**Homework Assignment 1 – R Code:**

1. Daily electric demand

##1a

daily20 <- head(elecdaily, 20)

daily <- ts(daily20)

autoplot(daily)

tslmdaily<- tslm(Demand~Temperature, data=daily)

plot(Demand~Temperature, data=daily, main= "Demand vs. Temp")

##1b

checkresiduals(tslmdaily$residuals)

##1c

demand15<-forecast(tslmdaily,newdata=data.frame(Temperature=15))

demand15

demand35<-forecast(tslmdaily,newdata=data.frame(Temperature=35))

demand35

##1d

autoplot(daily20, facets=TRUE)

daily20 %>%

as.data.frame() %>%

ggplot(aes(x=Temperature, y=Demand)) +

geom\_point() +

geom\_smooth(method="lm", se=FALSE)

fit <- tslm(Demand ~ Temperature, data=daily20)

checkresiduals(fit)

forecast(fit, newdata=data.frame(Temperature=c(15,35)))

autoplot(daily20, facets=TRUE)

summary(mens400)

Mens400

##Dataframe

Mens400 <- data.frame(mens400)

head(mens400)

##2a

autoplot(mens400, xlab="Year", ylab="Time",

main="Winning Time")

##2b

mtime<-time(mens400)

tslmmens<-(tslm(mens400~mtime, data=mens400))

tslmmens

autoplot(mens400, ylab="Time", xlab="Year",main= "Time by Year")+

geom\_abline(slope = tslmmens$coefficients[2],

intercept = tslmmens$coefficients[1])

##2c

checkresiduals(tslmmens$residuals)

##2d

mens400\_2020 <- forecast(tslmmens,newdata=data.frame(mtime=2020))

mens400\_2020

1. N/A
2. N/A

##5a

autoplot(fancy, xlab= "Year", ylab="Monthly Sales", main="Fancy Sales")

##5c

tslmfancy<-tslm(BoxCox(fancy,0)~season+trend)

tslmfancy

##5d

autoplot(tslmfancy$residuals,xlab= "Year", ylab="Monthly Sales", main="Residuals")

##5e

Time<-time(fancy)

cbind.data.frame(

Month = factor(

month.abb[round(12\*(Time - floor(Time)) + 1)],

labels = month.abb,

ordered = TRUE),

Residuals = tslmfancy$residuals ) %>%

ggplot(aes(x = Month, y = Residuals)) +

geom\_boxplot()

##5f

tslmfancy$coefficients

##5g

checkresiduals(tslmfancy)

##5h

future\_fancy <- rep(0, 36)

for(i in 1:36){

if(i %% 12 == 3){

future\_fancy[i] <- 1

}

}

# data as time series

future\_fancy <- ts(data = future\_fancy,

start = 1994,

end = c(1996, 12),

frequency = 12)

# forecast

fctslmfancy <- forecast(tslmfancy,newdata = data.frame(Time = time(future\_fancy)))

autoplot(fctslmfancy)

fctslmfancy$upper

#Homework Question 6

#6a

gas2004<-window(gasoline,end=2005)

autoplot(gas2004, xlab = 'Year', ylab = "Gas Supply (Weekly)", main = "Gas Supply")

fourier.gas1 <- tslm(gas2004 ~ trend + fourier(gas2004, K=7))

fourier.gas2 <- tslm(gas2004 ~ trend + fourier(gas2004, K=12))

fourier.gas3 <- tslm(gas2004 ~ trend + fourier(gas2004, K=20))

autoplot(gas2017, xlab = 'year', ylab = "Gas Supply (Weekly)", main= "Fourier Transformation") +autolayer(fitted(fourier.gas1))+autolayer(fitted(fourier.gas2))+autolayer(fitted(fourier.gas3))

#6b

CV(fourier.gas1)

CV(fourier.gas2)

CV(fourier.gas3)

#6c

checkresiduals(fourier.gas2$residuals)

#6d

fgas <- forecast(fourier.gas2, newdata=data.frame(fourier(gas2004,12,52)))

fgas

gas2005<-window(gasoline,start=2005, end=2006)

autoplot(gas2005, series = "Actual")+ autolayer(fgas$mean, series = "Forecast", main = "Forecast")

#7a

autoplot(huron, xlab = "Year", ylab="Level", main="Level of Lake Huron 1875-1972")

#7b

lmhuron<-tslm(huron~trend)

summary(lmhuron)

Time<-time(huron)

t2<-ts(pmax(0,Time-1915),start = 1875)

pwhuron<-tslm(huron~Time+t2)

summary(pwhuron)

#7c

forecasthuron <- forecast(lmhuron ,newdata=data.frame(Time=1980))

forecasthuron

fctslmhuron <- forecast(pwhuron,newdata = data.frame(Time = Time)))

autoplot(forecasthuron)

autoplot(forecasthuron)Time

Chapter 6

#Ch6

#2a

autoplot(plastics)

#2b

decompose\_plastics<-decompose(plastics, type= "multiplicative")

autoplot(decompose\_plastics)

#2c

plasticseasonal<-decompose\_plastics$x/decompose\_plastics$seasonal

autoplot(plasticseasonal)

#2d

plasticoutlier <- plastics

plasticoutlier[20] <- plasticoutlier[20] + 400

decomposeoutlier <- decompose(plasticoutlier, "multiplicative")

plasticoutlieradj <- decomposeoutlier$x / decomposeoutlier$seasonal

plot(plasticoutlieradj)

#3a

library(seasonal)

retaildata<-readxl::read\_excel("retail.xlsx", skip=1)

head(retaildata)

#5a

autoplot(cangas)

ggsubseriesplot(cangas)

ggseasonplot(cangas)

#5b

cangasstl<-stl(cangas, s.window = 12)

autoplot(cangasstl)

#6a

brickstl1<-stl(bricksq, s.window = "periodic", t.window = 12)

autoplot(brickstl1)

#6b

bricksea<-seasadj(brickstl1)

autoplot(bricksea, ylab = "Production", xlab = "Time",main = "Seasonal Adjusted Brick Production")

#6c

naivebrick<-naive(bricksea)

autoplot(naivebrick)

#6d

brickstlf<-stlf(bricksq,method="naive")

brickstlf\_fc<-forecast(brickstlf)

brickstlf\_fc

#6e

checkresiduals(brickstlf\_fc$residuals)

#6f

brickstl<-stl(bricksq,t.window=12, s.window="periodic", robust=TRUE)

brickstl1<-seasadj(brickstl)

brickstl2<-naive(brickstl1)

brickstl\_fc<-forecast(brickstl2)

brickstl\_fc

checkresiduals(brickstl\_fc$residuals)

#6g

bricksq

bricksq.train<-window(bricksq, end=c(1992,3))

bricksq.test<-window(bricksq, start=c(1992,4), end=c(1994,3))

bricksq.train