simple_reg_2.R

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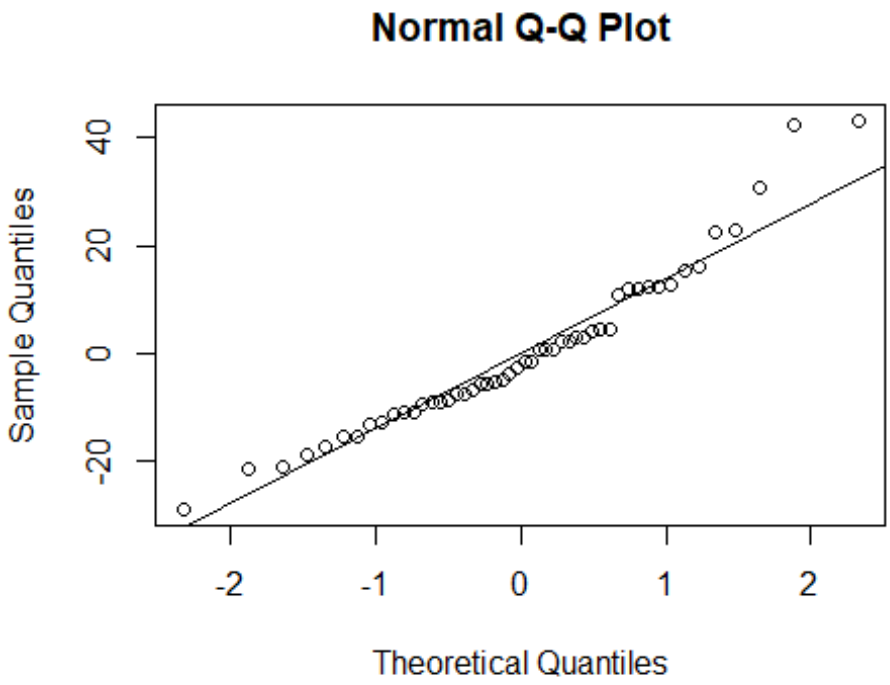
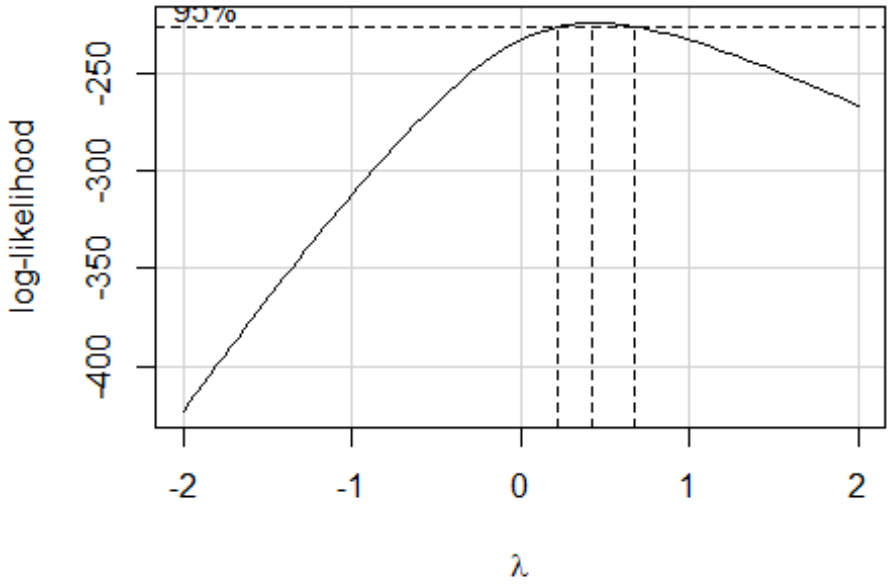
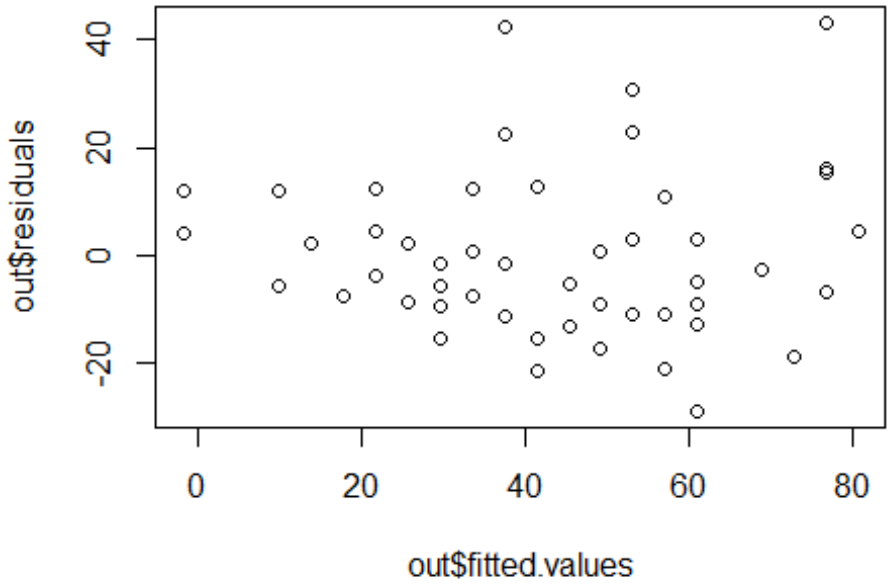
```
# 회귀분석 기초와 상관분석
# 모형진단
# 회귀모형은 1)정규성 2)독립성 3)등분산성을 가정하고 있다.
# 세운 회귀모형이 정규성 독립성 등분산성을 만족하는지 확인

if(!require(car)) install.packages("car"); library(car)

## Loading required package: car

## Warning: package 'car' was built under R version 3.4.4

## Loading required package: carData

## Warning: package 'carData' was built under R version 3.4.4

out <- lm(dist~speed, data=cars)

# 1. 정규성
qqnorm(out$residuals)
qqline(out$residuals) # Q-Q plot 을 이용한 정규성 검정 (점이 선 위에 있을 수록 정
규분포를 따름)
```




```r
shapiro.test(out$residuals) # 정규성을 만족하지 않음

##
##  Shapiro-Wilk normality test
##
## data:  out$residuals
## W = 0.94509, p-value = 0.02152

boxCox(cars$dist~cars$speed) # box-cox 변환을 통해 정규성
```




```r
# 2. 독립성

plot(out$fitted.values, out$residuals) #잔차도표를 그려서 시각적으로 확인
```

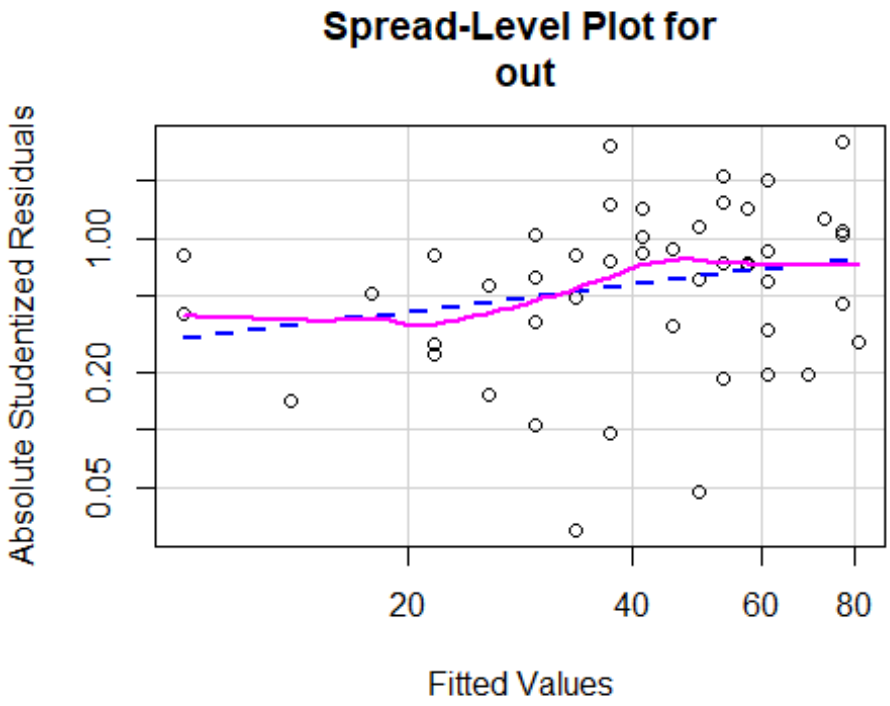



```
durbinWatsonTest(out)
```

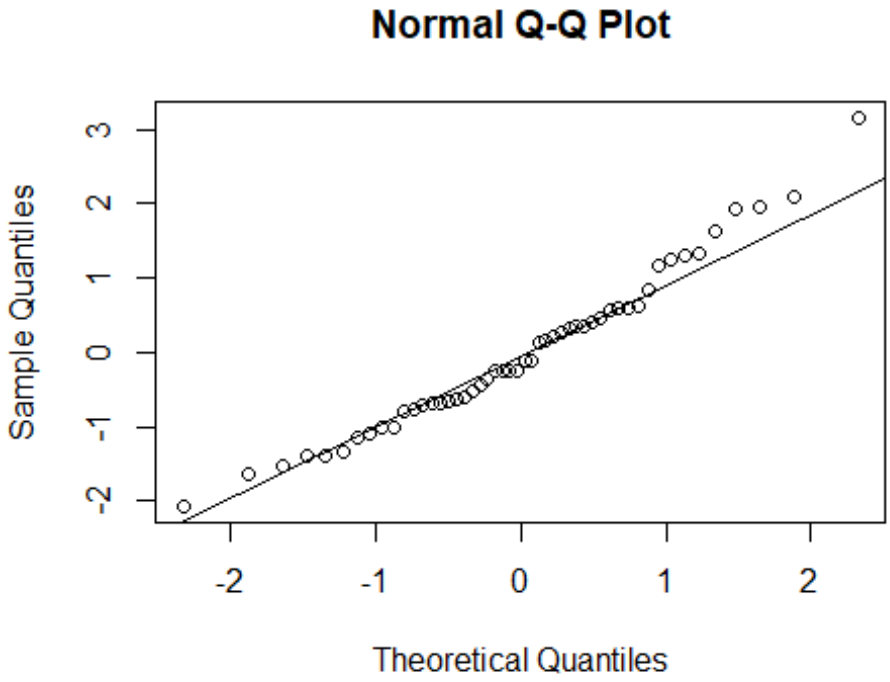
```
##  lag Autocorrelation D-W Statistic p-value
##    1       0.1604322      1.676225   0.208
##  Alternative hypothesis: rho != 0
```

```
# 3. 등분산성
spreadLevelPlot(out)
```

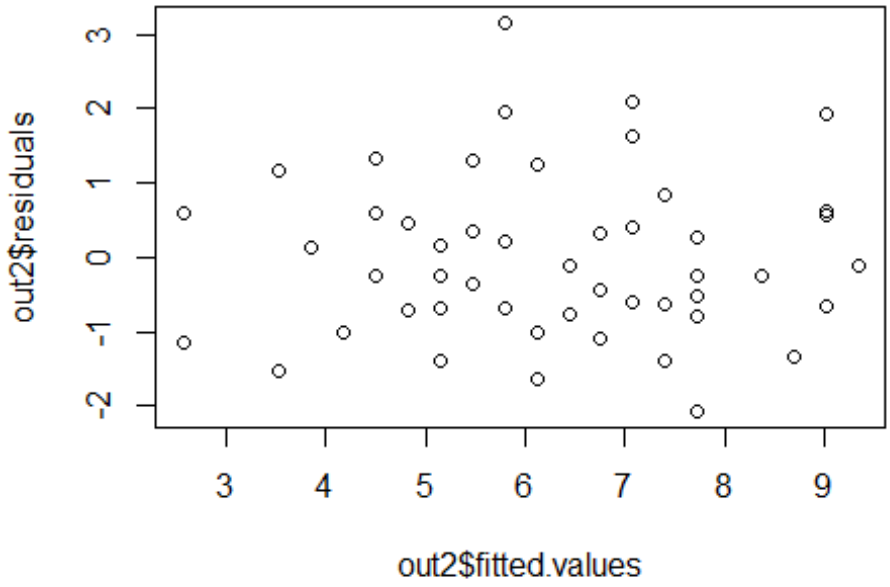
```
## Warning in spreadLevelPlot.lm(out):
## 2 negative fitted values removed
```



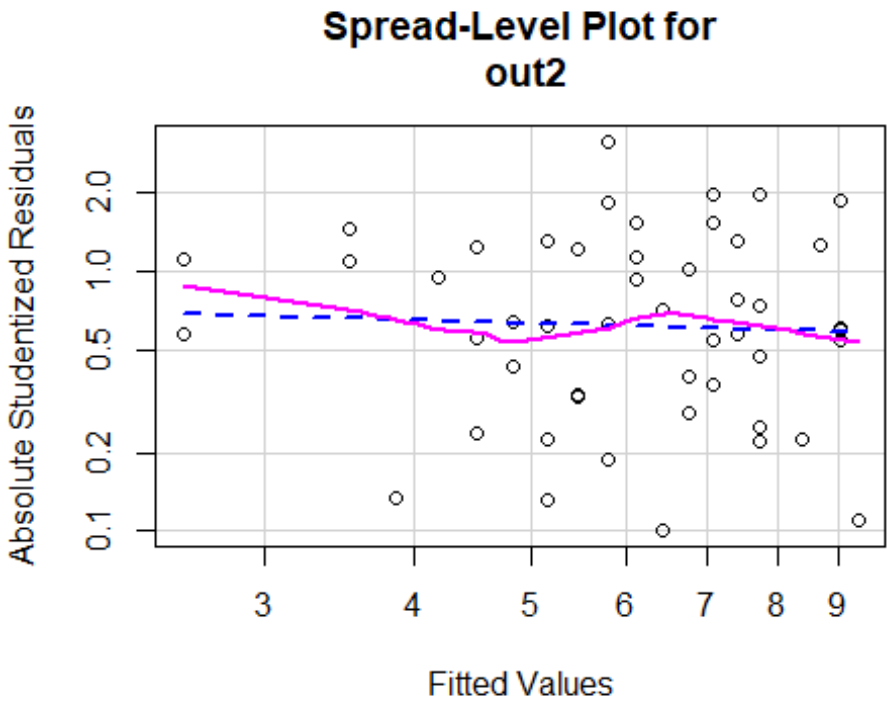

```
##
## Suggested power transformation:  0.5402974

ncvTest(out) # 등분산성을 만족하지 않음

## Non-constant Variance Score Test
## Variance formula: ~ fitted.values
## Chisquare = 4.650233    Df = 1     p = 0.03104933

# 정규성과 등분산성을 만족하기 위해 반응변수를 변환
out2 <- lm(sqrt(dist)~speed,data=cars)
qqnorm(out2$residuals)
qqline(out2$residuals) # Q-Q plot 을 이용한 정규성 검정 (점이 선 위에 있을 수록 정규분포를 따름)
```



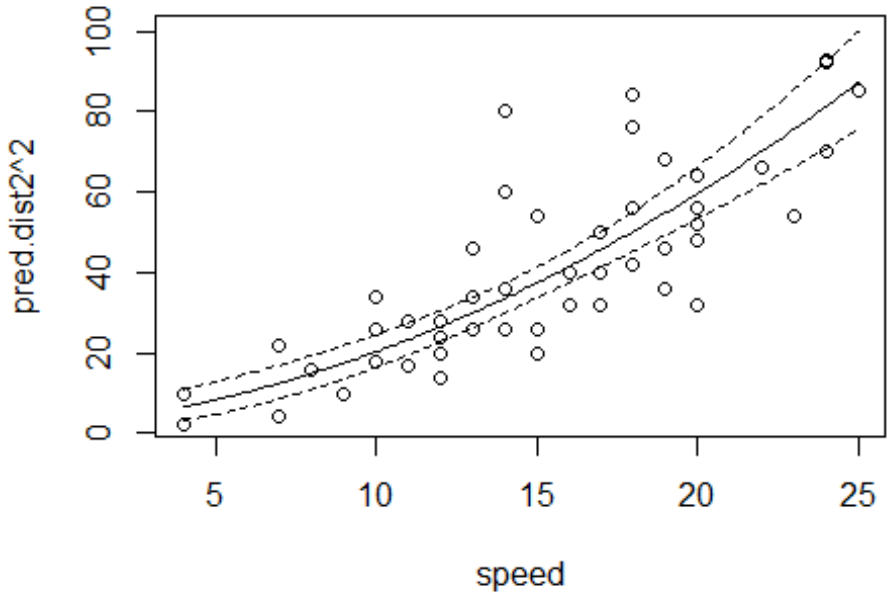

```
shapiro.test(out2$residuals) # 정규성을 만족

##
##  Shapiro-Wilk normality test
##
## data:  out2$residuals
## W = 0.97332, p-value = 0.3143

plot(out2$fitted.values, out2$residuals) #잔차도표를 그려서 시각적으로 확인
```



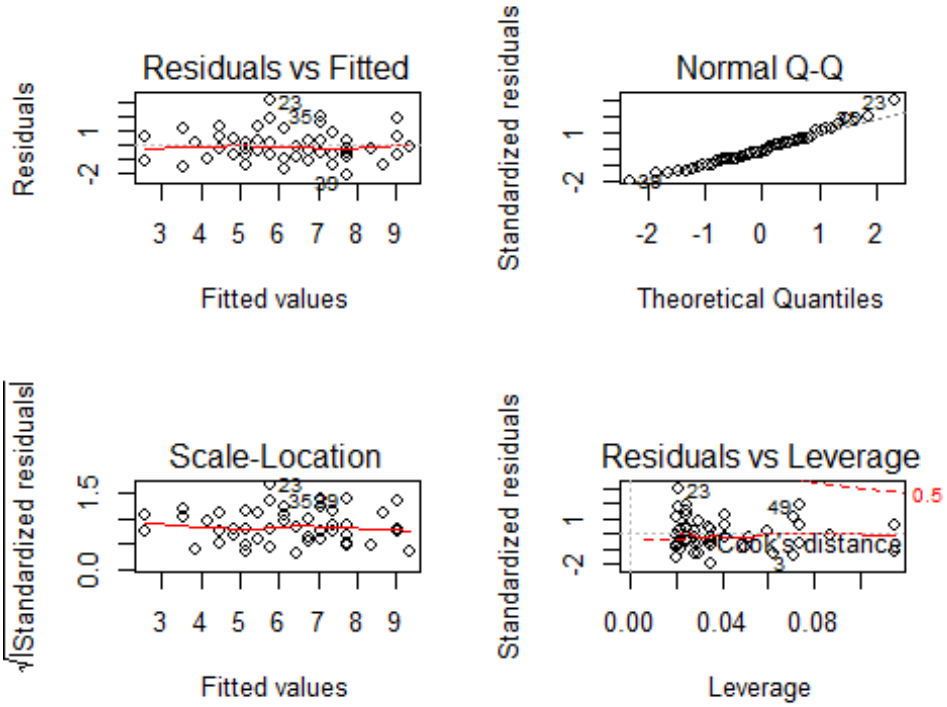

```
durbinWatsonTest(out2)

##  lag Autocorrelation D-W Statistic p-value
##    1      0.01762836      1.941736   0.732
##  Alternative hypothesis: rho != 0

spreadLevelPlot(out2)
```




```
##
## Suggested power transformation:  1.118288

ncvTest(out2) # 등분산성을 만족

## Non-constant Variance Score Test
## Variance formula: ~ fitted.values
## Chisquare = 0.01205185    Df = 1     p = 0.9125831

# 단순회귀모형의 시각화
speed <- seq(min(cars$speed), max(cars$speed),.1)
pred.dist2 <- predict(out2, newdata=data.frame(speed=speed), interval="confid
ence")
matplot(speed, pred.dist2^2, type='n')
matlines(speed, pred.dist2^2, lty=c(1,2,2), col=1) # 선형 회귀식은 직선, 신뢰구
간은 점선으로 표현
matpoints(cars$speed, cars$dist, pch=1)
```




```r
alligator = data.frame(
  lnLength = c(3.87, 3.61, 4.33, 3.43, 3.81, 3.83, 3.46, 3.76,
               3.50, 3.58, 4.19, 3.78, 3.71, 3.73, 3.78),
  lnWeight = c(4.87, 3.93, 6.46, 3.33, 4.38, 4.70, 3.50, 4.50,
               3.58, 3.64, 5.90, 4.43, 4.38, 4.42, 4.25)
)

# Q.5 악어자료의 정규성, 독립성, 등분산성을 확인하세요.
#     가정을 만족하지 않을 경우 반응변수를 변환시켜보세요


# 위의 방법외에도 회귀모형의 결과를  plot()으로 그리면 독립성, 정규성, 등분산성을 시각적으로 확인 가능
par(mfrow=c(2,2))
plot(out2)
```


Residuals vs Fitted
Residuals
Fitted values
Normal Q-Q
Standardized residuals
Theoretical Quantiles
Scale-Location
√|Standardized residuals|
Fitted values
Residuals vs Leverage
Standardized residuals
Cook's distance
Leverage