

Time series Tv Viewership

Installing the packages and loading the data

```
library(forecast)
```

```
## Warning: package 'forecast' was built under R version 3.4.4
```

```
library(ggplot2)
```

```
tv <- read.csv("TV_by_network_daypart.csv")
```

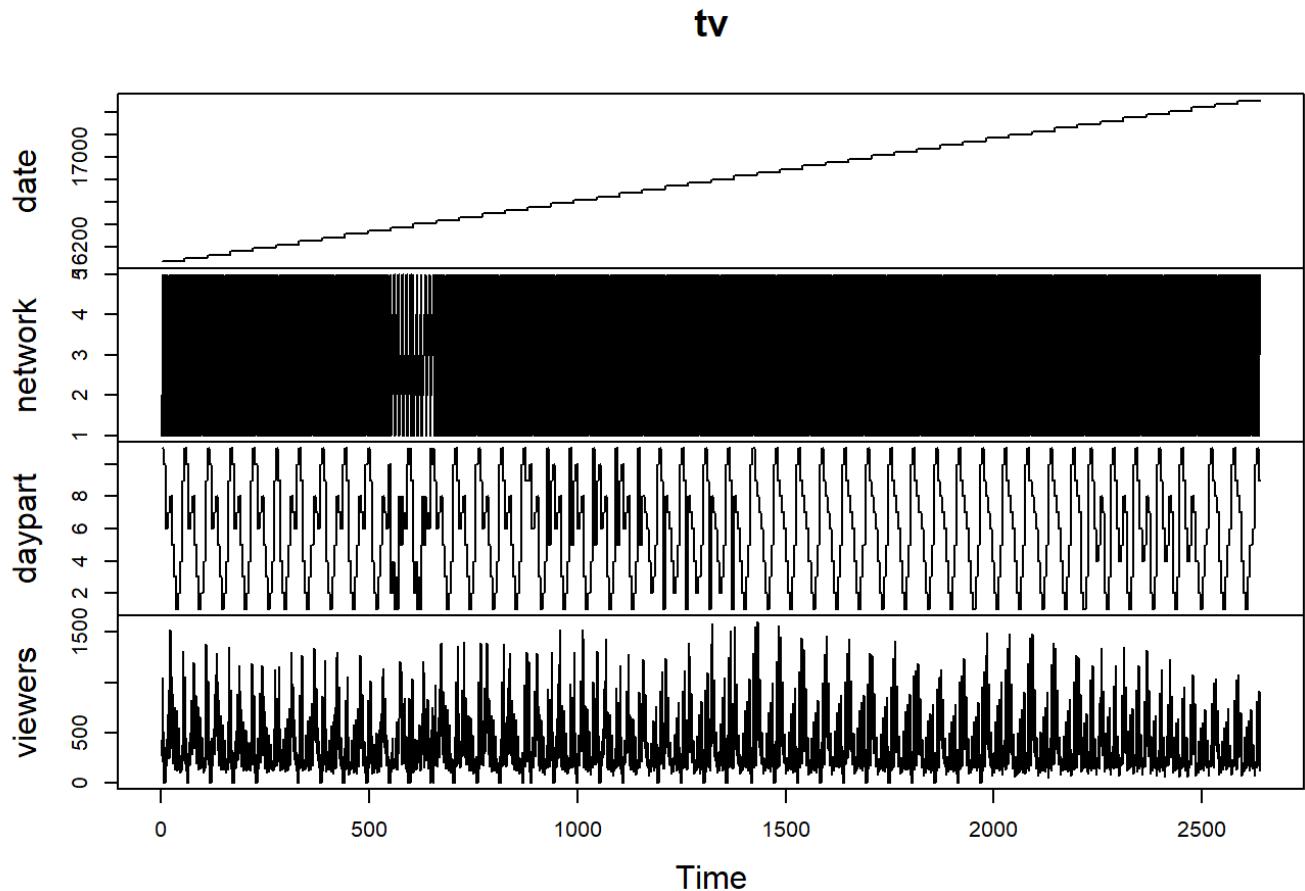
Let us convert data into a proper format

```
tvf <- sub('(\.{4})(.{2})','\\1-\\2', tv$date)
tvf <- as.Date(paste0(tvf, "-01"), "%Y-%m-%d")
tv$date <- tvf
```

Let us split data based on the network type and daypart

```
out <- split(tv, list(tv$network, tv$daypart))

plot.ts(tv)
```



```
for (i in 1:length(out)) {
  assign(paste0("tv_ts", i), as.data.frame(out[[i]]))
}
```

We create a function which gives us insights about the 55 time series created based on network type and daypart

```

traintest <- function(a)
{
  temp <- a
  train <- subset(temp, temp$date < "2017-01-01" & temp$date >= "2013-01-01")
  test <- subset(temp, temp$date >= "2017-01-01")

  timeseries <- ts(train$viewers, start = 2014-01-01 ,frequency = 12)
  timeseries1 <- ts(test$viewers, start = 2017-01-01 ,frequency = 12)

  plot.ts(timeseries)
  ts_stl <- stl(timeseries, s.window = "period")
  plot(ts_stl)
  ts_acf <- acf(timeseries)
  ts_pacf <- pacf(timeseries)

  ts_decompose = decompose(timeseries, "additive")
  #autoplot(ts_decompose) + theme_minimal()
  plot(ts_decompose)

  par(mfrow = c(1,1))
  ts_Hw <- HoltWinters(timeseries)
  ts_forecast <- forecast(ts_Hw, h =12)
  #autoplot(ts_forecast) + theme_minimal()
  plot(ts_forecast)
  lines(timeseries1, col = 'red')

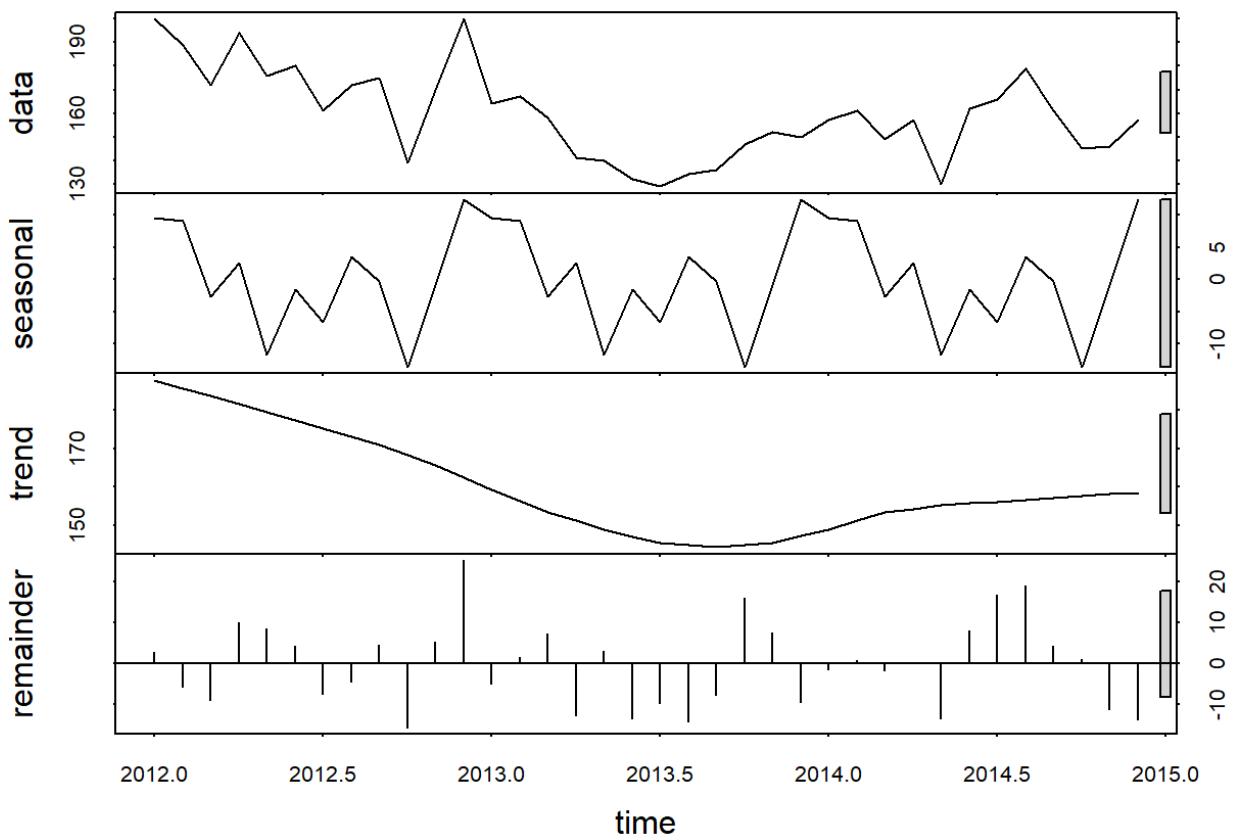
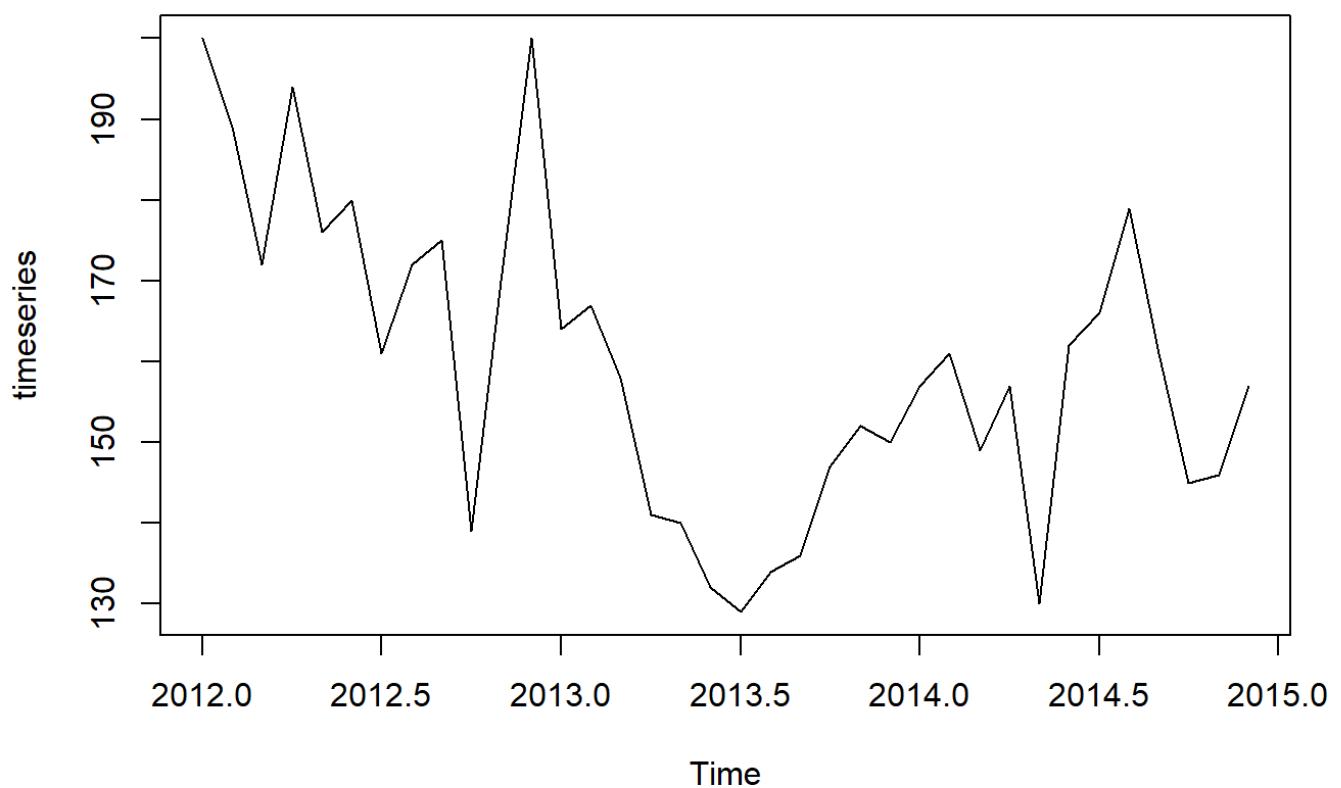
  mean(abs(test$viewers - ts_forecast$mean ))
}

}

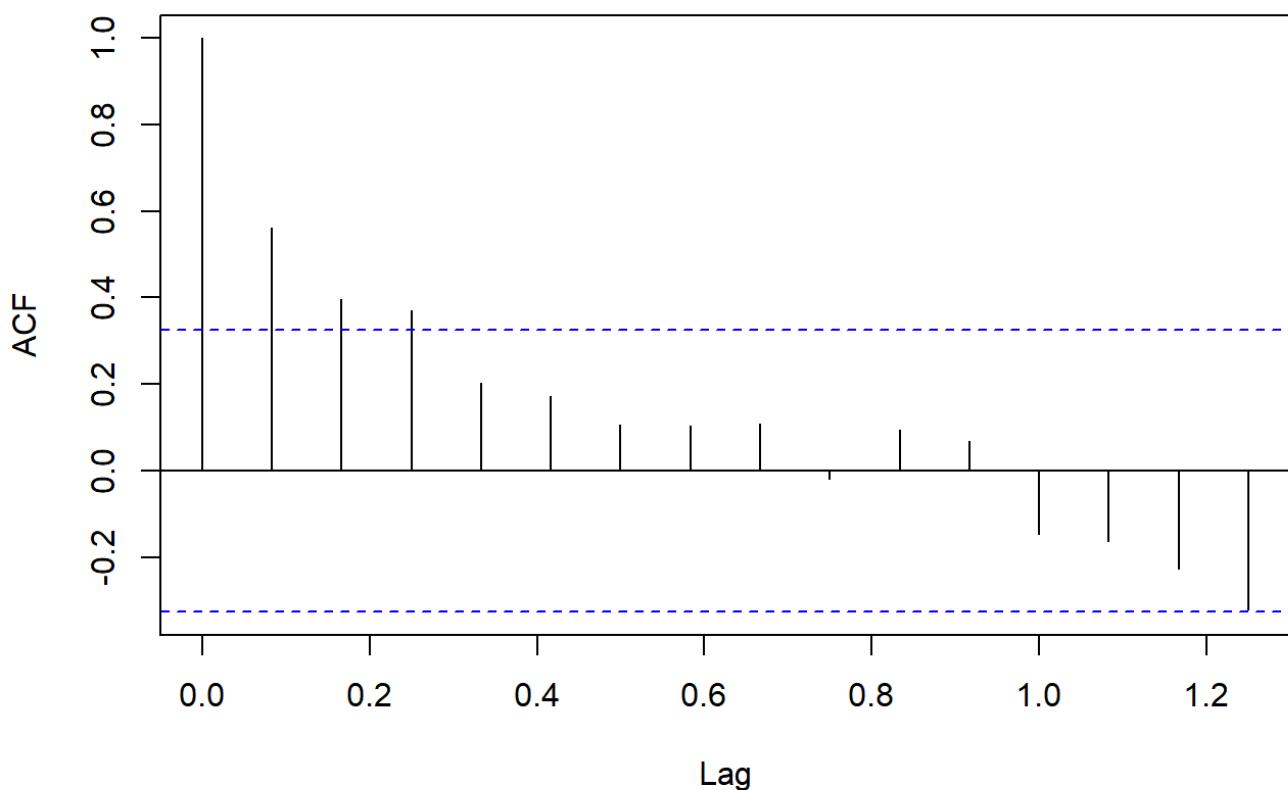
```

We call the function for all the 55 time series

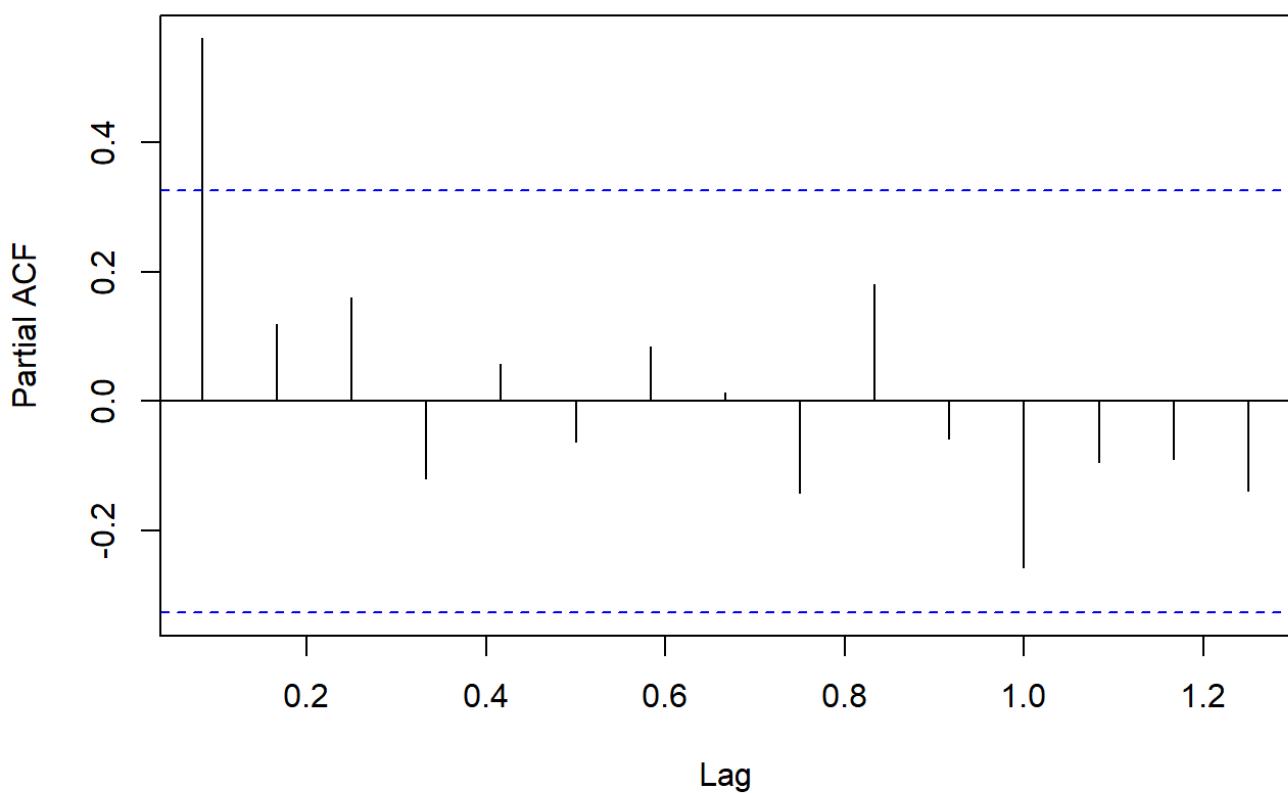
```
traintest(tv_ts1)
```



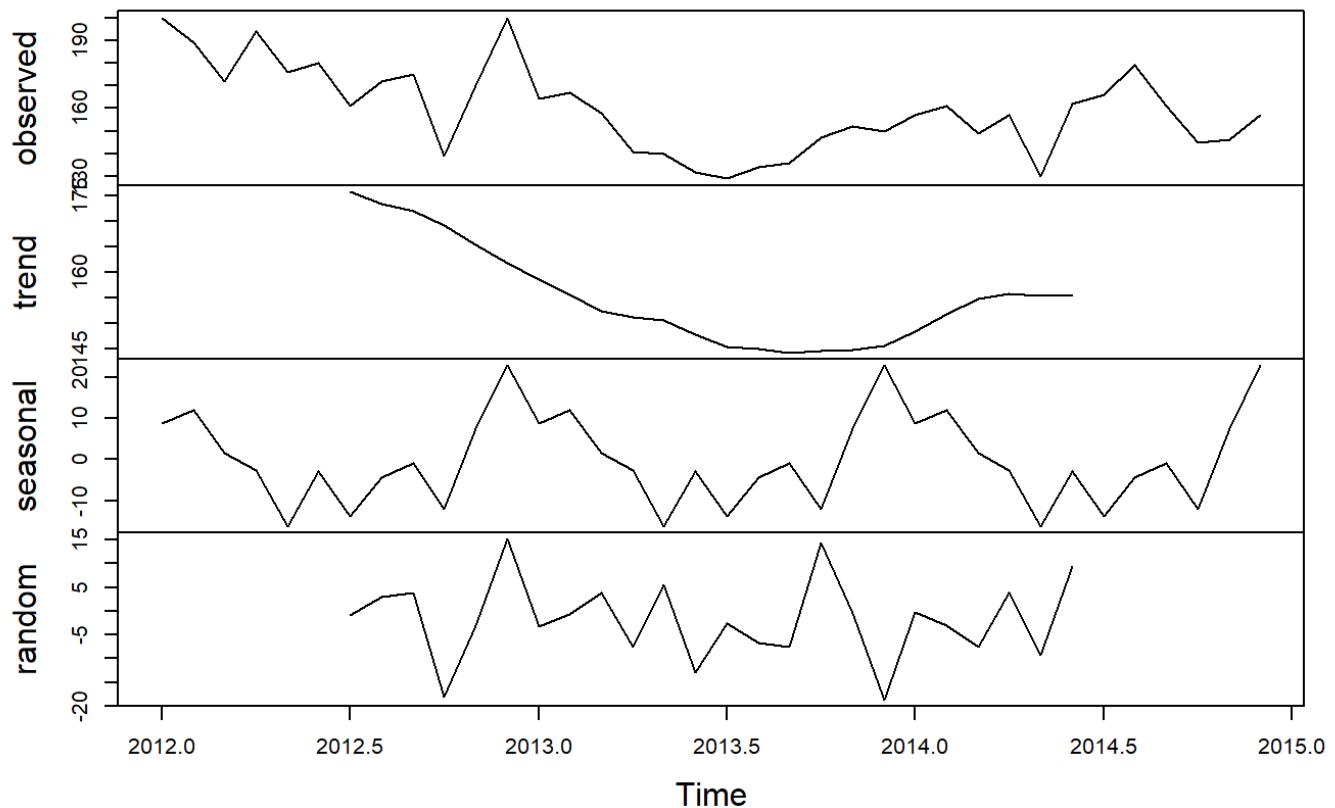
Series timeseries



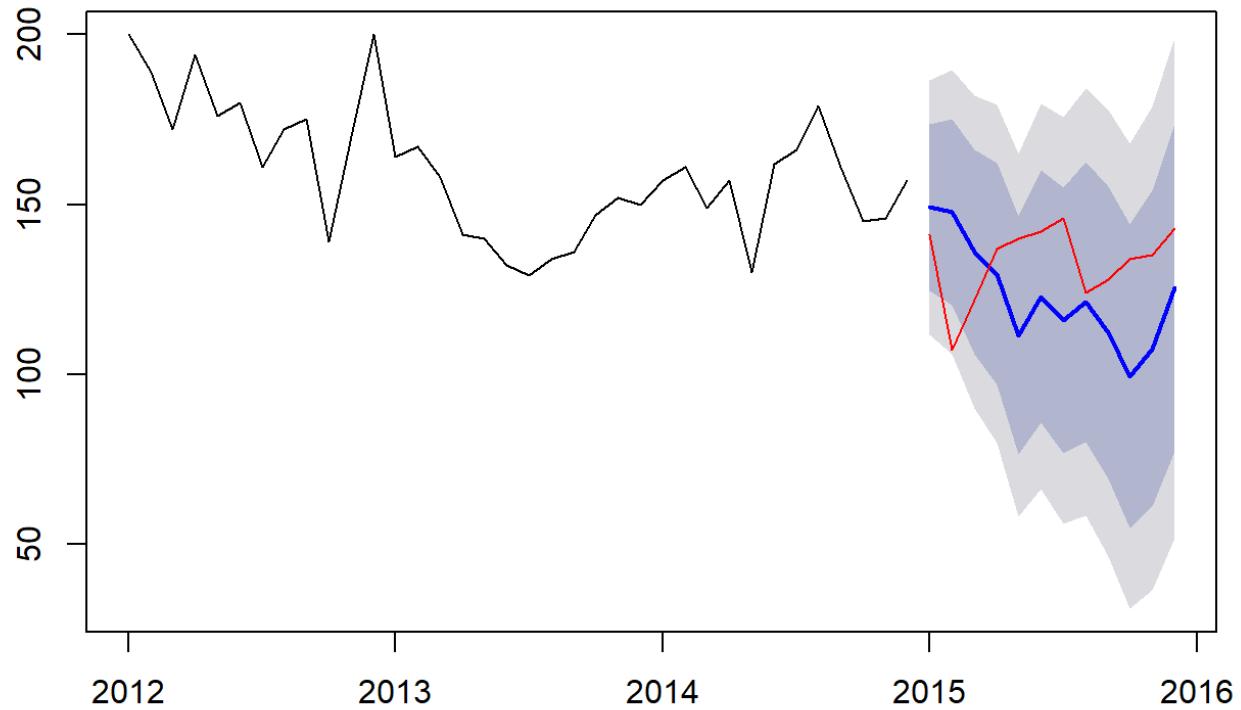
Series timeseries



Decomposition of additive time series

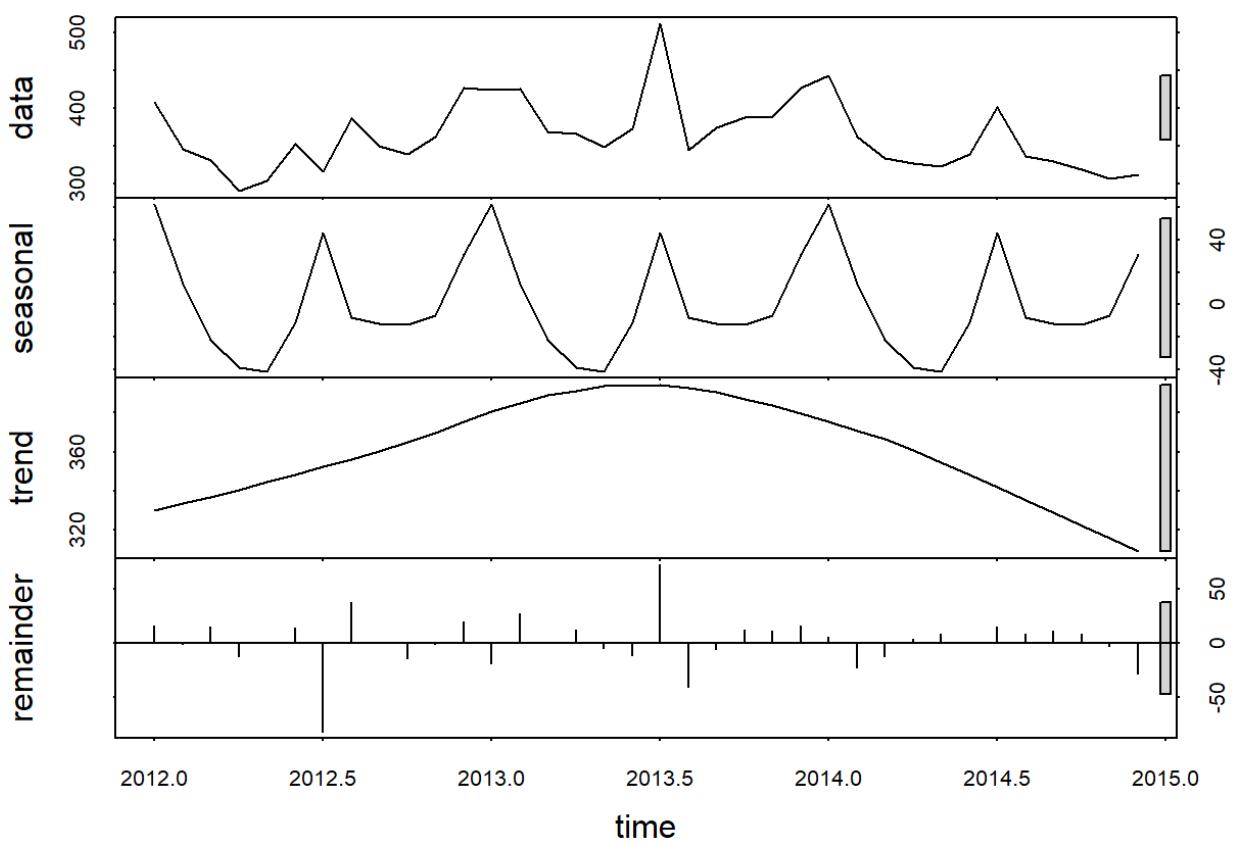
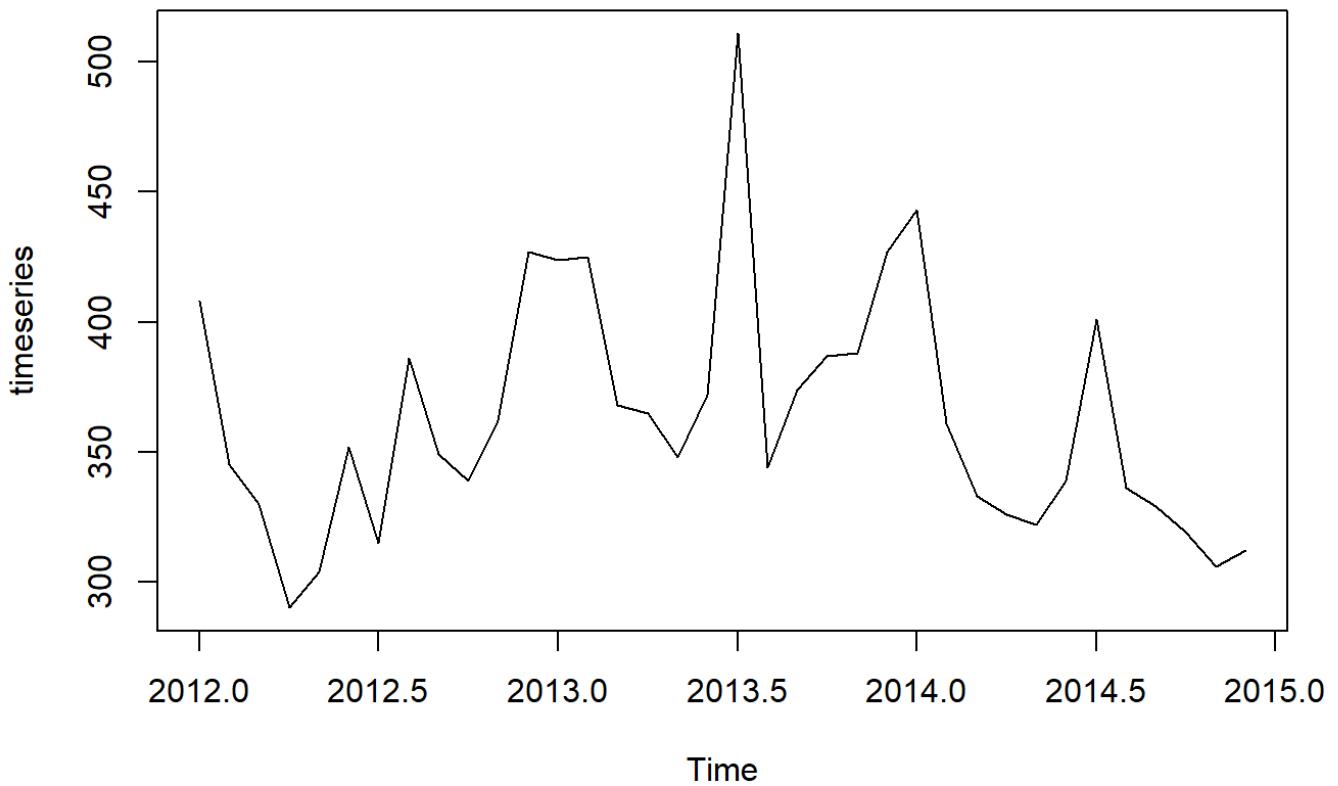


Forecasts from HoltWinters

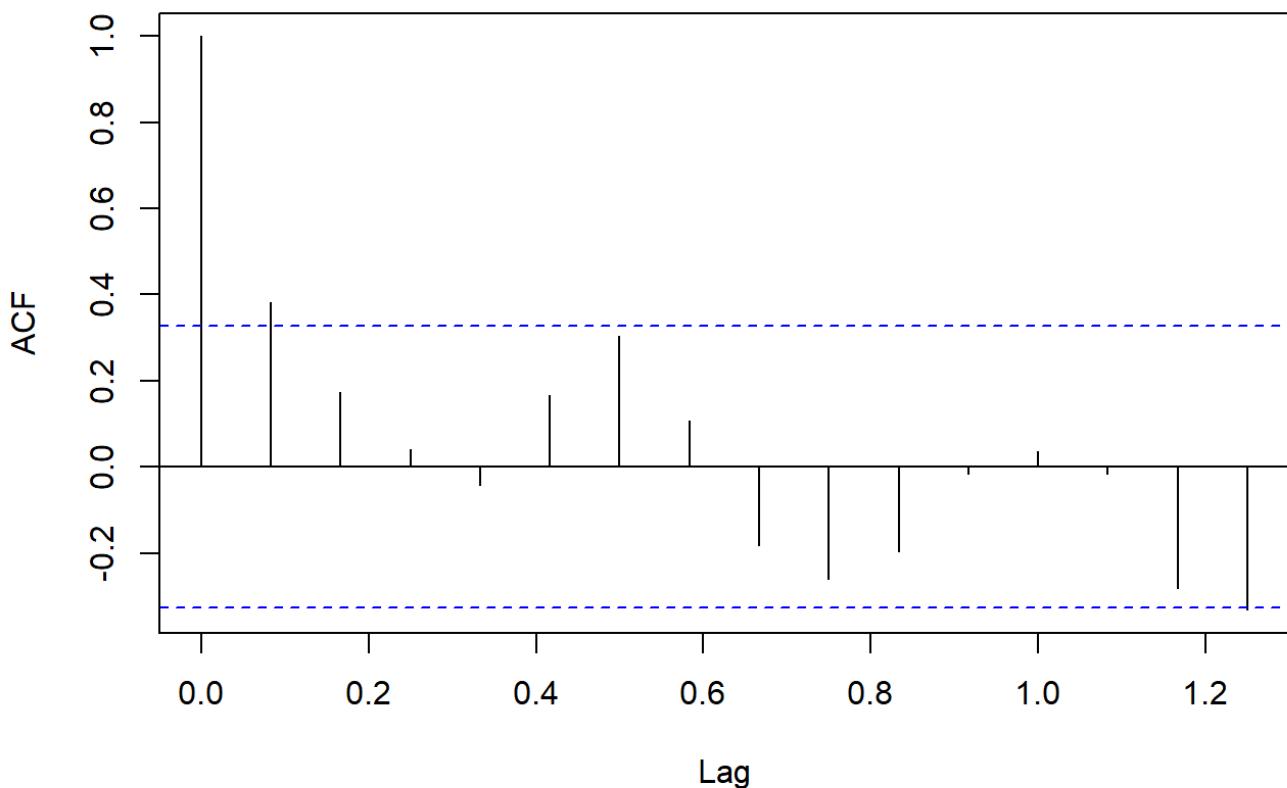


```
## [1] 20.52022
```

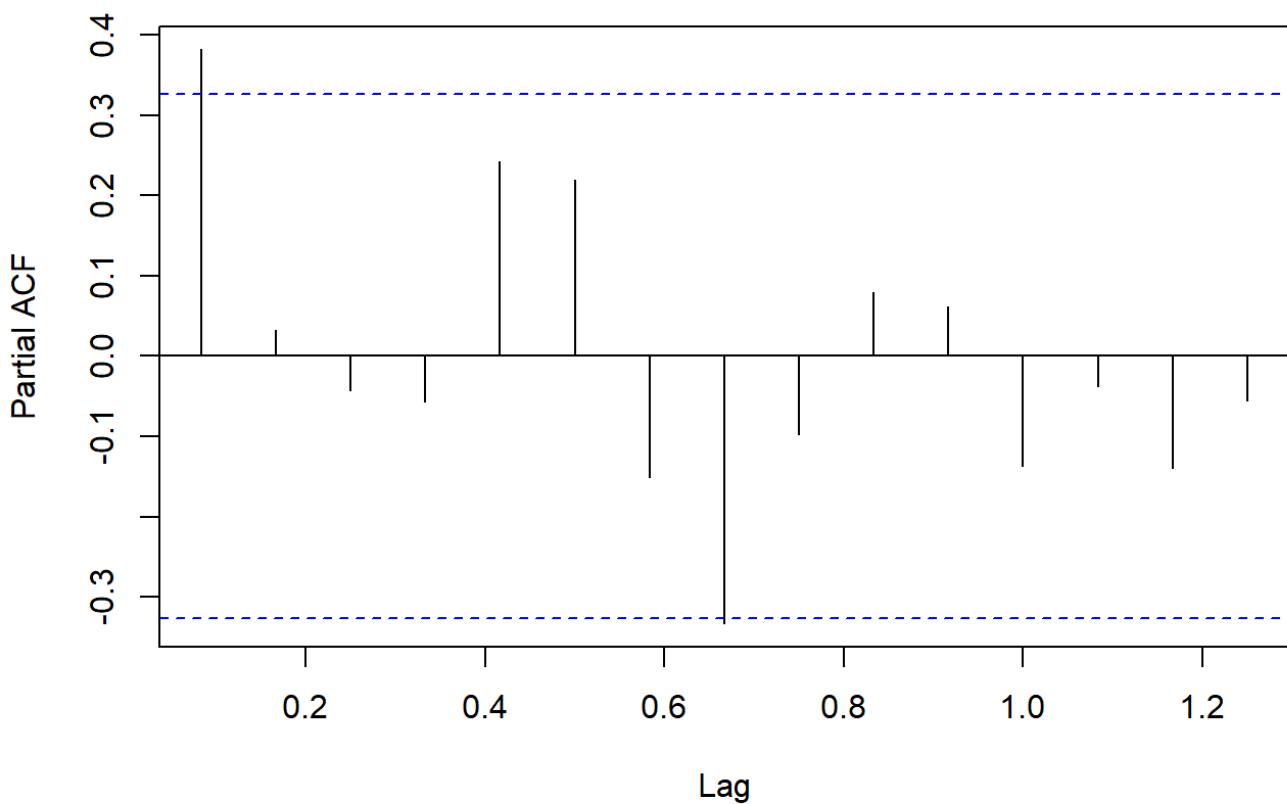
```
traintest(tv_ts2)
```



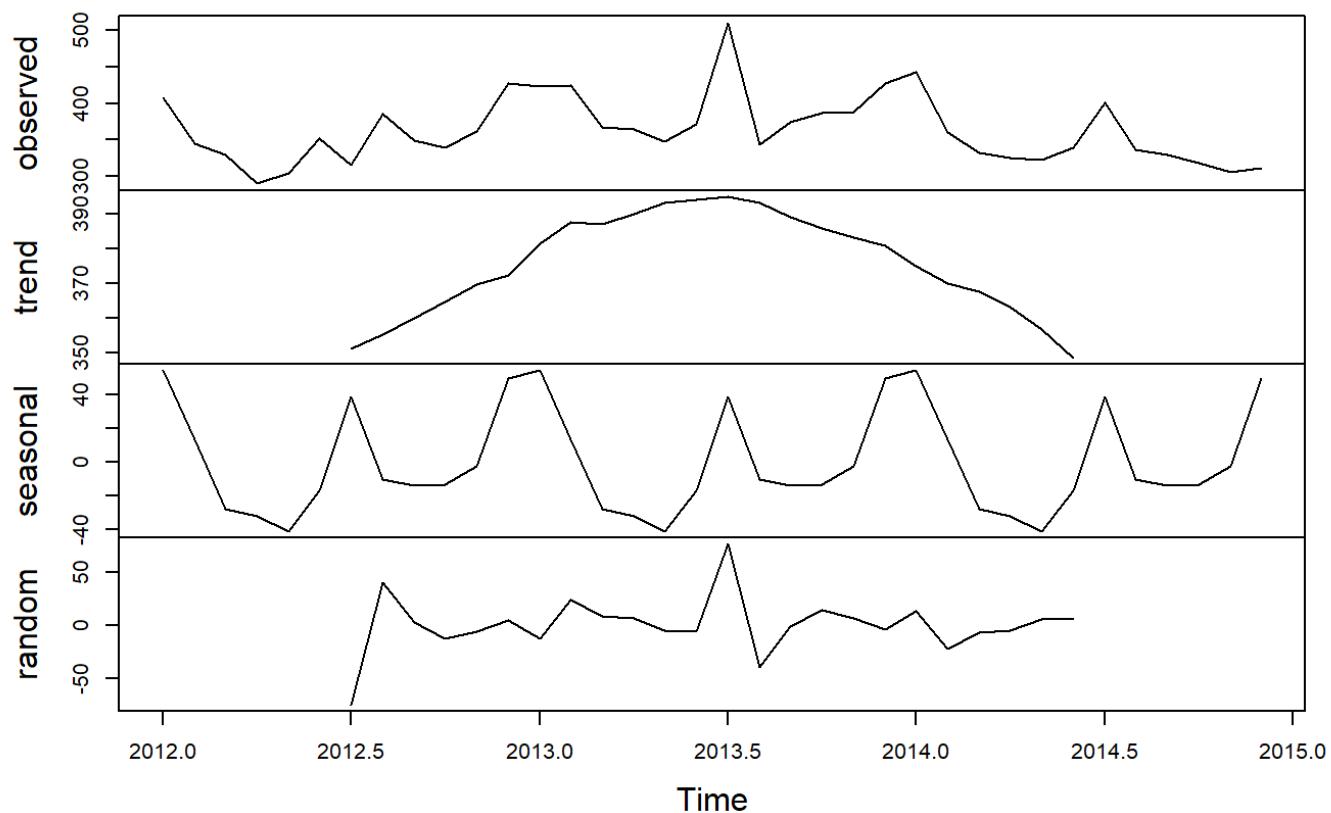
Series timeseries



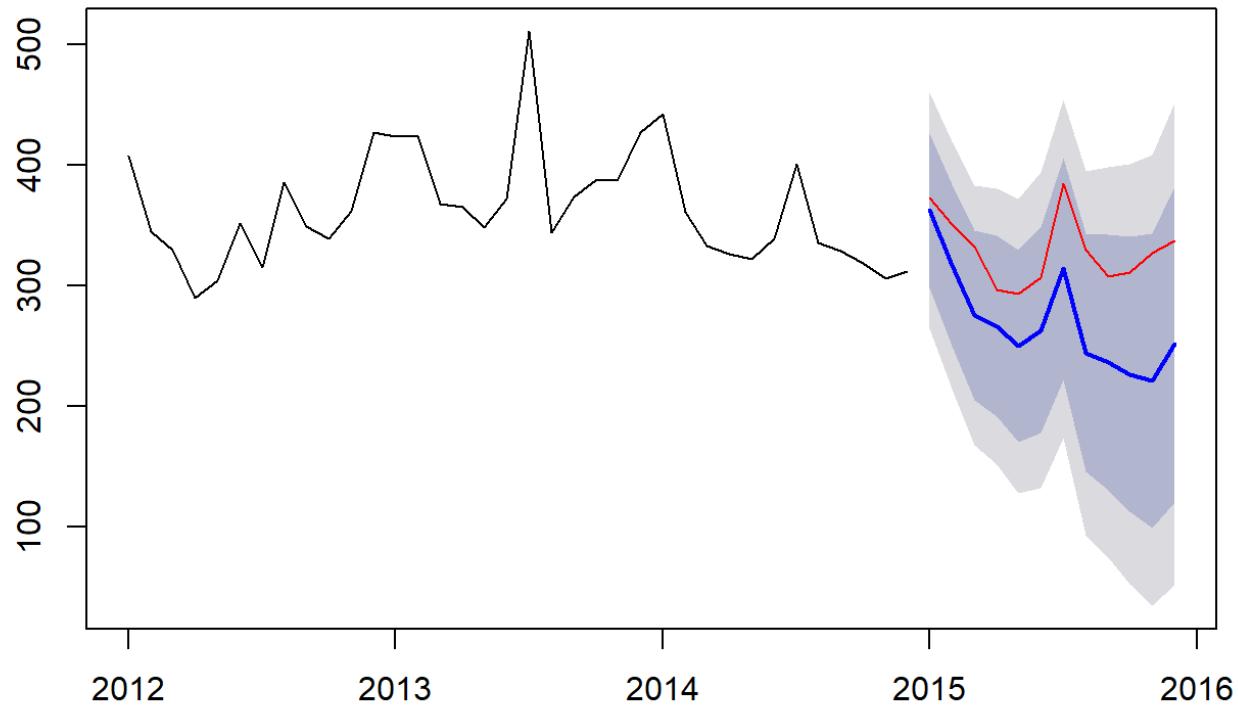
Series timeseries



Decomposition of additive time series

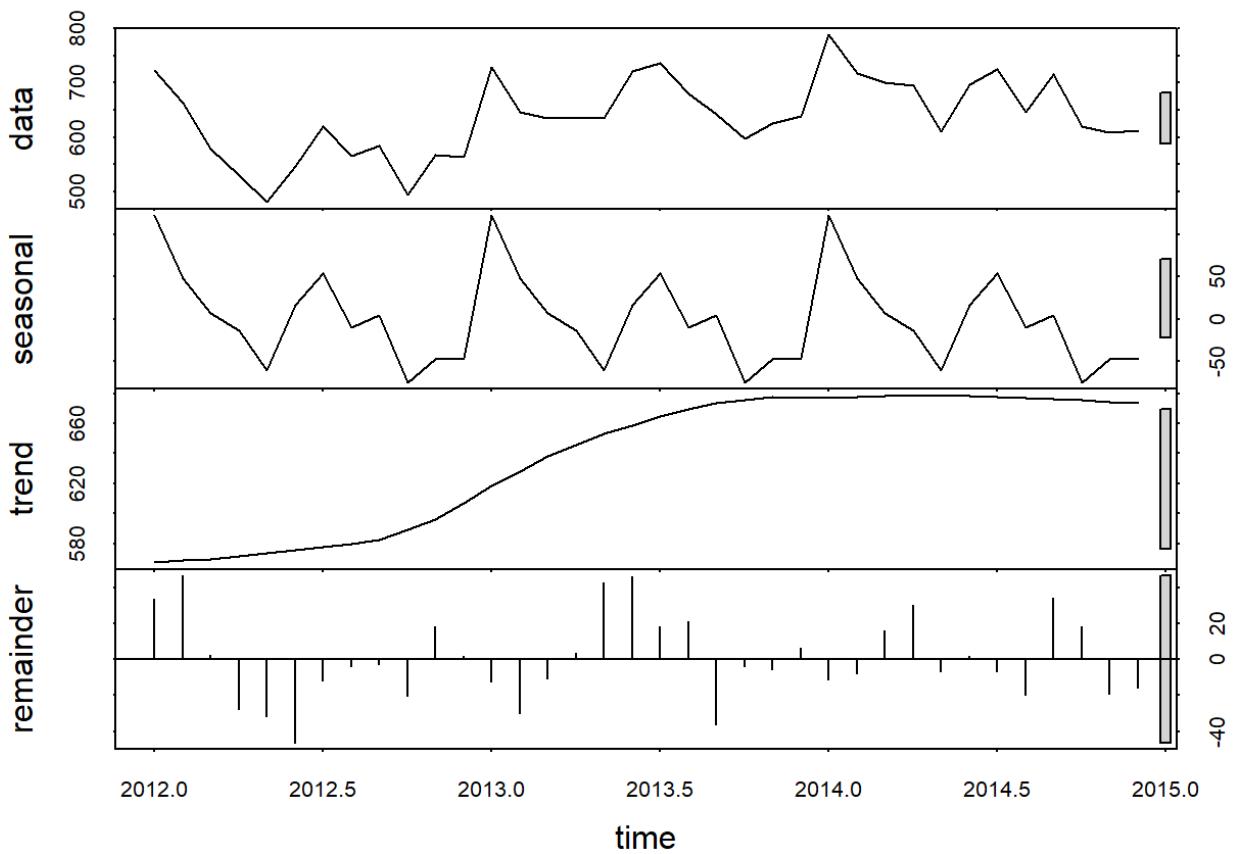
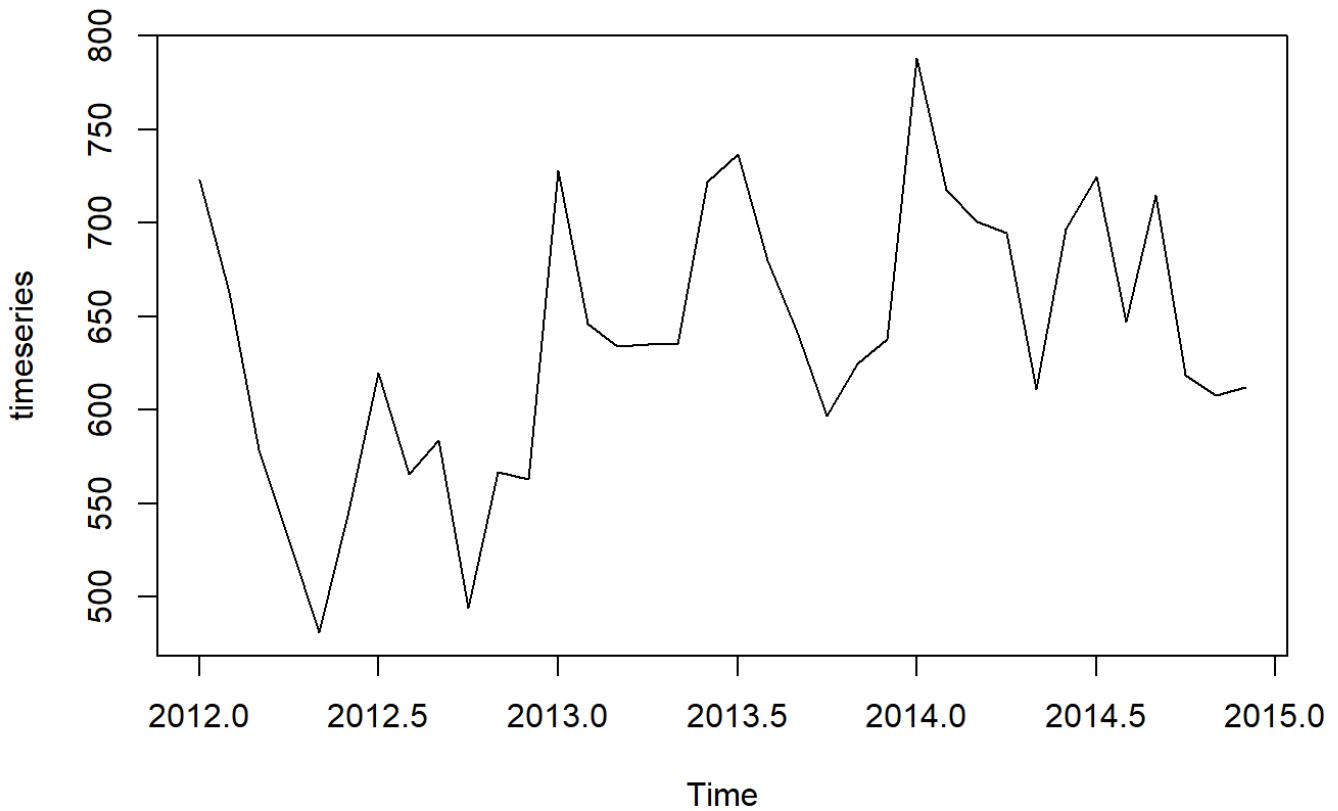


Forecasts from HoltWinters

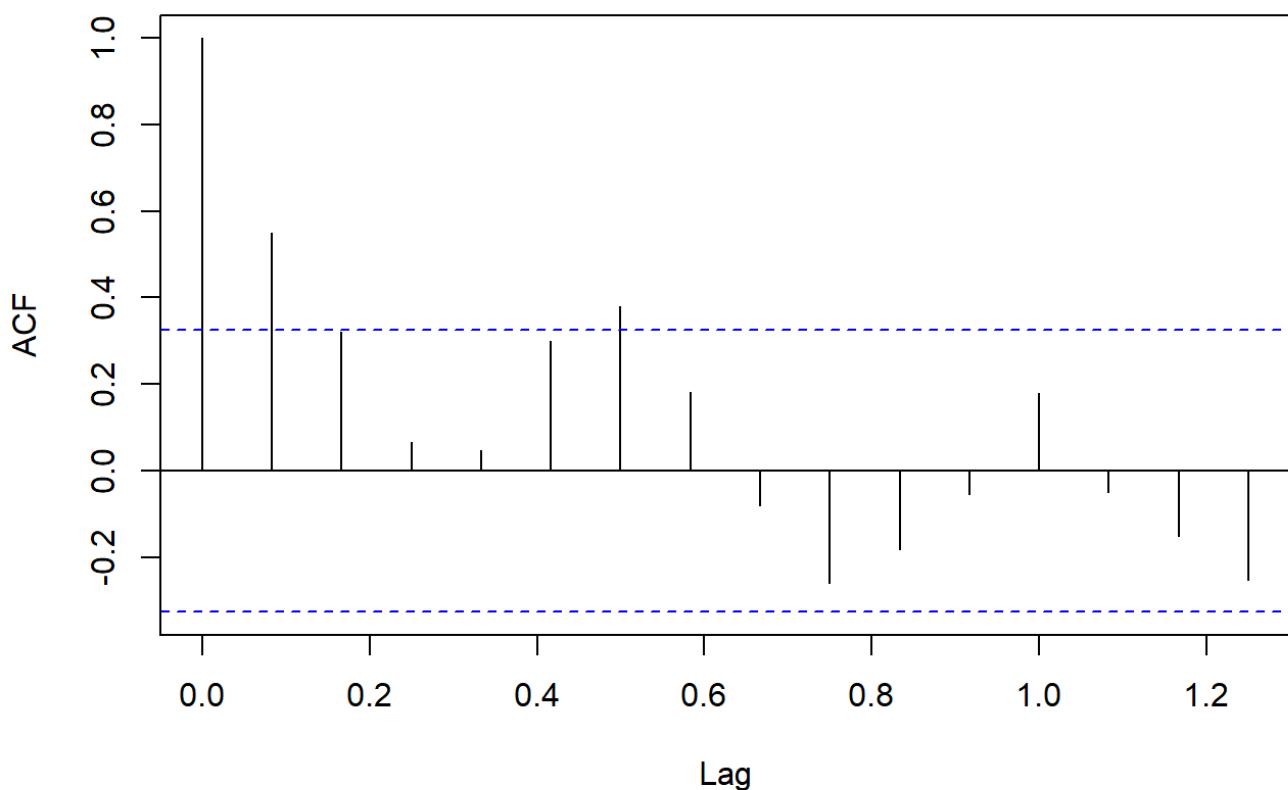


```
## [1] 60.27782
```

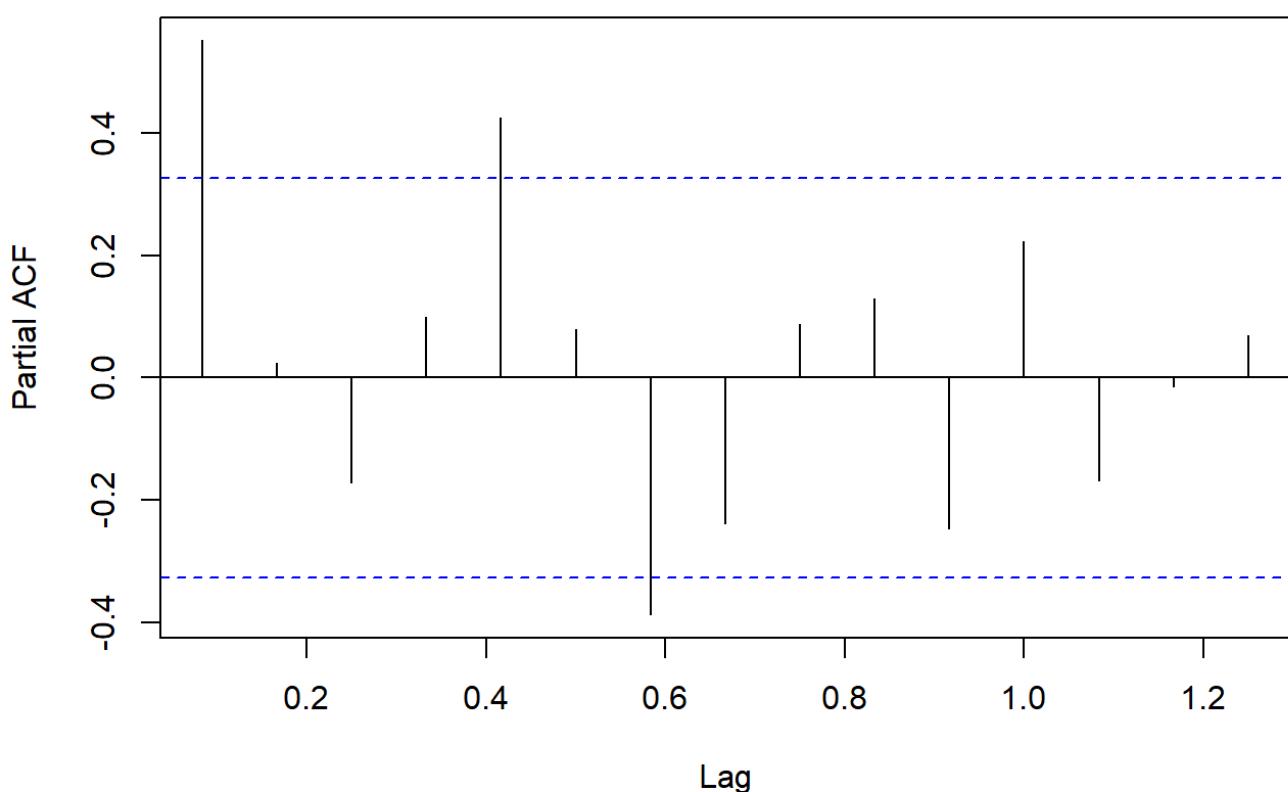
```
traintest(tv_ts3)
```



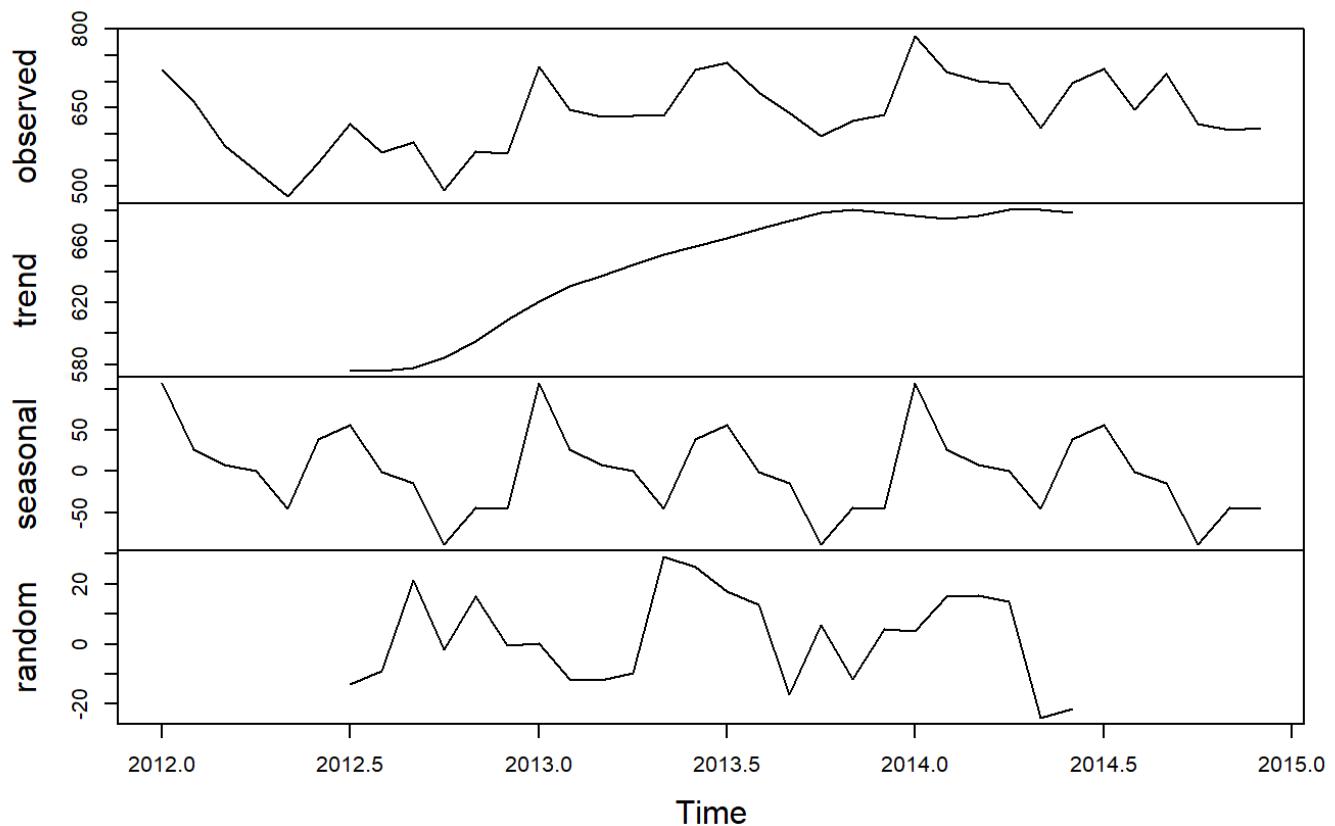
Series timeseries



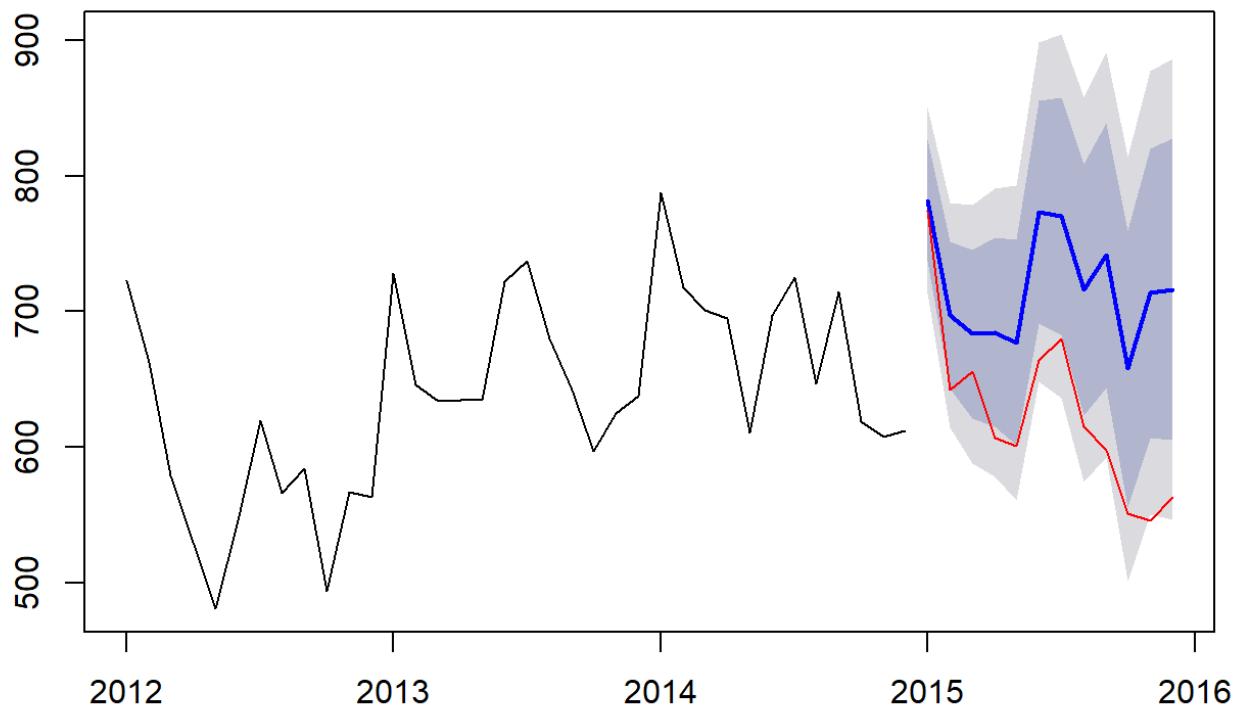
Series timeseries



Decomposition of additive time series

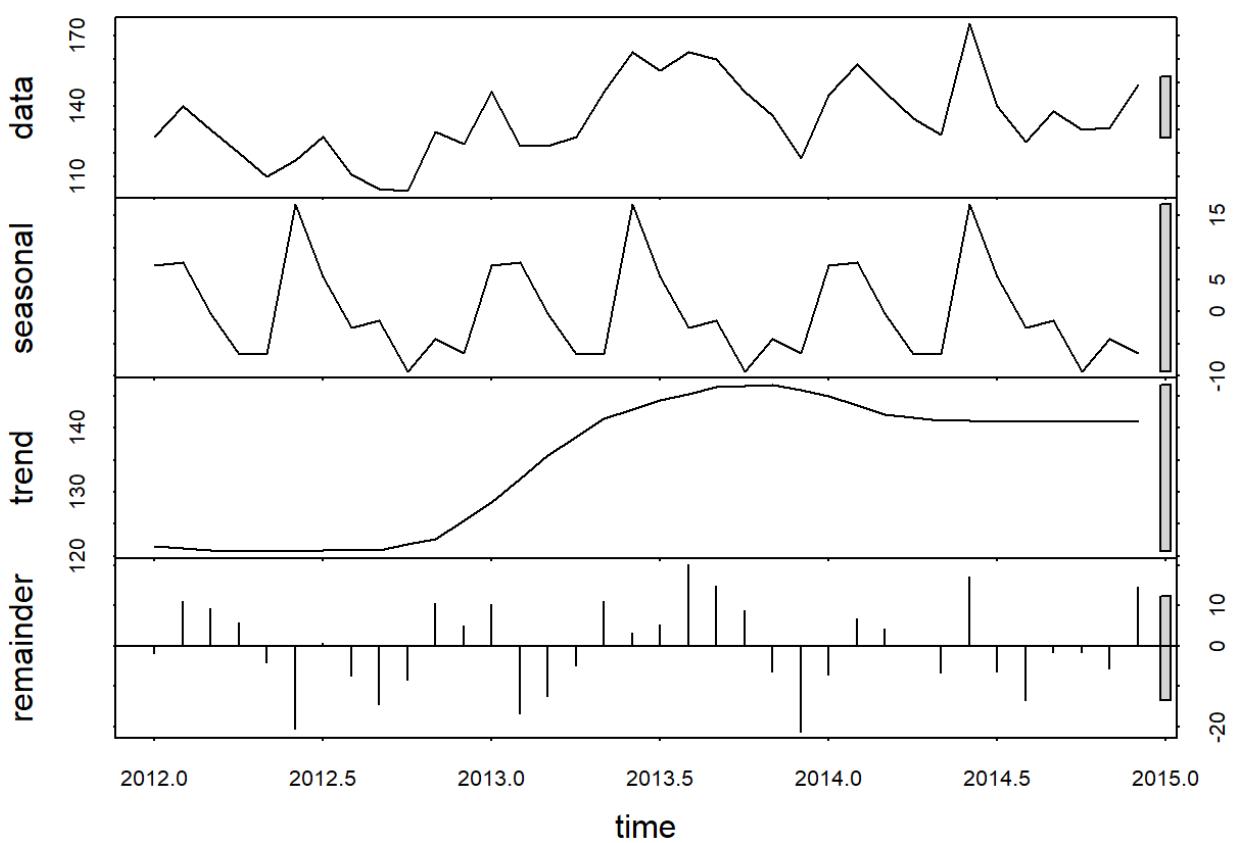
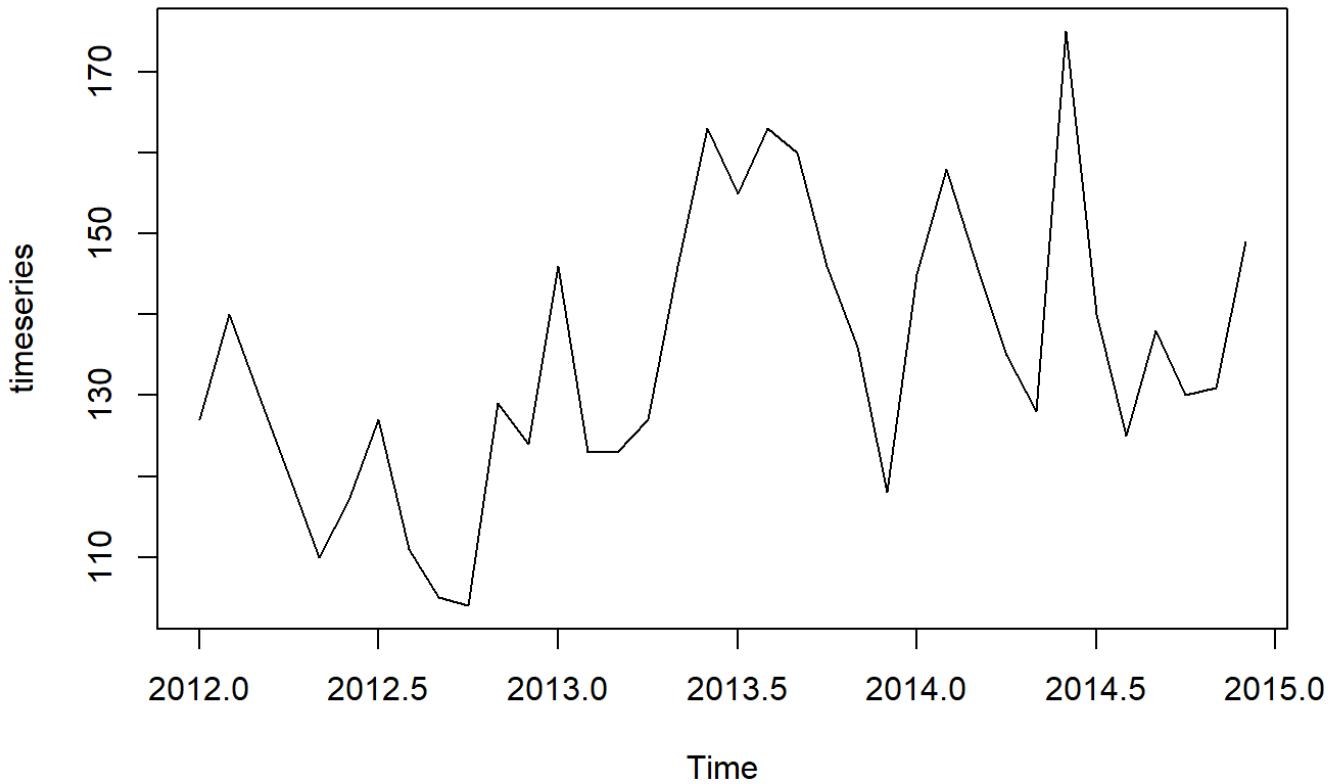


Forecasts from HoltWinters

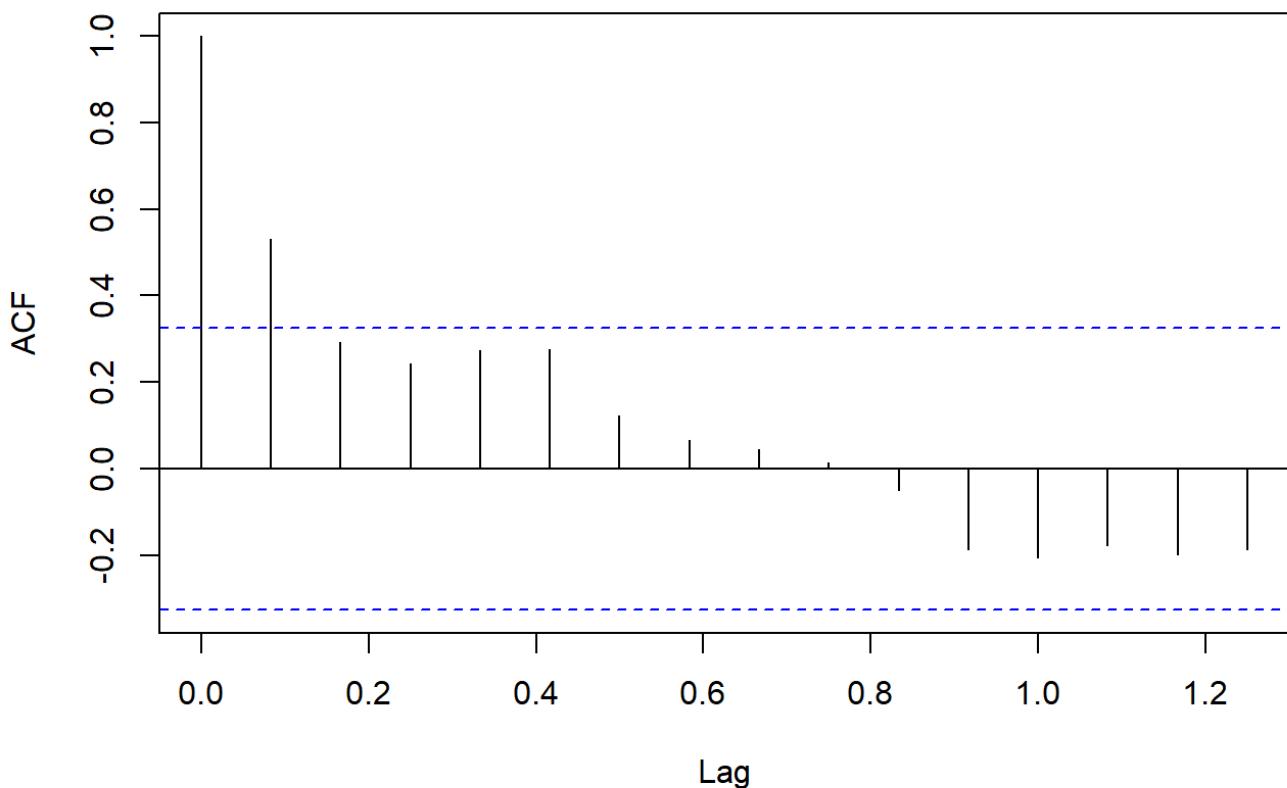


```
## [1] 93.10595
```

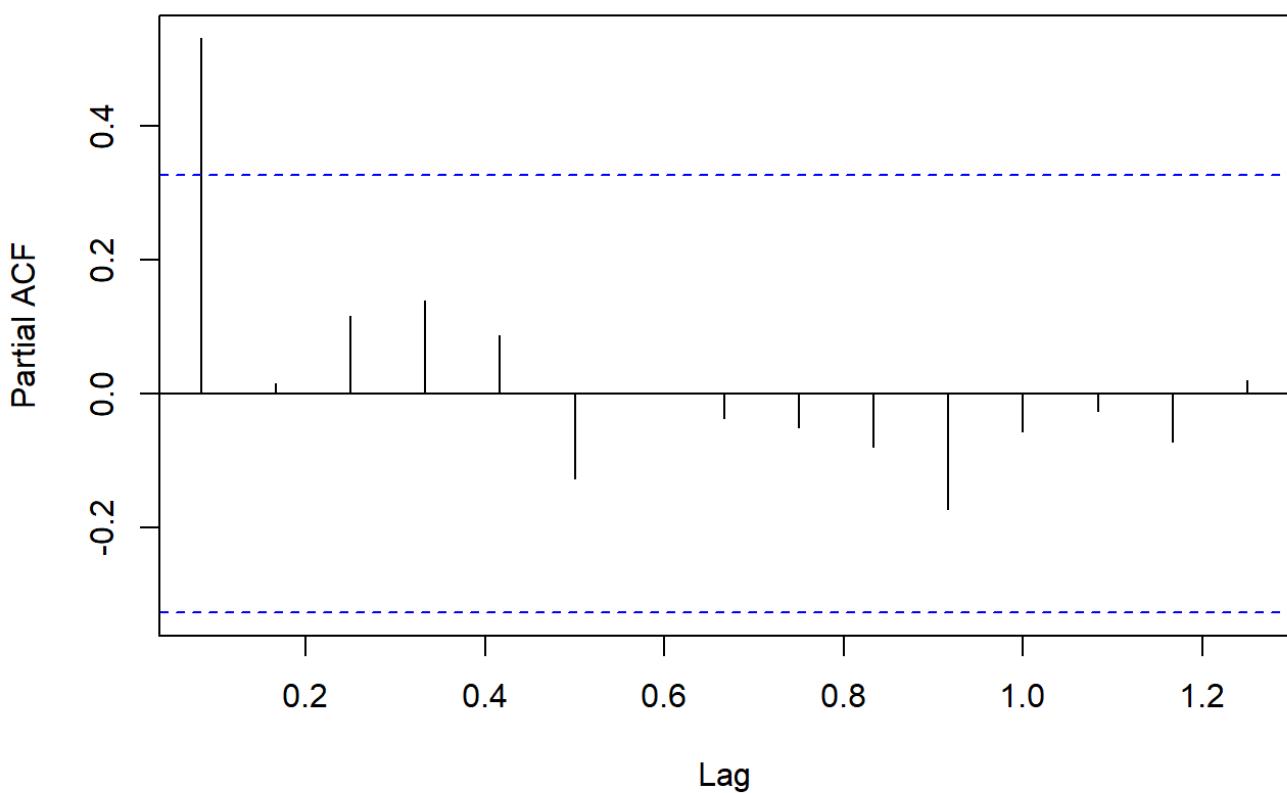
```
traintest(tv_ts4)
```



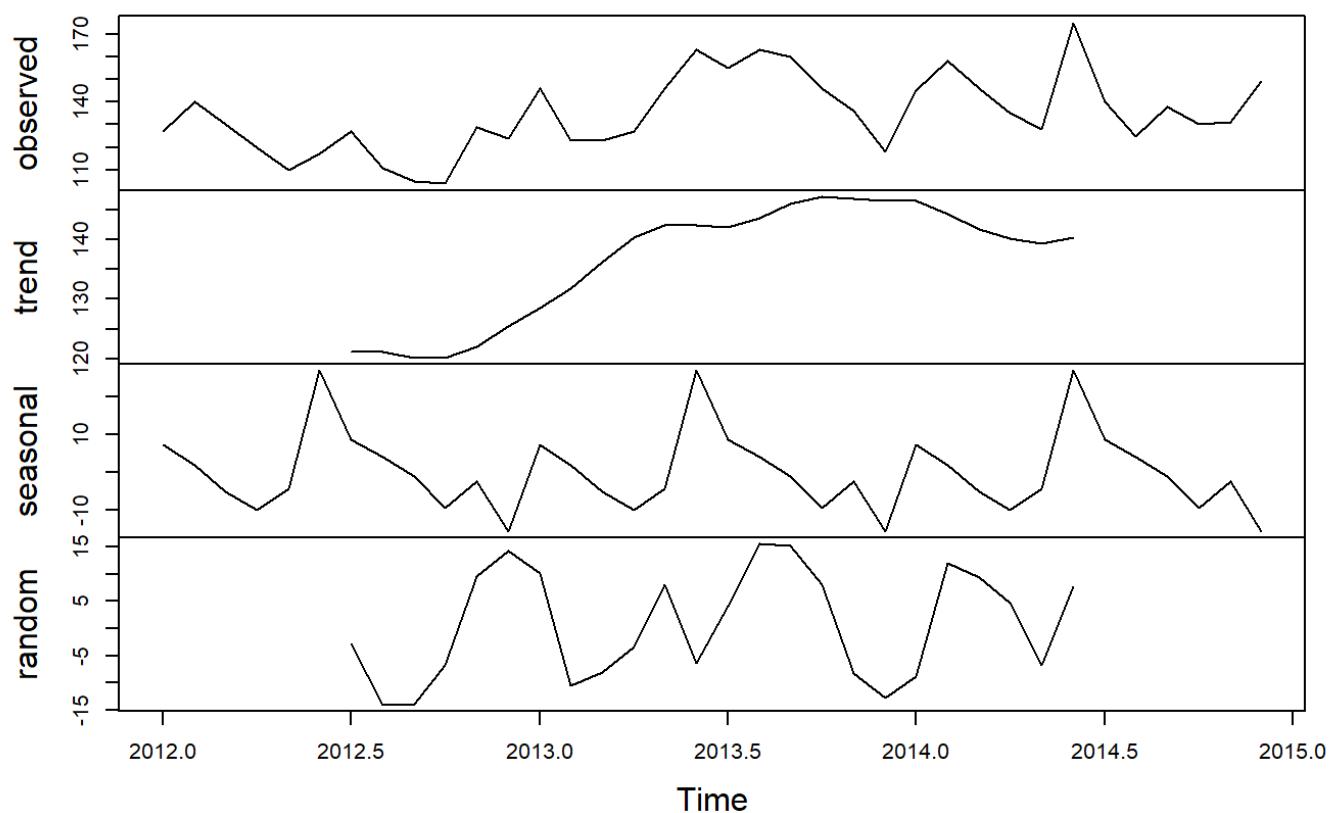
Series timeseries



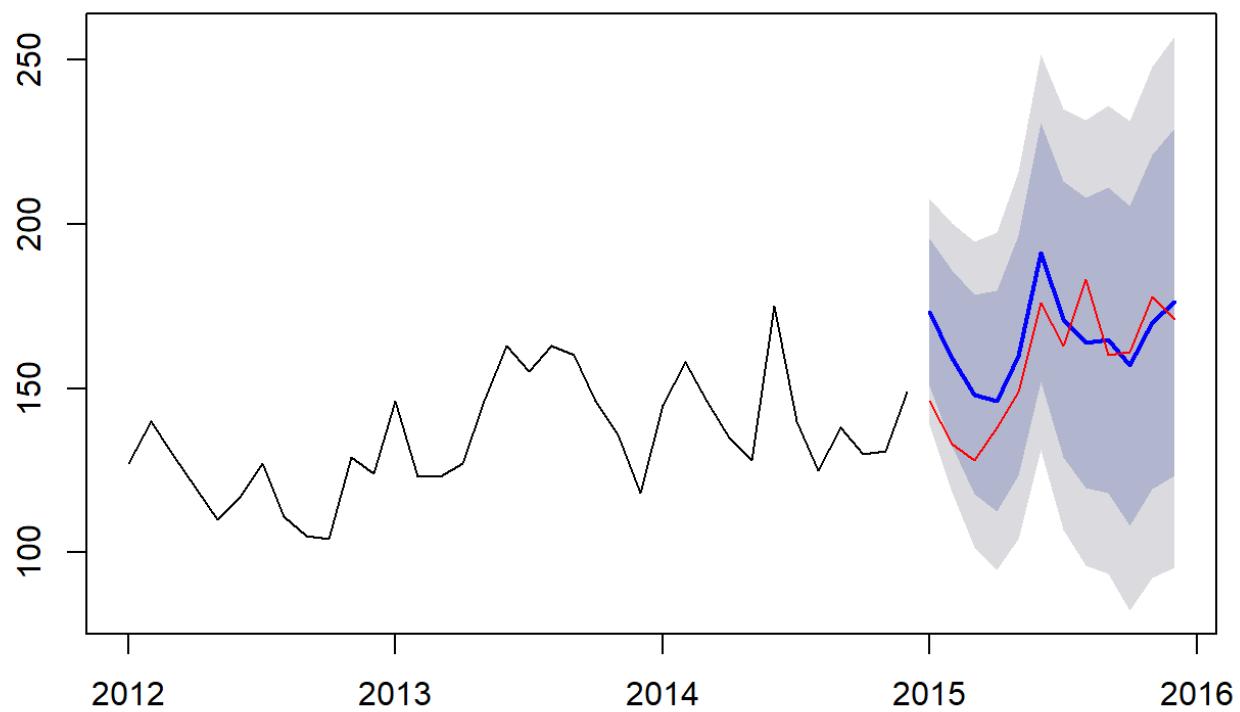
Series timeseries



Decomposition of additive time series

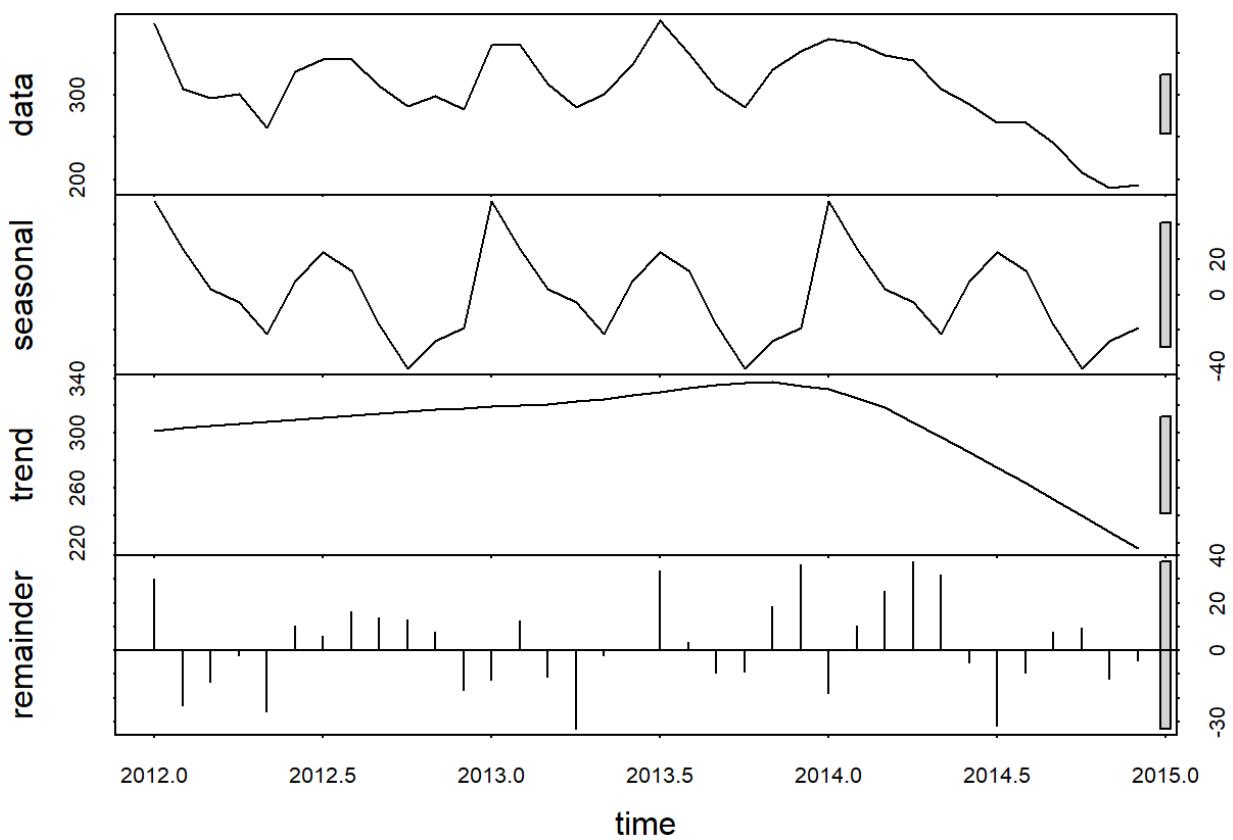
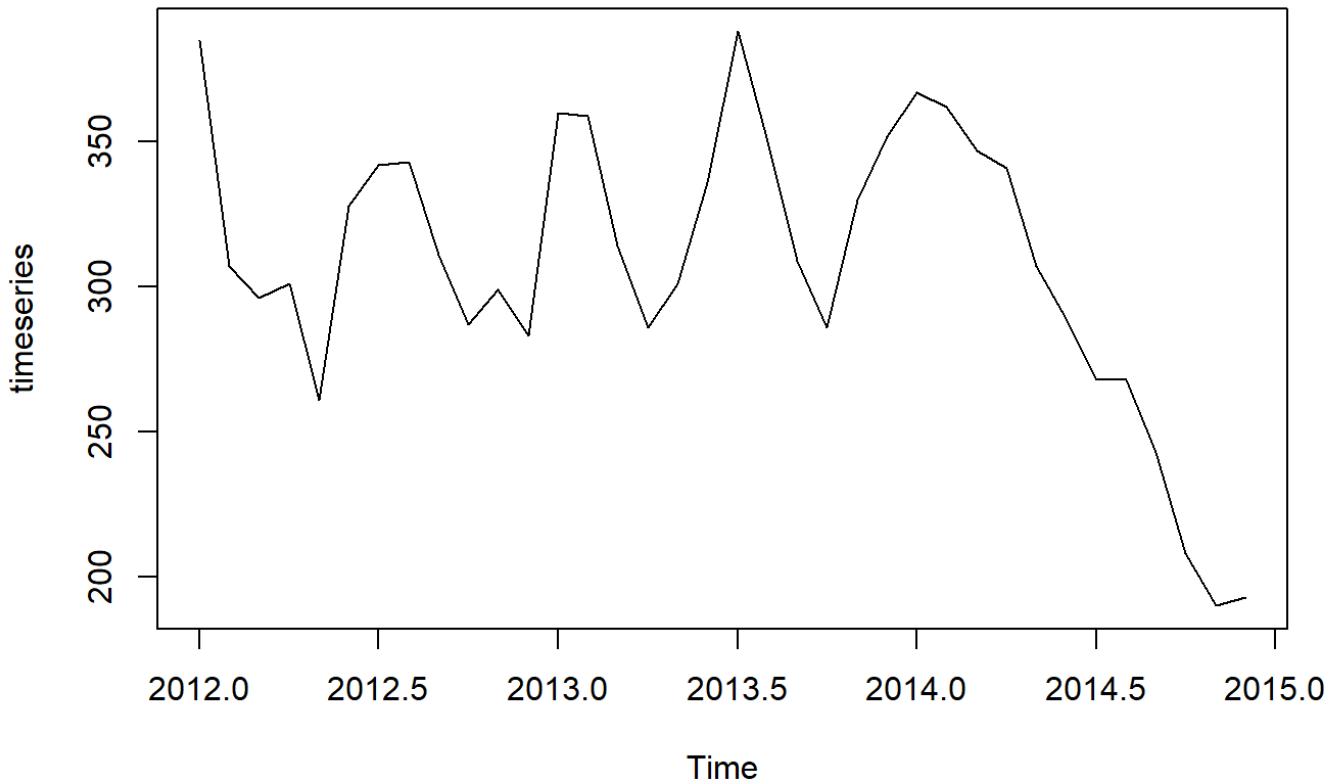


Forecasts from HoltWinters

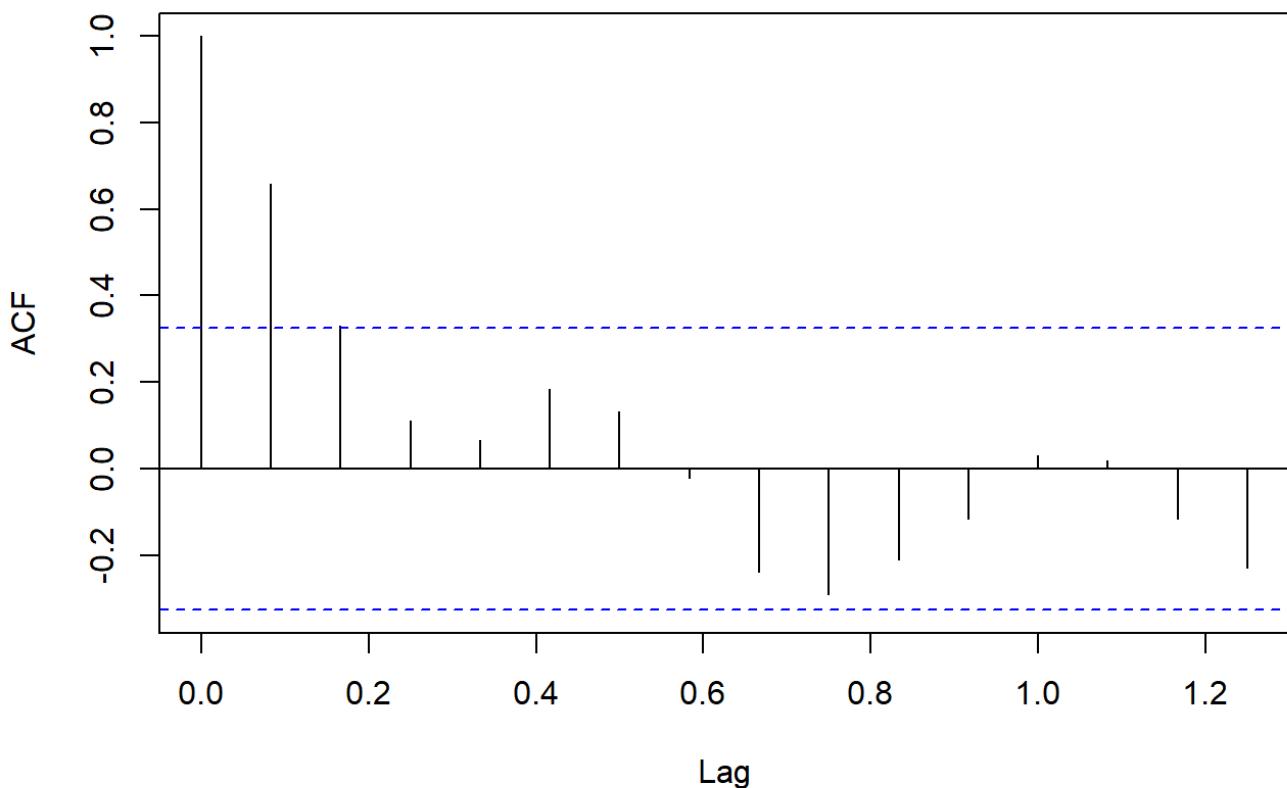


```
## [1] 13.07586
```

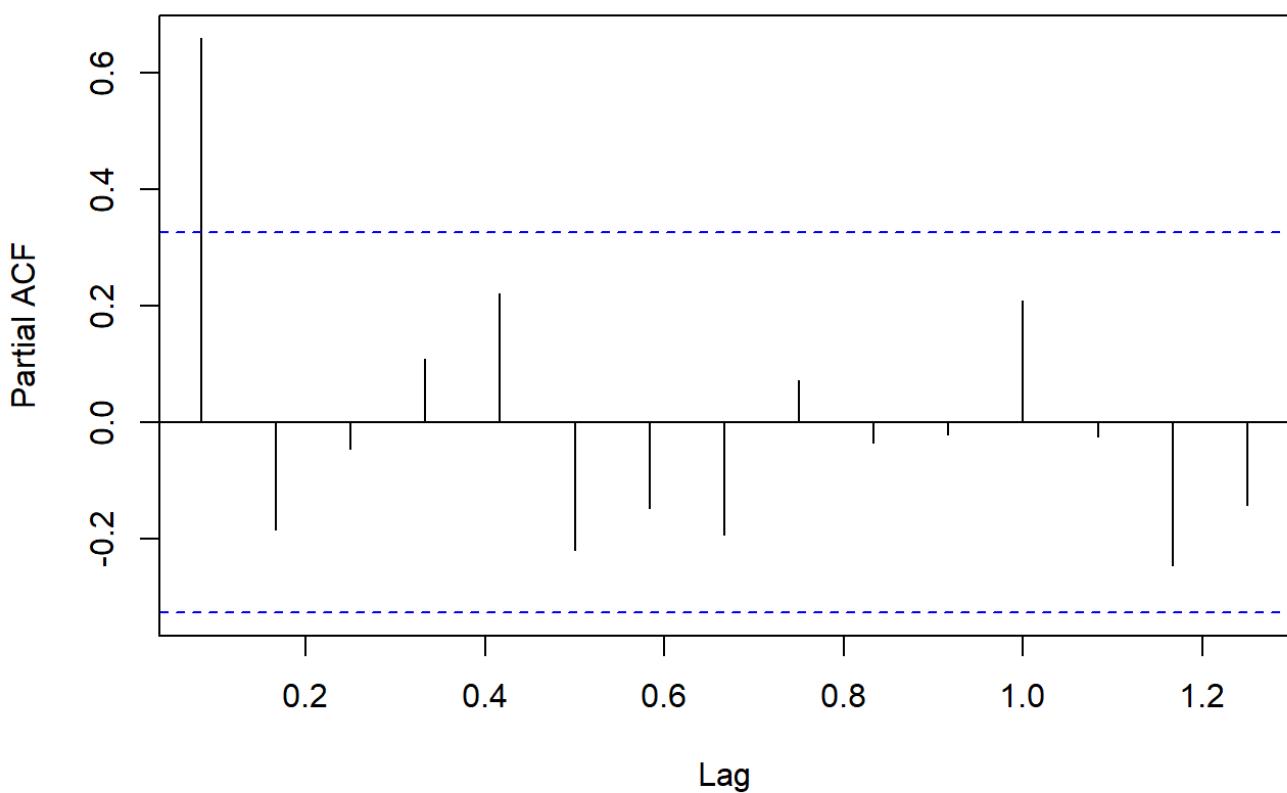
```
traintest(tv_ts5)
```



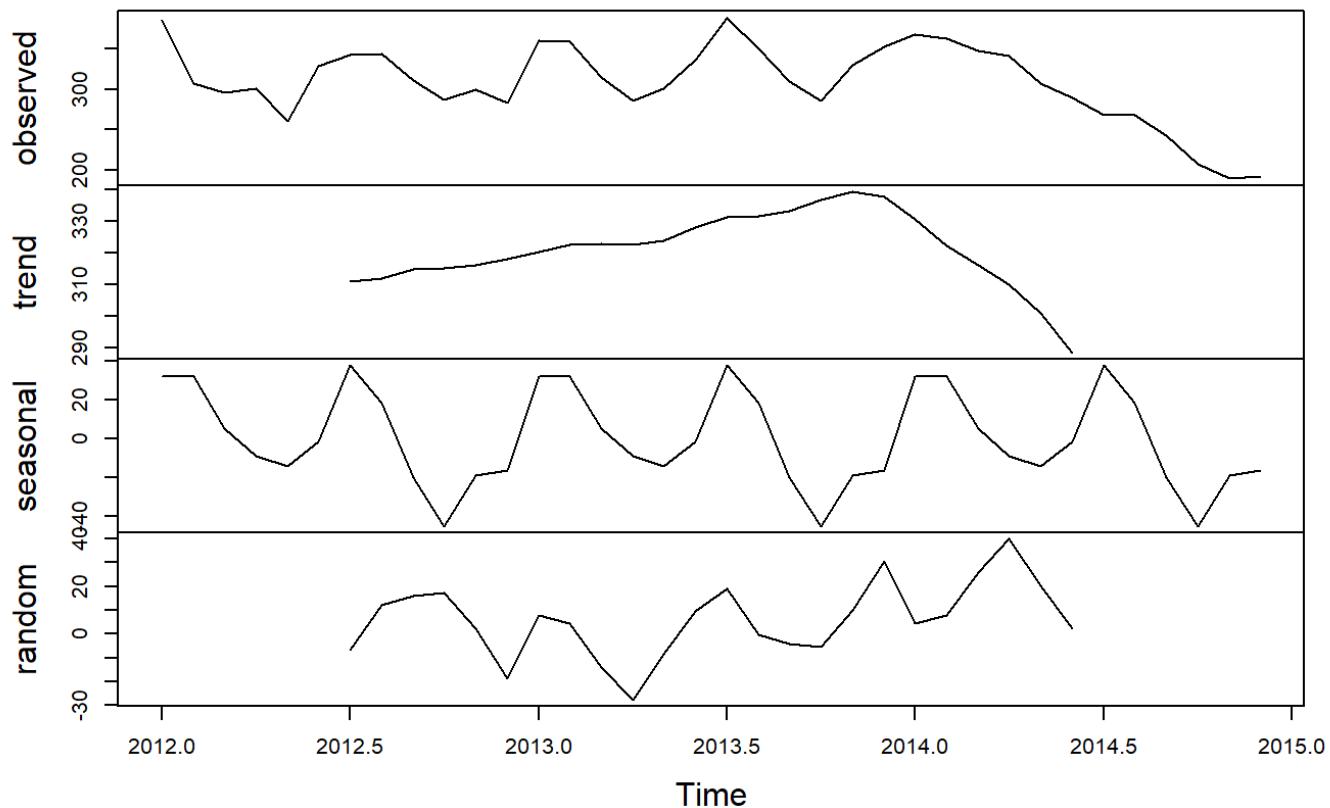
Series timeseries



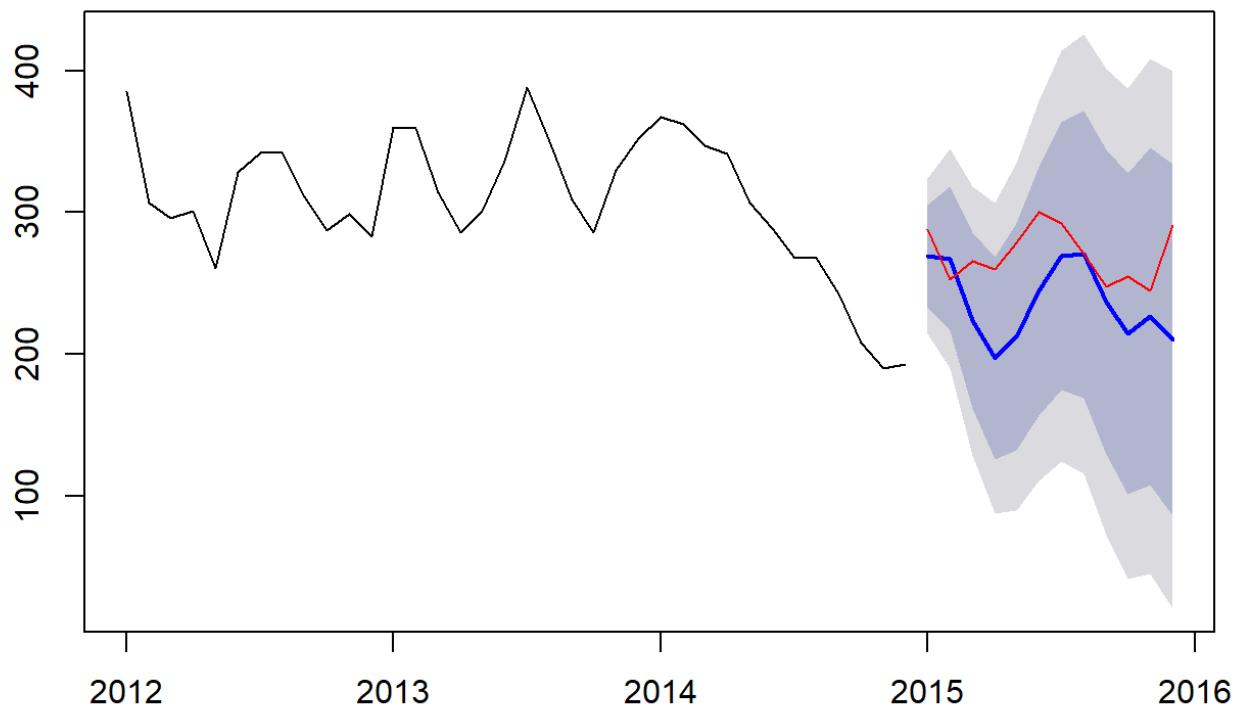
Series timeseries



Decomposition of additive time series

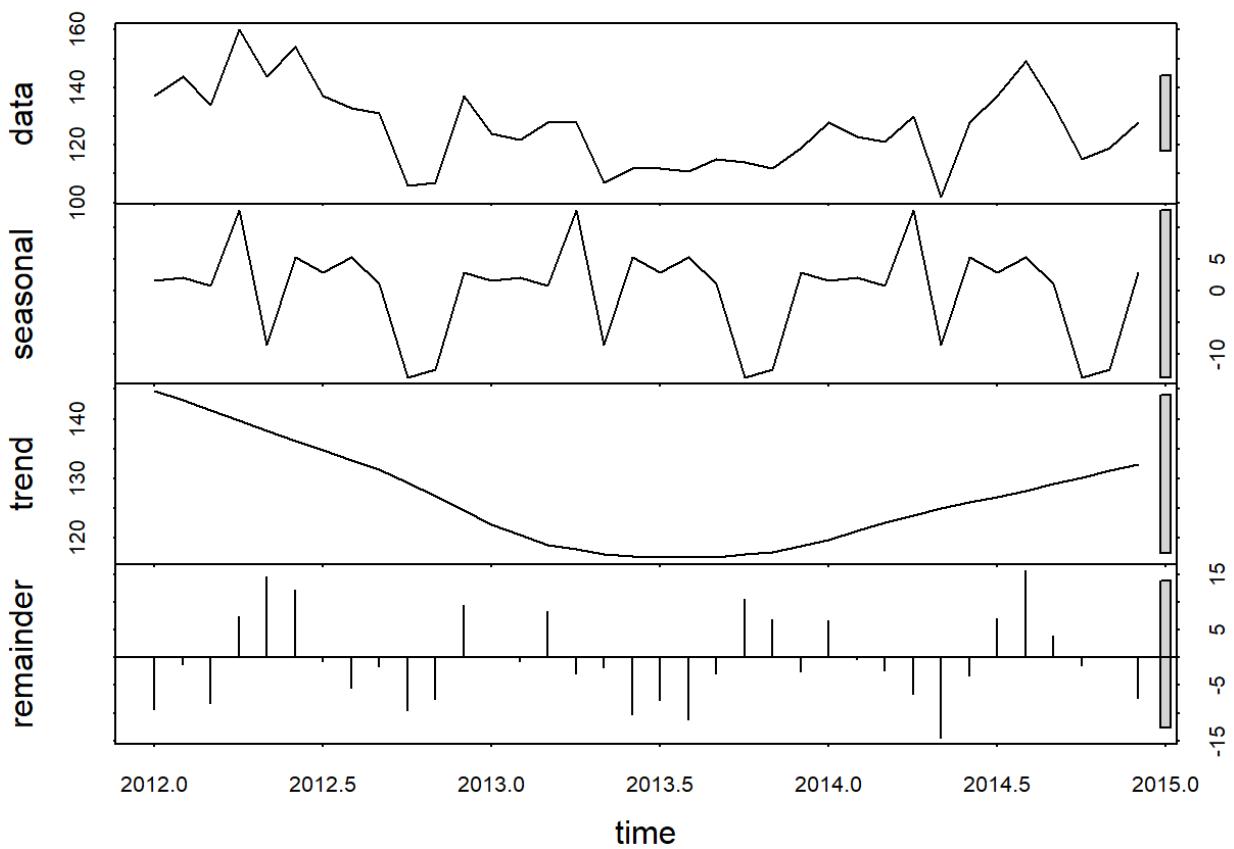
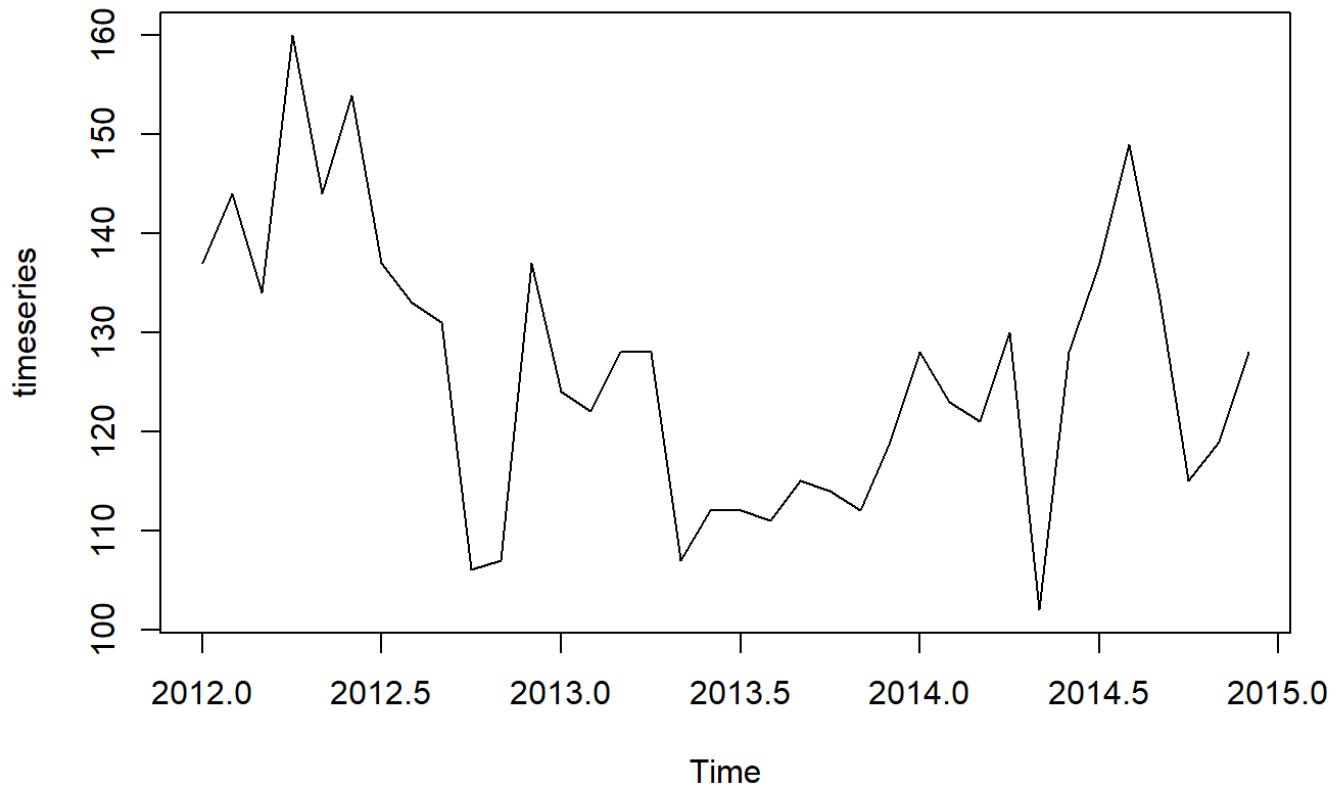


Forecasts from HoltWinters

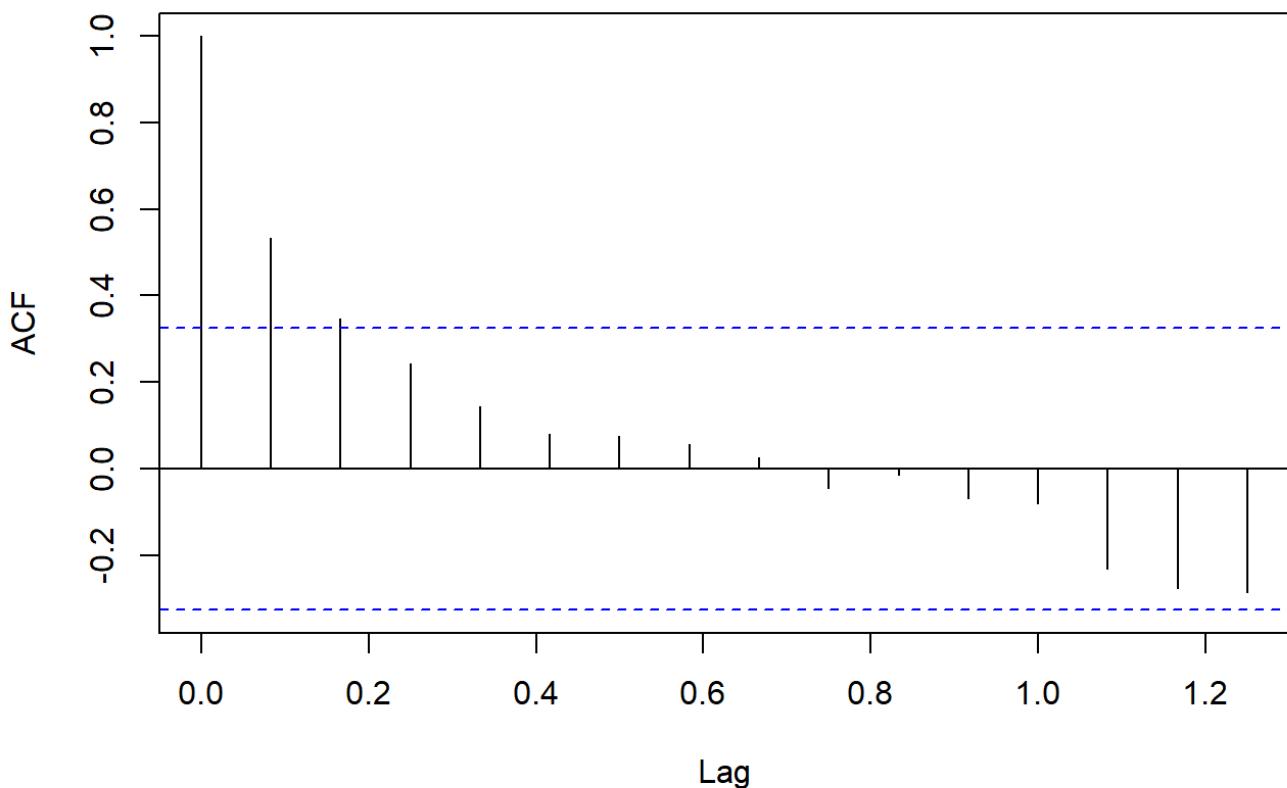


```
## [1] 36.1841
```

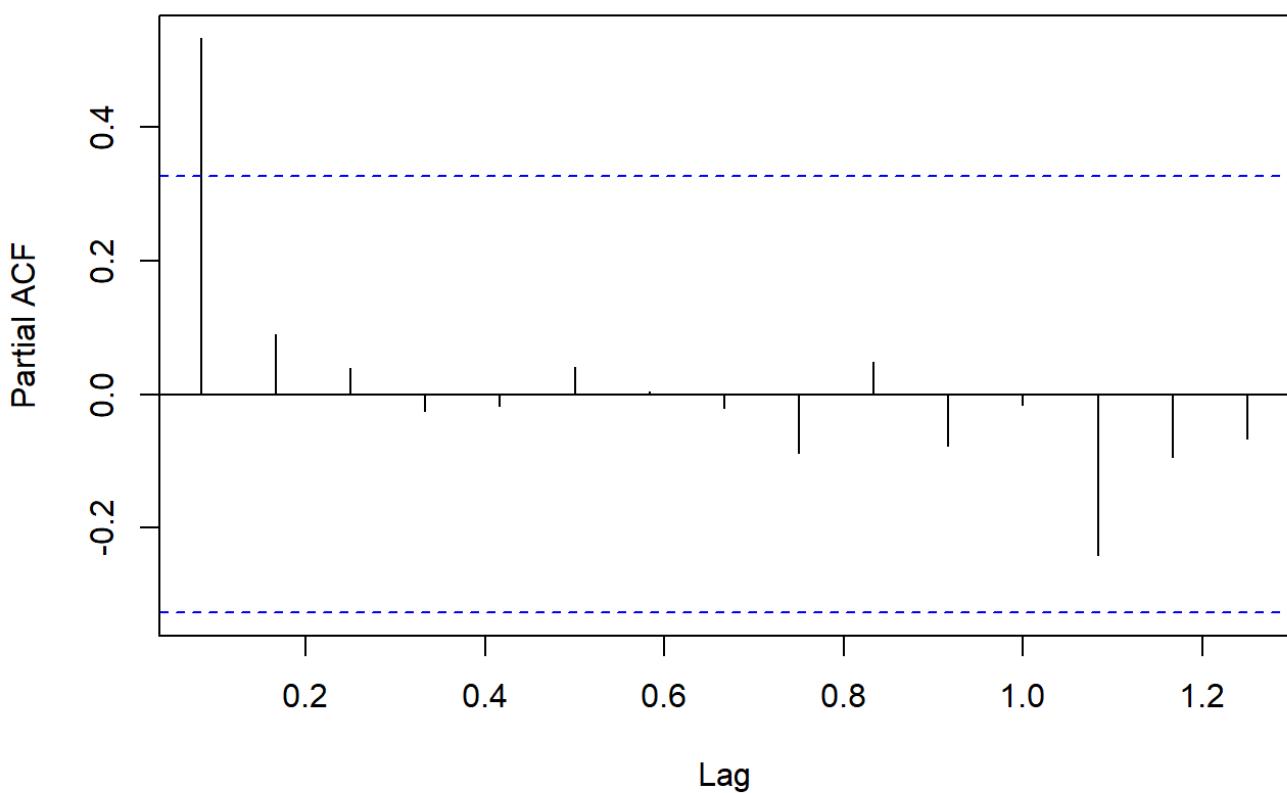
```
traintest(tv_ts6)
```



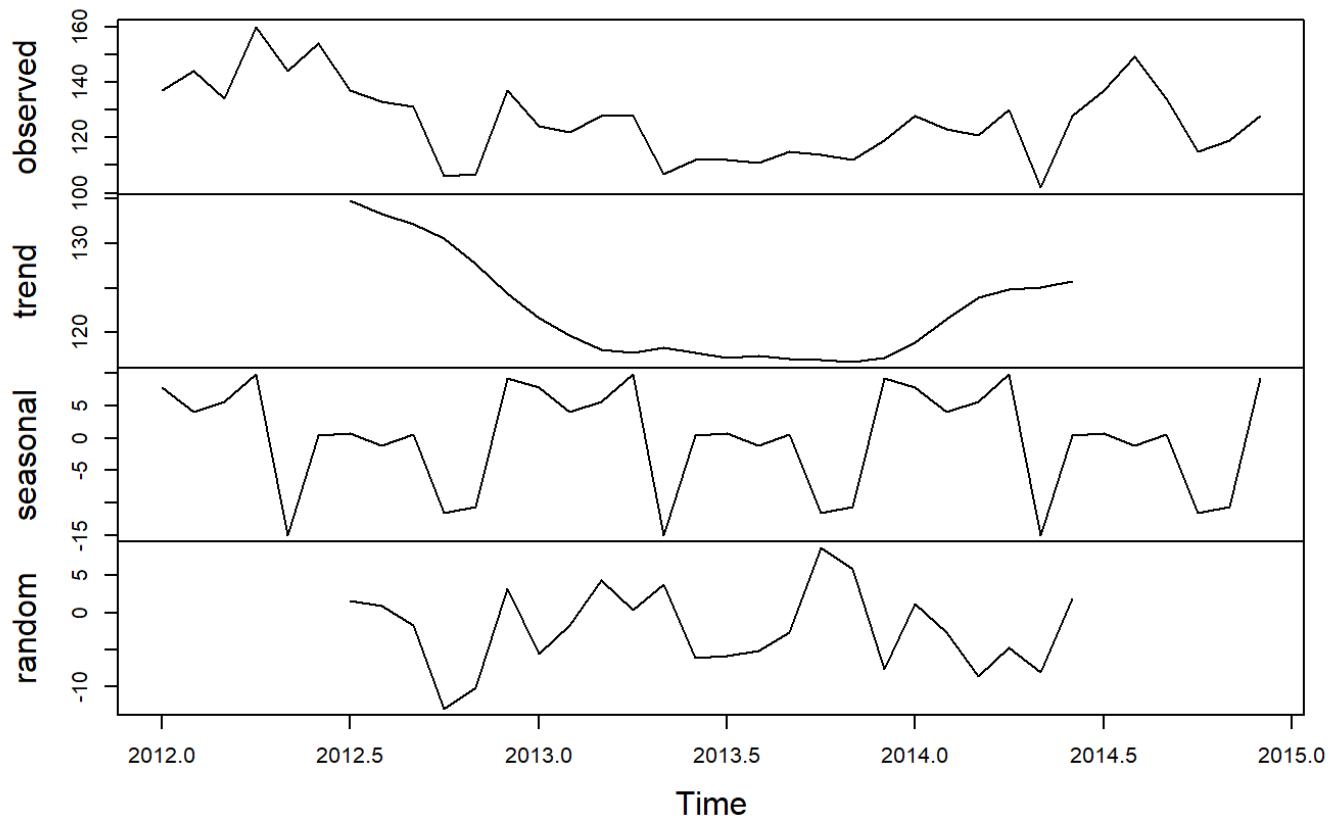
Series timeseries



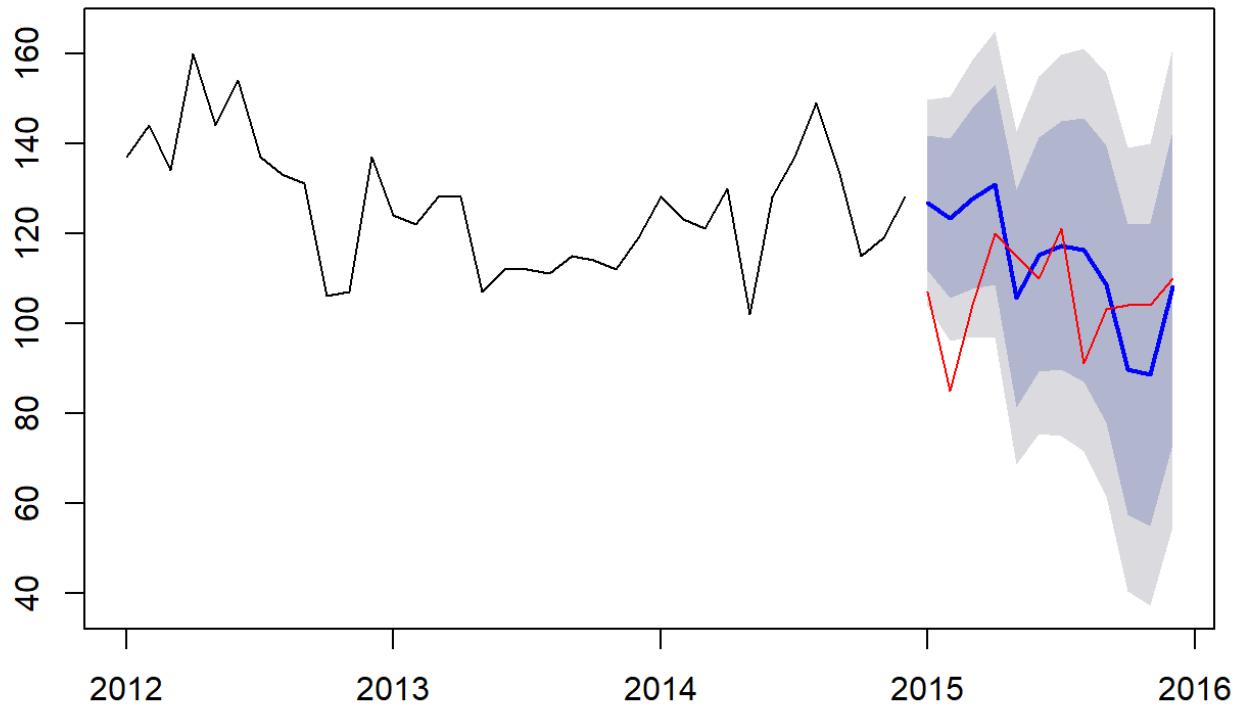
Series timeseries



Decomposition of additive time series

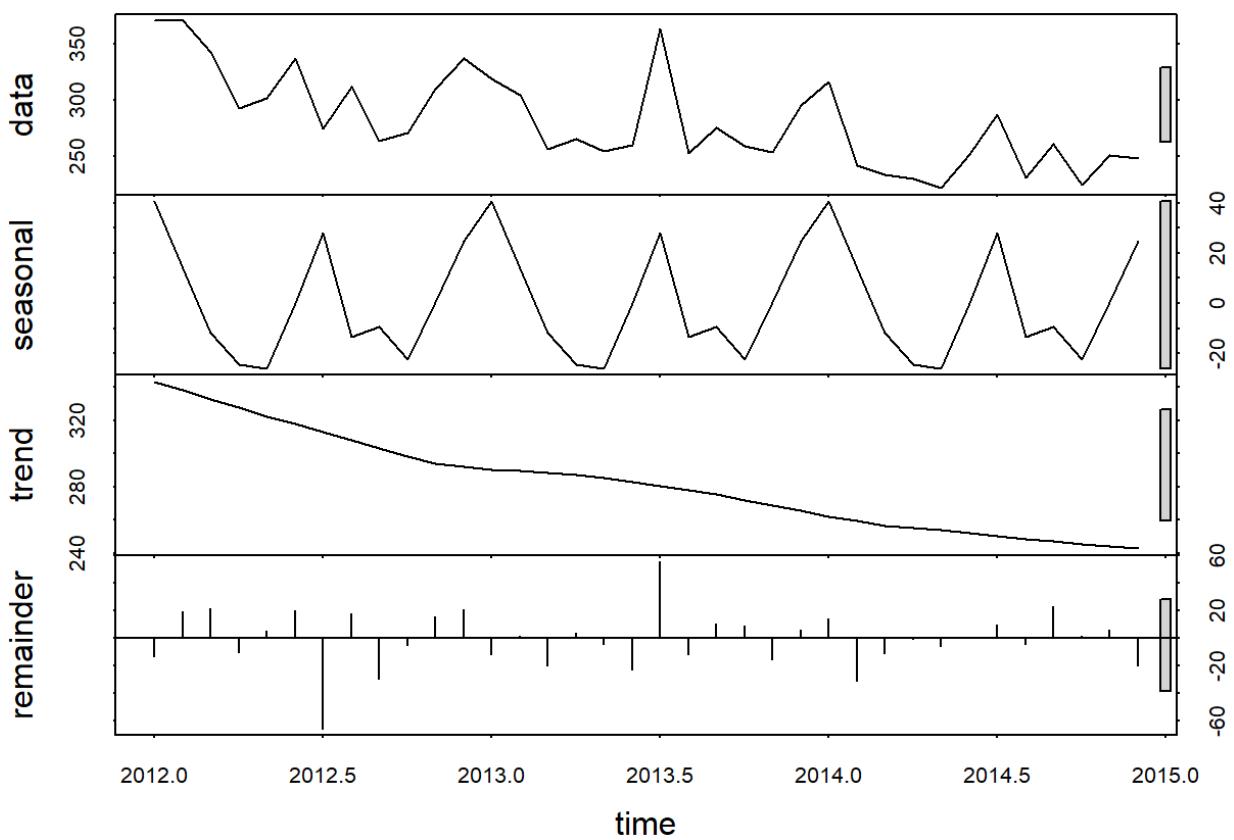
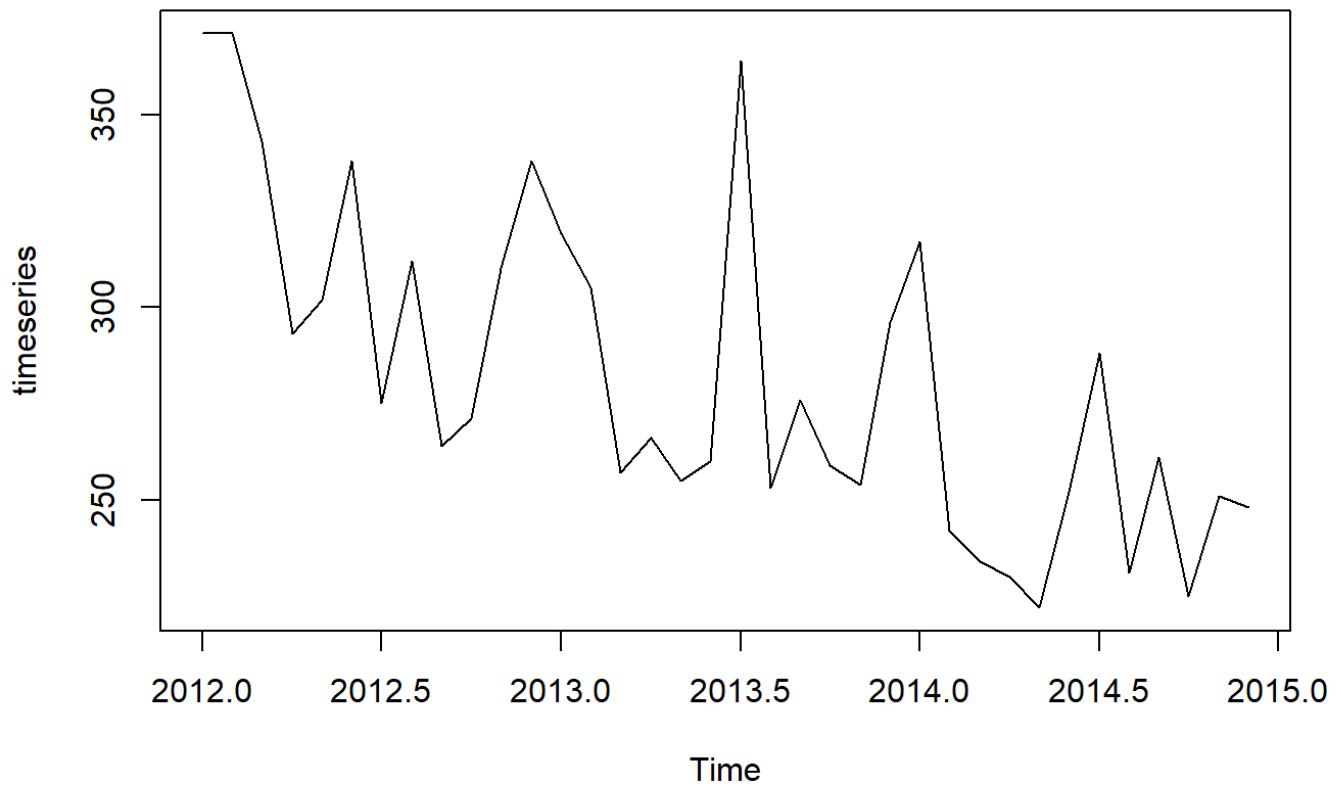


Forecasts from HoltWinters

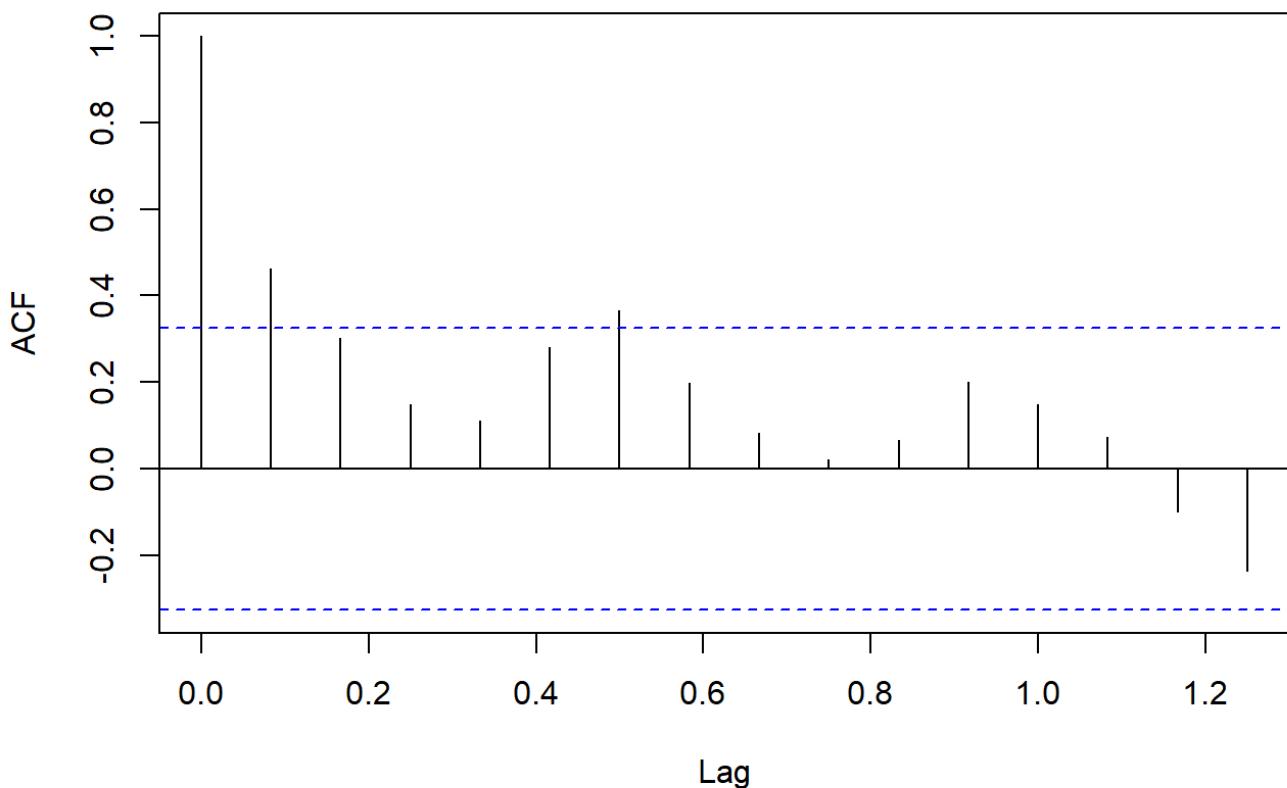


```
## [1] 14.46771
```

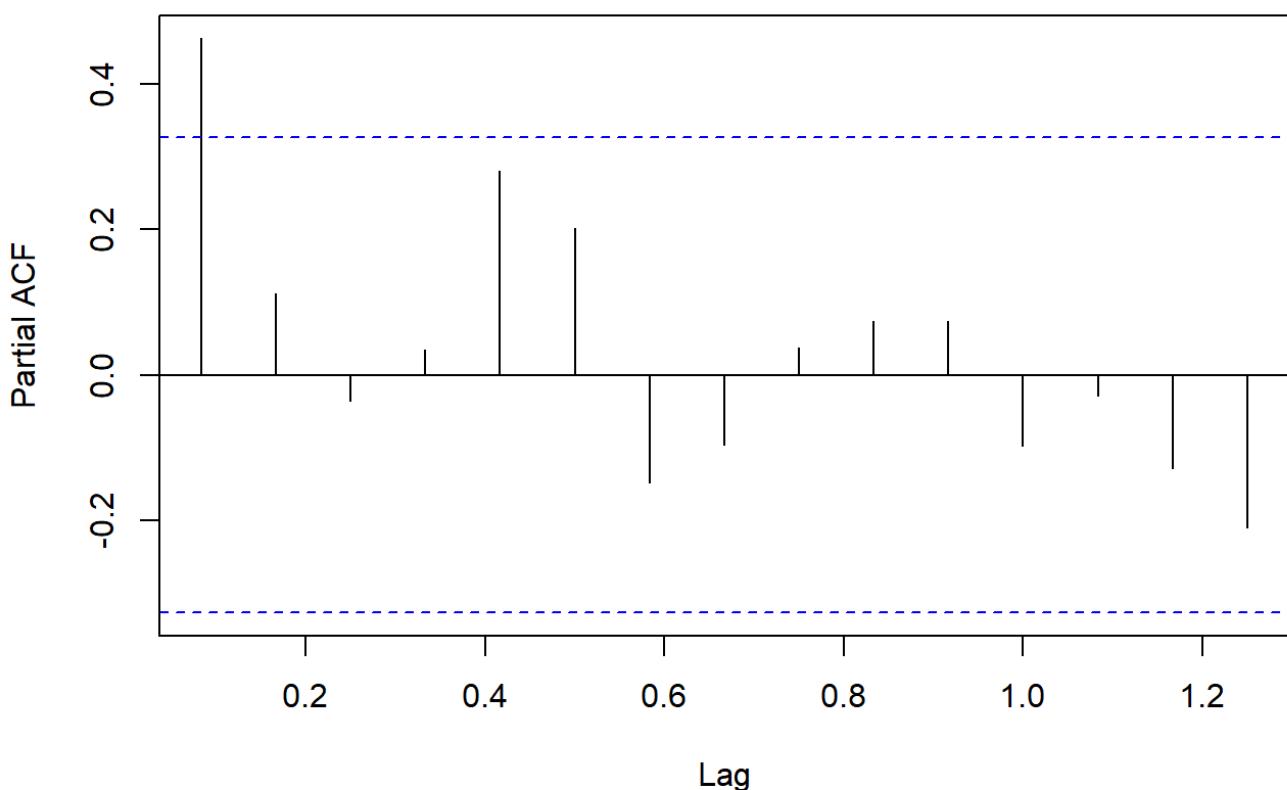
```
traintest(tv_ts7)
```



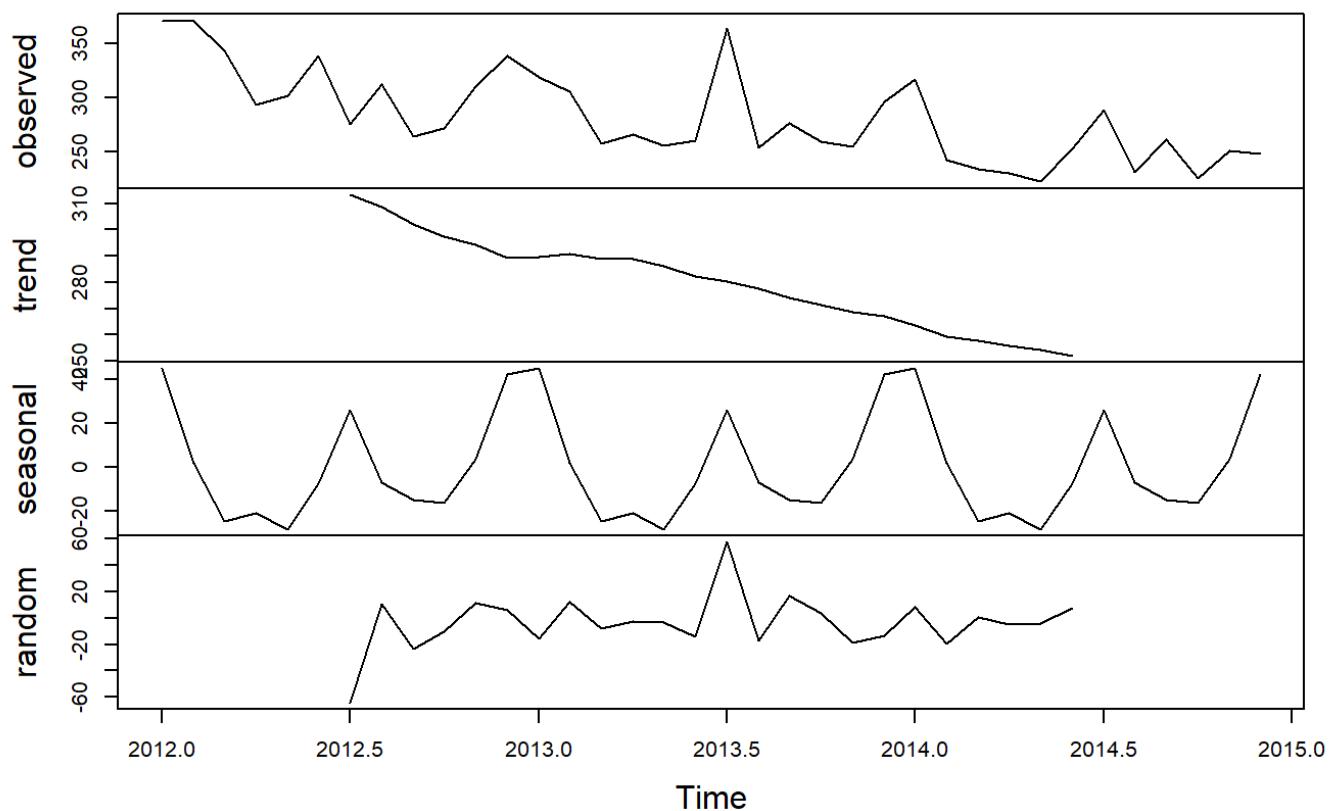
Series timeseries



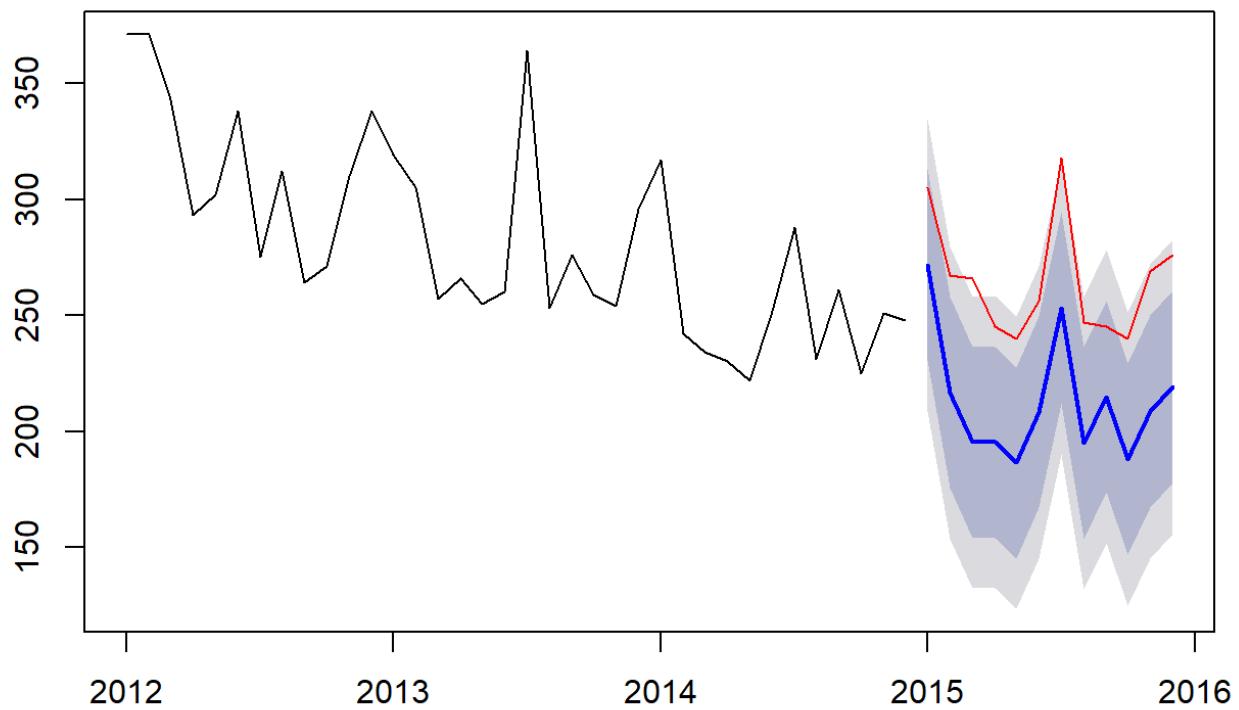
Series timeseries



Decomposition of additive time series

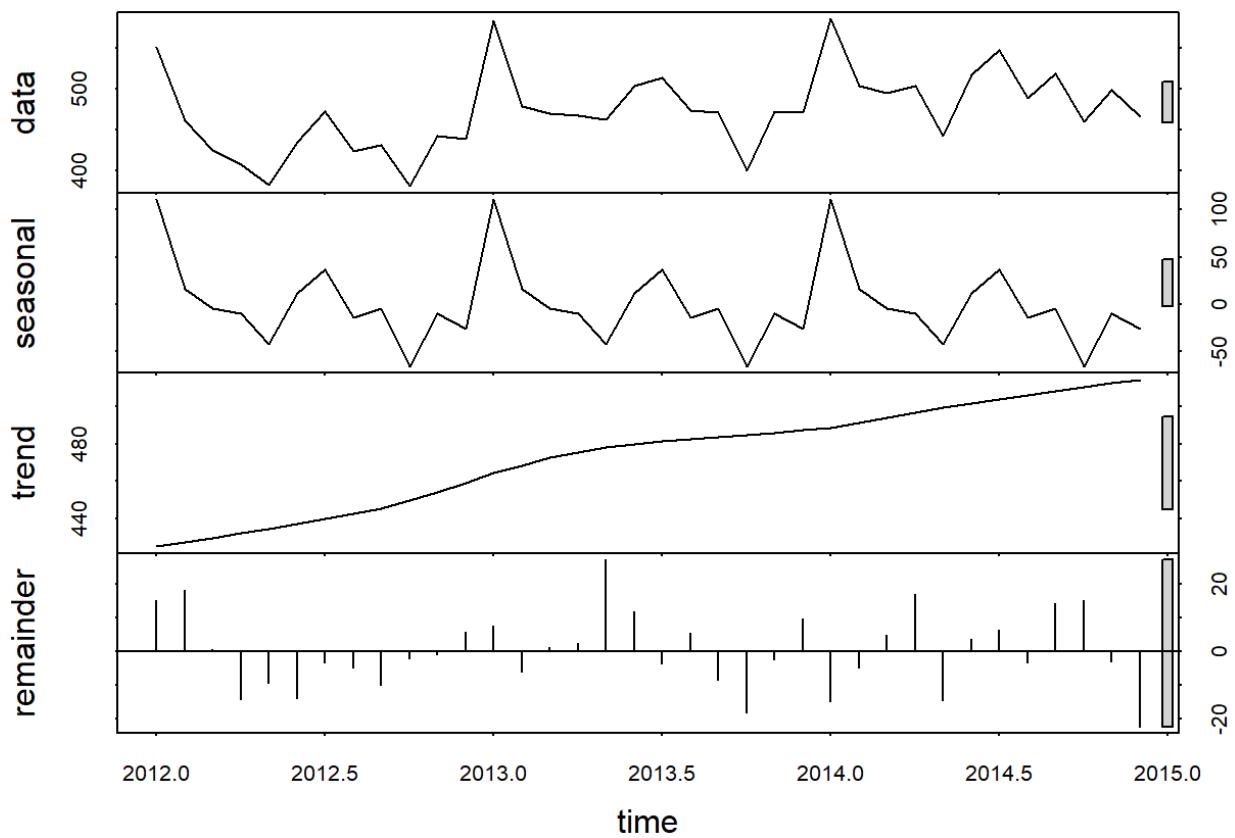
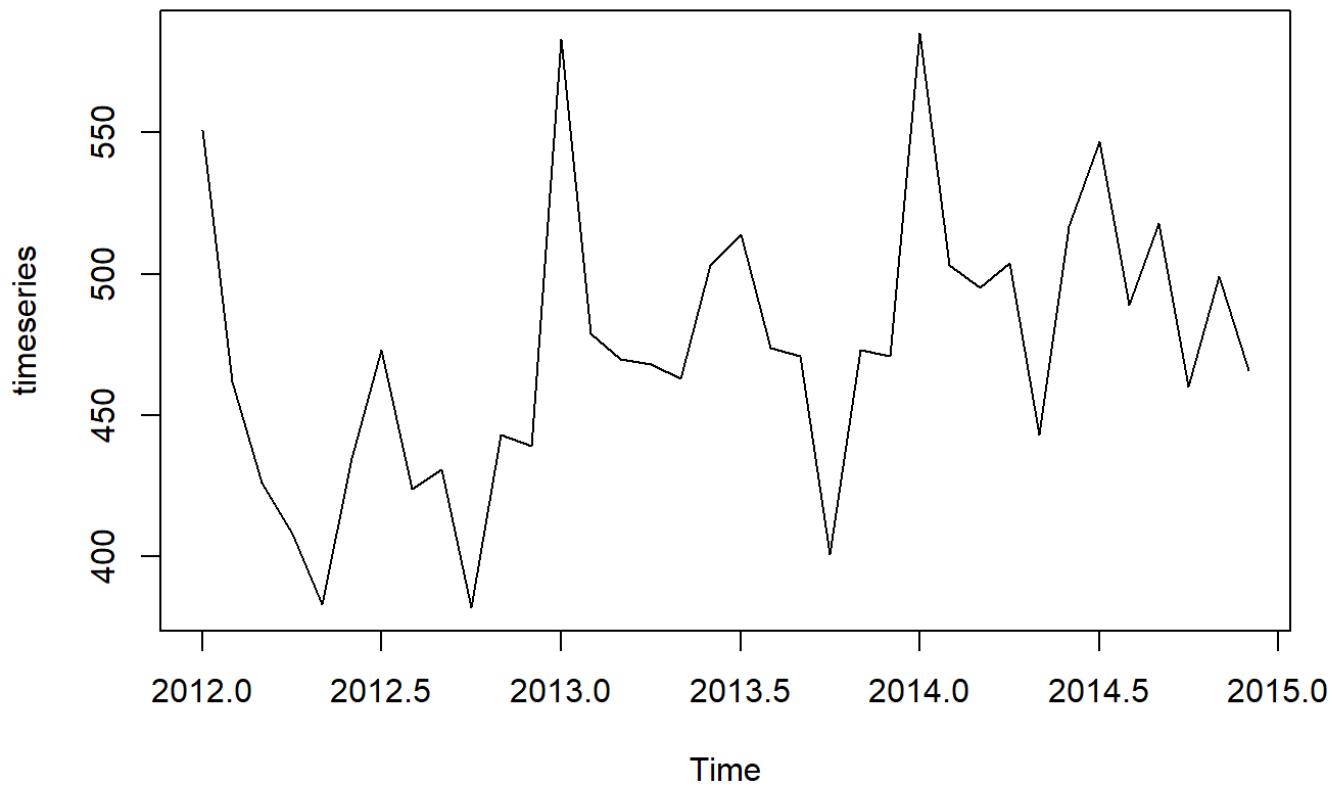


Forecasts from HoltWinters

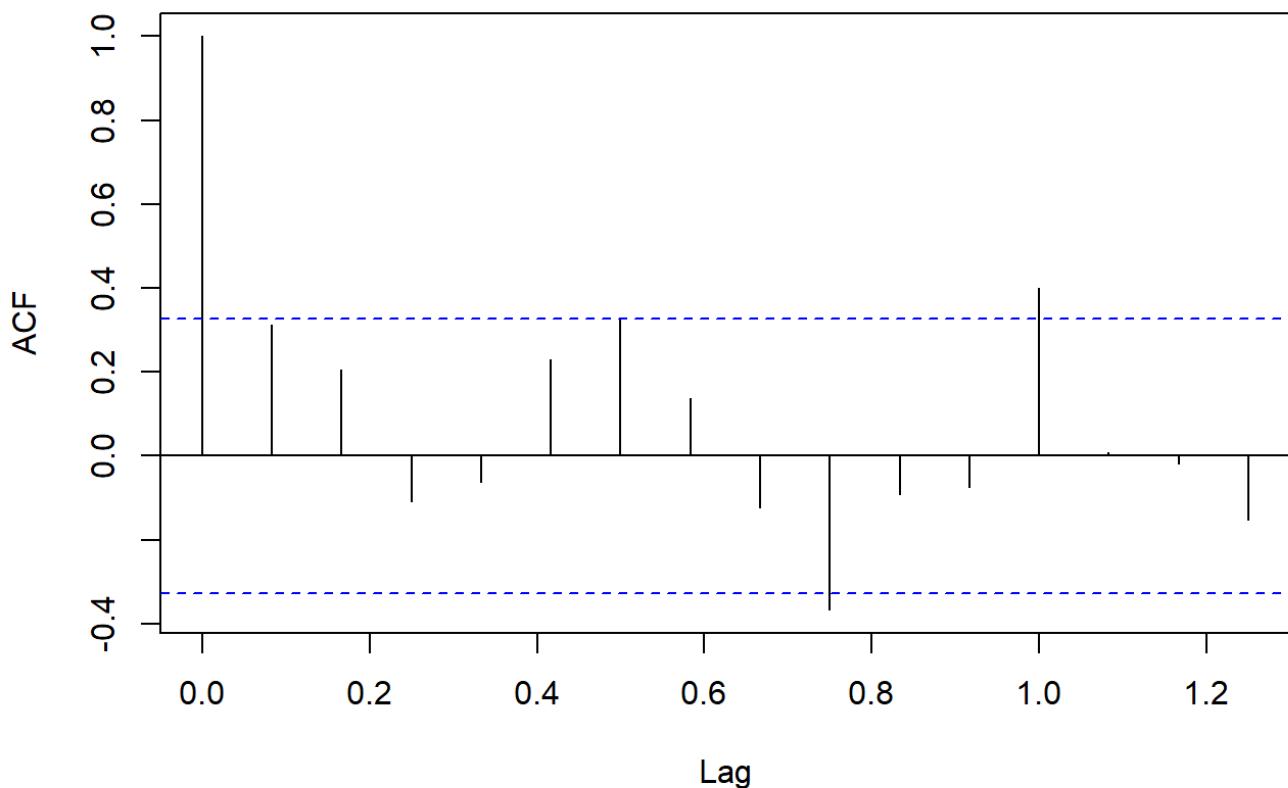


```
## [1] 51.74338
```

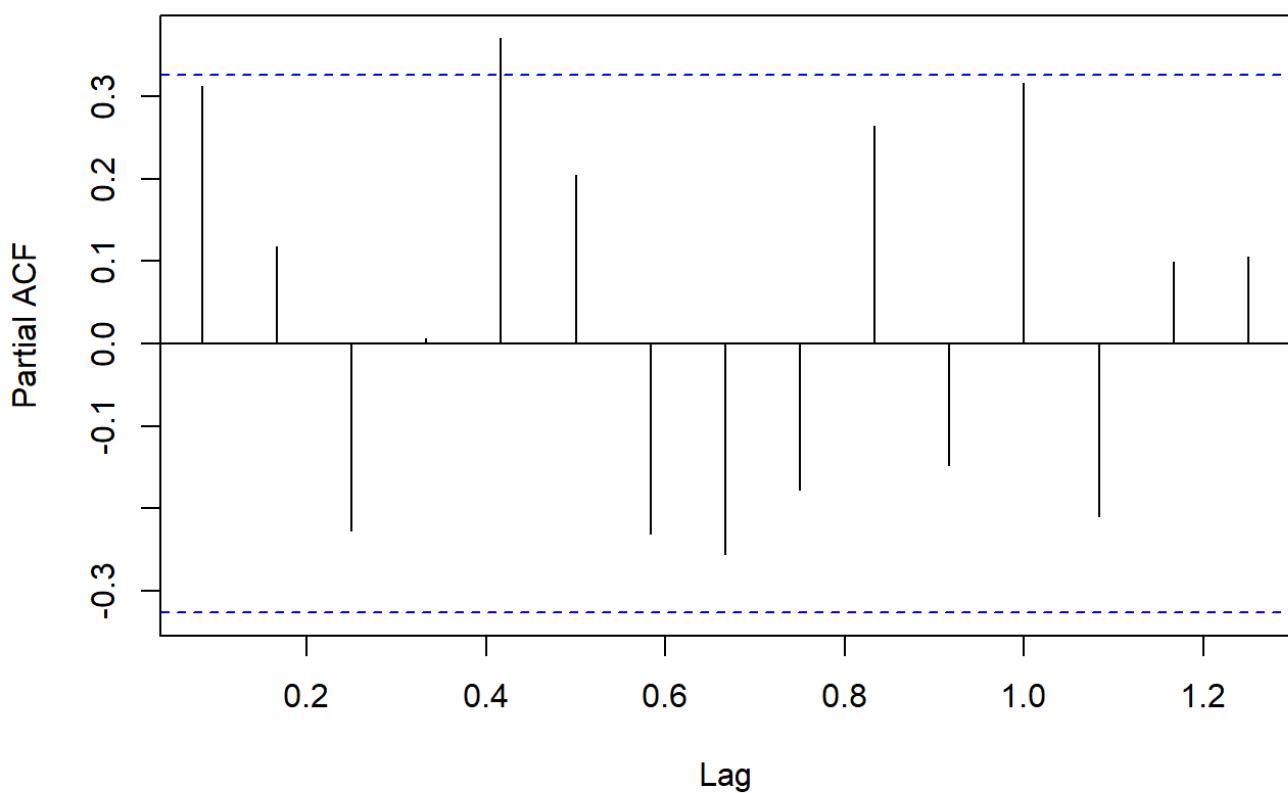
```
traintest(tv_ts8)
```



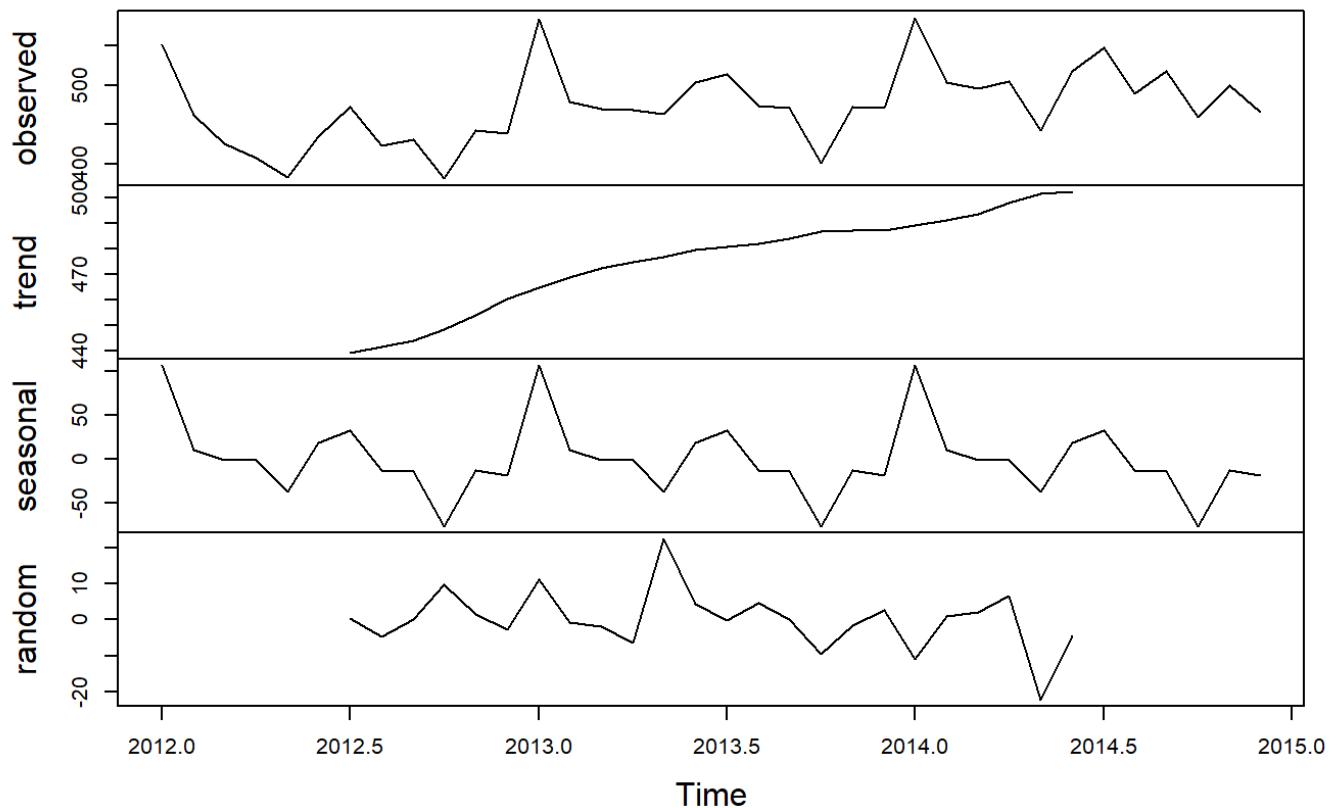
Series timeseries



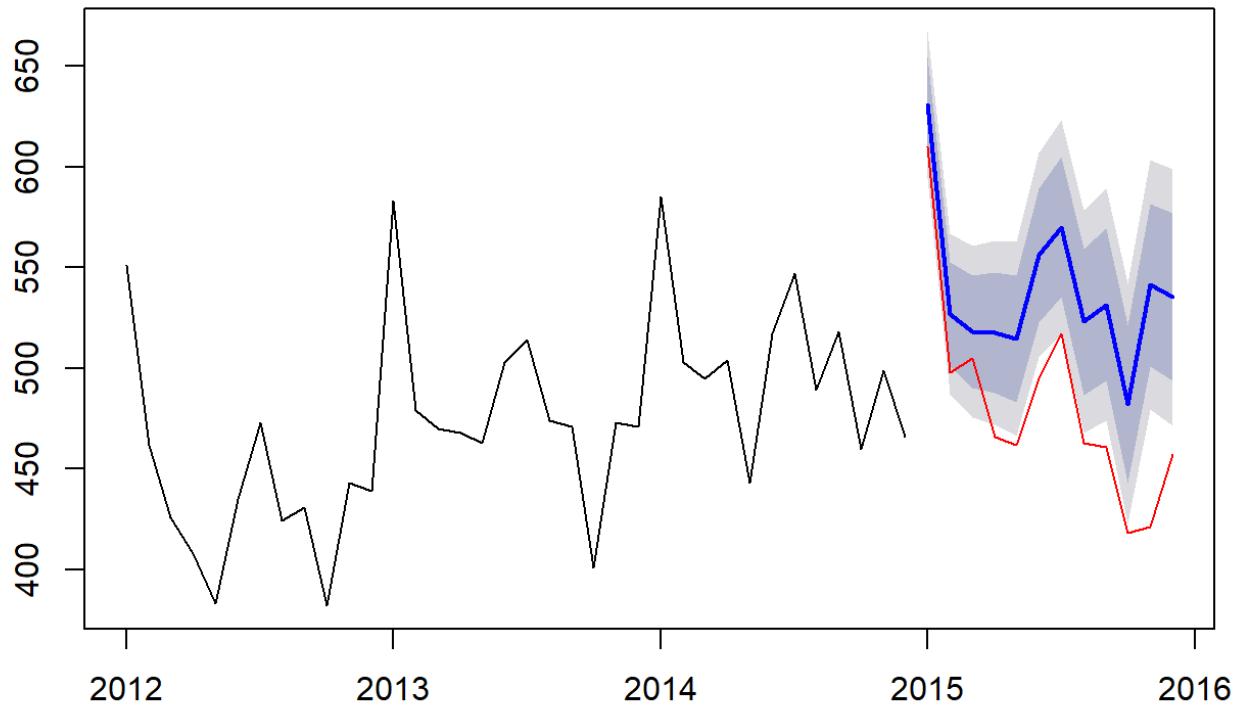
Series timeseries



Decomposition of additive time series

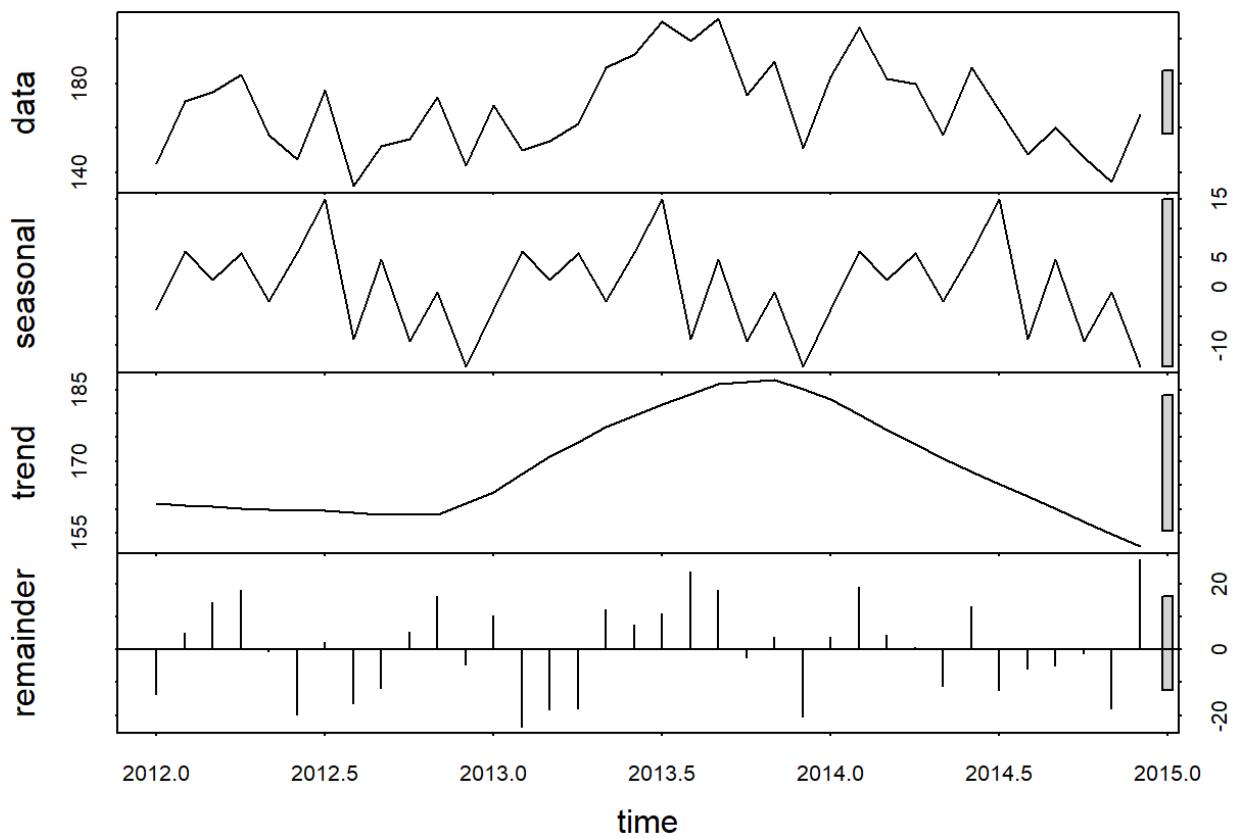
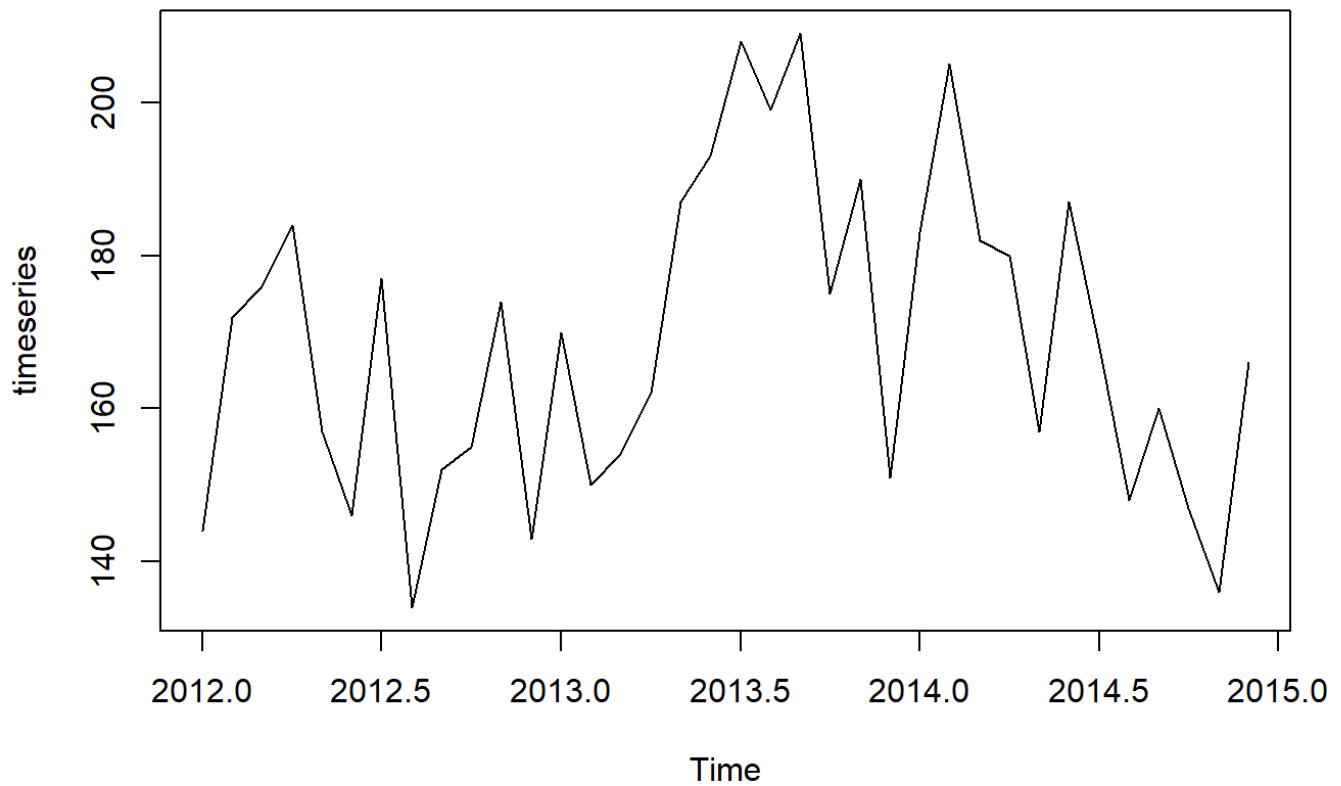


Forecasts from HoltWinters

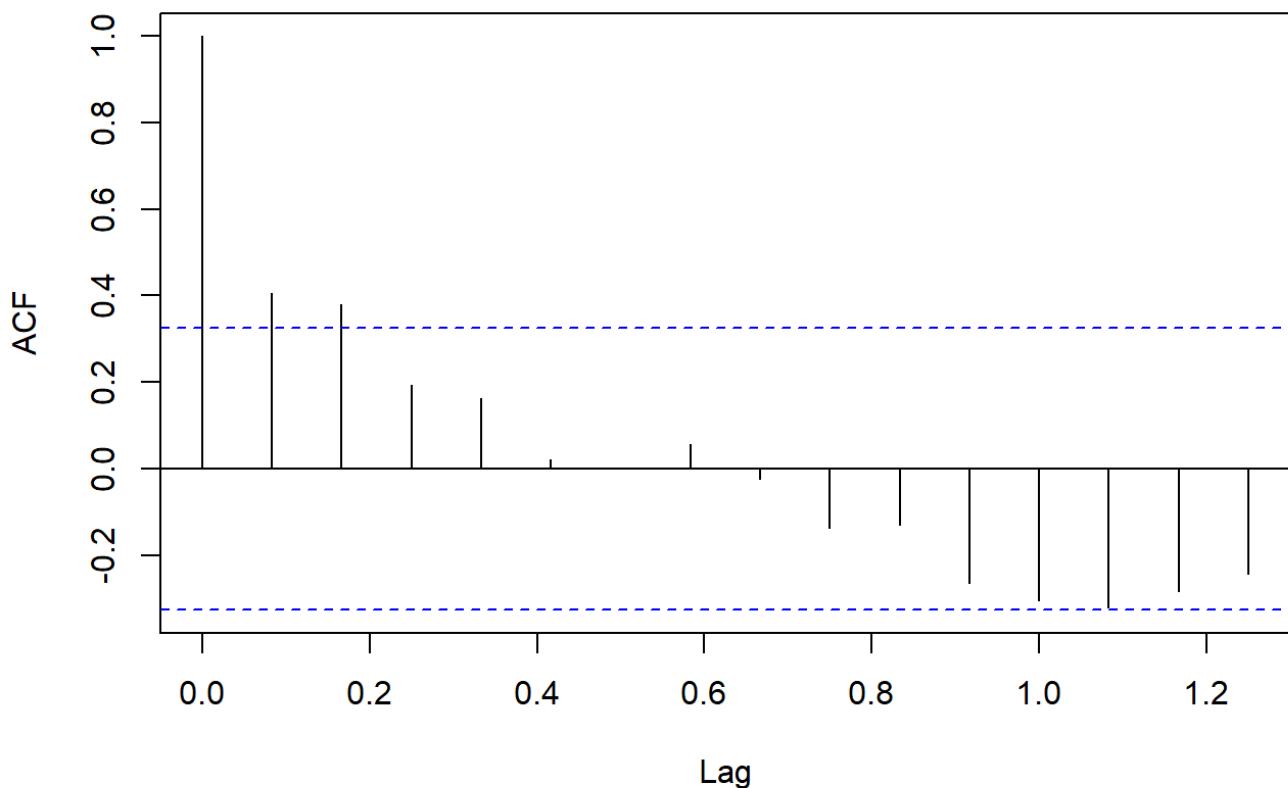


```
## [1] 56.29067
```

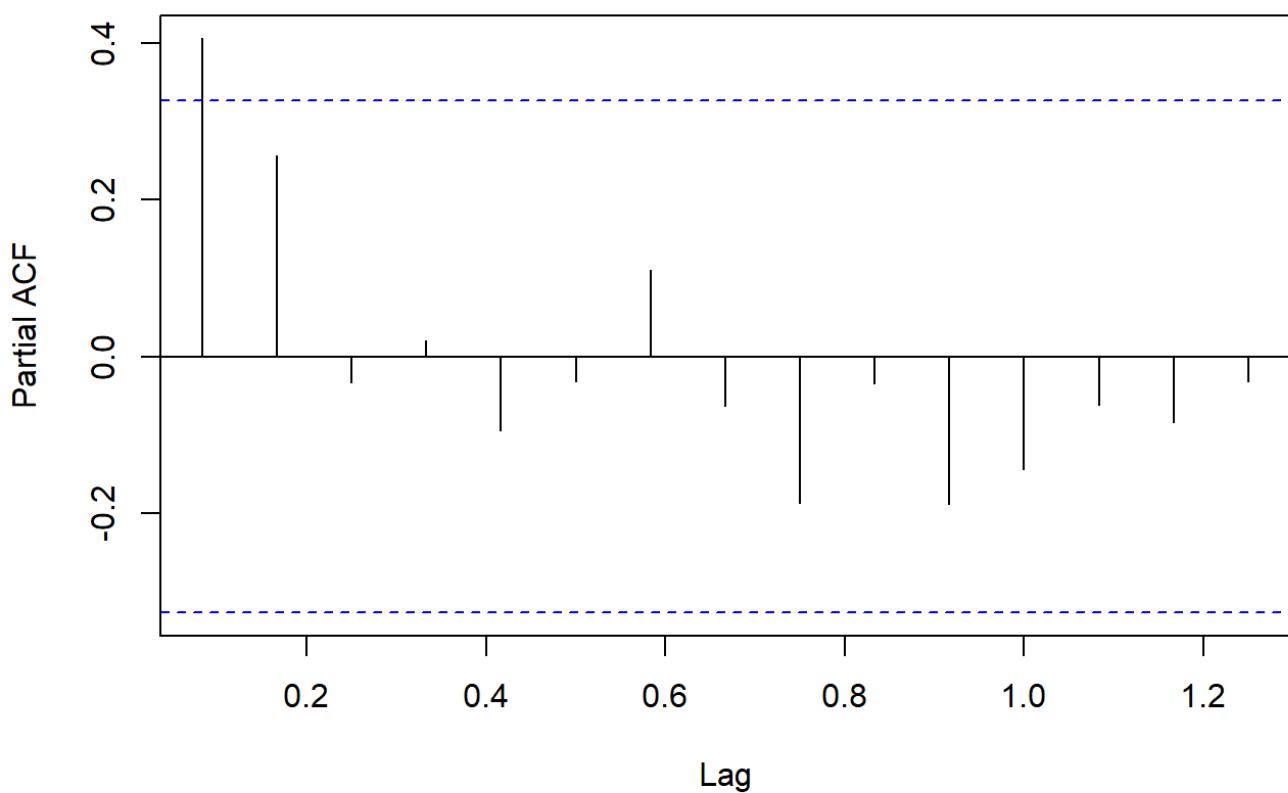
```
traintest(tv_ts9)
```



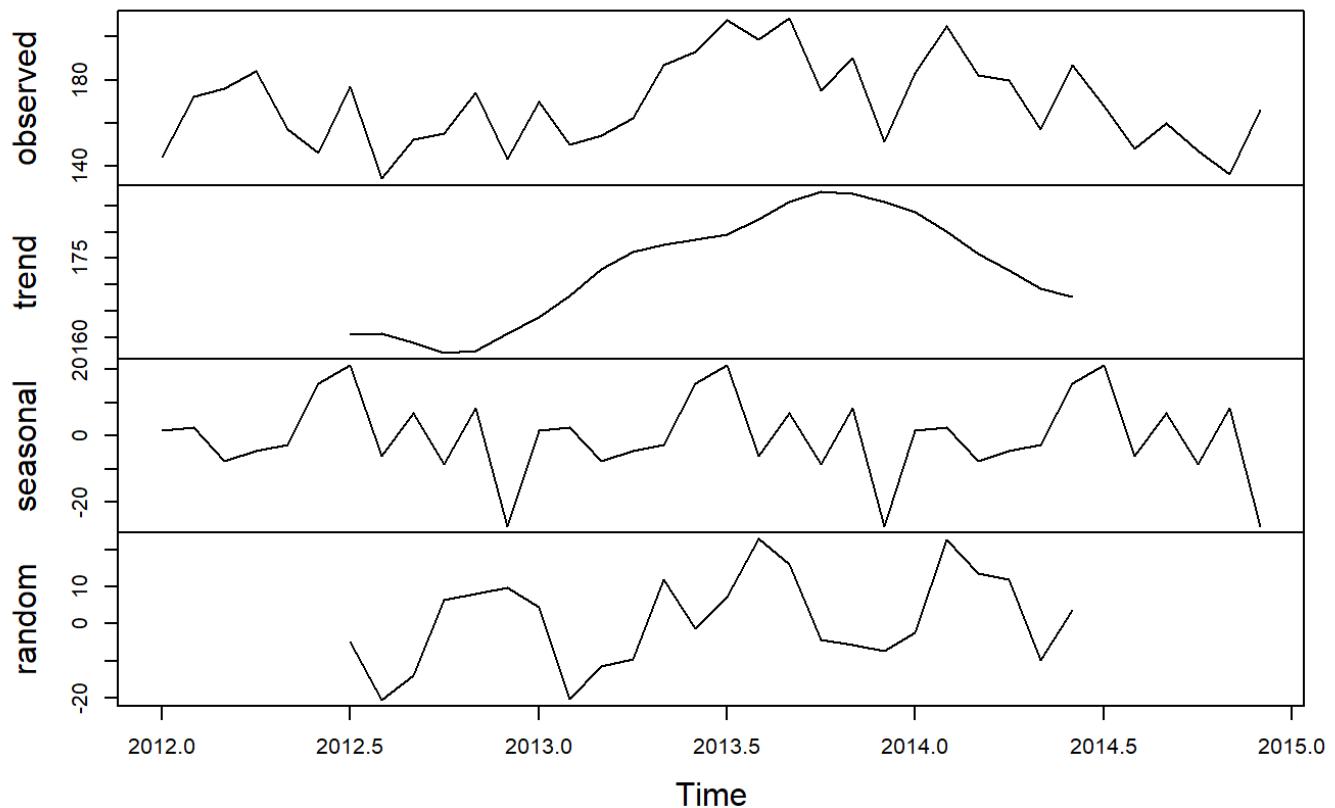
Series timeseries



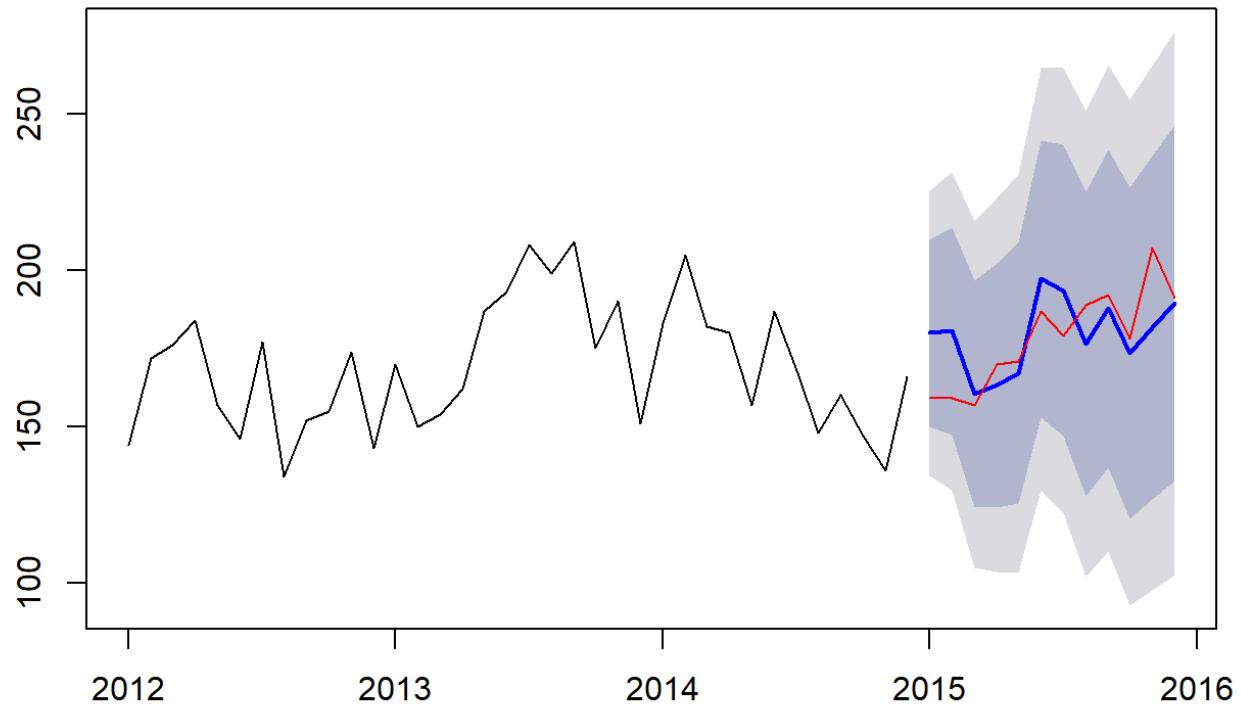
Series timeseries



Decomposition of additive time series

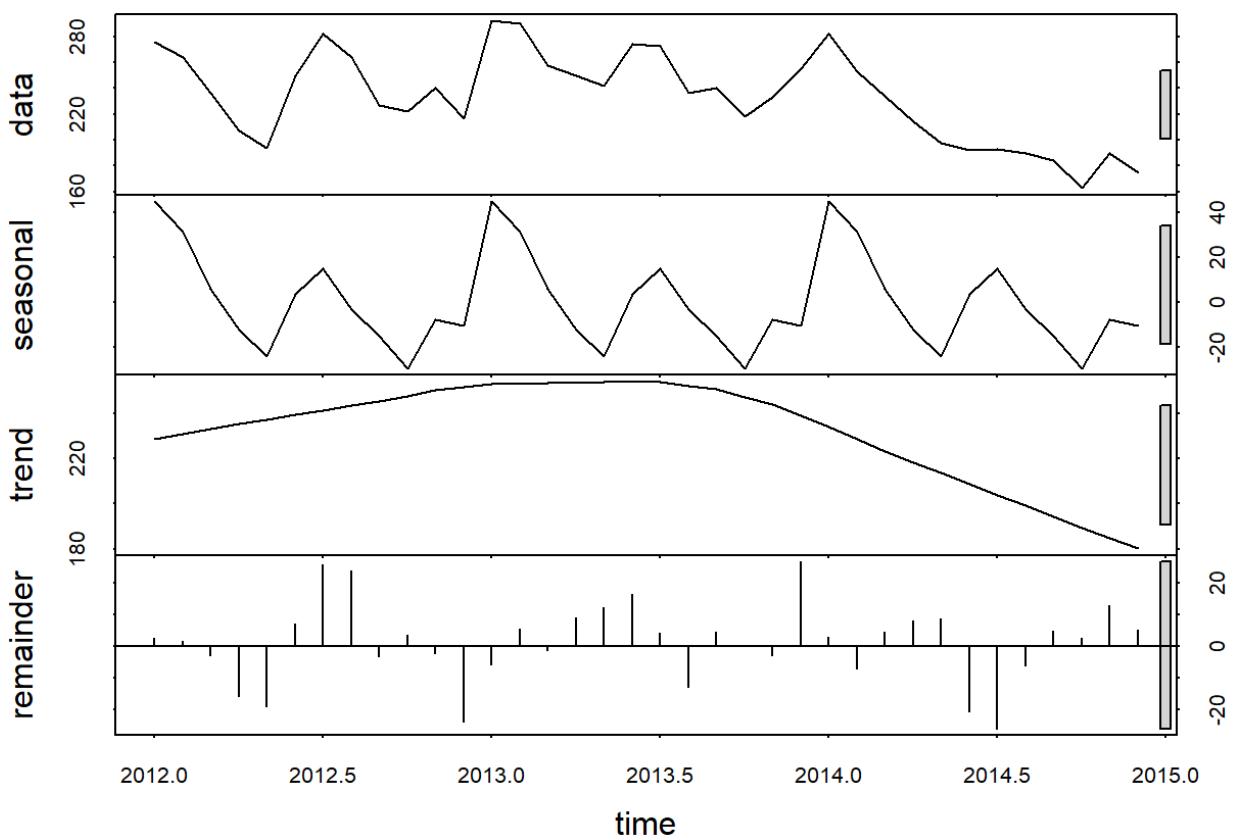
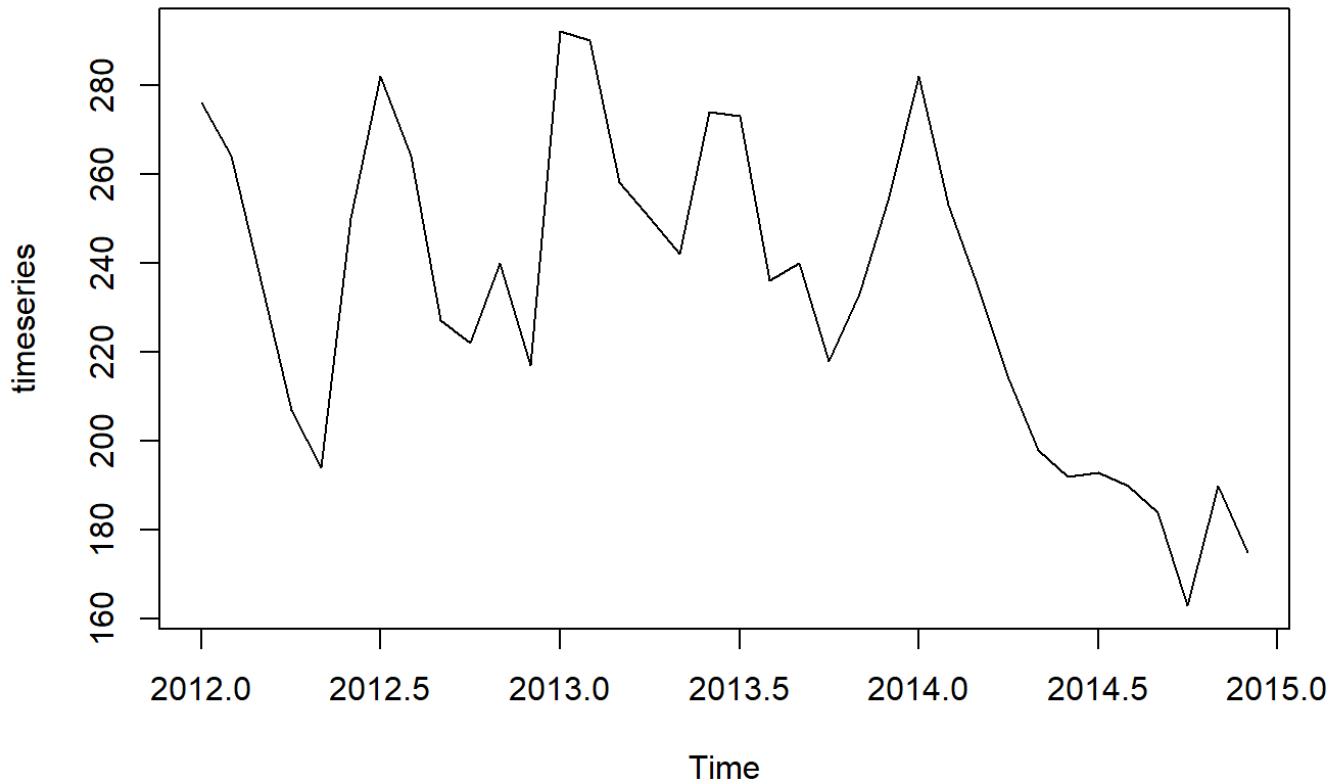


Forecasts from HoltWinters

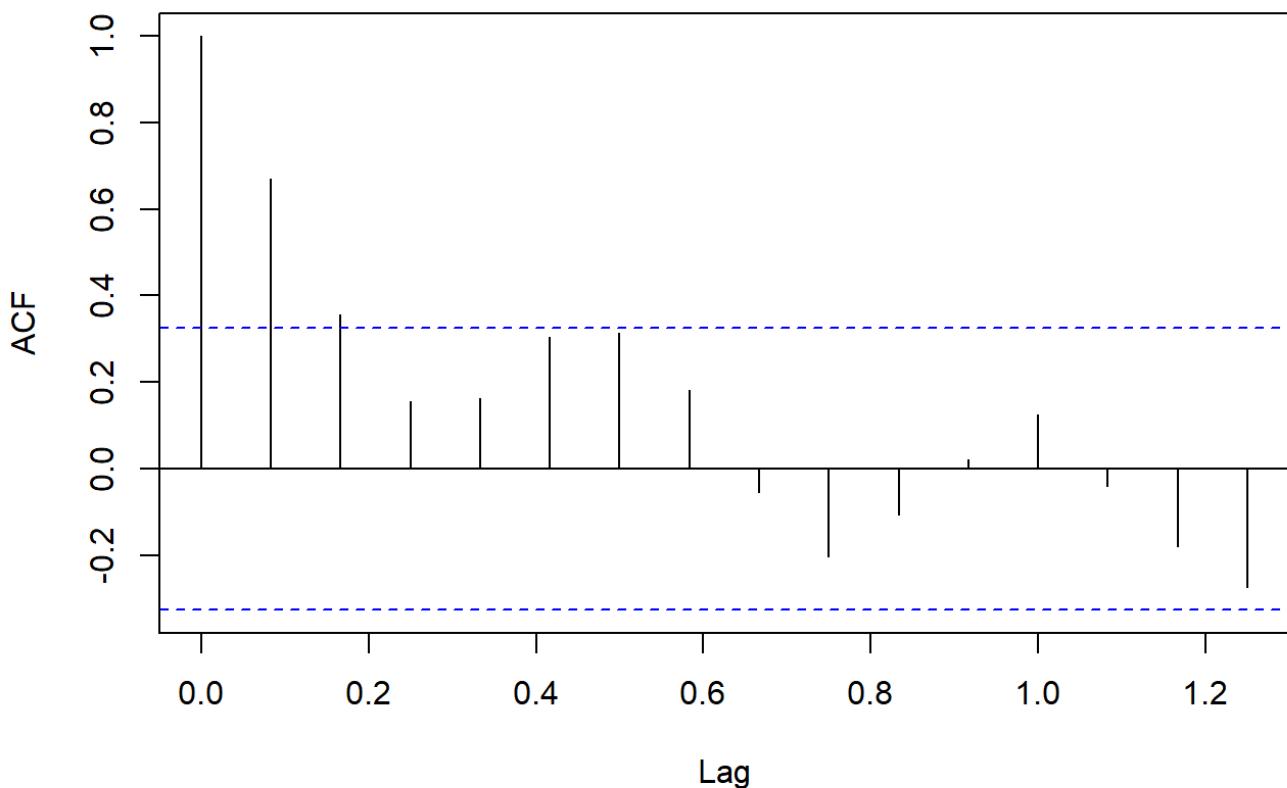


```
## [1] 10.7754
```

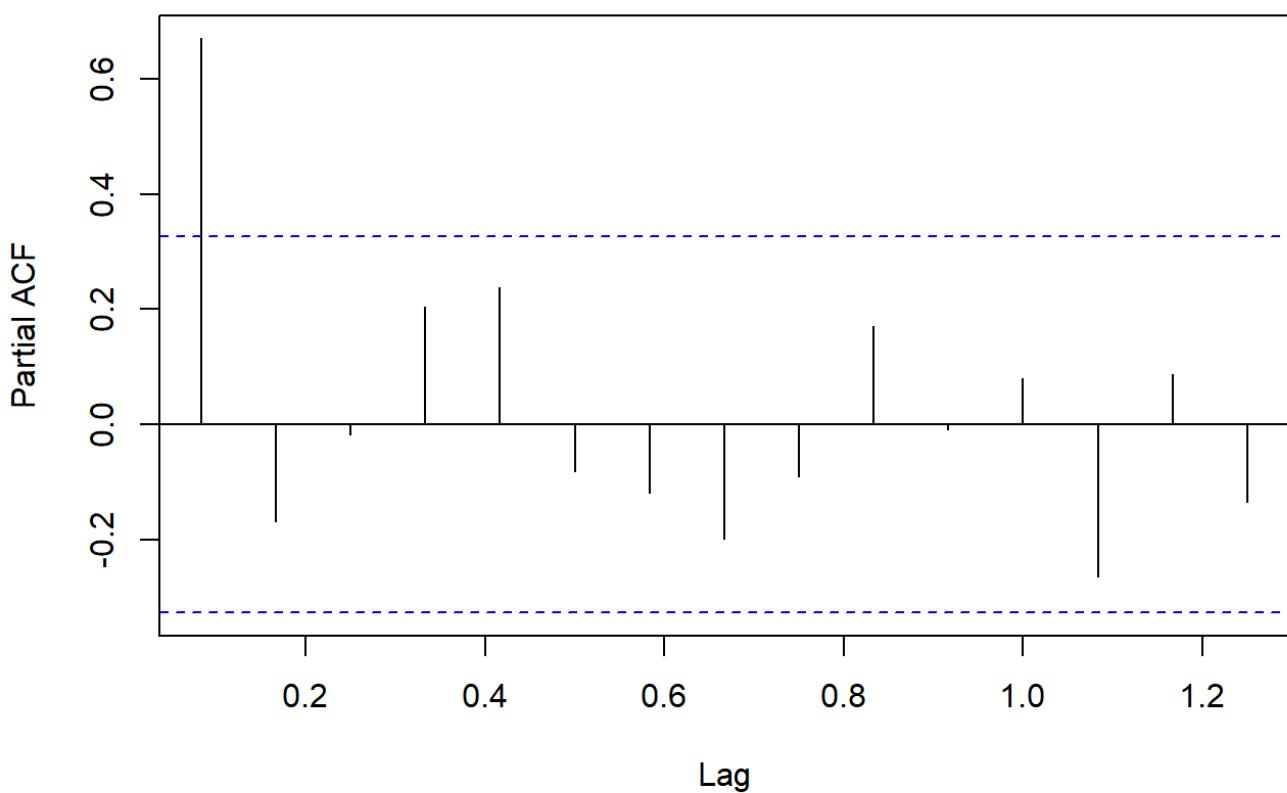
```
traintest(tv_ts10)
```



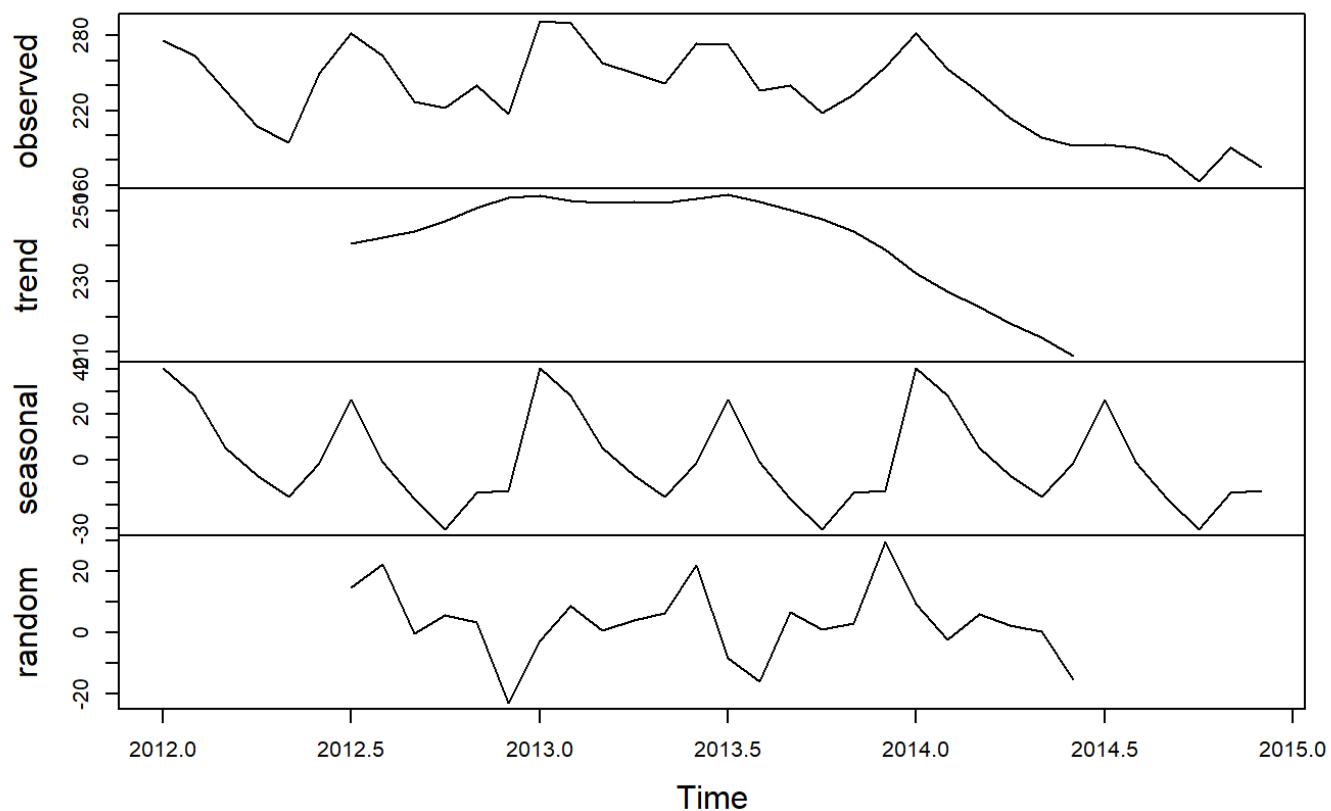
Series timeseries



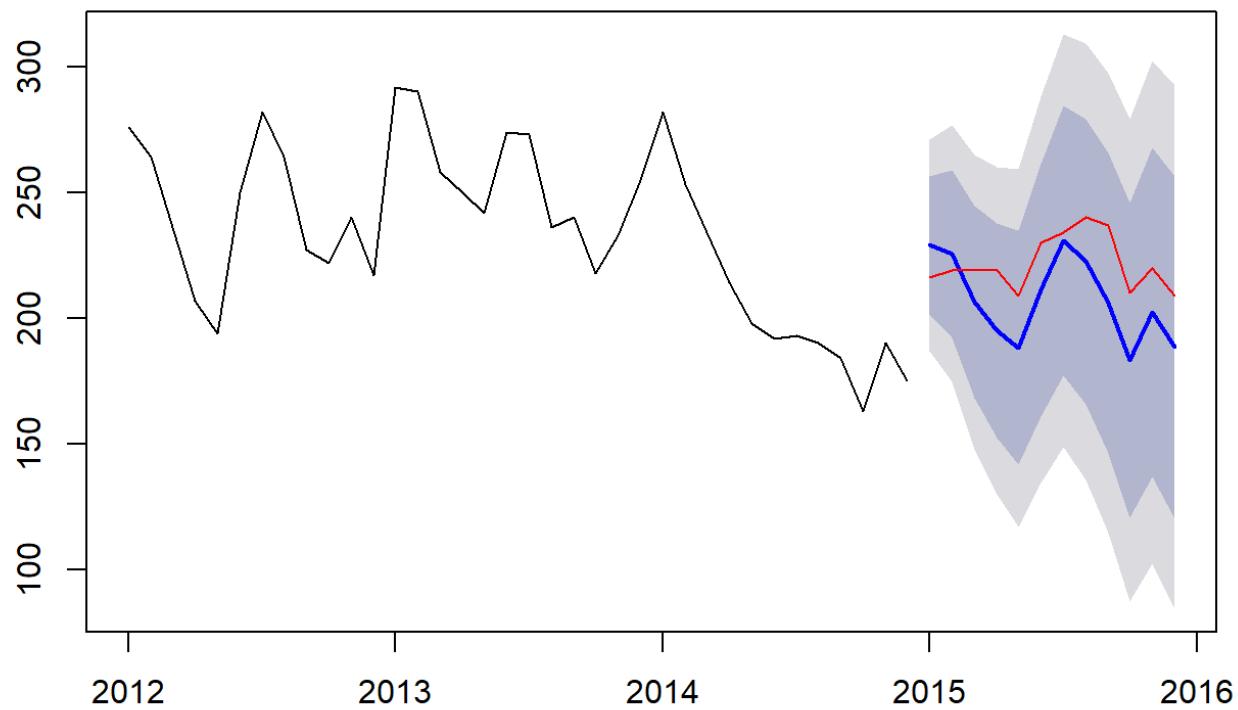
Series timeseries



Decomposition of additive time series

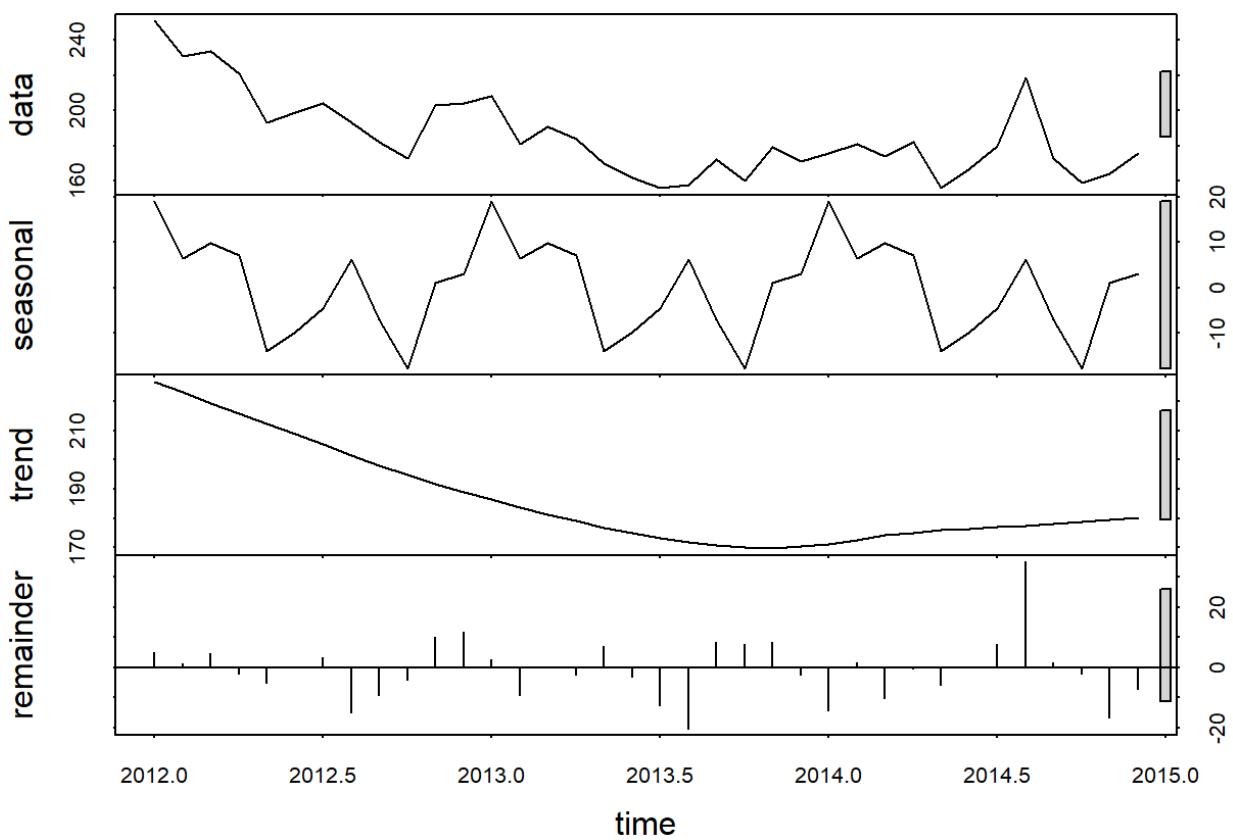
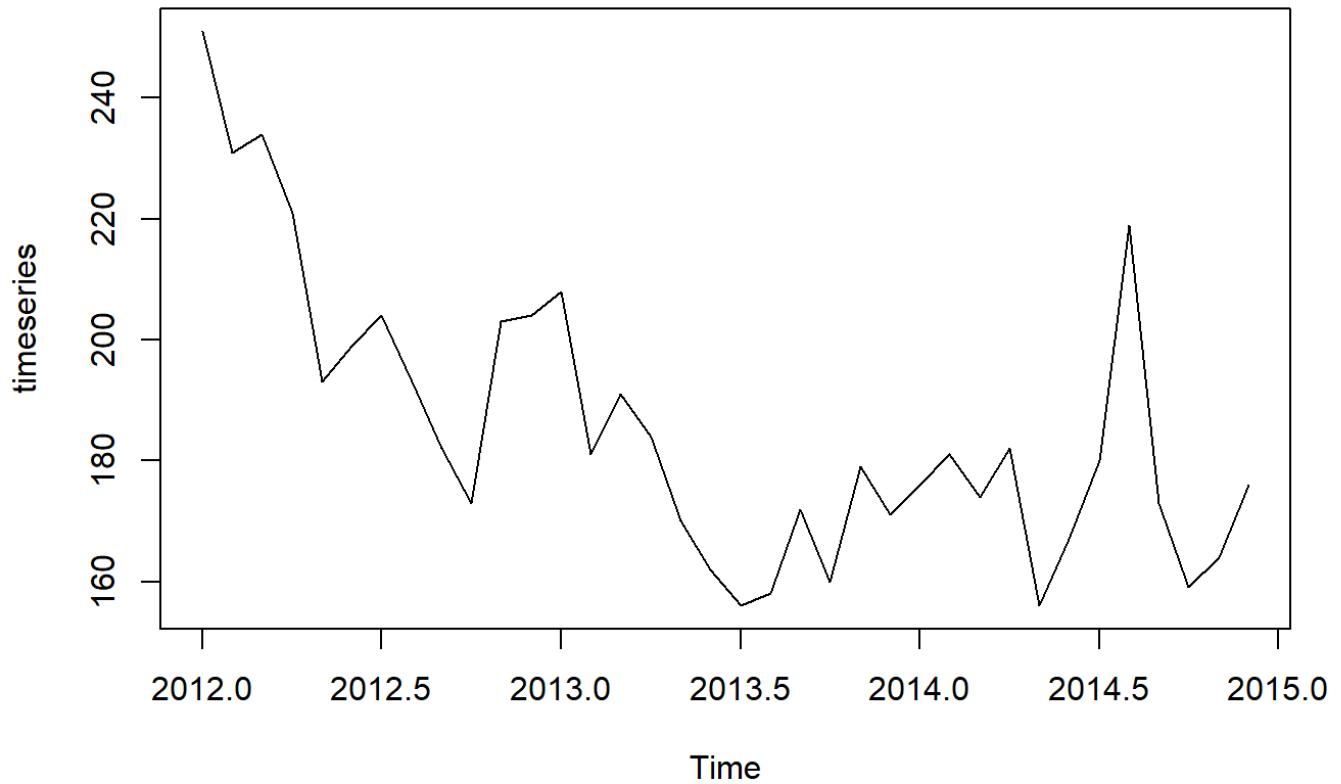


Forecasts from HoltWinters

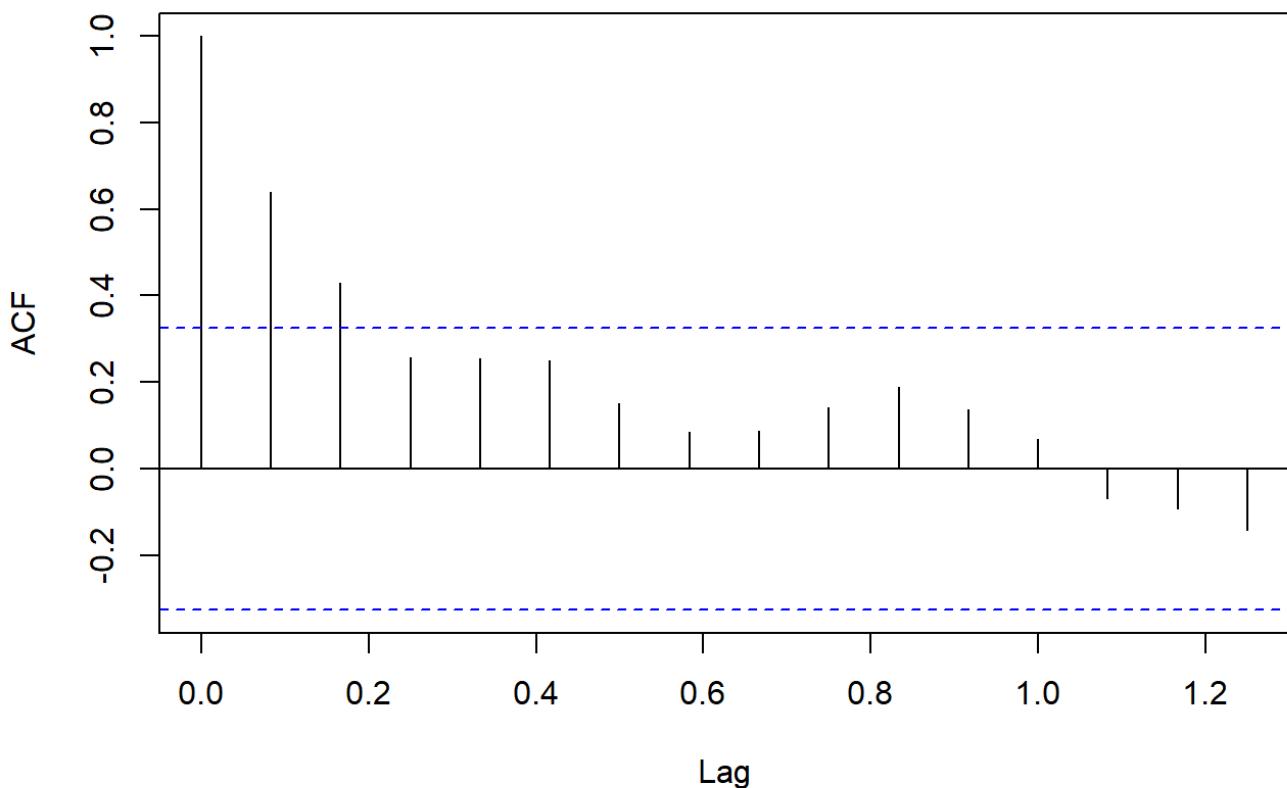


```
## [1] 17.68645
```

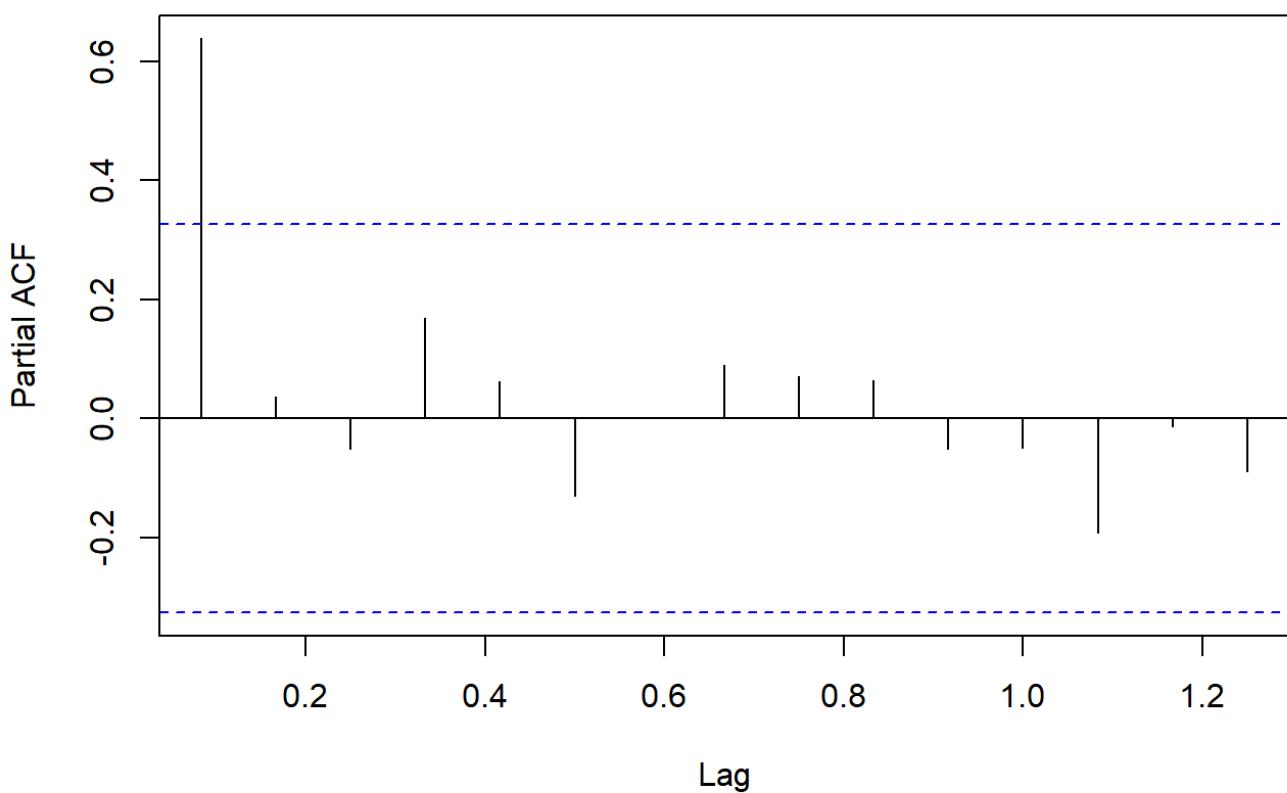
```
traintest(tv_ts11)
```



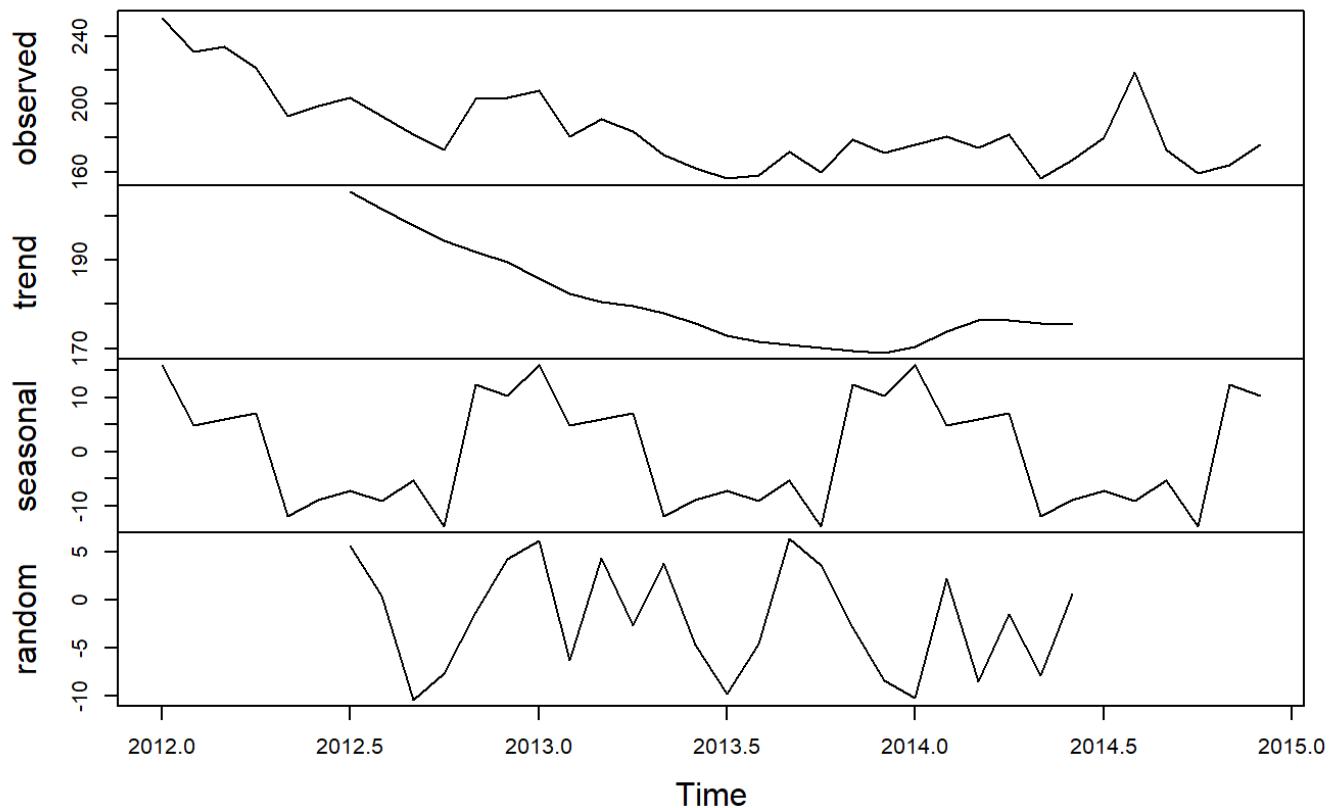
Series timeseries



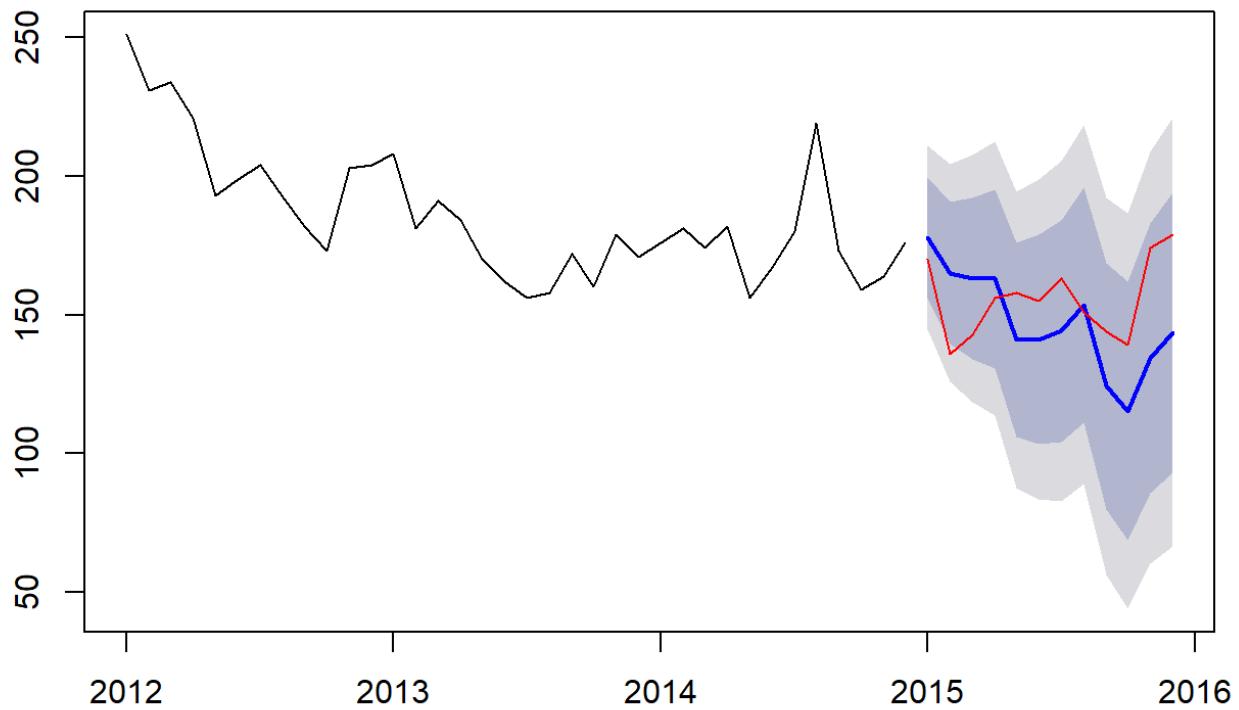
Series timeseries



Decomposition of additive time series

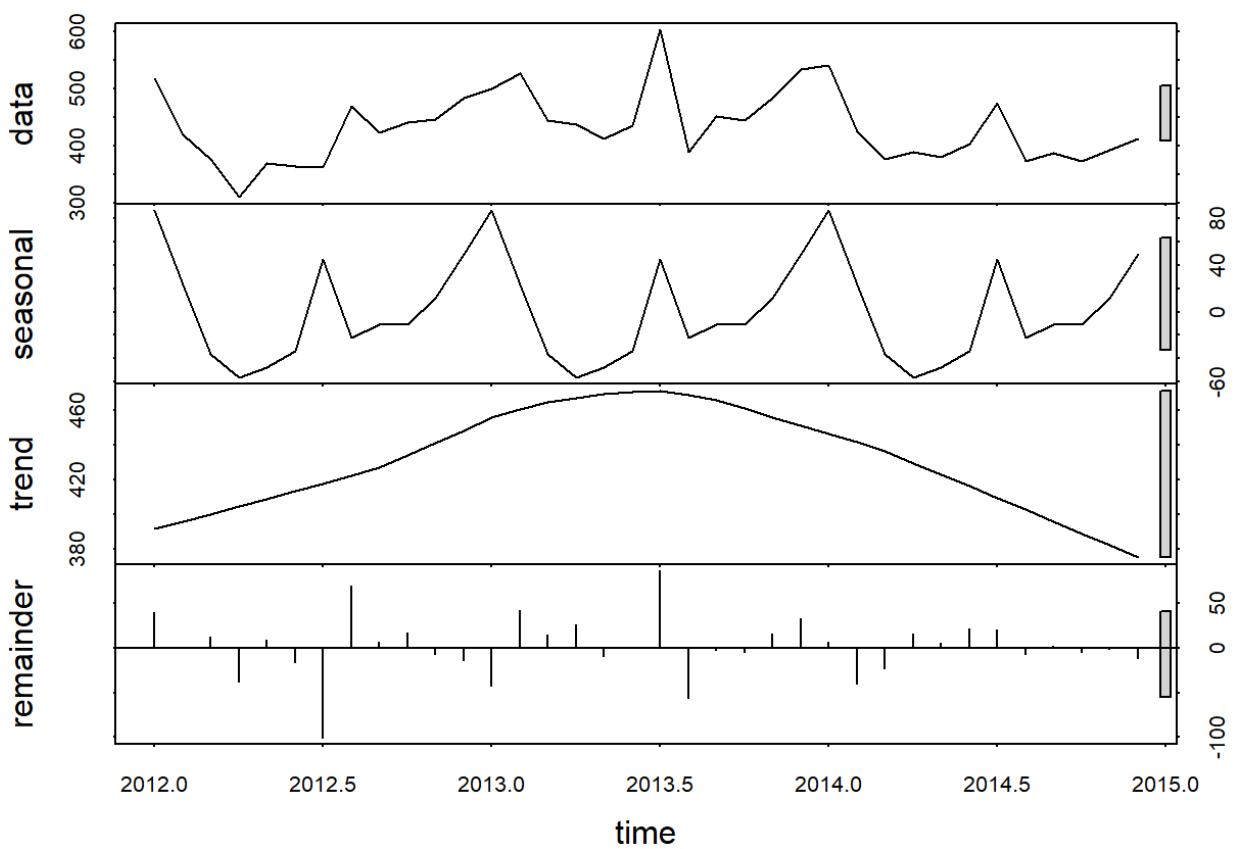
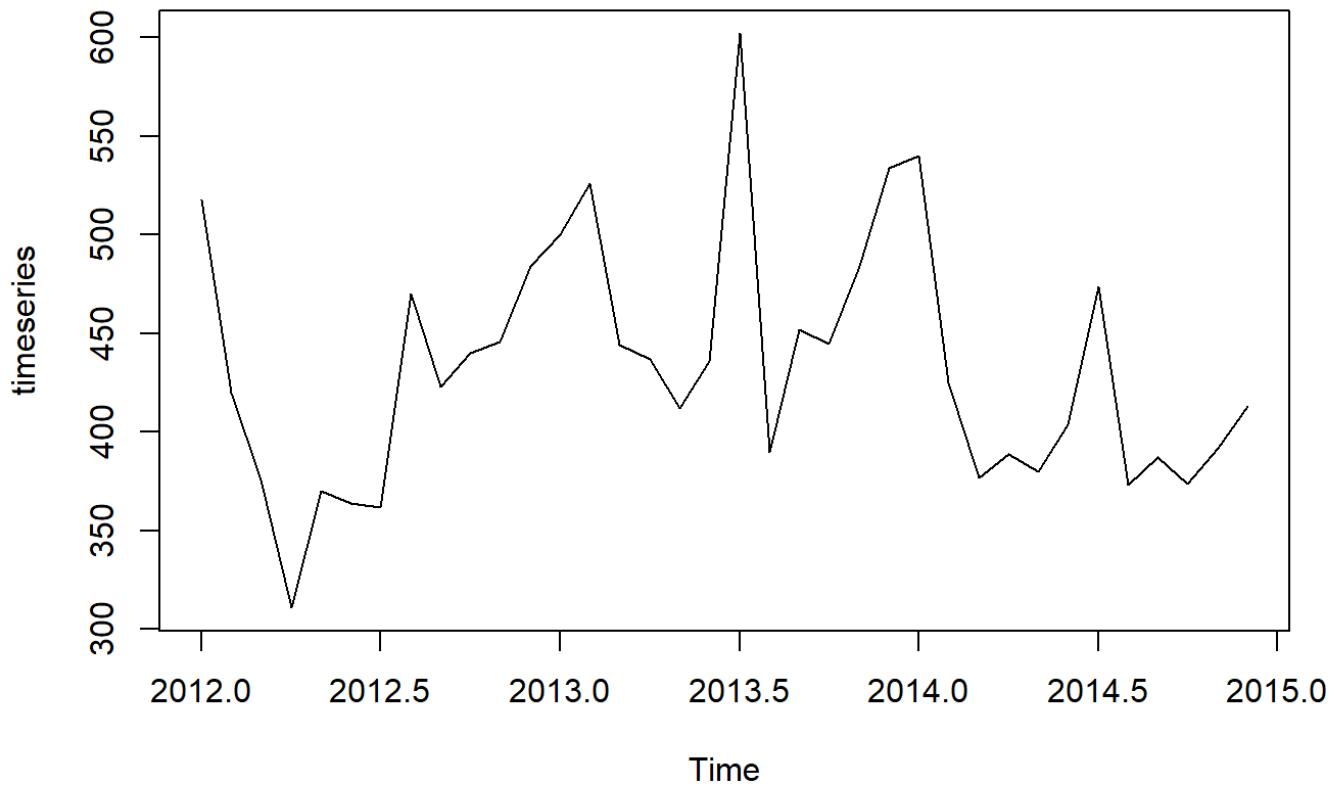


Forecasts from HoltWinters

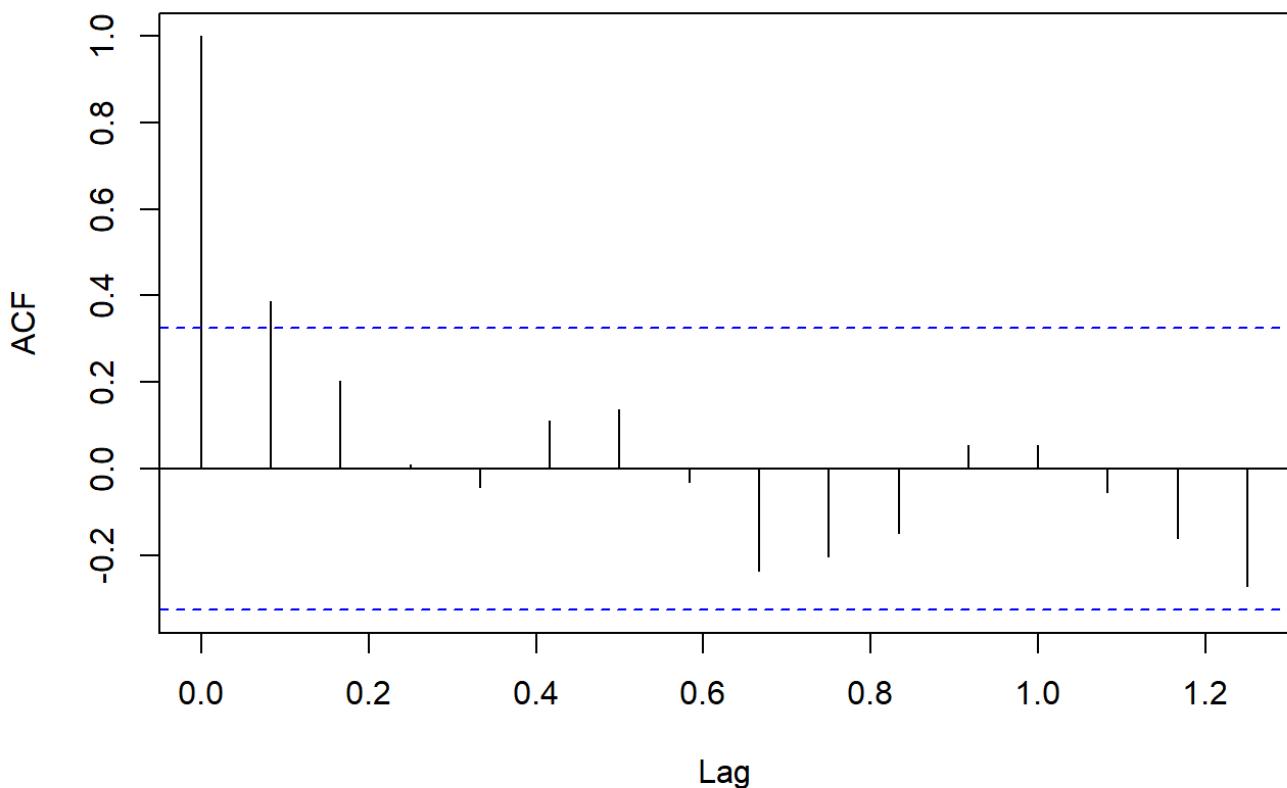


```
## [1] 19.5647
```

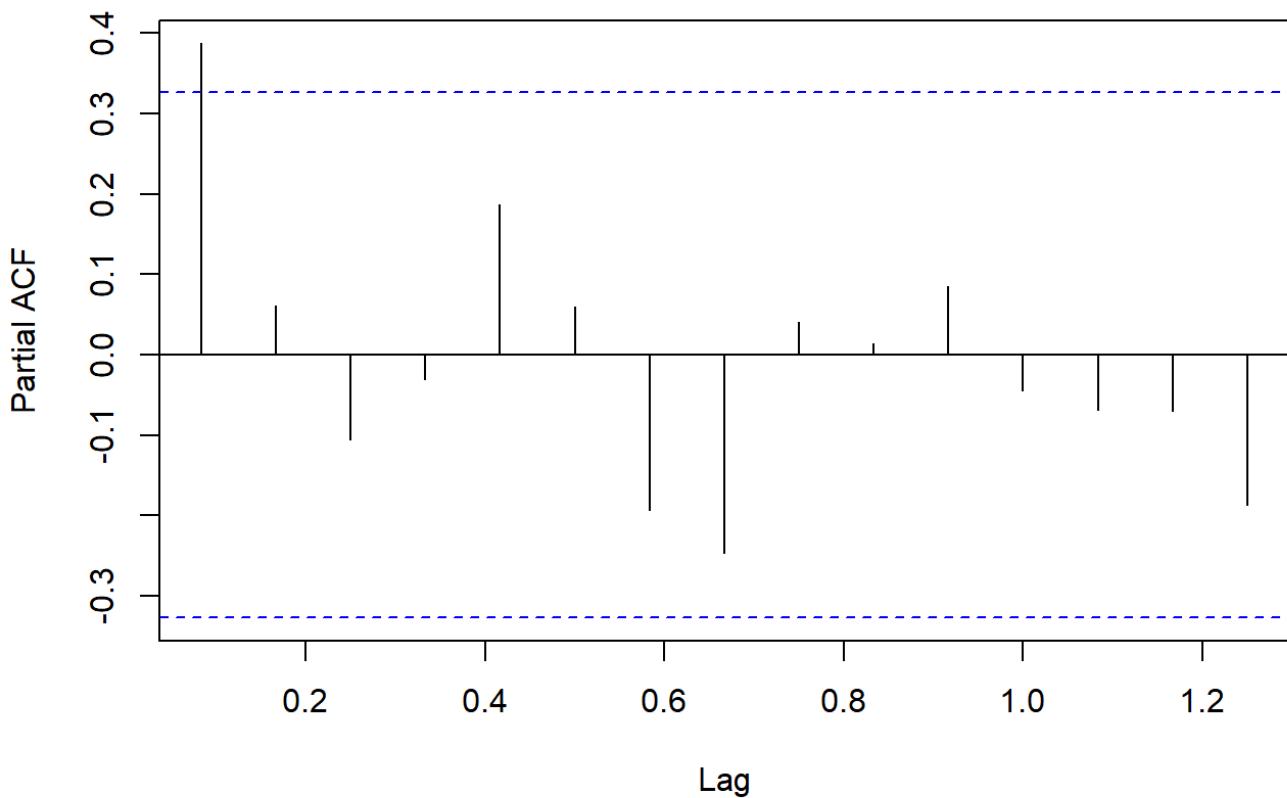
```
traintest(tv_ts12)
```



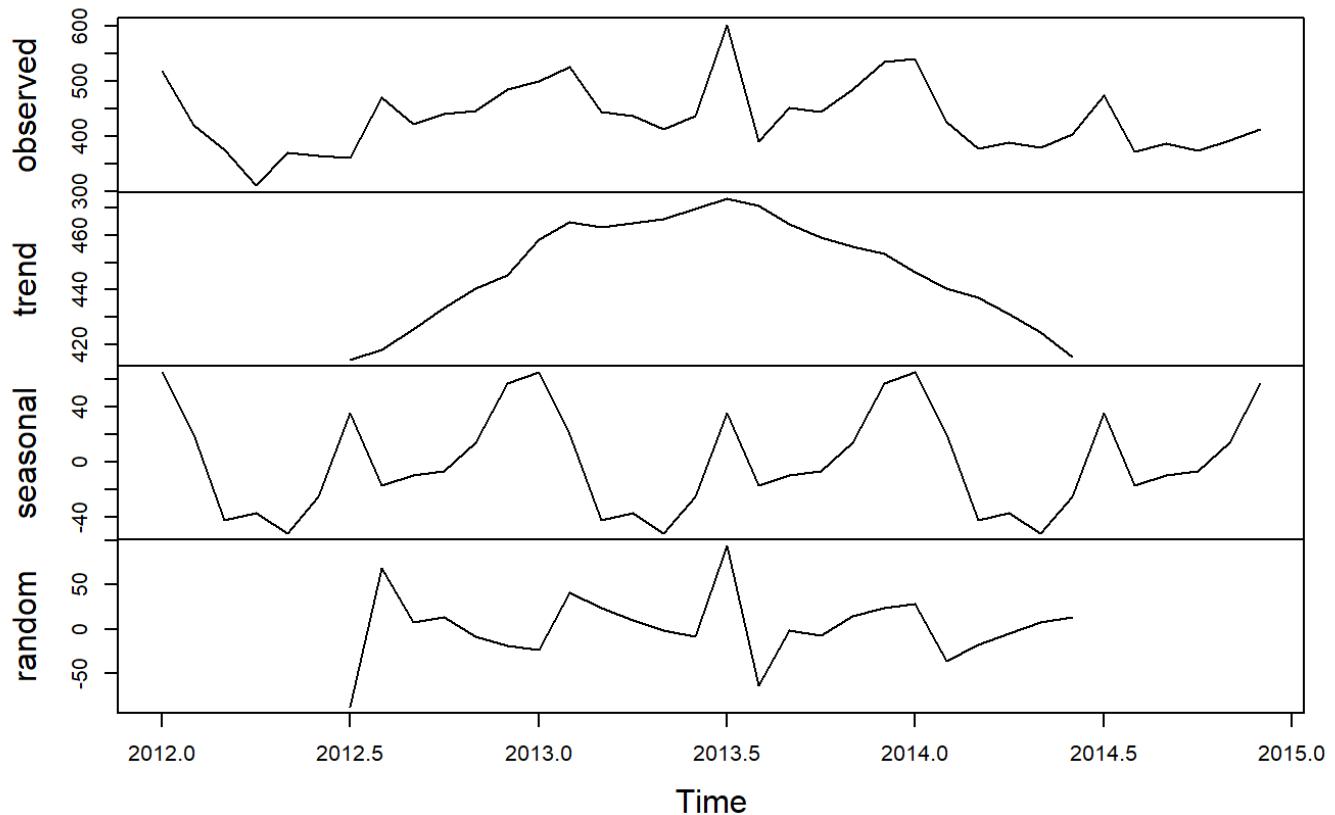
Series timeseries



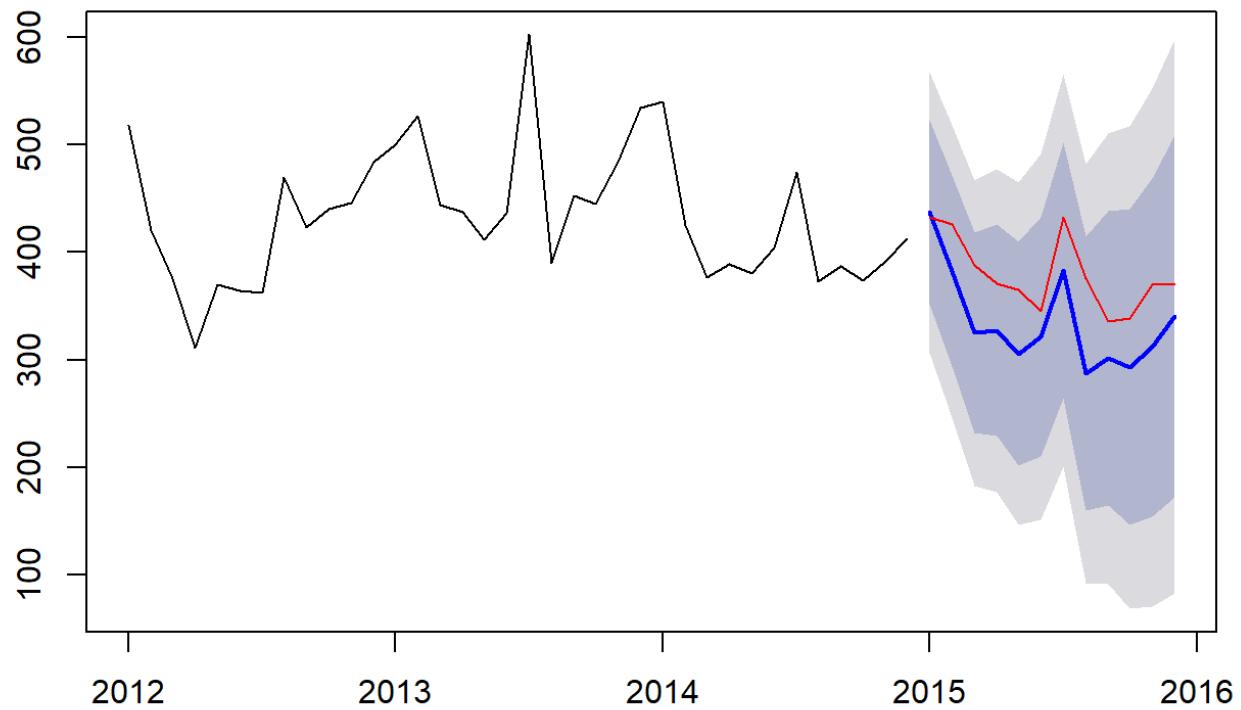
Series timeseries



Decomposition of additive time series

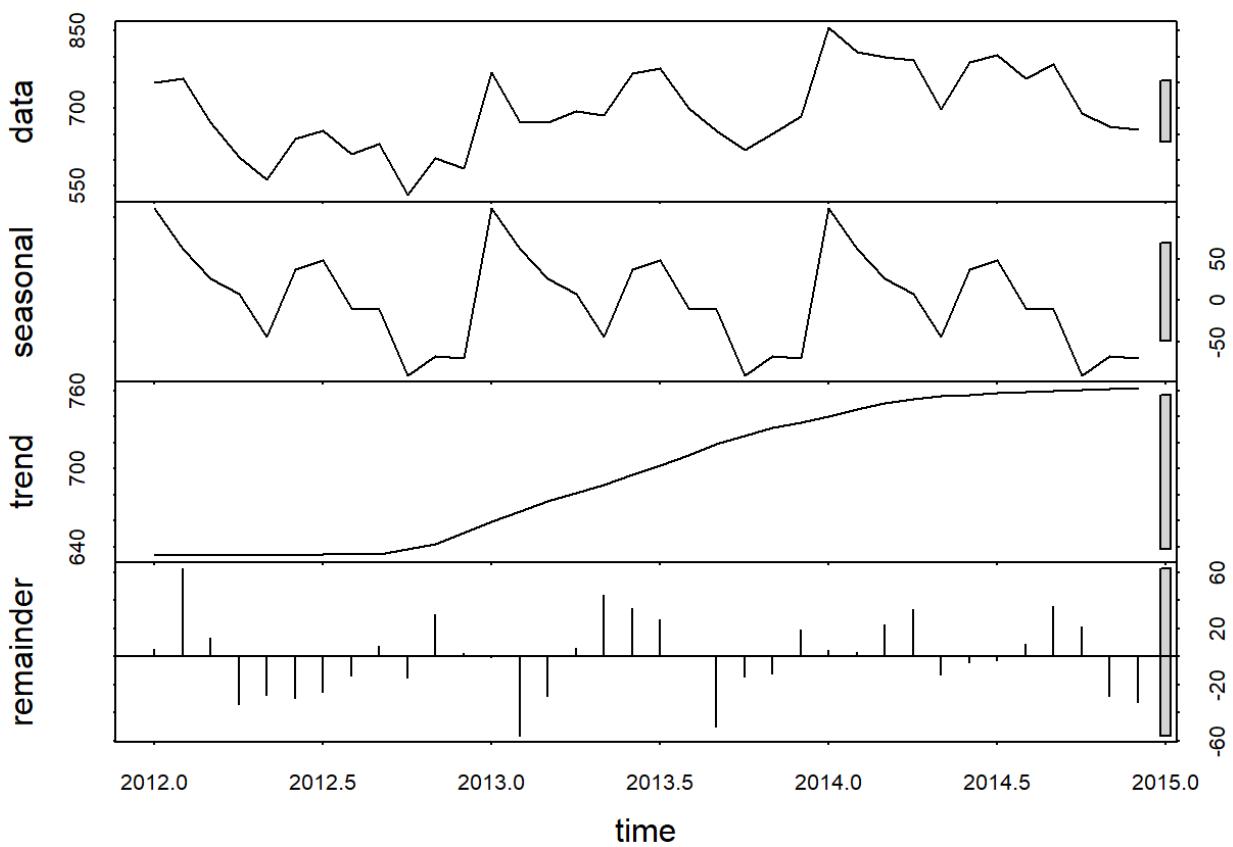
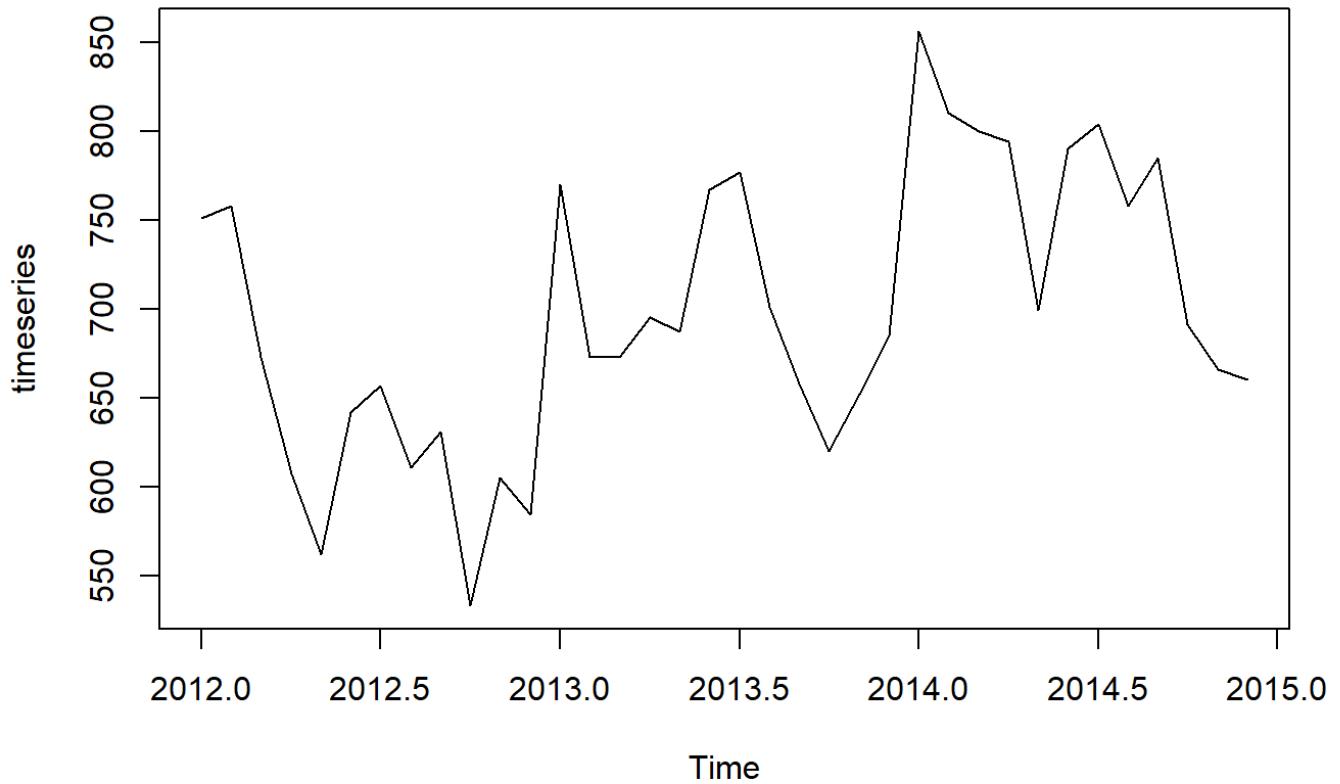


Forecasts from HoltWinters

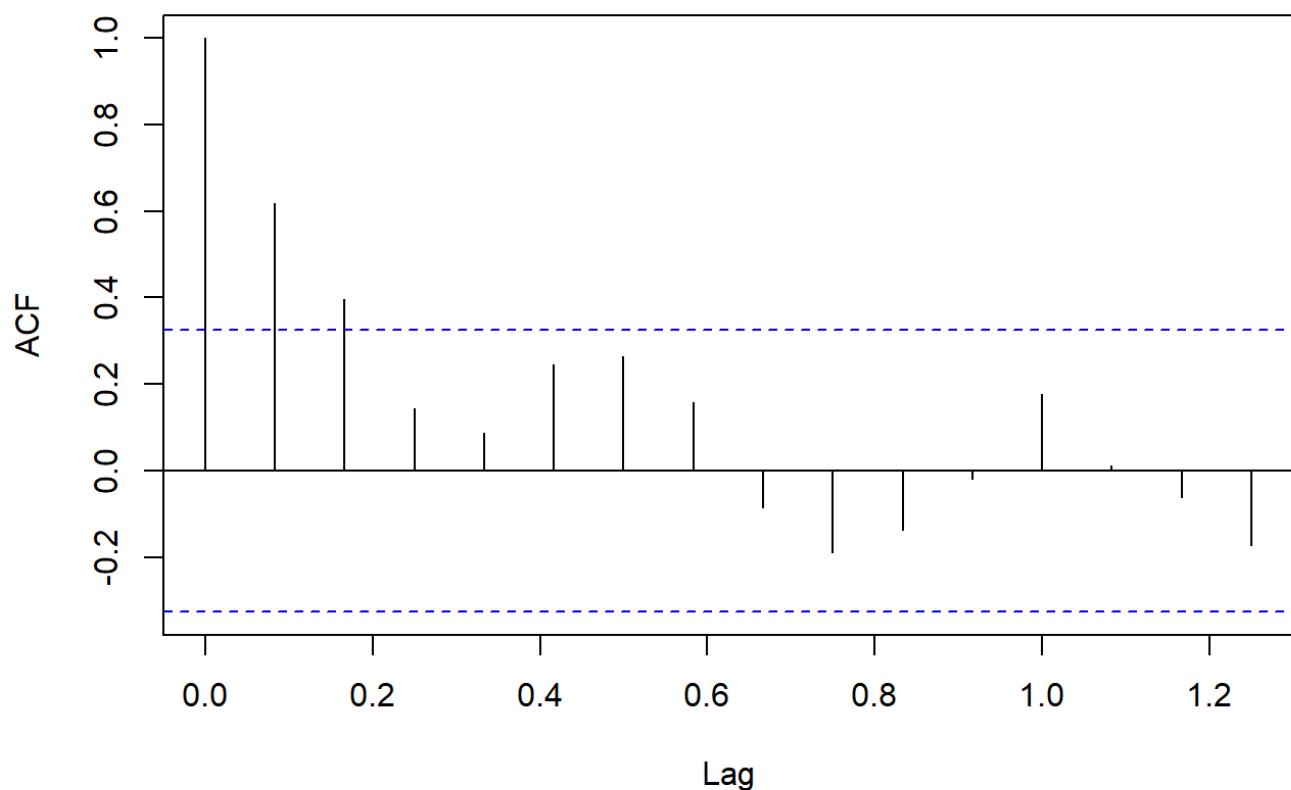


```
## [1] 45.32363
```

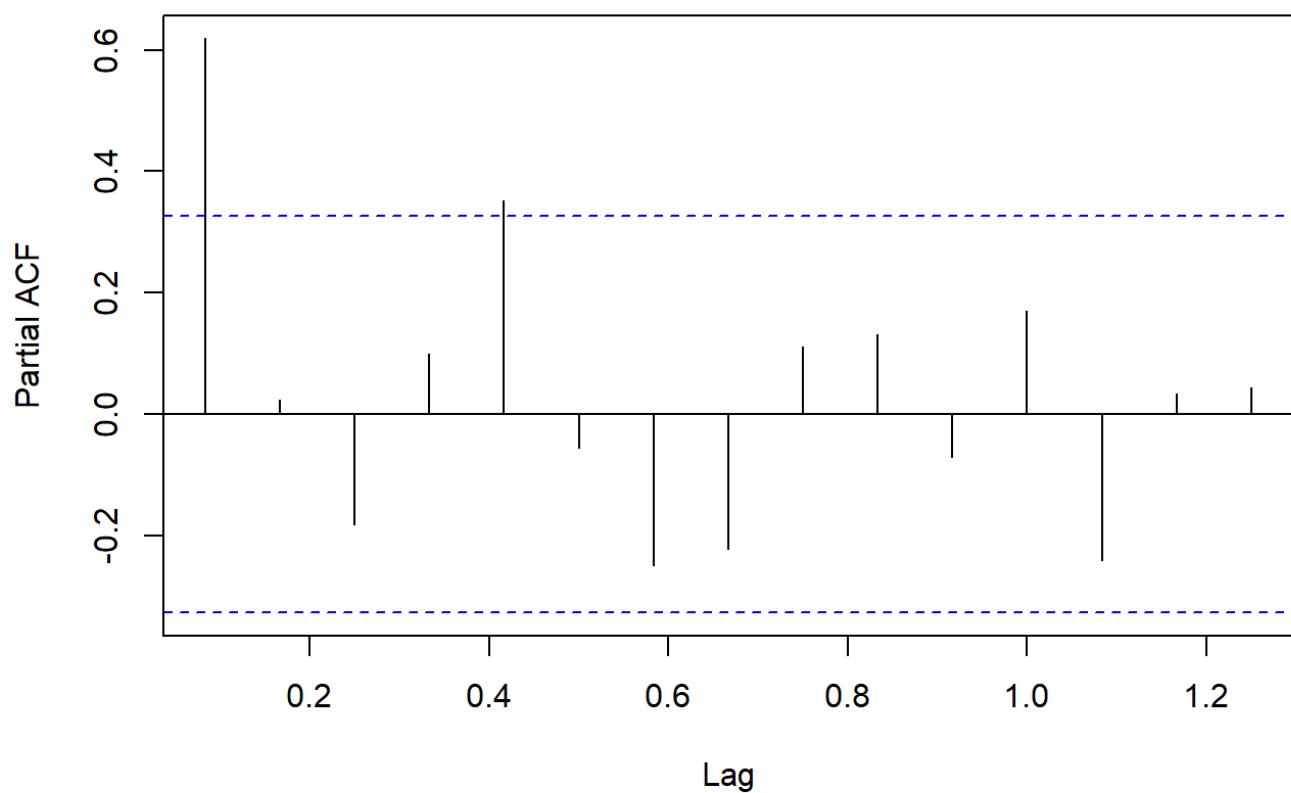
```
traintest(tv_ts13)
```



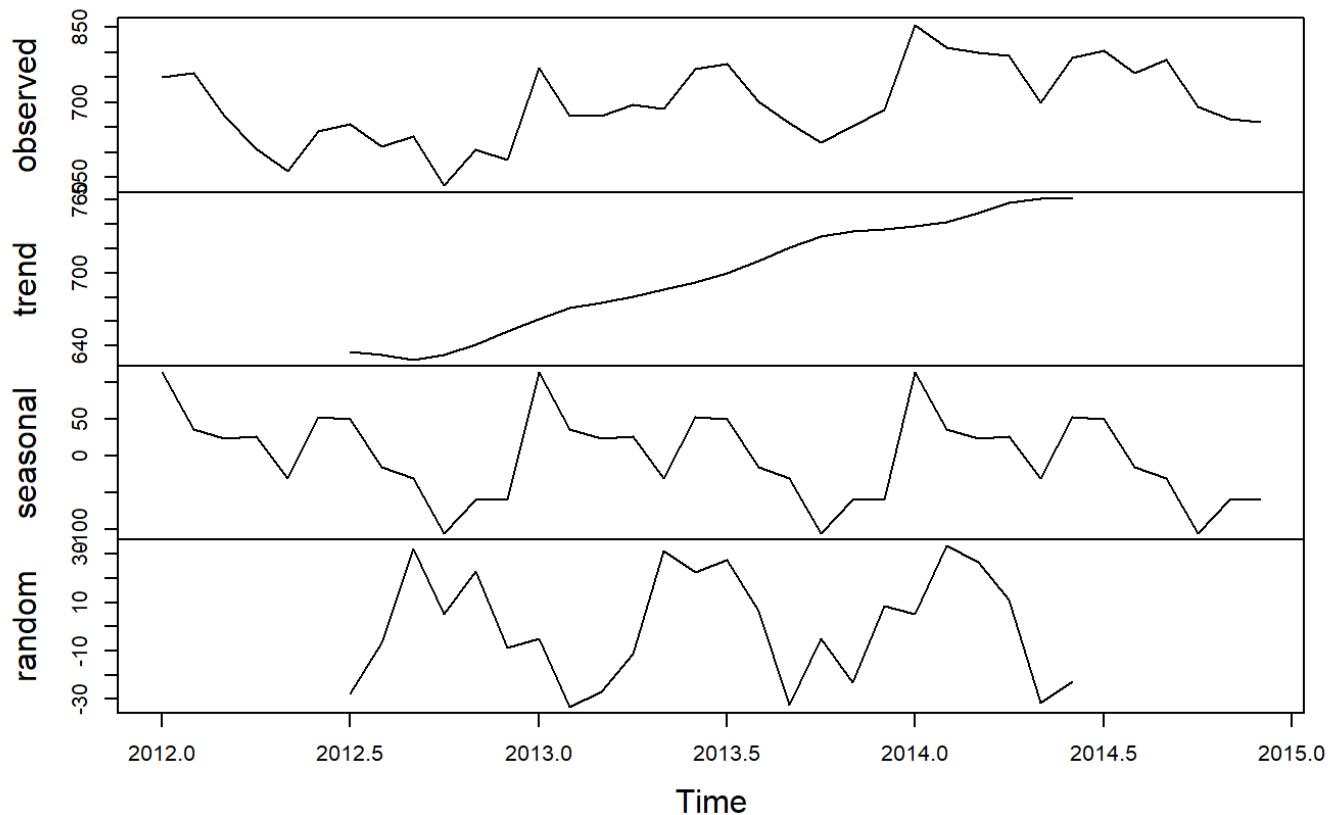
Series timeseries



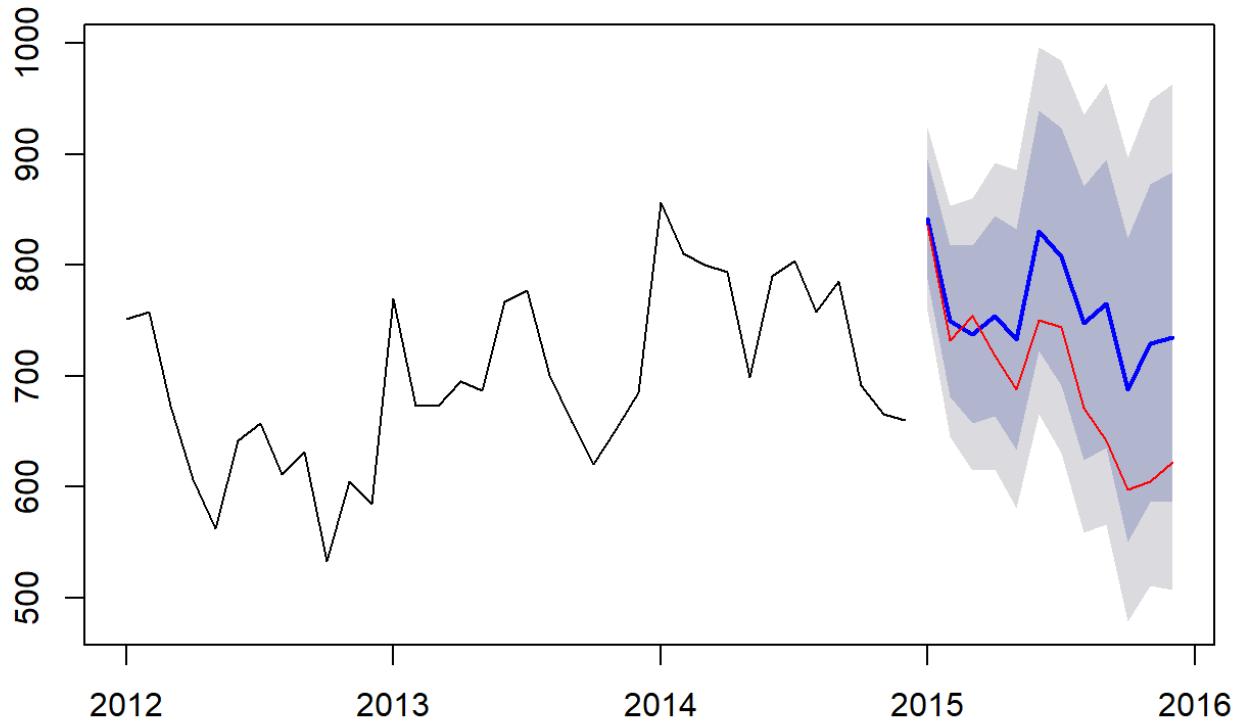
Series timeseries



Decomposition of additive time series

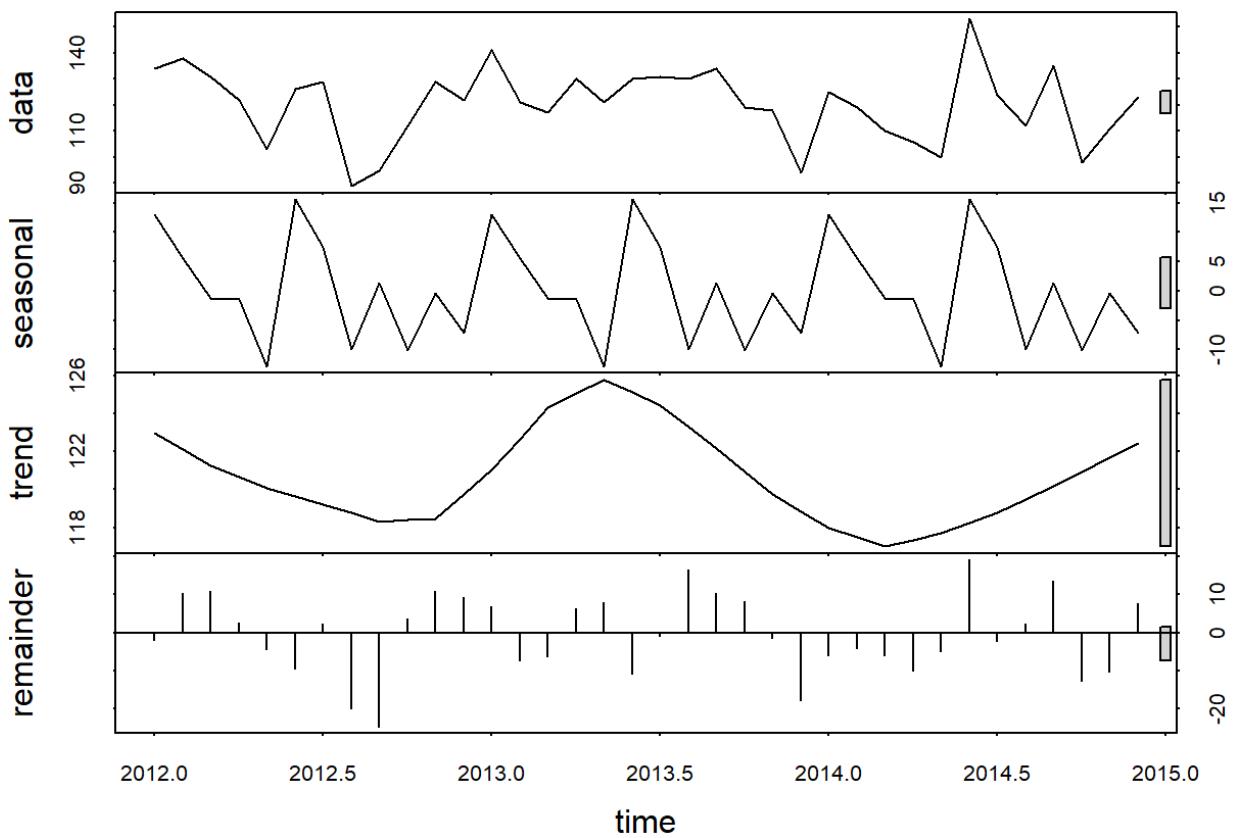
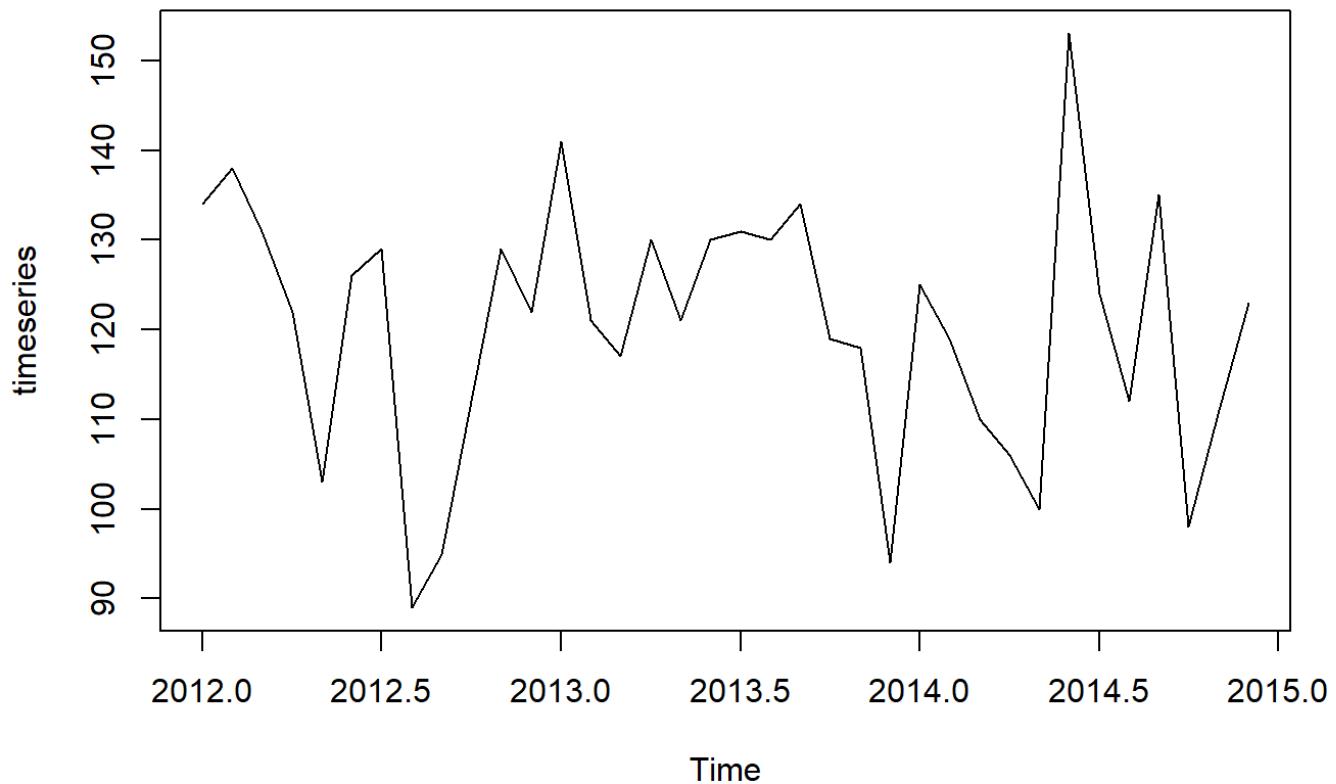


Forecasts from HoltWinters

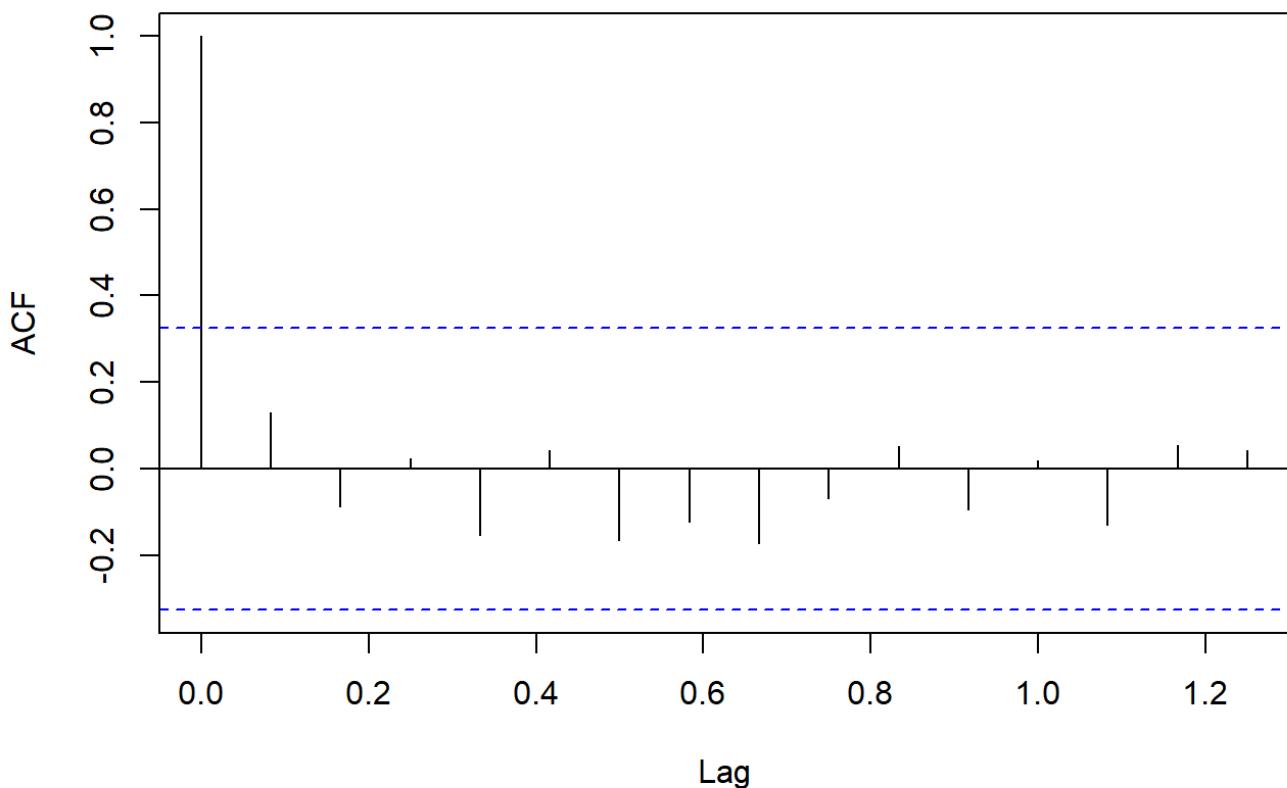


```
## [1] 65.99625
```

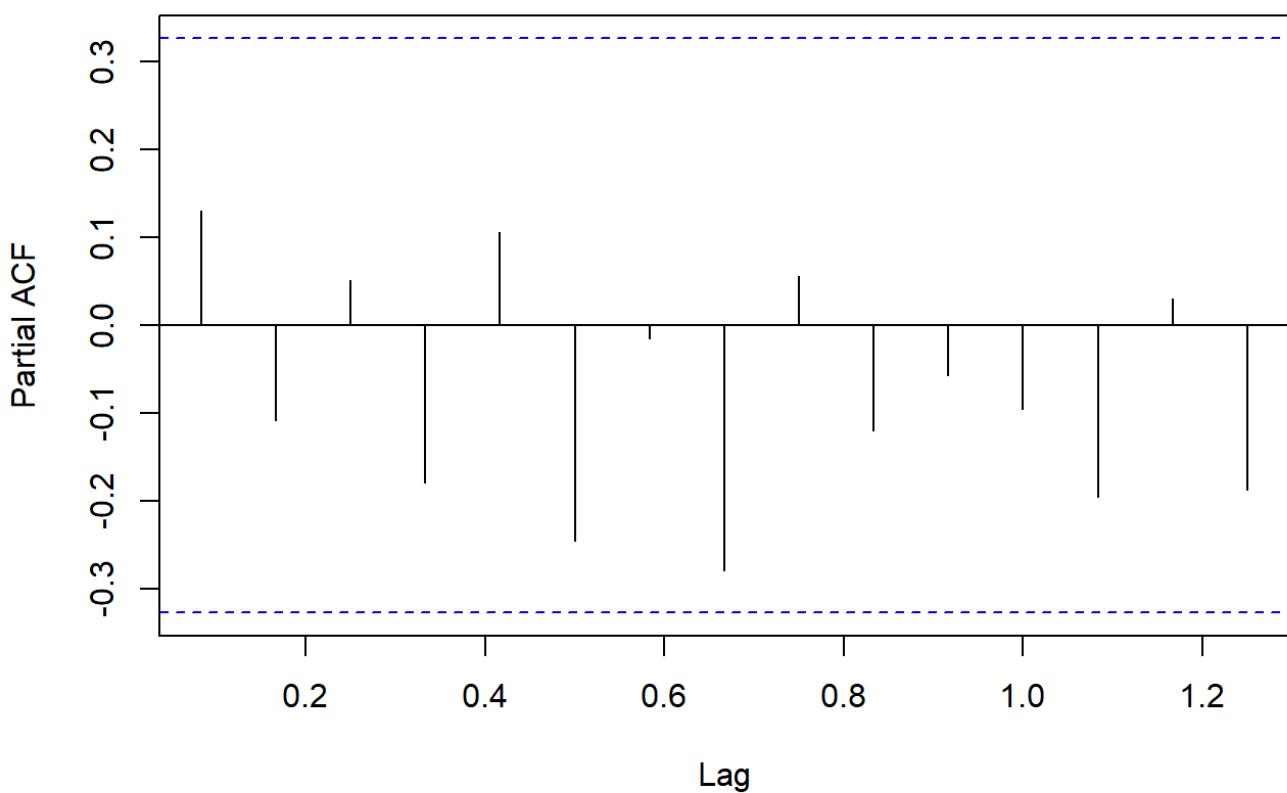
```
traintest(tv_ts14)
```



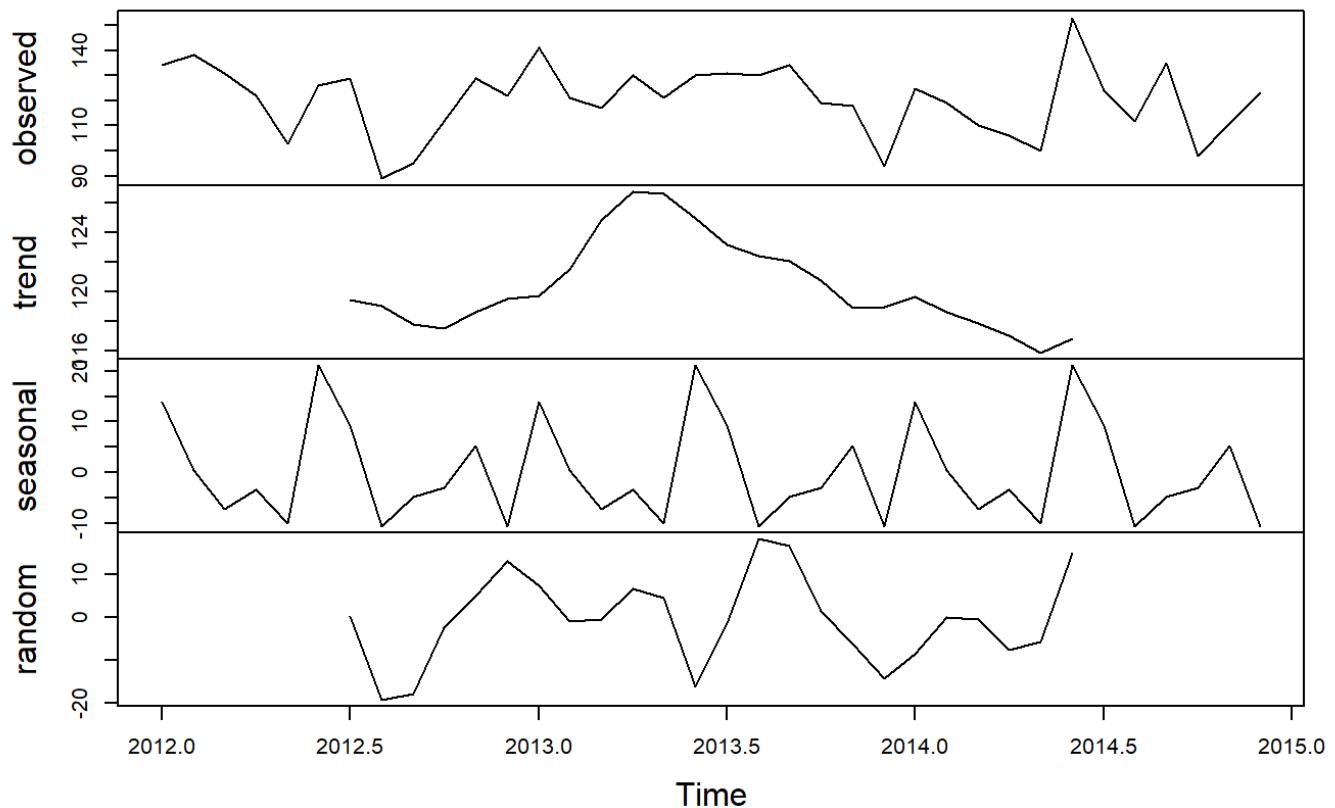
Series timeseries



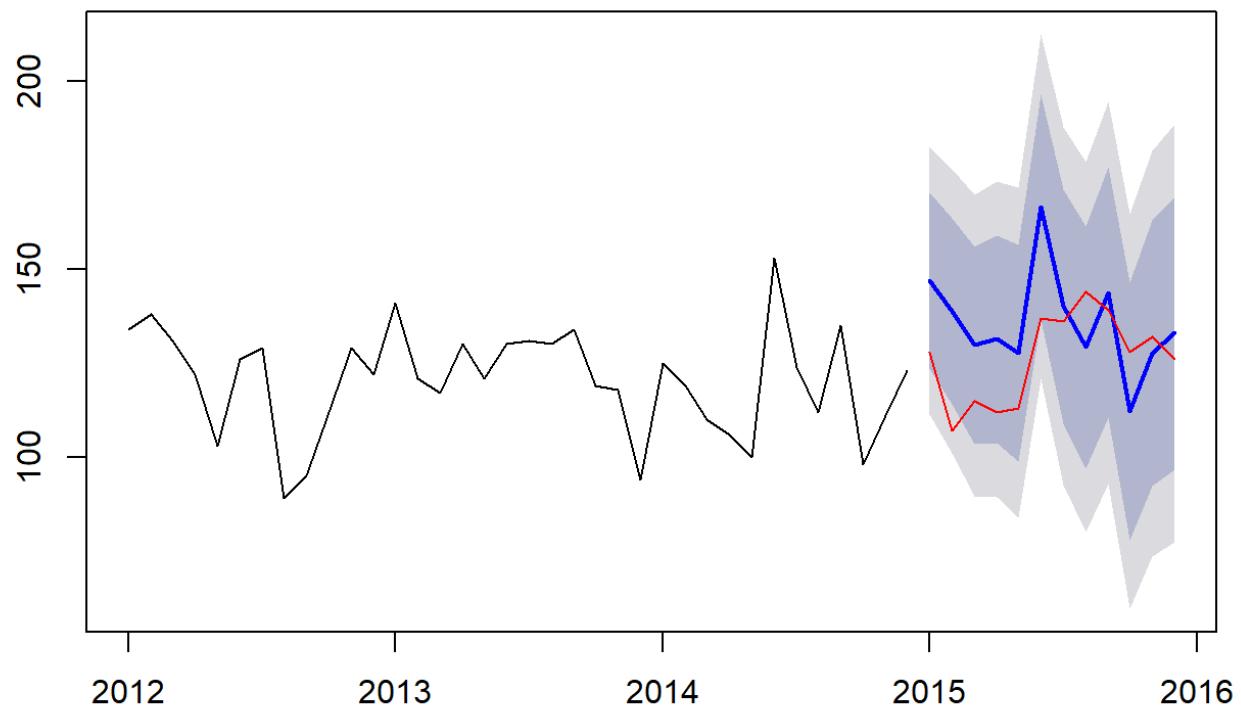
Series timeseries



Decomposition of additive time series

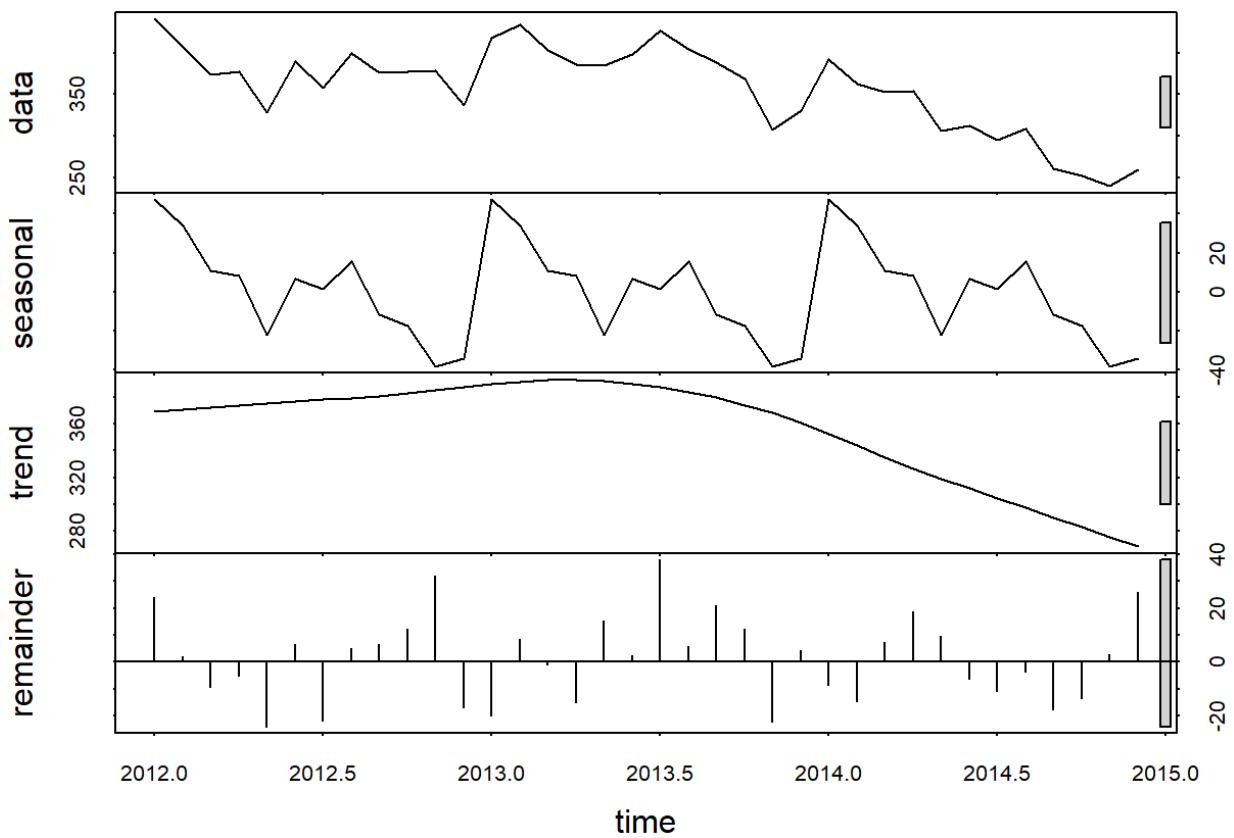


Forecasts from HoltWinters

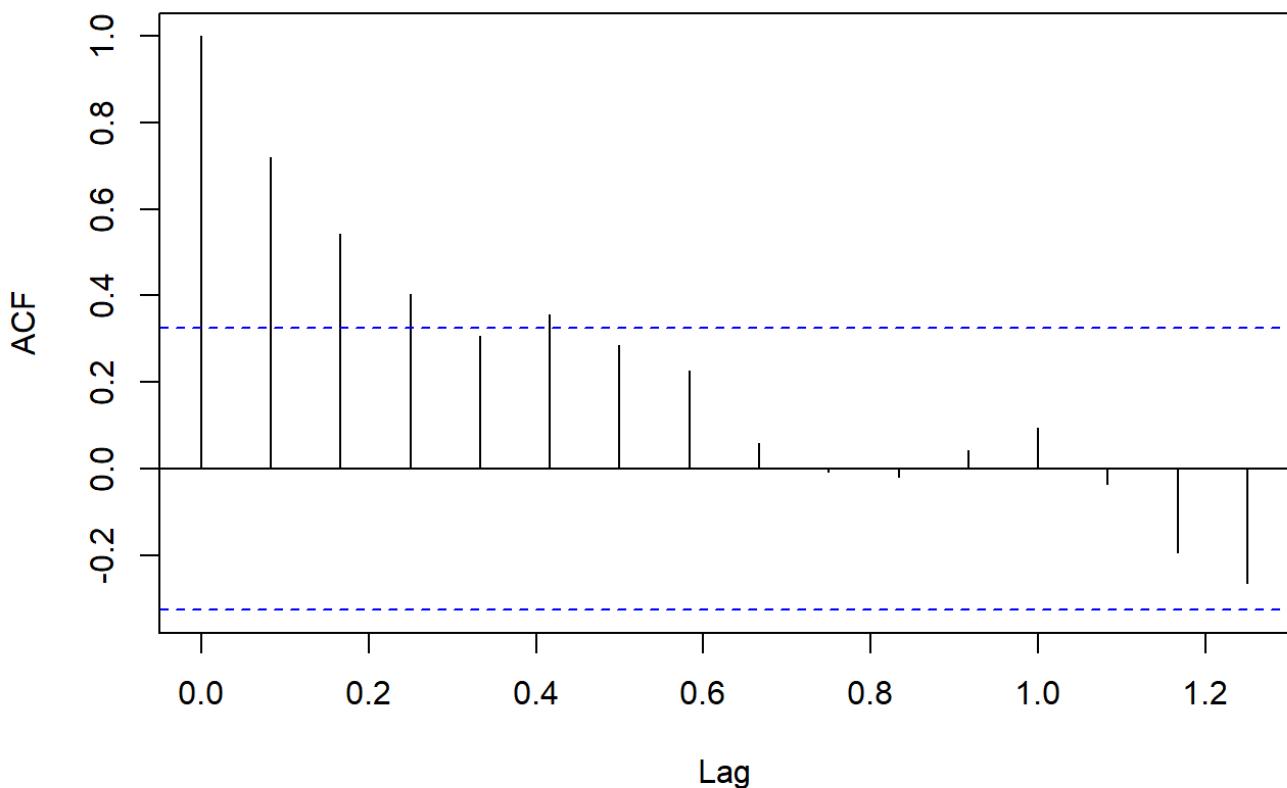


```
## [1] 15.02938
```

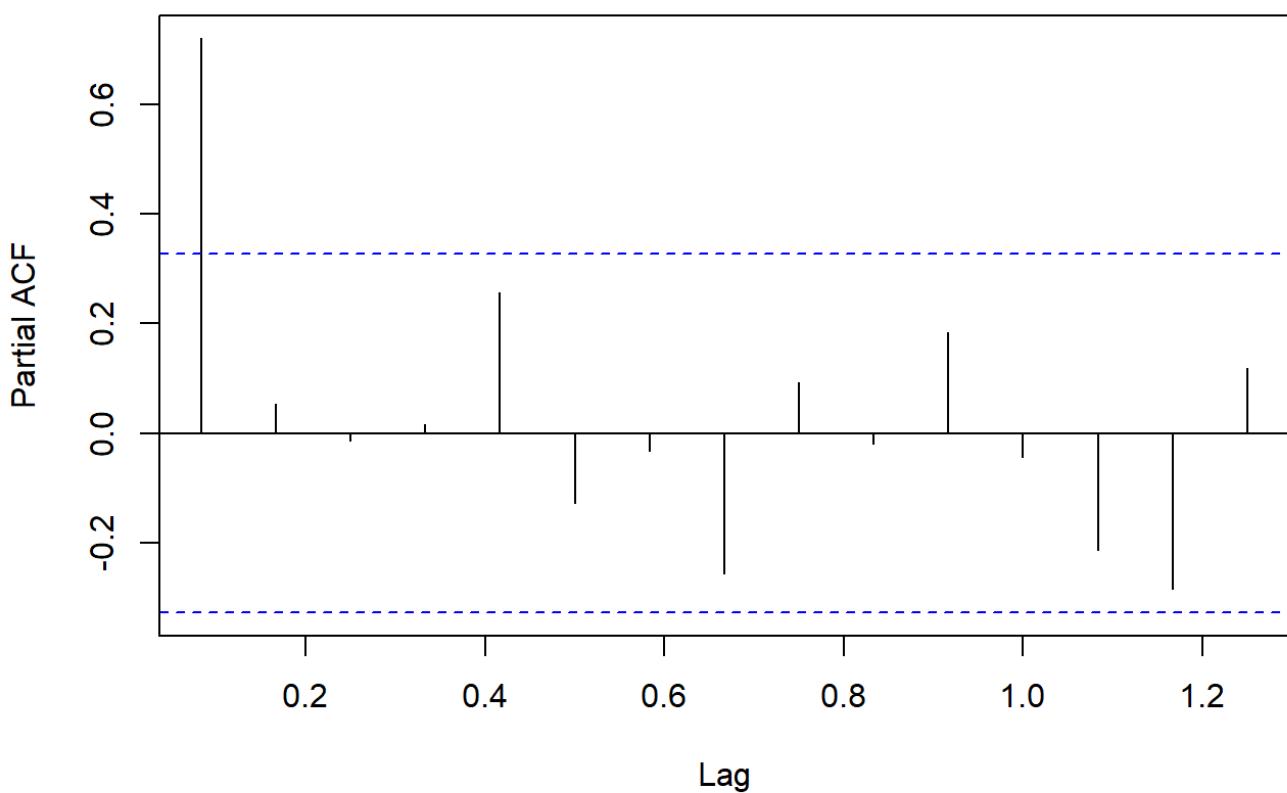
```
traintest(tv_ts15)
```



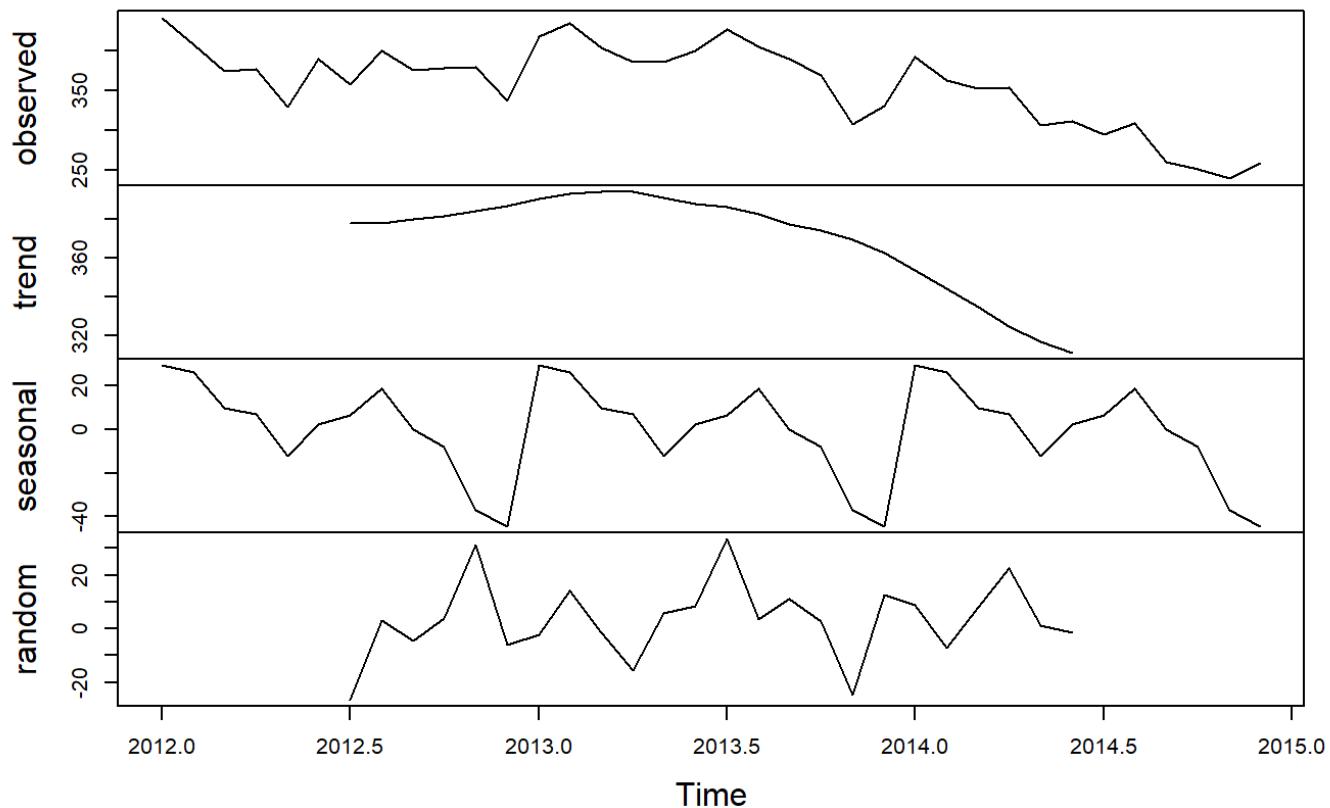
Series timeseries



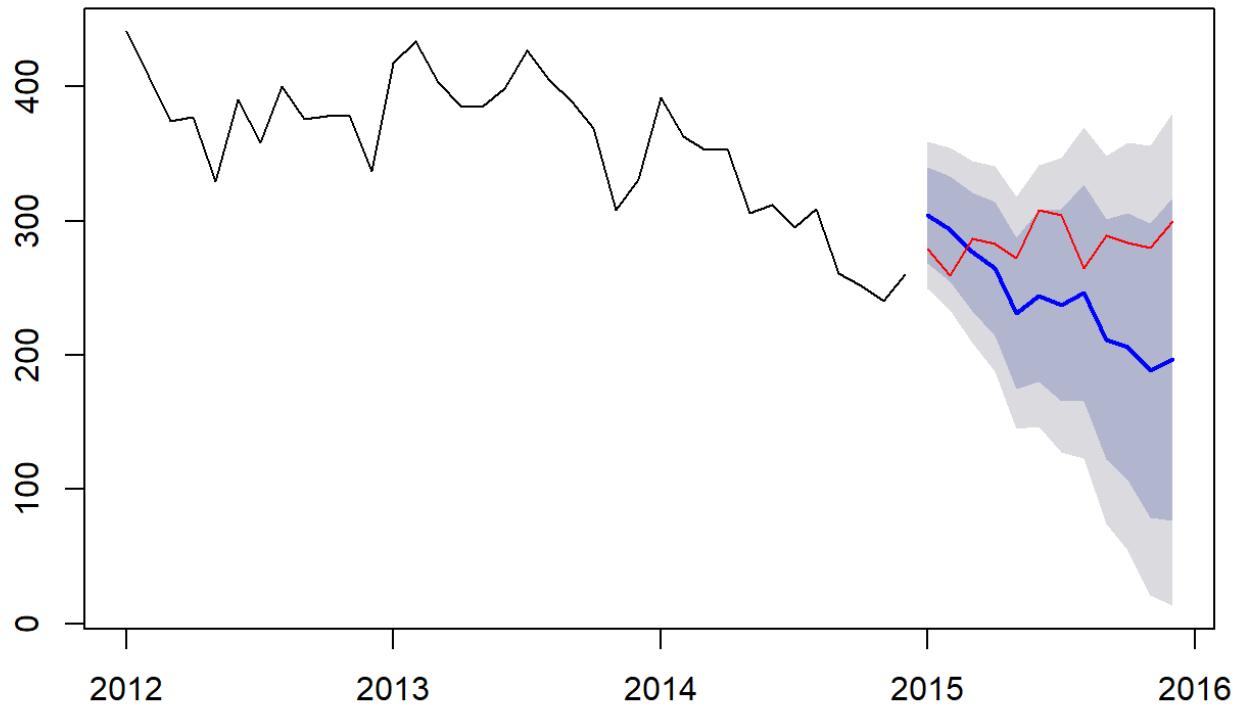
Series timeseries



Decomposition of additive time series

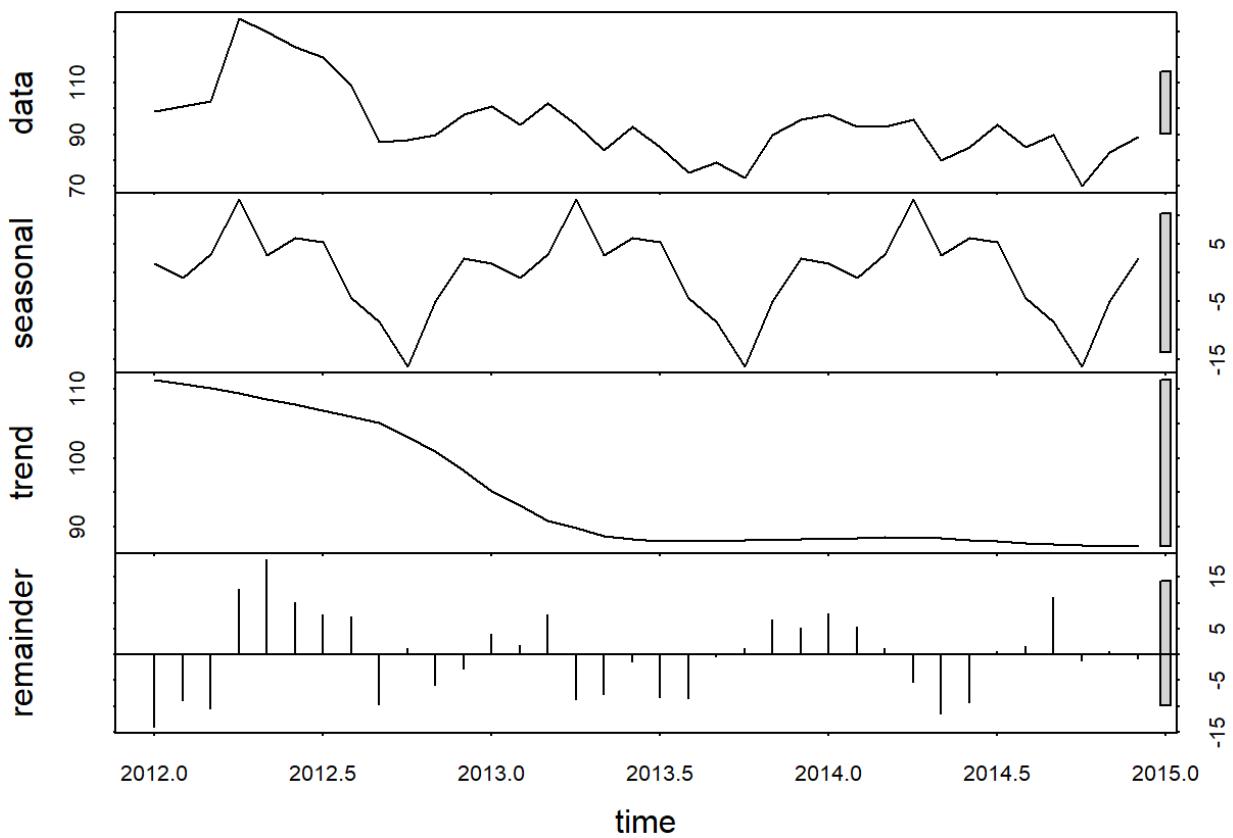
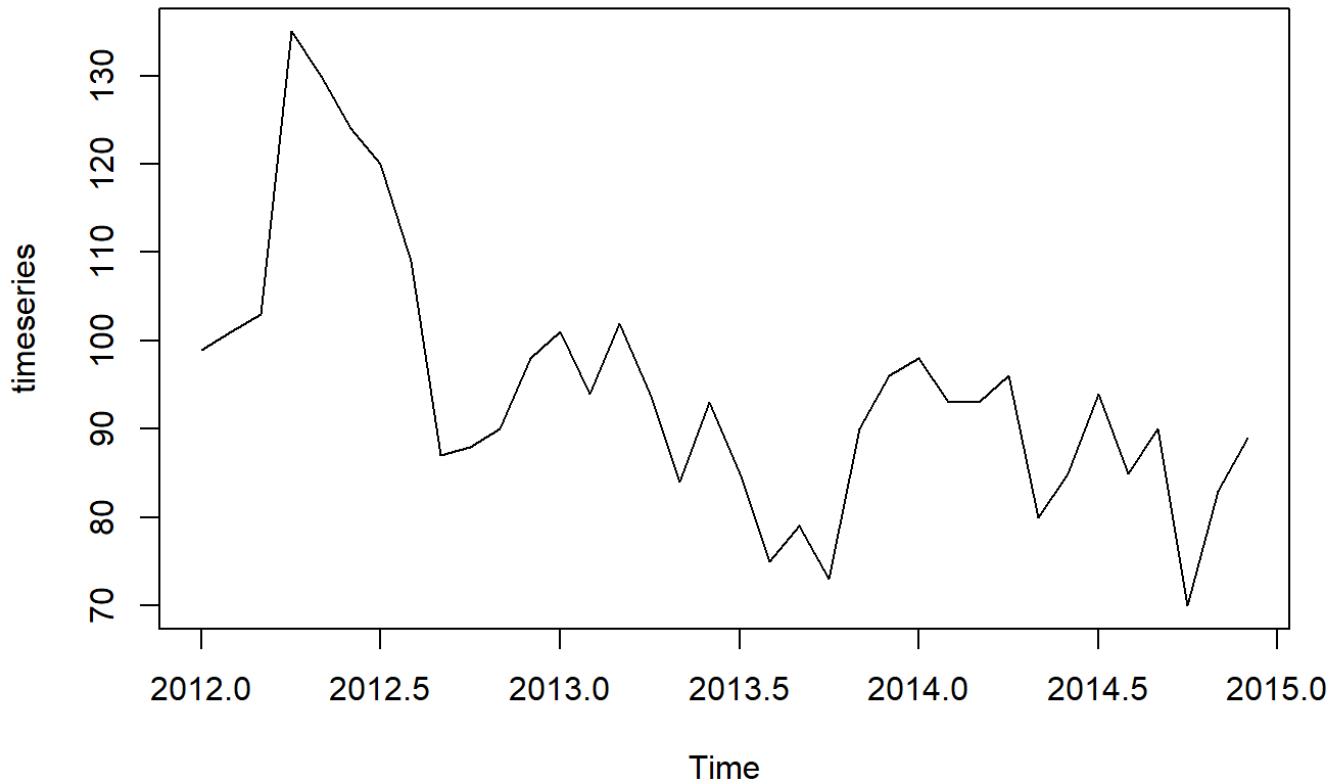


Forecasts from HoltWinters

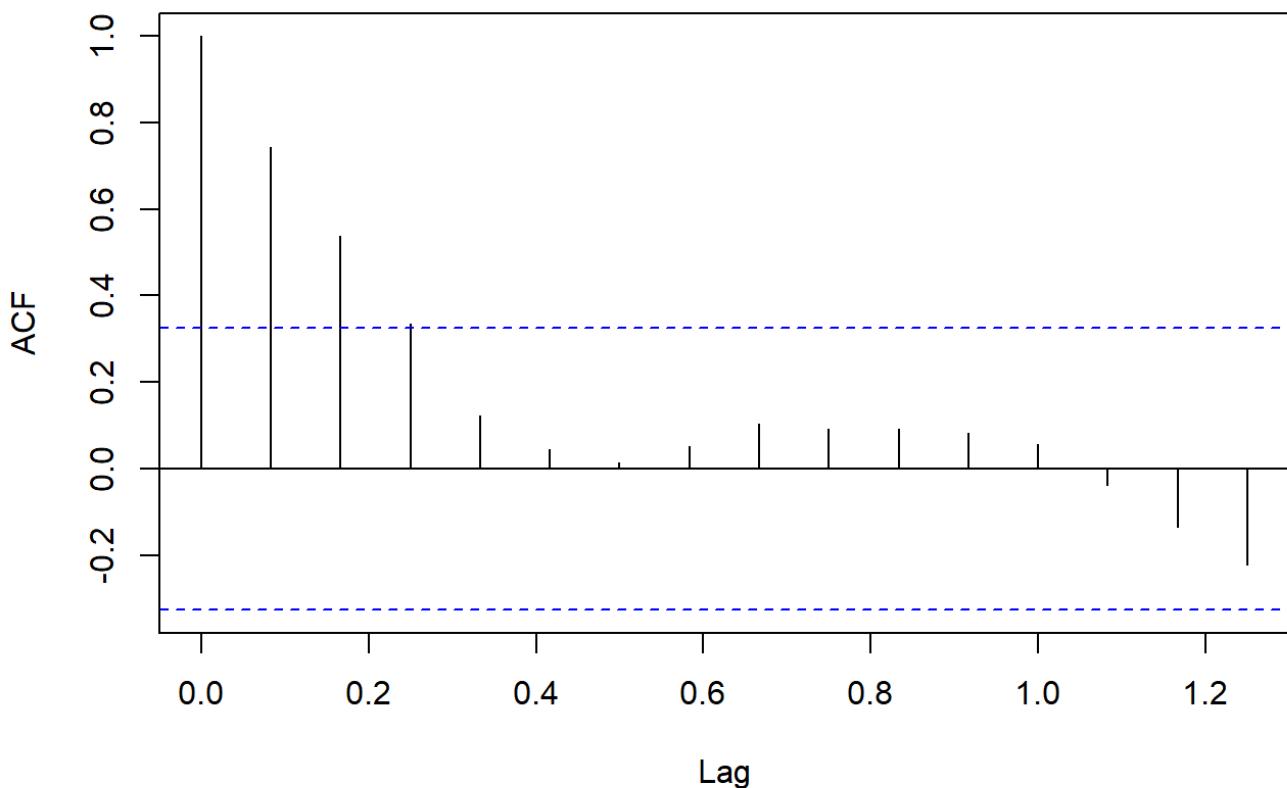


```
## [1] 52.38683
```

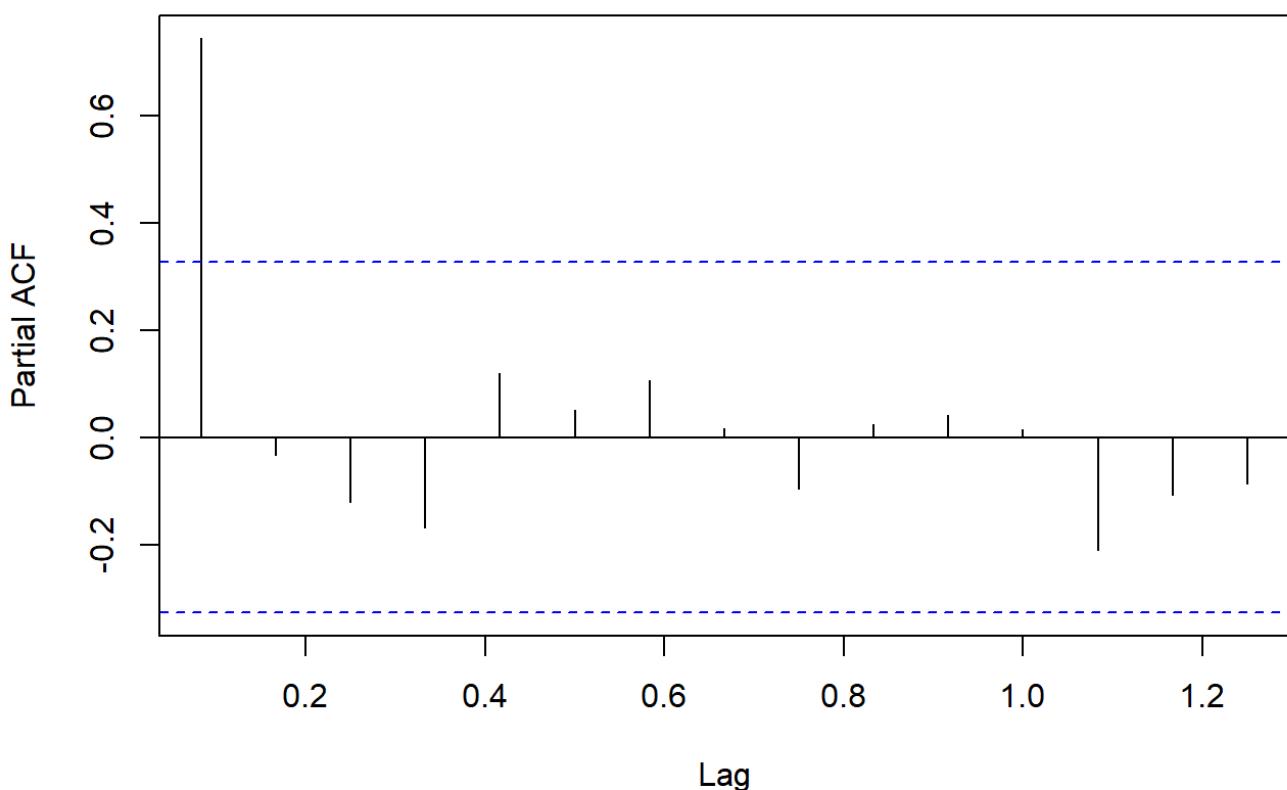
```
traintest(tv_ts16)
```



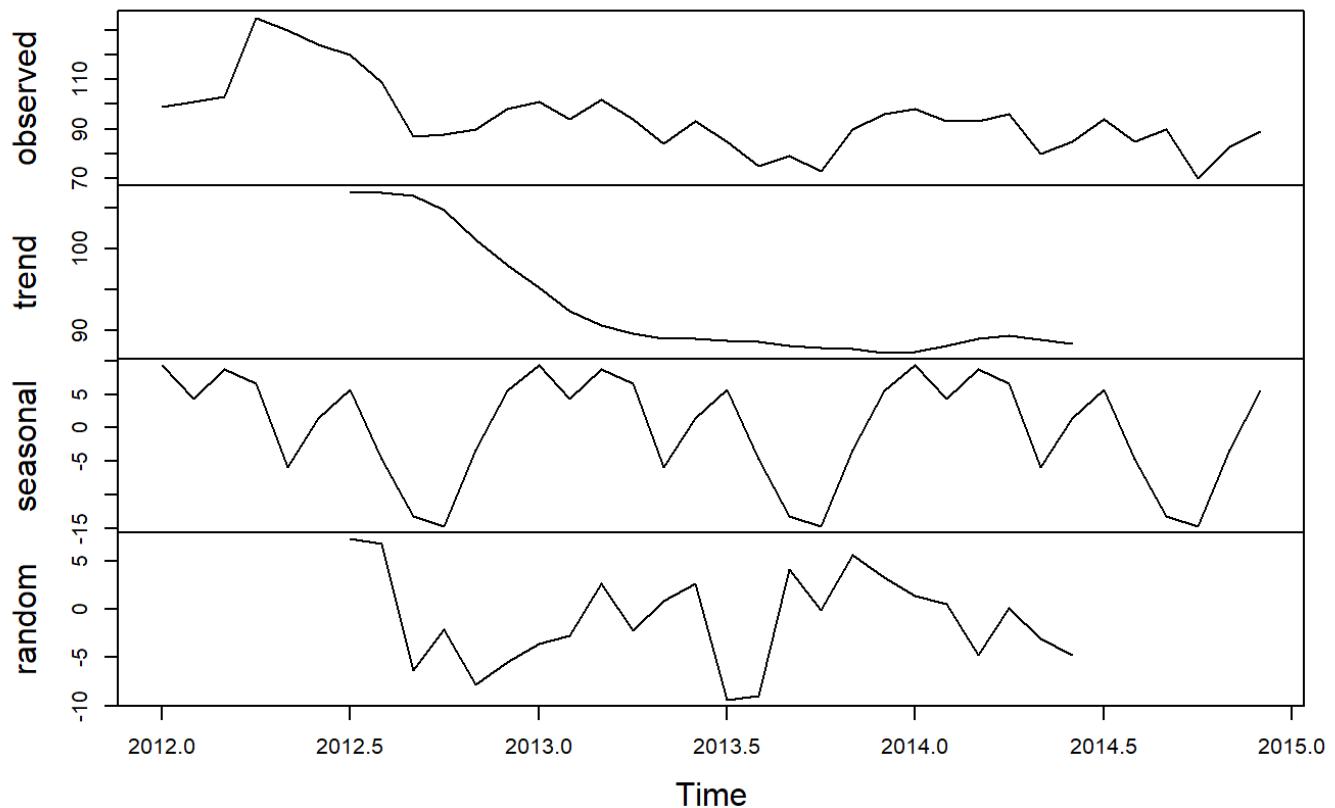
Series timeseries



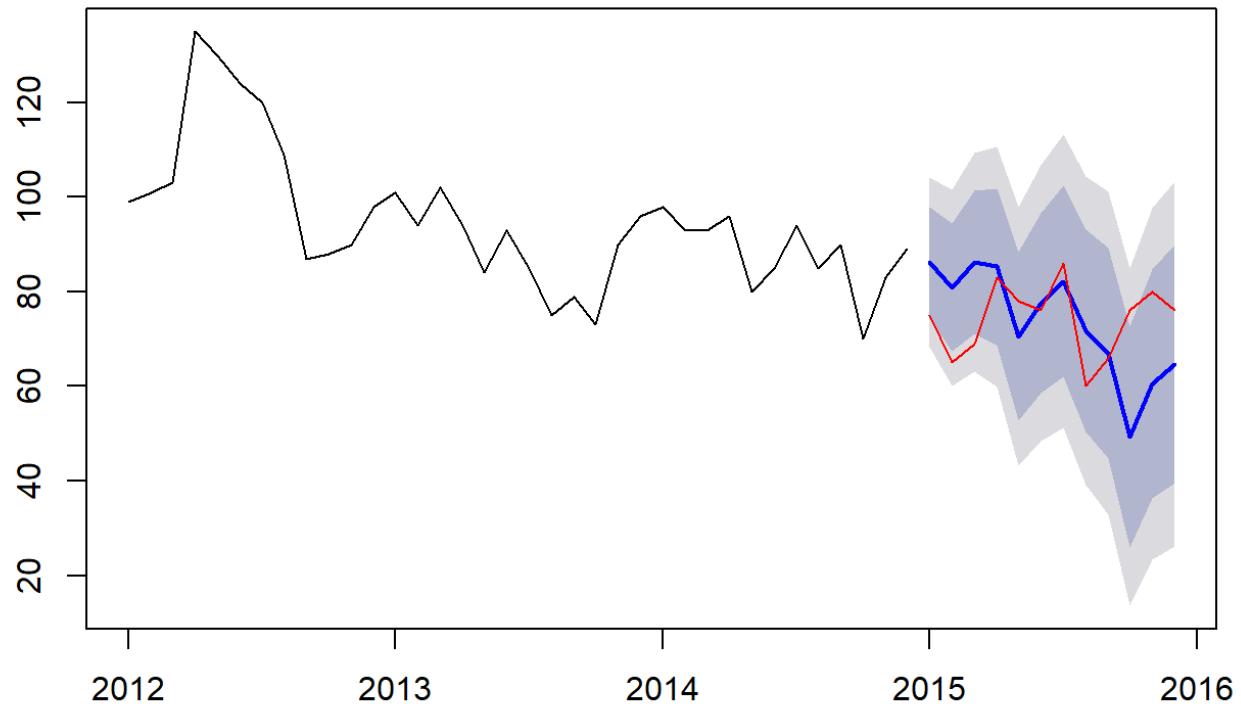
Series timeseries



Decomposition of additive time series

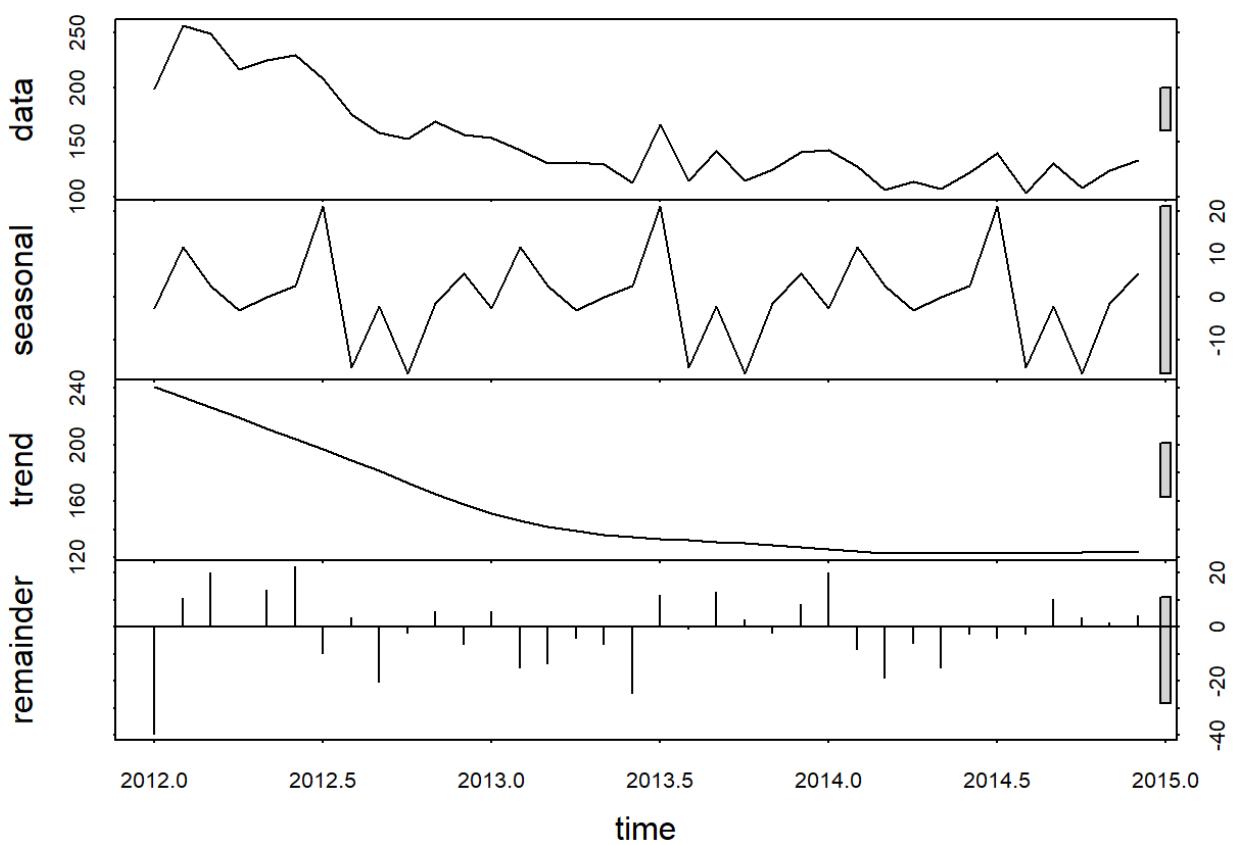
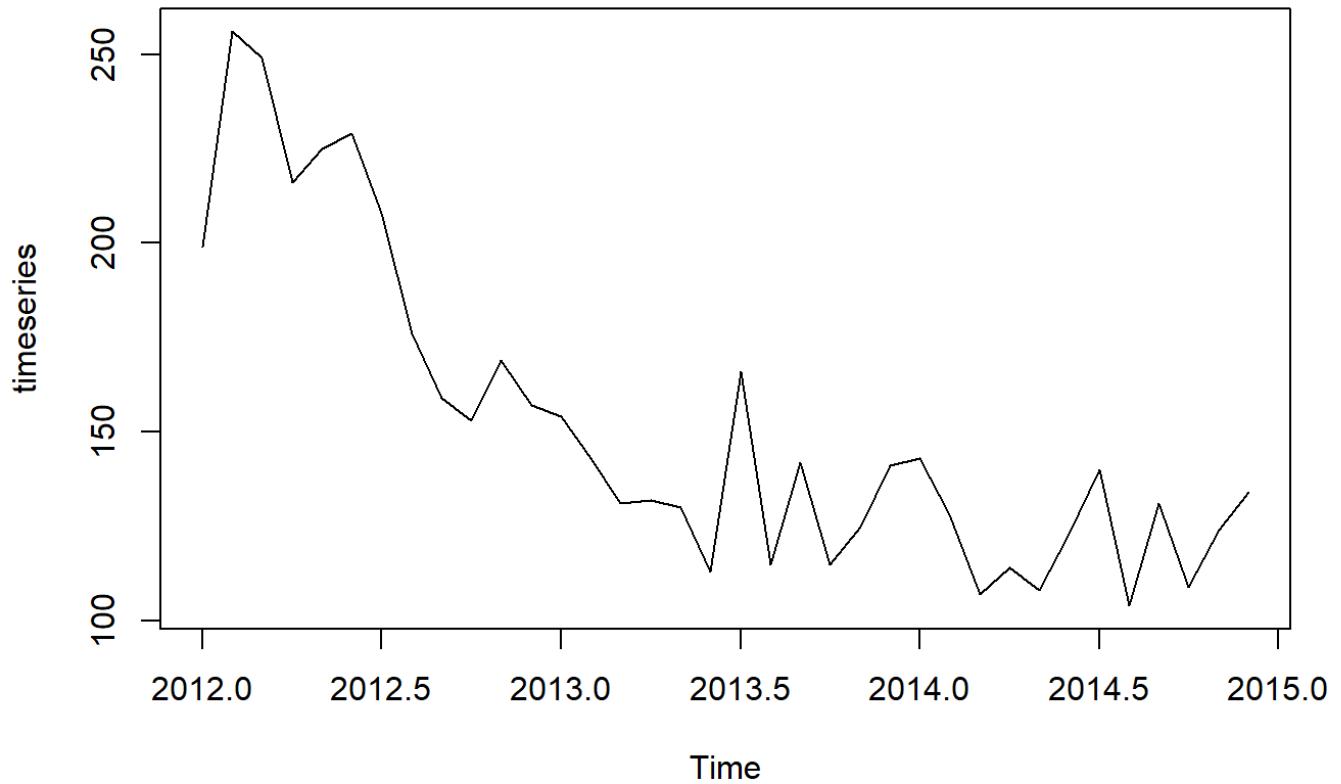


Forecasts from HoltWinters

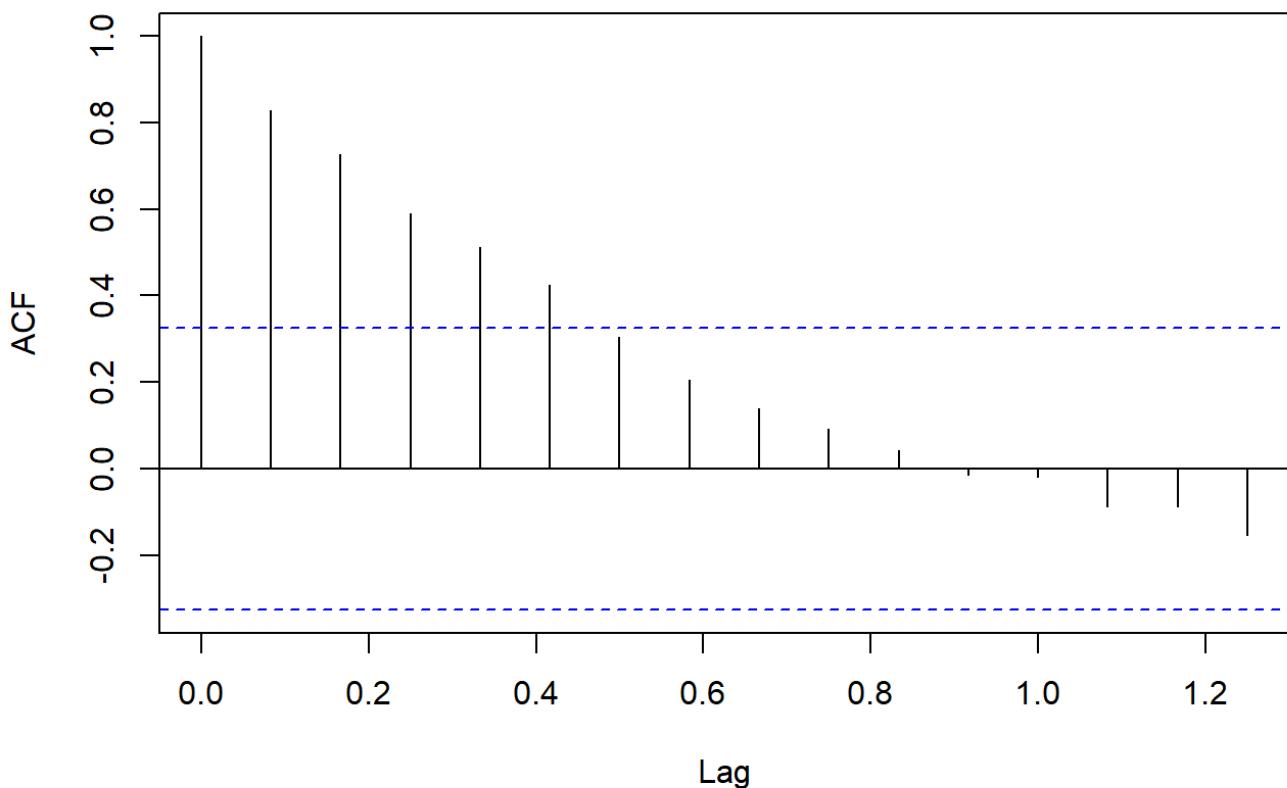


```
## [1] 10.81039
```

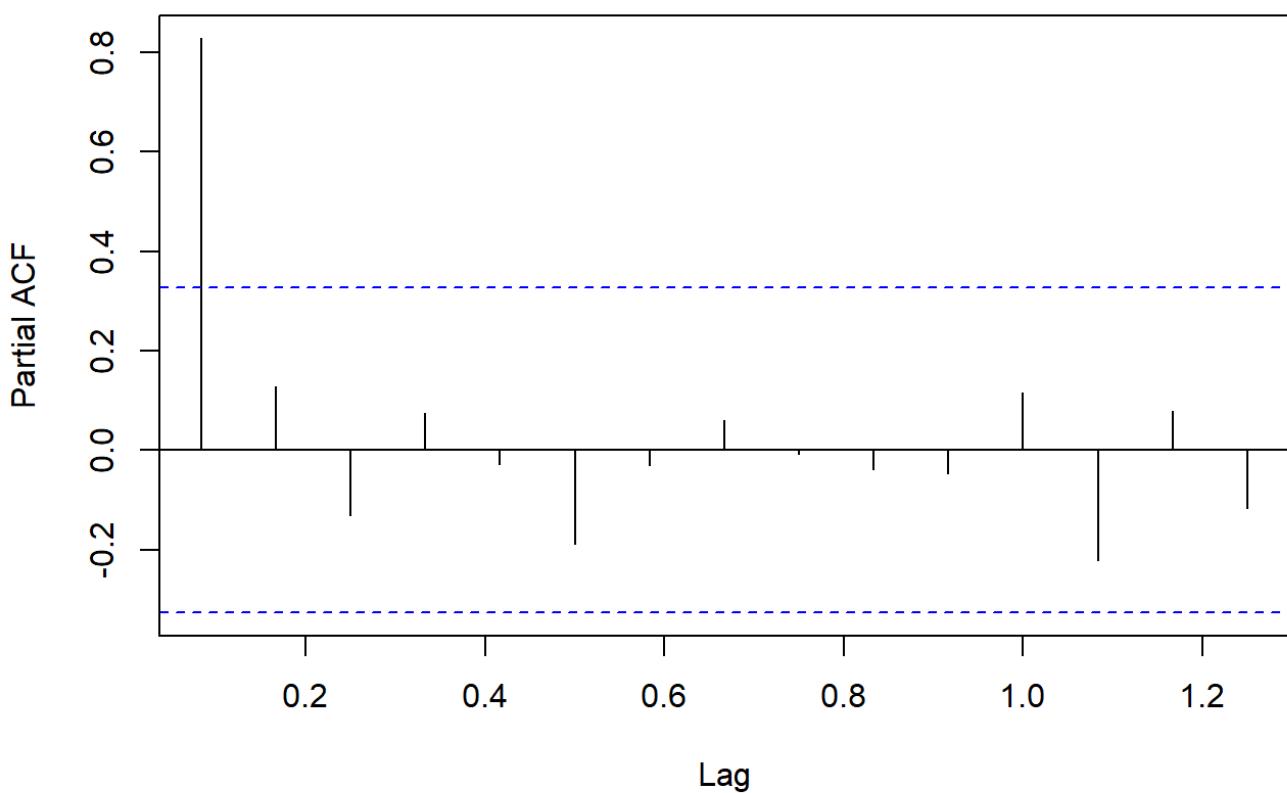
```
traintest(tv_ts17)
```



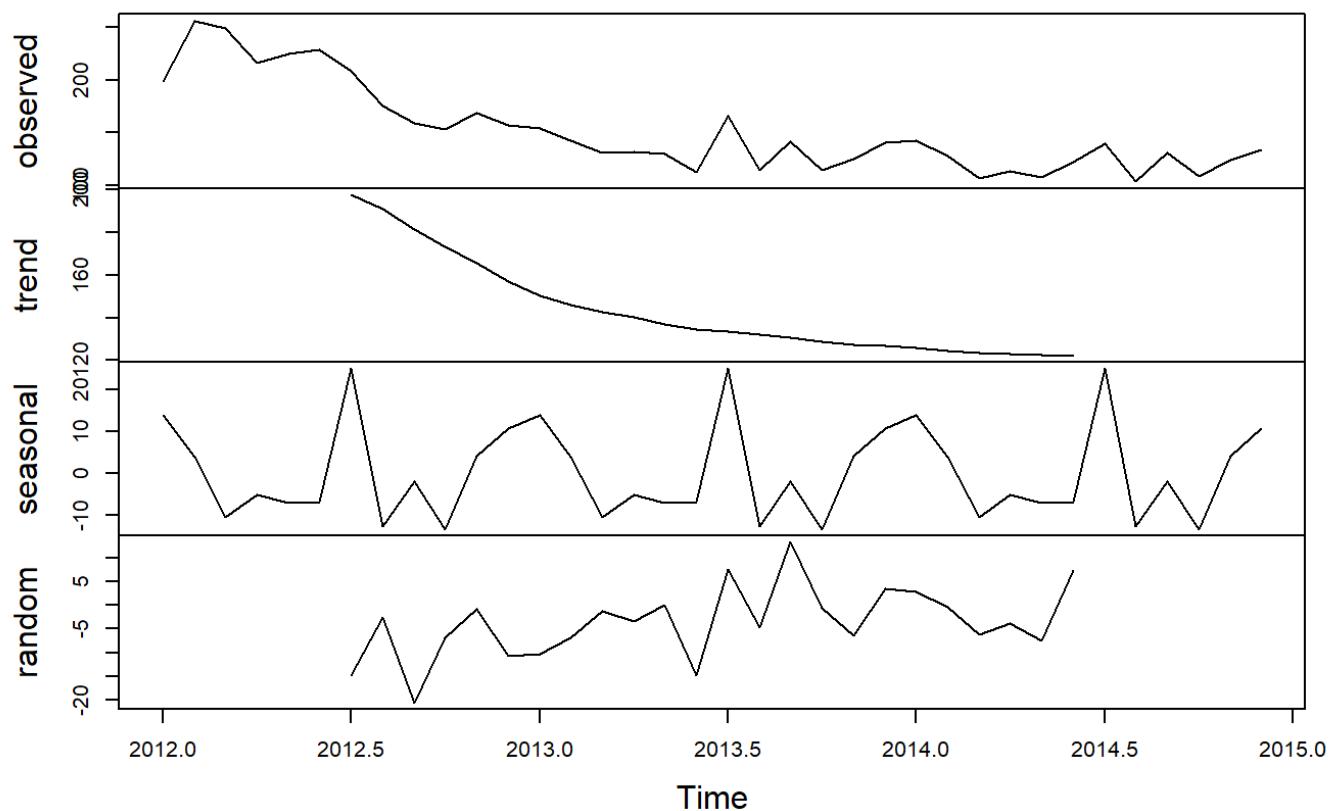
Series timeseries



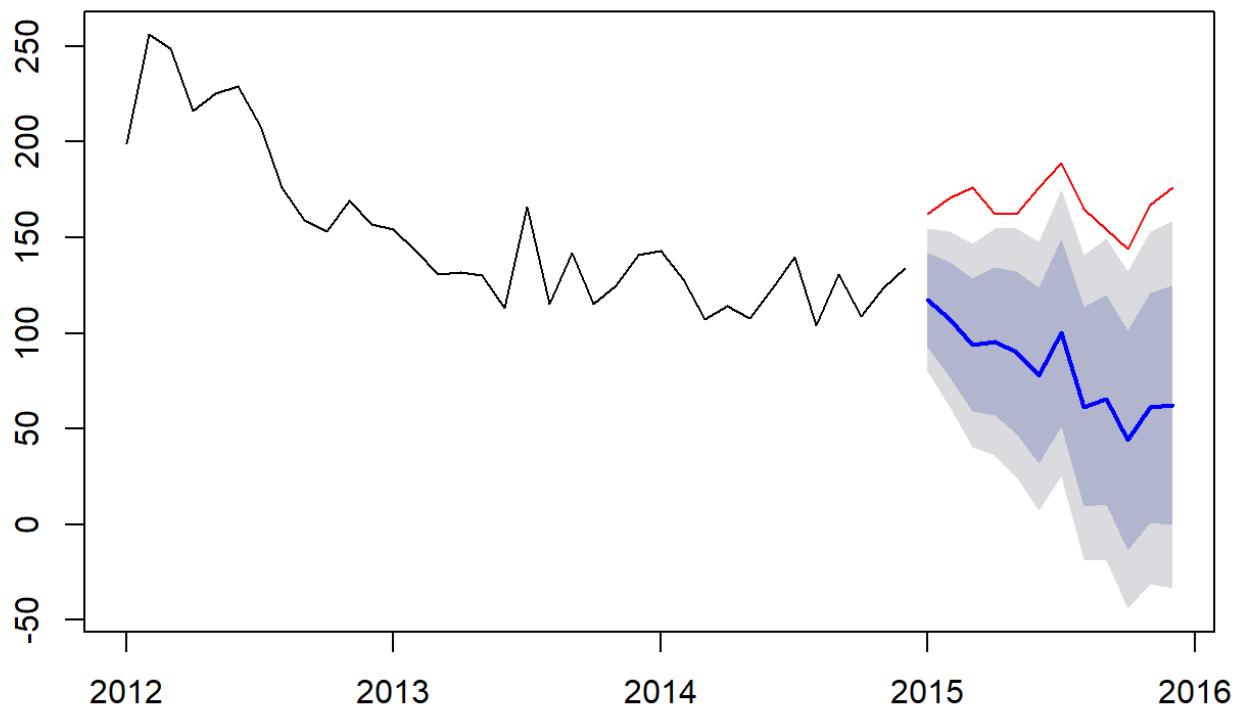
Series timeseries



Decomposition of additive time series

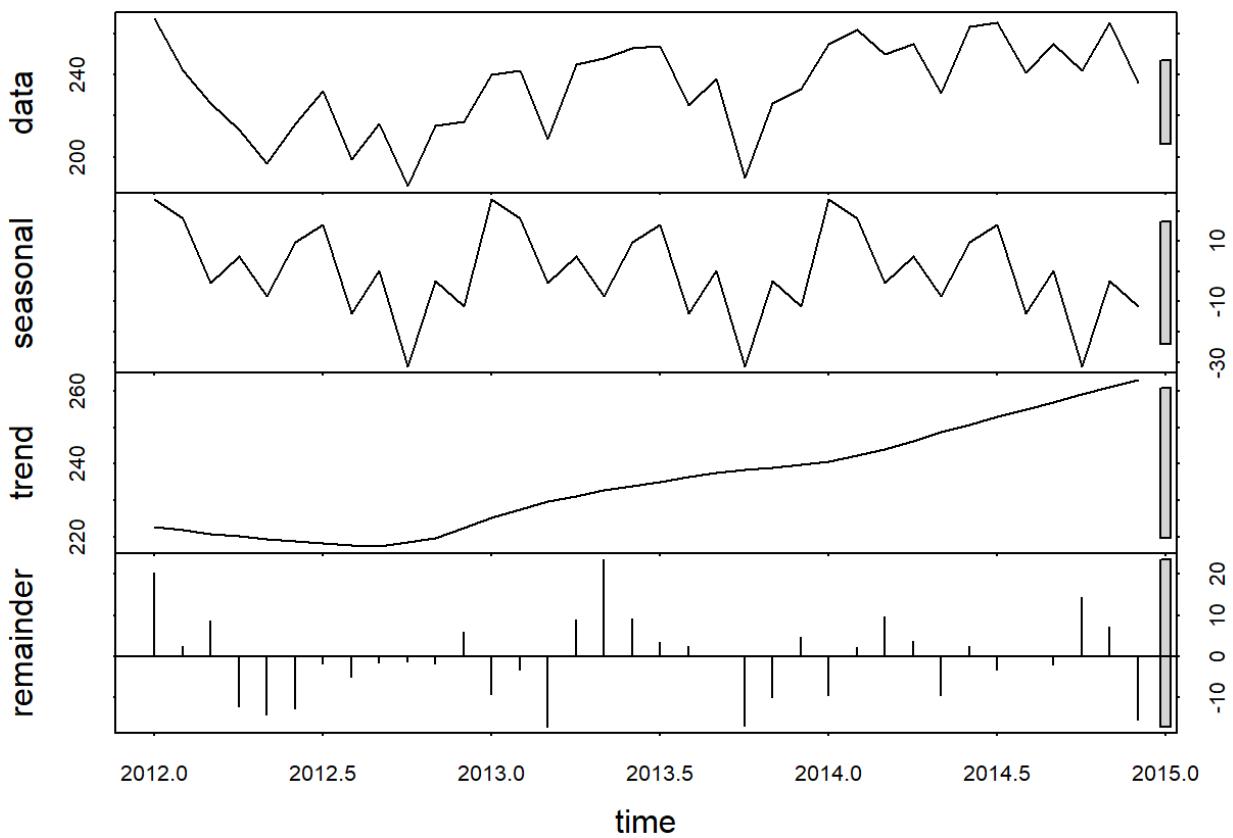
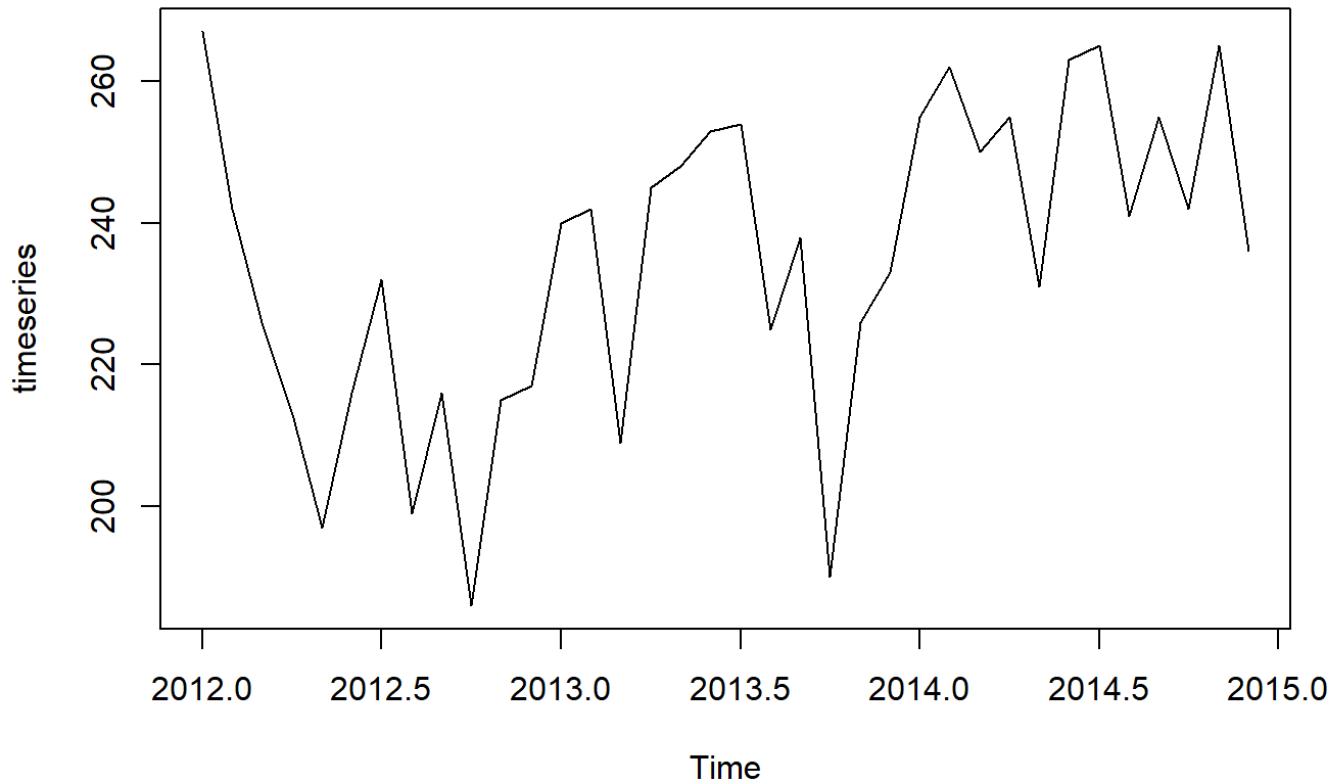


Forecasts from HoltWinters

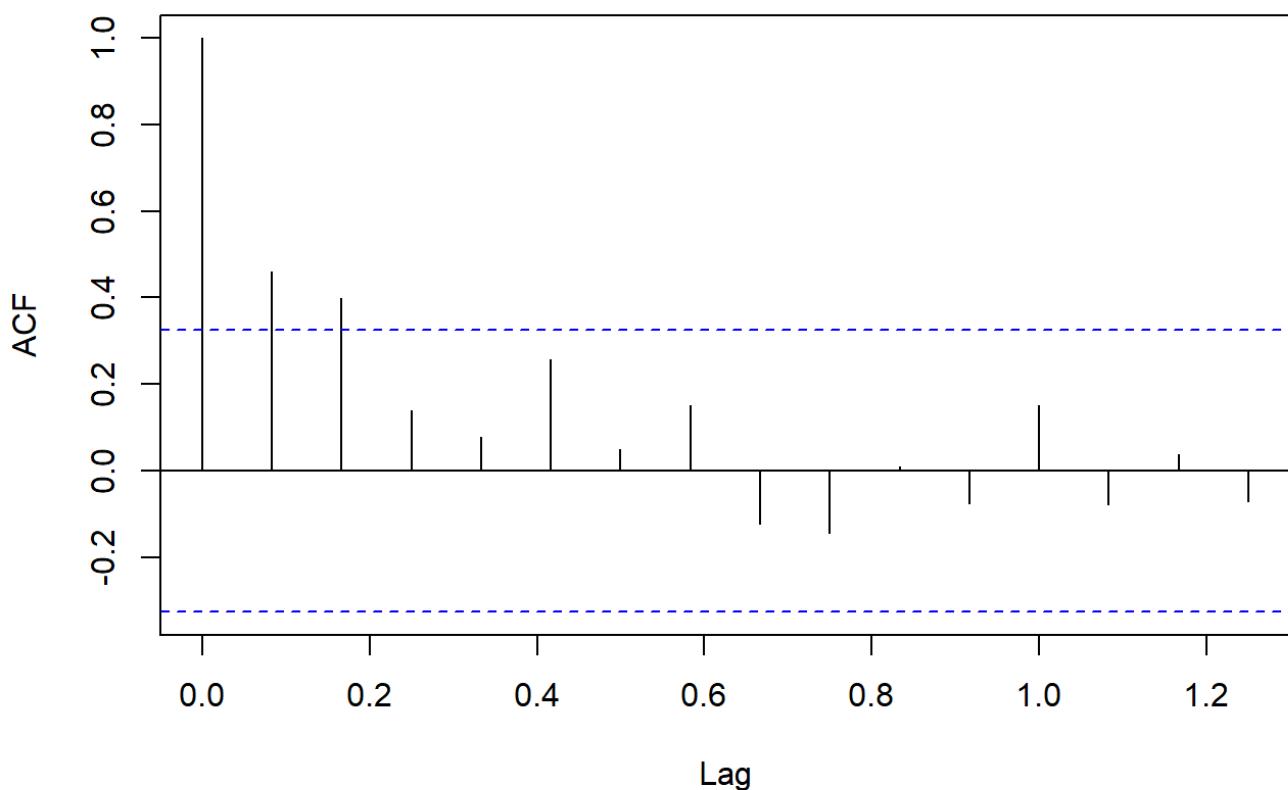


```
## [1] 85.63665
```

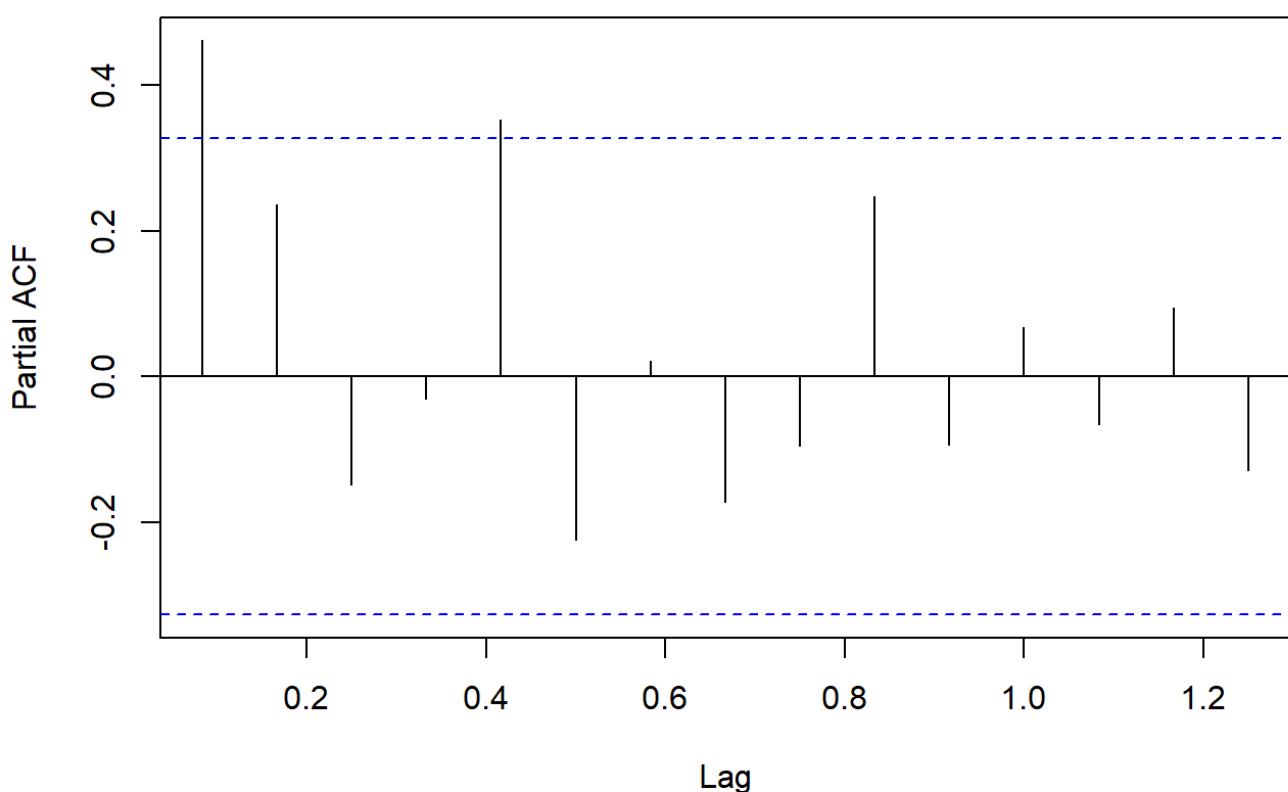
```
traintest(tv_ts18)
```



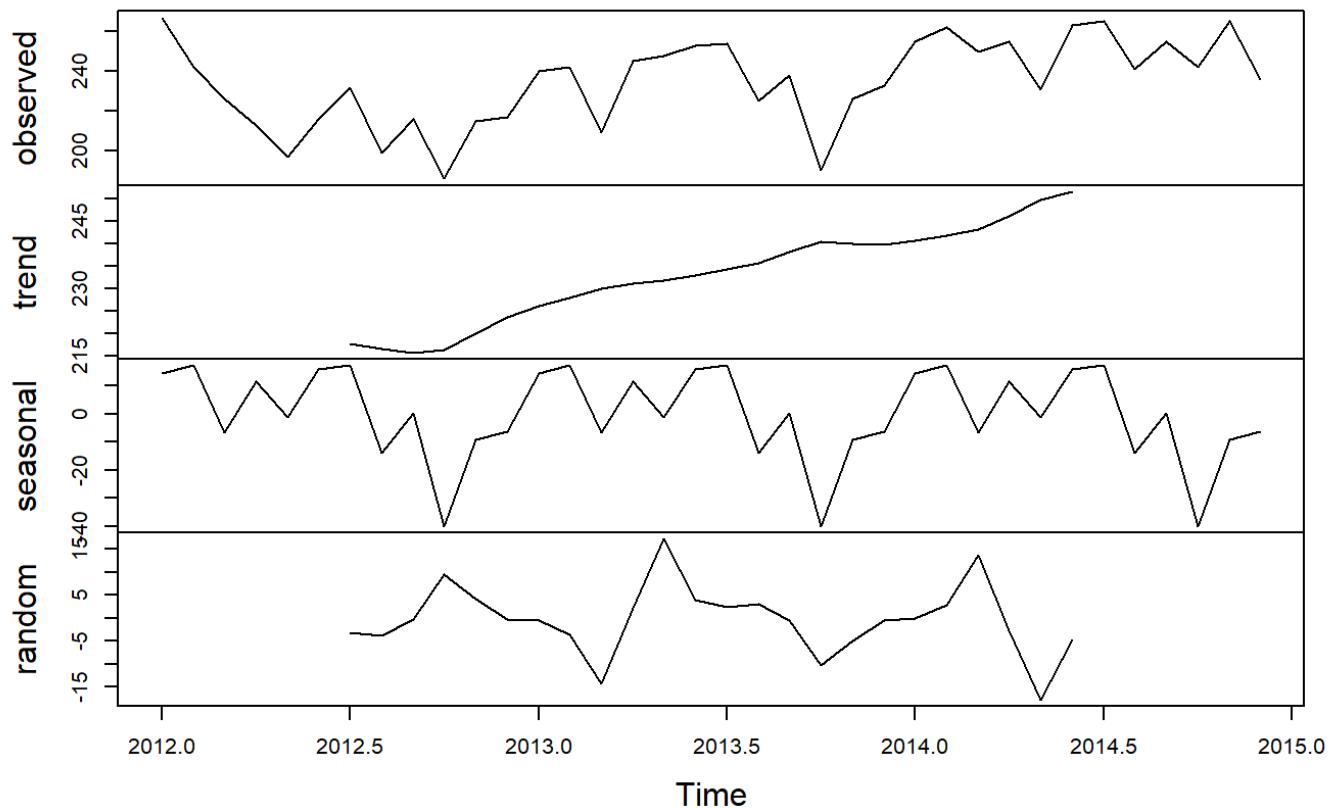
Series timeseries



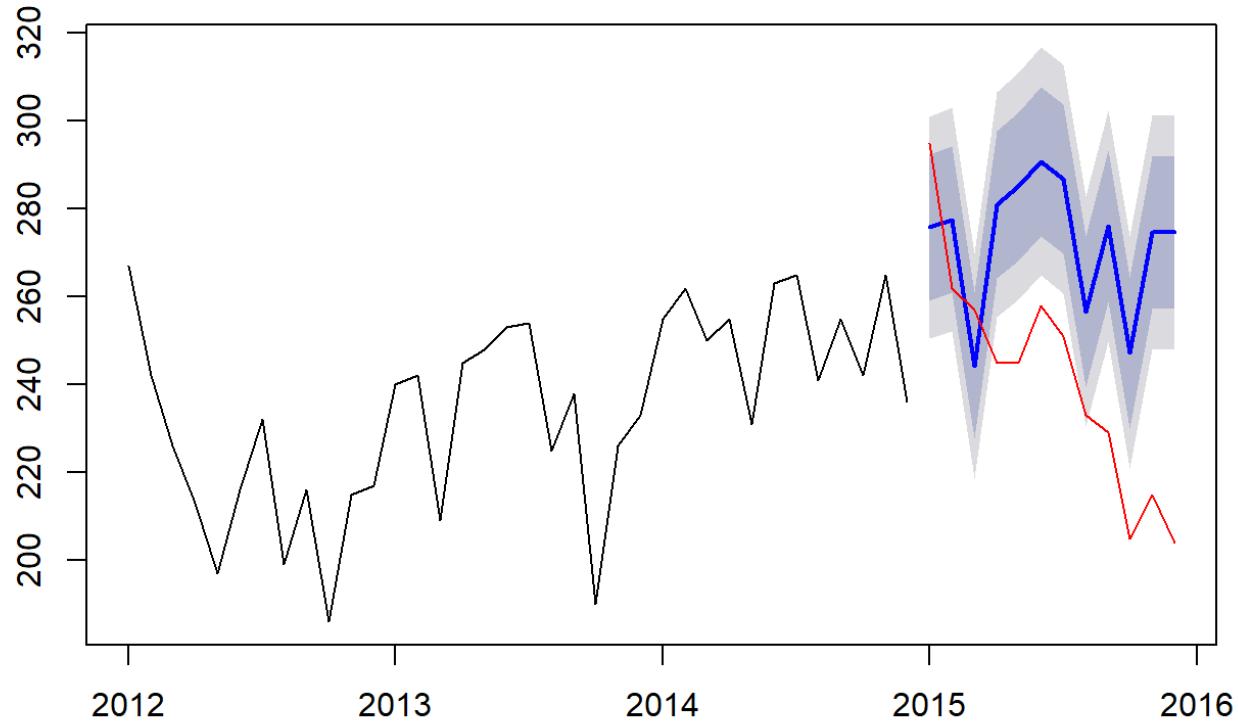
Series timeseries



Decomposition of additive time series

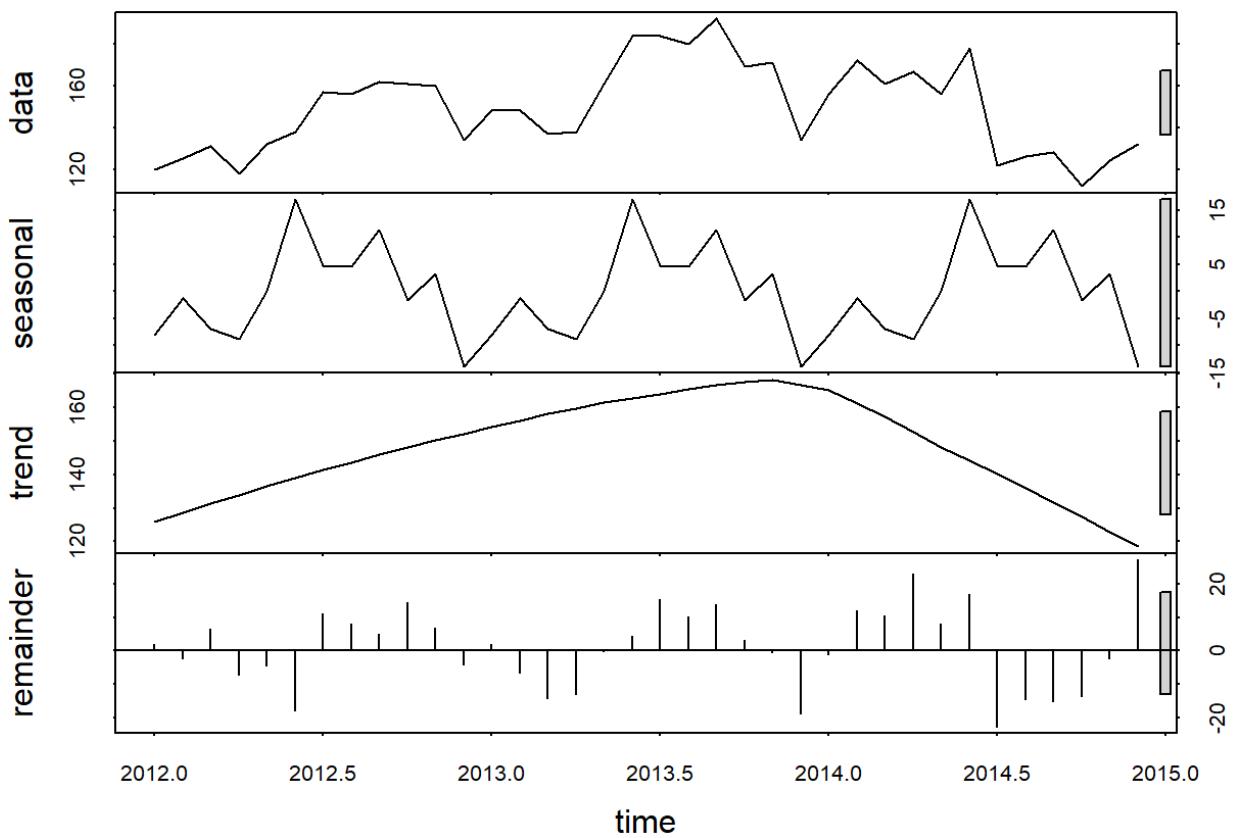
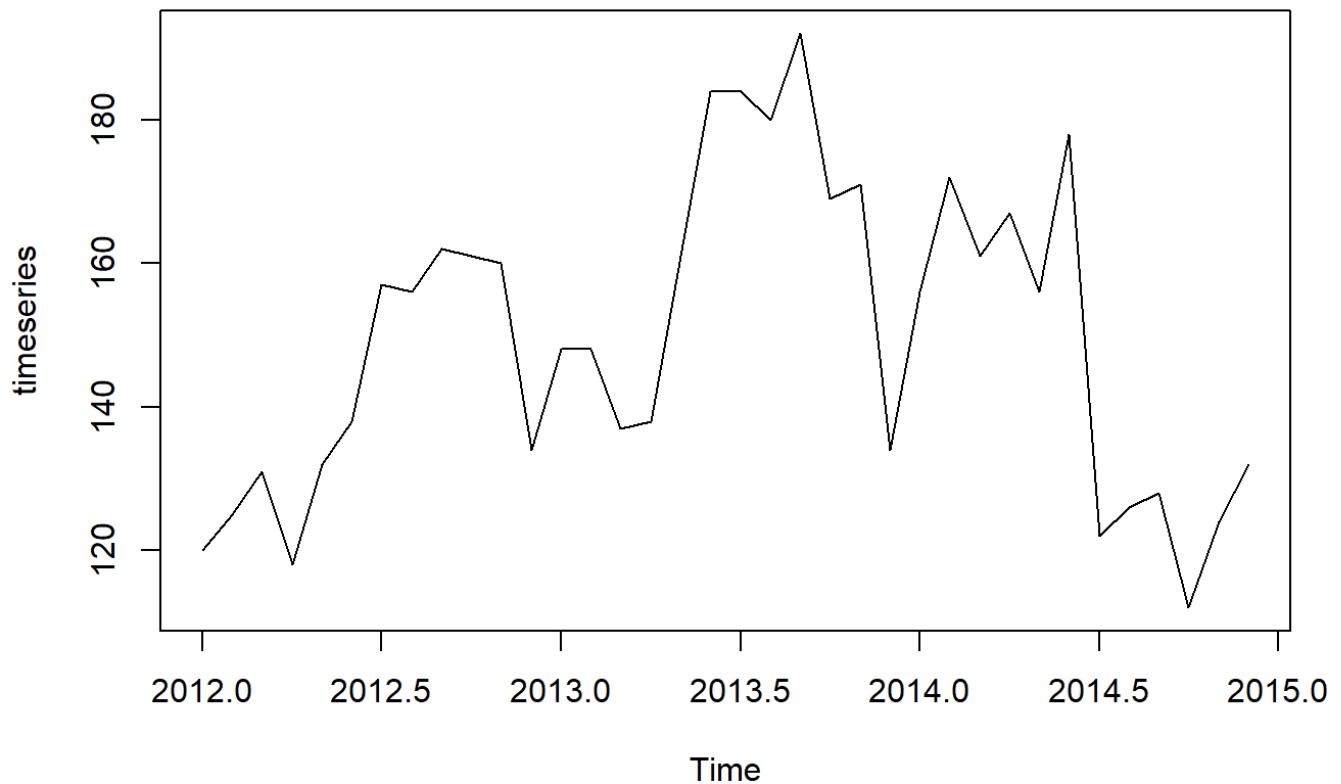


Forecasts from HoltWinters

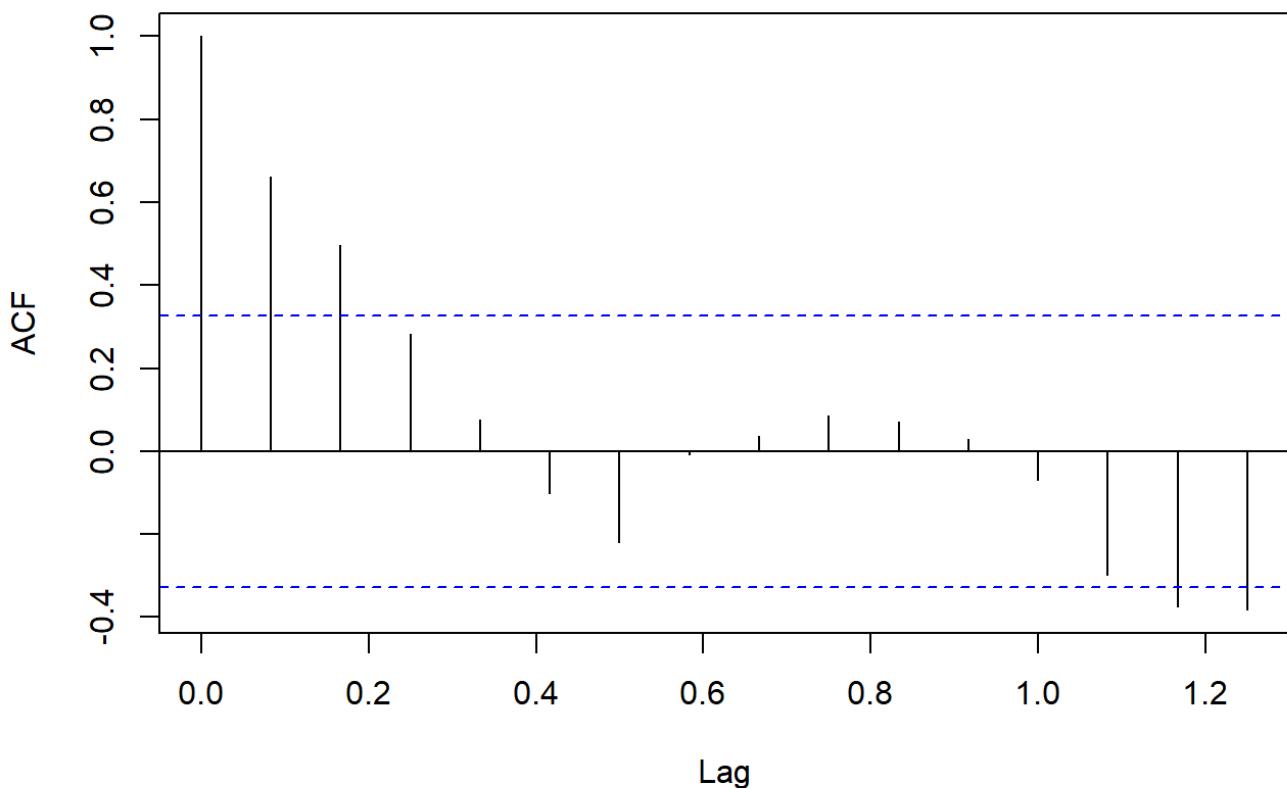


```
## [1] 36.28251
```

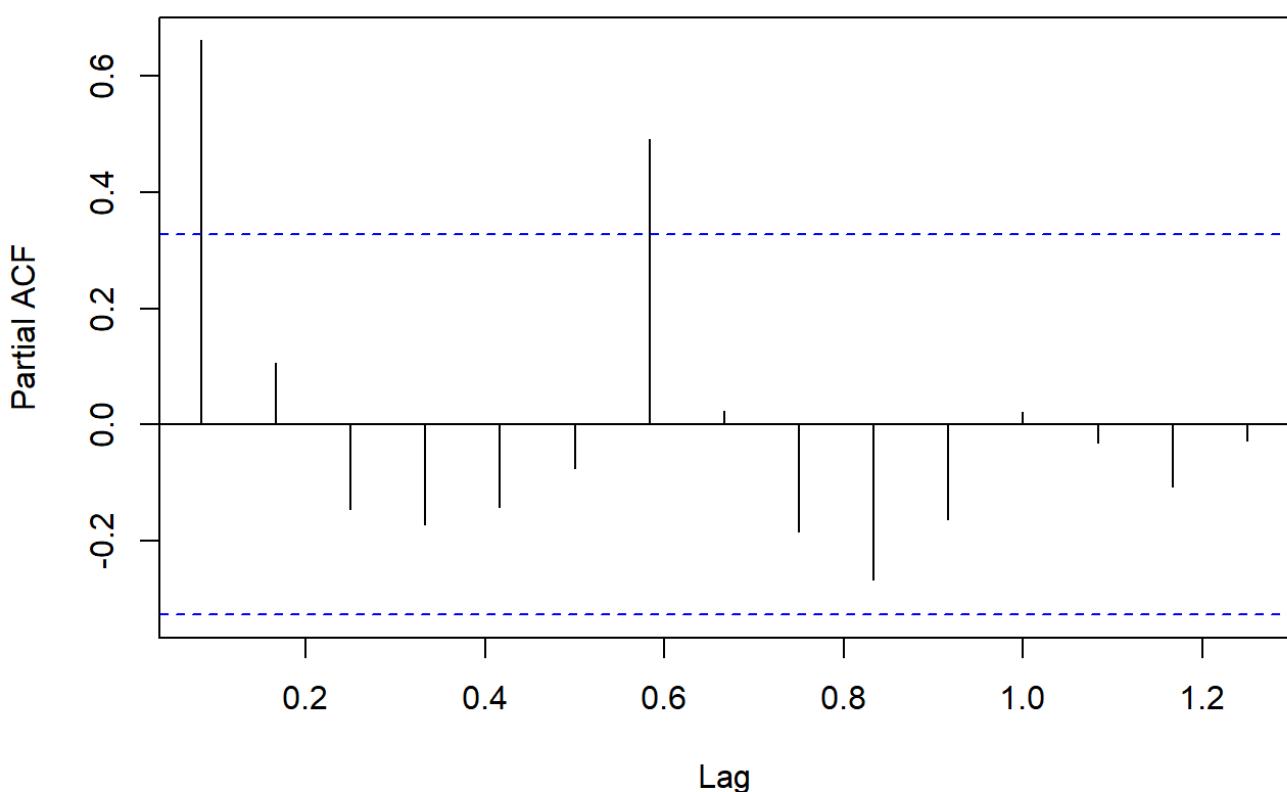
```
traintest(tv_ts19)
```



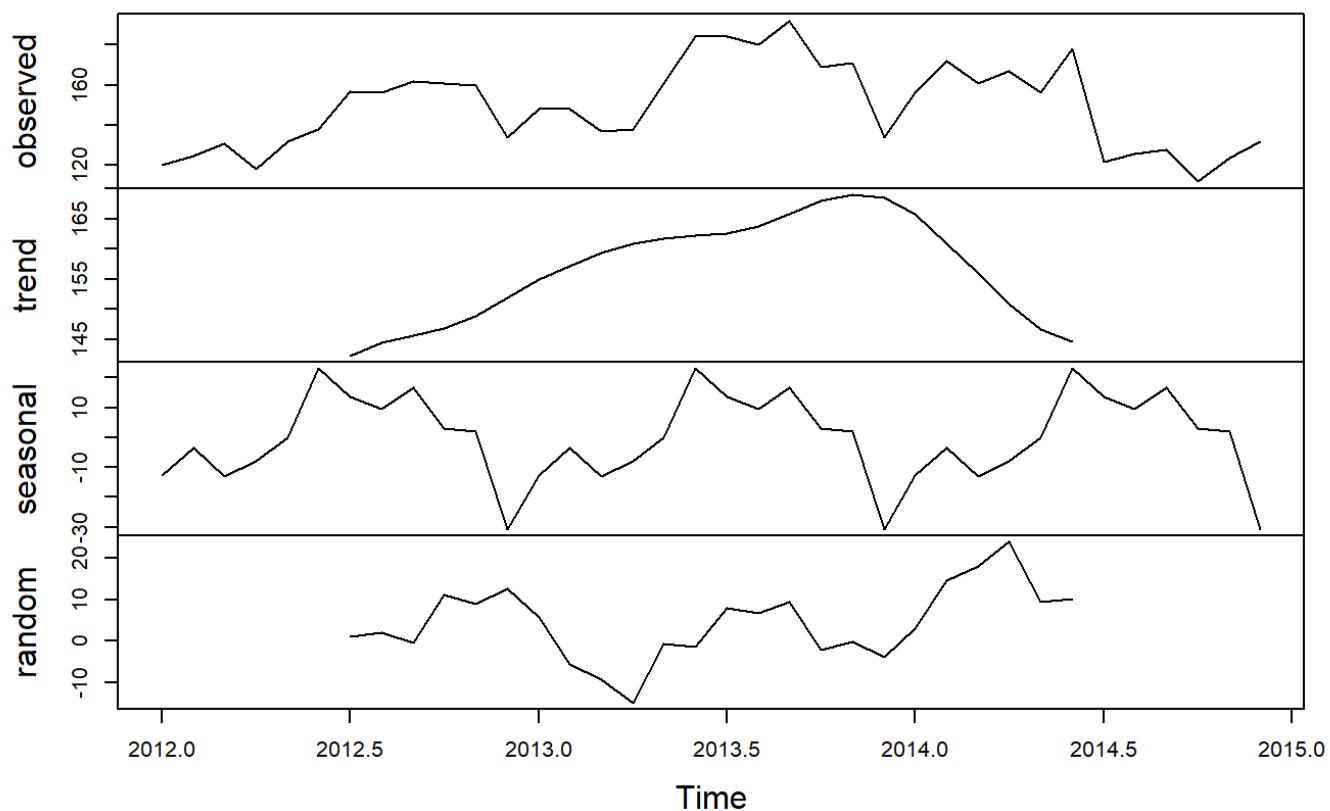
Series timeseries



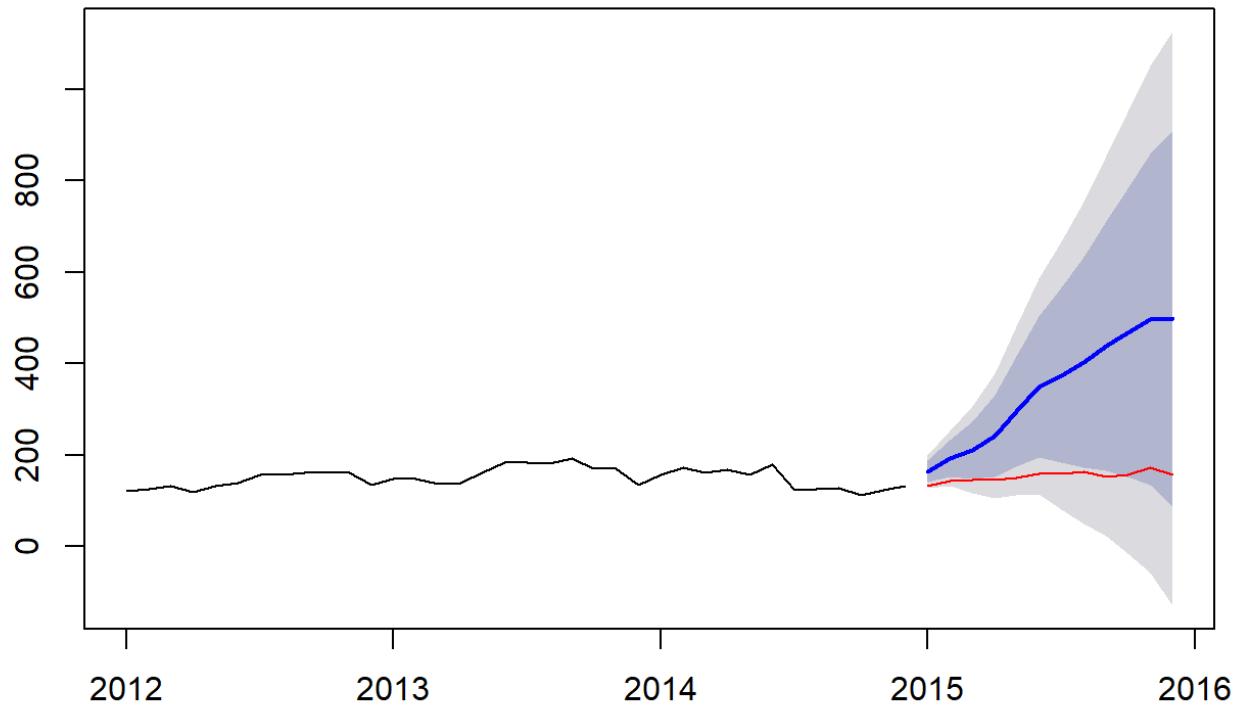
Series timeseries



Decomposition of additive time series

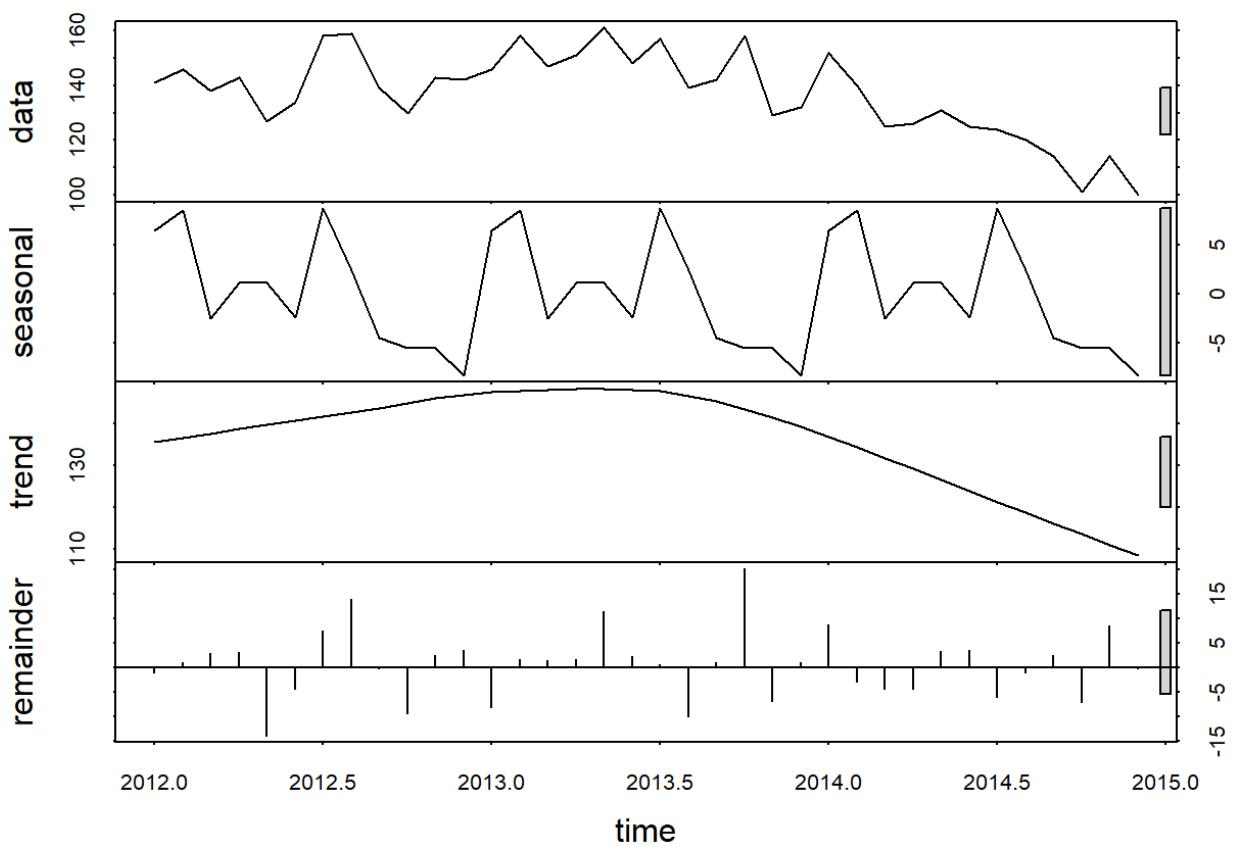
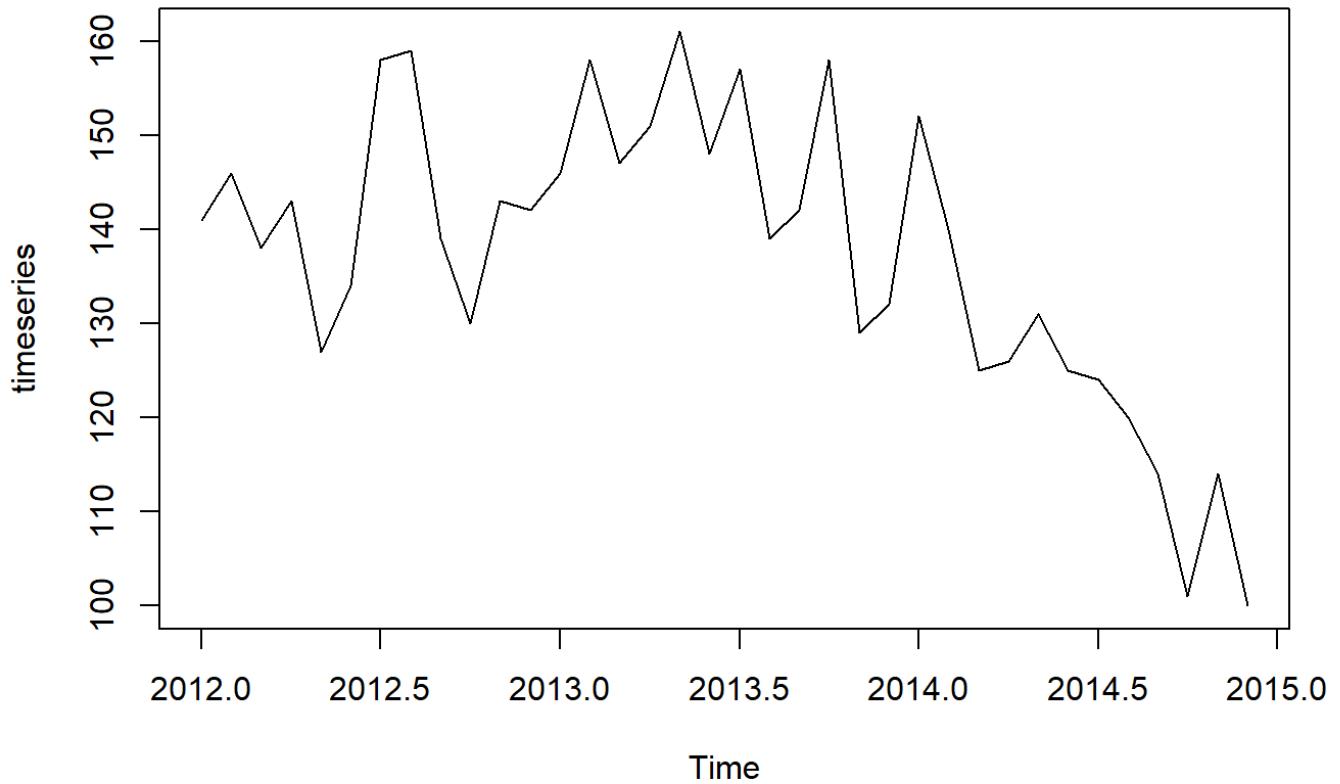


Forecasts from HoltWinters

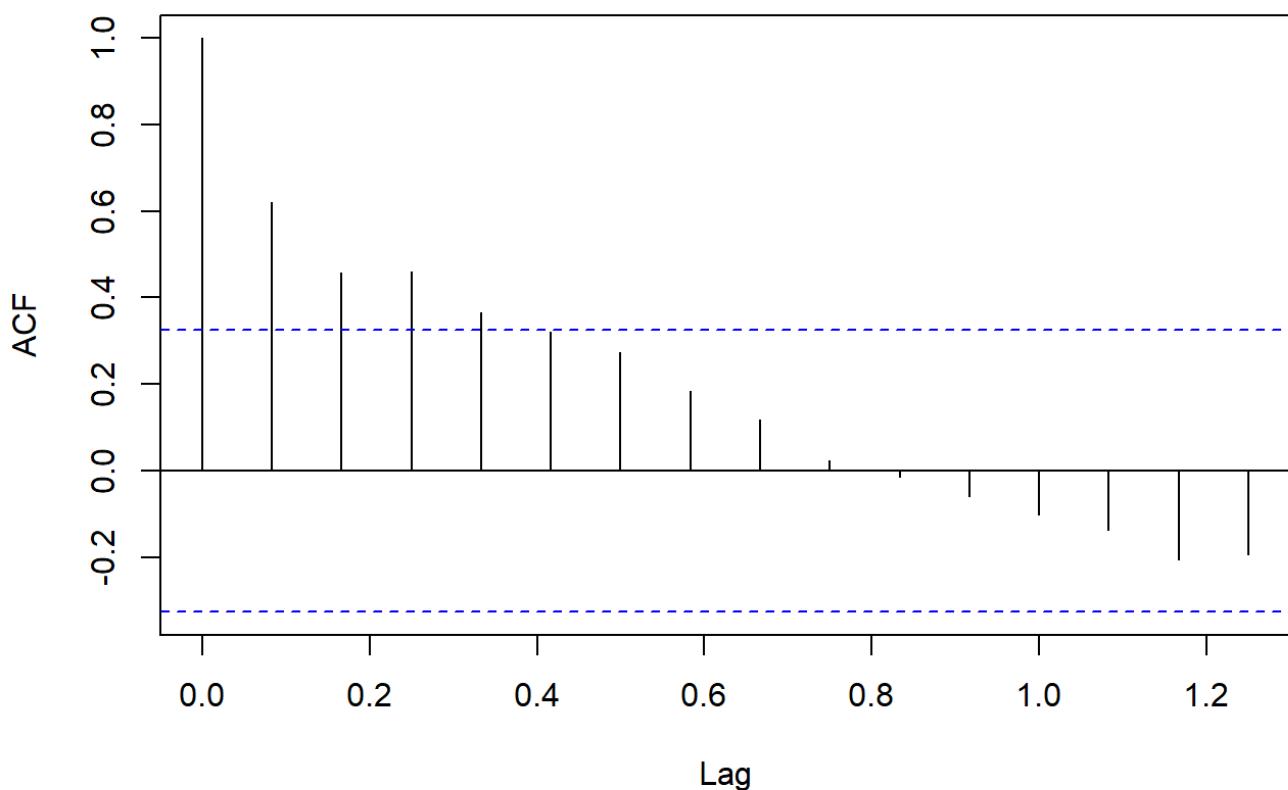


```
## [1] 190.8097
```

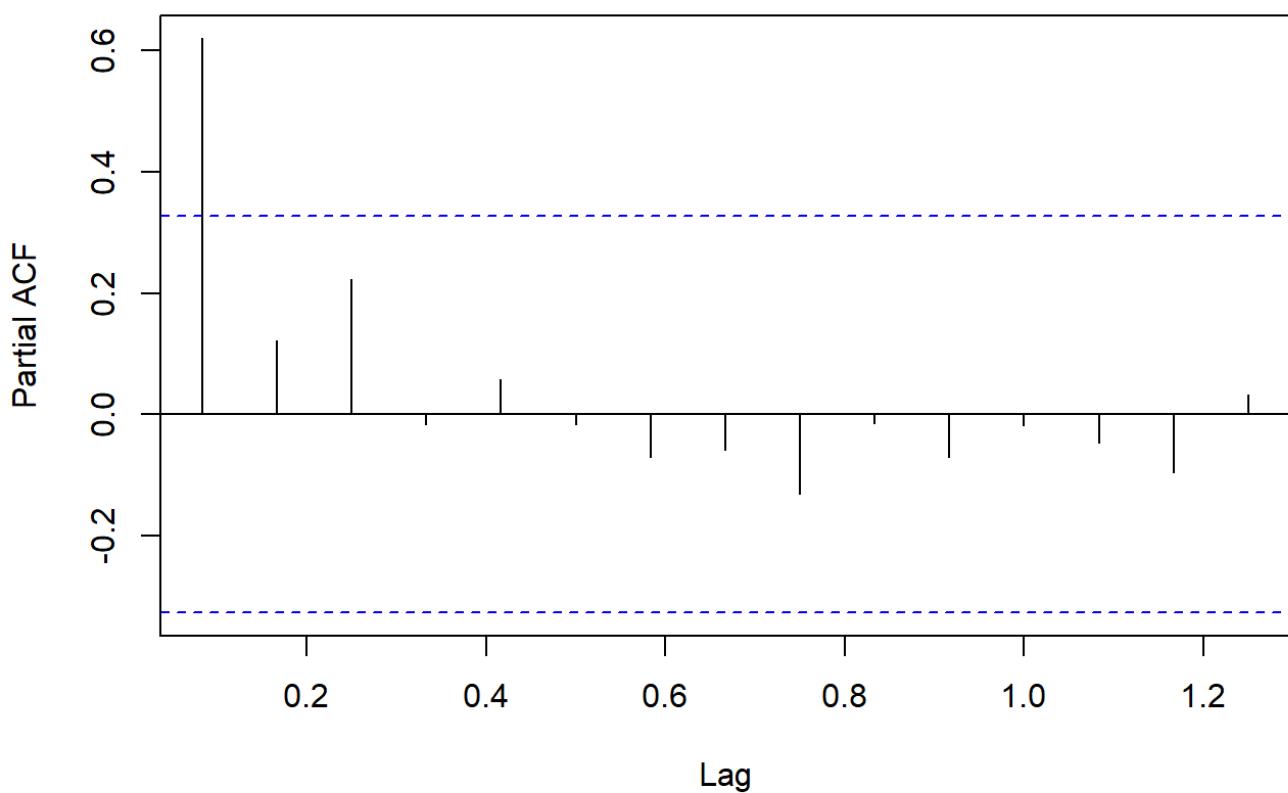
```
traintest(tv_ts20)
```



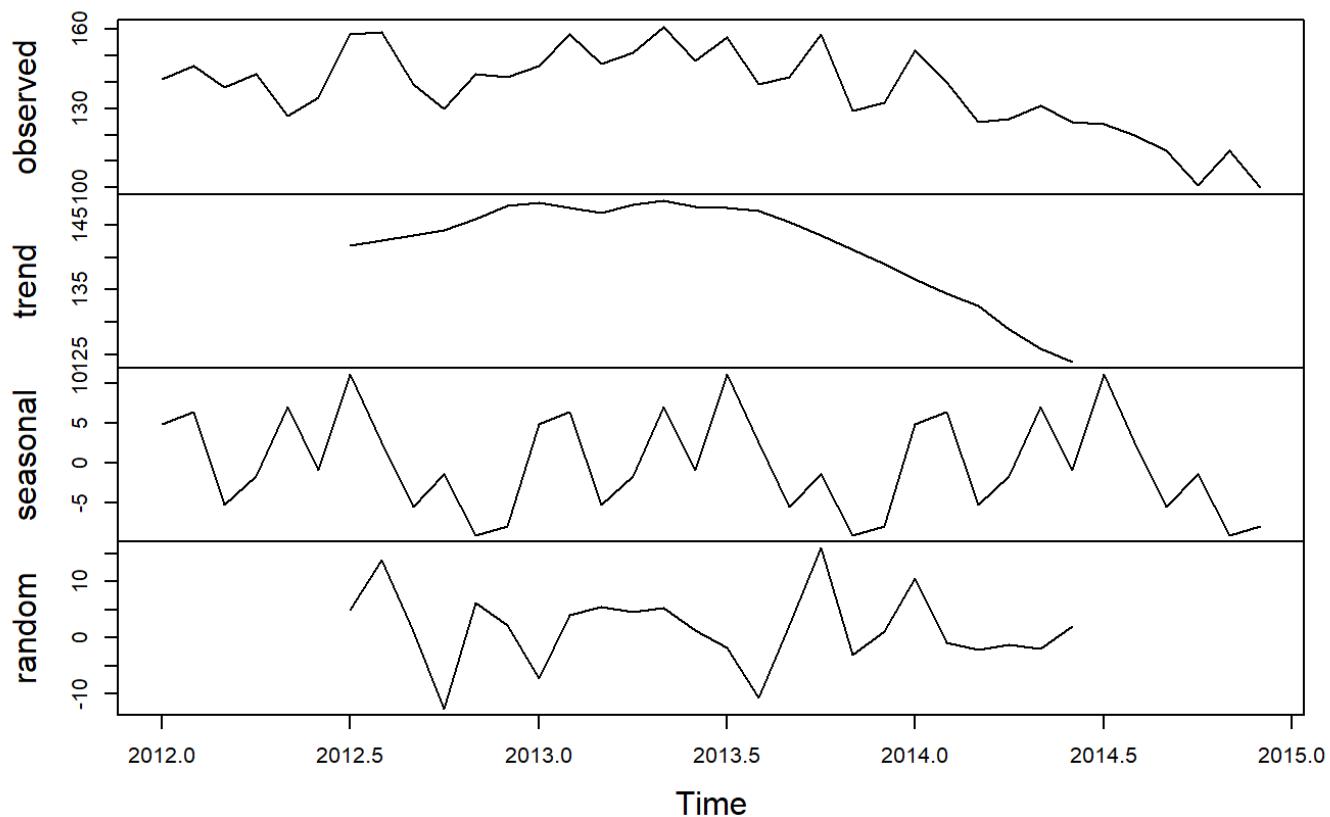
Series timeseries



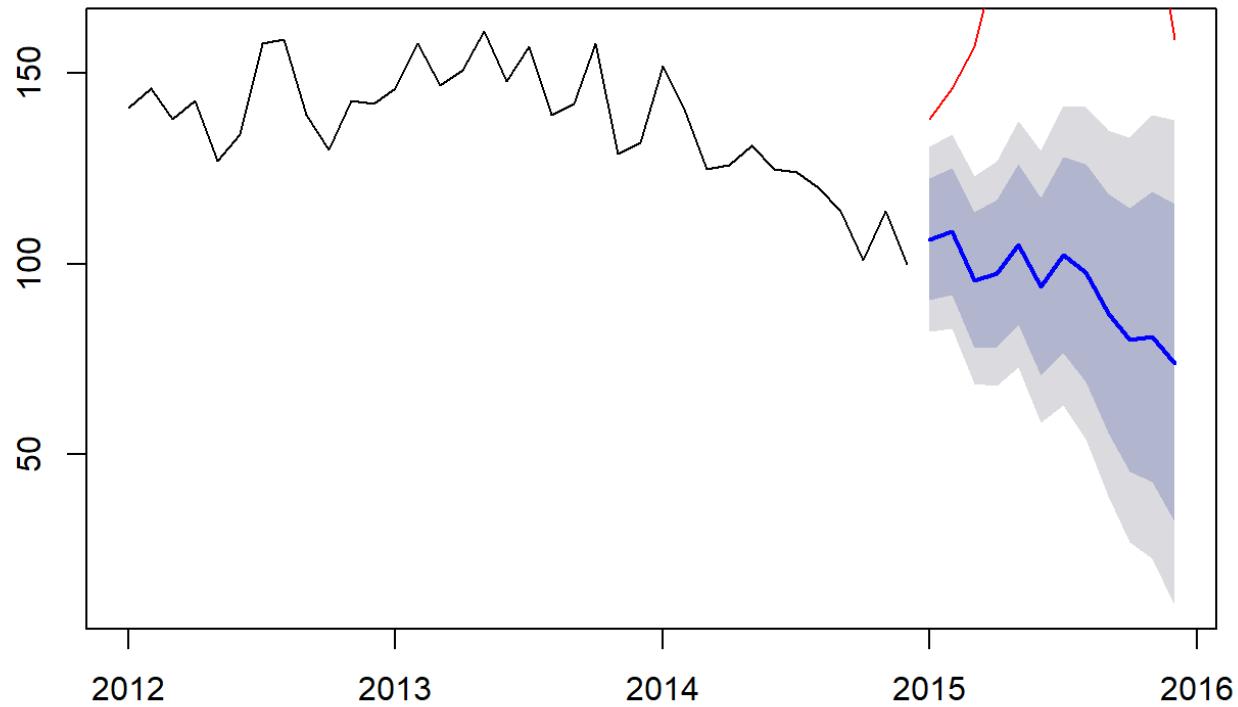
Series timeseries



Decomposition of additive time series

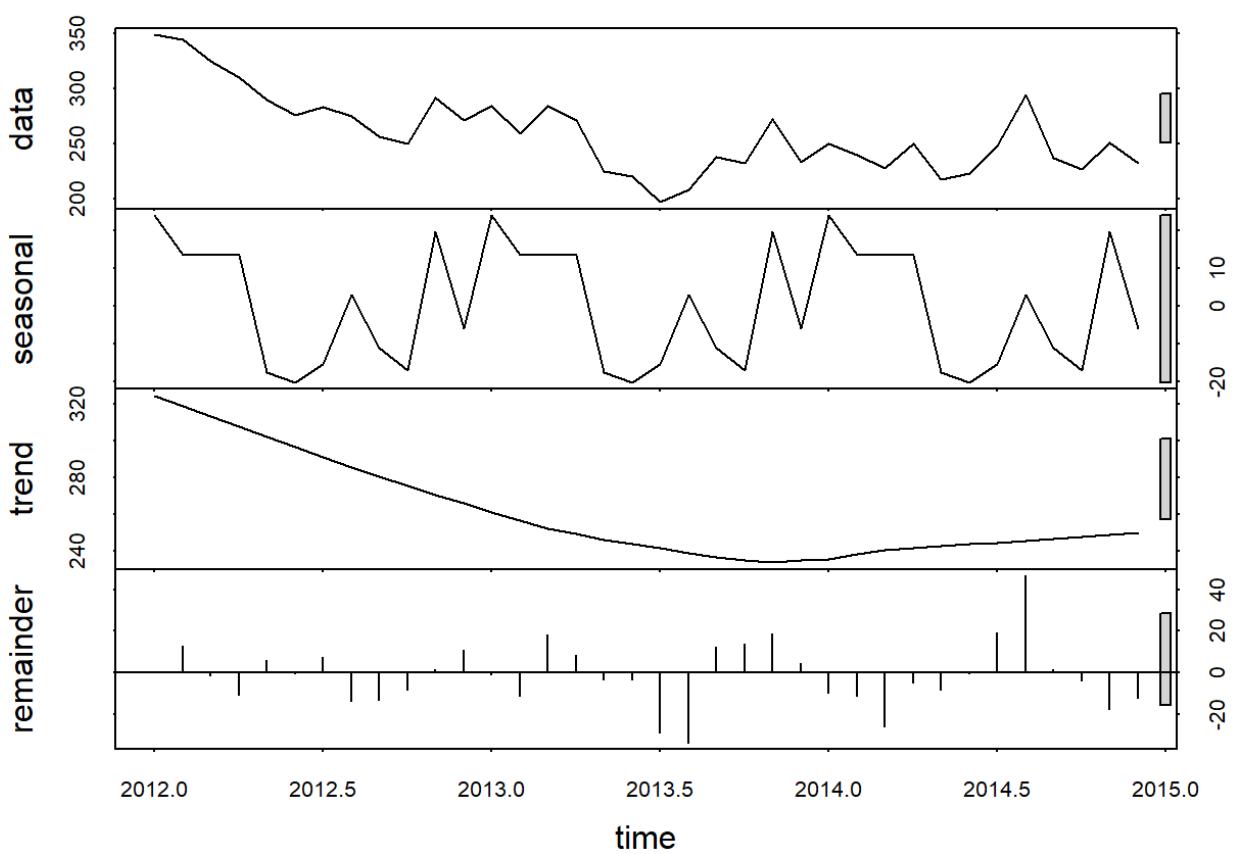
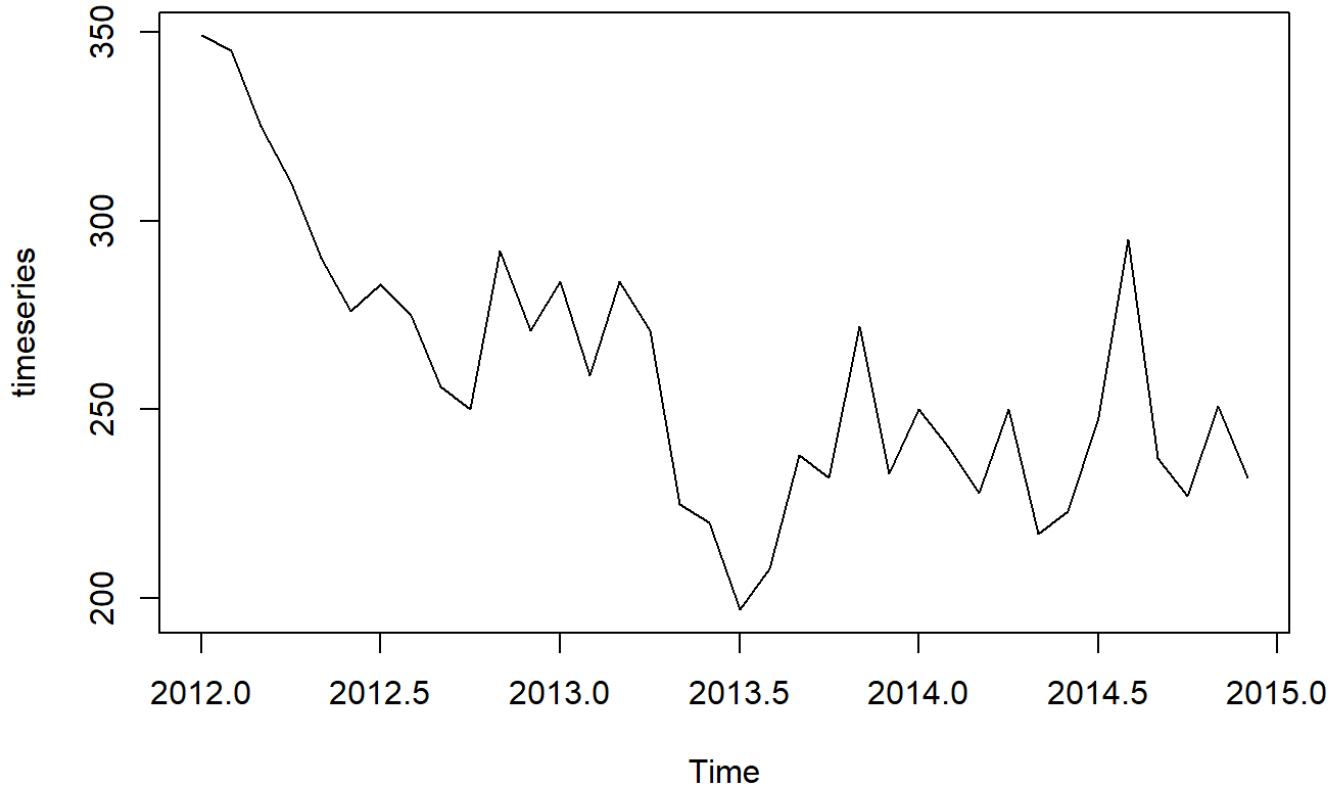


Forecasts from HoltWinters

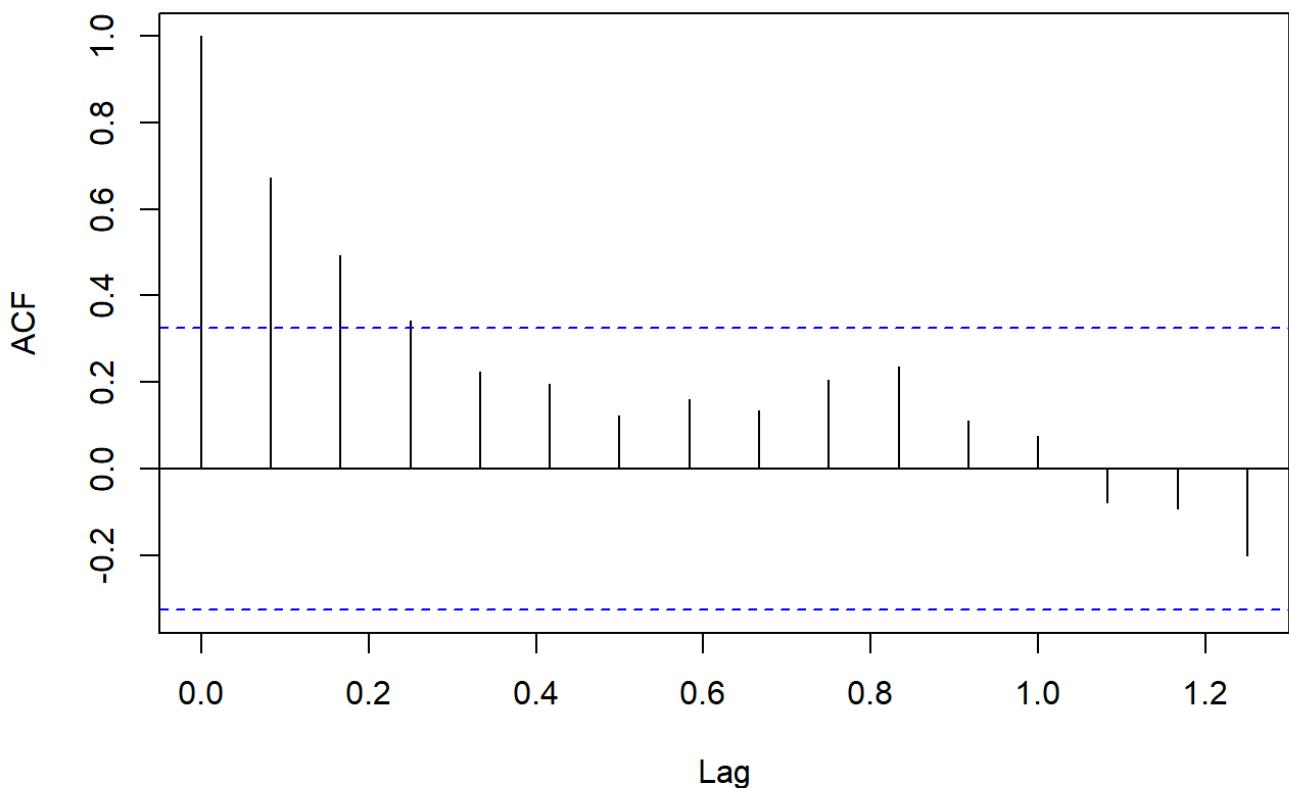


```
## [1] 86.44478
```

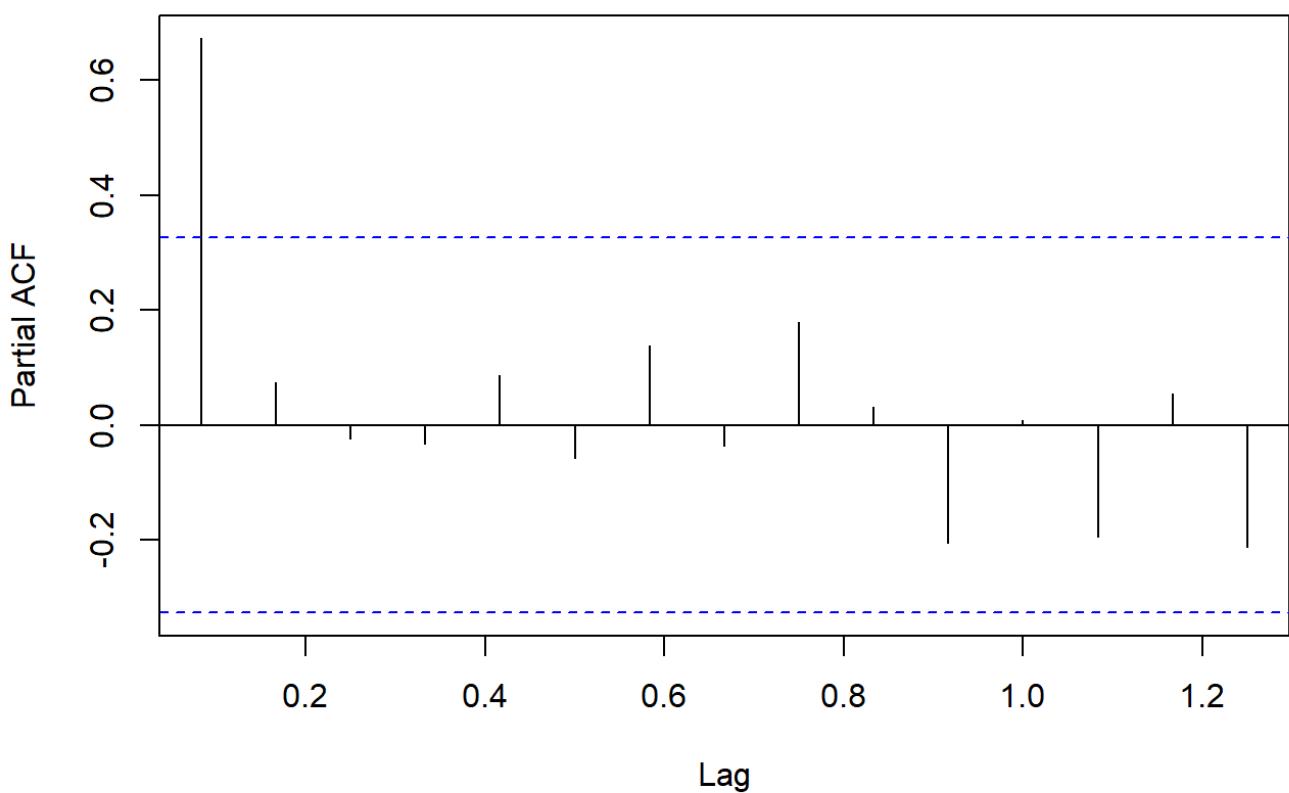
```
traintest(tv_ts21)
```



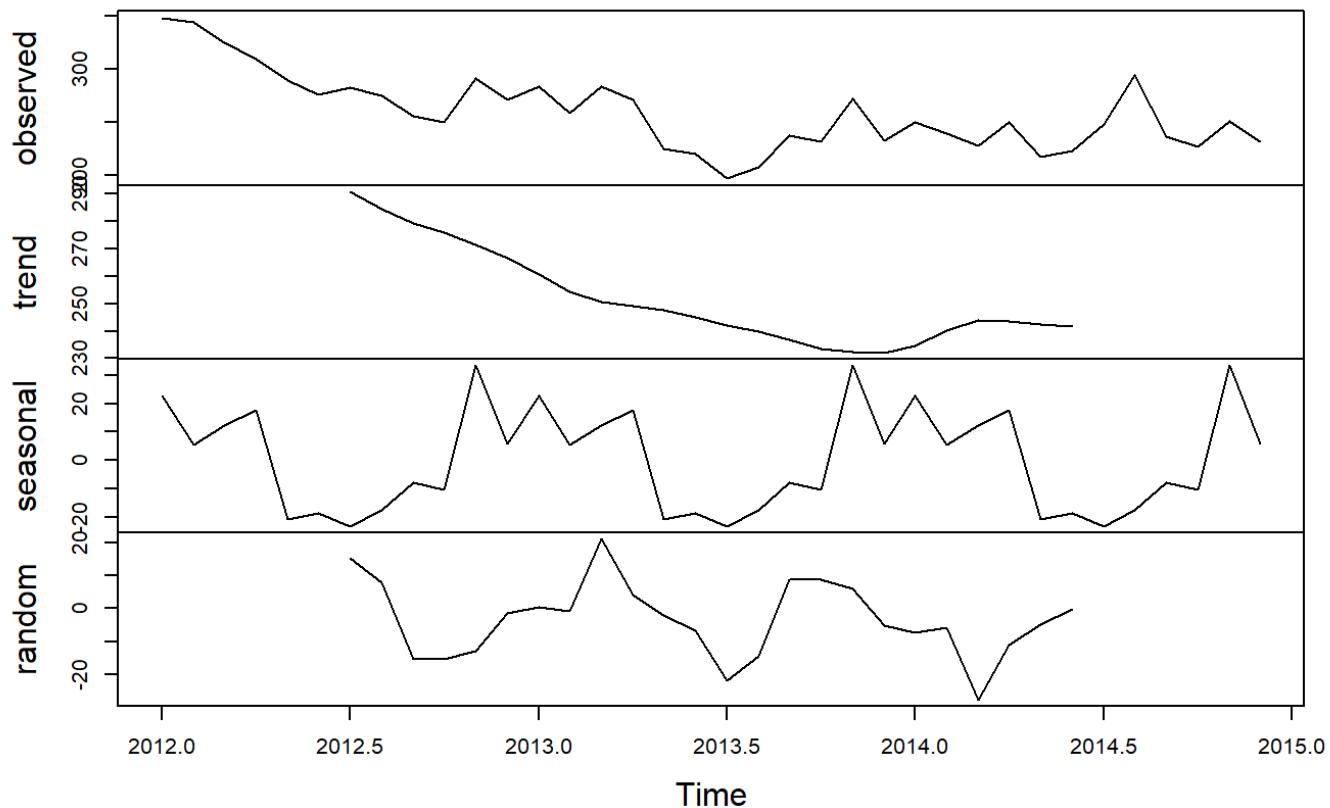
Series timeseries



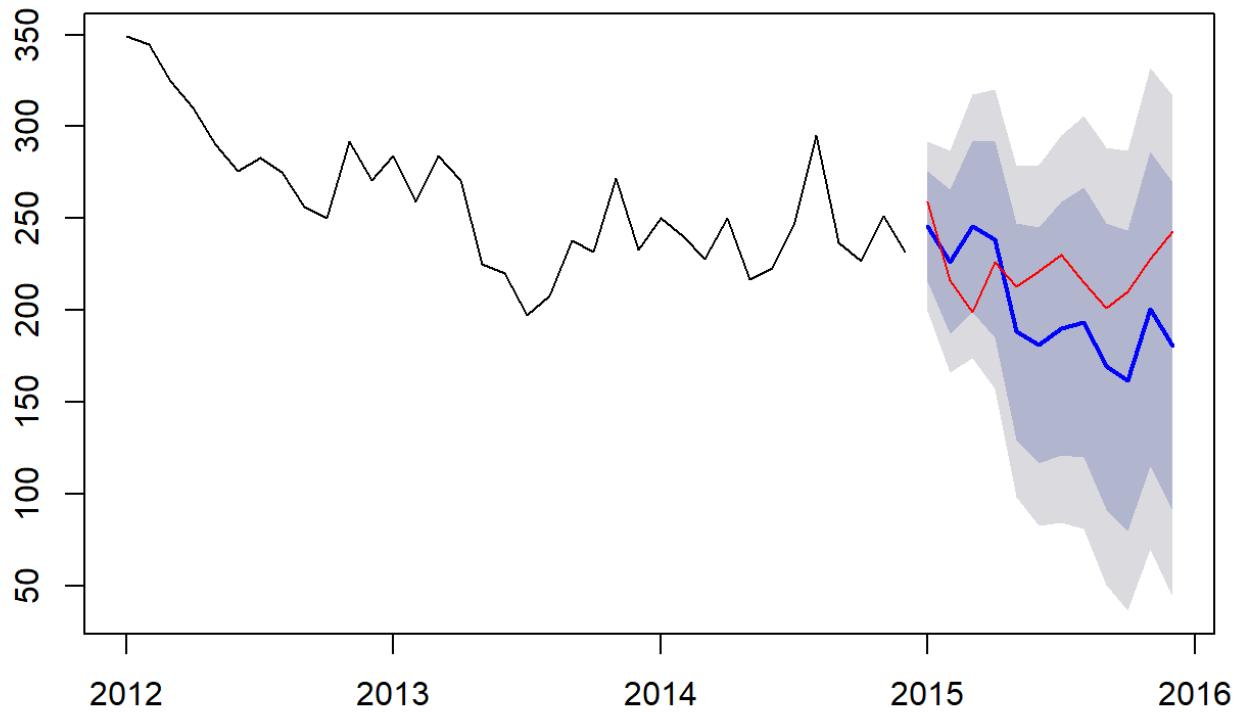
Series timeseries



Decomposition of additive time series

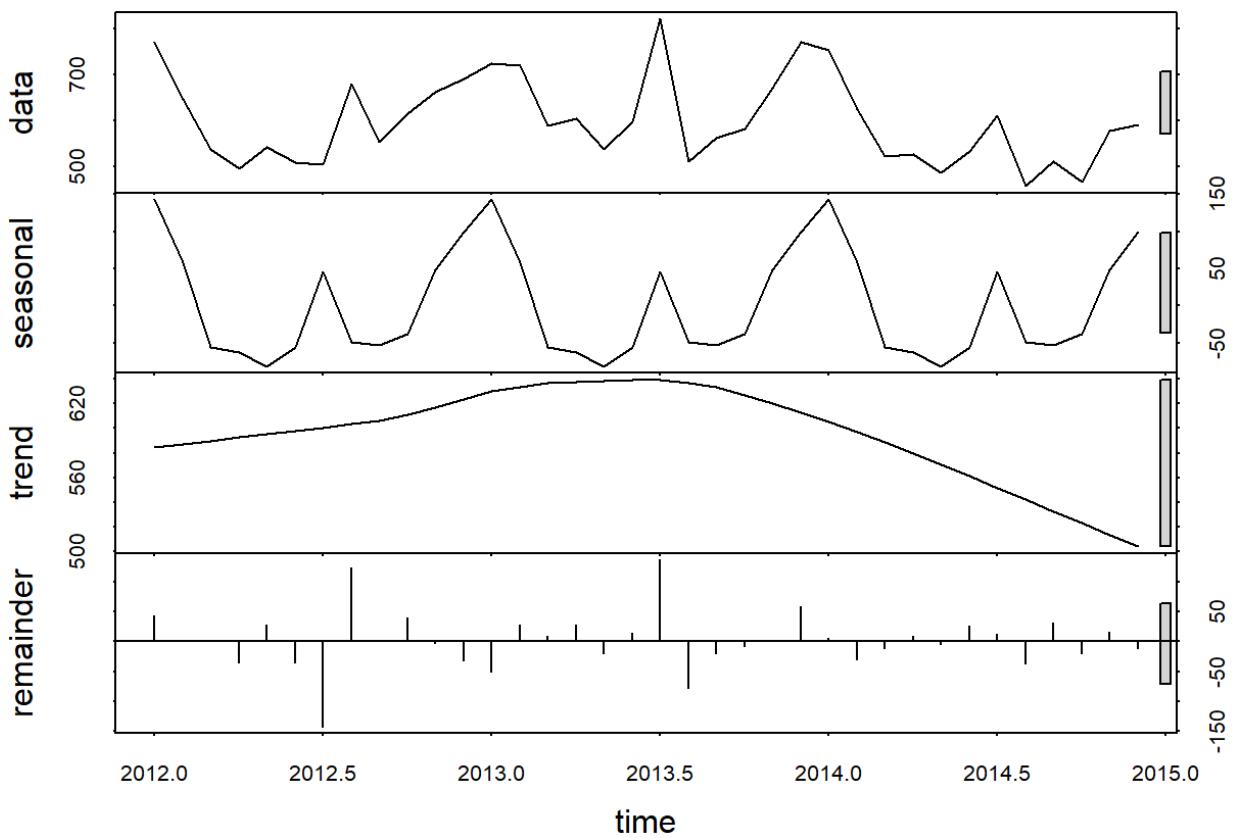
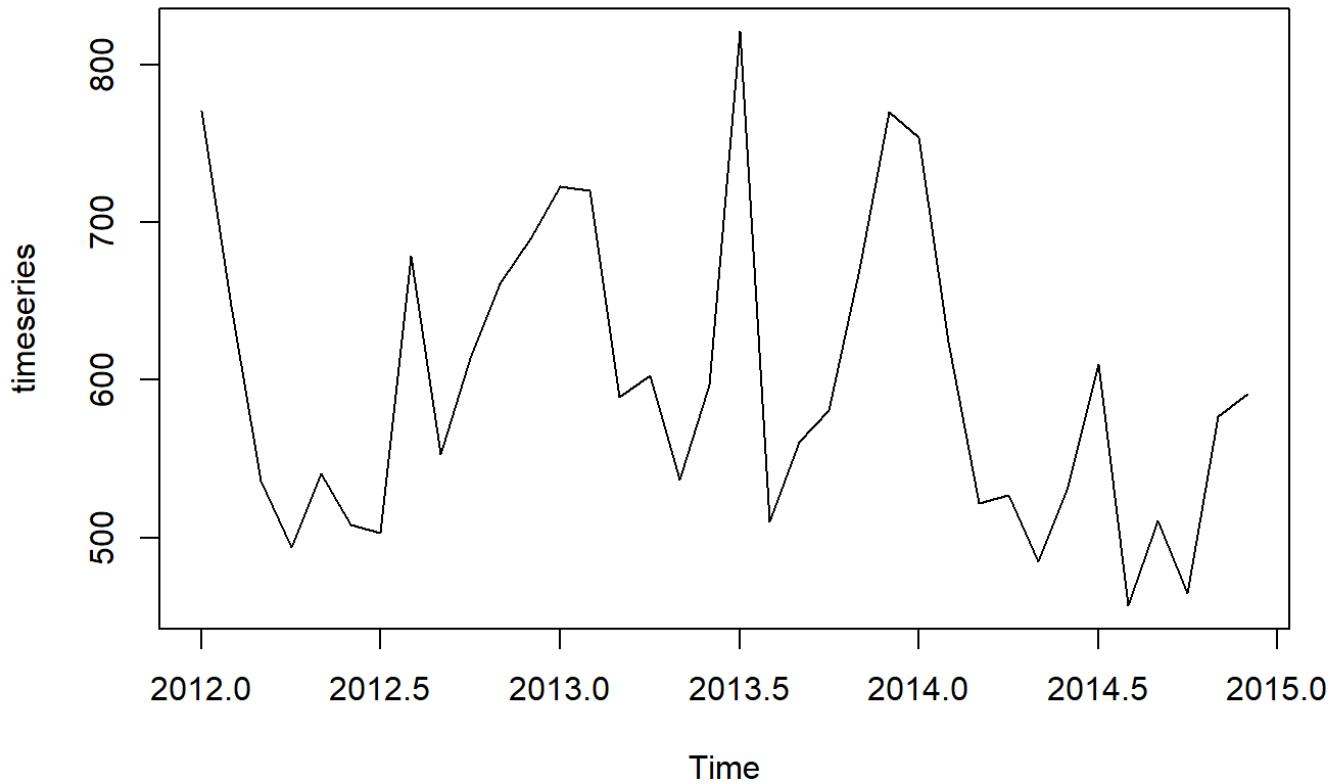


Forecasts from HoltWinters

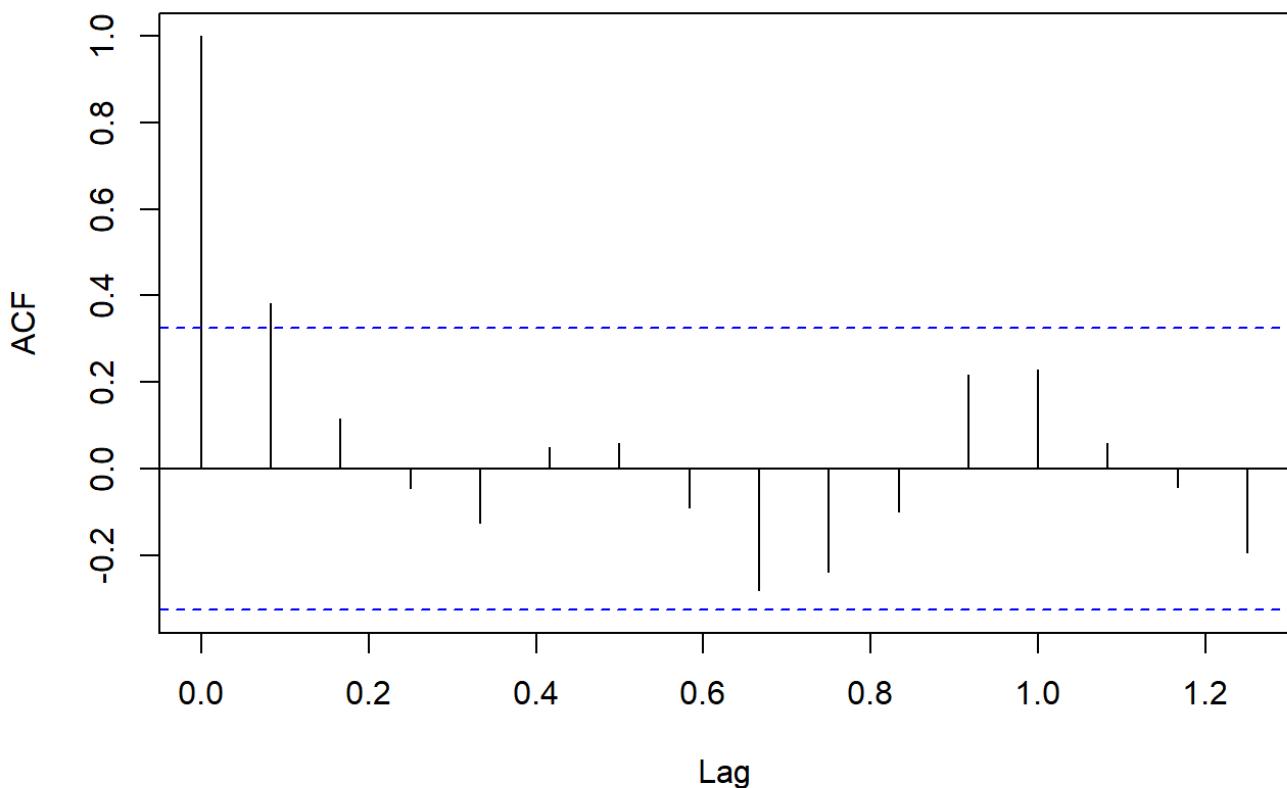


```
## [1] 31.60935
```

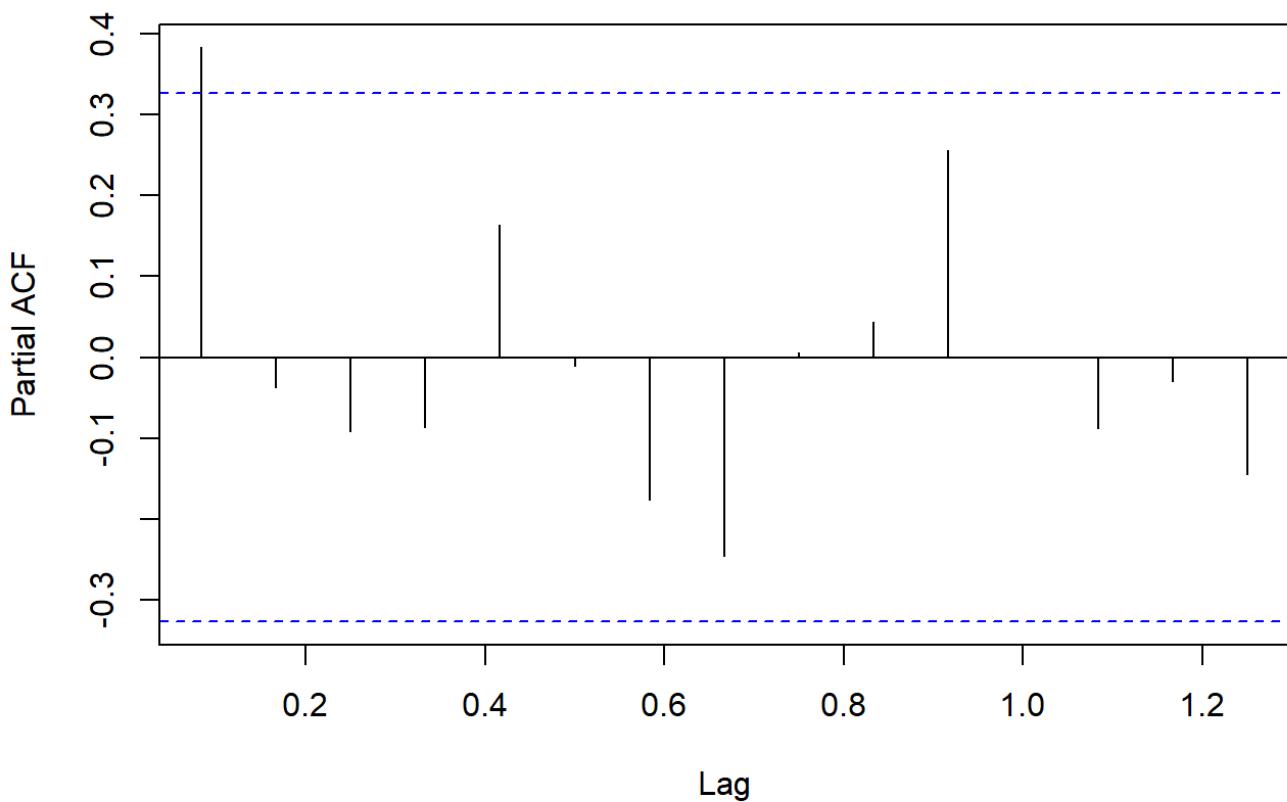
```
traintest(tv_ts22)
```



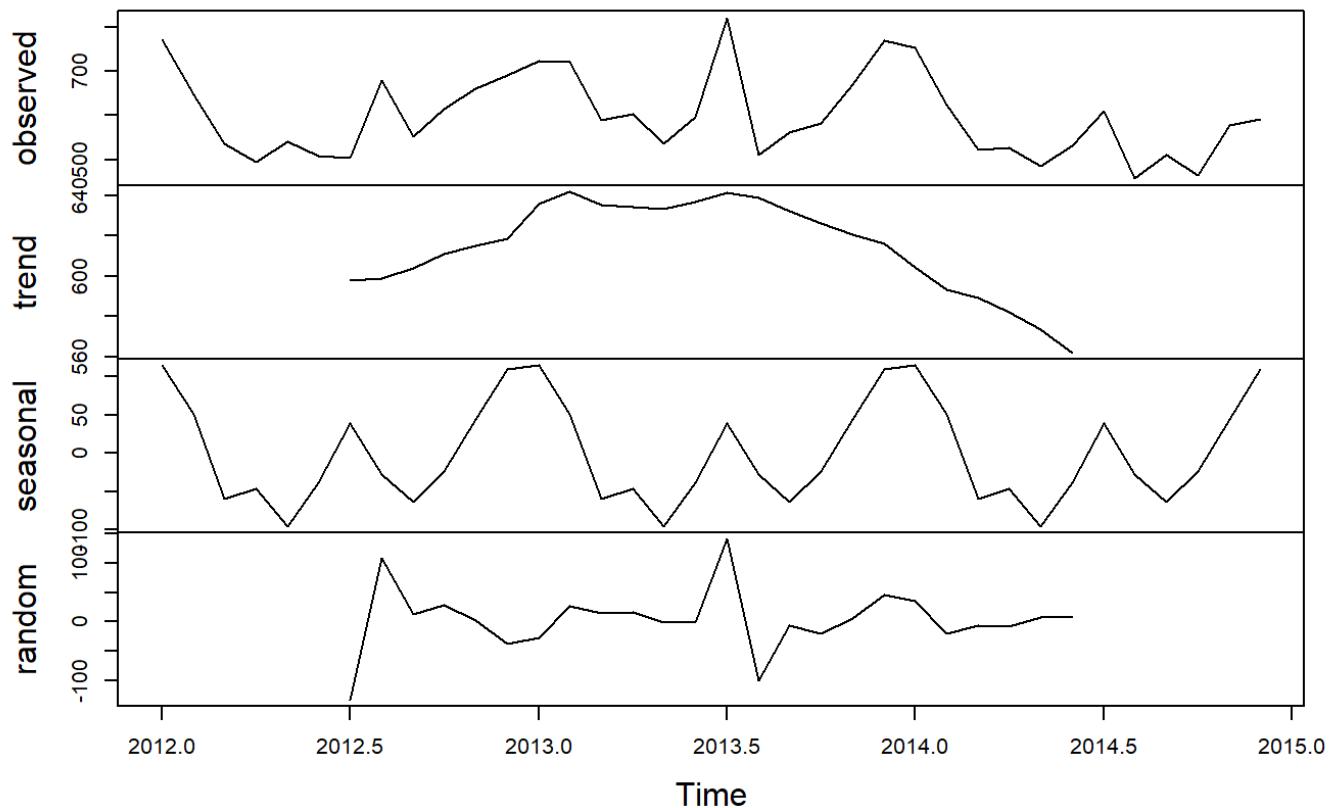
Series timeseries



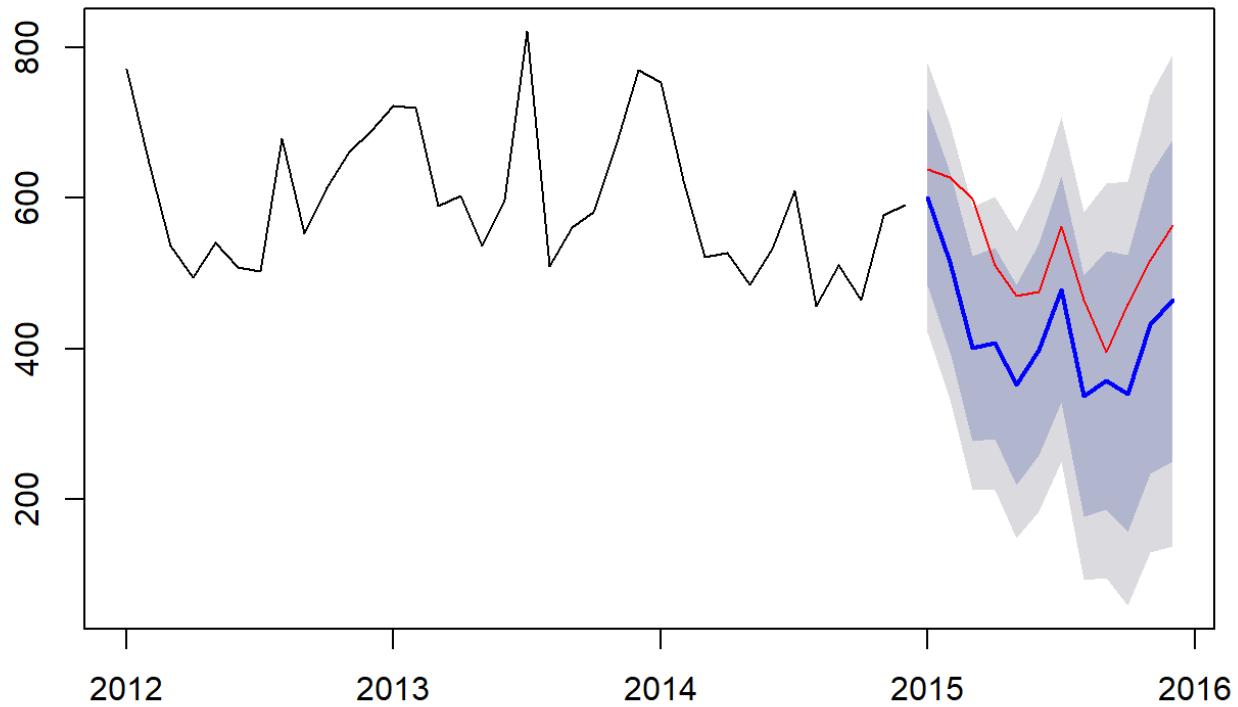
Series timeseries



Decomposition of additive time series

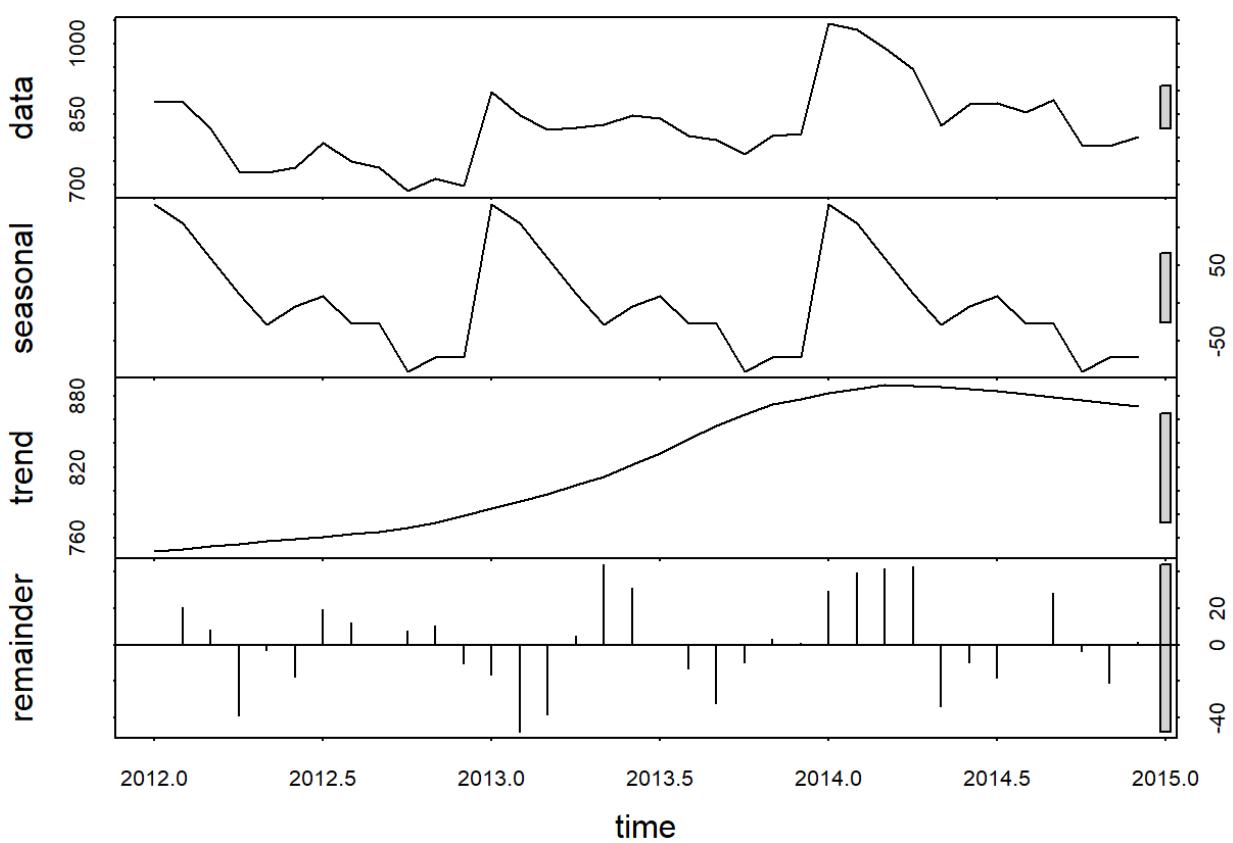
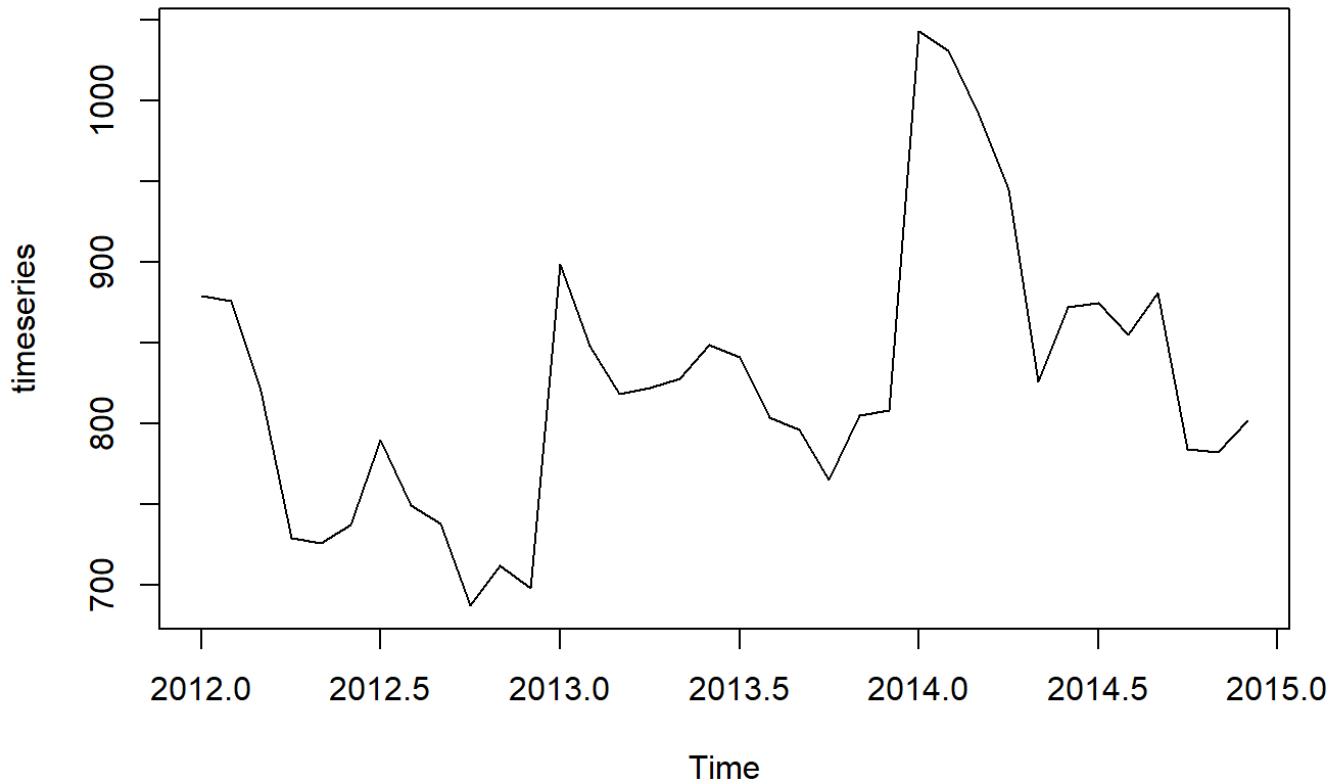


Forecasts from HoltWinters

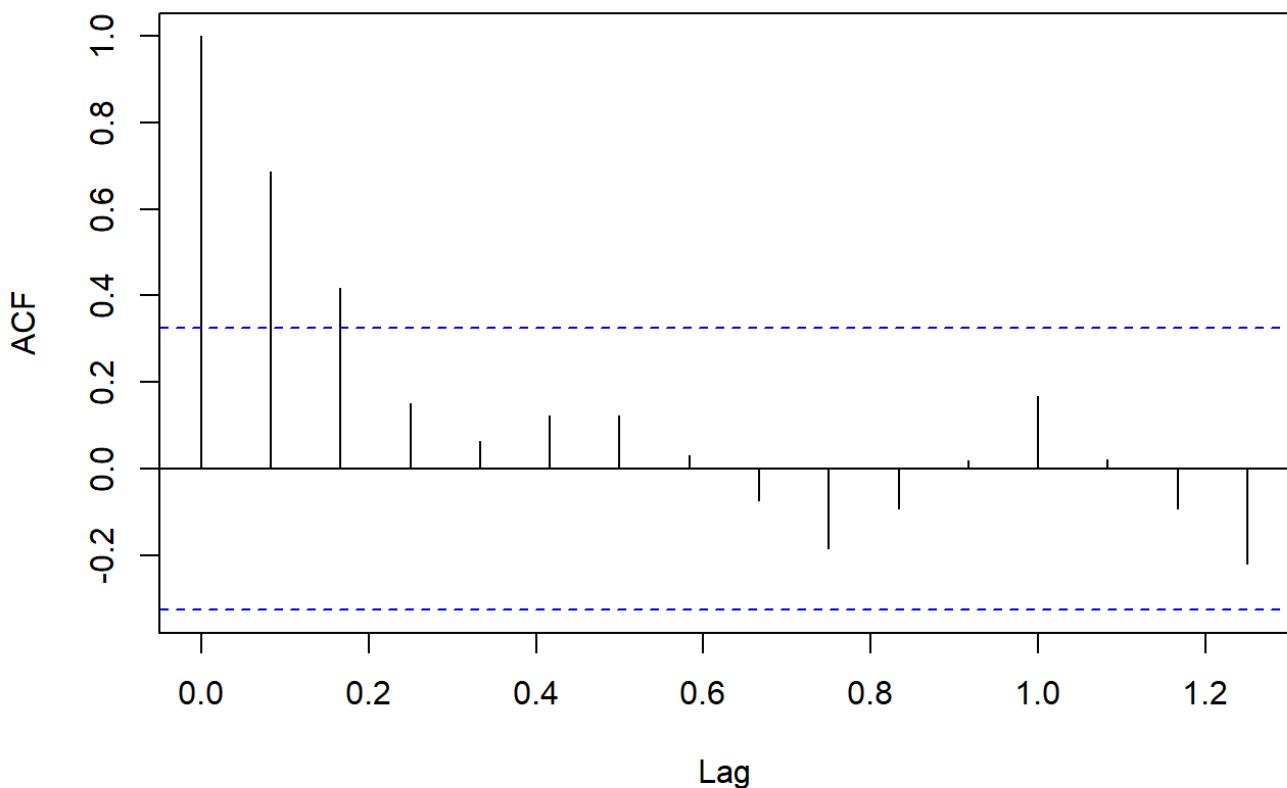


```
## [1] 99.76095
```

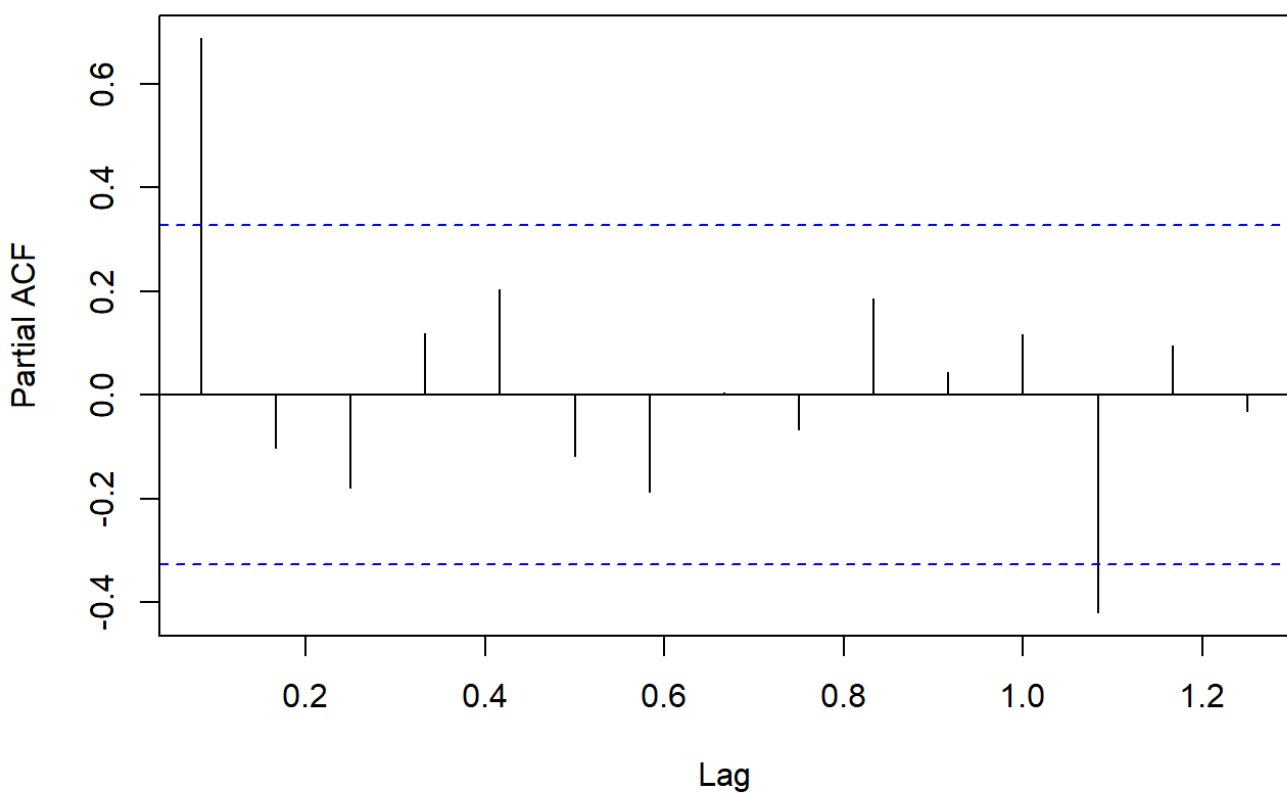
```
traintest(tv_ts23)
```



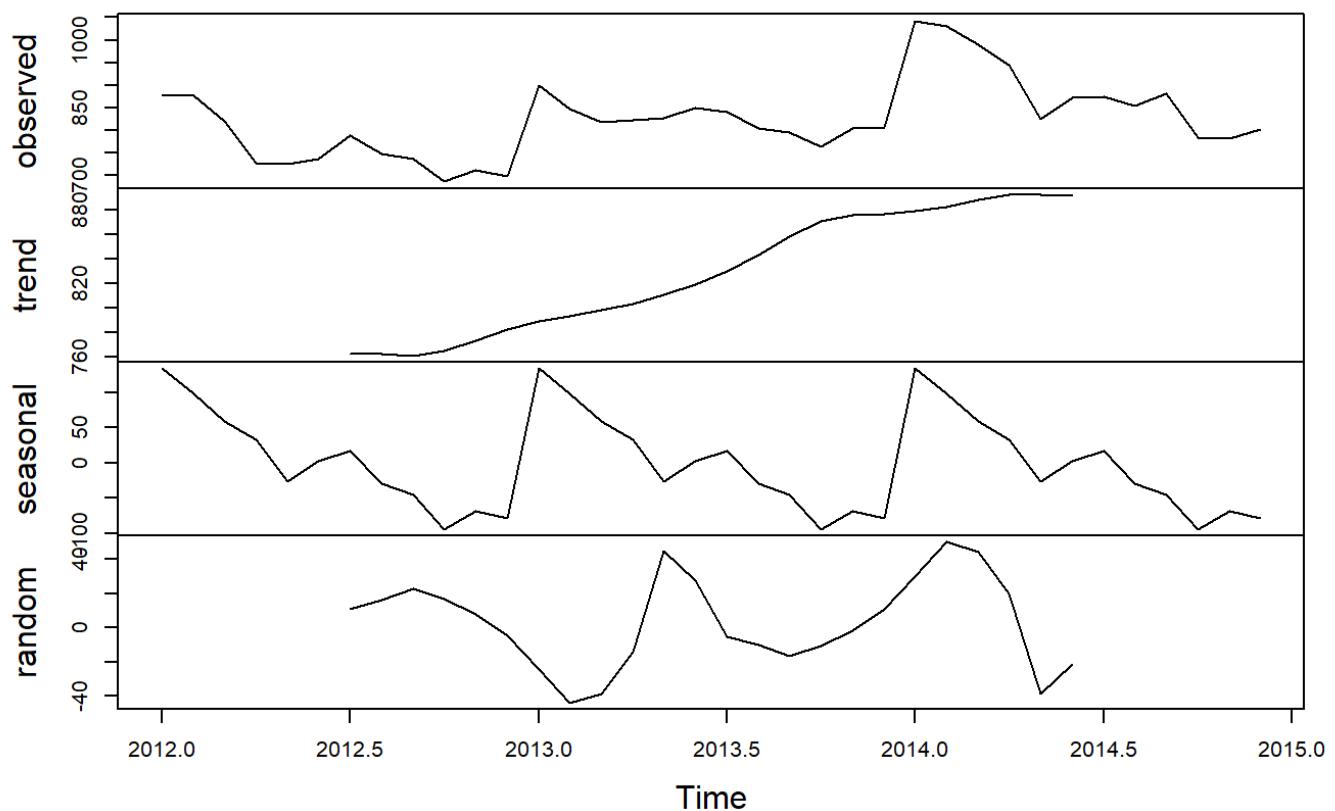
Series timeseries



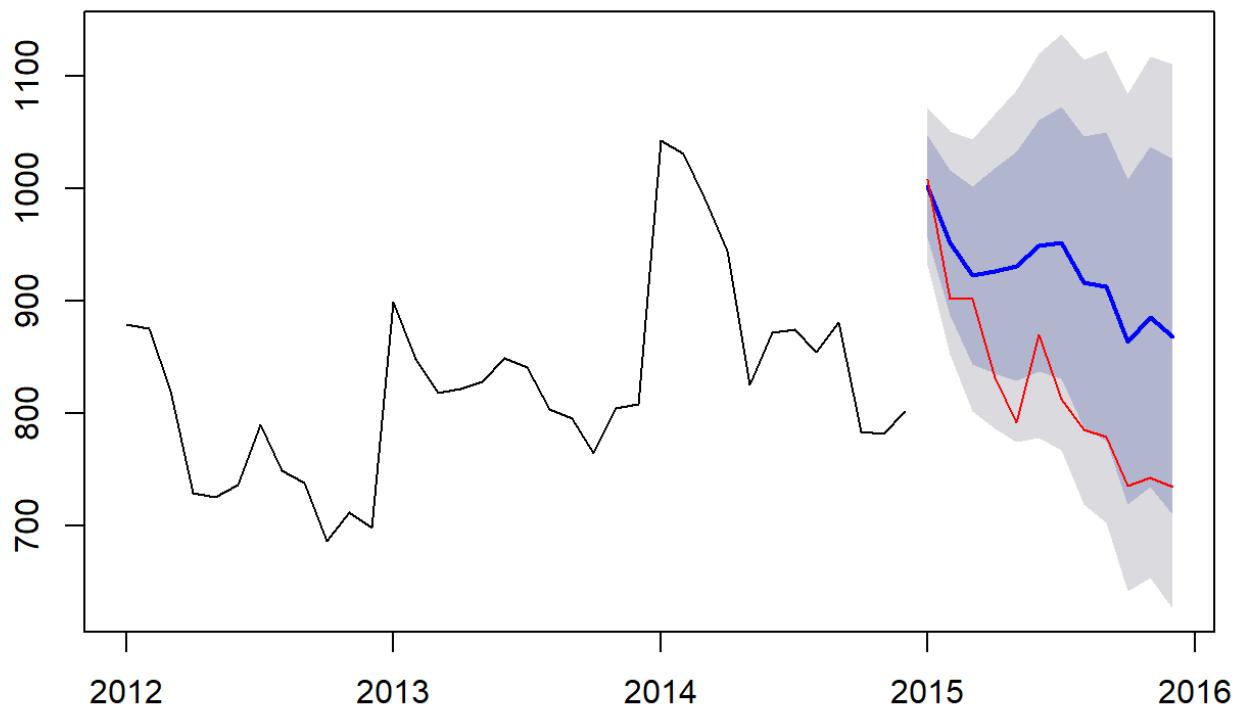
Series timeseries



Decomposition of additive time series

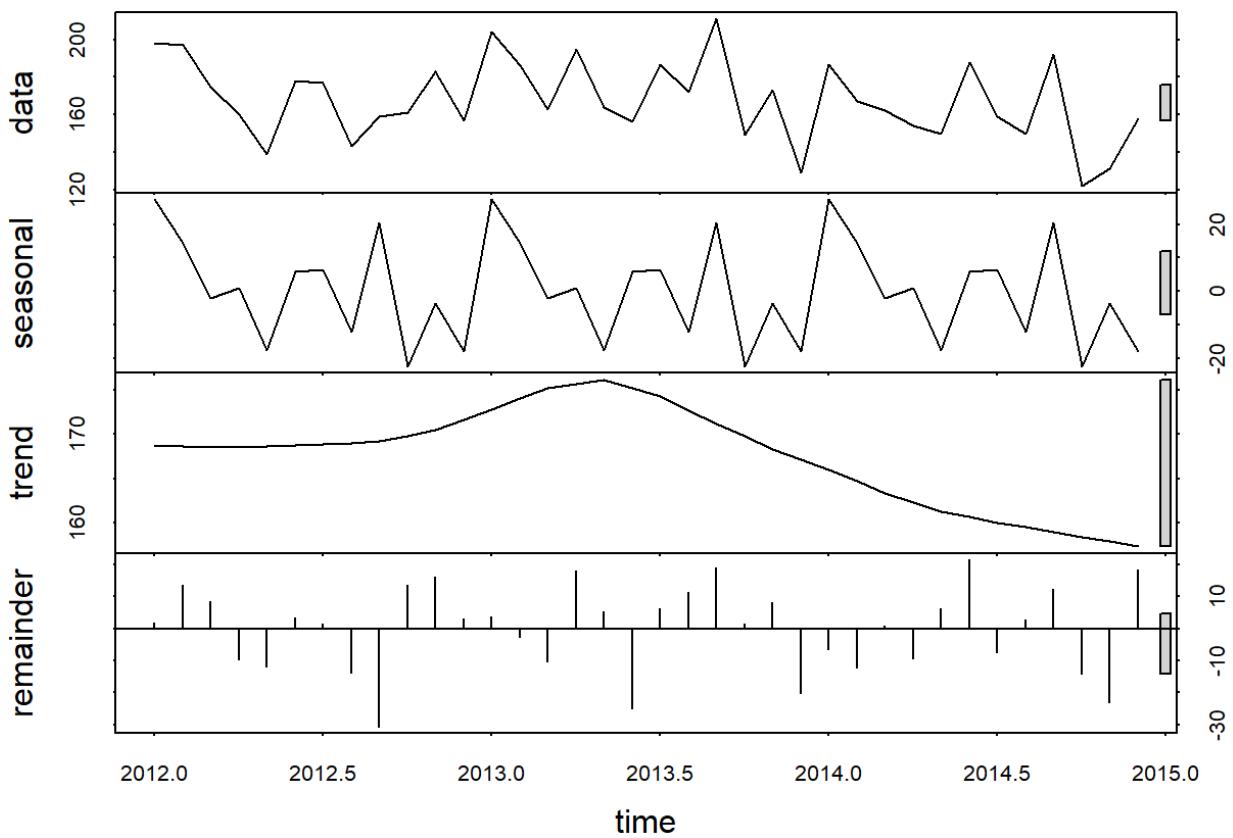
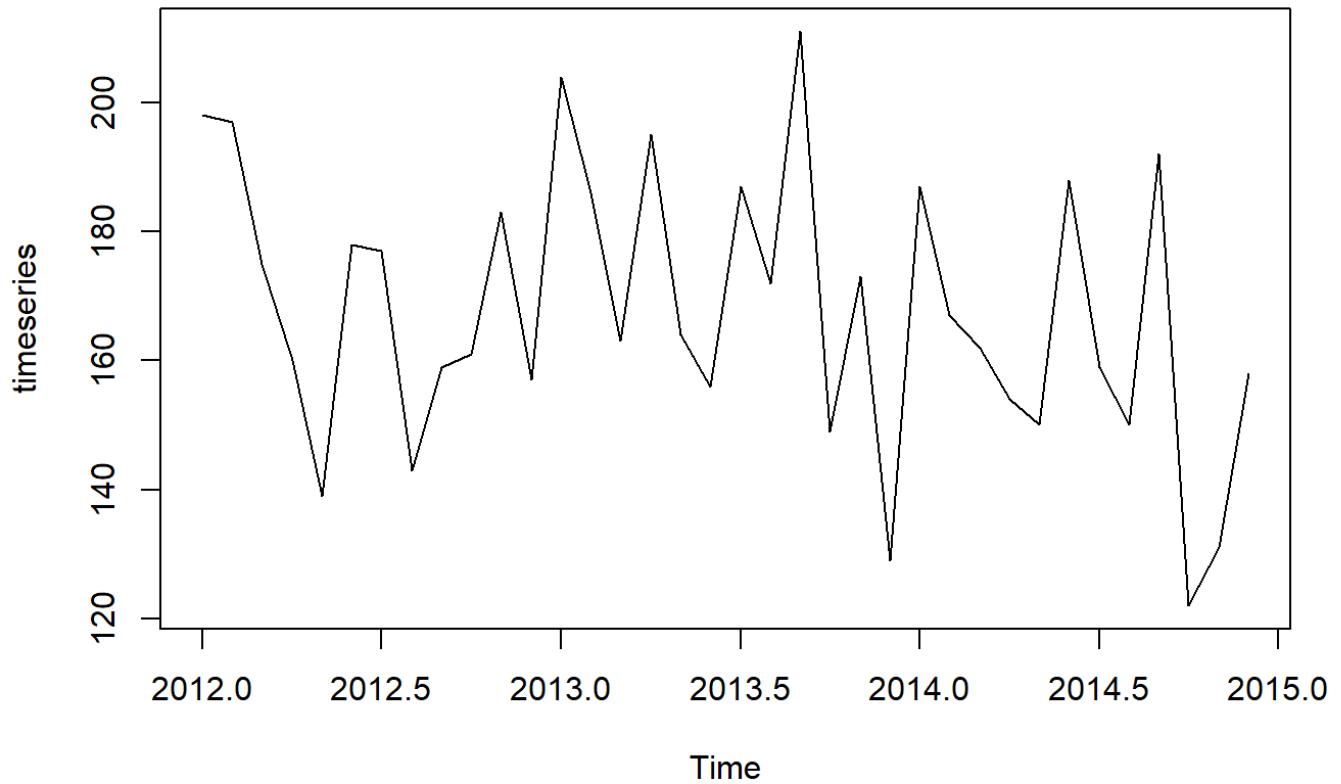


Forecasts from HoltWinters

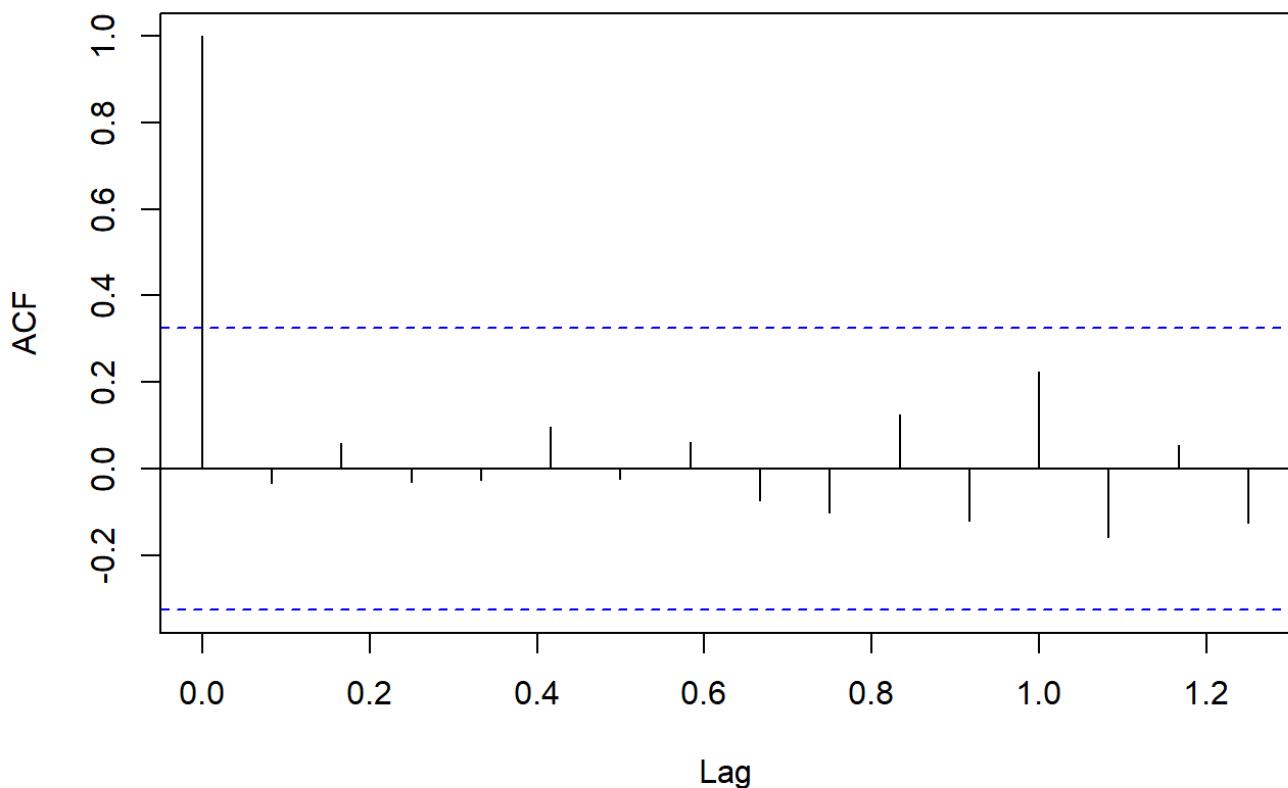


```
## [1] 99.73155
```

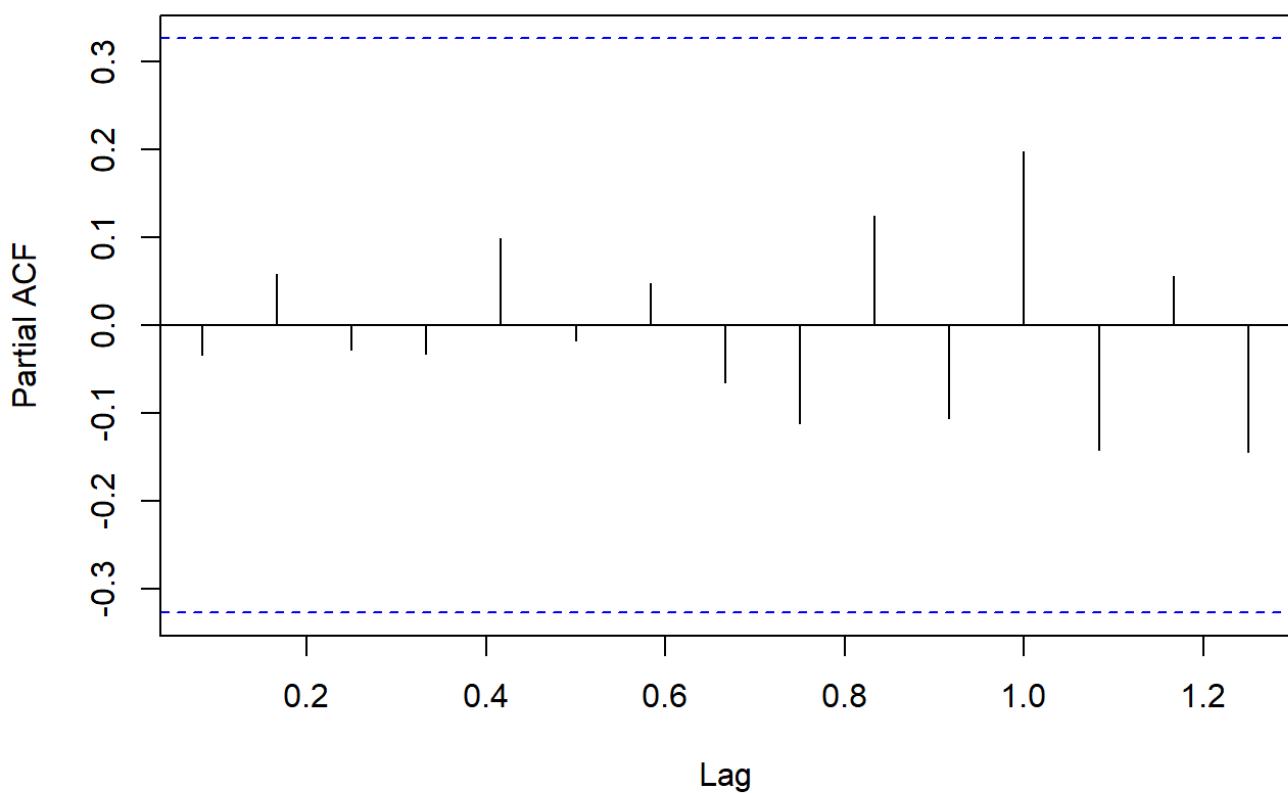
```
traintest(tv_ts24)
```



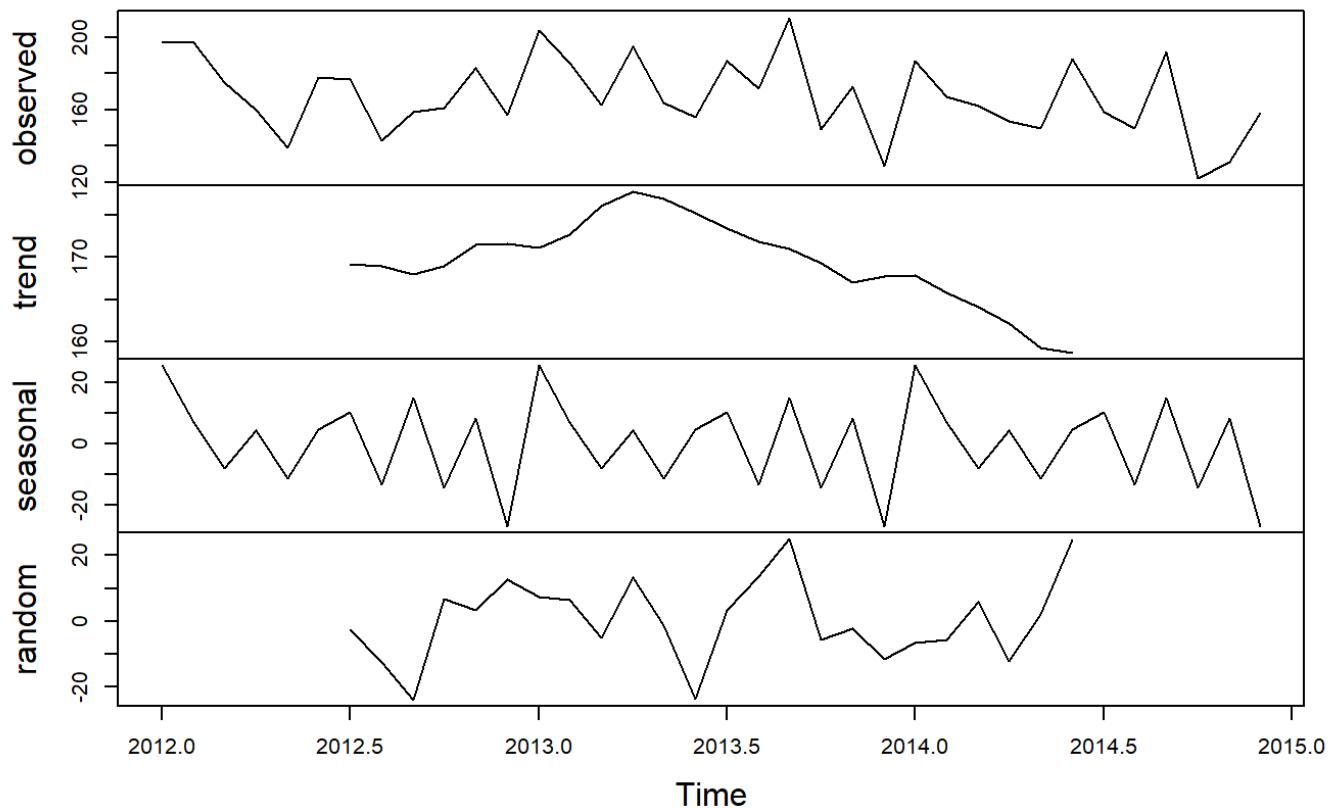
Series timeseries



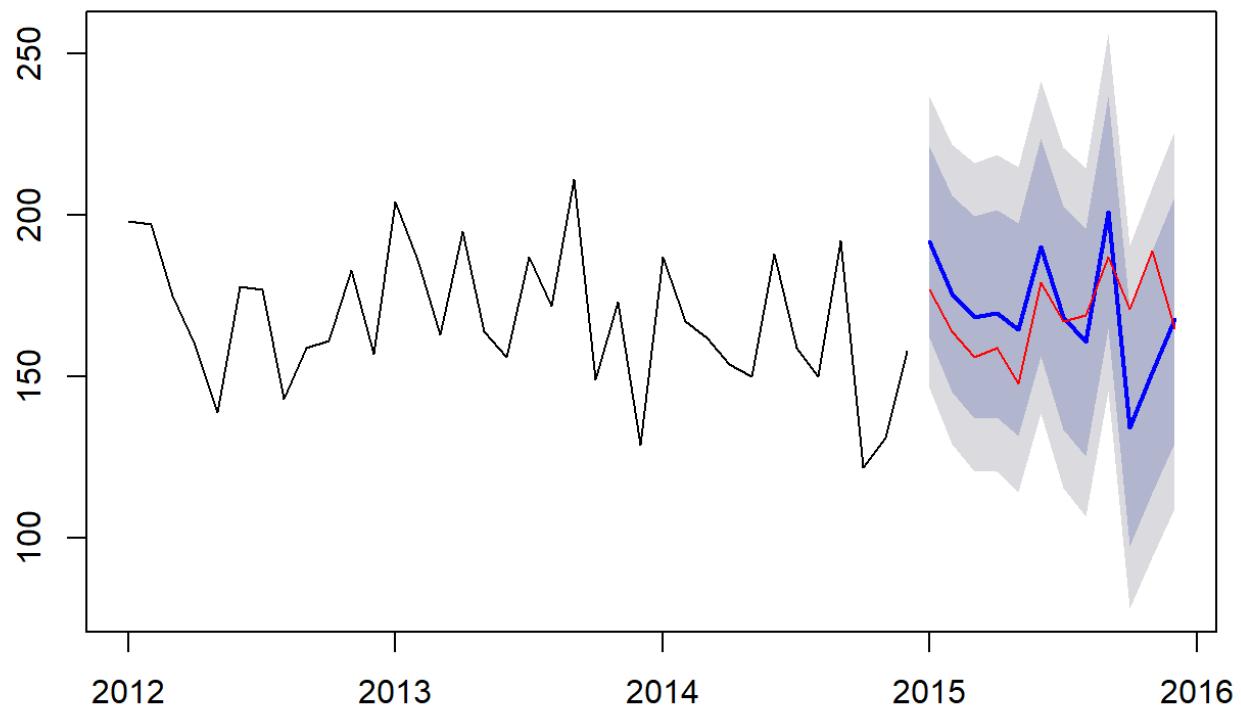
Series timeseries



Decomposition of additive time series

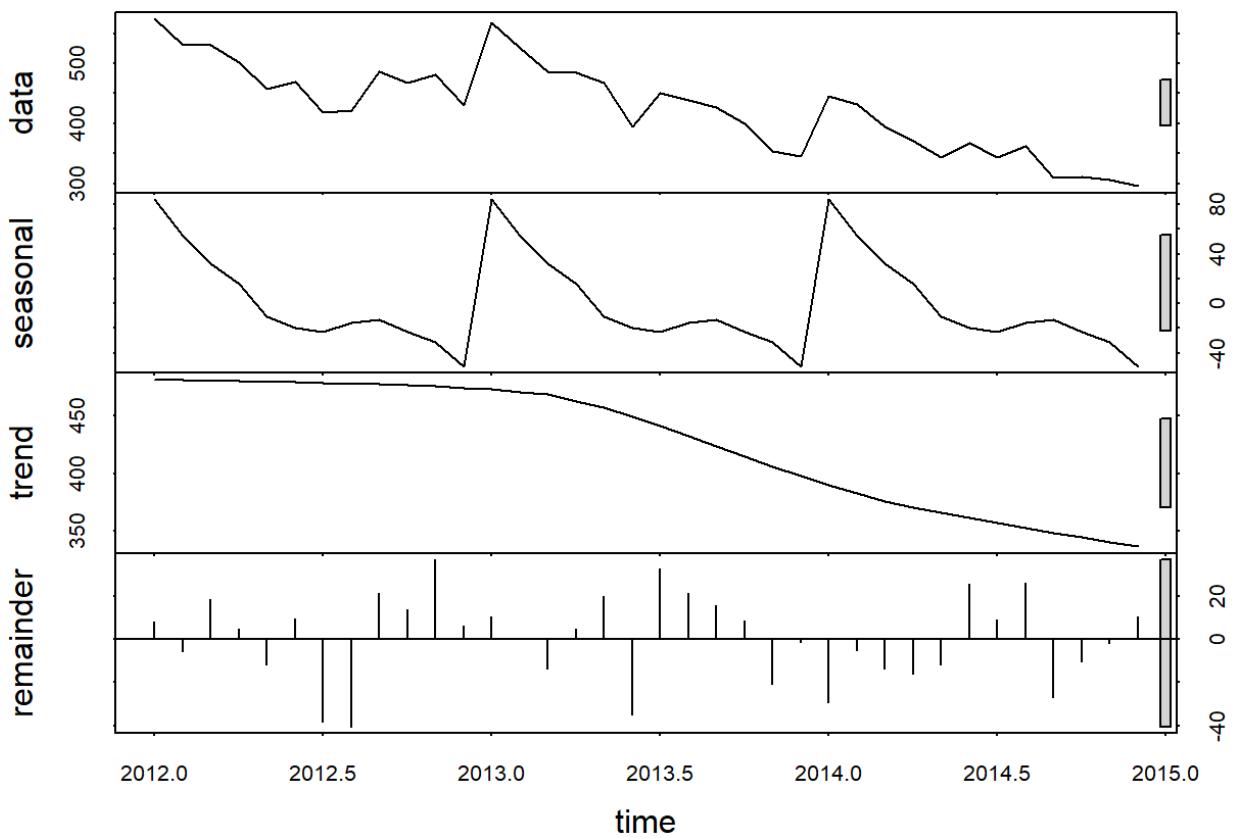
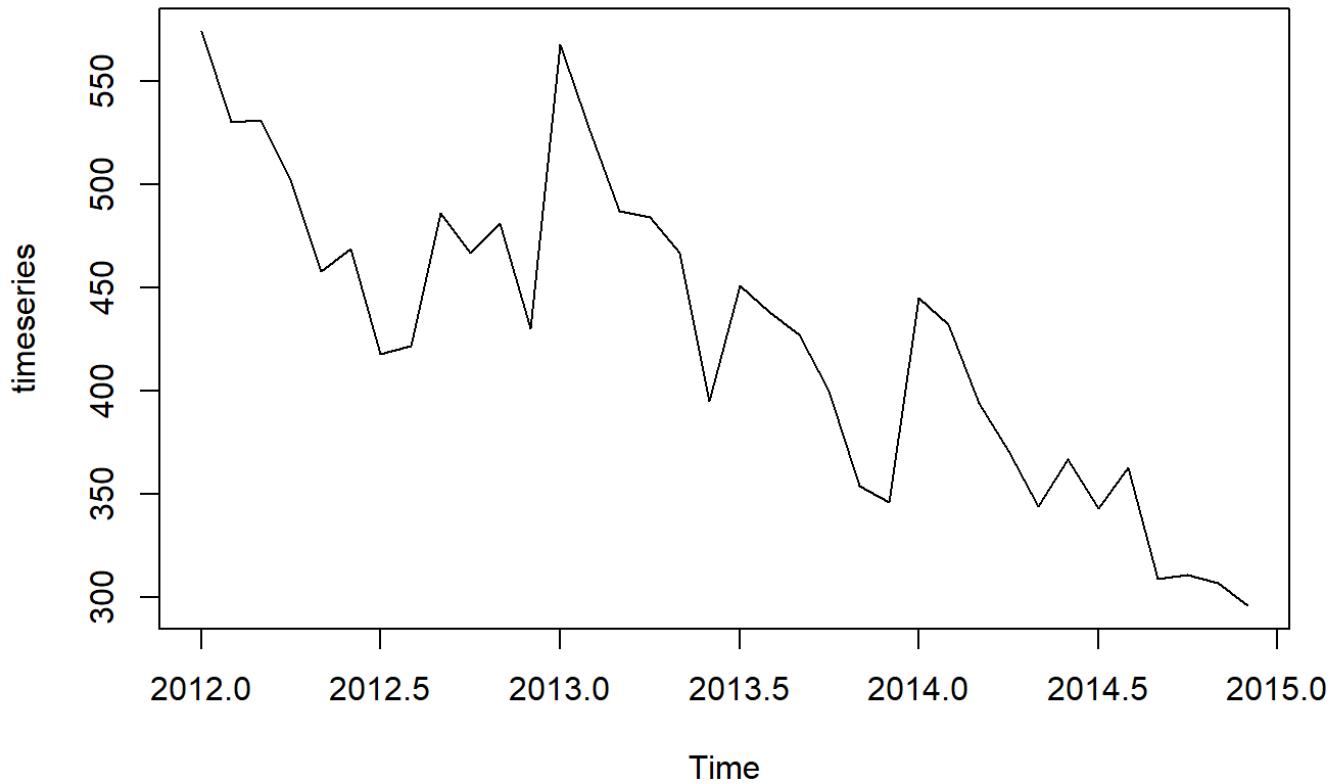


Forecasts from HoltWinters

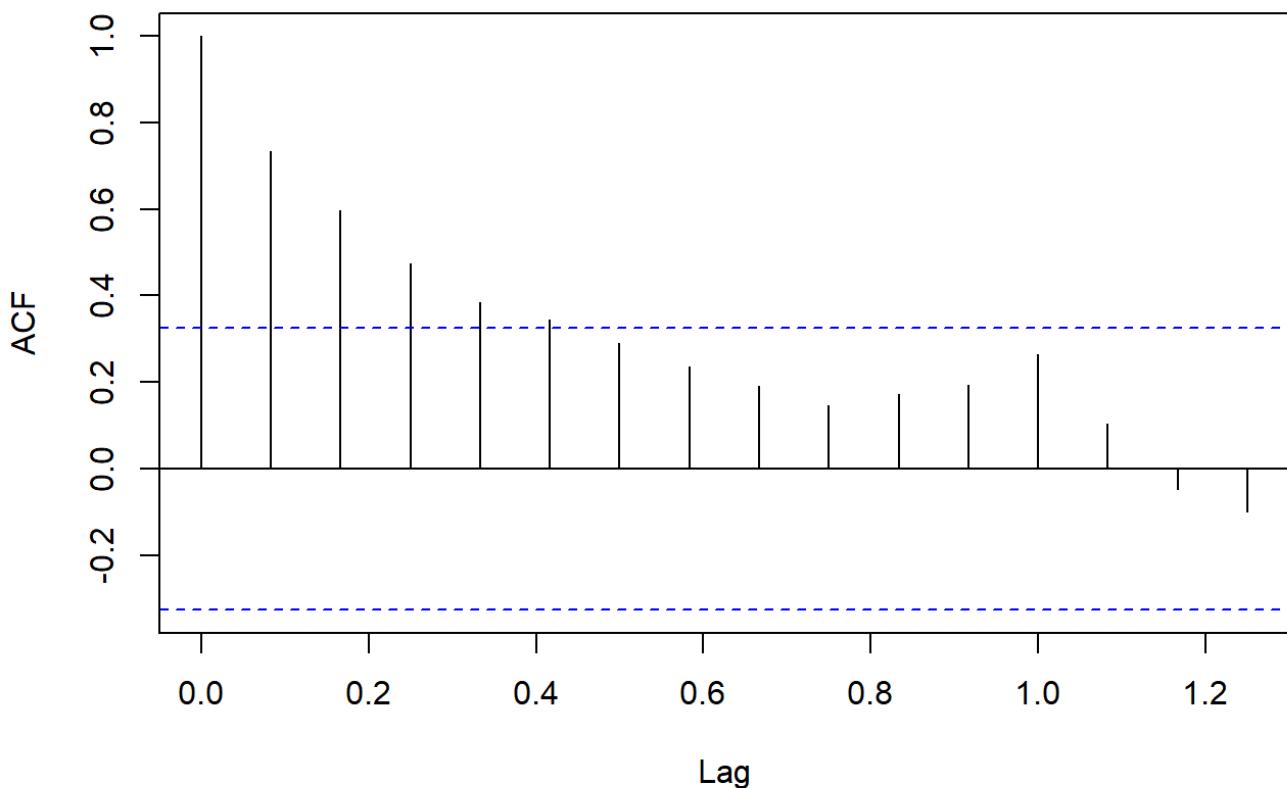


```
## [1] 14.73406
```

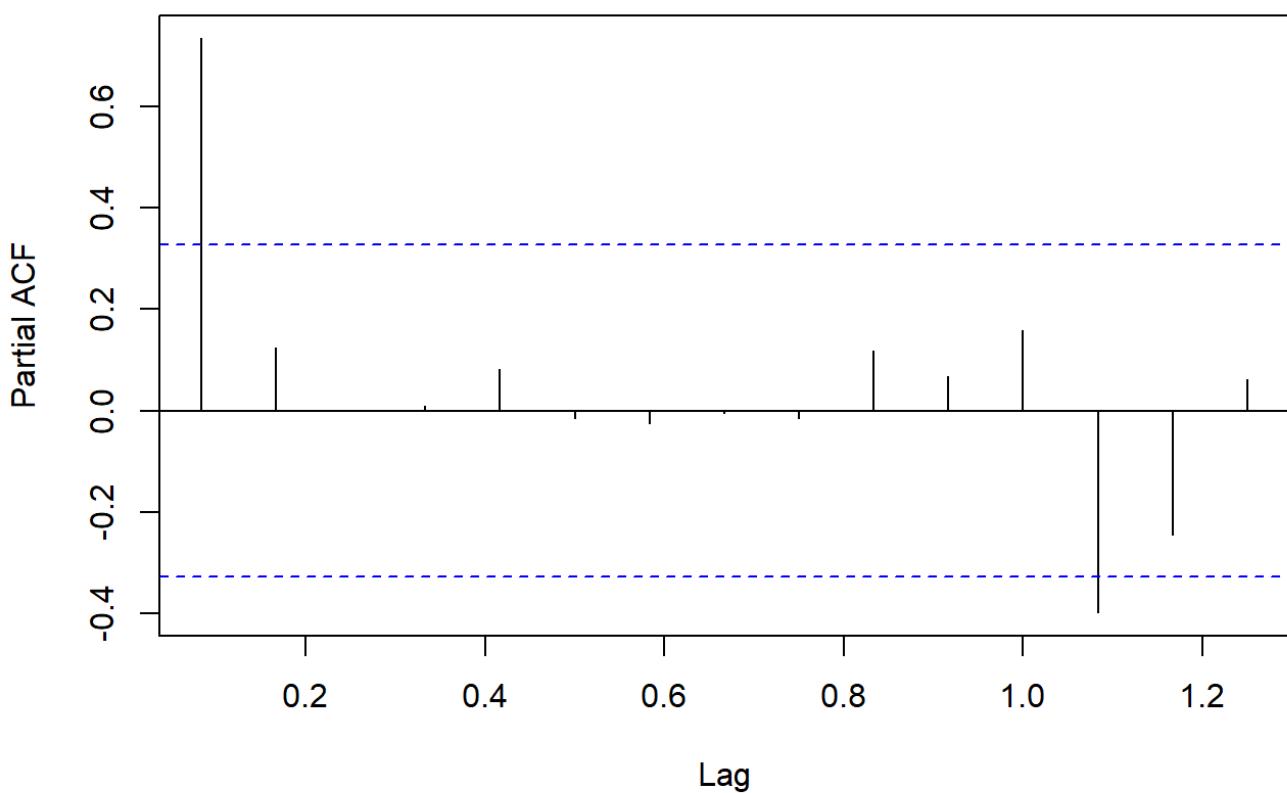
```
traintest(tv_ts25)
```



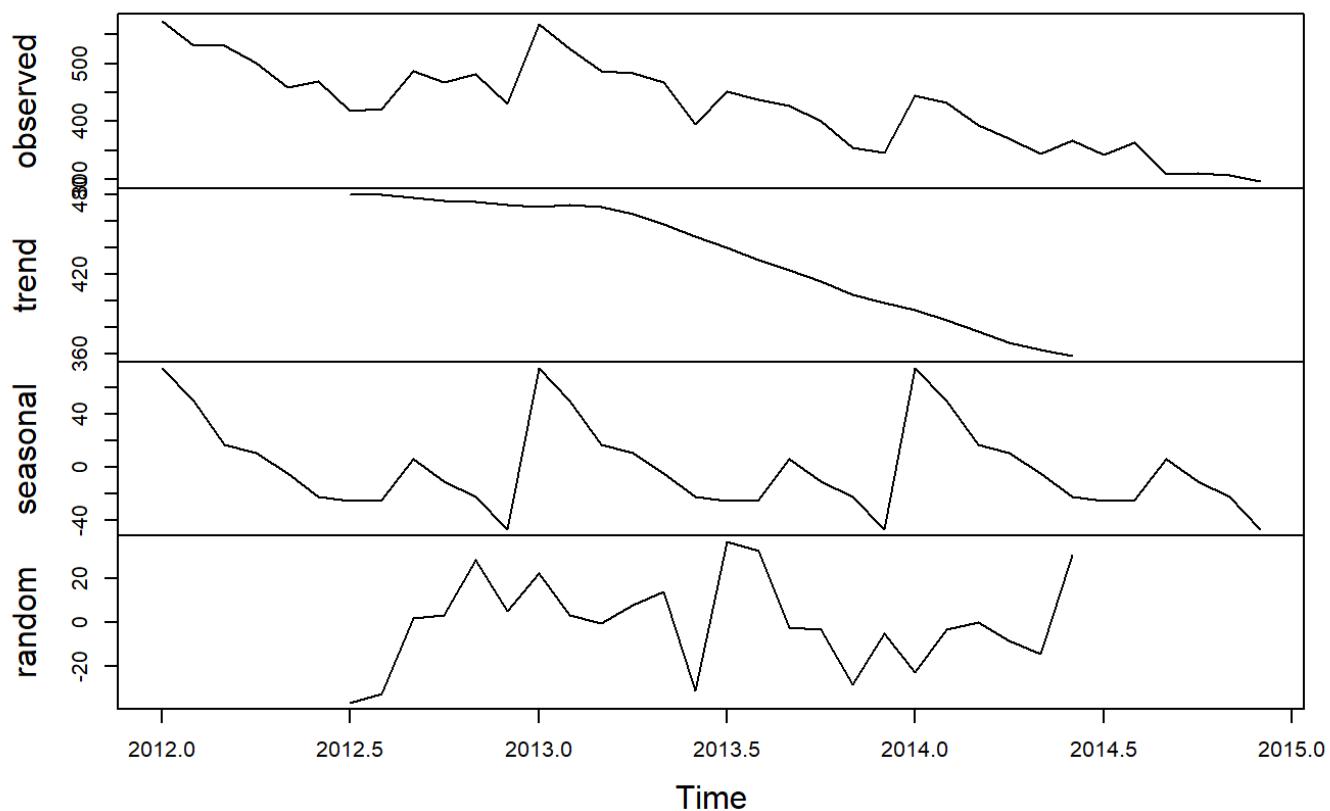
Series timeseries



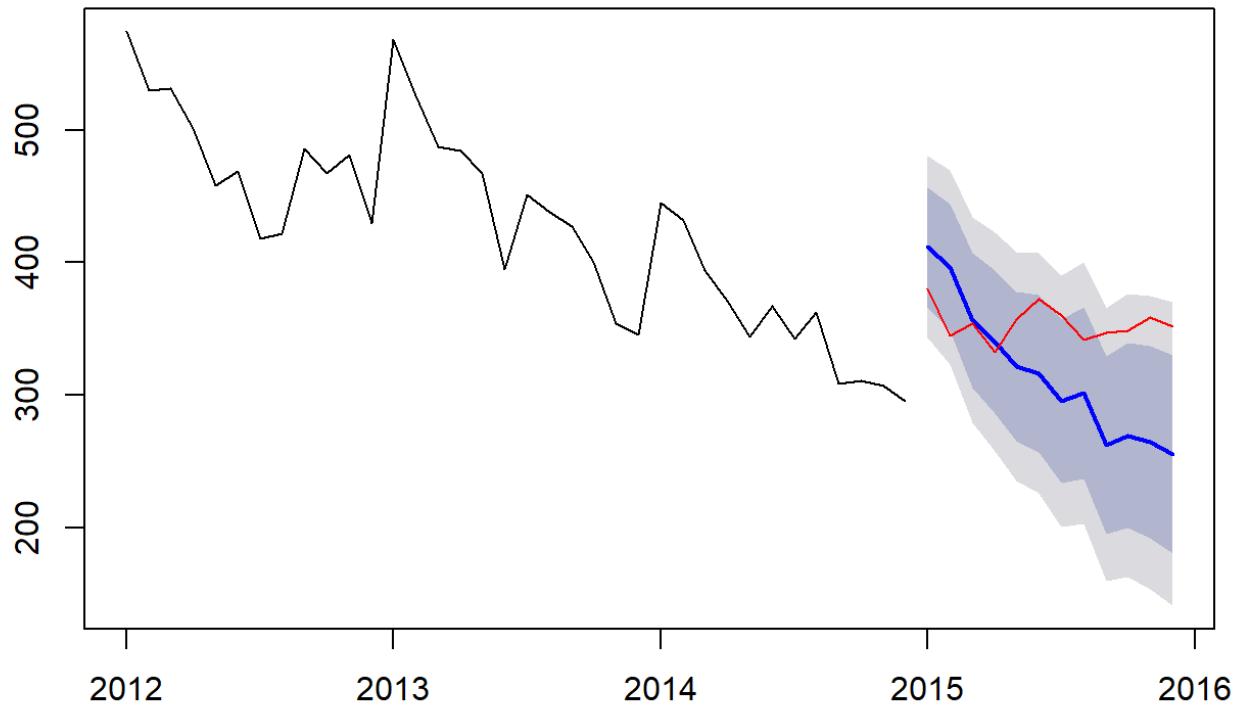
Series timeseries



Decomposition of additive time series

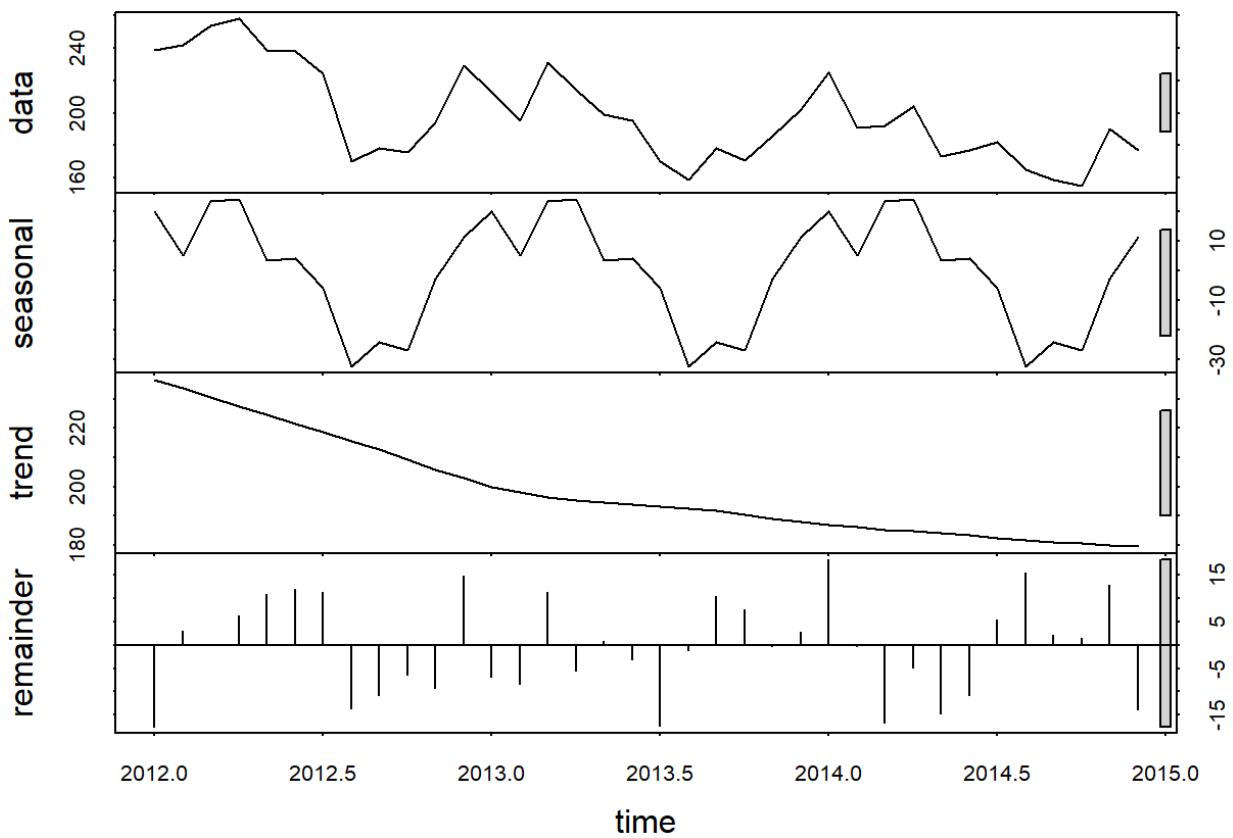
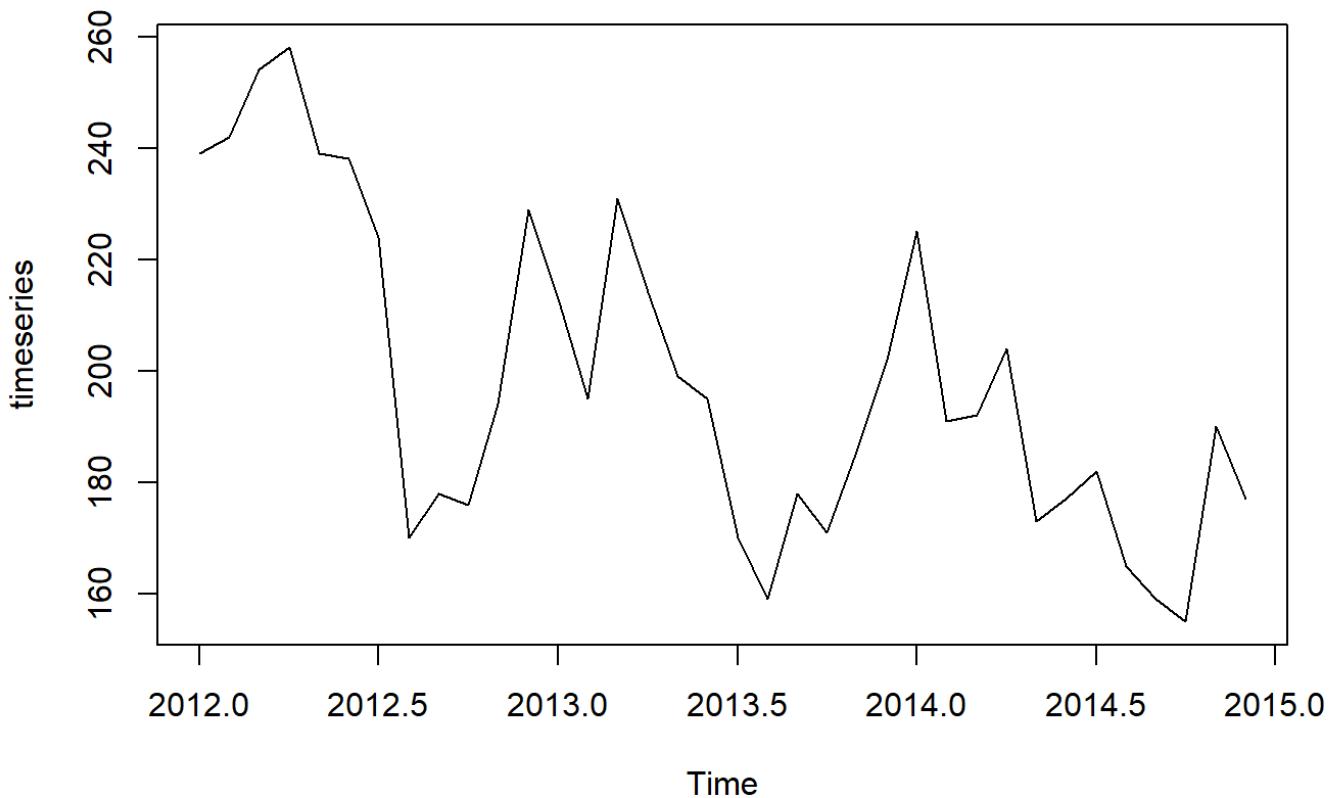


Forecasts from HoltWinters

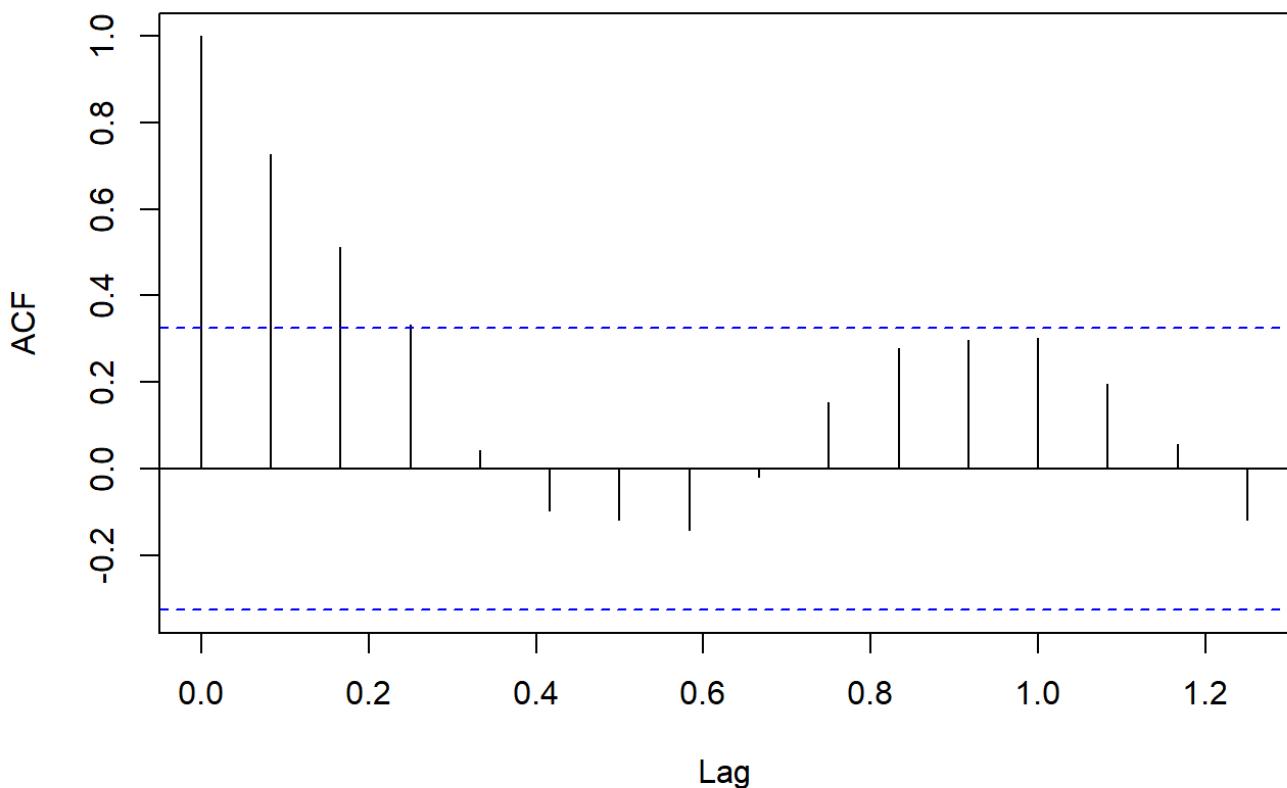


```
## [1] 53.5617
```

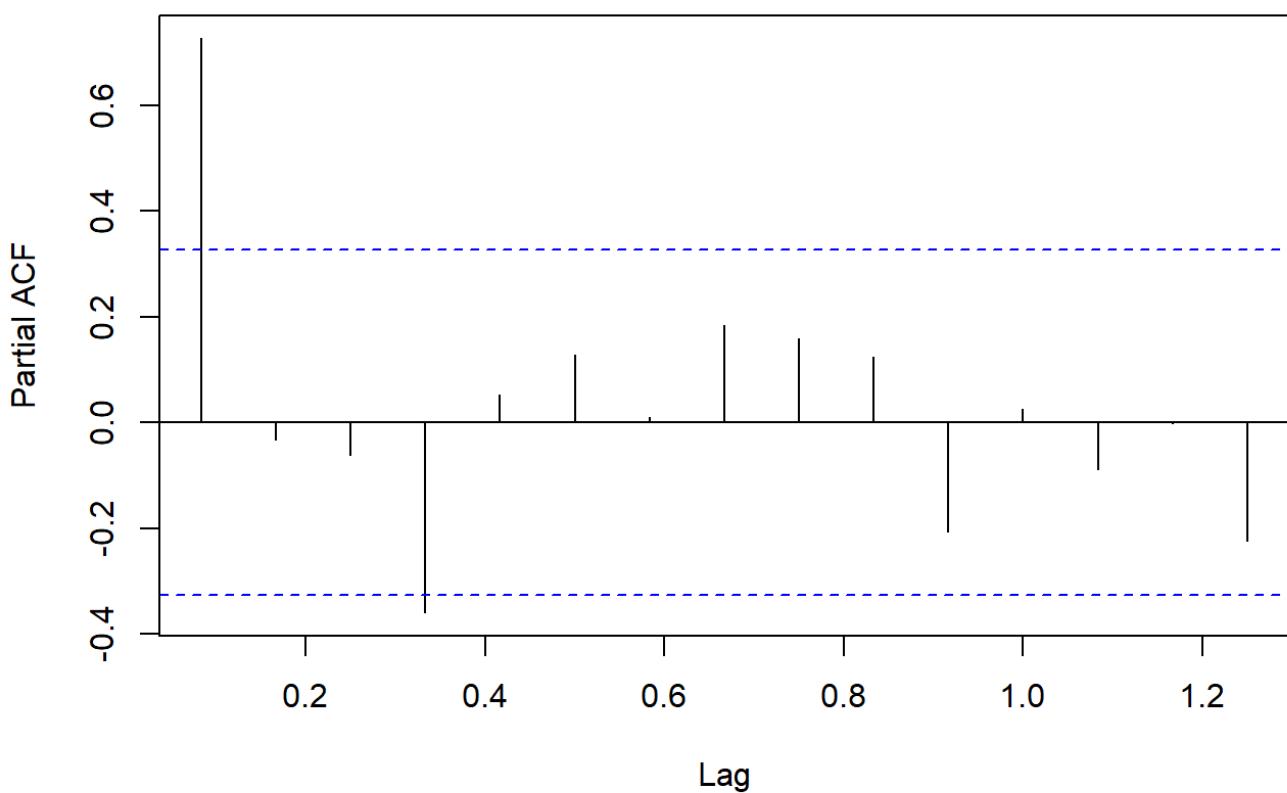
```
traintest(tv_ts26)
```



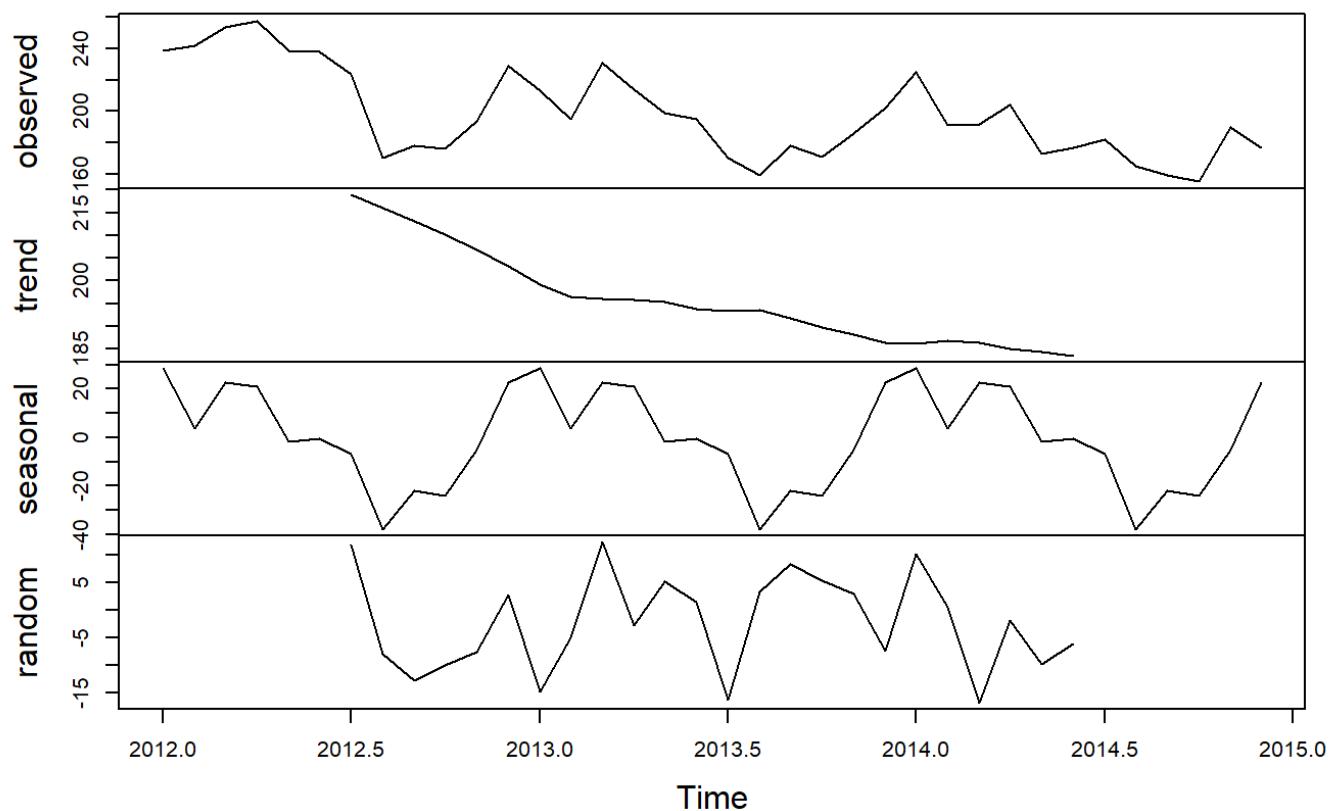
Series timeseries



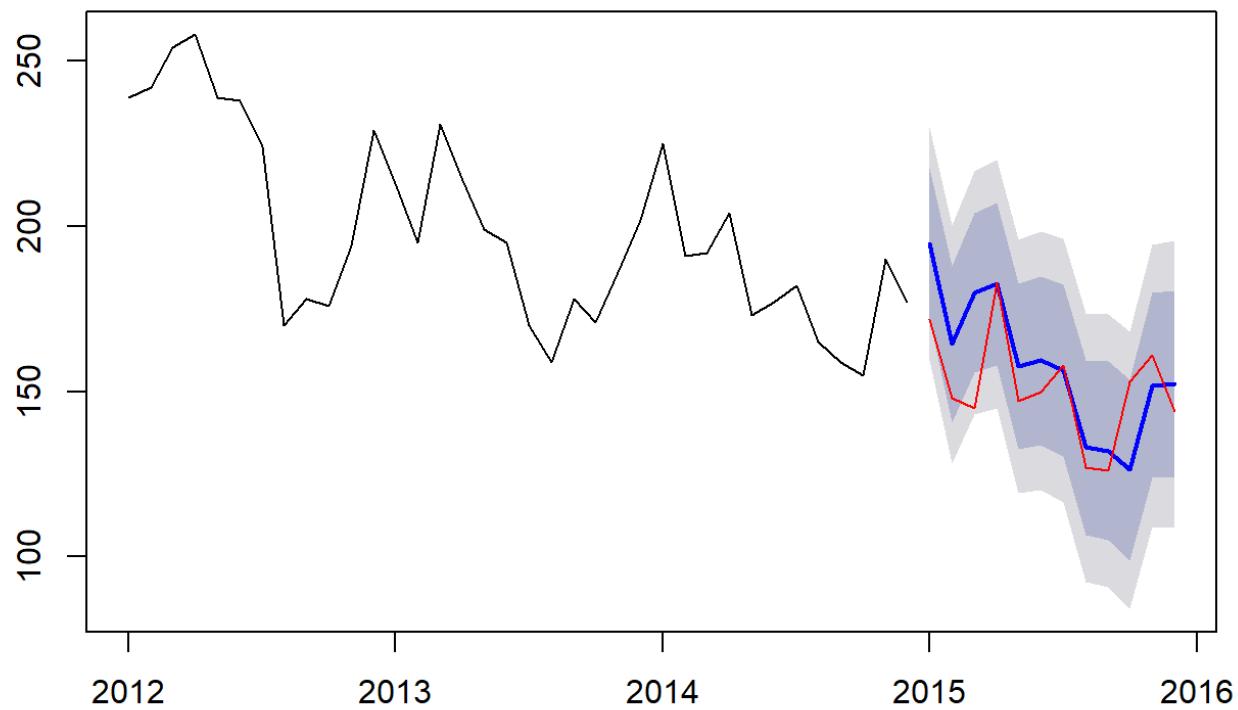
Series timeseries



Decomposition of additive time series

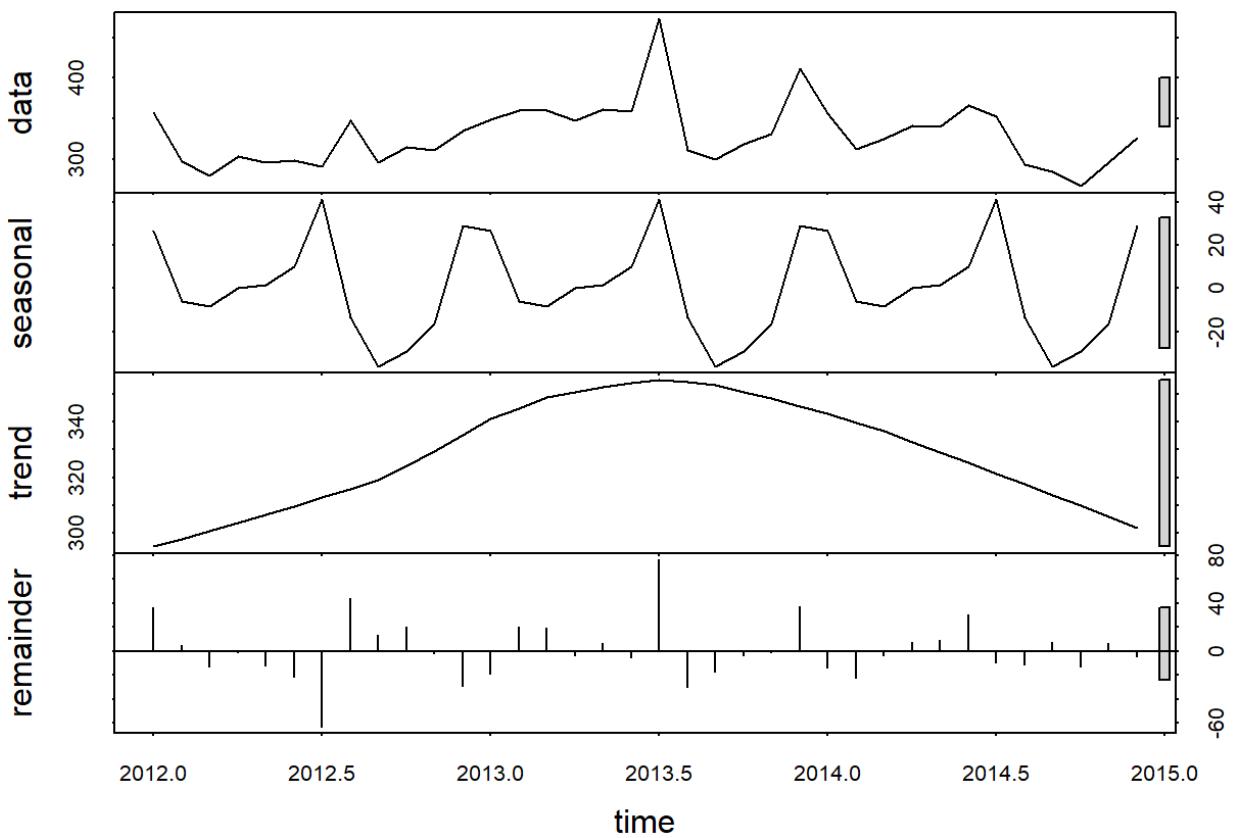
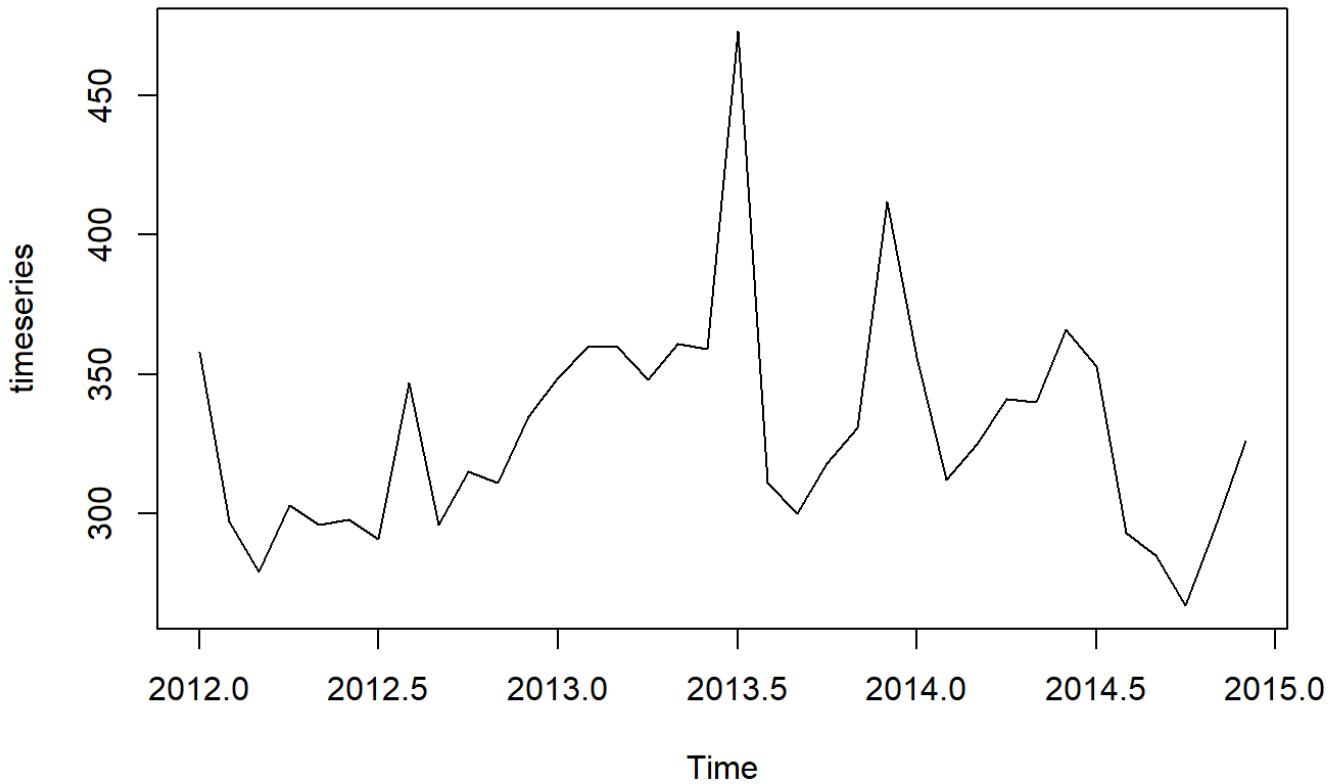


Forecasts from HoltWinters

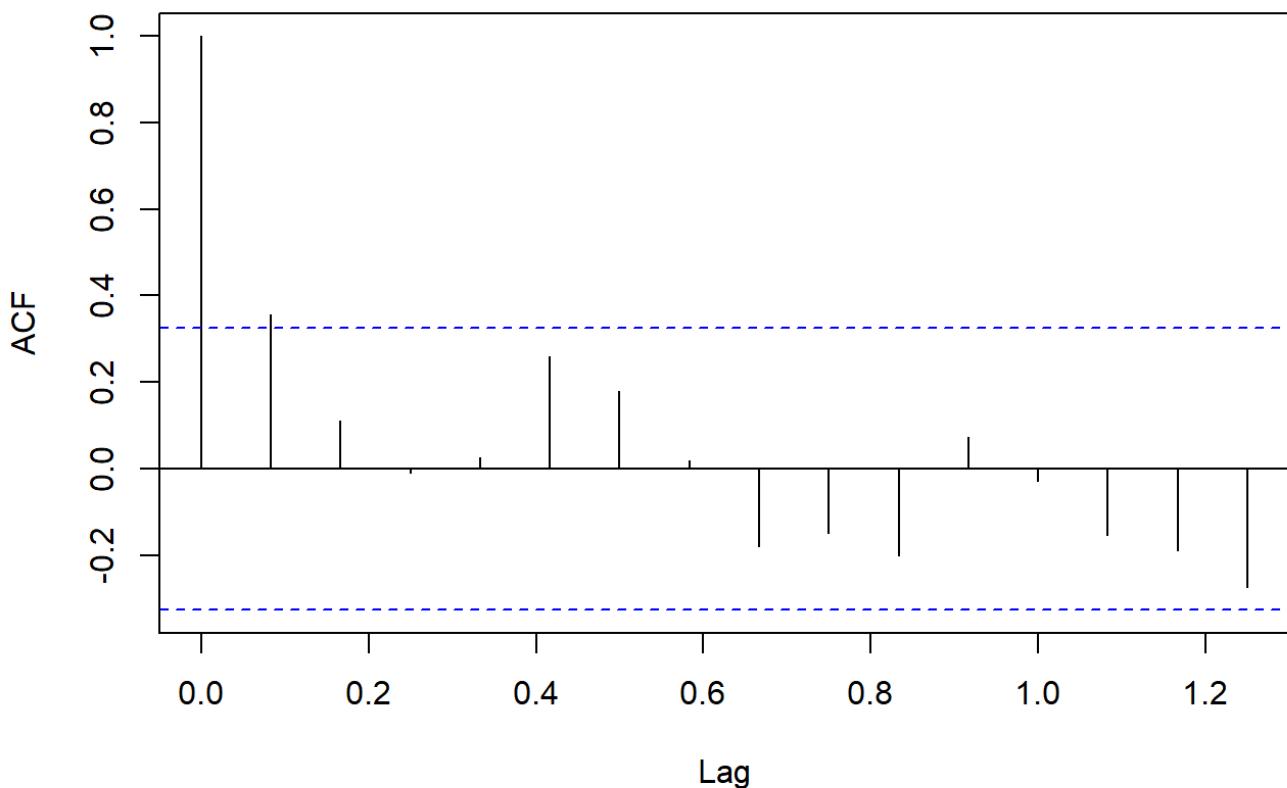


```
## [1] 12.68668
```

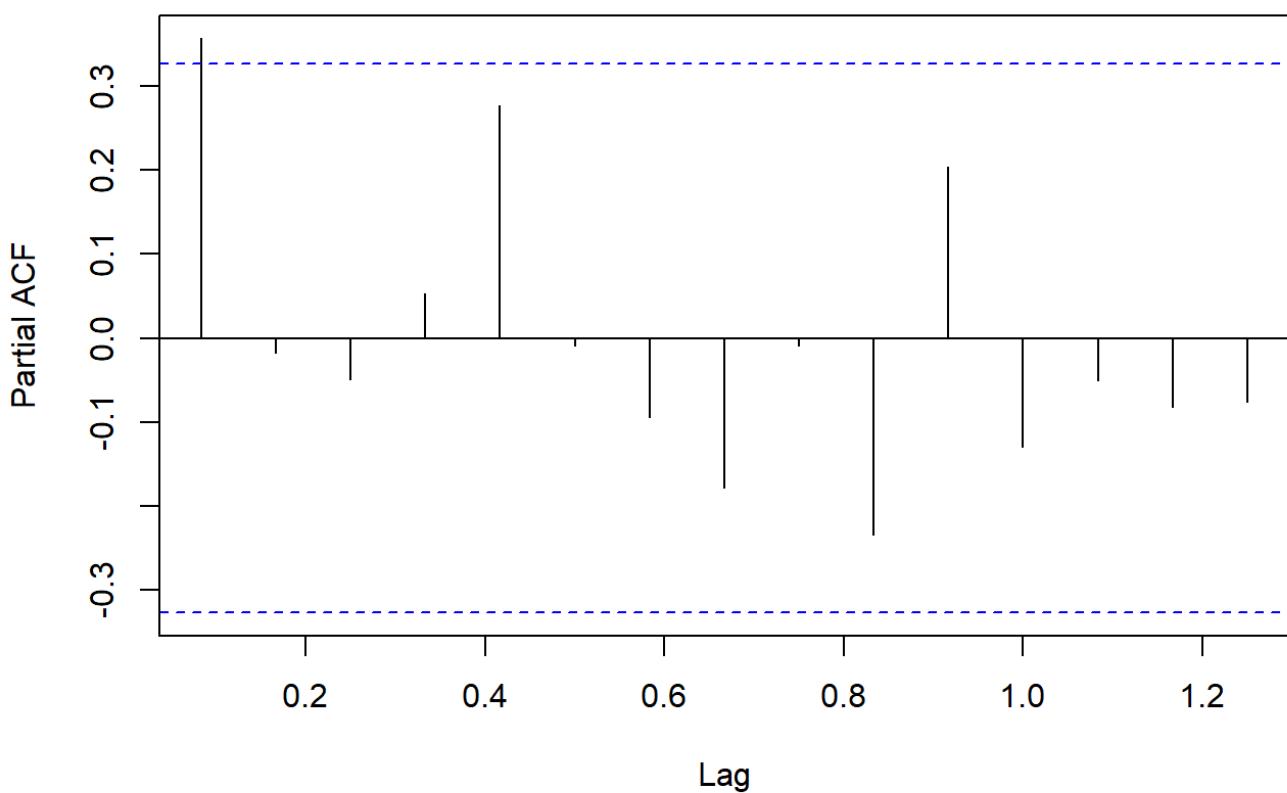
```
traintest(tv_ts27)
```



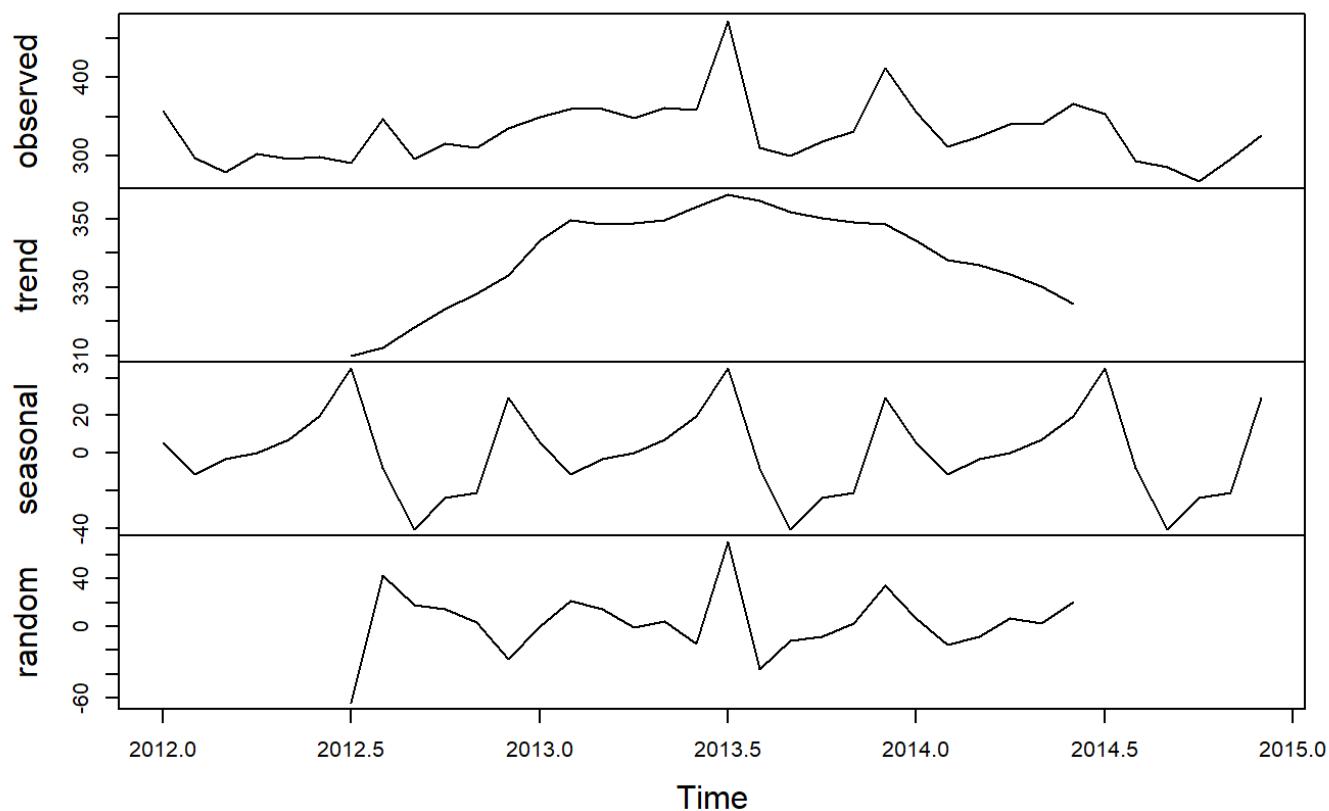
Series timeseries



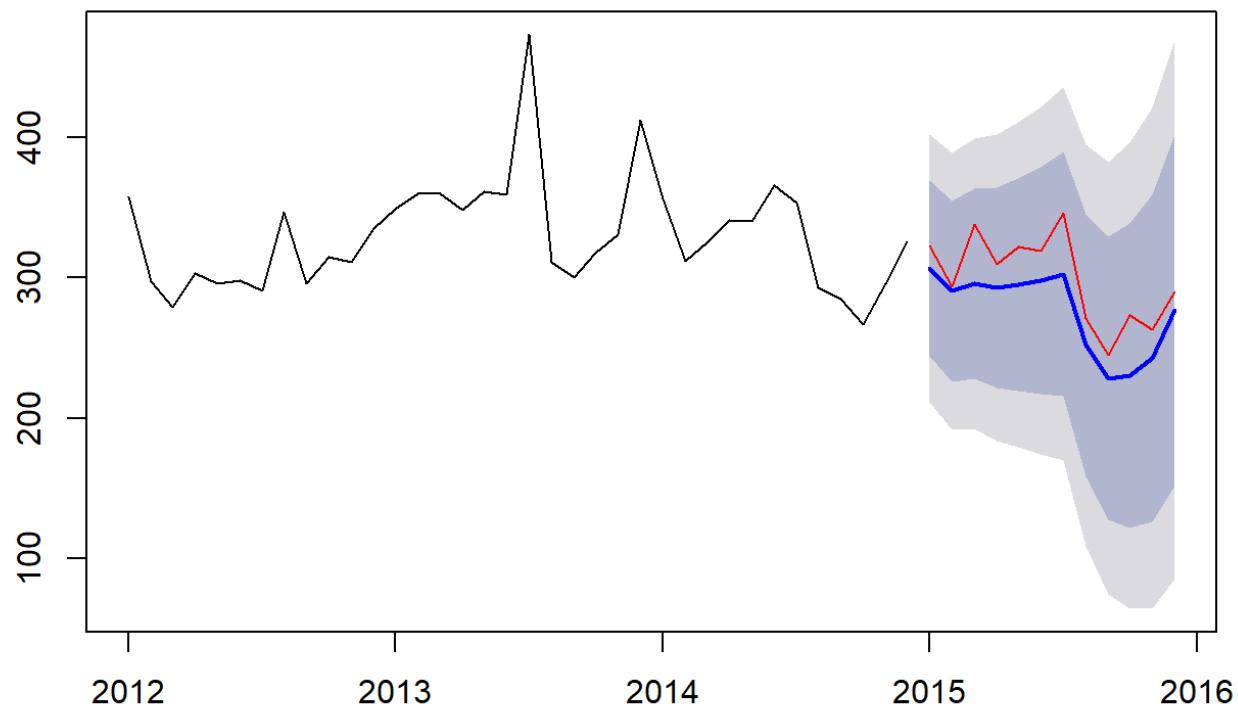
Series timeseries



Decomposition of additive time series

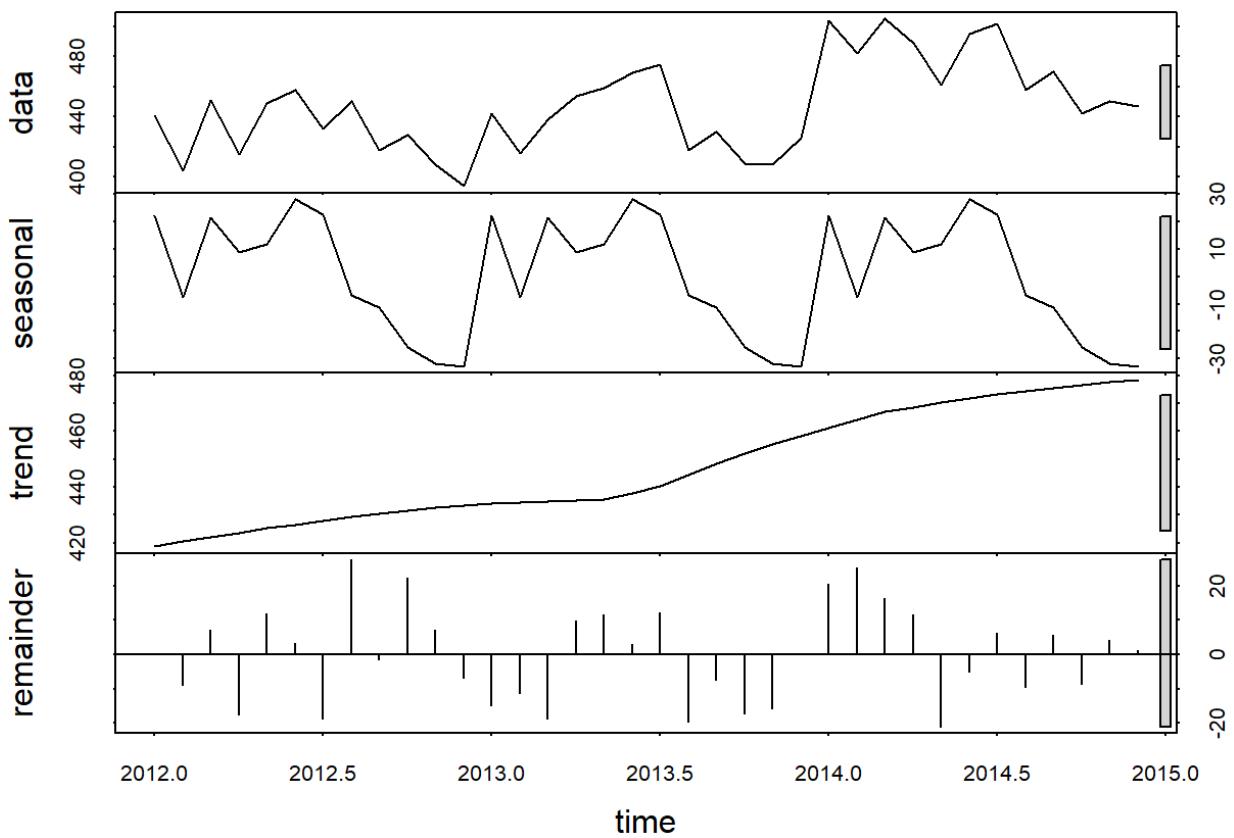
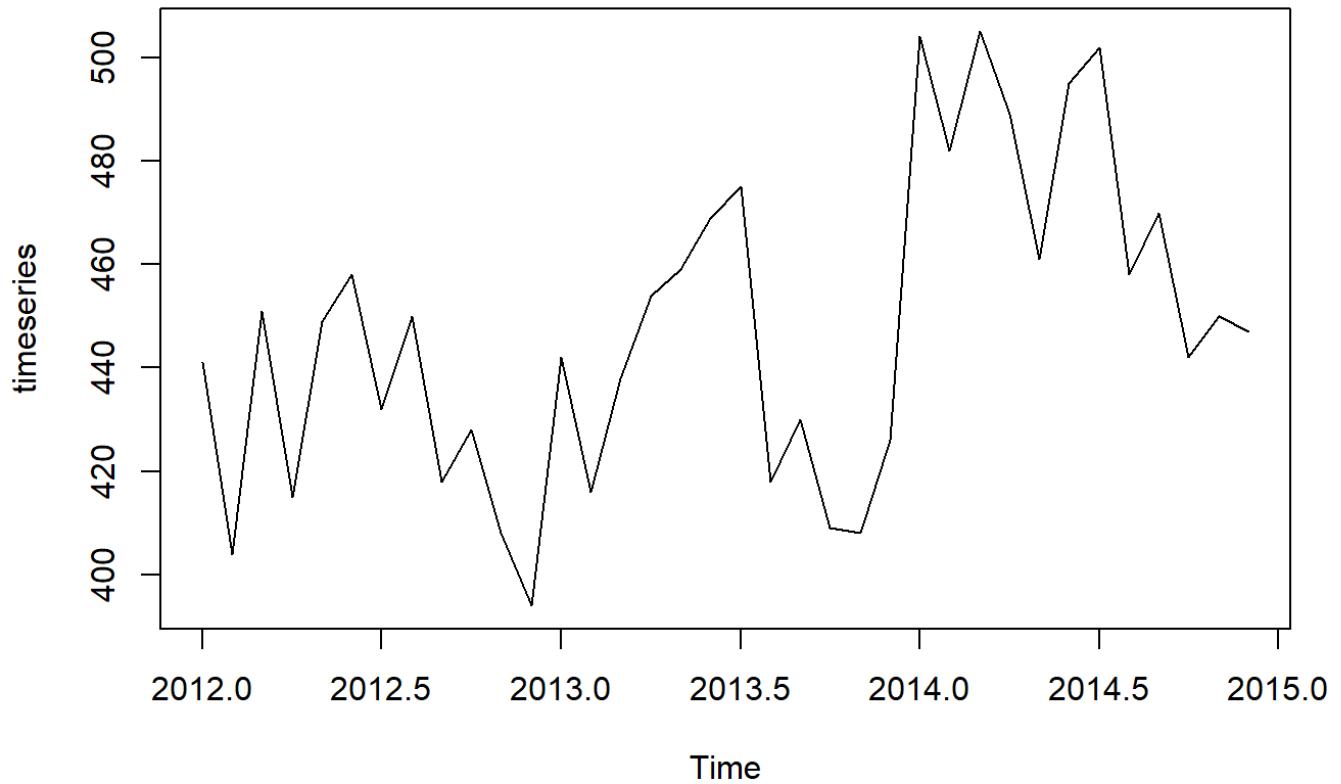


Forecasts from HoltWinters

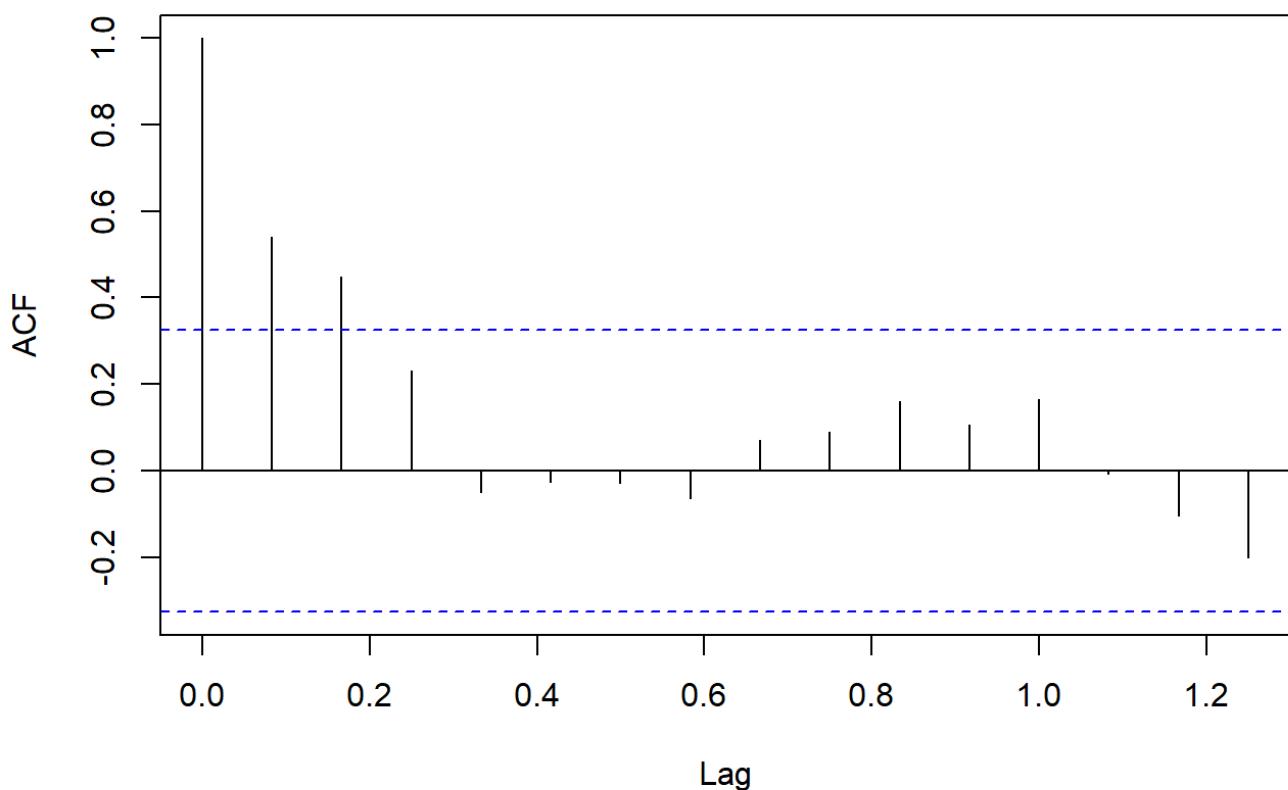


```
## [1] 23.47888
```

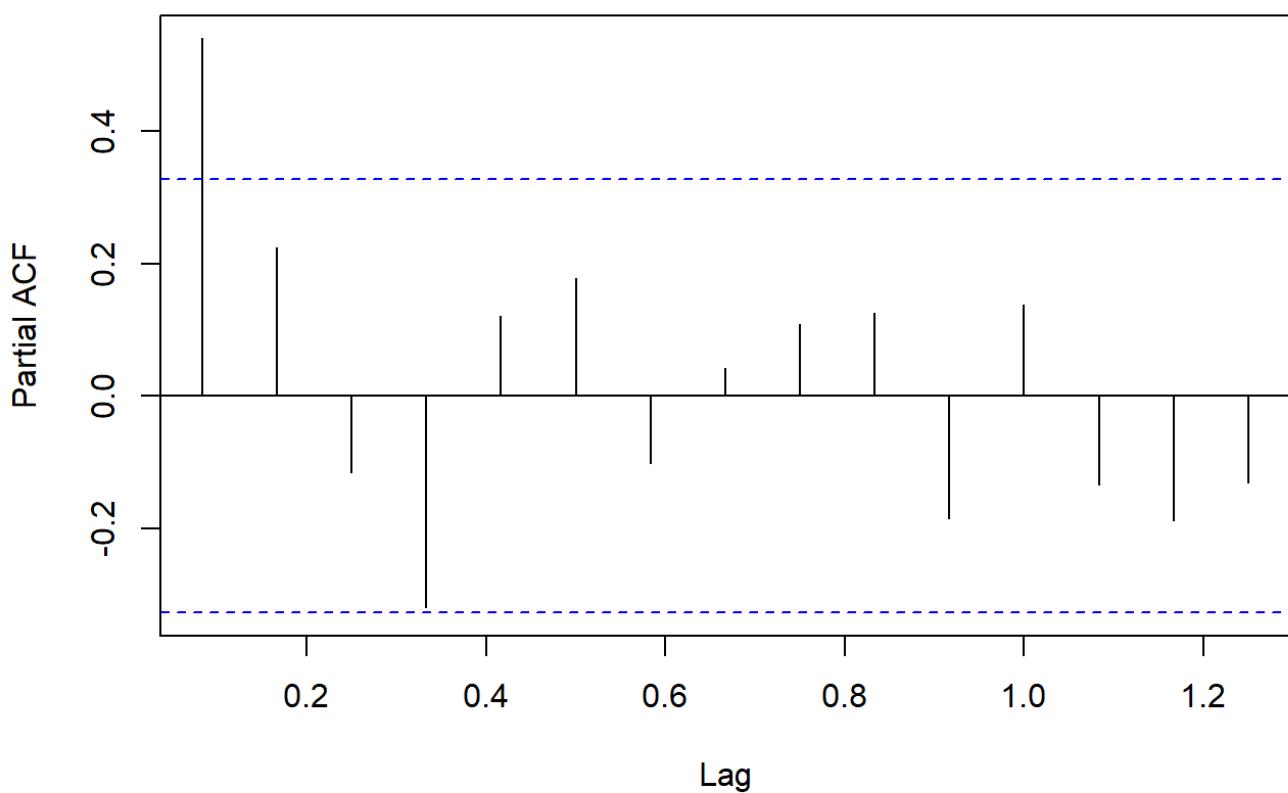
```
traintest(tv_ts28)
```



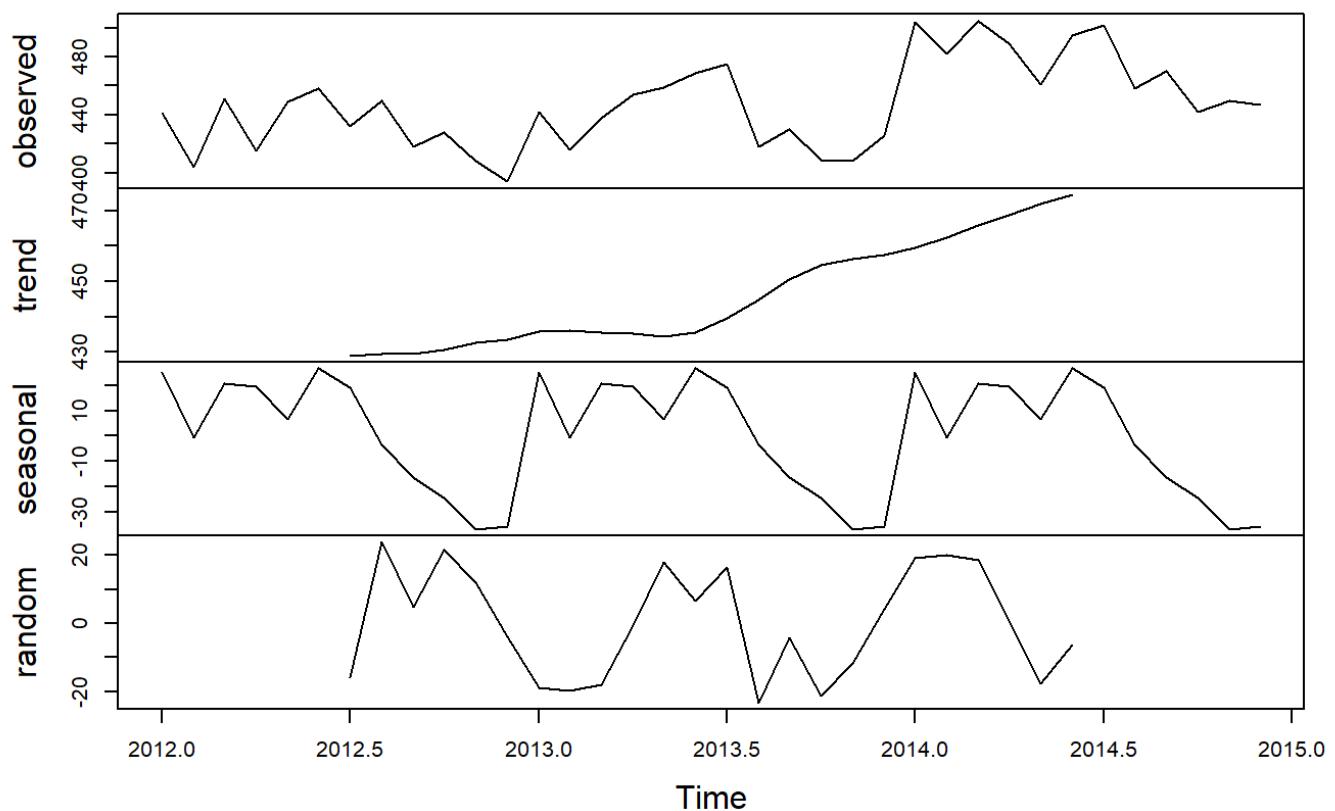
Series timeseries



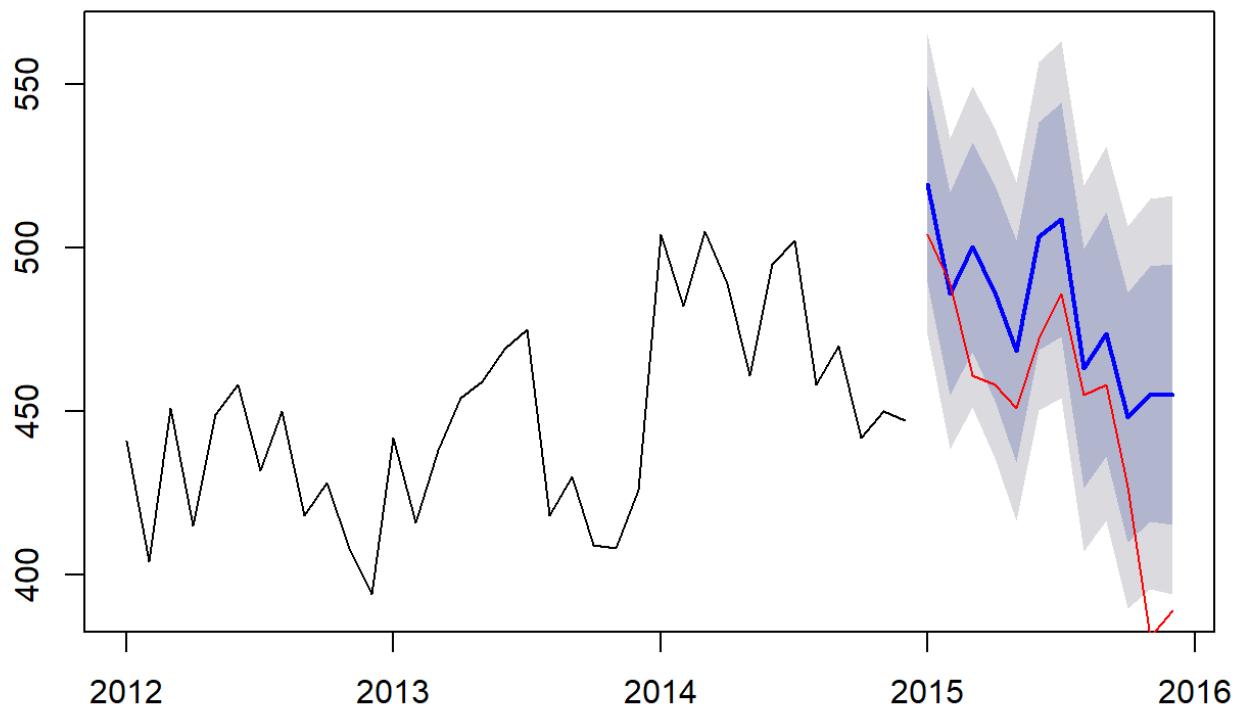
Series timeseries



Decomposition of additive time series

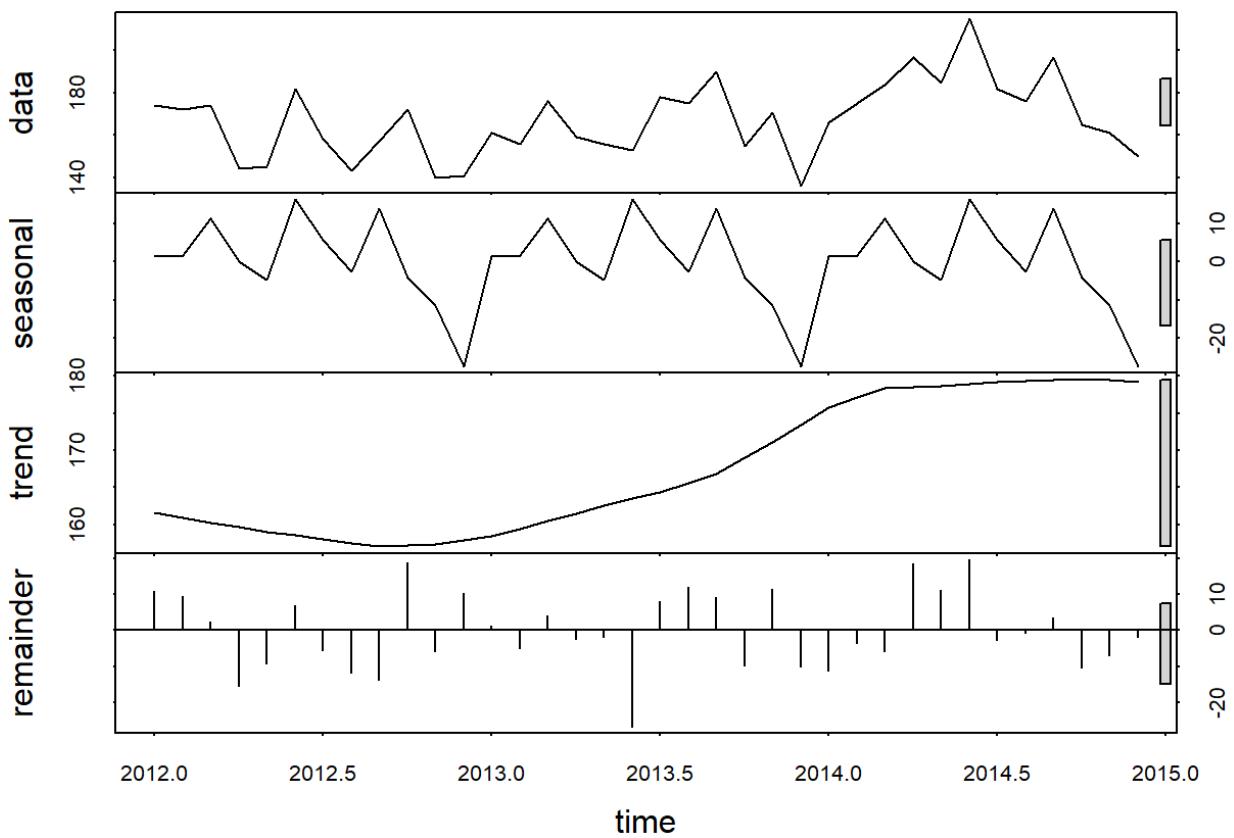
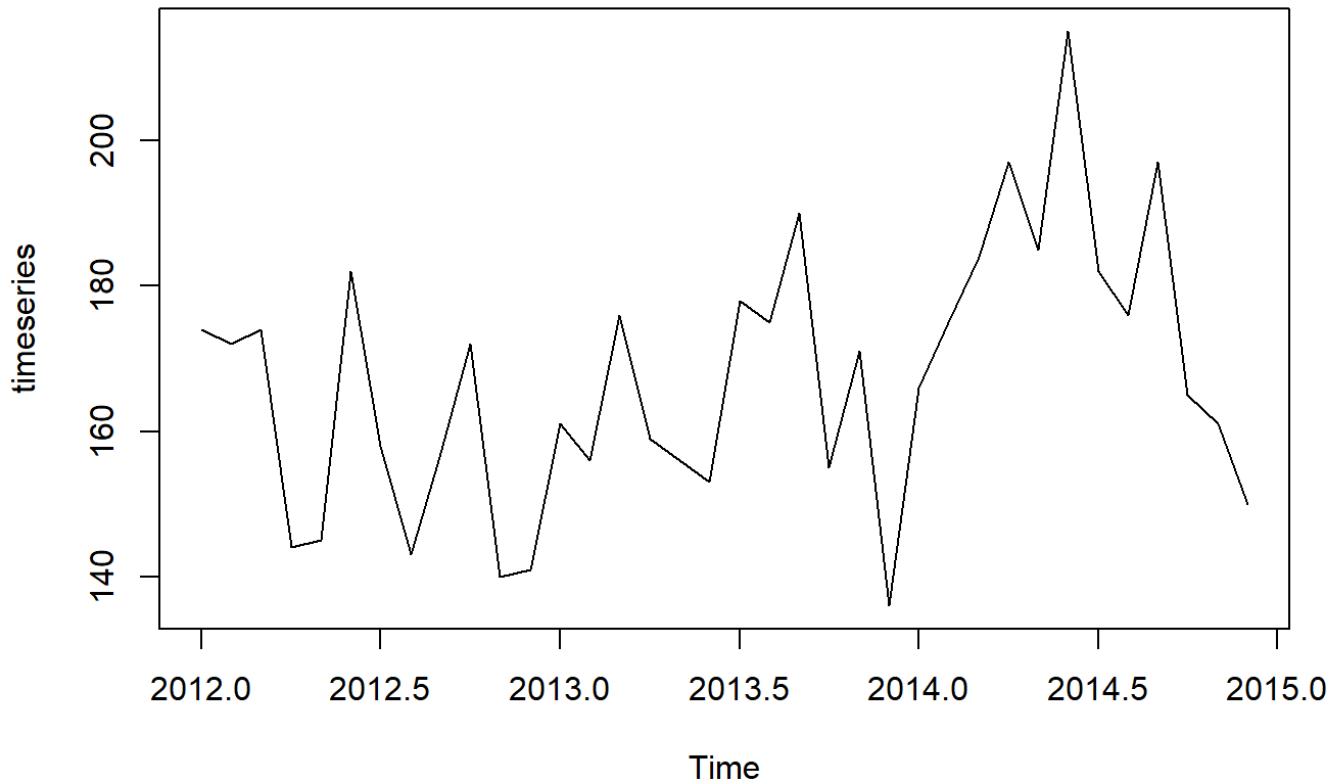


Forecasts from HoltWinters

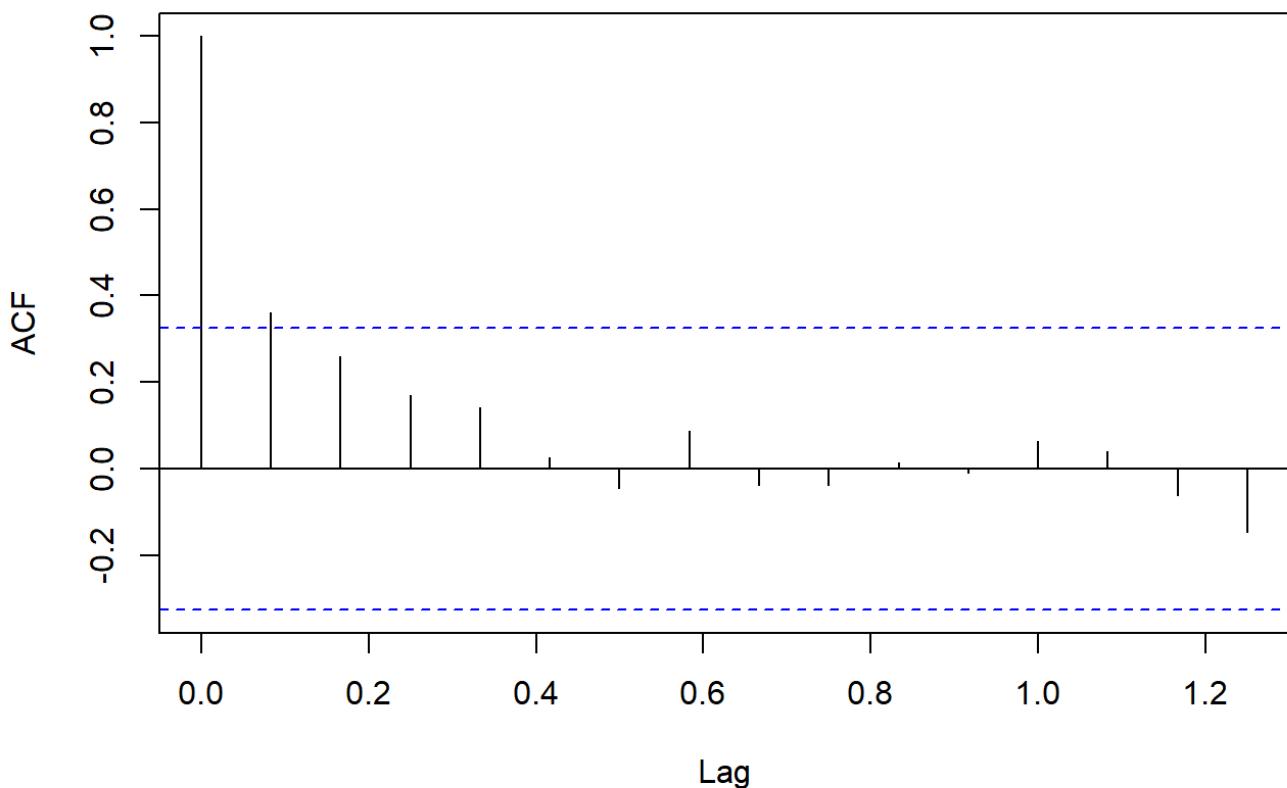


```
## [1] 28.49202
```

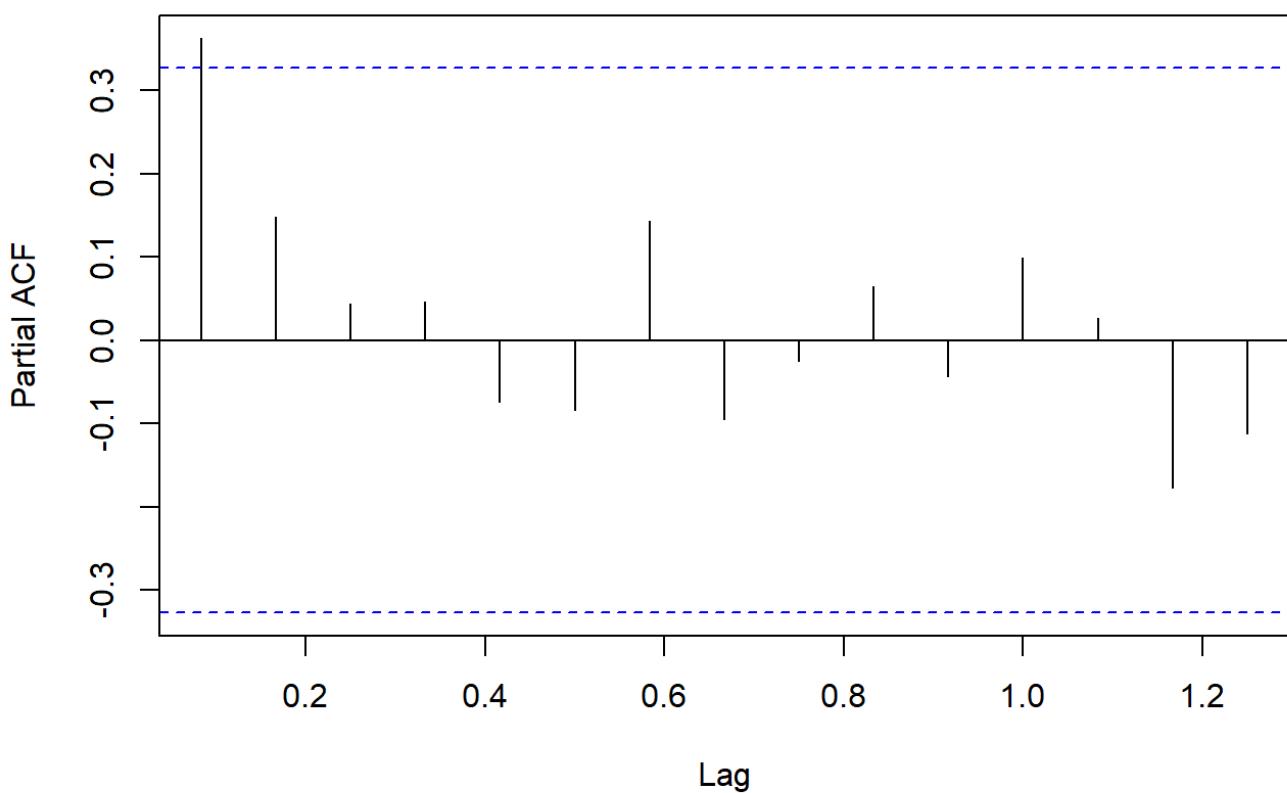
```
traintest(tv_ts29)
```



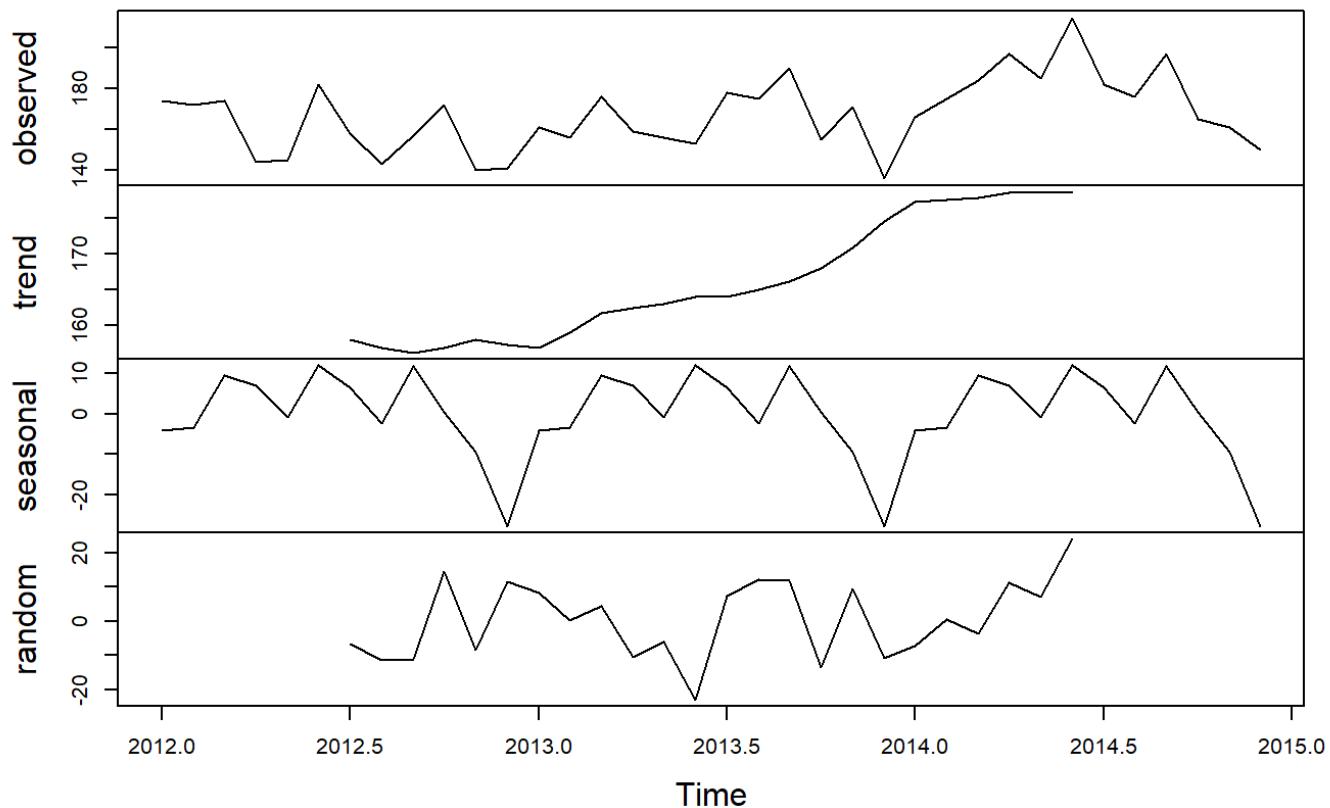
Series timeseries



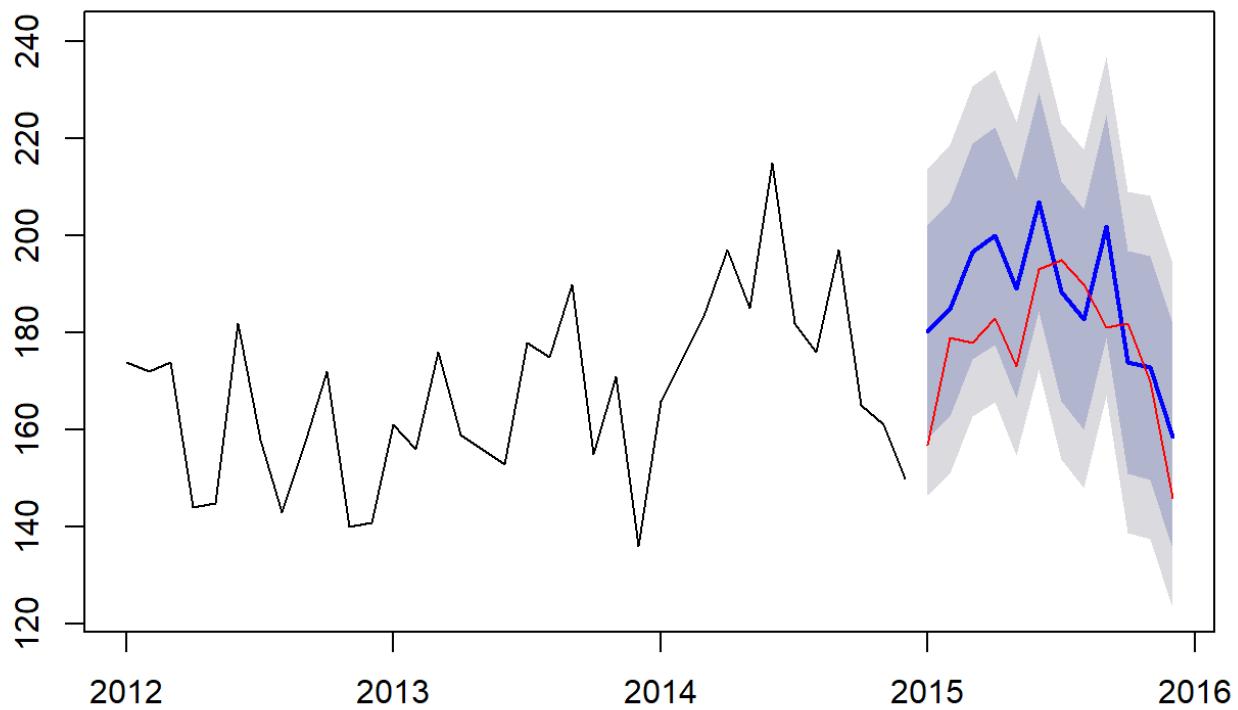
Series timeseries



Decomposition of additive time series

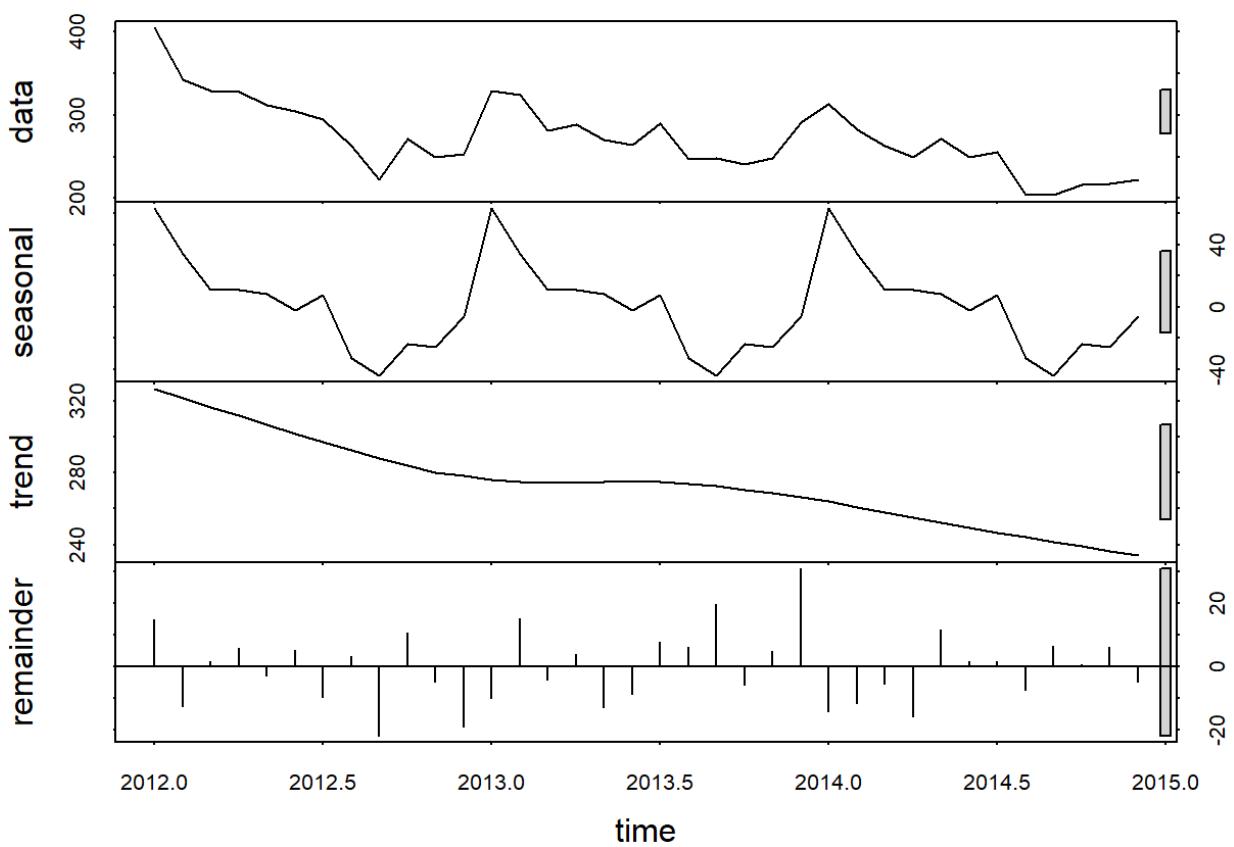
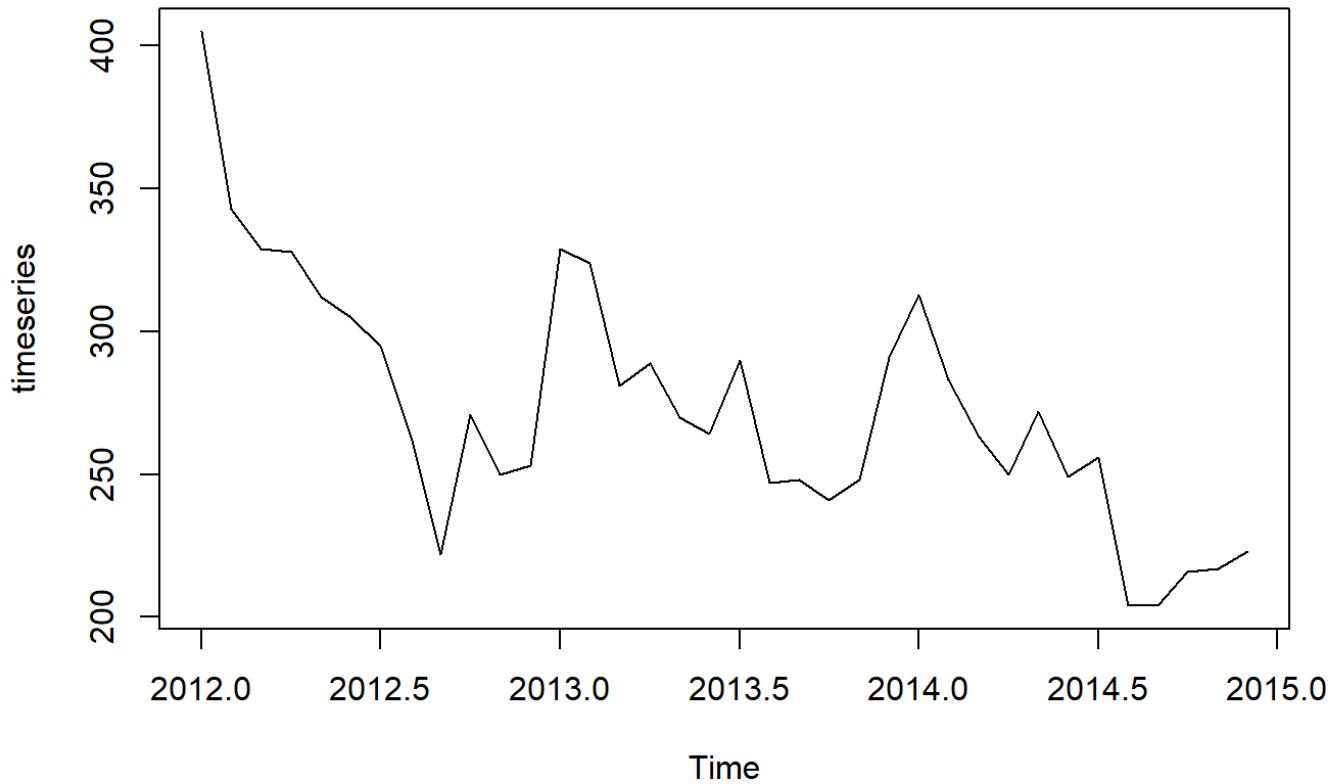


Forecasts from HoltWinters

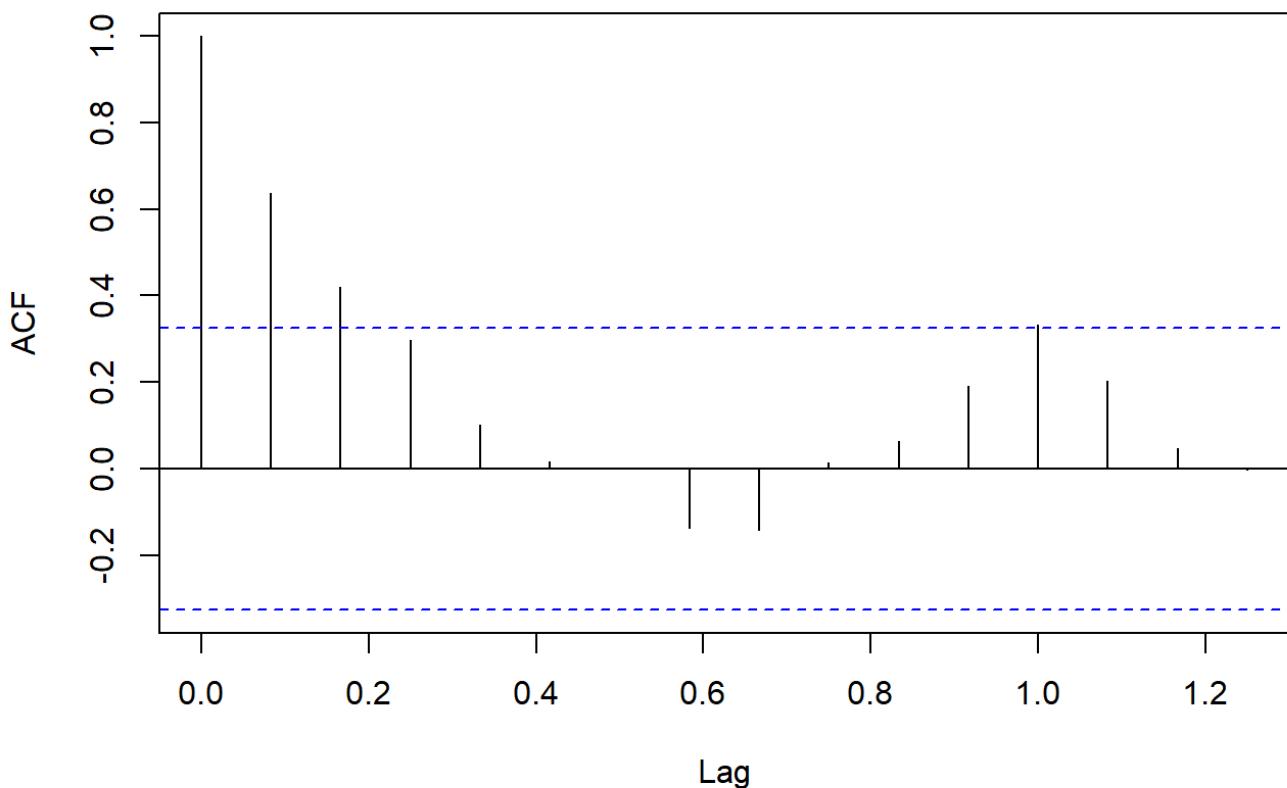


```
## [1] 12.72243
```

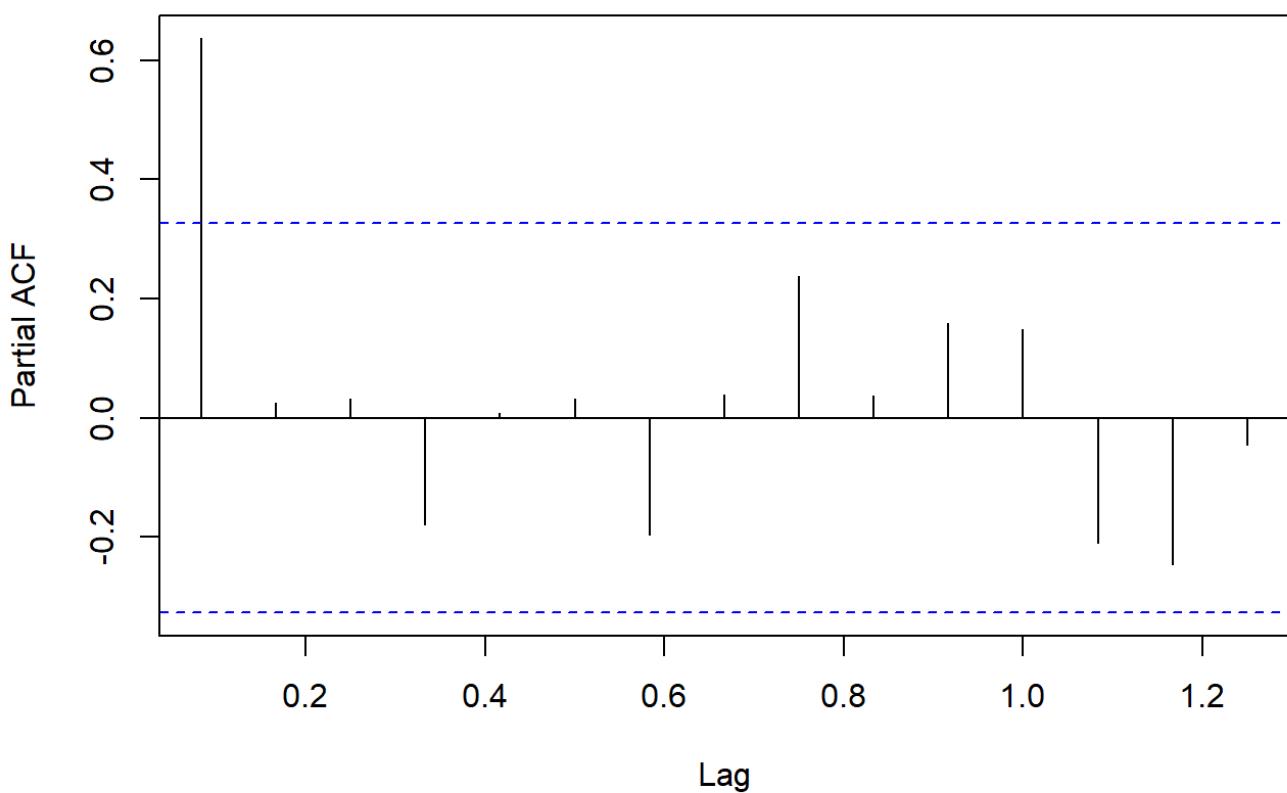
```
traintest(tv_ts30)
```



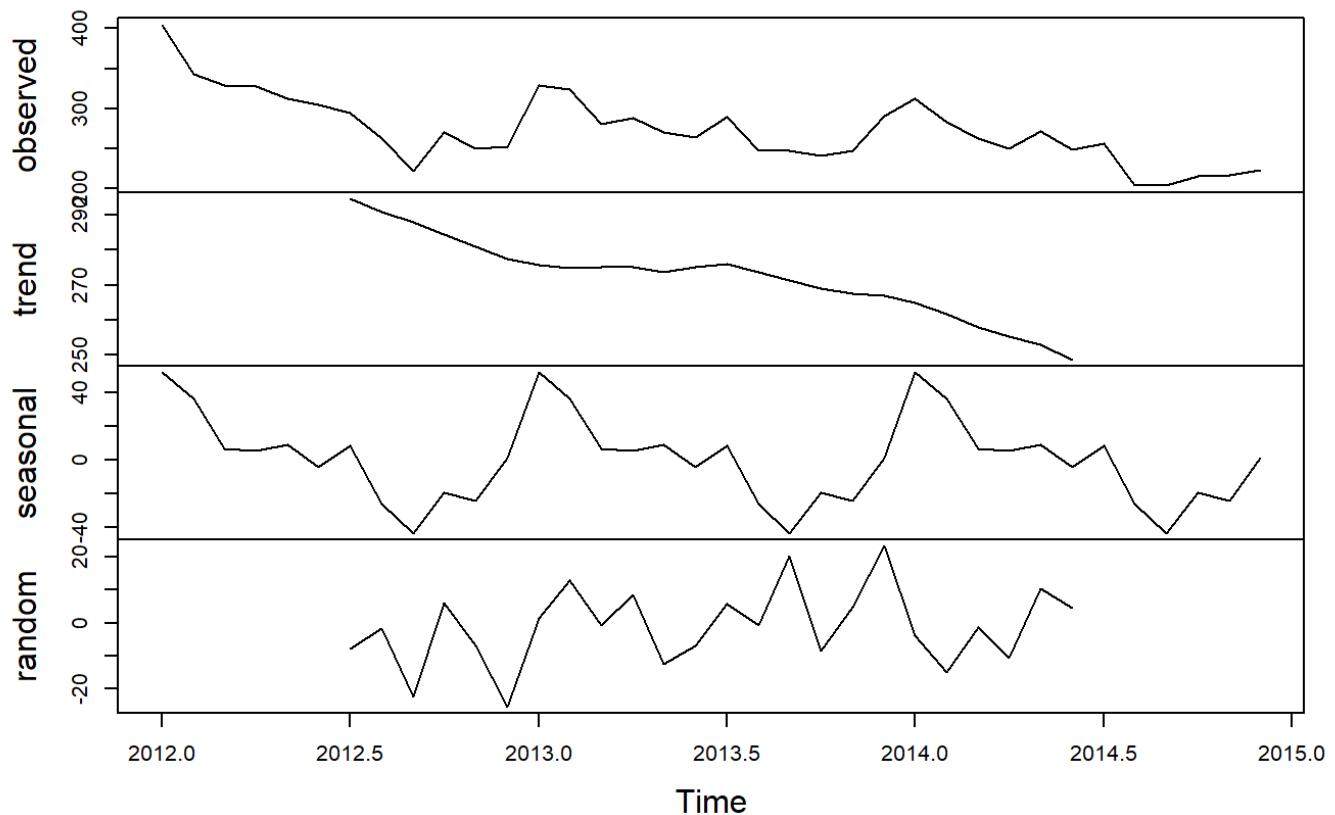
Series timeseries



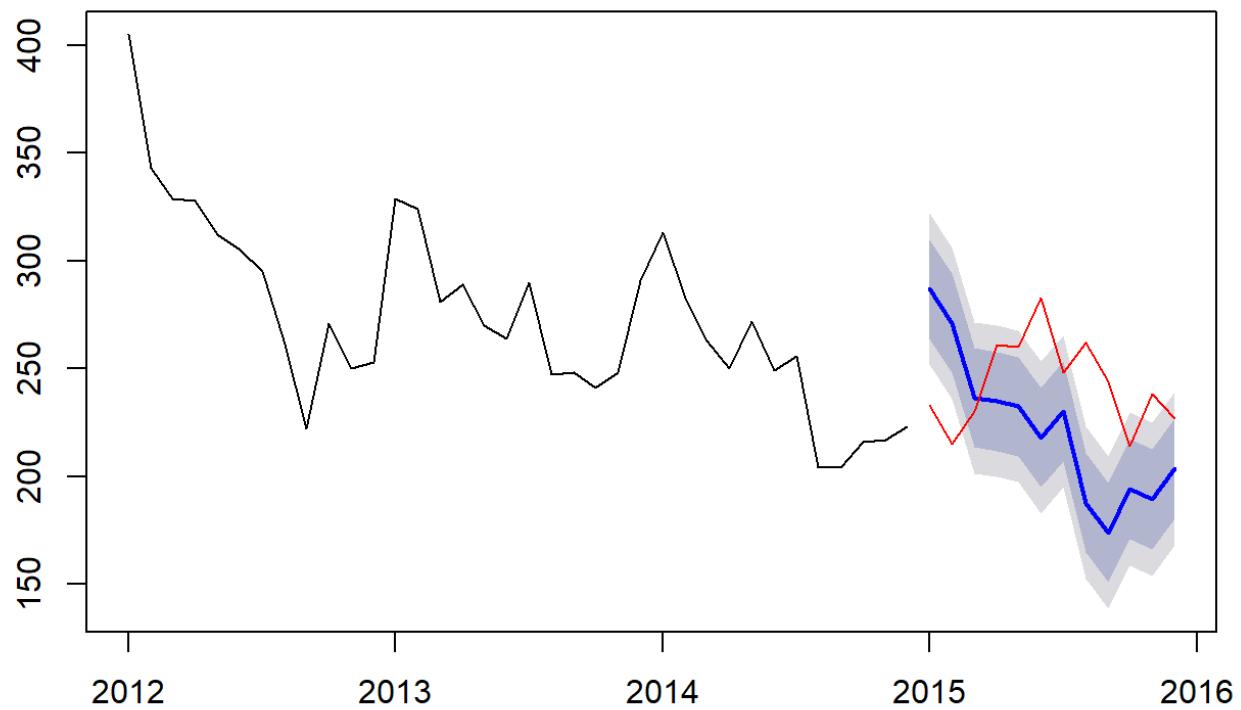
Series timeseries



Decomposition of additive time series

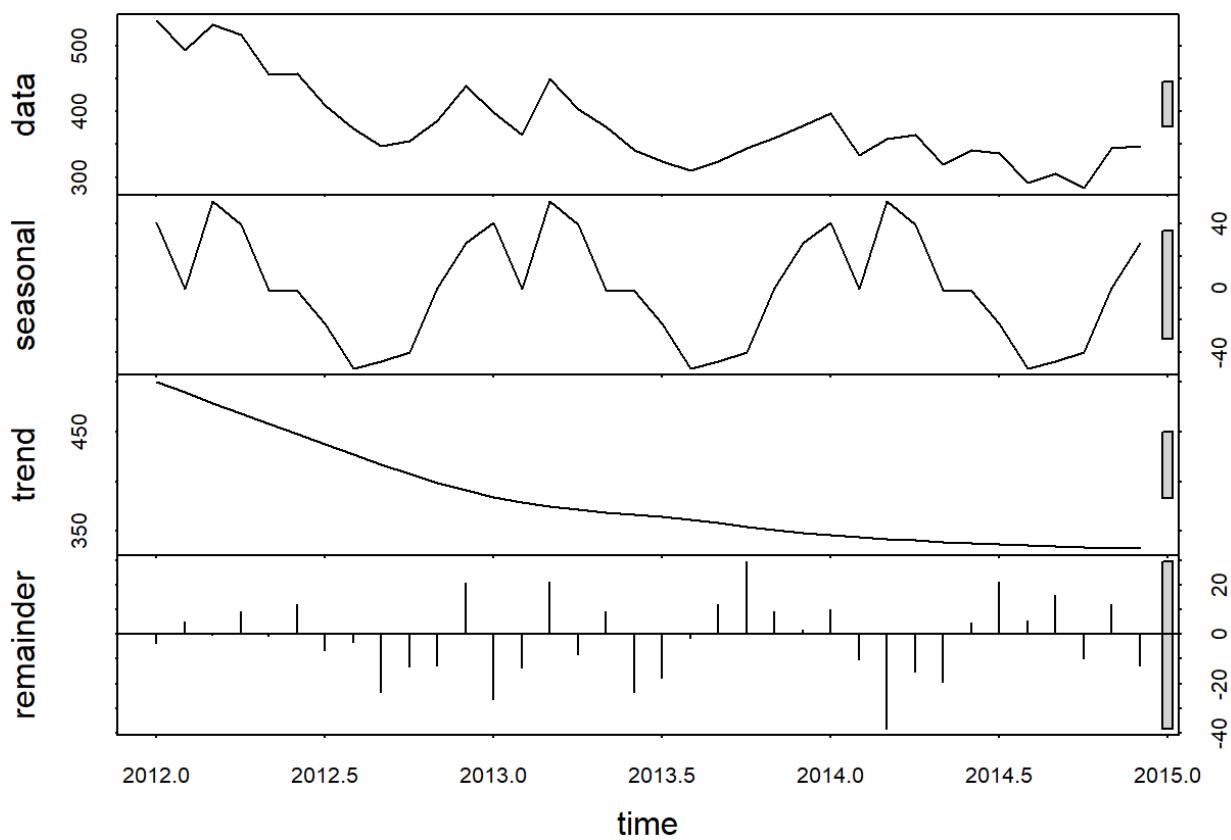
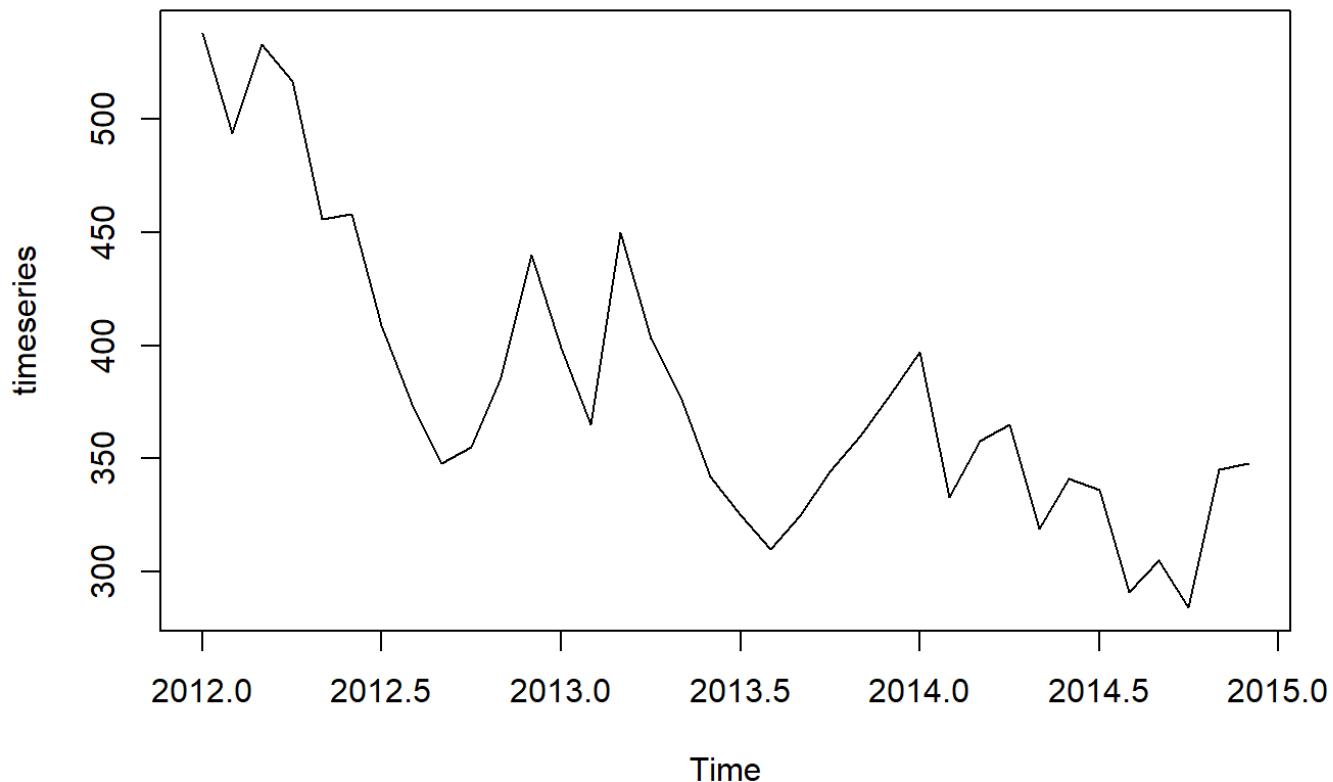


Forecasts from HoltWinters

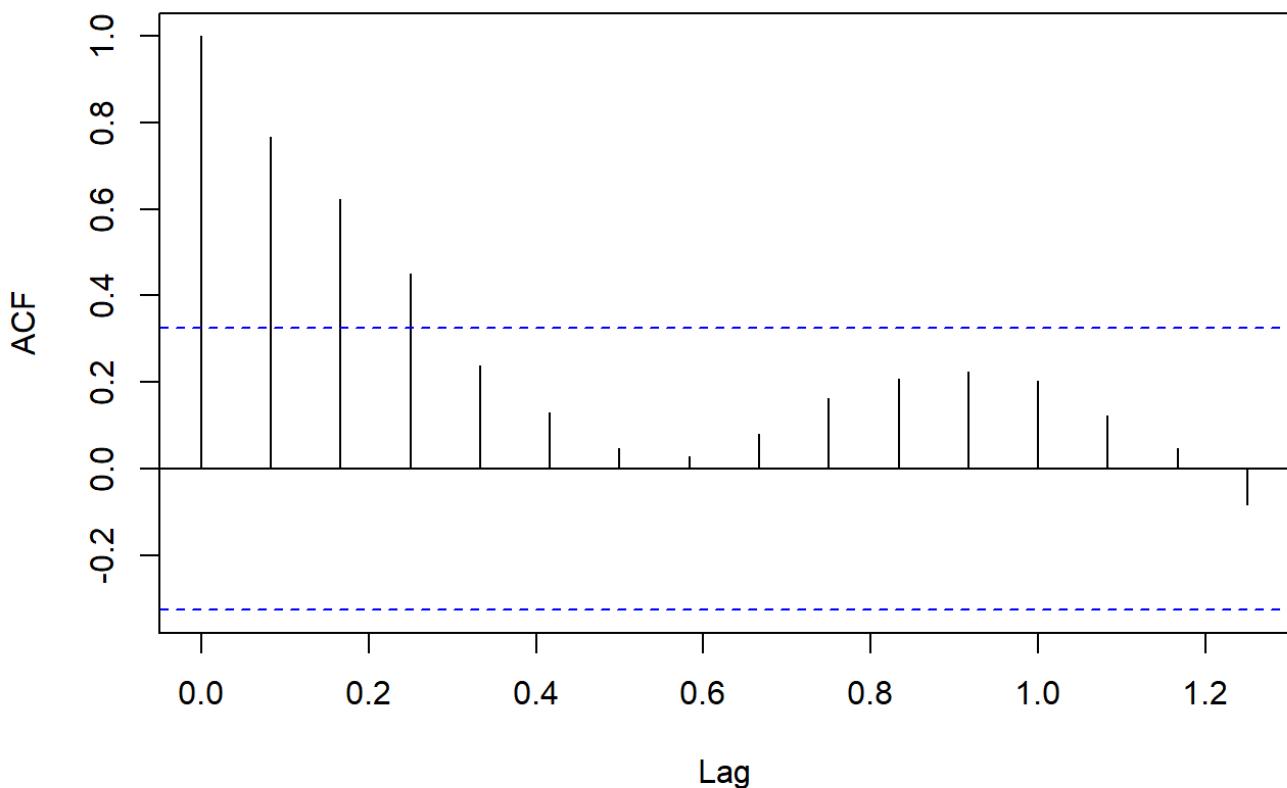


```
## [1] 40.78742
```

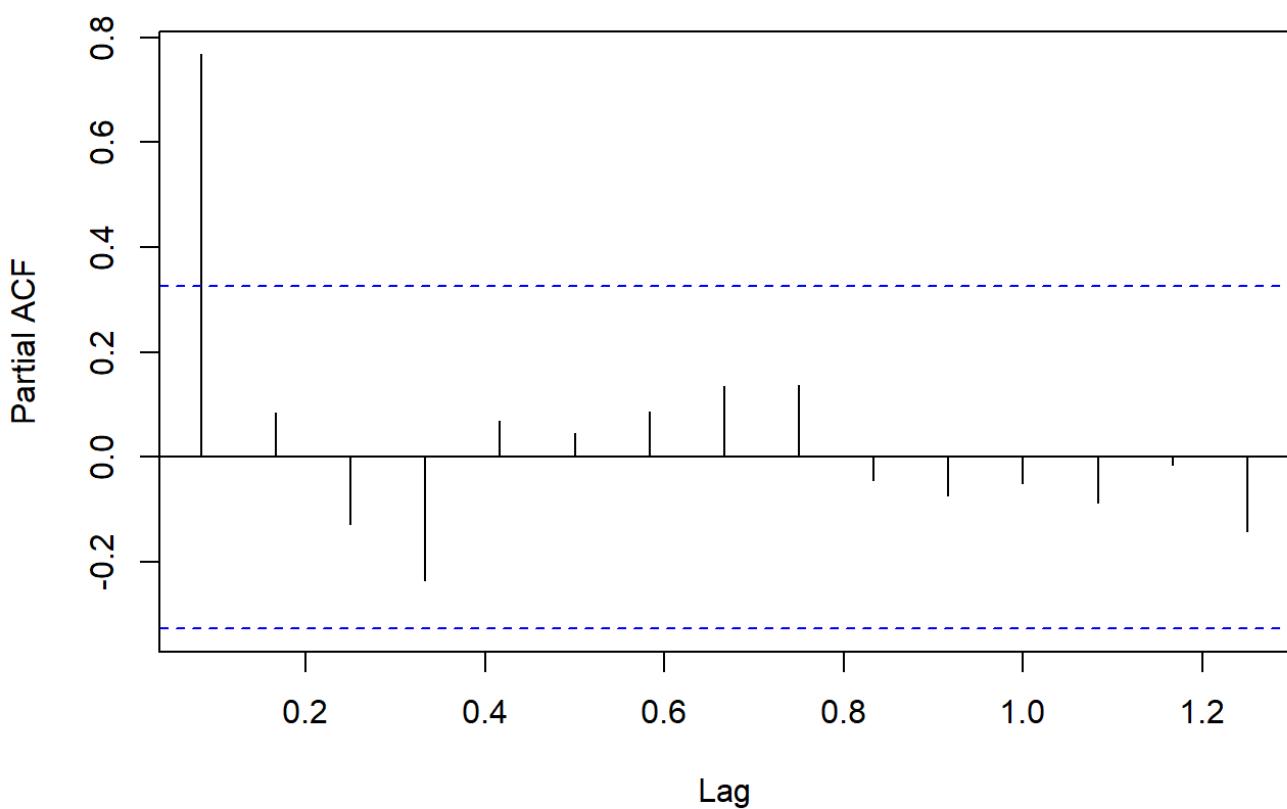
```
traintest(tv_ts31)
```



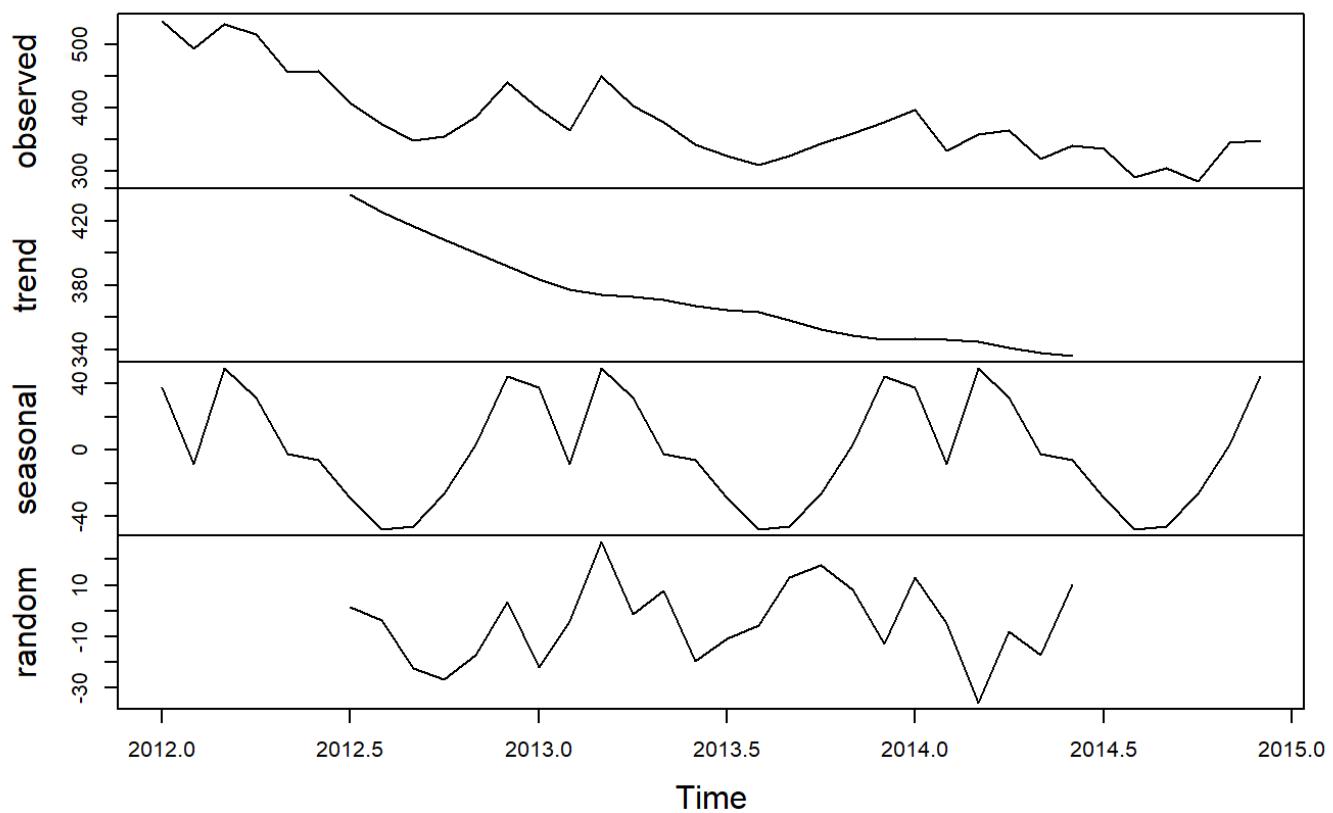
Series timeseries



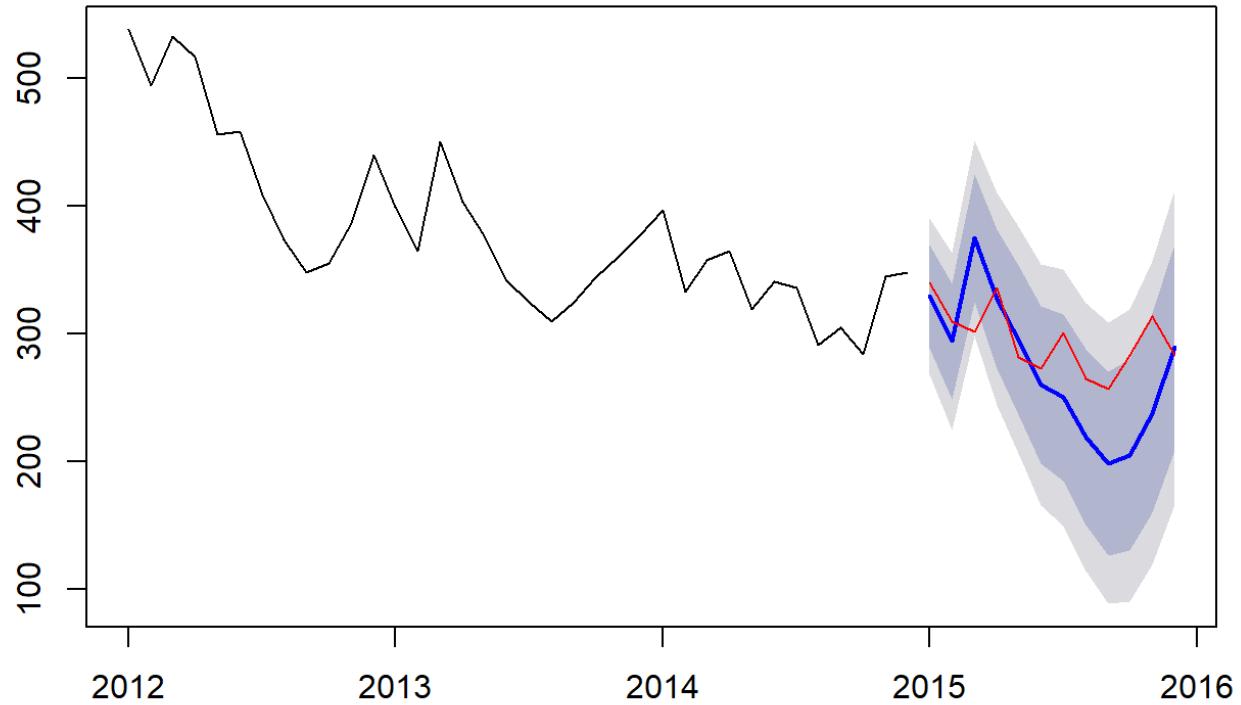
Series timeseries



Decomposition of additive time series

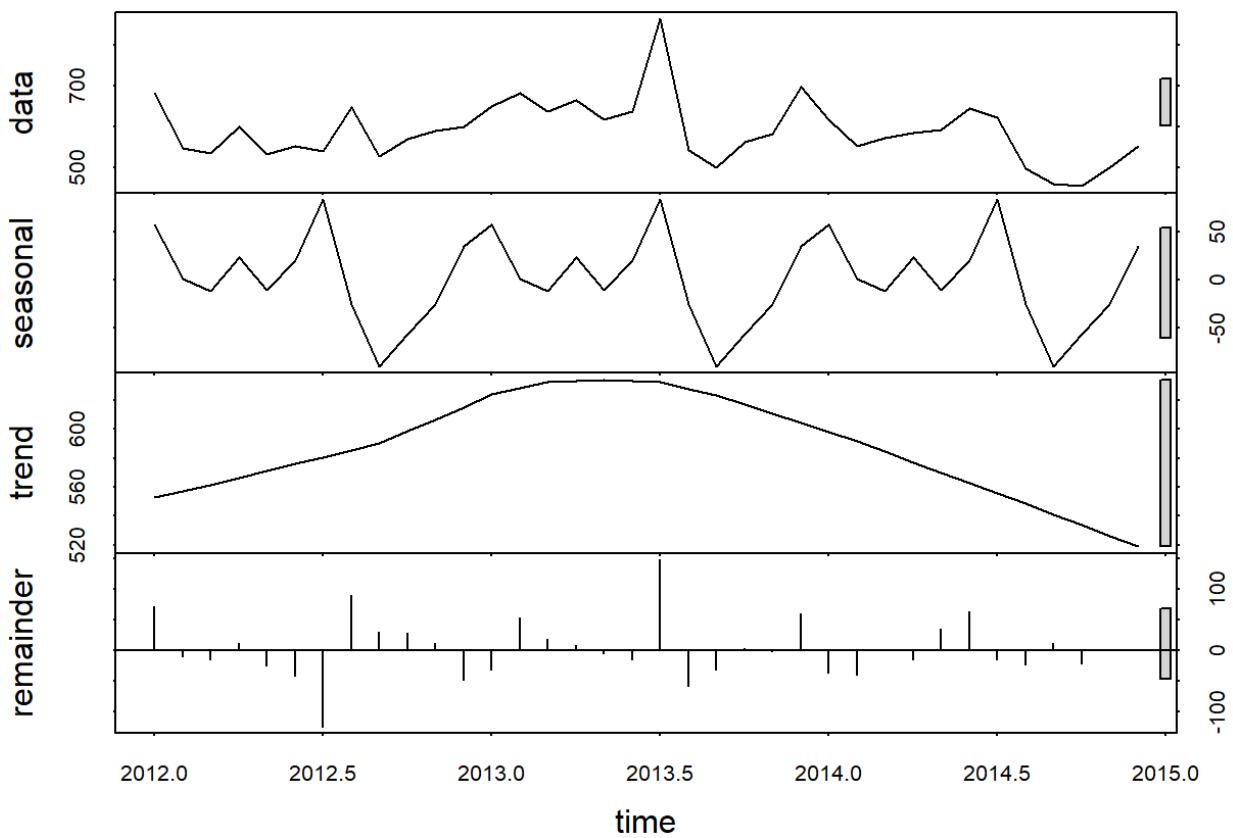
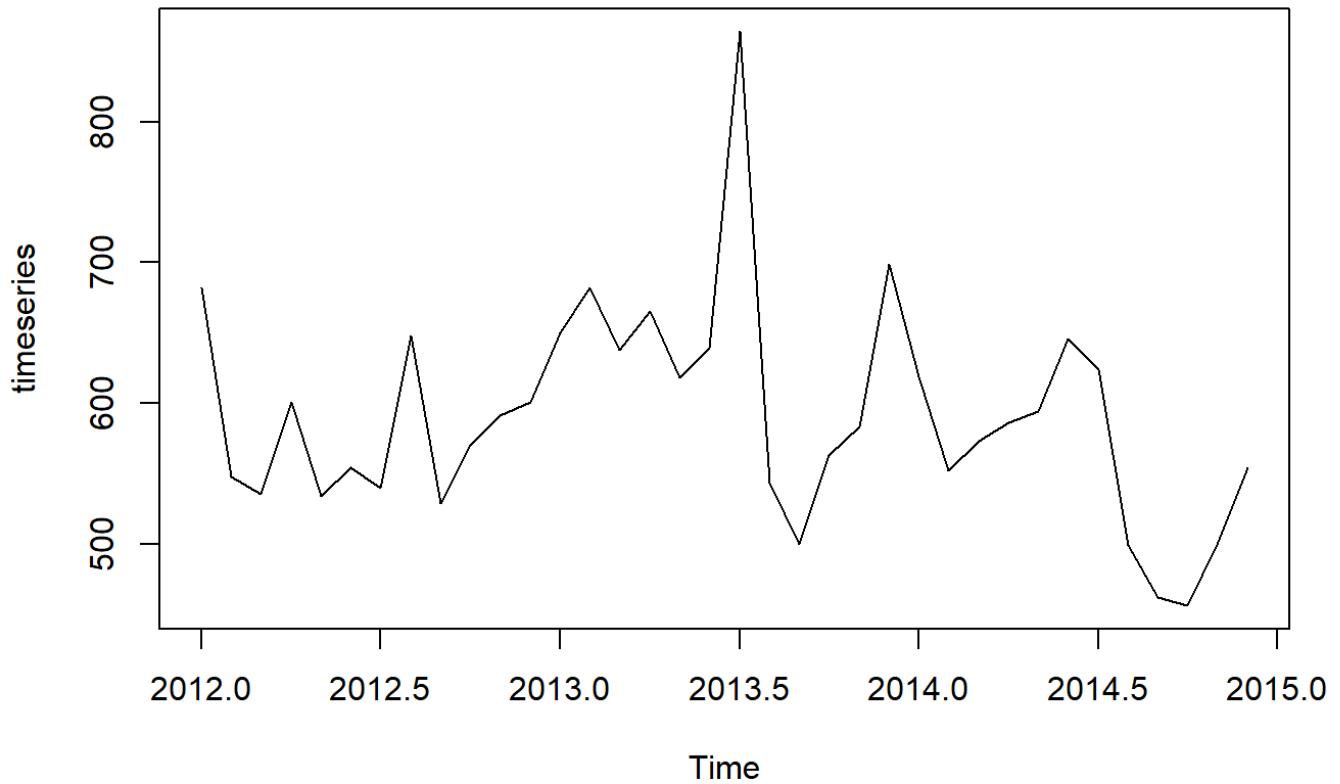


Forecasts from HoltWinters

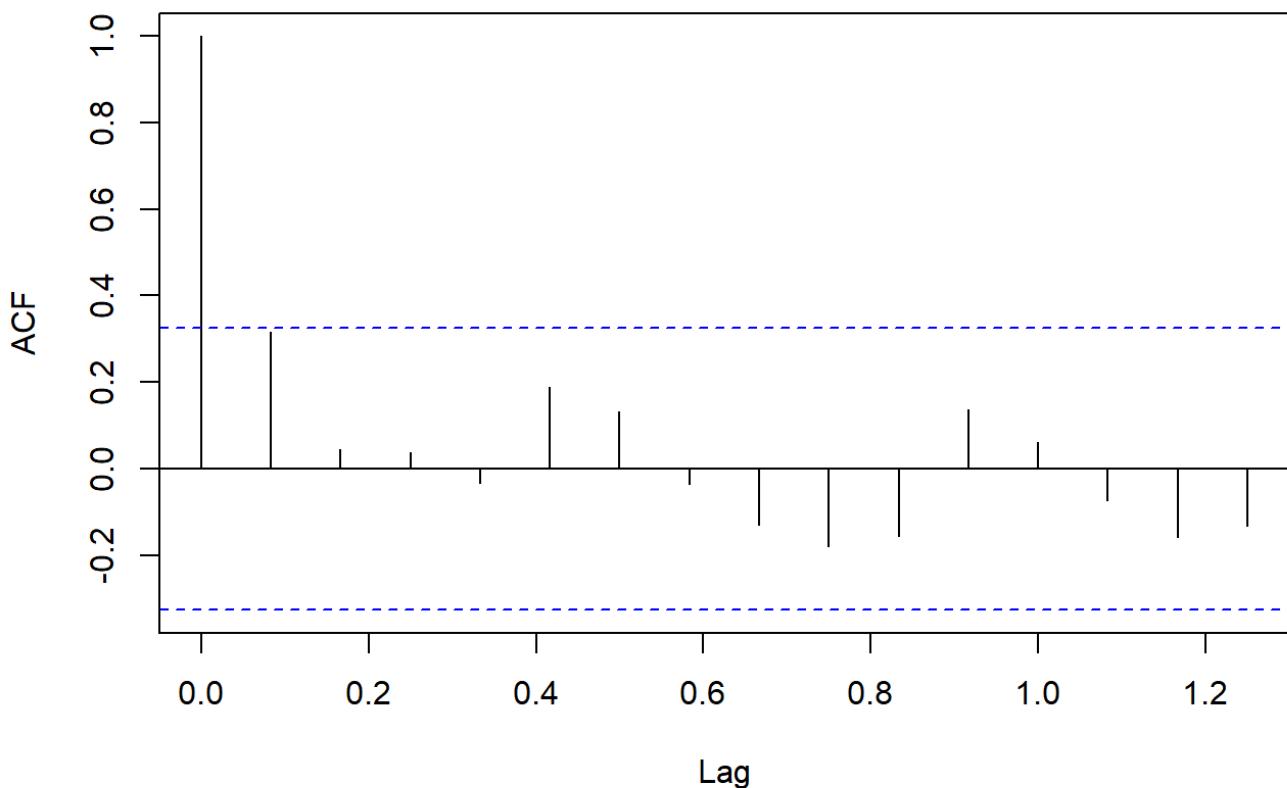


```
## [1] 37.53029
```

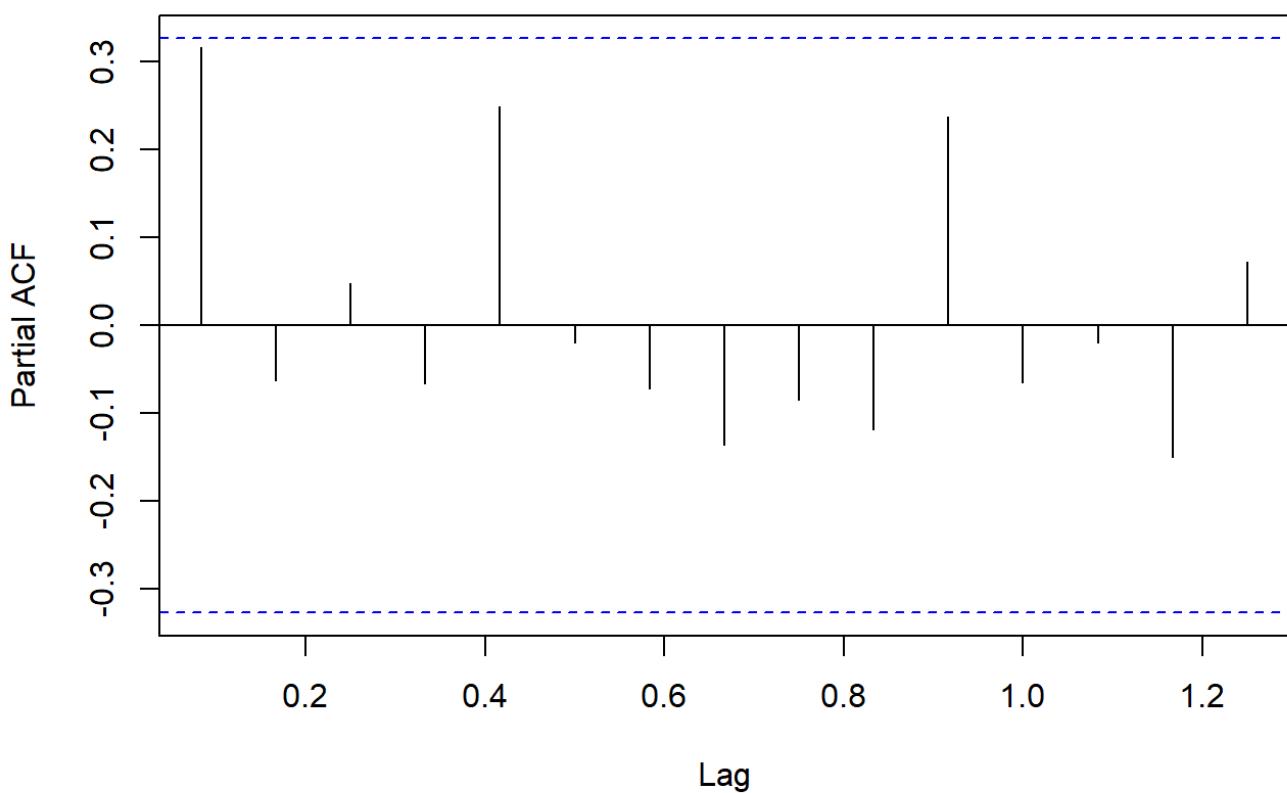
```
traintest(tv_ts32)
```



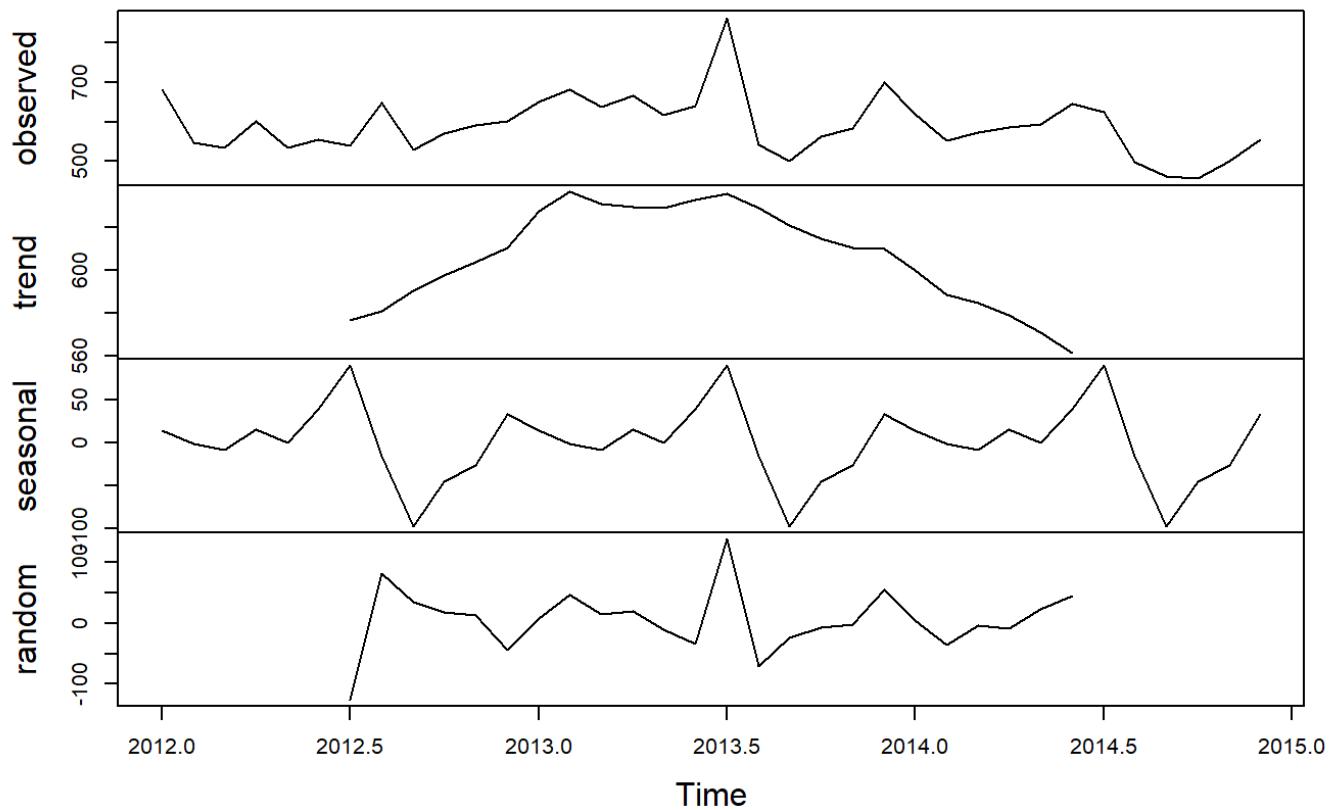
Series timeseries



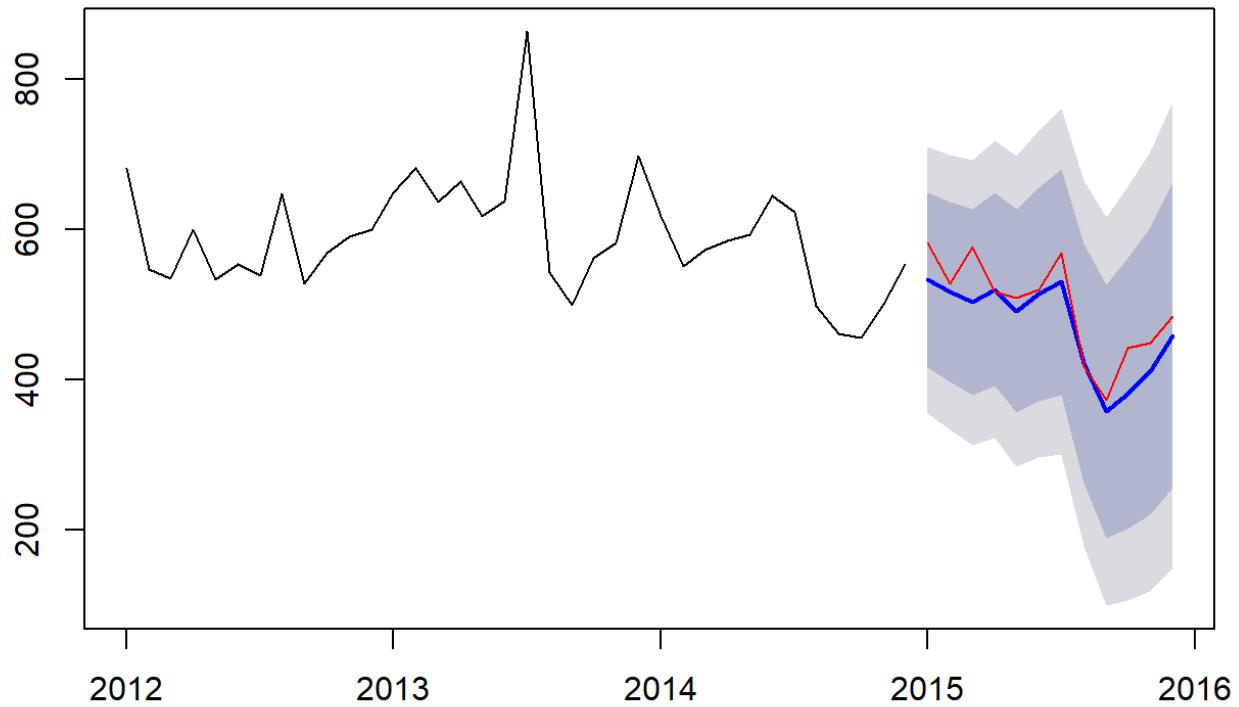
Series timeseries



Decomposition of additive time series

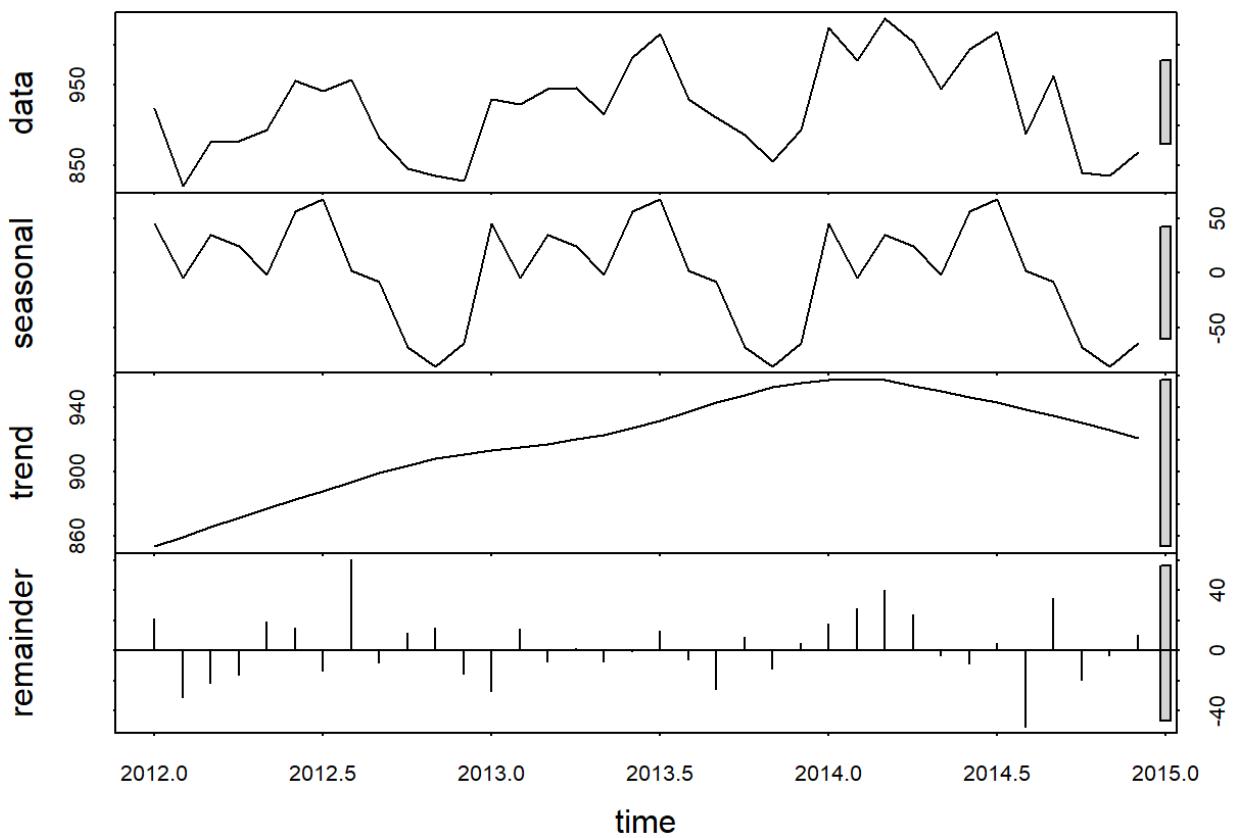
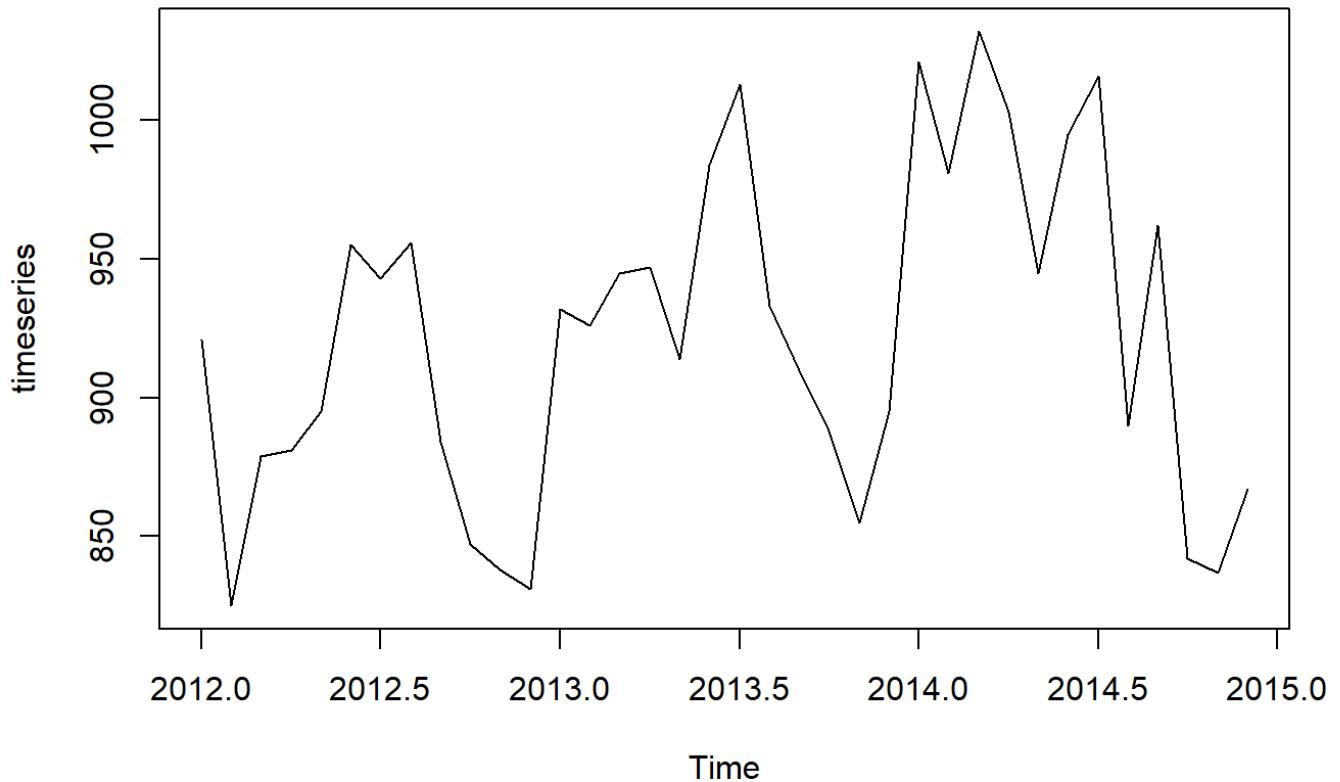


Forecasts from HoltWinters

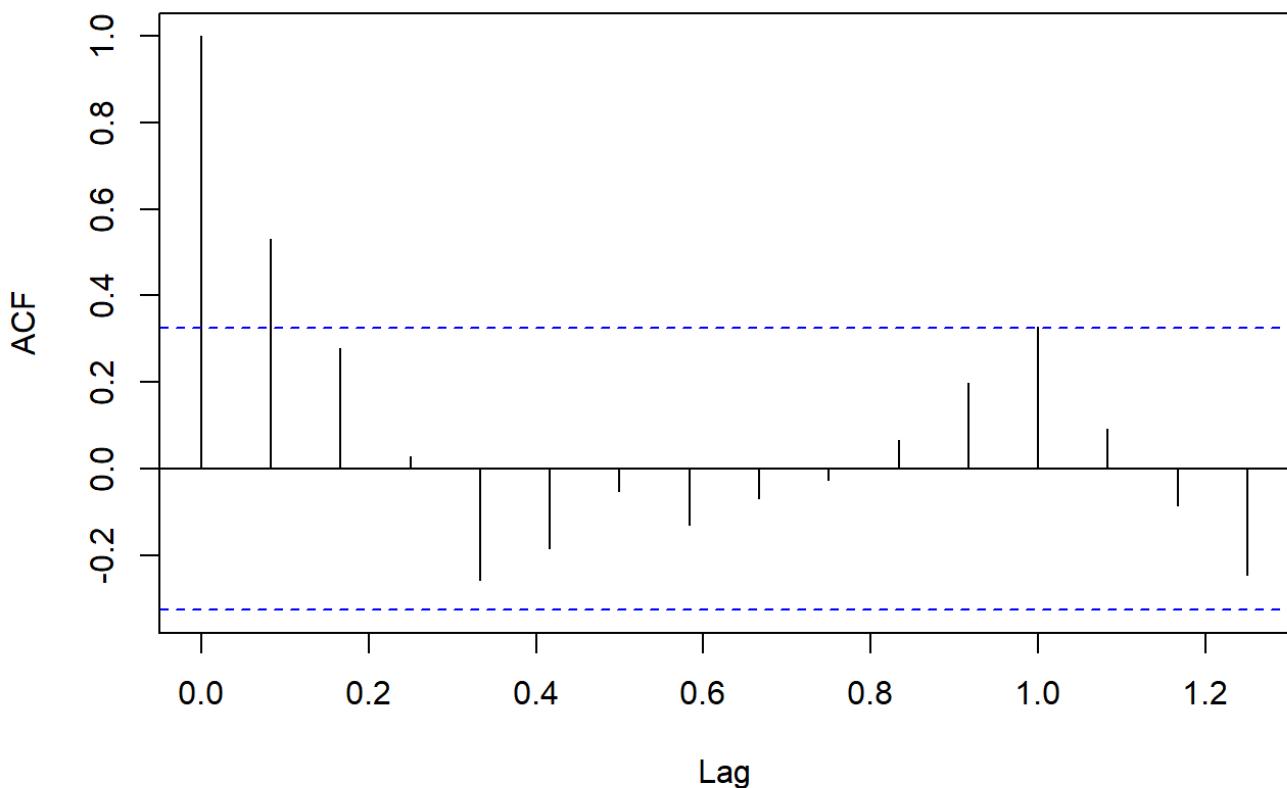


```
## [1] 28.41601
```

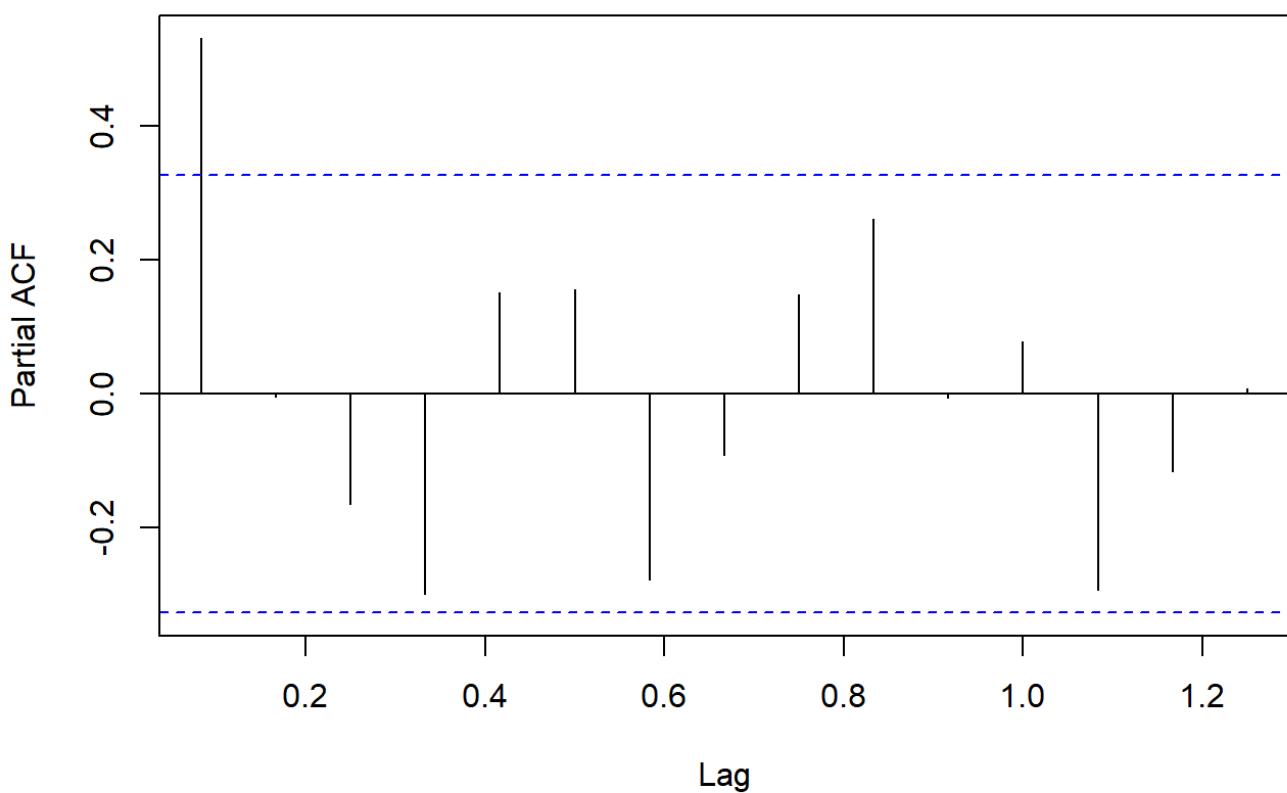
```
traintest(tv_ts33)
```



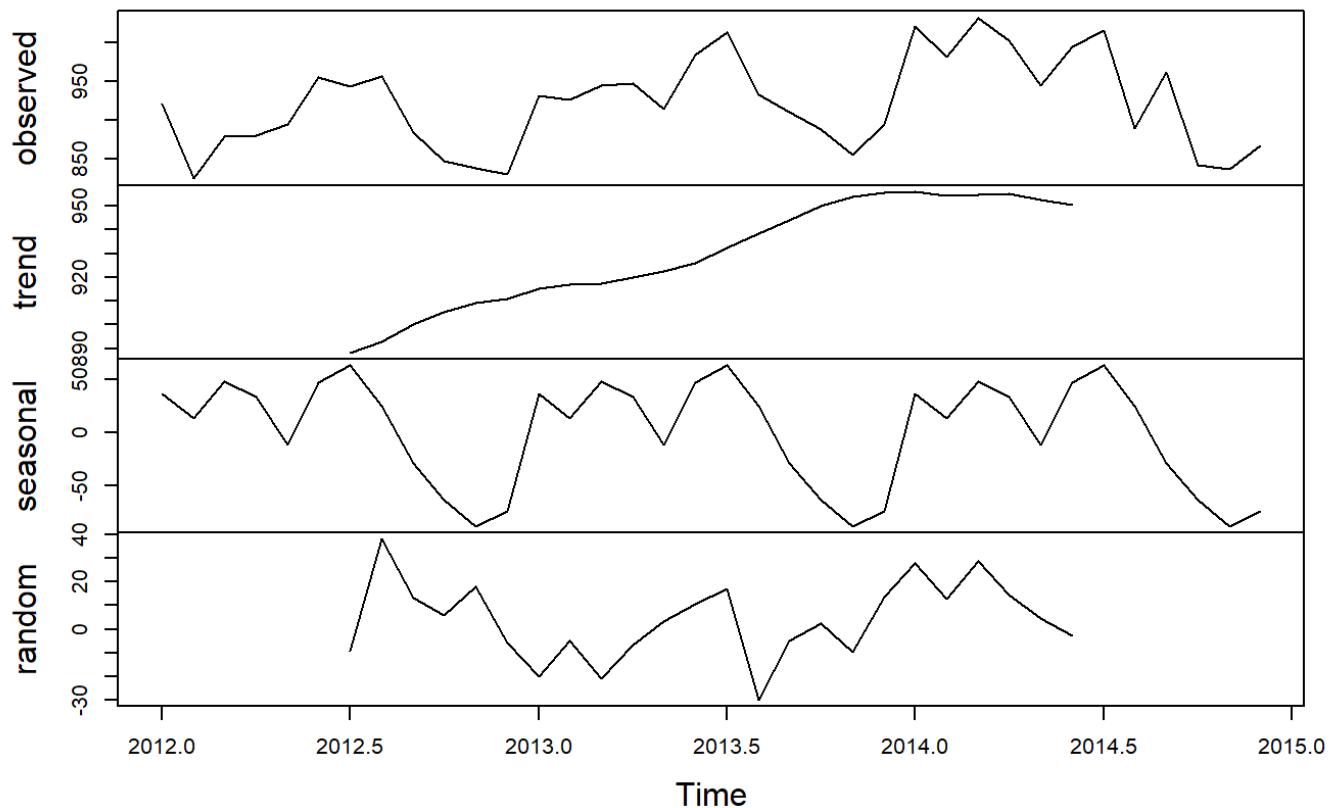
Series timeseries



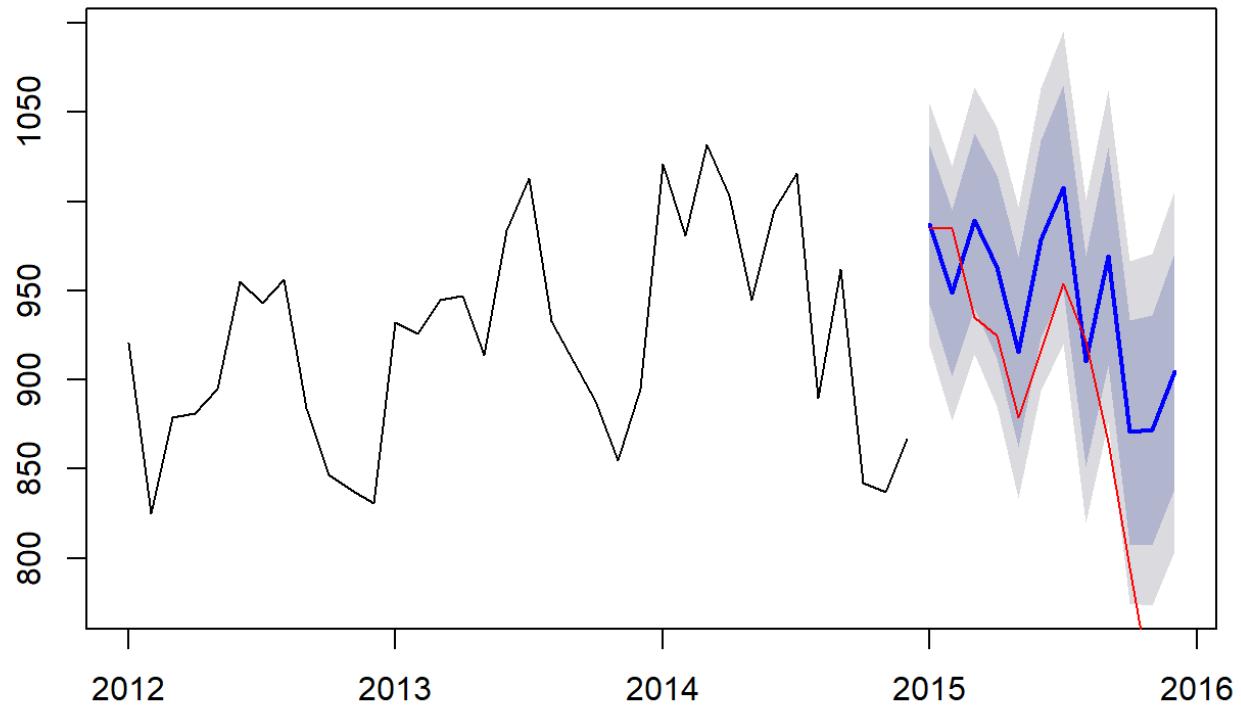
Series timeseries



Decomposition of additive time series

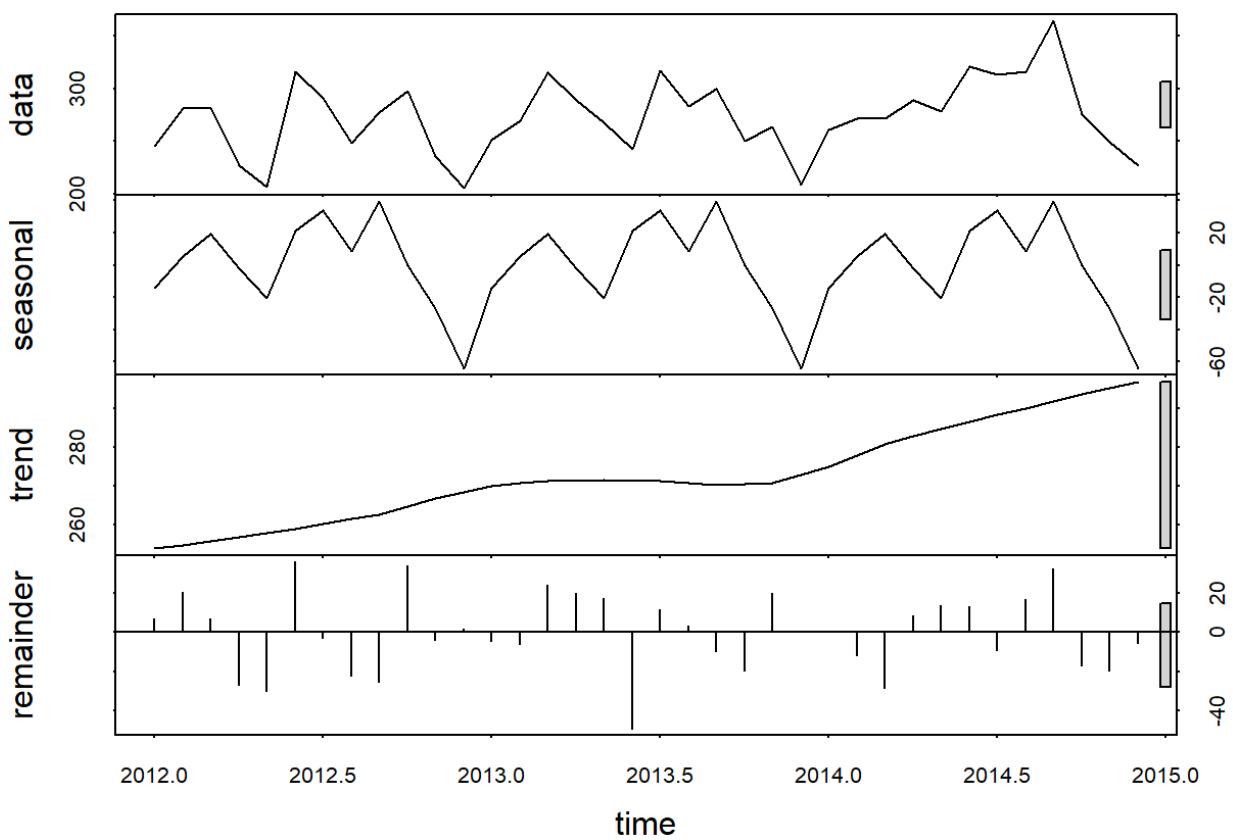
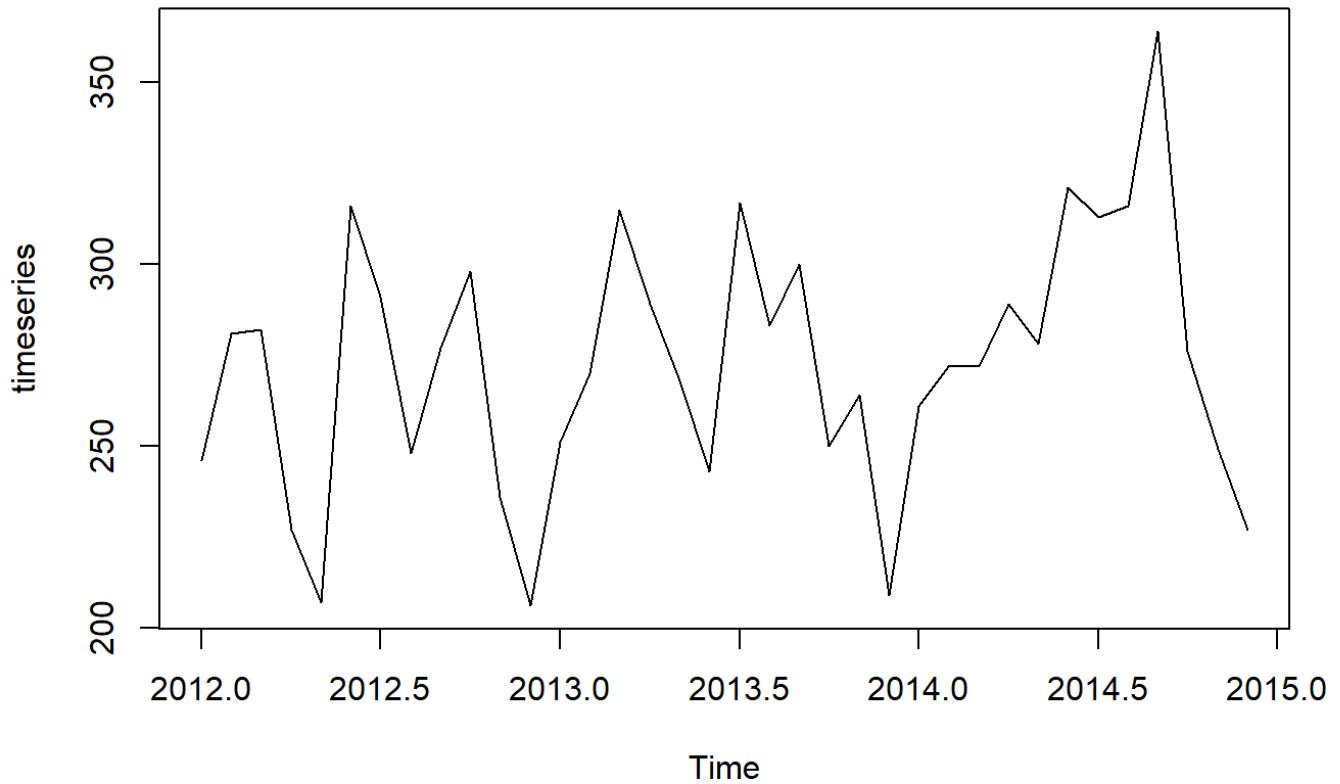


Forecasts from HoltWinters

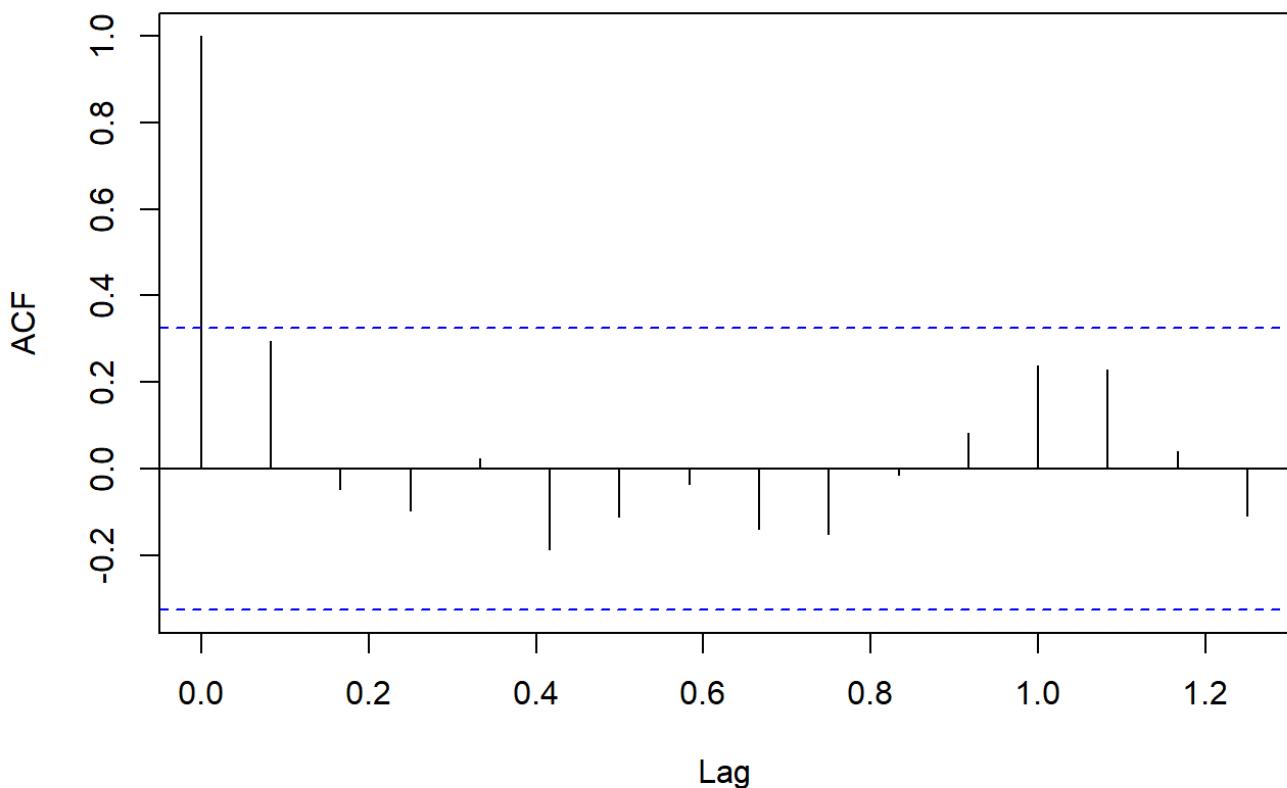


```
## [1] 68.66555
```

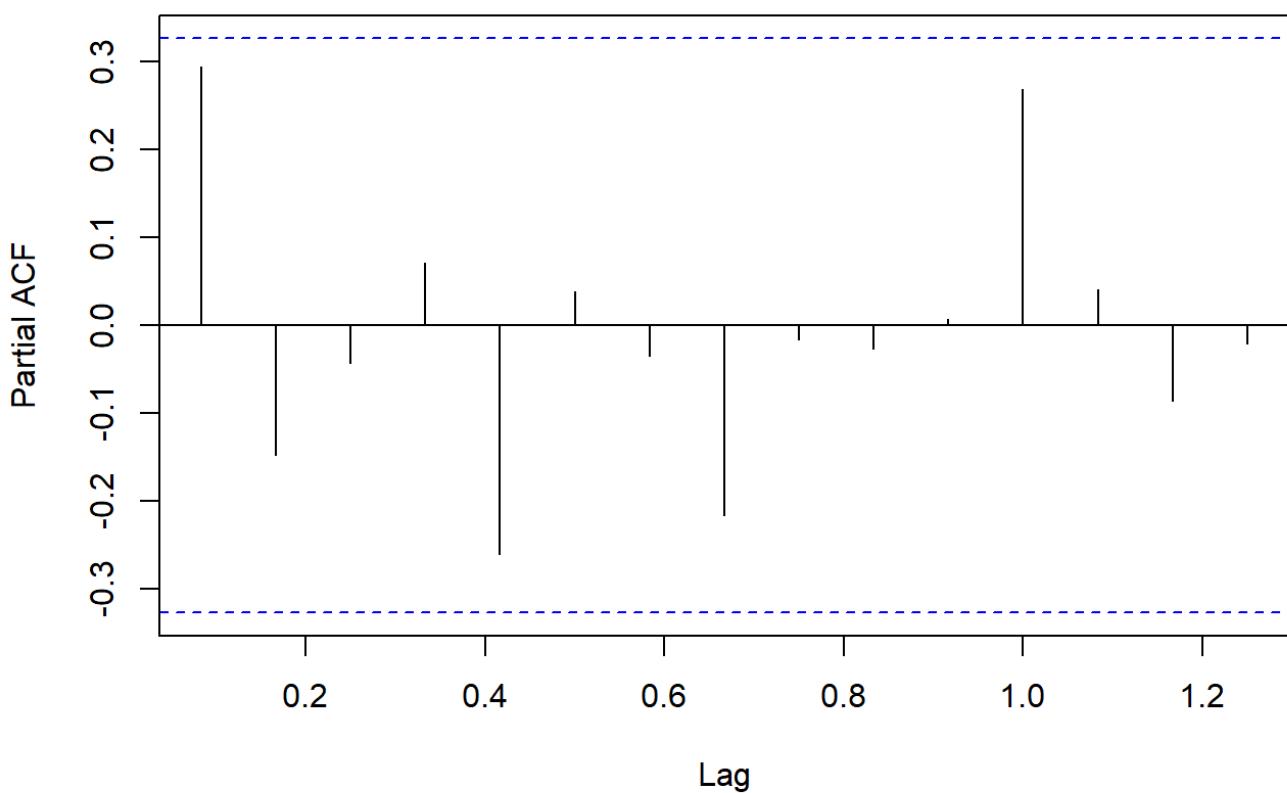
```
traintest(tv_ts34)
```



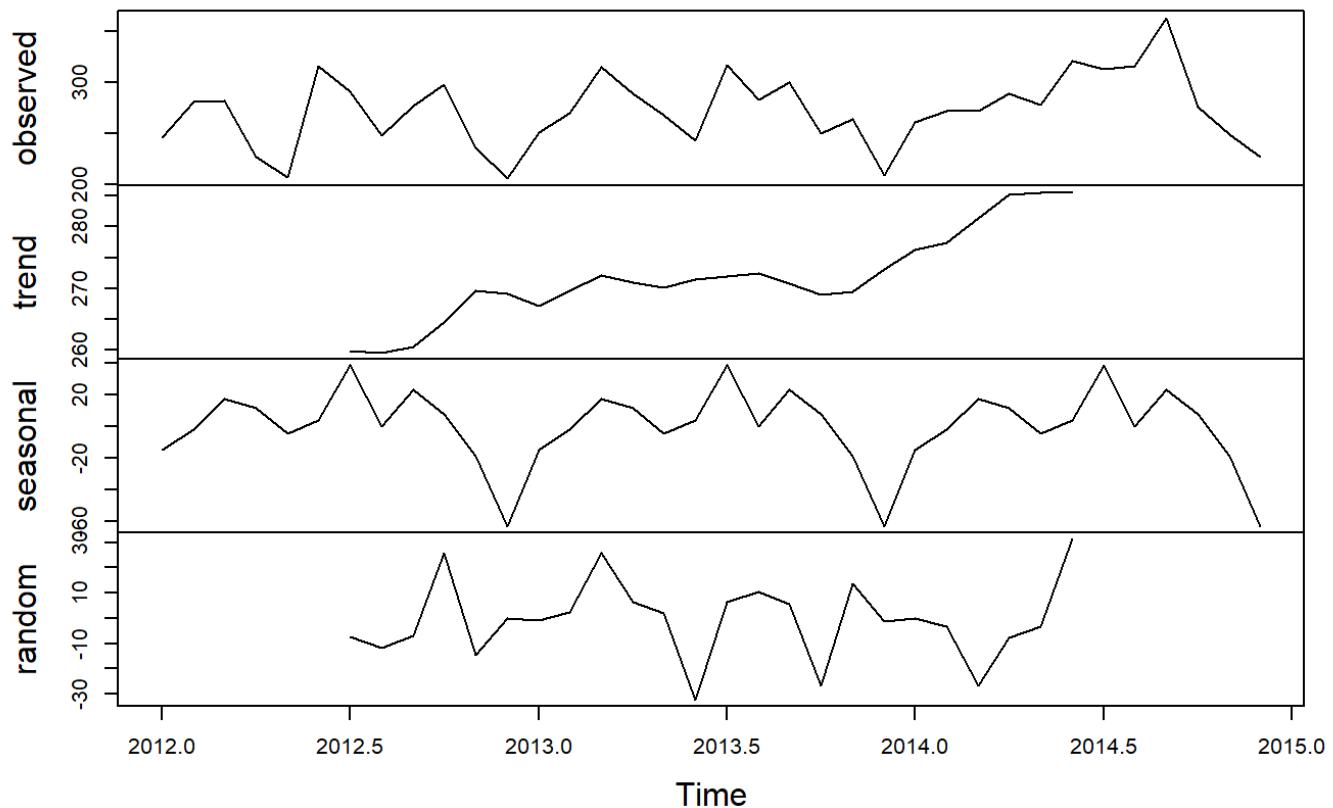
Series timeseries



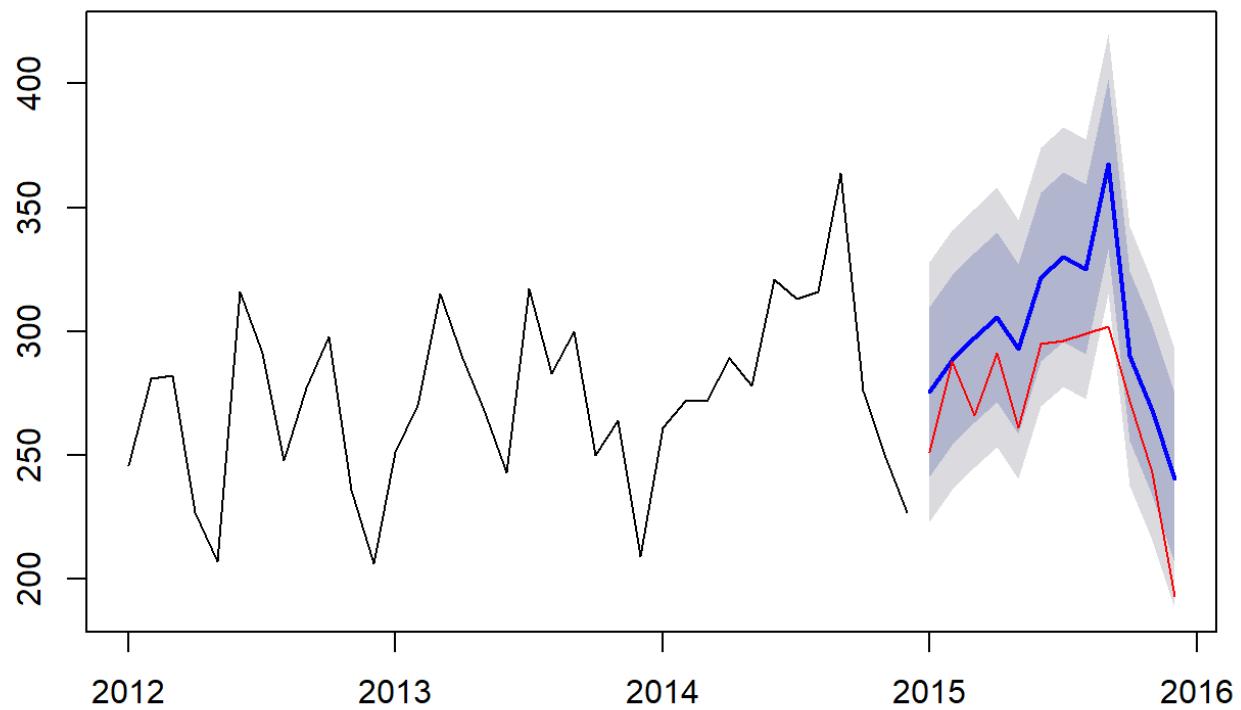
Series timeseries



Decomposition of additive time series

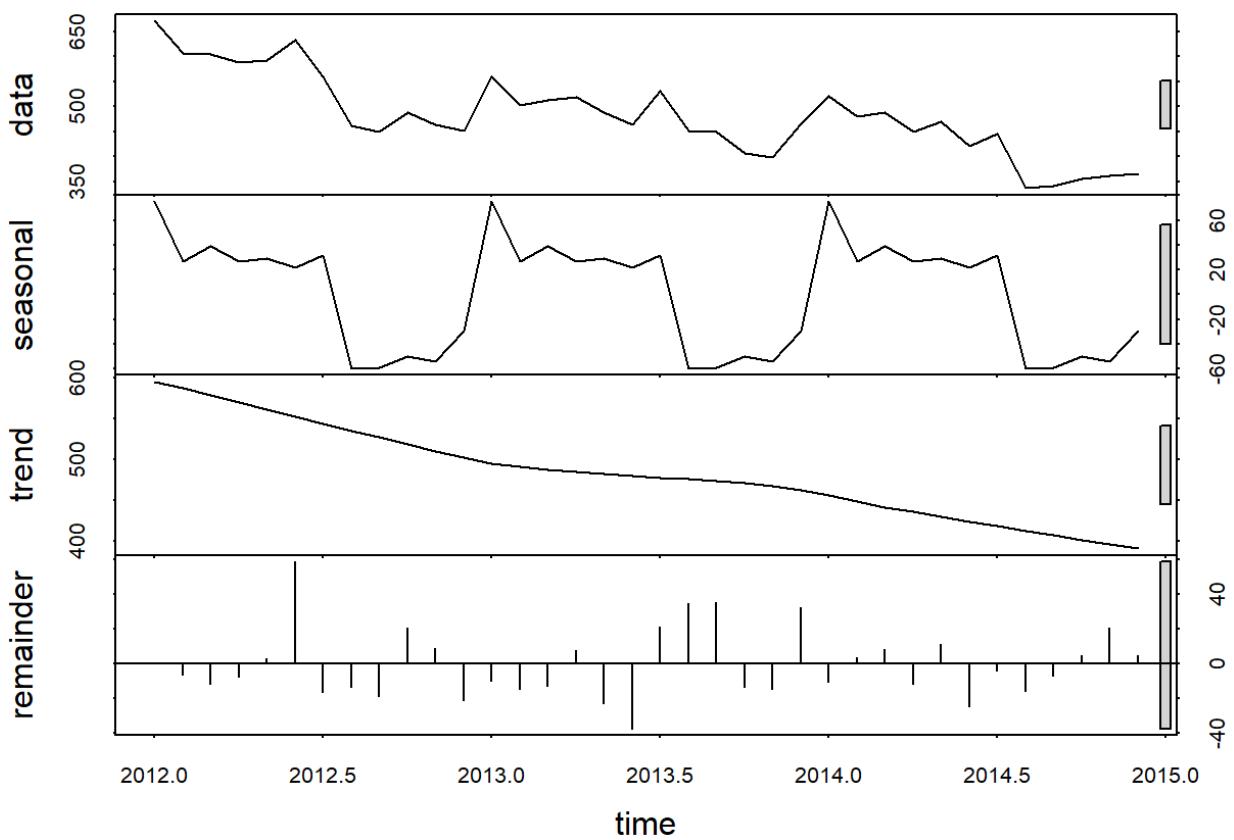
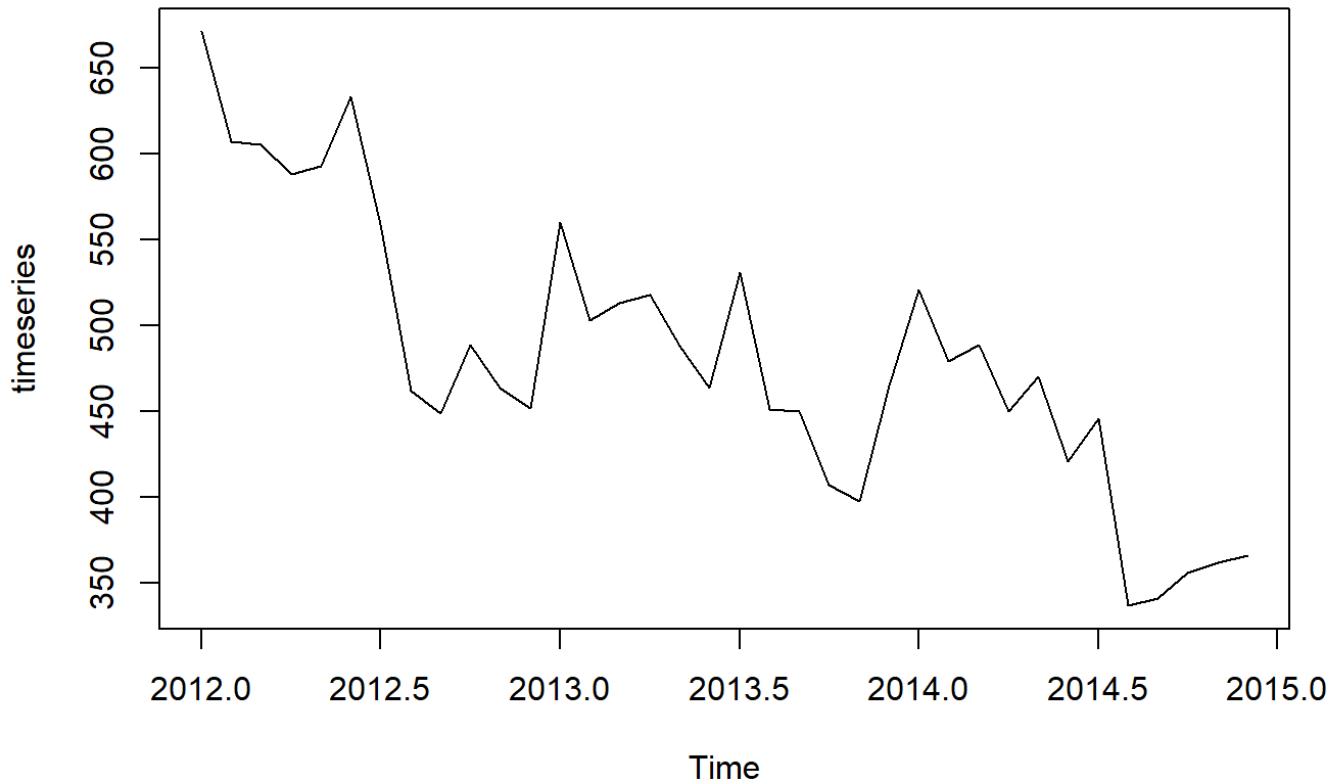


Forecasts from HoltWinters

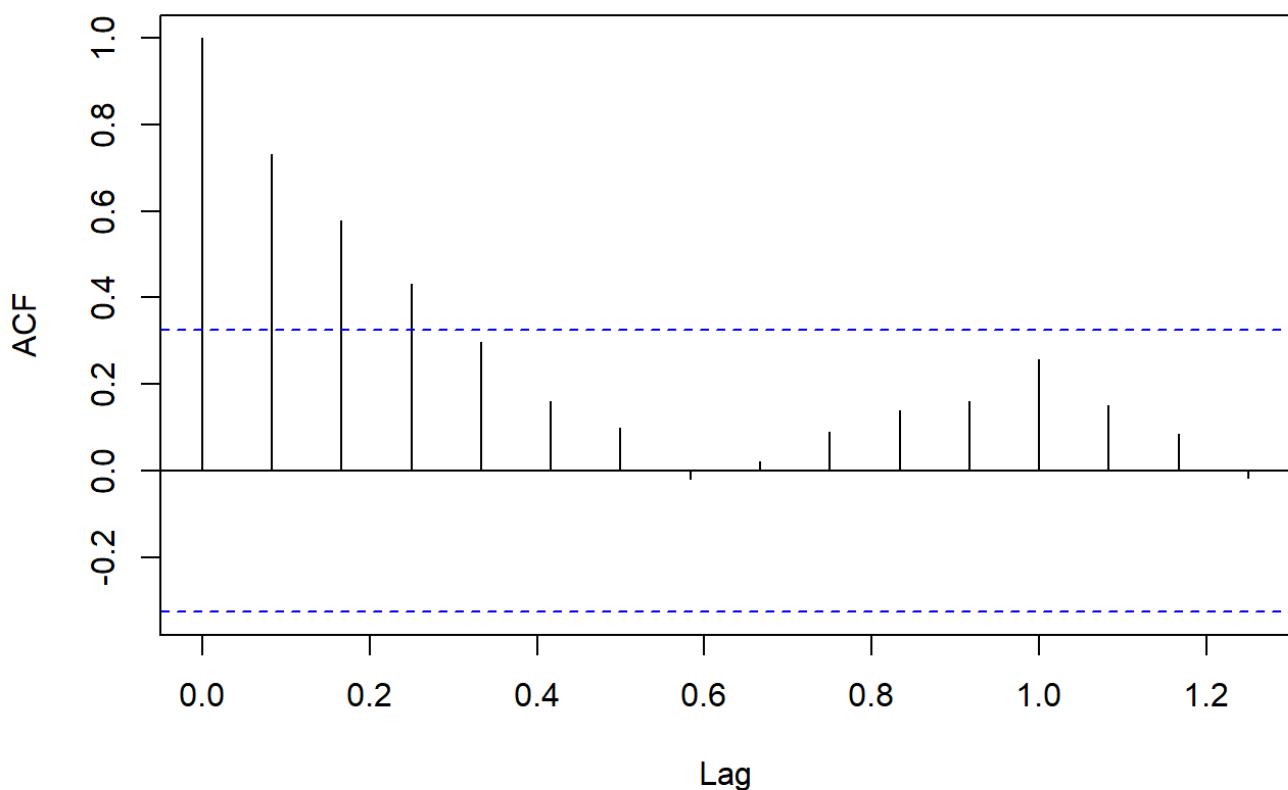


```
## [1] 28.7374
```

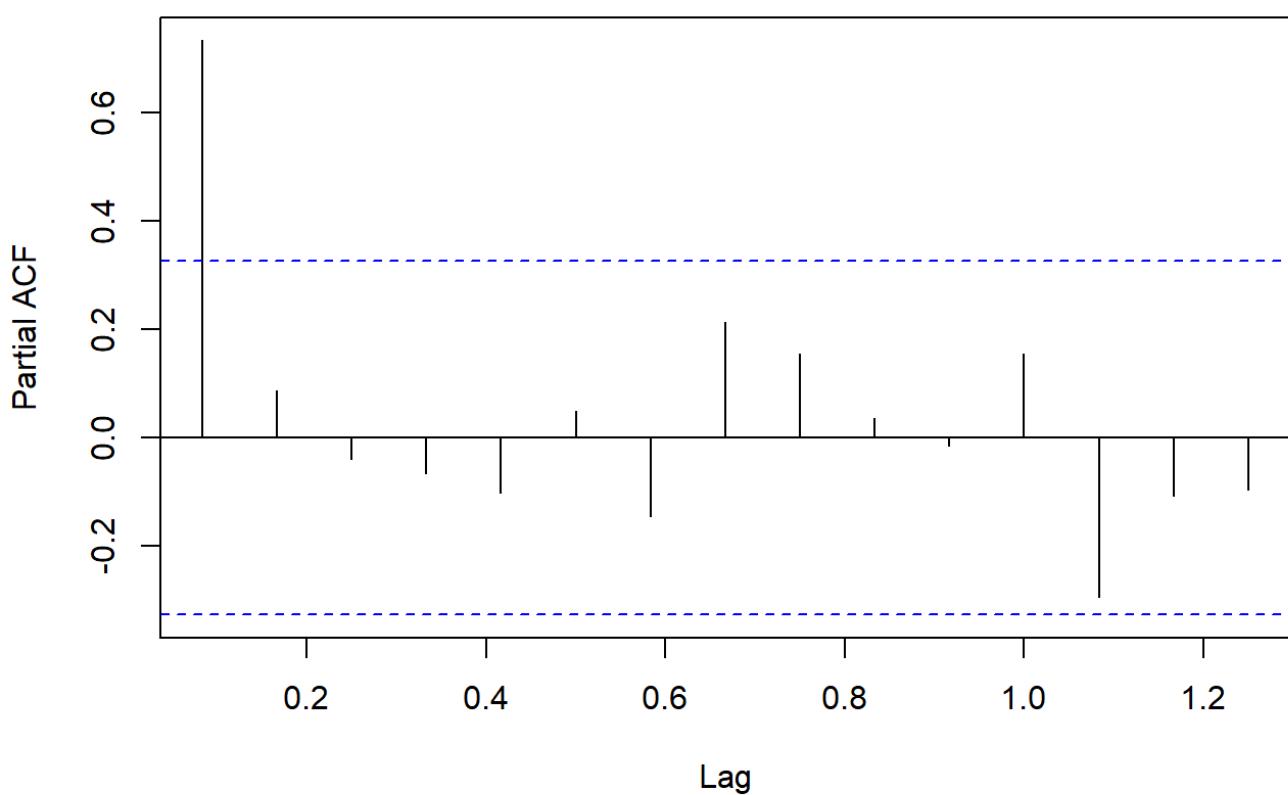
```
traintest(tv_ts35)
```



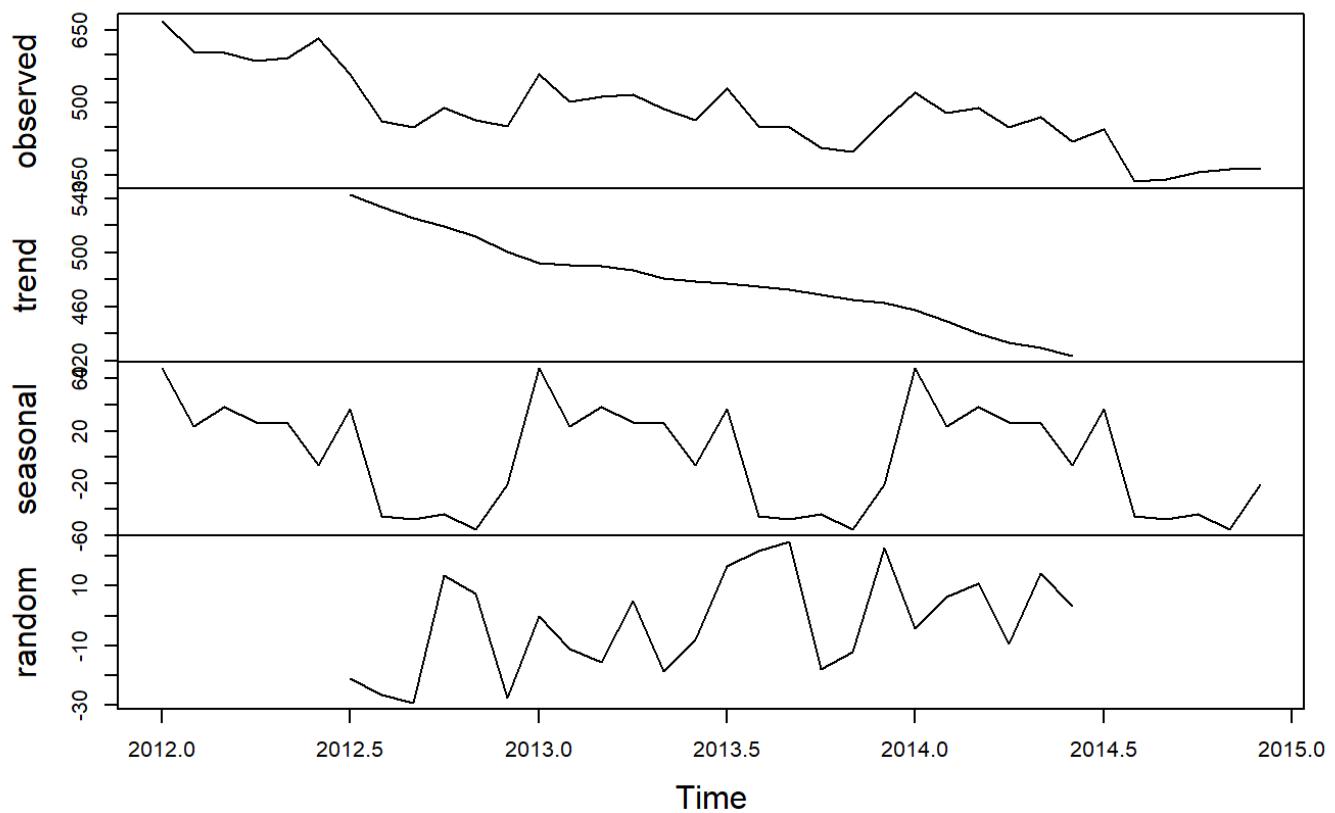
Series timeseries



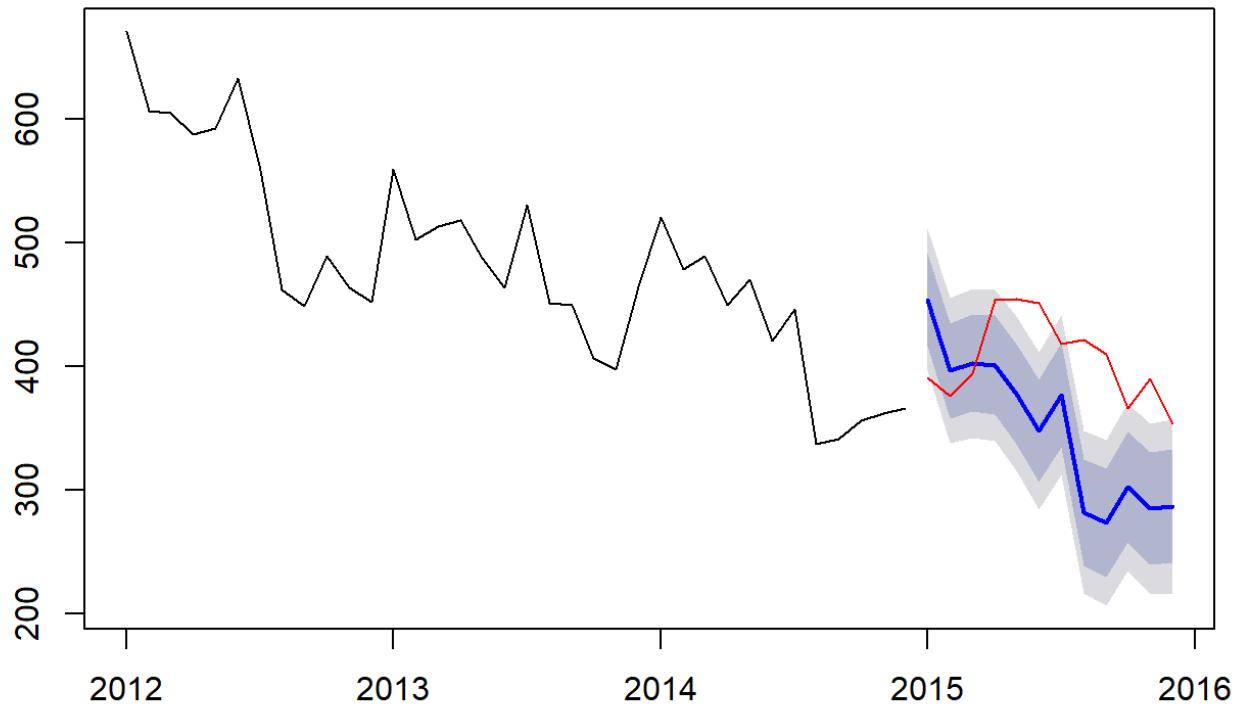
Series timeseries



Decomposition of additive time series

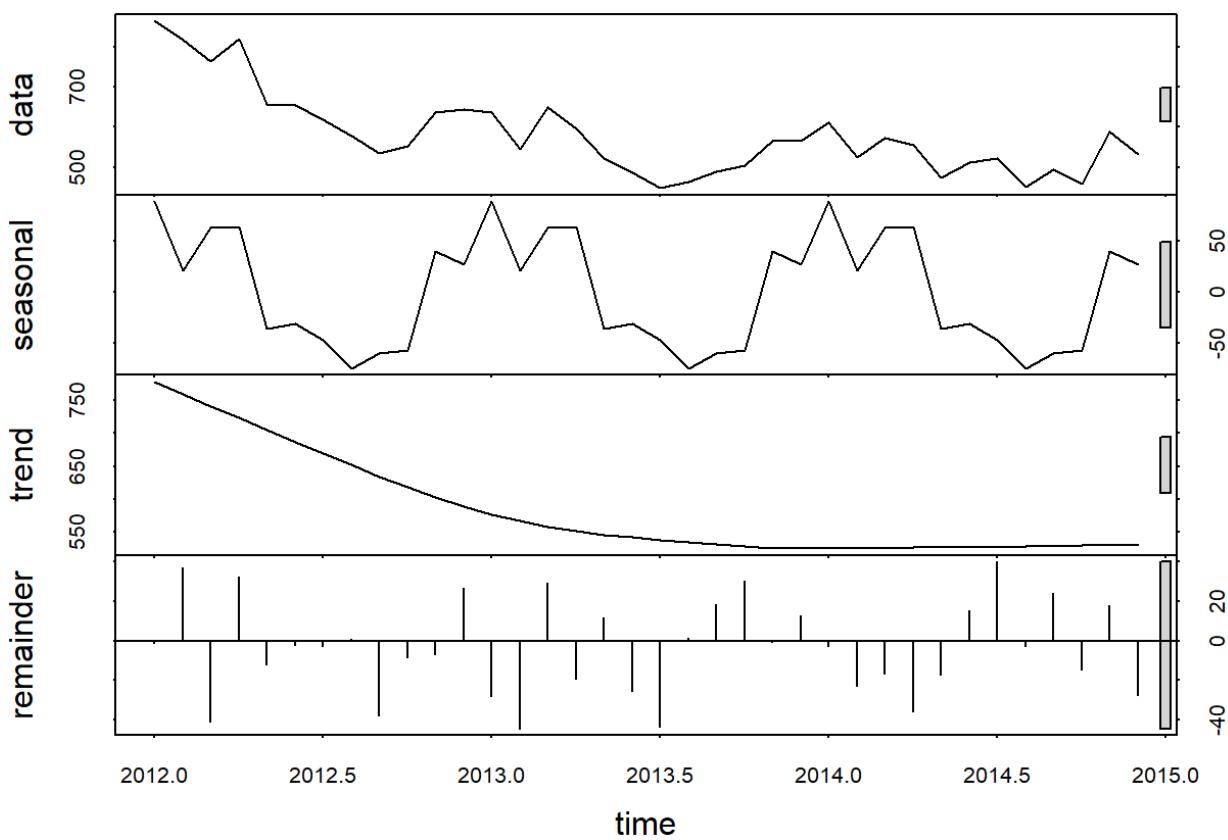
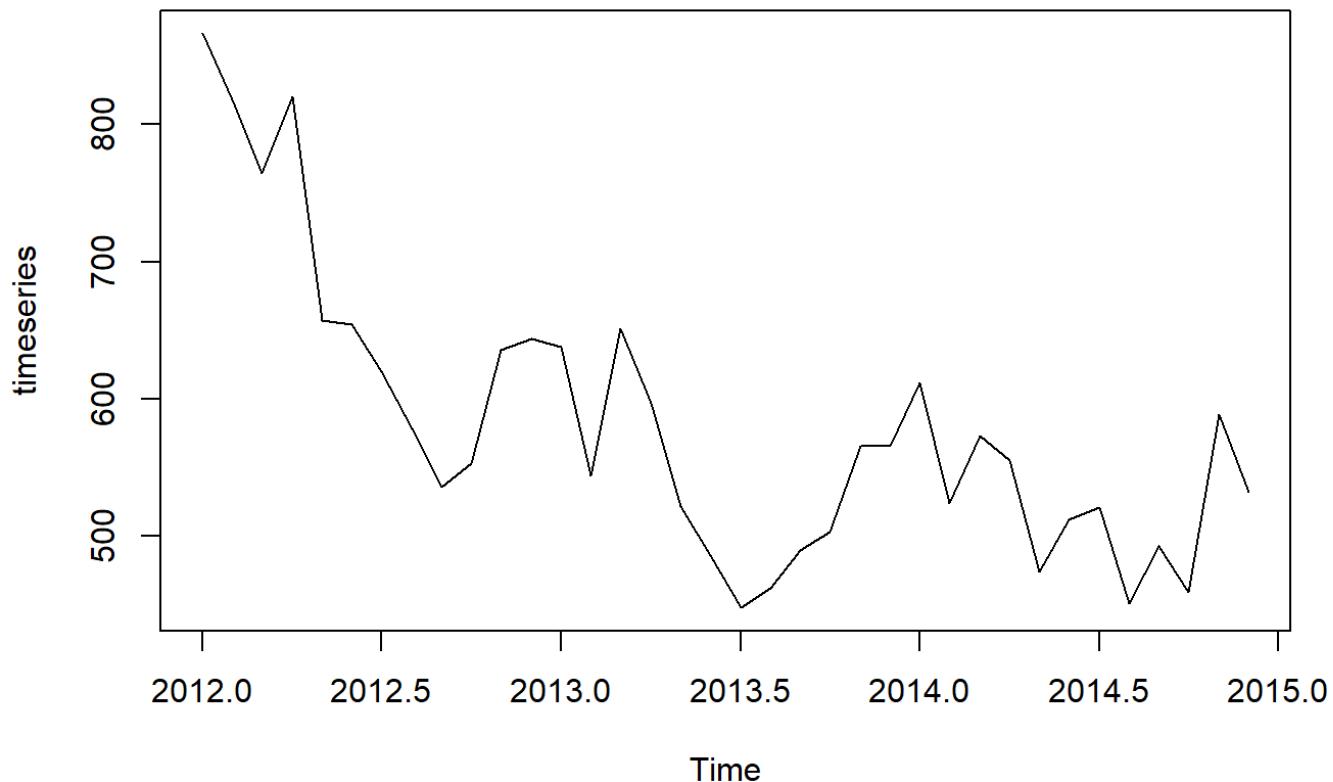


Forecasts from HoltWinters

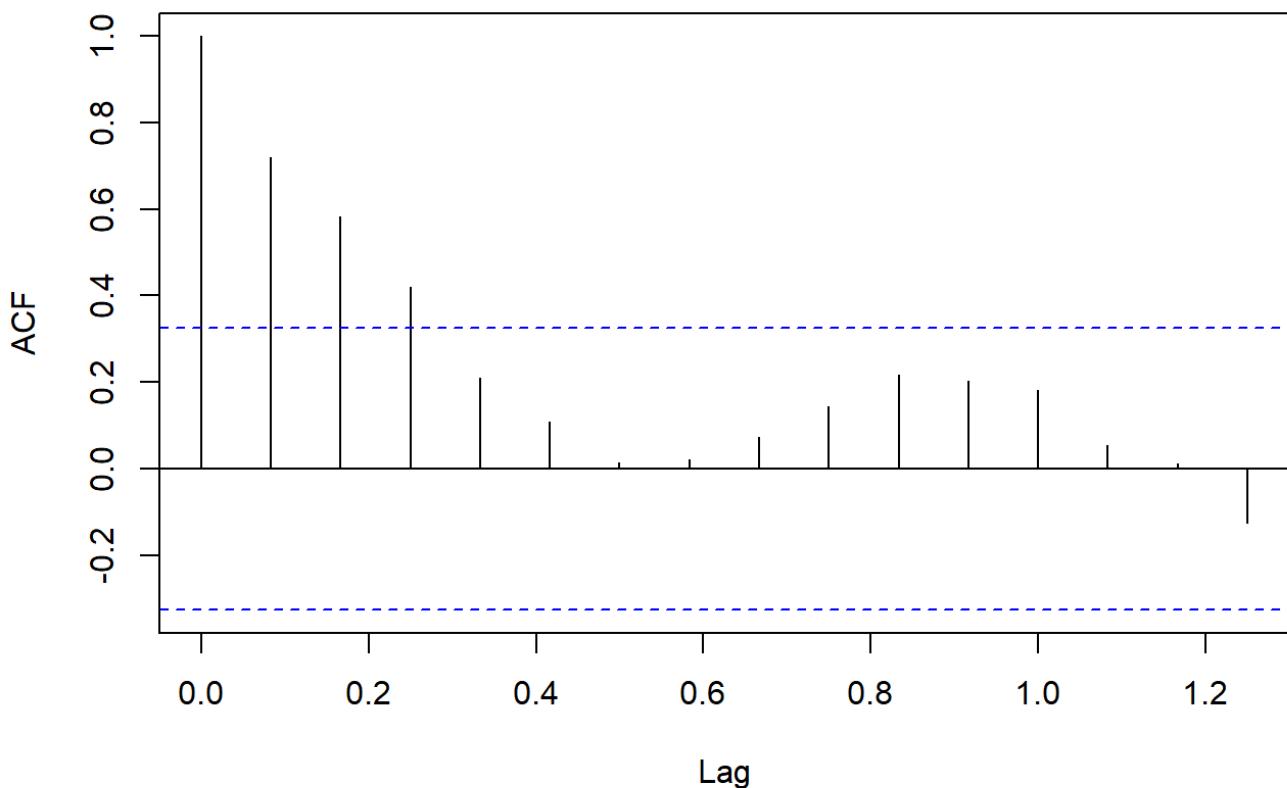


```
## [1] 73.21512
```

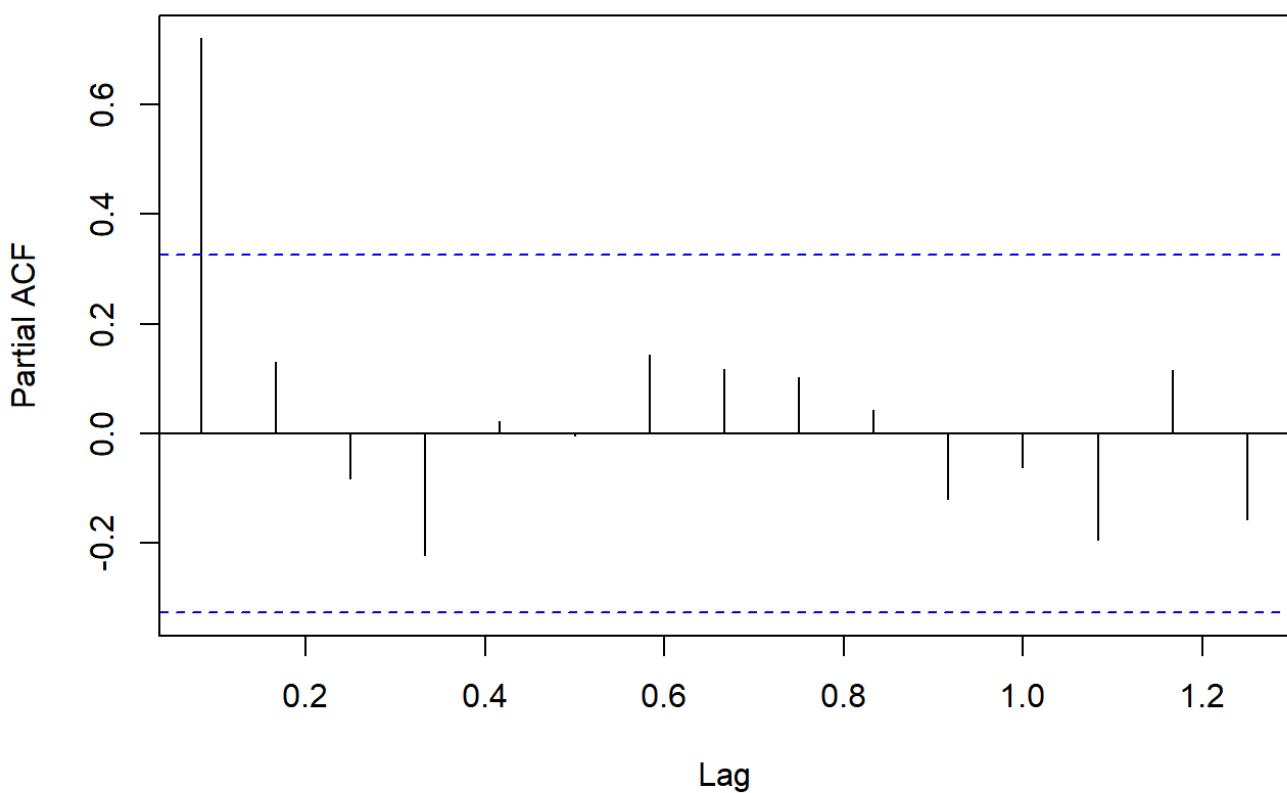
```
traintest(tv_ts36)
```



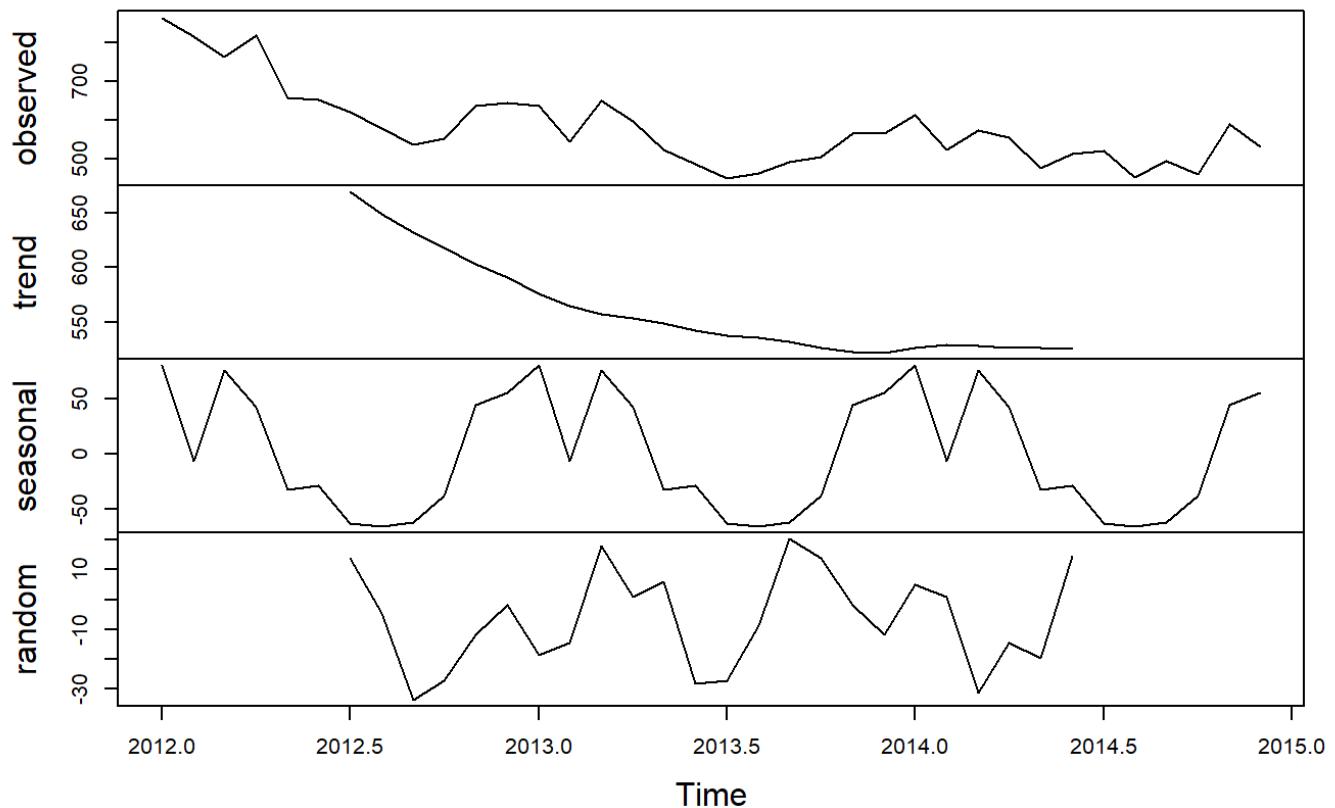
Series timeseries



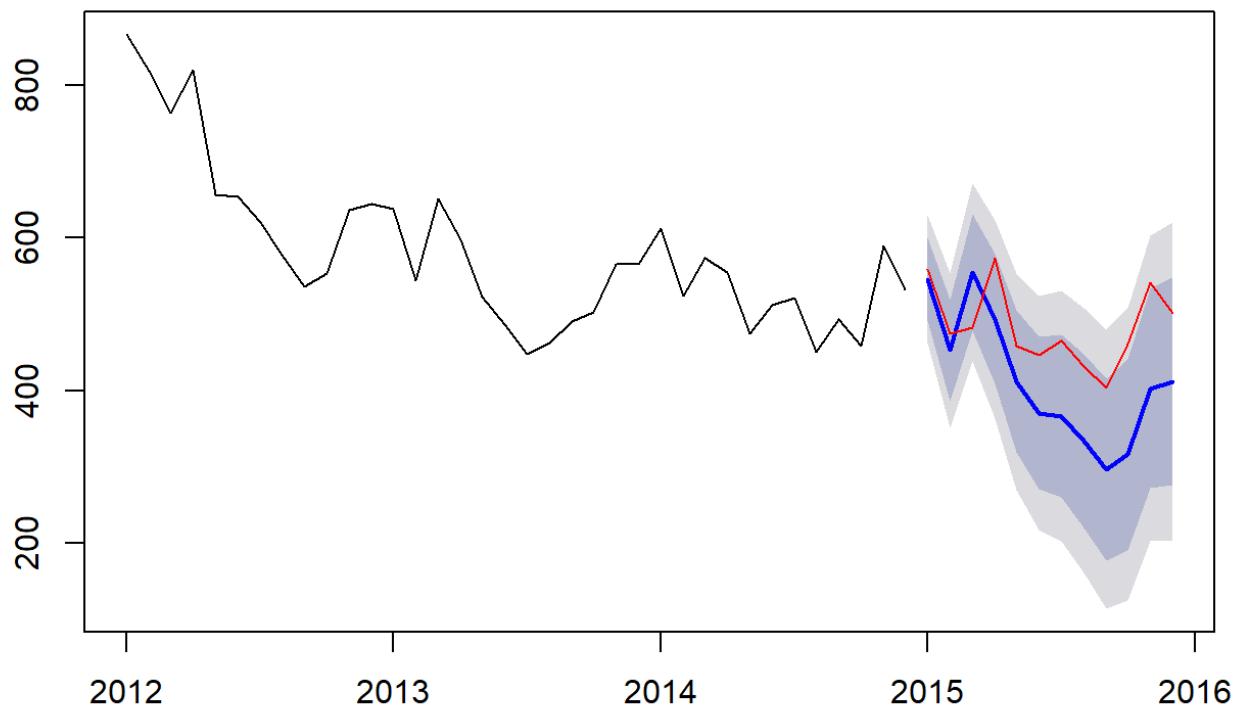
Series timeseries



Decomposition of additive time series

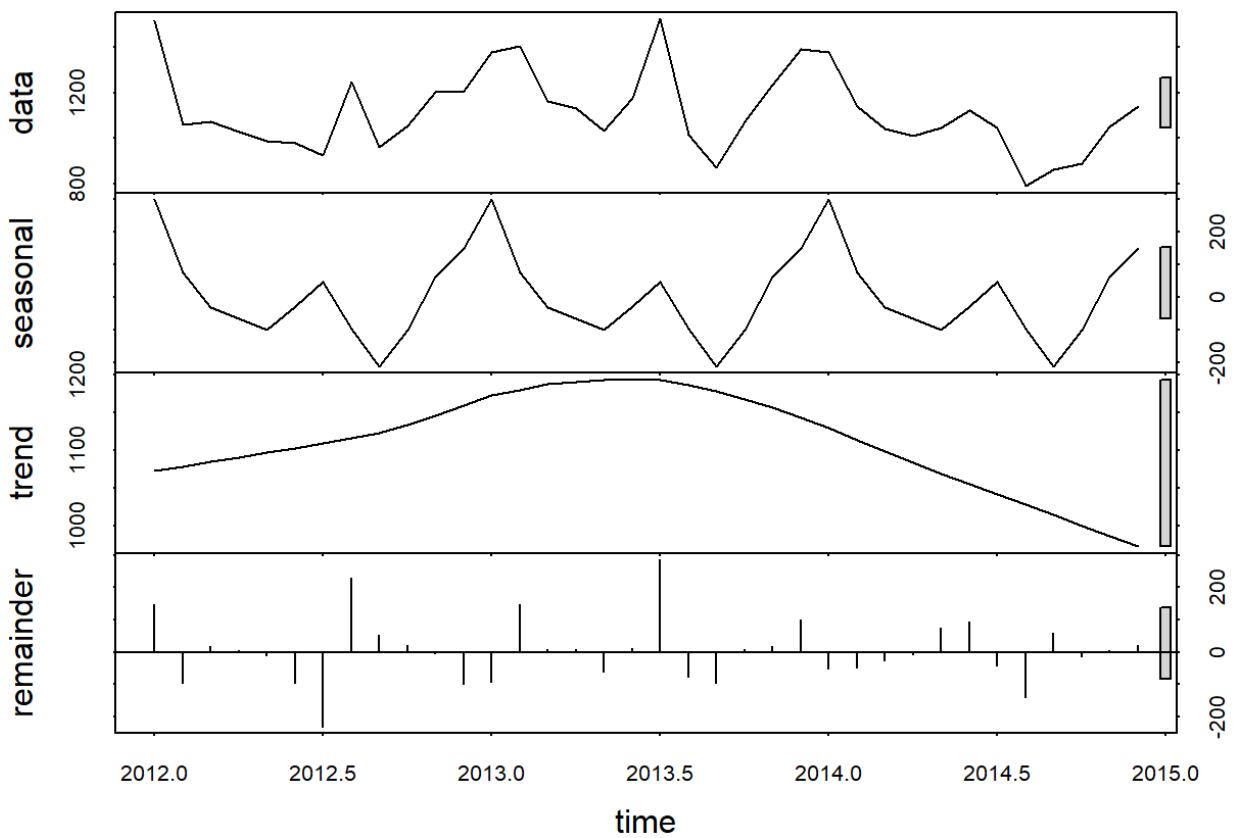
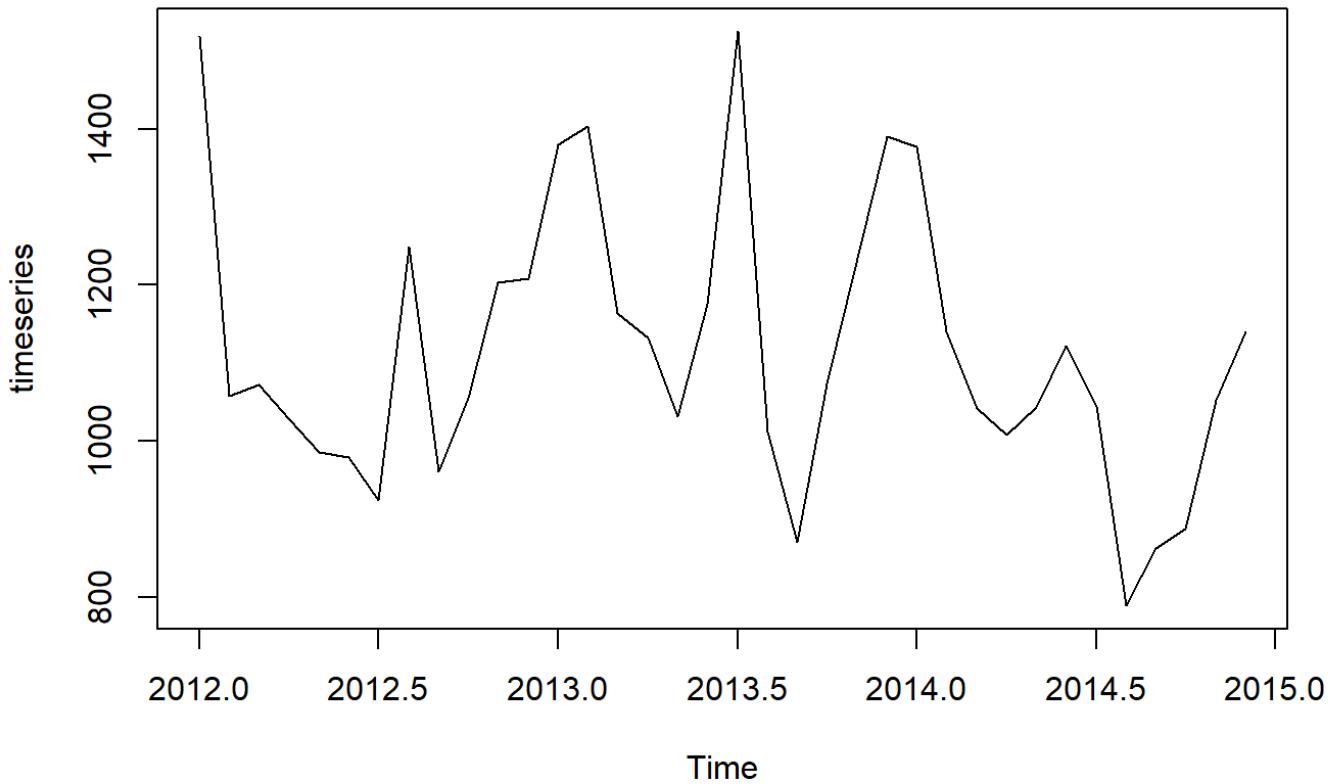


Forecasts from HoltWinters

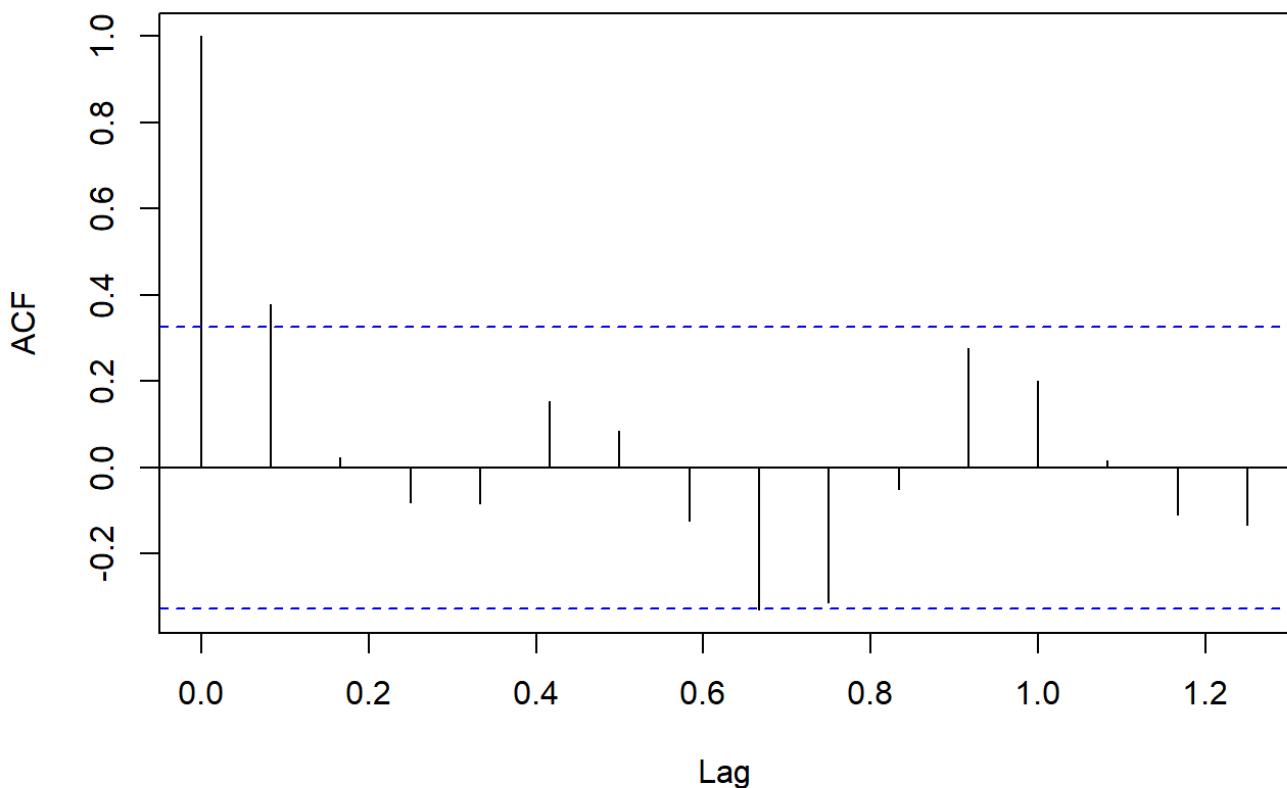


```
## [1] 82.10259
```

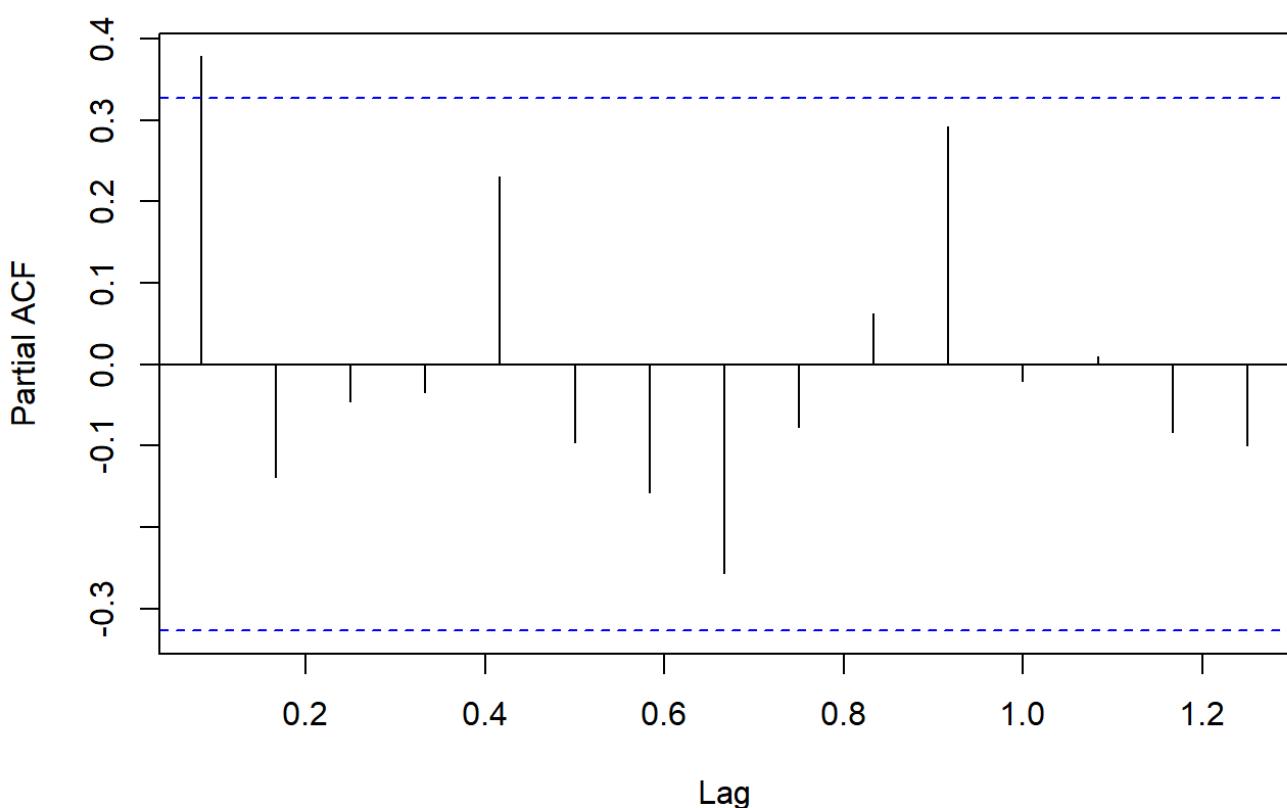
```
traintest(tv_ts37)
```



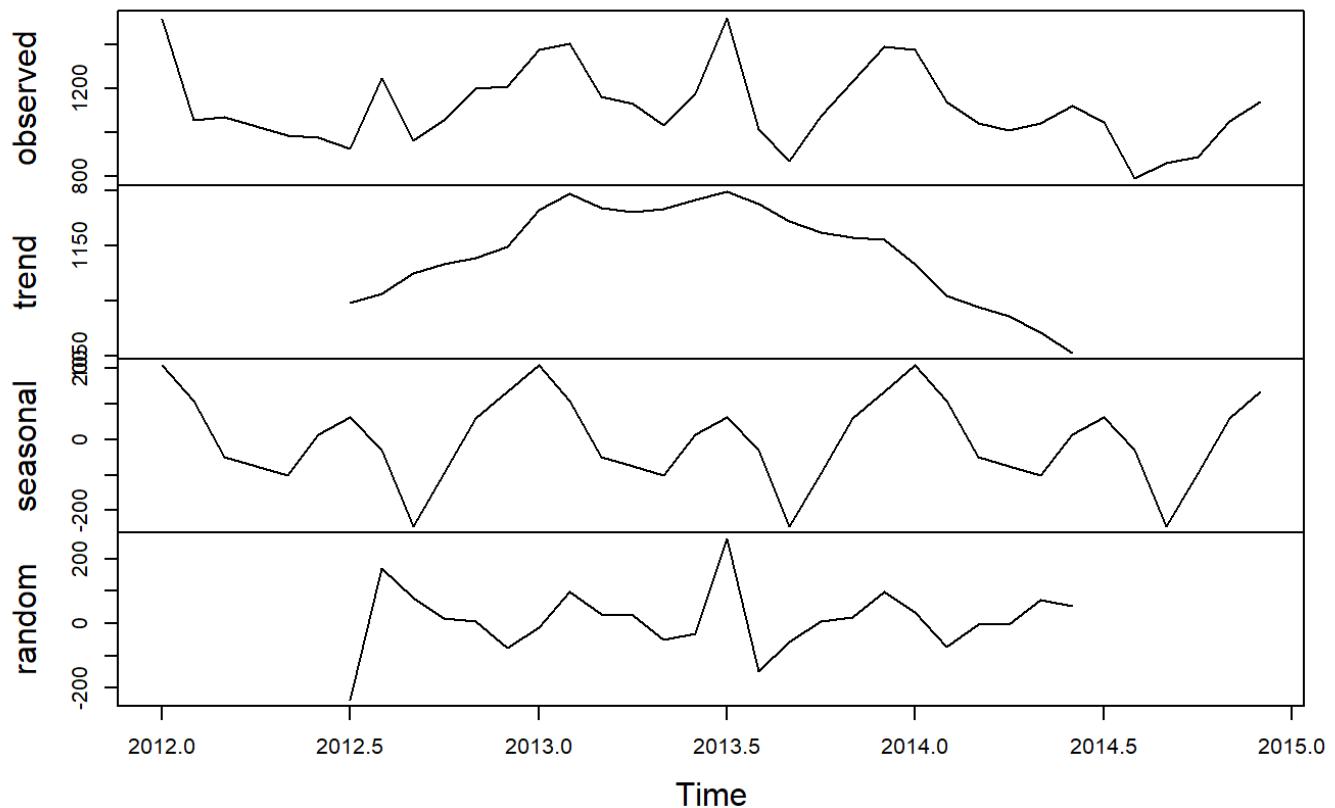
Series timeseries



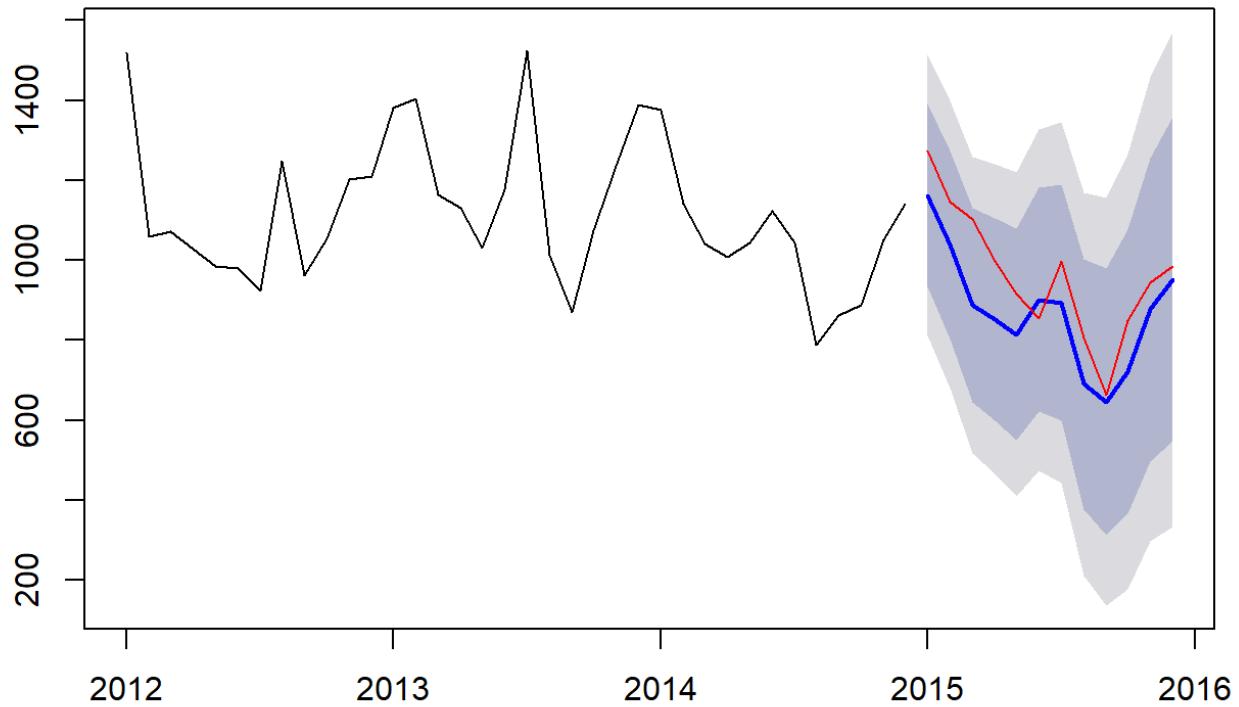
Series timeseries



Decomposition of additive time series

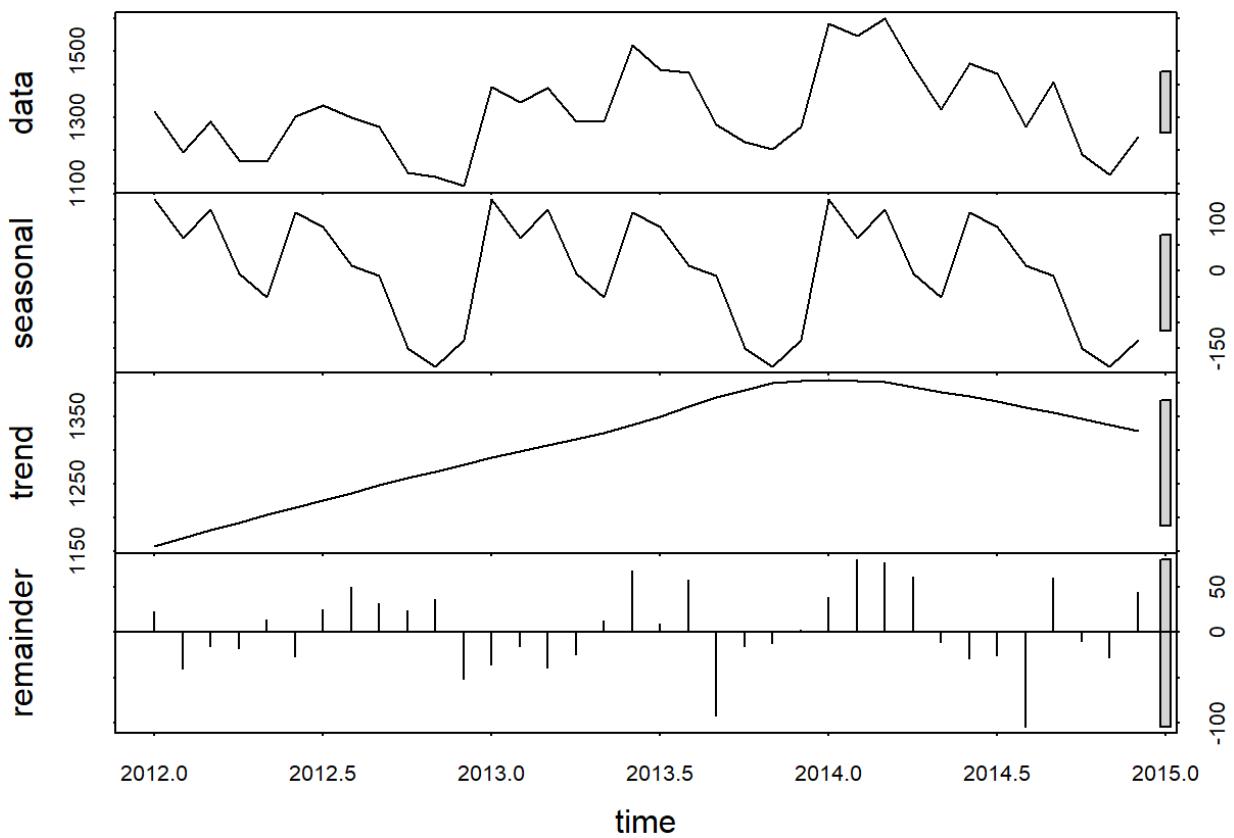
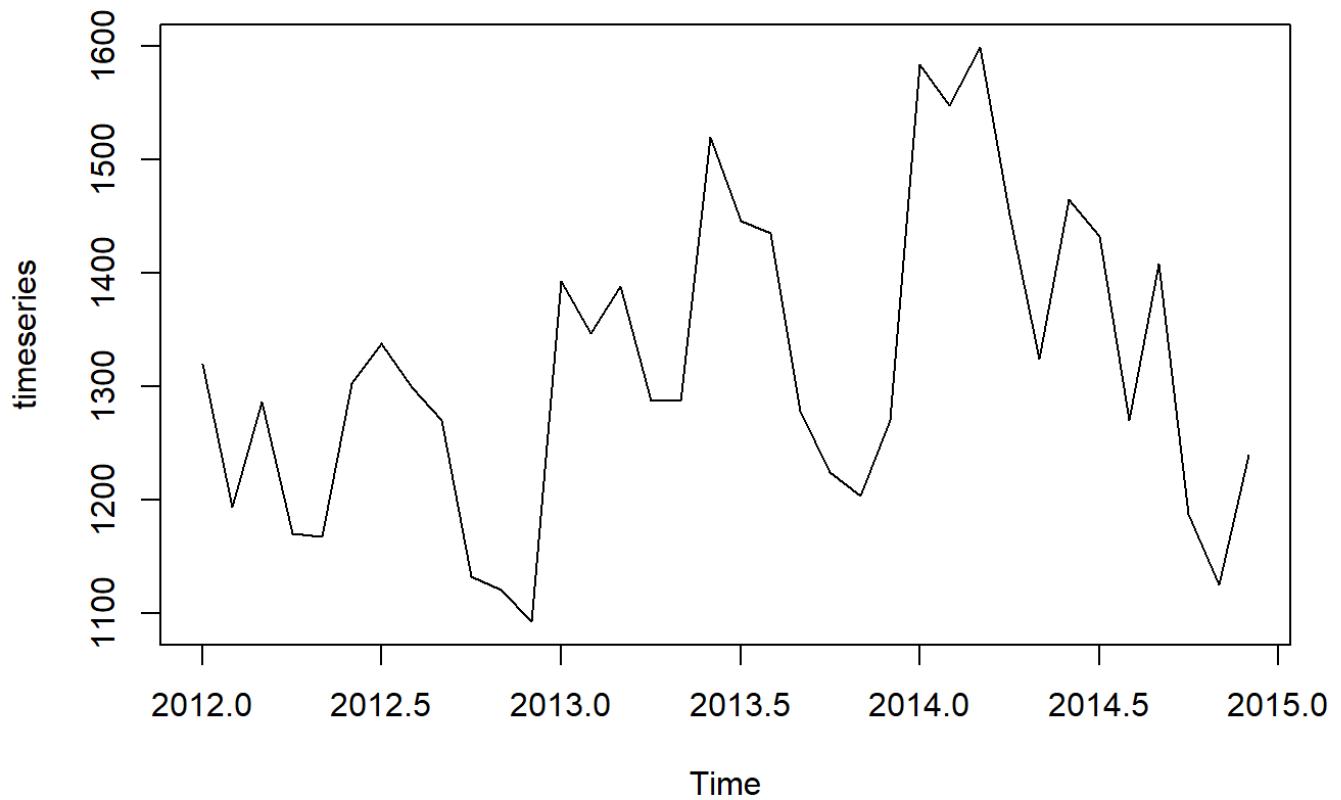


Forecasts from HoltWinters

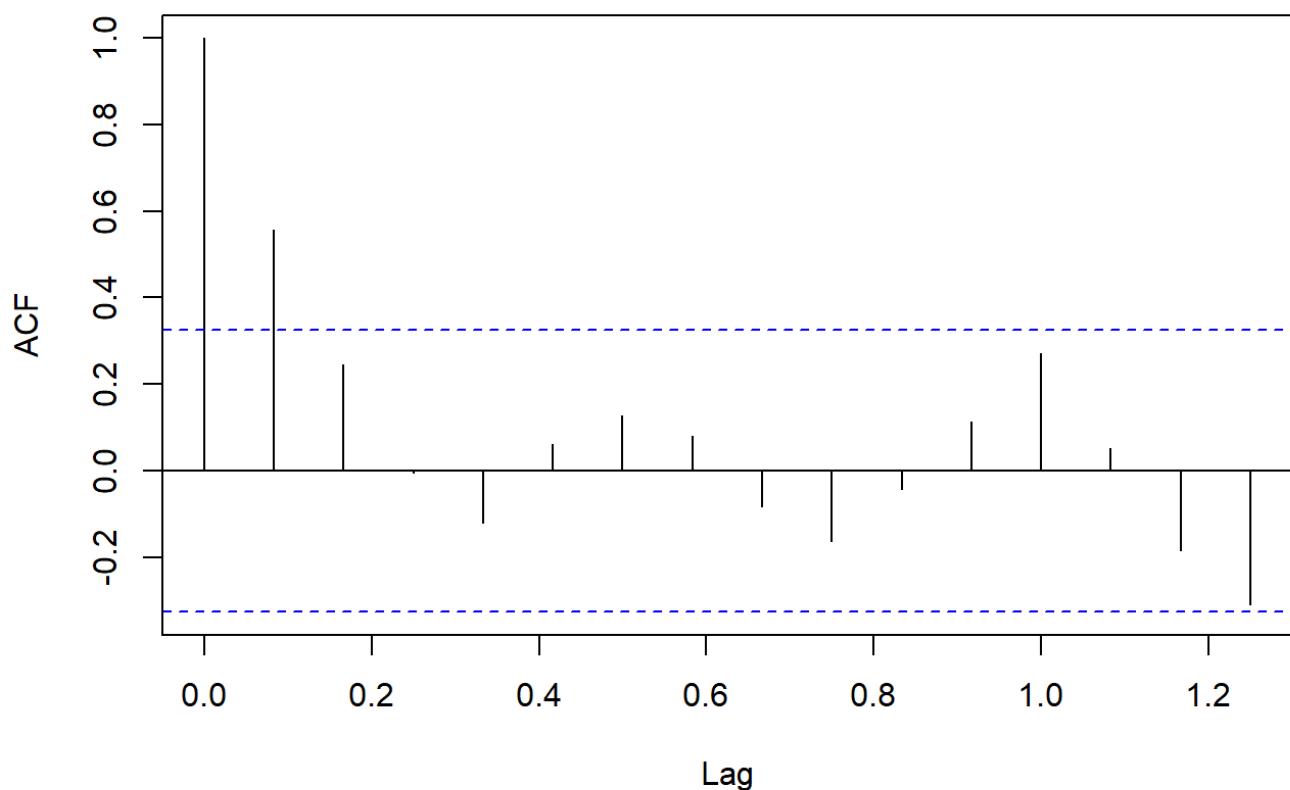


```
## [1] 99.05151
```

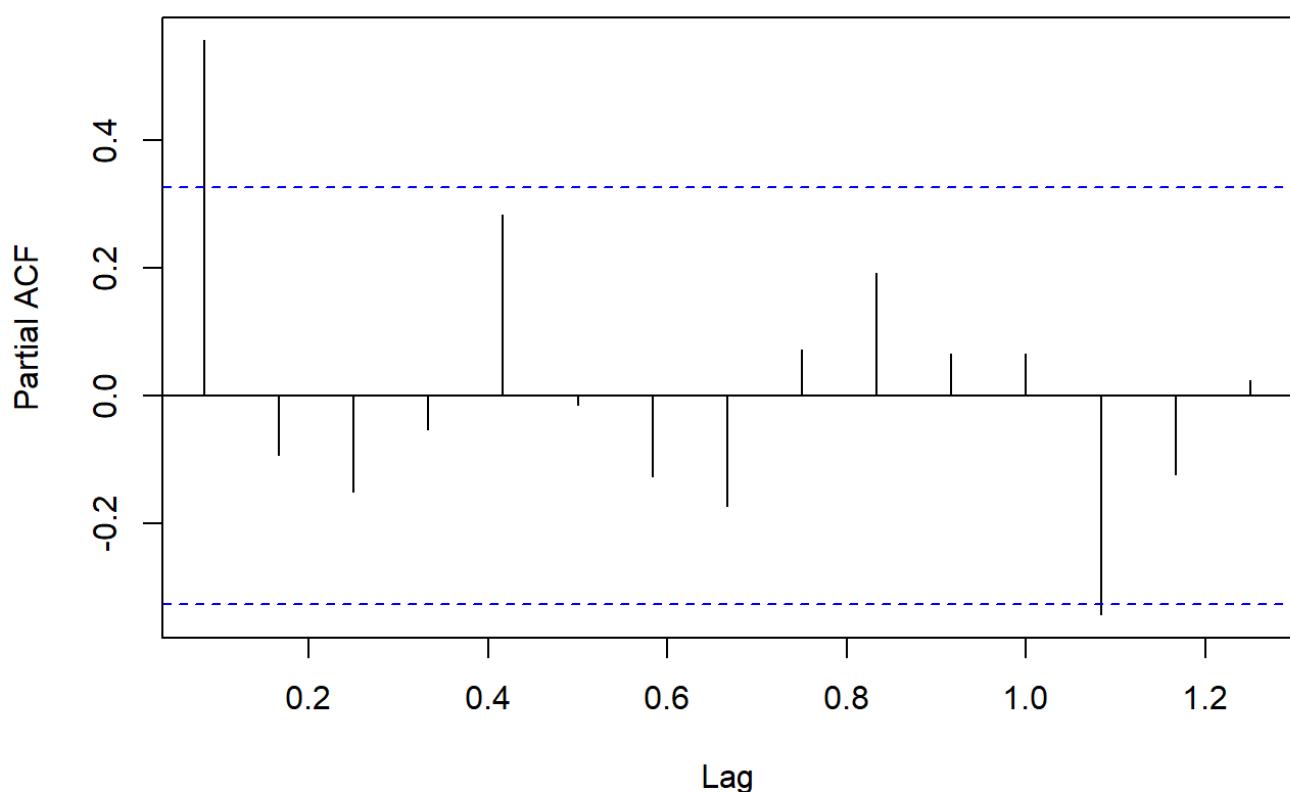
```
traintest(tv_ts38)
```



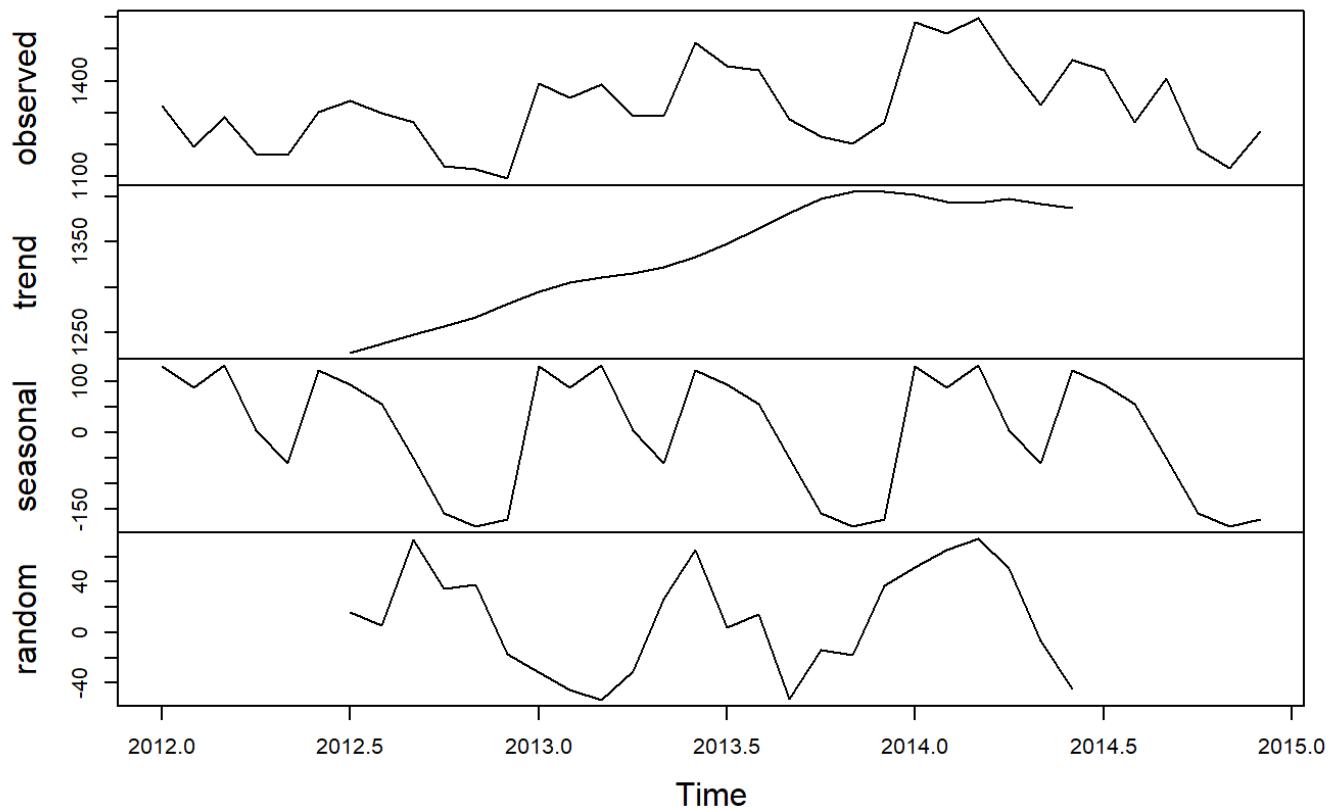
Series timeseries



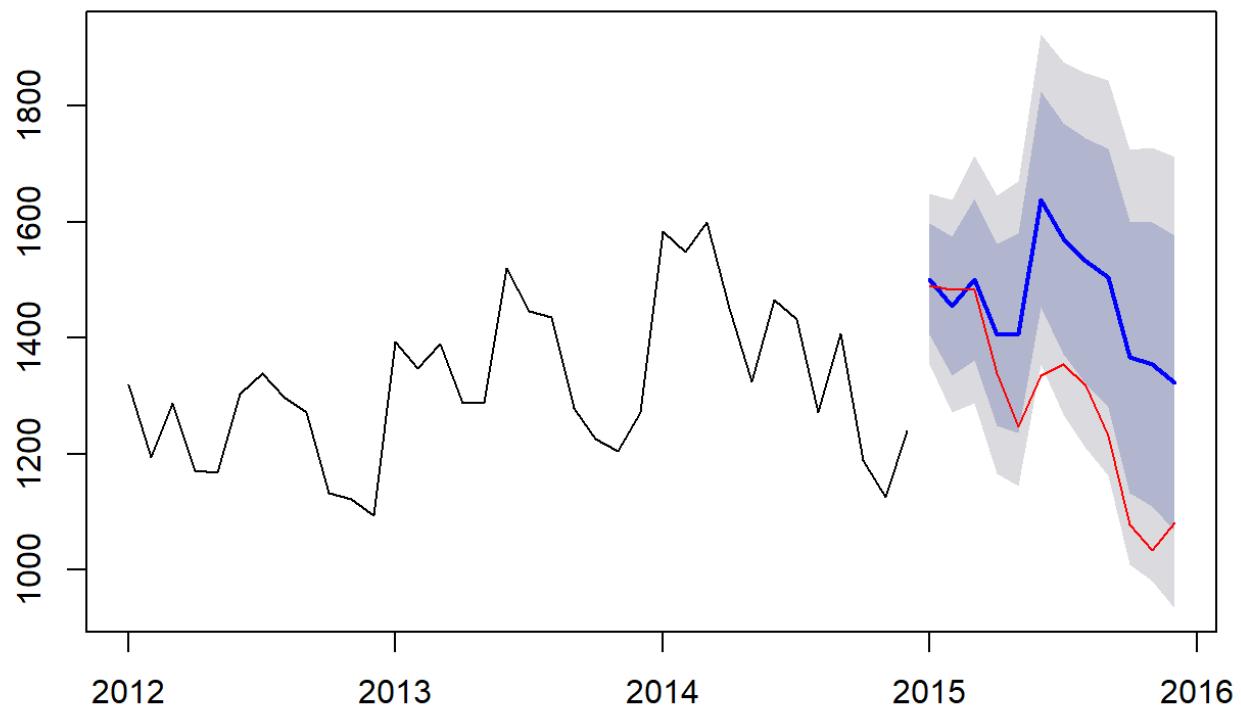
Series timeseries



Decomposition of additive time series

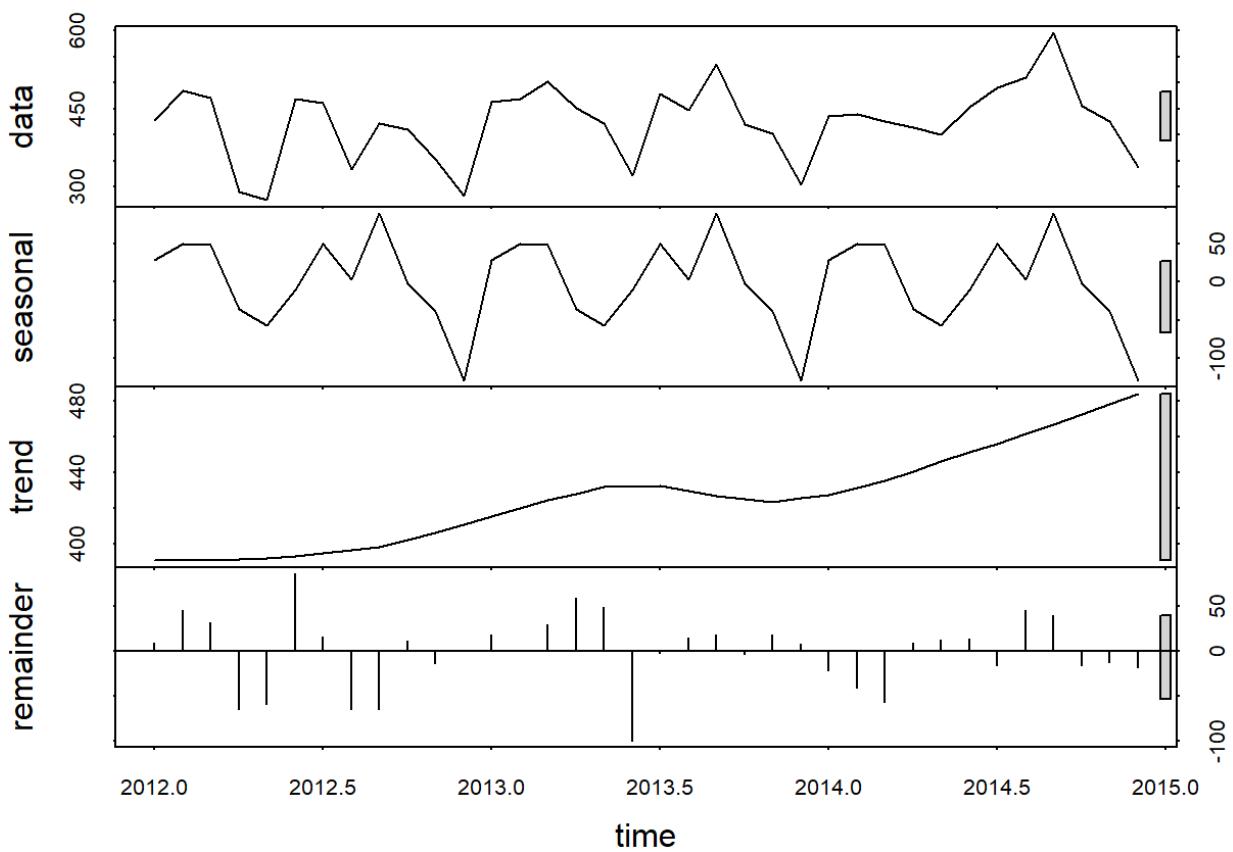
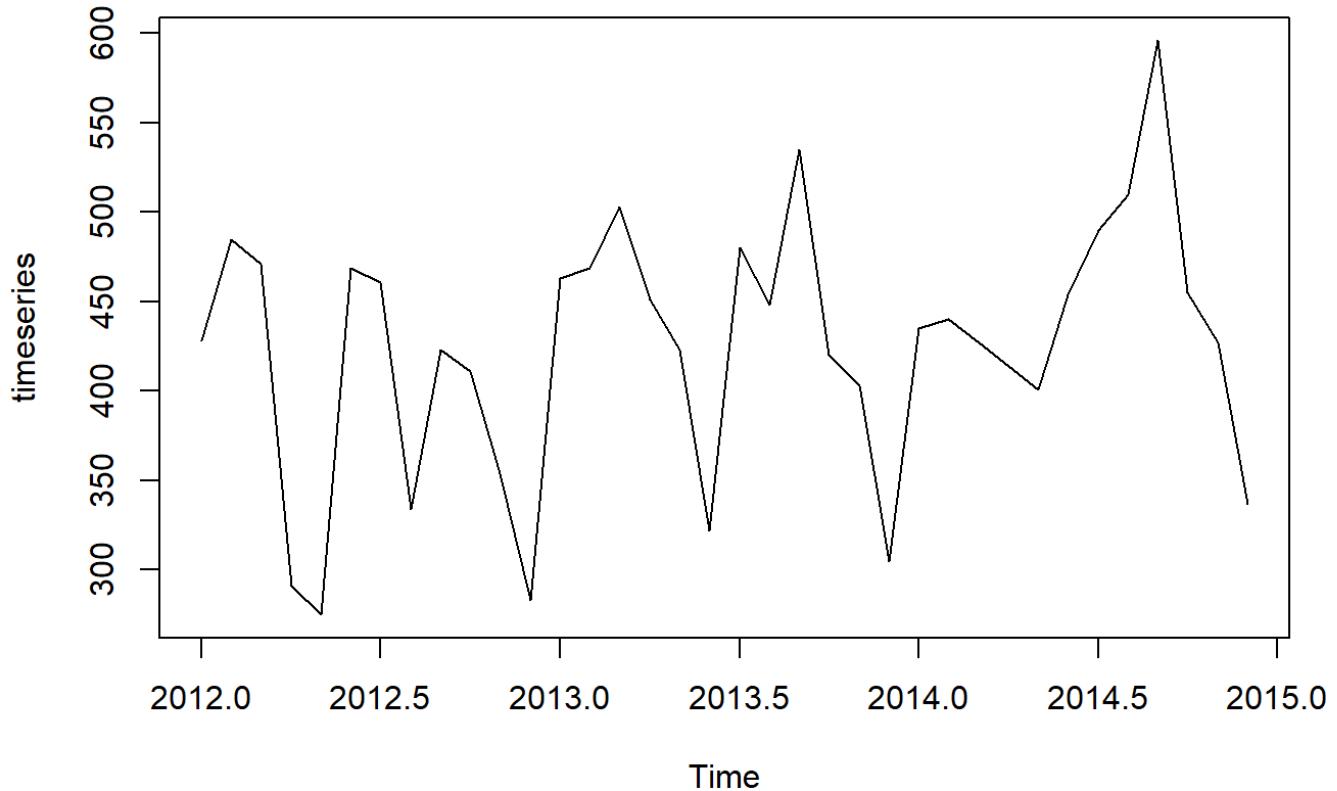


Forecasts from HoltWinters

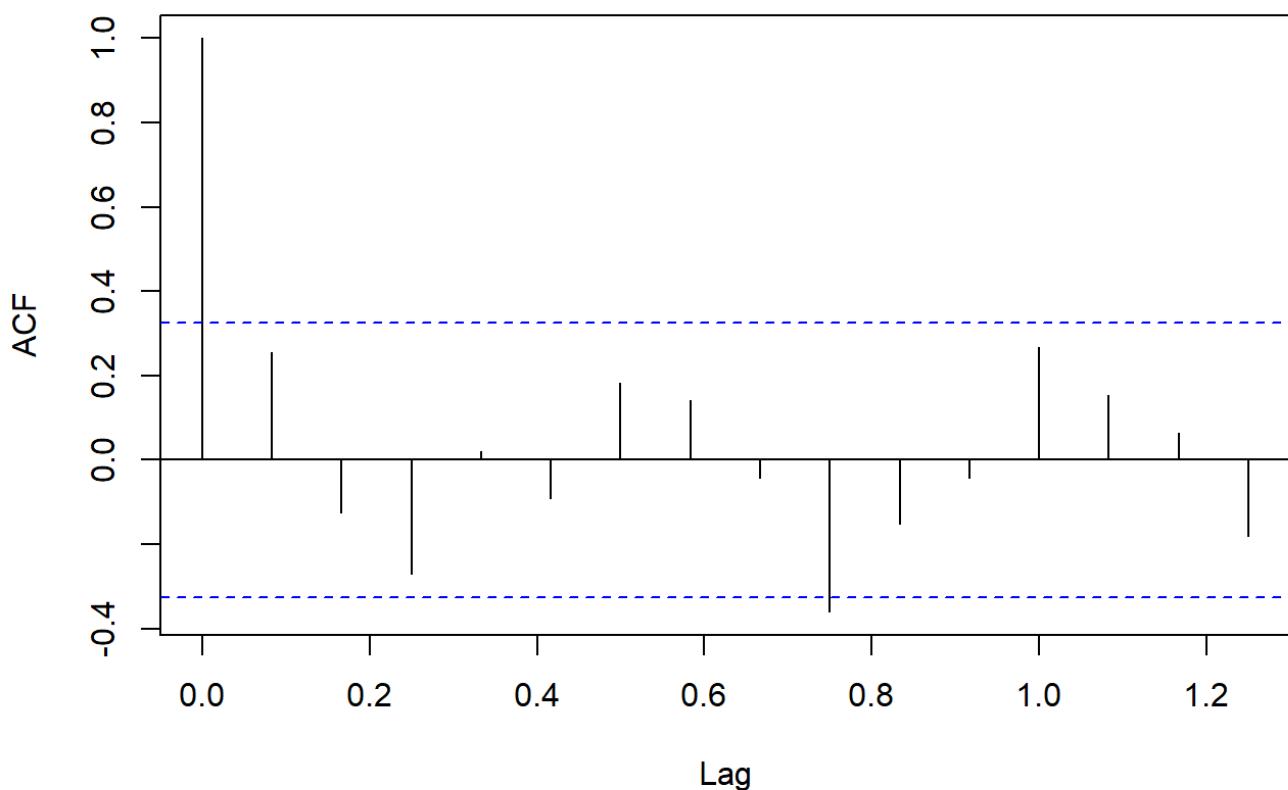


```
## [1] 178.7292
```

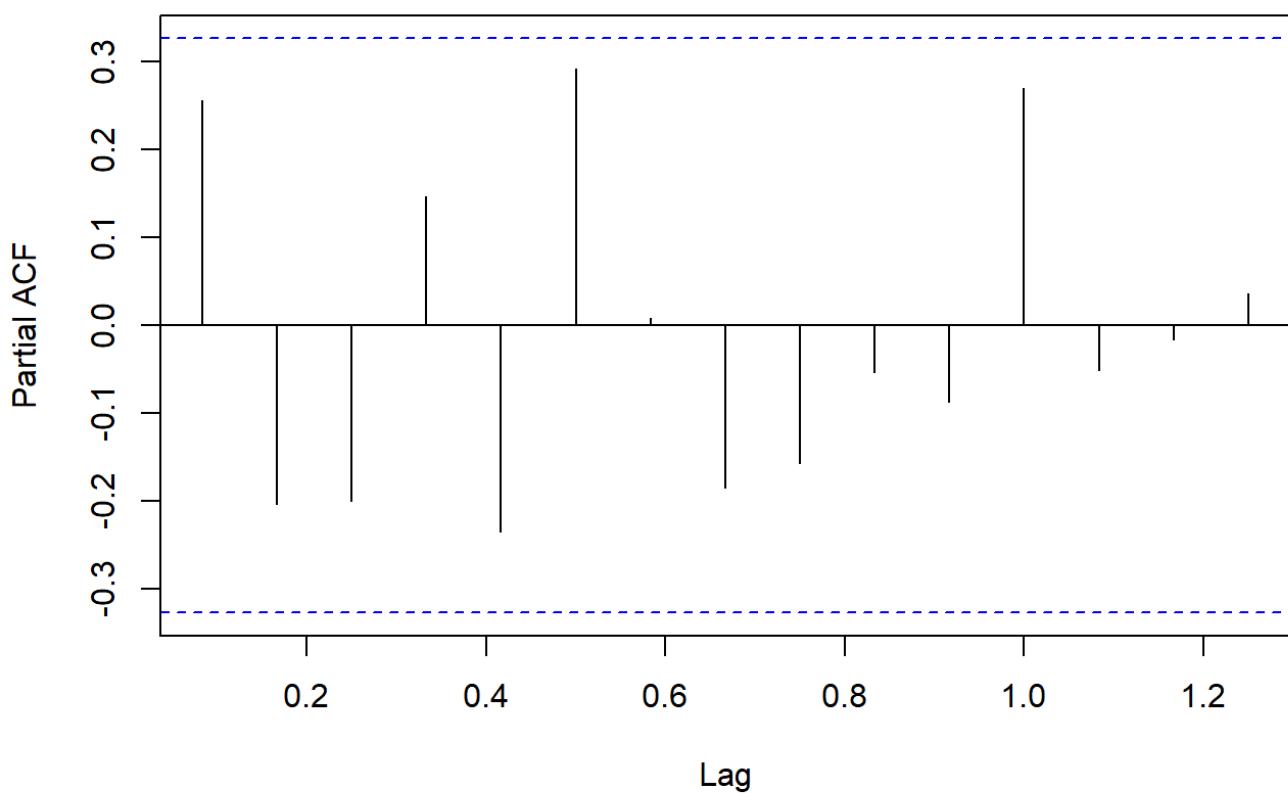
```
traintest(tv_ts39)
```



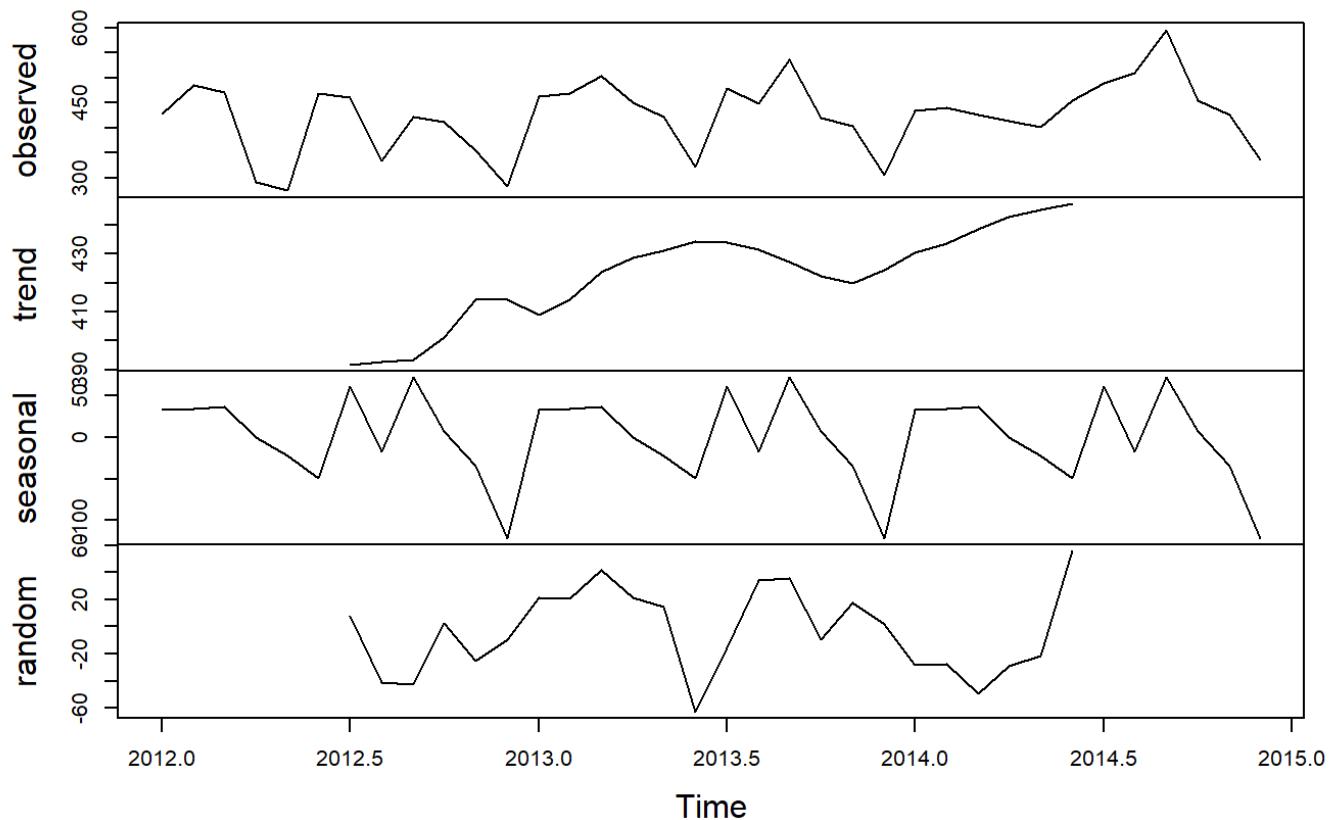
Series timeseries



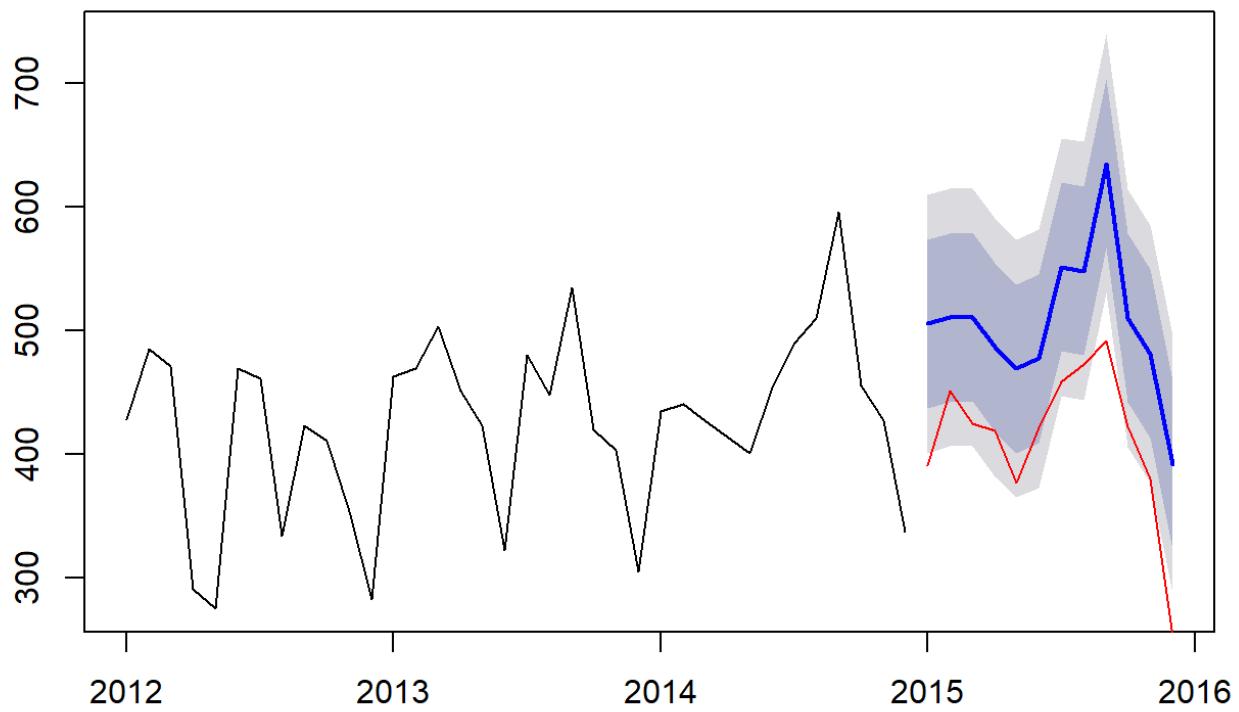
Series timeseries



Decomposition of additive time series

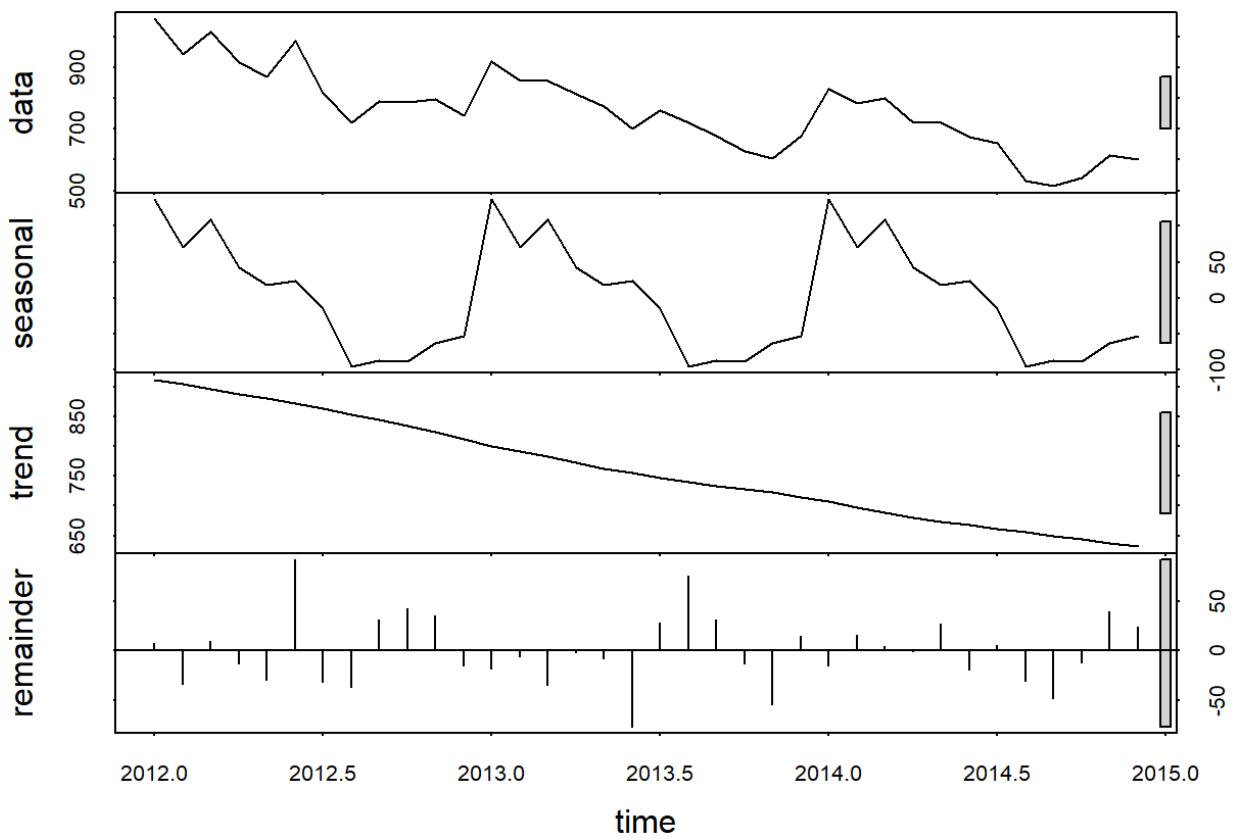
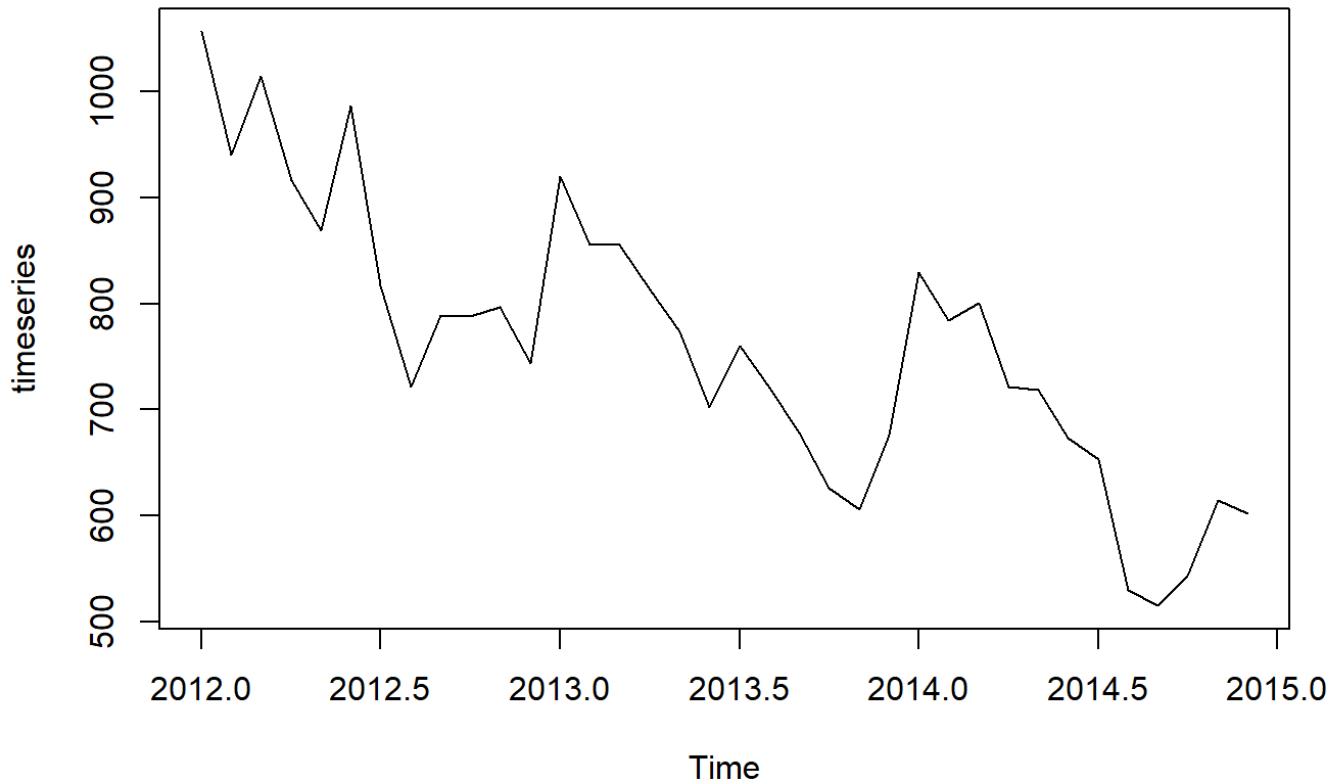


Forecasts from HoltWinters

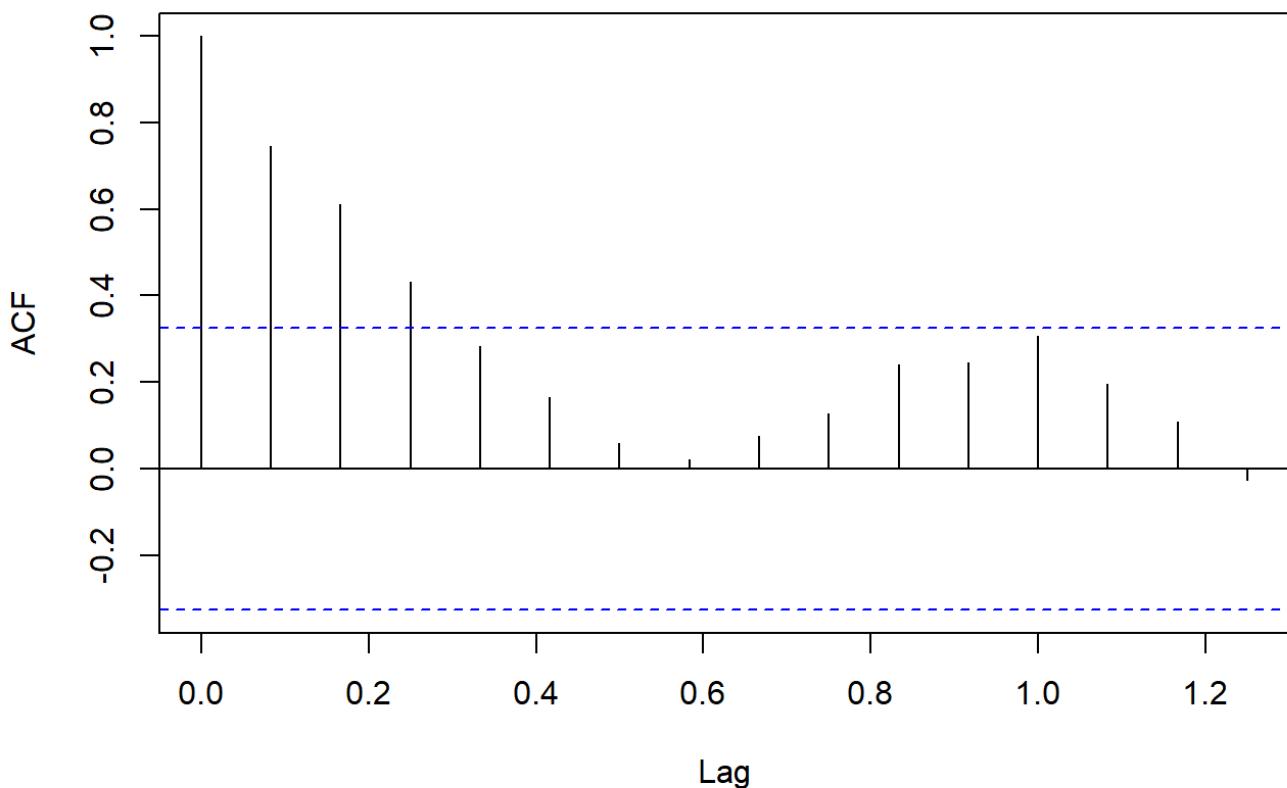


```
## [1] 92.76801
```

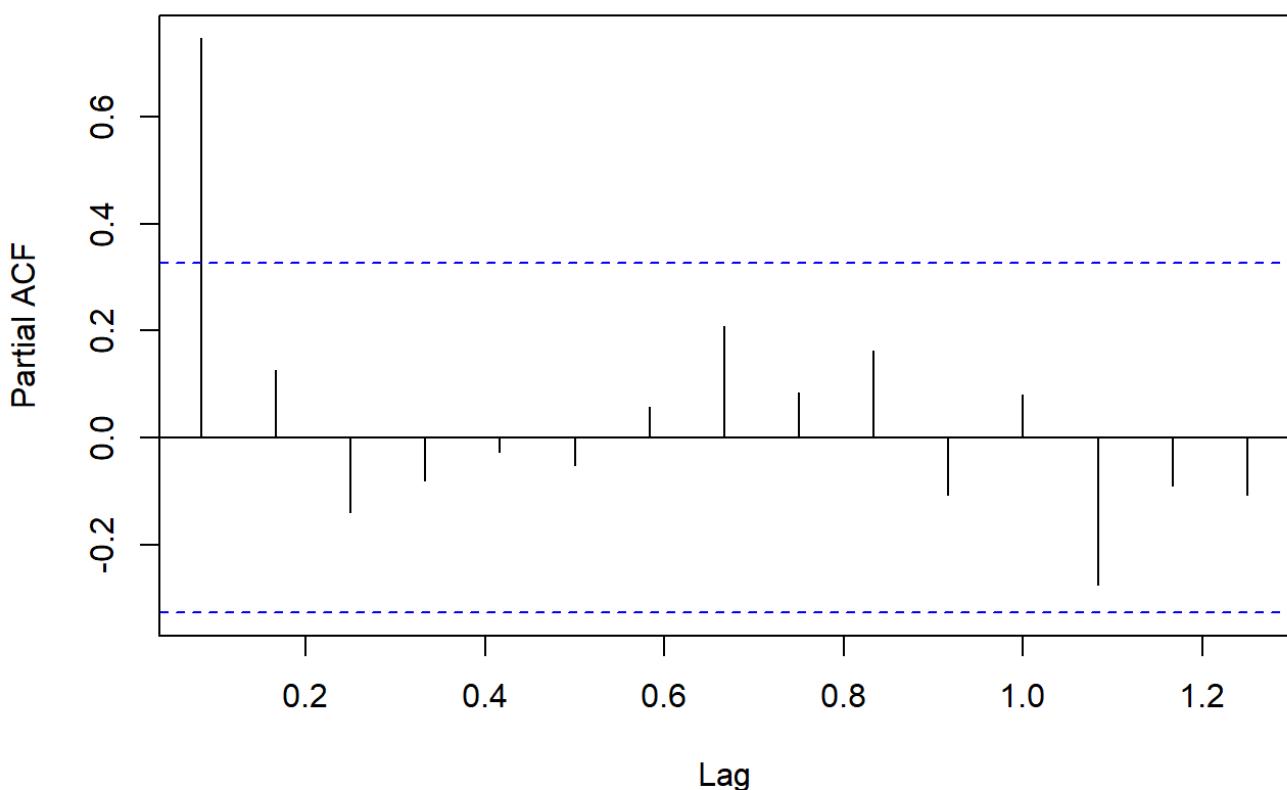
```
traintest(tv_ts40)
```



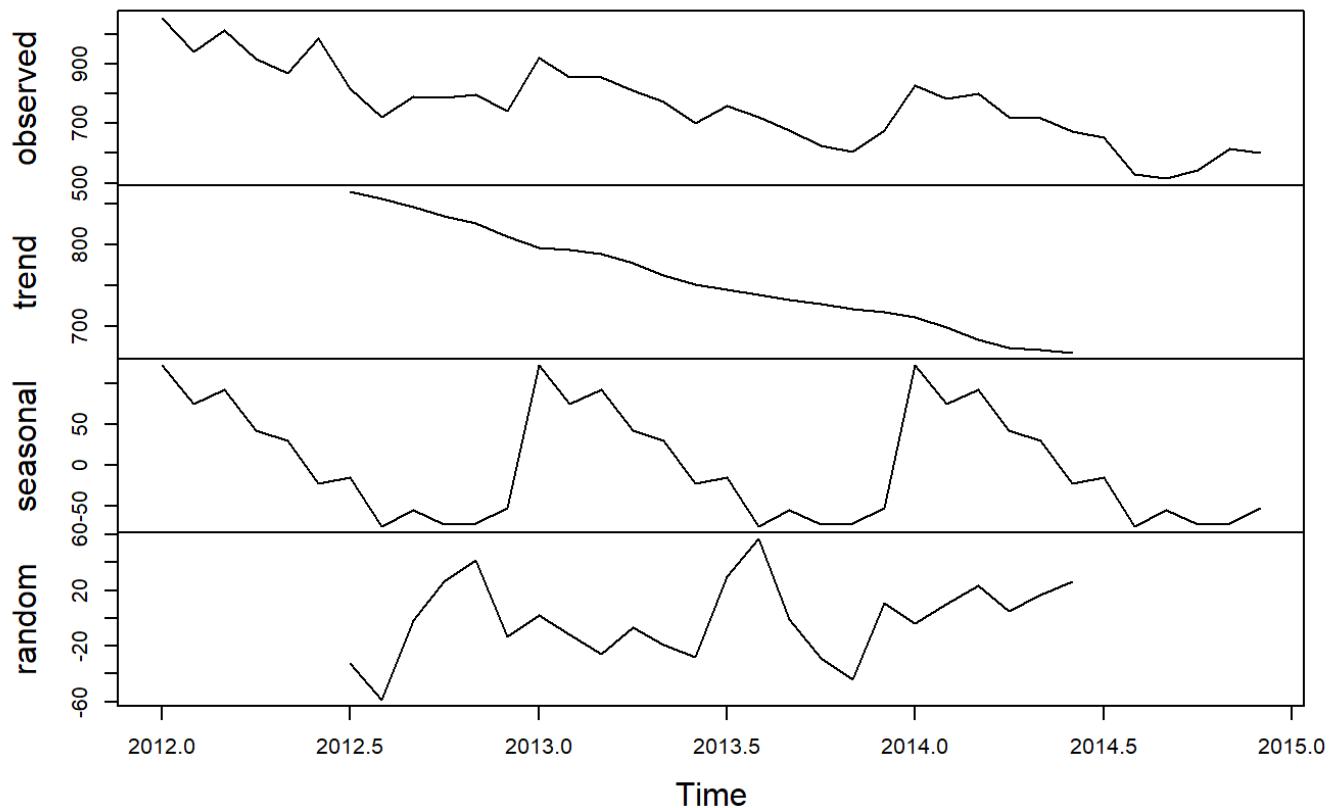
Series timeseries



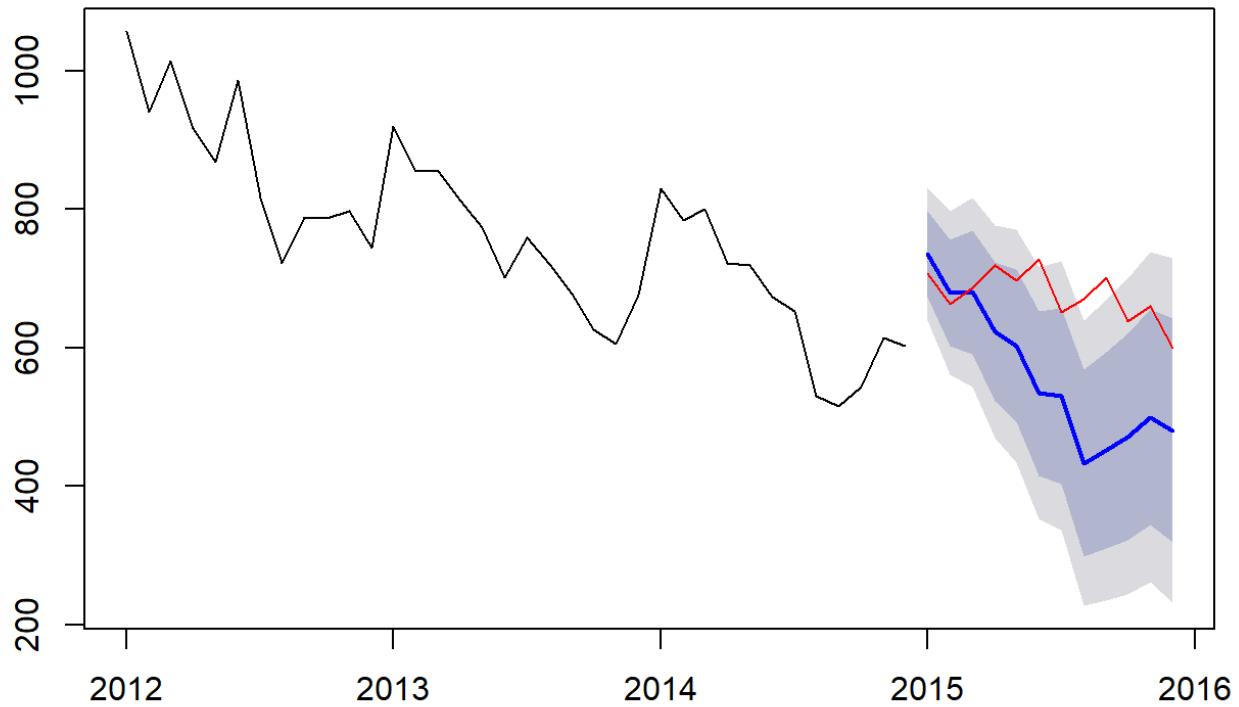
Series timeseries



Decomposition of additive time series

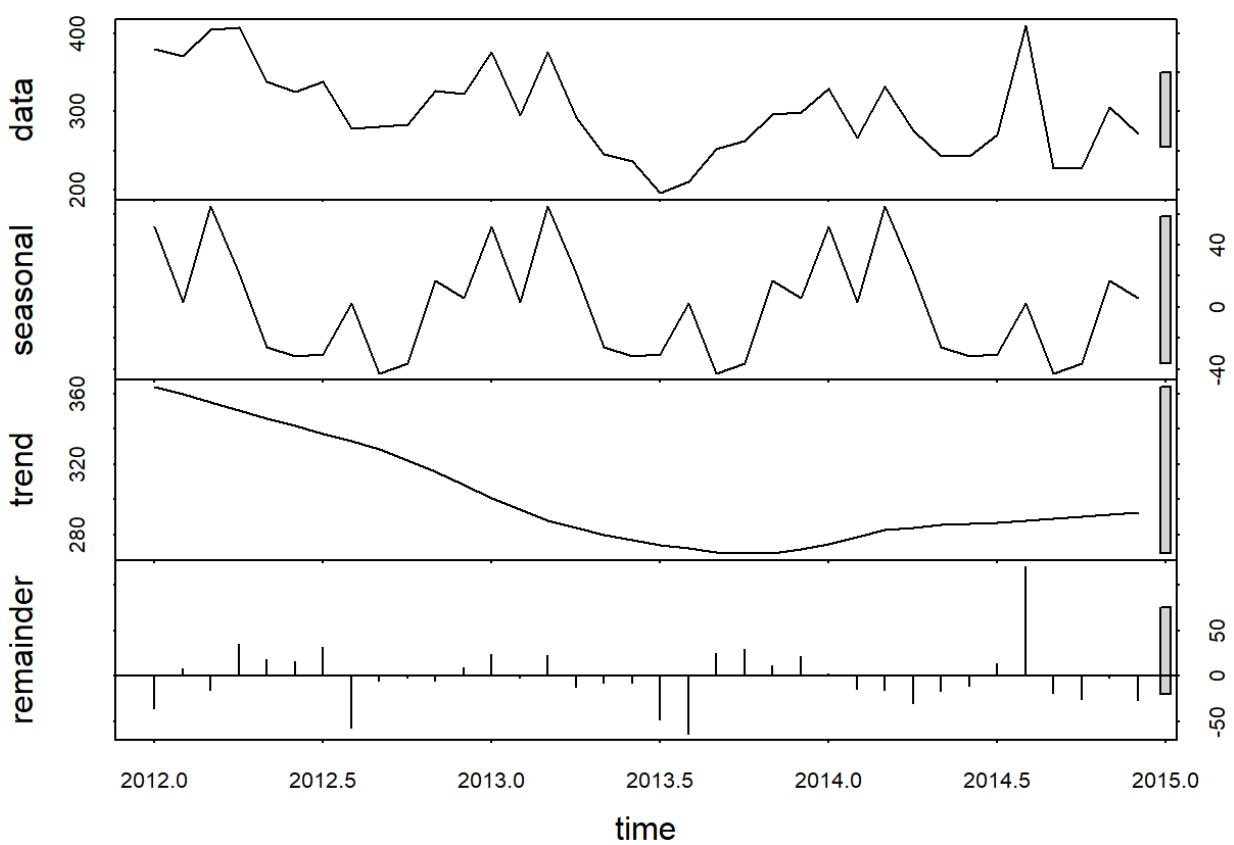
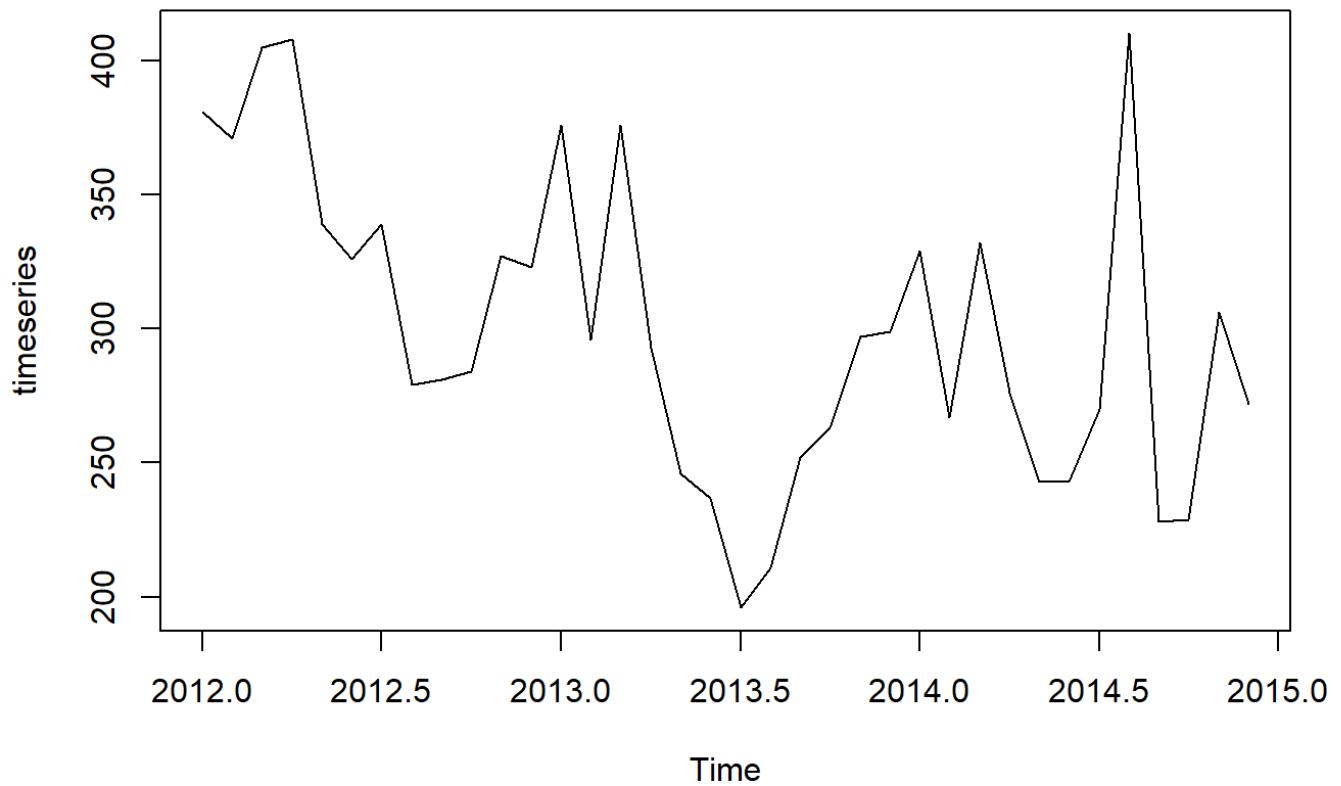


Forecasts from HoltWinters

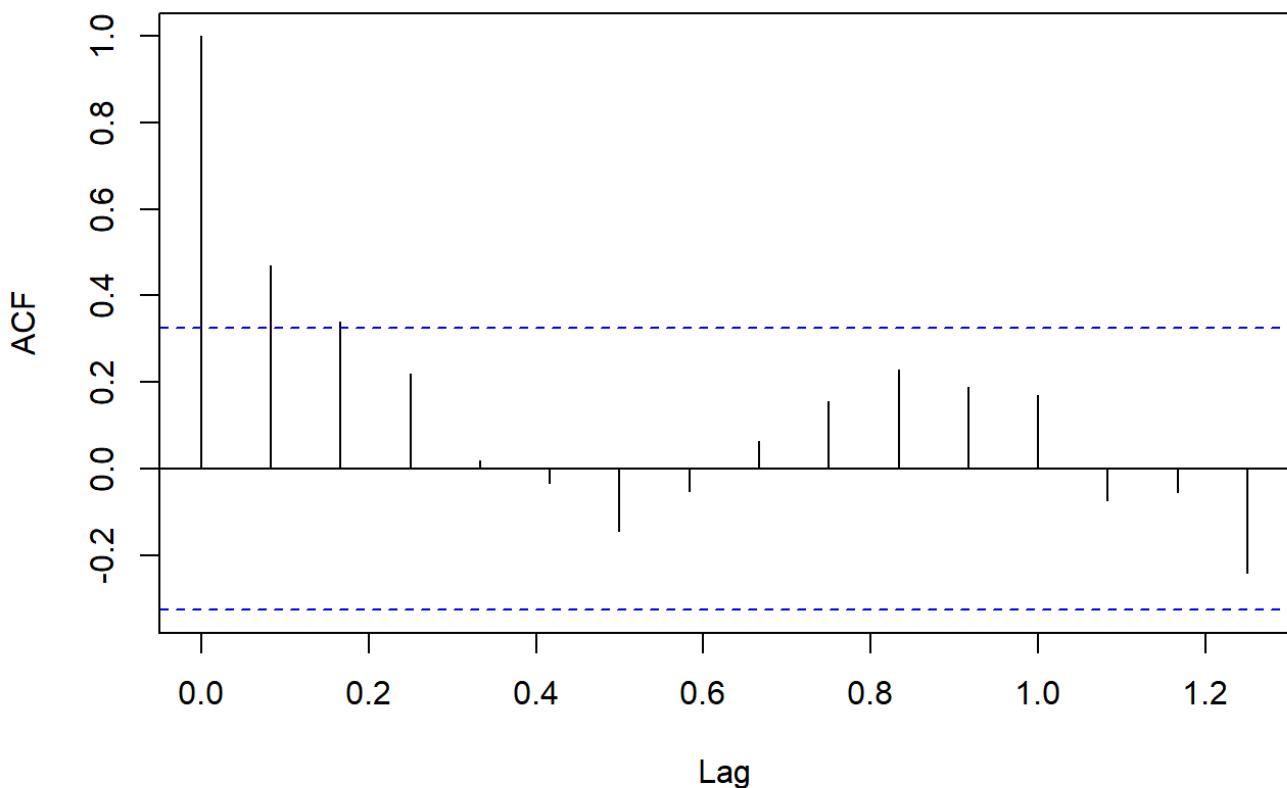


```
## [1] 124.1401
```

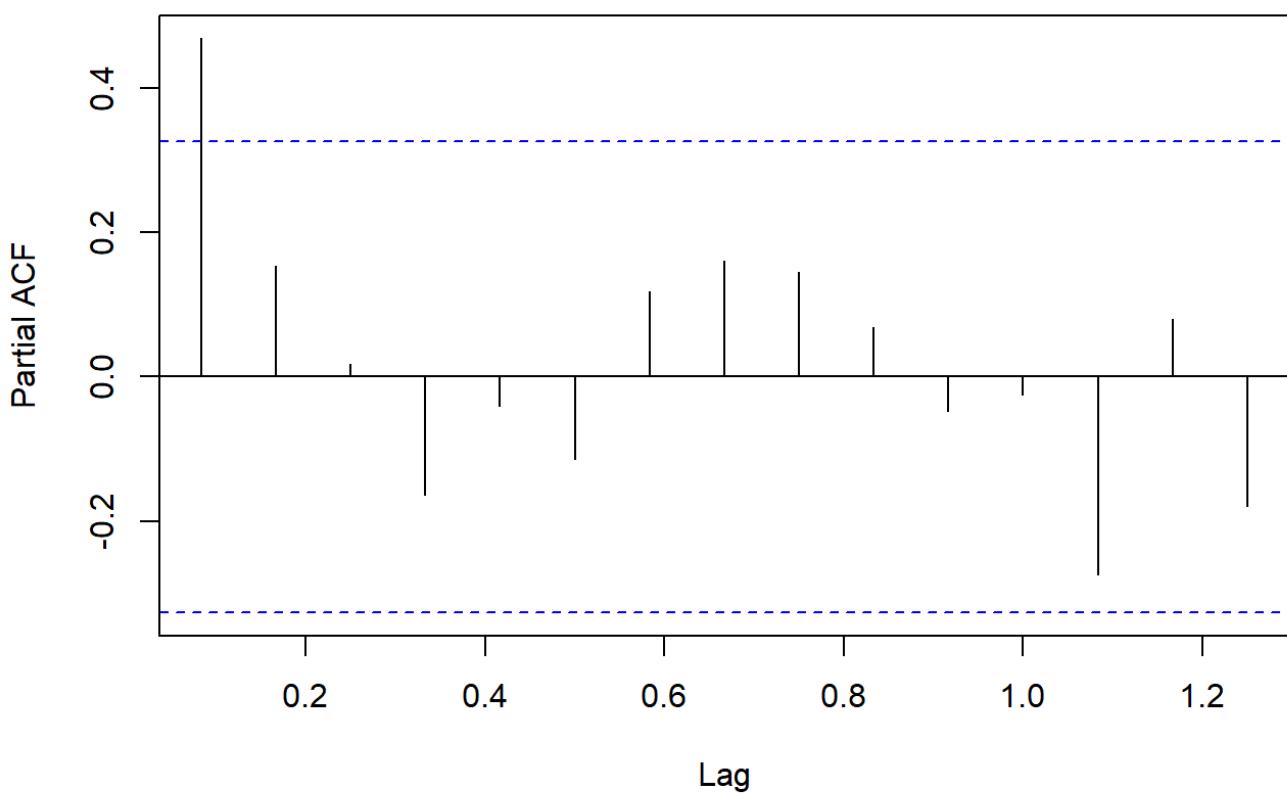
```
traintest(tv_ts41)
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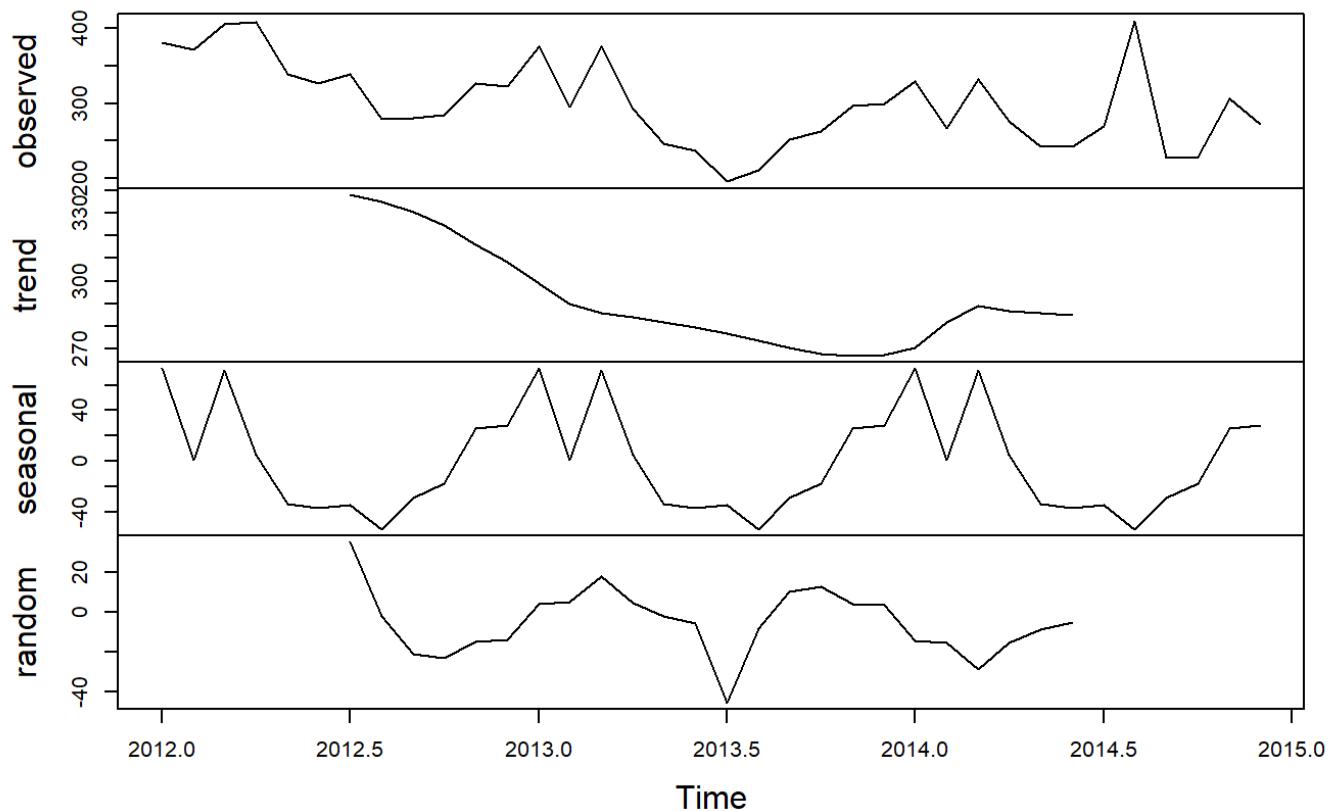
Series timeseries



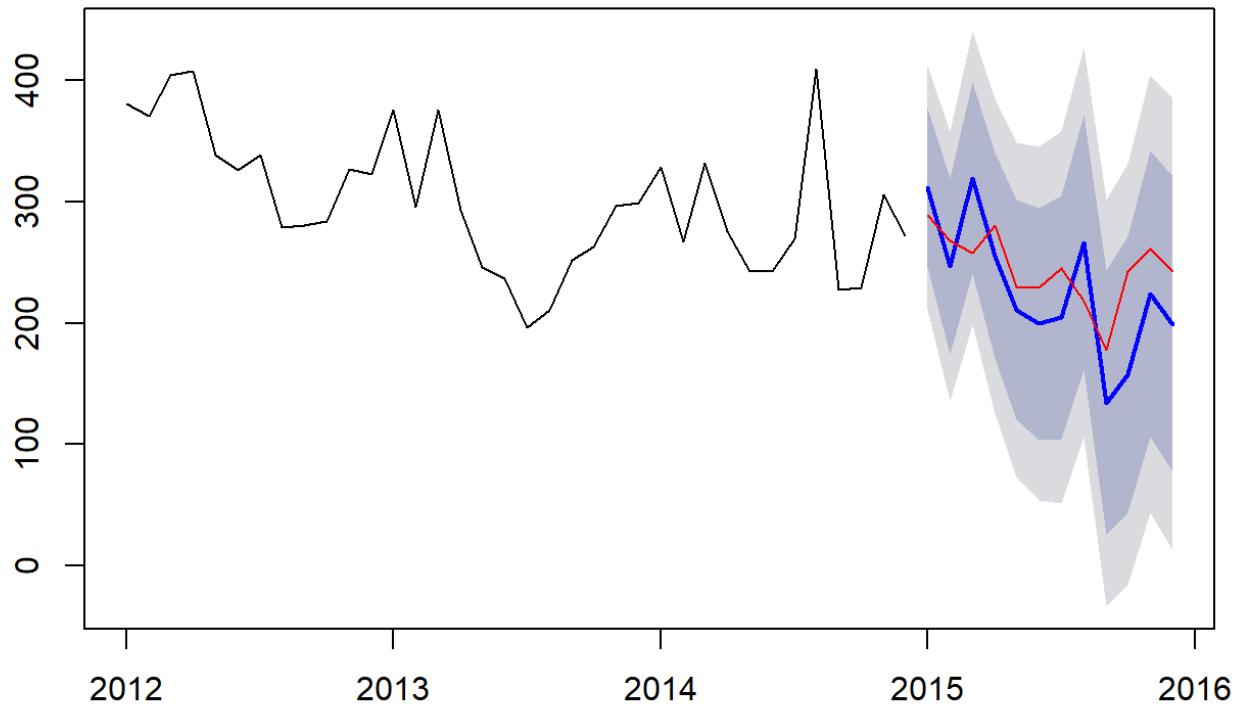
Series timeseries



Decomposition of additive time series

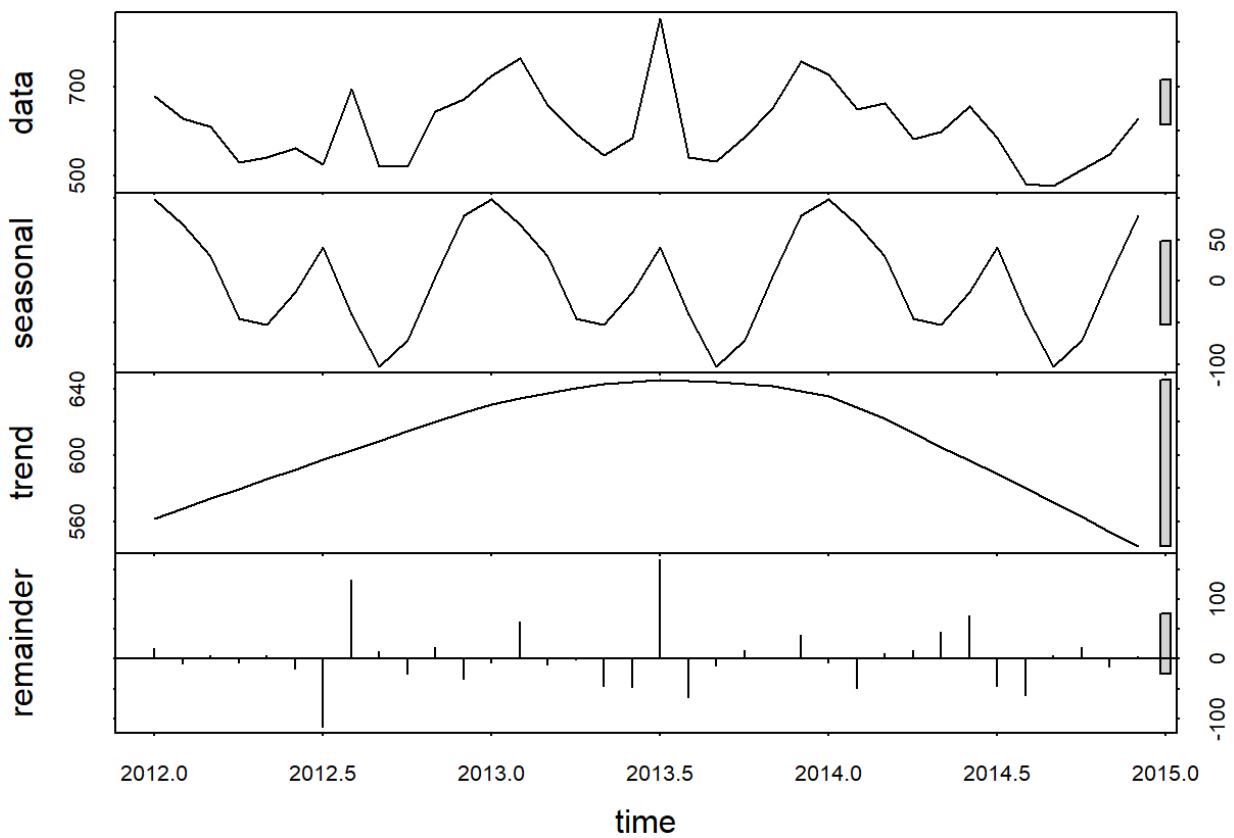
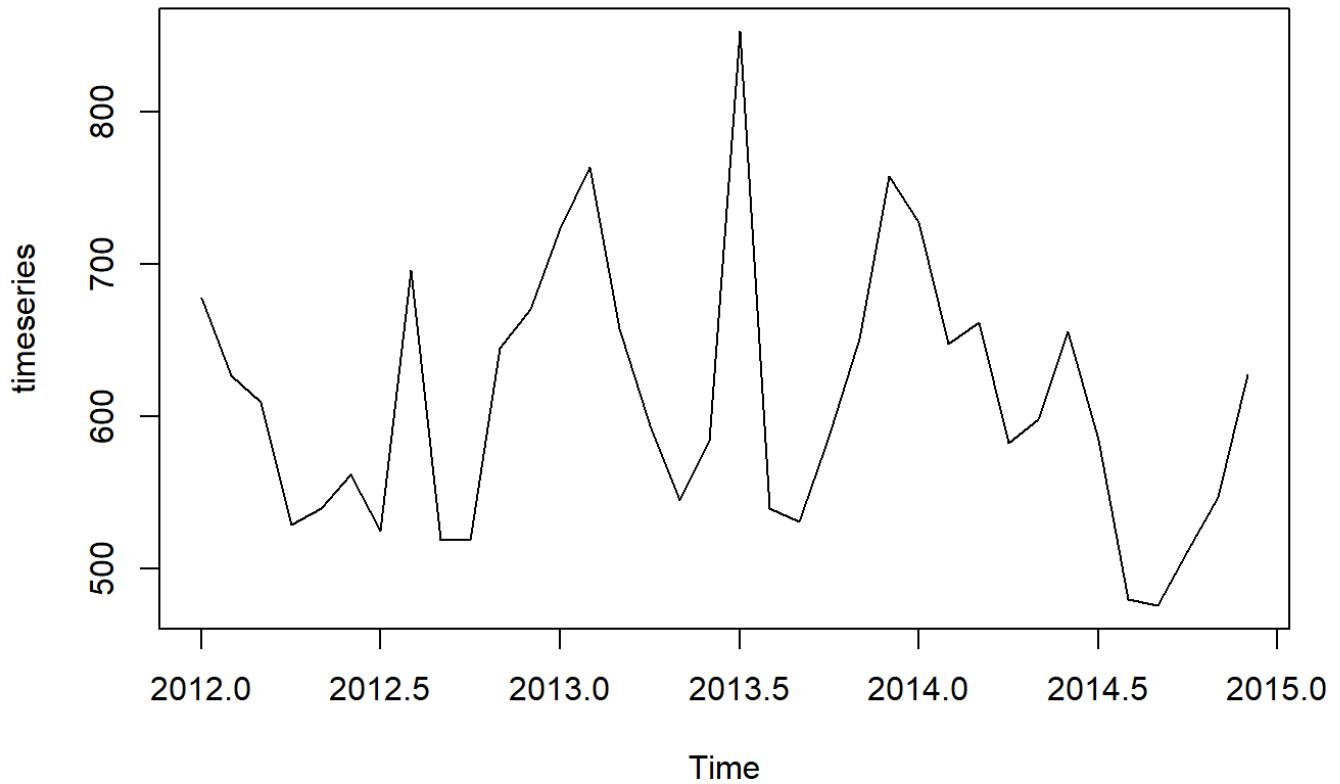


Forecasts from HoltWinters

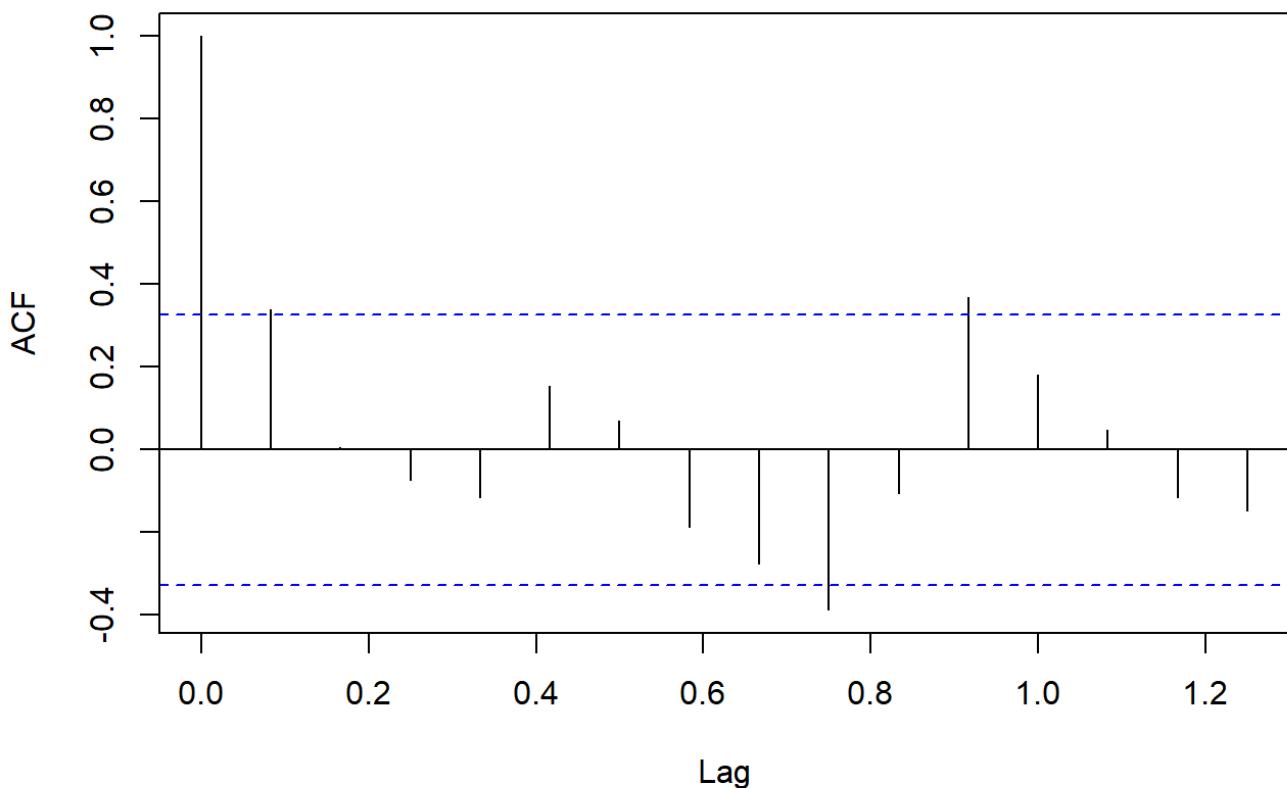


```
## [1] 39.82747
```

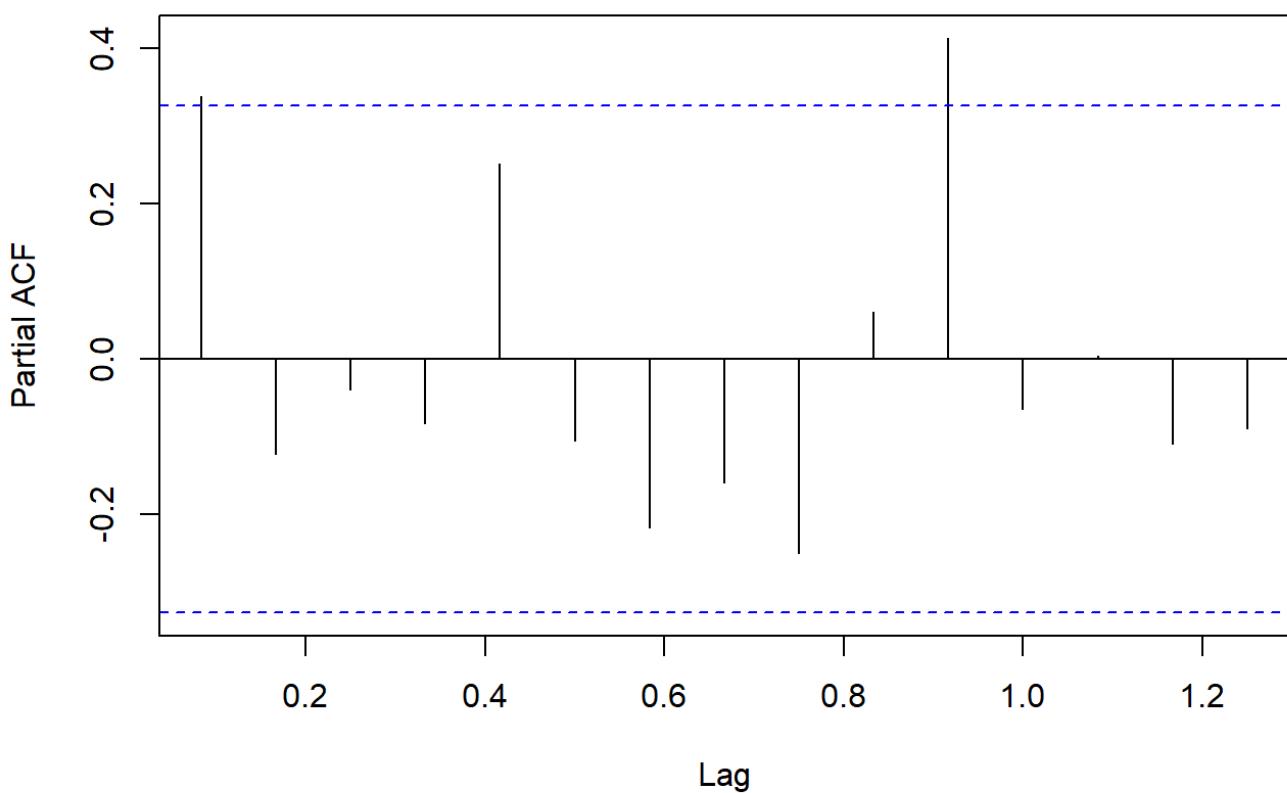
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traintest(tv_ts42)
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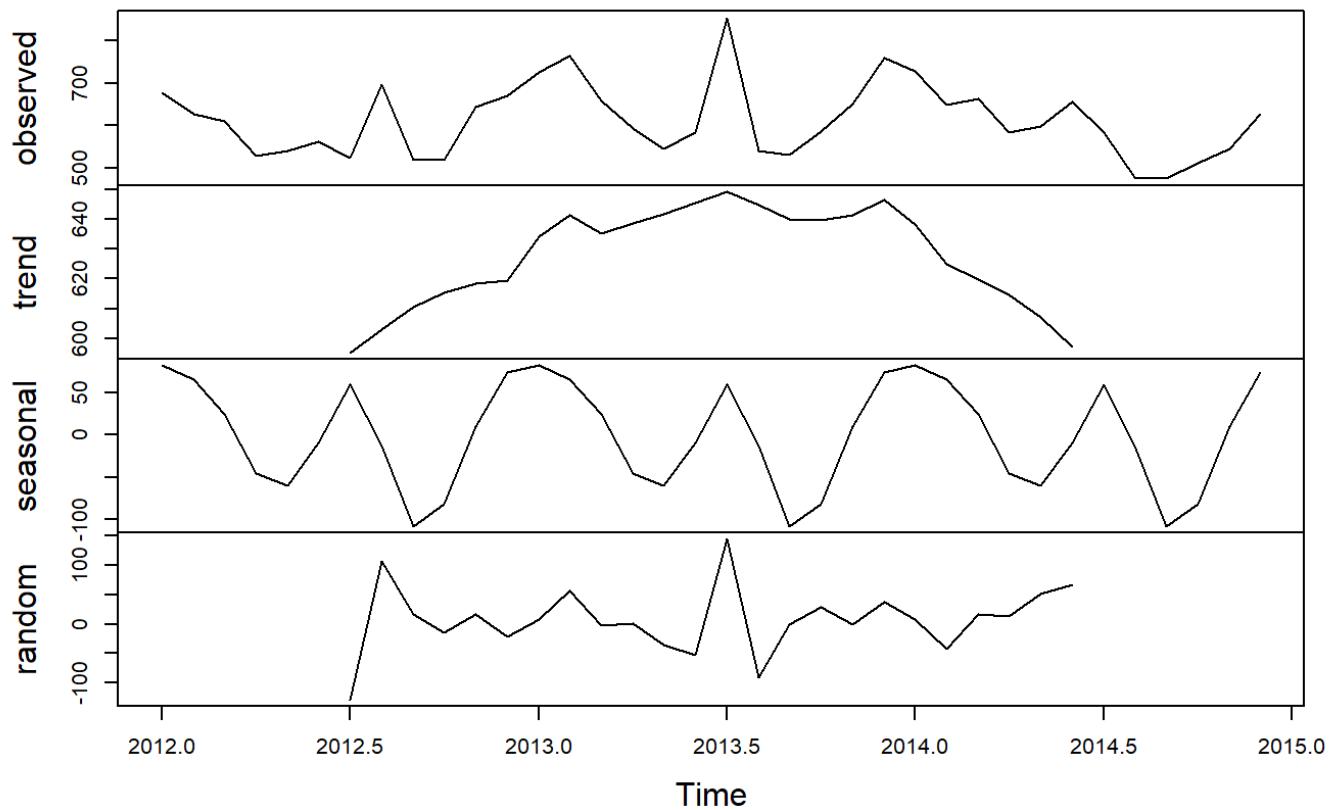
Series timeseries



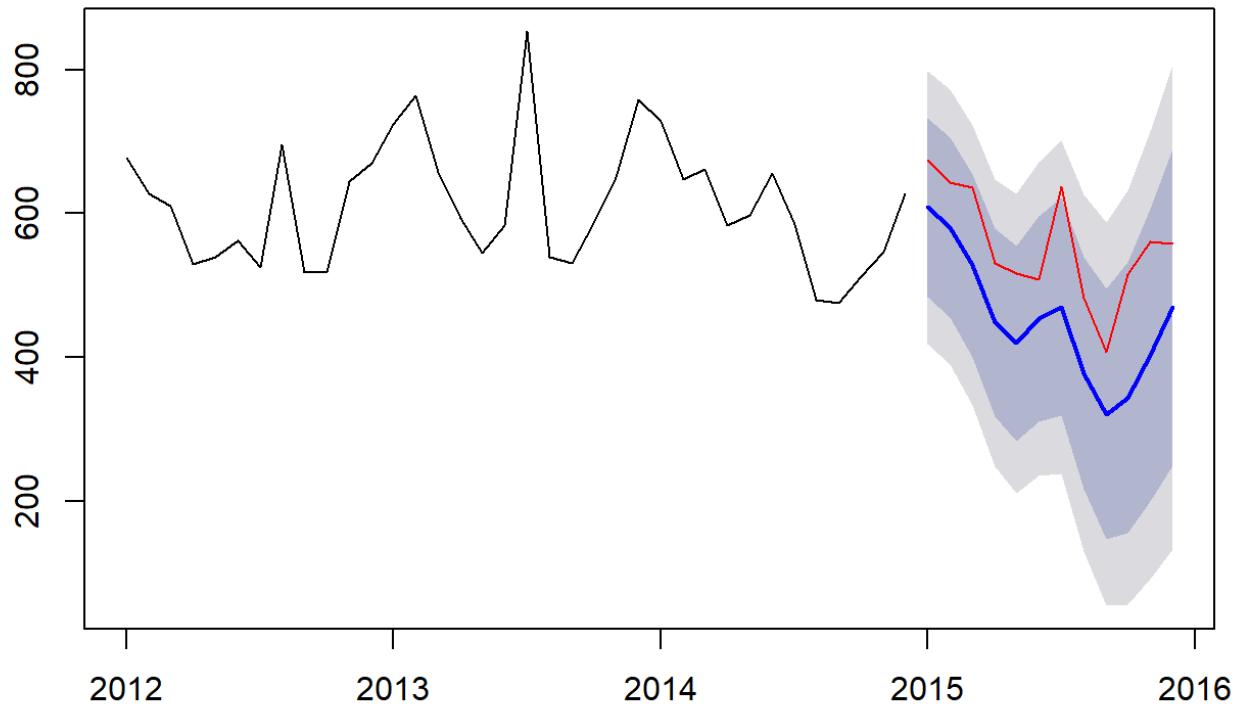
Series timeseries



Decomposition of additive time series

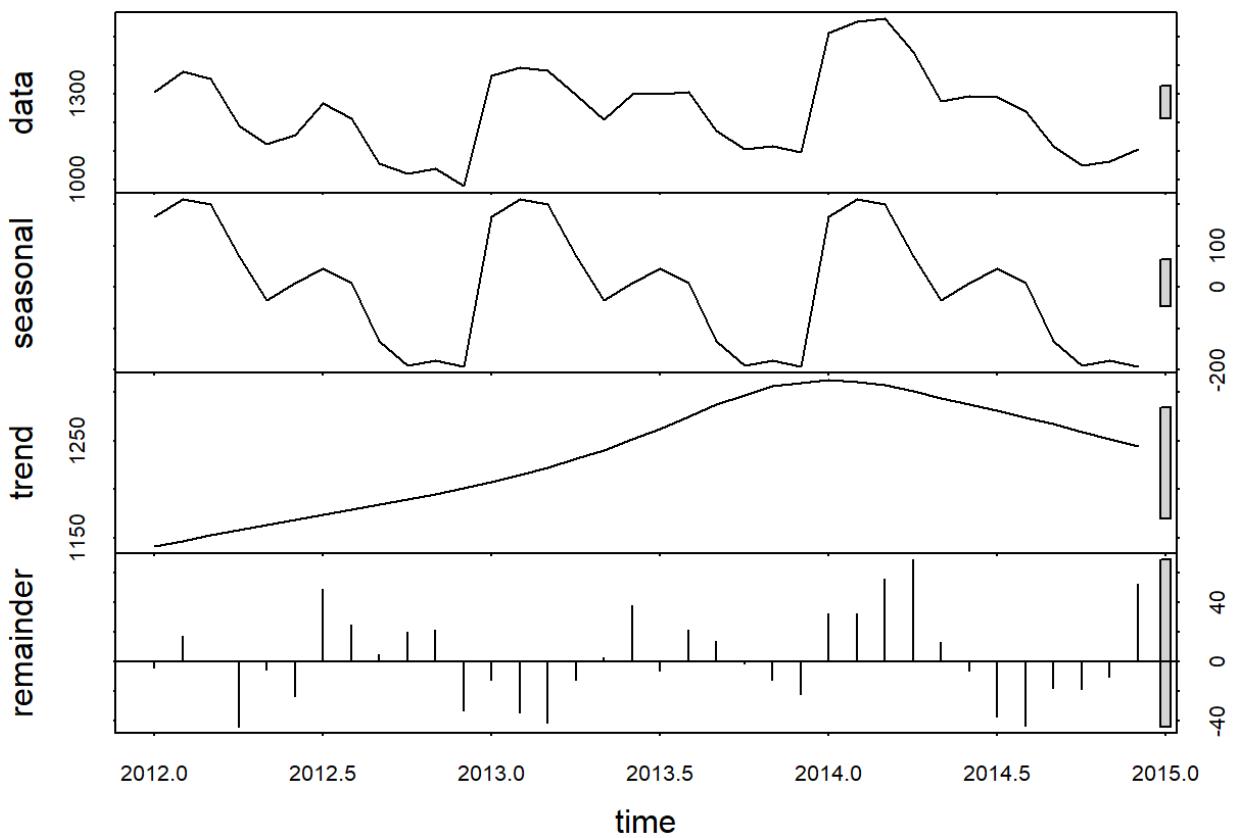
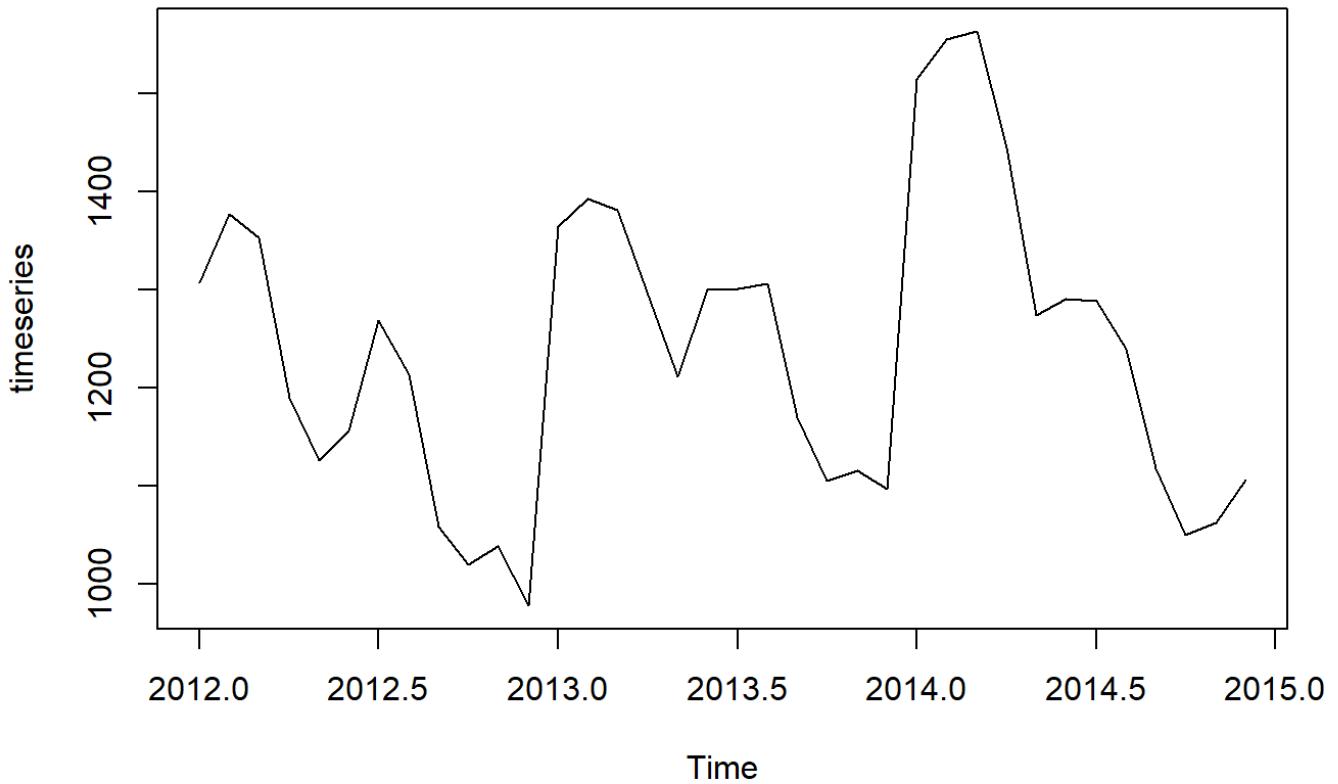


Forecasts from HoltWinters

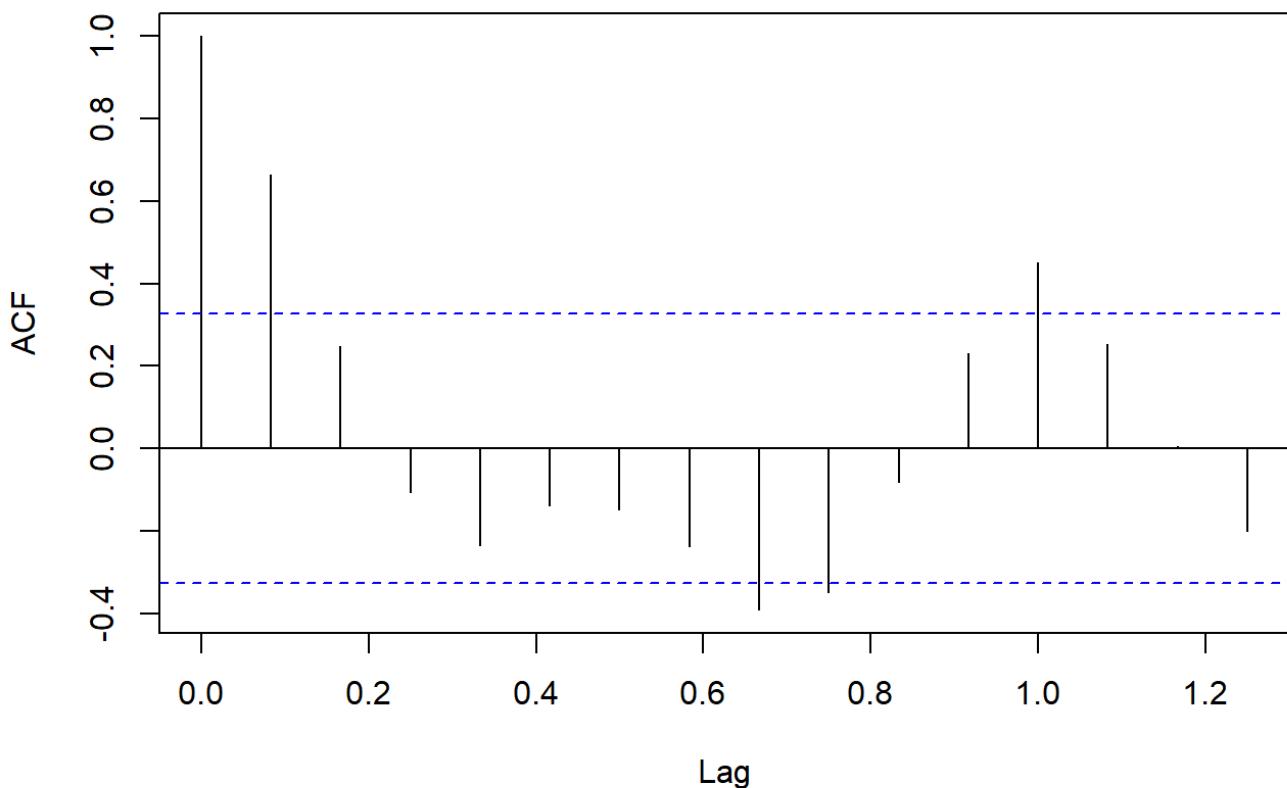


```
## [1] 103.7571
```

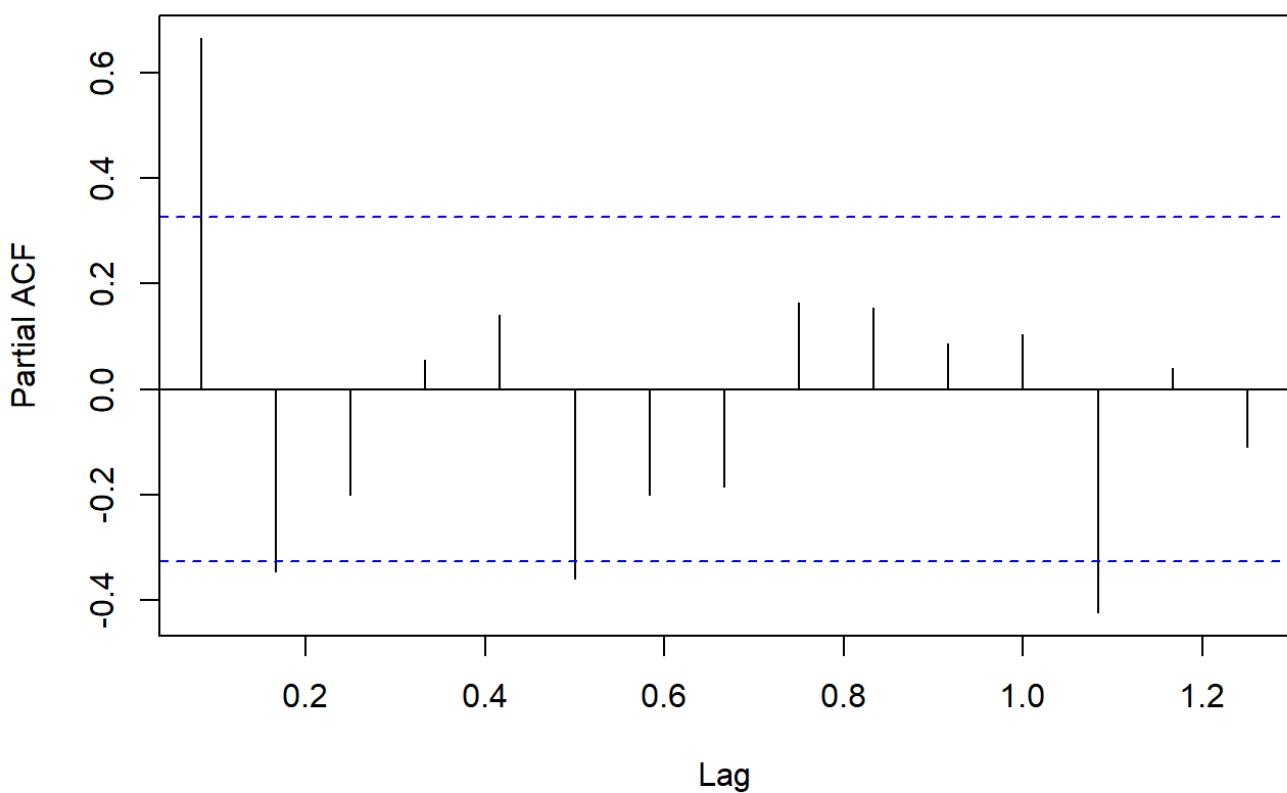
```
traintest(tv_ts43)
```



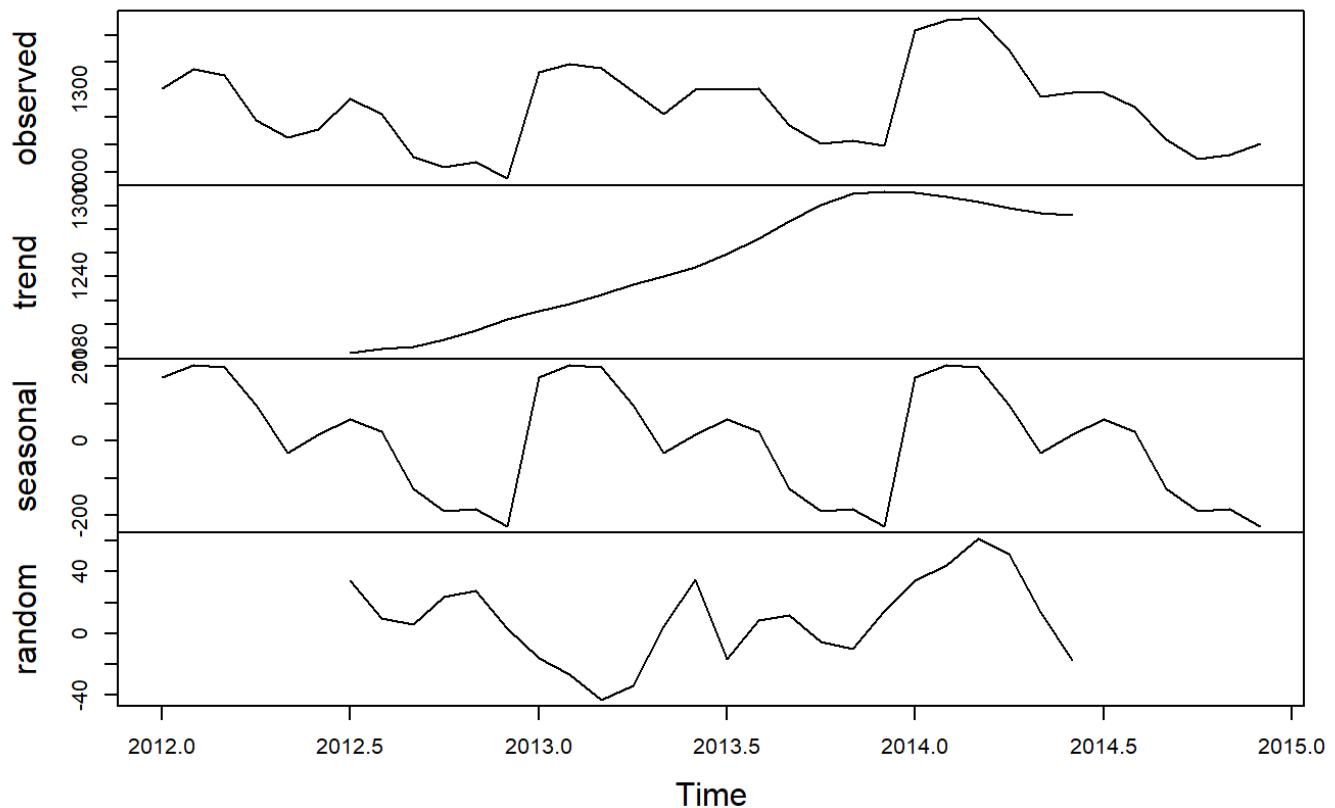
Series timeseries



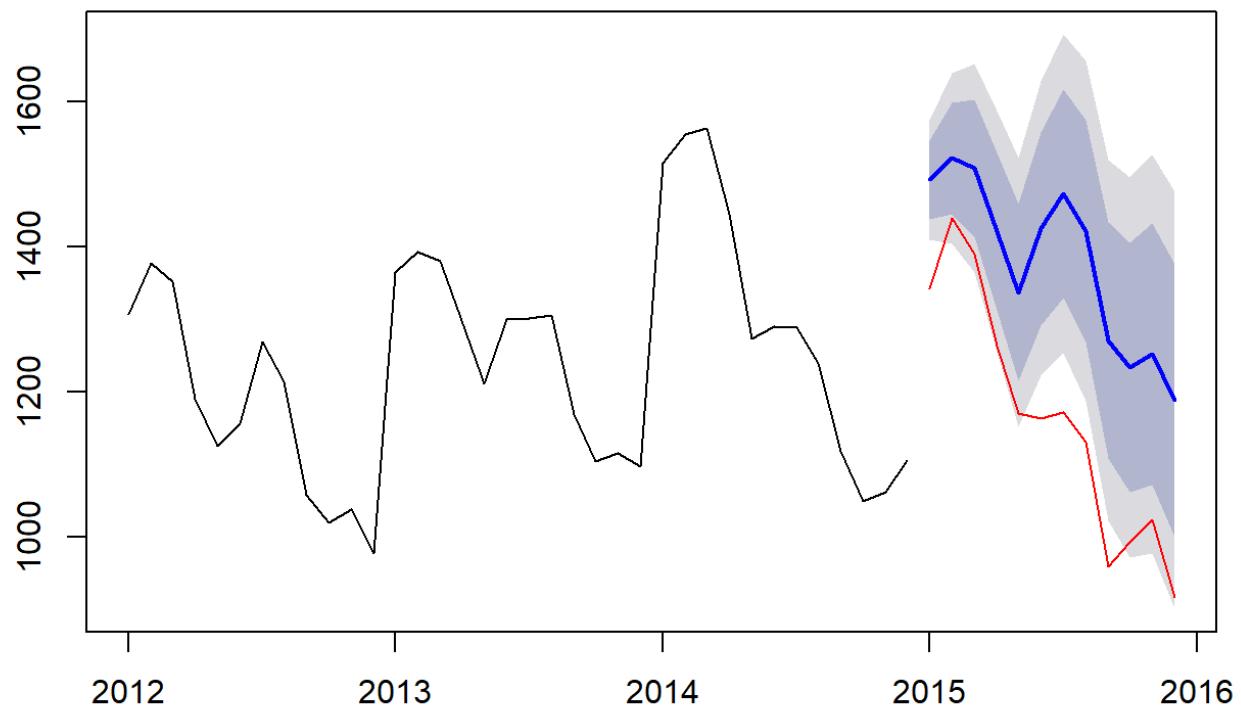
Series timeseries



Decomposition of additive time series

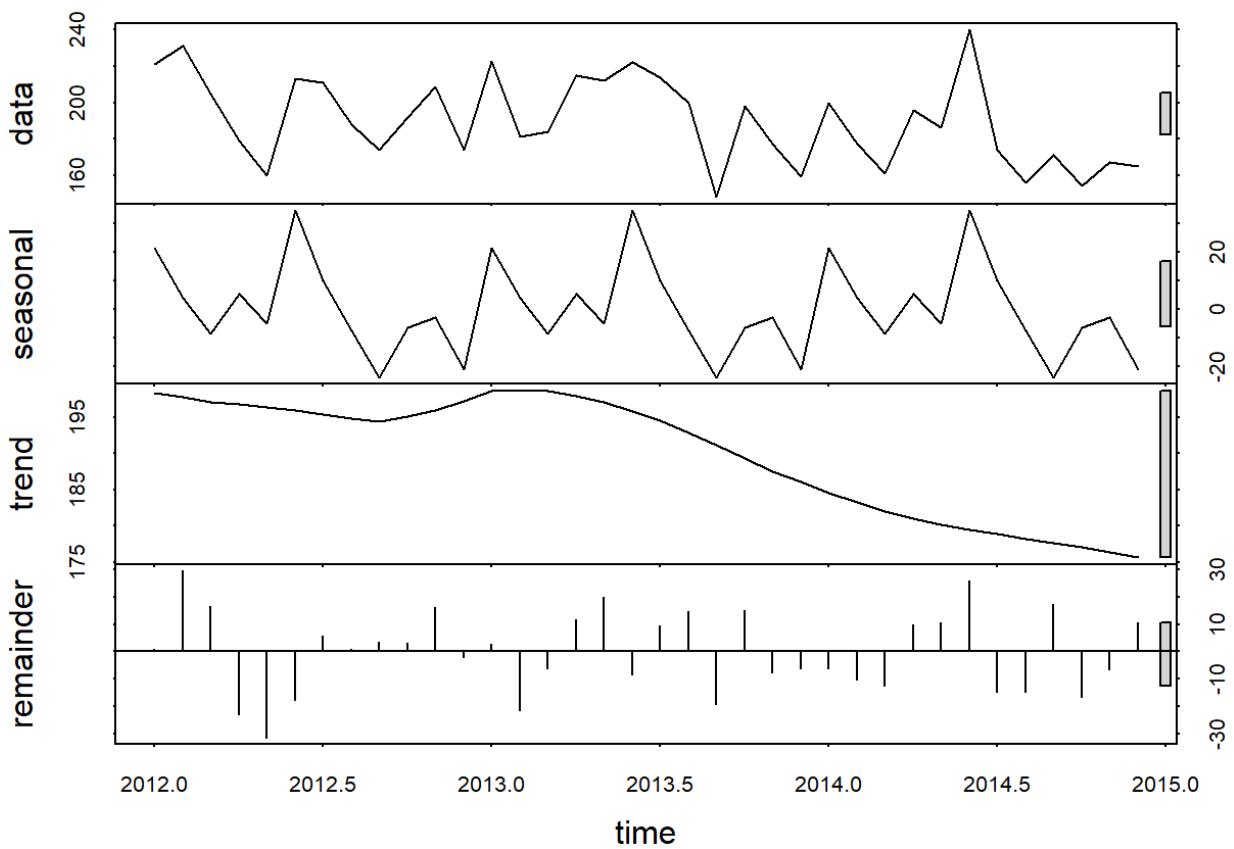
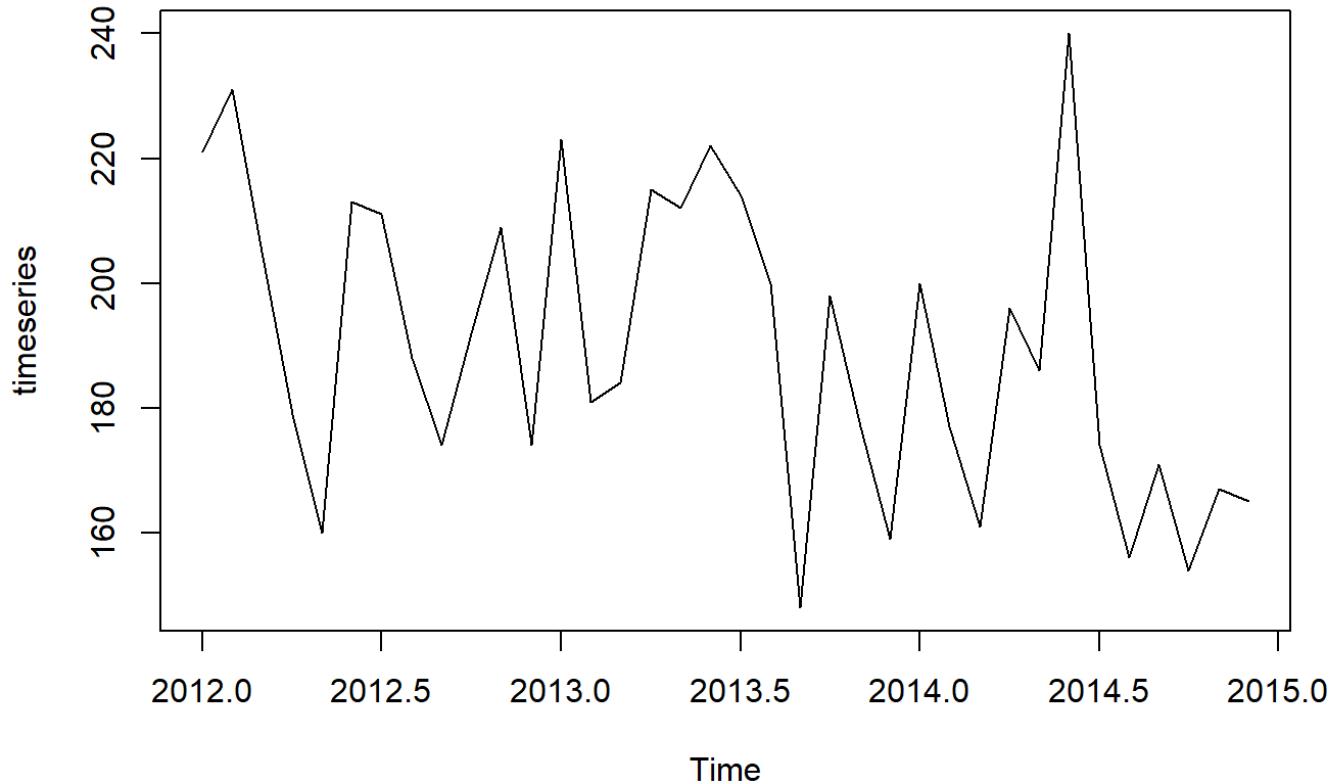


Forecasts from HoltWinters

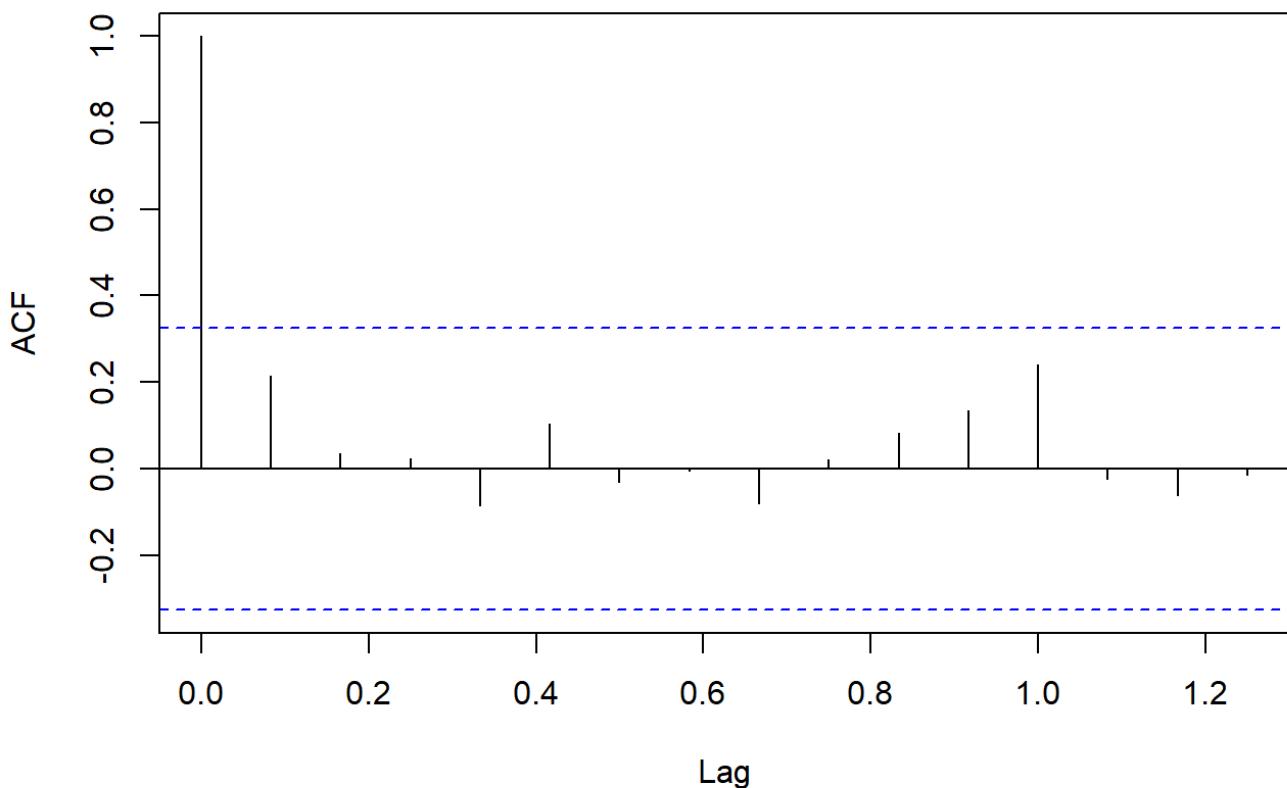


```
## [1] 215.2595
```

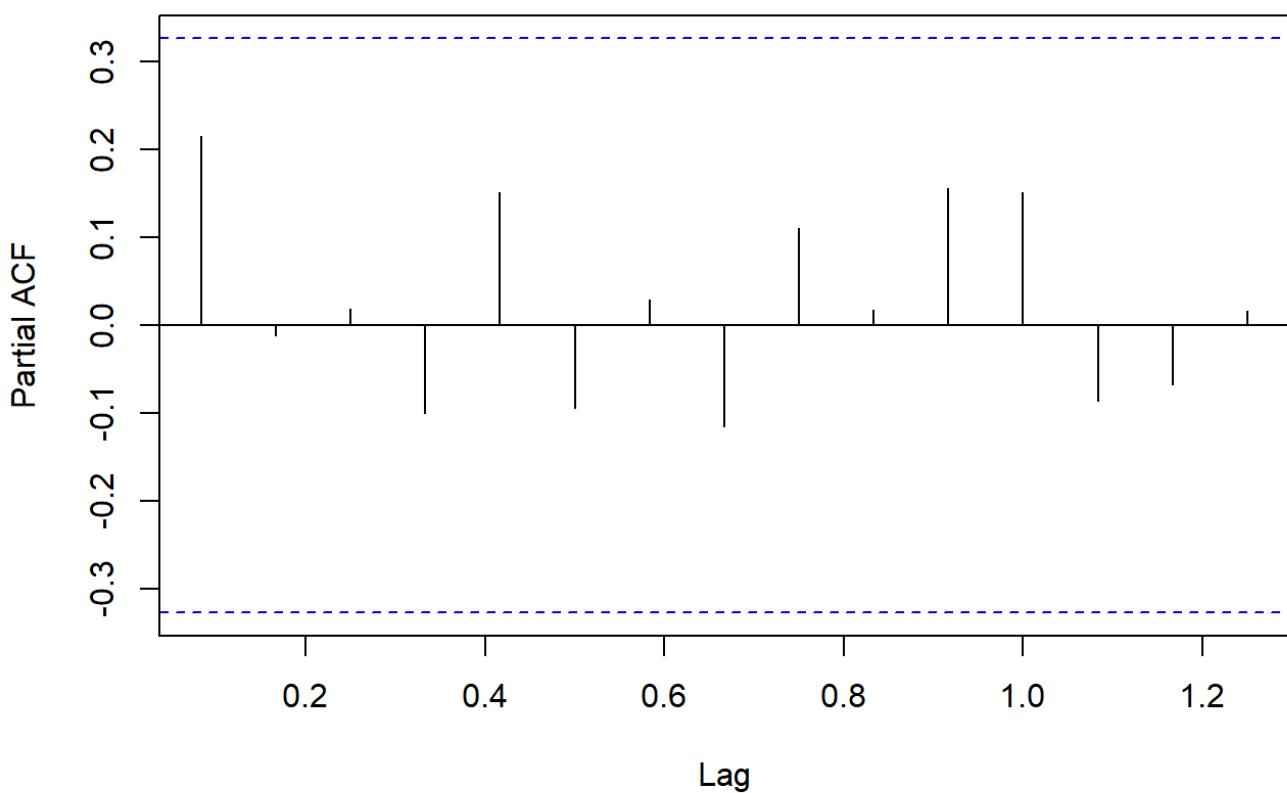
```
traintest(tv_ts44)
```



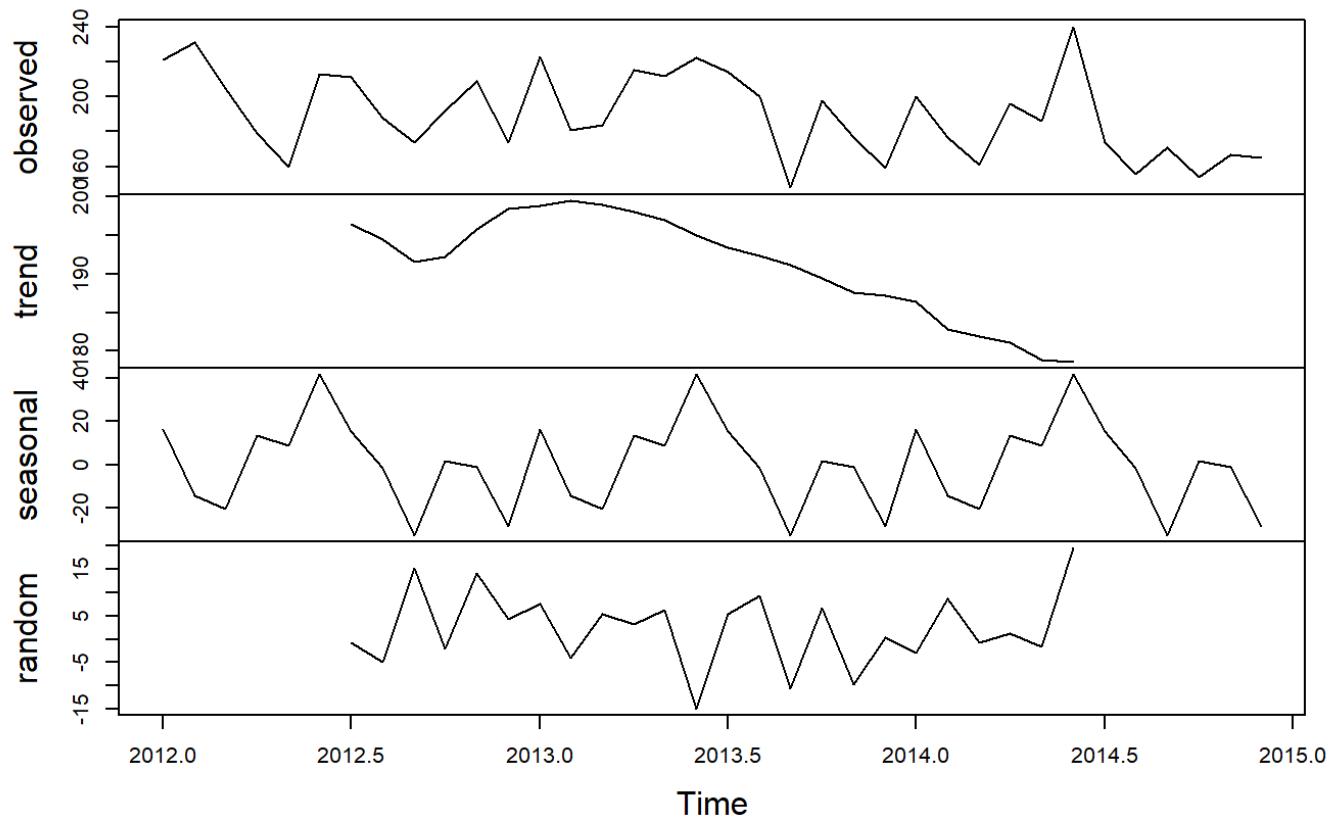
Series timeseries



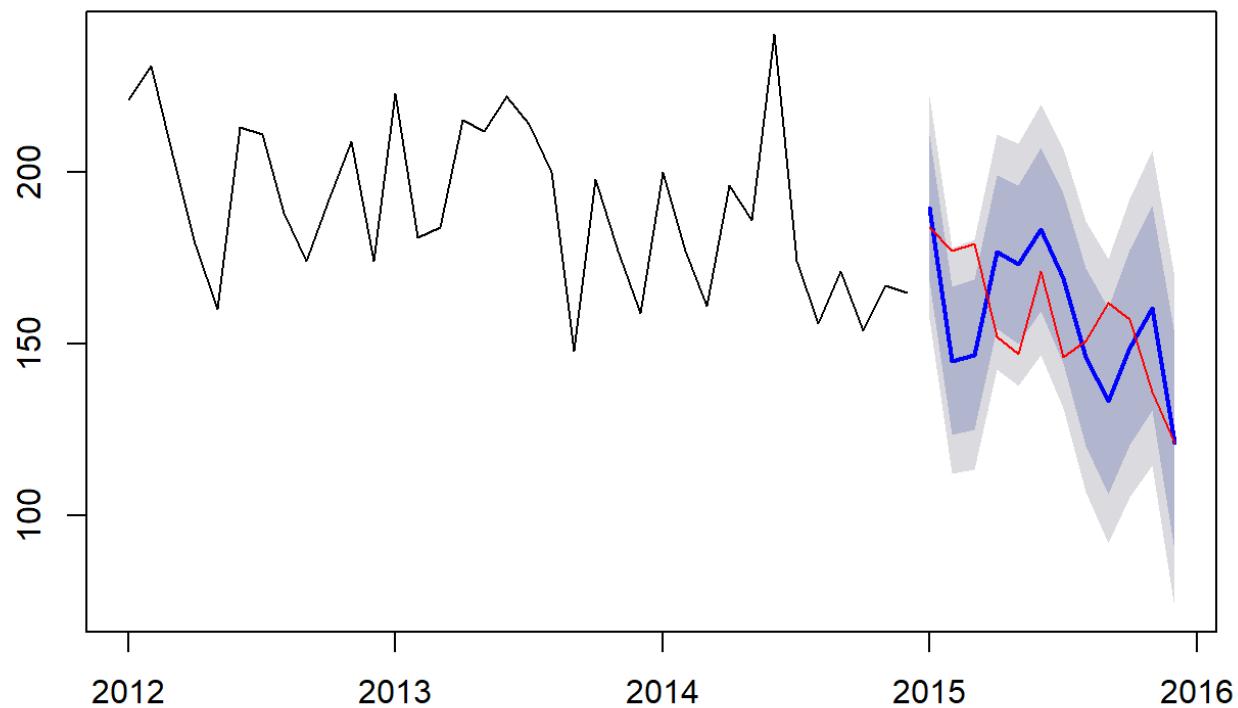
Series timeseries



Decomposition of additive time series

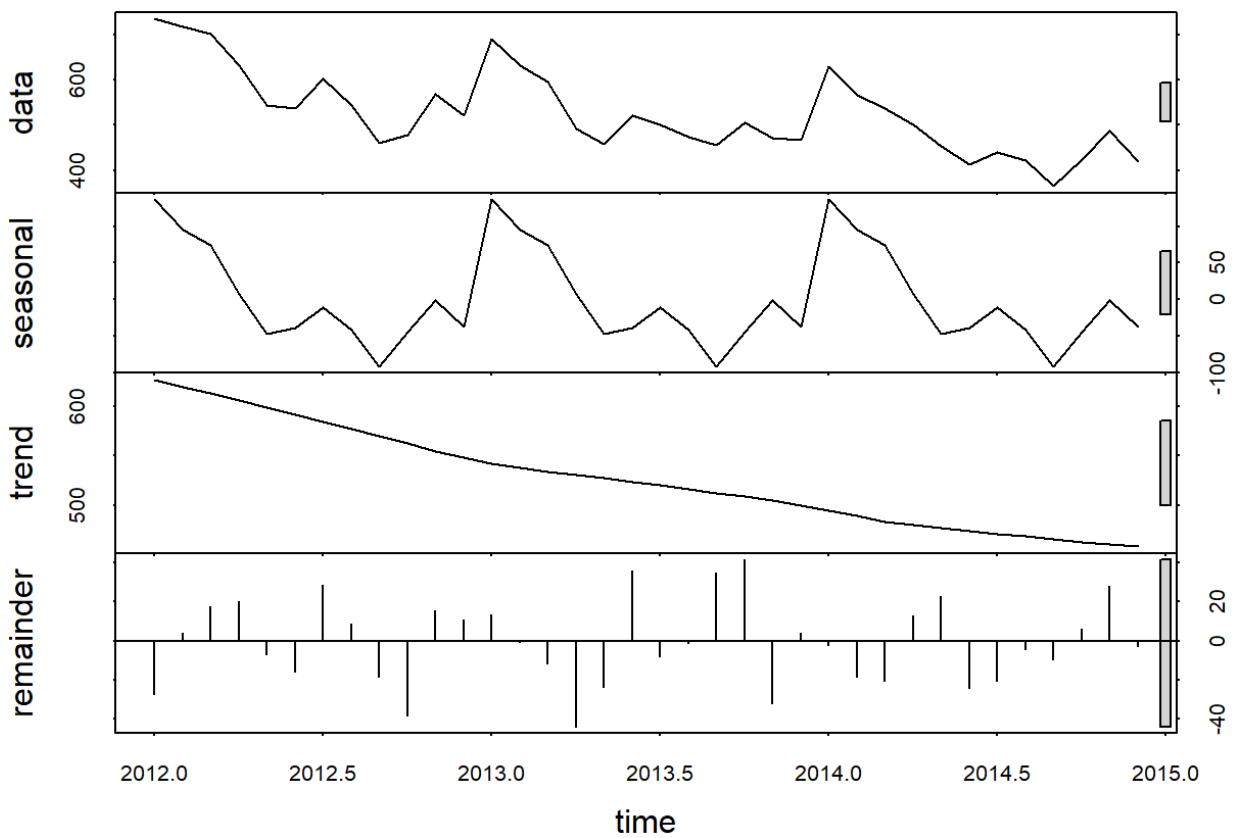
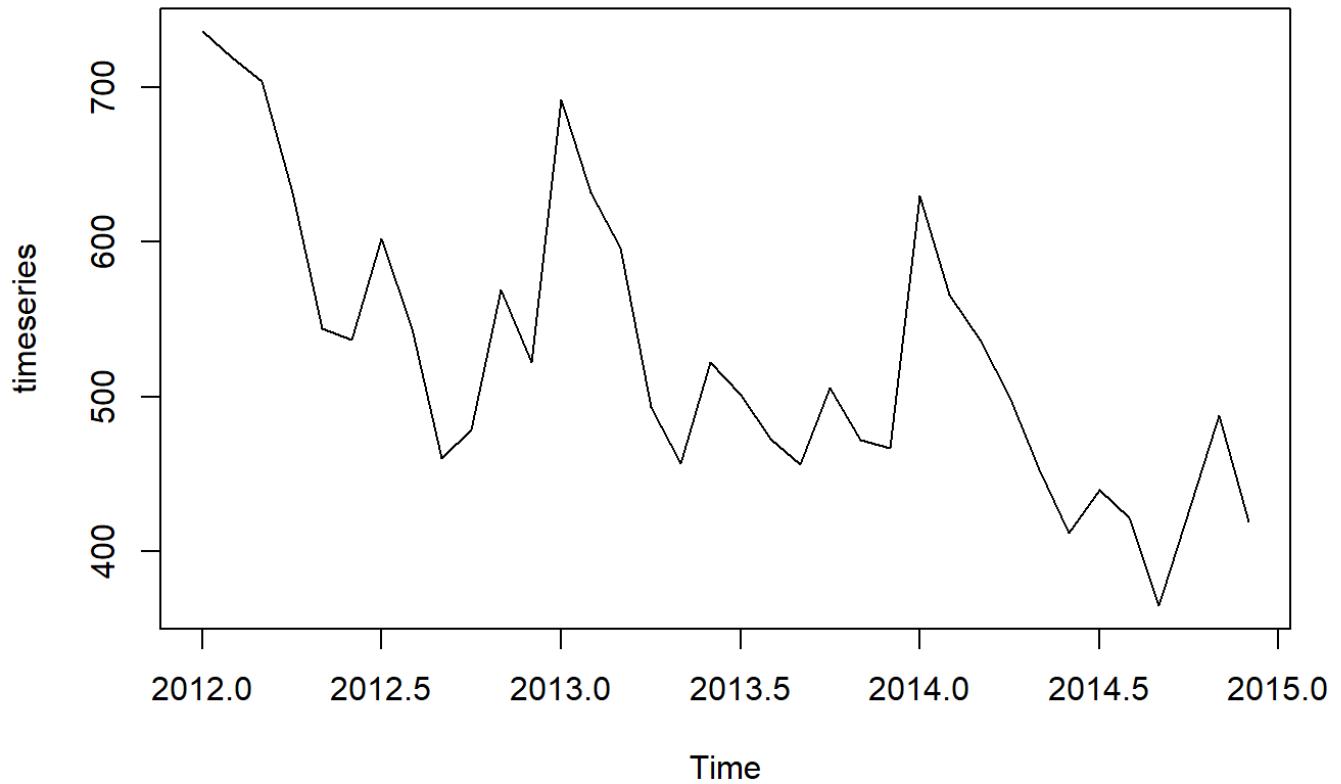


Forecasts from HoltWinters

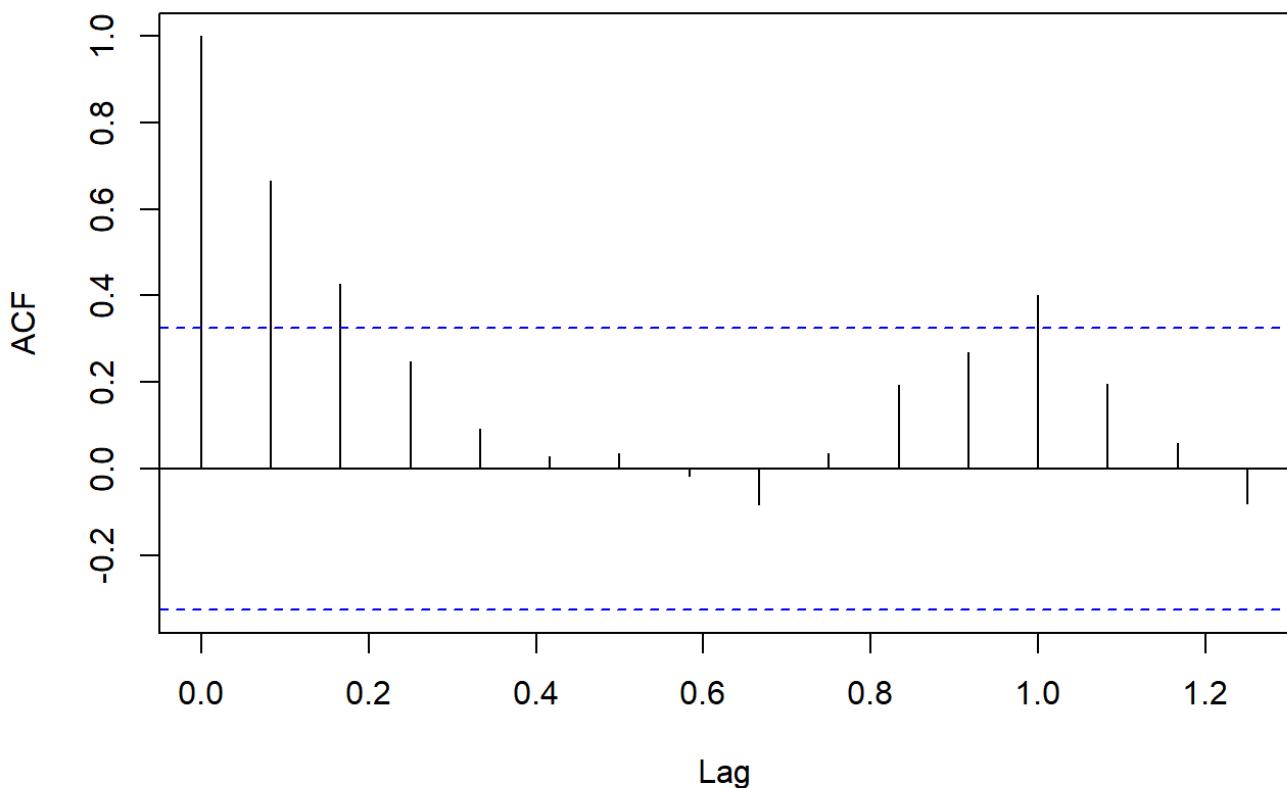


```
## [1] 18.49259
```

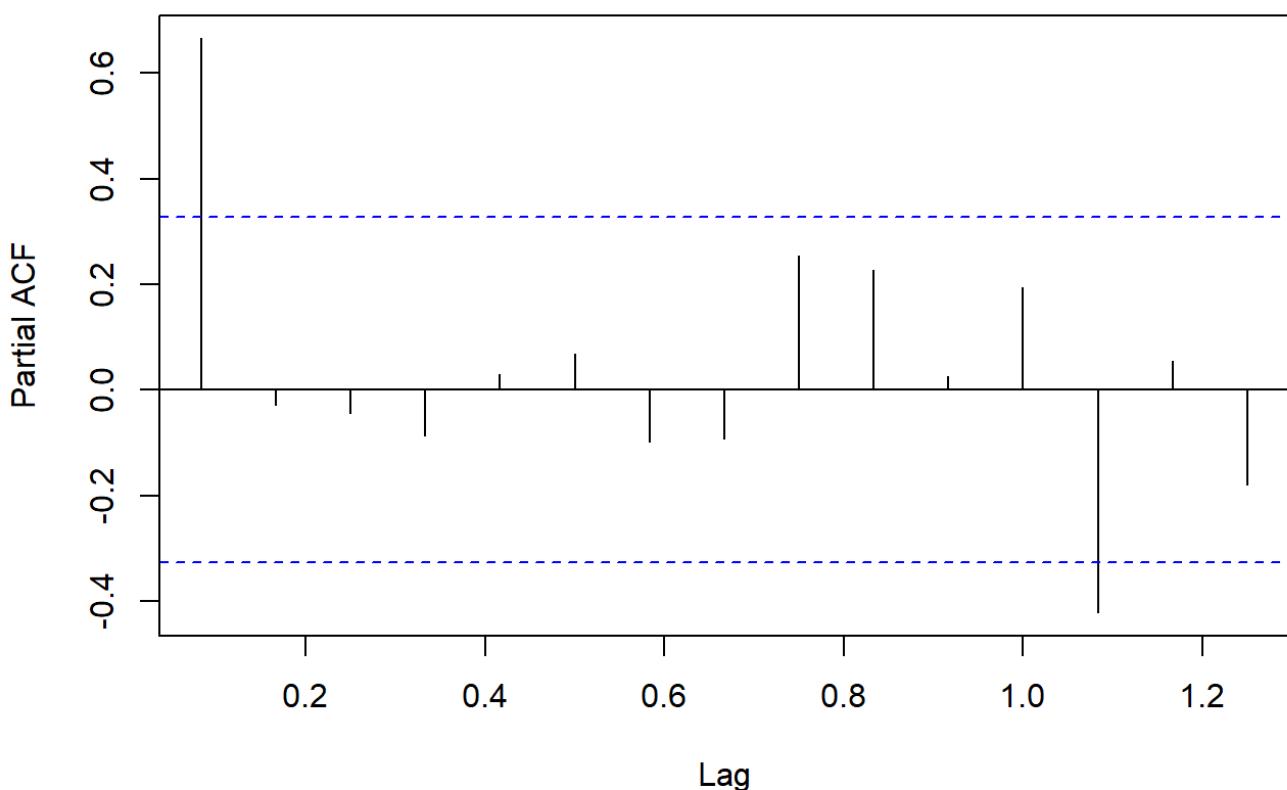
```
traintest(tv_ts45)
```



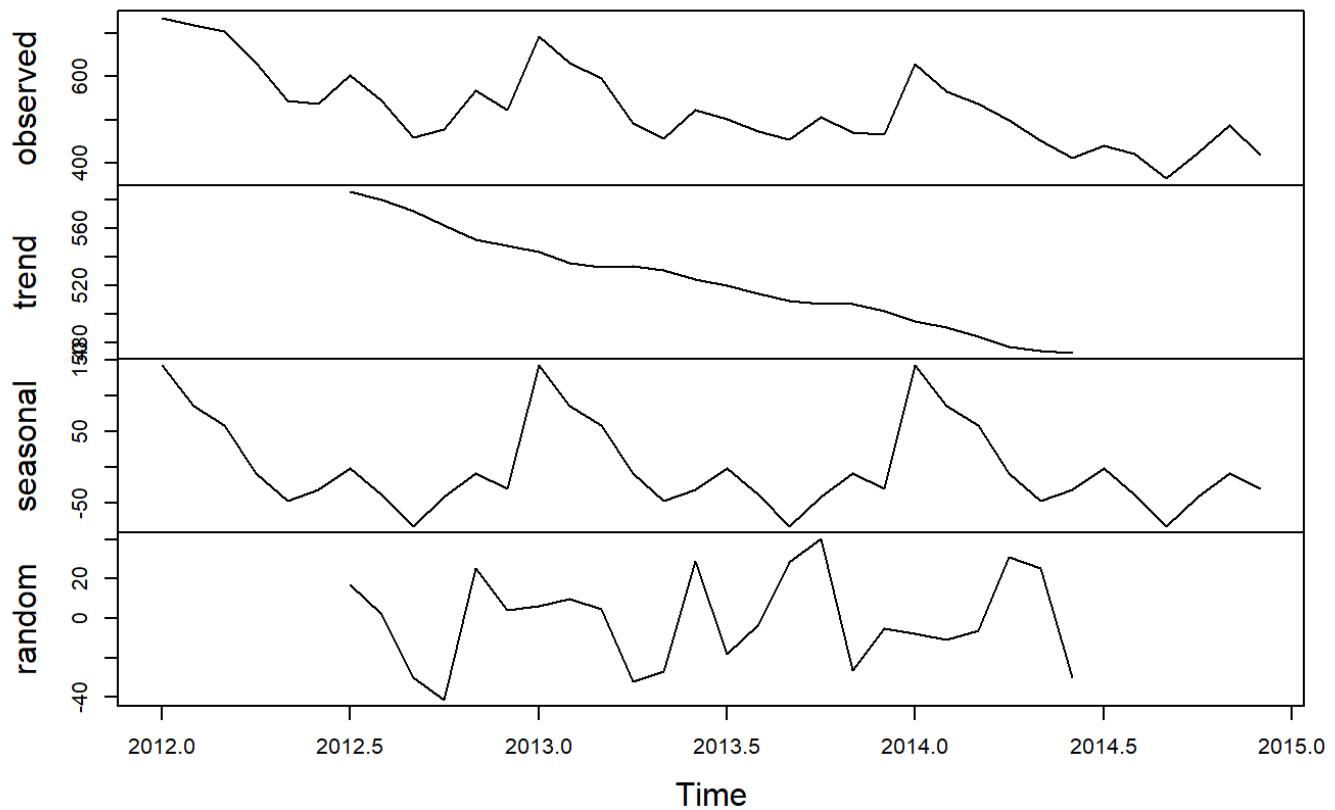
Series timeseries



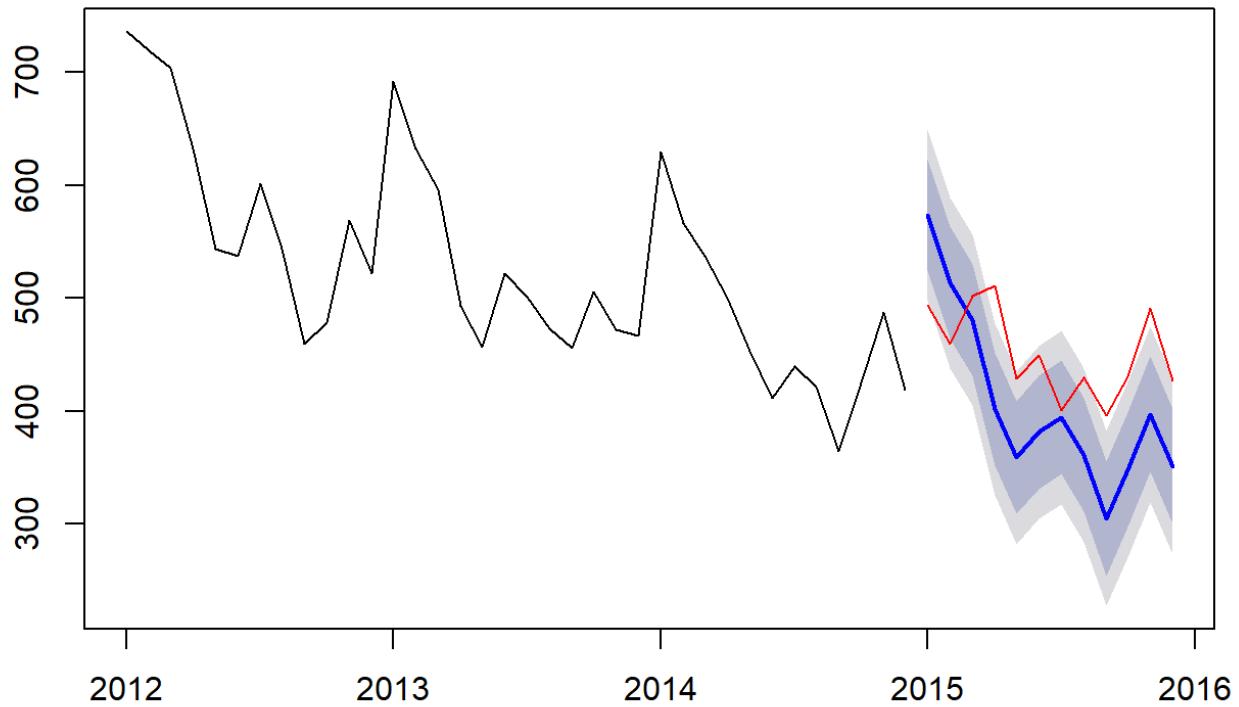
Series timeseries



Decomposition of additive time series

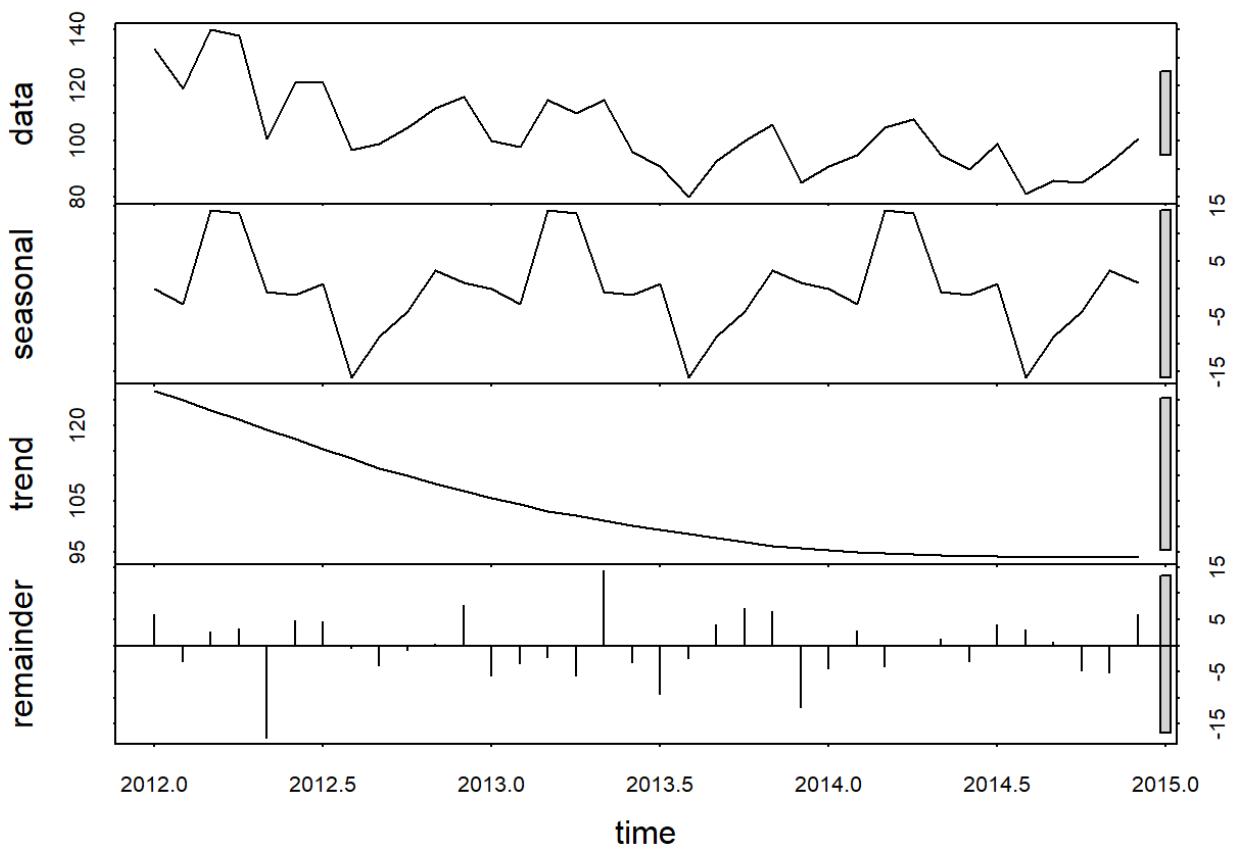
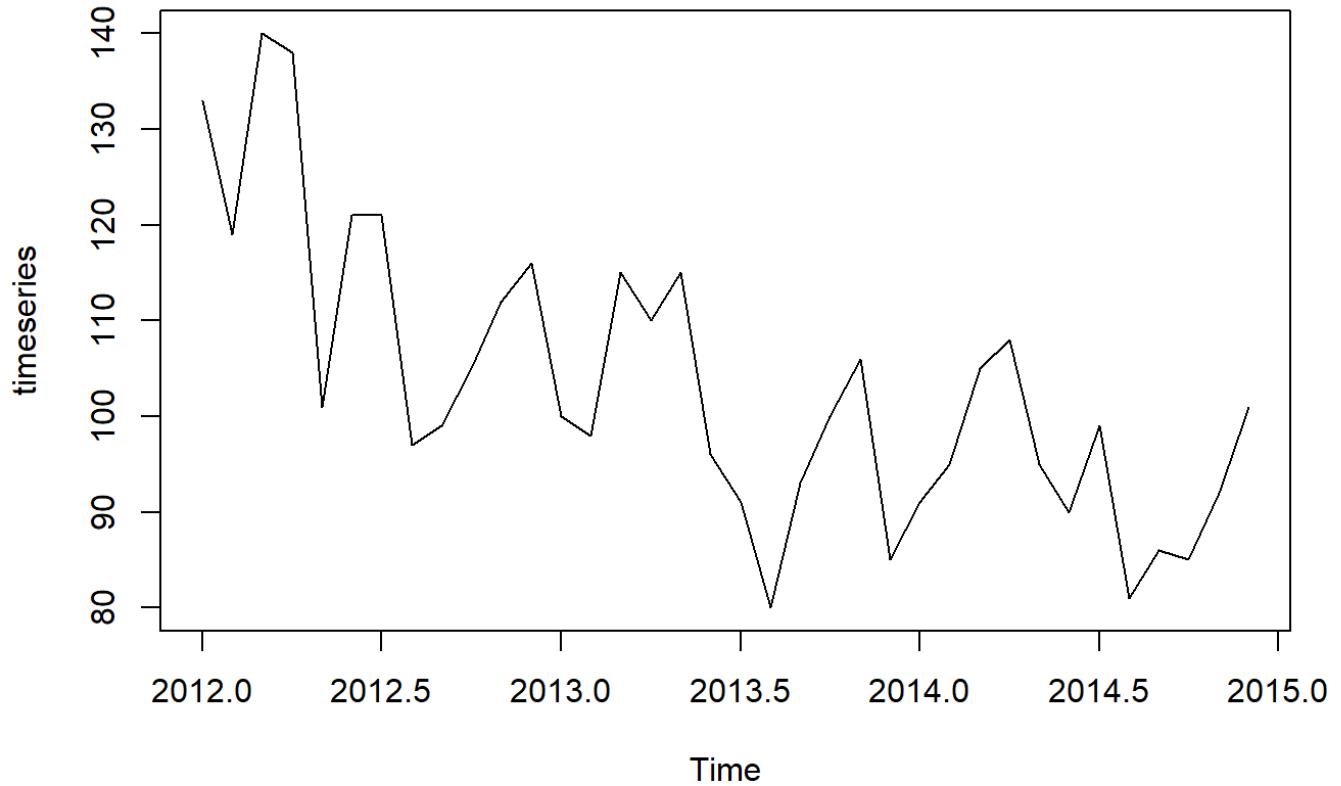


Forecasts from HoltWinters

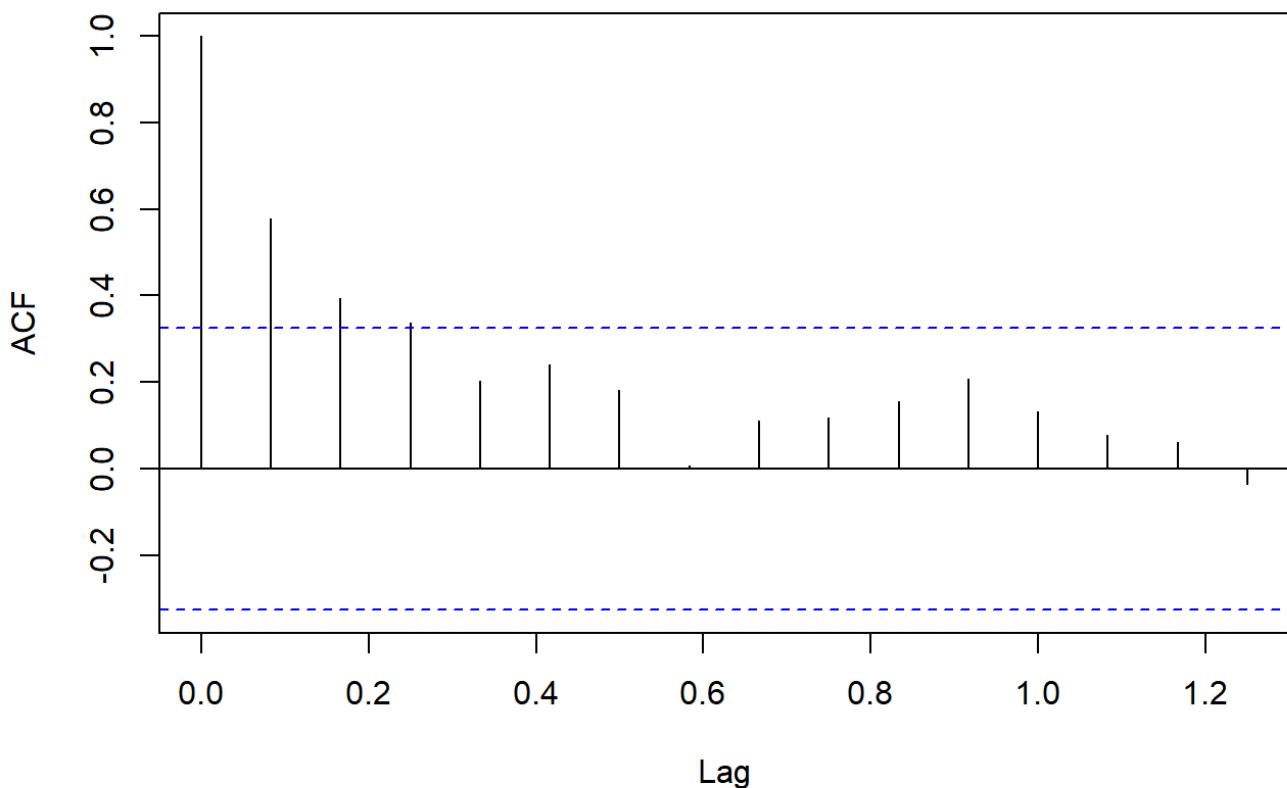


```
## [1] 68.41505
```

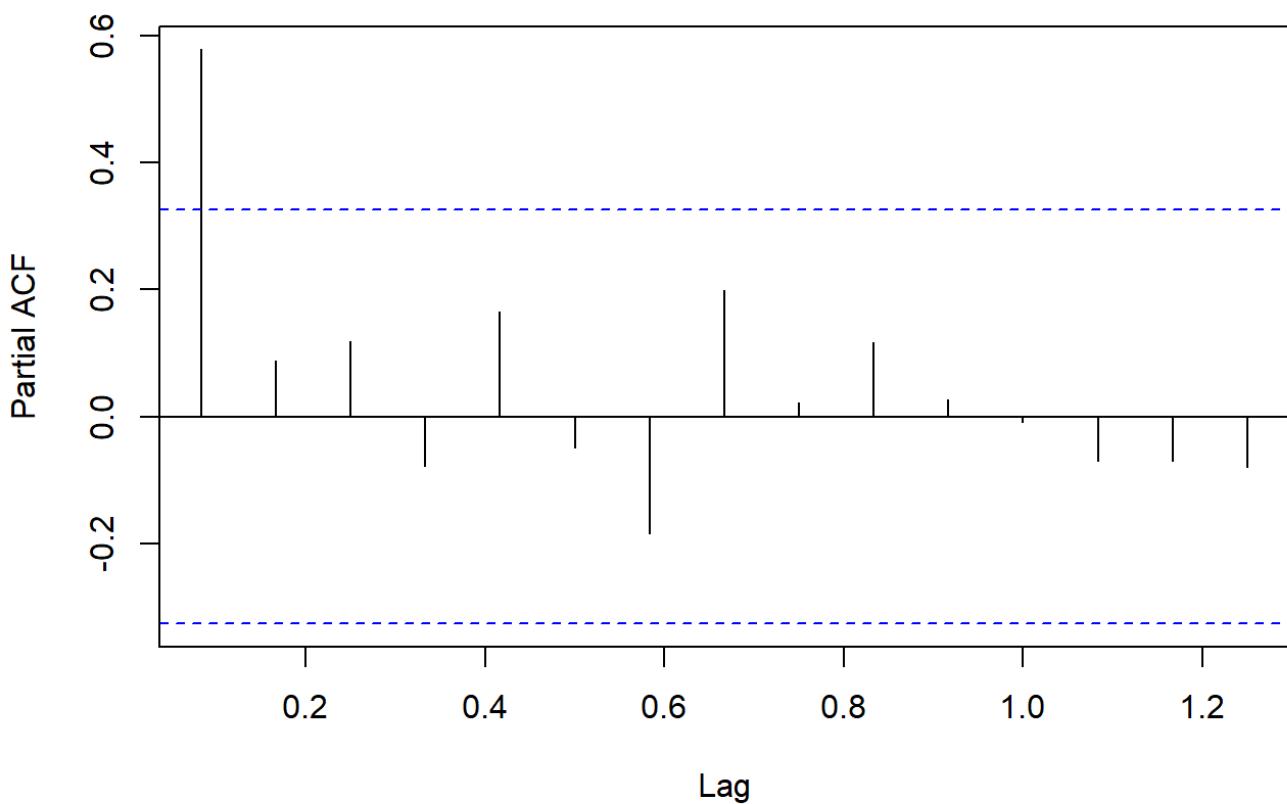
```
traintest(tv_ts46)
```



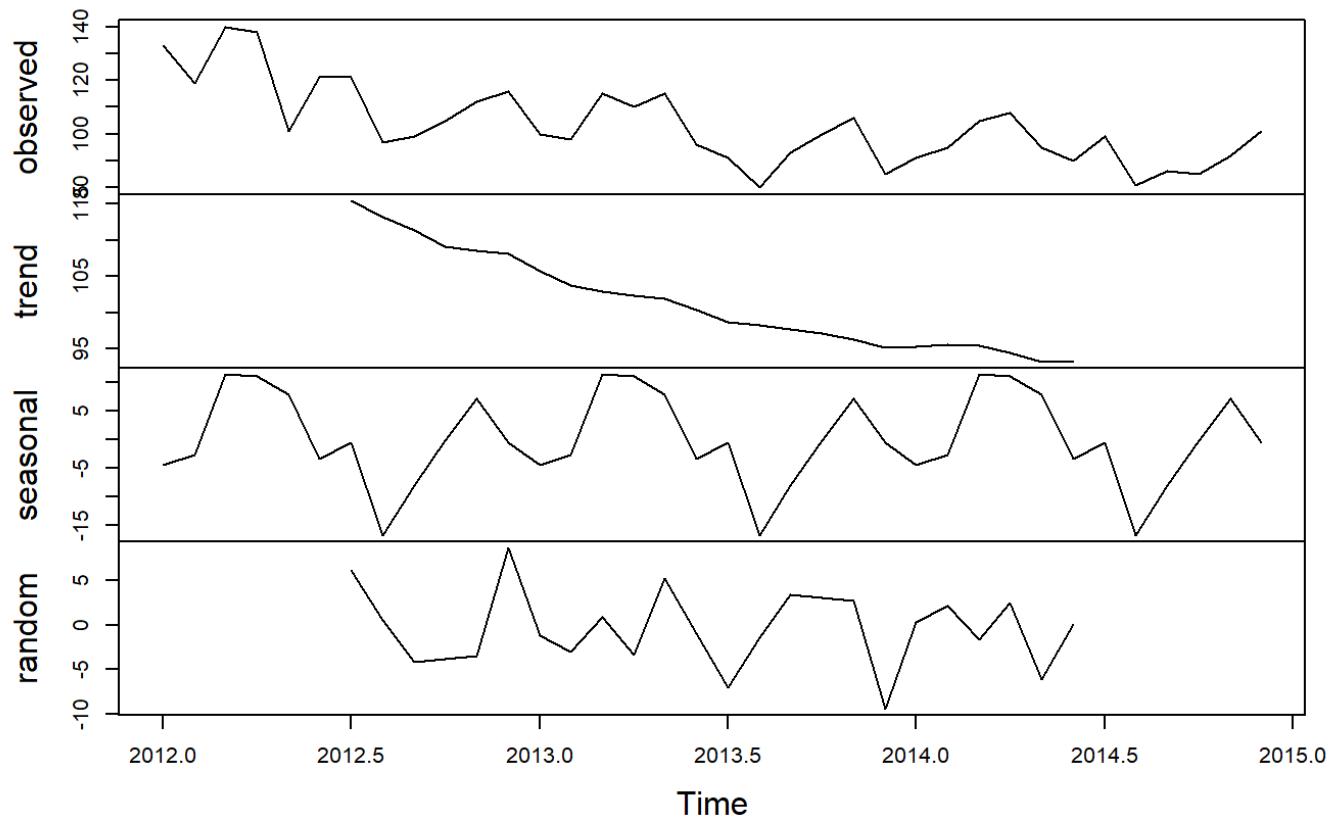
Series timeseries



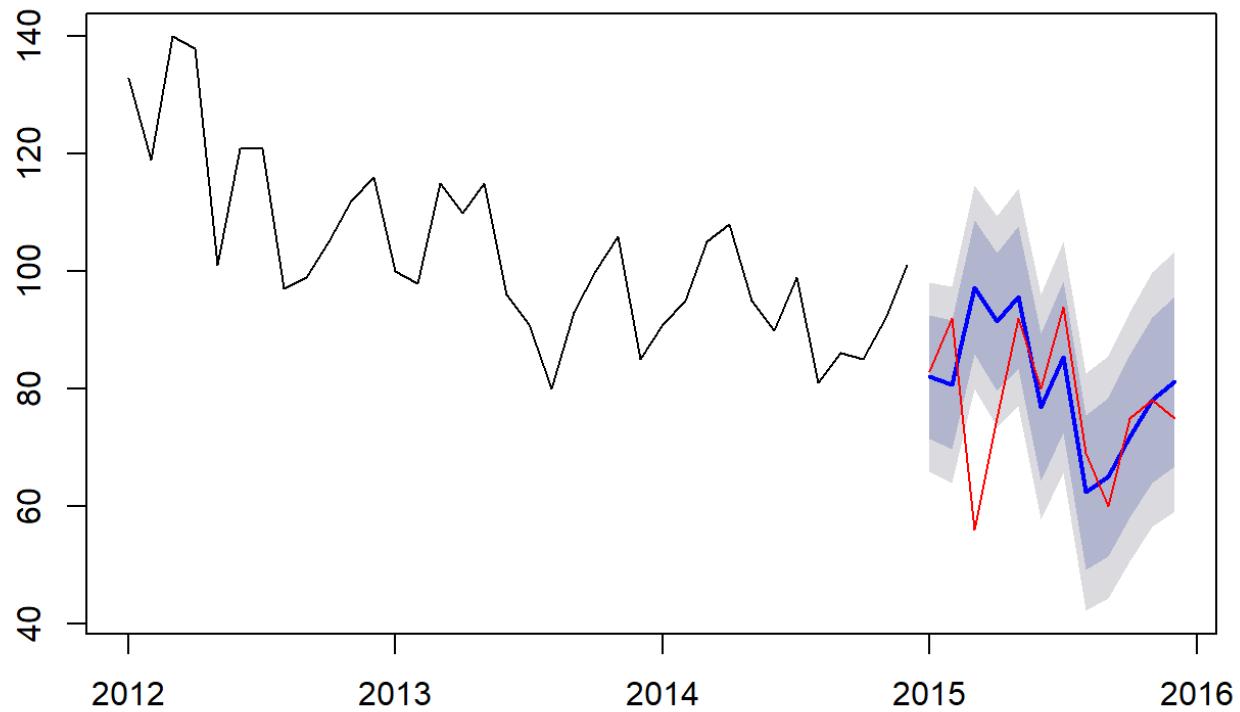
Series timeseries



Decomposition of additive time series

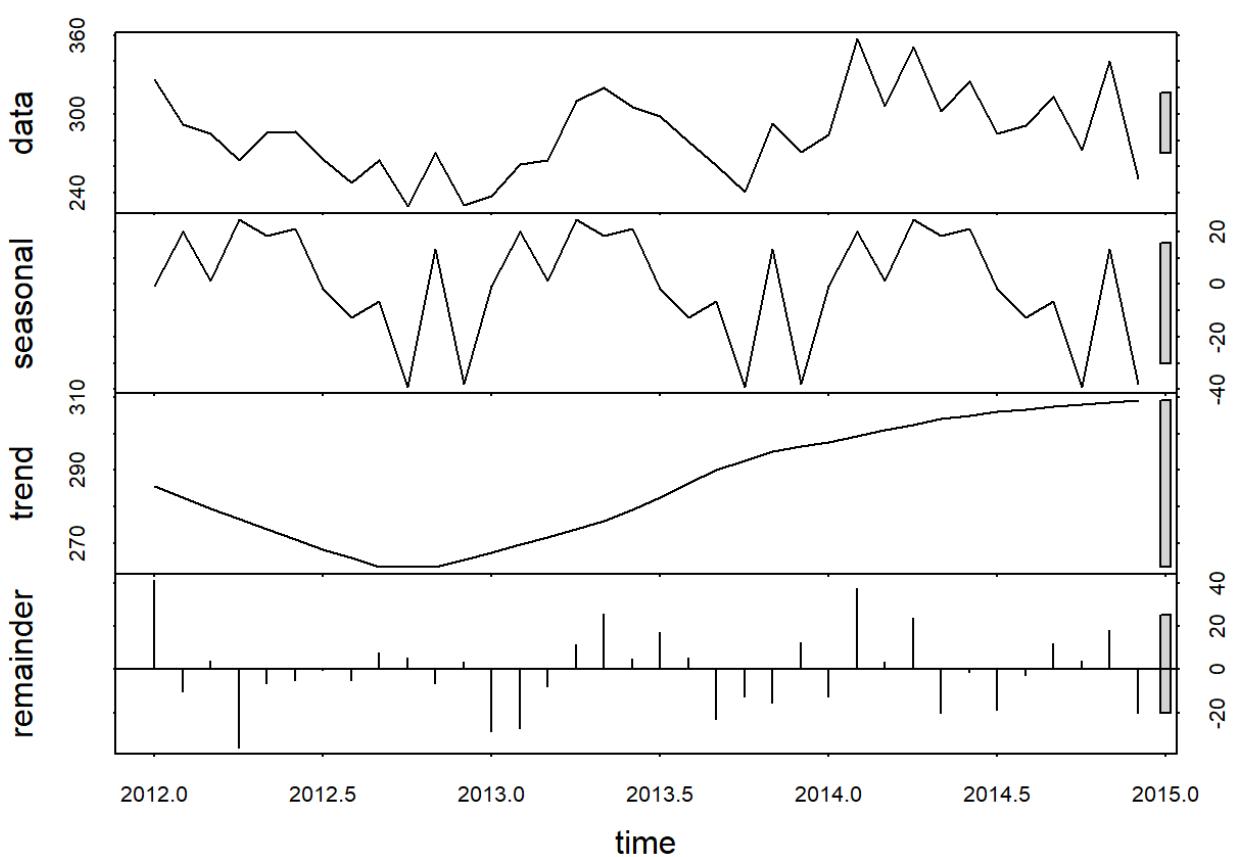
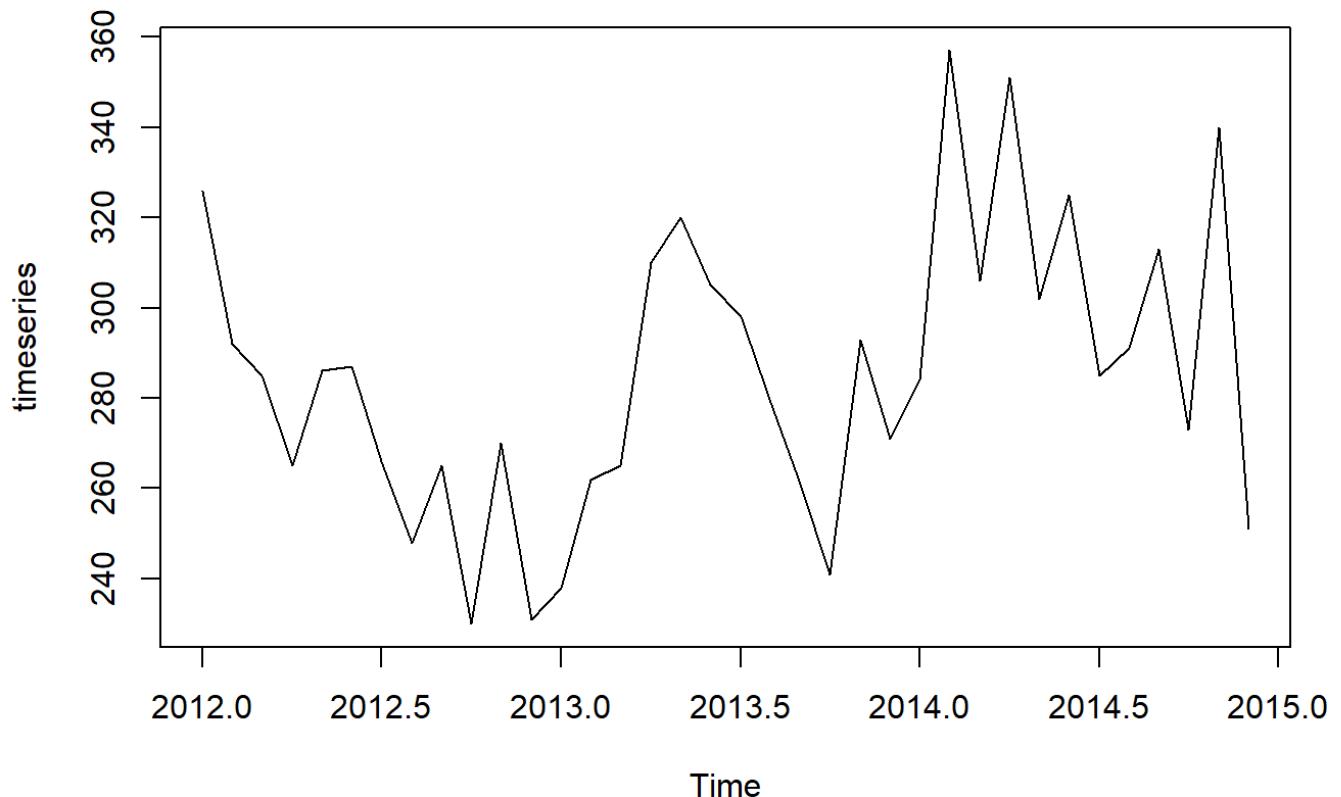


Forecasts from HoltWinters

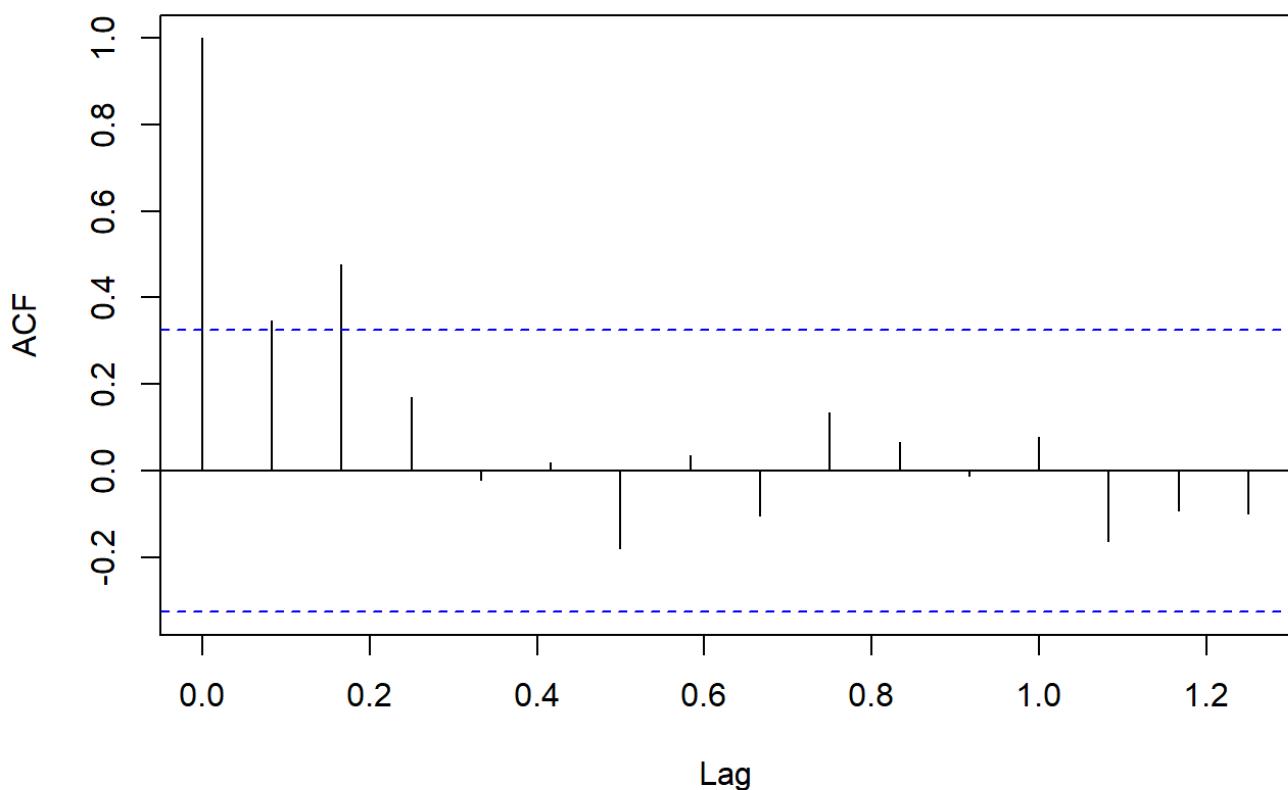


```
## [1] 8.875389
```

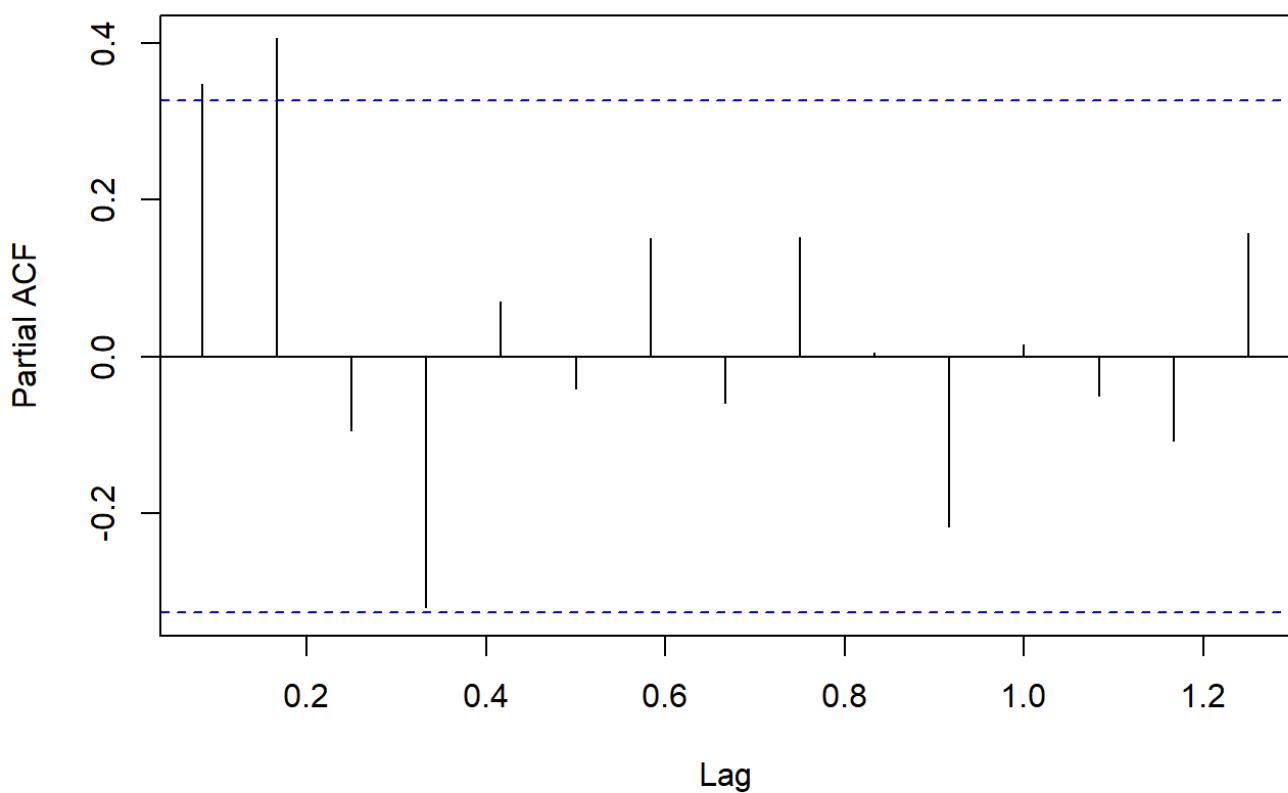
```
#traintest(tv_ts47)
traintest(tv_ts48)
```



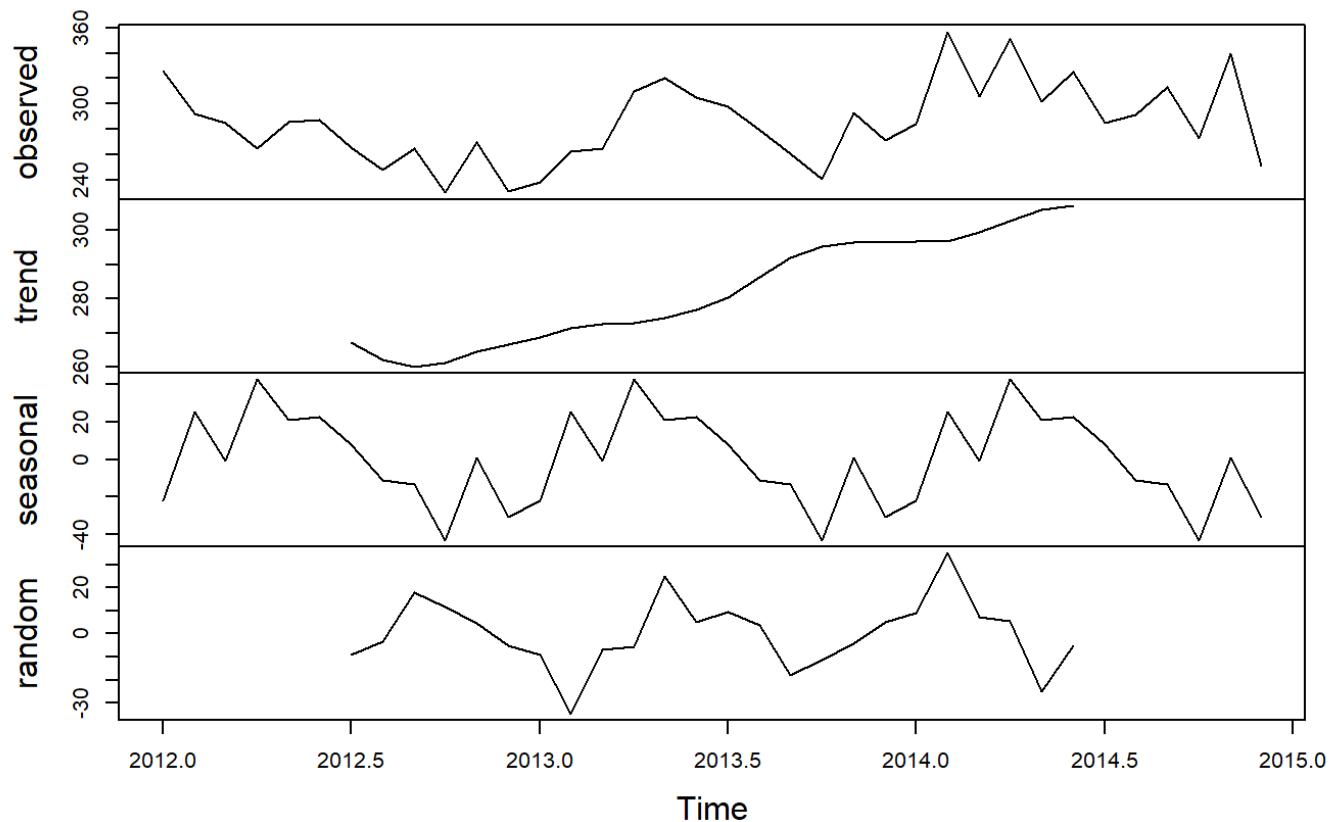
Series timeseries



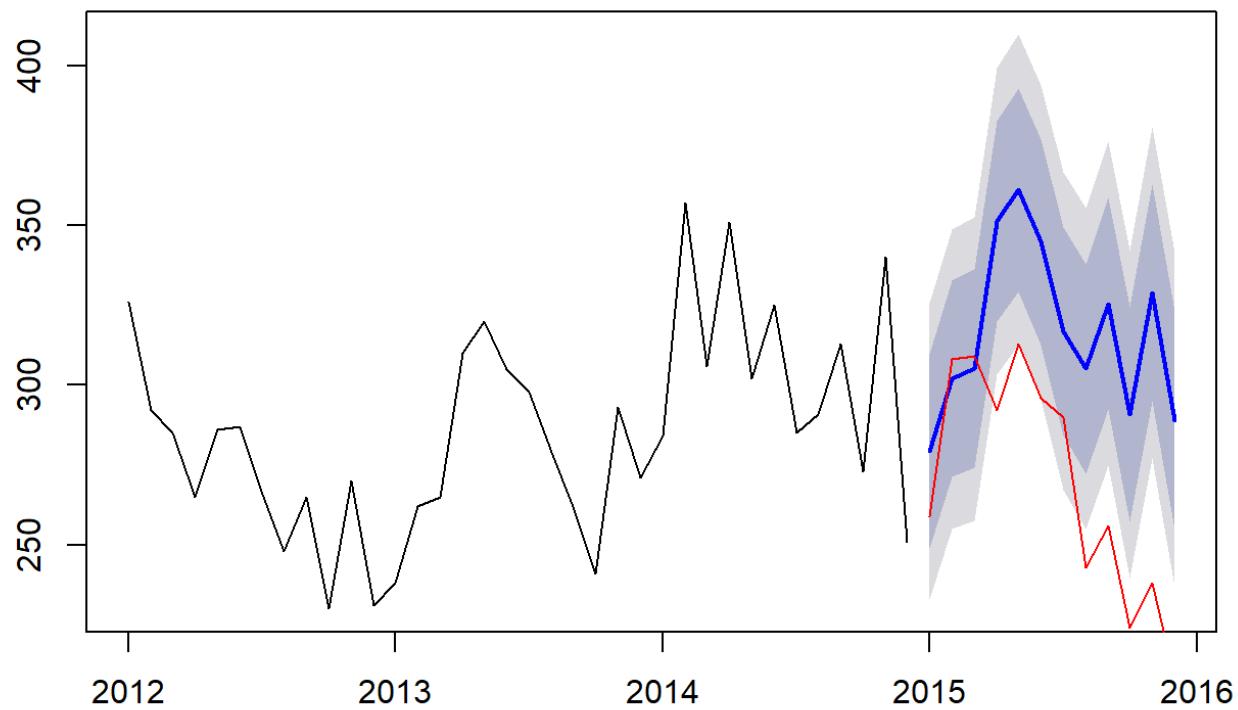
Series timeseries



Decomposition of additive time series

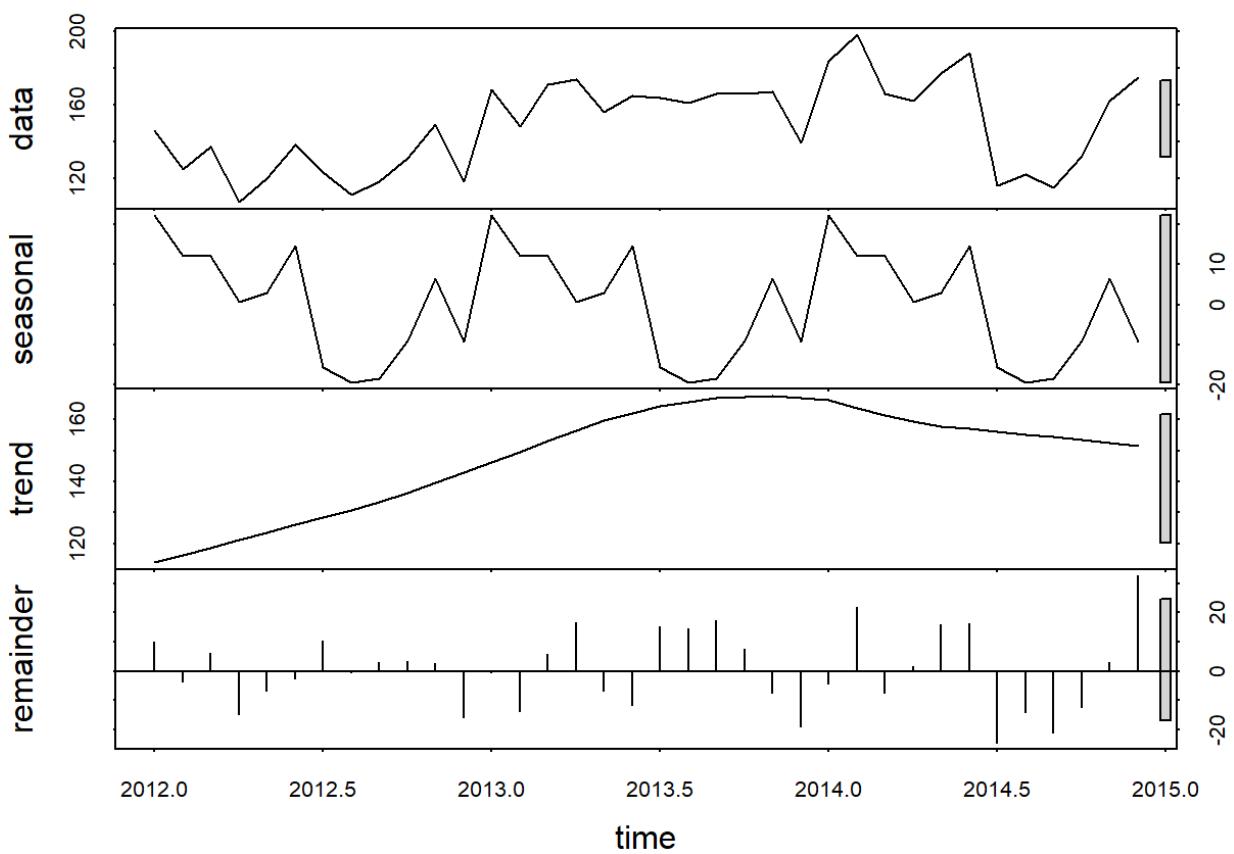
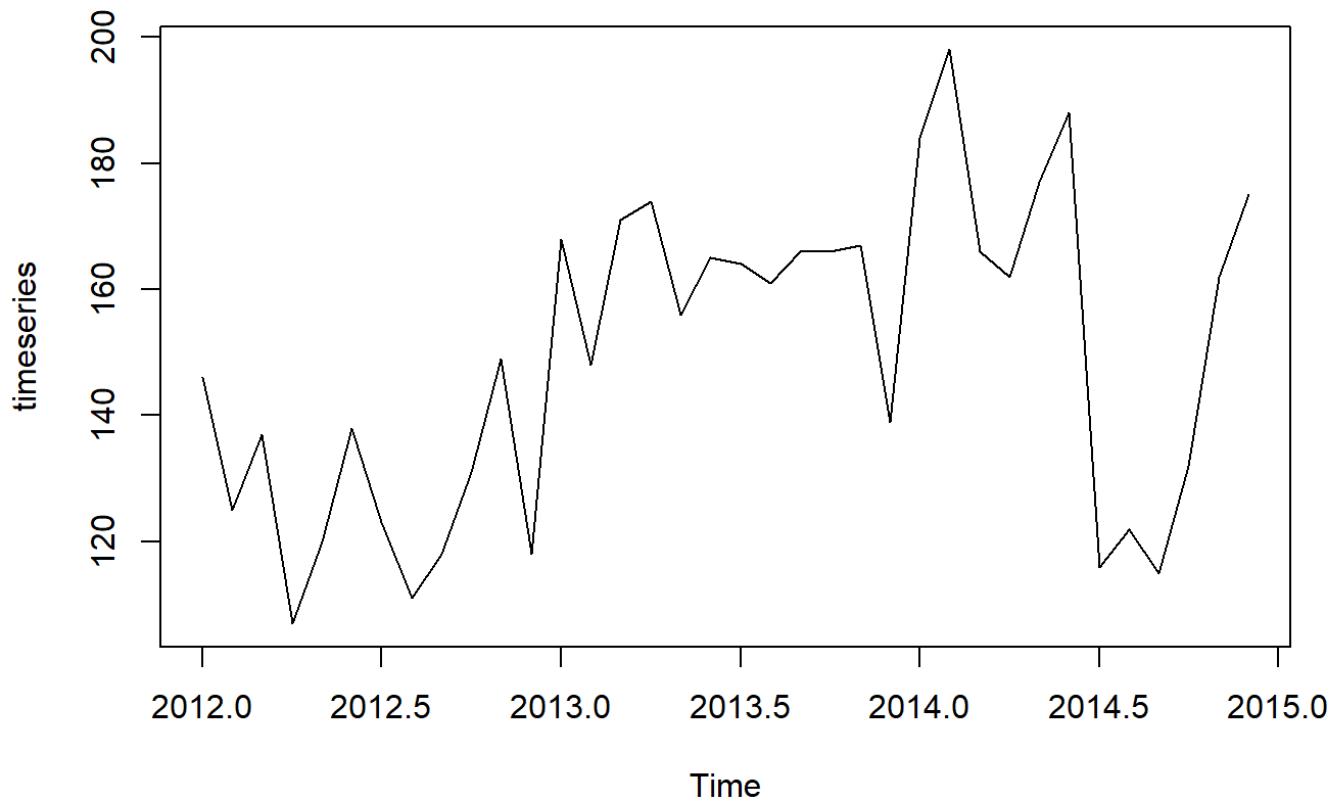


Forecasts from HoltWinters

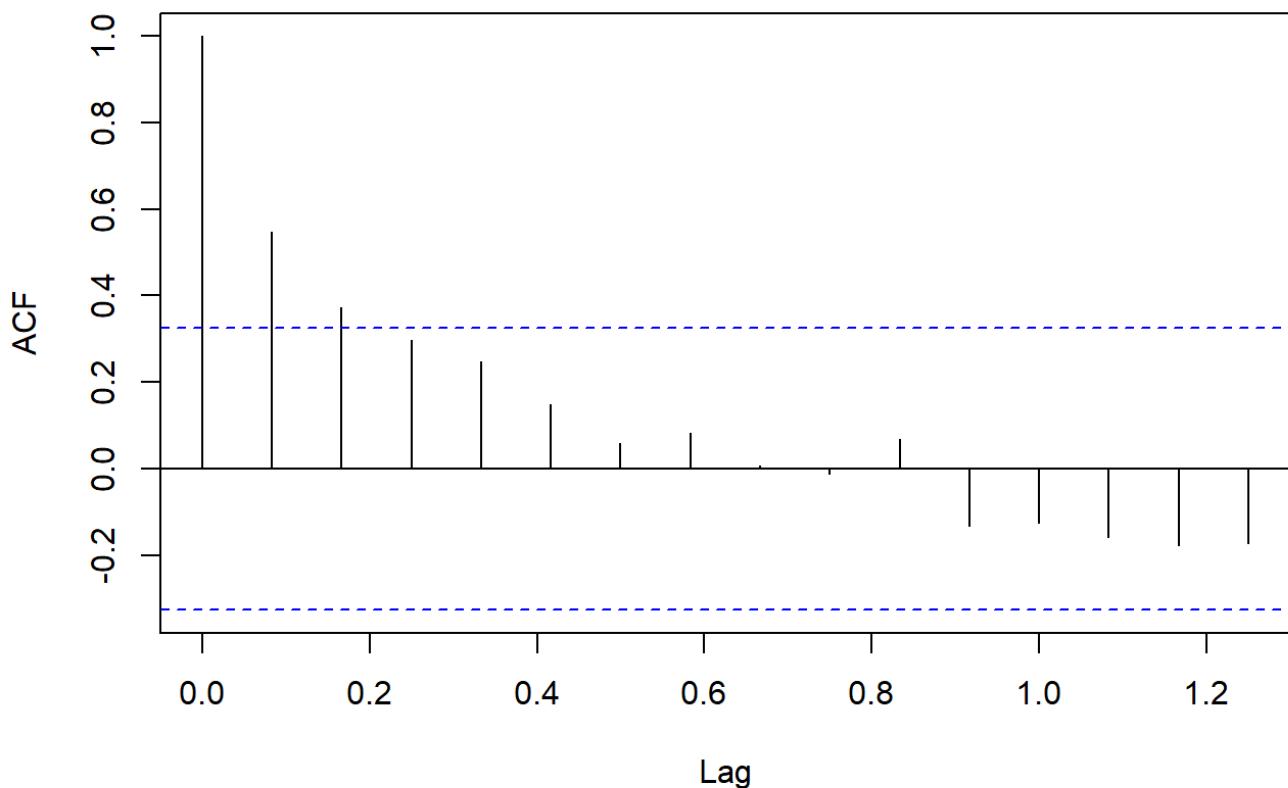


```
## [1] 48.63877
```

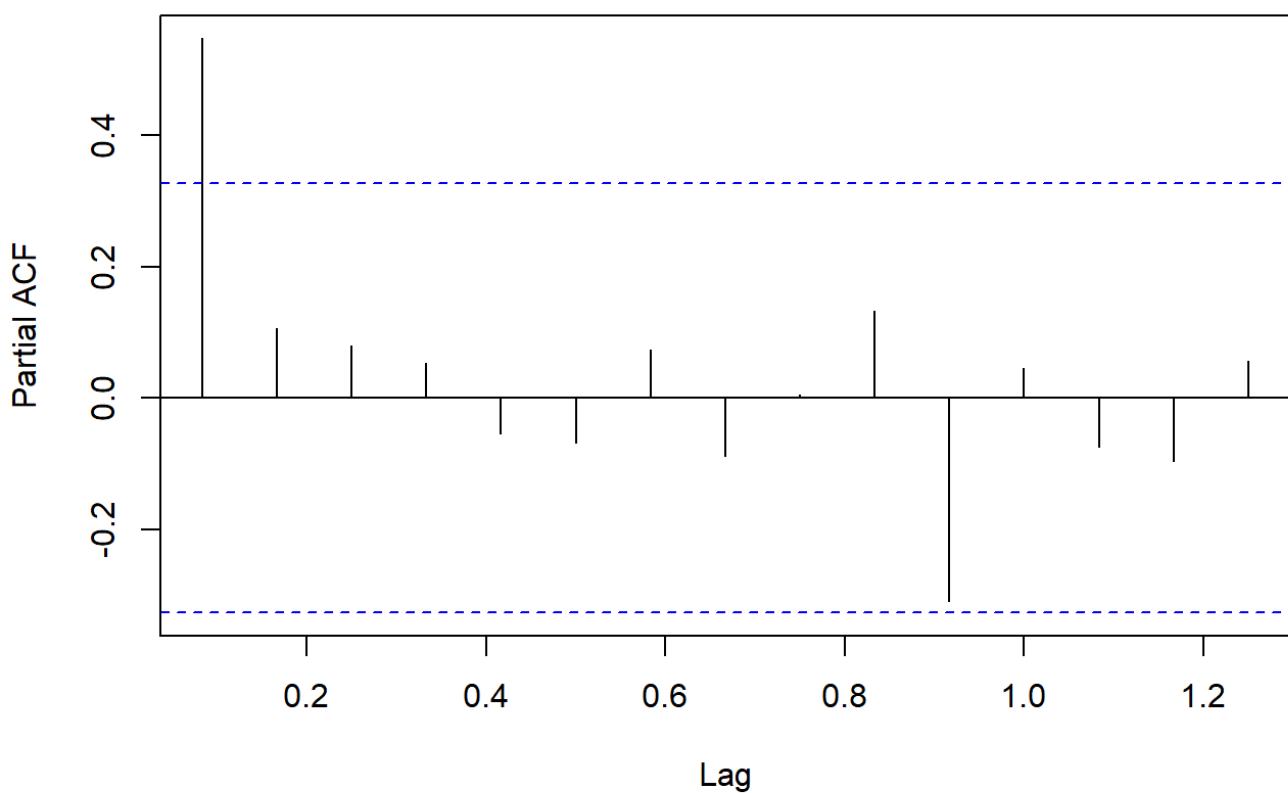
```
traintest(tv_ts49)
```



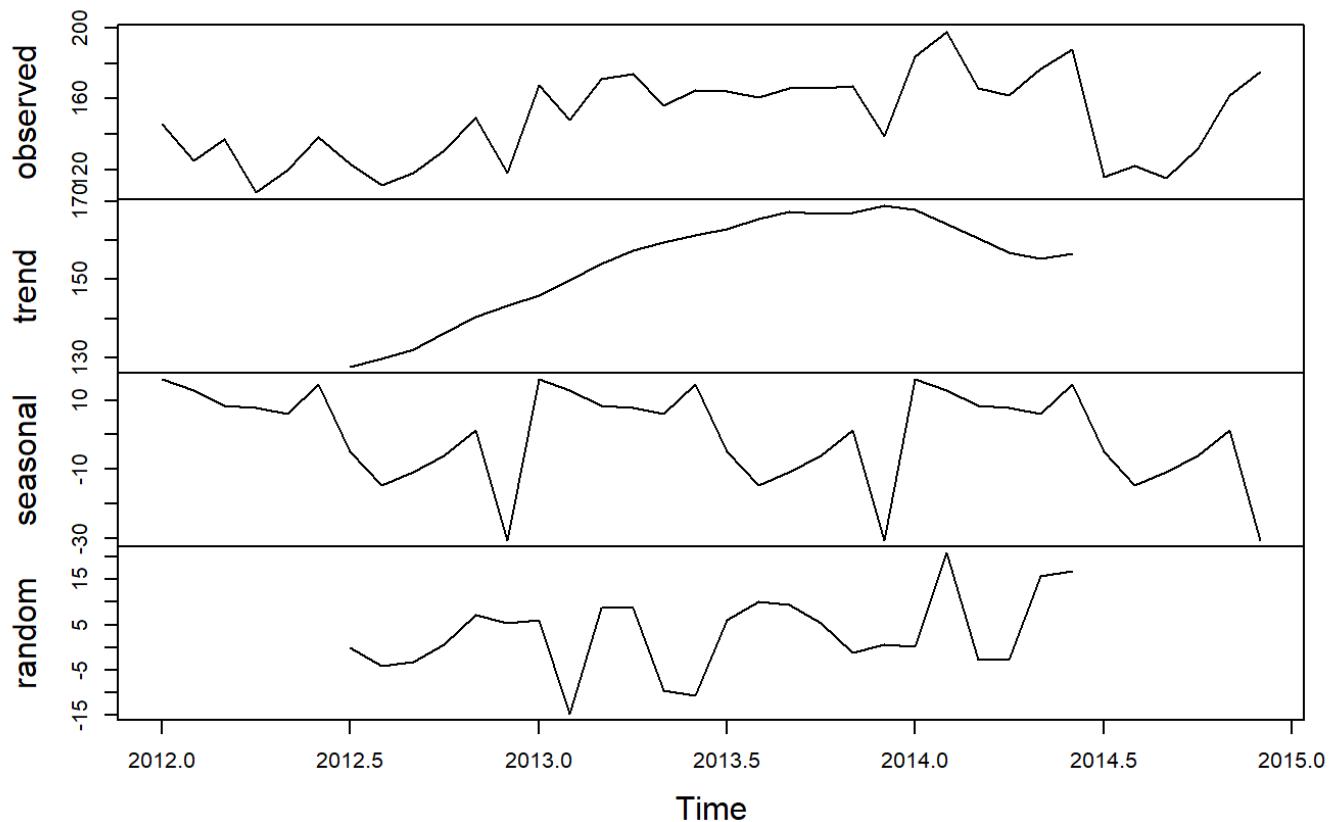
Series timeseries



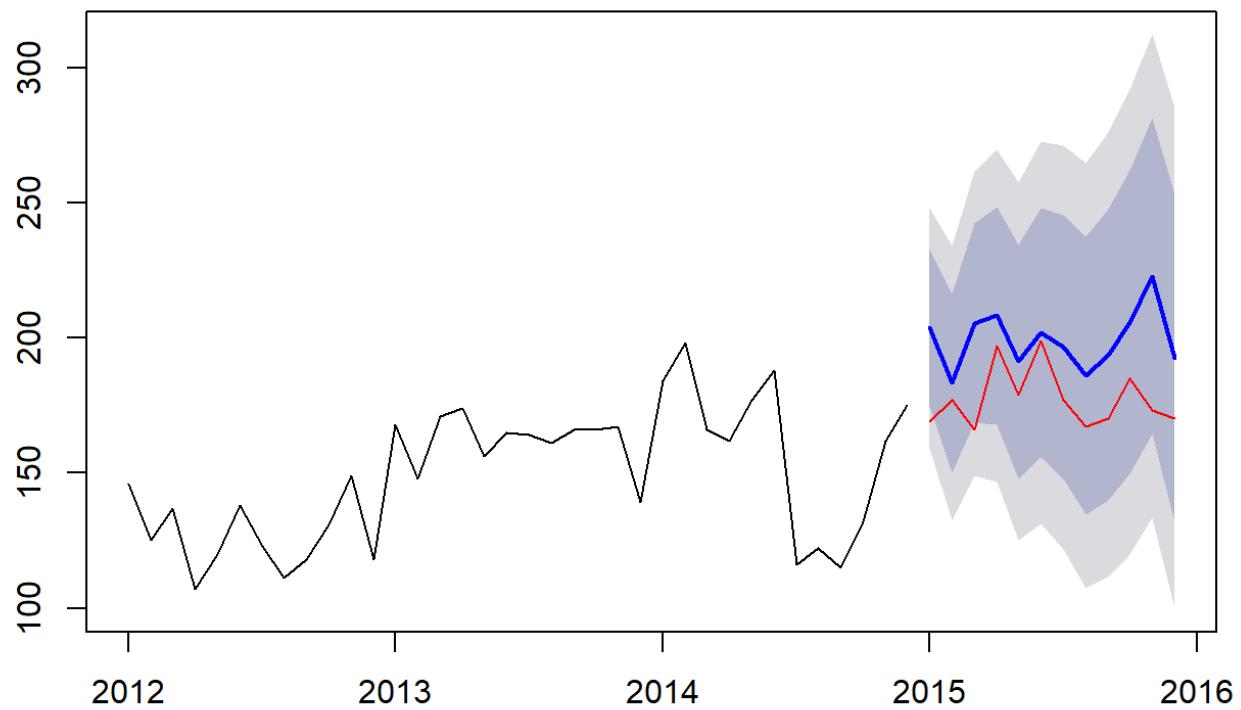
Series timeseries



Decomposition of additive time series

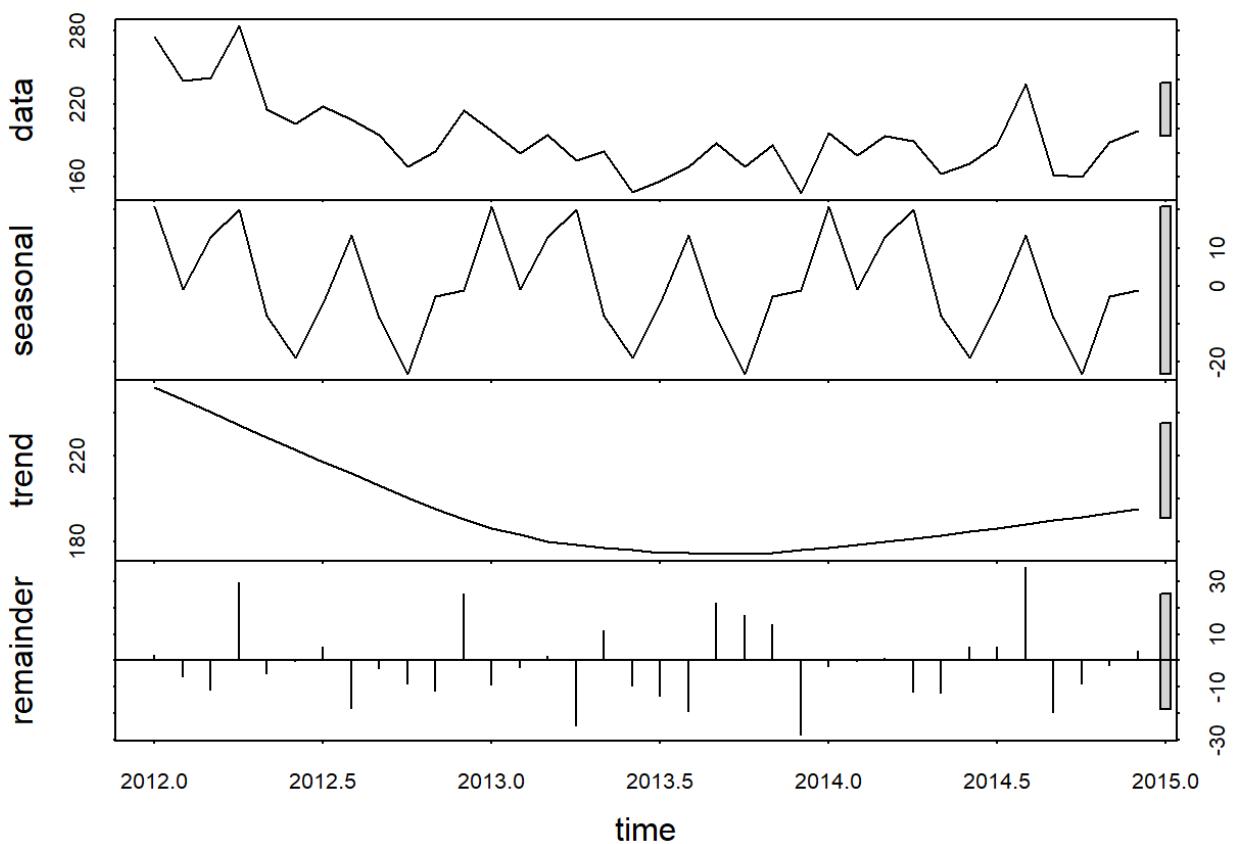
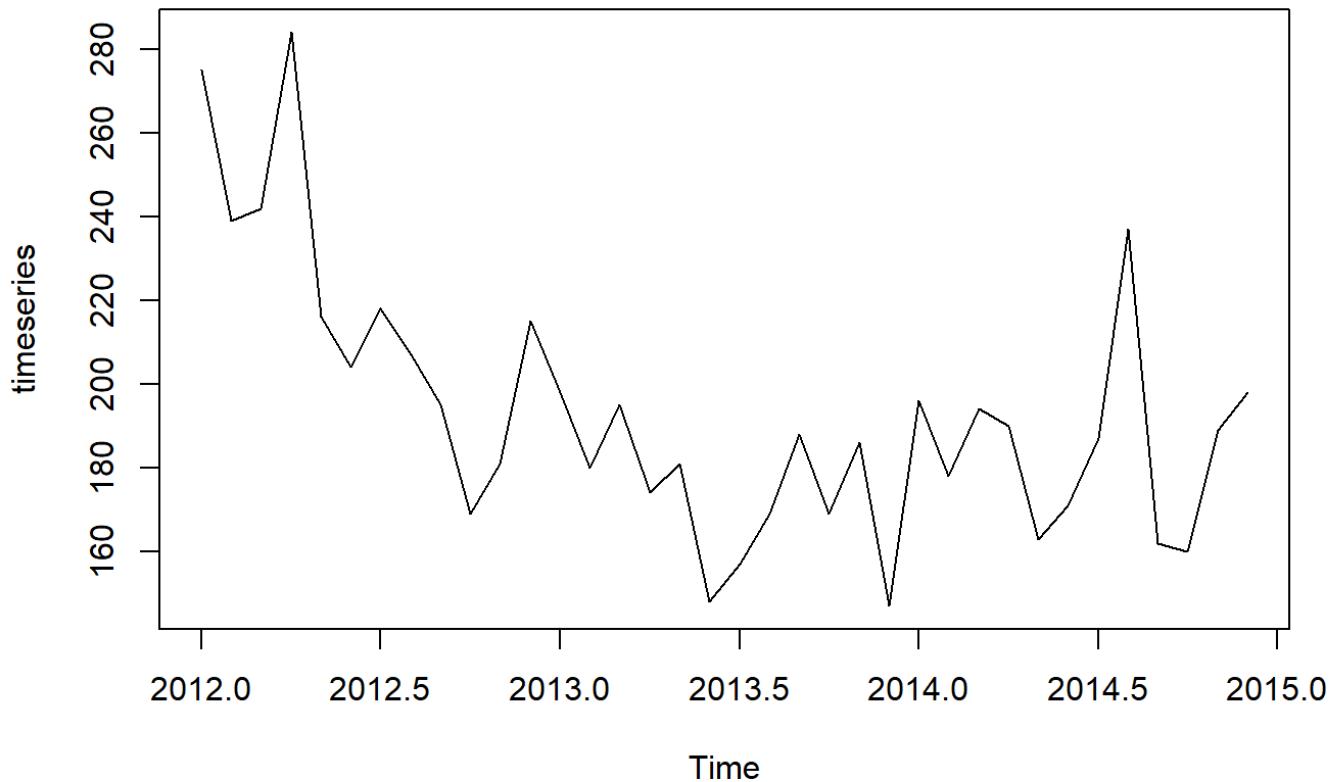


Forecasts from HoltWinters

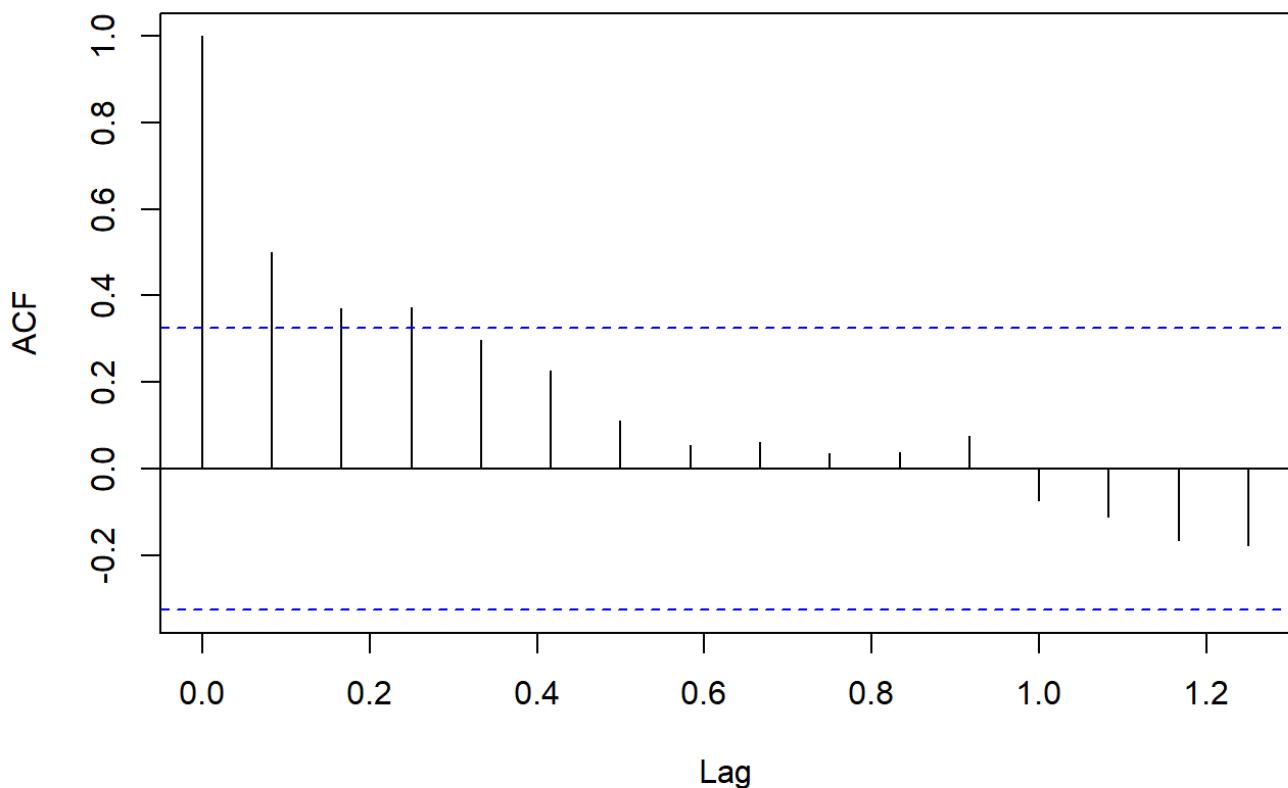


```
## [1] 21.82742
```

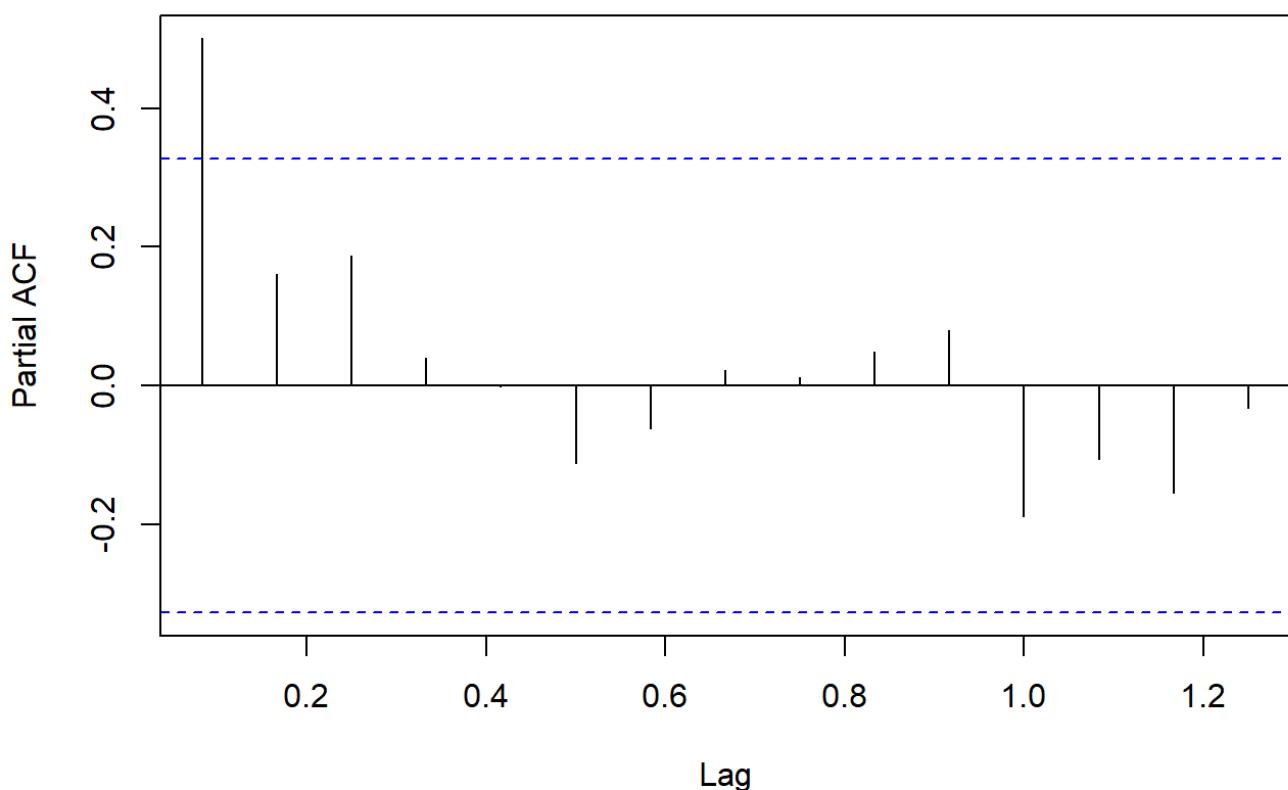
```
#traintest(tv_ts50)
traintest(tv_ts51)
```



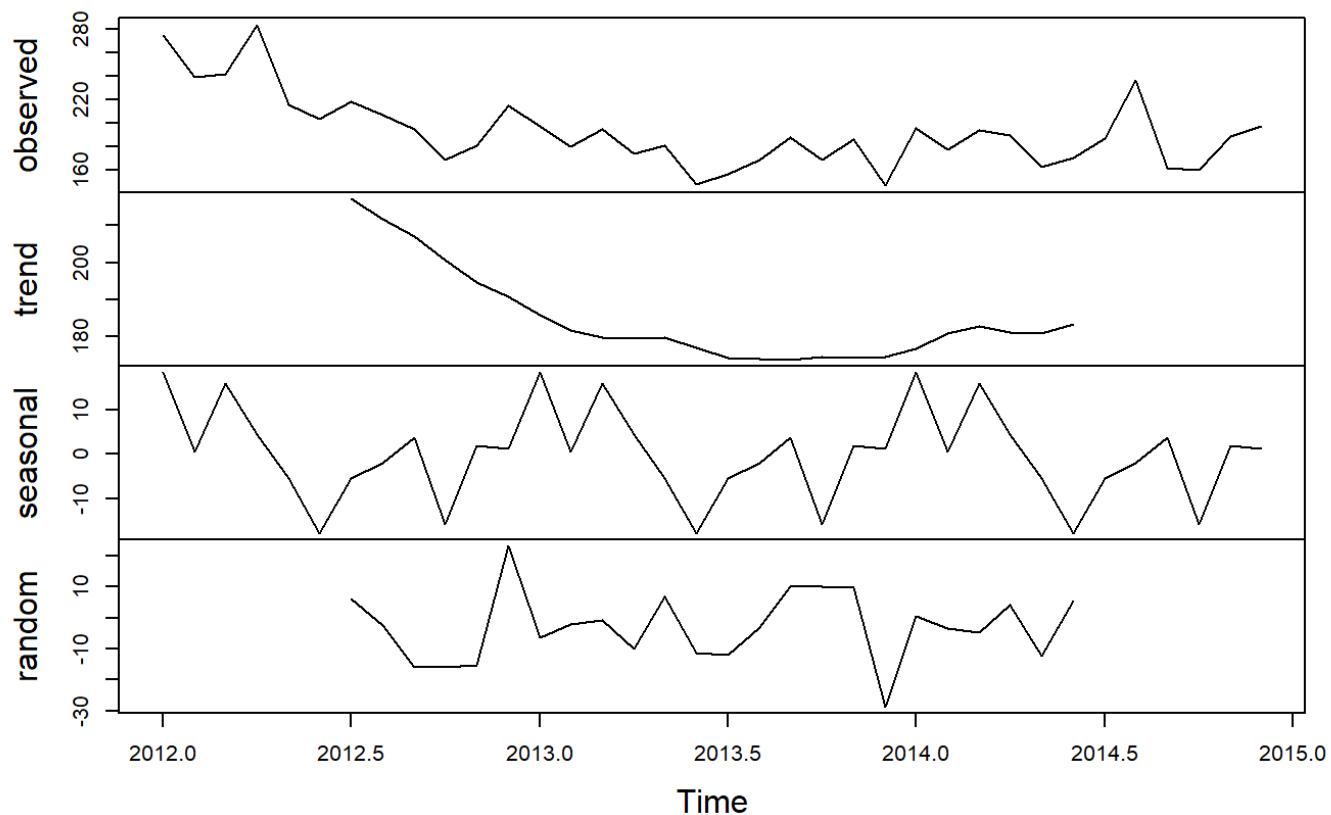
Series timeseries



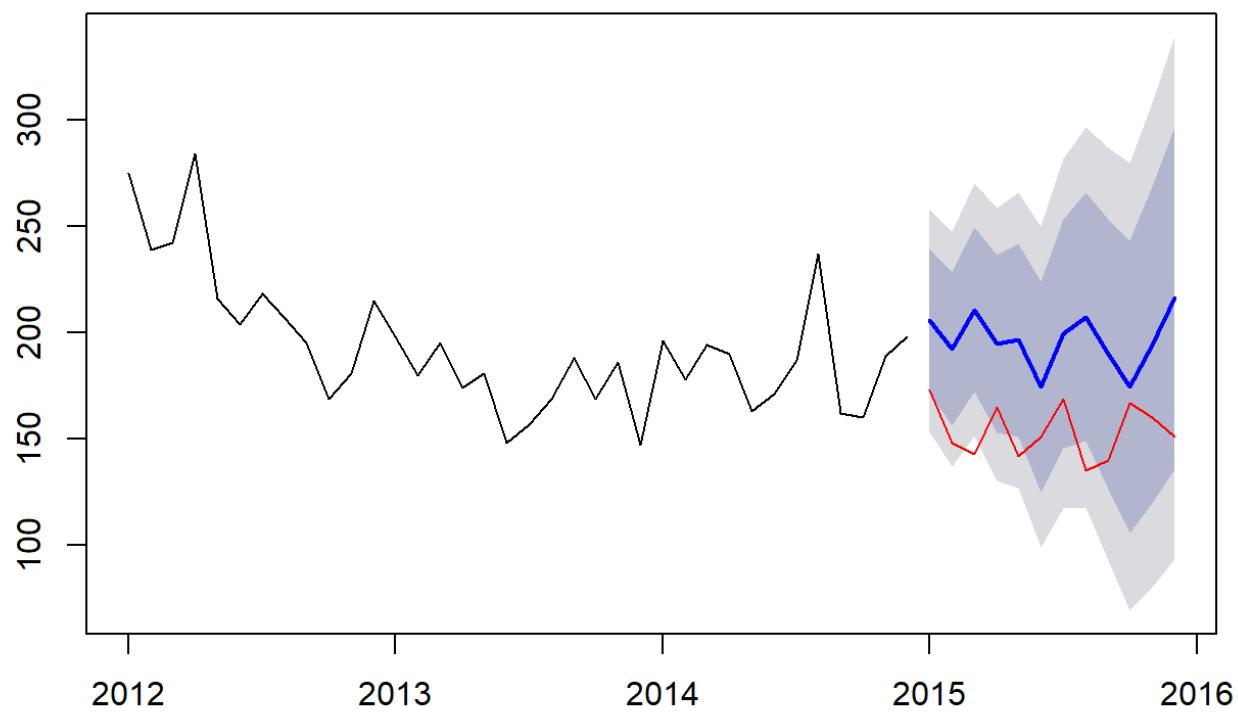
Series timeseries



Decomposition of additive time series

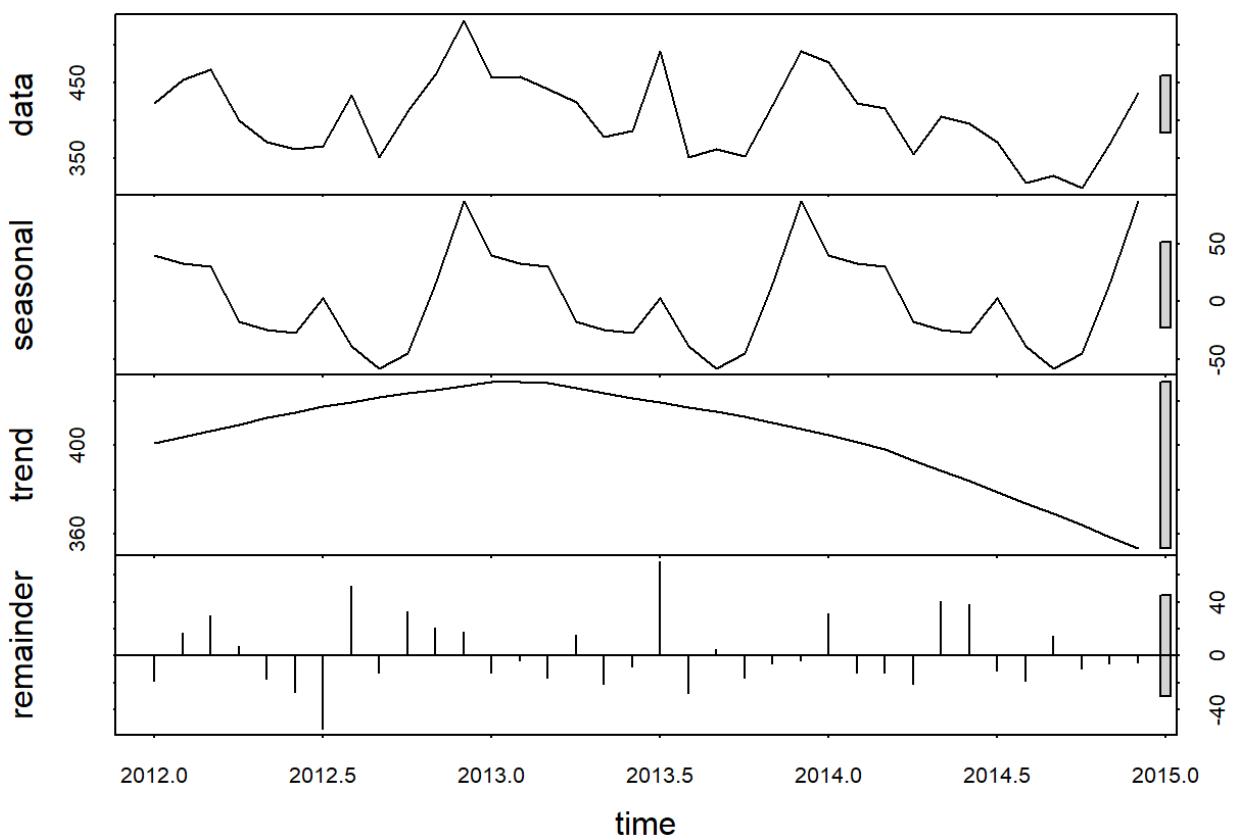
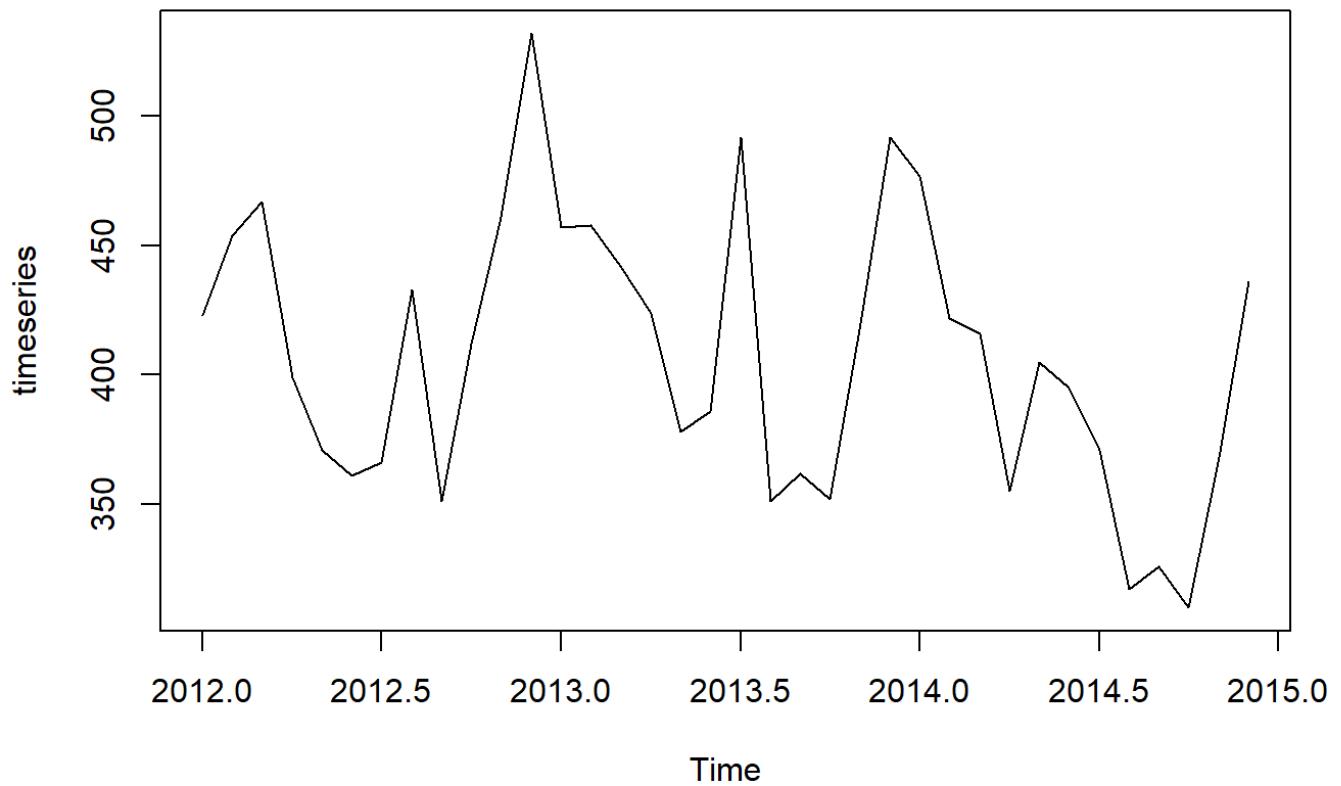


Forecasts from HoltWinters

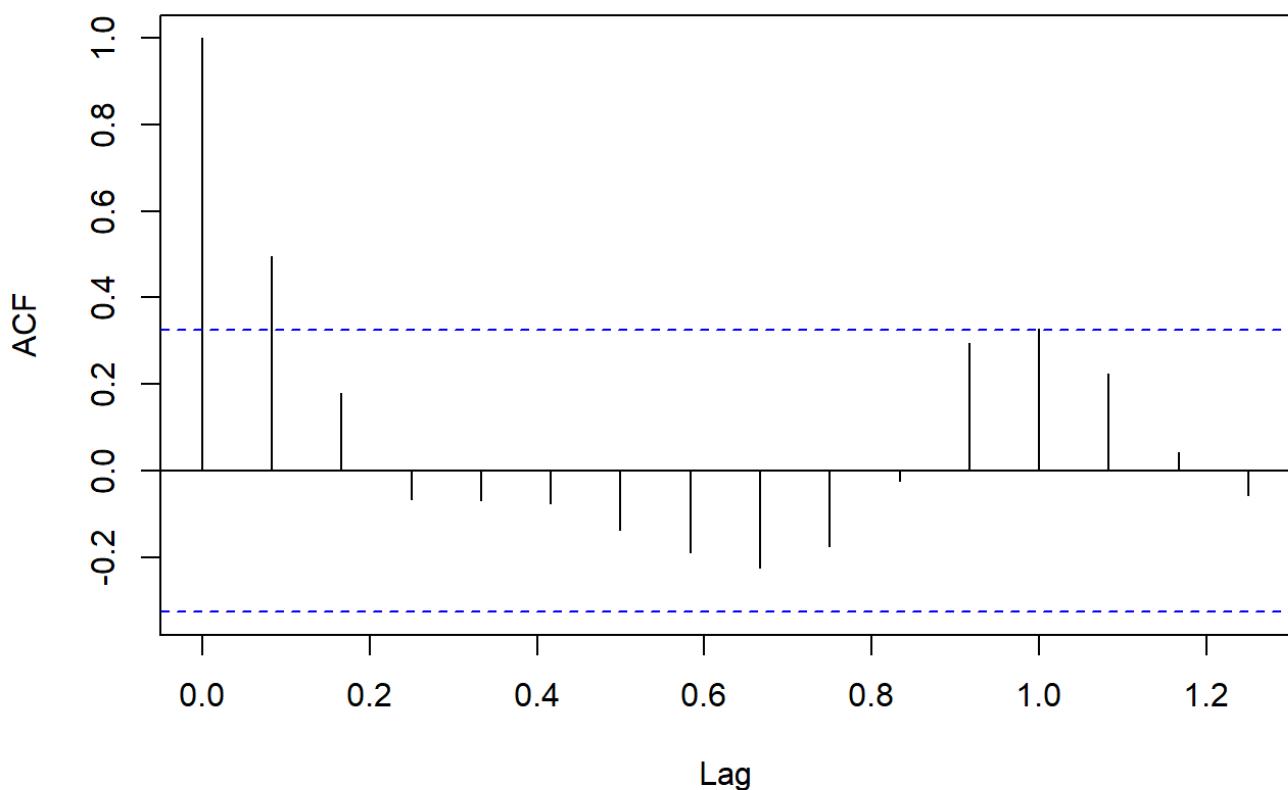


```
## [1] 42.66445
```

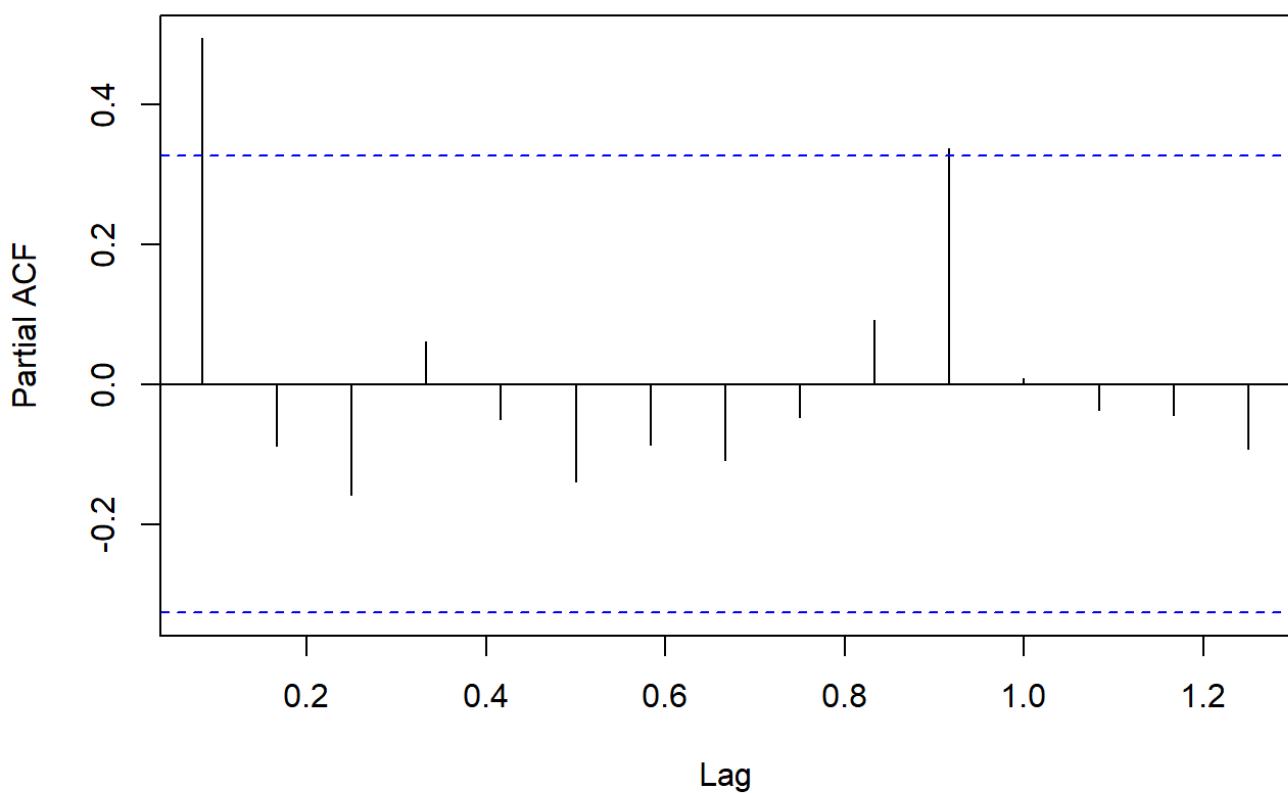
```
traintest(tv_ts52)
```



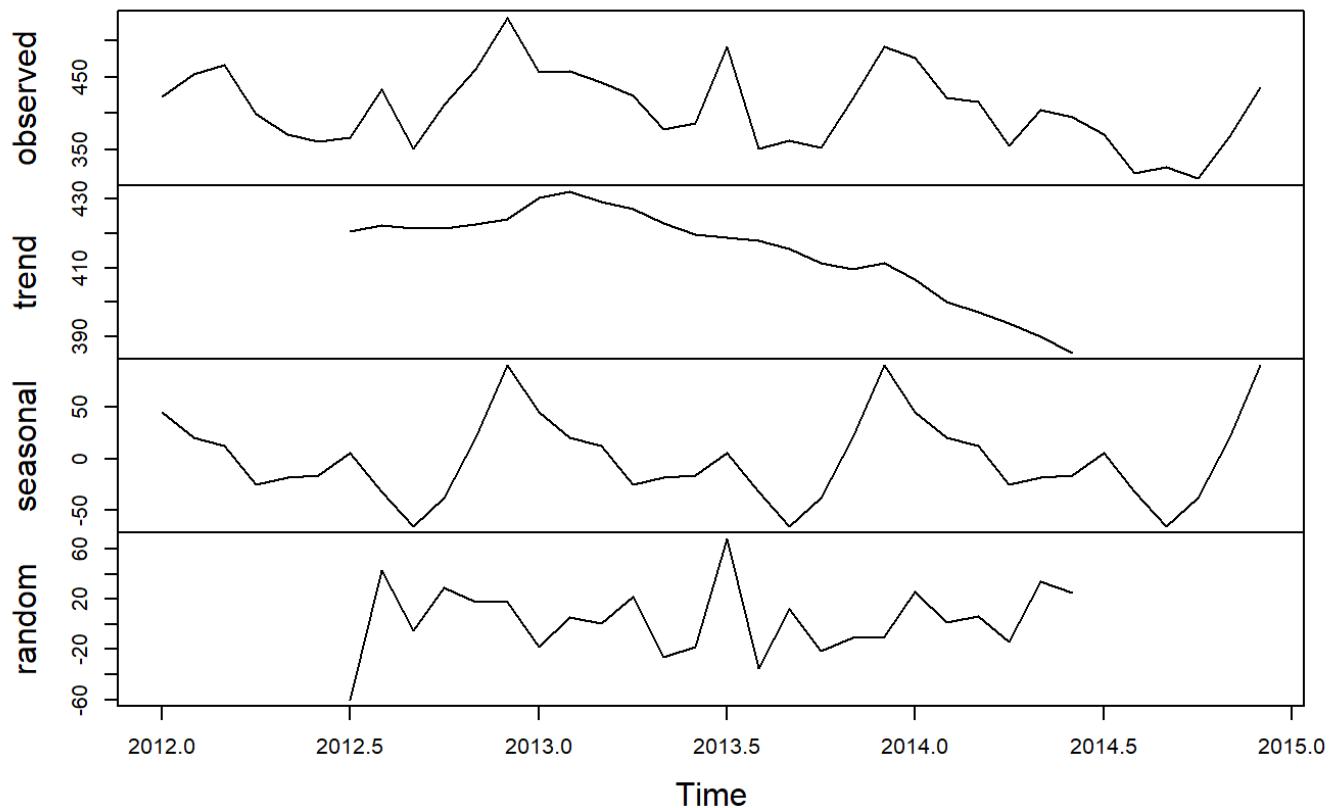
Series timeseries



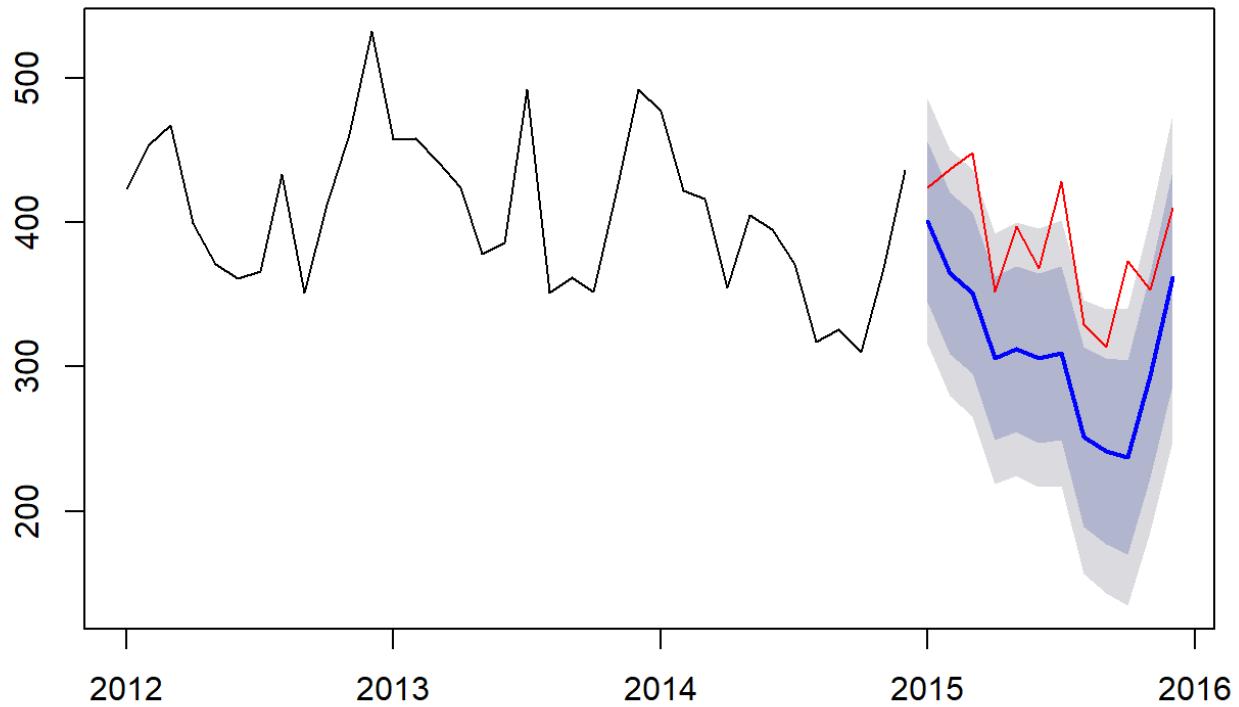
Series timeseries



Decomposition of additive time series

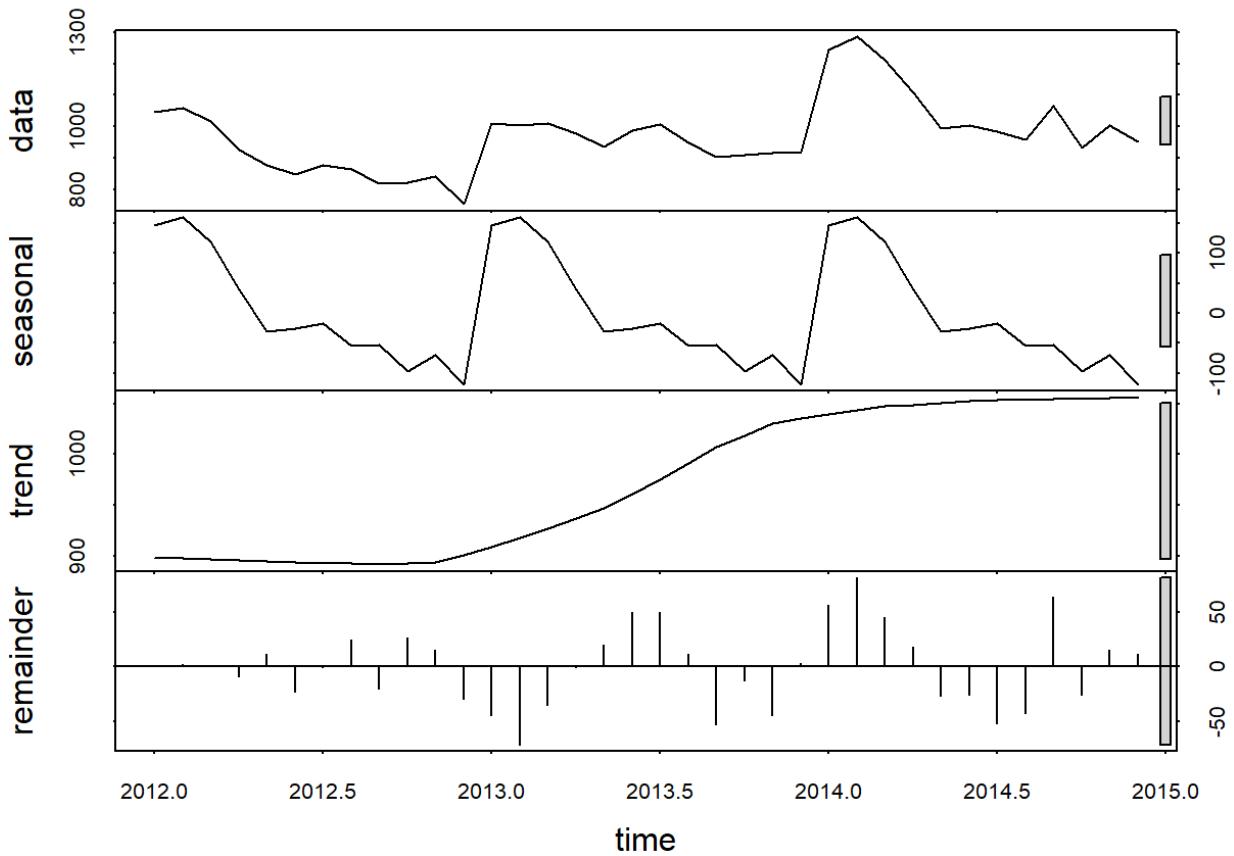
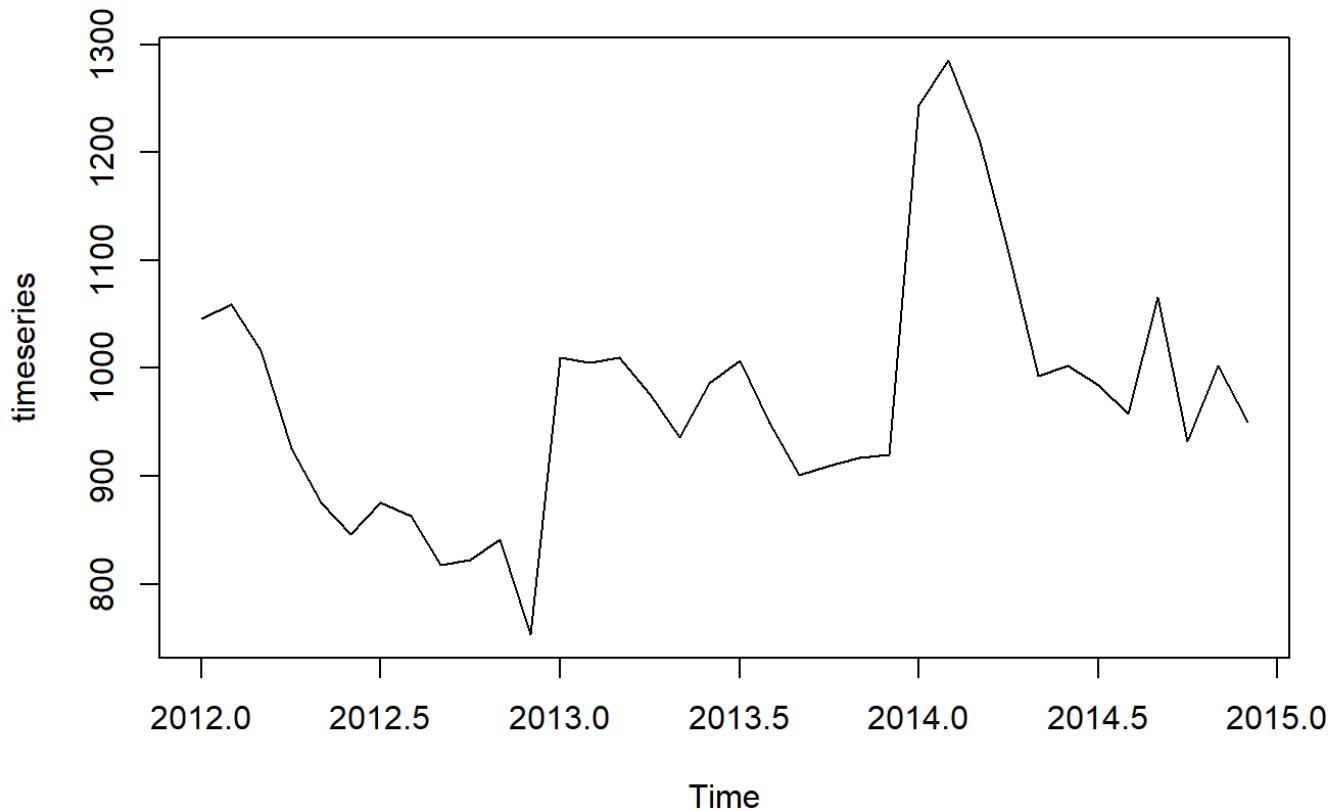


Forecasts from HoltWinters

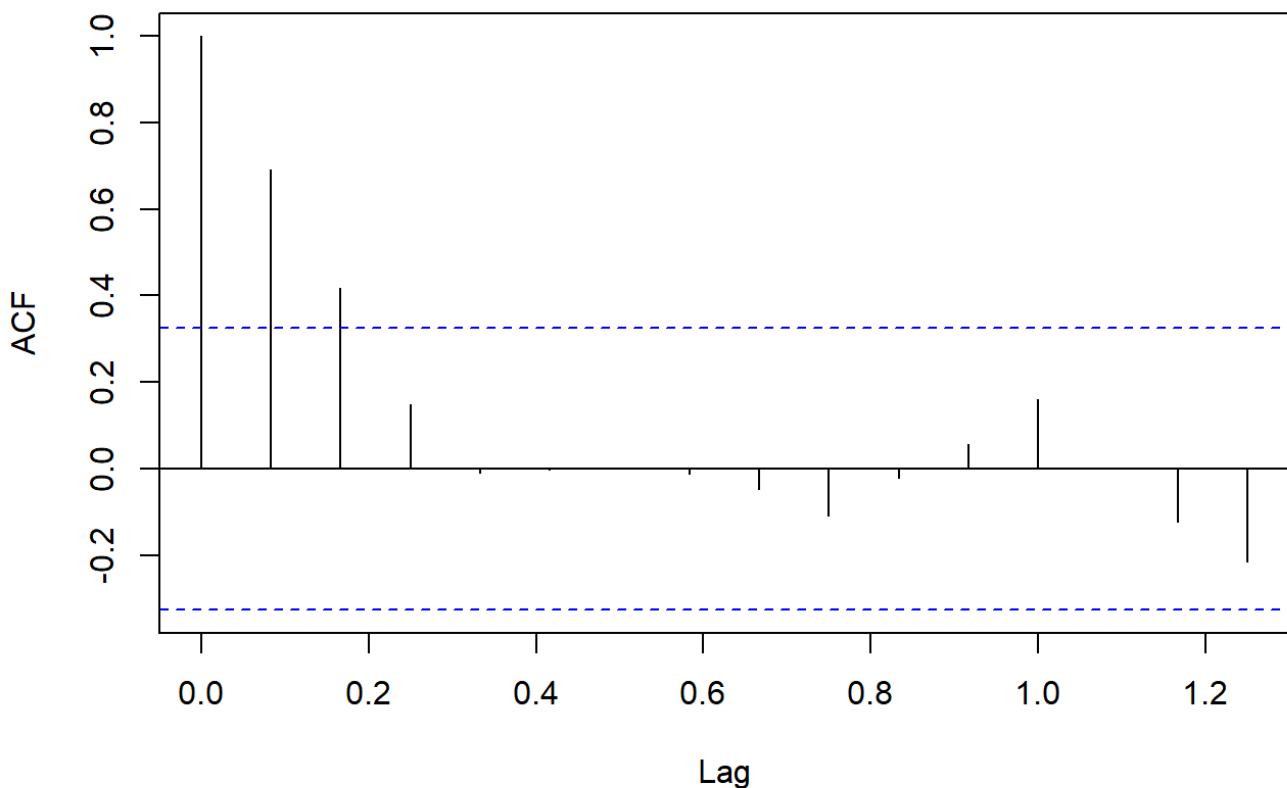


```
## [1] 74.74314
```

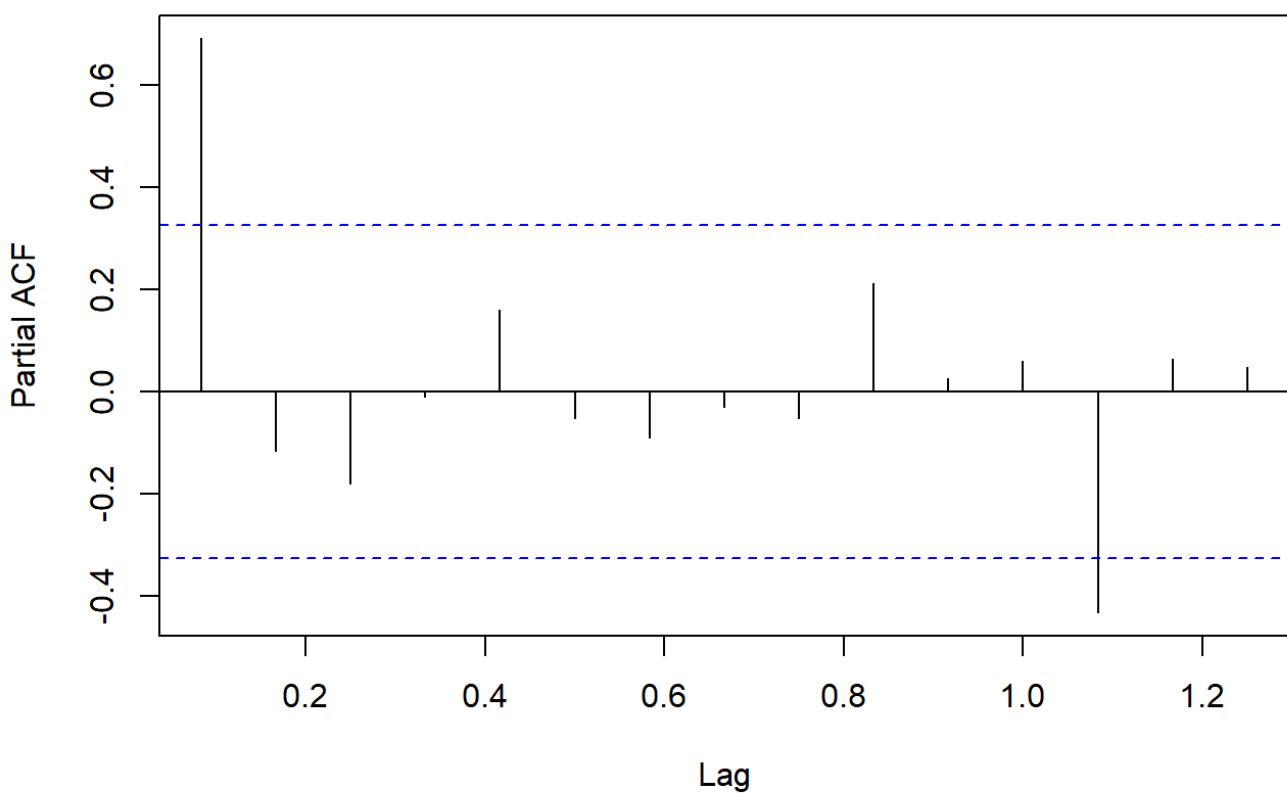
```
traintest(tv_ts53)
```



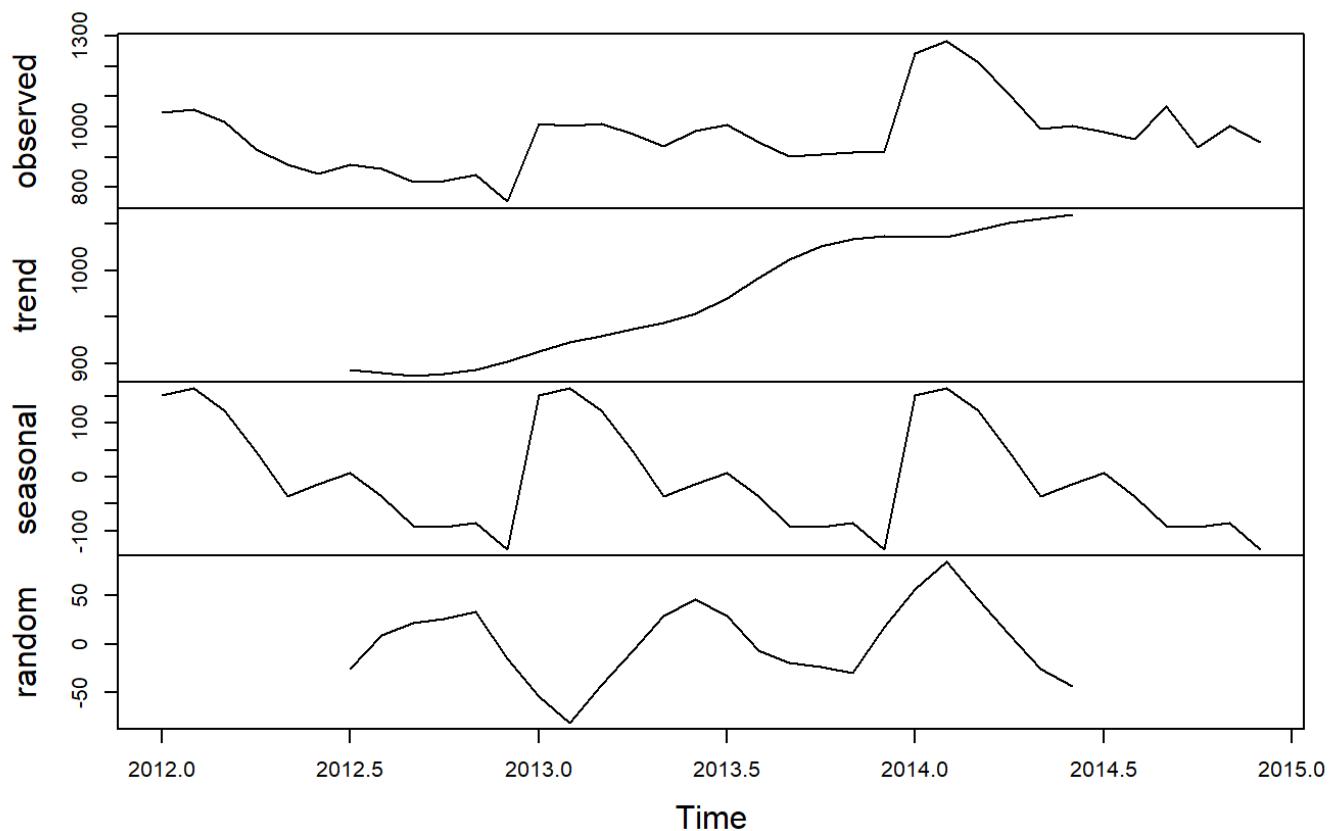
Series timeseries



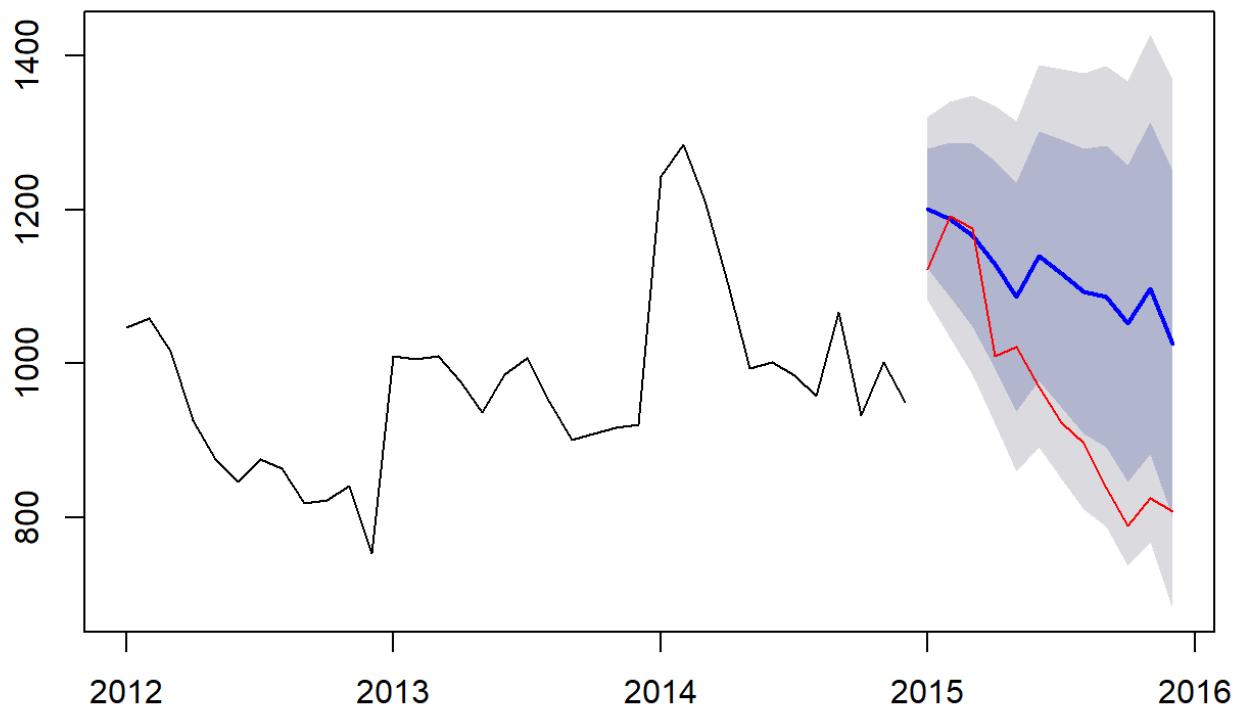
Series timeseries



Decomposition of additive time series

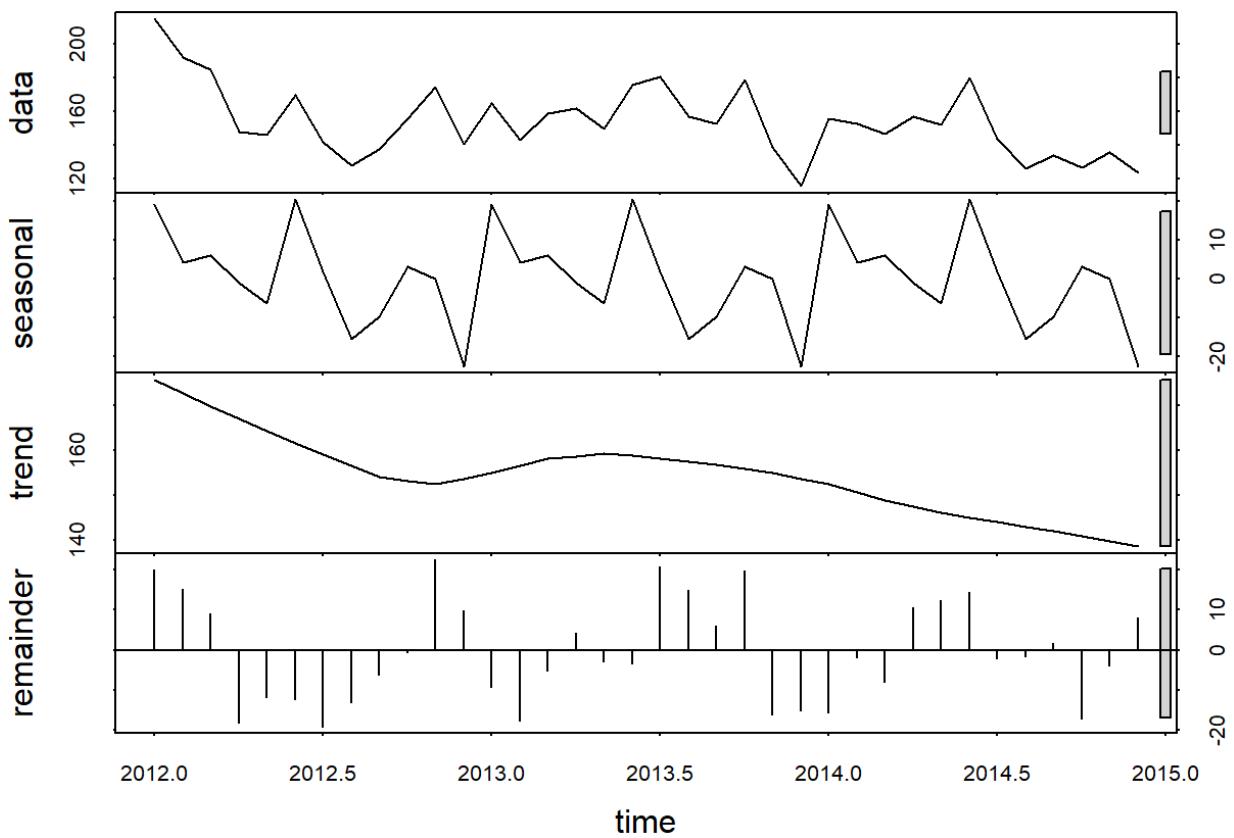
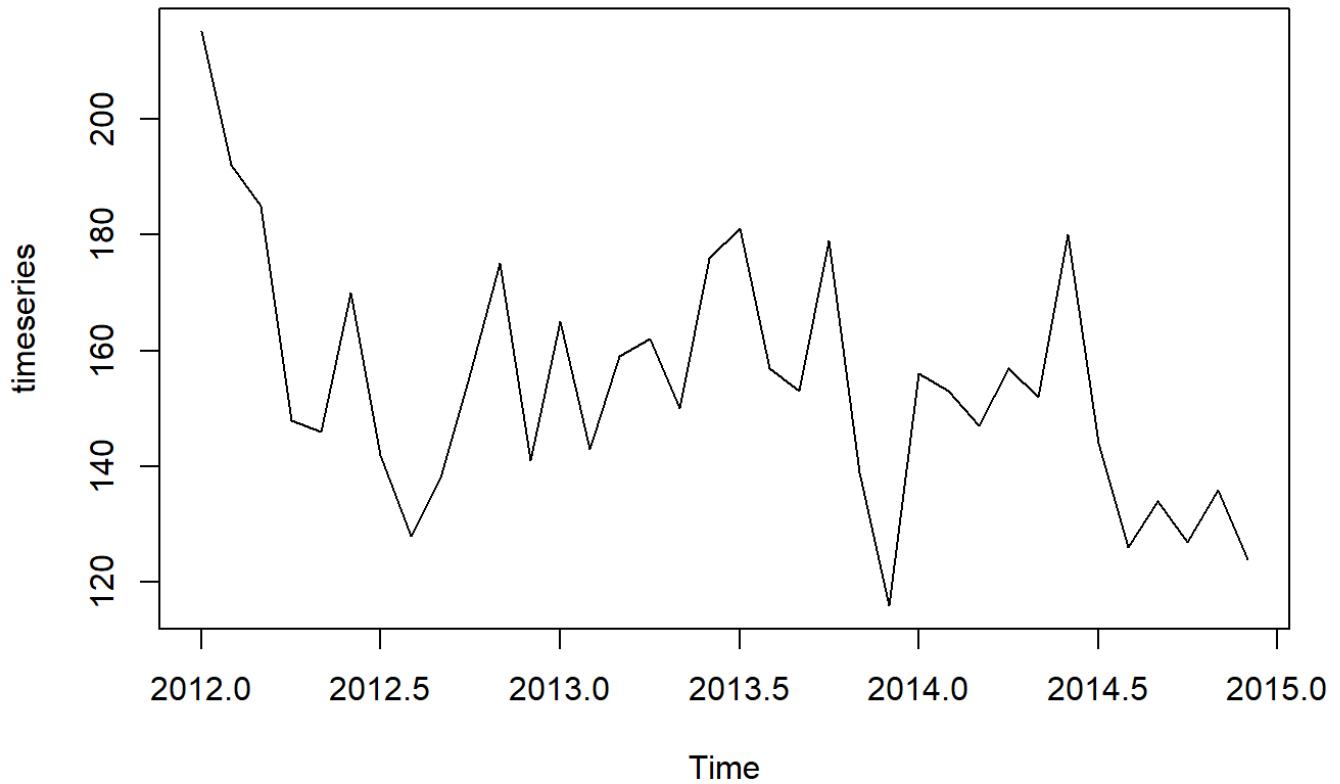


Forecasts from HoltWinters

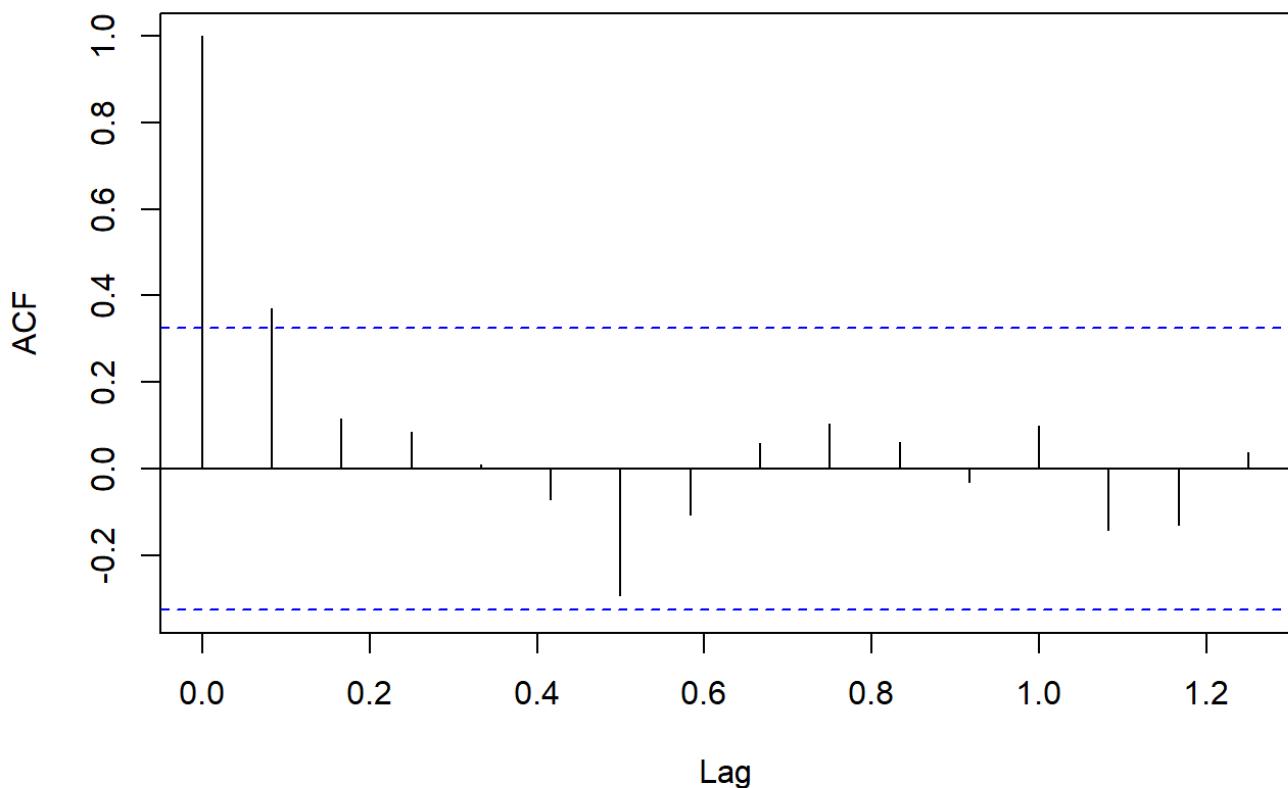


```
## [1] 153.1797
```

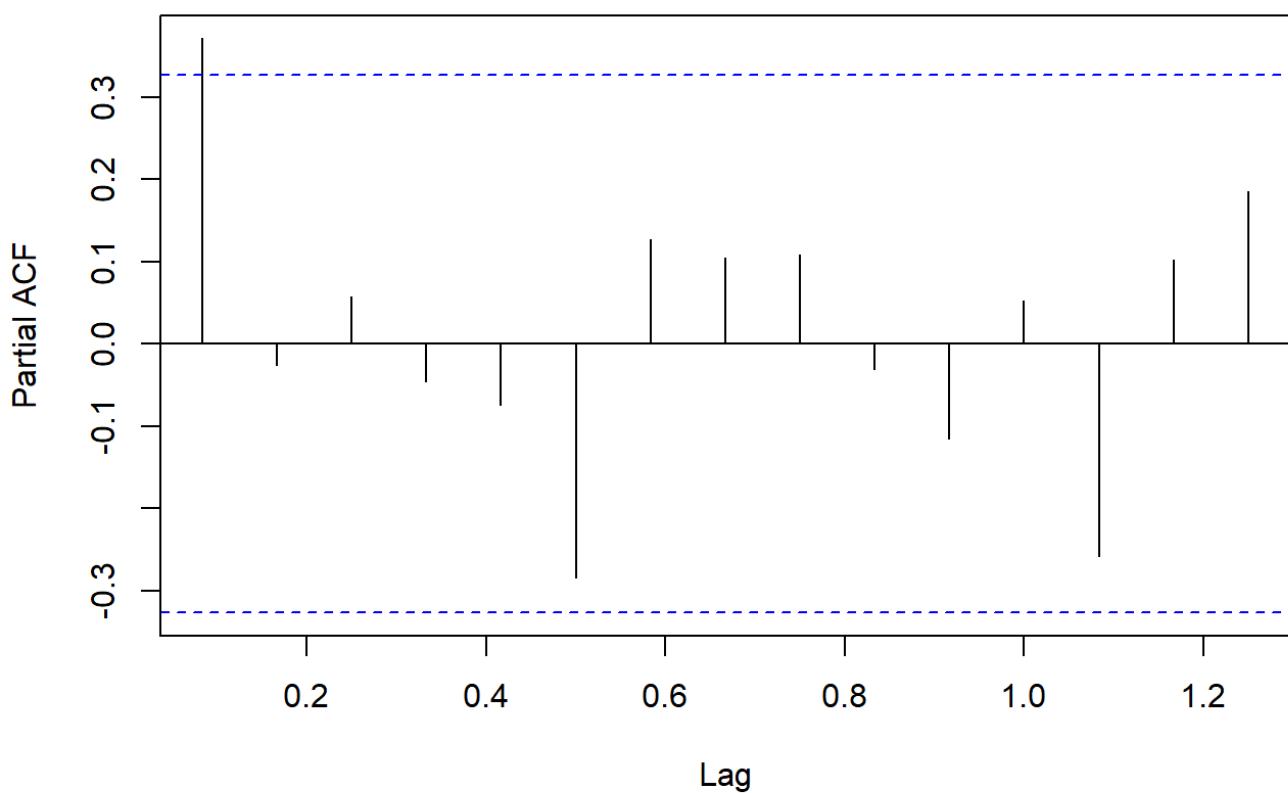
```
traintest(tv_ts54)
```



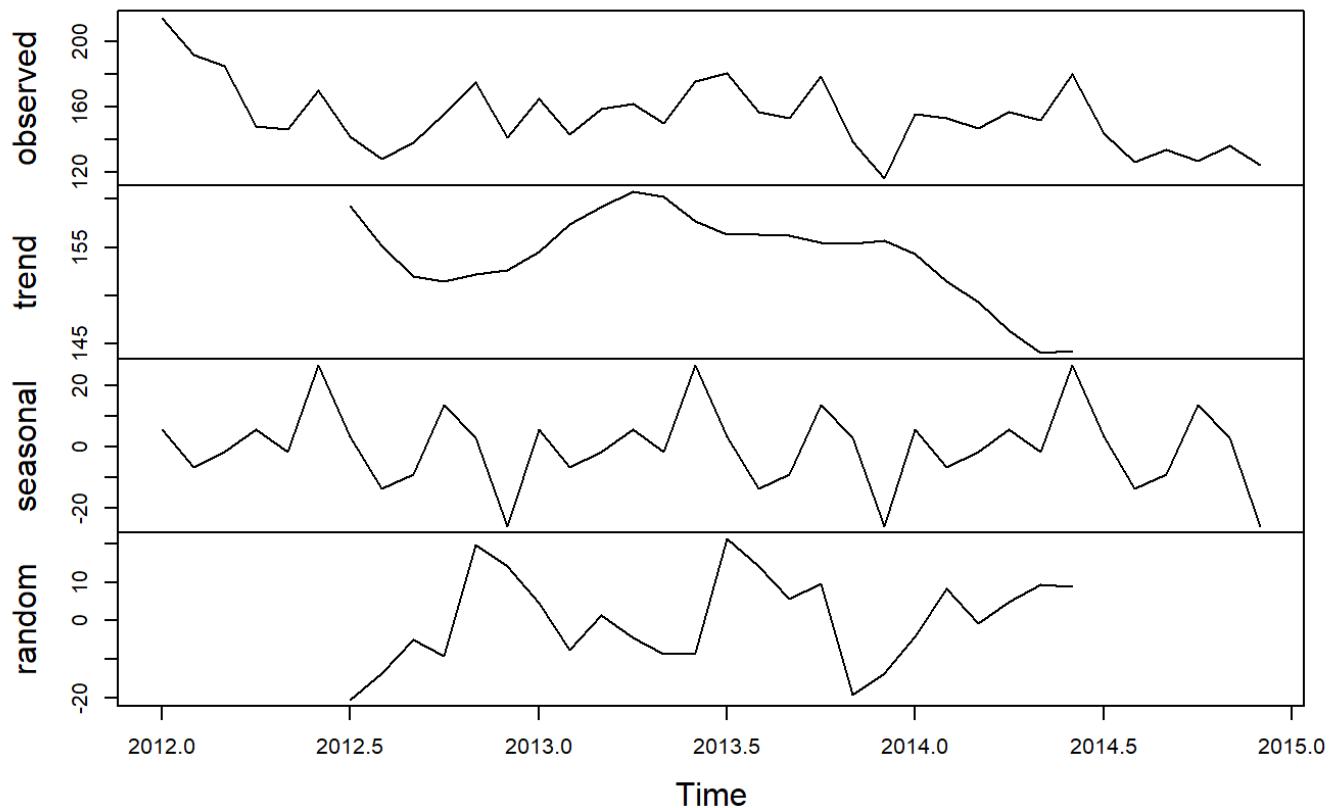
Series timeseries



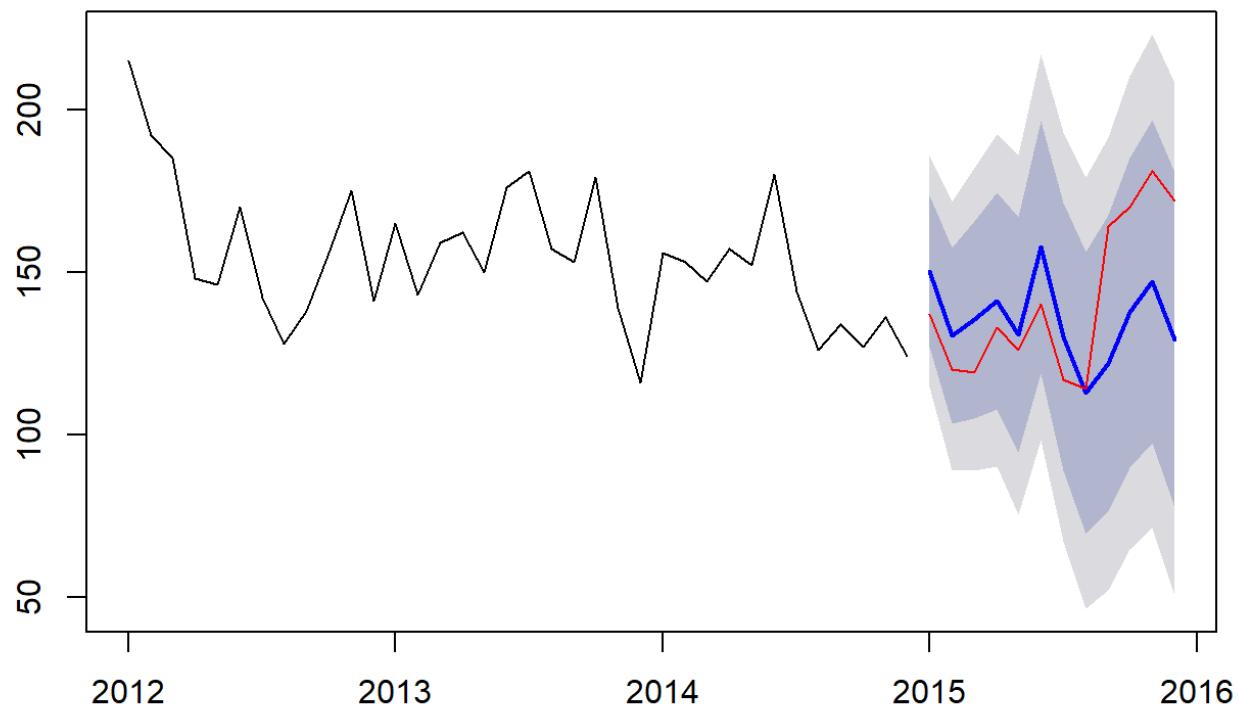
Series timeseries



Decomposition of additive time series

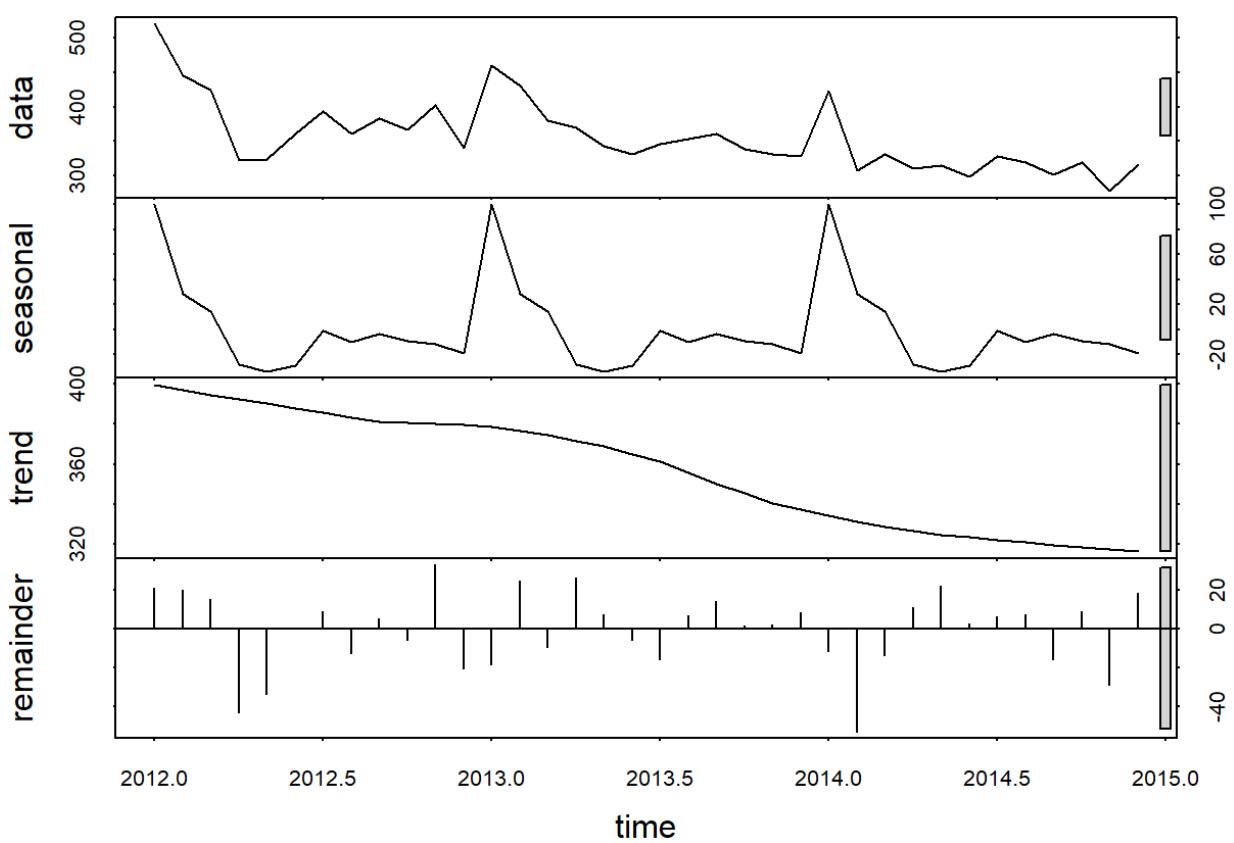
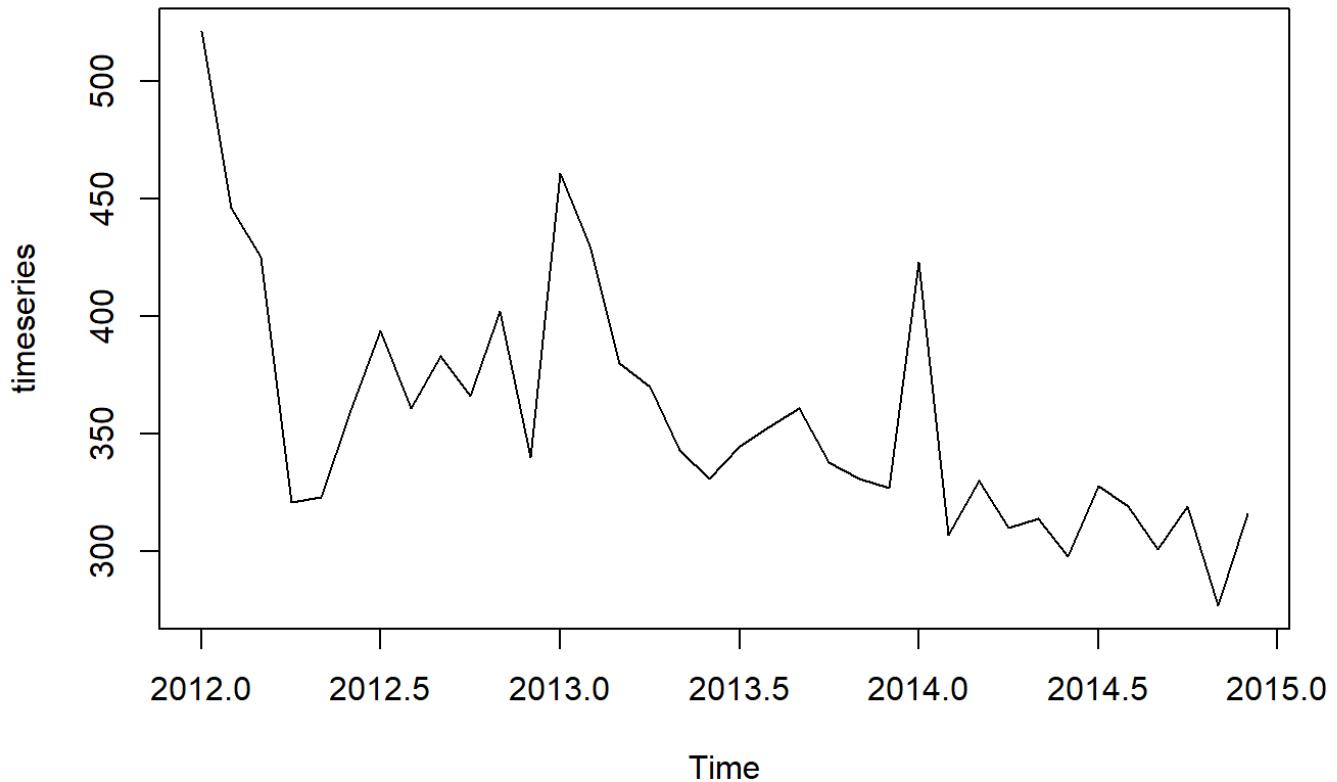


Forecasts from HoltWinters

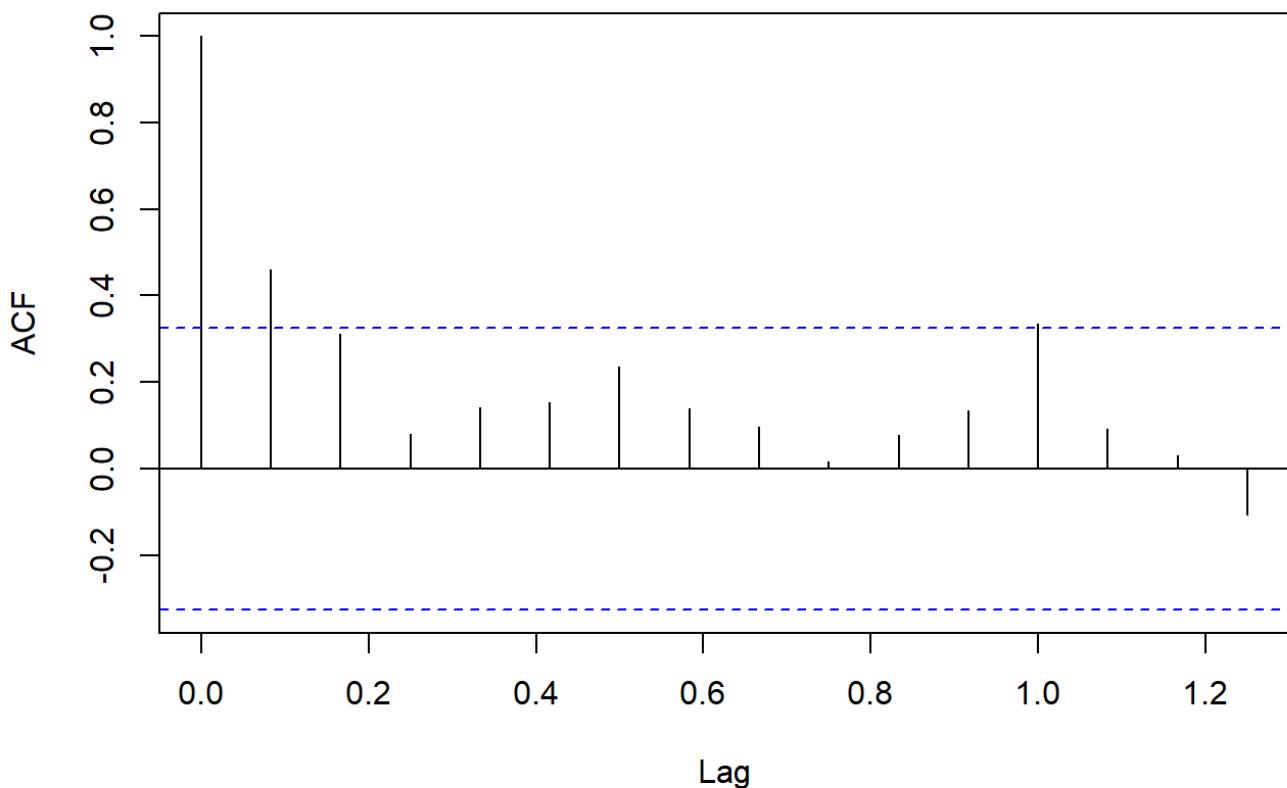


```
## [1] 19.6662
```

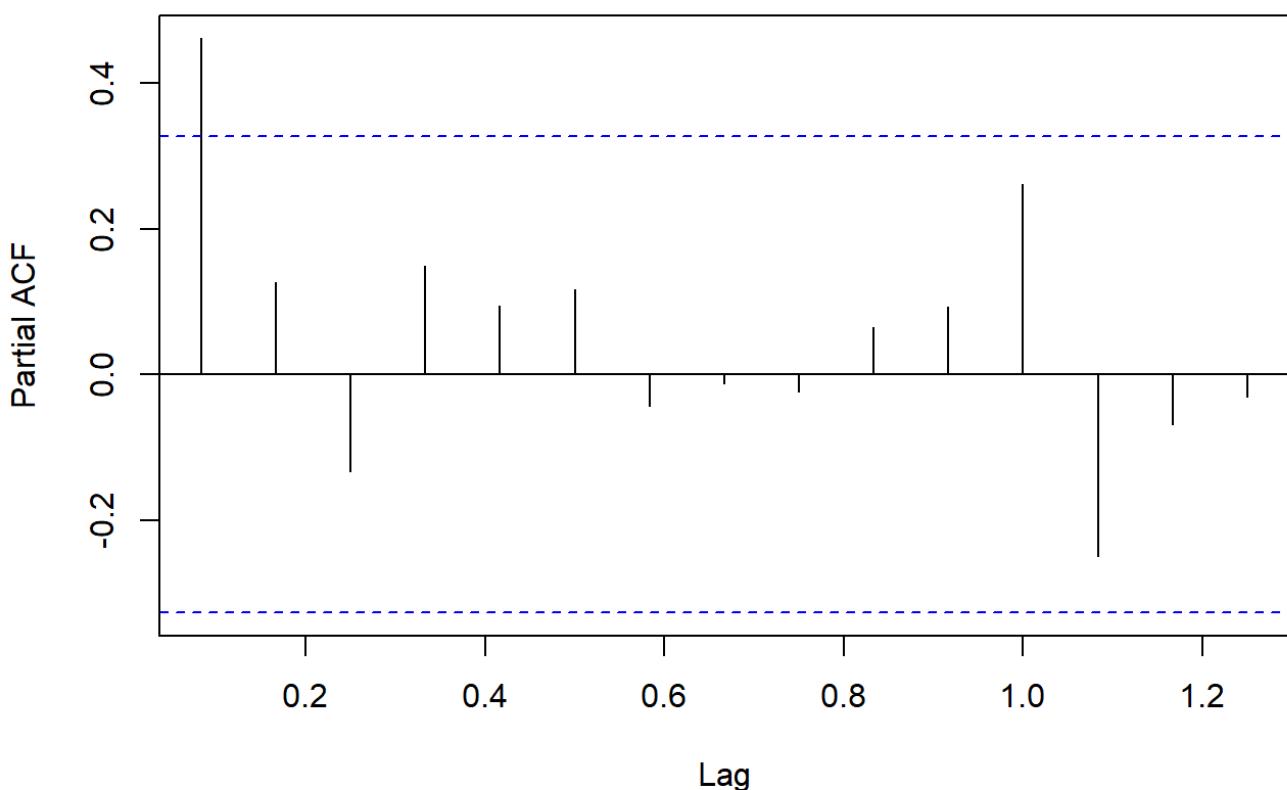
```
traintest(tv_ts55)
```



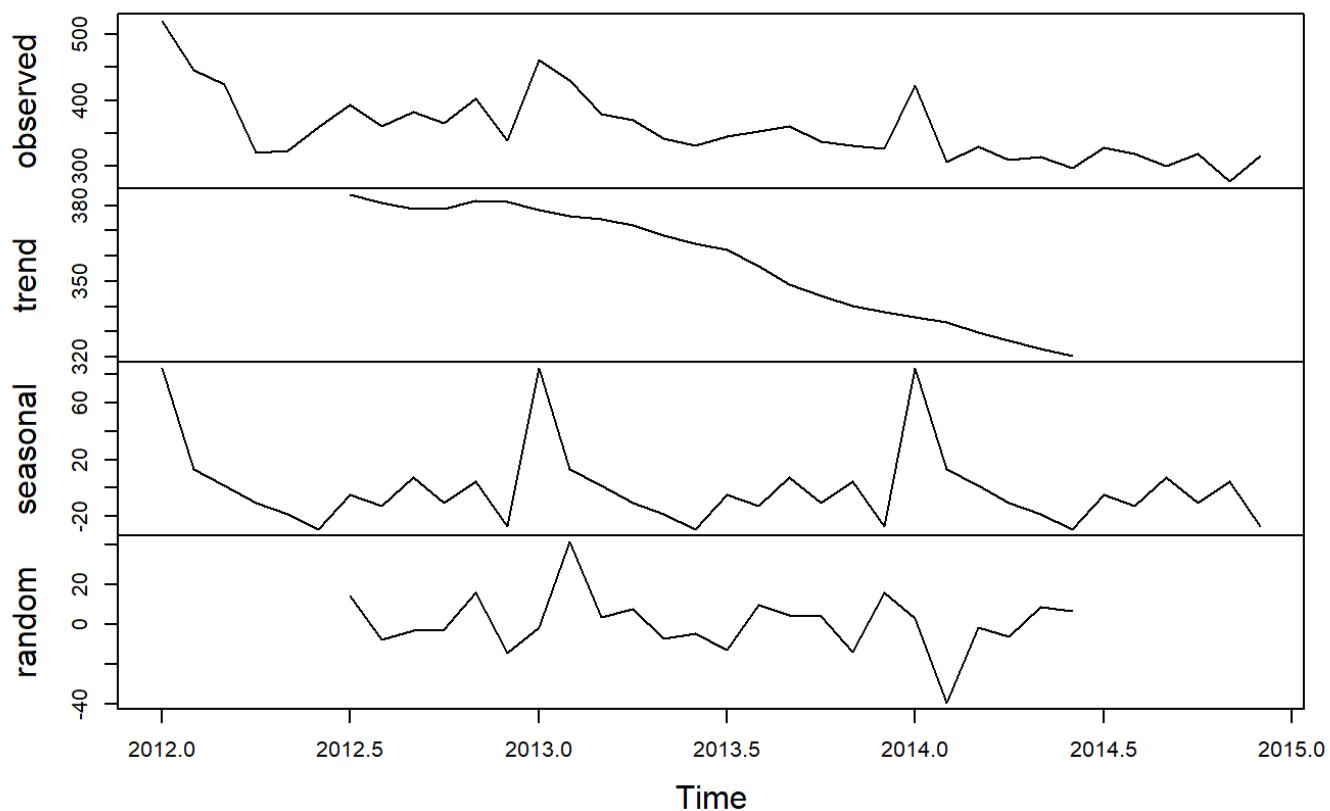
Series timeseries



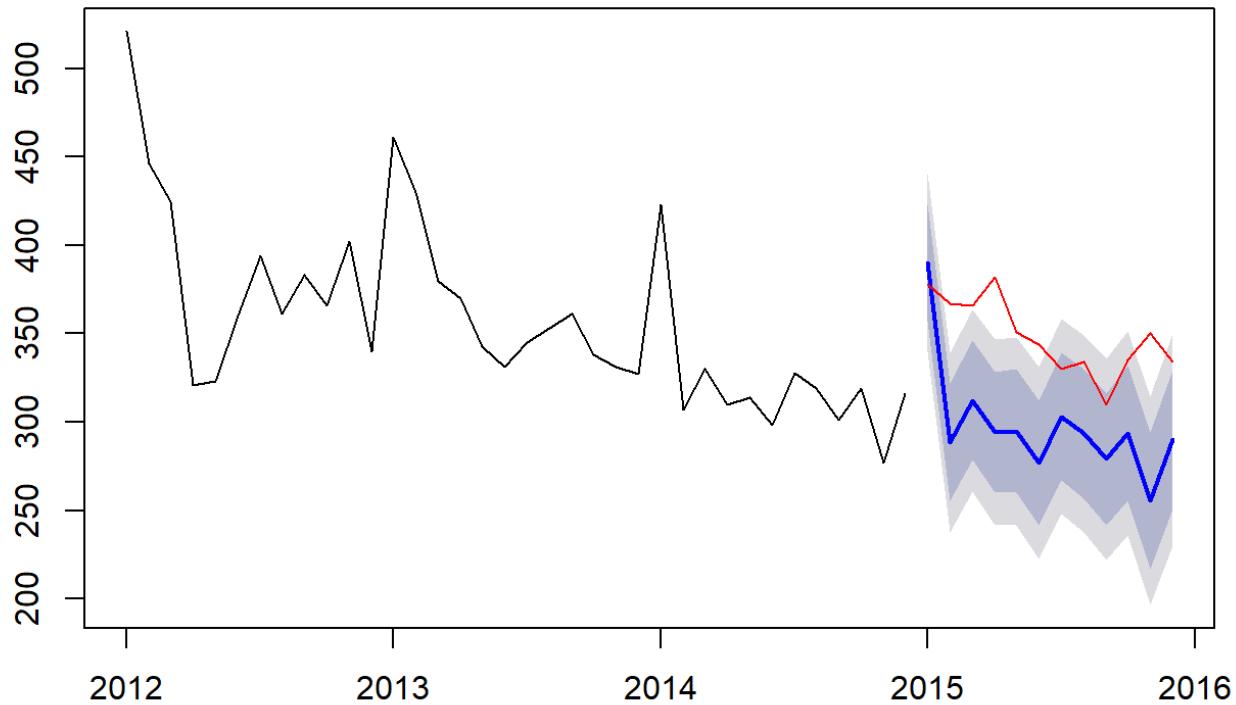
Series timeseries



Decomposition of additive time series



Forecasts from HoltWinters



```
## [1] 52.7505
```