# CÓDIGOS DE LECTURA Y PROCESAMIENTO DE DATOS CON R

En este anexo de la Tesis doctoral, se presentan los códigos utilizados para leer y procesar los datos con el programa estadístico R. Para la lectura de los datos se hizo uso de los siguientes paquetes.

**library**(dplyr)

##   
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':  
##   
## filter, lag

## The following objects are masked from 'package:base':  
##   
## intersect, setdiff, setequal, union

**library**(readxl)  
**library**(ggplot2)  
**library**(PerformanceAnalytics)

## Loading required package: xts

## Loading required package: zoo

##   
## Attaching package: 'zoo'

## The following objects are masked from 'package:base':  
##   
## as.Date, as.Date.numeric

##   
## Attaching package: 'xts'

## The following objects are masked from 'package:dplyr':  
##   
## first, last

##   
## Attaching package: 'PerformanceAnalytics'

Para la leyenda:

## The following object is masked from 'package:graphics':  
##   
## legend

**options**(encoding="UTF-8")  
*#pdm16\_17 <- read\_excel("Temporadas primera division masculino\_v1.xlsx",*   
 *# sheet = "Temporada16-17")*  
  
*#pdm17\_18 <- read\_excel("Temporadas primera division #masculino\_v1.xlsx",*   
 *# sheet = "Temporada17-18")*  
  
*#pdm18\_19 <- read\_excel("Temporadas primera division masculino\_v1.xlsx",*   
 *# sheet = "Temporada18-19")*  
  
*#pdm19\_20 <- read\_excel("Temporadas primera division masculino\_v1.xlsx",*   
 *# sheet = "Temporada19-20")*  
  
*#pdm20\_21 <- read\_excel("Temporadas primera division masculino\_v1.xlsx",*   
 *# sheet = "Temporada20-21")*  
  
pdm16\_17 <- **read\_excel**("C:/Users/Usuario/Desktop/cristina/Temporadas primera division masculino\_v1.xlsx",   
 sheet = "Temporada16-17")  
  
pdm17\_18 <- **read\_excel**("C:/Users/Usuario/Desktop/cristina/Temporadas primera division masculino\_v1.xlsx",   
 sheet = "Temporada17-18")  
  
pdm18\_19 <- **read\_excel**("C:/Users/Usuario/Desktop/cristina/Temporadas primera division masculino\_v1.xlsx",   
 sheet = "Temporada18-19")  
  
pdm19\_20 <- **read\_excel**("C:/Users/Usuario/Desktop/cristina/Temporadas primera division masculino\_v1.xlsx",   
 sheet = "Temporada19-20")  
  
pdm20\_21 <- **read\_excel**("C:/Users/Usuario/Desktop/cristina/Temporadas primera division masculino\_v1.xlsx",   
 sheet = "Temporada20-21")

Para la visualización gráfica de las tendencias generales de las acciones antideportivas de la Primera División por temporadas, se utilizaron los siguientes códigos.

Temporada 2016/17

*#temporada 16-17*  
**matplot**(pdm16\_17, type="b", lty = 1, lwd = 1, tck = 0.02,xaxt = "n",cex=0.8, pch =1**:ncol**(pdm16\_17),  
 main = "Temporada 16-17 masculino",   
 *# xlab = "Jornada",*  
 ylab = "Cantidad de acciones",  
 col = **rainbow**(**ncol**(pdm16\_17)))  
**legend**(**par**('usr')[1], **par**('usr')[1],ncol=3, legend = **colnames**(pdm16\_17),bty='n',cex=0.8, xpd=NA,  
 pch=1**:ncol**(pdm16\_17), col = **rainbow**(**ncol**(pdm16\_17)))

Temporada 2017/18

*#temporada 17-18*  
**matplot**(pdm17\_18, type="b", lty = 1, lwd = 1, tck = 0.02,xaxt = "n",cex=0.8, pch =1**:ncol**(pdm17\_18),  
 main = "Temporada 17-18 masculino",   
 *# xlab = "Jornada",*  
 ylab = "Cantidad de acciones",  
 col = **rainbow**(**ncol**(pdm17\_18)))  
**legend**(**par**('usr')[1], **par**('usr')[1],ncol=3, legend = **colnames**(pdm17\_18),bty='n',cex=0.8, xpd=NA,  
 pch=1**:ncol**(pdm17\_18), col = **rainbow**(**ncol**(pdm17\_18)))

Temporada 2018/19

*#temporada 18-19*  
**matplot**(pdm18\_19, type="b", lty = 1, lwd = 1, tck = 0.02,xaxt = "n",cex=0.8, pch =1**:ncol**(pdm18\_19),  
 main = "Temporada 18-19 masculino",   
 *# xlab = "Jornada",*  
 ylab = "Cantidad de acciones",  
 col = **rainbow**(**ncol**(pdm18\_19)))  
**legend**(**par**('usr')[1], **par**('usr')[1],ncol=3, legend = **colnames**(pdm18\_19),bty='n',cex=0.8, xpd=NA,  
 pch=1**:ncol**(pdm18\_19), col = **rainbow**(**ncol**(pdm18\_19)))

Temporada 2019/20

*#temporada 19\_20*  
**matplot**(pdm19\_20, type="b", lty = 1, lwd = 1, tck = 0.02,xaxt = "n",cex=0.8, pch =1**:ncol**(pdm19\_20),  
 main = "Temporada 19-20 masculino",   
 *# xlab = "Jornada",*  
 ylab = "Cantidad de acciones",  
 col = **rainbow**(**ncol**(pdm19\_20)))  
**legend**(**par**('usr')[1], **par**('usr')[1],ncol=3, legend = **colnames**(pdm19\_20),bty='n',cex=0.8, xpd=NA,  
 pch=1**:ncol**(pdm19\_20), col = **rainbow**(**ncol**(pdm19\_20)))

Temporada 2020/21

*#temporada 20\_21*  
**matplot**(pdm20\_21, type="b", lty = 1, lwd = 1, tck = 0.02,xaxt = "n",cex=0.8, pch =1**:ncol**(pdm20\_21),  
 main = "Temporada 20-21 masculino",   
 *# xlab = "Jornada",*  
 ylab = "Cantidad de acciones",  
 col = **rainbow**(**ncol**(pdm20\_21)))  
**legend**(**par**('usr')[1], **par**('usr')[1],ncol=3, legend = **colnames**(pdm20\_21),bty='n',cex=0.8, xpd=NA,  
 pch=1**:ncol**(pdm20\_21), col = **rainbow**(**ncol**(pdm20\_21)))

Para la lectura de los datos de la Segunda División del fútbol masculino, se utilizó el siguiente código:

**library**(dplyr)  
**library**(readxl)  
**library**(ggplot2)  
**library**(PerformanceAnalytics)  
  
sdm16\_17 <- **read\_excel**("C:/Users/Usuario/Desktop/cristina/Temporadas segunda division masculino\_v1.xlsx",   
 sheet = "Temporada16-17")  
  
sdm17\_18 <- **read\_excel**("C:/Users/Usuario/Desktop/cristina/Temporadas segunda division masculino\_v1.xlsx",   
 sheet = "Temporada17-18")  
  
sdm18\_19 <- **read\_excel**("C:/Users/Usuario/Desktop/cristina/Temporadas segunda division masculino\_v1.xlsx",   
 sheet = "Temporada18-19")  
  
sdm19\_20 <- **read\_excel**("C:/Users/Usuario/Desktop/cristina/Temporadas segunda division masculino\_v1.xlsx",   
 sheet = "Temporada19-20")  
  
sdm20\_21 <- **read\_excel**("C:/Users/Usuario/Desktop/cristina/Temporadas segunda division masculino\_v1.xlsx",   
 sheet = "Temporada20-21")

Y, para la obtención de los gráficos en los que se representan las tendencias de las acciones por temporadas.

Temporada 2016/17

*#temporada 16-17*  
**matplot**(sdm16\_17, type="b", lty = 1, lwd = 1, tck = 0.02,xaxt = "n",cex=0.8, pch =1**:ncol**(sdm16\_17),  
 main = "Temporada 16-17 masculino",   
 *# xlab = "Jornada",*  
 ylab = "Cantidad de acciones",  
 col = **rainbow**(**ncol**(sdm16\_17)))  
**legend**(**par**('usr')[1], **par**('usr')[1],ncol=3, legend = **colnames**(sdm16\_17),bty='n',cex=0.8, xpd=NA,  
 pch=1**:ncol**(sdm16\_17), col = **rainbow**(**ncol**(sdm16\_17)))

Temporada 2017/18

*#temporada 17-18*  
**matplot**(sdm17\_18, type="b", lty = 1, lwd = 1, tck = 0.02,xaxt = "n",cex=0.8, pch =1**:ncol**(sdm17\_18),  
 main = "Temporada 17-18 masculino",   
 *# xlab = "Jornada",*  
 ylab = "Cantidad de acciones",  
 col = **rainbow**(**ncol**(sdm17\_18)))  
**legend**(**par**('usr')[1], **par**('usr')[1],ncol=3, legend = **colnames**(sdm17\_18),bty='n',cex=0.8, xpd=NA,  
 pch=1**:ncol**(sdm17\_18), col = **rainbow**(**ncol**(sdm17\_18)))

Temporada 2018/19

*#temporada 18-19*  
**matplot**(sdm18\_19, type="b", lty = 1, lwd = 1, tck = 0.02,xaxt = "n",cex=0.8, pch =1**:ncol**(sdm18\_19),  
 main = "Temporada 18-19 masculino",   
 *# xlab = "Jornada",*  
 ylab = "Cantidad de acciones",  
 col = **rainbow**(**ncol**(sdm18\_19)))  
**legend**(**par**('usr')[1], **par**('usr')[1],ncol=3, legend = **colnames**(sdm18\_19),bty='n',cex=0.8, xpd=NA,  
 pch=1**:ncol**(sdm18\_19), col = **rainbow**(**ncol**(sdm18\_19)))

Temporada 2019/20

*#temporada 19\_20*  
**matplot**(sdm19\_20, type="b", lty = 1, lwd = 1, tck = 0.02,xaxt = "n",cex=0.8, pch =1**:ncol**(sdm19\_20),  
 main = "Temporada 19-20 masculino",   
 *# xlab = "Jornada",*  
 ylab = "Cantidad de acciones",  
 col = **rainbow**(**ncol**(sdm19\_20)))  
**legend**(**par**('usr')[1], **par**('usr')[1],ncol=3, legend = **colnames**(sdm19\_20),bty='n',cex=0.8, xpd=NA,  
 pch=1**:ncol**(sdm19\_20), col = **rainbow**(**ncol**(sdm19\_20)))

Temporada 2020/21

#temporada 20\_21  
matplot(sdm20\_21, type="b", lty = 1, lwd = 1, tck = 0.02,xaxt = "n",cex=0.8, pch =1:ncol(sdm20\_21),  
 main = "Temporada 19-20 masculino",   
 # xlab = "Jornada",  
 ylab = "Cantidad de acciones",  
 col = rainbow(ncol(sdm20\_21)))  
legend(par('usr')[1], par('usr')[1],ncol=3, legend = colnames(sdm20\_21),bty='n',cex=0.8, xpd=NA,  
 pch=1:ncol(sdm20\_21), col = rainbow(ncol(sdm20\_21)))

Finalmente, para la representación gráfica de la tendencia experimentada por las variables correspondientes a las acciones en la Primera División del fútbol femenino de la temporada 2020/21, se utilizó el siguiente código.

*#temporada 20\_21*  
**matplot**(pdf20\_21, type="b", lty = 1, lwd = 1, tck = 0.02,xaxt = "n",cex=0.8, pch =1**:ncol**(pdm20\_21),  
 main = "Temporada 20-21 femenino",   
 *# xlab = "Jornada",*  
 ylab = "Cantidad de acciones",  
 col = **rainbow**(**ncol**(pdm20\_21)))  
**legend**(**par**('usr')[1], **par**('usr')[1],ncol=3, legend = **colnames**(pdm20\_21),bty='n',cex=0.8, xpd=NA,  
 pch=1**:ncol**(pdm20\_21), col = **rainbow**(**ncol**(pdm20\_21)))

Los códigos utilizados para la realización de las pruebas de hipótesis en el caso del derribo, son los siguientes. Primero se presenta el correspondiente a Primera División y, posteriormente, el de Segunda.

Primera División

#prueba de hipotesis para la diferencia de medias entre la temporada 16-17 y temporada 17-18  
t.test(x=derribo$derribot16, y=derribo$derribot17, alternative="two.sided", mu=0,   
 paired=FALSE, var.equal=FALSE, conf.level=0.95)

##   
## Welch Two Sample t-test  
##   
## data: derribo$derribot16 and derribo$derribot17  
## t = 0.74226, df = 73.641, p-value = 0.4603  
## alternative hypothesis: true difference in means is not equal to 0  
## 95 percent confidence interval:  
## -1.462971 3.199813  
## sample estimates:  
## mean of x mean of y   
## 24.39474 23.52632

#prueba de hipotesis para la diferencia de medias entre la temporada 18-19 y temporada 19-20  
t.test(x=derribo$derribot18, y=derribo$derribot19, alternative="two.sided", mu=0,   
 paired=FALSE, var.equal=FALSE, conf.level=0.95)

##   
## Welch Two Sample t-test  
##   
## data: derribo$derribot18 and derribo$derribot19  
## t = 2.0856, df = 66.779, p-value = 0.04083  
## alternative hypothesis: true difference in means is not equal to 0  
## 95 percent confidence interval:  
## 0.09374974 4.27467131  
## sample estimates:  
## mean of x mean of y   
## 9.657895 7.473684

#prueba de hip?tesis para la diferencia de medias entre la temporada 18-19 y temporada 19-20  
t.test(x=derribo$derribot18, y=derribo$derribot20, alternative="two.sided", mu=0,   
 paired=FALSE, var.equal=FALSE, conf.level=0.95)

##   
## Welch Two Sample t-test  
##   
## data: derribo$derribot18 and derribo$derribot20  
## t = 4.5109, df = 55.714, p-value = 3.375e-05  
## alternative hypothesis: true difference in means is not equal to 0  
## 95 percent confidence interval:  
## 2.413593 6.270617  
## sample estimates:  
## mean of x mean of y   
## 9.657895 5.315789

#prueba de hip?tesis para la diferencia de medias entre la temporada 18-19 y temporada 19-20  
t.test(x=derribo$derribot19, y=derribo$derribot20, alternative="two.sided", mu=0,   
 paired=FALSE, var.equal=FALSE, conf.level=0.95)

##   
## Welch Two Sample t-test  
##   
## data: derribo$derribot19 and derribo$derribot20  
## t = 2.8685, df = 67.864, p-value = 0.005492  
## alternative hypothesis: true difference in means is not equal to 0  
## 95 percent confidence interval:  
## 0.656695 3.659094  
## sample estimates:  
## mean of x mean of y   
## 7.473684 5.315789

#prueba de hip?tesis para la diferencia de medias entre la temporada 16-17 y temporada 18-19  
t.test(x=derribo$derribot16, y=derribo$derribot18, alternative="two.sided", mu=0,   
 paired=FALSE, var.equal=FALSE, conf.level=0.95)

##   
## Welch Two Sample t-test  
##   
## data: derribo$derribot16 and derribo$derribot18  
## t = 12.612, df = 73.665, p-value < 2.2e-16  
## alternative hypothesis: true difference in means is not equal to 0  
## 95 percent confidence interval:  
## 12.40845 17.06524  
## sample estimates:  
## mean of x mean of y   
## 24.394737 9.657895

#prueba de hip?tesis para la diferencia de medias entre la temporada 16-17 y temporada 19-20  
t.test(x=derribo$derribot16, y=derribo$derribot19, alternative="two.sided", mu=0,   
 paired=FALSE, var.equal=FALSE, conf.level=0.95)

##   
## Welch Two Sample t-test  
##   
## data: derribo$derribot16 and derribo$derribot19  
## t = 16.882, df = 69.065, p-value < 2.2e-16  
## alternative hypothesis: true difference in means is not equal to 0  
## 95 percent confidence interval:  
## 14.92150 18.92061  
## sample estimates:  
## mean of x mean of y   
## 24.394737 7.473684

#prueba de hip?tesis para la diferencia de medias entre la temporada 16-17 y temporada 19-20  
t.test(x=derribo$derribot16, y=derribo$derribot20, alternative="two.sided", mu=0,   
 paired=FALSE, var.equal=FALSE, conf.level=0.95)

##   
## Welch Two Sample t-test  
##   
## data: derribo$derribot16 and derribo$derribot20  
## t = 20.885, df = 57.974, p-value < 2.2e-16  
## alternative hypothesis: true difference in means is not equal to 0  
## 95 percent confidence interval:  
## 17.25036 20.90754  
## sample estimates:  
## mean of x mean of y   
## 24.394737 5.315789

mdt16=mean(derribot16)  
mdt17=mean(derribot17)  
mdt18=mean(derribot18)  
mdt19=mean(derribot19)  
mdt20=mean(derribot20)  
  
derribomedia= data.frame(c(mdt16,mdt17,mdt18,mdt19,mdt20))  
derribomedia

## c.mdt16..mdt17..mdt18..mdt19..mdt20.  
## 1 24.394737  
## 2 23.526316  
## 3 9.657895  
## 4 7.473684  
## 5 5.315789

matplot(derribomedia, type="l", main="Promedios entre temporadas para la variable derribo")

Segunda División

#prueba de hip?tesis para la diferencia de medias entre la temporada 16-17 y temporada 17-18  
t.test(x=derribo\_s$sderribot16, y=derribo\_s$sderribot17, alternative="two.sided", mu=0,   
 paired=FALSE, var.equal=FALSE, conf.level=0.95)

##   
## Welch Two Sample t-test  
##   
## data: derribo\_s$sderribot16 and derribo\_s$sderribot17  
## t = 3.9063, df = 72.696, p-value = 0.0002079  
## alternative hypothesis: true difference in means is not equal to 0  
## 95 percent confidence interval:  
## 2.215589 6.832031  
## sample estimates:  
## mean of x mean of y   
## 24.16667 19.64286

#prueba de hip?tesis para la diferencia de medias entre la temporada 16-17 y temporada 18-19  
t.test(x=derribo\_s$sderribot16, y=derribo\_s$sderribot19, alternative="two.sided", mu=0,   
 paired=FALSE, var.equal=FALSE, conf.level=0.95)

##   
## Welch Two Sample t-test  
##   
## data: derribo\_s$sderribot16 and derribo\_s$sderribot19  
## t = 15.806, df = 61.431, p-value < 2.2e-16  
## alternative hypothesis: true difference in means is not equal to 0  
## 95 percent confidence interval:  
## 14.82889 19.12349  
## sample estimates:  
## mean of x mean of y   
## 24.166667 7.190476

#prueba de hip?tesis para la diferencia de medias entre la temporada 17 y temporada 19  
t.test(x=derribo\_s$sderribot17, y=derribo\_s$sderribot19, alternative="two.sided", mu=0,   
 paired=FALSE, var.equal=FALSE, conf.level=0.95)

##   
## Welch Two Sample t-test  
##   
## data: derribo\_s$sderribot17 and derribo\_s$sderribot19  
## t = 15.171, df = 76.095, p-value < 2.2e-16  
## alternative hypothesis: true difference in means is not equal to 0  
## 95 percent confidence interval:  
## 10.81766 14.08710  
## sample estimates:  
## mean of x mean of y   
## 19.642857 7.190476

#prueba de hip?tesis para la diferencia de medias entre la temporada 16 y temporada 20  
t.test(x=derribo\_s$sderribot16, y=derribo\_s$sderribot20, alternative="two.sided", mu=0,   
 paired=FALSE, var.equal=FALSE, conf.level=0.95)

##   
## Welch Two Sample t-test  
##   
## data: derribo\_s$sderribot16 and derribo\_s$sderribot20  
## t = 18.023, df = 54.037, p-value < 2.2e-16  
## alternative hypothesis: true difference in means is not equal to 0  
## 95 percent confidence interval:  
## 16.48440 20.61084  
## sample estimates:  
## mean of x mean of y   
## 24.166667 5.619048

#prueba de hip?tesis para la diferencia de medias entre la temporada 17 y temporada 20  
t.test(x=derribo\_s$sderribot17, y=derribo\_s$sderribot20, alternative="two.sided", mu=0,   
 paired=FALSE, var.equal=FALSE, conf.level=0.95)

##   
## Welch Two Sample t-test  
##   
## data: derribo\_s$sderribot17 and derribo\_s$sderribot20  
## t = 18.425, df = 66.284, p-value < 2.2e-16  
## alternative hypothesis: true difference in means is not equal to 0  
## 95 percent confidence interval:  
## 12.50432 15.54330  
## sample estimates:  
## mean of x mean of y   
## 19.642857 5.619048

#prueba de hip?tesis para la diferencia de medias entre la temporada 19 y temporada 20  
t.test(x=derribo\_s$sderribot19, y=derribo\_s$sderribot20, alternative="two.sided", mu=0,   
 paired=FALSE, var.equal=FALSE, conf.level=0.95)

##   
## Welch Two Sample t-test  
##   
## data: derribo\_s$sderribot19 and derribo\_s$sderribot20  
## t = 2.5111, df = 77.496, p-value = 0.01412  
## alternative hypothesis: true difference in means is not equal to 0  
## 95 percent confidence interval:  
## 0.3254275 2.8174297  
## sample estimates:  
## mean of x mean of y   
## 7.190476 5.619048

smdt16=mean(sderribot16)  
smdt17=mean(sderribot17)  
smdt18=mean(sderribot18)  
smdt19=mean(sderribot19)  
smdt20=mean(sderribot20)  
  
derribomedia\_s= data.frame(c(smdt16,smdt17,smdt18,smdt19,smdt20))  
derribomedia\_s

## c.smdt16..smdt17..smdt18..smdt19..smdt20.  
## 1 24.166667  
## 2 19.642857  
## 3 13.738095  
## 4 7.190476  
## 5 5.619048

matplot(derribomedia\_s, type="l", main="Promedios entre temporadas para la variable derribo")

Lo mismo se hizo con el derribo temerario en ambas competiciones.

Primera División

#prueba de hipótesis para la diferencia de medias entre la temporada 16-17 y temporada 17-18  
t.test(x=derribot$derribott16, y=derribot$derribott17, alternative="two.sided", mu=0,   
 paired=FALSE, var.equal=FALSE, conf.level=0.95)

##   
## Welch Two Sample t-test  
##   
## data: derribot$derribott16 and derribot$derribott17  
## t = 1.1925, df = 65.408, p-value = 0.2374  
## alternative hypothesis: true difference in means is not equal to 0  
## 95 percent confidence interval:  
## -0.4083223 1.6188486  
## sample estimates:  
## mean of x mean of y   
## 3.078947 2.473684

#prueba de hipótesis para la diferencia de medias entre la temporada 18-19 y temporada 19-20  
t.test(x=derribot$derribott18, y=derribot$derribott19, alternative="two.sided", mu=0,   
 paired=FALSE, var.equal=FALSE, conf.level=0.95)

##   
## Welch Two Sample t-test  
##   
## data: derribot$derribott18 and derribot$derribott19  
## t = 0.14741, df = 62.276, p-value = 0.8833  
## alternative hypothesis: true difference in means is not equal to 0  
## 95 percent confidence interval:  
## -2.313622 2.682043  
## sample estimates:  
## mean of x mean of y   
## 14.68421 14.50000

#prueba de hipótesis para la diferencia de medias entre la temporada 16-17 y temporada 18-19  
t.test(x=derribot$derribott18, y=derribot$derribott20, alternative="two.sided", mu=0,   
 paired=FALSE, var.equal=FALSE, conf.level=0.95)

##   
## Welch Two Sample t-test  
##   
## data: derribot$derribott18 and derribot$derribott20  
## t = 0.71815, df = 53.044, p-value = 0.4758  
## alternative hypothesis: true difference in means is not equal to 0  
## 95 percent confidence interval:  
## -1.509803 3.194014  
## sample estimates:  
## mean of x mean of y   
## 14.68421 13.84211

#prueba de hipótesis para la diferencia de medias entre la temporada 16-17 y temporada 18-19  
t.test(x=derribot$derribott16, y=derribot$derribott20, alternative="two.sided", mu=0,   
 paired=FALSE, var.equal=FALSE, conf.level=0.95)

##   
## Welch Two Sample t-test  
##   
## data: derribot$derribott16 and derribot$derribott20  
## t = -16.397, df = 71.542, p-value < 2.2e-16  
## alternative hypothesis: true difference in means is not equal to 0  
## 95 percent confidence interval:  
## -12.071838 -9.454478  
## sample estimates:  
## mean of x mean of y   
## 3.078947 13.842105

mdtt16=mean(derribott16)  
mdtt17=mean(derribott17)  
mdtt18=mean(derribott18)  
mdtt19=mean(derribott19)  
mdtt20=mean(derribott20)  
  
derribotmedia= data.frame(c(mdtt16,mdtt17,mdtt18,mdtt19,mdtt20))  
derribotmedia

## c.mdtt16..mdtt17..mdtt18..mdtt19..mdtt20.  
## 1 3.078947  
## 2 2.473684  
## 3 14.684211  
## 4 14.500000  
## 5 13.842105

matplot(derribotmedia, type="l", main="Promedios entre temporadas para la variable derribo temerario

Segunda División

*#prueba de hip?tesis para la diferencia de medias entre la temporada 16-17 y temporada 17-18*  
**t.test**(x=derribo\_s**$**sderribot16, y=derribo\_s**$**sderribot17, alternative="two.sided", mu=0,   
 paired=FALSE, var.equal=FALSE, conf.level=0.95)

##   
## Welch Two Sample t-test  
##   
## data: derribo\_s$sderribot16 and derribo\_s$sderribot17  
## t = 3.9063, df = 72.696, p-value = 0.0002079  
## alternative hypothesis: true difference in means is not equal to 0  
## 95 percent confidence interval:  
## 2.215589 6.832031  
## sample estimates:  
## mean of x mean of y   
## 24.16667 19.64286

*#prueba de hip?tesis para la diferencia de medias entre la temporada 16-17 y temporada 18-19*  
**t.test**(x=derribo\_s**$**sderribot16, y=derribo\_s**$**sderribot19, alternative="two.sided", mu=0,   
 paired=FALSE, var.equal=FALSE, conf.level=0.95)

##   
## Welch Two Sample t-test  
##   
## data: derribo\_s$sderribot16 and derribo\_s$sderribot19  
## t = 15.806, df = 61.431, p-value < 2.2e-16  
## alternative hypothesis: true difference in means is not equal to 0  
## 95 percent confidence interval:  
## 14.82889 19.12349  
## sample estimates:  
## mean of x mean of y   
## 24.166667 7.190476

*#prueba de hip?tesis para la diferencia de medias entre la temporada 17 y temporada 19*  
**t.test**(x=derribo\_s**$**sderribot17, y=derribo\_s**$**sderribot19, alternative="two.sided", mu=0,   
 paired=FALSE, var.equal=FALSE, conf.level=0.95)

##   
## Welch Two Sample t-test  
##   
## data: derribo\_s$sderribot17 and derribo\_s$sderribot19  
## t = 15.171, df = 76.095, p-value < 2.2e-16  
## alternative hypothesis: true difference in means is not equal to 0  
## 95 percent confidence interval:  
## 10.81766 14.08710  
## sample estimates:  
## mean of x mean of y   
## 19.642857 7.190476

*#prueba de hip?tesis para la diferencia de medias entre la temporada 16 y temporada 20*  
**t.test**(x=derribo\_s**$**sderribot16, y=derribo\_s**$**sderribot20, alternative="two.sided", mu=0,   
 paired=FALSE, var.equal=FALSE, conf.level=0.95)

##   
## Welch Two Sample t-test  
##   
## data: derribo\_s$sderribot16 and derribo\_s$sderribot20  
## t = 18.023, df = 54.037, p-value < 2.2e-16  
## alternative hypothesis: true difference in means is not equal to 0  
## 95 percent confidence interval:  
## 16.48440 20.61084  
## sample estimates:  
## mean of x mean of y   
## 24.166667 5.619048

*#prueba de hip?tesis para la diferencia de medias entre la temporada 17 y temporada 20*  
**t.test**(x=derribo\_s**$**sderribot17, y=derribo\_s**$**sderribot20, alternative="two.sided", mu=0,   
 paired=FALSE, var.equal=FALSE, conf.level=0.95)

##   
## Welch Two Sample t-test  
##   
## data: derribo\_s$sderribot17 and derribo\_s$sderribot20  
## t = 18.425, df = 66.284, p-value < 2.2e-16  
## alternative hypothesis: true difference in means is not equal to 0  
## 95 percent confidence interval:  
## 12.50432 15.54330  
## sample estimates:  
## mean of x mean of y   
## 19.642857 5.619048

*#prueba de hip?tesis para la diferencia de medias entre la temporada 19 y temporada 20*  
**t.test**(x=derribo\_s**$**sderribot19, y=derribo\_s**$**sderribot20, alternative="two.sided", mu=0,   
 paired=FALSE, var.equal=FALSE, conf.level=0.95)

##   
## Welch Two Sample t-test  
##   
## data: derribo\_s$sderribot19 and derribo\_s$sderribot20  
## t = 2.5111, df = 77.496, p-value = 0.01412  
## alternative hypothesis: true difference in means is not equal to 0  
## 95 percent confidence interval:  
## 0.3254275 2.8174297  
## sample estimates:  
## mean of x mean of y   
## 7.190476 5.619048

smdt16=**mean**(sderribot16)  
smdt17=**mean**(sderribot17)  
smdt18=**mean**(sderribot18)  
smdt19=**mean**(sderribot19)  
smdt20=**mean**(sderribot20)  
  
derribomedia\_s= **data.frame**(**c**(smdt16,smdt17,smdt18,smdt19,smdt20))  
derribomedia\_s

## c.smdt16..smdt17..smdt18..smdt19..smdt20.  
## 1 24.166667  
## 2 19.642857  
## 3 13.738095  
## 4 7.190476  
## 5 5.619048

**matplot**(derribomedia\_s, type="l", main="Promedios entre temporadas para la variable derribo")

Y, finalmente, para la variable sujetar también se hicieron las pruebas de hipótesis.

Primera División

#prueba de hipótesis para la diferencia de medias entre la temporada 16-17 y temporada 17-18  
t.test(x=sujetar$sujetar16, y=sujetar$sujetar17, alternative="two.sided", mu=0,   
 paired=FALSE, var.equal=FALSE, conf.level=0.95)

##   
## Welch Two Sample t-test  
##   
## data: sujetar$sujetar16 and sujetar$sujetar17  
## t = -0.045959, df = 63.737, p-value = 0.9635  
## alternative hypothesis: true difference in means is not equal to 0  
## 95 percent confidence interval:  
## -1.170291 1.117659  
## sample estimates:  
## mean of x mean of y   
## 4.973684 5.000000

t.test(x=sujetar$sujetar17, y=sujetar$sujetar18, alternative="two.sided", mu=0,   
 paired=FALSE, var.equal=FALSE, conf.level=0.95)

##   
## Welch Two Sample t-test  
##   
## data: sujetar$sujetar17 and sujetar$sujetar18  
## t = -1.9283, df = 72.586, p-value = 0.05772  
## alternative hypothesis: true difference in means is not equal to 0  
## 95 percent confidence interval:  
## -1.87307674 0.03097147  
## sample estimates:  
## mean of x mean of y   
## 5.000000 5.921053

t.test(x=sujetar$sujetar18, y=sujetar$sujetar19, alternative="two.sided", mu=0,   
 paired=FALSE, var.equal=FALSE, conf.level=0.95)

##   
## Welch Two Sample t-test  
##   
## data: sujetar$sujetar18 and sujetar$sujetar19  
## t = 2.718, df = 73.988, p-value = 0.008177  
## alternative hypothesis: true difference in means is not equal to 0  
## 95 percent confidence interval:  
## 0.3722538 2.4172199  
## sample estimates:  
## mean of x mean of y   
## 5.921053 4.526316

t.test(x=sujetar$sujetar18, y=sujetar$sujetar20, alternative="two.sided", mu=0,   
 paired=FALSE, var.equal=FALSE, conf.level=0.95)

##   
## Welch Two Sample t-test  
##   
## data: sujetar$sujetar18 and sujetar$sujetar20  
## t = 1.7543, df = 74, p-value = 0.08352  
## alternative hypothesis: true difference in means is not equal to 0  
## 95 percent confidence interval:  
## -0.1215107 1.9109844  
## sample estimates:  
## mean of x mean of y   
## 5.921053 5.026316

t.test(x=sujetar$sujetar19, y=sujetar$sujetar20, alternative="two.sided", mu=0,   
 paired=FALSE, var.equal=FALSE, conf.level=0.95)

##   
## Welch Two Sample t-test  
##   
## data: sujetar$sujetar19 and sujetar$sujetar20  
## t = -0.97409, df = 73.989, p-value = 0.3332  
## alternative hypothesis: true difference in means is not equal to 0  
## 95 percent confidence interval:  
## -1.5227735 0.5227735  
## sample estimates:  
## mean of x mean of y   
## 4.526316 5.026316

mst16=mean(sujetar16)  
mst17=mean(sujetar17)  
mst18=mean(sujetar18)  
mst19=mean(sujetar19)  
mst20=mean(sujetar20)  
  
sujtarmedia= data.frame(c(mst16,mst17,mst18,mst19,mst20))  
sujtarmedia

## c.mst16..mst17..mst18..mst19..mst20.  
## 1 4.973684  
## 2 5.000000  
## 3 5.921053  
## 4 4.526316  
## 5 5.026316

matplot(sujtarmedia, type="l", main="Promedios entre temporadas para la variable sujetar")

Segunda División

#prueba de hipótesis para la diferencia de medias entre la temporada 16-17 y temporada 17-18  
t.test(x=ssujetar$ssujetar16, y=ssujetar$ssujetar17, alternative="two.sided", mu=0,   
 paired=FALSE, var.equal=FALSE, conf.level=0.95)

##   
## Welch Two Sample t-test  
##   
## data: ssujetar$ssujetar16 and ssujetar$ssujetar17  
## t = -5.0862, df = 79.143, p-value = 2.399e-06  
## alternative hypothesis: true difference in means is not equal to 0  
## 95 percent confidence interval:  
## -3.842723 -1.681087  
## sample estimates:  
## mean of x mean of y   
## 4.642857 7.404762

t.test(x=ssujetar$ssujetar17, y=ssujetar$ssujetar18, alternative="two.sided", mu=0,   
 paired=FALSE, var.equal=FALSE, conf.level=0.95)

##   
## Welch Two Sample t-test  
##   
## data: ssujetar$ssujetar17 and ssujetar$ssujetar18  
## t = 0, df = 81.255, p-value = 1  
## alternative hypothesis: true difference in means is not equal to 0  
## 95 percent confidence interval:  
## -1.239404 1.239404  
## sample estimates:  
## mean of x mean of y   
## 7.404762 7.404762

t.test(x=ssujetar$ssujetar18, y=ssujetar$ssujetar19, alternative="two.sided", mu=0,   
 paired=FALSE, var.equal=FALSE, conf.level=0.95)

##   
## Welch Two Sample t-test  
##   
## data: ssujetar$ssujetar18 and ssujetar$ssujetar19  
## t = 1.2101, df = 74.981, p-value = 0.2301  
## alternative hypothesis: true difference in means is not equal to 0  
## 95 percent confidence interval:  
## -0.4462567 1.8272091  
## sample estimates:  
## mean of x mean of y   
## 7.404762 6.714286

t.test(x=ssujetar$ssujetar18, y=ssujetar$ssujetar20, alternative="two.sided", mu=0,   
 paired=FALSE, var.equal=FALSE, conf.level=0.95)

##   
## Welch Two Sample t-test  
##   
## data: ssujetar$ssujetar18 and ssujetar$ssujetar20  
## t = 3.9231, df = 73.737, p-value = 0.0001944  
## alternative hypothesis: true difference in means is not equal to 0  
## 95 percent confidence interval:  
## 1.089569 3.339002  
## sample estimates:  
## mean of x mean of y   
## 7.404762 5.190476

t.test(x=ssujetar$ssujetar19, y=ssujetar$ssujetar20, alternative="two.sided", mu=0,   
 paired=FALSE, var.equal=FALSE, conf.level=0.95)

##   
## Welch Two Sample t-test  
##   
## data: ssujetar$ssujetar19 and ssujetar$ssujetar20  
## t = 3.2565, df = 81.916, p-value = 0.001642  
## alternative hypothesis: true difference in means is not equal to 0  
## 95 percent confidence interval:  
## 0.592932 2.454687  
## sample estimates:  
## mean of x mean of y   
## 6.714286 5.190476

msst16=mean(ssujetar16)  
msst17=mean(ssujetar17)  
msst18=mean(ssujetar18)  
msst19=mean(ssujetar19)  
msst20=mean(ssujetar20)  
  
ssujtarmedia= data.frame(c(msst16,msst17,msst18,msst19,msst20))  
ssujtarmedia

## c.msst16..msst17..msst18..msst19..msst20.  
## 1 4.642857  
## 2 7.404762  
## 3 7.404762  
## 4 6.714286  
## 5 5.190476

matplot(ssujtarmedia, type="l", main="Promedios entre temporadas para la variable sujetar")