#R-CODE

library(fpp)

library(TSA)

library(astsa)

library(forecast)

library(MTS)

## Import original Data

econ = read.csv("Unemployment.csv")

## Format Date as Date

econ$date = as.Date(econ$date)

## Omit missing date, date range kept (Jan 1993 - Dec 2015)

econ = na.omit(econ)

## Scale variable that are measured in dollars

econ$manufacturers\_new\_orders = scale(econ$manufacturers\_new\_orders)

econ$construction\_spending = scale(econ$construction\_spending)

econ$retail\_sales = scale(econ$retail\_sales)

## Decompose the data so we can remove the seasonal adjustments

unem.decom = decompose(ts(data = econ$unem\_rate, start = c(1993,1), frequency = 12), type = "additive")

indprod.decom = decompose(ts(data = econ$industrial\_production\_index, start = c(1993,1), frequency = 12), type = "additive")

mannew.decom = decompose(ts(data = econ$manufacturers\_new\_orders, start = c(1993,1), frequency = 12), type = "additive")

constsp.decom = decompose(ts(data = econ$construction\_spending, start = c(1993,1), frequency = 12), type = "additive")

retail.decom = decompose(ts(data = econ$retail\_sales, start = c(1993,1), frequency = 12), type = "additive")

phouse.decom = decompose(ts(data = econ$purchase\_house\_price\_index, start = c(1993,1), frequency = 12), type = "additive")

## Add seasonally adjusted rate

econ$unem\_rate\_sa = unem.decom$x - unem.decom$sea

econ$ind\_prod\_sa = indprod.decom$x - indprod.decom$sea

econ$man\_new\_sa = mannew.decom$x - mannew.decom$sea

econ$cont\_spend\_sa = constsp.decom$x - constsp.decom$sea

econ$retail\_sa = retail.decom$x - retail.decom$sea

econ$p\_house\_sa = phouse.decom$x - phouse.decom$sea

adf.test(diff(diff(econ$unem\_rate\_sa)))

adf.test(diff(econ$ind\_prod\_sa))

adf.test(diff(econ$man\_new\_sa))

adf.test(diff(econ$cont\_spend\_sa))

adf.test(diff(econ$purchase\_house\_price\_index))

adf.test(diff(econ$retail\_sa))

st\_sa\_series = cbind(diff(diff(econ$unem\_rate\_sa)),diff(diff(econ$ind\_prod\_sa)),diff(diff(econ$man\_new\_sa)),

diff(diff(econ$cont\_spend\_sa)),diff(diff(log(econ$purchase\_house\_price\_index))),

diff(diff(econ$retail\_sa)))

###### for regression model building #########

#lag1.plot(st\_sa\_series[,1],12)

#lag2.plot(st\_sa\_series[,2], st\_sa\_series[,1],12)

#lag2.plot(st\_sa\_series[,3], st\_sa\_series[,1],12)

#lag2.plot(st\_sa\_series[,4], st\_sa\_series[,1],12)

#lag2.plot(st\_sa\_series[,5], st\_sa\_series[,1],12)

#lag2.plot(st\_sa\_series[,6], st\_sa\_series[,1],12)

#acf(diff(diff((econ[,8]))))

#lag1.plot(econ[,8],12)

#lag2.plot(econ[,3], econ[,2],12)

#lag2.plot(econ[,7], econ[,2],12)

#lag2.plot(econ[,4], econ[,2],12)

#lag2.plot(econ[,5], econ[,2],12)

#lag2.plot(econ[,6], econ[,2],12)

###############################################

## Season adjusted acf and pacf plots on stationary unemp series

acf2(st\_sa\_series[,1])

## Season adjusted SARIMA fit and Forecast

sarima(econ$unem\_rate\_sa,0,2,1,1,0,0,12, xreg=econ[,9:13])

sarima.for(econ$unem\_rate\_sa,24,0,2,1,1,0,0,12)

## SARIMA (1,2,1,1,1,1,12) without external regressors

plot(forecast(arima(econ[1:250,2],order=c(0,2,1),

seasonal=list(order=c(1,1,1),period=12))))

## SARIMA (1,2,1,1,1,1,12) with external regressors

plot(forecast(arima(econ[1:250,2],order=c(1,2,1),

seasonal=list(order=c(1,1,1),period=12),

xreg=econ[1:250,3:7]),

xreg=econ[1:24,3:7]))

## Season adjusted auto arima fit with forecast

fit=auto.arima(st\_sa\_series[,1],seasonal=T,xreg=st\_sa\_series[,2:6])

plot(forecast(fit,xreg=st\_sa\_series[1:24,2:6]), main="Forecast Non seasonal stationary Unemp\_Rate Series")