MGT\_6203

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rm(list=ls())  
library(dplyr)

## Warning: package 'dplyr' was built under R version 4.1.3

##   
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':  
##   
## filter, lag

## The following objects are masked from 'package:base':  
##   
## intersect, setdiff, setequal, union

library(ggplot2)

## Warning: package 'ggplot2' was built under R version 4.1.3

set.seed(200)  
germany\_datafile<-read.csv("germany-chart.csv")  
head(germany\_datafile,4)

## ï..Year Installed.Capacity..MW. Generation..GWÂ.h. Capacity.Factor.in.percent  
## 1 1990 55 71 14.74  
## 2 1991 106 100 10.77  
## 3 1992 174 275 18.04  
## 4 1993 326 600 21.01  
## Capacity.Factor  
## 1 0.1474  
## 2 0.1077  
## 3 0.1804  
## 4 0.2101

colnames(germany\_datafile)

## [1] "ï..Year" "Installed.Capacity..MW."   
## [3] "Generation..GWÂ.h." "Capacity.Factor.in.percent"  
## [5] "Capacity.Factor"

germany\_datafile <- germany\_datafile %>%  
 rename(Year = ï..Year,  
 Installed\_Capacity = Installed.Capacity..MW.,  
 Generation = Generation..GWÂ.h.,  
 Capacity\_Factor\_percent=Capacity.Factor.in.percent,  
 Capacity\_Factor=Capacity.Factor)

head(germany\_datafile,4)

## Year Installed\_Capacity Generation Capacity\_Factor\_percent Capacity\_Factor  
## 1 1990 55 71 14.74 0.1474  
## 2 1991 106 100 10.77 0.1077  
## 3 1992 174 275 18.04 0.1804  
## 4 1993 326 600 21.01 0.2101

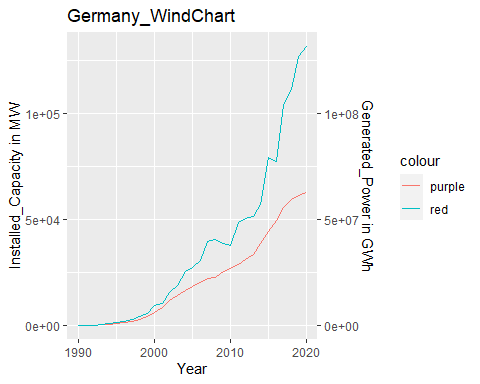
linear\_model1<-lm(Year~Installed\_Capacity,data=germany\_datafile)  
summary(linear\_model1)

##   
## Call:  
## lm(formula = Year ~ Installed\_Capacity, data = germany\_datafile)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -5.731 -2.244 1.129 1.711 3.015   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 1.996e+03 6.687e-01 2984.45 <2e-16 \*\*\*  
## Installed\_Capacity 4.286e-04 2.263e-05 18.94 <2e-16 \*\*\*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 2.529 on 29 degrees of freedom  
## Multiple R-squared: 0.9252, Adjusted R-squared: 0.9226   
## F-statistic: 358.6 on 1 and 29 DF, p-value: < 2.2e-16

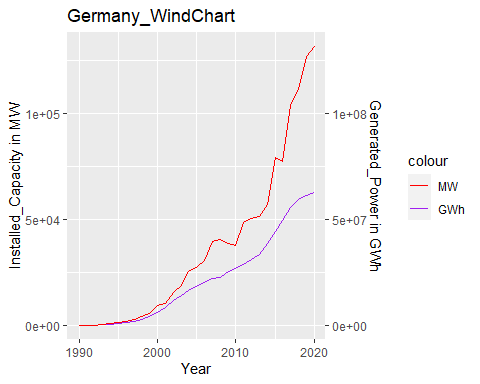
linear\_model2<-lm(Year~Generation,data=germany\_datafile)  
summary(linear\_model2)

##   
## Call:  
## lm(formula = Year ~ Generation, data = germany\_datafile)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -7.080 -2.615 1.028 2.327 4.895   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 1.997e+03 8.855e-01 2255.31 < 2e-16 \*\*\*  
## Generation 2.135e-04 1.650e-05 12.93 1.44e-13 \*\*\*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 3.555 on 29 degrees of freedom  
## Multiple R-squared: 0.8522, Adjusted R-squared: 0.8471   
## F-statistic: 167.3 on 1 and 29 DF, p-value: 1.438e-13

p<-ggplot(germany\_datafile) + # Create ggplot2 plot  
 geom\_line(aes(x=Year,y=Installed\_Capacity,color="purple"))+geom\_line(aes(x=Year,  
 y=Generation,color="red"))+   
 scale\_y\_continuous(  
 "Installed\_Capacity in MW",   
 sec.axis = sec\_axis(~ . \*1000, name = "Generated\_Power in GWh")  
 )+labs(title="Germany\_WindChart")  
p



p + scale\_color\_manual(name="colour",   
 labels = c("MW",   
 "GWh"),   
 values = c("red"="red",   
 "purple"="purple"))

 ##not a good graph hence converting variables to logs

log\_germany\_datafile<-germany\_datafile  
log\_germany\_datafile$log\_Installed\_Capacity<-log(germany\_datafile$Installed\_Capacity+1)  
log\_germany\_datafile$log\_Capacity\_Factor\_percent<-log(germany\_datafile$Capacity\_Factor+1)  
log\_germany\_datafile$log\_PowerGenerated<-log(germany\_datafile$Generation+1)

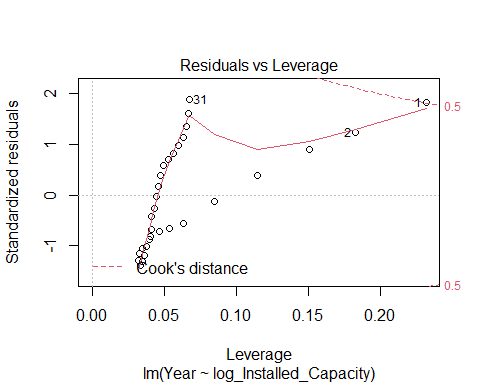
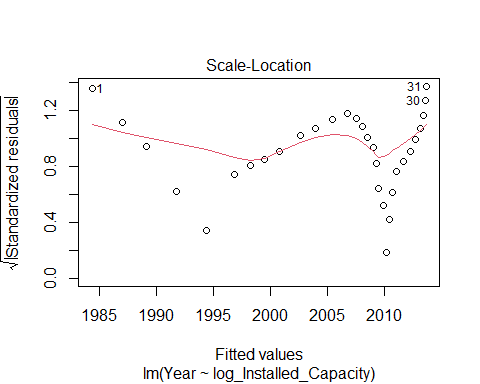
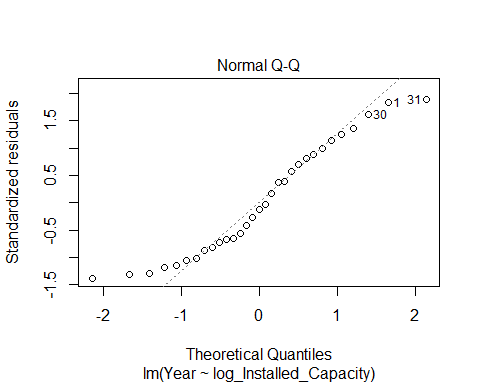
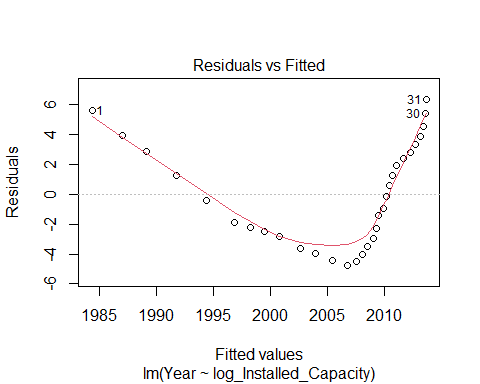
reg\_germany\_model\_1<-lm(Year~log\_Installed\_Capacity,data=log\_germany\_datafile)  
summary(reg\_germany\_model\_1)

##   
## Call:  
## lm(formula = Year ~ log\_Installed\_Capacity, data = log\_germany\_datafile)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -4.7444 -2.8900 -0.3938 2.8264 6.3540   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 1967.5962 2.8954 679.57 < 2e-16 \*\*\*  
## log\_Installed\_Capacity 4.1688 0.3151 13.23 8.14e-14 \*\*\*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 3.486 on 29 degrees of freedom  
## Multiple R-squared: 0.8579, Adjusted R-squared: 0.853   
## F-statistic: 175.1 on 1 and 29 DF, p-value: 8.143e-14

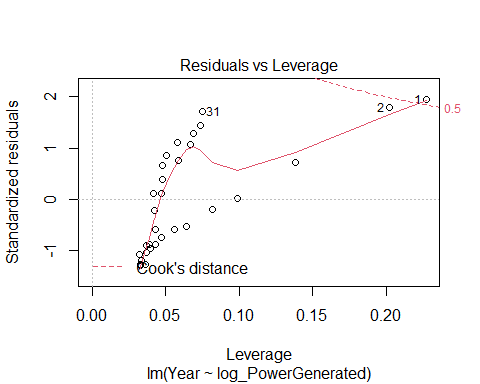
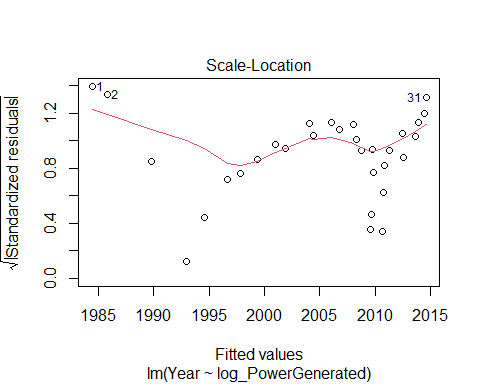
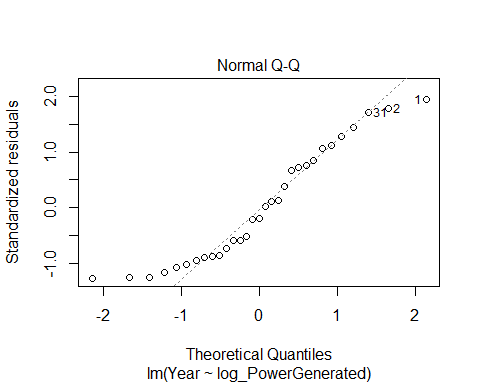
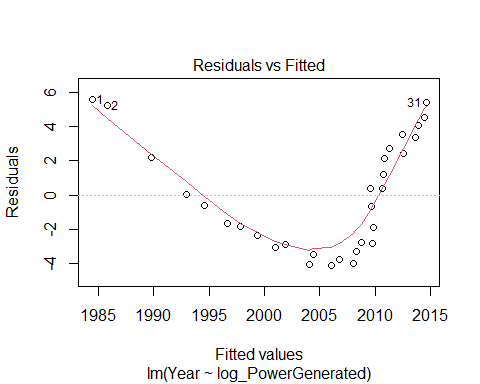
reg\_germany\_model\_2<-lm(Year~log\_PowerGenerated,data=log\_germany\_datafile)  
summary(reg\_germany\_model\_2)

##   
## Call:  
## lm(formula = Year ~ log\_PowerGenerated, data = log\_germany\_datafile)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -4.0875 -2.8330 -0.6193 2.5782 5.5759   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 1967.2362 2.7022 728.00 < 2e-16 \*\*\*  
## log\_PowerGenerated 4.0190 0.2808 14.31 1.12e-14 \*\*\*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 3.256 on 29 degrees of freedom  
## Multiple R-squared: 0.876, Adjusted R-squared: 0.8717   
## F-statistic: 204.9 on 1 and 29 DF, p-value: 1.116e-14

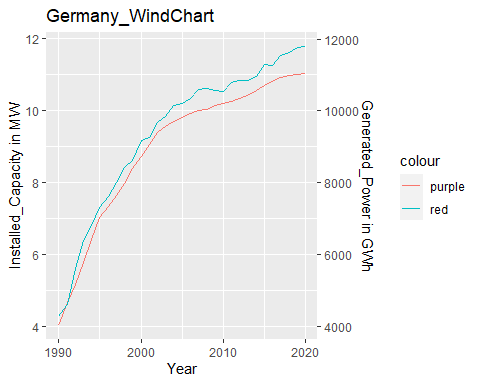
plot(reg\_germany\_model\_1)



plot(reg\_germany\_model\_2)



p<-ggplot(log\_germany\_datafile) + # Create ggplot2 plot  
 geom\_line(aes(x=Year,y=log\_Installed\_Capacity,color="purple"))+geom\_line(aes(x=Year,  
 y=log\_PowerGenerated,color="red"))+   
 scale\_y\_continuous(  
 "Installed\_Capacity in MW",   
 sec.axis = sec\_axis(~ . \*1000, name = "Generated\_Power in GWh")  
 )+labs(title="Germany\_WindChart")  
p



p + scale\_color\_manual(name="colour",   
 labels = c("MW",   
 "GWh"),   
 values = c("red"="red",   
 "purple"="purple"))

