GERMANY

data=read.csv("Germany.csv",header=T)

> data=data[sample(nrow(data)),]

> select.data=sample(1:nrow(data),0.8\*nrow(data))

> train.data=data[select.data,]

> test.data=data[-select.data]

> temp=train.data$AverageTemperature

> avgTemp=ts(temp,start=c(1824,1),freq=12)

start(avgTemp)

end(avgTemp)

basicStats(avgTemp)

hist(avgTemp,xlab="Average Temperature change",prob=TRUE,main="Histogram")

> xfit<-seq(min(avgTemp),max(avgTemp),length=40)

> yfit<-dnorm(xfit,mean=mean(avgTemp),sd=sd(avgTemp))

> lines(xfit, yfit, col="blue", lwd=2)

qqnorm(avgTemp)

> qqline(avgTemp,col=2)

normalTest(avgTemp,method=c("jb"))

plot(avgTemp, ylab='Average Temperature change')

> acf\_value=acf(coredata(avgTemp), plot=F, lag=20)

> acf(coredata(avgTemp), plot=T, lag=20)

> pacf(coredata(avgTemp),lag=15)

Box.test(coredata(avgTemp), lag=6, type='Ljung')

Box.test(coredata(avgTemp), lag=12, type='Ljung')

**AR13**

> ar13=arima(avgTemp,c(13,0,0))

> ar13

plot(ar13$residuals, type='l')

> qqnorm(ar13$residuals)

> qqline(ar13$residual,col=2)

> acf(ar13$residual, plot=T, lag=20)

> pacf(ar13$residual, plot=T, lag=20)

> tsdiag(ar13)

2)**MA13**

ma13=arima(avgTemp,c(0,0,13))

> ma13

plot(ma13$residuals, type='l')

> qqnorm(ma13$residuals)

> qqline(ma13$residual,col=2)

> acf(ma13$residual, plot=T, lag=20)

> pacf(ma13$residual, plot=T, lag=20)

> tsdiag(ma13)

>

> Box.test(ma13$resid, lag=6, type='Ljung')

Box.test(ma13$resid, lag=12, type='Ljung')

3)**AUTO ARIMA**

m1=auto.arima(coredata(avgTemp))

> m1

plot(m1$residuals, type='l')

> qqnorm(m1$residuals)

> qqline(m1$residual,col=2)

> acf(m1$residual, plot=T, lag=20)

> pacf(m1$residual, plot=T, lag=20)

> tsdiag(m1)

Testing

testTemp=test.data$AverageTemperature

> testavgTemp=ts(testTemp,start=c(1976,1),freq=12)

> start(testavgTemp)

CANADA

data=read.csv("Canada.csv",header=T)

> data=data[sample(nrow(data)),]

> select.data=sample(1:nrow(data),0.8\*nrow(data))

> train.data=data[select.data,]

> test.data=data[-select.data]

> temp=train.data$AverageTemperature

> avgTemp=ts(temp,start=c(1824,1),freq=12)

> start(avgTemp)

end(avgTemp)

basicStats(avgTemp)

hist(avgTemp,xlab="Average Temperature change",prob=TRUE,main="Histogram")

> xfit<-seq(min(avgTemp),max(avgTemp),length=40)

> yfit<-dnorm(xfit,mean=mean(avgTemp),sd=sd(avgTemp))

> lines(xfit, yfit, col="blue", lwd=2)

qqnorm(avgTemp)

> qqline(avgTemp,col=2)

> normalTest(avgTemp,method=c("jb"))

plot(avgTemp, ylab='Average Temperature change')

> acf\_value=acf(coredata(avgTemp), plot=F, lag=20)

acf(coredata(avgTemp), plot=T, lag=20)

> pacf(coredata(avgTemp),lag=15)

Box.test(coredata(avgTemp), lag=6, type='Ljung')

Box.test(coredata(avgTemp), lag=12, type='Ljung')

m1=ar(avgTemp,method='mle')

> m1

ar2=arima(avgTemp,c(2,0,0))

> ar2

plot(ar2$residuals, type='l')

> qqnorm(ar2$residuals)

qqline(ar2$residual,col=2)

> acf(ar2$residual, plot=T, lag=20)

> pacf(ar2$residual, plot=T, lag=20)

> tsdiag(ar2)

>

> m1=auto.arima(coredata(avgTemp))

> m1

plot(m1$residuals, type='l')

> qqnorm(m1$residuals)

> qqline(m1$residual,col=2)

> acf(m1$residual, plot=T, lag=20)

> pacf(m1$residual, plot=T, lag=20)

> tsdiag(m1)

Box.test(m1$residual, lag=6, type='Ljung')

Box.test(m1$residual, lag=12, type='Ljung')

EACF

source('eacf.R')

> EACF(avgTemp)

m2=arima(avgTemp, order=c(1,0,1), method='ML', include.mean=T)

> m2

plot(m2$residuals, type='l')

> qqnorm(m2$residuals)

> qqline(m2$residual,col=2)

> acf(m2$residual, plot=T, lag=20)

pacf(m2$residual, plot=T, lag=20)

Box.test(m2$residual, lag=6, type='Ljung')

Box.test(m2$residual, lag=12, type='Ljung')

TESING

testTemp=test.data$AverageTemperature

> testavgTemp=ts(testTemp,start=c(1976,1),freq=12)

> start(testavgTemp)

end(testavgTemp)

testar2=arima(testavgTemp,c(2,0,0))

> testar2

testauto=arima(testavgTemp,c(0,0,0))

> Ptestauto=forecast(testauto,120)

> accuracy(Ptestauto)

testmodel=arima(testavgTemp,c(1,0,1))

> testmodel

testauto=arima(testavgTemp,c(0,0,0))

> Ptestauto=forecast(testauto,120)

> accuracy(Ptestauto)

Ptestmodel=forecast(testmodel,120)

> accuracy(Ptestmodel)