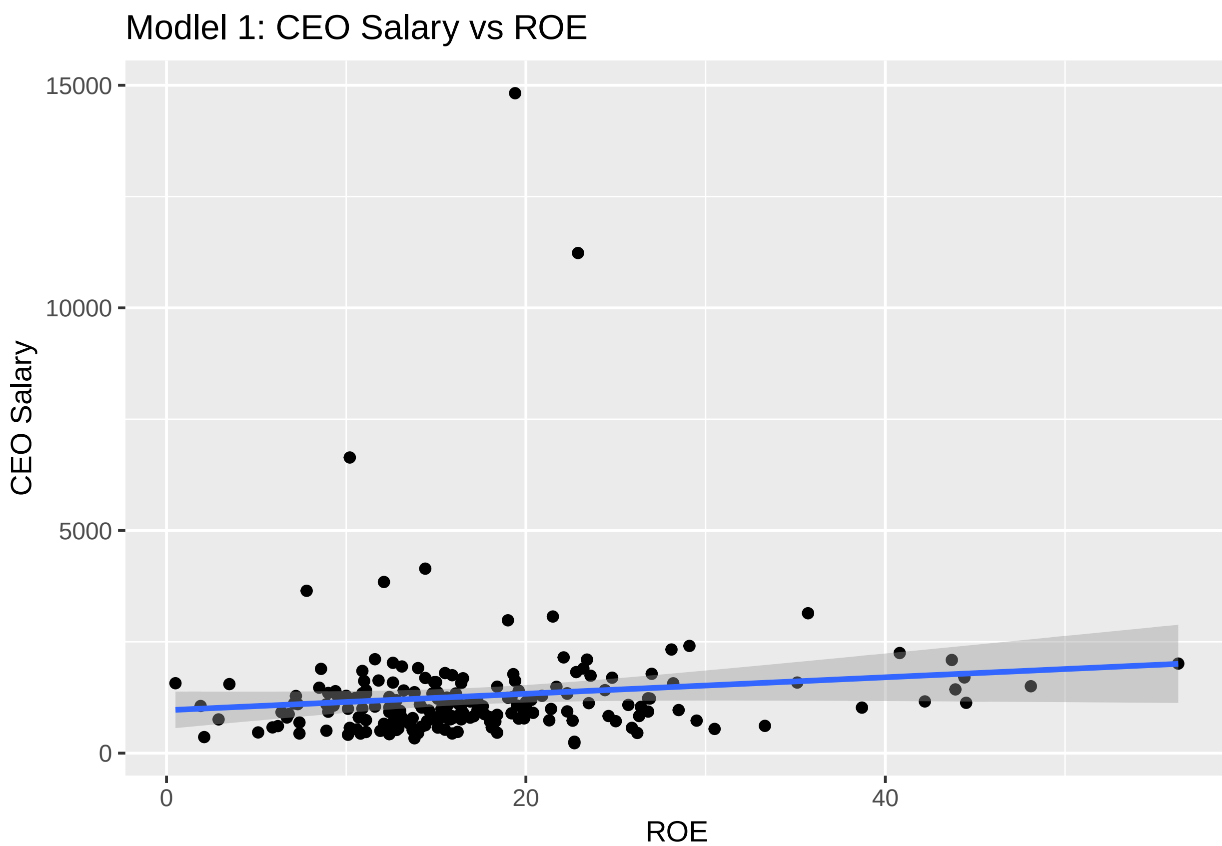
Simple OLS Estimations

```
# Salary vs ROE
model1 <- lm(salary ~ roe, data = desc.ceosal1)
stargazer(model1, title = "CEO Salary vs ROE", type = "text", style = "qje",
          out = "SRO/Model 1: Salary vs ROE.doc")
```

```
##
## CEO Salary vs ROE
## ==========================================================
##                                     salary
## ----------------------------------------------------------
## roe                                18.501*
##                                    (11.123)
##
## Constant                          963.191***
##                                   (213.240)
##
## N                                    209
## R2                                  0.013
```

```
## Adjusted R2                          0.008
## Residual Std. Error          1,366.555 (df = 207)
## F Statistic                  2.767* (df = 1; 207)
## ==========================================================
## Notes:                 ***Significant at the 1 percent level.
##                         **Significant at the 5 percent level.
##                          *Significant at the 10 percent level.
```

```r
(regline.model1 <- ggplot(desc.ceosal1, aes(x = roe, y = salary)) +
  geom_point() +
  labs(x = "ROE", y = "CEO Salary", title = "Modlel 1: CEO Salary vs ROE") +
  geom_smooth(method = "lm"))
```

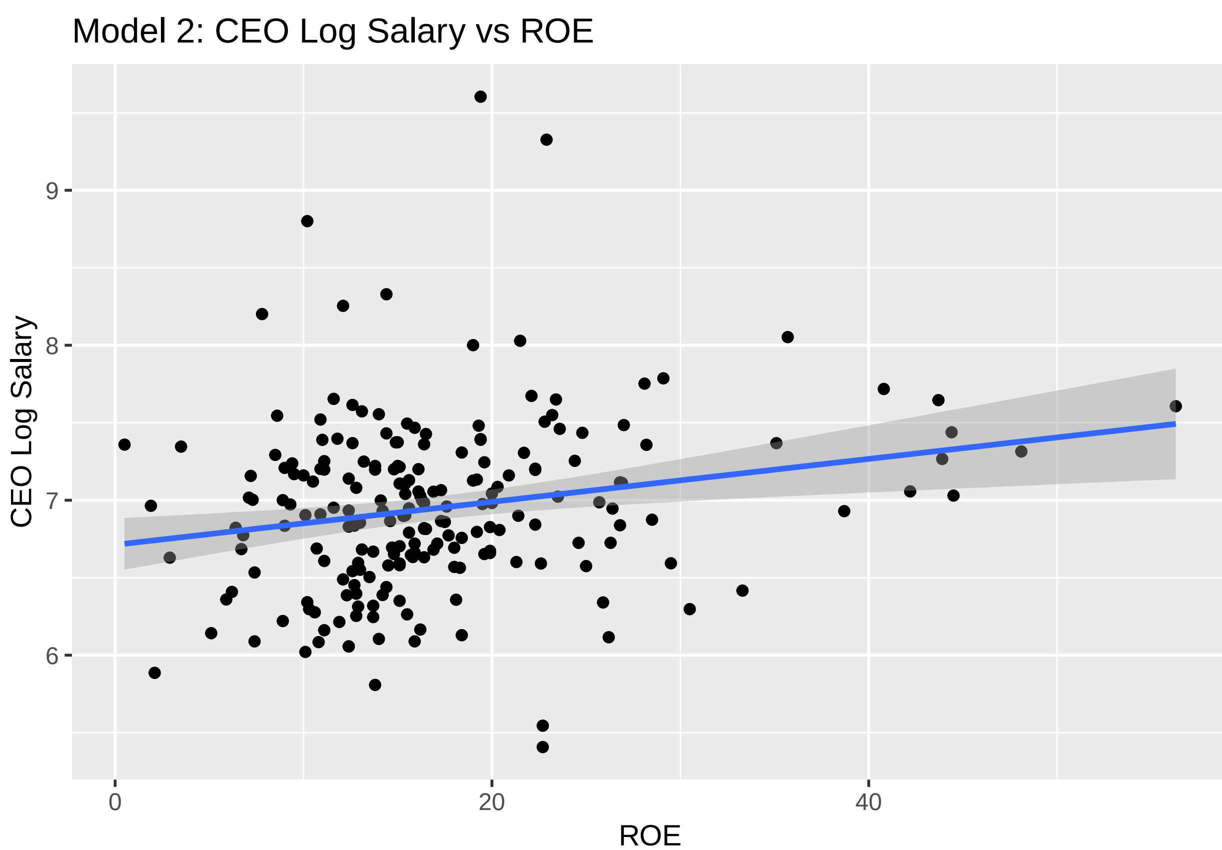



```r
ggsave("SRO/Model 1: CEO Salary vs ROE.png", regline.model1)

# Log Salary vs ROE
model2 <- lm(lsalary ~ roe, data = desc.ceosal1)
stargazer(model2, title = "Log CEO Salary vs ROE", type = "text", style = "qje",
          out = "SRO/Model 2: Log Salary vs ROE.doc")
```

```
##
## Log CEO Salary vs ROE
## ==========================================================
##                                      lsalary
## ----------------------------------------------------------
```

```
## roe                                  0.014***
##                                      (0.005)
##
## Constant                             6.712***
##                                      (0.087)
##
## N                                      209
## R2                                    0.043
## Adjusted R2                           0.039
## Residual Std. Error              0.555 (df = 207)
## F Statistic                   9.408*** (df = 1; 207)
## ==========================================================
## Notes:                 ***Significant at the 1 percent level.
##                         **Significant at the 5 percent level.
##                          *Significant at the 10 percent level.
```

```r
(regline.model2 <- ggplot(desc.ceosal1, aes(x = roe, y = lsalary)) +
  geom_point() +
  labs(x = "ROE", y = "CEO Log Salary", title = "Model 2: CEO Log Salary vs ROE") +
  geom_smooth(method = "lm"))
```



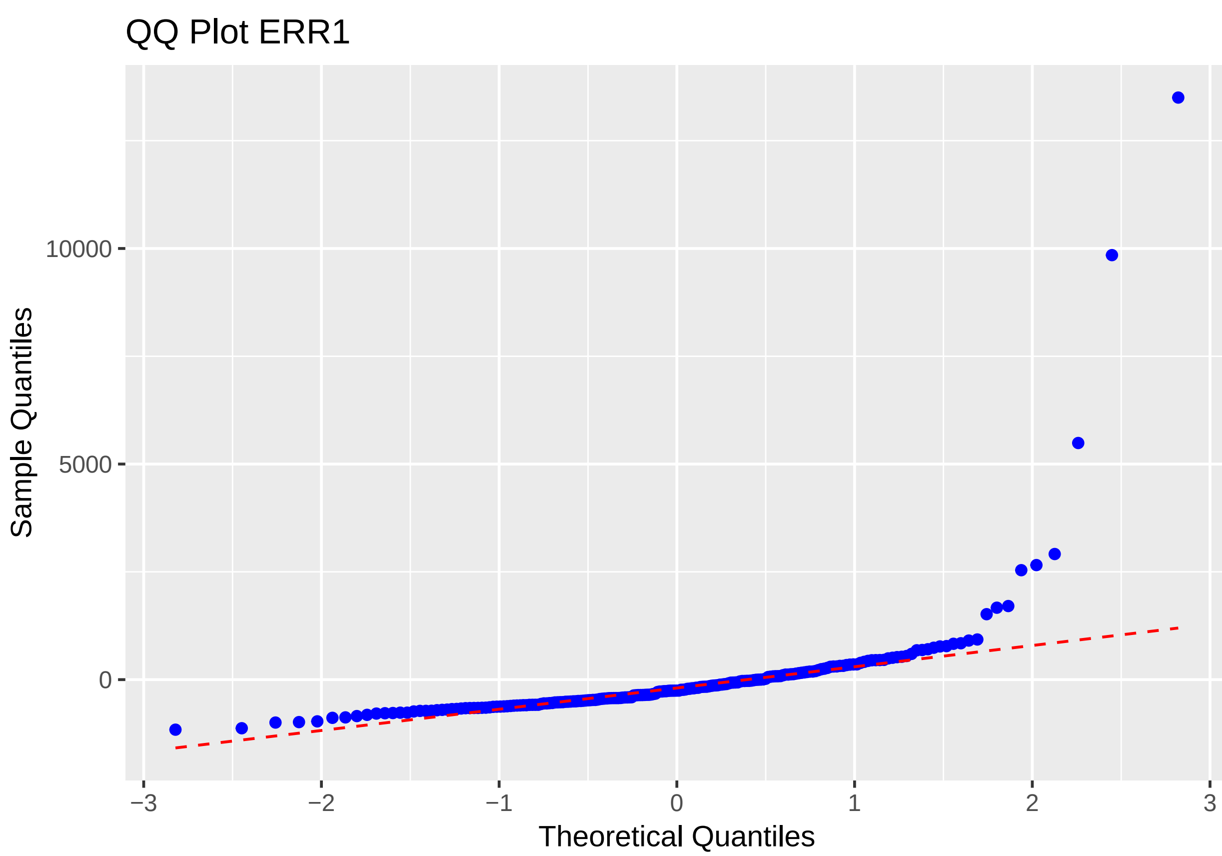

```r
ggsave("SRO/Model 2: CEO Log Salary vs ROE.png", regline.model2)
```

Checking Normal Distribution of Error Terms

```r
# Checking normal distribution of error term model 1
shapiro.test(residuals(model1))
```

```
##
##  Shapiro-Wilk normality test
##
## data:  residuals(model1)
## W = 0.41717, p-value < 2.2e-16
```

```r
(error.model1 <- ggplot(model1, aes(sample = model1$residuals)) +
  stat_qq(col = "blue") +
  stat_qq_line(col = "red", lty = 2) +
  labs(x = "Theoretical Quantiles", y = "Sample Quantiles", title = "QQ Plot ERR1"))
```

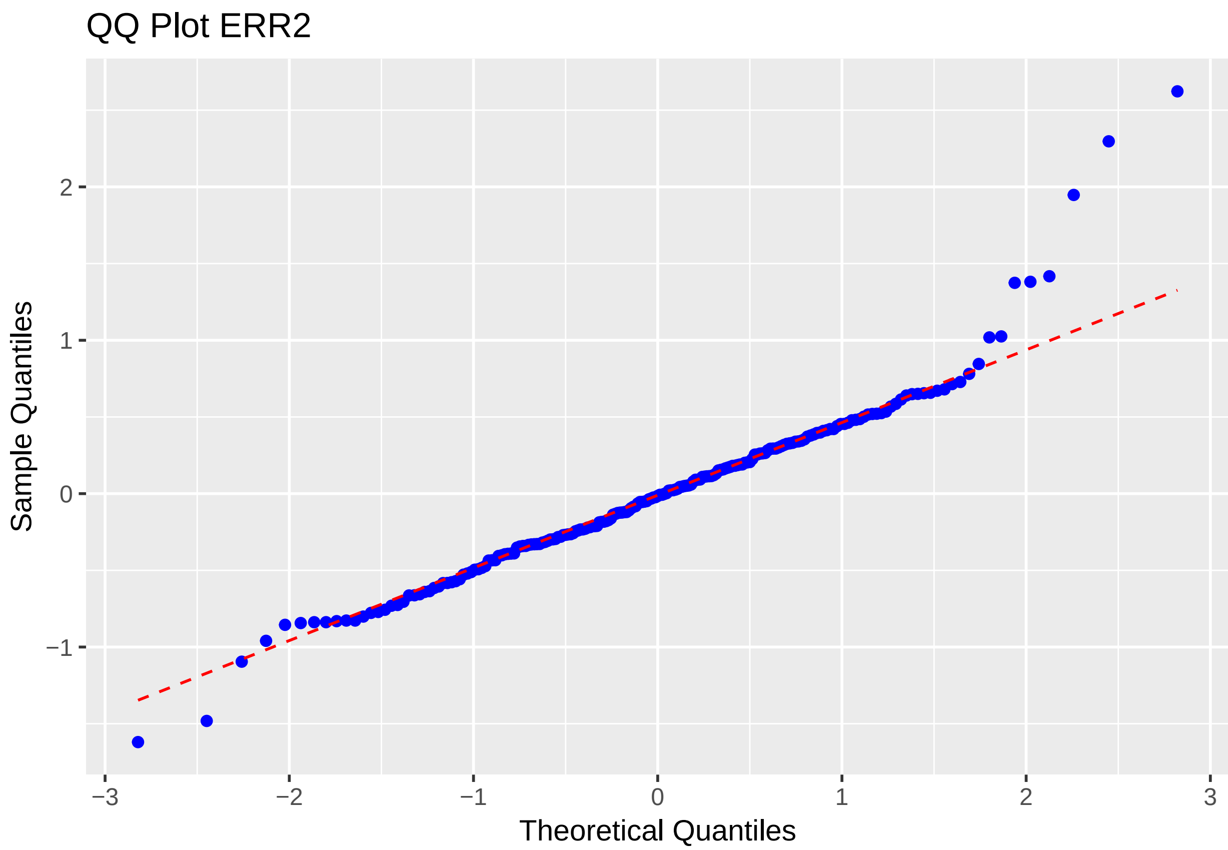



```r
ggsave("SRO/QQ Plot ERR1.png", error.model1)

# Checking normal distribution of error term model 2
shapiro.test(residuals(model2))
```

```
##
##  Shapiro-Wilk normality test
```

```
##
## data:  residuals(model2)
## W = 0.94288, p-value = 2.464e-07
```

```r
(error.model2 <- ggplot(model2, aes(sample = model2$residuals)) +
  stat_qq(col = "blue") +
  stat_qq_line(col = "red", lty = 2) +
  labs(x = "Theoretical Quantiles", y = "Sample Quantiles", title = "QQ Plot ERR2"))
```




```r
ggsave("SRO/QQ Plot ERR2.png", error.model2)
```

Test of Heteroskedasticity

```r
bptest(model1)
```

```
##
##  studentized Breusch-Pagan test
##
## data:  model1
## BP = 0.17205, df = 1, p-value = 0.6783
```

```r
bptest(model2)
```

```
##
##  studentized Breusch-Pagan test
##
## data:  model2
## BP = 0.022814, df = 1, p-value = 0.8799
```

References

Allaire, JJ, Yihui Xie, Jonathan McPherson, Javier Luraschi, Kevin Ushey, Aron Atkins, Hadley Wickham, Joe Cheng, and Winston Chang. 2018. *Rmarkdown: Dynamic Documents for R*. https://CRAN.R-project.org/package=rmarkdown.

Hlavac, Marek. 2018. *Stargazer: Well-Formatted Regression and Summary Statistics Tables*. https://CRAN.R-project.org/package=stargazer.

Hothorn, Torsten, Achim Zeileis, Richard W. Farebrother, and Clint Cummins. 2018. *Lmtest: Testing Linear Regression Models*. https://CRAN.R-project.org/package=lmtest.

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Shea, Justin M. 2018. *Wooldridge: 111 Data Sets from "Introductory Econometrics: A Modern Approach, 6e" by Jeffrey M. Wooldridge*. https://CRAN.R-project.org/package=wooldridge.

Wickham, Hadley. 2017. *Tidyverse: Easily Install and Load the 'Tidyverse'*. https://CRAN.R-project.org/package=tidyverse.

Wickham, Hadley, Winston Chang, Lionel Henry, Thomas Lin Pedersen, Kohske Takahashi, Claus Wilke, and Kara Woo. 2018. *Ggplot2: Create Elegant Data Visualisations Using the Grammar of Graphics*. https://CRAN.R-project.org/package=ggplot2.