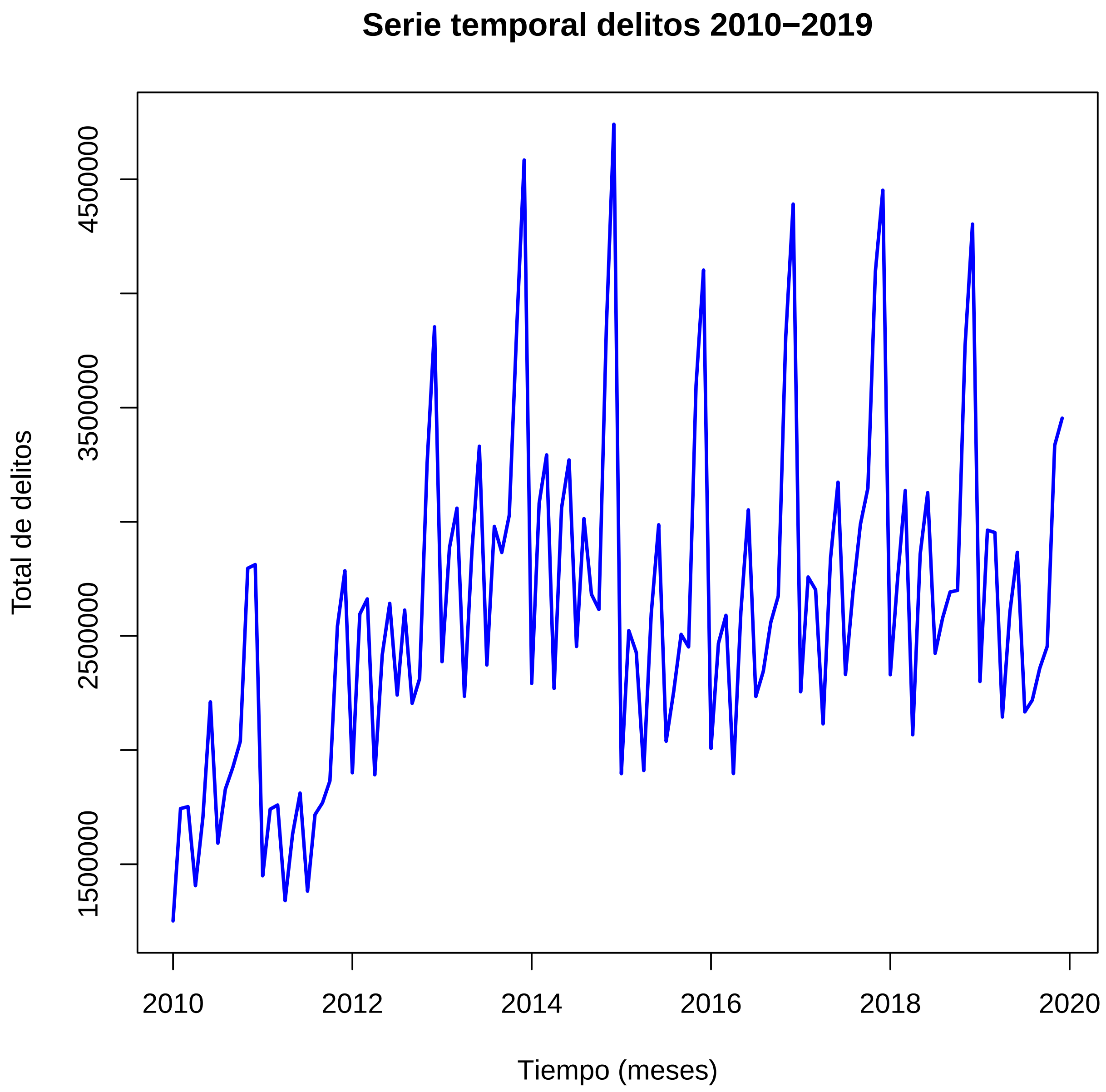
CONTENIDO

1. Serie de tiempo Delitos

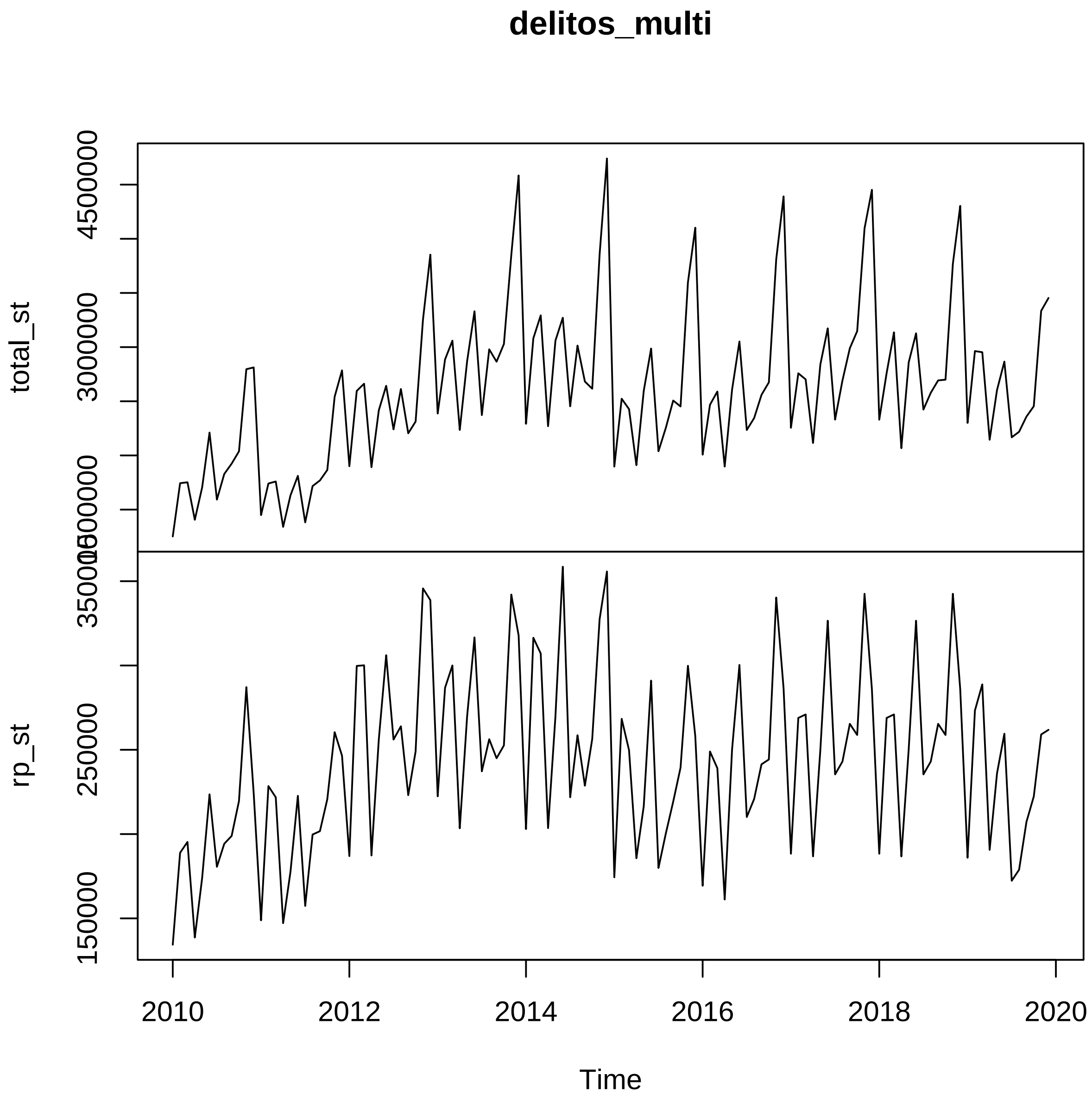
```
library(lubridate)

##
## Attaching package: 'lubridate
## The following objects are masked from 'package:base':
##
##     date, intersect, setdiff, union

library(tseries)

## Registered S3 method overwritten by 'quantmod':
##   method            from
##   as.zoo.data.frame zoo

library(forecast)
library(zoo)

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

library(ggplot2)
library(readr)
```

```
setwd("C:\\Users\\81799\\Downloads\\Pronosticos_y_series_de_tiempo\\data")
tabla_df <- read.csv("Tabla_rp.csv") #Leyendo la tabla
#Serie de tiempo de robos totales
total_st <- ts(tabla_df$totales,frequency = 12,start=c(2010,1),end=c(2019,12))
#Serie de tiempo de robos parciales
rp_st <- ts(tabla_df$Robo_pv,frequency = 12,start=c(2010,1),end=c(2019,12))
#Haciendo preguntas acerca de mi serie de tiempo
start(total_st)

## [1] 2010    1

end(total_st)

## [1] 2019   12

frequency(total_st)

## [1] 12

plot(total_st,
     col="blue", #Color de la linea
     lwd=2, #Ancho de la linea
     ylab="Total de delitos", #Leyenda en el eje y
     xlab="Tiempo (meses)", #Leyenda en el eje x
     main="Serie temporal delitos 2010-2019") #Título
```

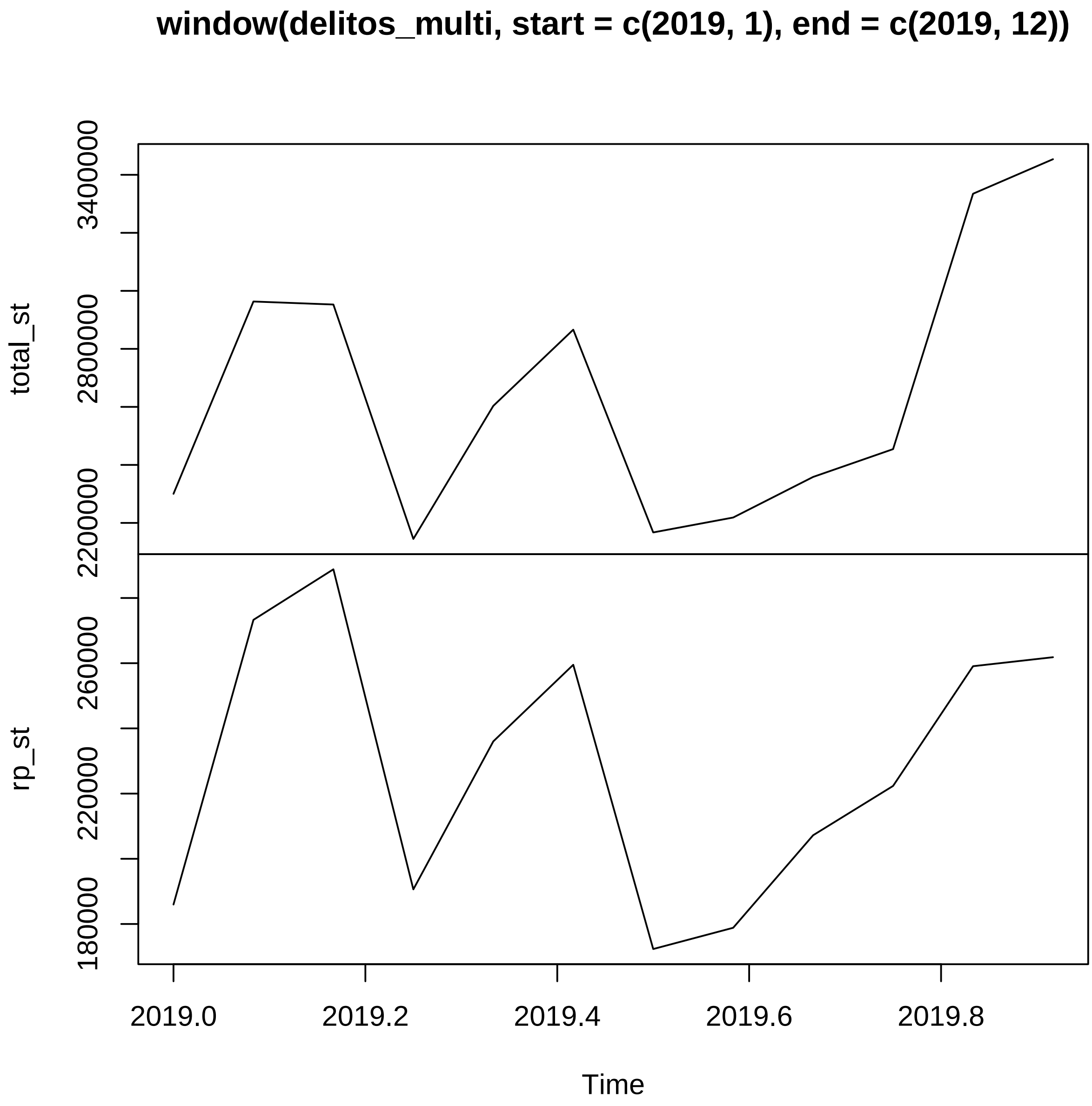


1.1. Series multi-variantes

```
delitos_multi <- cbind(total_st,rp_st) #cbin() pega tabla.
class(delitos_multi) #Notamos que dice mst (series multivariantes)

## [1] "mts"    "ts"     "matrix"

plot(delitos_multi) #Gráfica las dos gráficas
```

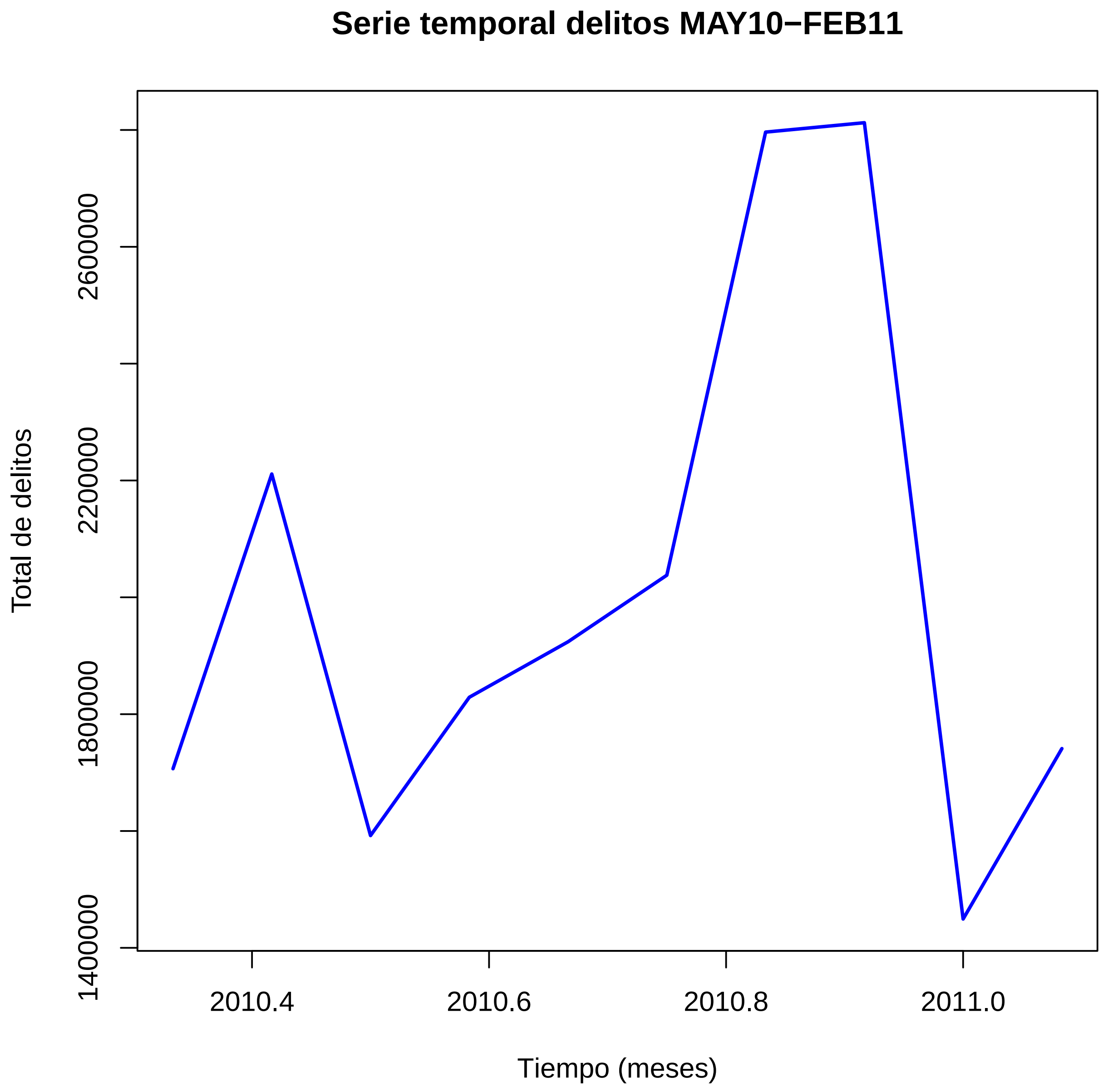


```
plot(window(delitos_multi,start=c(2019,1),end=c(2019,12))) #Es un subconjutno de delitos_multi
```



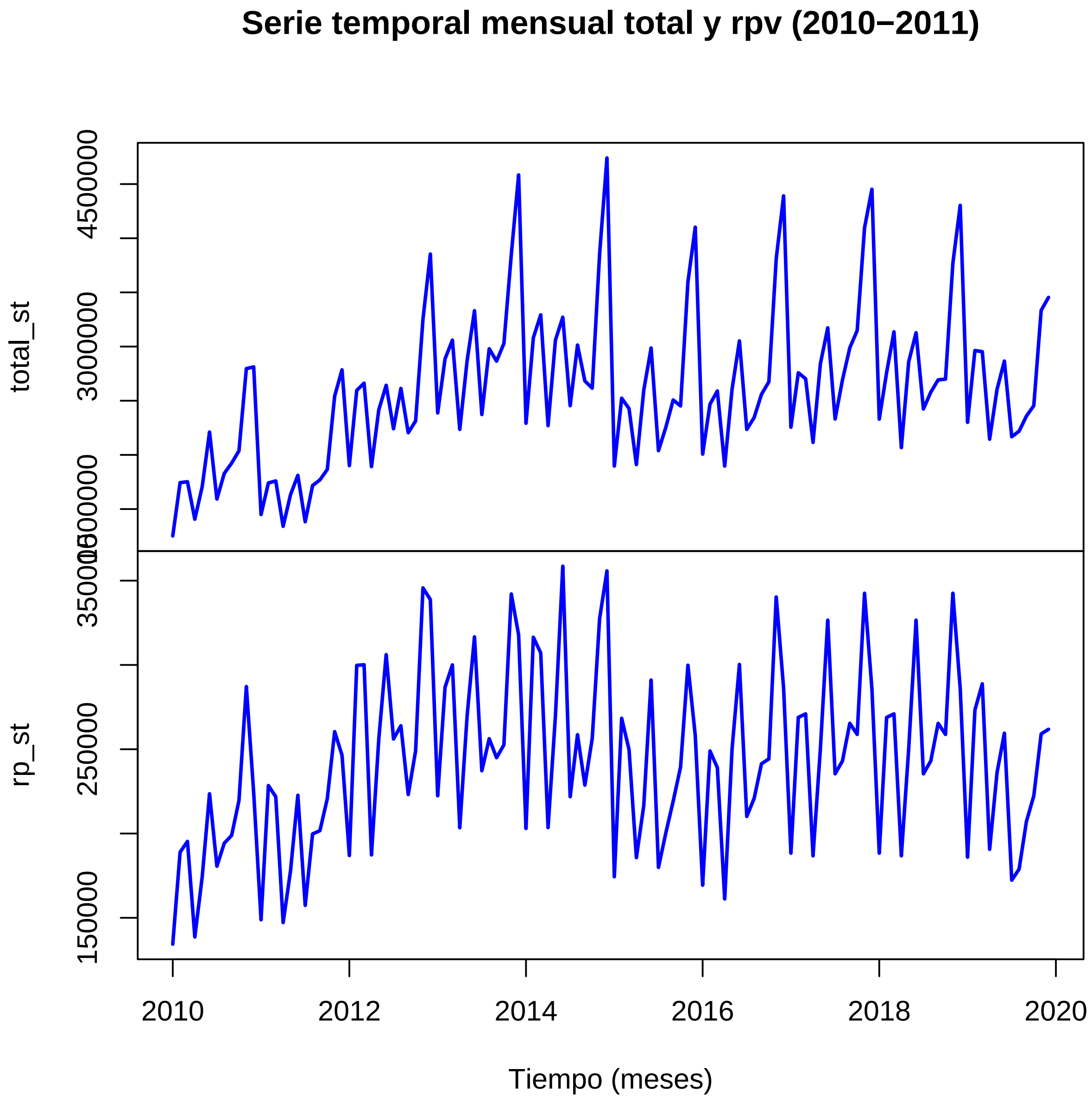
1.2. Subconjunto de la serie

```
sub_total <- total_st[5:14] #Se pide los datos desde el 5to hasta el 14
sub_total

##  [1] 1706575 2211111 1592174 1828911 1923947 2037877 2796350 2812446 1449285
## [10] 1741092

class(sub_total) #Es unvector para R (estos filtrados nos sirve para series de tiempo)

## [1] "integer"

#Para hacer filtrados en series de tiempo utilizamos lo que se llama ventanas
sub_total <- window(total_st,start=c(2010,5),end=c(2011,2))
sub_total

##            Jan     Feb Mar Apr     May     Jun     Jul     Aug     Sep     Oct
## 2010                         1706575 2211111 1592174 1828911 1923947 2037877
## 2011 1449285 1741092
##          Nov     Dec
## 2010 2796350 2812446
## 2011

class(sub_total) #Conserva la clase de serie de tiempo con window

## [1] "ts"

plot(sub_total,
     col="blue", #Color de laa linea
     lwd=2, #Tamaño de la linea
     ylab="Total de delitos", #Leyenda en el eje y
     xlab="Tiempo (meses)", #Leyenda en el eje x
     main="Serie temporal delitos MAY10-FEB11") #Título de la gráfica
```



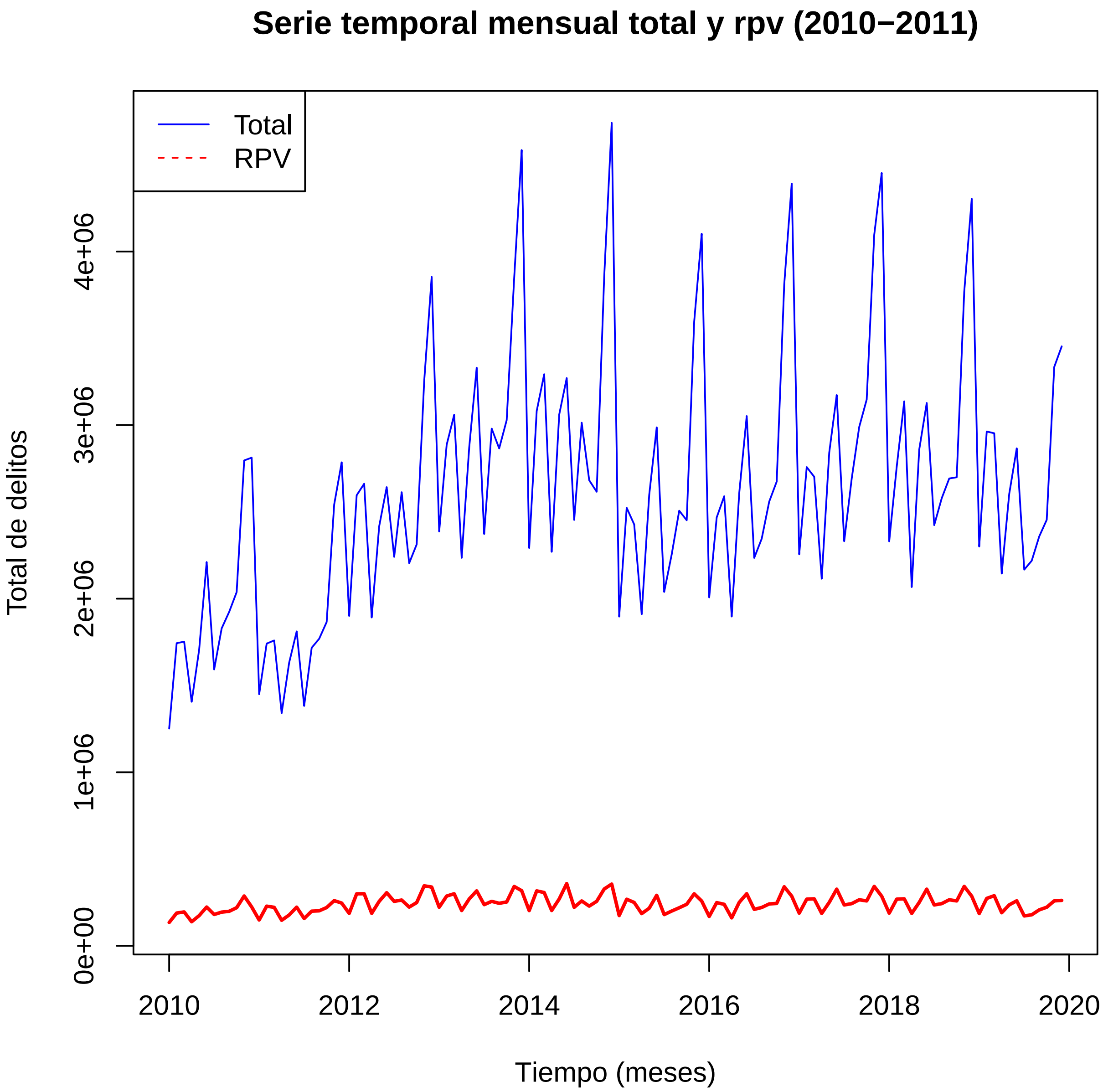
1.3. Plot multivariante en gráficos diferentes.

```
plot(delitos_multi,
     col="blue", #El color de la linea
     lwd=2, #Tamaño de la linea
     ylab="Total de delitos", #Leyenda en el eje y
     xlab="Tiempo (meses)", #Leyenda en el eje x
     main="Serie temporal mensual total y rpv (2010-2011)")
```



1.4. Plot multivariante en el mismo gráfico.

```
#plot.type ="single"-> Es para decir que gráfique las 2 en la misma
plot(delitos_multi,plot.type = "single",
     col=c("blue","red"), #Color de cada gráafico
     lwd=1:2, #controla los grosores
     lty=1:1, #controla el tipo de linea (1 continua, 2 discontinua)
     ylab="Total de delitos",
     xlab="Tiempo (meses)",
     main="Serie temporal mensual total y rpv (2010-2011)")
legend(x="topleft",legend=c("Total","RPV"),col=c("blue","red"),lty=1:2)
```



1.5. ZOO

Los objetos zoo, son series de tiempo con cierta ventajas, como el uso de fecgas como nombres de las filas. Esta librería pone como índice las fechas.

```
#seq() -> Sirve para hacer secuencias.
seq(1,10,2)

## [1] 1 3 5 7 9

tiempo <- seq(as.Date("2010/1/1"),as.Date("2019/12/1"),"months") #"months" -> mensualmente
tiempo
```

```
##   [1] "2010-01-01" "2010-02-01" "2010-03-01" "2010-04-01" "2010-05-01"
##   [6] "2010-06-01" "2010-07-01" "2010-08-01" "2010-09-01" "2010-10-01"
##  [11] "2010-11-01" "2010-12-01" "2011-01-01" "2011-02-01" "2011-03-01"
##  [16] "2011-04-01" "2011-05-01" "2011-06-01" "2011-07-01" "2011-08-01"
##  [21] "2011-09-01" "2011-10-01" "2011-11-01" "2011-12-01" "2012-01-01"
##  [26] "2012-02-01" "2012-03-01" "2012-04-01" "2012-05-01" "2012-06-01"
##  [31] "2012-07-01" "2012-08-01" "2012-09-01" "2012-10-01" "2012-11-01"
##  [36] "2012-12-01" "2013-01-01" "2013-02-01" "2013-03-01" "2013-04-01"
##  [41] "2013-05-01" "2013-06-01" "2013-07-01" "2013-08-01" "2013-09-01"
##  [46] "2013-10-01" "2013-11-01" "2013-12-01" "2014-01-01" "2014-02-01"
##  [51] "2014-03-01" "2014-04-01" "2014-05-01" "2014-06-01" "2014-07-01"
##  [56] "2014-08-01" "2014-09-01" "2014-10-01" "2014-11-01" "2014-12-01"
##  [61] "2015-01-01" "2015-02-01" "2015-03-01" "2015-04-01" "2015-05-01"
##  [66] "2015-06-01" "2015-07-01" "2015-08-01" "2015-09-01" "2015-10-01"
##  [71] "2015-11-01" "2015-12-01" "2016-01-01" "2016-02-01" "2016-03-01"
##  [76] "2016-04-01" "2016-05-01" "2016-06-01" "2016-07-01" "2016-08-01"
##  [81] "2016-09-01" "2016-10-01" "2016-11-01" "2016-12-01" "2017-01-01"
##  [86] "2017-02-01" "2017-03-01" "2017-04-01" "2017-05-01" "2017-06-01"
##  [91] "2017-07-01" "2017-08-01" "2017-09-01" "2017-10-01" "2017-11-01"
##  [96] "2017-12-01" "2018-01-01" "2018-02-01" "2018-03-01" "2018-04-01"
## [101] "2018-05-01" "2018-06-01" "2018-07-01" "2018-08-01" "2018-09-01"
## [106] "2018-10-01" "2018-11-01" "2018-12-01" "2019-01-01" "2019-02-01"
## [111] "2019-03-01" "2019-04-01" "2019-05-01" "2019-06-01" "2019-07-01"
## [116] "2019-08-01" "2019-09-01" "2019-10-01" "2019-11-01" "2019-12-01"

class(tiempo)

## [1] "Date"

head(tiempo)

## [1] "2010-01-01" "2010-02-01" "2010-03-01" "2010-04-01" "2010-05-01"
## [6] "2010-06-01"
```

1.5.1. Combinar el índice con la serie de tiempo

```
total_zoo <- zoo(x=tabla_df$totales,order.by = tiempo) #Los ordeno con el tiempo que hice
rp_zoo <- zoo(x=tabla_df$Robo_pv,order.by = tiempo) #Ordeno con el tiempo que hice
class(total_zoo)

## [1] "zoo"

str(total_zoo) #Es la estructura de total_zoo

## 'zoo' series from 2010-01-01 to 2019-12-01
##   Data: int [1:120] 1251731 1743703 1752245 1406049 1706575 2211111 1592174 1828911 1923947 2
##   Index:  Date[1:120], format: "2010-01-01" "2010-02-01" "2010-03-01" "2010-04-01" "2010-05-0

head(total_zoo)

## 2010-01-01 2010-02-01 2010-03-01 2010-04-01 2010-05-01 2010-06-01
##    1251731    1743703    1752245    1406049    1706575    2211111
```

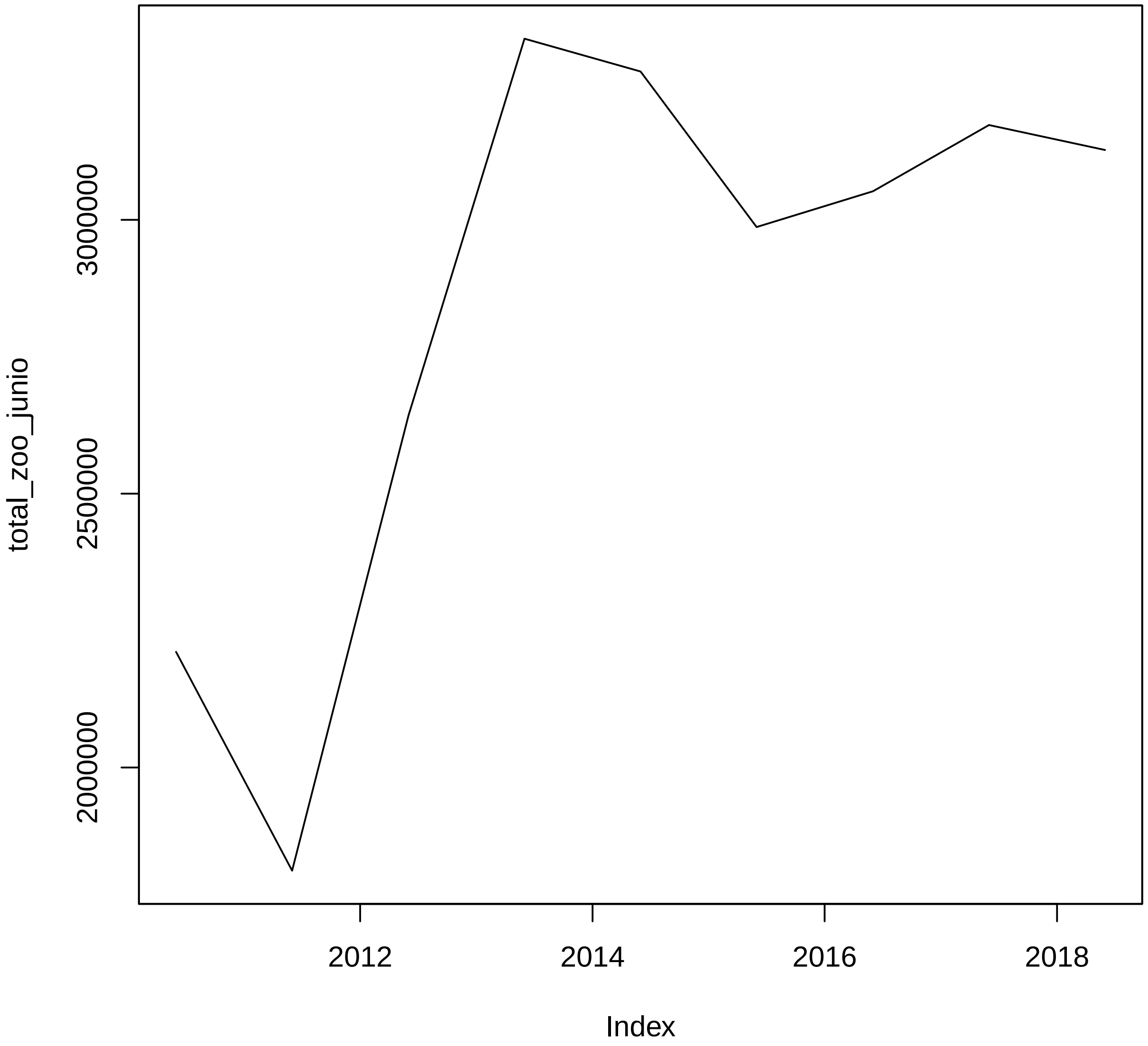
1.5.2. Extraer el índice de tiempo y los datos

```
index(total_zoo)  #devuelve las fechas (los índices)

##   [1] "2010-01-01" "2010-02-01" "2010-03-01" "2010-04-01" "2010-05-01"
##   [6] "2010-06-01" "2010-07-01" "2010-08-01" "2010-09-01" "2010-10-01"
##  [11] "2010-11-01" "2010-12-01" "2011-01-01" "2011-02-01" "2011-03-01"
##  [16] "2011-04-01" "2011-05-01" "2011-06-01" "2011-07-01" "2011-08-01"
##  [21] "2011-09-01" "2011-10-01" "2011-11-01" "2011-12-01" "2012-01-01"
##  [26] "2012-02-01" "2012-03-01" "2012-04-01" "2012-05-01" "2012-06-01"
##  [31] "2012-07-01" "2012-08-01" "2012-09-01" "2012-10-01" "2012-11-01"
##  [36] "2012-12-01" "2013-01-01" "2013-02-01" "2013-03-01" "2013-04-01"
##  [41] "2013-05-01" "2013-06-01" "2013-07-01" "2013-08-01" "2013-09-01"
##  [46] "2013-10-01" "2013-11-01" "2013-12-01" "2014-01-01" "2014-02-01"
##  [51] "2014-03-01" "2014-04-01" "2014-05-01" "2014-06-01" "2014-07-01"
##  [56] "2014-08-01" "2014-09-01" "2014-10-01" "2014-11-01" "2014-12-01"
##  [61] "2015-01-01" "2015-02-01" "2015-03-01" "2015-04-01" "2015-05-01"
##  [66] "2015-06-01" "2015-07-01" "2015-08-01" "2015-09-01" "2015-10-01"
##  [71] "2015-11-01" "2015-12-01" "2016-01-01" "2016-02-01" "2016-03-01"
##  [76] "2016-04-01" "2016-05-01" "2016-06-01" "2016-07-01" "2016-08-01"
##  [81] "2016-09-01" "2016-10-01" "2016-11-01" "2016-12-01" "2017-01-01"
##  [86] "2017-02-01" "2017-03-01" "2017-04-01" "2017-05-01" "2017-06-01"
##  [91] "2017-07-01" "2017-08-01" "2017-09-01" "2017-10-01" "2017-11-01"
##  [96] "2017-12-01" "2018-01-01" "2018-02-01" "2018-03-01" "2018-04-01"
## [101] "2018-05-01" "2018-06-01" "2018-07-01" "2018-08-01" "2018-09-01"
## [106] "2018-10-01" "2018-11-01" "2018-12-01" "2019-01-01" "2019-02-01"
## [111] "2019-03-01" "2019-04-01" "2019-05-01" "2019-06-01" "2019-07-01"
## [116] "2019-08-01" "2019-09-01" "2019-10-01" "2019-11-01" "2019-12-01"

coredata(total_zoo) #devuelve los datos

##   [1] 1251731 1743703 1752245 1406049 1706575 2211111 1592174 1828911 1923947
##  [10] 2037877 2796350 2812446 1449285 1741092 1759424 1340514 1631596 1811656
##  [19] 1382100 1717107 1768995 1865606 2542044 2785469 1900578 2595733 2662186
##  [28] 1891696 2416640 2642589 2240921 2613253 2204692 2312757 3252110 3853923
##  [37] 2386909 2886517 3059545 2235361 2870411 3330756 2372528 2979576 2865489
##  [46] 3028699 3848295 4584589 2292100 3081231 3293042 2269956 3060267 3270875
##  [55] 2453790 3014002 2682240 2615913 3854426 4741254 1896804 2523387 2427545
##  [64] 1910385 2596897 2986831 2038857 2254645 2506843 2451868 3596627 4102388
##  [73] 2007182 2467860 2590173 1897141 2606136 3052136 2234930 2345073 2559188
##  [82] 2674830 3809736 4391401 2255291 2758080 2702202 2114864 2840673 3173103
##  [91] 2331001 2692241 2989031 3147699 4095794 4452186 2330040 2760036 3136834
## [100] 2066958 2858765 3127512 2423601 2578603 2692431 2699435 3767985 4303854
## [109] 2300309 2963248 2952823 2144817 2603445 2866092 2167232 2218609 2358476
## [118] 2454378 3334720 3453767

start(total_zoo) #Nos da la fecha de inicio de la serie

## [1] "2010-01-01"

end(total_zoo)  #Nos da la fecha final de la serie

## [1] "2019-12-01"
```

1.5.3. Extraer subconjunto indexado por fechas

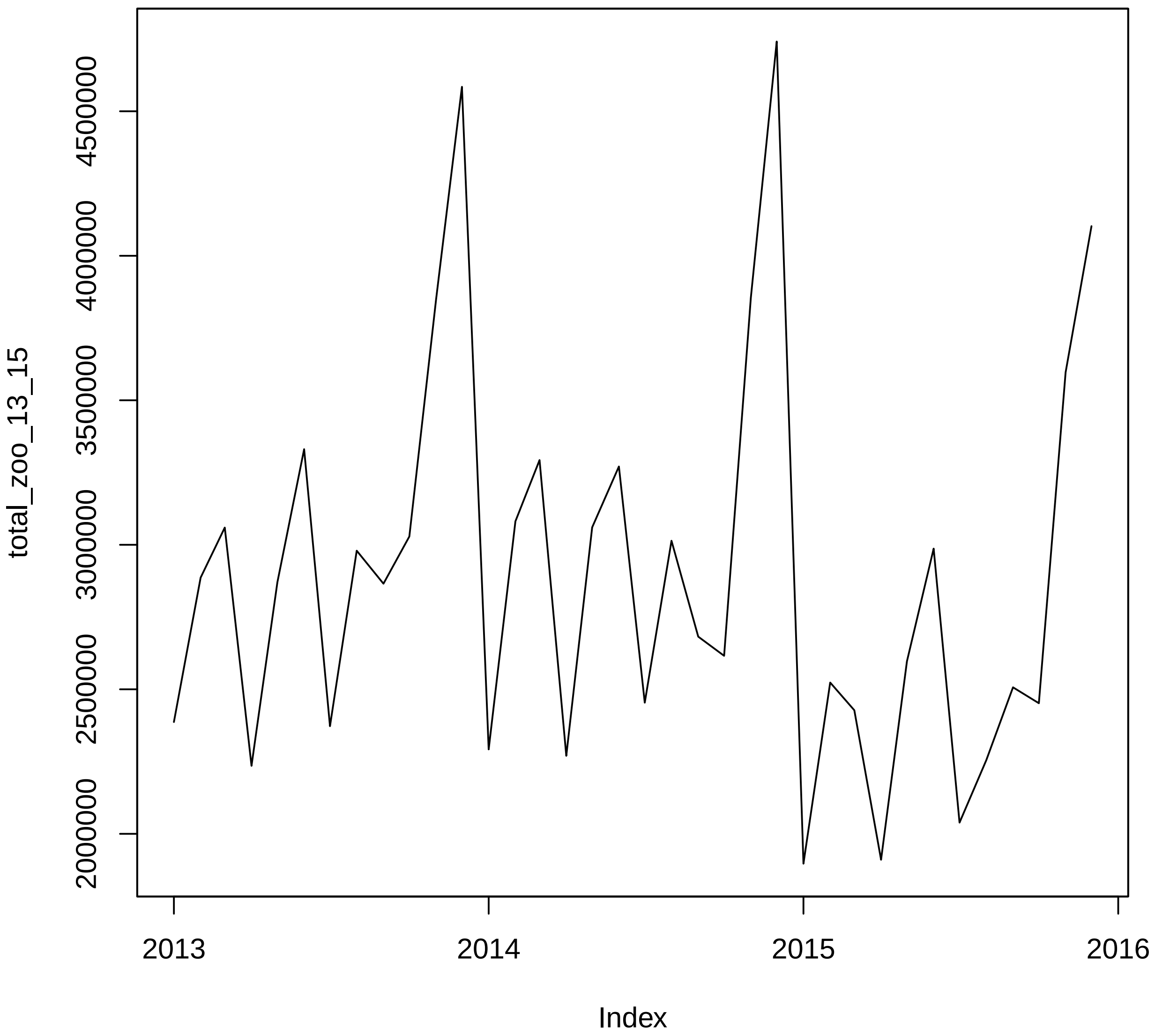
Una diferencia entre la librería zoo y ts, es que en está última no se puede extraer un subconjunto indexado por fechas.

```
#Me quedo con el 1er día de junio desde el año 2010 hasta 2018
total_zoo_junio <- total_zoo[as.Date(c("2010/06/01",
                                       "2011/06/01",
                                       "2012/06/01",
                                       "2013/06/01",
                                       "2014/06/01",
                                       "2015/06/01",
                                       "2016/06/01",
                                       "2017/06/01",
                                       "2018/06/01",
                                       "2018/06/01"))]
plot(total_zoo_junio)
```



Ventanas

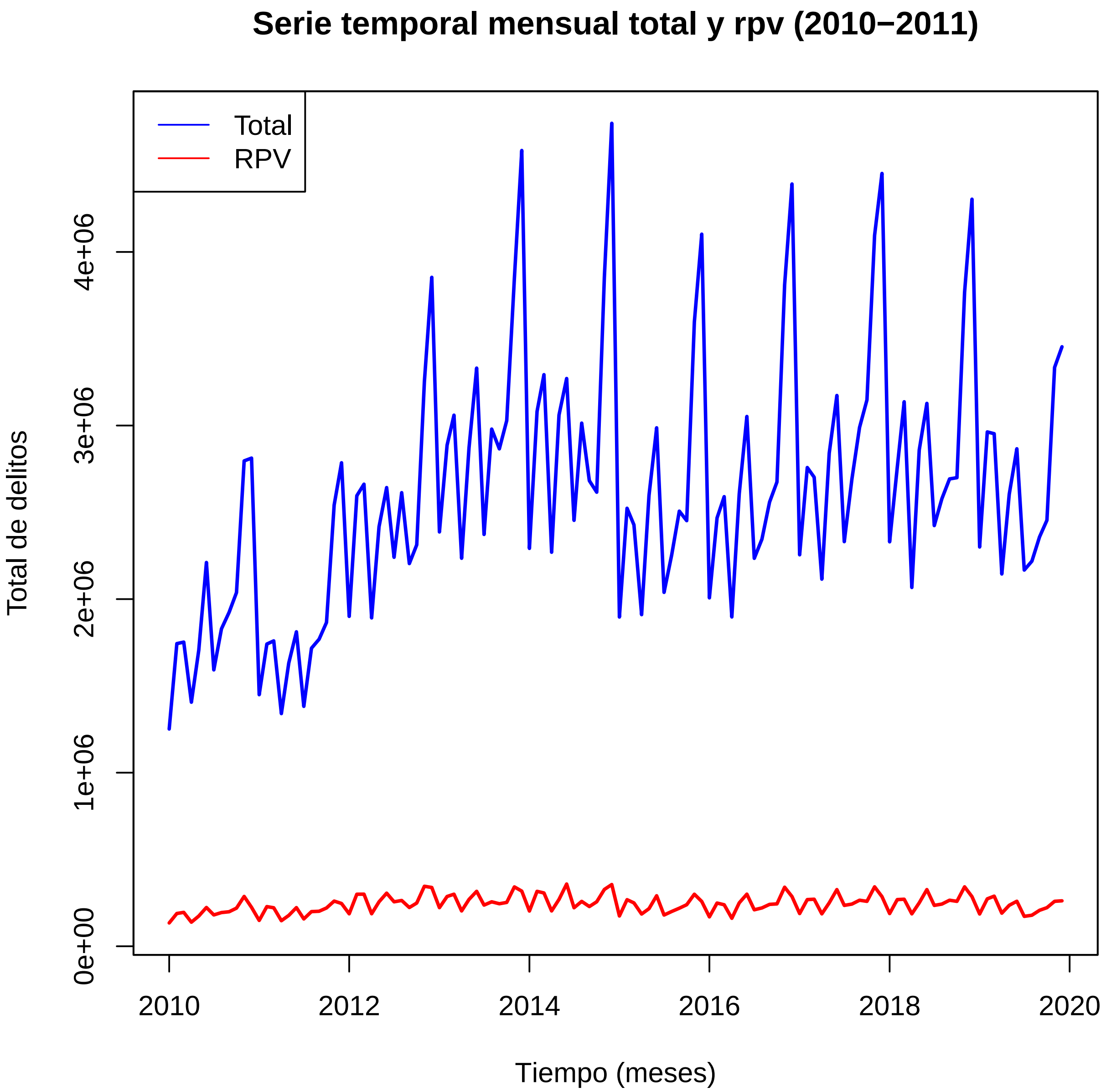
```
total_zoo_13_15 <- window(total_zoo,start=as.Date("2013/01/01"),end=as.Date("2015/12/1")) #Me q
total_zoo_13_15

## 2013-01-01 2013-02-01 2013-03-01 2013-04-01 2013-05-01 2013-06-01 2013-07-01
##    2386909    2886517    3059545    2235361    2870411    3330756    2372528
## 2013-08-01 2013-09-01 2013-10-01 2013-11-01 2013-12-01 2014-01-01 2014-02-01
##    2979576    2865489    3028699    3848295    4584589    2292100    3081231
## 2014-03-01 2014-04-01 2014-05-01 2014-06-01 2014-07-01 2014-08-01 2014-09-01
##    3293042    2269956    3060267    3270875    2453790    3014002    2682240
## 2014-10-01 2014-11-01 2014-12-01 2015-01-01 2015-02-01 2015-03-01 2015-04-01
##    2615913    3854426    4741254    1896804    2523387    2427545    1910385
## 2015-05-01 2015-06-01 2015-07-01 2015-08-01 2015-09-01 2015-10-01 2015-11-01
##    2596897    2986831    2038857    2254645    2506843    2451868    3596627
## 2015-12-01
##    4102388

plot(total_zoo_13_15)
```



1.5.4. Combinando series

```
delitos_multi_zoo <- cbind(total_zoo,rp_zoo)
class(delitos_multi_zoo)

## [1] "zoo"

head(delitos_multi_zoo)

##            total_zoo rp_zoo
## 2010-01-01   1251731 134364
## 2010-02-01   1743703 188933
## 2010-03-01   1752245 195342
## 2010-04-01   1406049 138640
## 2010-05-01   1706575 174195
## 2010-06-01   2211111 223569
```

```r
plot(delitos_multi_zoo,plot.type = "single",
     col=c("blue","red"),
     lwd=2:2,
     lty = 1:1,
     ylab="Total de delitos",
     xlab="Tiempo (meses)",
     main="Serie temporal mensual total y rpv (2010-2011)")
legend(x="topleft",legend=c("Total","RPV"),col=c("blue","red"),lty=1:1)
```



1.6. Graficador dygraphs

```r
#library(dygraphs)
#library(webshot)
#dygraph(total_zoo,main="Serie temporal mensual total (2010-2019)")
#dygraph(delitos_multi_zoo,main="Serie temporal mensual total (2010-2019)")
```