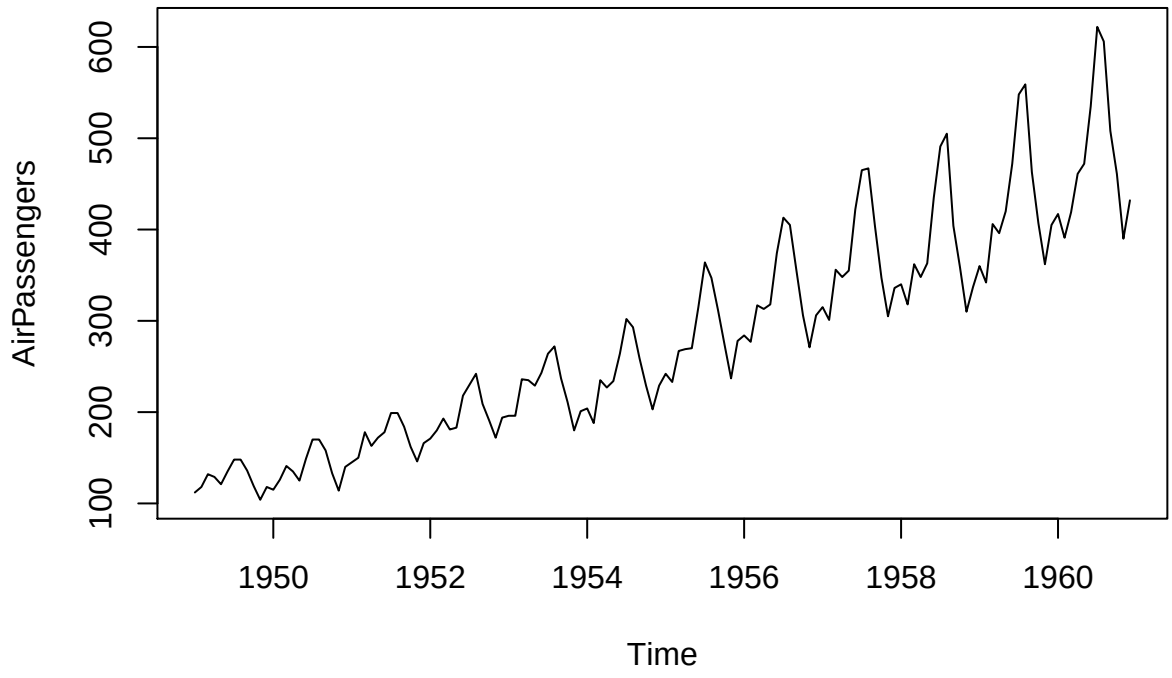
Time Series

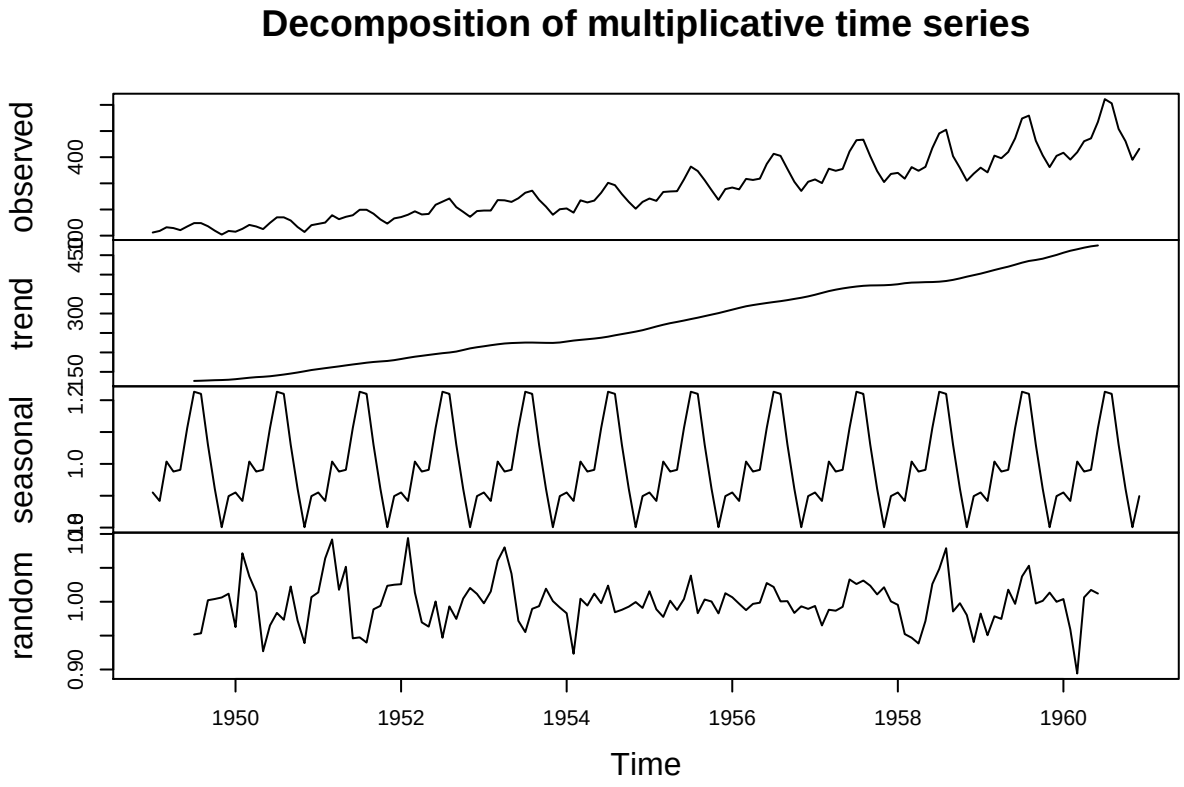
Andrea Huerfano

September 22, 2019

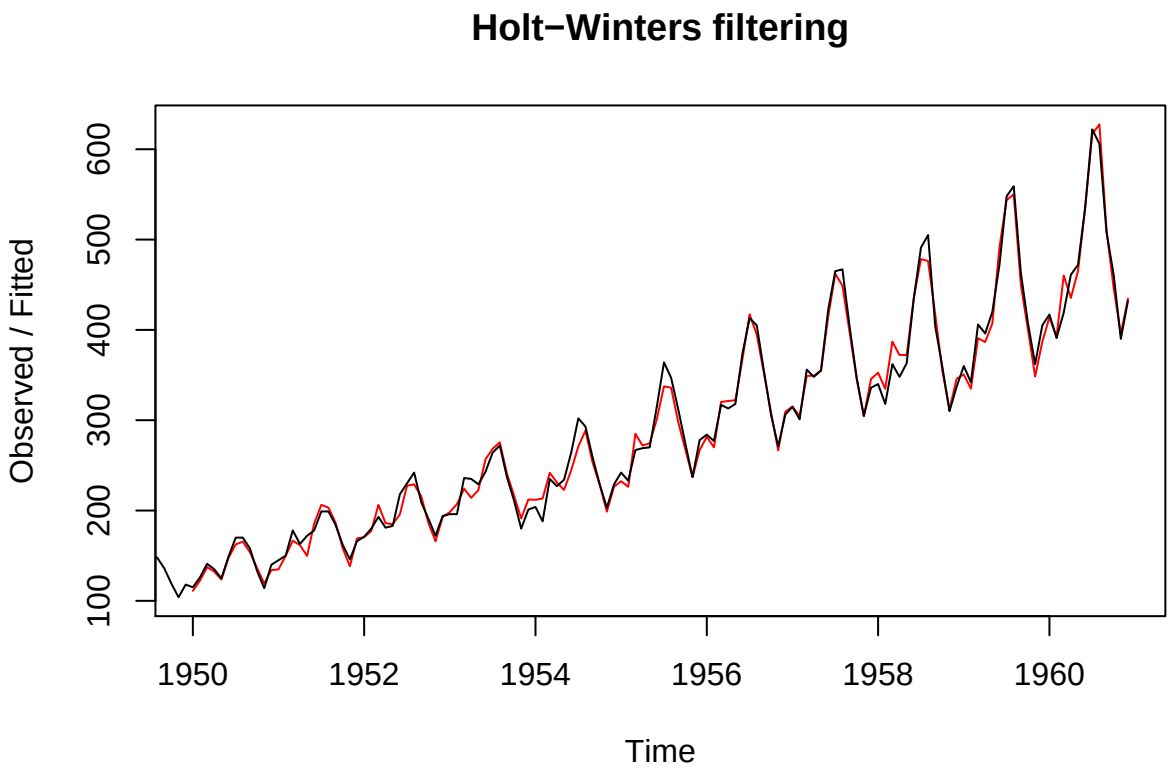
```
rm(list = ls())
air<-AirPassengers
plot(AirPassengers)
```



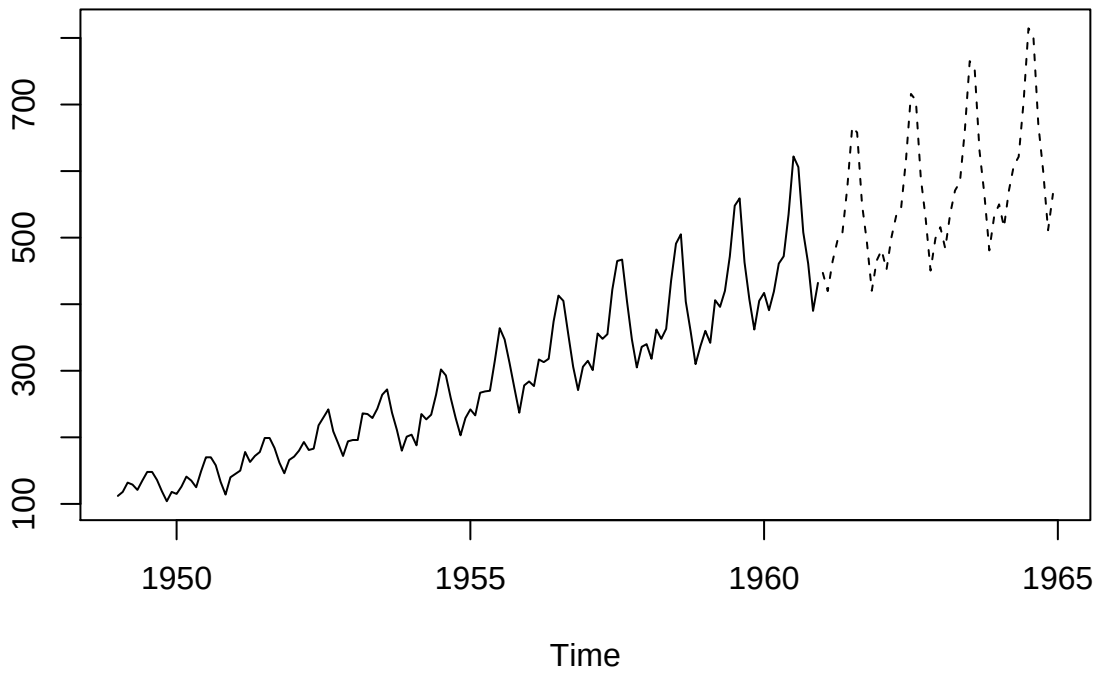

```
plot(decompose(air, type="mult"))
```




```
#En los datos observados sobresalia que el efecto estacional aumentaba
#junto con la tendencia por eso s vuelve a colocar en el Holt-Winters
ap.hw<-HoltWinters(air, seasonal = "mult")
plot(ap.hw)
```




```
ap.predict <-predict(ap.hw, n.ahead = 4*12) ##4 año,12 Meses
ts.plot(air,ap.predict,lty=1:2)
```




```
library(forecast)
```

```
## Warning: package 'forecast' was built under R version 3.5.3
```

```
AutoArimaModel=auto.arima(air)
AutoArimaModel ##Modelo propuesto ARIMA(1,1,2)
```

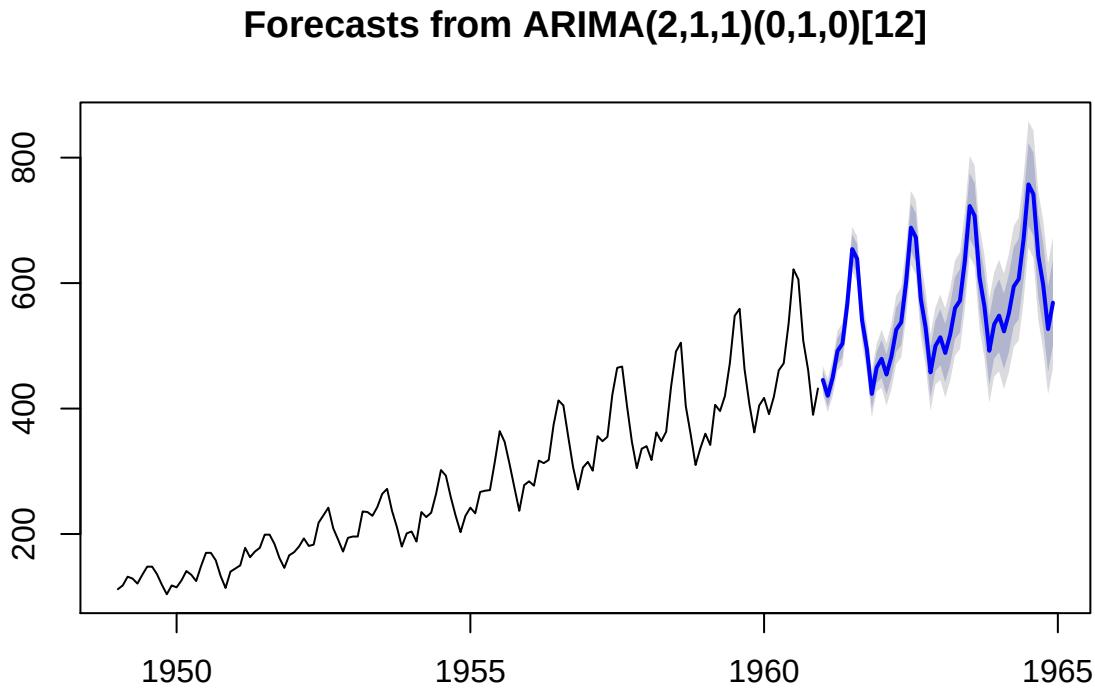
```
## Series: air
## ARIMA(2,1,1)(0,1,0)[12]
##
## Coefficients:
##          ar1     ar2      ma1
##       0.5960  0.2143  -0.9819
## s.e.  0.0888  0.0880   0.0292
##
## sigma^2 estimated as 132.3:  log likelihood=-504.92
## AIC=1017.85   AICc=1018.17   BIC=1029.35
```

```
forecast(AutoArimaModel,48)
```

```
##          Point Forecast    Lo 80    Hi 80    Lo 95    Hi 95
## Jan 1961       445.6349 430.8903 460.3795 423.0851 468.1847
## Feb 1961       420.3950 403.0907 437.6993 393.9304 446.8596
## Mar 1961       449.1983 429.7726 468.6240 419.4892 478.9074
## Apr 1961       491.8399 471.0270 512.6529 460.0092 523.6707
## May 1961       503.3945 481.5559 525.2330 469.9953 536.7937
## Jun 1961       566.8624 544.2637 589.4612 532.3007 601.4242
## Jul 1961       654.2602 631.0820 677.4383 618.8122 689.7081
```

```
## Aug 1961       638.5975 614.9704 662.2246 602.4630 674.7320
## Sep 1961       540.8837 516.9028 564.8647 504.2081 577.5594
## Oct 1961       494.1266 469.8624 518.3909 457.0177 531.2356
## Nov 1961       423.3327 398.8381 447.8273 385.8715 460.7939
## Dec 1961       465.5076 440.8229 490.1923 427.7556 503.2596
## Jan 1962       479.2908 448.9986 509.5831 432.9629 525.6188
## Feb 1962       454.1768 421.7184 486.6353 404.5359 503.8178
## Mar 1962       483.0870 448.7343 517.4396 430.5491 535.6248
## Apr 1962       525.8193 490.1122 561.5263 471.2101 580.4284
## May 1962       537.4507 500.6863 574.2151 481.2244 593.6770
## Jun 1962       600.9839 563.3924 638.5754 543.4927 658.4752
## Jul 1962       688.4370 650.1834 726.6907 629.9331 746.9410
## Aug 1962       672.8213 634.0292 711.6134 613.4940 732.1487
## Sep 1962       575.1475 535.9102 614.3847 515.1393 635.1557
## Oct 1962       528.4242 488.8131 568.0352 467.8443 589.0040
## Nov 1962       457.6590 417.7293 497.5886 396.5918 518.7261
## Dec 1962       499.8582 459.6529 540.0634 438.3695 561.3468
## Jan 1963       513.6621 469.1197 558.2046 445.5403 581.7839
## Feb 1963       488.5657 442.0966 535.0347 417.4973 559.6340
## Mar 1963       517.4907 469.2891 565.6923 443.7727 591.2087
## Apr 1963       560.2356 510.7326 609.7386 484.5273 635.9439
## May 1963       571.8777 521.3206 622.4349 494.5572 649.1983
## Jun 1963       635.4201 584.0070 686.8332 556.7905 714.0496
## Jul 1963       722.8809 670.7579 775.0039 643.1656 802.5961
## Aug 1963       707.2717 654.5511 759.9923 626.6425 787.9009
## Sep 1963       609.6034 556.3717 662.8350 528.1926 691.0142
## Oct 1963       562.8848 509.2098 616.5598 480.7959 644.9737
## Nov 1963       492.1236 438.0584 546.1887 409.4381 574.8091
## Dec 1963       534.3262 479.9133 588.7391 451.1089 617.5435
## Jan 1964       548.1330 489.9450 606.3211 459.1421 637.1239
## Feb 1964       523.0390 463.0275 583.0505 431.2593 614.8187
## Mar 1964       551.9661 490.2877 613.6445 457.6371 646.2951
## Apr 1964       594.7128 531.7389 657.6866 498.4025 691.0230
## May 1964       606.3564 542.3052 670.4076 508.3985 704.3143
## Jun 1964       669.9000 604.9500 734.8499 570.5676 769.2324
## Jul 1964       757.3619 691.6473 823.0765 656.8600 857.8637
## Aug 1964       741.7536 675.3792 808.1281 640.2427 843.2646
## Sep 1964       644.0861 577.1339 711.0383 541.6915 746.4806
## Oct 1964       597.3682 529.9032 664.8331 494.1895 700.5468
## Nov 1964       526.6075 458.6818 594.5332 422.7241 630.4909
## Dec 1964       568.8106 500.4659 637.1552 464.2865 673.3347
```

```
plot(forecast(AutoArimaModel,48))
```


Forecasts from ARIMA(2,1,1)(0,1,0)[12]
200
400
600
800
1950
1955
1960
1965