**Module 6 (Demonstration)**

**R Script File**

**QMB-6304 Analytical Methods for Business**

**rm(list=ls())**

**library(rio)**

**# Preprocessing**

**old.cars=import("6304 Multiple Regression Assgt Example Data.xlsx")**

**colnames(old.cars)=tolower(make.names(colnames(old.cars)))**

**old.cars$year=as.factor(old.cars$year)**

**old.cars$cylinders=as.factor(old.cars$cylinders)**

**# Analysis 1**

**cars.out=lm(mpg~cubic.inches+horsepower+weight,data=old.cars)**

**# Analysis 2 and 3**

**summary(cars.out)**

**confint(cars.out)**

**# Analysis 4**

**#-----------------------------**

**par(mfrow=c(2,2))**

**plot(old.cars$mpg,cars.out$fitted.values,pch=19,**

**main=paste("Actual v. Fitted, Old Cars, r=",**

**round(cor(old.cars$mpg,cars.out$fitted.values),3)))**

**abline(0,1,col="red",lwd=3)**

**qqnorm(cars.out$residuals,pch=19,**

**main="Residuals QQ Plot, Old Cars")**

**qqline(cars.out$residuals,col="red",lwd=3)**

**hist(cars.out$residuals,col="red",**

**main="Residuals, Old Cars",freq=FALSE)**

**curve(dnorm(x,mean(cars.out$residuals),**

**sd(cars.out$residuals)),**

**from=min(cars.out$residuals),**

**to=max(cars.out$residuals),**

**lwd=3,add=TRUE)**

**plot(old.cars$mpg,rstandard(cars.out),pch=19,**

**main="Standardized Residuals, Old Cars")**

**abline(0,0,col="red",lwd=3)**

**par(mfrow=c(1,1))**

**#-----------------------------**

**# Analysis 5**

**leverage=hat(model.matrix(cars.out))**

**plot(leverage,pch=19,main="Leverage Plot, Old Cars")**

**abline(3\*mean(leverage),0,col="red",lwd=3)**

**old.cars[leverage>3\*mean(leverage),c(6,8,9)]**

**# Analysis 6**

**cars2.out=lm(mpg~cubic.inches+horsepower+weight**

**+I(horsepower^2)+I(weight^2),data=old.cars)**

**summary(cars.out)**

**summary(cars2.out)**

**#-----------------------------**

**par(mfrow=c(1,2))**

**plot(old.cars$mpg,cars.out$fitted.values,**

**pch=19,main="Original Model")**

**abline(0,1,col="red",lwd=3)**

**plot(old.cars$mpg,cars2.out$fitted.values,**

**pch=19,main="Squared Terms Model")**

**abline(0,1,col="red",lwd=3)**

**par(mfrow=c(1,1))**

**#-----------------------------**

**#-----------------------------**

**par(mfrow=c(2,2))**

**plot(old.cars$mpg,cars2.out$fitted.values,pch=19,**

**main=paste("Actual v. Fitted, Squared Cars, r=",**

**round(cor(old.cars$mpg,cars2.out$fitted.values),3)))**

**abline(0,1,col="red",lwd=3)**

**qqnorm(cars2.out$residuals,pch=19,**

**main="Residuals QQ Plot, Squared Cars")**

**qqline(cars2.out$residuals,col="red",lwd=3)**

**hist(cars2.out$residuals,col="red",**

**main="Residuals, Squared Cars",freq=FALSE)**

**curve(dnorm(x,mean(cars2.out$residuals),**

**sd(cars2.out$residuals)),**

**from=min(cars2.out$residuals),**

**to=max(cars2.out$residuals),**

**lwd=3,add=TRUE)**

**plot(old.cars$mpg,rstandard(cars2.out),pch=19,**

**main="Standardized Residuals, Squared Cars")**

**abline(0,0,col="red",lwd=3)**

**par(mfrow=c(1,1))**

**#-----------------------------**

**# Analysis 7**

**cars3.out=lm(mpg~cubic.inches+horsepower+weight**

**+cylinders,data=old.cars)**

**summary(cars.out)**

**summary(cars3.out)**

**# Analysis 8**

**cars4.out=lm(mpg~cubic.inches+horsepower+weight**

**+year,data=old.cars)**

**summary(cars.out)**

**summary(cars4.out)**

**# Just For Fun**

**continuous.old.cars=old.cars[,c(1,3,4,5)]**

**plot(continuous.old.cars)**

**cars5.out=lm(mpg~cubic.inches+horsepower+weight**

**+I(horsepower^2)+I(weight^2)**

**+horsepower:weight**

**+cylinders+year,data=old.cars)**

**summary(cars5.out)**

**#-----------------------------**

**par(mfrow=c(2,2))**

**plot(old.cars$mpg,cars5.out$fitted.values,pch=19,**

**main=paste("Actual v. Fitted, Kitchen Sink Cars, r=",**

**round(cor(old.cars$mpg,cars5.out$fitted.values),3)))**

**abline(0,1,col="red",lwd=3)**

**qqnorm(cars5.out$residuals,pch=19,**

**main="Residuals QQ Plot, Kitchen Sink Cars")**

**qqline(cars5.out$residuals,col="red",lwd=3)**

**hist(cars5.out$residuals,col="red",**

**main="Residuals, Kitchen Sink Cars",freq=FALSE)**

**curve(dnorm(x,mean(cars5.out$residuals),**

**sd(cars5.out$residuals)),**

**from=min(cars5.out$residuals),**

**to=max(cars5.out$residuals),**

**lwd=3,add=TRUE)**

**plot(old.cars$mpg,rstandard(cars5.out),pch=19,**

**main="Standardized Residuals, Kitchen Sink Cars")**

**abline(0,0,col="red",lwd=3)**

**par(mfrow=c(1,1))**

**moments::skewness(cars5.out$residuals)**

**moments::kurtosis(cars5.out$residuals)**

**#-----------------------------**