**Assignment-Forecasting**

1. Plastic Sales;

#FORECASTING PLASTIC SALES

#loading the data set

plastic <- PlasticSales

plot(plastic$Sales, type = "l")

#creating dummy variable for month

ps <- data.frame(outer(rep(month.abb, length = 60), month.abb, "==") + 0 )

View(ps)

colnames(ps) <- month.abb

psdata <- cbind(plastic, ps)

View(psdata)

psdata['t'] <- 1:60

psdata["logsales"] <- log(psdata$Sales)

psdata["tsqrd"] <- psdata["t"] \* psdata["t"]

#data partioning

ps\_train <- psdata[1:48,]

ps\_test <- psdata[49:60,]

####Linear Model####

lin\_mod <- lm(Sales ~ t, data = ps\_train)

summary(lin\_mod)

lin\_pred <- data.frame(predict(lin\_mod, interval = 'predict', newdata = ps\_test))

View(lin\_pred)

rmse\_lin <- sqrt(mean((ps\_test$Sales - lin\_pred$fit) ^ 2, na.rm = T))

rmse\_lin:

**Result: 260.9378**

####Exponential Model####

expo\_mod <- lm(logsales ~ t, data = ps\_train)

summary(expo\_mod)

expo\_pred <- data.frame(predict(expo\_mod, interval = 'predict', newdata = ps\_test))

rmse\_expo <- sqrt(mean((ps\_test$Sales - exp(expo\_pred$fit))^2 , na.rm = T))

rmse\_expo

**Result: 268.6938**

####Quadratic Model####

quad\_mod <- lm(Sales ~ t + tsqrd, data = ps\_train)

summary(quad\_mod)

quad\_pred <- data.frame(predict(quad\_mod, interval = 'predict', newdata = ps\_test))

View(quad\_pred)

rmse\_quad <- sqrt(mean((ps\_test$Sales - quad\_pred$fit)^2, na.rm = T))

rmse\_quad

**Result: 297.4067**

####Additive Seasonality Model####

add\_sea <- lm(Sales ~ Jan+Feb+Mar+Apr+May+Jun+Jul+Aug+Sep+Oct+Nov,data= ps\_train)

summary(add\_sea)

add\_sea\_pred <- data.frame(predict(add\_sea, interval = 'predict', newdata = ps\_test))

rmse\_add\_sea <- sqrt(mean((ps\_test$Sales - add\_sea\_pred$fit)^2, na.rm = T))

rmse\_add\_sea

**Result: 235.6027**

####Multiplicative Seasonality####

mul\_sea <- lm(logsales ~ Jan+Feb+Mar+Apr+May+Jun+Jul+Aug+Sep+Oct+Nov,data= ps\_train )

summary(mul\_sea)

mul\_sea\_pred <- data.frame(predict(mul\_sea, interval = 'predict', newdata = ps\_test))

rmse\_mul\_sea <- sqrt(mean((ps\_test$Sales - exp(mul\_sea\_pred$fit))^2, na.rm = T))

rmse\_mul\_sea

**Result: 239.6543**

1. **COCO COLA SALES**

#FORECASTING COCO COLA SALES

#loading the data set

cola<-CocaCola\_Sales\_Rawdata

plot(cola$Sales, type = "l")

#creating dummy variable for month

CS <- data.frame(outer(rep(month.abb, length = 42), month.abb, "==") + 0 )

View(CS)

colnames(CS) <- month.abb

CSdata <- cbind(cola, CS)

View(CSdata)

CSdata['t'] <- 1:42

CSdata["logsales"] <- log(CSdata$Sales)

CSdata["tsqrd"] <- CSdata["t"] \* CSdata["t"]

#data partioning

CS\_train <- CSdata[1:30,]

CS\_test <- CSdata[31:42,]

####Linear Model####

lin\_mod <- lm(Sales ~ t, data = CS\_train)

summary(lin\_mod)

lin\_pred <- data.frame(predict(lin\_mod, interval = 'predict', newdata = CS\_test))

View(lin\_pred)

rmse\_lin <- sqrt(mean((CS\_test$Sales - lin\_pred$fit) ^ 2, na.rm = T))

rmse\_lin

**RESULT: 714.0144**

####Exponential Model####

expo\_mod <- lm(logsales ~ t, data = CS\_train)

summary(expo\_mod)

expo\_pred <- data.frame(predict(expo\_mod, interval = 'predict', newdata = CS\_test))

rmse\_expo <- sqrt(mean((CS\_test$Sales - exp(expo\_pred$fit))^2 , na.rm = T))

rmse\_expo

**Result: 552.2821**

####Quadratic Model####

quad\_mod <- lm(Sales ~ t + tsqrd, data = CS\_train)

summary(quad\_mod)

quad\_pred <- data.frame(predict(quad\_mod, interval = 'predict', newdata = CS\_test))

View(quad\_pred)

rmse\_quad <- sqrt(mean((CS\_test$Sales - quad\_pred$fit)^2, na.rm = T))

rmse\_quad

**Result: 646.2715**

####Additive Seasonality Model####

add\_sea <- lm(Sales ~ Jan+Feb+Mar+Apr+May+Jun+Jul+Aug+Sep+Oct+Nov,data= CS\_train)

summary(add\_sea)

add\_sea\_pred <- data.frame(predict(add\_sea, interval = 'predict', newdata = CS\_test))

rmse\_add\_sea <- sqrt(mean((CS\_test$Sales - add\_sea\_pred$fit)^2, na.rm = T))

rmse\_add\_sea

**Result: 1770.515**

####Additive Seasonality with linear trend####

add\_sea\_lin <- lm(Sales ~ t +Jan+Feb+Mar+Apr+May+Jun+Jul+Aug+Sep+Oct+Nov,data= CS\_train)

summary(add\_sea\_lin)

add\_sea\_lin\_pred <- data.frame(predict(add\_sea\_lin, interval = 'predict', newdata = CS\_test))

rmse\_add\_sea\_lin <- sqrt(mean((CS\_test$Sales - add\_sea\_lin\_pred$fit)^2, na.rm = T))

rmse\_add\_sea\_lin

**Result: 627.8074**

####Multiplicative Seasonality####

mul\_sea <- lm(logsales ~ Jan+Feb+Mar+Apr+May+Jun+Jul+Aug+Sep+Oct+Nov,data= CS\_train )

summary(mul\_sea)

mul\_sea\_pred <- data.frame(predict(mul\_sea, interval = 'predict', newdata = CS\_test))

rmse\_mul\_sea <- sqrt(mean((CS\_test$Sales - exp(mul\_sea\_pred$fit))^2, na.rm = T))

rmse\_mul\_sea

**Result: 1820.766**

1. **Air Lines DATA**

#FORECASTING AIRLINES DATA

#loading the data set

Aird<-Airlines.Data

plot(Aird$Passengers, type = "l")

#creating dummy variable for Passengers

Aird <- data.frame(outer(rep(month.abb, length = 96), month.abb, "==") + 0 )

View(Aird)

colnames(Aird) <- month.abb

Airddata <- cbind(Airlines.Data, Aird)

View(Airddata)

Airddata['t'] <- 1:96

Airddata["logsales"] <- log(Airddata$Passengers)

Airddata["tsqrd"] <- Airddata["t"] \* Airddata["t"]

#data partioning

Aird\_train <- Airddata[1:60,]

Aird\_test <- Airddata[61:96,]

####Linear Model####

lin\_mod <- lm(Passengers ~ t, data = Aird\_train)

summary(lin\_mod)

lin\_pred <- data.frame(predict(lin\_mod, interval = 'predict', newdata = Aird\_test))

View(lin\_pred)

rmse\_lin <- sqrt(mean((Aird\_test$Passengers - lin\_pred$fit) ^ 2, na.rm = T))

rmse\_lin

####Exponential Model####

expo\_mod <- lm(logPassengers ~ t, data = Aird\_train)

summary(expo\_mod)

expo\_pred <- data.frame(predict(expo\_mod, interval = 'predict', newdata = Aird\_test))

rmse\_expo <- sqrt(mean((Aird\_test$Passengers - exp(expo\_pred$fit))^2 , na.rm = T))

rmse\_expo

####Quadratic Model####

quad\_mod <- lm(Passengers ~ t + tsqrd, data = Aird\_train)

summary(quad\_mod)

quad\_pred <- data.frame(predict(quad\_mod, interval = 'predict', newdata = Aird\_test))

View(quad\_pred)

rmse\_quad <- sqrt(mean((Aird\_test$Passengers - quad\_pred$fit)^2, na.rm = T))

rmse\_quad

####Additive Seasonality Model####

add\_sea <- lm(Passengers ~ Jan+Feb+Mar+Apr+May+Jun+Jul+Aug+Sep+Oct+Nov,data= Aird\_train)

summary(add\_sea)

add\_sea\_pred <- data.frame(predict(add\_sea, interval = 'predict', newdata = Aird\_test))

rmse\_add\_sea <- sqrt(mean((Aird\_test$Passengers - add\_sea\_pred$fit)^2, na.rm = T))

rmse\_add\_sea

####Additive Seasonality with linear trend####

add\_sea\_lin <- lm(Passengers ~ t +Jan+Feb+Mar+Apr+May+Jun+Jul+Aug+Sep+Oct+Nov,data= Aird\_train)

summary(add\_sea\_lin)

add\_sea\_lin\_pred <- data.frame(predict(add\_sea\_lin, interval = 'predict', newdata = Aird\_test))

rmse\_add\_sea\_lin <- sqrt(mean((Aird\_test$Passengers - add\_sea\_lin\_pred$fit)^2, na.rm = T))

rmse\_add\_sea\_lin

####Multiplicative Seasonality####

mul\_sea <- lm(logPassengers ~ Jan+Feb+Mar+Apr+May+Jun+Jul+Aug+Sep+Oct+Nov,data= Aird\_train )

summary(mul\_sea)

mul\_sea\_pred <- data.frame(predict(mul\_sea, interval = 'predict', newdata = Aird\_test))

rmse\_mul\_sea <- sqrt(mean((Aird\_test$Passengers - exp(mul\_sea\_pred$fit))^2, na.rm = T))

rmse\_mul\_sea