COVID-19 Testing Data Analysis

Analyst

2025-05-16

Contents

```
## [1] "Missing values in India: 887"
```

```
## [1] "Missing values in Ireland: 847"
```

```
## [1] "Summary Statistics for India Daily:"
```

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
##      157   388641   388641   691665   990559 35855632
```

```
## [1] "Summary Statistics for India Weekly:"
```

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
##     1337  2720487  2720487  4827302  7331882 38048893
```

```
## [1] "Summary Statistics for India Monthly:"
```

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
##     5157 11659230 12047871 20774641 31723967 65233161
```

```
## [1] "Summary Statistics for Ireland Daily:"
```

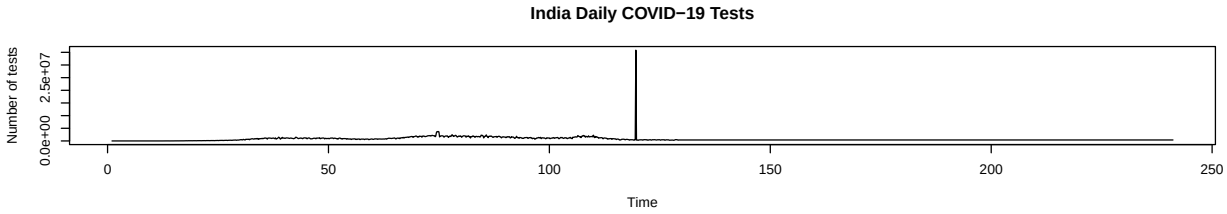
```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##     946    5553    5553    9978   14078   49212
```

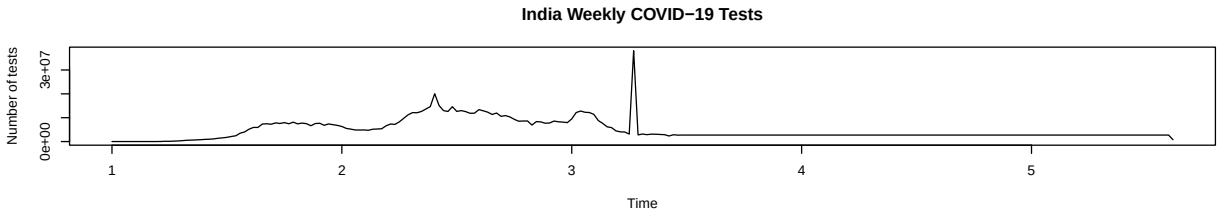
```
## [1] "Summary Statistics for Ireland Weekly:"
```

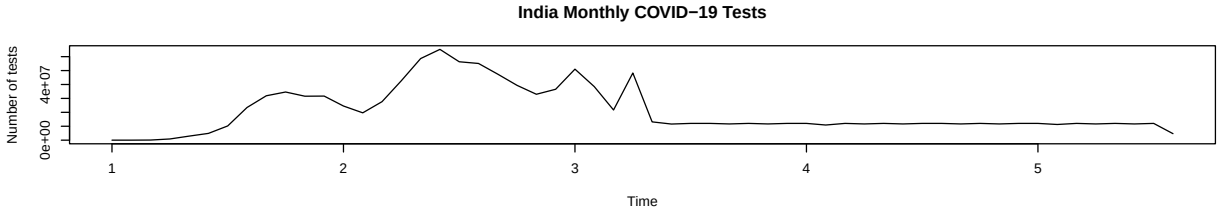
```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    5553   38871   38871   69597  102536  291275
```

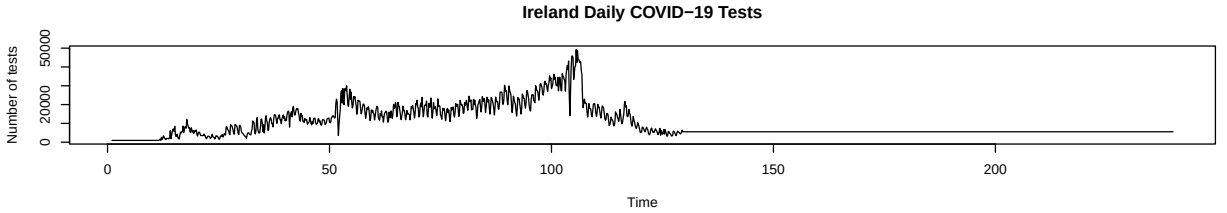
```
## [1] "Summary Statistics for Ireland Monthly:"
```

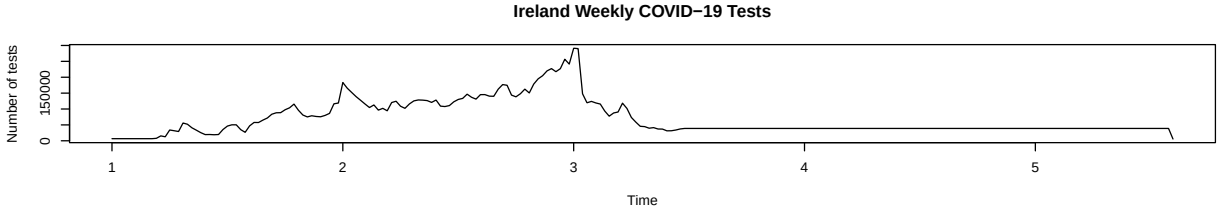
```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   22212  166590  172143  298274  445280 1036239
```

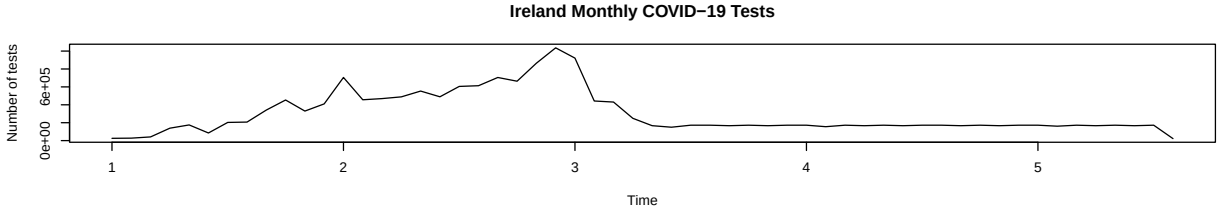

India Daily COVID−19 Tests
Number of tests
0.0e+00
2.5e+07
0
50
100
150
200
250
Time

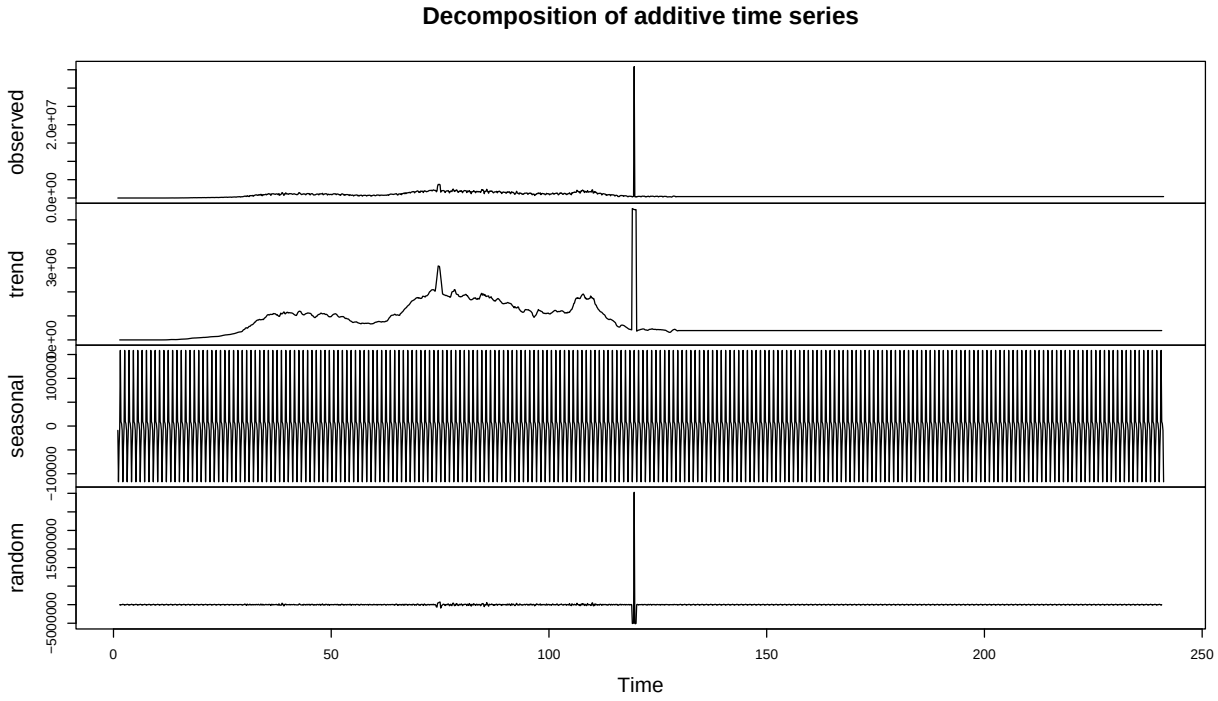

India Weekly COVID−19 Tests
Number of tests
0e+00
3e+07
1
2
3
4
5
Time

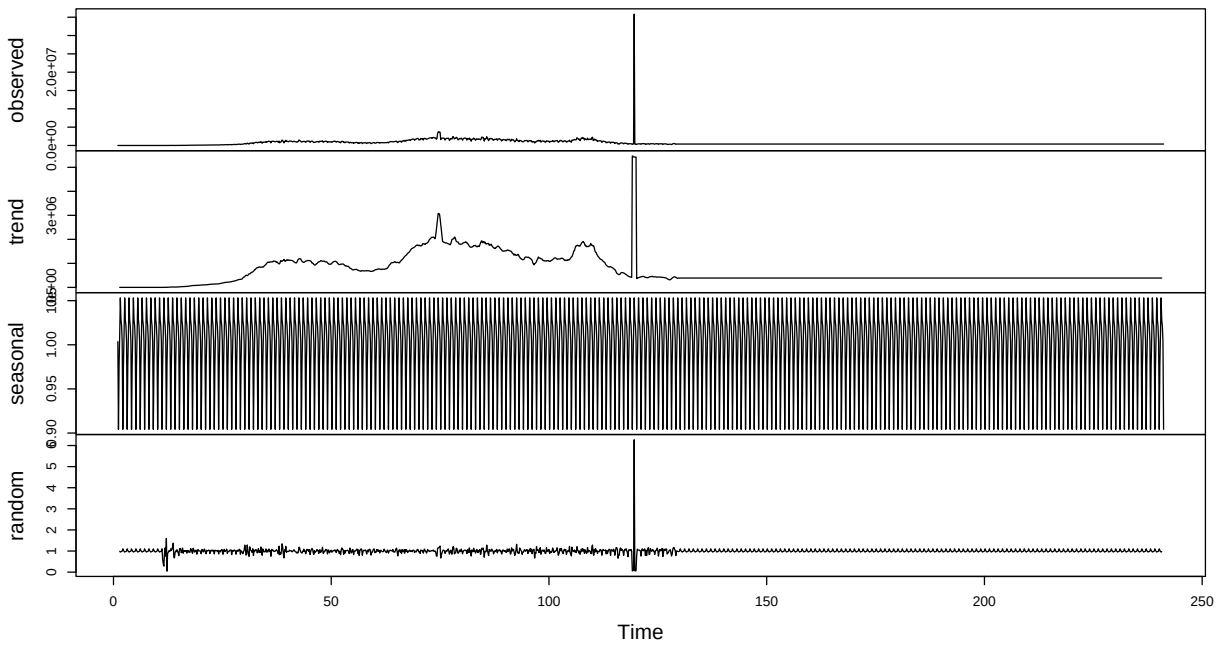

India Monthly COVID−19 Tests
Number of tests
0e+00
4e+07
1
2
3
4
5
Time

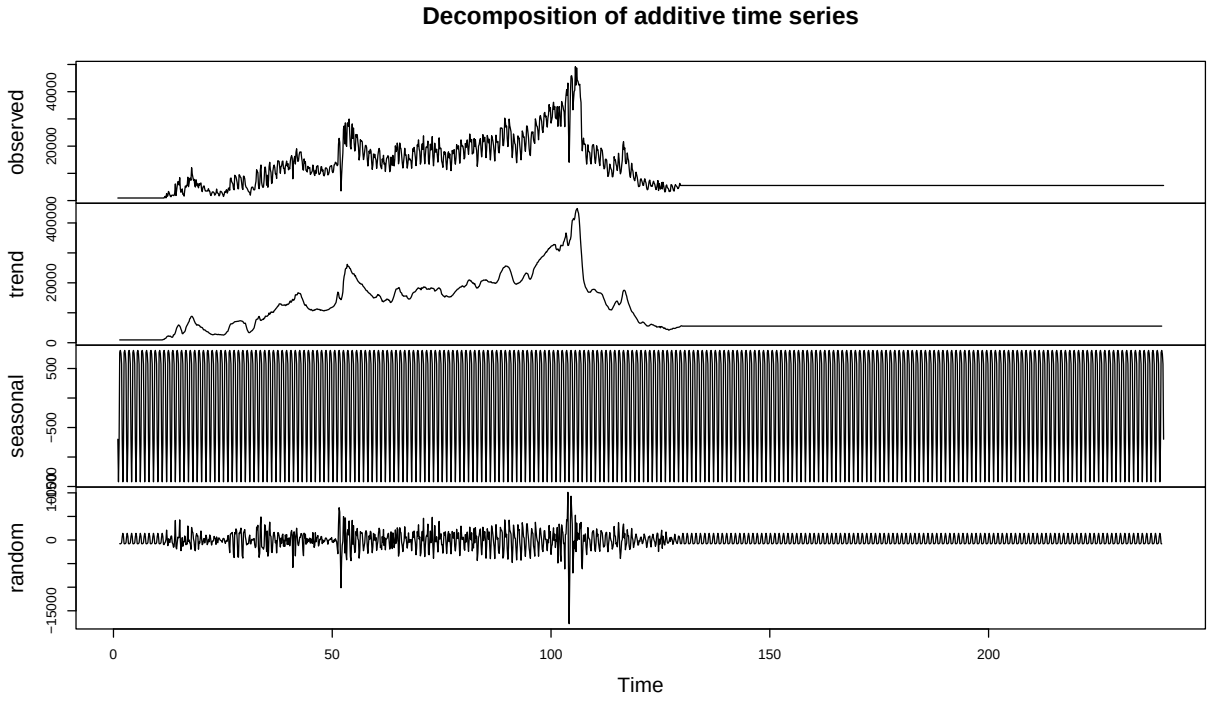

Ireland Daily COVID−19 Tests
Number of tests
0
20000
50000
0
50
100
150
200
Time

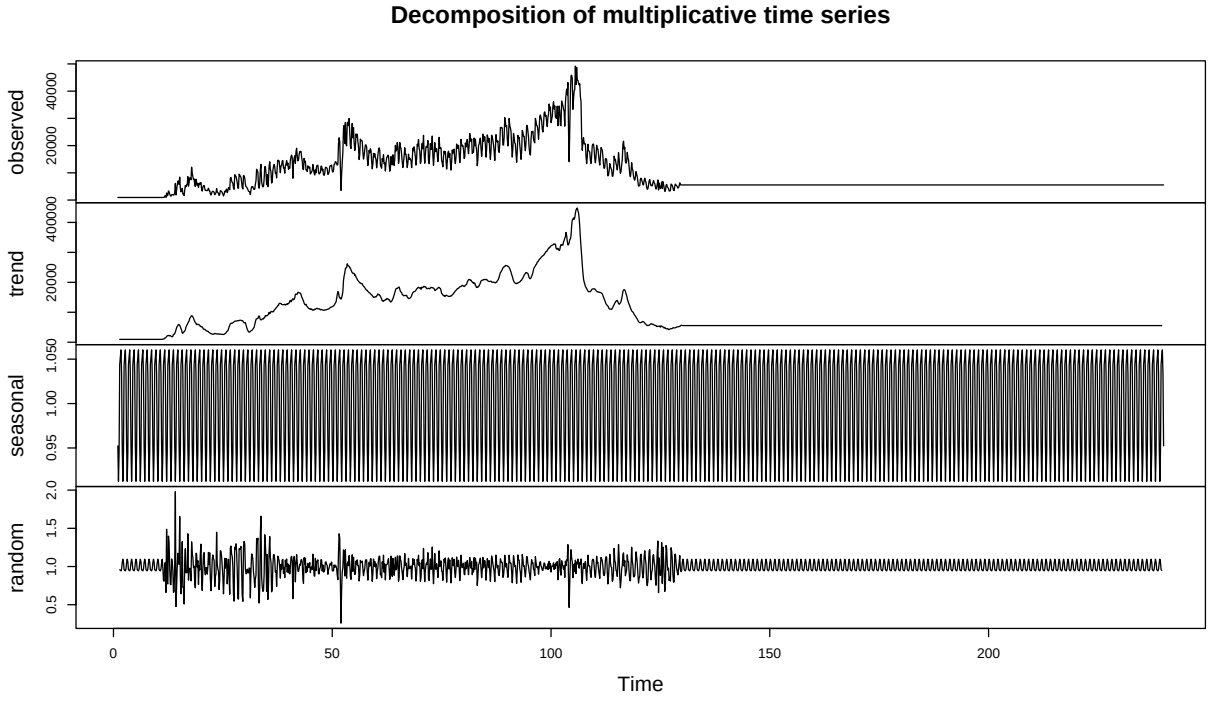

Ireland Weekly COVID−19 Tests
Number of tests
0
150000
1
2
3
4
5
Time

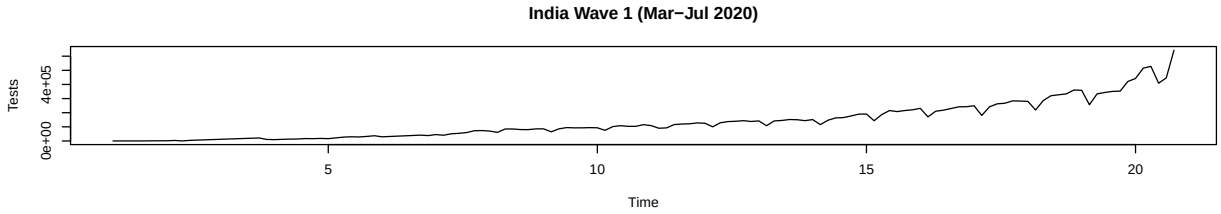

Ireland Monthly COVID−19 Tests
Number of tests
0e+00
6e+05
1
2
3
4
5
Time

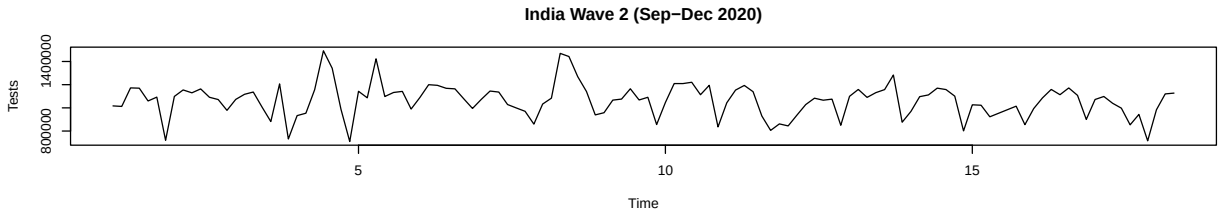

Decomposition of additive time series
observed
trend
seasonal
random
Time

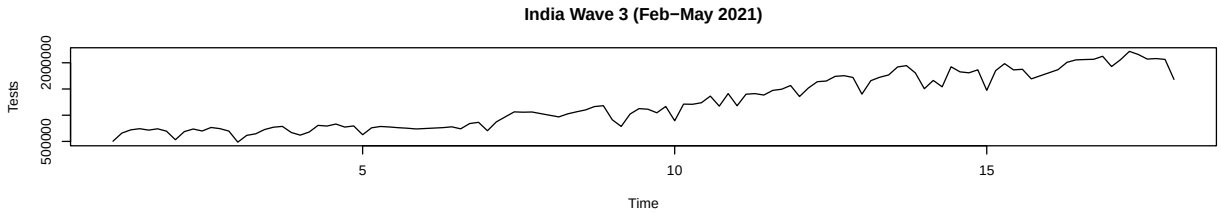

Decomposition of multiplicative time series
observed
trend
seasonal
random
Time


Decomposition of additive time series
observed
trend
seasonal
random
Time


Decomposition of multiplicative time series
observed
trend
seasonal
random
Time







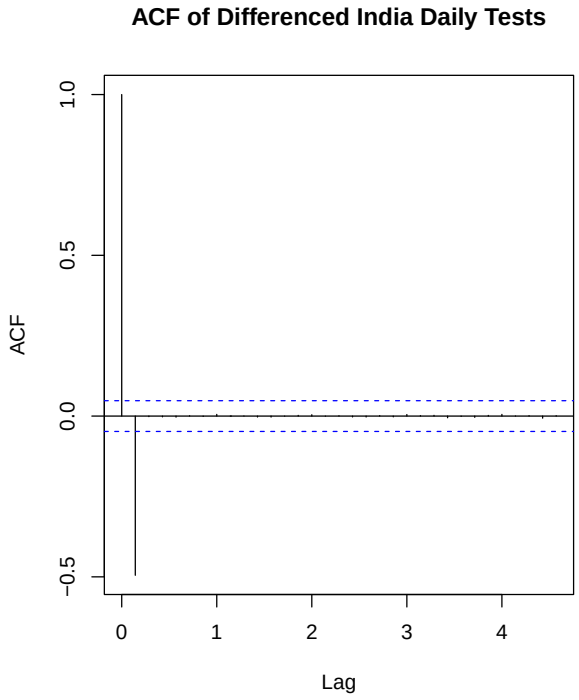

```
## [1] "AIC Values for ETS Models:"
##   Model      AIC
## 1  Auto 54193.09
## 2   ANN 58586.14
## 3   AAN 58591.75
## 4   AAA 58593.10
## 5   MAM 56904.28
```

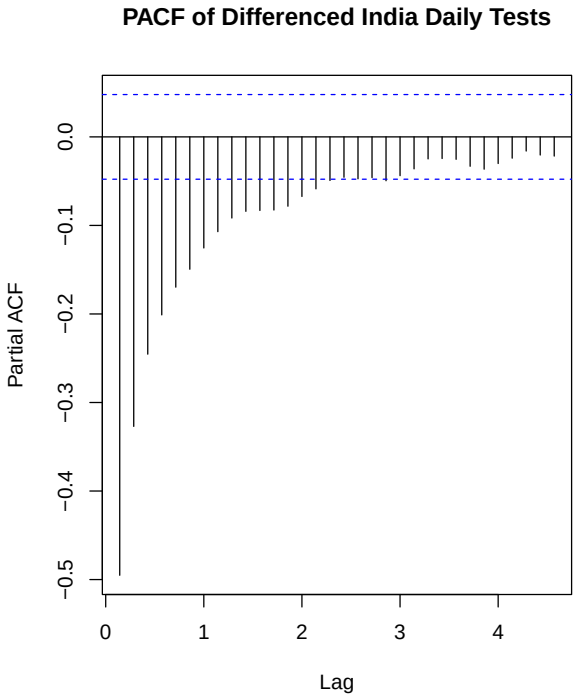
```
## Warning in adf.test(india_ts_daily): p-value smaller than printed p-value
```

```
## [1] "ADF Test for India Daily Time Series:"
##
##  Augmented Dickey-Fuller Test
##
## data:  india_ts_daily
## Dickey-Fuller = -5.4061, Lag order = 11, p-value = 0.01
## alternative hypothesis: stationary
```

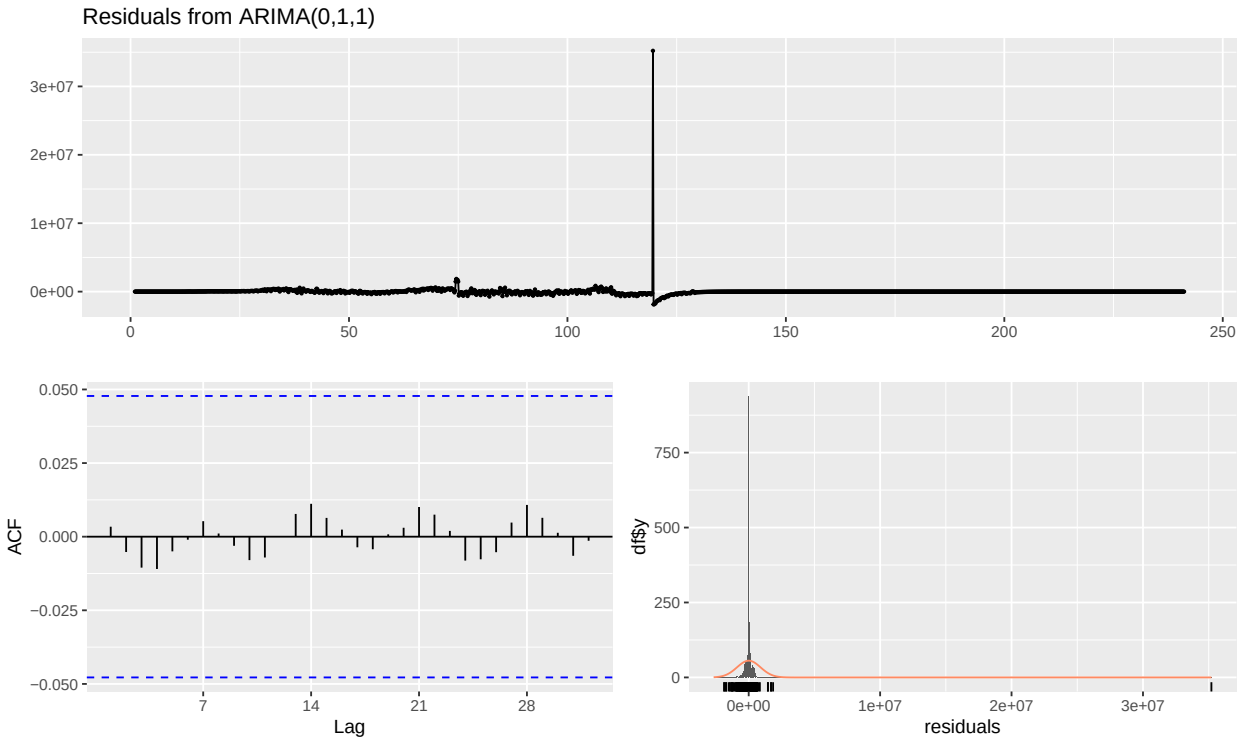
```
## Warning in adf.test(india_ts_daily_diff): p-value smaller than printed p-value
```

```
## [1] "ADF Test for Differenced India Daily Time Series:"
##
##  Augmented Dickey-Fuller Test
##
## data:  india_ts_daily_diff
## Dickey-Fuller = -20.292, Lag order = 11, p-value = 0.01
## alternative hypothesis: stationary
```



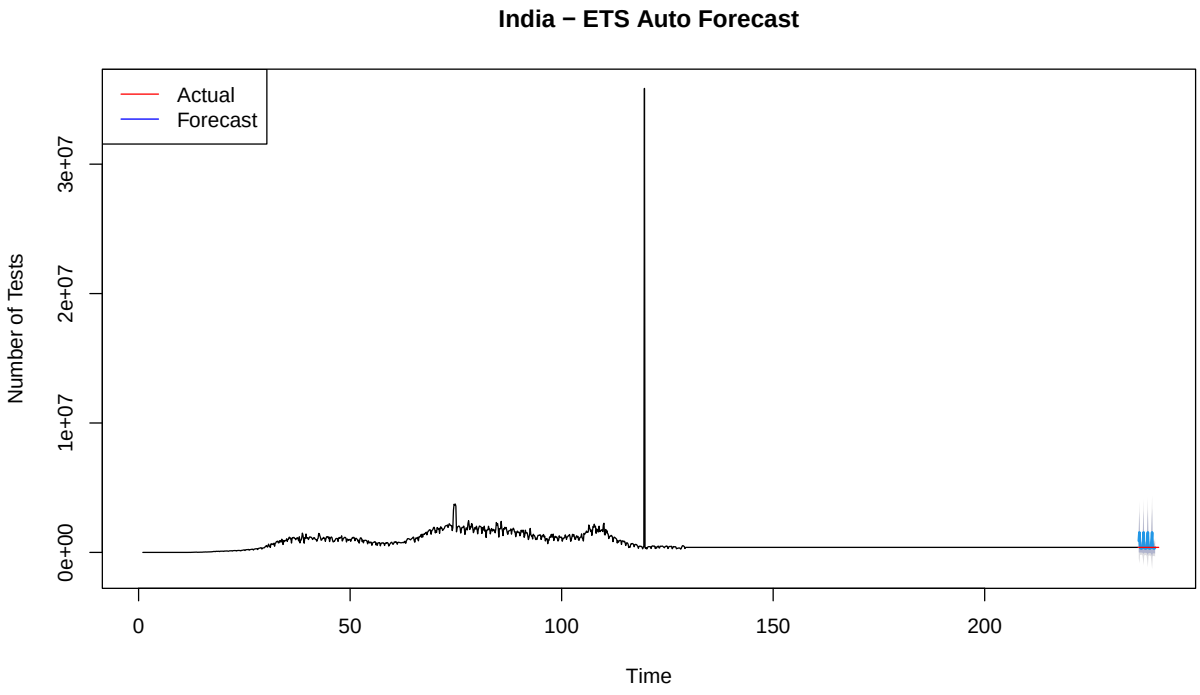


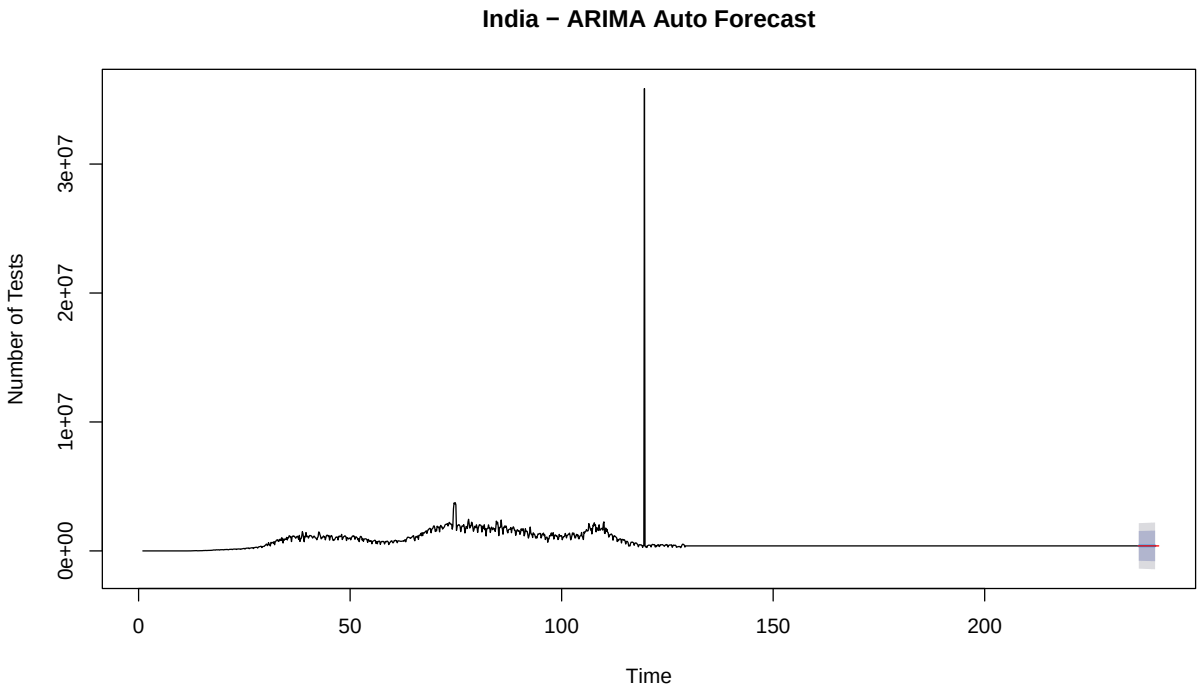

```
## [1] "Auto ARIMA Model Summary for India:"
## Series: india_ts_daily
## ARIMA(0,1,1)
##
## Coefficients:
##           ma1
##       -0.9549
## s.e.   0.0070
##
## sigma^2 = 7.946e+11:  log likelihood = -25416.59
## AIC=50837.18   AICc=50837.19   BIC=50848.04
##
## Training set error measures:
##                     ME     RMSE      MAE       MPE     MAPE     MASE       ACF1
## Training set 5121.424 890880.5 130772.6 -4.292908 17.53101 1.183215 0.00339392
## [1] "AIC Values for ARIMA Models:"
##            Model      AIC
## 1     Auto ARIMA 50837.18
## 2 Manual ARIMA 1 50664.47
## 3 Manual ARIMA 2 50670.46
```



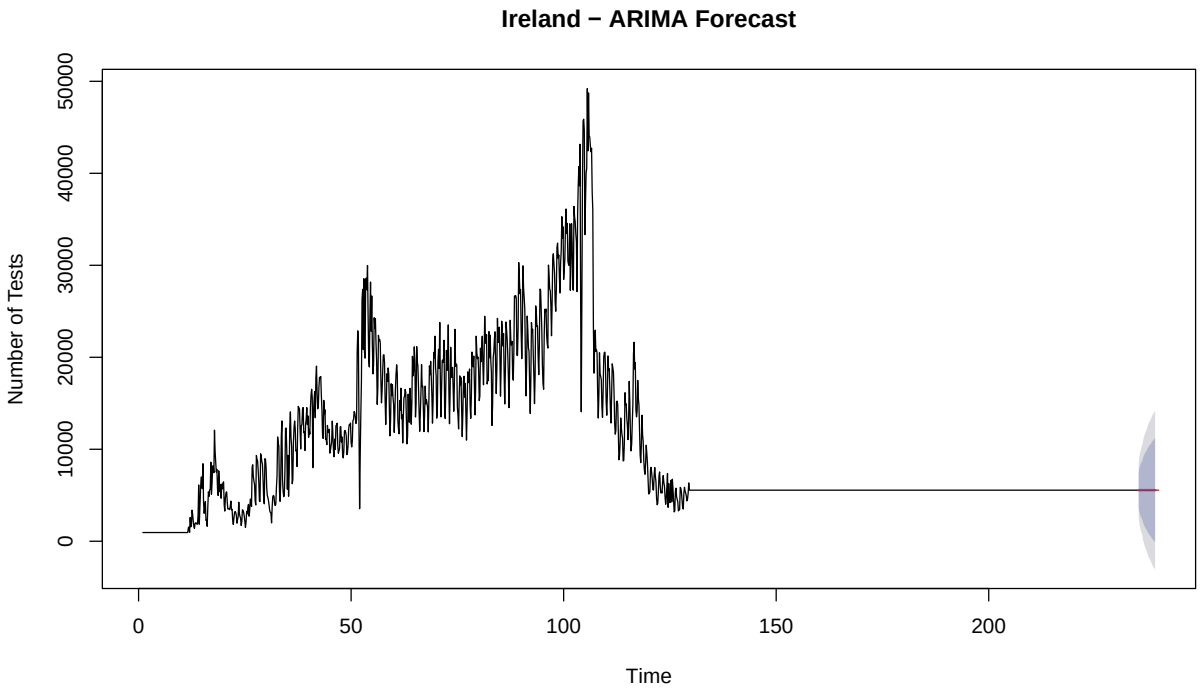

```
##
##  Ljung-Box test
##
## data:  Residuals from ARIMA(0,1,1)
## Q* = 1.0678, df = 13, p-value = 1
##
## Model df: 1.   Total lags used: 14

## [1] "Auto ARIMA Model Summary for India Wave 1:"
## Series: india_wave1
## ARIMA(3,2,2)(1,0,0)[7]
##
## Coefficients:
##          ar1      ar2      ar3      ma1      ma2    sar1
##       -0.7956  -0.7475  -0.7599  -0.2797  -0.6282  0.7741
## s.e.   0.1476   0.0979   0.0917   0.1397   0.1451  0.0687
##
## sigma^2 = 445224509:  log likelihood = -1560.21
## AIC=3134.42   AICc=3135.29   BIC=3154.86
##
## Training set error measures:
##                     ME     RMSE      MAE       MPE     MAPE      MASE
## Training set 2038.482 20484.14 10428.43 -12.09388 25.80895 0.3983685
##                       ACF1
## Training set -0.006007049
## [1] "Auto ARIMA Model Summary for India Wave 2:"
## Series: india_wave2
## ARIMA(1,0,0)(2,0,0)[7] with non-zero mean
##
```

```
## Coefficients:
##          ar1    sar1    sar2        mean
##       0.3911  0.2037  0.3983  1056461.11
## s.e.  0.0830  0.0831  0.0836    37575.02
##
## sigma^2 = 1.353e+10:  log likelihood = -1595.82
## AIC=3201.65   AICc=3202.17   BIC=3215.67
##
## Training set error measures:
##                     ME     RMSE      MAE       MPE     MAPE      MASE       ACF1
## Training set 179.8554 114405.5 85212.12 -1.209261 8.301348 0.6552549 0.02342202
## [1] "Auto ARIMA Model Summary for India Wave 3:"
## Series: india_wave3
## ARIMA(0,1,1)(2,0,0)[7]
##
## Coefficients:
##           ma1    sar1    sar2
##       -0.5316  0.3968  0.2567
## s.e.   0.1008  0.0888  0.0916
##
## sigma^2 = 1.092e+10:  log likelihood = -1544.45
## AIC=3096.89   AICc=3097.24   BIC=3108.01
##
## Training set error measures:
##                     ME     RMSE      MAE       MPE     MAPE      MASE       ACF1
## Training set 8665.315 102763.9 77383.57 0.4104953 6.674233 0.6424911 0.06068479
```

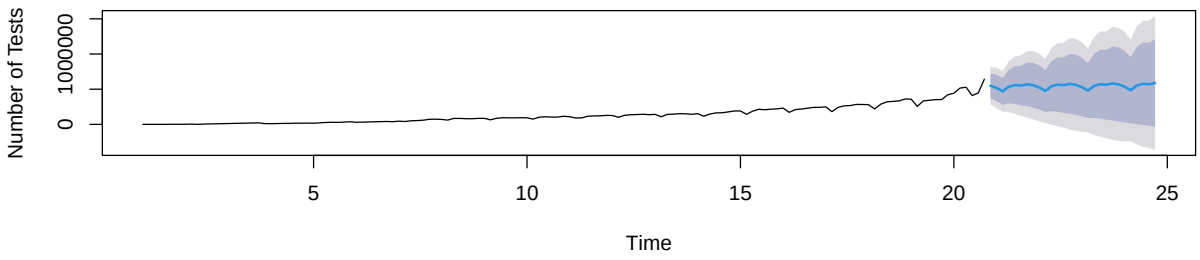


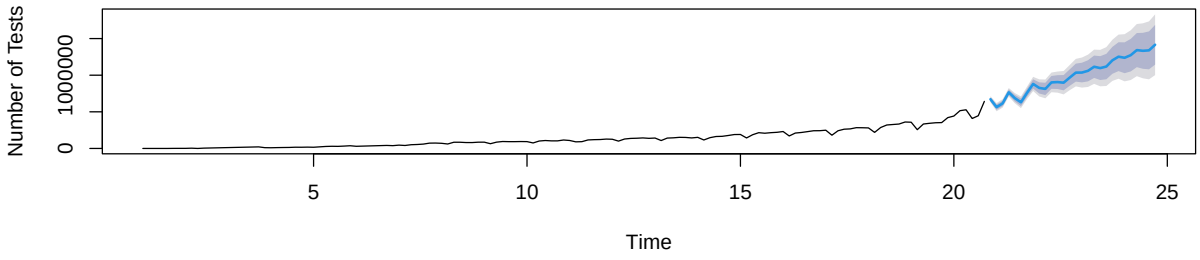


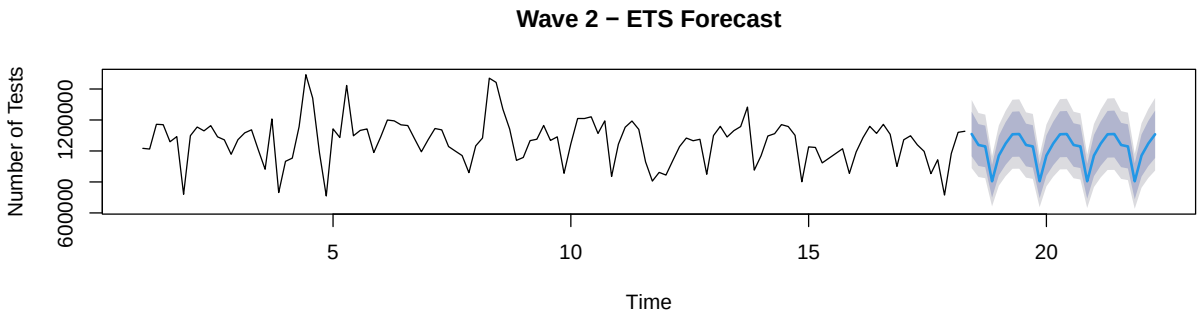

```
## [1] "Forecast Accuracy Comparison for India:"
##   Model         RMSE          MAE         MAPE
## 1   ETS 4.813171e+05 2.778670e+05 7.149709e+01
## 2 ARIMA 6.402843e-10 6.402843e-10 1.647495e-13

## [1] "Auto ARIMA Model Summary for Ireland:"
## Series: ireland_train
## ARIMA(2,0,1)(0,1,2)[7]
##
## Coefficients:
##          ar1      ar2      ma1     sma1     sma2
##       1.4026  -0.4221  -0.6672  -0.7215  -0.1131
## s.e.  0.0723   0.0677   0.0615   0.0255   0.0249
##
## sigma^2 = 2156474:  log likelihood = -14226.29
## AIC=28464.57   AICc=28464.62   BIC=28496.96
##
## Training set error measures:
##                     ME     RMSE      MAE        MPE     MAPE      MASE
## Training set 6.957835 1463.112 719.1588 -0.8635439 6.690368 0.6472969
##                     ACF1
## Training set 0.001419786
```

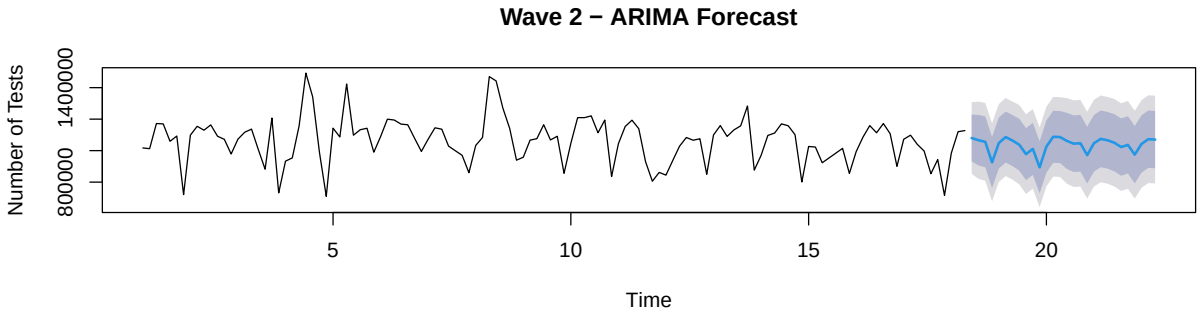


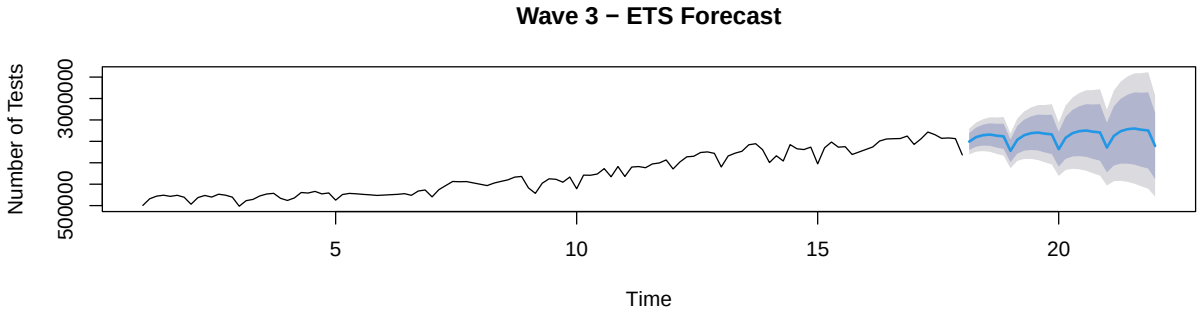

```
## [1] "Final Comparison between India and Ireland ARIMA Models:"
##   Country ARIMA_Model         RMSE          MAE
## 1   India 0 1 0 7 1 0 6.402843e-10 6.402843e-10
## 2 Ireland 2 1 0 7 0 1 8.621328e-05 7.208676e-05
```

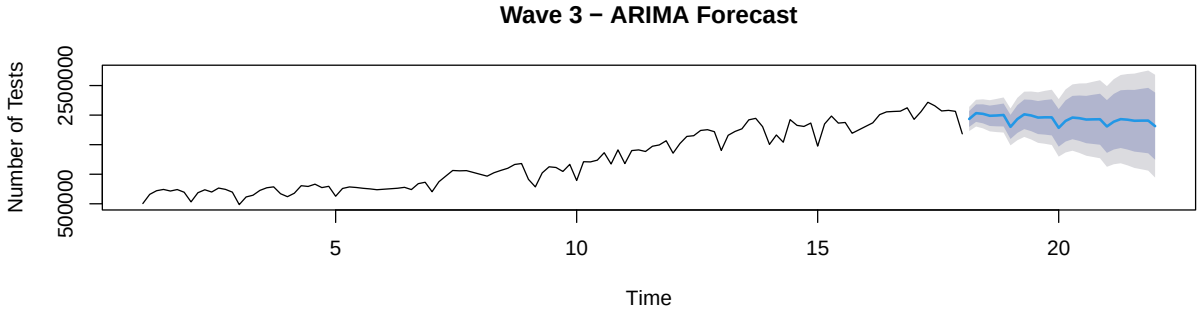













```
## [1] "Comparison of Models across Waves:"
##     Wave  ETS_AIC ARIMA_AIC
## 1 Wave 1 3393.897  3134.420
## 2 Wave 2 3423.783  3201.649
## 3 Wave 3 3317.861  3096.893
```

```
## [1] "Analysis completed and all plots displayed."
```