Time Series Spring 2021 Project

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4/11/2021

Contents

#EDA Project: Step 1 - Cleaning up the data - Handling missing data

```
#dataset with complete calendar
#vis_miss(Fondren.Visitors.NA)

#read in the data after replacing closures with 0
Fondren.Visitors.Revised <- read.csv("~/Desktop/ts-project/Fondren-Visitors-Revised.csv")
x=Fondren.Visitors.Revised$Visitors

#how many remaining missing values?
summary(x)
```

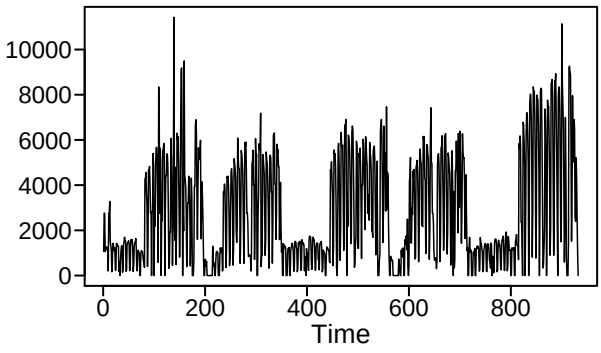
```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.    NA's
##       0     892    1682    2758    4842   11430      13
```

```
#impute NA with the mean
x = na_mean(x)

#check to see if the NA's have been changed
summary(x)
```

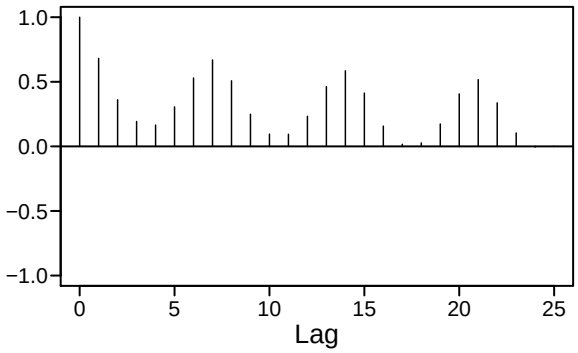
```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##     0.0   899.2  1697.5  2758.2  4819.2 11430.0
```

#EDA Project: Step 2 - Evaluating original dataset with univariate models - Removing the 1/7 frequency and seeing what's left over

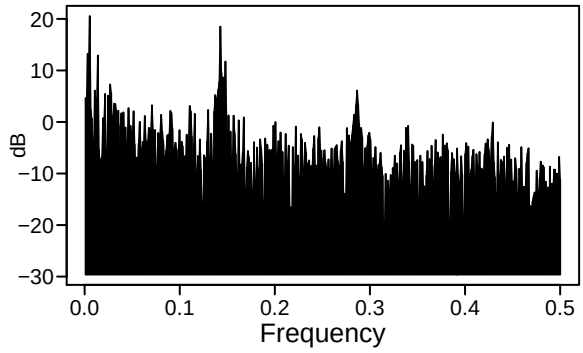
```
#visualize data
plotts.sample.wge(x) #definitely some periods
```



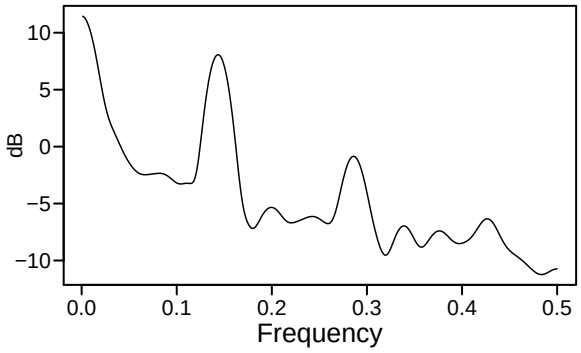
Realization



Sample Autocorrelations



Periodogram



Parzen Window

```
## $autplt
##  [1]  1.000000000  0.681280053  0.360533375  0.192705934  0.165181823
##  [6]  0.305456753  0.529517033  0.669055222  0.507503787  0.248726733
## [11]  0.095194312  0.094065229  0.232792445  0.462130387  0.585170837
## [16]  0.412914048  0.156965341  0.016340970  0.026788357  0.173392839
## [21]  0.405941921  0.516834547  0.336803491  0.103765697 -0.005423112
## [26]  0.001151845
##
## $freq
##   [1] 0.001072961 0.002145923 0.003218884 0.004291845 0.005364807
##   [6] 0.006437768 0.007510730 0.008583691 0.009656652 0.010729614
##  [11] 0.011802575 0.012875536 0.013948498 0.015021459 0.016094421
##  [16] 0.017167382 0.018240343 0.019313305 0.020386266 0.021459227
##  [21] 0.022532189 0.023605150 0.024678112 0.025751073 0.026824034
##  [26] 0.027896996 0.028969957 0.030042918 0.031115880 0.032188841
##  [31] 0.033261803 0.034334764 0.035407725 0.036480687 0.037553648
##  [36] 0.038626609 0.039699571 0.040772532 0.041845494 0.042918455
##  [41] 0.043991416 0.045064378 0.046137339 0.047210300 0.048283262
##  [46] 0.049356223 0.050429185 0.051502146 0.052575107 0.053648069
##  [51] 0.054721030 0.055793991 0.056866953 0.057939914 0.059012876
##  [56] 0.060085837 0.061158798 0.062231760 0.063304721 0.064377682
##  [61] 0.065450644 0.066523605 0.067596567 0.068669528 0.069742489
##  [66] 0.070815451 0.071888412 0.072961373 0.074034335 0.075107296
##  [71] 0.076180258 0.077253219 0.078326180 0.079399142 0.080472103
##  [76] 0.081545064 0.082618026 0.083690987 0.084763948 0.085836910
##  [81] 0.086909871 0.087982833 0.089055794 0.090128755 0.091201717
```

```
##  [86] 0.092274678 0.093347639 0.094420601 0.095493562 0.096566524
##  [91] 0.097639485 0.098712446 0.099785408 0.100858369 0.101931330
##  [96] 0.103004292 0.104077253 0.105150215 0.106223176 0.107296137
## [101] 0.108369099 0.109442060 0.110515021 0.111587983 0.112660944
## [106] 0.113733906 0.114806867 0.115879828 0.116952790 0.118025751
## [111] 0.119098712 0.120171674 0.121244635 0.122317597 0.123390558
## [116] 0.124463519 0.125536481 0.126609442 0.127682403 0.128755365
## [121] 0.129828326 0.130901288 0.131974249 0.133047210 0.134120172
## [126] 0.135193133 0.136266094 0.137339056 0.138412017 0.139484979
## [131] 0.140557940 0.141630901 0.142703863 0.143776824 0.144849785
## [136] 0.145922747 0.146995708 0.148068670 0.149141631 0.150214592
## [141] 0.151287554 0.152360515 0.153433476 0.154506438 0.155579399
## [146] 0.156652361 0.157725322 0.158798283 0.159871245 0.160944206
## [151] 0.162017167 0.163090129 0.164163090 0.165236052 0.166309013
## [156] 0.167381974 0.168454936 0.169527897 0.170600858 0.171673820
## [161] 0.172746781 0.173819742 0.174892704 0.175965665 0.177038627
## [166] 0.178111588 0.179184549 0.180257511 0.181330472 0.182403433
## [171] 0.183476395 0.184549356 0.185622318 0.186695279 0.187768240
## [176] 0.188841202 0.189914163 0.190987124 0.192060086 0.193133047
## [181] 0.194206009 0.195278970 0.196351931 0.197424893 0.198497854
## [186] 0.199570815 0.200643777 0.201716738 0.202789700 0.203862661
## [191] 0.204935622 0.206008584 0.207081545 0.208154506 0.209227468
## [196] 0.210300429 0.211373391 0.212446352 0.213519313 0.214592275
## [201] 0.215665236 0.216738197 0.217811159 0.218884120 0.219957082
## [206] 0.221030043 0.222103004 0.223175966 0.224248927 0.225321888
## [211] 0.226394850 0.227467811 0.228540773 0.229613734 0.230686695
## [216] 0.231759657 0.232832618 0.233905579 0.234978541 0.236051502
## [221] 0.237124464 0.238197425 0.239270386 0.240343348 0.241416309
## [226] 0.242489270 0.243562232 0.244635193 0.245708155 0.246781116
## [231] 0.247854077 0.248927039 0.250000000 0.251072961 0.252145923
## [236] 0.253218884 0.254291845 0.255364807 0.256437768 0.257510730
## [241] 0.258583691 0.259656652 0.260729614 0.261802575 0.262875536
## [246] 0.263948498 0.265021459 0.266094421 0.267167382 0.268240343
## [251] 0.269313305 0.270386266 0.271459227 0.272532189 0.273605150
## [256] 0.274678112 0.275751073 0.276824034 0.277896996 0.278969957
## [261] 0.280042918 0.281115880 0.282188841 0.283261803 0.284334764
## [266] 0.285407725 0.286480687 0.287553648 0.288626609 0.289699571
## [271] 0.290772532 0.291845494 0.292918455 0.293991416 0.295064378
## [276] 0.296137339 0.297210300 0.298283262 0.299356223 0.300429185
## [281] 0.301502146 0.302575107 0.303648069 0.304721030 0.305793991
## [286] 0.306866953 0.307939914 0.309012876 0.310085837 0.311158798
## [291] 0.312231760 0.313304721 0.314377682 0.315450644 0.316523605
## [296] 0.317596567 0.318669528 0.319742489 0.320815451 0.321888412
## [301] 0.322961373 0.324034335 0.325107296 0.326180258 0.327253219
## [306] 0.328326180 0.329399142 0.330472103 0.331545064 0.332618026
## [311] 0.333690987 0.334763948 0.335836910 0.336909871 0.337982833
## [316] 0.339055794 0.340128755 0.341201717 0.342274678 0.343347639
## [321] 0.344420601 0.345493562 0.346566524 0.347639485 0.348712446
## [326] 0.349785408 0.350858369 0.351931330 0.353004292 0.354077253
## [331] 0.355150215 0.356223176 0.357296137 0.358369099 0.359442060
## [336] 0.360515021 0.361587983 0.362660944 0.363733906 0.364806867
## [341] 0.365879828 0.366952790 0.368025751 0.369098712 0.370171674
## [346] 0.371244635 0.372317597 0.373390558 0.374463519 0.375536481
## [351] 0.376609442 0.377682403 0.378755365 0.379828326 0.380901288
```

```
## [356] 0.381974249 0.383047210 0.384120172 0.385193133 0.386266094
## [361] 0.387339056 0.388412017 0.389484979 0.390557940 0.391630901
## [366] 0.392703863 0.393776824 0.394849785 0.395922747 0.396995708
## [371] 0.398068670 0.399141631 0.400214592 0.401287554 0.402360515
## [376] 0.403433476 0.404506438 0.405579399 0.406652361 0.407725322
## [381] 0.408798283 0.409871245 0.410944206 0.412017167 0.413090129
## [386] 0.414163090 0.415236052 0.416309013 0.417381974 0.418454936
## [391] 0.419527897 0.420600858 0.421673820 0.422746781 0.423819742
## [396] 0.424892704 0.425965665 0.427038627 0.428111588 0.429184549
## [401] 0.430257511 0.431330472 0.432403433 0.433476395 0.434549356
## [406] 0.435622318 0.436695279 0.437768240 0.438841202 0.439914163
## [411] 0.440987124 0.442060086 0.443133047 0.444206009 0.445278970
## [416] 0.446351931 0.447424893 0.448497854 0.449570815 0.450643777
## [421] 0.451716738 0.452789700 0.453862661 0.454935622 0.456008584
## [426] 0.457081545 0.458154506 0.459227468 0.460300429 0.461373391
## [431] 0.462446352 0.463519313 0.464592275 0.465665236 0.466738197
## [436] 0.467811159 0.468884120 0.469957082 0.471030043 0.472103004
## [441] 0.473175966 0.474248927 0.475321888 0.476394850 0.477467811
## [446] 0.478540773 0.479613734 0.480686695 0.481759657 0.482832618
## [451] 0.483905579 0.484978541 0.486051502 0.487124464 0.488197425
## [456] 0.489270386 0.490343348 0.491416309 0.492489270 0.493562232
## [461] 0.494635193 0.495708155 0.496781116 0.497854077 0.498927039
## [466] 0.500000000
##
## $db
##   [1]   4.61499788   3.90605446  13.21769929  10.19014068  20.52441678
##   [6]   2.36913465   0.61723957  -4.52105197  -6.89653177   6.08237113
##  [11]   1.89961066   4.54276030  12.87356843  -5.45625759  -7.66833791
##  [16]  -7.38303000  -6.88991434   0.72142901  -0.37159853   5.42143285
##  [21] -11.95054549  -6.92305529   5.10236306  -0.42594920   7.25687116
##  [26]   5.60901075  -5.24614549   1.20103903   3.54899148   3.48128426
##  [31]   2.20860439 -16.90283871   2.17748934 -19.63768012  -0.81478840
##  [36]   1.66896884  -2.96174998   1.84830878  -3.83713490  -1.07898220
##  [41]  -7.80306891  -3.95765169   2.67021098  -1.43662287  -0.77940084
##  [46]  -2.60718349  -2.50845877   2.06269527  -4.42764778 -10.17258491
##  [51]  -6.92340702  -8.98998863  -4.22933737   0.02497058  -4.93880738
##  [56] -10.63624512  -3.92217989  -4.18924187   1.14271748  -3.75233939
##  [61]  -5.16291728  -3.64425824  -1.15950945 -16.84886498  -1.44208542
##  [66]   3.21439889  -1.68376279  -3.37536854  -1.56913852 -14.38686086
##  [71]  -8.82304184  -2.16483186 -19.46644256  -2.24725276   1.36037466
##  [76]  -1.91548970  -3.78840095  -7.32273093  -7.24757162  -5.52846340
##  [81]  -2.64814981  -2.48420118  -2.43678765   2.13547674   1.73764805
##  [86]  -1.25373479 -10.46500037  -5.07272001  -4.04316100  -5.37125163
##  [91] -16.53107213  -5.60498303  -1.61792717  -9.97942588  -3.83911658
##  [96]  -4.74022535  -7.80233796  -6.66531885  -9.20665235  -2.47461838
## [101]  -3.97052954  -3.59992576   3.07526370   2.00607257  -2.83132496
## [106] -19.89070296  -4.62704756   1.55394732 -10.12347198 -11.69569818
## [111]  -6.62133259  -9.20199511  -3.40466025  -9.40058486 -18.62532851
## [116] -17.47564194  -6.48672644  -7.02197081  -9.53732340  -3.82922160
## [121]   2.29476918  -6.69685037 -11.23871718  -2.28687446  -7.47724078
## [126] -18.00231093   1.97261194   5.19301759   3.06289091   4.73924539
## [131]   6.24104715   7.79760053  18.50218431   9.51727301   7.47386533
## [136]   8.60624345   5.21029680  11.71644673   1.06200786 -12.42498432
## [141]   1.25561982  -7.42166730  -1.87679257 -10.01687069  -7.91307186
```

```
## [146]   1.21613554  -2.18967025  -6.26547616 -10.91018351 -13.60889528
## [151]   0.29688793 -10.11148671  -8.27249969  -8.66441134  -6.03911322
## [156]   0.86501713 -12.83269571 -17.17578975  -8.80424146  -5.66180167
## [161]  -6.92772000 -11.08450789  -7.94798974 -13.54216122 -20.18205053
## [166]  -3.93792300 -13.98203866 -12.78092177  -4.97613306 -22.58037681
## [171]  -8.96390788  -3.40243413  -5.16719802  -8.11915249 -26.93079380
## [176] -15.08105128  -3.21288627 -10.89793103  -4.41868588  -6.79993925
## [181]  -5.44950942  -9.11013756  -5.44623038  -9.40295980  -0.74833696
## [186]  -5.77864048  -0.03473637 -11.28204385  -6.38650449  -3.73251144
## [191]  -7.32939118  -2.06211201  -6.43048377  -5.85382758 -14.88798821
## [196] -11.80365622  -2.33485282 -11.88171835  -8.10826001  -4.59549115
## [201] -17.71513647 -16.55813340 -22.22895372  -4.89900998 -10.72657522
## [206] -10.59030794  -0.90200483 -23.96772201  -6.52916198 -13.89748960
## [211] -11.12387303  -2.35311326  -3.49029304  -9.42225877 -11.91835635
## [216]  -4.05596045  -5.94639522 -12.07251249  -8.03406260  -7.49174564
## [221] -11.65046327  -8.52594179  -9.19882994  -5.24960568  -2.74997734
## [226]  -9.59517843  -8.45826722 -19.79032075  -3.20105360  -1.03909171
## [231]  -5.48389717  -5.59251628 -15.60045683  -7.11092992  -5.50531521
## [236]  -7.87984217  -9.13627314  -9.53566892  -7.26505157 -11.72522815
## [241]  -9.15583089  -5.15766565  -9.52615788 -11.67319611  -5.27313496
## [246]  -4.86628860  -4.52175406  -7.56927975  -8.51764868 -11.23419558
## [251]  -5.57754252  -3.75319202  -7.80364340 -17.04010217 -13.91587422
## [256] -15.15546616  -1.20147290  -9.92132787  -2.62362508  -3.88772727
## [261] -13.07975387  -2.62951383  -0.77446903   1.36021851   0.63494262
## [266]   3.27106961   6.08072318   3.45501209  -0.38040073  -4.39517185
## [271]  -1.16715757  -2.97361414 -12.79832902  -9.35156386  -5.09462205
## [276] -13.92502534  -4.66710204  -2.65431702  -2.10548506  -3.47491639
## [281]  -8.81352914 -13.94067043  -7.01306766  -7.48869444  -4.89806616
## [286]  -9.54181041  -9.95011455  -8.36025523  -8.16434094  -6.01590377
## [291]  -8.74125658 -10.44805358 -24.88696869 -20.94412728 -10.08415920
## [296] -24.81890646 -11.39004379 -21.06331541 -13.14833209 -10.30352234
## [301] -17.71311491  -8.93884955 -10.21408854  -6.53850596 -14.43188348
## [306]  -8.06160246 -12.04041233 -13.70721868  -6.09430478  -4.53532397
## [311] -17.87921176 -11.41491993  -5.58416489 -16.42023357  -1.15208673
## [316]  -7.88549661  -0.77495125  -7.70697509 -15.46810727 -13.52795786
## [321]  -4.38598721  -4.64744786 -14.49680886  -7.79599671 -19.69628317
## [326]  -7.41528943 -19.35445439 -16.12116048  -6.54967138 -13.21740200
## [331]  -7.78533168 -13.60131968 -12.52014556 -17.32412108 -10.38537862
## [336]  -5.63329059 -20.16400427  -7.18382840 -17.23421641  -4.62411907
## [341] -12.10247602 -13.12700114  -8.53466432  -3.51606429 -17.40139904
## [346]  -5.93861786  -6.99979908  -8.44603393  -6.83349315 -16.91684996
## [351]  -2.45703597 -12.50478340  -4.57157301 -14.56328941  -4.15373372
## [356]  -5.60053248 -22.66345724 -22.66342563  -9.68617829  -6.04122948
## [361]  -7.52659621  -7.26024008  -9.84109785 -29.60354338  -5.15515450
## [366] -10.42490972 -13.29571221 -11.41380792  -6.67976919 -10.21727475
## [371] -21.20159852 -21.48582357  -6.29450238  -4.12649452 -16.86213523
## [376]  -4.78603733 -13.71637694 -10.19840353  -9.24036682  -6.71187926
## [381]  -5.38359732 -11.94360002 -12.42357819  -6.26293175  -8.58334558
## [386] -11.64404391  -5.81805791 -13.66635273  -9.06160084  -9.64515037
## [391] -10.17528580  -6.34400602  -4.18029924  -8.11323045  -3.37626787
## [396]  -5.45738167  -8.52084810  -7.54284111  -2.89034308  -0.11640347
## [401]  -7.82979515 -10.73616099 -17.22463500 -13.74604404  -3.95934411
## [406] -10.35340695 -14.43556935  -7.39361927  -7.71755897 -11.87668665
## [411]  -6.71700185 -12.33026884 -14.54478991  -5.00557385 -11.70903466
```

```
## [416]  -4.42459856 -14.32732360  -7.30148146 -12.57894890 -11.52502455
## [421] -11.91544986  -7.05218366  -9.08979762 -15.31616936 -15.99489229
## [426]  -9.08792113 -12.05451264  -4.90075372 -13.85110581 -12.57603603
## [431] -12.62392979 -12.90116115  -7.99717750  -6.13479067  -5.12721016
## [436] -19.36955414 -16.31205389 -19.42998209 -15.42342713 -14.46245828
## [441] -13.68484393 -17.58408022  -9.46136483 -14.00691245 -15.00349092
## [446] -10.91785134  -7.71001287 -11.42835865  -8.44906830  -8.84130039
## [451] -14.59233658 -11.57945508 -15.96493068 -12.72394359 -20.55046805
## [456]  -8.68496313 -19.24133596 -11.96764532 -13.51165596  -9.26530338
## [461]  -9.25798453 -11.84593689 -10.02162359 -14.41097075  -6.79406252
## [466] -11.25980032
##
## $dbz
##   [1]  11.45071090  11.39468389  11.30139517  11.17098983  11.00369289
##   [6]  10.79983244  10.55987115  10.28444748   9.97442795   9.63097174
##  [11]   9.25560861   8.85032985   8.41769022   7.96091508   7.48400218
##  [16]   6.99180016   6.49003746   5.98526790   5.48469562   4.99584974
##  [21]   4.52610247   4.08206555   3.66895121   3.29002426   2.94627789
##  [26]   2.63642305   2.35720013   2.10393700   1.87122415   1.65357290
##  [31]   1.44595763   1.24419271   1.04513901   0.84676200   0.64807460
##  [36]   0.44899804   0.25016983   0.05272364  -0.14193723  -0.33235206
##  [41]  -0.51718185  -0.69533908  -0.86605755  -1.02889981  -1.18370844
##  [46]  -1.33051592  -1.46943332  -1.60053997  -1.72379425  -1.83898066
##  [51]  -1.94570162  -2.04341442  -2.13150670  -2.20939697  -2.27664281
##  [56]  -2.33303774  -2.37867969  -2.41399939  -2.43974457  -2.45692383
##  [61]  -2.46672114  -2.47039617  -2.46918644  -2.46422547  -2.45648694
##  [66]  -2.44675987  -2.43565489  -2.42363735  -2.41107977  -2.39832425
##  [71]  -2.38574481  -2.37380030  -2.36307054  -2.35427095  -2.34824432
##  [76]  -2.34593134  -2.34832374  -2.35640583  -2.37109000  -2.39315172
##  [81]  -2.42316806  -2.46146255  -2.50805794  -2.56263758  -2.62451628
##  [86]  -2.69262189  -2.76549064  -2.84128094  -2.91781276  -2.99264062
##  [91]  -3.06316859  -3.12681175  -3.18120223  -3.22442685  -3.25527109
##  [96]  -3.27343268  -3.27966235  -3.27579276  -3.26462810  -3.24968401
## [101]  -3.23478237  -3.22351274  -3.21857041  -3.22097308  -3.22915774
## [106]  -3.23798493  -3.23775976  -3.21354420  -3.14527472  -3.00938607
## [111]  -2.78246708  -2.44659762  -1.99462120  -1.43282714  -0.77954622
## [116]  -0.06049567   0.69670522   1.46673397   2.22872856   2.96676538
## [121]   3.66936570   4.32862852   4.93934043   5.49821509   6.00330076
## [126]   6.45354247   6.84846862   7.18797118   7.47215373   7.70122736
## [131]   7.87544031   7.99503090   8.06019705   8.07107750   8.02774183
## [136]   7.93018746   7.77834287   7.57207712   7.31121657   6.99557059
## [141]   6.62496913   6.19931636   5.71866628   5.18332836   4.59401379
## [146]   3.95203555   3.25957744   2.52004664   1.73851738   0.92225361
## [151]   0.08125685  -0.77128763  -1.61889454  -2.44231405  -3.22103172
## [156]  -3.93580001  -4.57173981  -5.12097087  -5.58359994  -5.96653113
## [161]  -6.28061305  -6.53732824  -6.74615937  -6.91320615  -7.04106880
## [166]  -7.12969670  -7.17778950  -7.18432259  -7.14980578  -7.07698980
## [171]  -6.97091580  -6.83840731  -6.68724737  -6.52531359  -6.35987475
## [176]  -6.19714316  -6.04208291  -5.89841968  -5.76878118  -5.65490346
## [181]  -5.55785372  -5.47823616  -5.41636098  -5.37236606  -5.34628874
## [186]  -5.33808986  -5.34763626  -5.37465052  -5.41863818  -5.47880379
## [191]  -5.55396718  -5.64249216  -5.74223946  -5.85055648  -5.96431497
## [196]  -6.08000595  -6.19389545  -6.30223638  -6.40151980  -6.48873703
## [201]  -6.56161429  -6.61878039  -6.65983592  -6.68531049  -6.69651658
```

```
## [206]  -6.69532831  -6.68392514  -6.66454152  -6.63925618  -6.60984219
## [211]  -6.57768619  -6.54377419  -6.50873384  -6.47291830  -6.43651495
## [216]  -6.39966148  -6.36255333  -6.32552917  -6.28912485  -6.25409142
## [221]  -6.22137777  -6.19208296  -6.16738681  -6.14846877  -6.13642494
## [226]  -6.13219175  -6.13648258  -6.14974079  -6.17211007  -6.20342079
## [231]  -6.24318875  -6.29062090  -6.34462116  -6.40378854  -6.46639950
## [236]  -6.53036788  -6.59317912  -6.65180151  -6.70258649  -6.74118245
## [241]  -6.76250023  -6.76078045  -6.72981589  -6.66336738  -6.55577155
## [246]  -6.40267555  -6.20176436  -5.95330600  -5.66036008  -5.32858191
## [251]  -4.96567213  -4.58061675  -4.18289363  -3.78178947  -3.38590548
## [256]  -3.00286492  -2.63919285  -2.30032014  -1.99066375  -1.71374512
## [261]  -1.47231941  -1.26849933  -1.10386454  -0.97955287  -0.89633246
## [266]  -0.85465559  -0.85469555  -0.89636798  -0.97933816  -1.10301538
## [271]  -1.26653554  -1.46873325  -1.70810486  -1.98276496  -2.29039977
## [276]  -2.62822285  -2.99294073  -3.38073837  -3.78729650  -4.20785338
## [281]  -4.63732084  -5.07045815  -5.50209531  -5.92738167  -6.34202008
## [286]  -6.74243633  -7.12583506  -7.49010952  -7.83360192  -8.15474609
## [291]  -8.45165668  -8.72175247  -8.96151189  -9.16645405  -9.33141429
## [296]  -9.45113106  -9.52107979  -9.53839518  -9.50265464  -9.41630050
## [301]  -9.28457536  -9.11499875  -8.91654861  -8.69876781  -8.47098365
## [306]  -8.24174536  -8.01850005  -7.80747048  -7.61367512  -7.44103135
## [311]  -7.29249524  -7.17020613  -7.07561717  -7.00960217  -6.97253496
## [316]  -6.96434082  -6.98452117  -7.03215386  -7.10587162  -7.20382227
## [321]  -7.32361550  -7.46226326  -7.61612404  -7.78086571  -7.95146642
## [326]  -8.12227681  -8.28716786  -8.43978263  -8.57389525  -8.68385526
## [331]  -8.76506492  -8.81441114  -8.83056588  -8.81408798  -8.76730311
## [336]  -8.69399116  -8.59895149  -8.48753270  -8.36520237  -8.23720575
## [341]  -8.10833137  -7.98277800  -7.86410337  -7.75523036  -7.65848801
## [346]  -7.57566900  -7.50809043  -7.45664961  -7.42186988  -7.40393461
## [351]  -7.40270920  -7.41775233  -7.44831875  -7.49335673  -7.55150404
## [356]  -7.62108723  -7.70012935  -7.78637191  -7.87731632  -7.97028921
## [361]  -8.06253350  -8.15132351  -8.23409746  -8.30859558  -8.37298771
## [366]  -8.42597222  -8.46682971  -8.49542036  -8.51212200  -8.51771551
## [371]  -8.51323227  -8.49978333  -8.47839183  -8.44984830  -8.41460474
## [376]  -8.37271880  -8.32385433  -8.26733953  -8.20227863  -8.12770713
## [381]  -8.04277437  -7.94693217  -7.84010478  -7.72281647  -7.59625873
## [386]  -7.46228809  -7.32335758  -7.18239462  -7.04264514  -6.90750544
## [391]  -6.78036093  -6.66444524  -6.56272708  -6.47782649  -6.41195787
## [396]  -6.36689498  -6.34395211  -6.34397607  -6.36734454  -6.41396773
## [401]  -6.48329180  -6.57430390  -6.68554042  -6.81510114  -6.96067316
## [406]  -7.11956951  -7.28878708  -7.46508791  -7.64510574  -7.82547617
## [411]  -8.00298427  -8.17471843  -8.33821521  -8.49157807  -8.63355424
## [416]  -8.76355928  -8.88164676  -8.98842872  -9.08496037  -9.17260583
## [421]  -9.25290258  -9.32743915  -9.39775577  -9.46527247  -9.53124446
## [426]  -9.59674116  -9.66264343  -9.72965283  -9.79830711  -9.86899707
## [431]  -9.94198125 -10.01739627 -10.09526187 -10.17548104 -10.25783609
## [436] -10.34198244 -10.42744187 -10.51359734 -10.59969117 -10.68482825
## [441] -10.76798577 -10.84803052 -10.92374470 -10.99386063 -11.05710435
## [446] -11.11224751 -11.15816593 -11.19390219 -11.21872879 -11.23220694
## [451] -11.23423570 -11.22508637 -11.20541734 -11.17626667 -11.13902173
## [456] -11.09536754 -11.04721761 -10.99663293 -10.94573494 -10.89661844
## [461] -10.85126948 -10.81149183 -10.77884436 -10.75459035 -10.73965892
## [466] -10.73461809
```

```r
acf(x) #sinusoidal, slowly damping  behavior, peaks at 7, 14, 21
parzen.wge(x)
```

```
## $freq
##   [1] 0.001072961 0.002145923 0.003218884 0.004291845 0.005364807
##   [6] 0.006437768 0.007510730 0.008583691 0.009656652 0.010729614
##  [11] 0.011802575 0.012875536 0.013948498 0.015021459 0.016094421
##  [16] 0.017167382 0.018240343 0.019313305 0.020386266 0.021459227
##  [21] 0.022532189 0.023605150 0.024678112 0.025751073 0.026824034
##  [26] 0.027896996 0.028969957 0.030042918 0.031115880 0.032188841
##  [31] 0.033261803 0.034334764 0.035407725 0.036480687 0.037553648
##  [36] 0.038626609 0.039699571 0.040772532 0.041845494 0.042918455
##  [41] 0.043991416 0.045064378 0.046137339 0.047210300 0.048283262
##  [46] 0.049356223 0.050429185 0.051502146 0.052575107 0.053648069
##  [51] 0.054721030 0.055793991 0.056866953 0.057939914 0.059012876
##  [56] 0.060085837 0.061158798 0.062231760 0.063304721 0.064377682
##  [61] 0.065450644 0.066523605 0.067596567 0.068669528 0.069742489
##  [66] 0.070815451 0.071888412 0.072961373 0.074034335 0.075107296
##  [71] 0.076180258 0.077253219 0.078326180 0.079399142 0.080472103
##  [76] 0.081545064 0.082618026 0.083690987 0.084763948 0.085836910
##  [81] 0.086909871 0.087982833 0.089055794 0.090128755 0.091201717
##  [86] 0.092274678 0.093347639 0.094420601 0.095493562 0.096566524
##  [91] 0.097639485 0.098712446 0.099785408 0.100858369 0.101931330
##  [96] 0.103004292 0.104077253 0.105150215 0.106223176 0.107296137
## [101] 0.108369099 0.109442060 0.110515021 0.111587983 0.112660944
## [106] 0.113733906 0.114806867 0.115879828 0.116952790 0.118025751
## [111] 0.119098712 0.120171674 0.121244635 0.122317597 0.123390558
## [116] 0.124463519 0.125536481 0.126609442 0.127682403 0.128755365
## [121] 0.129828326 0.130901288 0.131974249 0.133047210 0.134120172
## [126] 0.135193133 0.136266094 0.137339056 0.138412017 0.139484979
## [131] 0.140557940 0.141630901 0.142703863 0.143776824 0.144849785
## [136] 0.145922747 0.146995708 0.148068670 0.149141631 0.150214592
## [141] 0.151287554 0.152360515 0.153433476 0.154506438 0.155579399
## [146] 0.156652361 0.157725322 0.158798283 0.159871245 0.160944206
## [151] 0.162017167 0.163090129 0.164163090 0.165236052 0.166309013
## [156] 0.167381974 0.168454936 0.169527897 0.170600858 0.171673820
## [161] 0.172746781 0.173819742 0.174892704 0.175965665 0.177038627
## [166] 0.178111588 0.179184549 0.180257511 0.181330472 0.182403433
## [171] 0.183476395 0.184549356 0.185622318 0.186695279 0.187768240
## [176] 0.188841202 0.189914163 0.190987124 0.192060086 0.193133047
## [181] 0.194206009 0.195278970 0.196351931 0.197424893 0.198497854
## [186] 0.199570815 0.200643777 0.201716738 0.202789700 0.203862661
## [191] 0.204935622 0.206008584 0.207081545 0.208154506 0.209227468
## [196] 0.210300429 0.211373391 0.212446352 0.213519313 0.214592275
## [201] 0.215665236 0.216738197 0.217811159 0.218884120 0.219957082
## [206] 0.221030043 0.222103004 0.223175966 0.224248927 0.225321888
## [211] 0.226394850 0.227467811 0.228540773 0.229613734 0.230686695
## [216] 0.231759657 0.232832618 0.233905579 0.234978541 0.236051502
## [221] 0.237124464 0.238197425 0.239270386 0.240343348 0.241416309
## [226] 0.242489270 0.243562232 0.244635193 0.245708155 0.246781116
## [231] 0.247854077 0.248927039 0.250000000 0.251072961 0.252145923
## [236] 0.253218884 0.254291845 0.255364807 0.256437768 0.257510730
## [241] 0.258583691 0.259656652 0.260729614 0.261802575 0.262875536
```

```
## [246] 0.263948498 0.265021459 0.266094421 0.267167382 0.268240343
## [251] 0.269313305 0.270386266 0.271459227 0.272532189 0.273605150
## [256] 0.274678112 0.275751073 0.276824034 0.277896996 0.278969957
## [261] 0.280042918 0.281115880 0.282188841 0.283261803 0.284334764
## [266] 0.285407725 0.286480687 0.287553648 0.288626609 0.289699571
## [271] 0.290772532 0.291845494 0.292918455 0.293991416 0.295064378
## [276] 0.296137339 0.297210300 0.298283262 0.299356223 0.300429185
## [281] 0.301502146 0.302575107 0.303648069 0.304721030 0.305793991
## [286] 0.306866953 0.307939914 0.309012876 0.310085837 0.311158798
## [291] 0.312231760 0.313304721 0.314377682 0.315450644 0.316523605
## [296] 0.317596567 0.318669528 0.319742489 0.320815451 0.321888412
## [301] 0.322961373 0.324034335 0.325107296 0.326180258 0.327253219
## [306] 0.328326180 0.329399142 0.330472103 0.331545064 0.332618026
## [311] 0.333690987 0.334763948 0.335836910 0.336909871 0.337982833
## [316] 0.339055794 0.340128755 0.341201717 0.342274678 0.343347639
## [321] 0.344420601 0.345493562 0.346566524 0.347639485 0.348712446
## [326] 0.349785408 0.350858369 0.351931330 0.353004292 0.354077253
## [331] 0.355150215 0.356223176 0.357296137 0.358369099 0.359442060
## [336] 0.360515021 0.361587983 0.362660944 0.363733906 0.364806867
## [341] 0.365879828 0.366952790 0.368025751 0.369098712 0.370171674
## [346] 0.371244635 0.372317597 0.373390558 0.374463519 0.375536481
## [351] 0.376609442 0.377682403 0.378755365 0.379828326 0.380901288
## [356] 0.381974249 0.383047210 0.384120172 0.385193133 0.386266094
## [361] 0.387339056 0.388412017 0.389484979 0.390557940 0.391630901
## [366] 0.392703863 0.393776824 0.394849785 0.395922747 0.396995708
## [371] 0.398068670 0.399141631 0.400214592 0.401287554 0.402360515
## [376] 0.403433476 0.404506438 0.405579399 0.406652361 0.407725322
## [381] 0.408798283 0.409871245 0.410944206 0.412017167 0.413090129
## [386] 0.414163090 0.415236052 0.416309013 0.417381974 0.418454936
## [391] 0.419527897 0.420600858 0.421673820 0.422746781 0.423819742
## [396] 0.424892704 0.425965665 0.427038627 0.428111588 0.429184549
## [401] 0.430257511 0.431330472 0.432403433 0.433476395 0.434549356
## [406] 0.435622318 0.436695279 0.437768240 0.438841202 0.439914163
## [411] 0.440987124 0.442060086 0.443133047 0.444206009 0.445278970
## [416] 0.446351931 0.447424893 0.448497854 0.449570815 0.450643777
## [421] 0.451716738 0.452789700 0.453862661 0.454935622 0.456008584
## [426] 0.457081545 0.458154506 0.459227468 0.460300429 0.461373391
## [431] 0.462446352 0.463519313 0.464592275 0.465665236 0.466738197
## [436] 0.467811159 0.468884120 0.469957082 0.471030043 0.472103004
## [441] 0.473175966 0.474248927 0.475321888 0.476394850 0.477467811
## [446] 0.478540773 0.479613734 0.480686695 0.481759657 0.482832618
## [451] 0.483905579 0.484978541 0.486051502 0.487124464 0.488197425
## [456] 0.489270386 0.490343348 0.491416309 0.492489270 0.493562232
## [461] 0.494635193 0.495708155 0.496781116 0.497854077 0.498927039
## [466] 0.500000000
##
## $pzgram
##   [1]  11.45071090  11.39468389  11.30139517  11.17098983  11.00369289
##   [6]  10.79983244  10.55987115  10.28444748   9.97442795   9.63097174
##  [11]   9.25560861   8.85032985   8.41769022   7.96091508   7.48400218
##  [16]   6.99180016   6.49003746   5.98526790   5.48469562   4.99584974
##  [21]   4.52610247   4.08206555   3.66895121   3.29002426   2.94627789
##  [26]   2.63642305   2.35720013   2.10393700   1.87122415   1.65357290
##  [31]   1.44595763   1.24419271   1.04513901   0.84676200   0.64807460
```

```
##  [36]   0.44899804   0.25016983   0.05272364  -0.14193723  -0.33235206
##  [41]  -0.51718185  -0.69533908  -0.86605755  -1.02889981  -1.18370844
##  [46]  -1.33051592  -1.46943332  -1.60053997  -1.72379425  -1.83898066
##  [51]  -1.94570162  -2.04341442  -2.13150670  -2.20939697  -2.27664281
##  [56]  -2.33303774  -2.37867969  -2.41399939  -2.43974457  -2.45692383
##  [61]  -2.46672114  -2.47039617  -2.46918644  -2.46422547  -2.45648694
##  [66]  -2.44675987  -2.43565489  -2.42363735  -2.41107977  -2.39832425
##  [71]  -2.38574481  -2.37380030  -2.36307054  -2.35427095  -2.34824432
##  [76]  -2.34593134  -2.34832374  -2.35640583  -2.37109000  -2.39315172
##  [81]  -2.42316806  -2.46146255  -2.50805794  -2.56263758  -2.62451628
##  [86]  -2.69262189  -2.76549064  -2.84128094  -2.91781276  -2.99264062
##  [91]  -3.06316859  -3.12681175  -3.18120223  -3.22442685  -3.25527109
##  [96]  -3.27343268  -3.27966235  -3.27579276  -3.26462810  -3.24968401
## [101]  -3.23478237  -3.22351274  -3.21857041  -3.22097308  -3.22915774
## [106]  -3.23798493  -3.23775976  -3.21354420  -3.14527472  -3.00938607
## [111]  -2.78246708  -2.44659762  -1.99462120  -1.43282714  -0.77954622
## [116]  -0.06049567   0.69670522   1.46673397   2.22872856   2.96676538
## [121]   3.66936570   4.32862852   4.93934043   5.49821509   6.00330076
## [126]   6.45354247   6.84846862   7.18797118   7.47215373   7.70122736
## [131]   7.87544031   7.99503090   8.06019705   8.07107750   8.02774183
## [136]   7.93018746   7.77834287   7.57207712   7.31121657   6.99557059
## [141]   6.62496913   6.19931636   5.71866628   5.18332836   4.59401379
## [146]   3.95203555   3.25957744   2.52004664   1.73851738   0.92225361
## [151]   0.08125685  -0.77128763  -1.61889454  -2.44231405  -3.22103172
## [156]  -3.93580001  -4.57173981  -5.12097087  -5.58359994  -5.96653113
## [161]  -6.28061305  -6.53732824  -6.74615937  -6.91320615  -7.04106880
## [166]  -7.12969670  -7.17778950  -7.18432259  -7.14980578  -7.07698980
## [171]  -6.97091580  -6.83840731  -6.68724737  -6.52531359  -6.35987475
## [176]  -6.19714316  -6.04208291  -5.89841968  -5.76878118  -5.65490346
## [181]  -5.55785372  -5.47823616  -5.41636098  -5.37236606  -5.34628874
## [186]  -5.33808986  -5.34763626  -5.37465052  -5.41863818  -5.47880379
## [191]  -5.55396718  -5.64249216  -5.74223946  -5.85055648  -5.96431497
## [196]  -6.08000595  -6.19389545  -6.30223638  -6.40151980  -6.48873703
## [201]  -6.56161429  -6.61878039  -6.65983592  -6.68531049  -6.69651658
## [206]  -6.69532831  -6.68392514  -6.66454152  -6.63925618  -6.60984219
## [211]  -6.57768619  -6.54377419  -6.50873384  -6.47291830  -6.43651495
## [216]  -6.39966148  -6.36255333  -6.32552917  -6.28912485  -6.25409142
## [221]  -6.22137777  -6.19208296  -6.16738681  -6.14846877  -6.13642494
## [226]  -6.13219175  -6.13648258  -6.14974079  -6.17211007  -6.20342079
## [231]  -6.24318875  -6.29062090  -6.34462116  -6.40378854  -6.46639950
## [236]  -6.53036788  -6.59317912  -6.65180151  -6.70258649  -6.74118245
## [241]  -6.76250023  -6.76078045  -6.72981589  -6.66336738  -6.55577155
## [246]  -6.40267555  -6.20176436  -5.95330600  -5.66036008  -5.32858191
## [251]  -4.96567213  -4.58061675  -4.18289363  -3.78178947  -3.38590548
## [256]  -3.00286492  -2.63919285  -2.30032014  -1.99066375  -1.71374512
## [261]  -1.47231941  -1.26849933  -1.10386454  -0.97955287  -0.89633246
## [266]  -0.85465559  -0.85469555  -0.89636798  -0.97933816  -1.10301538
## [271]  -1.26653554  -1.46873325  -1.70810486  -1.98276496  -2.29039977
## [276]  -2.62822285  -2.99294073  -3.38073837  -3.78729650  -4.20785338
## [281]  -4.63732084  -5.07045815  -5.50209531  -5.92738167  -6.34202008
## [286]  -6.74243633  -7.12583506  -7.49010952  -7.83360192  -8.15474609
## [291]  -8.45165668  -8.72175247  -8.96151189  -9.16645405  -9.33141429
## [296]  -9.45113106  -9.52107979  -9.53839518  -9.50265464  -9.41630050
## [301]  -9.28457536  -9.11499875  -8.91654861  -8.69876781  -8.47098365
```

```
## [306]  -8.24174536  -8.01850005  -7.80747048  -7.61367512  -7.44103135
## [311]  -7.29249524  -7.17020613  -7.07561717  -7.00960217  -6.97253496
## [316]  -6.96434082  -6.98452117  -7.03215386  -7.10587162  -7.20382227
## [321]  -7.32361550  -7.46226326  -7.61612404  -7.78086571  -7.95146642
## [326]  -8.12227681  -8.28716786  -8.43978263  -8.57389525  -8.68385526
## [331]  -8.76506492  -8.81441114  -8.83056588  -8.81408798  -8.76730311
## [336]  -8.69399116  -8.59895149  -8.48753270  -8.36520237  -8.23720575
## [341]  -8.10833137  -7.98277800  -7.86410337  -7.75523036  -7.65848801
## [346]  -7.57566900  -7.50809043  -7.45664961  -7.42186988  -7.40393461
## [351]  -7.40270920  -7.41775233  -7.44831875  -7.49335673  -7.55150404
## [356]  -7.62108723  -7.70012935  -7.78637191  -7.87731632  -7.97028921
## [361]  -8.06253350  -8.15132351  -8.23409746  -8.30859558  -8.37298771
## [366]  -8.42597222  -8.46682971  -8.49542036  -8.51212200  -8.51771551
## [371]  -8.51323227  -8.49978333  -8.47839183  -8.44984830  -8.41460474
## [376]  -8.37271880  -8.32385433  -8.26733953  -8.20227863  -8.12770713
## [381]  -8.04277437  -7.94693217  -7.84010478  -7.72281647  -7.59625873
## [386]  -7.46228809  -7.32335758  -7.18239462  -7.04264514  -6.90750544
## [391]  -6.78036093  -6.66444524  -6.56272708  -6.47782649  -6.41195787
## [396]  -6.36689498  -6.34395211  -6.34397607  -6.36734454  -6.41396773
## [401]  -6.48329180  -6.57430390  -6.68554042  -6.81510114  -6.96067316
## [406]  -7.11956951  -7.28878708  -7.46508791  -7.64510574  -7.82547617
## [411]  -8.00298427  -8.17471843  -8.33821521  -8.49157807  -8.63355424
## [416]  -8.76355928  -8.88164676  -8.98842872  -9.08496037  -9.17260583
## [421]  -9.25290258  -9.32743915  -9.39775577  -9.46527247  -9.53124446
## [426]  -9.59674116  -9.66264343  -9.72965283  -9.79830711  -9.86899707
## [431]  -9.94198125 -10.01739627 -10.09526187 -10.17548104 -10.25783609
## [436] -10.34198244 -10.42744187 -10.51359734 -10.59969117 -10.68482825
## [441] -10.76798577 -10.84803052 -10.92374470 -10.99386063 -11.05710435
## [446] -11.11224751 -11.15816593 -11.19390219 -11.21872879 -11.23220694
## [451] -11.23423570 -11.22508637 -11.20541734 -11.17626667 -11.13902173
## [456] -11.09536754 -11.04721761 -10.99663293 -10.94573494 -10.89661844
## [461] -10.85126948 -10.81149183 -10.77884436 -10.75459035 -10.73965892
## [466] -10.73461809
```

```
mean(x)
```

```
## [1] 2758.213
```

```
#prelimary aic check
aic5.wge(x, p=0:8, q = 0:2, type = "bic")
```

```
## ---------WORKING... PLEASE WAIT...
##
##
## Five Smallest Values of  bic

##       p    q        bic
## 21    6    2   14.55170
## 18    5    2   14.55543
## 27    8    2   14.56614
## 26    8    1   14.58682
## 25    8    0   14.59116
```

```r
#overfitting
est.ar.wge(x, p=10, type="burg")
```

```
##
## Coefficients of Original polynomial:
## 0.6041 -0.0951 0.0860 -0.0732 0.0621 0.1350 0.3726 -0.0946 -0.1011 -0.0357
##
## Factor                 Roots                Abs Recip    System Freq
## 1-1.1934B+0.9201B^2    0.6485+-0.8162i      0.9592       0.1432
## 1-0.9407B              1.0630               0.9407       0.0000
## 1+0.3329B+0.7550B^2   -0.2205+-1.1296i      0.8689       0.2807
## 1+1.3540B+0.6035B^2   -1.1219+-0.6312i      0.7768       0.4184
## 1-0.6831B              1.4639               0.6831       0.0000
## 1+0.5262B+0.1325B^2   -1.9852+-1.8986i      0.3640       0.3785
##
##


## $phi
##  [1]  0.60410080 -0.09508697  0.08598949 -0.07317406  0.06212747
##  [6]  0.13503440  0.37258537 -0.09455525 -0.10108736 -0.03570268
##
## $res
##   [1]  -826.804911   809.250861   -20.172860 -1154.835372   -52.197280
##   [6]  -249.389527   -91.349369  -535.762215 -1006.994328 -1598.002805
##  [11]  2294.945290   487.135084  1179.923154 -1262.069538    55.803391
##  [16]  -351.911708 -1012.391696 -1280.586559  -512.052714  -664.979511
##  [21]  -158.628834   133.292624   105.418371  -704.719735  -486.106737
##  [26]   206.982082  -290.546475  -145.143161  -182.736808    14.711900
##  [31]  -799.736778    32.249163 -1461.545078  -266.123272  -148.013548
##  [36]    10.482496   -53.397746  -808.489143  -183.128176   774.645746
##  [41]    12.937009   -67.635278  -360.503876    76.678491  -882.411791
##  [46]  -286.696138   120.344552  -373.656137  -295.211227  -123.964523
##  [51]   -32.088096  -718.896927  -333.530771   200.050581  -209.999483
##  [56]  -343.805152   -55.711900  -219.242833  -671.446171   -77.984123
##  [61]  -104.315778  -309.032683  -242.243229    11.461266  -221.336529
##  [66]  -653.910422  -380.405719  -175.070163  -441.106878  -496.202457
##  [71]  -434.672445 -1052.736015  -146.902317   442.538698  -290.342804
##  [76]  -378.671670  -241.825156  -181.442173    -9.932117  -119.306632
##  [81]  -885.715253  3213.568810   966.153590  1691.286307   381.766424
##  [86]   794.229242 -1973.389201   347.140699  1079.015695  -250.405912
##  [91]   470.602839     3.863101    32.189397  1281.409238 -2807.699325
##  [96]   379.312532 -1325.019604  2252.020373   287.596229 -3221.582259
## [101]  2627.427850   -22.331574  2478.833321   526.592751   266.610131
## [106]   316.237720   594.333737 -2352.697178  6535.104301  -588.786726
## [111] -3324.436505  1719.396416   541.835213 -3119.324889  2371.000712
## [116] -3704.071286  1964.139944  1250.163333  1128.883208   871.642535
## [121] -2739.017392  1760.658117   723.847169  -564.401634   157.943668
## [126]   237.310207   683.215421   320.106164 -2420.650217 -1899.864351
## [131]  -630.906540 -1470.589793  2980.288729   266.313446   379.274145
## [136] -1149.748702  1403.118572  3436.680816  6189.754832 -7438.024274
## [141] -1000.041945  2922.574692 -1739.884174   153.624694   866.802079
## [146] -1558.575857  3023.885619  1300.365267 -1165.717744 -1079.441601
## [151]   282.339440  1699.841094  2653.563338  1926.658217  -985.857300
```

```
## [156] -3051.943339  2979.394260 -1732.252864  4812.123631 -5856.992622
## [161]  -432.720960   587.289564  1990.825684 -2465.950433  -385.672245
## [166] -2095.614655   -33.100340  1411.473665   290.339393   216.402374
## [171] -1208.702071   527.595820  1344.740648  -674.337979 -3851.122578
## [176] -1277.561275  -660.327740   694.568888  2145.230357  -532.208948
## [181]  3483.490169  3416.241750  2838.783462  -512.927220 -1457.990695
## [186]   390.159925   933.196502 -1184.156935  -505.039066   681.215853
## [191]  2578.309340 -2168.636378    60.928174  -308.951551  -890.181215
## [196] -1763.368071 -2529.555938 -2013.708510  -192.793589  -402.752712
## [201] -1561.900211 -1232.309088   -88.830829  -303.279001    61.911224
## [206]  -396.321459  -700.122558  -676.450965  -482.307427  -482.329096
## [211]  -260.018210  -307.902643  -363.233676  -385.512149   913.487851
## [216]  -750.239088    10.283488  -214.032994  -615.459432  -427.369312
## [221]    38.234080  -265.447403   -16.520538   -76.118147     1.379505
## [226]  -834.527538  -372.690899  -821.358902    83.424641  -157.599550
## [231]  -294.151911   105.897078   390.270572  -719.896289  -316.613924
## [236]  2576.745504   505.417136  1414.388493   726.483501  -342.830107
## [241] -1187.891149   110.636710  1380.538267  -242.374261   309.974852
## [246]   129.573323   259.152808 -1095.107398  -471.754675  -141.181657
## [251]   796.950482   353.051937   461.547898    55.943026 -1000.188008
## [256]   391.419440  2312.523639  -494.719413   -30.012838   169.633905
## [261]  -771.011671   450.267853    42.293559  2068.537842  -648.475474
## [266]   234.860249   797.417251   246.988032 -1695.040603   269.797342
## [271]  1094.584585   -33.171815   393.694794   207.538734  -180.636080
## [276] -1007.867834    82.603763  1764.405439   -98.196640   994.033645
## [281]    75.484133   -39.758784  1123.997729  -835.810346 -3565.660429
## [286] -2300.845154 -1693.839060  -831.489921  -262.366423 -1097.723179
## [291]   189.096173  4117.470357  1701.596580  2256.055882   127.937456
## [296]  1446.665002 -2120.777657   481.003226  1724.325161  -823.480294
## [301]   503.017695 -4372.732363  -464.383492  2347.335384   716.923857
## [306]   627.907138   -53.024214  1428.424667  4797.613999 -3726.357980
## [311]  -815.077483 -2441.737611  2364.220540  -528.492315   -37.187696
## [316]  -164.869498  1064.875161  -535.530738   -17.299325  1420.494189
## [321]  -581.267034   383.711503   -91.921804   386.528829 -1489.982727
## [326]   302.264463  1183.874095    18.916887   464.407609  -371.068040
## [331]  1325.770346 -1601.847205   781.520259  1718.148320   371.084547
## [336]  1001.582561  -619.985693  1191.453922  -913.928075   267.362958
## [341]   781.974053  -660.802872   522.154624   570.293748  1369.906076
## [346] -1632.294403   438.130478  -515.662311 -2571.717210 -2132.445787
## [351]  -831.195989 -1974.776899  -268.573992    82.164578 -1172.010198
## [356]   -34.467555   296.510093   113.754382  -805.077393  -376.366422
## [361] -1114.758947   154.965670  -257.655040  -210.827407     6.938921
## [366]  -759.721538  -171.168843   513.216857  -327.939866  -270.377865
## [371]  -125.101860   -31.389468   220.578470  -806.818179  -750.671774
## [376]   311.963592  -216.276029  -178.335410  -312.224529    11.444638
## [381]  -728.883886  -287.617802   140.309289  -408.419829  -209.971555
## [386]    28.583527  -194.217422  -626.252056  -315.816738   284.700454
## [391]  -406.370821  -279.689378  -155.478215    59.737982  -773.633799
## [396]   170.567193  -828.306115 -1357.858899   356.565011  -532.432861
## [401]   -77.035786  -448.454500  -548.542626   847.691971   411.028349
## [406]  -109.239208   -42.523937  -427.481631  -685.951478  -421.844465
## [411]   213.213308  -325.595126  -254.842308  -136.239872   -62.531611
## [416]  -648.228104  -412.542474   -25.151282  -398.427495  -266.621508
## [421]  -166.103618  -573.256734   137.642098  -655.867057   253.962508
```

```
## [426]  -415.984547  -114.996264   -69.757710   -73.280780  -908.875818
## [431]  -257.987564   -89.627562  -554.456399  -490.595292  -448.020973
## [436]  -972.306922  -167.029012   458.094645  -195.435107  -242.764734
## [441]  -207.247187    48.804864   238.488265  -396.339482  -694.045237
## [446]  3386.350356   942.349749  1966.027583   583.590687   757.144913
## [451] -2111.727615    85.445402  1906.341074  -184.689269   493.821316
## [456]   325.766729   -53.722579 -1330.951803 -1325.502091 -2229.028374
## [461]  2546.452692   440.100170   460.873442  -410.450372  -252.416599
## [466]  1690.204223  3535.529203 -1252.851877   -69.418284   987.599636
## [471]   247.110239  -945.646996   214.539993  1877.104424  -450.298909
## [476]  1555.468579  -541.739759 -3236.124186  3626.753033 -1915.276339
## [481]  2009.943987  -654.610947   537.125234   751.355629  1311.495066
## [486] -1986.779835  -734.551170  2188.121805   245.389106   787.240519
## [491]  -156.844775  -177.059218 -1528.352337  -949.648841 -2416.450436
## [496] -2102.000030  2691.176955  1047.716976   214.519328  -343.384150
## [501]   389.466304  3619.671590   238.949430  -280.381131  -662.026770
## [506]   112.160210 -1083.634601  2643.950747 -1359.362804  1435.784165
## [511]   -15.995059   525.891964   100.635355  -124.632788  3024.276598
## [516]   -56.021980  -607.515169  -427.109783 -1261.559712   460.288914
## [521]   845.722705 -2403.692388  2044.413048   126.032509  1142.544920
## [526]   791.214355 -1445.014972  -538.900583 -1041.849205  1929.683137
## [531]   -32.488323   943.849152   659.370330   161.900682 -1431.704784
## [536]  -152.955347  1089.202082 -2404.232363 -3762.130417 -1489.345075
## [541]  -421.210064   664.882241  -796.959814  3586.983212  1926.082261
## [546]  3956.539670  1981.306728   513.947575 -1634.869735   394.909796
## [551]  1178.193419 -2527.640946   531.464700 -2030.124211  1005.710581
## [556]  5364.422225 -3020.669389   232.694139  -590.665573 -1499.330596
## [561] -1275.995682 -2033.883010 -2877.498858  -331.261374 -1321.108155
## [566] -1086.385147   -56.947757   401.550532  -319.947426  -328.457640
## [571]  -828.190718  -684.854335  -604.364562  -555.666047  -475.707699
## [576]  -229.655289  -293.404705  -361.555650  -385.512149   344.487851
## [581]  -249.505733  -459.664823  -517.259962  -362.218193   712.728384
## [586]  -359.922923    40.285112   -72.937208   270.170286 -1010.835031
## [591]  -449.132450   585.336893  -309.787714   185.636911  -398.471761
## [596]  -143.534308  1698.216979 -1581.011963 -1181.791745  -785.701963
## [601]  3118.533581  1034.425340  2139.064043 -2678.802293   864.610607
## [606]  1771.859324    40.426198   434.805179  -722.093711   734.998648
## [611]   333.147742 -1448.044492 -1134.096681  2655.361196  -118.731459
## [616]   557.405357   -57.166930   206.534095 -1108.283891   793.988191
## [621]  1276.022273   182.132028   -61.986797   741.529380 -1061.937344
## [626]  1070.183280  -647.098016  2187.894268  -319.376842  1145.835034
## [631]  -649.236284  1671.208574 -2255.405403   302.840683  1159.007636
## [636]  -131.486371    78.187488   923.177088  -315.295434 -1203.098400
## [641]   112.176042  1595.312787  1501.975309 -1128.421270   781.370153
## [646]  -599.713282  1432.339231  -878.056485 -3416.306853 -3162.935553
## [651] -1350.664899  -840.492503  -367.103287  -915.635468  -212.223016
## [656]  4180.653657  2093.498431  2084.693183  1183.034483   122.064838
## [661] -1665.925044   157.374008  1602.117025  -265.425239   961.334429
## [666]    40.054602   297.970898  -800.956180    67.308453  1805.402426
## [671]   -36.314969   592.606663  -282.442450  -311.071096  -695.656642
## [676]   -25.265535   980.582143  -787.530269  -224.126745   659.930428
## [681]   631.885069 -1500.479034  -148.533981  1679.169905  -239.585722
## [686]  -950.673748 -3439.154001  3352.061236 -2009.960651  -362.396122
## [691]   877.058396    10.072000  2664.958549  1685.058466   303.553556
```

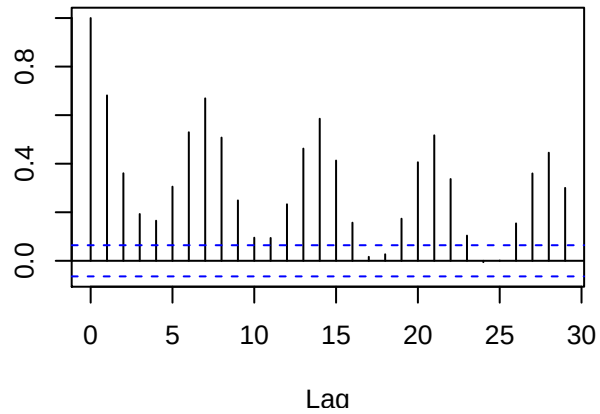
```
## [696]  -710.964082  4382.048717 -3475.516169  -785.128507  1848.697554
## [701]   310.063229  -361.737477 -1612.419299  -184.840704  3368.424535
## [706]   331.903727  -539.233190   302.731658   637.188431 -1003.087666
## [711]   -86.077476  -112.490017 -2410.809664 -2042.143204 -1133.943790
## [716] -1622.353471  -310.343249  -103.104217  -846.974720  -491.010981
## [721]   173.866986   206.823526  -701.023100  -389.618183 -1123.087409
## [726]   -14.714314  -322.991961  -223.575588   141.392524  -787.569334
## [731]  -187.417393   551.883392  -340.836906  -199.392948  -239.781193
## [736]    64.296959   178.538778  -810.582909  -820.795521   579.363773
## [741]  -348.251899  -121.903733  -385.986891  -100.163740  -665.803530
## [746]  -399.724507  -247.339172  -310.552673   -83.293937   -19.800407
## [751]    61.352849  -782.408009  -358.617473   324.955933  -371.946179
## [756]  -252.238516  -477.759993  -506.693681   101.702338  -525.106526
## [761]   231.112086  -502.368904 -1479.491036   260.885166  -275.945399
## [766]  -654.196356  -530.814604   390.364452    41.150571   514.329771
## [771]    46.554848  -113.139428  -865.173174  -377.077199   105.266006
## [776]  -343.059149  -485.024375  -163.306071  -176.562225  -423.085198
## [781]  -436.830736   248.283639  -284.362575   -15.302833    61.557918
## [786]  -337.049113  -657.874715  -398.715368    75.169664    33.087336
## [791]   -78.576238  -480.165508  -994.209933   148.553281   936.679619
## [796]  -594.695176  -922.441519  -534.909683    34.002056  -805.411102
## [801]  -536.097722    19.540073  -432.056271  -141.147478   -84.268230
## [806]    39.998635  -840.137610  -374.037677   481.785437  -205.307267
## [811]   193.310331  -477.606615   104.958772   415.782846  -474.919026
## [816]  4283.682896   991.619740  2352.209325  1326.837495 -1312.531064
## [821]   345.810389 -1509.549240 -3743.766279  3869.428849   191.935935
## [826]   966.459236  1011.508180 -2832.249233  2377.479403  3451.980653
## [831]    61.887895  -133.646890   377.964399   860.600542 -2331.403755
## [836]  1146.631267  2314.420003   484.618055   856.700887   633.172157
## [841]   649.340925 -1528.262116   784.219299  2345.124653  -256.922589
## [846]   844.555409   513.741965   207.118478 -1570.612532    89.632725
## [851]  2165.544463  -337.021442   751.324352   405.090793   678.746940
## [856] -2316.570814  1298.109166  2054.954232   236.228285   917.487791
## [861]   -83.304951  -186.674485 -1200.650812 -1706.347663 -3525.669811
## [866] -2240.696212  3376.680092  1207.323550  1353.884404 -2193.919834
## [871]  2647.214565  4972.324337   851.795821  -464.450601  -817.621586
## [876]   351.093016 -1011.572055  -127.385289  3074.789228   322.752448
## [881]  1505.076303  1203.891450  -443.705378 -1247.865125   286.687247
## [886]  2569.052161  -359.396916  1232.728319   -66.109753  1497.314308
## [891]  -302.297419 -3183.016274  3306.940519  -328.672481  1010.733438
## [896]   429.987754   109.451119  -994.010335   974.837363  5451.385855
## [901] -1975.658580   248.703200   -18.752885   133.677729 -1640.037561
## [906]  -307.531169   285.429828 -2835.881038 -3764.208923 -1847.850369
## [911]  -156.847648   223.494550  -340.146391  5112.182422  2530.024838
## [916]  4700.523764  4042.760140   833.021026 -2284.061963   273.771934
## [921]   684.324045 -3773.166279   364.568020   722.280654  2276.587155
## [926] -1003.524683  -711.823085   213.456063  -713.139496 -2338.354948
## [931] -3003.120081 -2200.139741
##
## $avar
## [1] 2000236
##
## $aic
## [1] 14.53238
```

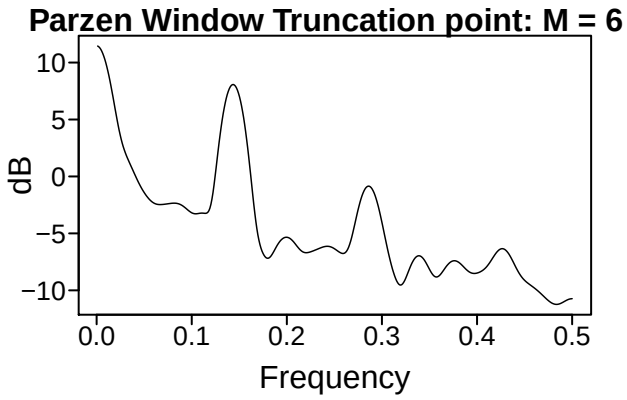
```
##
## $aicc
## [1] 15.53489
##
## $bic
## [1] 14.58947
```

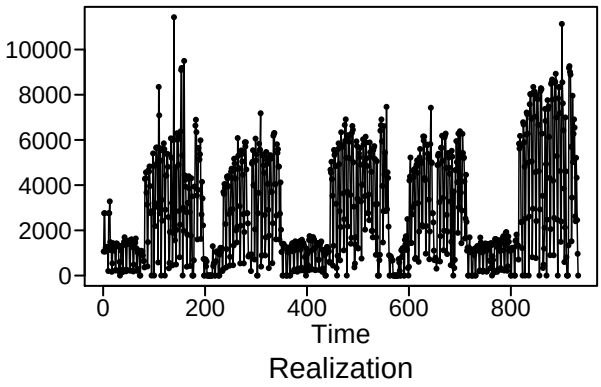
```
#ACF showed peaks at 7, indicating a weekly trend, comparing factor table s=7
factor.wge(phi=c(0,0,0,0,0,0,1))
```

```
##
## Coefficients of Original polynomial:
## 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 1.0000
##
## Factor                 Roots                Abs Recip    System Freq
## 1-1.0000B              1.0000               1.0000       0.0000
## 1+0.4450B+1.0000B^2   -0.2225+-0.9749i      1.0000       0.2857
## 1-1.2470B+1.0000B^2    0.6235+-0.7818i      1.0000       0.1429
## 1+1.8019B+1.0000B^2   -0.9010+-0.4339i      1.0000       0.4286
##
##
```

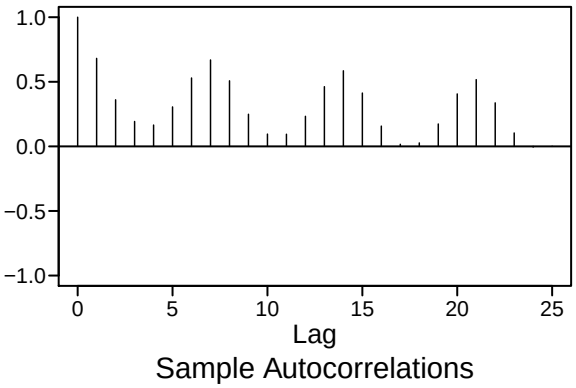
```
#removing the 1/7 period
x.s7 = artrans.wge(x, phi.tr = c(0,0,0,0,0,0,1))
```



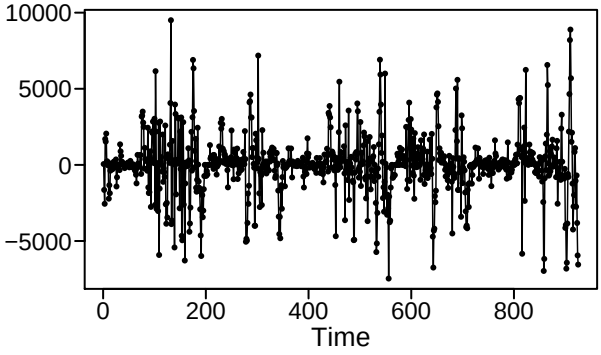




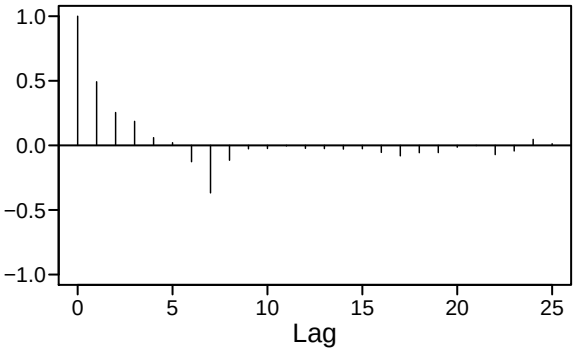
Realization



Sample Autocorrelations

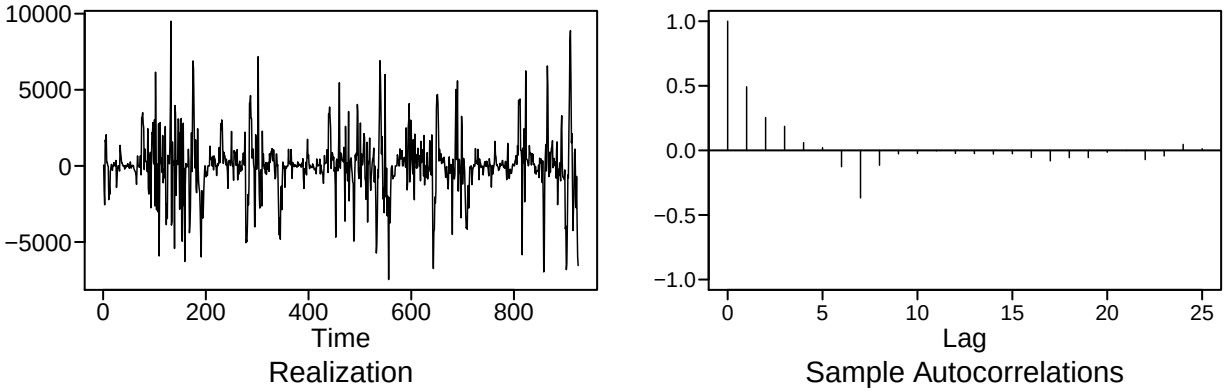


Transformed Realization

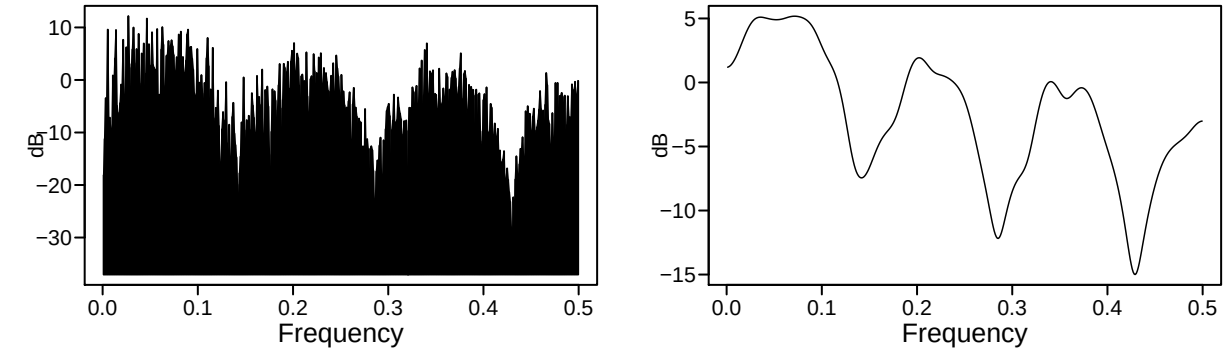


Sample Autocorrelations

```
#visualize the transformed data
plotts.sample.wge(x.s7)
```



Realization Sample Autocorrelations



Periodogram Parzen Window

```
## $autplt
##  [1]  1.000000000  0.492266032  0.254306029  0.185928886  0.059564244
##  [6]  0.020485364 -0.126483413 -0.367814964 -0.115107733 -0.026722267
## [11] -0.023991477 -0.003952913 -0.023028488 -0.024796507 -0.028824191
## [16] -0.026012618 -0.054379359 -0.081034429 -0.056692165 -0.055803894
## [21] -0.013788218 -0.001339559 -0.071332276 -0.043246062  0.046148795
## [26]  0.012355688
##
## $freq
##   [1] 0.001081081 0.002162162 0.003243243 0.004324324 0.005405405
##   [6] 0.006486486 0.007567568 0.008648649 0.009729730 0.010810811
##  [11] 0.011891892 0.012972973 0.014054054 0.015135135 0.016216216
##  [16] 0.017297297 0.018378378 0.019459459 0.020540541 0.021621622
##  [21] 0.022702703 0.023783784 0.024864865 0.025945946 0.027027027
##  [26] 0.028108108 0.029189189 0.030270270 0.031351351 0.032432432
##  [31] 0.033513514 0.034594595 0.035675676 0.036756757 0.037837838
##  [36] 0.038918919 0.040000000 0.041081081 0.042162162 0.043243243
##  [41] 0.044324324 0.045405405 0.046486486 0.047567568 0.048648649
##  [46] 0.049729730 0.050810811 0.051891892 0.052972973 0.054054054
##  [51] 0.055135135 0.056216216 0.057297297 0.058378378 0.059459459
##  [56] 0.060540541 0.061621622 0.062702703 0.063783784 0.064864865
##  [61] 0.065945946 0.067027027 0.068108108 0.069189189 0.070270270
##  [66] 0.071351351 0.072432432 0.073513514 0.074594595 0.075675676
##  [71] 0.076756757 0.077837838 0.078918919 0.080000000 0.081081081
##  [76] 0.082162162 0.083243243 0.084324324 0.085405405 0.086486486
##  [81] 0.087567568 0.088648649 0.089729730 0.090810811 0.091891892
```

```
##  [86] 0.092972973 0.094054054 0.095135135 0.096216216 0.097297297
##  [91] 0.098378378 0.099459459 0.100540541 0.101621622 0.102702703
##  [96] 0.103783784 0.104864865 0.105945946 0.107027027 0.108108108
## [101] 0.109189189 0.110270270 0.111351351 0.112432432 0.113513514
## [106] 0.114594595 0.115675676 0.116756757 0.117837838 0.118918919
## [111] 0.120000000 0.121081081 0.122162162 0.123243243 0.124324324
## [116] 0.125405405 0.126486486 0.127567568 0.128648649 0.129729730
## [121] 0.130810811 0.131891892 0.132972973 0.134054054 0.135135135
## [126] 0.136216216 0.137297297 0.138378378 0.139459459 0.140540541
## [131] 0.141621622 0.142702703 0.143783784 0.144864865 0.145945946
## [136] 0.147027027 0.148108108 0.149189189 0.150270270 0.151351351
## [141] 0.152432432 0.153513514 0.154594595 0.155675676 0.156756757
## [146] 0.157837838 0.158918919 0.160000000 0.161081081 0.162162162
## [151] 0.163243243 0.164324324 0.165405405 0.166486486 0.167567568
## [156] 0.168648649 0.169729730 0.170810811 0.171891892 0.172972973
## [161] 0.174054054 0.175135135 0.176216216 0.177297297 0.178378378
## [166] 0.179459459 0.180540541 0.181621622 0.182702703 0.183783784
## [171] 0.184864865 0.185945946 0.187027027 0.188108108 0.189189189
## [176] 0.190270270 0.191351351 0.192432432 0.193513514 0.194594595
## [181] 0.195675676 0.196756757 0.197837838 0.198918919 0.200000000
## [186] 0.201081081 0.202162162 0.203243243 0.204324324 0.205405405
## [191] 0.206486486 0.207567568 0.208648649 0.209729730 0.210810811
## [196] 0.211891892 0.212972973 0.214054054 0.215135135 0.216216216
## [201] 0.217297297 0.218378378 0.219459459 0.220540541 0.221621622
## [206] 0.222702703 0.223783784 0.224864865 0.225945946 0.227027027
## [211] 0.228108108 0.229189189 0.230270270 0.231351351 0.232432432
## [216] 0.233513514 0.234594595 0.235675676 0.236756757 0.237837838
## [221] 0.238918919 0.240000000 0.241081081 0.242162162 0.243243243
## [226] 0.244324324 0.245405405 0.246486486 0.247567568 0.248648649
## [231] 0.249729730 0.250810811 0.251891892 0.252972973 0.254054054
## [236] 0.255135135 0.256216216 0.257297297 0.258378378 0.259459459
## [241] 0.260540541 0.261621622 0.262702703 0.263783784 0.264864865
## [246] 0.265945946 0.267027027 0.268108108 0.269189189 0.270270270
## [251] 0.271351351 0.272432432 0.273513514 0.274594595 0.275675676
## [256] 0.276756757 0.277837838 0.278918919 0.280000000 0.281081081
## [261] 0.282162162 0.283243243 0.284324324 0.285405405 0.286486486
## [266] 0.287567568 0.288648649 0.289729730 0.290810811 0.291891892
## [271] 0.292972973 0.294054054 0.295135135 0.296216216 0.297297297
## [276] 0.298378378 0.299459459 0.300540541 0.301621622 0.302702703
## [281] 0.303783784 0.304864865 0.305945946 0.307027027 0.308108108
## [286] 0.309189189 0.310270270 0.311351351 0.312432432 0.313513514
## [291] 0.314594595 0.315675676 0.316756757 0.317837838 0.318918919
## [296] 0.320000000 0.321081081 0.322162162 0.323243243 0.324324324
## [301] 0.325405405 0.326486486 0.327567568 0.328648649 0.329729730
## [306] 0.330810811 0.331891892 0.332972973 0.334054054 0.335135135
## [311] 0.336216216 0.337297297 0.338378378 0.339459459 0.340540541
## [316] 0.341621622 0.342702703 0.343783784 0.344864865 0.345945946
## [321] 0.347027027 0.348108108 0.349189189 0.350270270 0.351351351
## [326] 0.352432432 0.353513514 0.354594595 0.355675676 0.356756757
## [331] 0.357837838 0.358918919 0.360000000 0.361081081 0.362162162
## [336] 0.363243243 0.364324324 0.365405405 0.366486486 0.367567568
## [341] 0.368648649 0.369729730 0.370810811 0.371891892 0.372972973
## [346] 0.374054054 0.375135135 0.376216216 0.377297297 0.378378378
## [351] 0.379459459 0.380540541 0.381621622 0.382702703 0.383783784
```

```
## [356] 0.384864865 0.385945946 0.387027027 0.388108108 0.389189189
## [361] 0.390270270 0.391351351 0.392432432 0.393513514 0.394594595
## [366] 0.395675676 0.396756757 0.397837838 0.398918919 0.400000000
## [371] 0.401081081 0.402162162 0.403243243 0.404324324 0.405405405
## [376] 0.406486486 0.407567568 0.408648649 0.409729730 0.410810811
## [381] 0.411891892 0.412972973 0.414054054 0.415135135 0.416216216
## [386] 0.417297297 0.418378378 0.419459459 0.420540541 0.421621622
## [391] 0.422702703 0.423783784 0.424864865 0.425945946 0.427027027
## [396] 0.428108108 0.429189189 0.430270270 0.431351351 0.432432432
## [401] 0.433513514 0.434594595 0.435675676 0.436756757 0.437837838
## [406] 0.438918919 0.440000000 0.441081081 0.442162162 0.443243243
## [411] 0.444324324 0.445405405 0.446486486 0.447567568 0.448648649
## [416] 0.449729730 0.450810811 0.451891892 0.452972973 0.454054054
## [421] 0.455135135 0.456216216 0.457297297 0.458378378 0.459459459
## [426] 0.460540541 0.461621622 0.462702703 0.463783784 0.464864865
## [431] 0.465945946 0.467027027 0.468108108 0.469189189 0.470270270
## [436] 0.471351351 0.472432432 0.473513514 0.474594595 0.475675676
## [441] 0.476756757 0.477837838 0.478918919 0.480000000 0.481081081
## [446] 0.482162162 0.483243243 0.484324324 0.485405405 0.486486486
## [451] 0.487567568 0.488648649 0.489729730 0.490810811 0.491891892
## [456] 0.492972973 0.494054054 0.495135135 0.496216216 0.497297297
## [461] 0.498378378 0.499459459
##
## $db
##   [1] -18.1422445 -11.2438349  -3.4837040  -4.5053956   9.5812124
##   [6]  -7.7812926  -7.1751550 -10.0807382 -10.7847525   0.8454719
##  [11]  -1.2198171   4.0790480   9.4885329  -4.9373306  -8.7994570
##  [16]  -6.2858261  -4.4348675  -0.8794836  -1.3961485   7.6409736
##  [21]  -8.0051928  -4.1002629   6.1999289  -0.4823450  12.1394350
##  [26]   3.0391117 -12.0094165   2.2963331   5.8043200   9.9695701
##  [31]   3.1616846  -4.2353388   5.8684917  -6.5771179   8.7507167
##  [36]  -0.7030093  -8.8810123   5.0328799   1.4753076   6.9321118
##  [41] -14.3354661   1.1925624  11.6754253 -17.7268291   6.7861609
##  [46]  -6.9581072   2.7531288   9.0549236   2.8408094   2.2774119
##  [51]   1.9189837  -2.4564369   9.6700830  -6.4245857  -2.7989458
##  [56]  -5.4710671   5.7658460  10.0363728   6.7117192  -8.5663832
##  [61]  -1.1637782   4.5757696   4.7485574   7.3953474   3.7062045
##  [66]   6.5337948   7.5368115   6.3777077   4.7259513   0.5875561
##  [71]   1.2567738   4.3253911   2.2085810   8.6402687   0.8397786
##  [76]   9.1868569  -3.4172197   4.3574387  -1.1957848   1.3638496
##  [81]   3.6718938   8.6160483   9.5760489   3.0484648   6.2111506
##  [86]   6.2969528   4.0282258   1.9566328  -2.5010284  -3.1555712
##  [91]  -3.4718861   5.8721638  -2.8428482  -0.5190272  -1.4429922
##  [96]   0.9093746  -2.6274853  -8.2890155  -0.5817392  -1.2901485
## [101]   4.1343522   7.9798675   2.6045207 -13.5255182  -1.8084828
## [106] -12.5255853   6.1008315  -7.3044106 -11.7785338  -5.3104626
## [111]  -7.4515181  -2.0344199  -8.7666685 -16.0597380 -19.4183768
## [116]  -9.4138049  -6.1255957 -11.4404127  -7.7081973  -0.4424377
## [121] -12.0517030 -20.3223214  -8.5203877 -16.2005036 -16.9008293
## [126]  -7.0555518  -4.3562684 -10.2017723 -12.3907023 -14.7606432
## [131] -19.9463286 -28.0912802 -17.7741617 -14.5949783  -8.0891341
## [136] -10.0621504   0.4679189  -9.6119159 -17.6259253  -7.6605351
## [141] -18.3132751  -6.8228109 -18.7827105  -9.5443231  -2.5333753
## [146]  -4.9039503  -7.2307453 -10.3990658 -15.5037985   0.7580873
```

```
## [151]  -4.5963361  -3.2319569  -8.7673933  -4.7548767   1.9703408
## [156] -13.7965109 -12.4680807  -1.9411616  -4.7746905  -1.2668672
## [161]  -5.0446856 -14.2399361 -27.8610765  -9.8726605  -1.7974171
## [166]  -7.3811394  -2.1595352  -3.9538787 -12.5760160  -5.7919158
## [171]  -1.0135499   3.0230955  -5.4271829 -20.5153961  -3.8271981
## [176]   3.0644931   2.2624342  -5.6679708   1.4943438   3.4449139
## [181] -10.9783053  -1.6469267   3.4852312   5.5510686   2.2609441
## [186]   6.9956582  -3.2444702   1.6903340   5.0081466   4.1365075
## [191]  -1.0956291 -11.7358904   0.6768417   1.0253439  -0.7585730
## [196]  -0.2194866  -4.4218767   5.2374648  -3.1480495  -9.4122913
## [201]  -5.9456808   0.1528479   0.6994774  -6.2875306   4.8978110
## [206]   1.6202126  -6.7507116   1.3242197  -8.1981212   4.2666374
## [211]  -4.2340099   5.0727100  -1.4210483  -2.0357151   2.2601405
## [216]  -4.4569239   1.2931345  -0.4116202  -2.0634028  -6.7699207
## [221]  -2.2370556   0.7852187  -1.3042047   3.1608894  -5.8365075
## [226]  -2.5191961   4.6472411   2.2228541   0.6636439  -2.3523783
## [231]  -8.9873374   0.9583408  -2.5910128  -2.1886592  -4.8122035
## [236]  -6.0825390  -5.2558538  -6.1908465  -4.0432226  -2.3602673
## [241] -11.3022209 -17.3442036  -4.6549245  -1.5162156  -5.2584676
## [246]  -5.2820517  -7.0329431 -11.3337518  -7.3508655  -8.0283729
## [251]  -8.1089310 -26.6885359 -12.6459162 -19.0752526  -5.5541053
## [256] -14.7581816 -11.2781270 -13.1858696 -27.1469840 -13.1472523
## [261] -12.6396689 -13.3642400 -17.3005106 -25.2229220 -23.4202315
## [266] -17.4447062 -15.3266956 -16.2018585 -12.5249035 -10.9878059
## [271] -19.8562865 -19.9365314 -11.4933900 -17.7219044  -9.3816281
## [276]  -5.8973121  -5.1641607  -4.5554770  -6.8926934 -30.0626053
## [281]  -9.5695036  -7.7532012  -2.8031792 -10.0209504  -8.1124428
## [286]  -7.6667079  -3.3466895  -5.3572239  -6.4232248  -7.5217890
## [291] -14.6223979 -10.3963228  -7.8496503 -12.4209622  -7.7148833
## [296] -37.0437824  -9.7159472  -5.2942950  -5.3518586  -7.6521242
## [301]  -1.4275583  -2.4296374 -10.2933323  -2.2707594  -1.1307159
## [306]  -6.6211978  -5.0906918   2.1807144  -2.6665281   3.6928211
## [311] -15.9243875  -3.0064041   5.6880485  -6.0816346   6.9505453
## [316]  -8.3849445  -3.0165073   1.6284150  -6.9751828   1.2331274
## [321]   1.8206717  -8.0216091  -2.6368222  -2.8509901  -5.5834847
## [326] -10.6181940   2.1389819  -4.6473031  -4.9987271  -4.4117427
## [331]  -1.6228025  -4.1252962  -3.4691078   1.2314046   0.5819259
## [336] -13.3147185  -1.8399388  -2.0003411   0.3958870   1.5608932
## [341]  -0.4903046   1.8469868   0.2560472  -2.9890211  -3.4702257
## [346]  -1.3189456   2.1637384   5.0541927 -14.0004971  -3.6575493
## [351]   1.0935834   1.6929198   0.2263686  -6.3942820  -8.1205872
## [356]  -0.9508697  -2.2896007  -1.3206227  -2.2633951  -1.8945875
## [361] -24.6442798  -3.0233346  -1.8525799 -18.6772624  -2.8132464
## [366]  -2.5622877  -9.7925893 -15.8417623 -11.7076087  -3.8612635
## [371]  -2.7119996  -7.9209710  -1.4252975 -10.4092576 -10.1314463
## [376]  -9.7351576  -4.5643368  -5.3183733 -10.4868389 -12.0200710
## [381]  -8.2970412 -11.7073540 -10.9994524  -9.3074190 -15.0661380
## [386] -13.4349975 -16.7994958 -15.7072716 -15.1505006 -13.5679731
## [391] -20.7219284 -19.0661820 -16.8528621 -19.0130172 -21.3858067
## [396] -23.1918062 -28.0737433 -33.8066650 -22.3581684 -27.9361551
## [401] -18.9515700 -14.5481486 -17.9352619 -19.3424721 -16.0611189
## [406] -13.1186394 -13.6024553 -10.9190725 -15.1071276 -18.2166916
## [411]  -5.9757852 -11.3792179  -5.0104382 -13.2280802  -6.4329338
## [416] -11.7644139  -9.8391524  -6.9882619  -5.4735457  -9.6439299
```

```
## [421] -12.7392458  -9.0259574  -7.7510793  -5.6507724  -2.1373007
## [426]  -5.5644404 -14.8862720  -5.8283040 -14.1460458  -4.7554083
## [431]   1.3002203  -0.9631958  -7.6358460  -8.3577796 -15.0048883
## [436] -12.3480597  -6.3267190 -12.6261131 -13.3612183  -0.5913827
## [441] -10.9912737  -0.5689660 -14.3264650  -3.0663451  -3.1168251
## [446]  -2.4789674  -3.2236584  -7.5206260  -2.9861237 -17.8477369
## [451]  -8.6200154  -3.1012091  -7.2908720  -7.0911829  -8.2382292
## [456]  -0.8556567  -1.8895455  -6.0094964  -0.3514642  -4.3838214
## [461]  -2.7998243  -0.1740866
##
## $dbz
##   [1]  1.192257e+00  1.223581e+00  1.275458e+00  1.347397e+00  1.438712e+00
##   [6]  1.548518e+00  1.675733e+00  1.819067e+00  1.977020e+00  2.147879e+00
##  [11]  2.329719e+00  2.520423e+00  2.717703e+00  2.919143e+00  3.122246e+00
##  [16]  3.324498e+00  3.523423e+00  3.716652e+00  3.901979e+00  4.077414e+00
##  [21]  4.241226e+00  4.391978e+00  4.528548e+00  4.650149e+00  4.756329e+00
##  [26]  4.846975e+00  4.922296e+00  4.982810e+00  5.029316e+00  5.062857e+00
##  [31]  5.084686e+00  5.096209e+00  5.098937e+00  5.094424e+00  5.084209e+00
##  [36]  5.069763e+00  5.052436e+00  5.033425e+00  5.013750e+00  4.994245e+00
##  [41]  4.975571e+00  4.958239e+00  4.942640e+00  4.929086e+00  4.917841e+00
##  [46]  4.909151e+00  4.903261e+00  4.900417e+00  4.900856e+00  4.904779e+00
##  [51]  4.912322e+00  4.923515e+00  4.938254e+00  4.956274e+00  4.977136e+00
##  [56]  5.000234e+00  5.024819e+00  5.050031e+00  5.074951e+00  5.098654e+00
##  [61]  5.120265e+00  5.139006e+00  5.154237e+00  5.165482e+00  5.172433e+00
##  [66]  5.174948e+00  5.173023e+00  5.166754e+00  5.156282e+00  5.141742e+00
##  [71]  5.123201e+00  5.100600e+00  5.073719e+00  5.042140e+00  5.005245e+00
##  [76]  4.962225e+00  4.912109e+00  4.853822e+00  4.786243e+00  4.708281e+00
##  [81]  4.618956e+00  4.517479e+00  4.403324e+00  4.276304e+00  4.136618e+00
##  [86]  3.984902e+00  3.822245e+00  3.650183e+00  3.470667e+00  3.285982e+00
##  [91]  3.098635e+00  2.911192e+00  2.726086e+00  2.545407e+00  2.370683e+00
##  [96]  2.202706e+00  2.041397e+00  1.885765e+00  1.733936e+00  1.583269e+00
## [101]  1.430530e+00  1.272094e+00  1.104166e+00  9.229791e-01  7.249699e-01
## [106]  5.069168e-01  2.660513e-01  1.418925e-04 -2.924375e-01 -6.126468e-01
## [111] -9.607181e-01 -1.336086e+00 -1.737312e+00 -2.161995e+00 -2.606687e+00
## [116] -3.066824e+00 -3.536691e+00 -4.009472e+00 -4.477397e+00 -4.932051e+00
## [121] -5.364833e+00 -5.767549e+00 -6.133065e+00 -6.455888e+00 -6.732553e+00
## [126] -6.961700e+00 -7.143846e+00 -7.280912e+00 -7.375650e+00 -7.431109e+00
## [131] -7.450245e+00 -7.435727e+00 -7.389928e+00 -7.315037e+00 -7.213251e+00
## [136] -7.086949e+00 -6.938826e+00 -6.771940e+00 -6.589683e+00 -6.395679e+00
## [141] -6.193648e+00 -5.987256e+00 -5.779974e+00 -5.574964e+00 -5.374998e+00
## [146] -5.182404e+00 -4.999035e+00 -4.826261e+00 -4.664966e+00 -4.515547e+00
## [151] -4.377921e+00 -4.251517e+00 -4.135276e+00 -4.027648e+00 -3.926588e+00
## [156] -3.829573e+00 -3.733631e+00 -3.635413e+00 -3.531297e+00 -3.417543e+00
## [161] -3.290498e+00 -3.146840e+00 -2.983835e+00 -2.799588e+00 -2.593235e+00
## [166] -2.365054e+00 -2.116474e+00 -1.849979e+00 -1.568919e+00 -1.277272e+00
## [171] -9.793836e-01 -6.797221e-01 -3.826691e-01 -9.236096e-02  1.874199e-01
## [176]  4.533101e-01  7.023938e-01  9.322067e-01  1.140724e+00  1.326339e+00
## [181]  1.487844e+00  1.624405e+00  1.735550e+00  1.821154e+00  1.881439e+00
## [186]  1.916970e+00  1.928664e+00  1.917796e+00  1.886006e+00  1.835302e+00
## [191]  1.768050e+00  1.686953e+00  1.595008e+00  1.495432e+00  1.391566e+00
## [196]  1.286739e+00  1.184119e+00  1.086547e+00  9.963730e-01  9.153221e-01
## [201]  8.444056e-01  7.838901e-01  7.333343e-01  6.916855e-01  6.574232e-01
## [206]  6.287284e-01  6.036561e-01  5.802931e-01  5.568867e-01  5.319351e-01
## [211]  5.042390e-01  4.729154e-01  4.373772e-01  3.972876e-01  3.524928e-01
```

```
## [216]  3.029448e-01  2.486181e-01  1.894312e-01  1.251782e-01  5.547580e-02
## [221] -2.026791e-02 -1.028633e-01 -1.933264e-01 -2.928466e-01 -4.027384e-01
## [226] -5.243826e-01 -6.591615e-01 -8.083941e-01 -9.732726e-01 -1.154806e+00
## [231] -1.353771e+00 -1.570671e+00 -1.805706e+00 -2.058750e+00 -2.329344e+00
## [236] -2.616701e+00 -2.919722e+00 -3.237035e+00 -3.567046e+00 -3.908020e+00
## [241] -4.258165e+00 -4.615749e+00 -4.979205e+00 -5.347248e+00 -5.718971e+00
## [246] -6.093903e+00 -6.472037e+00 -6.853792e+00 -7.239925e+00 -7.631376e+00
## [251] -8.029056e+00 -8.433580e+00 -8.844941e+00 -9.262133e+00 -9.682727e+00
## [256] -1.010242e+01 -1.051457e+01 -1.090992e+01 -1.127646e+01 -1.159989e+01
## [261] -1.186474e+01 -1.205627e+01 -1.216296e+01 -1.217885e+01 -1.210495e+01
## [266] -1.194910e+01 -1.172441e+01 -1.144679e+01 -1.113264e+01 -1.079708e+01
## [271] -1.045298e+01 -1.011064e+01 -9.777899e+00 -9.460457e+00 -9.162242e+00
## [276] -8.885754e+00 -8.632351e+00 -8.402454e+00 -8.195690e+00 -8.010965e+00
## [281] -7.846495e+00 -7.699799e+00 -7.567664e+00 -7.446117e+00 -7.330407e+00
## [286] -7.215047e+00 -7.093928e+00 -6.960558e+00 -6.808421e+00 -6.631470e+00
## [291] -6.424689e+00 -6.184648e+00 -5.909932e+00 -5.601356e+00 -5.261888e+00
## [296] -4.896327e+00 -4.510792e+00 -4.112143e+00 -3.707434e+00 -3.303475e+00
## [301] -2.906528e+00 -2.522126e+00 -2.155008e+00 -1.809124e+00 -1.487679e+00
## [306] -1.193219e+00 -9.276976e-01 -6.925614e-01 -4.888103e-01 -3.170507e-01
## [311] -1.775333e-01 -7.017554e-02  5.429569e-03  5.001820e-02  6.467315e-02
## [316]  5.085240e-02  1.042695e-02 -5.427546e-02 -1.404255e-01 -2.446540e-01
## [321] -3.630306e-01 -4.910726e-01 -6.238017e-01 -7.558624e-01 -8.817166e-01
## [326] -9.959158e-01 -1.093437e+00 -1.170049e+00 -1.222658e+00 -1.249569e+00
## [331] -1.250621e+00 -1.227155e+00 -1.181830e+00 -1.118332e+00 -1.041015e+00
## [336] -9.545470e-01 -8.636051e-01 -7.726340e-01 -6.856888e-01 -6.063460e-01
## [341] -5.376710e-01 -4.822258e-01 -4.421011e-01 -4.189603e-01 -4.140880e-01
## [346] -4.284355e-01 -4.626603e-01 -5.171591e-01 -5.920910e-01 -6.873952e-01
## [351] -8.027999e-01 -9.378270e-01 -1.091792e+00 -1.263802e+00 -1.452756e+00
## [356] -1.657344e+00 -1.876053e+00 -2.107186e+00 -2.348889e+00 -2.599189e+00
## [361] -2.856055e+00 -3.117469e+00 -3.381514e+00 -3.646470e+00 -3.910909e+00
## [366] -4.173789e+00 -4.434523e+00 -4.693029e+00 -4.949741e+00 -5.205597e+00
## [371] -5.461983e+00 -5.720658e+00 -5.983665e+00 -6.253226e+00 -6.531650e+00
## [376] -6.821239e+00 -7.124213e+00 -7.442648e+00 -7.778422e+00 -8.133173e+00
## [381] -8.508256e+00 -8.904694e+00 -9.323115e+00 -9.763655e+00 -1.022582e+01
## [386] -1.070827e+01 -1.120853e+01 -1.172259e+01 -1.224438e+01 -1.276512e+01
## [391] -1.327272e+01 -1.375132e+01 -1.418141e+01 -1.454096e+01 -1.480794e+01
## [396] -1.496417e+01 -1.499934e+01 -1.491364e+01 -1.471765e+01 -1.442959e+01
## [401] -1.407120e+01 -1.366397e+01 -1.322671e+01 -1.277445e+01 -1.231844e+01
## [406] -1.186658e+01 -1.142417e+01 -1.099454e+01 -1.057959e+01 -1.018033e+01
## [411] -9.797118e+00 -9.429995e+00 -9.078809e+00 -8.743344e+00 -8.423393e+00
## [416] -8.118785e+00 -7.829401e+00 -7.555164e+00 -7.296020e+00 -7.051914e+00
## [421] -6.822758e+00 -6.608413e+00 -6.408660e+00 -6.223188e+00 -6.051579e+00
## [426] -5.893311e+00 -5.747756e+00 -5.614187e+00 -5.491796e+00 -5.379703e+00
## [431] -5.276978e+00 -5.182655e+00 -5.095748e+00 -5.015262e+00 -4.940201e+00
## [436] -4.869570e+00 -4.802381e+00 -4.737646e+00 -4.674384e+00 -4.611615e+00
## [441] -4.548378e+00 -4.483744e+00 -4.416845e+00 -4.346906e+00 -4.273299e+00
## [446] -4.195582e+00 -4.113555e+00 -4.027297e+00 -3.937201e+00 -3.843980e+00
## [451] -3.748663e+00 -3.652561e+00 -3.557224e+00 -3.464373e+00 -3.375828e+00
## [456] -3.293428e+00 -3.218962e+00 -3.154092e+00 -3.100295e+00 -3.058811e+00
## [461] -3.030604e+00 -3.016334e+00
```

#EDA Project: Step 3 - Forecasting the ARIMA(8,0,0), s = 7 on the original dataset

```r
#estimates for an arma model
aic5.wge(x.s7, p=0:8, q=0:3, type = "aic")
```

```
## ---------WORKING... PLEASE WAIT...
##
##
## Five Smallest Values of  aic

##       p    q        aic
## 33    8    0   14.61412
## 34    8    1   14.61470
## 36    8    3   14.61568
## 35    8    2   14.61681
## 32    7    3   14.62224
```

```r
aic5.wge(x.s7, type = "bic")
```

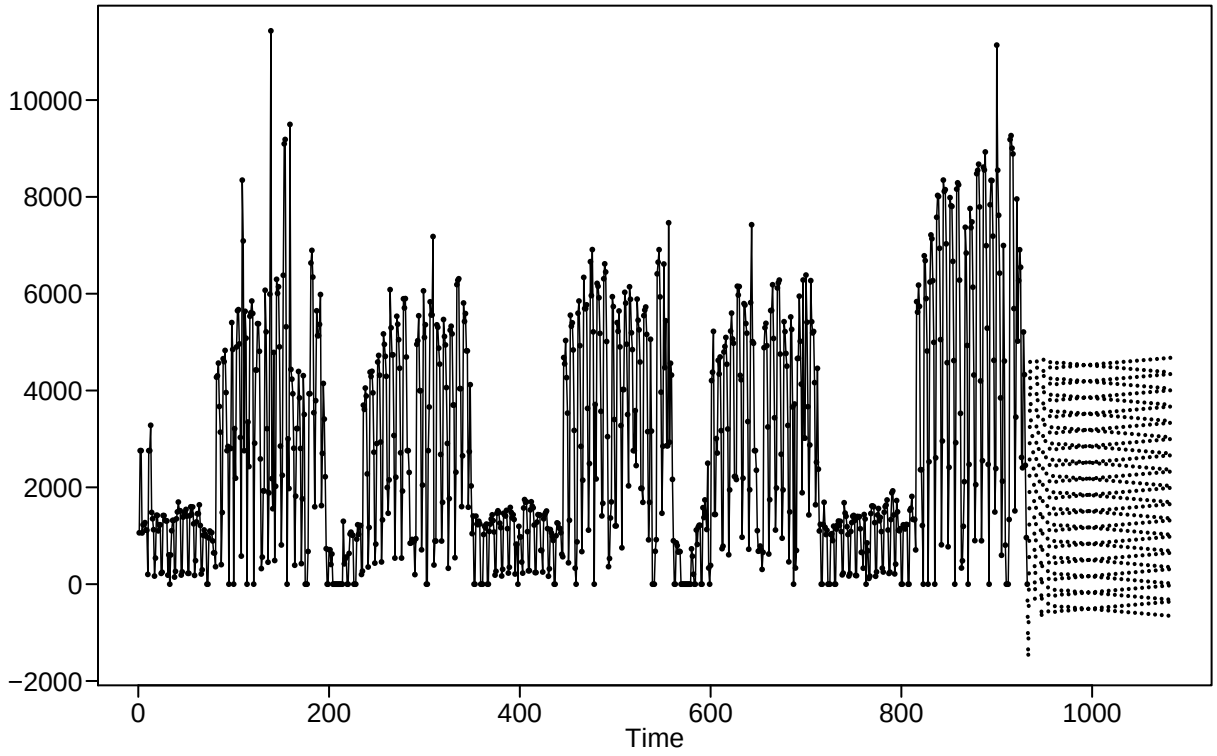
```
## ---------WORKING... PLEASE WAIT...
##
##
## Five Smallest Values of  bic

##       p    q        bic
## 18    5    2   14.74075
## 12    3    2   14.83149
## 4     1    0   14.86813
## 15    4    2   14.87334
## 5     1    1   14.87498
```

```r
#estimating the coefficients AR(8)
x.ar = est.ar.wge(x.s7, p=8)
```

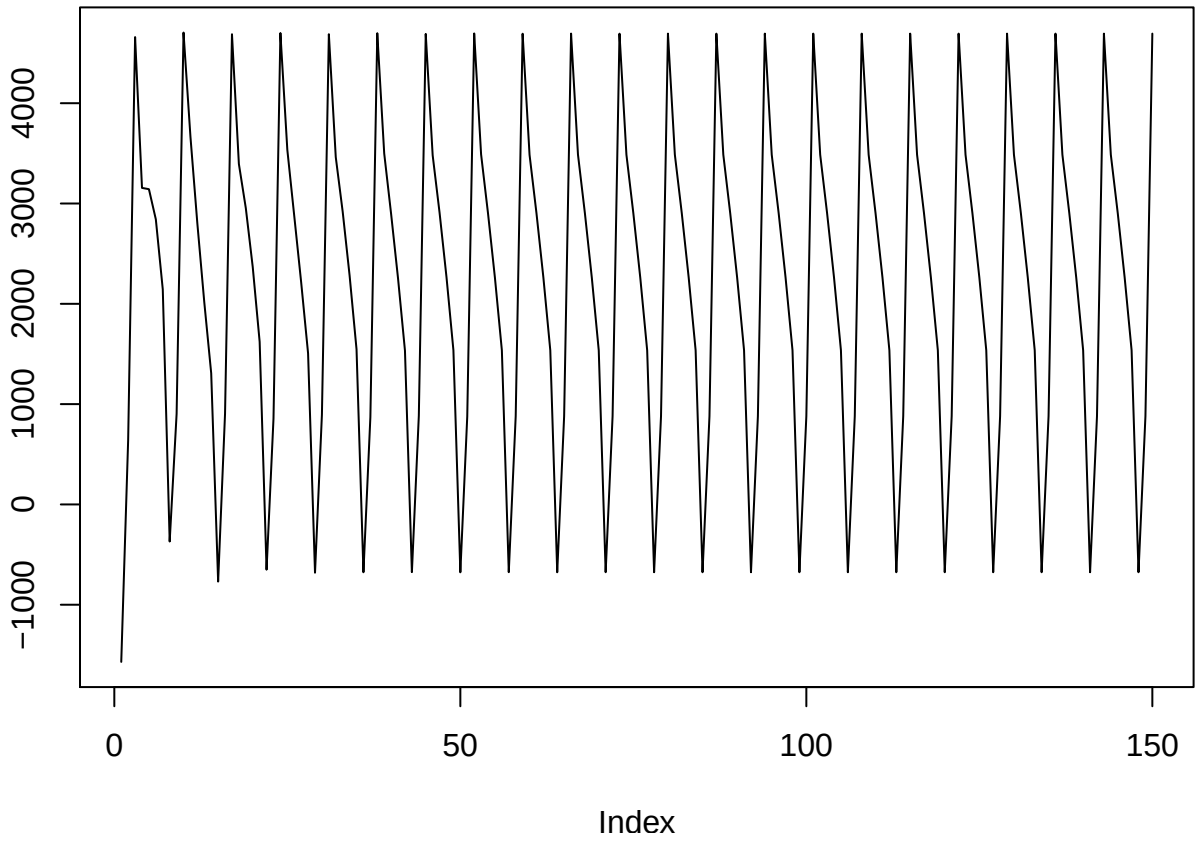
```
##
## Coefficients of Original polynomial:
## 0.5343 0.0059 0.0780 -0.0332 0.0599 -0.0294 -0.4570 0.3028
##
## Factor                 Roots                Abs Recip    System Freq
## 1+1.1655B+0.8448B^2   -0.6898+-0.8414i      0.9192       0.3593
## 1-0.3634B+0.8180B^2    0.2221+-1.0831i      0.9045       0.2178
## 1+0.8810B             -1.1351               0.8810       0.5000
## 1-1.5520B+0.7474B^2    1.0383+-0.5098i      0.8645       0.0726
## 1-0.6653B              1.5031               0.6653       0.0000
##
##
##
## Coefficients of Original polynomial:
## 0.5343 0.0059 0.0780 -0.0332 0.0599 -0.0294 -0.4570 0.3028
##
## Factor                 Roots                Abs Recip    System Freq
## 1+1.1655B+0.8448B^2   -0.6898+-0.8414i      0.9192       0.3593
## 1-0.3634B+0.8180B^2    0.2221+-1.0831i      0.9045       0.2178
```

```
## 1+0.8810B             -1.1351                0.8810       0.5000
## 1-1.5520B+0.7474B^2    1.0383+-0.5098i       0.8645       0.0726
## 1-0.6653B              1.5031                0.6653       0.0000
##
##
```

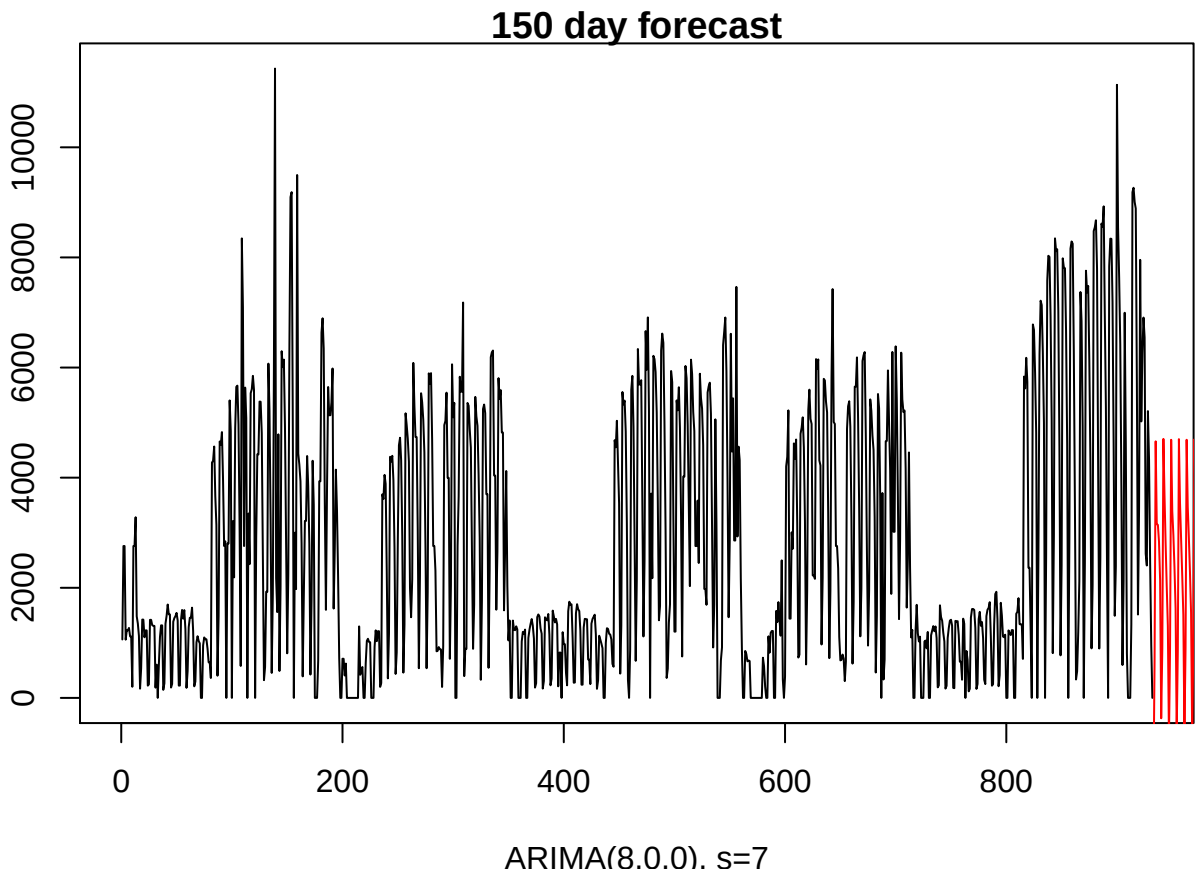
```
#x.ar$phi
#x.ar$avar

#forecasting 150 days the ARIMA(8,0,0) with s=7
x.ar.fore = fore.aruma.wge(x, phi= x.ar$phi, s=7, n.ahead = 150, limits = F, lastn=F)
```




```
#plot of the  forecast - 150 days
plot(x.ar.fore$f, type = "l")
```




```
plot(seq(1,932,1), x, type = "l",xlim = c(0,932),xlab ="ARIMA(8,0,0), s=7", ylab = "Visitors", main = "
lines(seq(933,1082,1), x.ar.fore$f, type = "l", col = "red")
```




```
#ASE of ARIMA(8,0,0) with s=7
x.ar.ase = mean((x.ar.fore$f-x[(932-149):932])^2)
x.ar.ase
```

```
## [1] 20352512
```

```
#white noise?
ljung.wge(x.ar.fore$res, p=8)
```

```
## Obs -0.01013881 0.00280828 0.0324528 -0.005347089 0.03430444 0.01399828 -0.1476897 0.02891451 0.0326
```

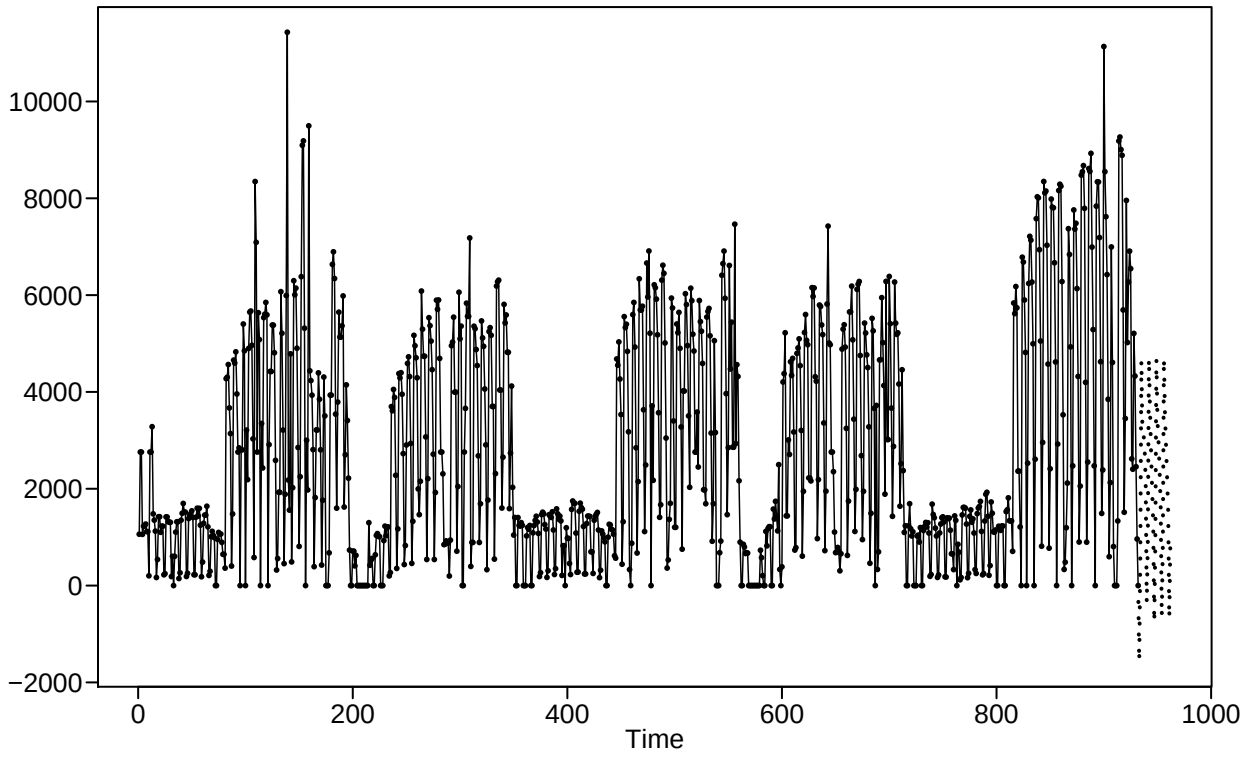
```
## $test
## [1] "Ljung-Box test"
##
## $K
## [1] 24
##
## $chi.square
## [1] 111.149
##
## $df
## [1] 16
##
## $pval
## [1] 2.220446e-16
```

```r
ljung.wge(x.ar.fore$res, K=48, p=8)
```

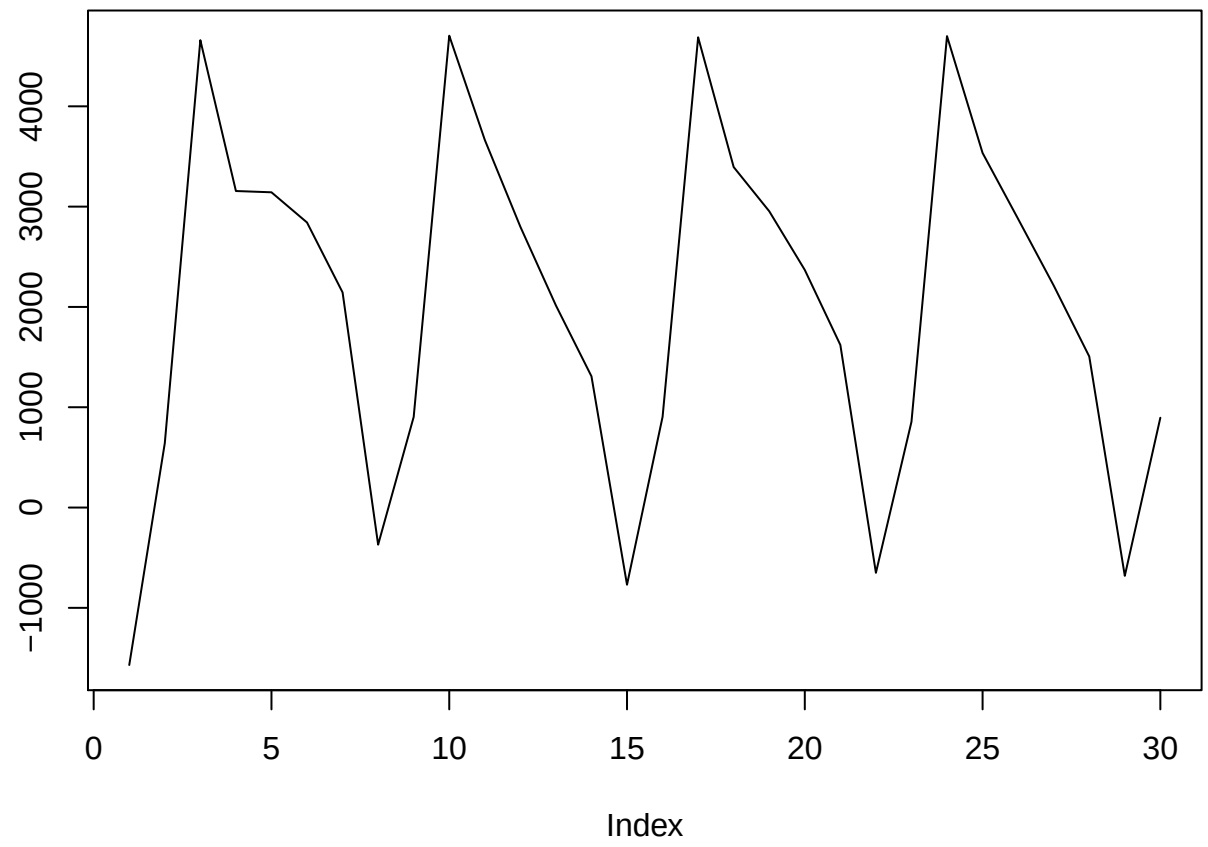
```
## Obs -0.01013881 0.00280828 0.0324528 -0.005347089 0.03430444 0.01399828 -0.1476897 0.02891451 0.0326
```

```
## $test
## [1] "Ljung-Box test"
##
## $K
## [1] 48
##
## $chi.square
## [1] 151.4228
##
## $df
## [1] 40
##
## $pval
## [1] 7.21645e-15
```

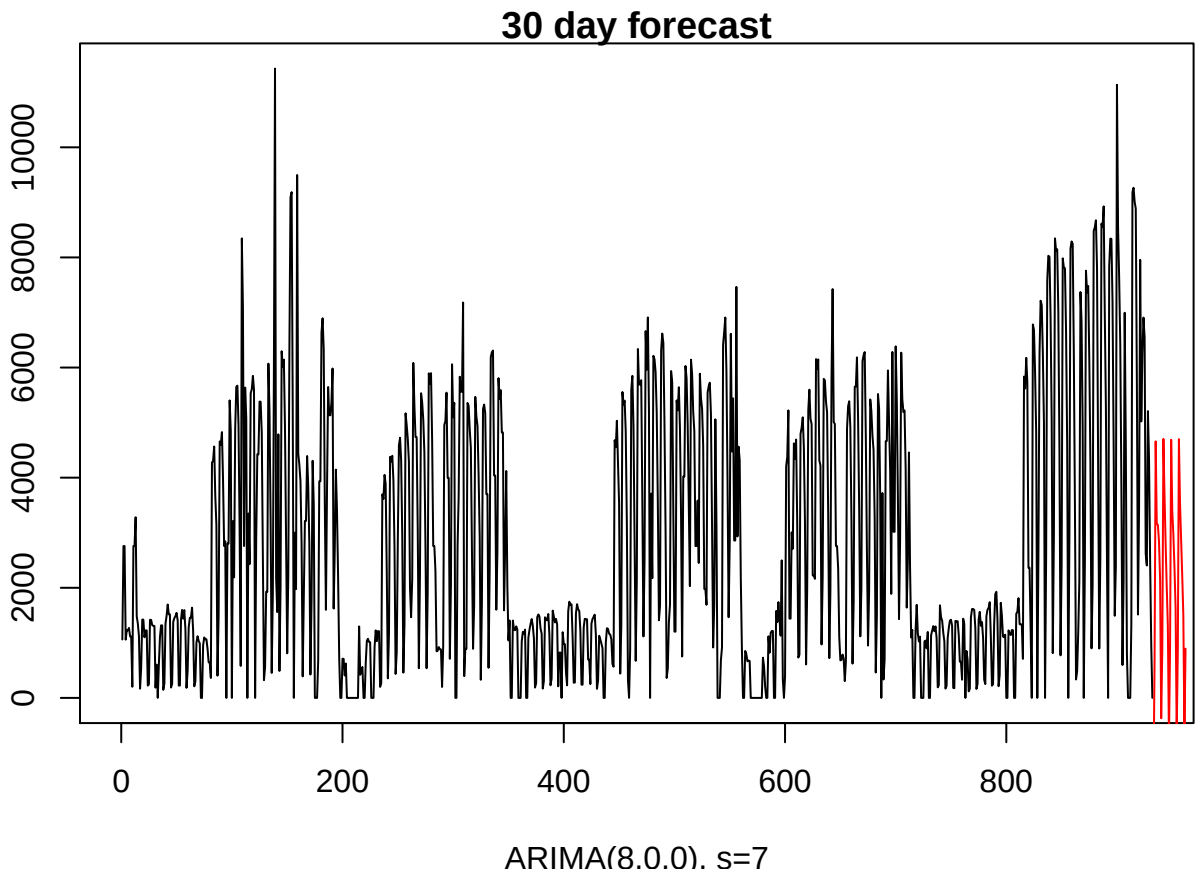
```r
#forecasting 30 days the ARIMA(8,0,0) with s=7
x.ar.fore30 = fore.aruma.wge(x, phi= x.ar$phi, s=7, n.ahead = 30, limits = F, lastn=F)
```



```r
#plot of the  forecast - 30 days
plot(x.ar.fore30$f, type = "l")
```




```r
plot(seq(1,932,1), x, type = "l",xlim = c(0,932),xlab ="ARIMA(8,0,0), s=7", ylab = "Visitors", main = "
lines(seq(933,962,1), x.ar.fore30$f, type = "l", col = "red")
```




```
#ASE of ARIMA(8,0,0) with s=7 forecast of 30
x.ar.ase30 = mean((x.ar.fore30$f-x[(932-149):932])^2)

#white noise test
ljung.wge(x.ar.fore$res, p=8)
```

```
## Obs -0.01013881 0.00280828 0.0324528 -0.005347089 0.03430444 0.01399828 -0.1476897 0.02891451 0.0326
```

```
## $test
## [1] "Ljung-Box test"
##
## $K
## [1] 24
##
## $chi.square
## [1] 111.149
##
## $df
## [1] 16
##
## $pval
## [1] 2.220446e-16
```

```
ljung.wge(x.ar.fore$res, K=48, p=8)
```

```
## Obs -0.01013881 0.00280828 0.0324528 -0.005347089 0.03430444 0.01399828 -0.1476897 0.02891451 0.0326
```

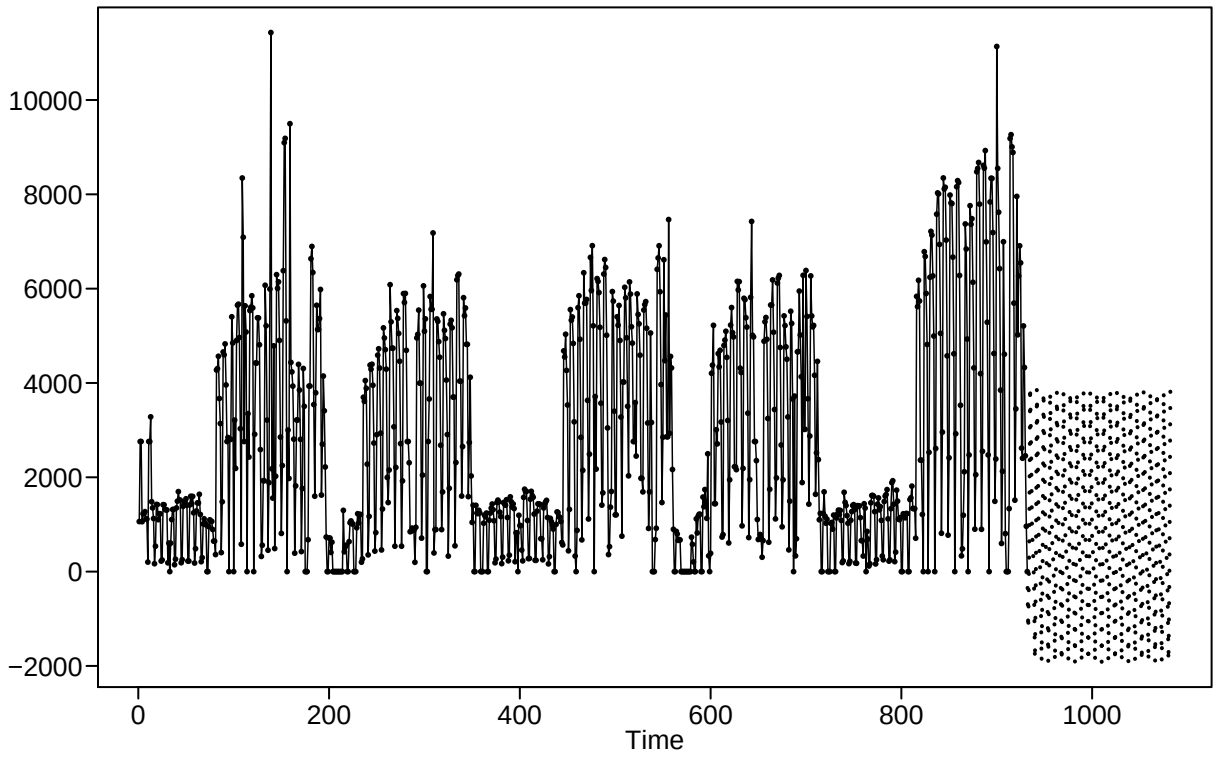
```
## $test
## [1] "Ljung-Box test"
##
## $K
## [1] 48
##
## $chi.square
## [1] 151.4228
##
## $df
## [1] 40
##
## $pval
## [1] 7.21645e-15
```

#EDA Project: Step 4 - Forecasting the ARIMA(5,0,2) with s = 7 on the original dataset

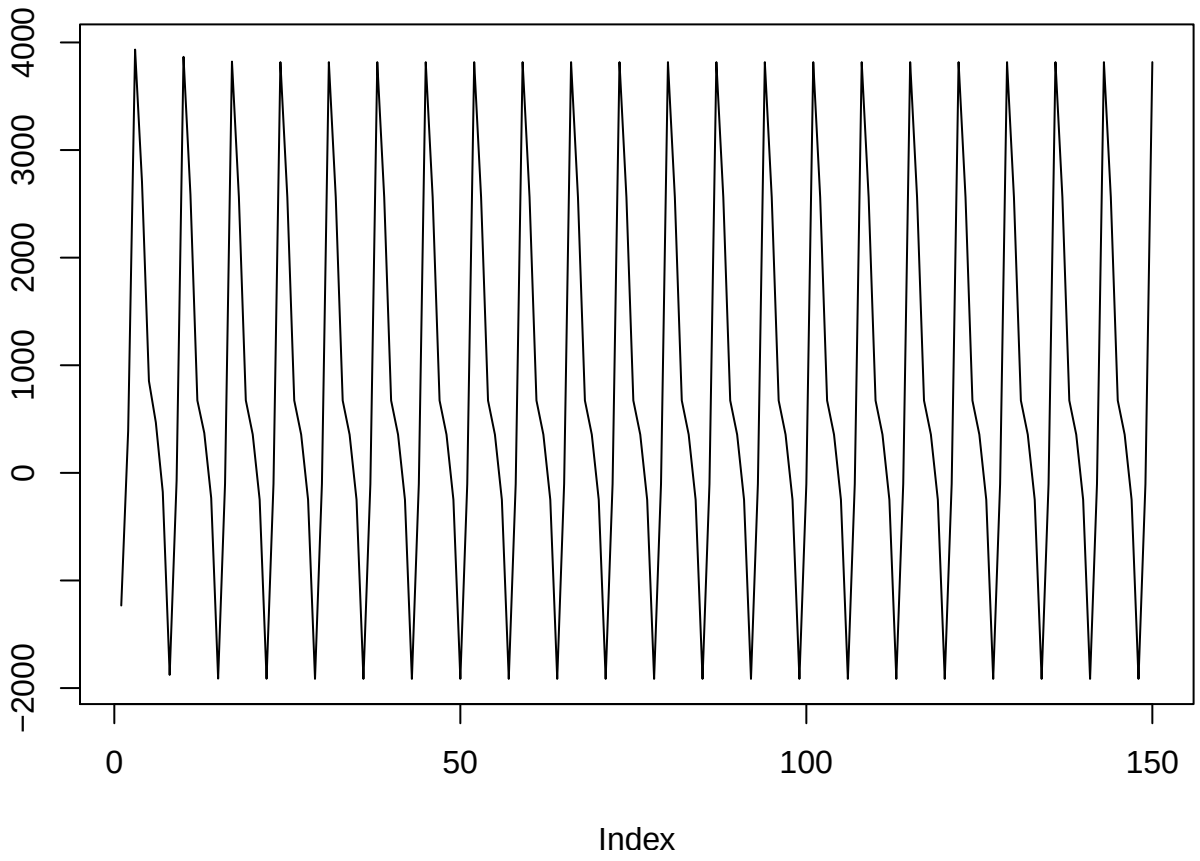
```
#estimating the coefficients ARMA(5,2)
x.arma = est.arma.wge(x.s7, p=5, q=2)
```

```
##
## Coefficients of Original polynomial:
## 0.0822 -0.6396 0.4624 -0.0656 0.2450
##
## Factor                 Roots                Abs Recip    System Freq
## 1+0.7015B+0.5966B^2   -0.5879+-1.1535i      0.7724       0.3250
## 1-0.0475B+0.5577B^2    0.0426+-1.3383i      0.7468       0.2449
## 1-0.7362B              1.3583               0.7362       0.0000
##
##
```

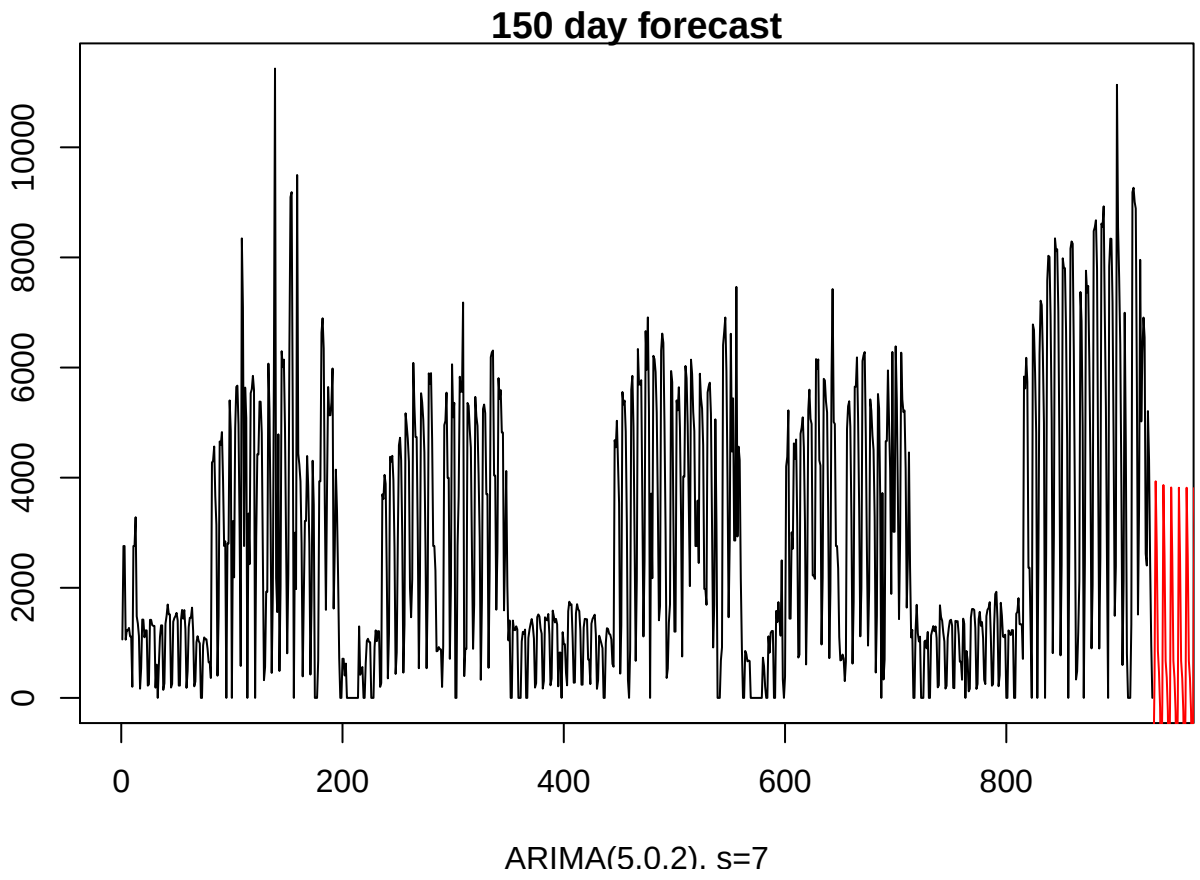
```
#x.arma$phi
#x.arma$theta
#x.arma$avar

#forecasting the ARIMA(5,0,2)
x.arma.fore = fore.aruma.wge(x, phi= x.arma$phi, theta = x.arma$theta, s=7,  n.ahead = 150, limits = F,
```




```
#plot of the  forecast - 150 days
plot(x.arma.fore$f, type = "l")
```




```
plot(seq(1,932,1), x, type = "l",xlim = c(0,932),xlab ="ARIMA(5,0,2), s=7", ylab = "Visitors", main = "
lines(seq(933,1082,1), x.arma.fore$f, type = "l", col = "red")
```




```
#ASE for 150 day forecast
x.arma.ase = mean((x.arma.fore$f-x[(932-149):932])^2)


#ljung box test
ljung.wge(x.arma.fore$res, p=5, q=2)
```

```
## Obs 0.01901792 0.01649596 0.06211594 0.06860331 -0.1630531 -0.06524551 -0.2770343 0.01006 -0.0957178
```

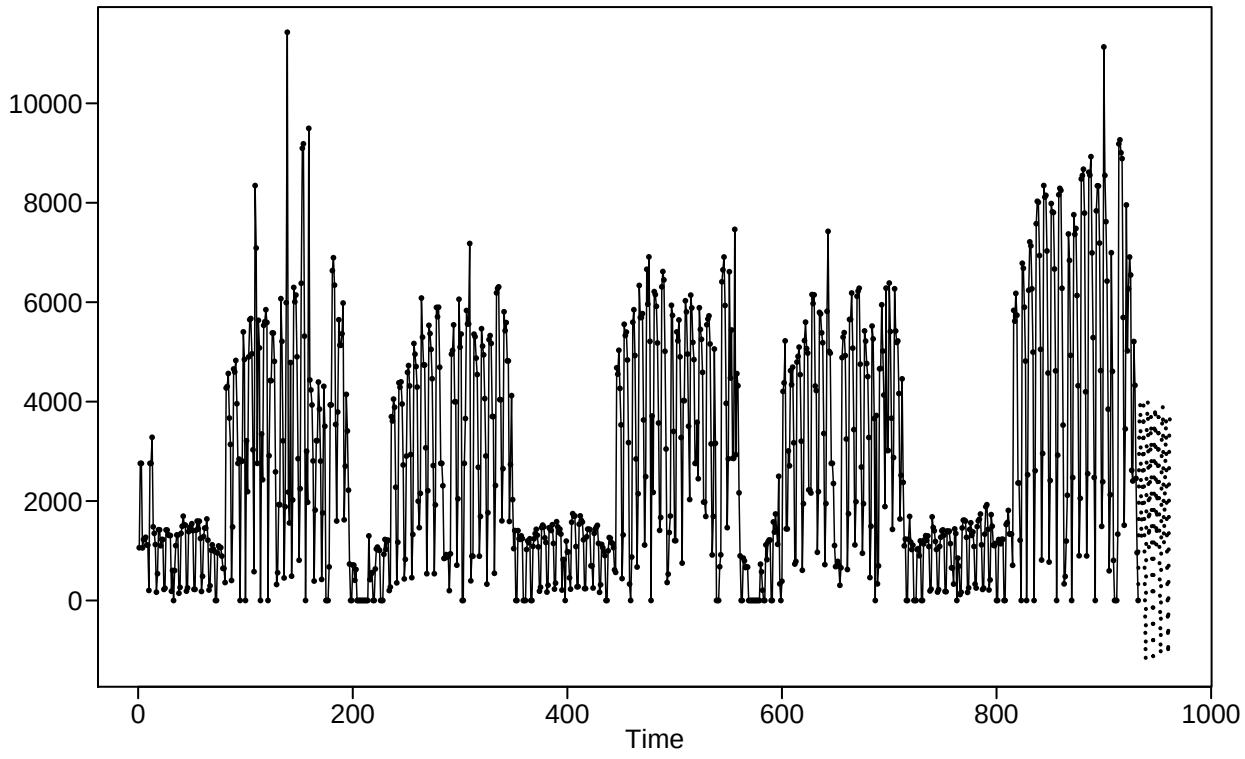
```
## $test
## [1] "Ljung-Box test"
##
## $K
## [1] 24
##
## $chi.square
## [1] 157.208
##
## $df
## [1] 17
##
## $pval
## [1] 0
```

```r
ljung.wge(x.arma.fore$res, K=48, p=5, q=2)
```

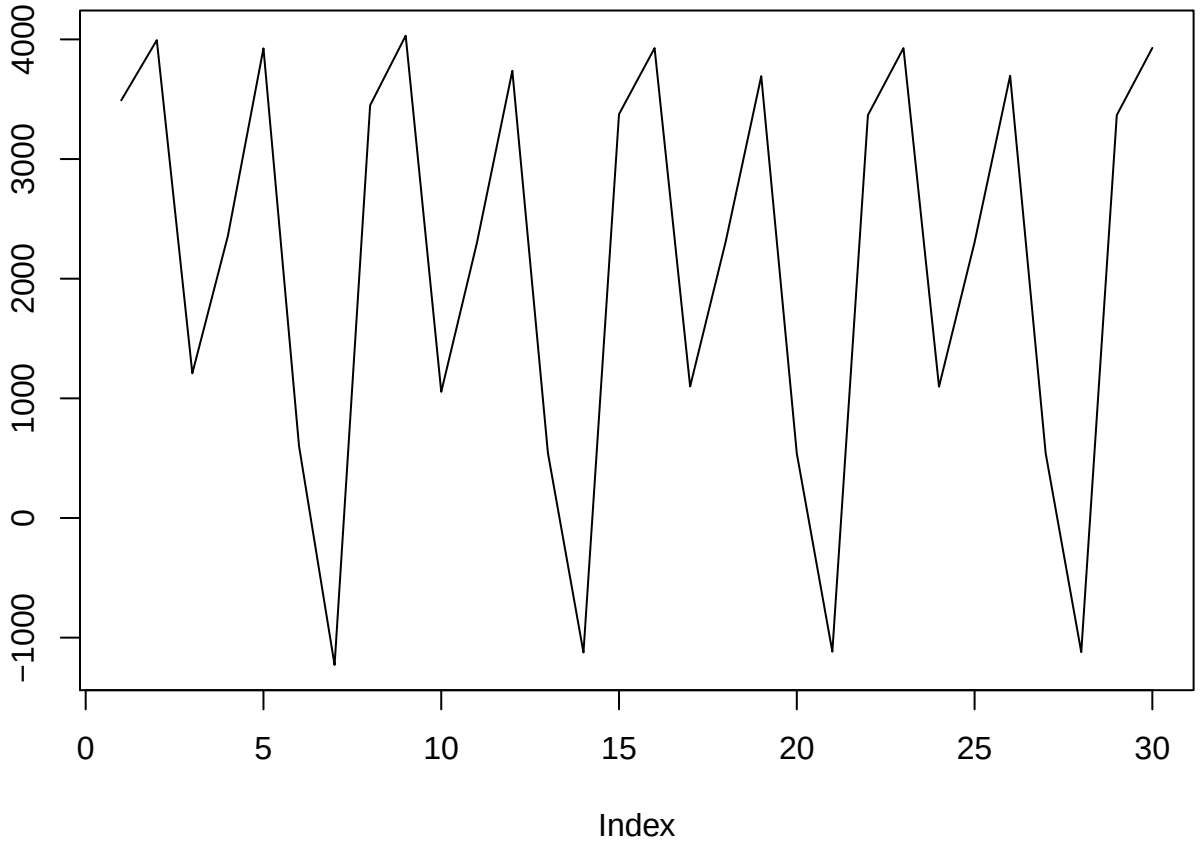
```
## Obs 0.01901792 0.01649596 0.06211594 0.06860331 -0.1630531 -0.06524551 -0.2770343 0.01006 -0.0957178
```

```
## $test
## [1] "Ljung-Box test"
##
## $K
## [1] 48
##
## $chi.square
## [1] 184.0963
##
## $df
## [1] 41
##
## $pval
## [1] 0
```

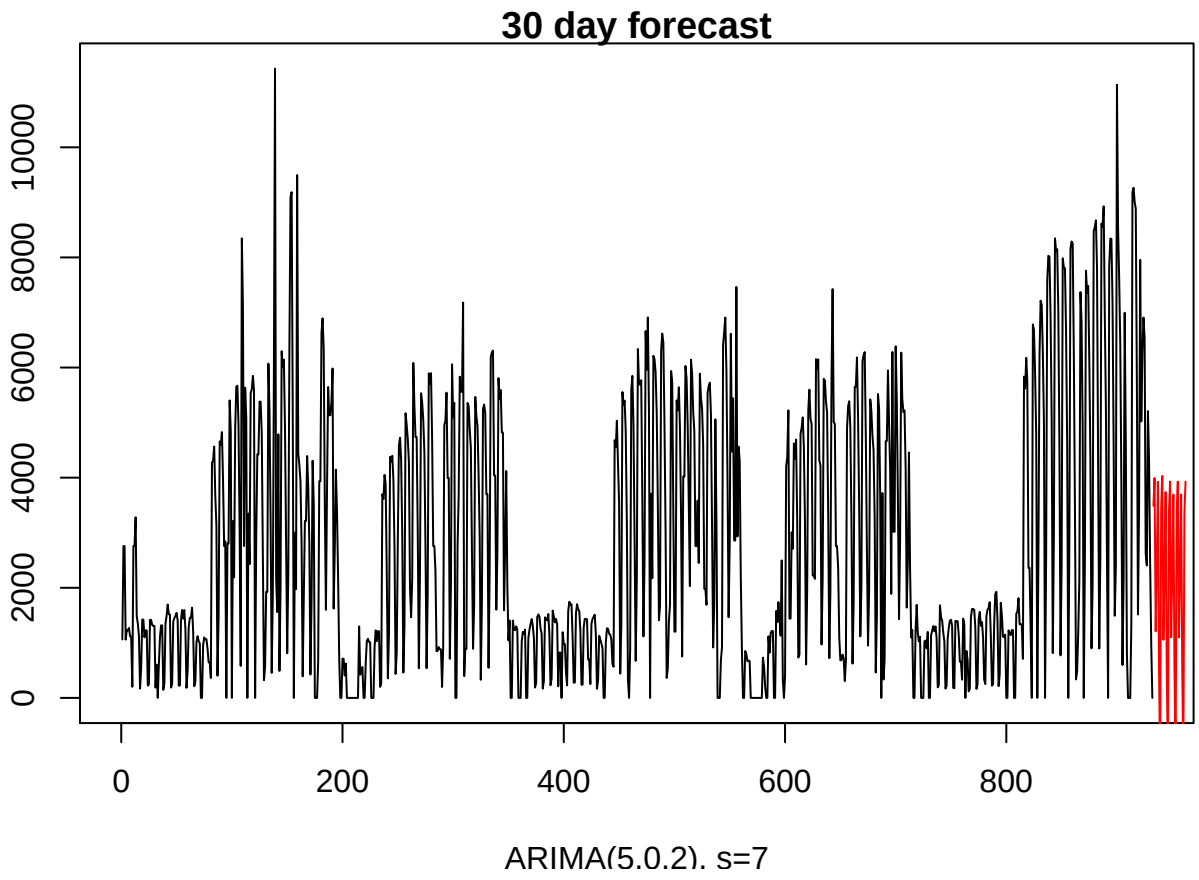
```r
#forecasting 30 days the ARIMA(5,0,2) with s=7
x.arma.fore30 = fore.aruma.wge(x, phi= x.arma$phi, s=7, n.ahead = 30, limits = F, lastn=F)
```



```r
#plot of the  forecast - 30 days
plot(x.arma.fore30$f, type = "l")
```




```r
plot(seq(1,932,1), x, type = "l",xlim = c(0,932),xlab ="ARIMA(5,0,2), s=7", ylab = "Visitors", main = "
lines(seq(933,962,1), x.arma.fore30$f, type = "l", col = "red")
```




```
#ASE of ARIMA(5,0,2), s=7 forecast of 30
x.arma.ase30 = mean((x.arma.fore30$f-x[(932-149):932])^2)


#white noise test
ljung.wge(x.ar.fore$res, p=8)
```

```
## Obs -0.01013881 0.00280828 0.0324528 -0.005347089 0.03430444 0.01399828 -0.1476897 0.02891451 0.0326
```

```
## $test
## [1] "Ljung-Box test"
##
## $K
## [1] 24
##
## $chi.square
## [1] 111.149
##
## $df
## [1] 16
##
## $pval
## [1] 2.220446e-16
```

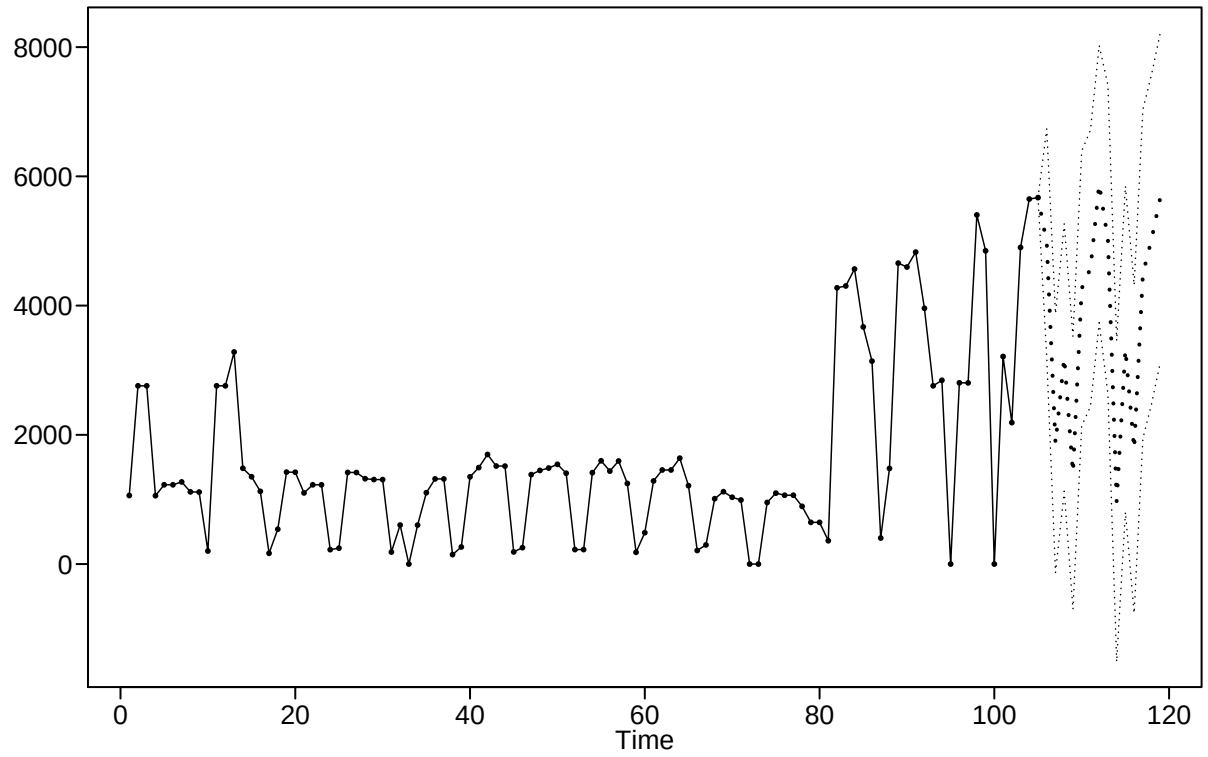
```
ljung.wge(x.ar.fore$res, K=48, p=8)
```

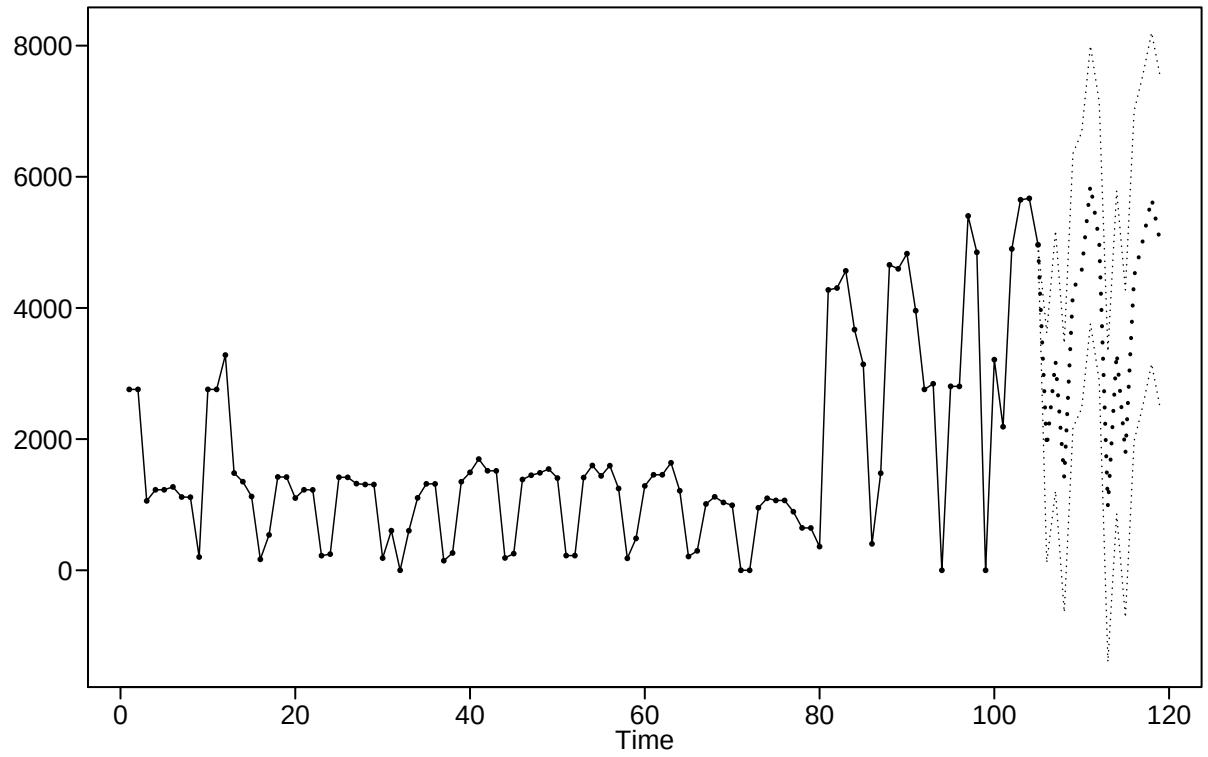
```
## Obs -0.01013881 0.00280828 0.0324528 -0.005347089 0.03430444 0.01399828 -0.1476897 0.02891451 0.0326
```

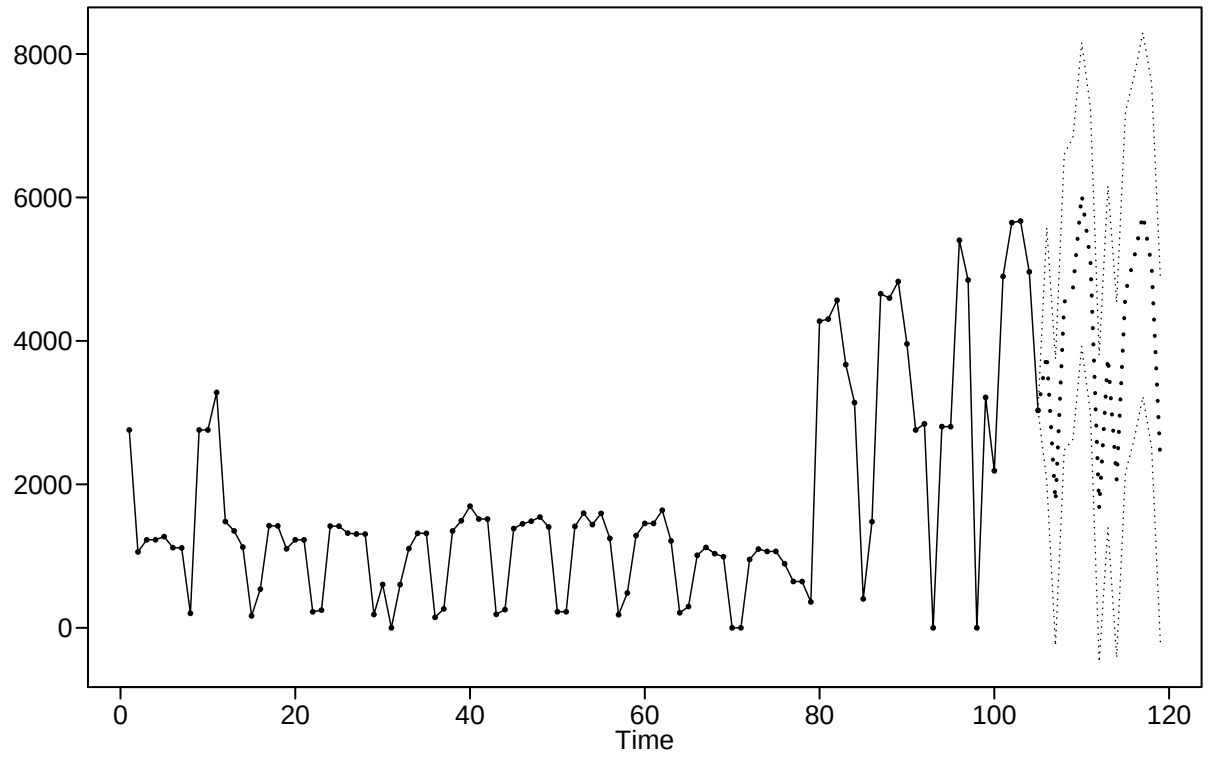
```
## $test
## [1] "Ljung-Box test"
##
## $K
## [1] 48
##
## $chi.square
## [1] 151.4228
##
## $df
## [1] 40
##
## $pval
## [1] 7.21645e-15
```

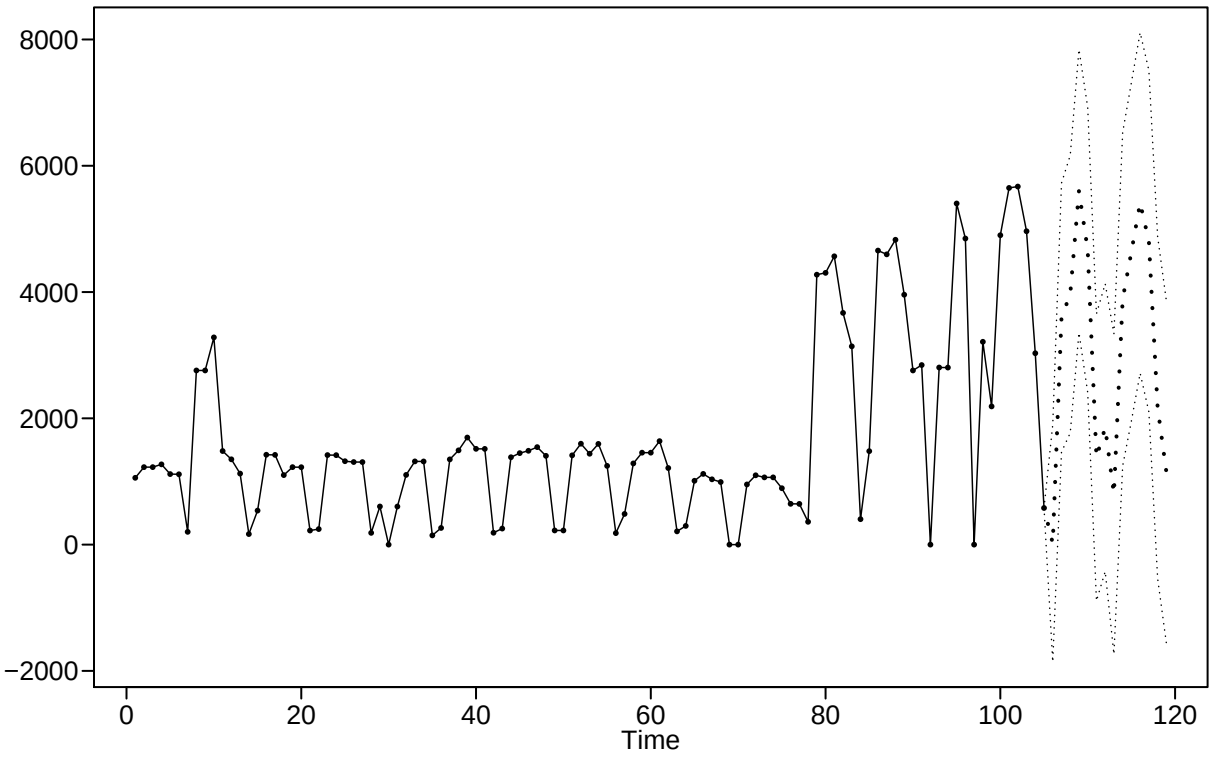
#EDA Project: Step 5 - Rolling Window ASE for ARIMA(8,0,0), s = 7

```
# This idea is to calculate many ASEs and take the average by using a smaller training set and forecast

#ARIMA(8,0,0), s=7
phis = x.ar$phi
s = 7
d = 0

trainingSize = 105
horizon = 14
ASEHolder = numeric()

for( i in 1:(159-(trainingSize + horizon) + 1))
{

  forecasts = fore.aruma.wge(x[i:(i+(trainingSize-1))],phi = phis, s = s, d = d,n.ahead = horizon)

  ASE = mean((x[(trainingSize+i):(trainingSize+ i + (horizon) - 1)] - forecasts$f)^2)

  ASEHolder[i] = ASE

}
```


8000
6000
4000
2000
0
0
20
40
60
80
100
120
Time


8000
6000
4000
2000
0
0
20
40
60
80
100
120
Time


8000
6000
4000
2000
0
0
20
40
60
80
100
120
Time


8000
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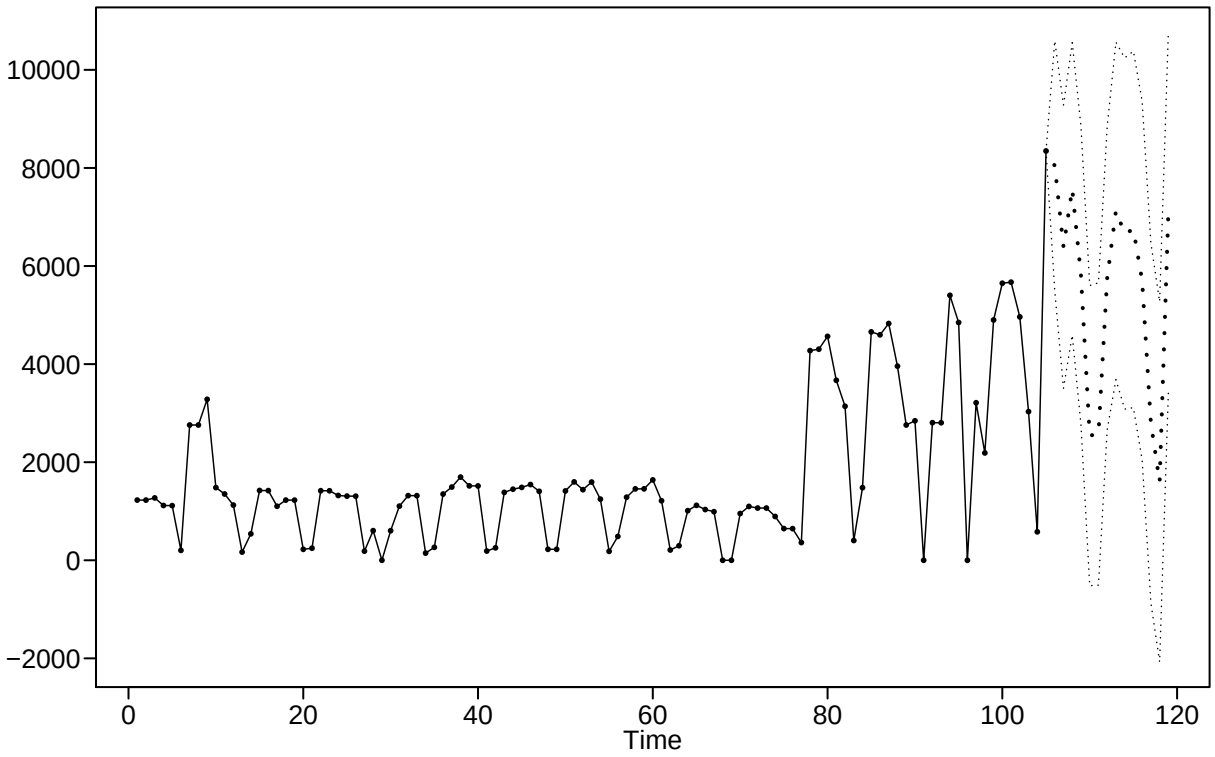
4000
2000
0
−2000
0
20
40
60
80
100
120
Time


10000
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2000
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−2000
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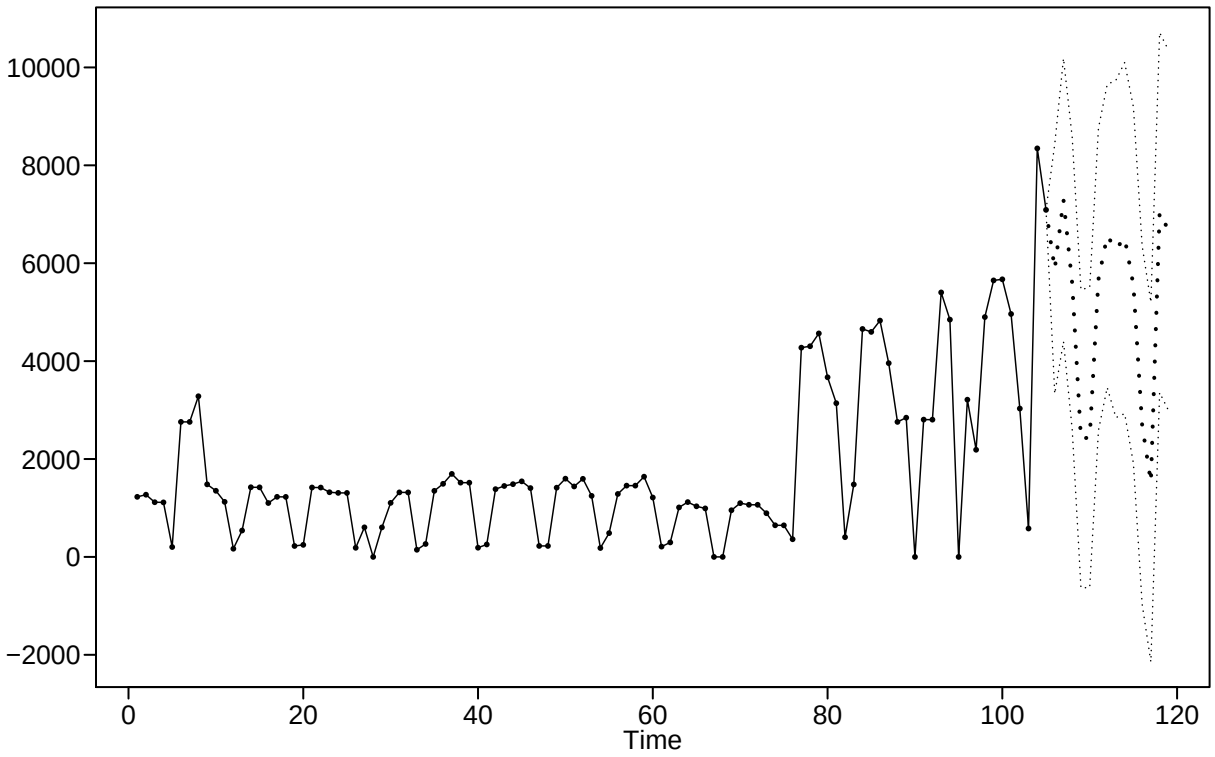
20
40
60
80
100
120
Time


10000
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2000
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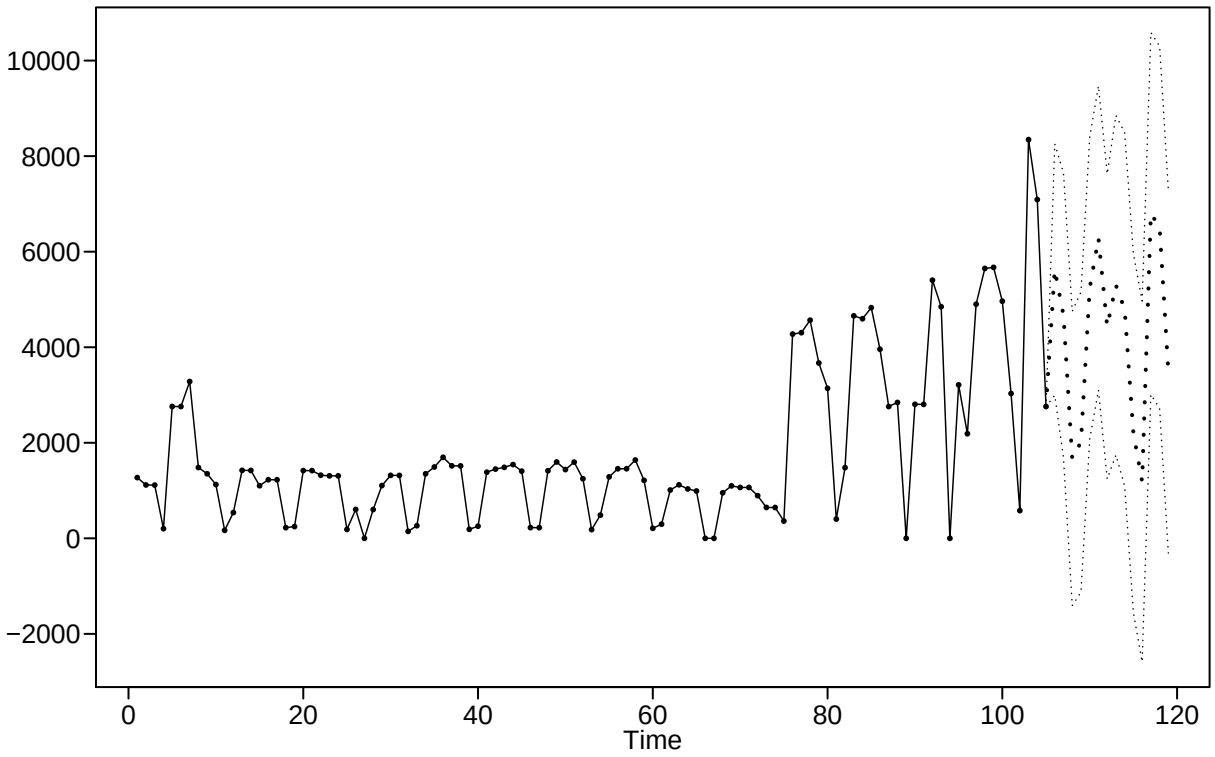
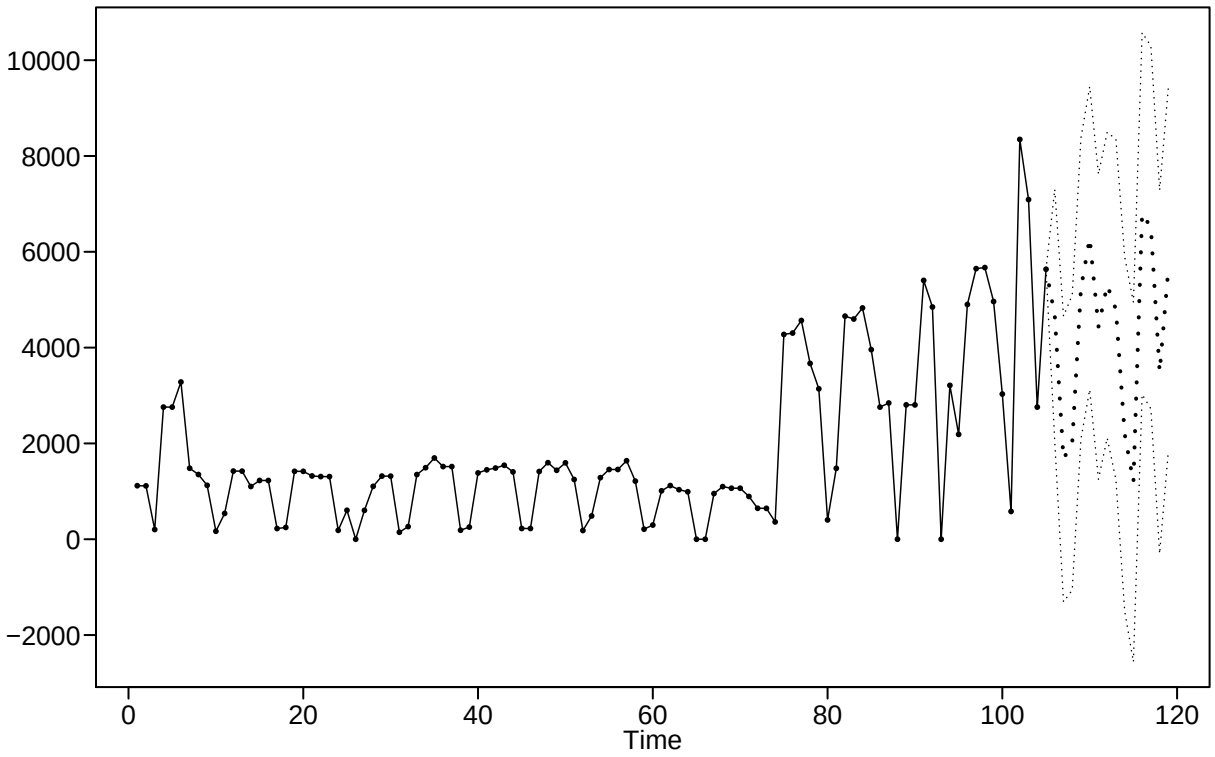
−2000
0
20
40
60
80
100
120
Time


10000
8000
6000
4000
2000
0
−2000
0
20
40
60
80
100
120
Time


10000
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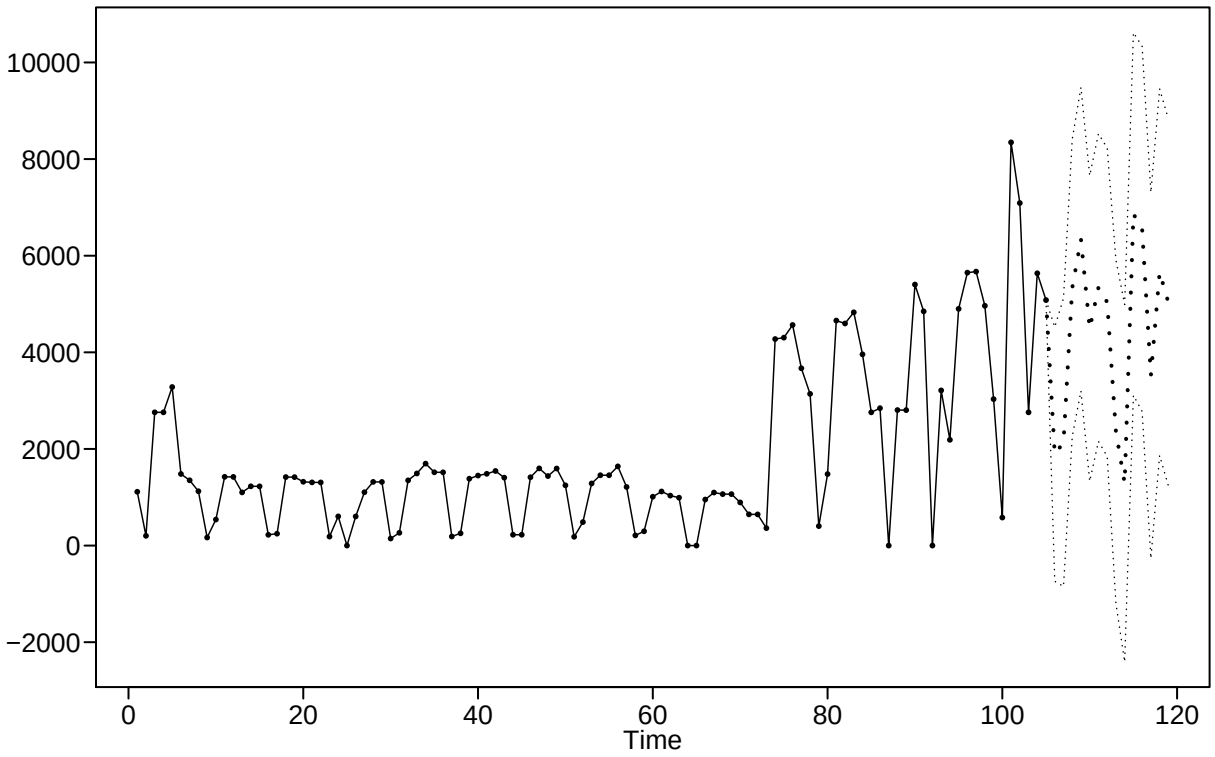
4000
2000
0
−2000
0
20
40
60
80
100
120
Time


10000
8000
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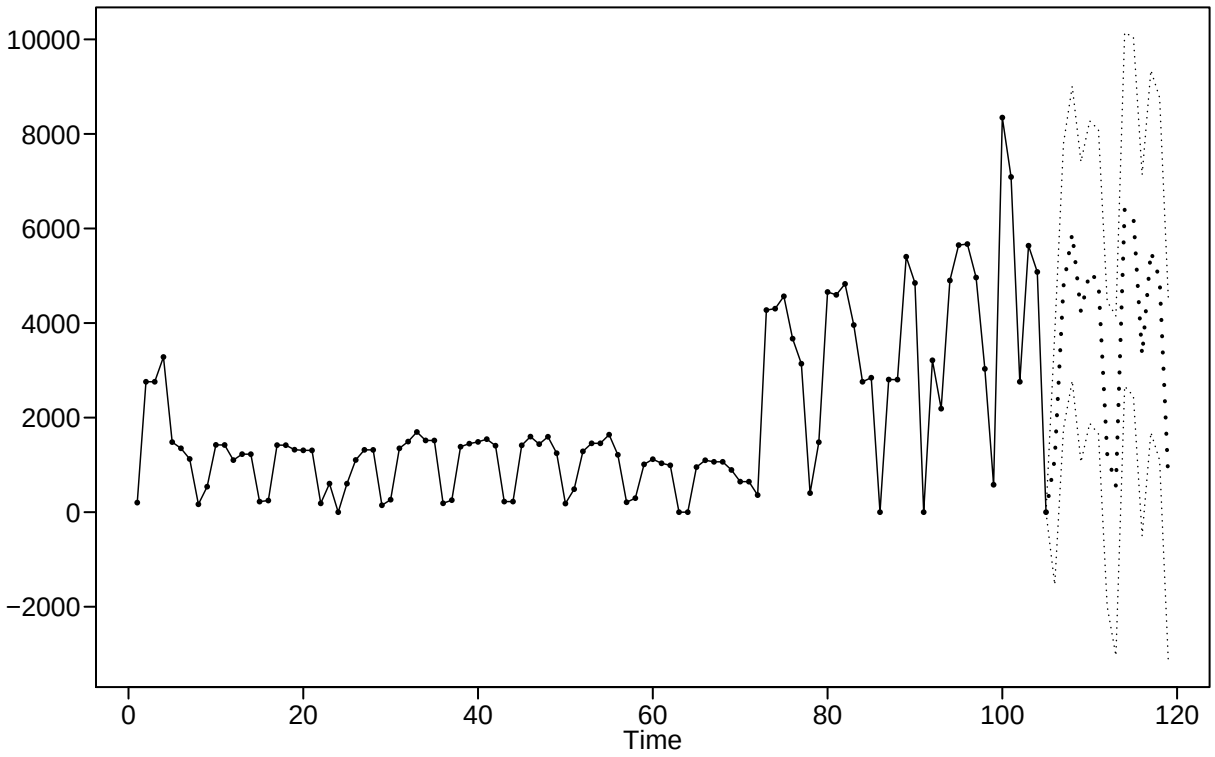
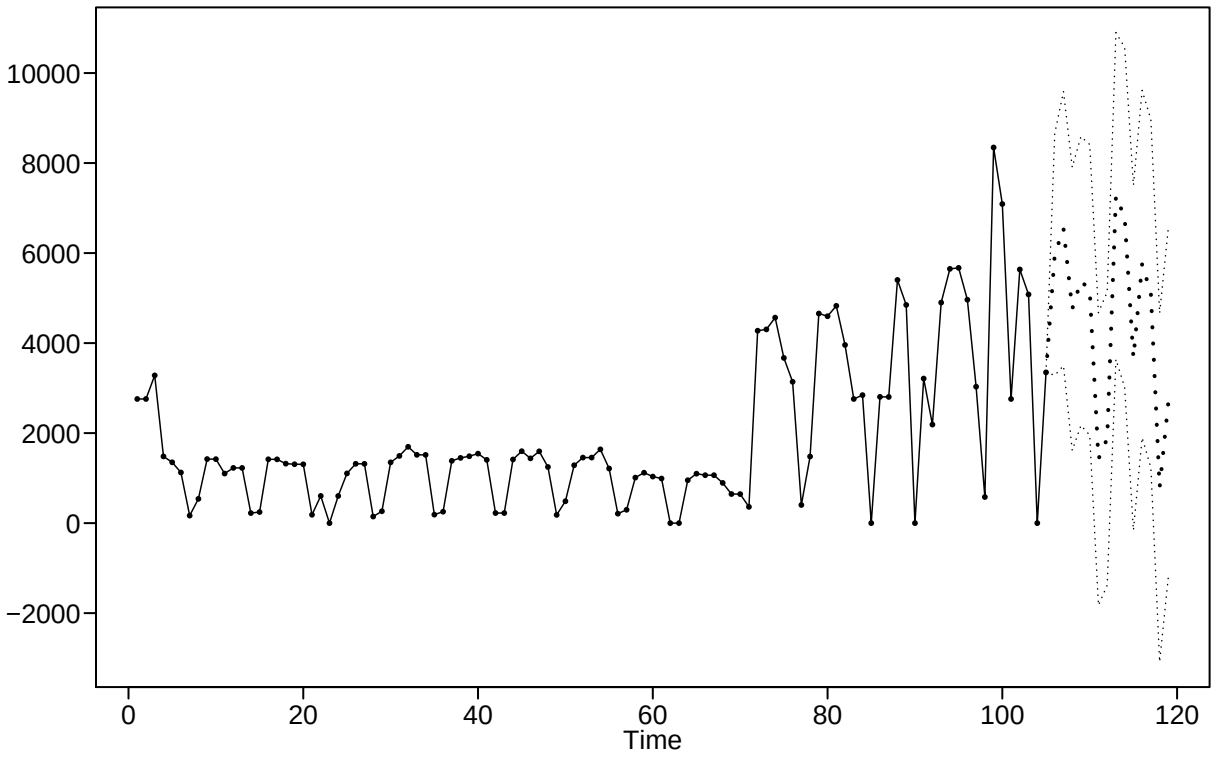
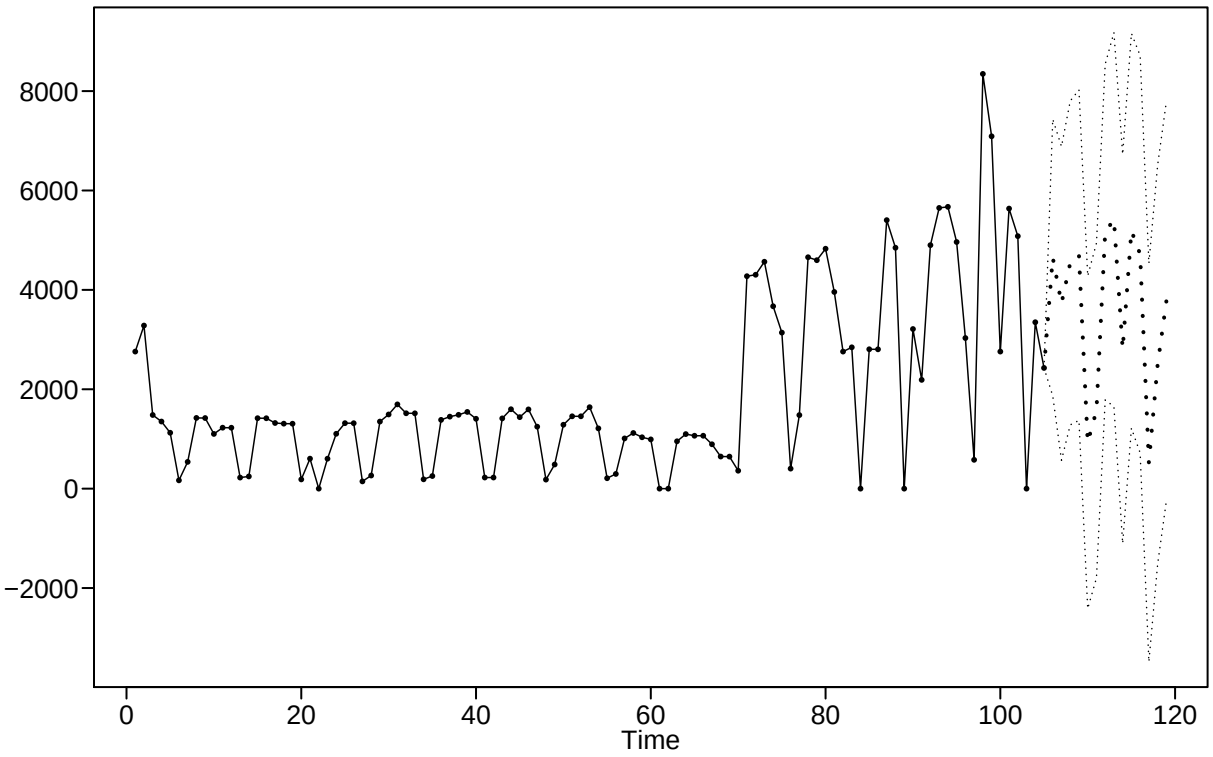
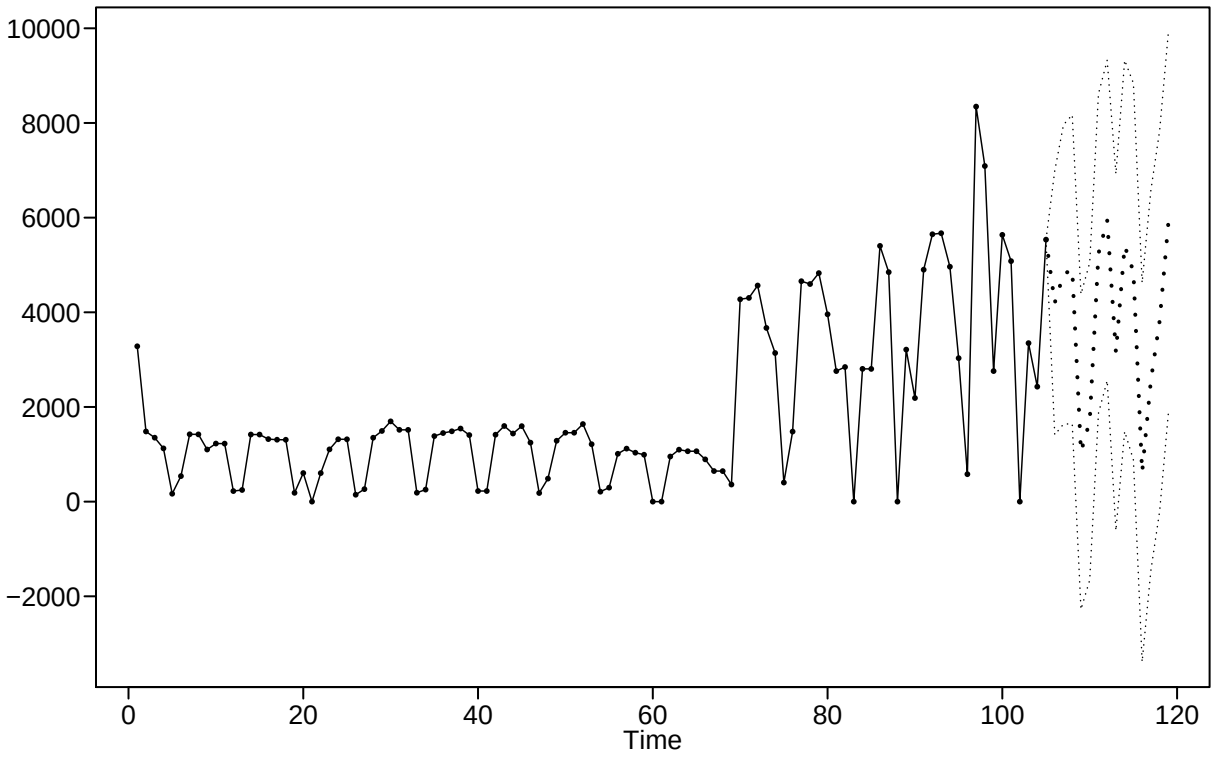
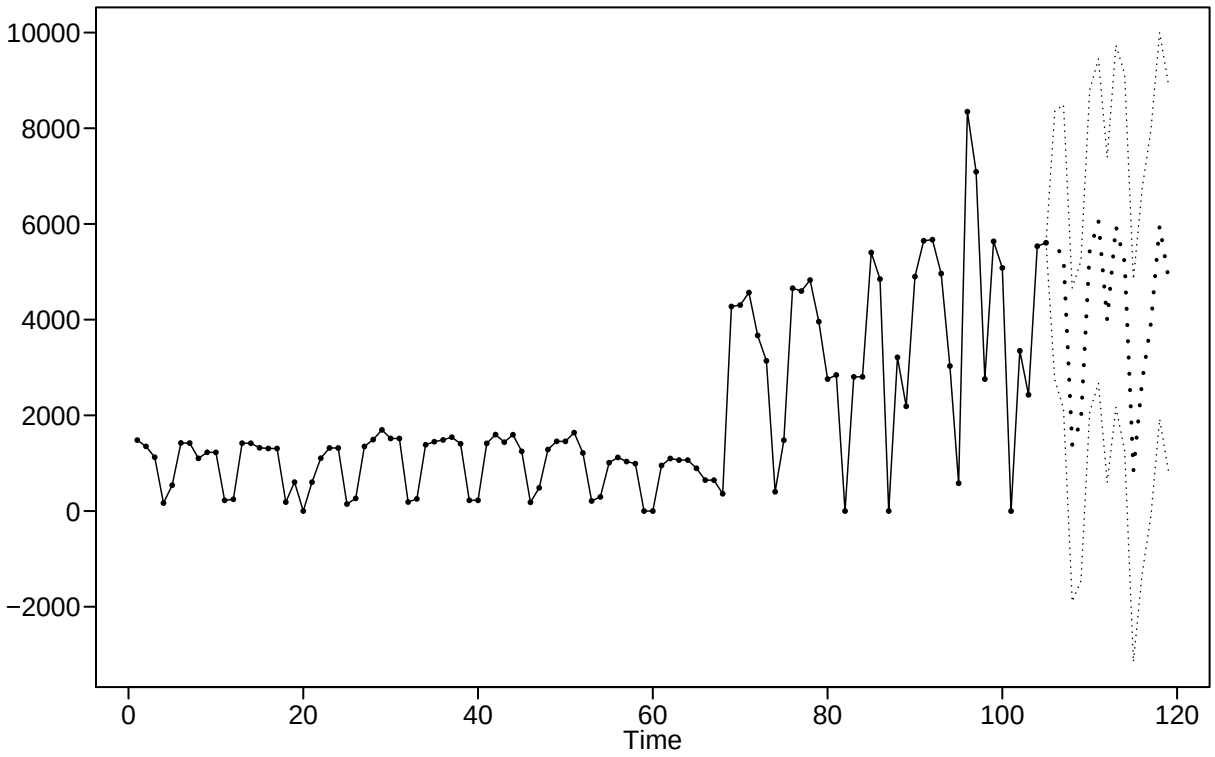
4000
2000
0
−2000
0
20
40
60
80
100
120
Time

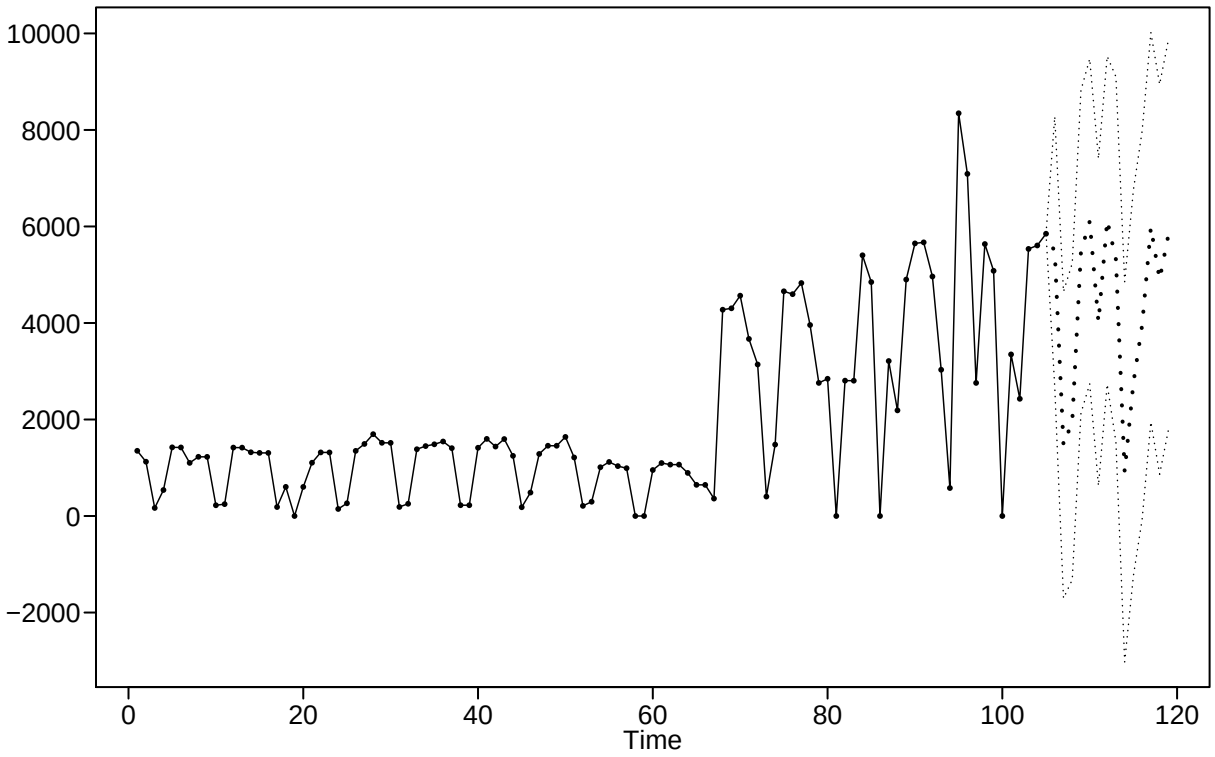

10000
8000
6000
4000
2000
0
−2000
0
20
40
60
80
100
120
Time

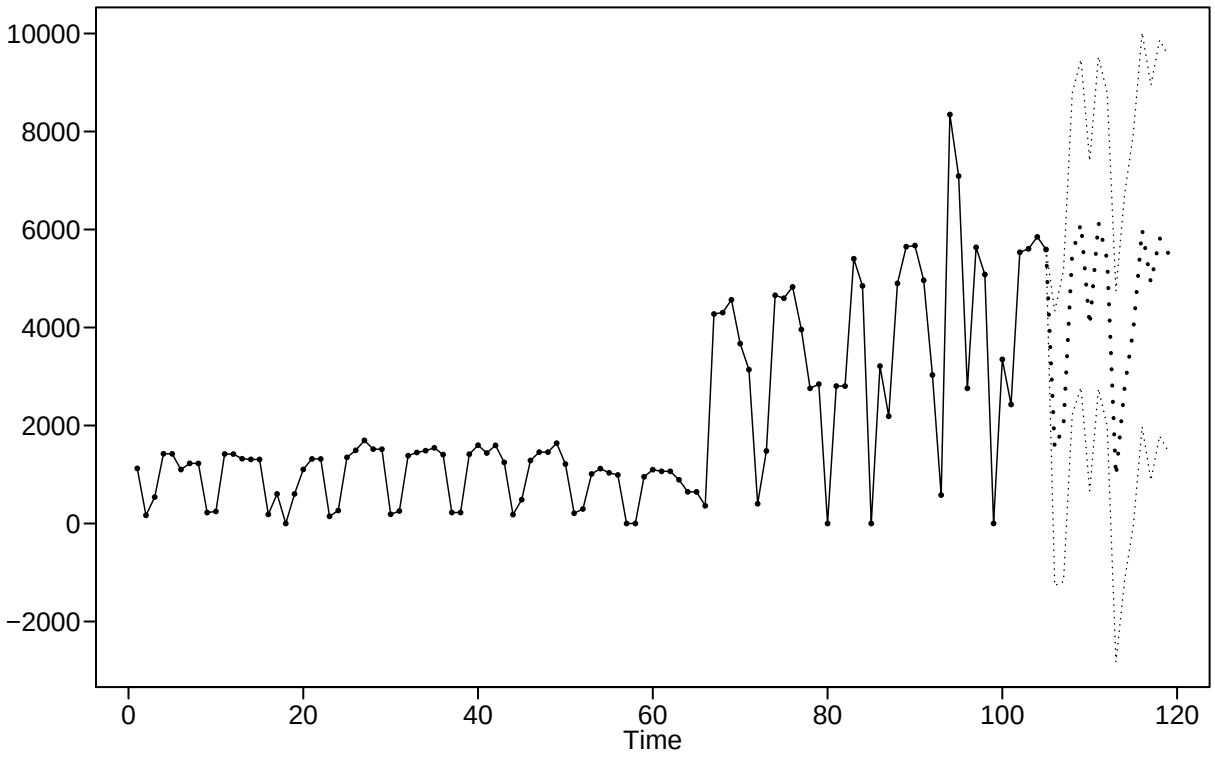

10000
8000
6000
4000
2000
0
−2000
0
20
40
60
80
100
120
Time


8000
6000
4000
2000
0
−2000
0
20
40
60
80
100
120
Time


10000
8000
6000
4000
2000
0
−2000
0
20
40
60
80
100
120
Time


10000
8000
6000
4000
2000
0
−2000
0
20
40
60
80
100
120
Time


10000
8000
6000
4000
2000
0
−2000
0
20
40
60
80
100
120
Time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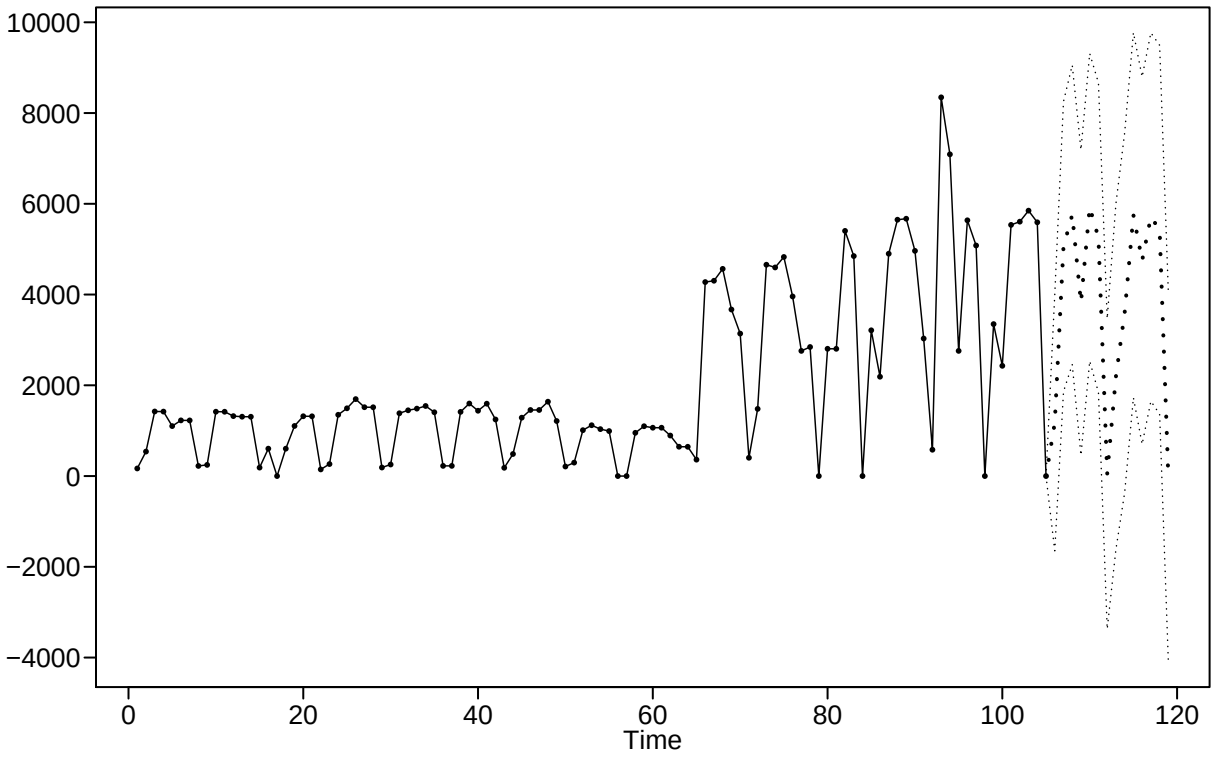
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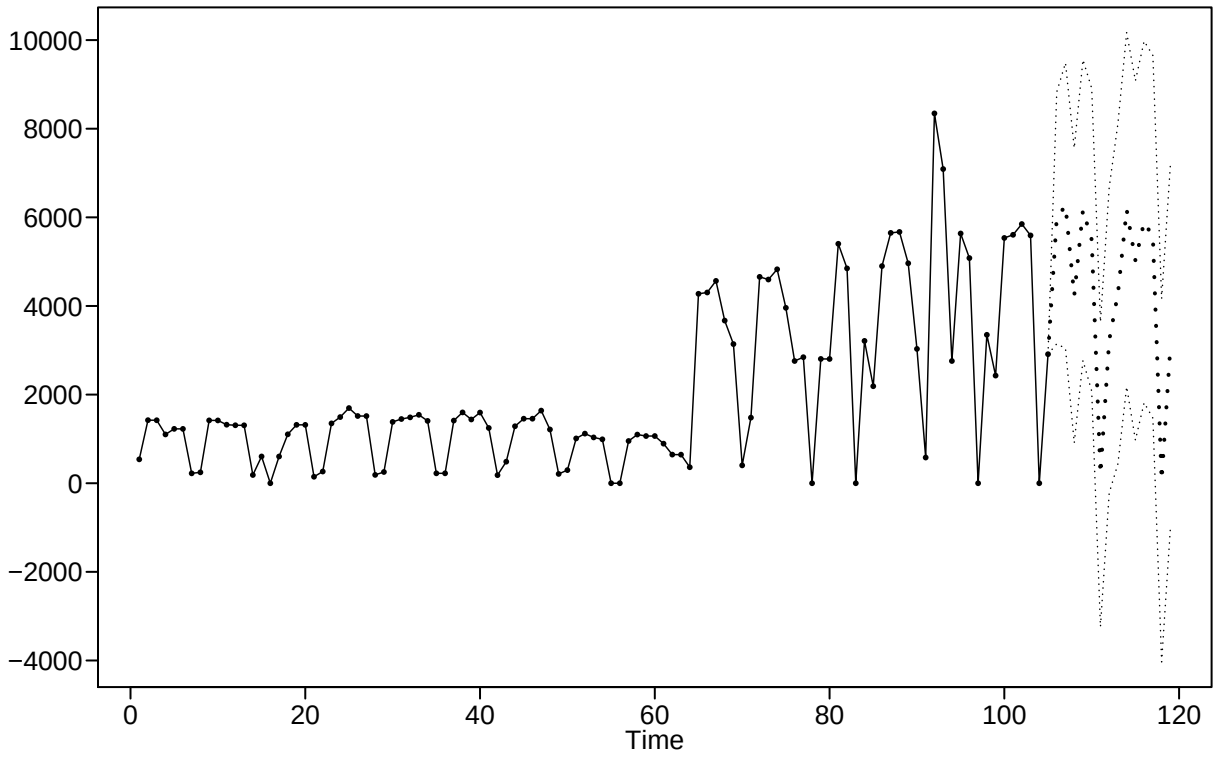
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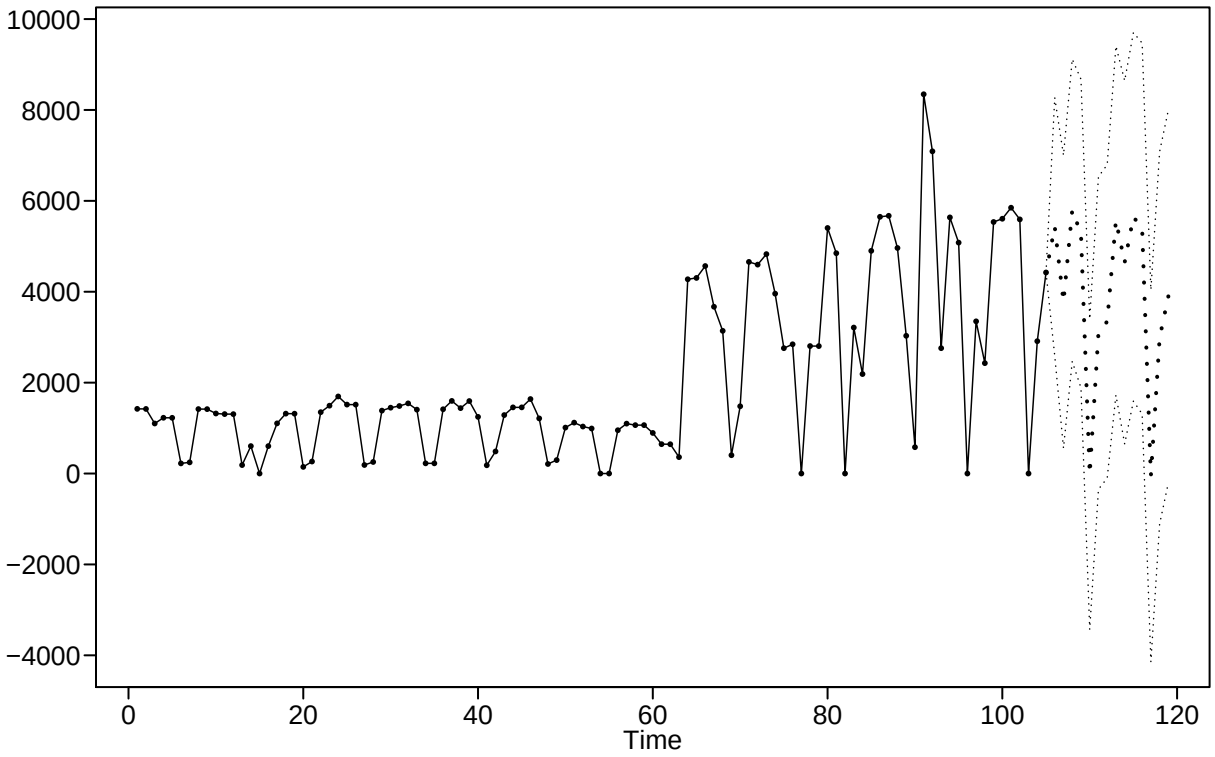
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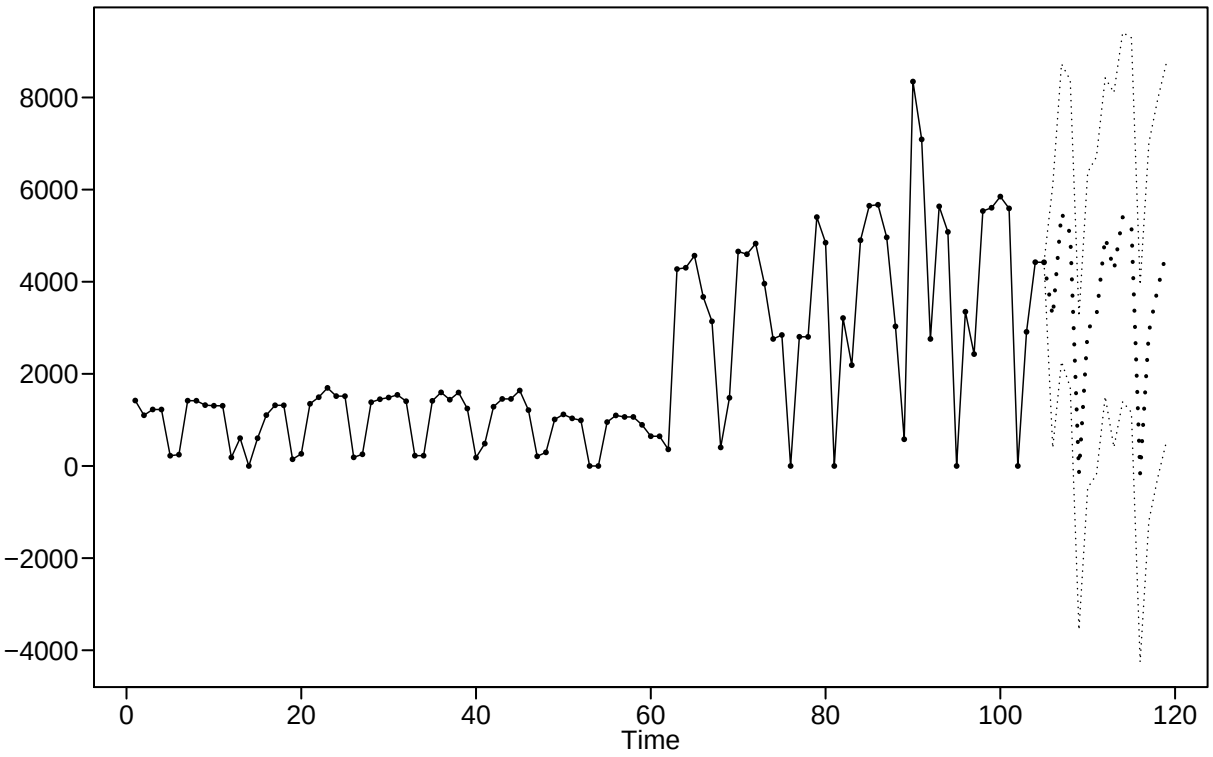
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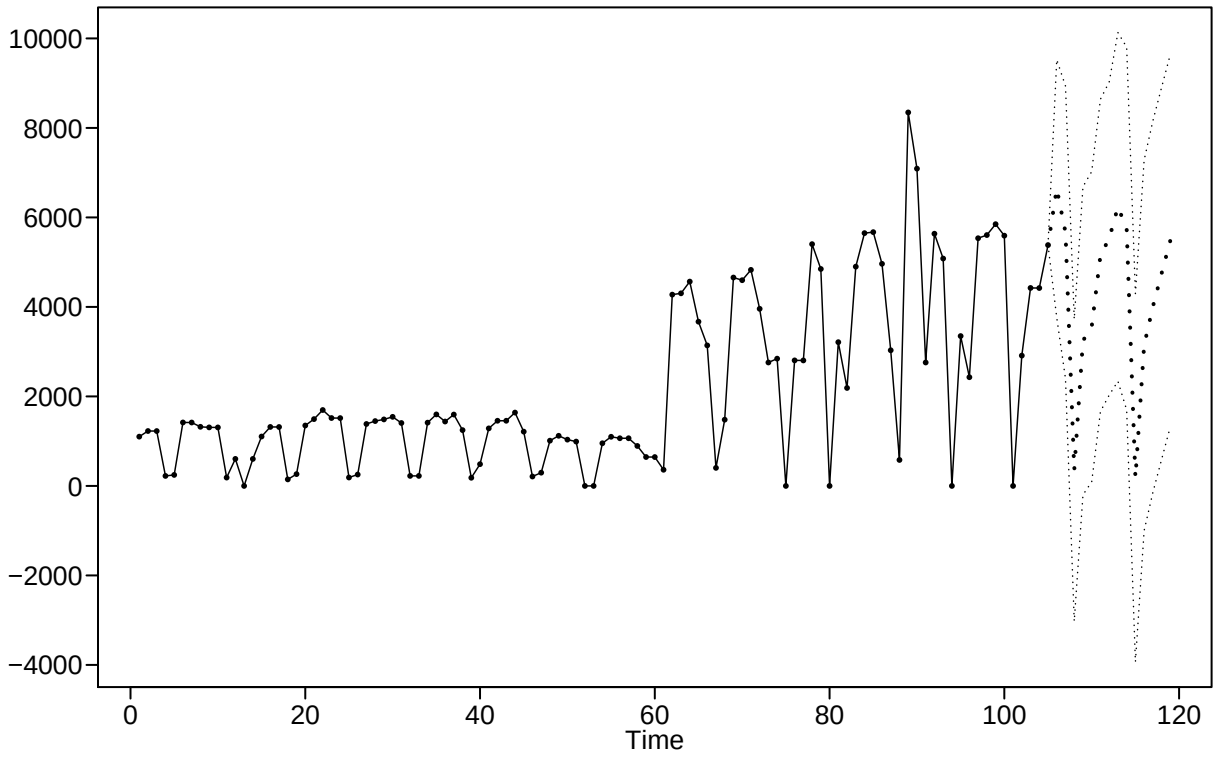
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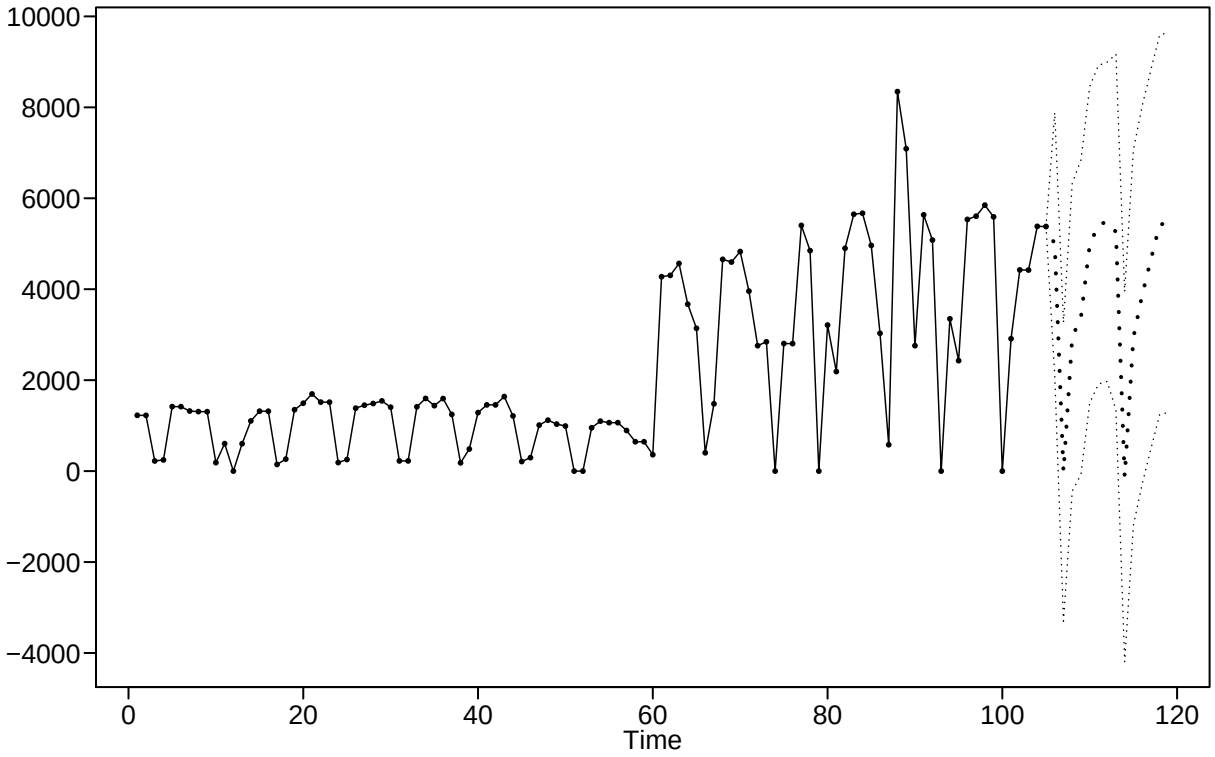
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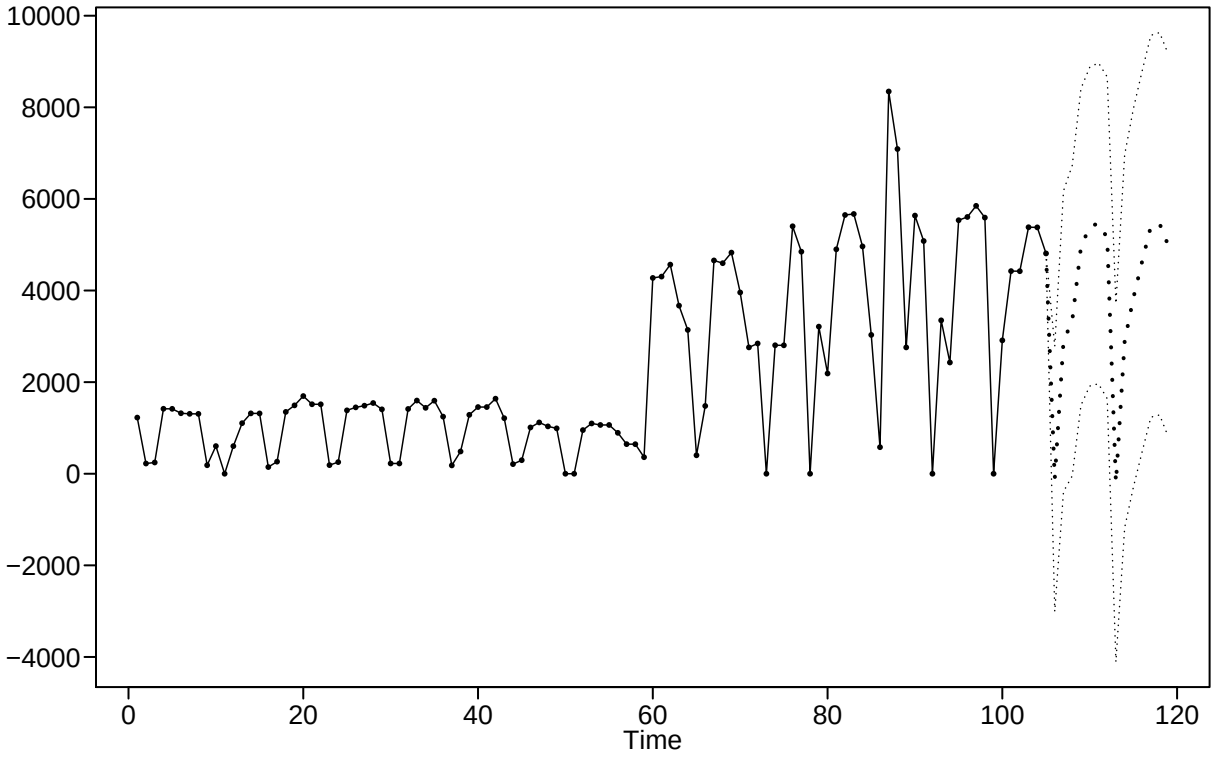
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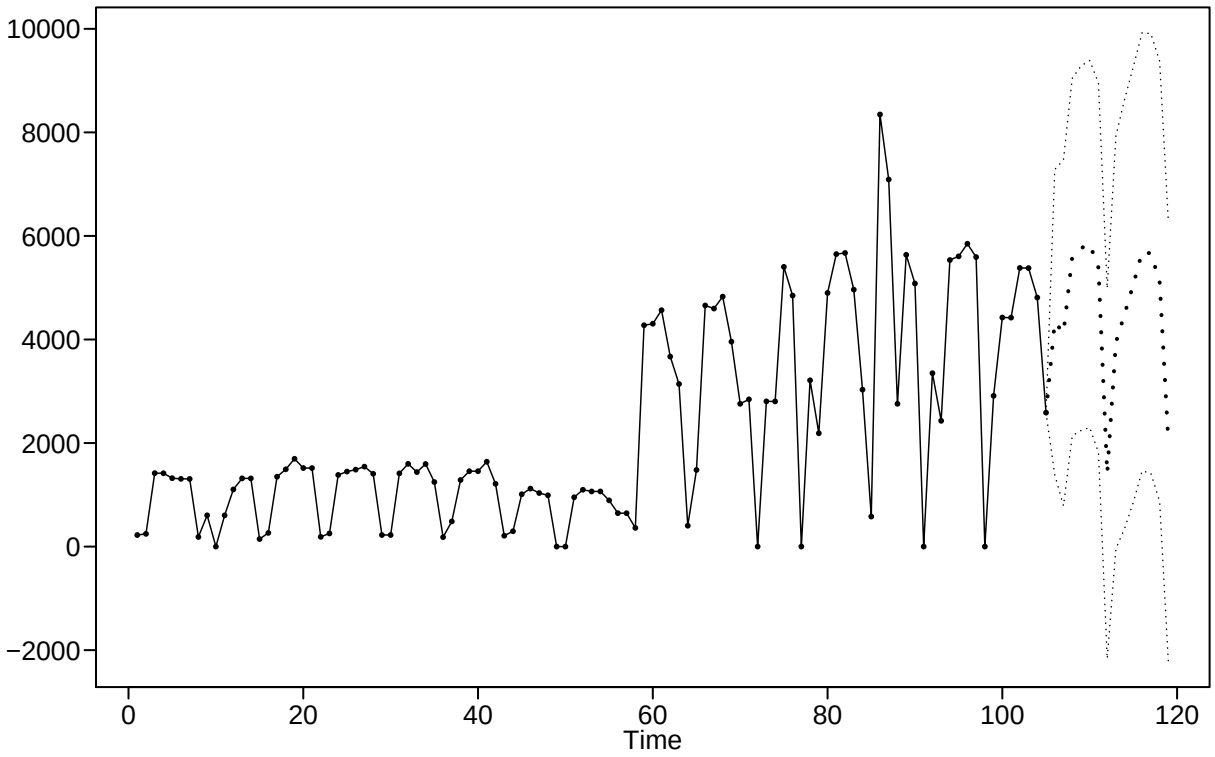
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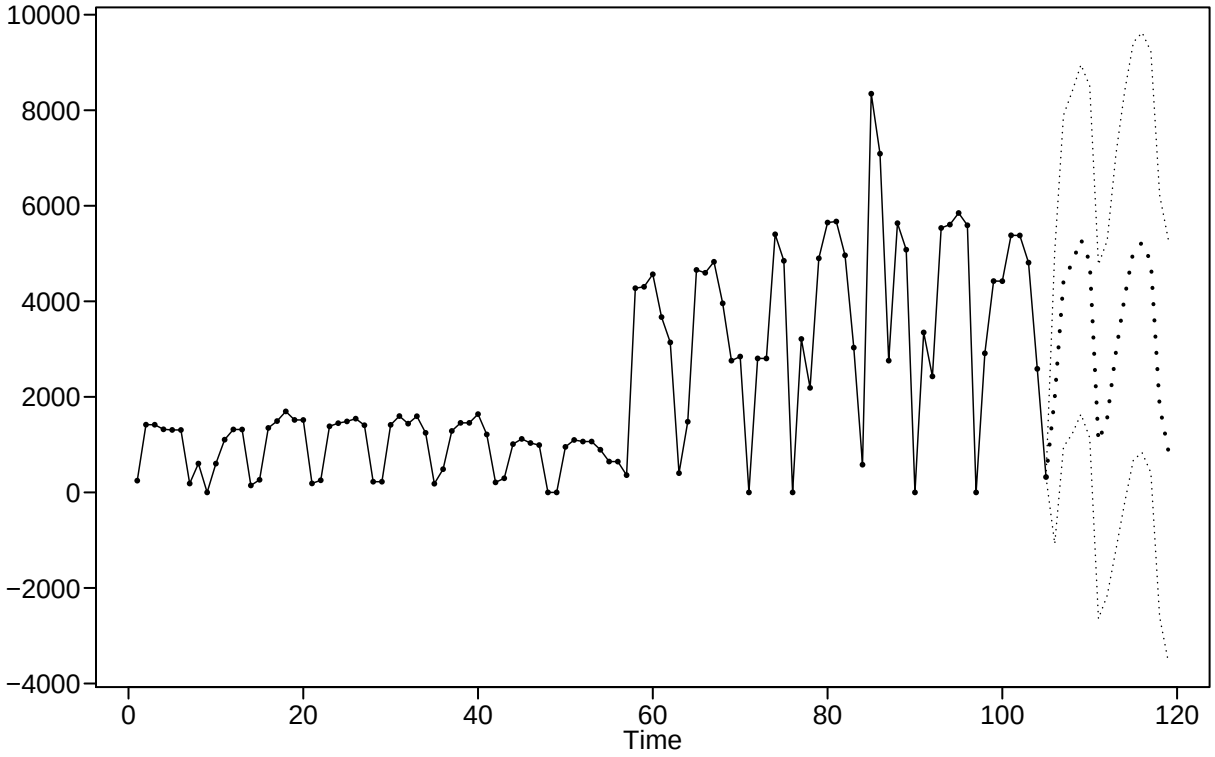
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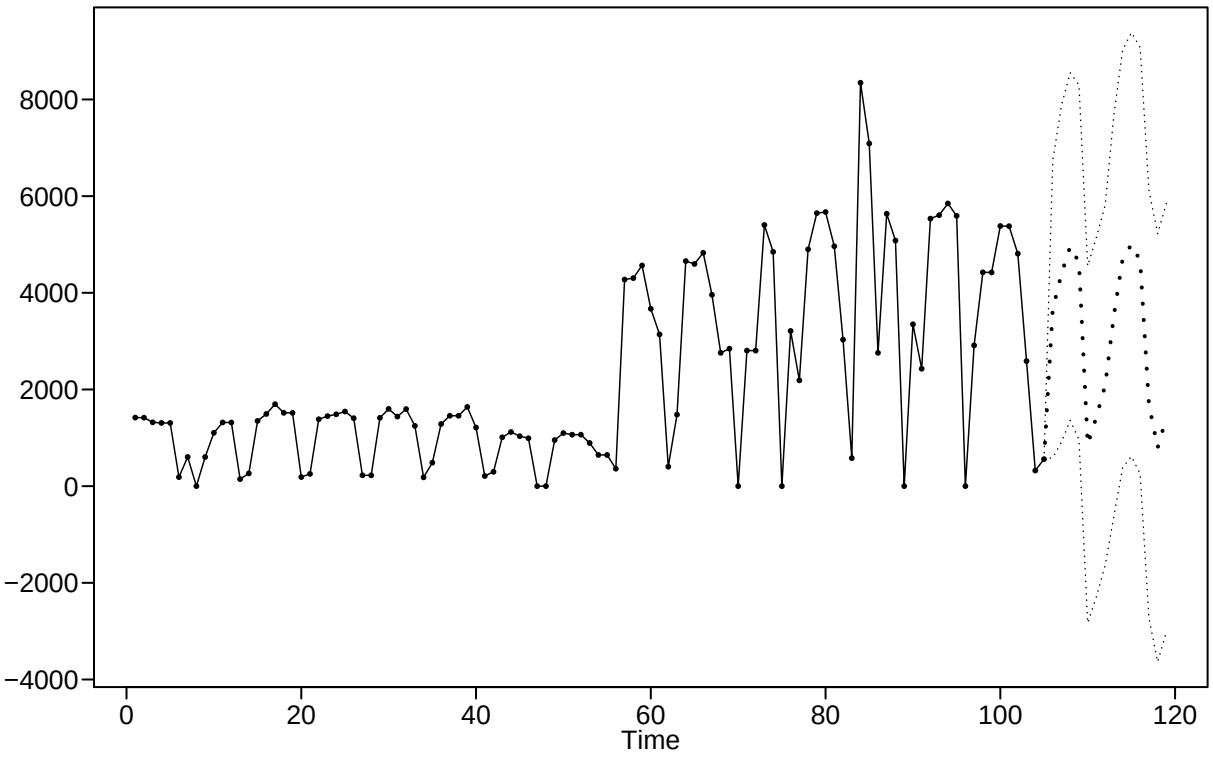
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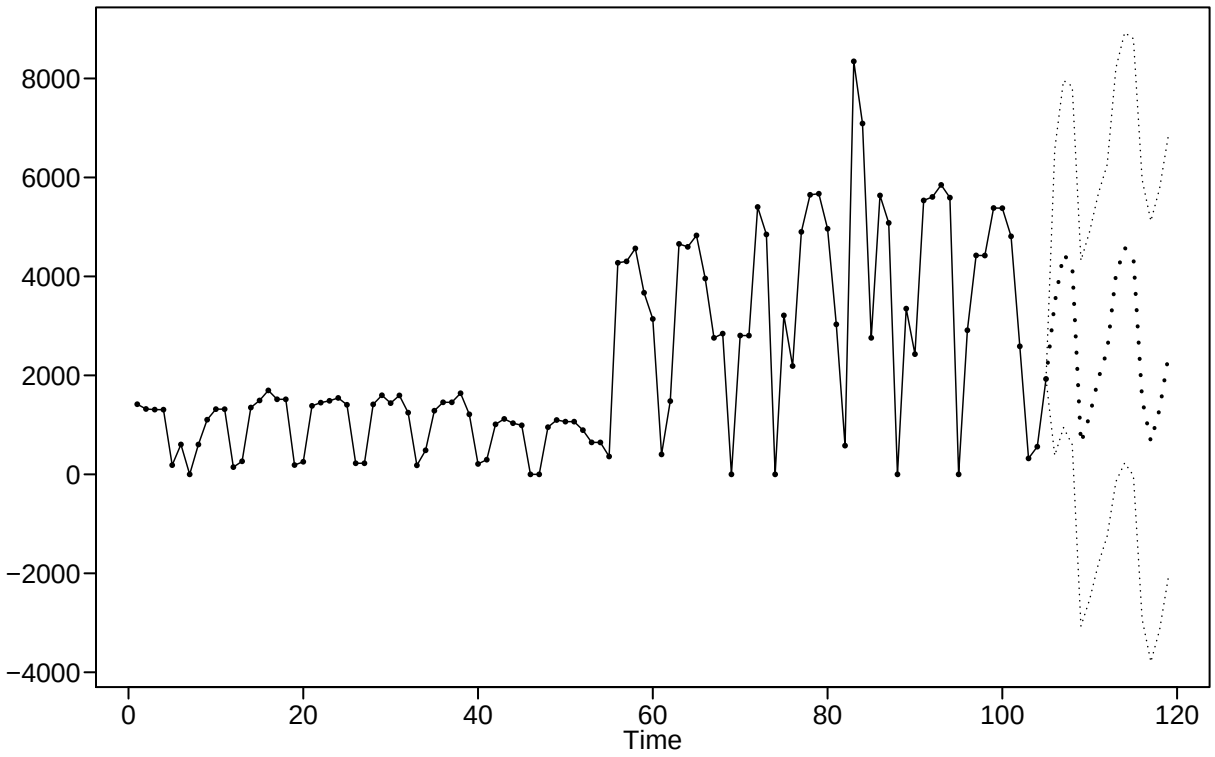
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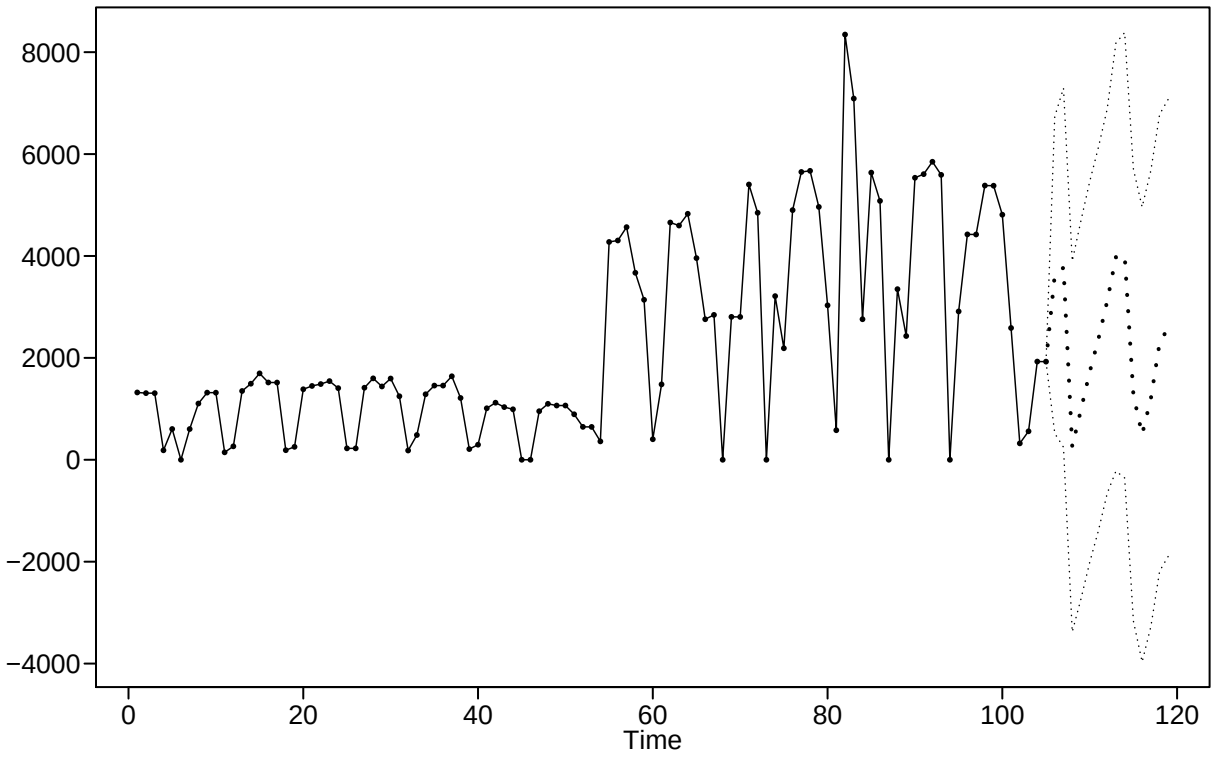
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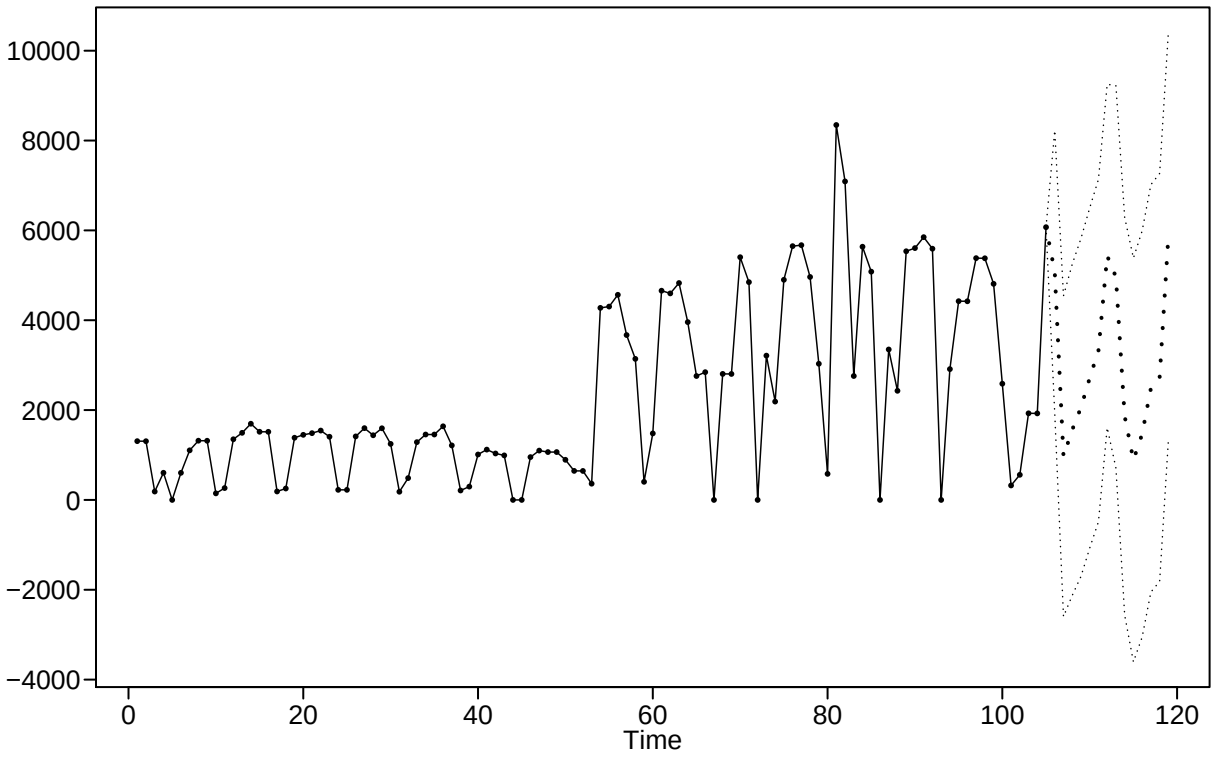
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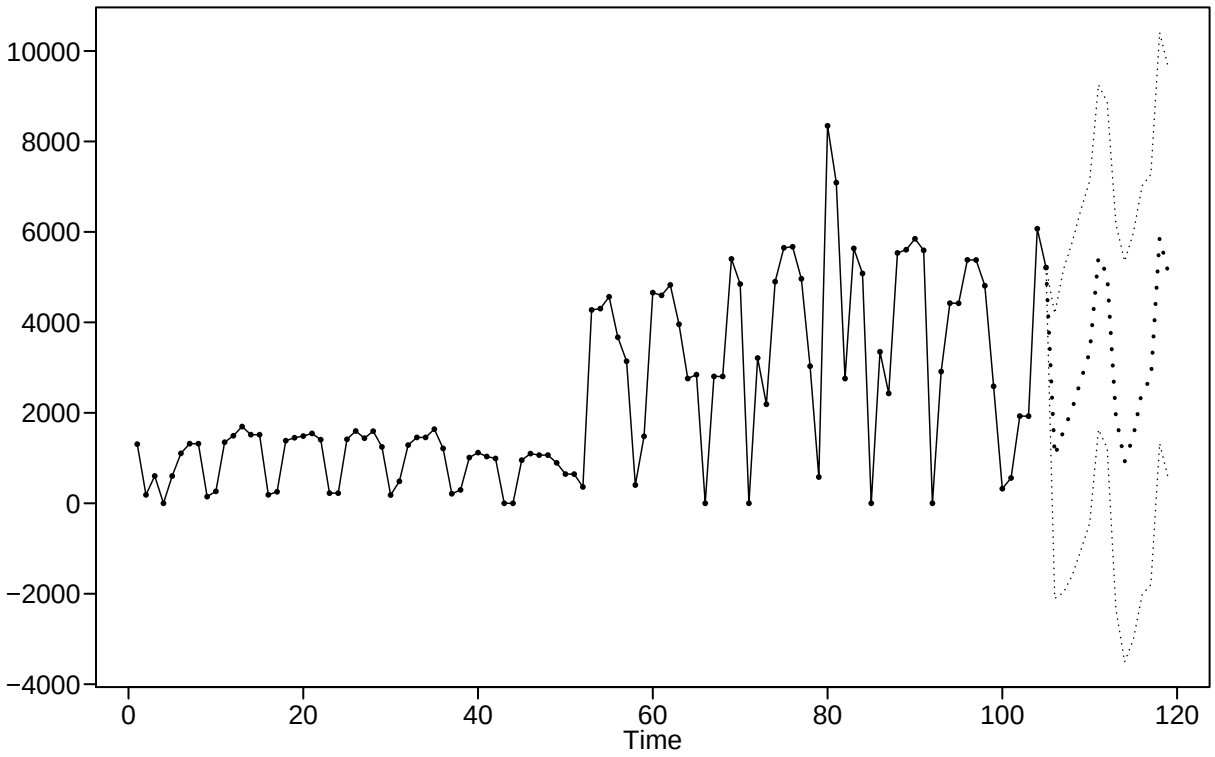
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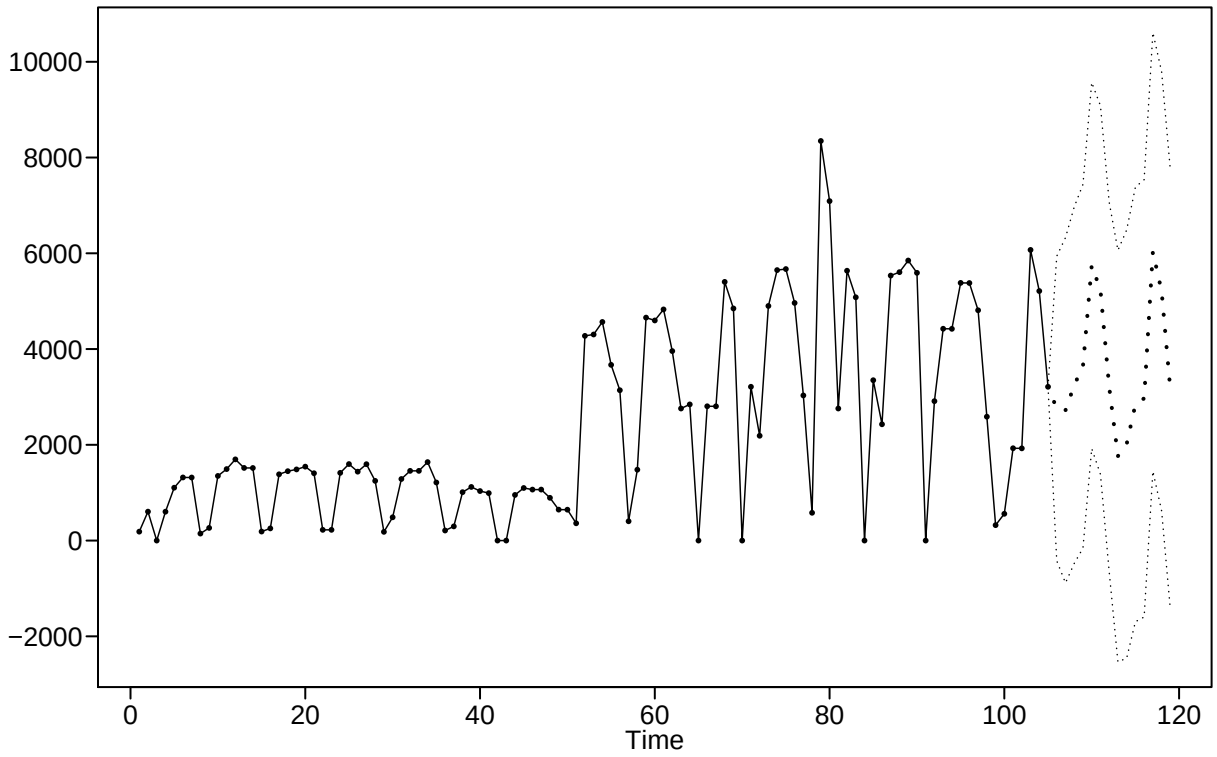
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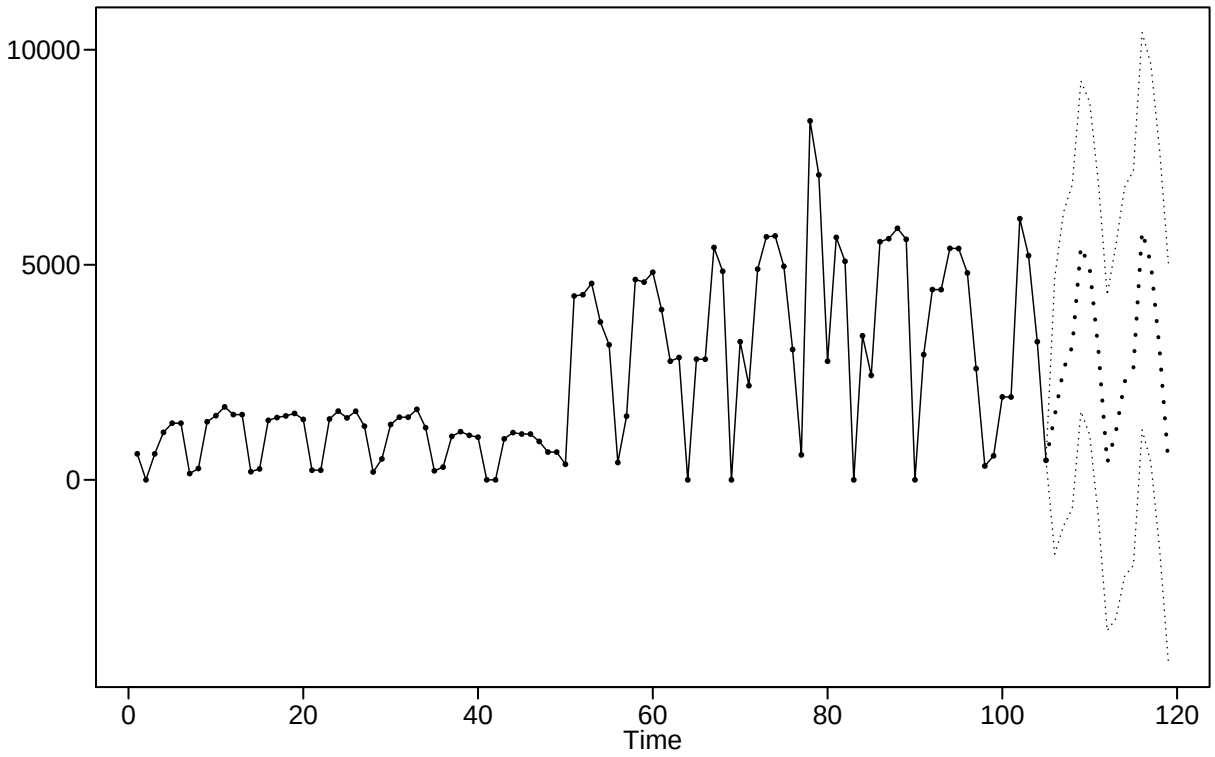
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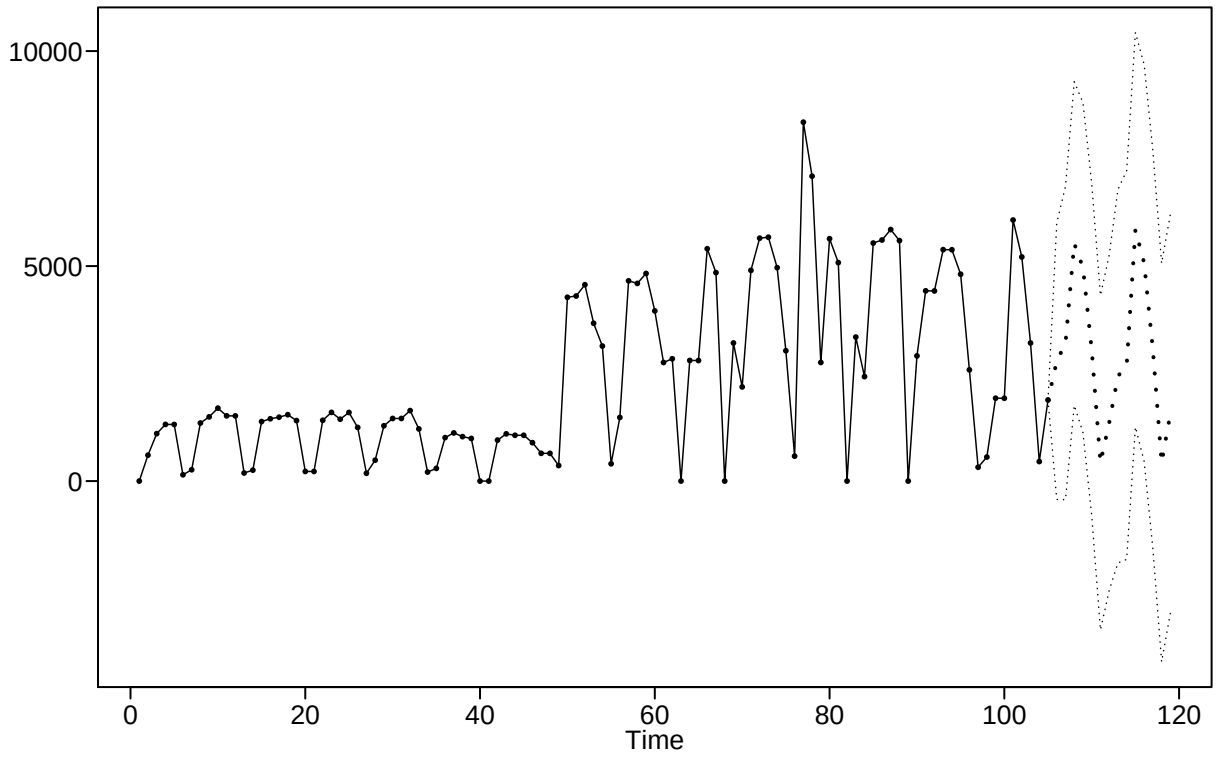
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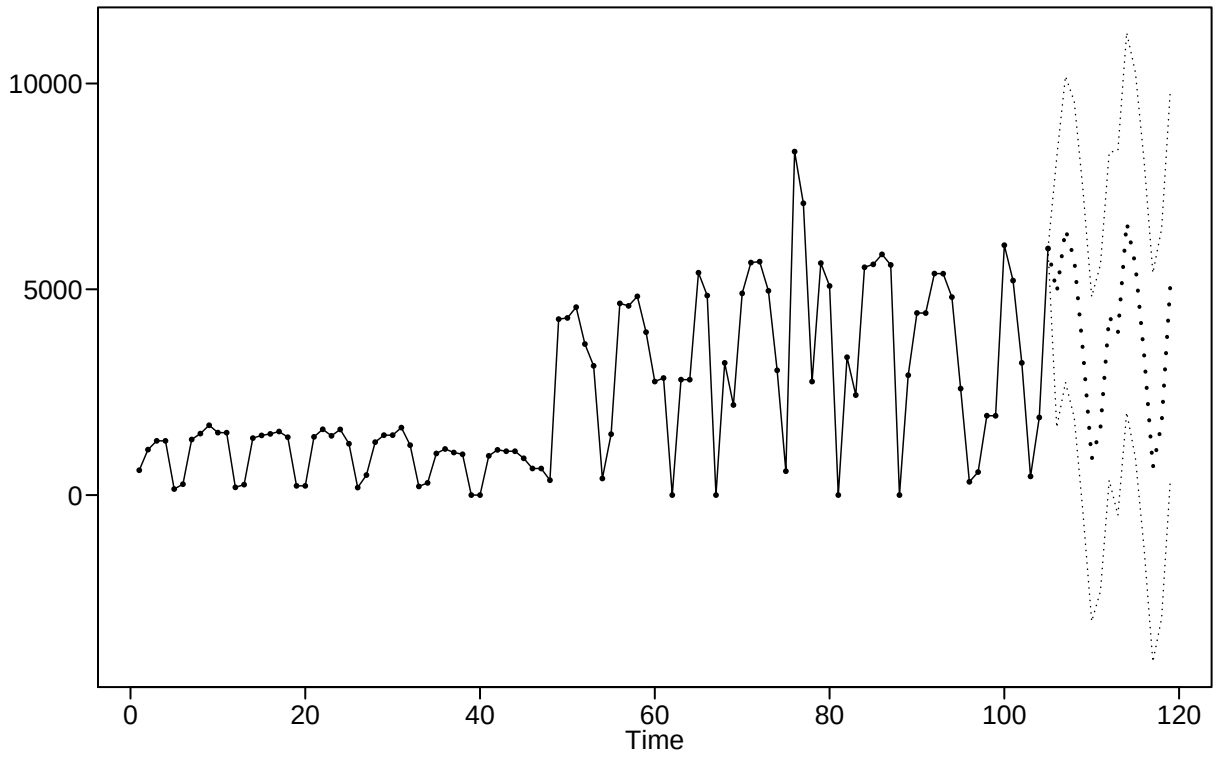
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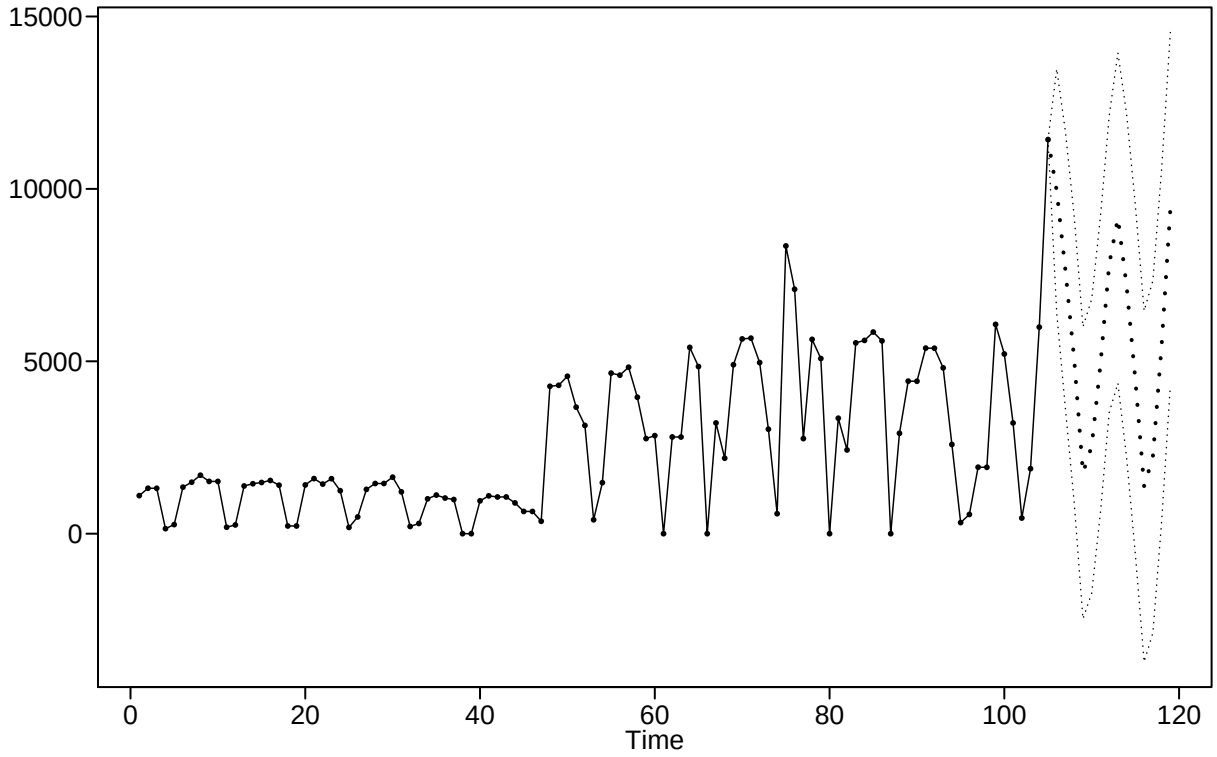
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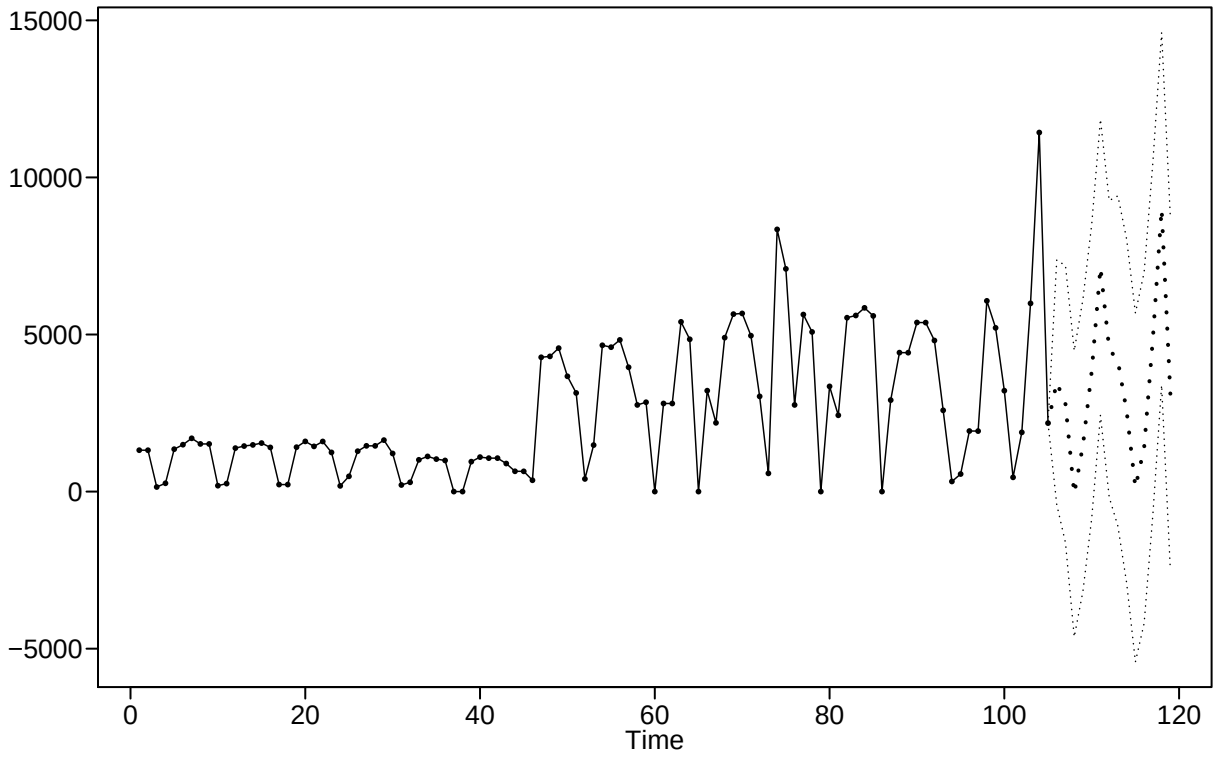
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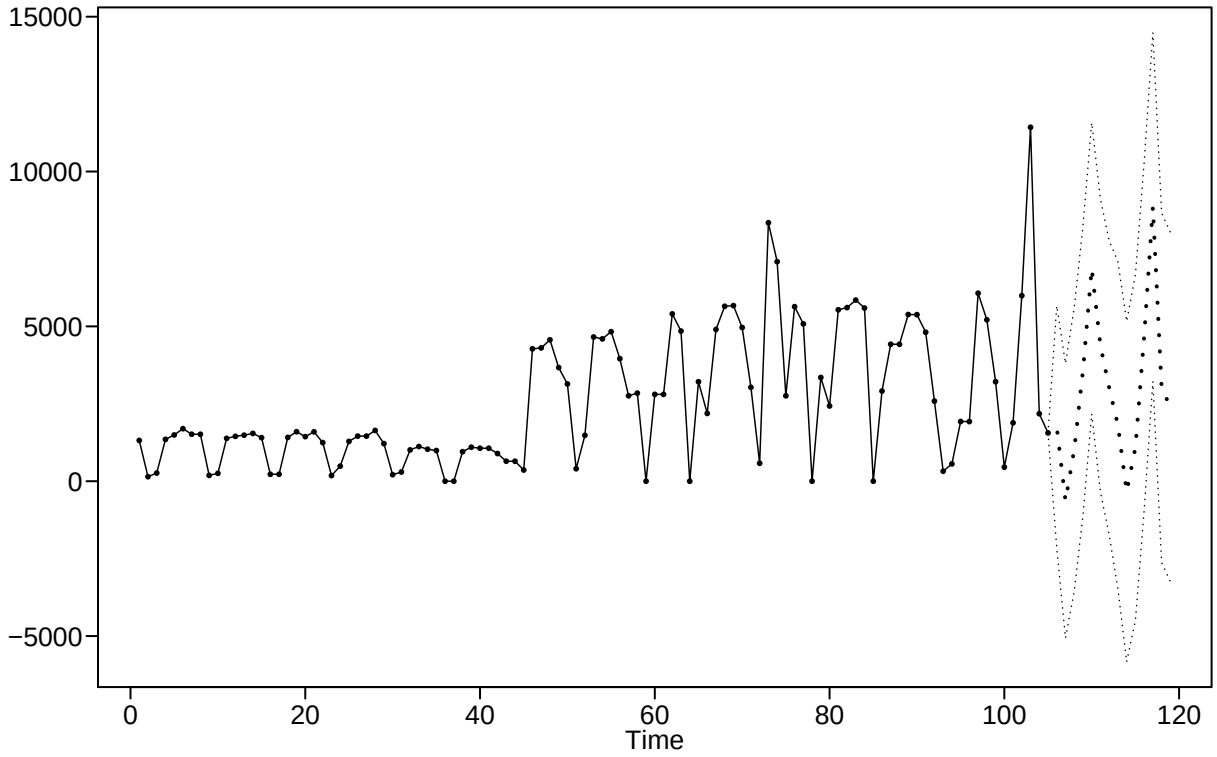
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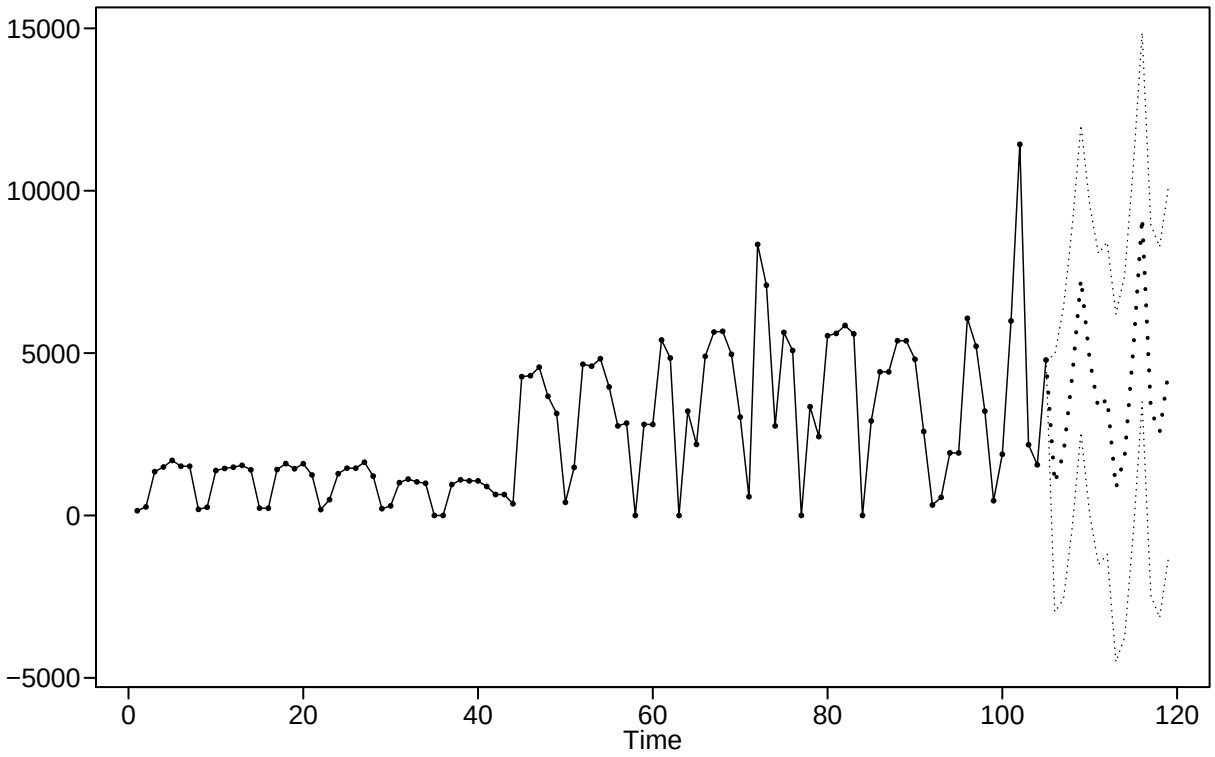
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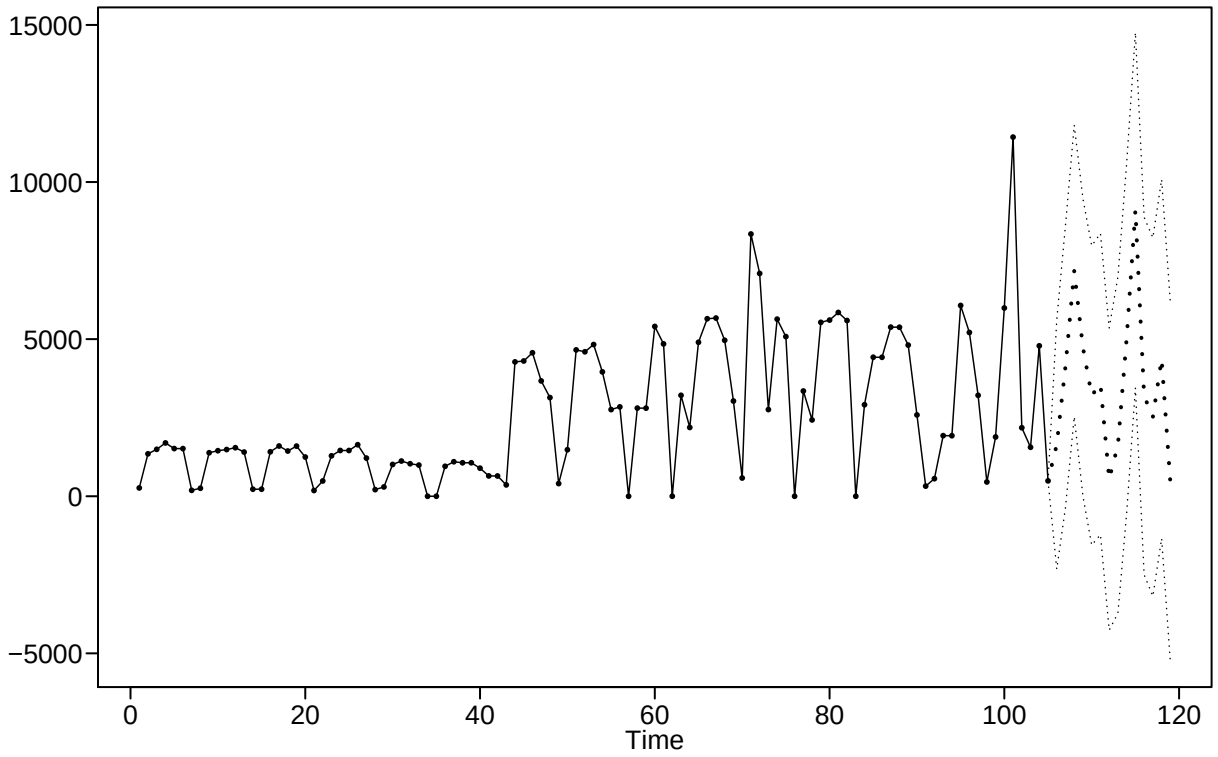
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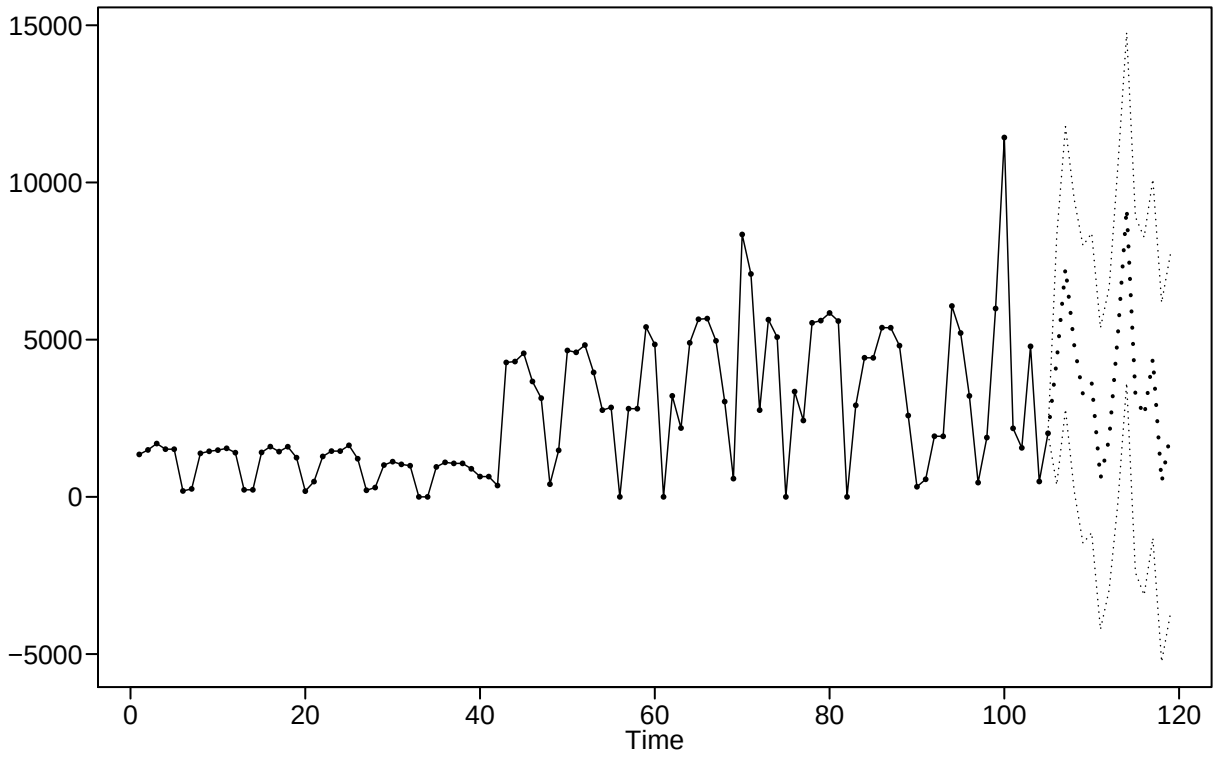
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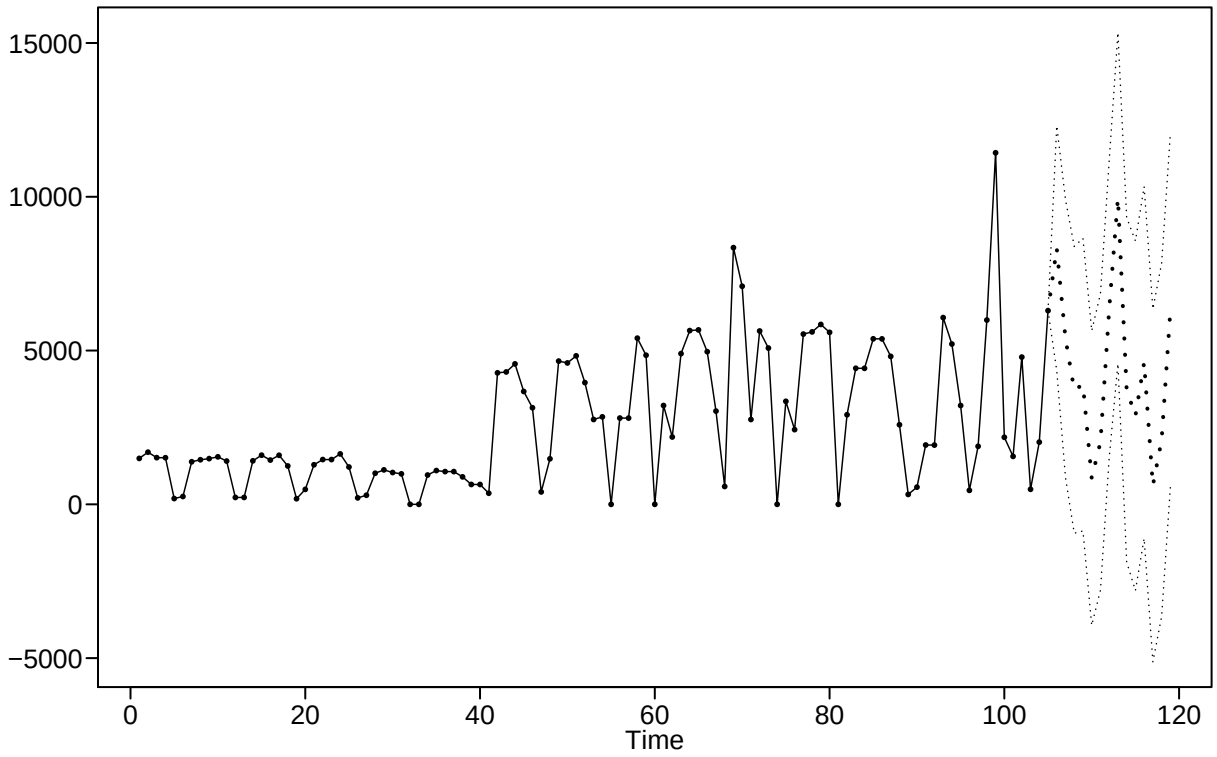
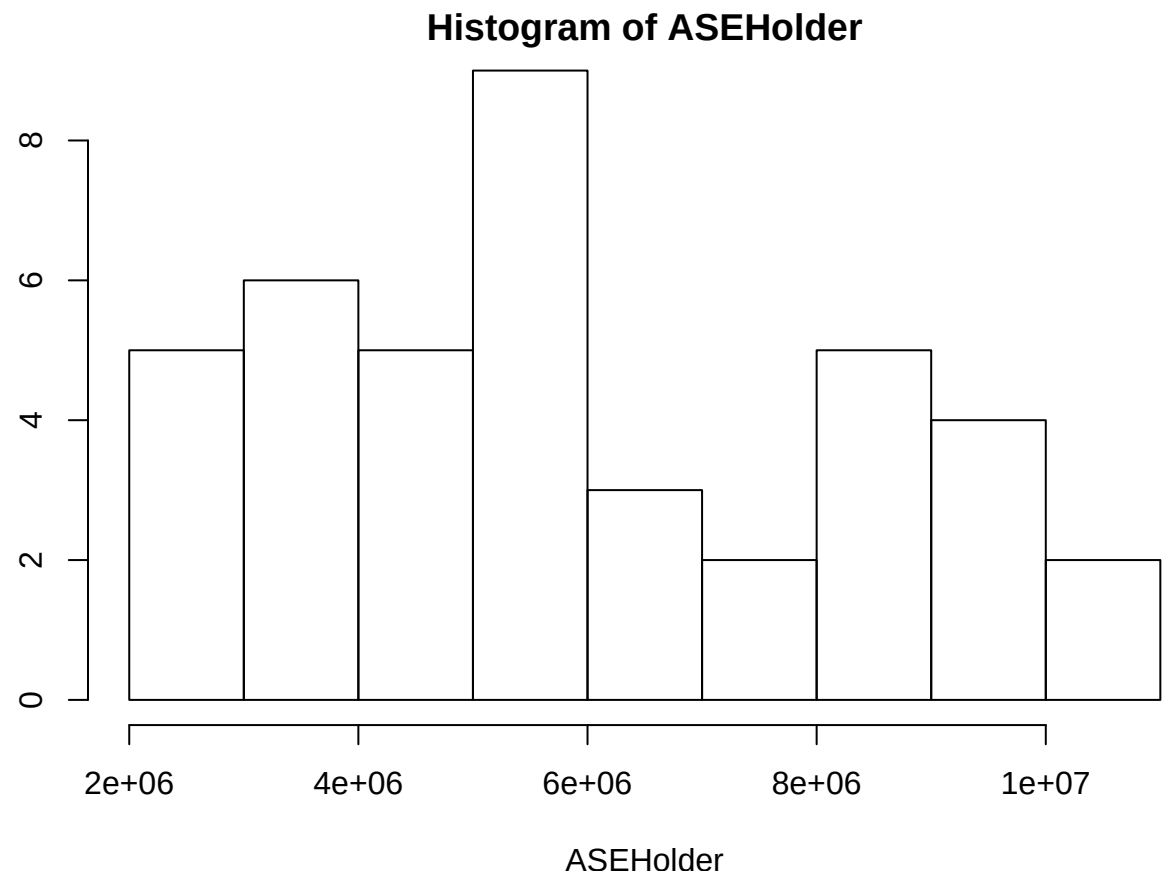



```
ASEHolder
```

```
##  [1]  5031894  5059372  5312996  7301050  4115762  3782666  2633013
##  [8]  2638247  2729960  2565626  3101969  2638975  3516570  3884512
## [15]  3955099  3999327  4327200  5767052  4869894  4612348  7595316
## [22]  8108423  8940628 10394802  6964466  6859357  8601394 10662399
## [29]  9949960  9915760  8992661  9654507  9334361  6495020  8719938
## [36]  4229250  5692754  5352201  5943987  5767446  5870584
```

```
hist(ASEHolder)
```



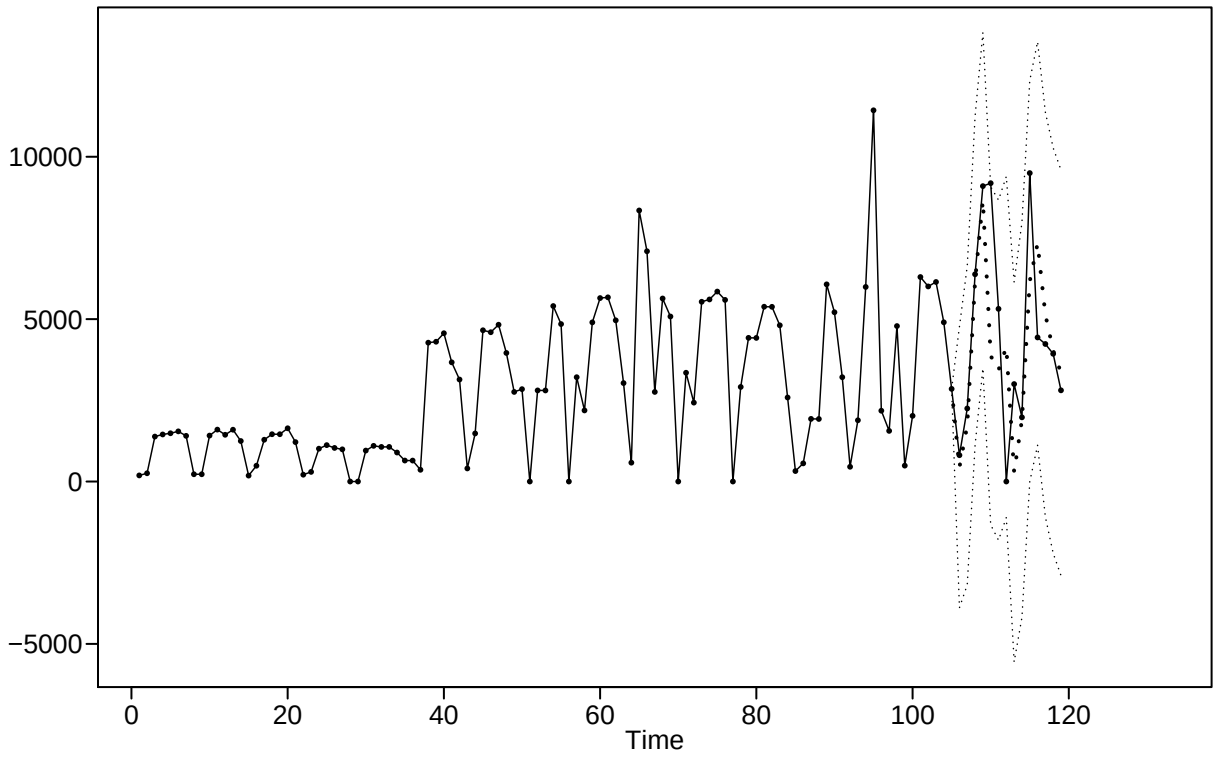

```
WindowedASE = mean(ASEHolder)

summary(ASEHolder)
```

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
##  2565626  3999327  5692754  5997286  8108423 10662399
```

```
WindowedASE
```

```
## [1] 5997286
```

```
# Visualization
i = 45
fs = fore.aruma.wge(x[i:(i+(trainingSize+horizon)-1)],phi = phis, s = s, d = d,n.ahead = 14, lastn = TRU
```



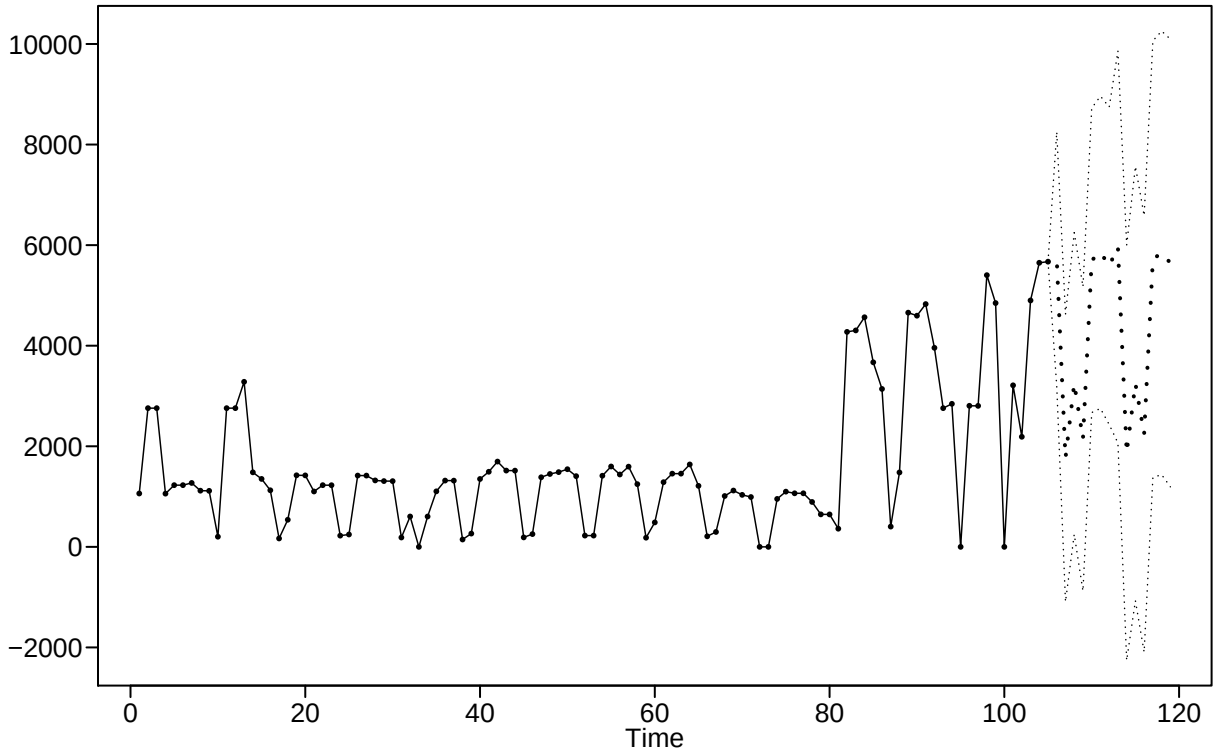

```
ASE = mean((x[(i+trainingSize):(i+(trainingSize+horizon)-1)] - fs$f )^2)
ASE
```

```
## [1] 5539106
```

#EDA Project: Step 6 - Rolling Window ASE for ARIMA(5,0,2) with s=7

```
#ARIMA(5,0,2), s=7
phis = x.arma$phi
thetas = x.arma$theta
s = 7
d = 0

trainingSize = 105
horizon = 14
ASEHolder = numeric()

for( i in 1:(159-(trainingSize + horizon) + 1))
{

  forecasts = fore.aruma.wge(x[i:(i+(trainingSize-1))],phi = phis, theta = thetas, s = s, d = d,n.ahead

  ASE = mean((x[(trainingSize+i):(trainingSize+ i + (horizon) - 1)] - forecasts$f)^2)

  ASEHolder[i] = ASE
```

```
}
```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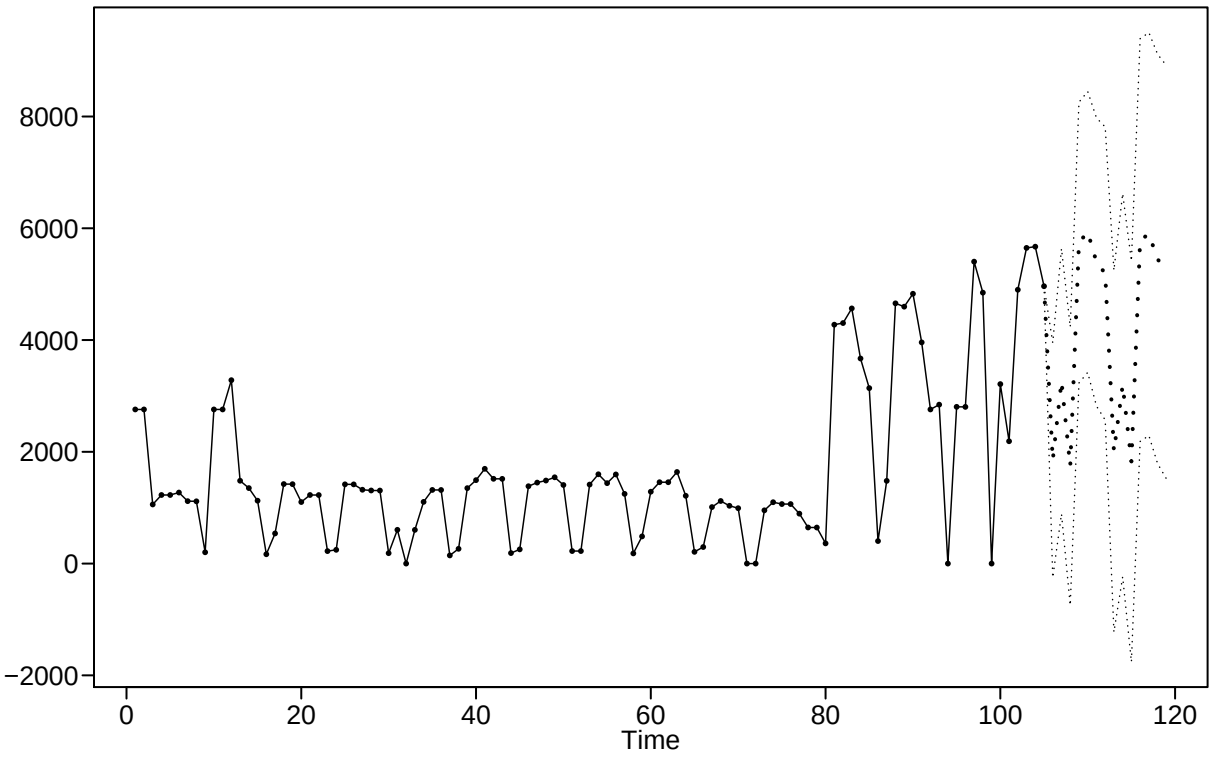
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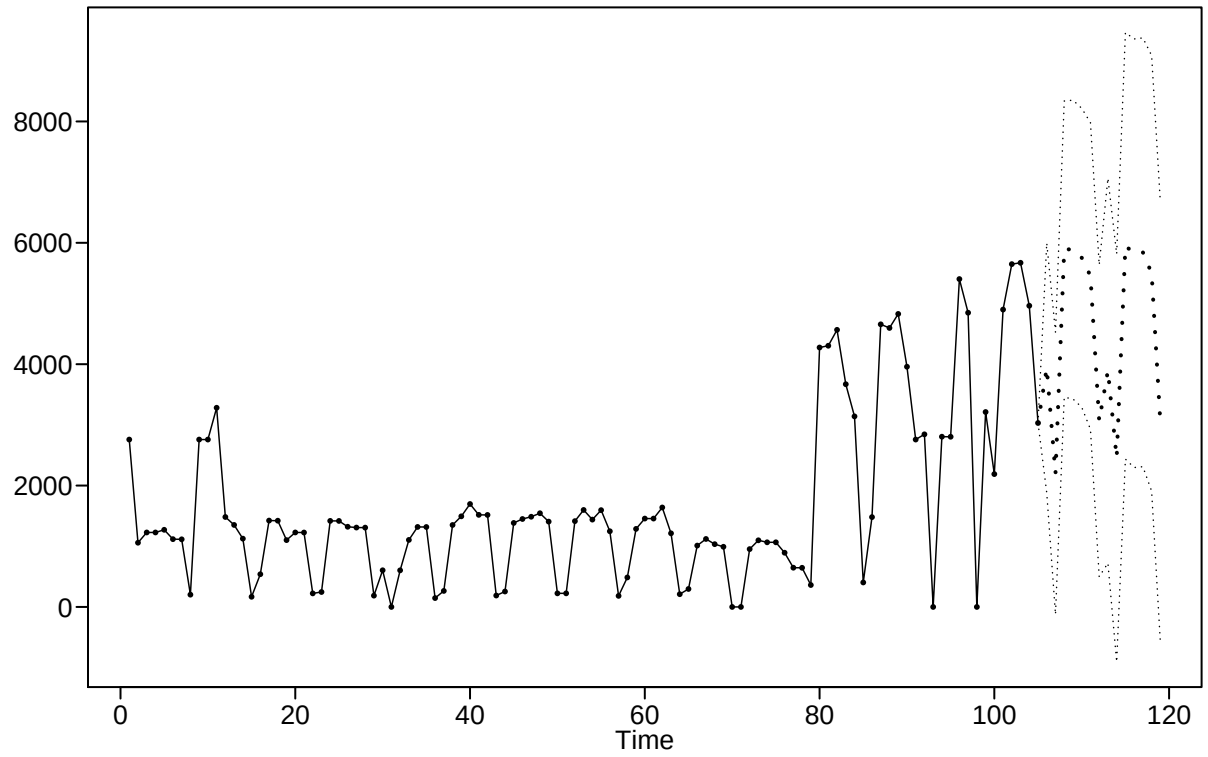
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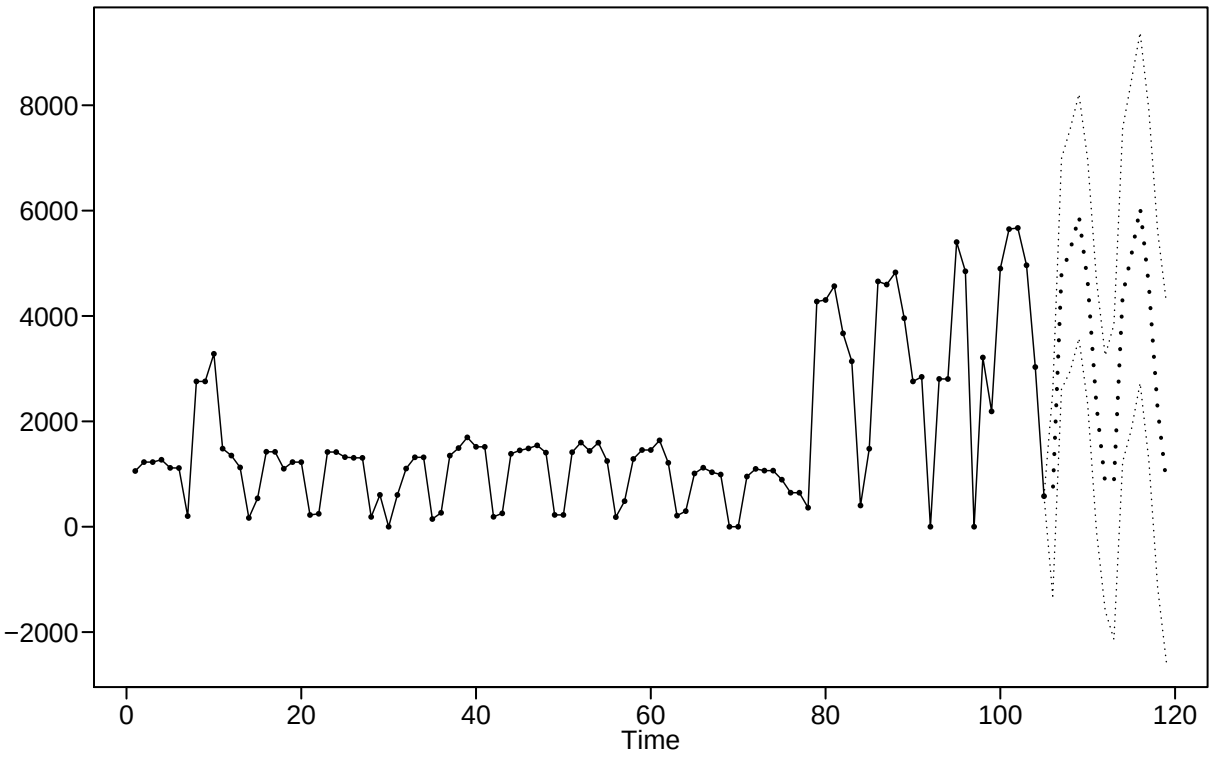
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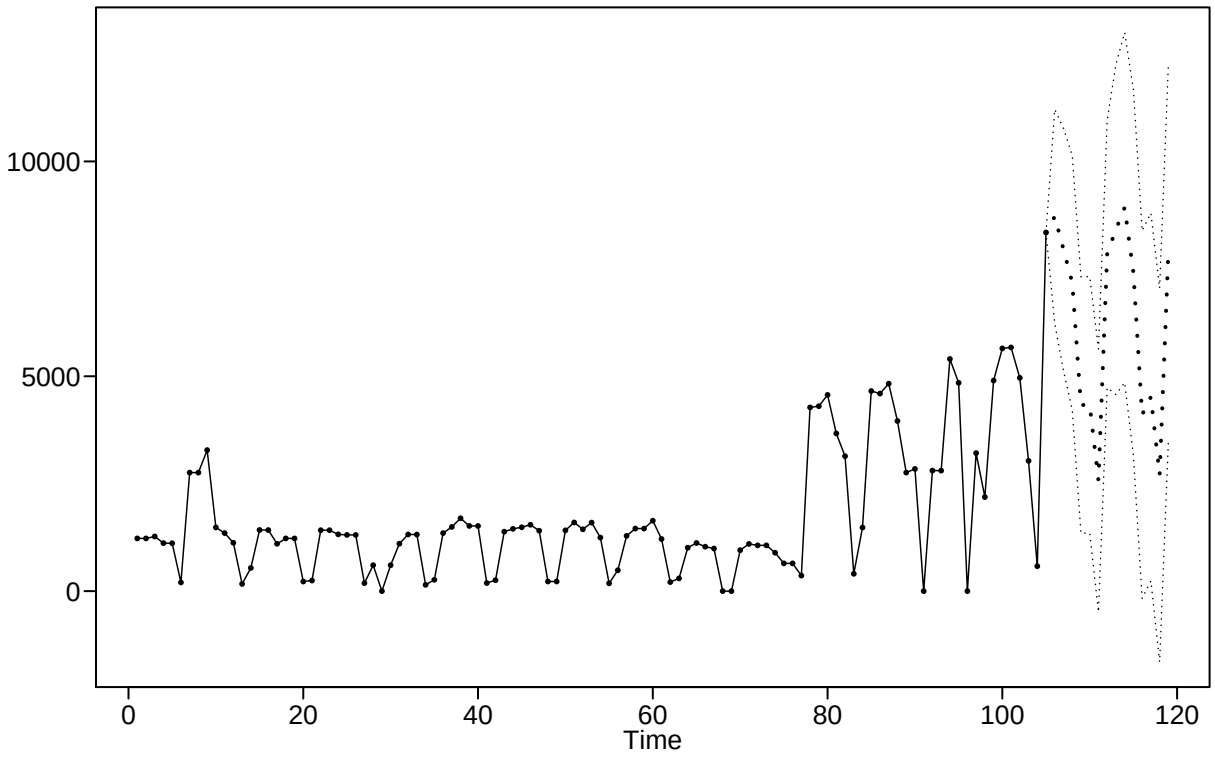
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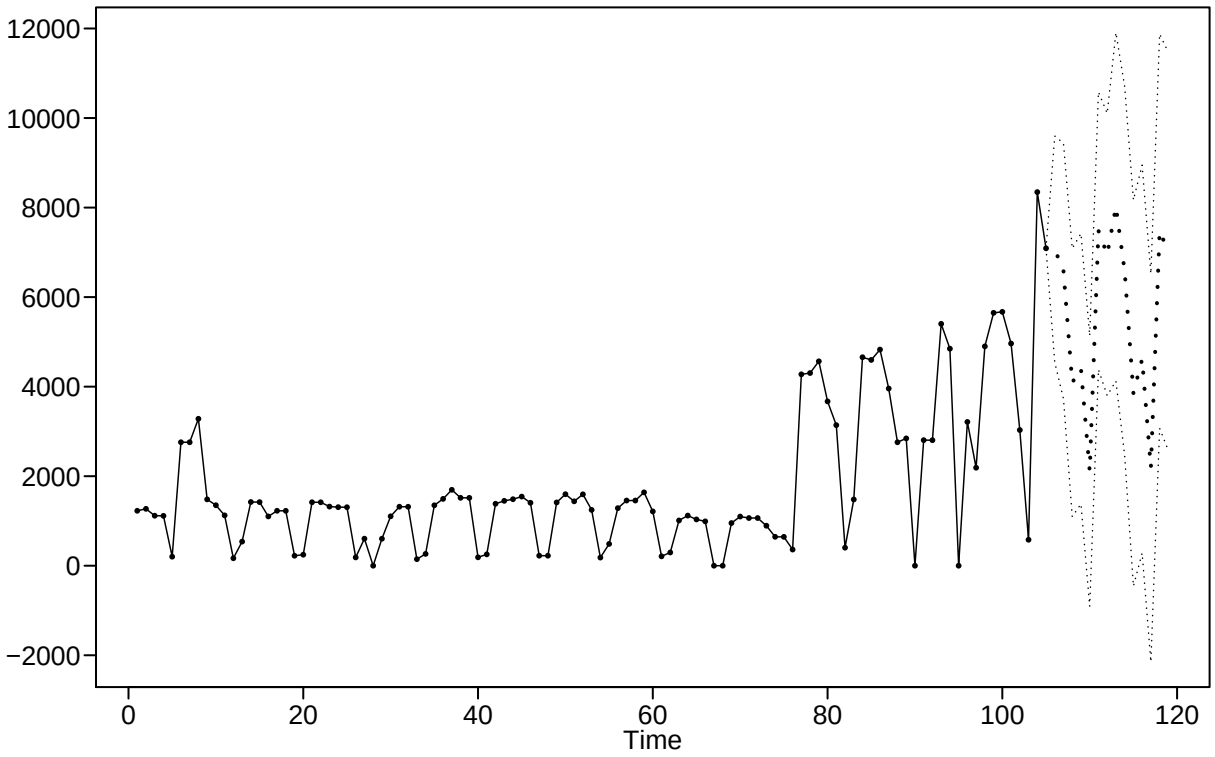
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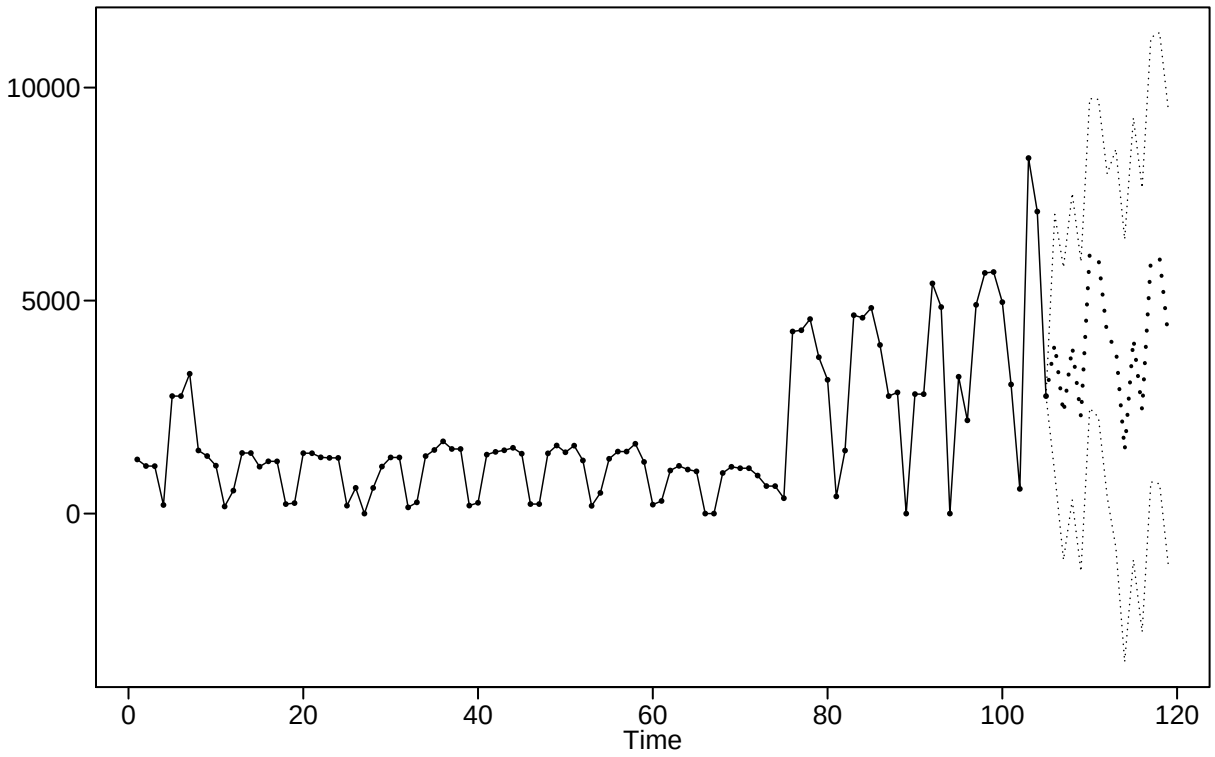
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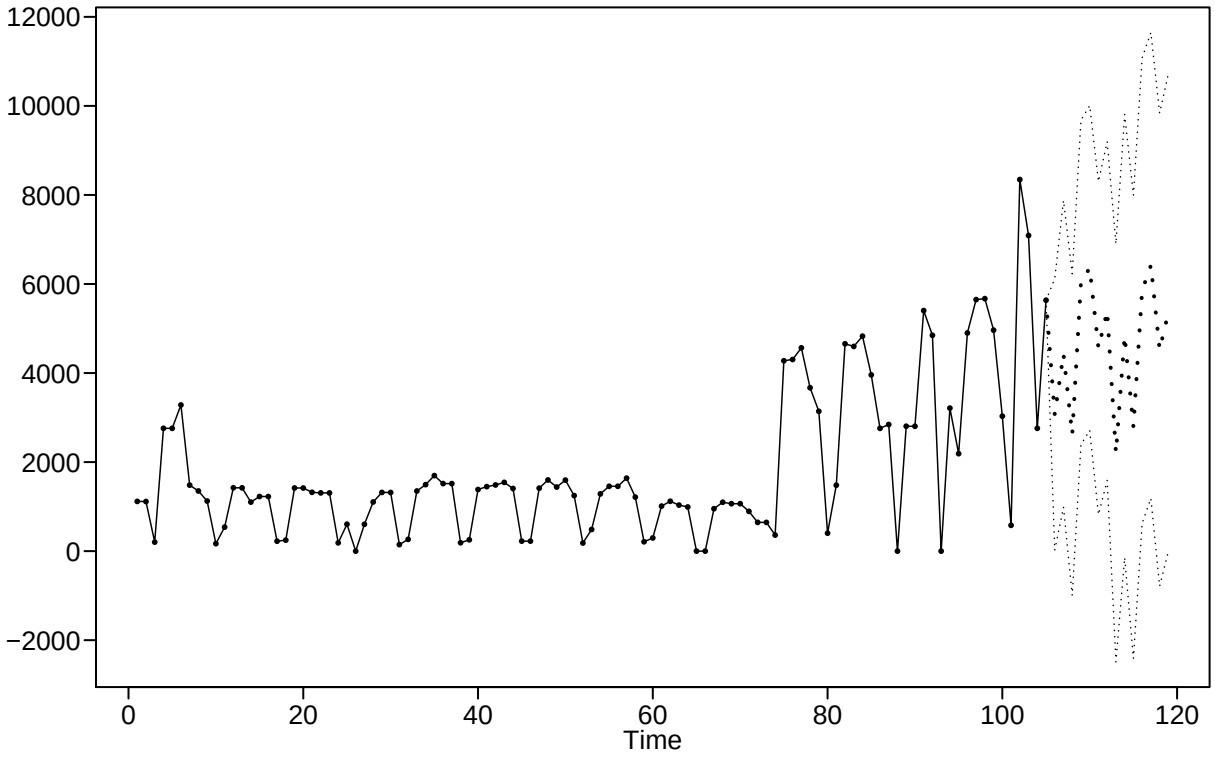
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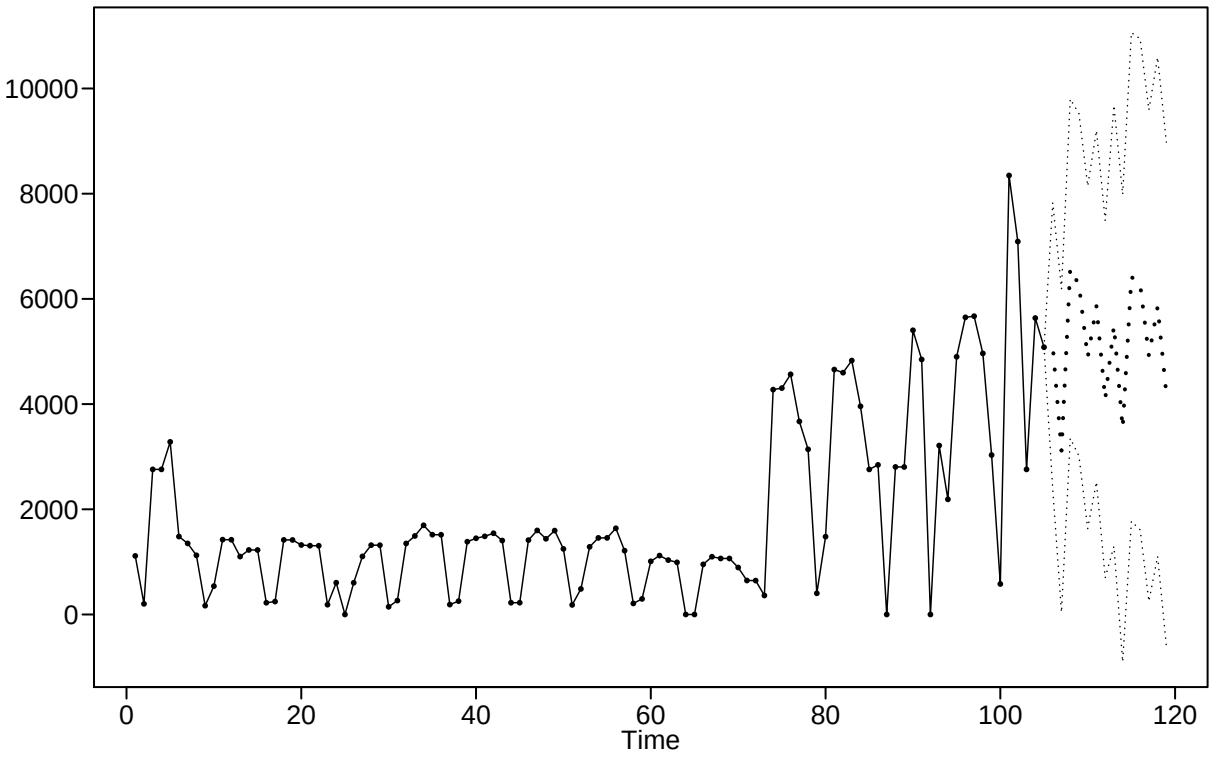
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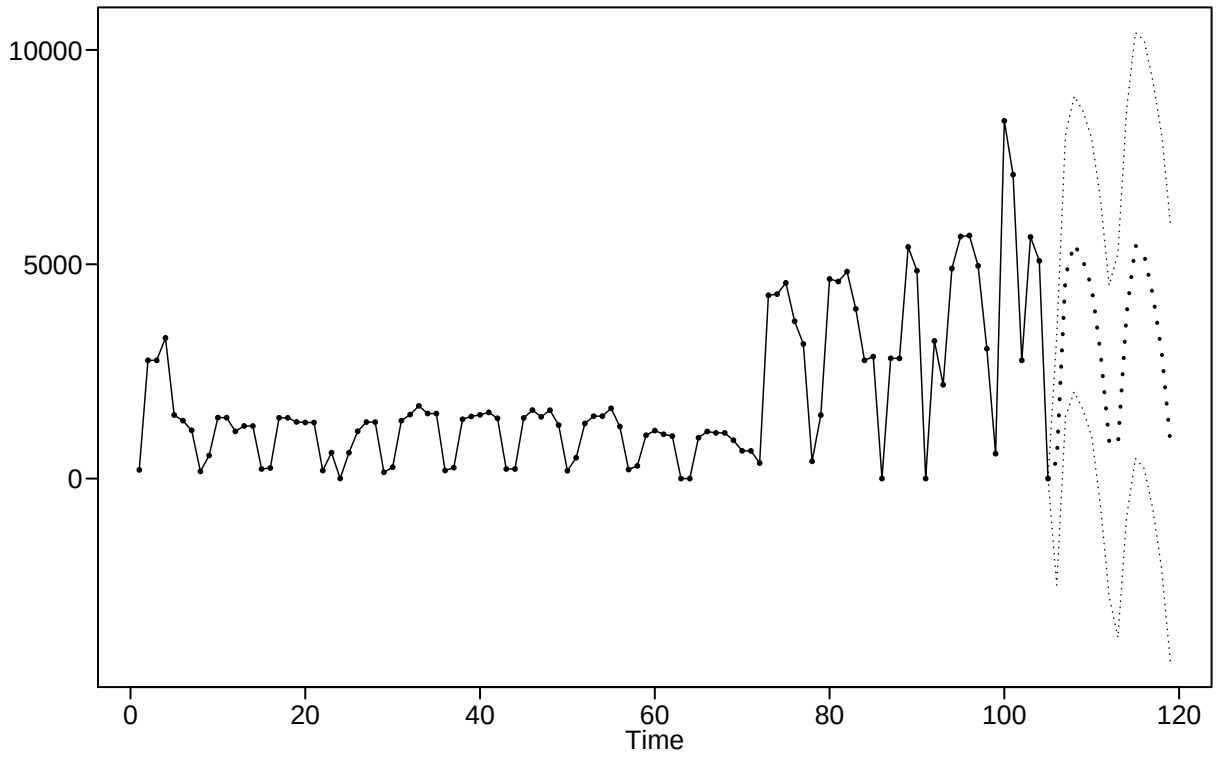
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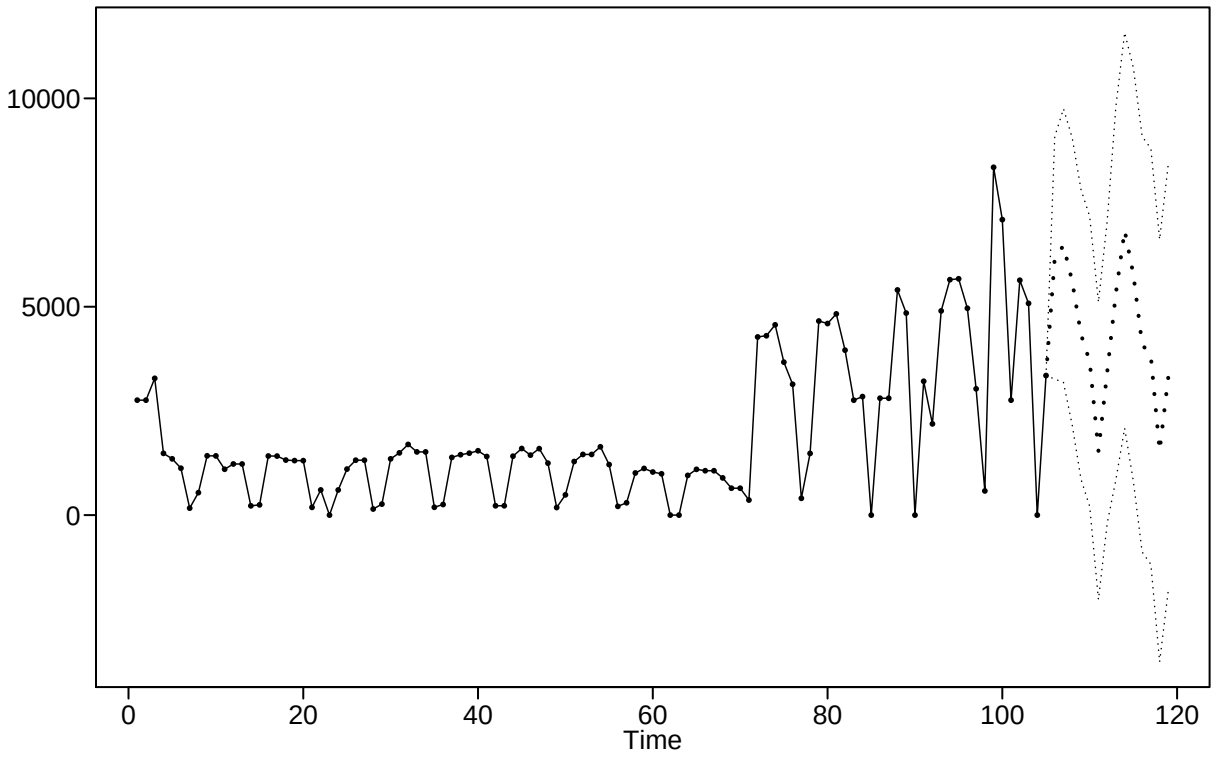
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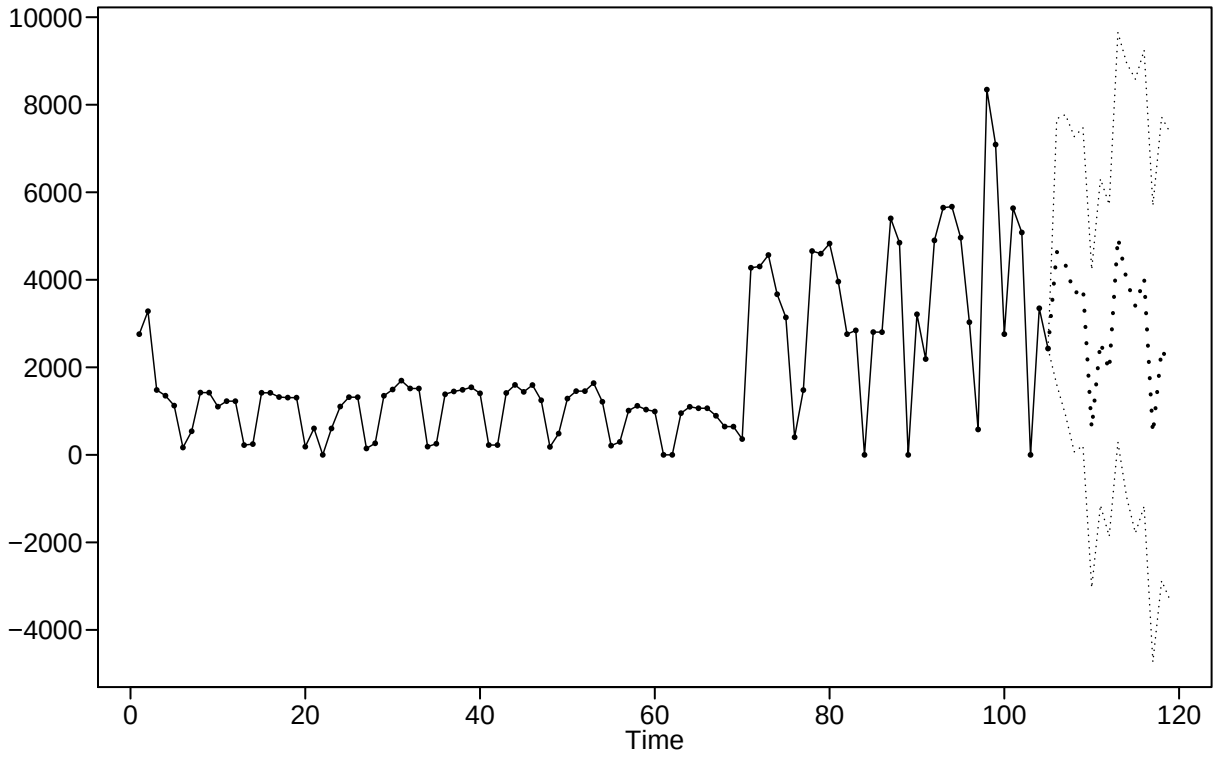
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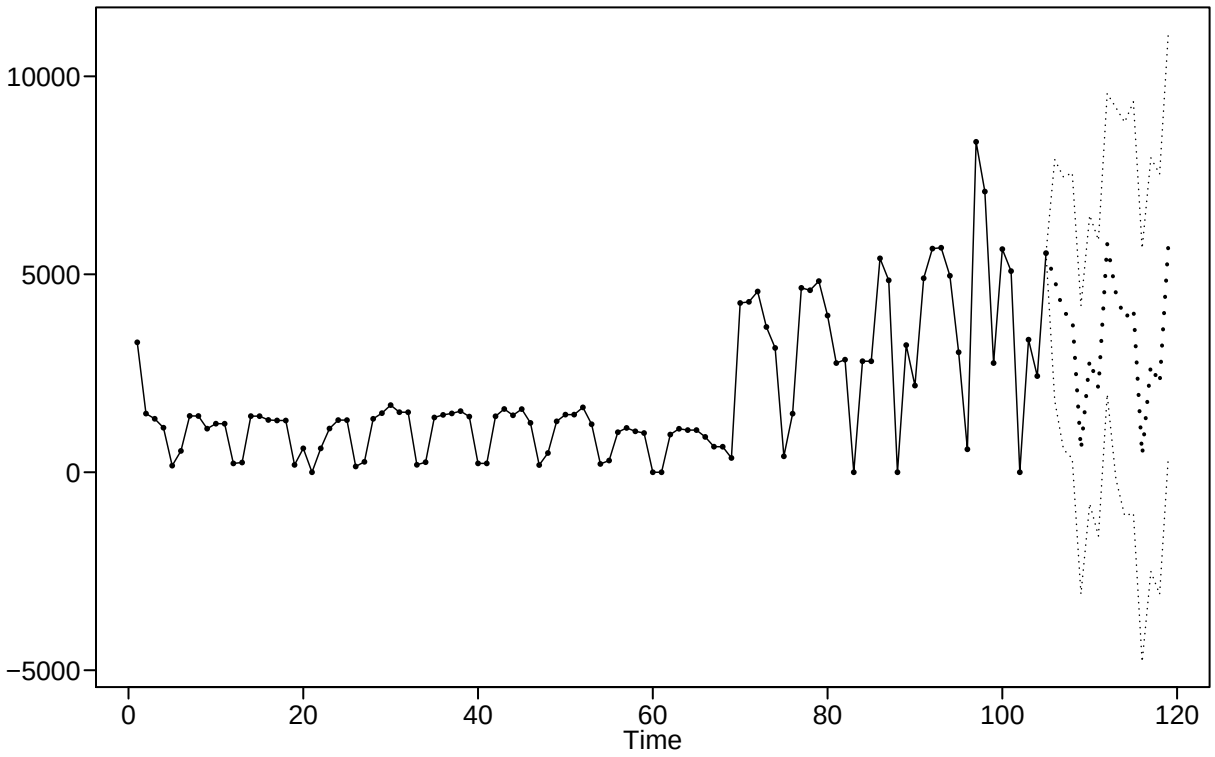
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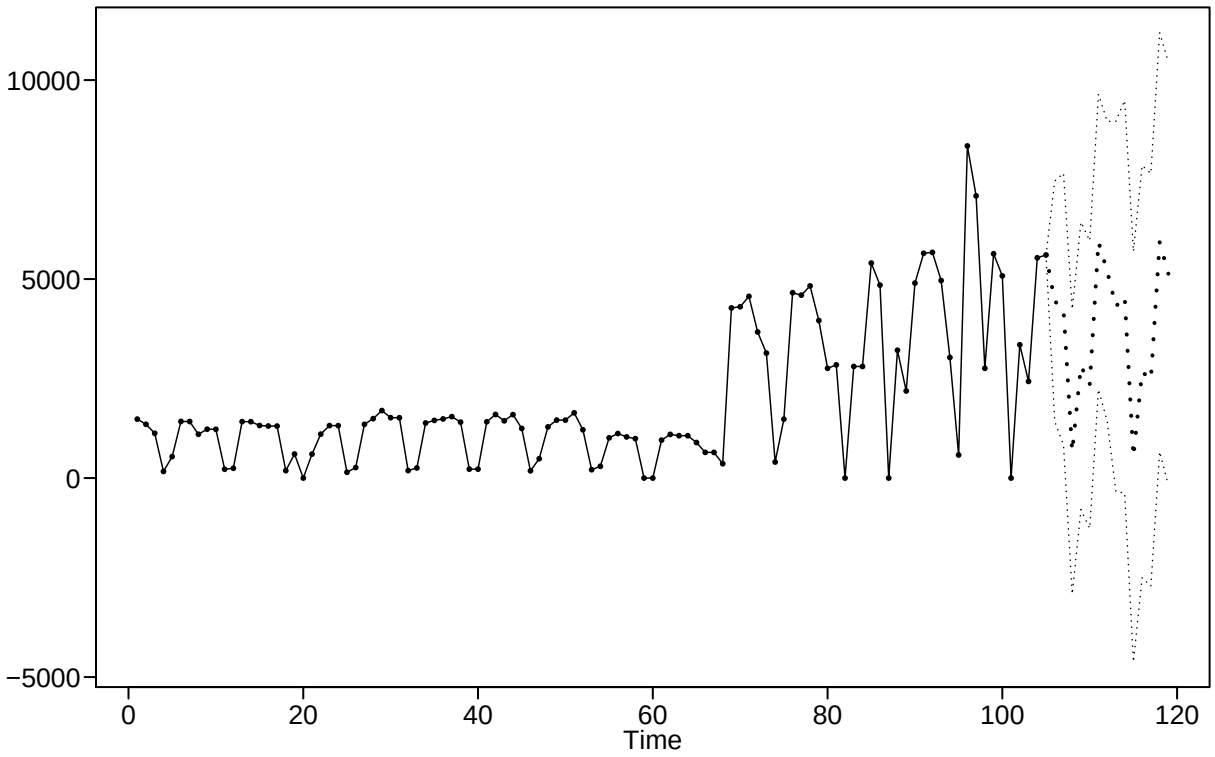
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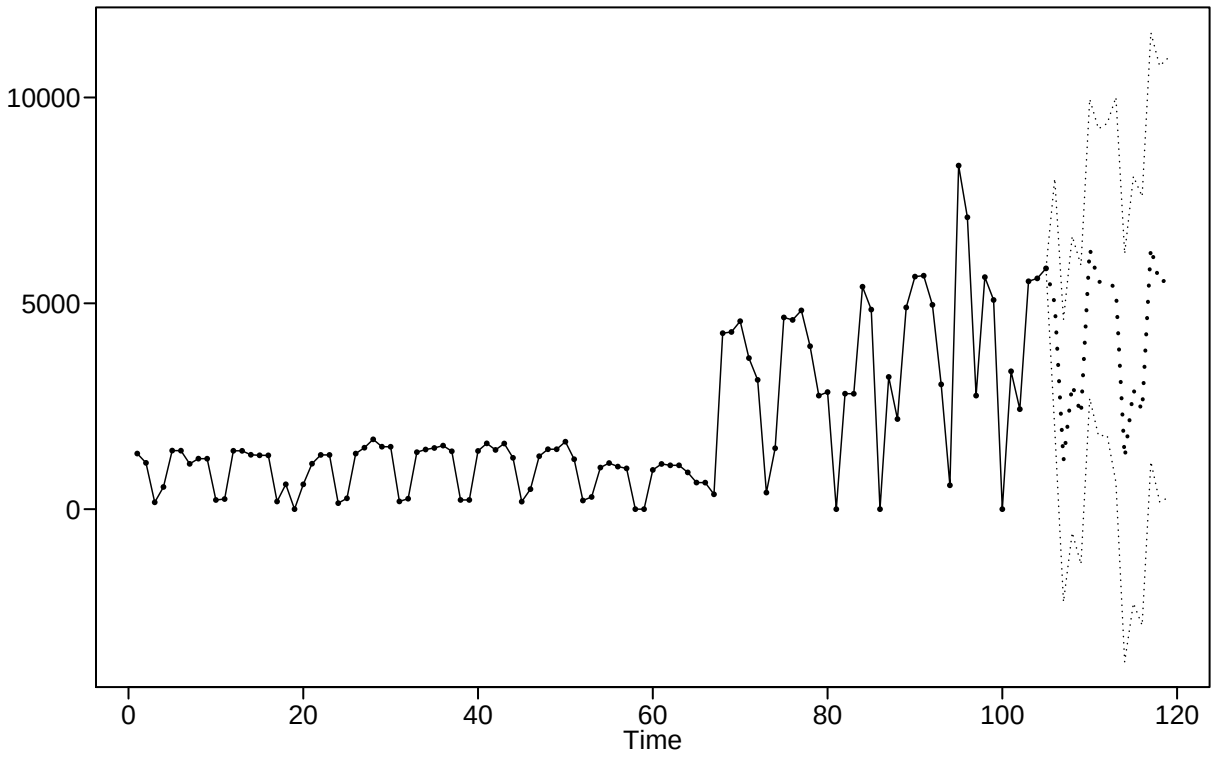
Time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40
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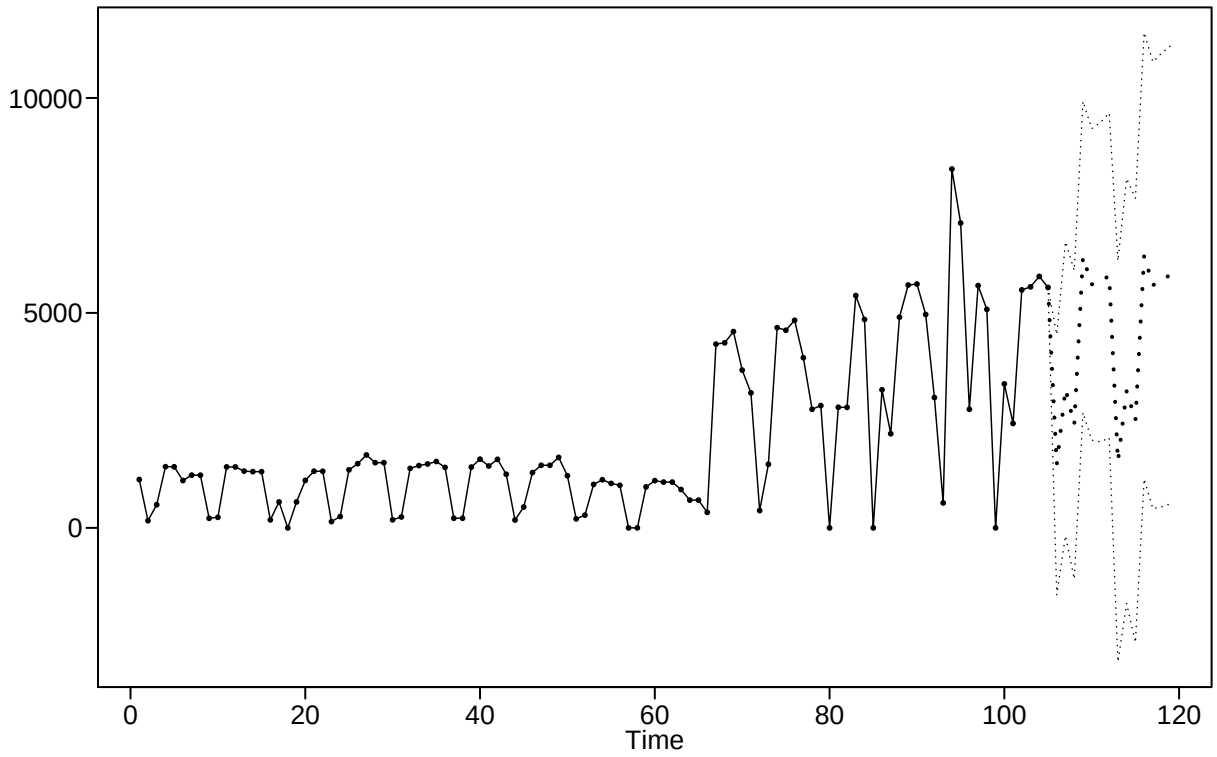
120
Time


10000
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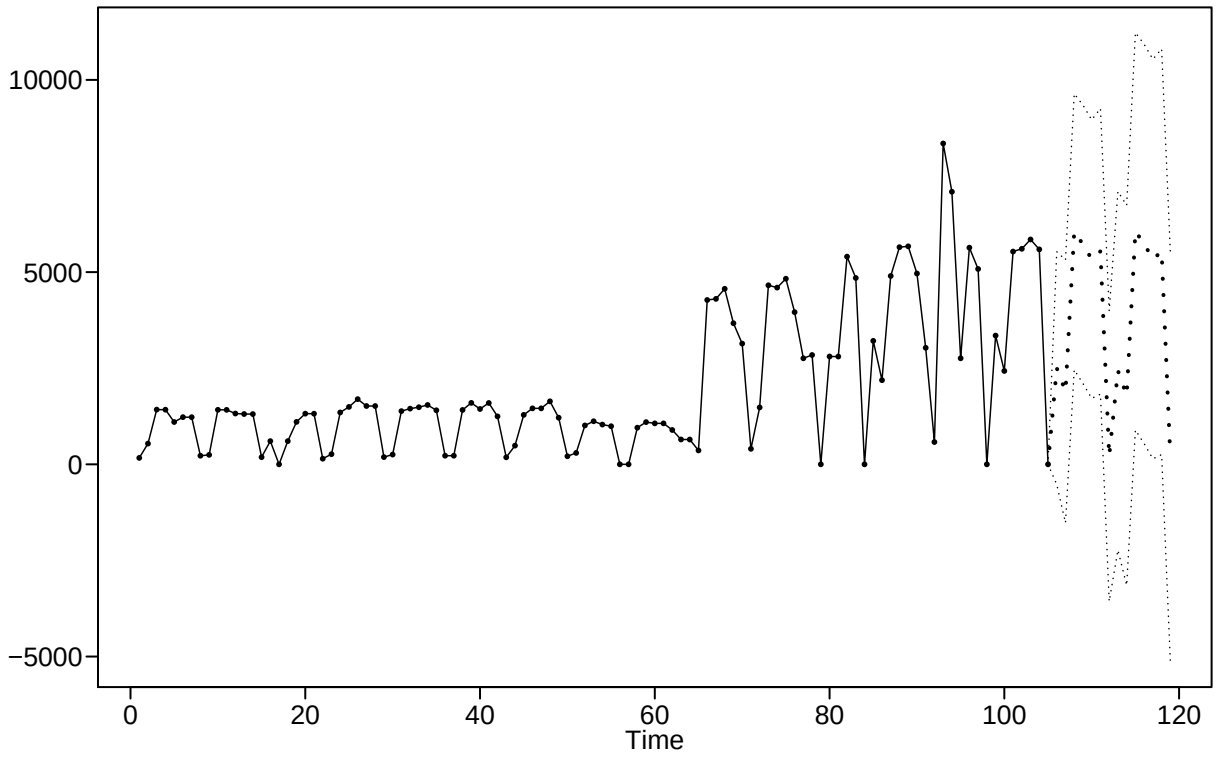
Time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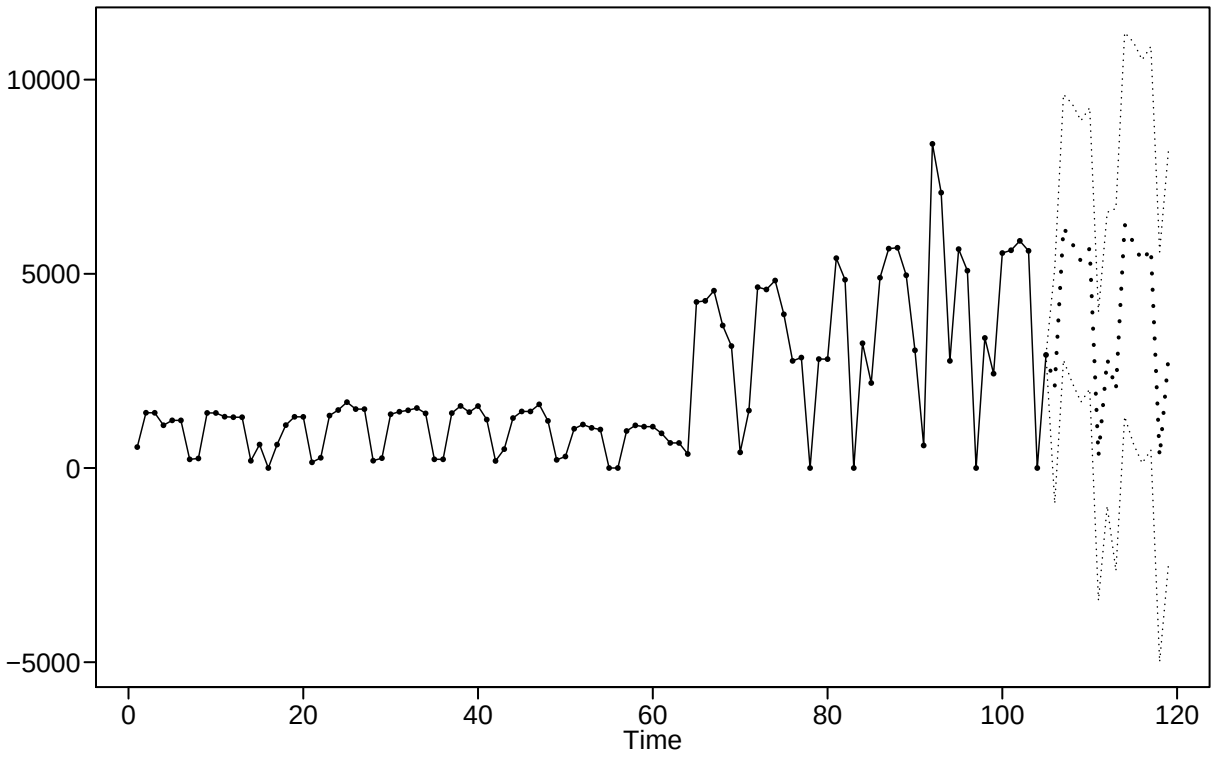
Time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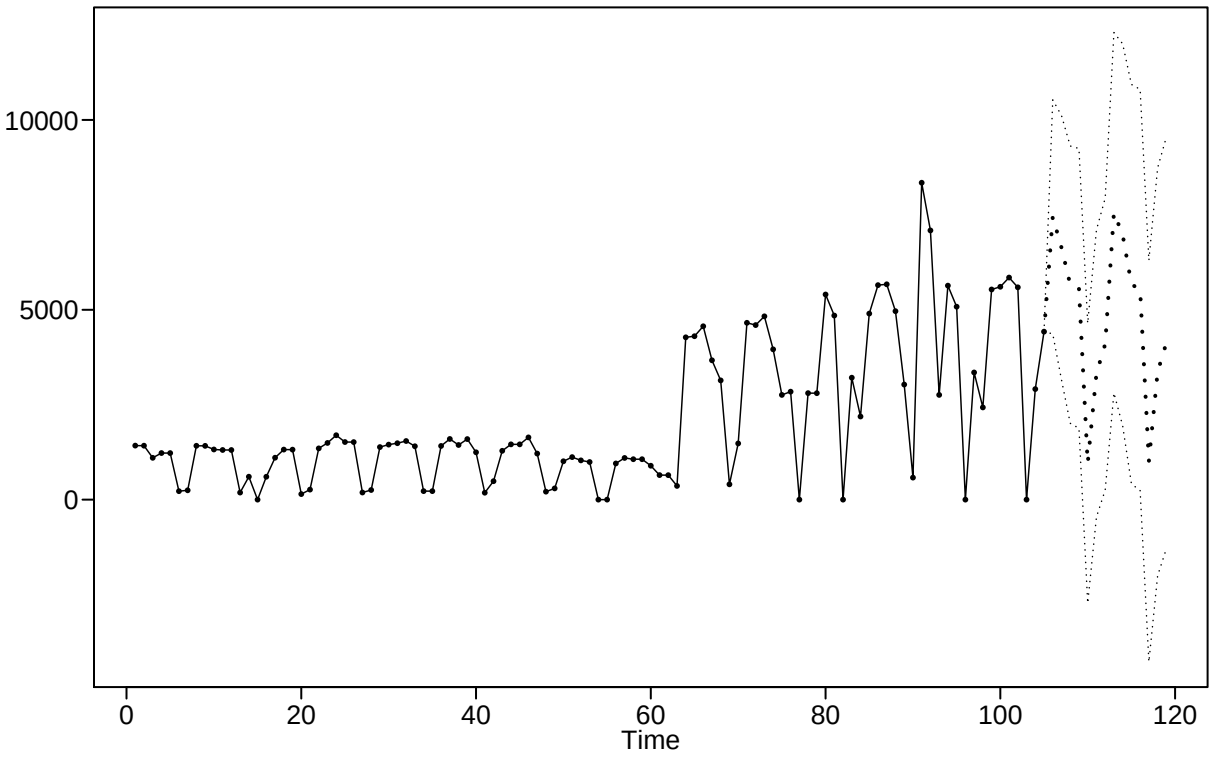
Time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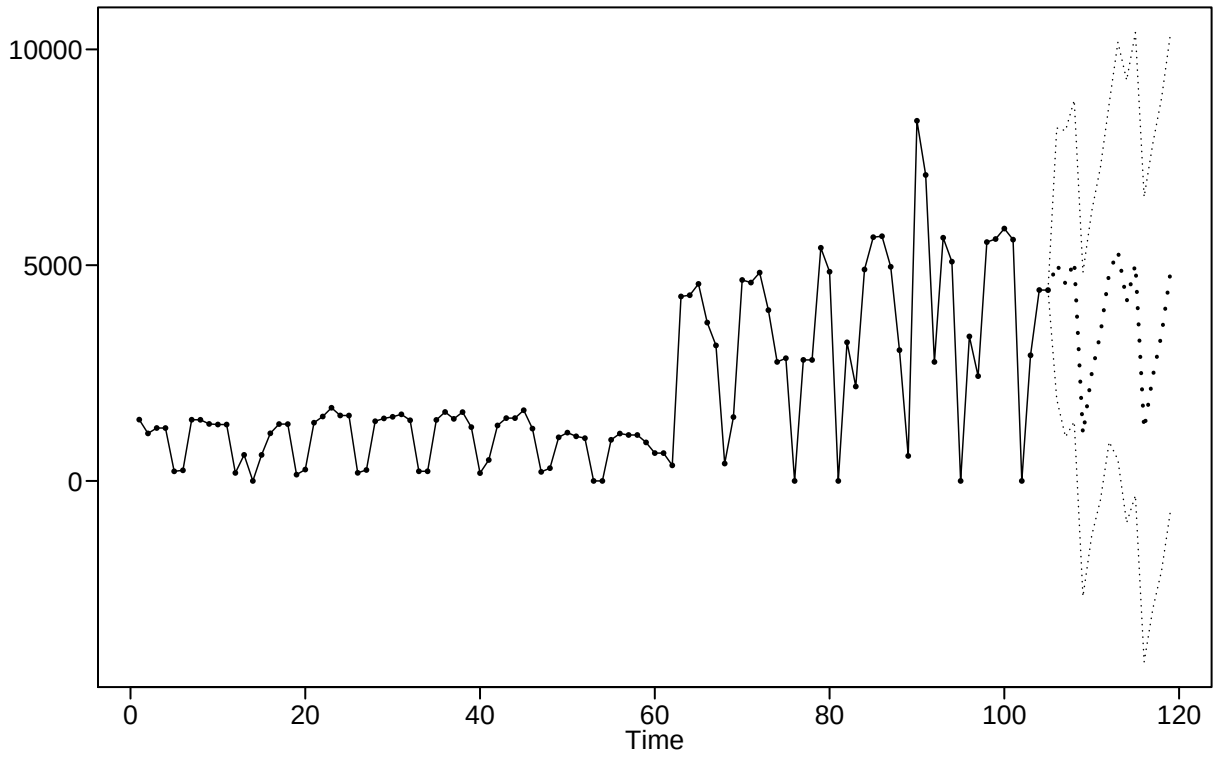
Time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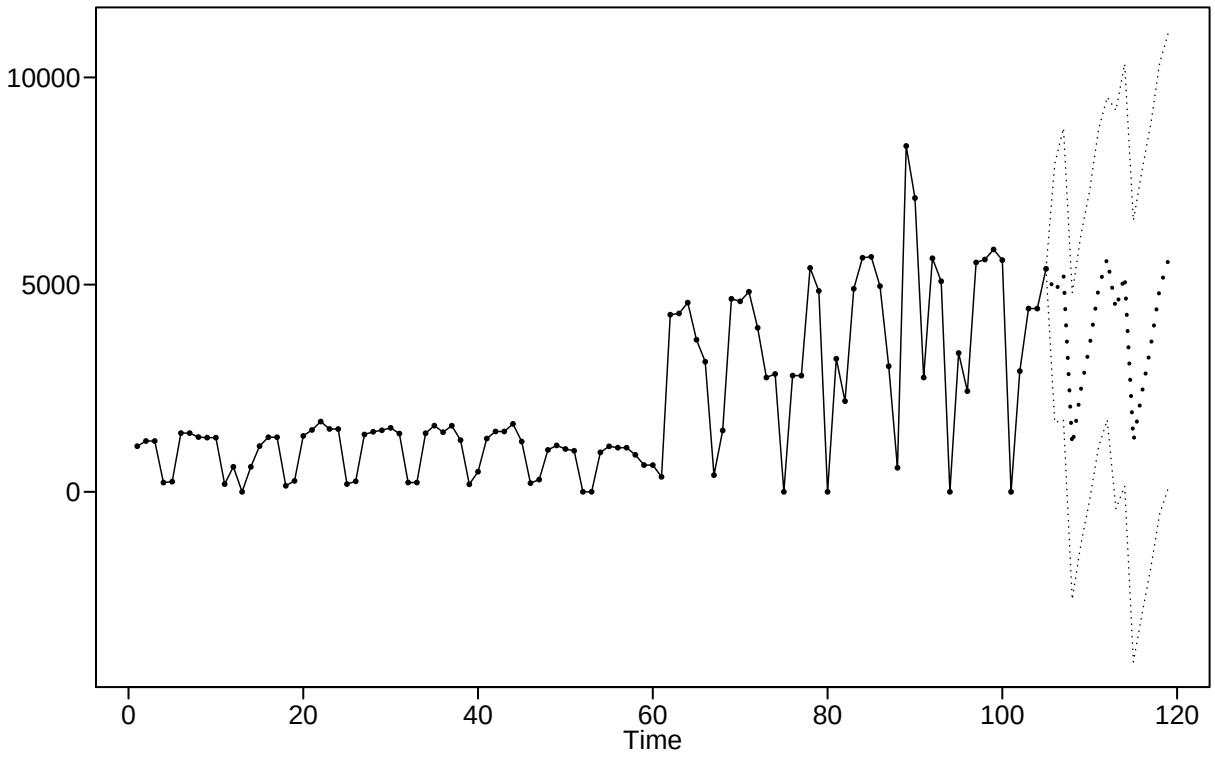
100
120
Time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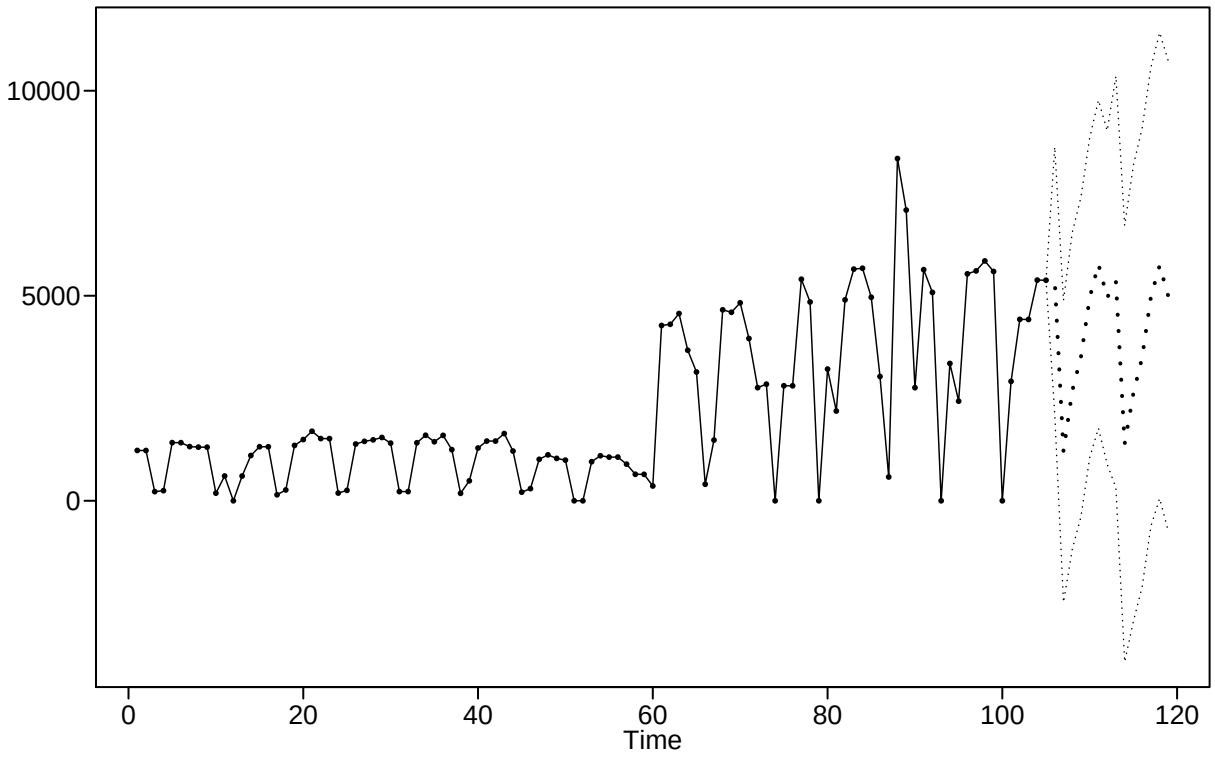
Time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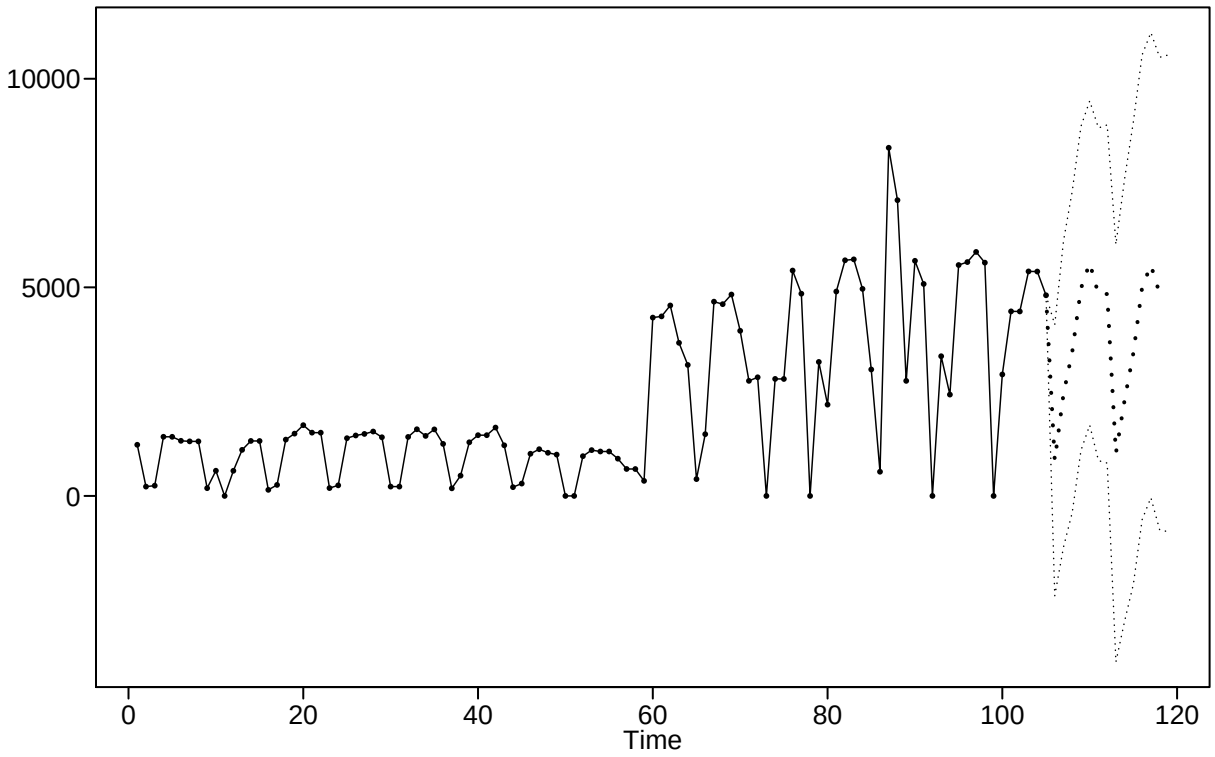
Time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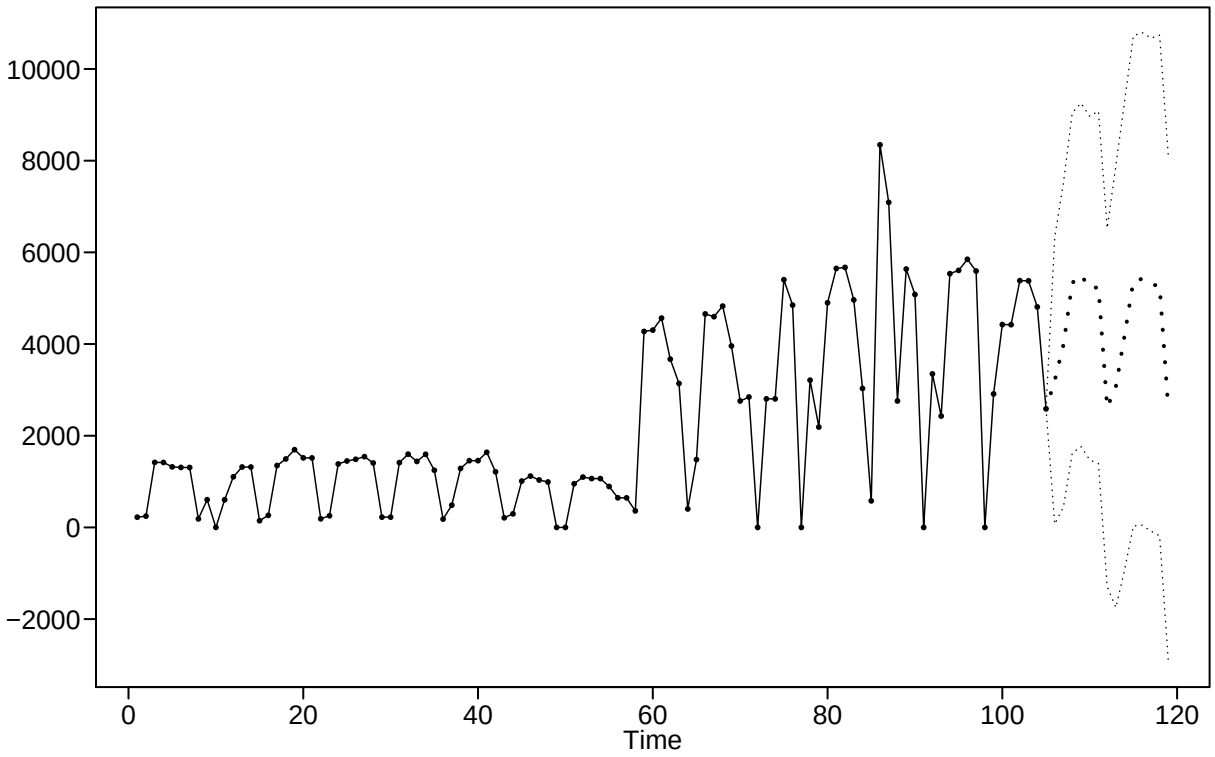
Time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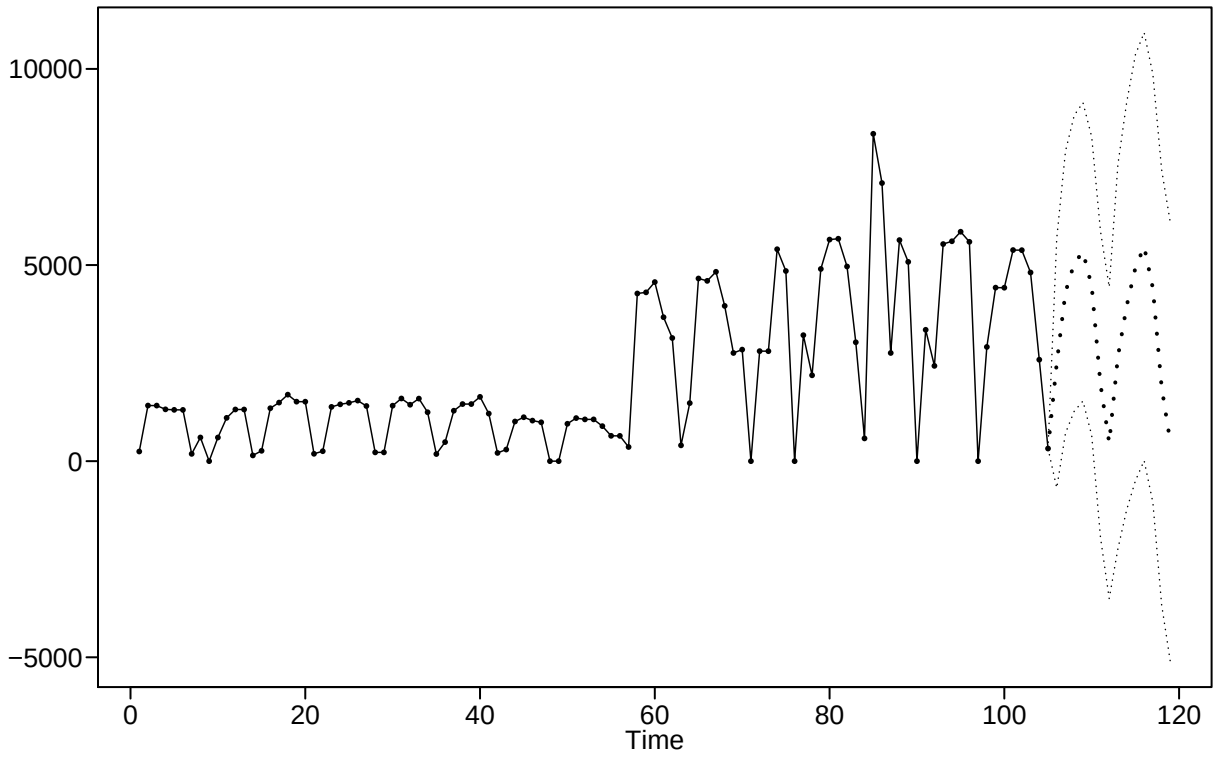
Time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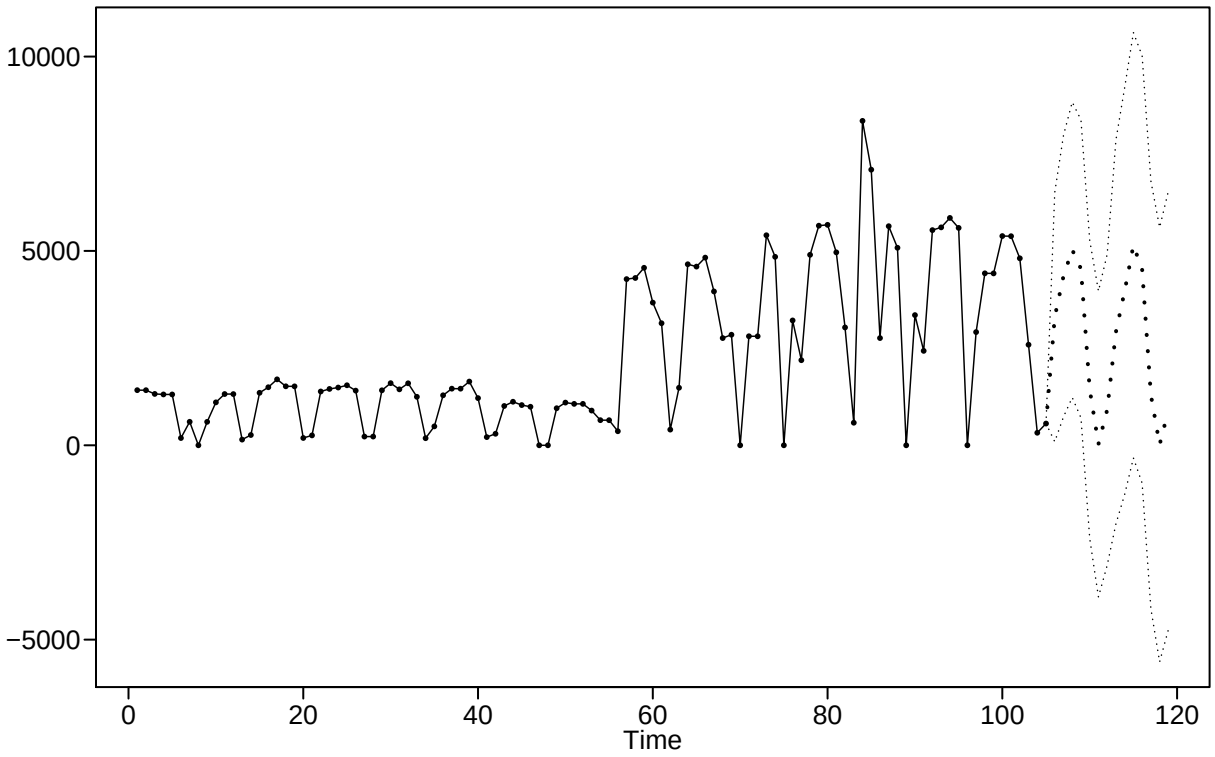
Time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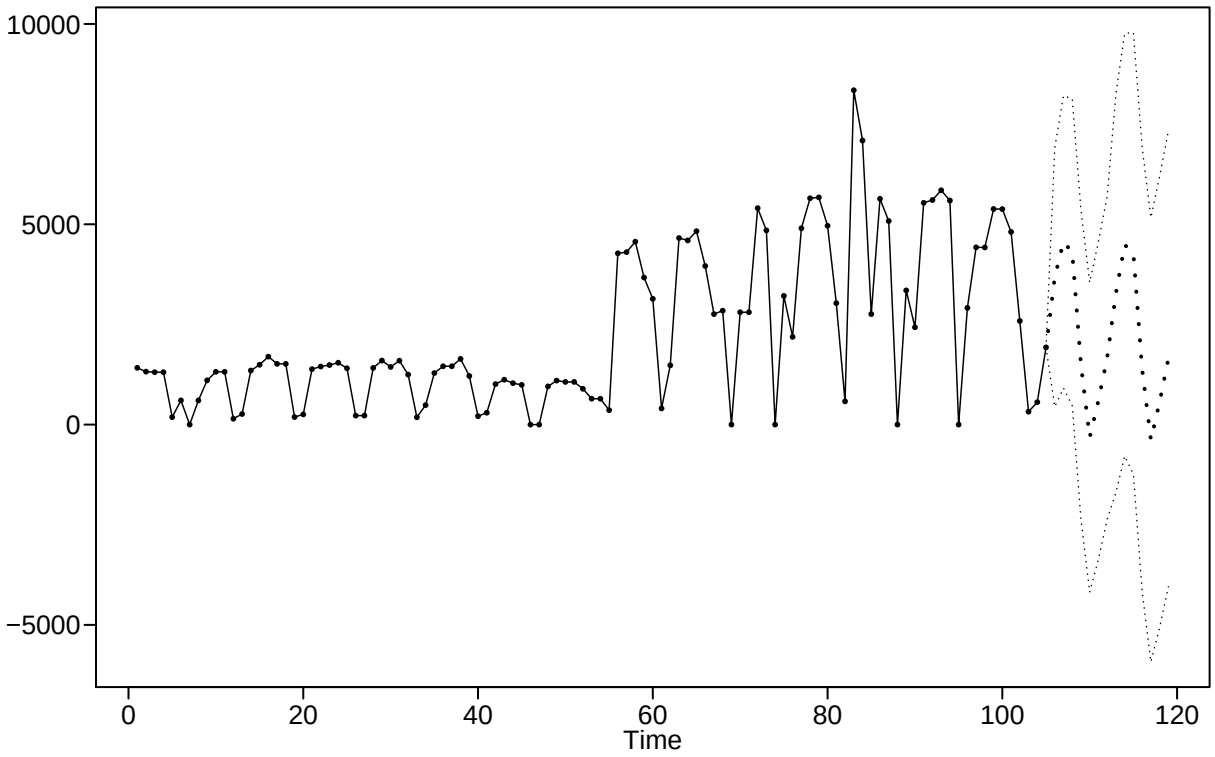
Time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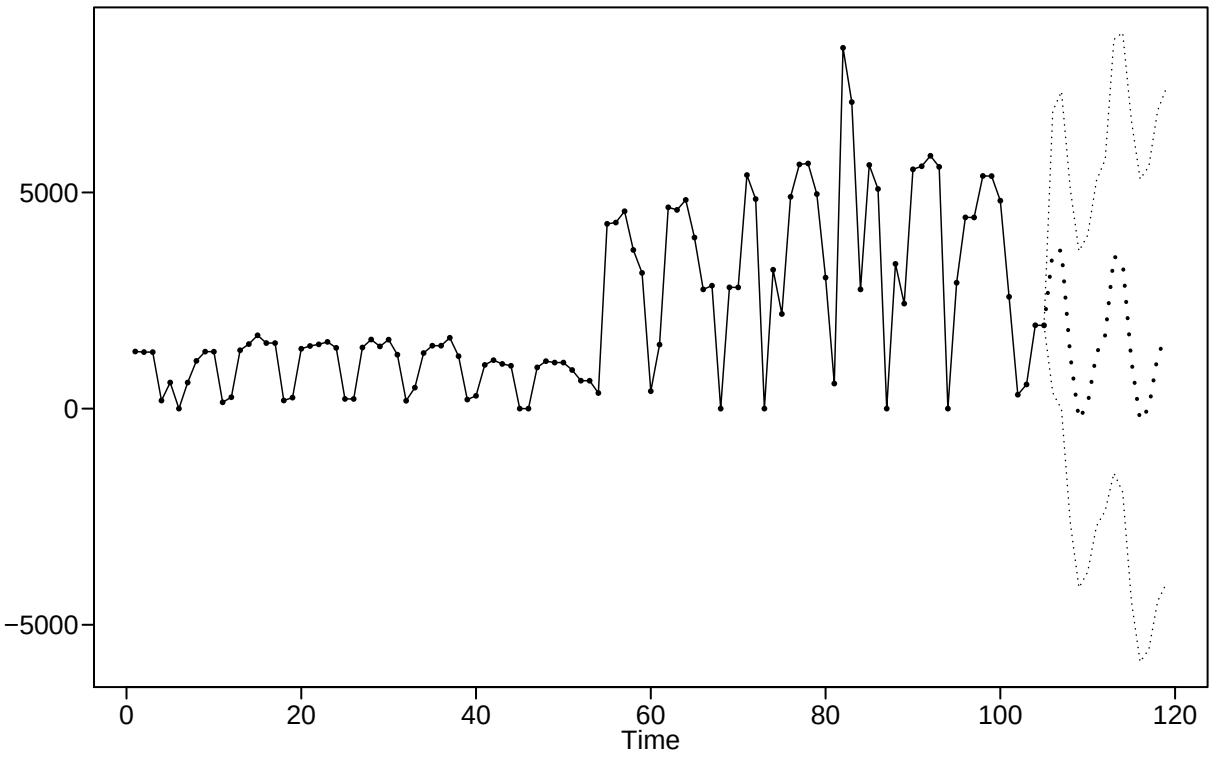
Time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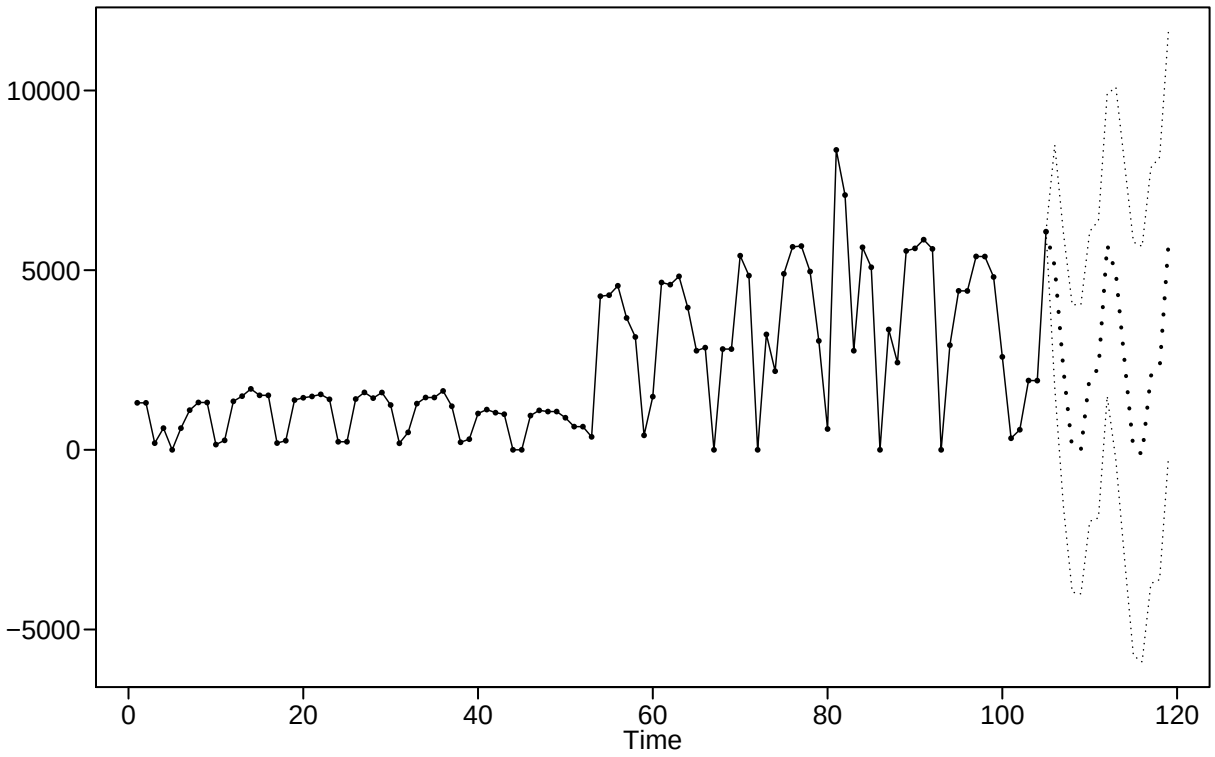
Time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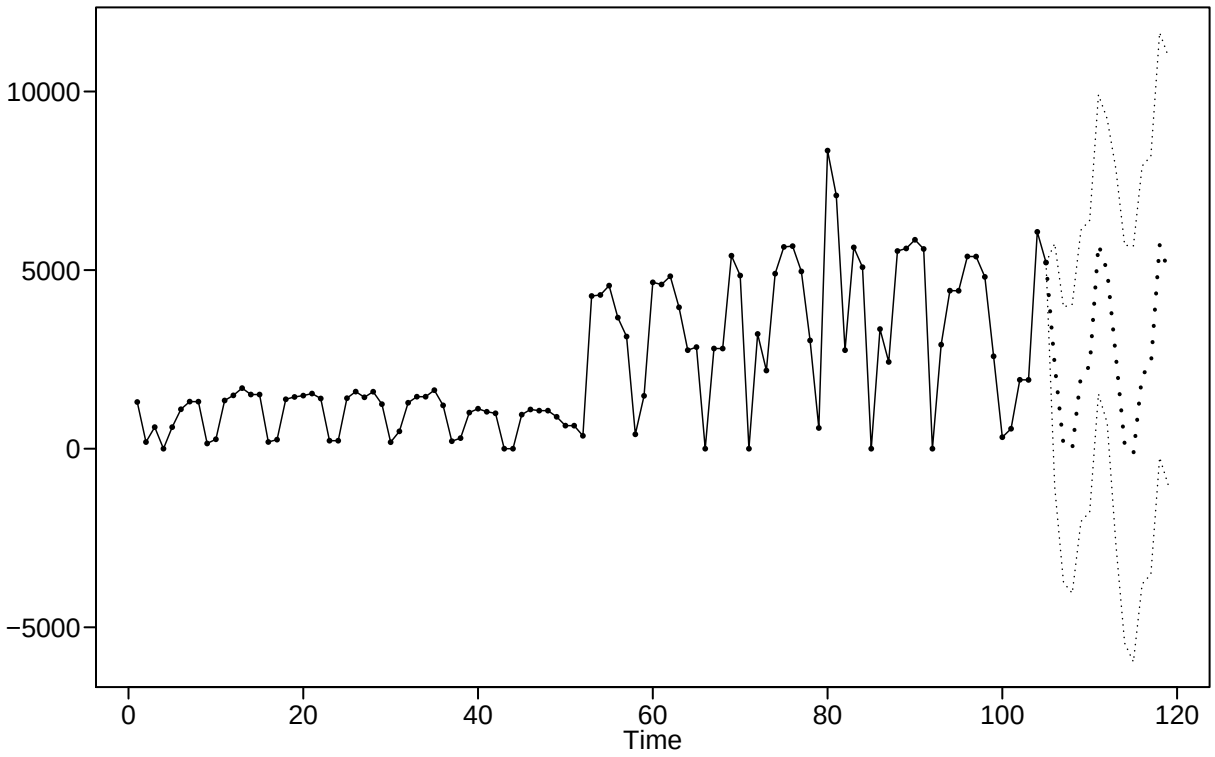
Time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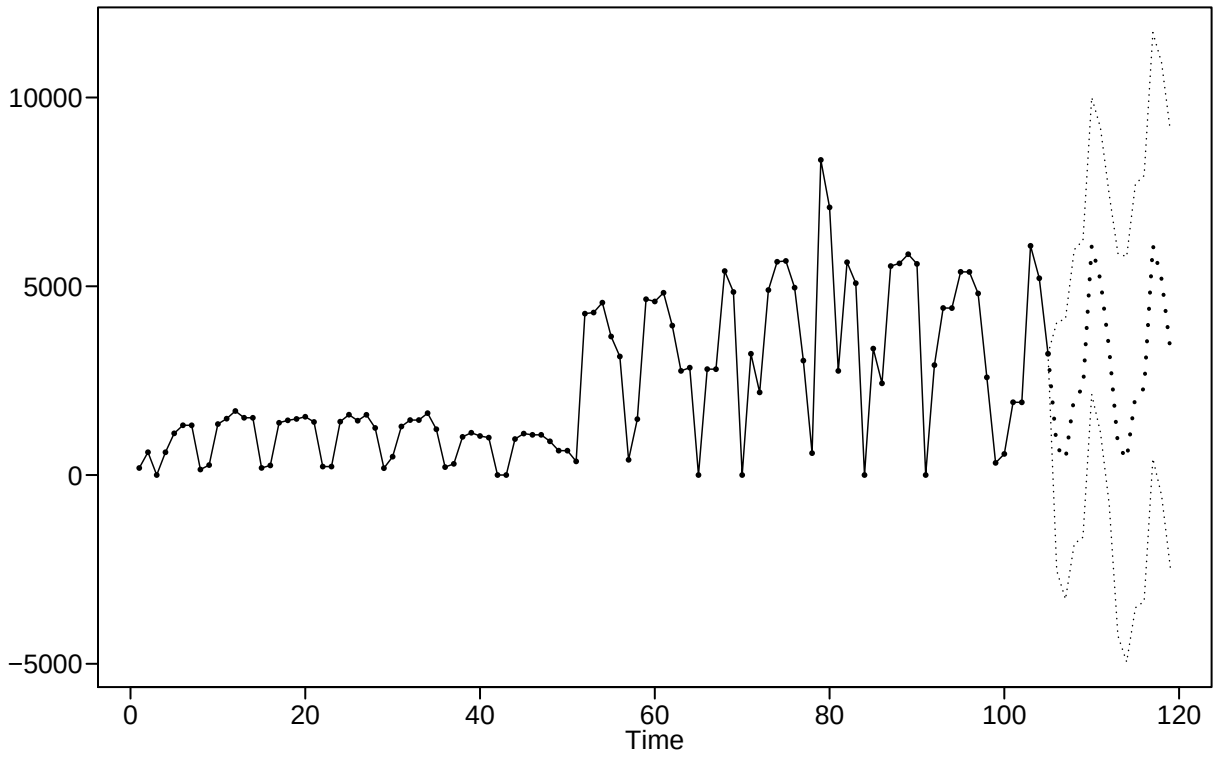
Time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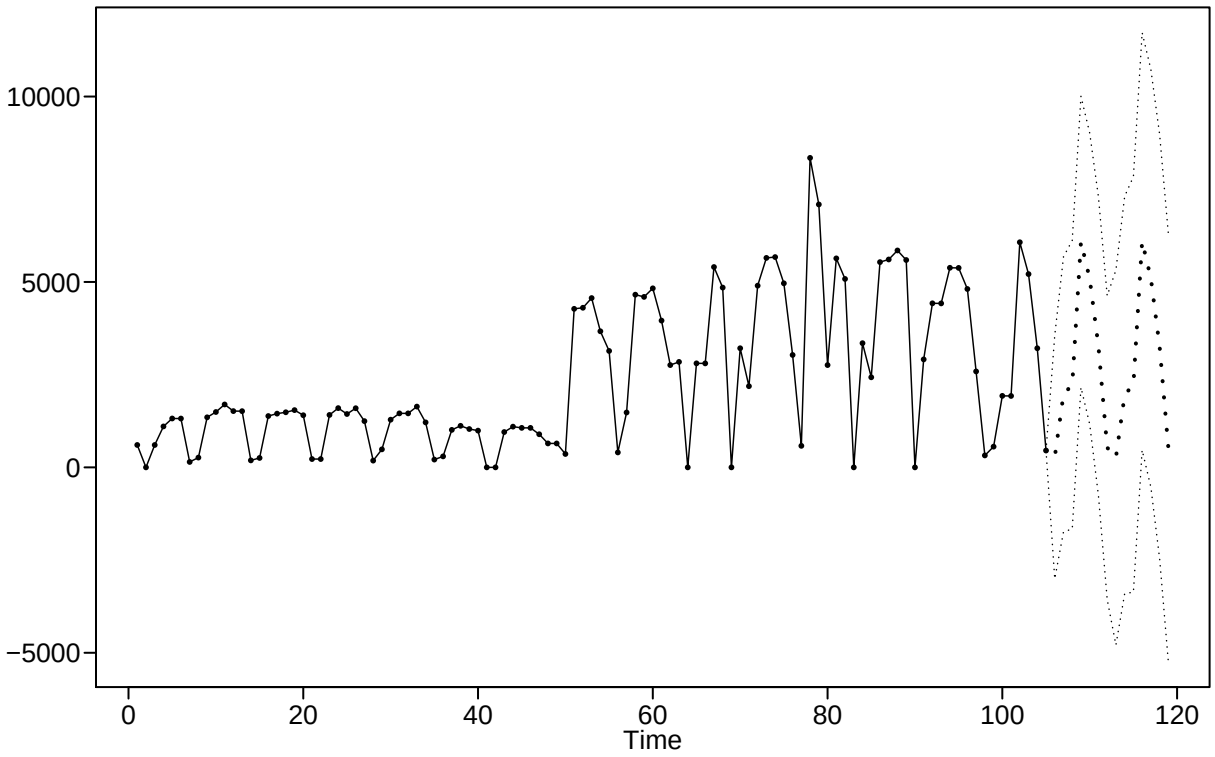
Time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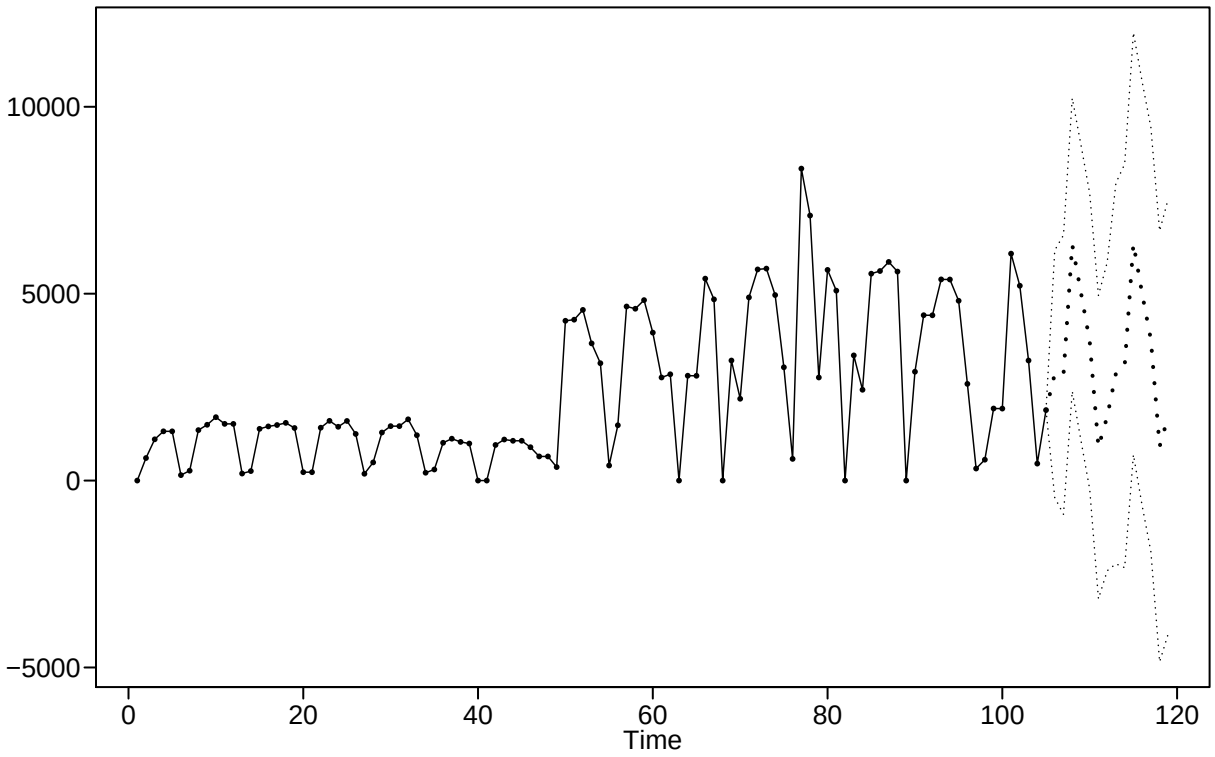
Time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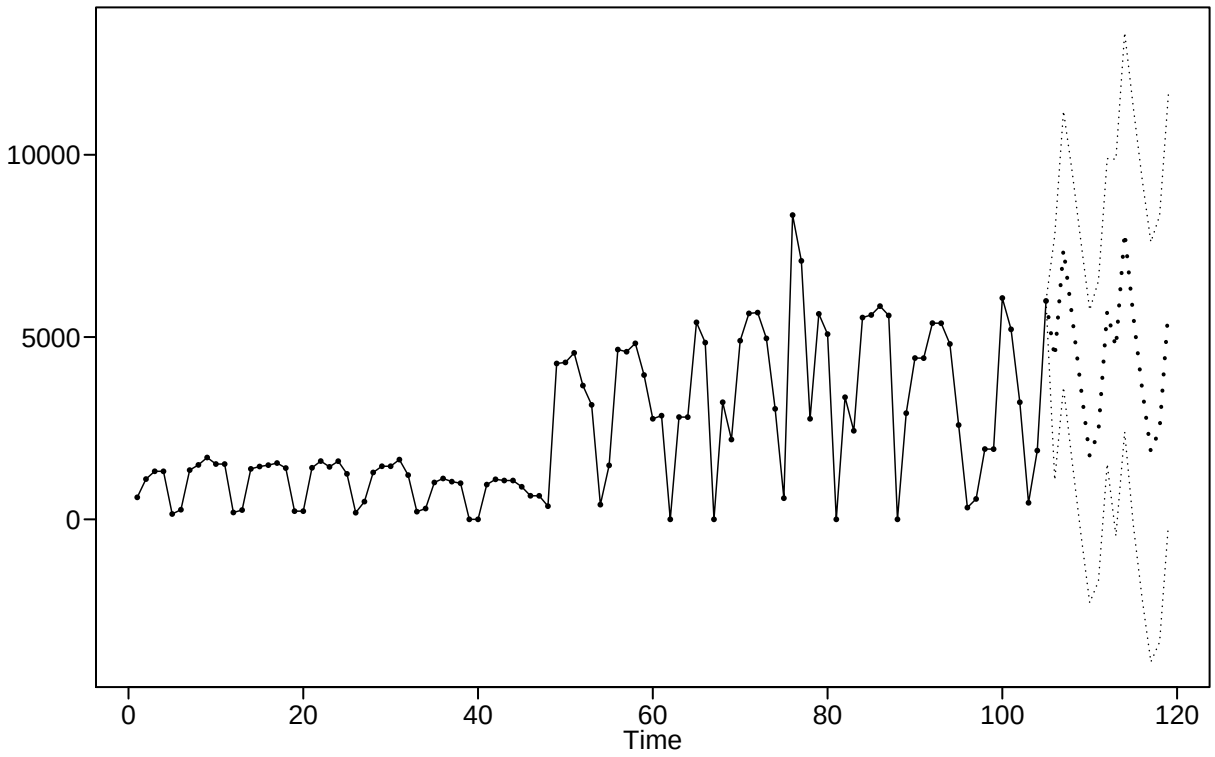
Time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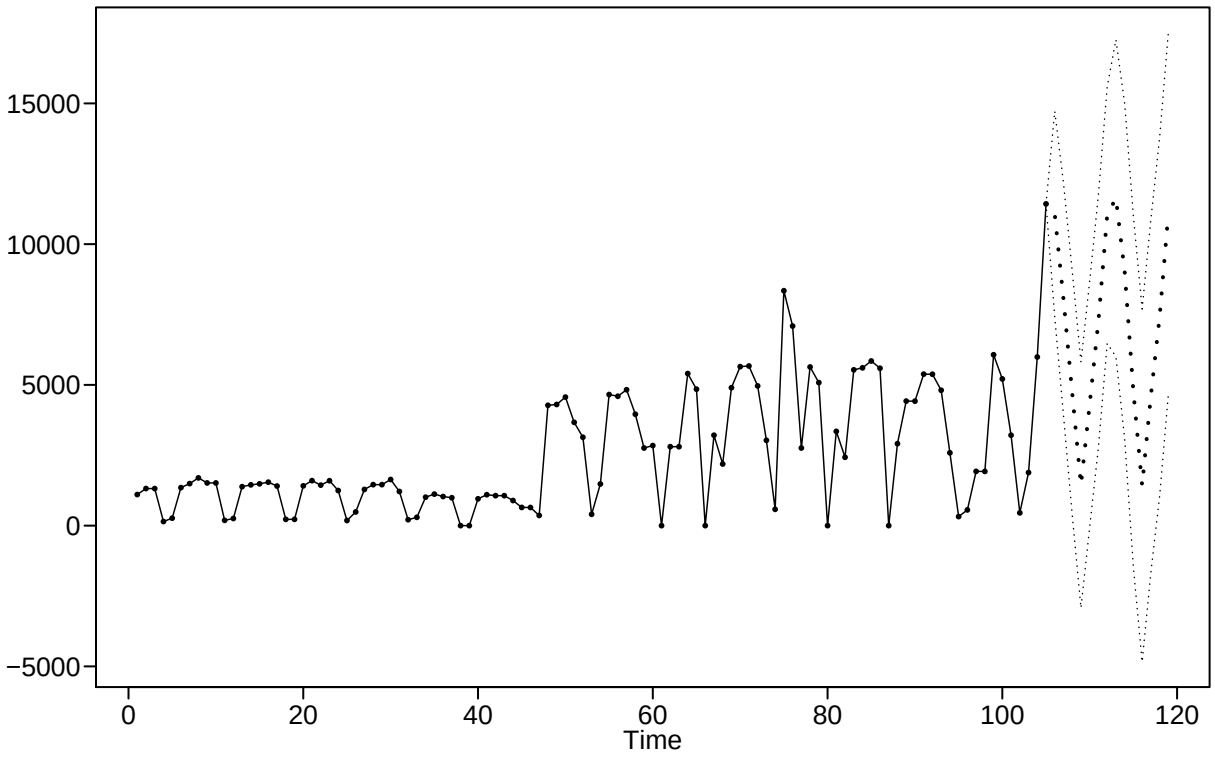
Time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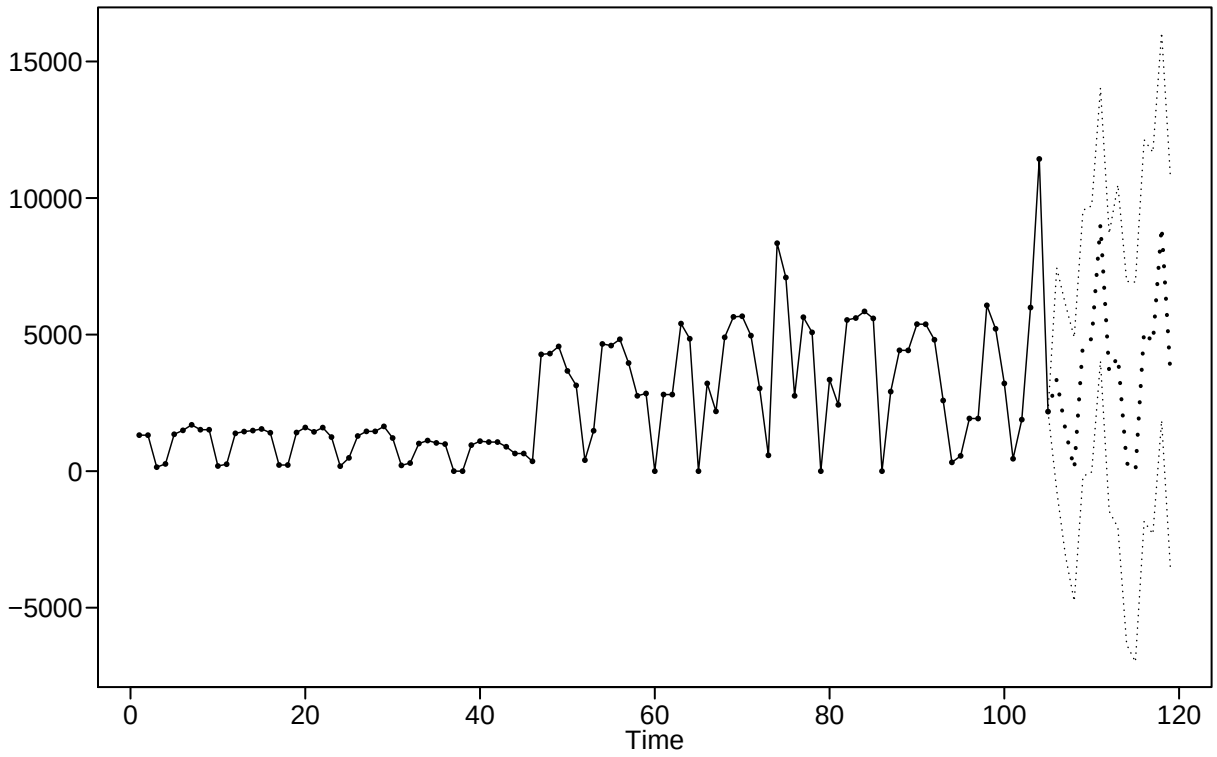
Time


15000
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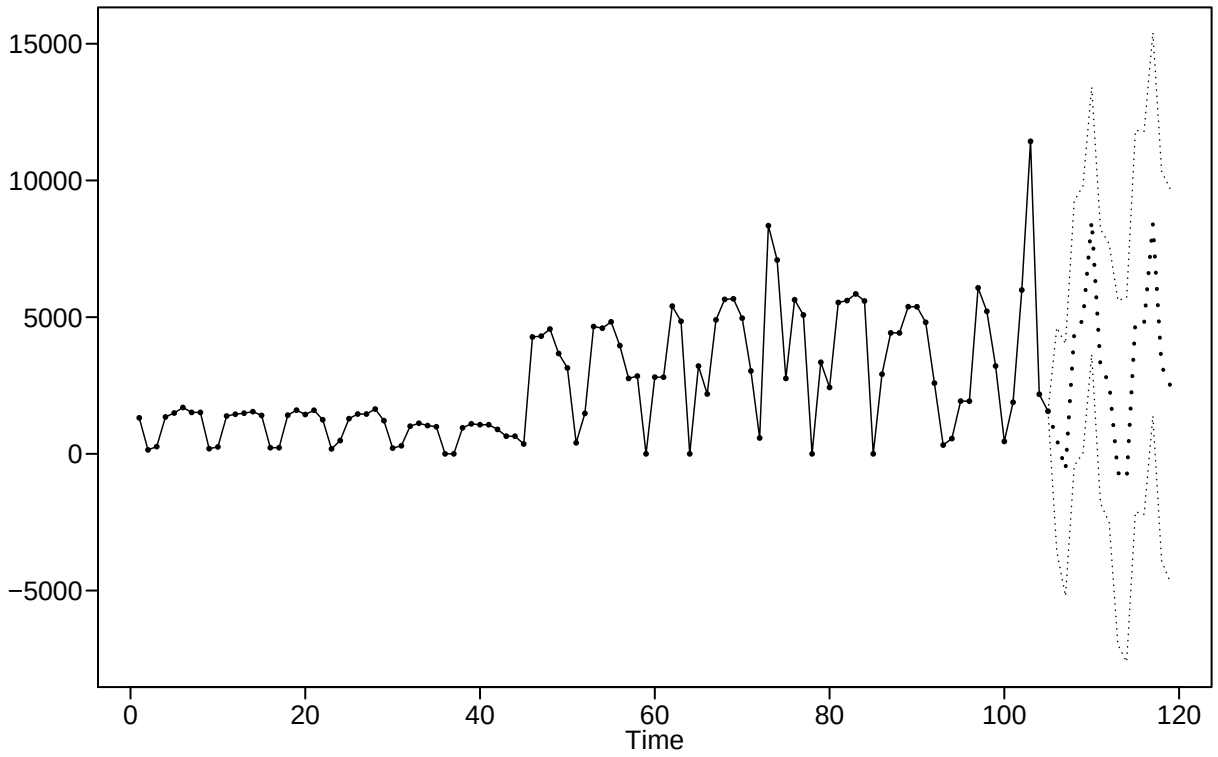
Time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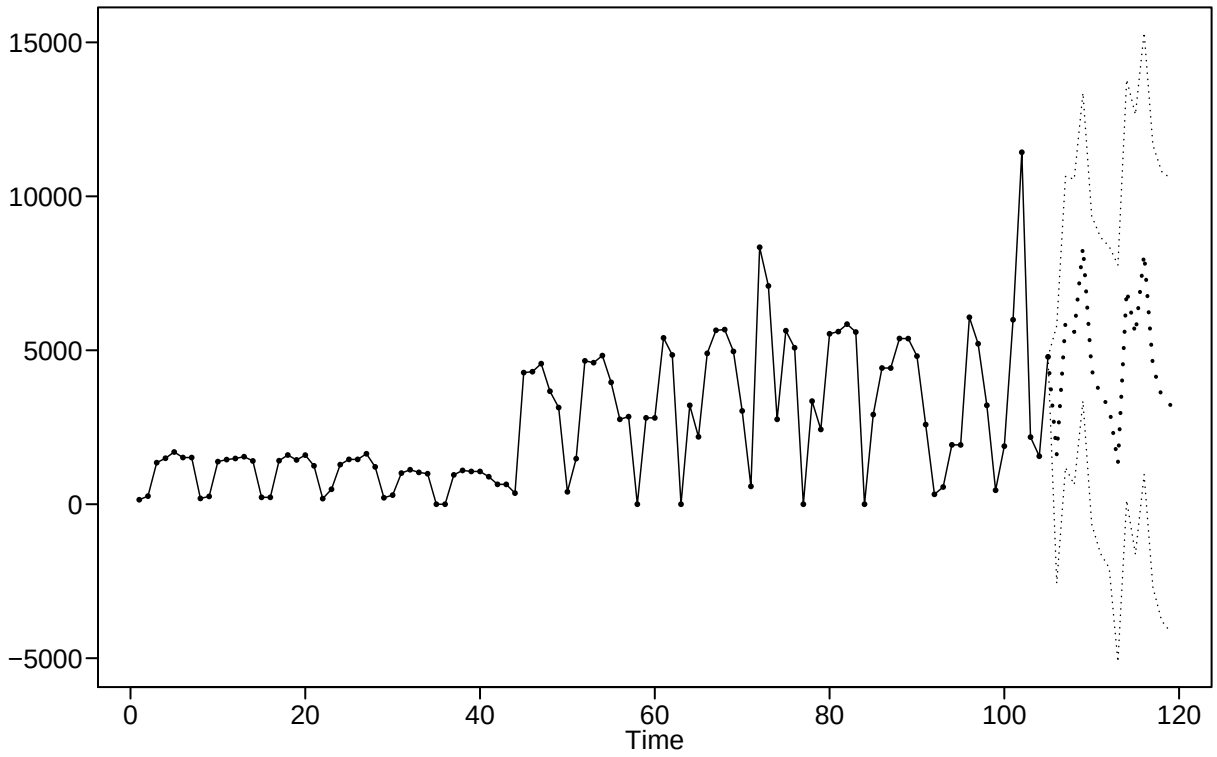
Time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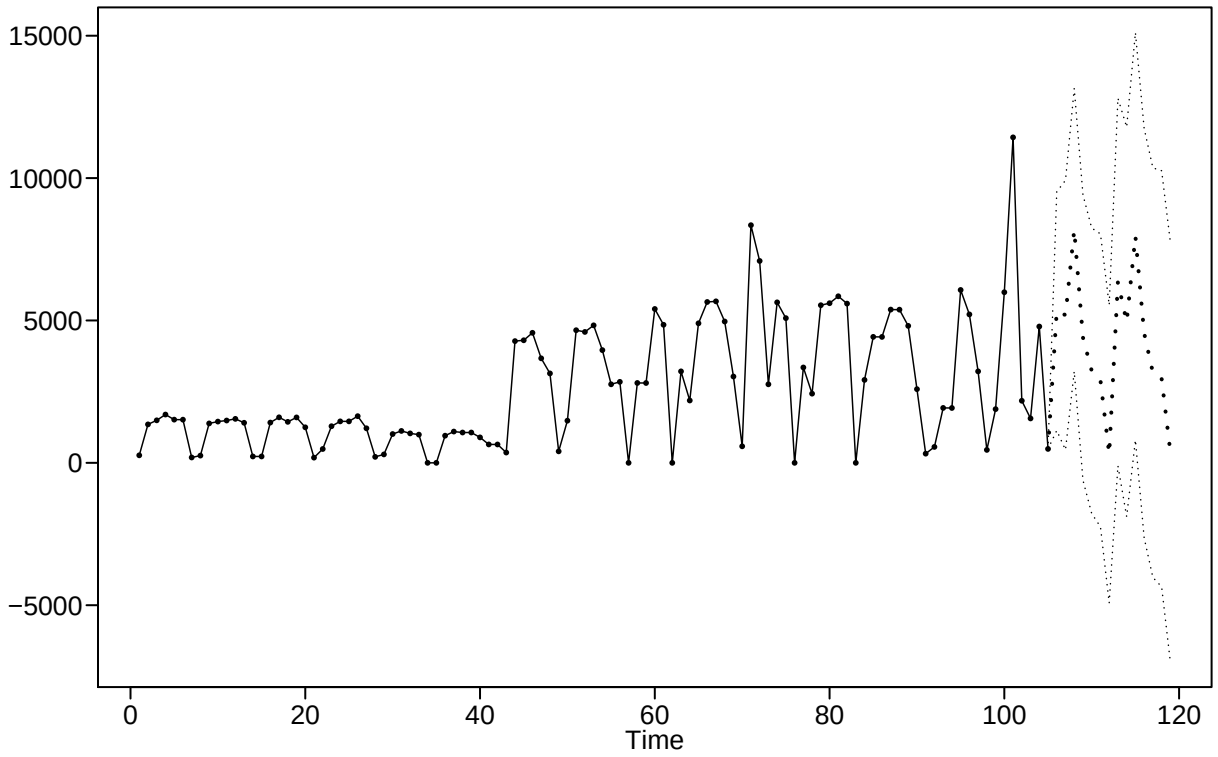
Time


15000
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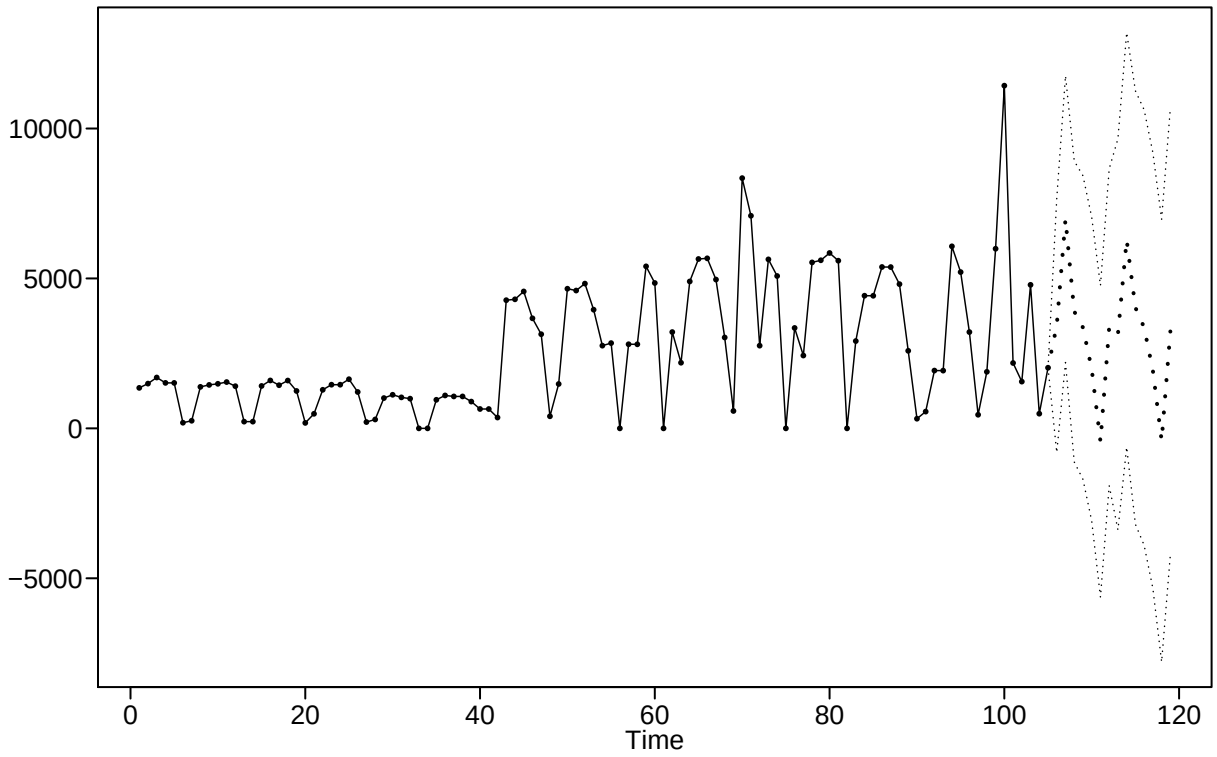
120
Time


10000
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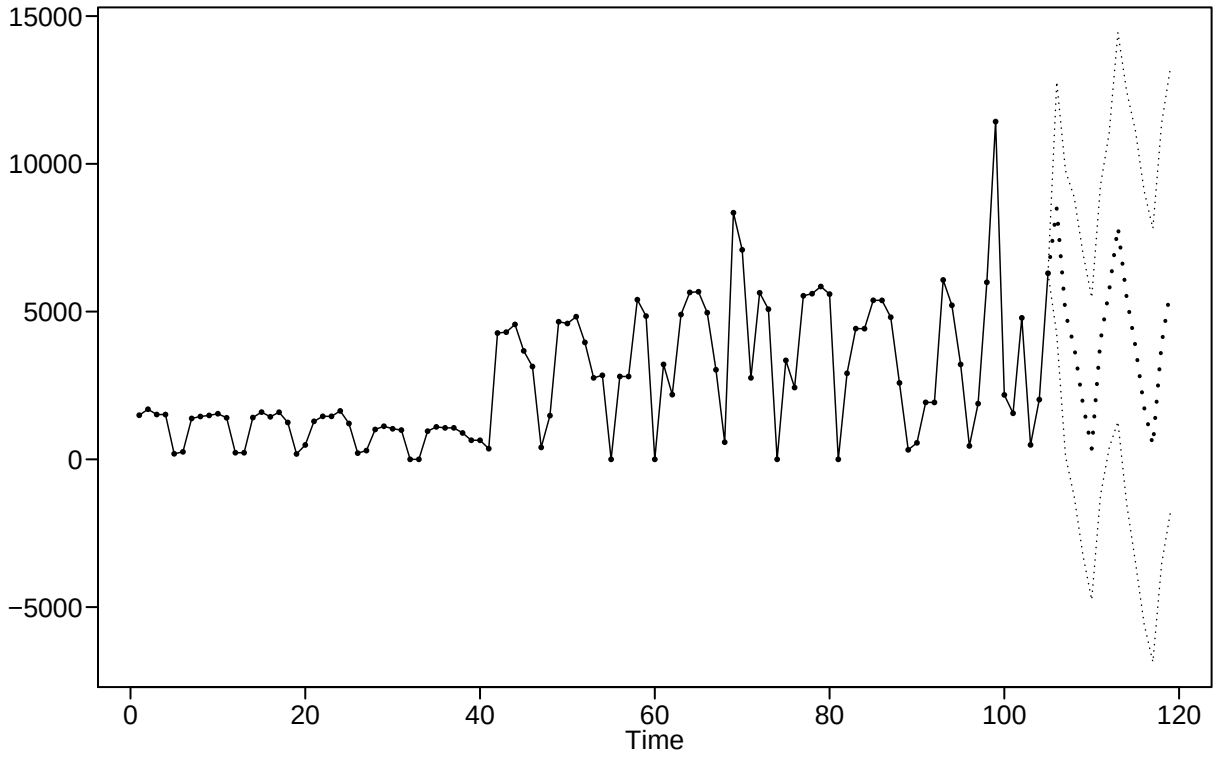
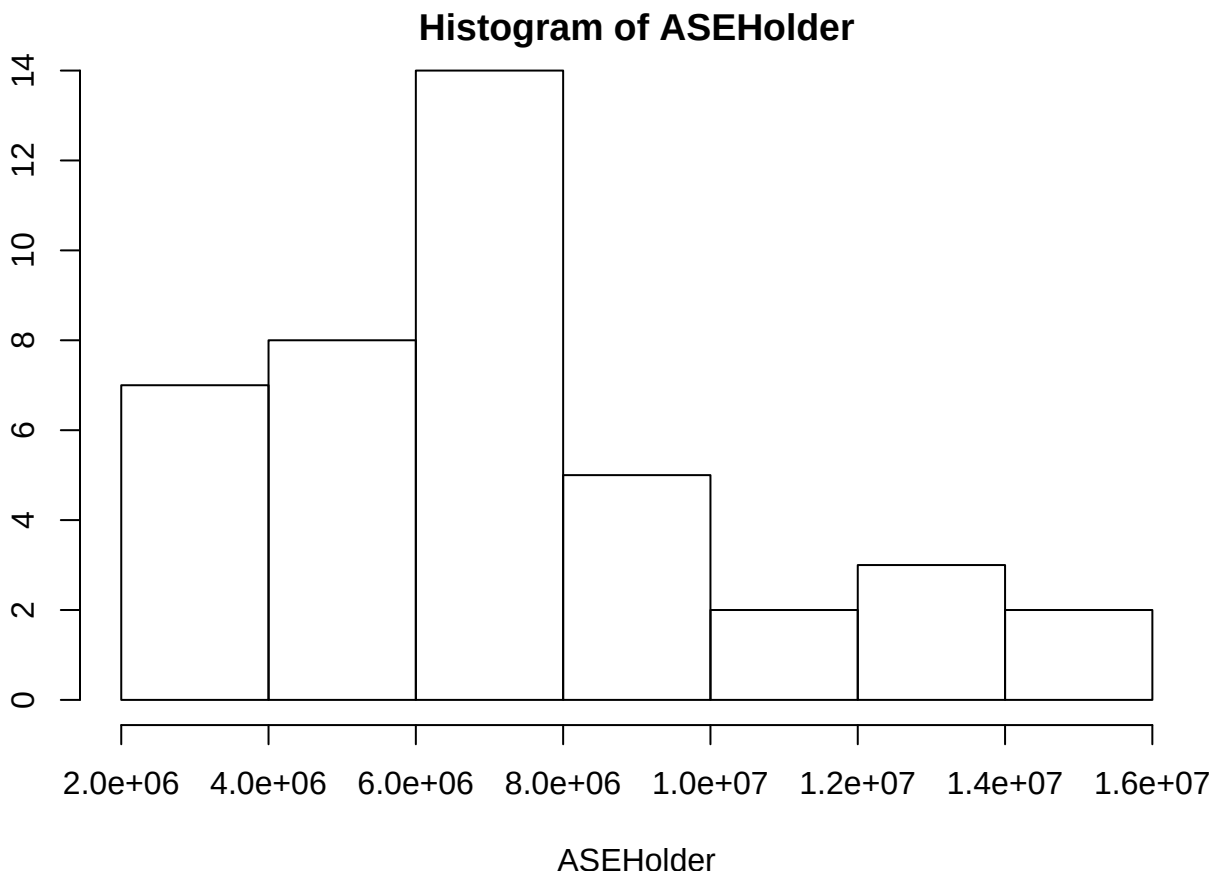
Time




```
ASEHolder
```

```
##  [1]  4552401  4931183  5687139  6954320  9828927  8295263  6201609
##  [8]  5770508  6098024  2672677  3066477  2471467  3229319  3697920
## [15]  3893155  4141832  4489189  5114689  7950097  3666326  6244388
## [22]  6684121  7469068  8761558  6868112  7854238 10384826 14330213
## [29] 12186489 12053530 11853100 12134345  9701193  7344995 15381765
## [36]  6340228  8311406  6246123  6054511  6136995  4192003
```

```
hist(ASEHolder)
```



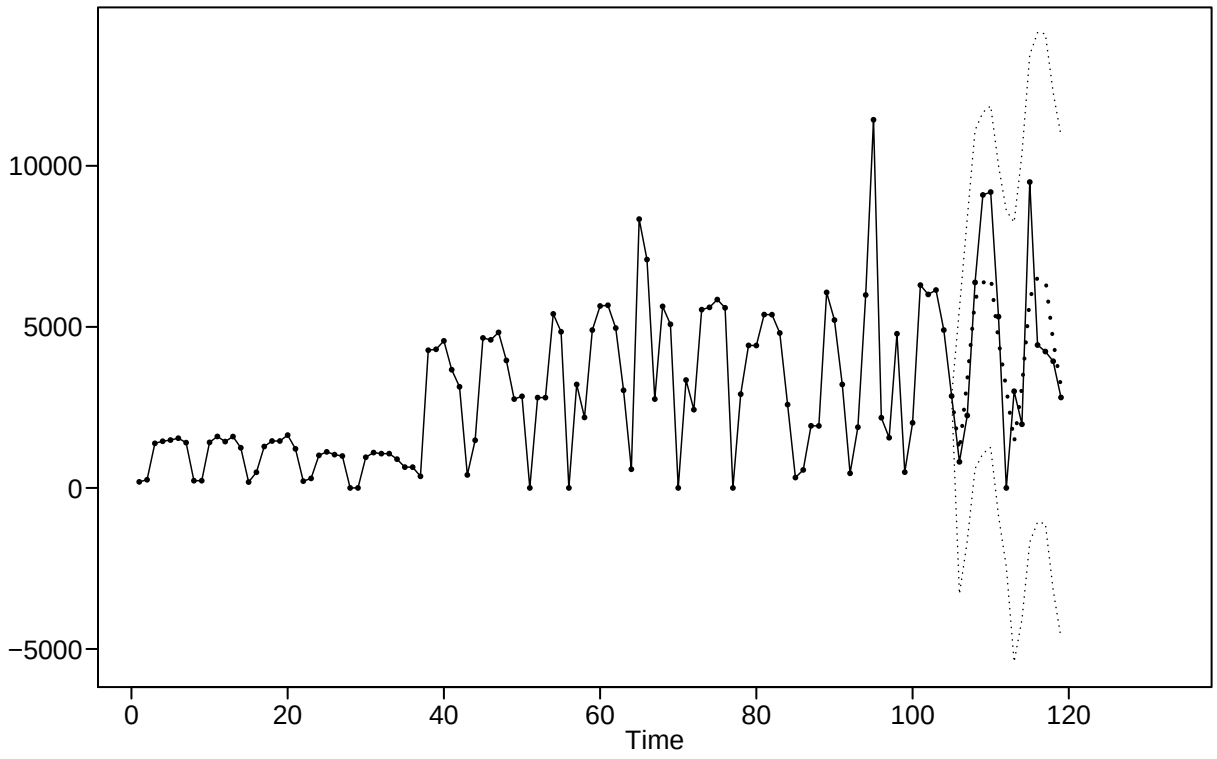

```
WindowedASE = mean(ASEHolder)

summary(ASEHolder)
```

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
##  2471467  4552401  6246123  7054774  8311406 15381765
```

```
WindowedASE
```

```
## [1] 7054774
```

```
# Visualization
i = 45
fs = fore.aruma.wge(x[i:(i+(trainingSize+horizon)-1)],phi = phis, theta = thetas, s = s, d = d,n.ahead =
```

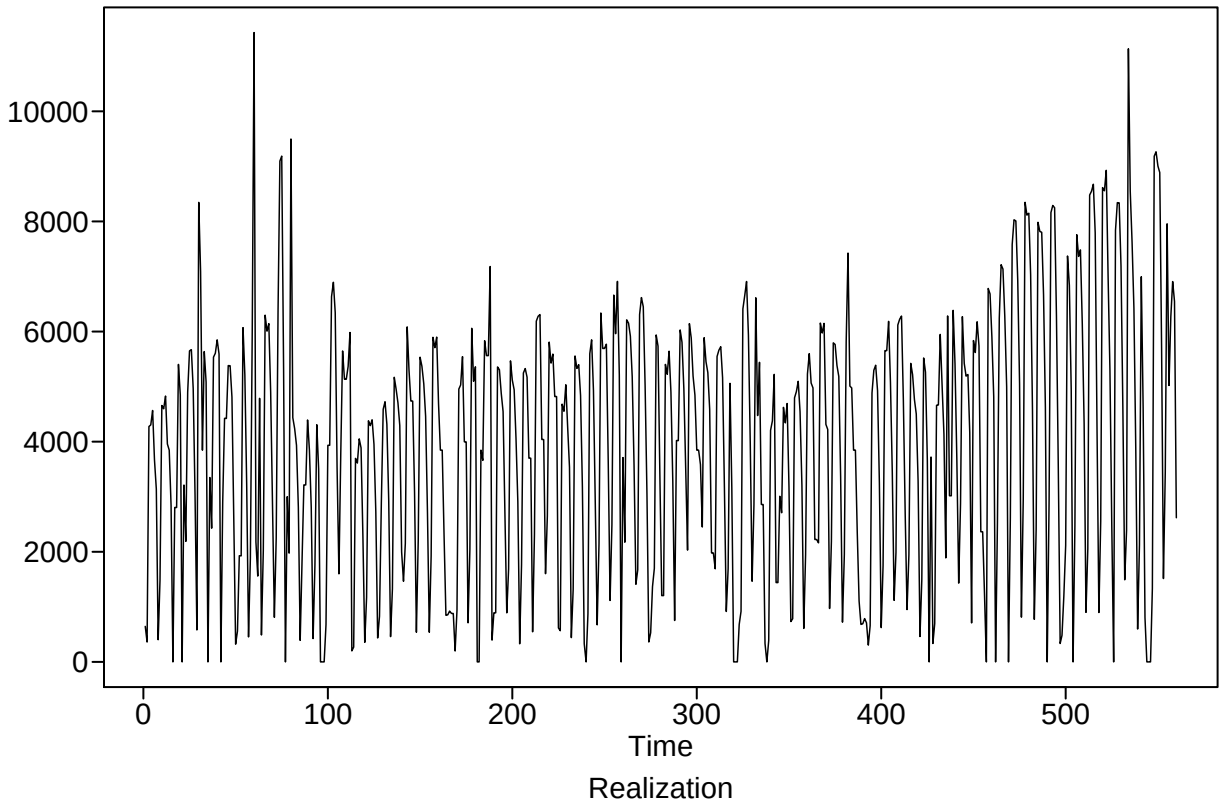



```
ASE = mean((x[(i+trainingSize):(i+(trainingSize+horizon)-1)] - fs$f )^2)
ASE
```

```
## [1] 3786073
```

#Final Project: Slides 7-12 - Removed summer semester and winter - Kept Weeks 1-16 - Reviewing the revised dataset - ACF & SD, transformation

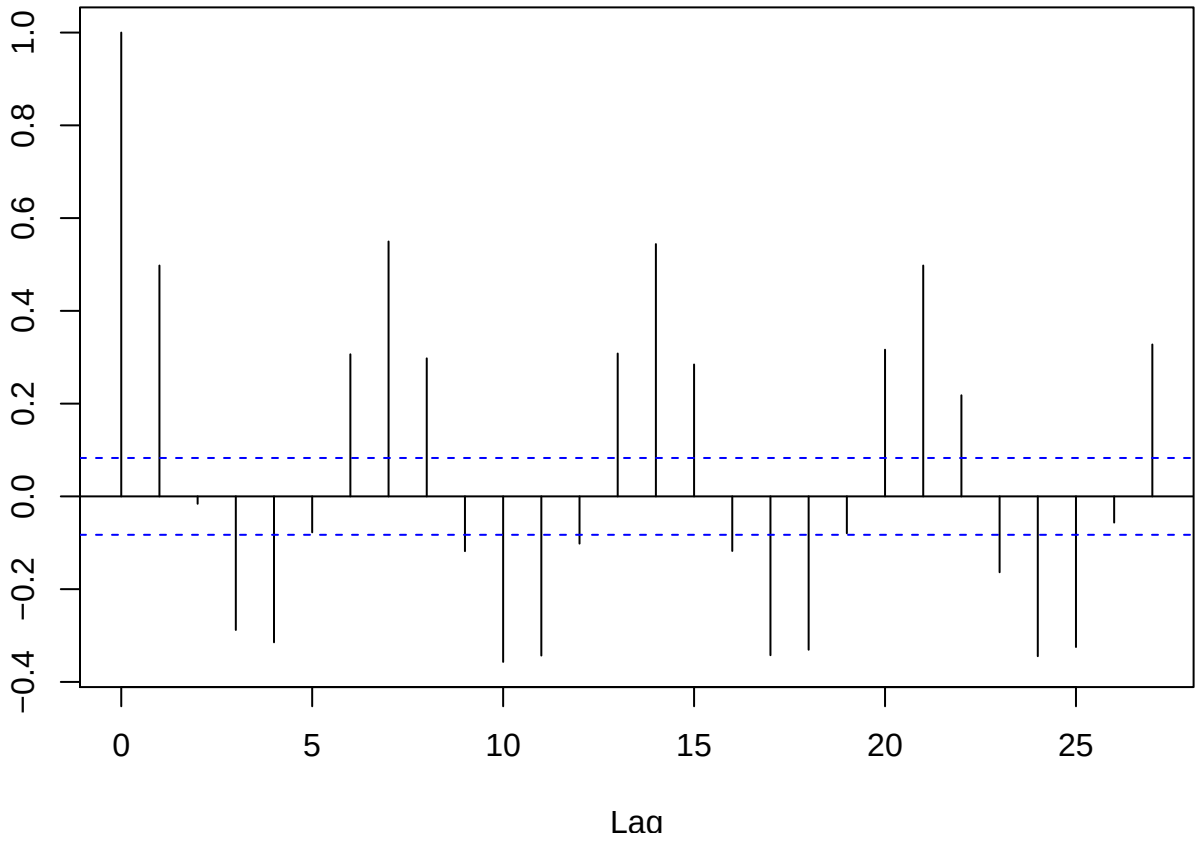
```
X <- read.csv("~/Desktop/fondren_reg_sem.csv")

plotts.wge(X$visitors)
```



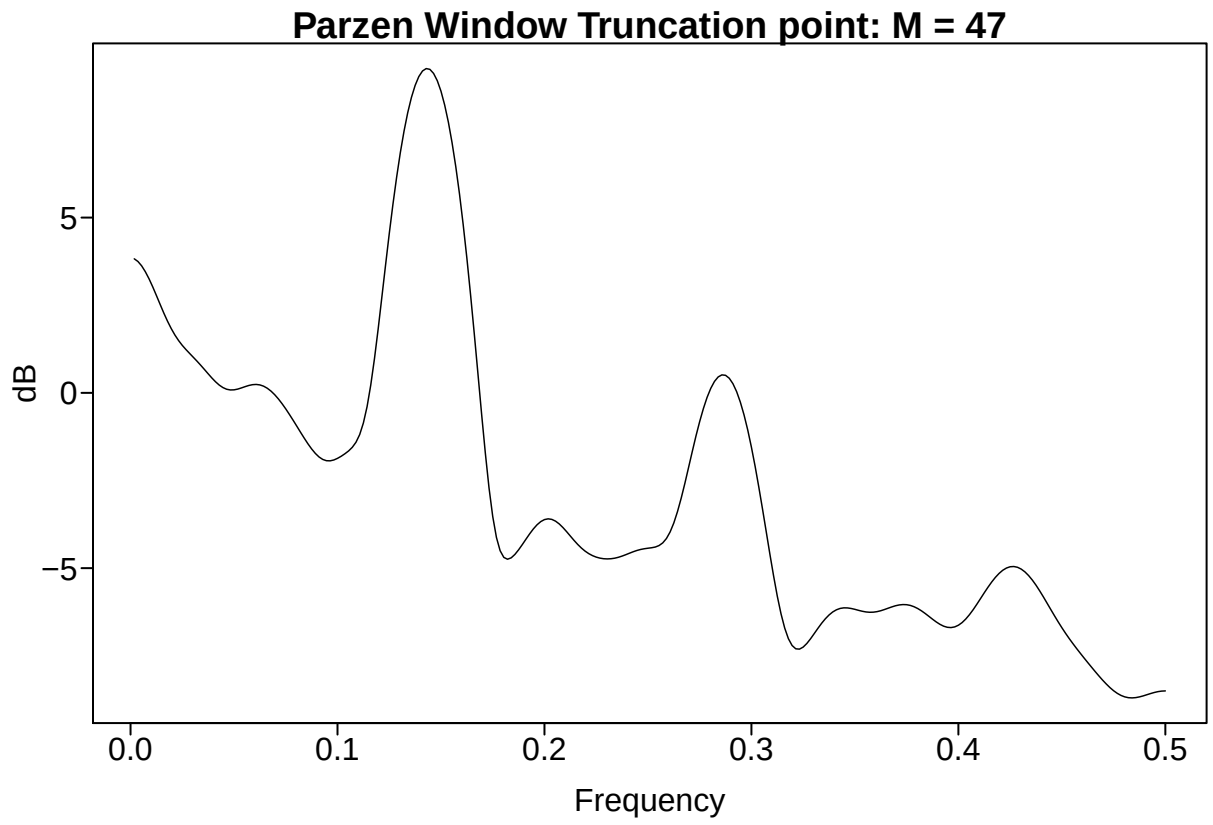

```
mean(X$visitors)
```

```
## [1] 3916.712
```

```
acf(X$visitors)
```




```
parzen.wge(X$visitors)
```




```
## $freq
##   [1] 0.001785714 0.003571429 0.005357143 0.007142857 0.008928571
##   [6] 0.010714286 0.012500000 0.014285714 0.016071429 0.017857143
##  [11] 0.019642857 0.021428571 0.023214286 0.025000000 0.026785714
##  [16] 0.028571429 0.030357143 0.032142857 0.033928571 0.035714286
##  [21] 0.037500000 0.039285714 0.041071429 0.042857143 0.044642857
##  [26] 0.046428571 0.048214286 0.050000000 0.051785714 0.053571429
##  [31] 0.055357143 0.057142857 0.058928571 0.060714286 0.062500000
##  [36] 0.064285714 0.066071429 0.067857143 0.069642857 0.071428571
##  [41] 0.073214286 0.075000000 0.076785714 0.078571429 0.080357143
##  [46] 0.082142857 0.083928571 0.085714286 0.087500000 0.089285714
##  [51] 0.091071429 0.092857143 0.094642857 0.096428571 0.098214286
##  [56] 0.100000000 0.101785714 0.103571429 0.105357143 0.107142857
##  [61] 0.108928571 0.110714286 0.112500000 0.114285714 0.116071429
##  [66] 0.117857143 0.119642857 0.121428571 0.123214286 0.125000000
##  [71] 0.126785714 0.128571429 0.130357143 0.132142857 0.133928571
##  [76] 0.135714286 0.137500000 0.139285714 0.141071429 0.142857143
##  [81] 0.144642857 0.146428571 0.148214286 0.150000000 0.151785714
##  [86] 0.153571429 0.155357143 0.157142857 0.158928571 0.160714286
##  [91] 0.162500000 0.164285714 0.166071429 0.167857143 0.169642857
##  [96] 0.171428571 0.173214286 0.175000000 0.176785714 0.178571429
## [101] 0.180357143 0.182142857 0.183928571 0.185714286 0.187500000
## [106] 0.189285714 0.191071429 0.192857143 0.194642857 0.196428571
## [111] 0.198214286 0.200000000 0.201785714 0.203571429 0.205357143
## [116] 0.207142857 0.208928571 0.210714286 0.212500000 0.214285714
## [121] 0.216071429 0.217857143 0.219642857 0.221428571 0.223214286
```

```
## [126] 0.225000000 0.226785714 0.228571429 0.230357143 0.232142857
## [131] 0.233928571 0.235714286 0.237500000 0.239285714 0.241071429
## [136] 0.242857143 0.244642857 0.246428571 0.248214286 0.250000000
## [141] 0.251785714 0.253571429 0.255357143 0.257142857 0.258928571
## [146] 0.260714286 0.262500000 0.264285714 0.266071429 0.267857143
## [151] 0.269642857 0.271428571 0.273214286 0.275000000 0.276785714
## [156] 0.278571429 0.280357143 0.282142857 0.283928571 0.285714286
## [161] 0.287500000 0.289285714 0.291071429 0.292857143 0.294642857
## [166] 0.296428571 0.298214286 0.300000000 0.301785714 0.303571429
## [171] 0.305357143 0.307142857 0.308928571 0.310714286 0.312500000
## [176] 0.314285714 0.316071429 0.317857143 0.319642857 0.321428571
## [181] 0.323214286 0.325000000 0.326785714 0.328571429 0.330357143
## [186] 0.332142857 0.333928571 0.335714286 0.337500000 0.339285714
## [191] 0.341071429 0.342857143 0.344642857 0.346428571 0.348214286
## [196] 0.350000000 0.351785714 0.353571429 0.355357143 0.357142857
## [201] 0.358928571 0.360714286 0.362500000 0.364285714 0.366071429
## [206] 0.367857143 0.369642857 0.371428571 0.373214286 0.375000000
## [211] 0.376785714 0.378571429 0.380357143 0.382142857 0.383928571
## [216] 0.385714286 0.387500000 0.389285714 0.391071429 0.392857143
## [221] 0.394642857 0.396428571 0.398214286 0.400000000 0.401785714
## [226] 0.403571429 0.405357143 0.407142857 0.408928571 0.410714286
## [231] 0.412500000 0.414285714 0.416071429 0.417857143 0.419642857
## [236] 0.421428571 0.423214286 0.425000000 0.426785714 0.428571429
## [241] 0.430357143 0.432142857 0.433928571 0.435714286 0.437500000
## [246] 0.439285714 0.441071429 0.442857143 0.444642857 0.446428571
## [251] 0.448214286 0.450000000 0.451785714 0.453571429 0.455357143
## [256] 0.457142857 0.458928571 0.460714286 0.462500000 0.464285714
## [261] 0.466071429 0.467857143 0.469642857 0.471428571 0.473214286
## [266] 0.475000000 0.476785714 0.478571429 0.480357143 0.482142857
## [271] 0.483928571 0.485714286 0.487500000 0.489285714 0.491071429
## [276] 0.492857143 0.494642857 0.496428571 0.498214286 0.500000000
##
## $pzgram
##   [1]  3.82433926  3.74787441  3.62370077  3.45674756  3.25391590
##   [6]  3.02395144  2.77710891  2.52451837  2.27721752  2.04492854
##  [11]  1.83480546  1.65048618  1.49176336  1.35501272  1.23426515
##  [16]  1.12261749  1.01363448  0.90248279  0.78667097  0.66637110
##  [21]  0.54434216  0.42548169  0.31603677  0.22253990  0.15060825
##  [26]  0.10382627  0.08296822  0.08575704  0.10720569  0.14041262
##  [31]  0.17757173  0.21095126  0.23367211  0.24021658  0.22667751
##  [36]  0.19079765  0.13185670  0.05045509 -0.05176750 -0.17244589
##  [41] -0.30880060 -0.45790425 -0.61685633 -0.78282372 -0.95292479
##  [46] -1.12397296 -1.29214649 -1.45270599 -1.59992187 -1.72737563
##  [51] -1.82872975 -1.89890060 -1.93534515 -1.93898470 -1.91427299
##  [56] -1.86812424 -1.80774724 -1.73769832 -1.65659288 -1.55404048
##  [61] -1.40874948 -1.18943938 -0.86053225 -0.39299937  0.22349027
##  [66]  0.97439699  1.82449710  2.72912307  3.64518121  4.53745748
##  [71]  5.38020449  6.15602665  6.85387340  7.46710771  7.99198327
##  [76]  8.42655324  8.76992764  9.02178285  9.18204367  9.25068048
##  [81]  9.22758327  9.11248806  8.90494214  8.60430255  8.20976979
##  [86]  7.72046688  7.13558470  6.45463031  5.67783881  4.80684470
##  [91]  3.84575674  2.80283123  1.69294697  0.54091830 -0.61494509
##  [96] -1.72106211 -2.71255565 -3.52681148 -4.12404698 -4.50213613
## [101] -4.69327699 -4.74580407 -4.70589254 -4.60860520 -4.47754664
```

```
## [106] -4.32840083 -4.17271717 -4.02038518 -3.88062001 -3.76189626
## [111] -3.67138783 -3.61434177 -3.59361772 -3.60946956 -3.65956704
## [116] -3.73923555 -3.84189974 -3.95971966 -4.08438732 -4.20800384
## [121] -4.32390162 -4.42724506 -4.51527095 -4.58712100 -4.64334030
## [126] -4.68521139 -4.71412577 -4.73115710 -4.73692143 -4.73171986
## [131] -4.71588268 -4.69018509 -4.65618922 -4.61638964 -4.57409207
## [136] -4.53301916 -4.49669200 -4.46766476 -4.44669735 -4.43195234
## [141] -4.41832357 -4.39706096 -4.35593885 -4.28026644 -4.15494355
## [146] -3.96741113 -3.71078729 -3.38606199 -3.00240412 -2.57546532
## [151] -2.12447943 -1.66930160 -1.22821075 -0.81672652 -0.44727237
## [156] -0.12936724  0.12993881  0.32557377  0.45399744  0.51284096
## [161]  0.50064075  0.41666242  0.26080684  0.03359286 -0.26378432
## [166] -0.62931455 -1.05994445 -1.55124668 -2.09697629 -2.68851716
## [171] -3.31425687 -3.95899840 -4.60363110 -5.22541963 -5.79934403
## [176] -6.30076863 -6.70918475 -7.01198774 -7.20678042 -7.30115255
## [181] -7.31013087 -7.25256684 -7.14786206 -7.01379651 -6.86549860
## [186] -6.71521042 -6.57245625 -6.44433820 -6.33581739 -6.24993326
## [191] -6.18796409 -6.14955382 -6.13283773 -6.13460089 -6.15050223
## [196] -6.17539019 -6.20372168 -6.23007156 -6.24968691 -6.25900955
## [201] -6.25607389 -6.24069953 -6.21443829 -6.18029237 -6.14227036
## [206] -6.10487253 -6.07259243 -6.04949495 -6.03889898 -6.04316472
## [211] -6.06357028 -6.10025643 -6.15222173 -6.21735693 -6.29251597
## [216] -6.37362858 -6.45586409 -6.53385694 -6.60199979 -6.65479922
## [221] -6.68727332 -6.69535380 -6.67624196 -6.62866648 -6.55300254
## [226] -6.45123607 -6.32678540 -6.18421672 -6.02890205 -5.86666773
## [231] -5.70347046 -5.54512318 -5.39707893 -5.26427015 -5.15099522
## [236] -5.06084117 -4.99663225 -4.96039546 -4.95333690 -4.97582588
## [241] -5.02738702 -5.10670418 -5.21164323 -5.33930422 -5.48611451
## [246] -5.64797387 -5.82045771 -5.99907494 -6.17956365 -6.35819229
## [251] -6.53202330 -6.69909309 -6.85847285 -7.01019586 -7.15506346
## [256] -7.29436477 -7.42955787 -7.56196006 -7.69248556 -7.82145523
## [261] -7.94848987 -8.07248938 -8.19169463 -8.30382562 -8.40628704
## [266] -8.49642739 -8.57183102 -8.63061387 -8.67168648 -8.69494593
## [271] -8.70136455 -8.69295846 -8.67263875 -8.64396801 -8.61085819
## [276] -8.57724963 -8.54680655 -8.52265405 -8.50717067 -8.50184136
```

```
#bic
aic5.wge(X$visitors, type="bic") #initially chooses the ARMA(5,2)
```

```
## ---------WORKING... PLEASE WAIT...
##
##
## Five Smallest Values of  bic

##       p    q       bic
## 18    5    2   14.99332
## 9     2    2   15.04424
## 17    5    1   15.08016
## 12    3    2   15.09156
## 15    4    2   15.09998
```

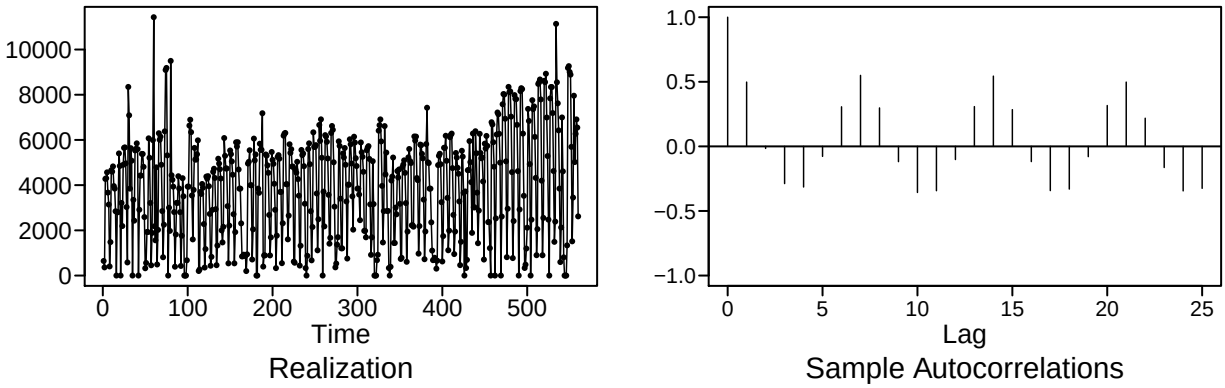
```
#overfitting to address the .14 peak
est.ar.wge(X$visitors, p=10, type="burg")
```

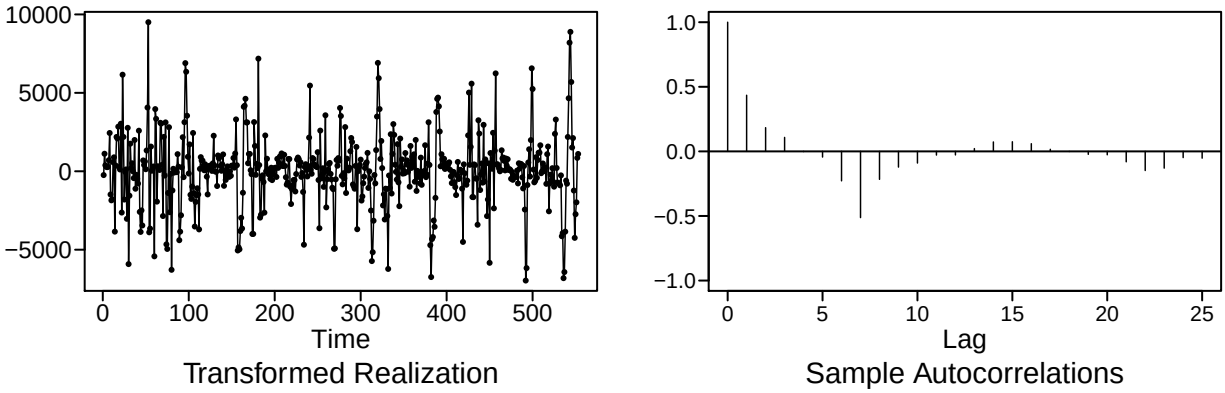
```
##
## Coefficients of Original polynomial:
## 0.5013 -0.1156 0.0230 -0.0918 -0.0157 0.0938 0.3468 -0.0863 -0.1159 -0.0656
##
## Factor                 Roots                Abs Recip    System Freq
## 1-1.1990B+0.9320B^2    0.6433+-0.8119i      0.9654       0.1434
## 1+0.3083B+0.7645B^2   -0.2016+-1.1258i      0.8743       0.2782
## 1-1.6117B+0.6745B^2    1.1947+-0.2350i      0.8213       0.0309
## 1+1.3759B+0.5977B^2   -1.1509+-0.5903i      0.7731       0.4246
## 1+0.6254B+0.2285B^2   -1.3683+-1.5823i      0.4780       0.3635
##
##


## $phi
##  [1]  0.50128314 -0.11562360  0.02302257 -0.09177078 -0.01573355
##  [6]  0.09378961  0.34684516 -0.08626350 -0.11590280 -0.06564059
##
## $res
##   [1] -1682.578505 -1548.649638  1249.848096  -986.340647  -156.183170
##   [6]  -702.970108   284.054546 -1630.305599   128.475167   647.348836
##  [11]  -758.006171    16.761639  -349.979252   706.325873   414.836770
##  [16] -2927.354942  -241.609929 -1760.056810  1570.739600   -94.787538
##  [21] -4070.788757  2010.447261  -365.117382  1990.019279   337.323890
##  [26]  -171.696090   145.514083   419.960117 -2363.590392  6217.083167
##  [31]  -280.162064 -2064.261282  1142.868954   712.018151 -2911.584743
##  [36]  2436.069161 -3681.840143  1365.679865   809.327488  1140.033465
##  [41]  1031.210496 -2740.066575  1534.745006   661.126329  -761.821367
##  [46]   123.453964    28.985300   603.788831   344.273915 -2432.070772
##  [51] -2226.808082 -1228.052375 -2016.190999  2276.043984  -189.684772
##  [56]  -153.360071 -1576.720544   705.717413  2943.781803  5965.850626
##  [61] -7036.585363 -1465.613016  2636.742759 -1752.230315   151.715528
##  [66]   623.123606 -1927.083529  2776.169521  1421.153796 -1052.455806
##  [71] -1226.668045    65.474362  1565.812438  2567.301926  2161.359741
##  [76]  -552.166497 -2787.710159  3004.857096 -1381.139278  4834.521727
##  [81] -5293.990821  -733.816305   694.059138  1905.409682 -2169.988721
##  [86]  -713.801733 -2540.131853  -627.567785   907.980401   -67.862591
##  [91]  -317.213621 -1682.422097  -136.058914   740.315559 -1215.501968
##  [96] -4392.533905 -2221.099944 -1677.929951  -330.649647  1189.235040
## [101] -1457.454137  2429.980647  2852.353097  2563.691581  -463.746877
## [106] -1594.694153   254.795050   911.316256 -1038.850034  -431.493274
## [111]   658.698377  2689.584752 -3213.961736 -1650.959548   265.287140
## [116]  -873.165280  -223.301173  -857.351144 -1700.889209  -720.926431
## [121]   158.240174   959.031843  -836.032375  -278.380871  -355.124507
## [126]  -266.896001 -1493.291622 -1023.058371  -780.931160   107.124329
## [131]  -177.190058   -28.576446  -421.618185 -1462.477402  -162.652436
## [136]  1762.083249  -876.889044  -439.033803  -185.574656 -1130.056951
## [141]   107.659562  -280.885013  1638.495961  -877.540331   -78.506910
## [146]   637.879840    65.273603 -1771.647371   -35.294532   747.157387
## [151]  -276.529971   200.988965    63.791599  -389.289193 -1171.625729
## [156]  -220.162048  1391.066466  -346.117400   787.187920     3.557197
```

```
## [161]   886.397055  1596.345791 -1278.383967 -3664.981980 -2790.086636
## [166] -2291.933558 -1720.995887 -1653.462447 -2418.064196  -835.244948
## [171]  3045.862600   894.335210  1466.215351  -439.245856   841.566492
## [176] -2396.938943   -25.894449  1388.627236 -1066.047379   297.317098
## [181] -4472.315723 -1104.362152  2959.272326  -247.426991   408.589905
## [186]  -550.593232  1073.819521  4688.770865 -3561.005034 -1388.639944
## [191] -2622.145941  1907.205484  -479.029441  -363.562499  -393.861084
## [196]   697.108197  -689.189930  -297.968134   945.224859  -866.147722
## [201]    54.007236  -282.262213    85.436701 -1666.629563   -95.542758
## [206]   772.056802  -347.116639   172.853104  -592.871420   989.405363
## [211] -1721.549251   406.862489  1429.019312   114.429174   915.533759
## [216]  -600.804166  1075.461948  -806.200522   176.683689   751.416953
## [221]  -772.160751   473.842202   618.095558  1379.784547 -2414.492013
## [226] -1352.019947   983.815902  -778.421424   276.100541  -468.234403
## [231]   -59.420072 -1447.236949   174.355339  1661.118148  -522.579086
## [236]   201.674836   145.765667  -293.834061 -1457.689550 -1641.458532
## [241] -2722.367292  1764.744061    28.408192    39.327125  -794.922097
## [246]  -777.265641  1223.215450  3175.164291 -1364.955839  -338.846767
## [251]   811.299361   240.574524  -840.379049   142.392665  1735.922341
## [256]  -421.042032  1586.324162  -305.556356 -3193.362765  3481.114350
## [261] -1731.366594  1791.973633  -552.776105   345.309703   896.633174
## [266]  1353.888385 -1747.938880  -838.155710  1946.611197   306.415956
## [271]   803.901304    14.239311  -160.978627 -1436.982785 -1074.305567
## [276] -2692.753771 -2704.570311  1957.946347   630.722721  -229.415657
## [281]  -765.413305  -225.510206  3074.126407    26.134701  -532.534194
## [286]  -888.100441  -191.050021 -1132.365189  2400.134761 -1404.080380
## [291]  1123.113189   -45.731965   411.972446   137.036318  -146.967128
## [296]  2978.233629   135.528081  -528.533213  -265.795115  -166.959997
## [301]  1025.318686   475.407218 -2300.098106  1821.969800   152.249568
## [306]   966.651648   382.428503 -1756.703203  -448.897477 -1064.198316
## [311]  1651.739314  -131.622700   702.497442   637.585799    62.226419
## [316] -1449.206774  -373.879835   798.183857 -2585.824604 -4192.886534
## [321] -2212.485006 -1340.592200  -242.034525 -1709.854475  2375.280425
## [326]  1064.033476  3267.215000  1825.485094   323.519996 -1666.690846
## [331]   254.718029  1166.428601 -2398.854723   458.037275 -1920.530418
## [336]   778.233514 -1730.818992 -2026.454199 -3389.600578  1185.276747
## [341]  -485.638773  1611.718674 -2643.555919   371.788443  1251.803354
## [346]  -479.899221   -79.885728 -1238.470992   171.683590    49.780282
## [351] -1772.331018 -1577.158445  2001.305527  -450.374518   193.102809
## [356]  -368.182407  -161.345431 -1350.128139   410.117948   922.354640
## [361]  -133.065030  -297.784354   538.654102 -1227.194108   845.803295
## [366]  -759.947796  1862.495937  -391.420822   987.263056  -551.119846
## [371]  1575.557768 -2076.702765   138.626043  1040.437332  -235.029123
## [376]    42.441613   908.543066  -322.349267 -1200.282562   -64.830513
## [381]  1372.652313  1360.787314 -1066.481987   719.246609   481.146763
## [386]  1901.541753 -1158.364488 -3484.316218 -3588.421813 -1984.274035
## [391] -1702.408017 -1739.336548 -2273.449495 -1232.452812  3051.093152
## [396]  1254.057496  1288.809202   601.694141  -404.877366 -2025.965782
## [401]  -313.771451  1199.781337  -502.914306   748.288985    -4.903957
## [406]   176.018317  -787.886949   -78.536576  1621.024965  -113.247803
## [411]   554.850517  -200.043743  -354.207901  -666.447025  -149.214141
## [416]   789.297844  -953.455813  -445.554326   490.405050   447.297331
## [421] -1585.278382  -482.150968  1261.804426  -532.224634 -1209.288823
## [426] -3766.950822  2595.676009 -2288.270724 -1002.856741   251.826502
```

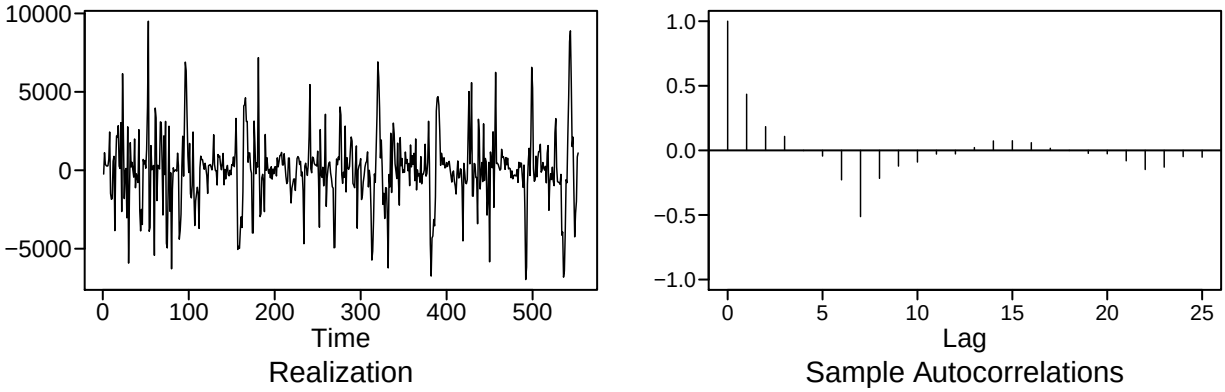
```
## [431]  -804.277075  2082.687141  1416.583941    23.038235  -917.473898
## [436]  4038.946996 -3225.719571 -1086.840145  1709.956912   266.766259
## [441]  -243.222558 -1579.990904  -460.794621  3149.056715   406.086139
## [446]  -439.387722   205.281298   581.066743 -1762.392593  3661.885900
## [451]  -848.587436  1023.780549   320.560975 -2154.369036   143.866222
## [456]  -724.315202 -3490.133895  3446.283641   -24.257284   776.705581
## [461]   972.561072 -2982.492072  2043.993686  3346.142064   168.652108
## [466]    -8.818766   420.626825  1121.488059 -1942.518534  1234.195641
## [471]  2476.173091   689.587506  1267.197693  1074.623670  1100.560885
## [476]  -924.526696  1149.424463  2716.097414   185.557968  1386.398183
## [481]  1153.870430   784.100400  -873.028460   510.575688  2496.446385
## [486]    83.787132  1211.506251   973.330033  1133.513781 -1691.364673
## [491]  1555.187530  2359.639143   581.546896  1408.088625   480.934702
## [496]   268.371077  -659.907968 -1400.009312 -3496.564101 -2677.707663
## [501]  2866.575020  1050.253068  1149.940683 -2285.242448  2105.674451
## [506]  4788.258149  1015.753746  -196.481939  -651.657101   504.236686
## [511]  -520.660893   139.546513  3229.211449   647.263846  1939.508931
## [516]  1854.348837   145.650819  -578.463138   750.811861  2956.228034
## [521]   210.160452  1779.793283   694.848383  2087.348501   570.964108
## [526] -2513.249270  3533.665534   182.769984  1463.622465  1178.676535
## [531]   584.731924  -364.545140  1396.025146  5867.596076 -1149.148412
## [536]   778.002248   792.148890   701.522643  -826.701185   162.233435
## [541]   576.772308 -2616.263639 -3750.018688 -2097.577920  -789.774492
## [546]  -375.571206 -1053.314803  4114.103049  1970.326833  4400.984208
## [551]  4358.483321  1265.211327 -1657.201655   733.366403  1228.020260
## [556] -3112.140760   755.874786  1279.554060  2719.859766  -220.125807
##
## $avar
## [1] 2757647
##
## $aic
## [1] 14.86917
##
## $aicc
## [1] 15.87376
##
## $bic
## [1] 14.95419
```

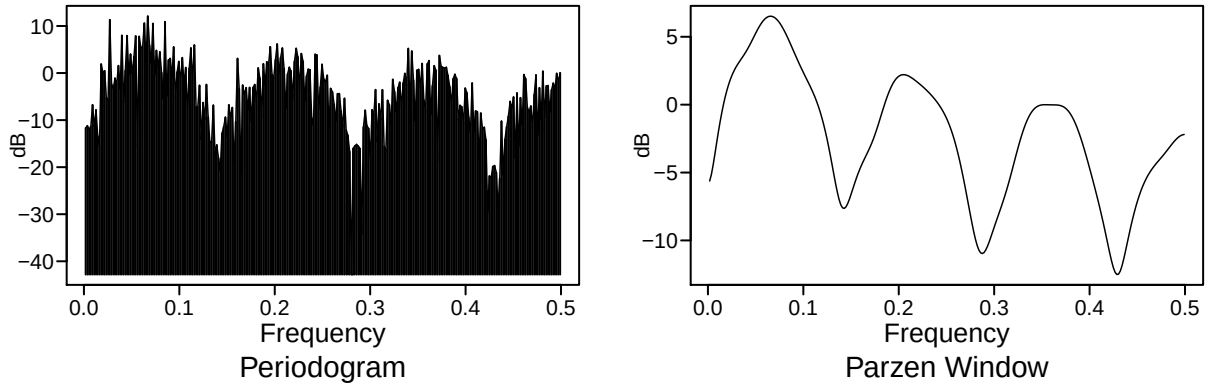
```
#differencing for seasonality s=7
Xs = artrans.wge(X$visitors, phi.tr = c(0,0,0,0,0,0,1))
```






```
plotts.sample.wge(Xs)
```






```
## $autplt
##  [1]  1.0000000000  0.4345528041  0.1834881606  0.1081434027 -0.0014816929
##  [6] -0.0439331869 -0.2281059083 -0.5126981440 -0.2166705925 -0.1215680245
## [11] -0.0903229951 -0.0285816541 -0.0274345808  0.0217037919  0.0730968412
## [16]  0.0744557512  0.0594618500  0.0160787023 -0.0009929875 -0.0229742854
## [21] -0.0264914553 -0.0808669560 -0.1480250171 -0.1297452835 -0.0482387695
## [26] -0.0525787093
##
## $freq
##   [1] 0.001808318 0.003616637 0.005424955 0.007233273 0.009041591
##   [6] 0.010849910 0.012658228 0.014466546 0.016274864 0.018083183
##  [11] 0.019891501 0.021699819 0.023508137 0.025316456 0.027124774
##  [16] 0.028933092 0.030741410 0.032549729 0.034358047 0.036166365
##  [21] 0.037974684 0.039783002 0.041591320 0.043399638 0.045207957
##  [26] 0.047016275 0.048824593 0.050632911 0.052441230 0.054249548
##  [31] 0.056057866 0.057866184 0.059674503 0.061482821 0.063291139
##  [36] 0.065099458 0.066907776 0.068716094 0.070524412 0.072332731
##  [41] 0.074141049 0.075949367 0.077757685 0.079566004 0.081374322
##  [46] 0.083182640 0.084990958 0.086799277 0.088607595 0.090415913
##  [51] 0.092224231 0.094032550 0.095840868 0.097649186 0.099457505
##  [56] 0.101265823 0.103074141 0.104882459 0.106690778 0.108499096
##  [61] 0.110307414 0.112115732 0.113924051 0.115732369 0.117540687
##  [66] 0.119349005 0.121157324 0.122965642 0.124773960 0.126582278
##  [71] 0.128390597 0.130198915 0.132007233 0.133815552 0.135623870
##  [76] 0.137432188 0.139240506 0.141048825 0.142857143 0.144665461
##  [81] 0.146473779 0.148282098 0.150090416 0.151898734 0.153707052
```

```
##  [86] 0.155515371 0.157323689 0.159132007 0.160940325 0.162748644
##  [91] 0.164556962 0.166365280 0.168173599 0.169981917 0.171790235
##  [96] 0.173598553 0.175406872 0.177215190 0.179023508 0.180831826
## [101] 0.182640145 0.184448463 0.186256781 0.188065099 0.189873418
## [106] 0.191681736 0.193490054 0.195298373 0.197106691 0.198915009
## [111] 0.200723327 0.202531646 0.204339964 0.206148282 0.207956600
## [116] 0.209764919 0.211573237 0.213381555 0.215189873 0.216998192
## [121] 0.218806510 0.220614828 0.222423146 0.224231465 0.226039783
## [126] 0.227848101 0.229656420 0.231464738 0.233273056 0.235081374
## [131] 0.236889693 0.238698011 0.240506329 0.242314647 0.244122966
## [136] 0.245931284 0.247739602 0.249547920 0.251356239 0.253164557
## [141] 0.254972875 0.256781193 0.258589512 0.260397830 0.262206148
## [146] 0.264014467 0.265822785 0.267631103 0.269439421 0.271247740
## [151] 0.273056058 0.274864376 0.276672694 0.278481013 0.280289331
## [156] 0.282097649 0.283905967 0.285714286 0.287522604 0.289330922
## [161] 0.291139241 0.292947559 0.294755877 0.296564195 0.298372514
## [166] 0.300180832 0.301989150 0.303797468 0.305605787 0.307414105
## [171] 0.309222423 0.311030741 0.312839060 0.314647378 0.316455696
## [176] 0.318264014 0.320072333 0.321880651 0.323688969 0.325497288
## [181] 0.327305606 0.329113924 0.330922242 0.332730561 0.334538879
## [186] 0.336347197 0.338155515 0.339963834 0.341772152 0.343580470
## [191] 0.345388788 0.347197107 0.349005425 0.350813743 0.352622061
## [196] 0.354430380 0.356238698 0.358047016 0.359855335 0.361663653
## [201] 0.363471971 0.365280289 0.367088608 0.368896926 0.370705244
## [206] 0.372513562 0.374321881 0.376130199 0.377938517 0.379746835
## [211] 0.381555154 0.383363472 0.385171790 0.386980108 0.388788427
## [216] 0.390596745 0.392405063 0.394213382 0.396021700 0.397830018
## [221] 0.399638336 0.401446655 0.403254973 0.405063291 0.406871609
## [226] 0.408679928 0.410488246 0.412296564 0.414104882 0.415913201
## [231] 0.417721519 0.419529837 0.421338156 0.423146474 0.424954792
## [236] 0.426763110 0.428571429 0.430379747 0.432188065 0.433996383
## [241] 0.435804702 0.437613020 0.439421338 0.441229656 0.443037975
## [246] 0.444846293 0.446654611 0.448462929 0.450271248 0.452079566
## [251] 0.453887884 0.455696203 0.457504521 0.459312839 0.461121157
## [256] 0.462929476 0.464737794 0.466546112 0.468354430 0.470162749
## [261] 0.471971067 0.473779385 0.475587703 0.477396022 0.479204340
## [266] 0.481012658 0.482820976 0.484629295 0.486437613 0.488245931
## [271] 0.490054250 0.491862568 0.493670886 0.495479204 0.497287523
## [276] 0.499095841
##
## $db
##   [1] -11.68856535 -11.22986605 -11.95078552 -11.38125310  -6.77059069
##   [6] -11.41132192  -7.84207475 -13.40898792 -15.49592365   1.89769882
##  [11]   0.02129437   0.47358959  -5.30162675  -5.70915943  11.31507567
##  [16]  -2.35057164  -3.29545555  -1.10740093  -2.40638305   1.55305043
##  [21]  -3.45008971   7.98193589  -6.16450099   0.48964688   7.94385965
##  [26]  -0.42233536   4.00466172  -0.16153201   3.46412576   7.86795838
##  [31] -15.50311608   7.77355006   5.42873101   5.42187903  10.58822032
##  [36]   2.45304378  12.08111770   5.87259288   2.10493754  10.51711991
##  [41]  -0.44640990   4.79223706   1.30496886   4.48259221   0.05627484
##  [46]  -5.58900461  10.88795341  -4.91297299   2.75900096   3.08827468
##  [51]  -0.94931103   5.53789703  -5.07626172   0.17043981   2.44379896
##  [56]  -1.99437796   3.24797218  -2.34781193   1.15344214  -9.08288981
##  [61]   0.94287222   5.31852508  -1.57679061   5.94203581  -7.22750355
```

```
##  [66]  -7.22670318  -2.62503625 -14.17329395  -6.28583962  -9.85587843
##  [71]  -2.45269294  -9.39377341 -14.81670451 -14.60707265  -6.84235601
##  [76] -17.23536055 -15.29433416 -18.10226393 -20.75399823 -12.84843488
##  [81] -11.47291689  -9.39895472 -13.70618616  -6.76965757  -9.50005290
##  [86]  -7.34650890 -19.28493390 -10.36913749   3.08463926  -3.37023318
##  [91] -21.40837007  -2.58988978  -4.60765959  -3.13364864  -7.90054608
##  [96]  -3.07299682 -10.42882138  -3.10997897  -2.46382830  -6.15438957
## [101]   1.06912446  -1.13992453  -9.31871206   1.93871087  -2.57987105
## [106]   2.36416343   1.75383250   5.57296407  -0.33270641  -1.05886716
## [111]   2.76957962   6.15975305  -0.11197845   3.24707090   5.29952807
## [116]   0.93718783  -7.64571153  -0.26600042   1.20259132   0.42910748
## [121]  -5.50145044   2.41014422   5.22903535   3.40456983  -3.54805657
## [126]   4.12208111   2.45971888  -5.97903822  -0.66933388   0.78981663
## [131]   0.70495765  -9.53743876 -11.11638018   3.96218358   3.84730469
## [136]  -7.79379070  -3.01871141   1.83257629  -1.31691113  -1.91472255
## [141]  -0.49376724 -11.55411276  -3.28328643  -4.00874503  -6.62007294
## [146] -10.27088081  -4.40889309  -4.38926150  -8.02525992 -11.45422679
## [151]  -5.38548397 -12.19329644 -13.26946231 -16.68953646 -42.82323292
## [156] -16.05170956 -15.50975902 -15.18409901 -15.54813171 -16.06689854
## [161] -34.22861189 -11.51697439  -7.92249925 -11.18968949 -11.80307860
## [166] -18.10768857  -7.82713824  -8.97001050  -3.55152372 -14.60137053
## [171]  -6.56620084  -9.93312137  -3.57312130 -15.68301451 -16.31415542
## [176]  -5.81373503  -6.74603922 -11.28496925  -1.36200754  -3.99204130
## [181]  -8.26514842  -3.15772810  -1.97147123  -7.22785902  -2.19565387
## [186]  -0.09311007  -2.60336337   5.20782419  -7.65149161   4.65136093
## [191]  -1.54580384 -10.31409034   0.57233365   0.75925081  -3.15053273
## [196]   2.01509541  -5.75757623  -7.83490573   1.91792949   2.62287845
## [201]  -8.89519571  -2.73082928   1.53067875   0.57892637 -18.61839369
## [206]   3.72266843   1.44660976   1.18678009   1.01084778   1.20151258
## [211]  -0.53707890  -2.89846950  -6.76540979  -1.24066469  -0.27858878
## [216]  -1.20835252  -9.96992554  -6.88500778  -7.18222483 -10.59935200
## [221]  -3.22675835  -4.24019162  -9.39565384 -12.78163890  -2.13725144
## [226] -12.60839556  -8.07506466  -8.22494717 -18.27857498  -8.52591641
## [231] -11.83029866 -11.53996970 -14.20780220 -29.65508968 -21.89088781
## [236] -22.23512204 -19.88736001 -19.67412873 -21.14706626 -28.67301310
## [241] -22.43146422 -10.22984303 -21.69564950 -14.13784356 -11.44237191
## [246]  -9.20519006  -6.05280512  -7.52907529  -5.10545973 -18.14933164
## [251]  -4.23981438 -15.72258039  -5.25938231 -11.13532990  -0.34380605
## [256]  -1.21219434  -7.38753424  -8.29471625  -7.01818687 -11.52578654
## [261]  -4.56194175  -0.41322086 -13.27563129  -3.14407800  -9.92923241
## [266]   0.37106793  -9.32303527  -2.74885563  -2.67777952  -8.34269805
## [271]  -3.60135326  -2.16882041  -3.32604932  -0.08858736  -1.80622749
## [276]   0.03545073
##
## $dbz
##   [1]  -5.623096481  -5.145421078  -4.459394245  -3.667322238  -2.847284660
##   [6]  -2.048474230  -1.298063575  -0.609240454   0.012961088   0.568112002
##  [11]   1.058421092   1.487720050   1.860982647   2.184123846   2.463923094
##  [16]   2.707968239   2.924542625   3.122394722   3.310350644   3.496765117
##  [21]   3.688857851   3.892039119   4.109366849   4.341271754   4.585627618
##  [26]   4.838150817   5.093027285   5.343622718   5.583142590   5.805155271
##  [31]   6.003946792   6.174718631   6.313662861   6.417954767   6.485698246
##  [36]   6.515850236   6.508141047   6.462999696   6.381487595   6.265240115
##  [41]   6.116413157   5.937630578   5.731927895   5.502687950   5.253565067
```

```
##  [46]   4.988395532   4.711093823   4.425535584   4.135429669   3.844182456
##  [51]   3.554758226   3.269539894   2.990195487   2.717557581   2.451525273
##  [56]   2.191000237   1.933868570   1.677037390   1.416529458   1.147631633
##  [61]   0.865086131   0.563309508   0.236624664  -0.120503805  -0.513231681
##  [66]  -0.946083364  -1.422660606  -1.945268960  -2.514399346  -3.127981650
##  [71]  -3.780315693  -4.460610518  -5.151190126  -5.825762579  -6.448794749
##  [76]  -6.977803402  -7.370348502  -7.595226362  -7.643054422  -7.529458338
##  [81]  -7.288544368  -6.961378454  -6.586137524  -6.193035329  -5.803313727
##  [86]  -5.430317160  -5.081122903  -4.757991946  -4.459445850  -4.181035799
##  [91]  -3.915965641  -3.655745853  -3.391022036  -3.112640928  -2.812890409
##  [96]  -2.486708474  -2.132567598  -1.752775748  -1.353102953  -0.941862152
## [101]  -0.528725953  -0.123579209   0.264385949   0.627255674   0.958685571
## [106]   1.253973113   1.509994488   1.725073218   1.898824899   2.032001403
## [111]   2.126342113   2.184429413   2.209540057   2.205482438   2.176411909
## [116]   2.126621858   2.060316625   1.981381926   1.893176692   1.798373844
## [121]   1.698874156   1.595806441   1.489611292   1.380188994   1.267079847
## [126]   1.149640307   1.027181705   0.899048126   0.764623563   0.623272798
## [131]   0.474233082   0.316482760   0.148616884  -0.031242077  -0.225477856
## [136]  -0.436948964  -0.668895033  -0.924793651  -1.208186020  -1.522490355
## [141]  -1.870818498  -2.255805368  -2.679454498  -3.142997124  -3.646757465
## [146]  -4.190012518  -4.770830056  -5.385862581  -6.030067875  -6.696321019
## [151]  -7.374886832  -8.052753849  -8.712922628  -9.333926887  -9.890139819
## [156] -10.353636292 -10.698181166 -10.904900676 -10.967617784 -10.895061110
## [161] -10.708506251 -10.436079051 -10.106524939  -9.744655374  -9.369094595
## [166]  -8.991830614  -8.618797484  -8.250917921  -7.885324185  -7.516669742
## [171]  -7.138512433  -6.744718263  -6.330753843  -5.894670086  -5.437590350
## [176]  -4.963621774  -4.479265188  -3.992526042  -3.511967420  -3.045896093
## [181]  -2.601778789  -2.185898617  -1.803207606  -1.457312262  -1.150533458
## [186]  -0.883996821  -0.657726617  -0.470730708  -0.321075570  -0.205958962
## [191]  -0.121794103  -0.064323177  -0.028778834  -0.010108656  -0.003267840
## [196]  -0.003569272  -0.007060107  -0.010875421  -0.013510293  -0.014958262
## [201]  -0.016687381  -0.021458450  -0.033021825  -0.055748544  -0.094253798
## [206]  -0.153058645  -0.236316636  -0.347613096  -0.489831033  -0.665070429
## [211]  -0.874606247  -1.118873099  -1.397469375  -1.709179523  -2.052019021
## [216]  -2.423311639  -2.819811659  -3.237883400  -3.673745158  -4.123773247
## [221]  -4.584845088  -5.054681181  -5.532130266  -6.017336361  -6.511733862
## [226]  -7.017834709  -7.538790081  -8.077715971  -8.636758504  -9.215842024
## [231]  -9.811009891 -10.412286218 -11.001167977 -11.548383976 -12.013556239
## [236] -12.349426169 -12.512623087 -12.478503637 -12.251630752 -11.863998974
## [241] -11.362479487 -10.794555029 -10.199420681  -9.605325852  -9.030665797
## [246]  -8.486354492  -7.978141015  -7.508414452  -7.077467505  -6.684327129
## [251]  -6.327274549  -6.004152947  -5.712533238  -5.449786976  -5.213101654
## [256]  -4.999465972  -4.805649001  -4.628195577  -4.463458689  -4.307686271
## [261]  -4.157172772  -4.008474217  -3.858669857  -3.705636808  -3.548291760
## [266]  -3.386751428  -3.222374434  -3.057669837  -2.896084748  -2.741706154
## [271]  -2.598923413  -2.472096151  -2.365260884  -2.281894460  -2.224738580
## [276]  -2.195680434
```

```
#mean of visitors
mean(X$visitors)
```

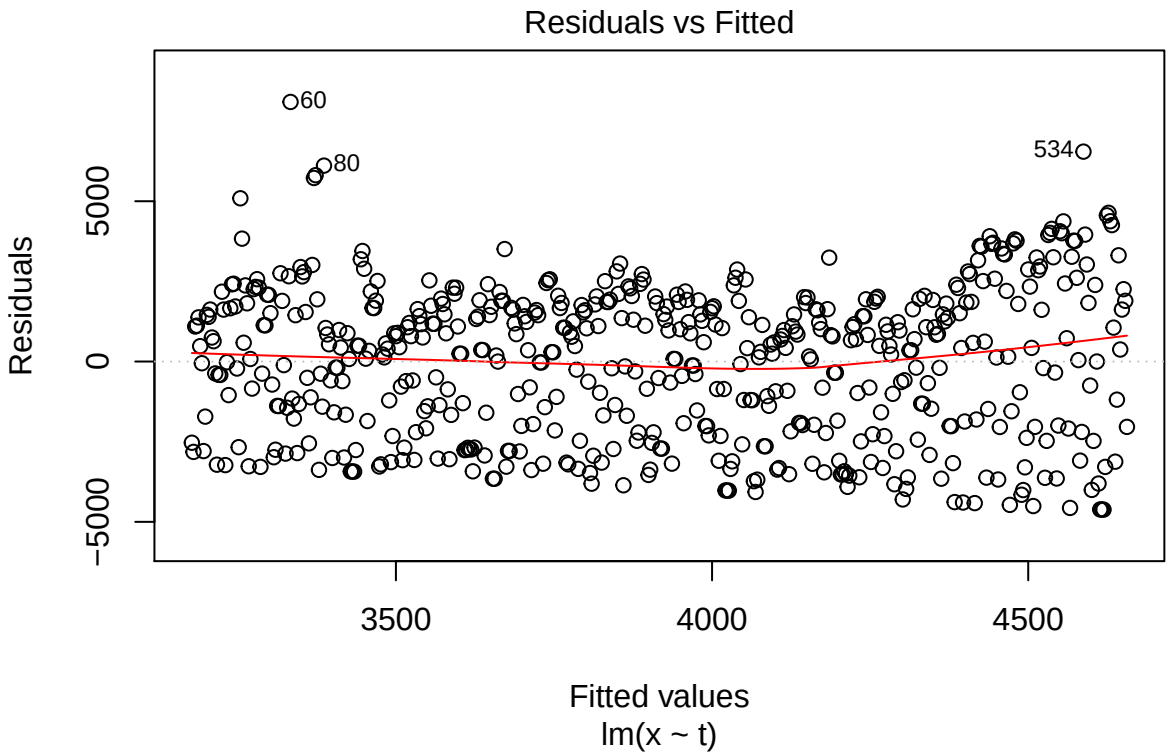
```
## [1] 3916.712
```

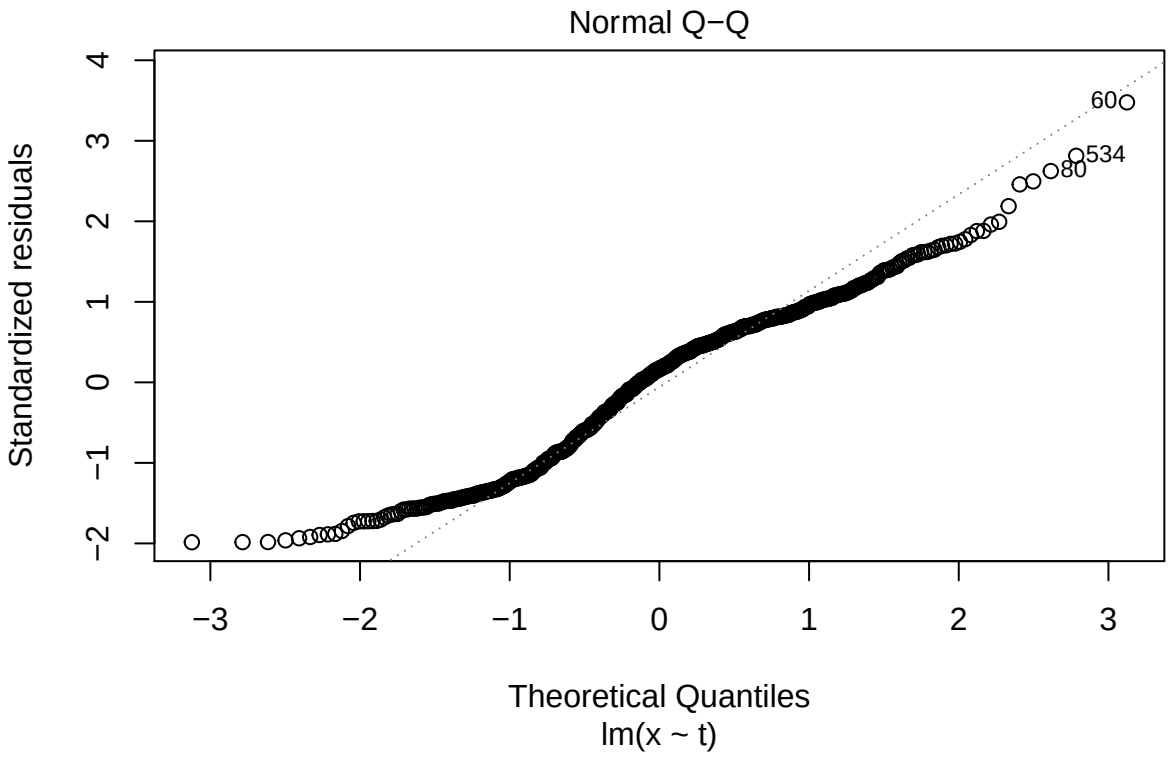
#Final Project: Slide 15 -Signal plus noise

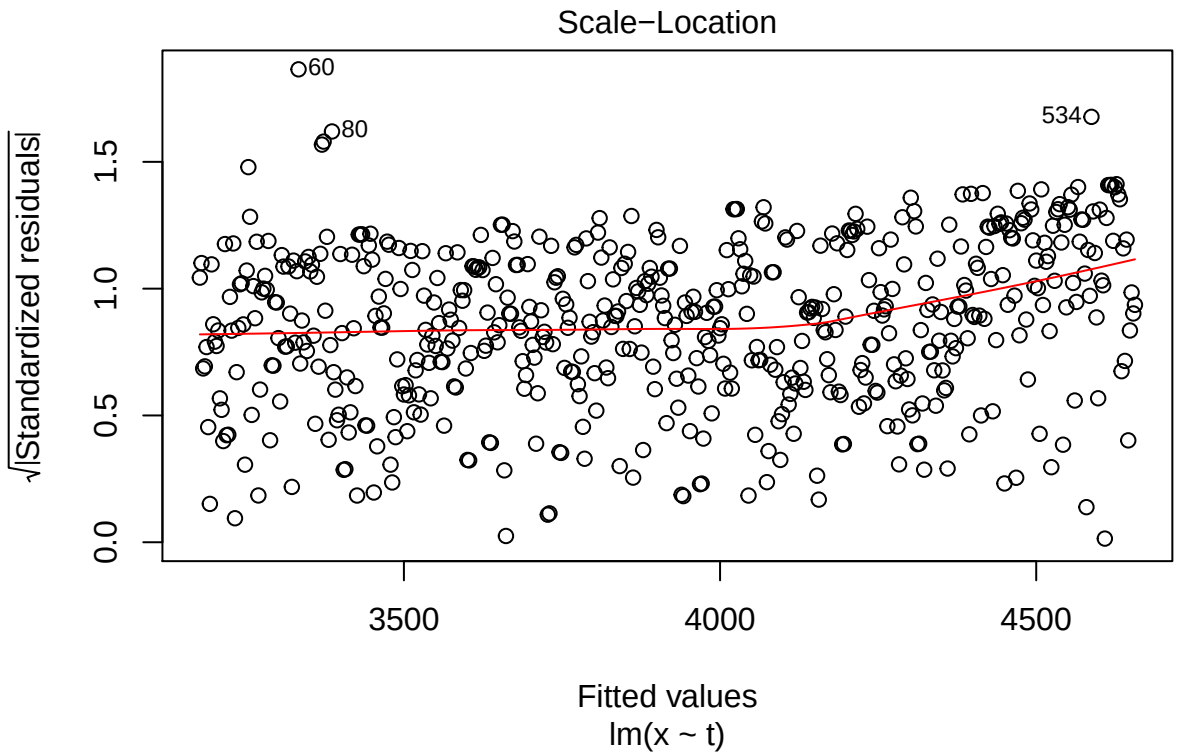
```r
x=X$visitors
t = seq(1,560,1)
df = data.frame(x = x, t= t)
fit = lm(x~t, data = df)
summary(fit)
```

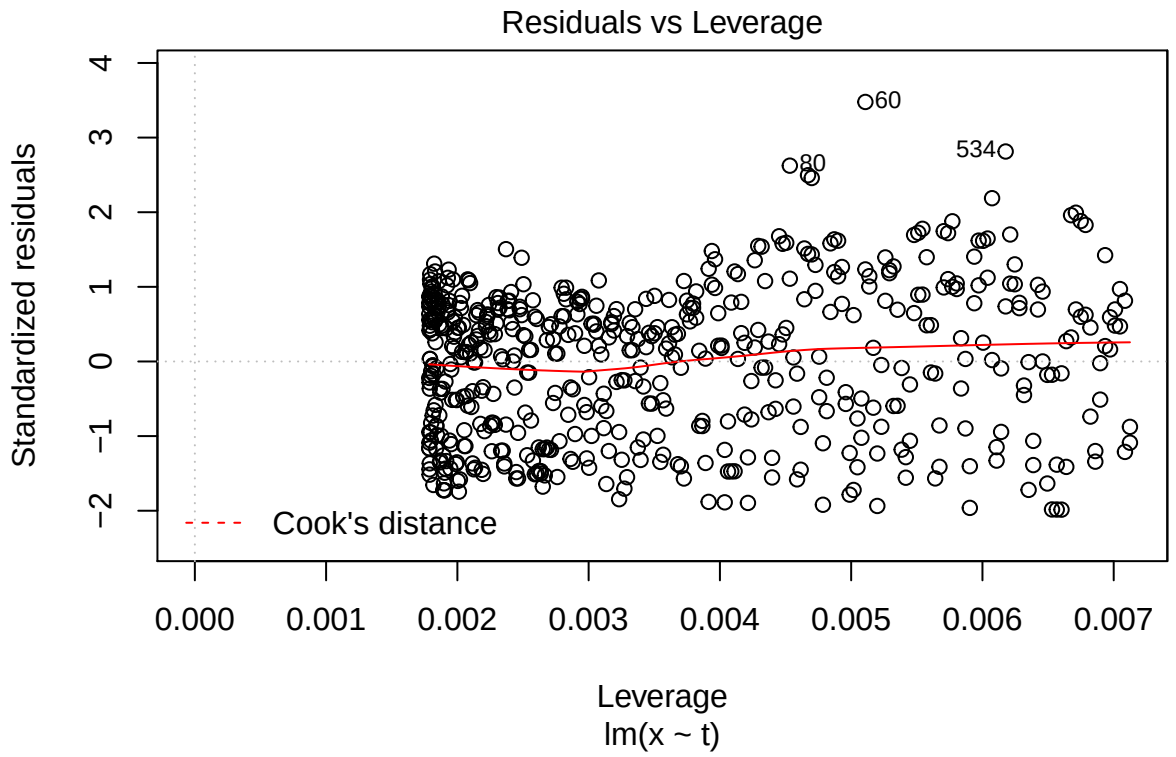
```
##
## Call:
## lm(formula = x ~ t, data = df)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -4619.1 -2014.4   387.8  1745.9  8096.6
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) 3174.6372   197.5490  16.070  < 2e-16 ***
## t              2.6455     0.6102   4.336 1.72e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2334 on 558 degrees of freedom
## Multiple R-squared:  0.03259,    Adjusted R-squared:  0.03086
## F-statistic:  18.8 on 1 and 558 DF,  p-value: 1.725e-05
```

```r
plot(fit)
```


Residuals vs Fitted
60
80
534
Residuals
5000
0
−5000
3500
4000
4500
Fitted values
lm(x ~ t)

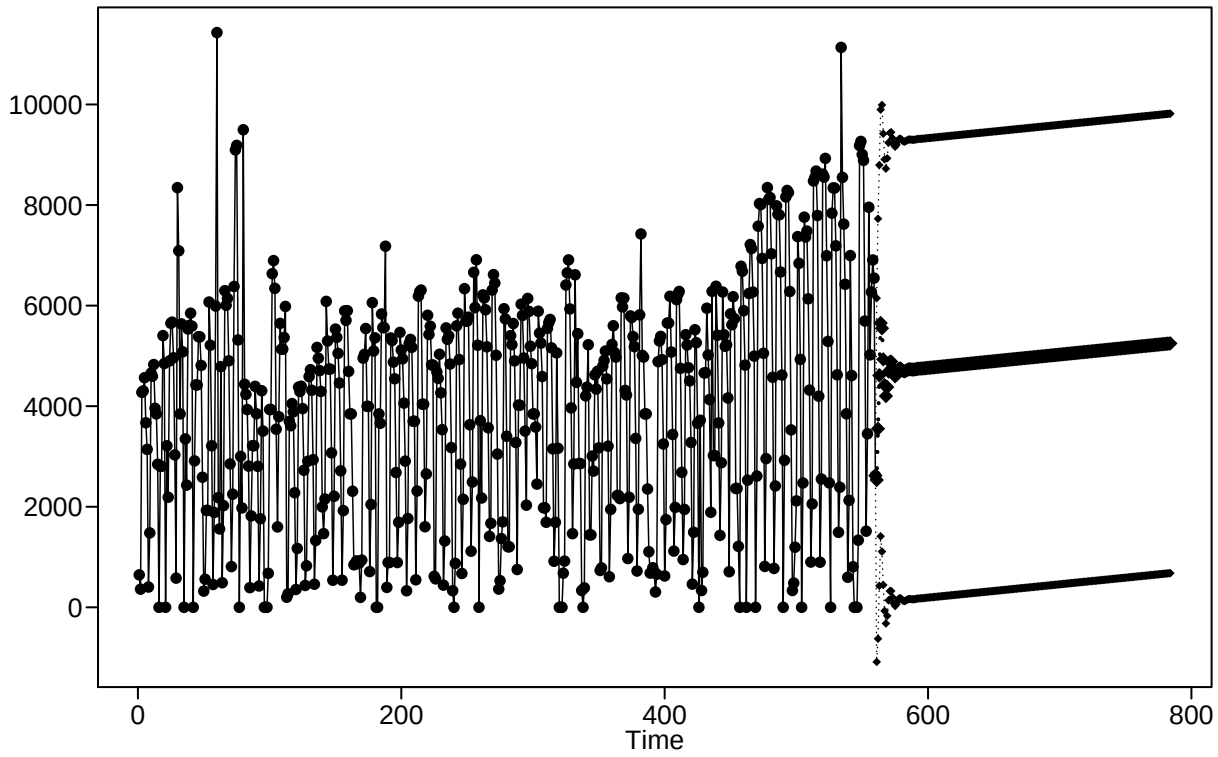

Normal Q−Q
Standardized residuals
Theoretical Quantiles
lm(x ~ t)
60
534
80
−3
−2
−1
0
1
2
3
−2
−1
0
1
2
3
4


Scale−Location
60
80
534
√|Standardized residuals|
0.0
0.5
1.0
1.5
3500
4000
4500
Fitted values
lm(x ~ t)




```
f = fore.sigplusnoise.wge(X$visitors, n.ahead = 224)
```

```
##
## Coefficients of Original polynomial:
## 0.5773 -0.2651 -0.0814 -0.1848 0.0921
##
## Factor                 Roots                Abs Recip    System Freq
## 1-1.0178B+0.6508B^2    0.7820+-0.9618i      0.8067       0.1414
## 1+0.8196B+0.3733B^2   -1.0976+-1.2140i      0.6110       0.3670
## 1-0.3791B              2.6377               0.3791       0.0000
##
##
```




```
f$b0
```

```
## (Intercept)          tl
## 3174.637212    2.645543
```

```
cfit = cochrane.orcutt(fit)
summary(cfit)
```

```
## Call:
## lm(formula = x ~ t, data = df)
##
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept) 3216.7646   335.9848   9.574  < 2e-16 ***
## t              2.5151     1.0343   2.432  0.01534 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2044.96 on 557 degrees of freedom
## Multiple R-squared:  0.0105 ,  Adjusted R-squared:  0.0087
## F-statistic: 5.9 on 1 and 557 DF,  p-value: < 1.534e-02
##
## Durbin-Watson statistic
## (original):    1.03431 , p-value: 7.465e-31
## (transformed): 1.64541 , p-value: 1.108e-05
```

#Final Project: Slides 16-18

```
#aic & bic, both choose the ARMA(3,2)
aic5.wge(Xs)
```

```
## ---------WORKING... PLEASE WAIT...
##
##
## Five Smallest Values of  aic

##       p    q        aic
## 18    5    2   15.12607
## 15    4    2   15.16240
## 12    3    2   15.17845
## 4     1    0   15.22296
## 5     1    1   15.22652
```

```
aic5.wge(Xs, type = "bic")
```

```
## ---------WORKING... PLEASE WAIT...
##
##
## Five Smallest Values of  bic

##       p    q        bic
## 18    5    2   15.18850
## 15    4    2   15.21702
## 12    3    2   15.22527
## 4     1    0   15.23857
## 5     1    1   15.24993
```

```
#identifying the phis and thetas for ARMA(5,2)
Xs.arma = est.arma.wge(Xs, p = 5, q = 2)
```

```
##
## Coefficients of Original polynomial:
## 0.4107 0.7832 -0.2779 0.0108 -0.1854
##
## Factor                 Roots                Abs Recip    System Freq
## 1+0.9534B             -1.0489               0.9534       0.5000
## 1-1.6581B+0.7431B^2    1.1156+-0.3180i      0.8621       0.0442
## 1+0.2940B+0.2616B^2   -0.5619+-1.8726i      0.5115       0.2964
##
##
```

```
Xs.arma
```

```
## $phi
## [1]  0.41069522  0.78321460 -0.27787570  0.01083583 -0.18535146
##
## $theta
```

```
## [1] 0.06113105 0.88951583
##
## $res
##   [1]  -745.535288   528.051751  -372.866281  -647.074080  -115.298562
##   [6]  -590.871512   520.288443  1563.770923 -2353.954389 -1675.576845
##  [11] -1353.844253   873.519663   852.816772 -4593.621517  1555.902282
##  [16]   959.611412  1370.300644  1508.066140 -1347.089411  -345.897556
##  [21]  2719.731049 -3684.678880  7606.073815  -207.497957 -1522.768384
##  [26]  1005.421771   297.037891 -1531.383942  4499.408089 -6076.756535
##  [31]  1478.846753  2533.682698   -65.863749  1431.791270  -946.913126
##  [36]   122.063758  1797.205221 -1346.011447   151.908274  -143.526010
##  [41]  -707.398675  3416.629444 -3803.170123 -2282.870731 -1768.773274
##  [46] -2444.378178  1767.175454  -381.221696  -191.479865 -1031.197500
##  [51]     5.224841  2786.930837  7067.128903 -7590.577550 -2545.581904
##  [56]  2049.746043  -329.234101  1471.555682  -232.457974 -5053.182618
##  [61]  5756.870826  1901.133451 -2668.923383  1233.997889  -815.427366
##  [66]   939.667858  2930.289892  2415.173267  -427.448512 -2391.574957
##  [71]  3329.917831  -216.305815  4219.404307 -4952.053956 -2663.702729
##  [76]   997.965996  3558.107808 -2330.082909   534.206468 -6343.637094
##  [81]   548.593518   468.313560  -911.596259   -42.290863 -1828.310728
##  [86]  -475.693661  -545.293238  -584.771528 -5914.562041 -2852.208574
##  [91] -3166.919451   657.440693   511.485276 -2406.543923  1268.572779
##  [96]  3911.318468  2338.514106   426.882399 -1588.795631  -753.946038
## [101]  1774.651632 -1269.223474  -386.748846   409.507974  3432.021424
## [106] -1226.131641 -2420.321454  -292.281914  -739.055665   245.188008
## [111] -1255.119543 -3171.195864   870.496520   282.679874  -240.807995
## [116]  -269.068350 -1144.163595  -718.828865  -570.954071  -622.351455
## [121] -1141.626418 -1840.167405    66.313900  -293.693179  -362.708198
## [126]  -453.100700  -891.473264    13.633951  1355.178661  -799.107358
## [131]  -616.727456  -429.506515 -1328.100091  1348.677405   102.502457
## [136]   721.265409  -268.322101  -163.670177   337.761016   971.543241
## [141] -1188.540666   563.773216  -578.859259   526.925271   446.154220
## [146]  -299.717082   -80.946887    67.655388  -149.406464   482.810862
## [151]   254.555064   718.506050   -15.965512  1038.680566  3000.575159
## [156]  -642.932139 -4706.417524 -2998.174476 -3125.913853 -1627.754377
## [161] -1615.217475 -3265.640621 -1095.987954  2842.820543  1062.296444
## [166]  1382.630994  -550.170325   266.814431 -1689.189124   171.607051
## [171]   436.565196  -396.352853   158.207596 -3935.032744 -2104.866721
## [176]  4422.549379   748.437495  -474.830046    96.986617  -562.111964
## [181]  7277.224638 -2344.566543 -2410.963035 -2027.150790   768.701007
## [186]   848.266546  -144.356509 -2065.574332  3061.380614  -808.079761
## [191]   902.878620  -353.995753  -601.140436   343.286041  -862.449804
## [196]   712.503031  -967.296072   524.923428  -567.151449   418.425098
## [201]  -103.713222  -429.683443   710.438828  -151.486870   387.240576
## [206]   692.919338   498.680431   945.976983   -82.376579   490.339090
## [211]  1078.611256   392.996777   -69.207925  -270.908311   -12.907111
## [216]  1577.994222   930.927236  -725.430546 -1450.952407  -165.826999
## [221]  -225.064034    91.236423  -316.008874 -1186.283117    69.930120
## [226]   463.138830   331.197825   115.116229  -372.729943    85.992226
## [231]  -866.915705  -141.754515 -1482.748333 -4315.976804  1710.887329
## [236]  -166.996633  -108.898730 -1001.078782  -503.640847  1404.564588
## [241]  3932.748023 -2233.129589  -589.545070   359.857351   415.627566
## [246]   765.855207   208.966083   702.477182   357.233478  1728.593507
## [251]  -684.724509 -2734.617409  4134.765789  -845.538804   489.697907
```

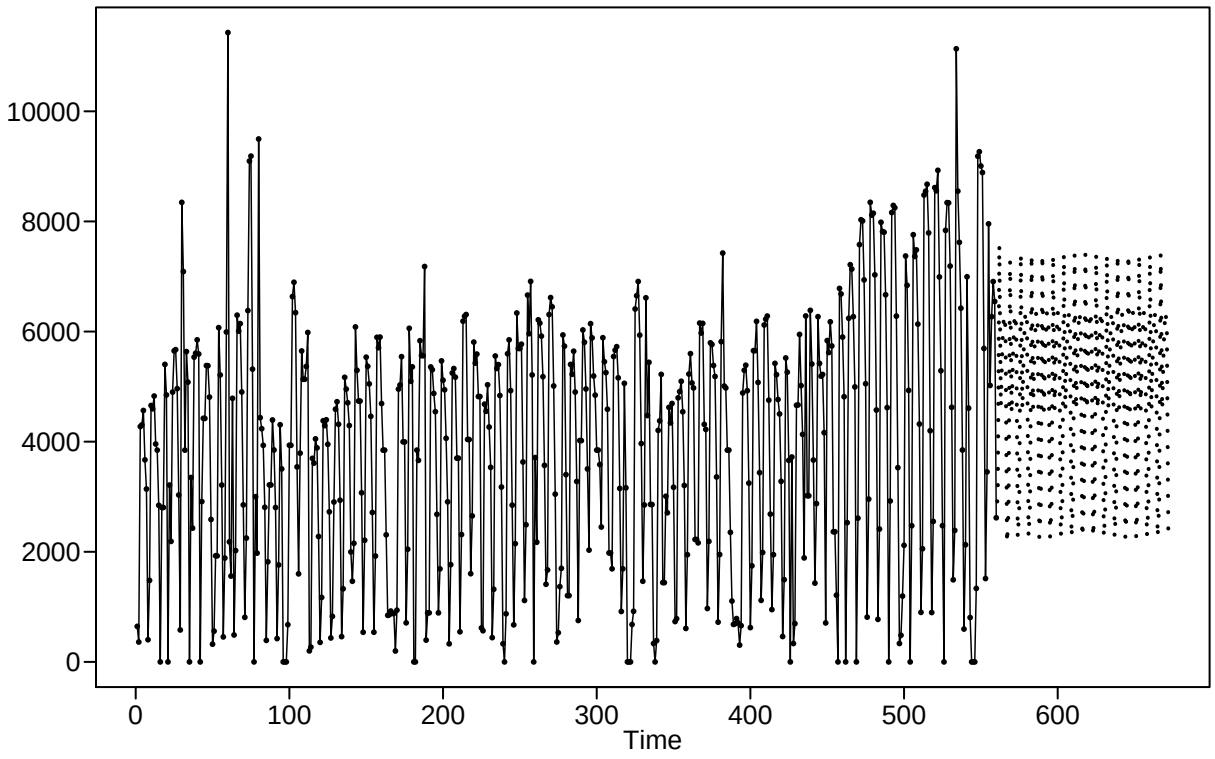
```
## [256]   551.178314 -1049.443407  1003.313225  3480.630945 -3006.717888
## [261]   586.347660   266.287030   664.825506  1082.020743  -495.064640
## [266]    87.689640  -984.362528  -256.913354 -4597.536261 -2830.070597
## [271]   706.173365   747.009328  -401.559494  -242.756871 -1034.538794
## [276]  2808.040605   946.787137 -2112.625970 -1498.697078  -468.882432
## [281]  -490.066698  3069.203660 -2523.636767  1455.755344  -484.098281
## [286]   117.095545   407.162492  1041.991985  1998.712291  1126.276096
## [291] -1063.614580  -531.177366  -315.403654  1189.639009  2155.014888
## [296] -3869.771410  1904.277878    38.978417  1008.011448   787.969551
## [301] -2168.334988  -749.629610  -369.814043    79.761006   323.765334
## [306]   194.673205   120.452094   662.169673 -1785.852782   182.232625
## [311]  -835.171435 -2398.829428 -4985.179512 -3630.050622 -1901.939983
## [316]    90.707931 -1736.523475   -60.926025   993.951772  3620.208995
## [321]  1800.836300   251.478149 -1749.045083   831.153454  -400.629418
## [326] -1790.939008    56.082958 -2182.835078   963.137744  -506.167001
## [331] -1942.035891 -5293.662711  1588.704865 -1681.290971  2402.523626
## [336] -3447.032166   309.574425  1225.997763   -53.986098 -1052.139291
## [341] -1586.736823 -1064.774209  1140.922170 -1473.730030 -2442.048389
## [346]  2565.480025 -1166.252426   915.897213 -1200.827211  -119.113774
## [351]  -511.306204  1046.103966  -196.191316   449.014278  -476.479160
## [356]   351.127020 -1143.413378  1976.129217  -335.596945  1019.701770
## [361]   120.175544   969.630351  -687.306168  2368.345237 -1560.751613
## [366]   852.916506    28.916880   178.165515    22.288748  1166.088702
## [371]  -588.046754   141.430668   227.488163    53.937677  2137.584507
## [376] -1125.558388   432.205760   299.077971  3363.344316  -544.291704
## [381] -4304.909761 -5056.217289 -1836.834803 -2486.201086 -1576.218423
## [386] -3288.403493 -1763.122274  2581.968880  1245.871562  1190.311153
## [391]   180.110136  -851.813015 -1910.330523    41.401901  -102.019344
## [396]    39.541861   721.470151  -124.624096   422.068570   566.066708
## [401]   390.641638   696.897586   736.129780   249.780412    69.935019
## [406]  -278.649452   537.933051   410.680958  -241.658197  -446.599402
## [411]  -954.567469   473.362968   775.793350  -616.644919  -315.010015
## [416]   -21.411895  -118.175124 -1246.404124 -4332.138646  1703.039805
## [421]  -829.087604  -866.098408 -1264.348302 -1348.731918  1851.547650
## [426]  3195.887282 -1911.592628   656.653366  4217.196791 -3837.955540
## [431]  -484.990563   561.395089   870.549433   169.872398    37.569487
## [436] -2911.485323  4804.734285  1383.636173 -1407.590919   410.016277
## [441]   276.736445  -160.344136  3502.447086 -1318.981442  1489.284545
## [446]   579.593004 -2668.313696    53.813429  1124.990209 -5184.314397
## [451]  3473.869973  -178.511836   151.574975  2311.825985 -4182.013178
## [456]  2414.465026  4743.552147 -1387.632188   359.309783   -90.914302
## [461]   274.594303   841.212810   406.240659  2199.013537   757.335992
## [466]  1540.646801   800.388253   736.421317  1497.076127  1034.110350
## [471]  1545.897508   851.955844  1021.027718  1140.971892   424.547022
## [476]  1296.729056   334.225254   949.720253   636.288463   697.503274
## [481]   510.219417   926.759596  -165.301018  1447.041552   458.269774
## [486]  1025.351761   732.354695   -92.327298  -418.661908  1121.247772
## [491] -2059.839584 -5578.851223 -3549.963067  1042.426097   805.279729
## [496]   735.945454 -2063.797759   569.409280  4420.251610  1756.771647
## [501] -2337.346211 -1708.141735  -844.511536  1314.366978  -212.830048
## [506]  1193.023697  1217.009584  1029.954148  1748.728171  -477.650265
## [511]   719.166912   870.525379   787.329733   685.849119   993.170684
## [516]  -216.126497  2175.001688  1783.539701 -2240.526110   836.197572
## [521]   429.607197   342.906706  1107.201891  -441.812714  -220.778776
```

```
## [526]  2918.242292  2763.657227  -488.377923  -413.811328  -394.184961
## [531]   164.202927    84.540308   690.773347 -3563.750872 -2029.835596
## [536] -5462.036207 -3999.951027 -2082.907650  -297.044985 -1853.976079
## [541]   333.322169  1425.311400  4021.806725  3885.218658   550.295906
## [546] -1670.156894   658.342262 -1731.009083 -2919.066397  -130.966808
## [551]  -228.799558  2897.448828  1327.417524
##
## $avar
## [1] 3602497
##
## $aic
## [1] 15.12607
##
## $aicc
## [1] 16.13029
##
## $bic
## [1] 15.1885
##
## $se.phi
## [1] 0.006127939 0.009917811 0.003532805 0.002244385 0.001835445
##
## $se.theta
## [1] 0.004947952 0.004826713
```

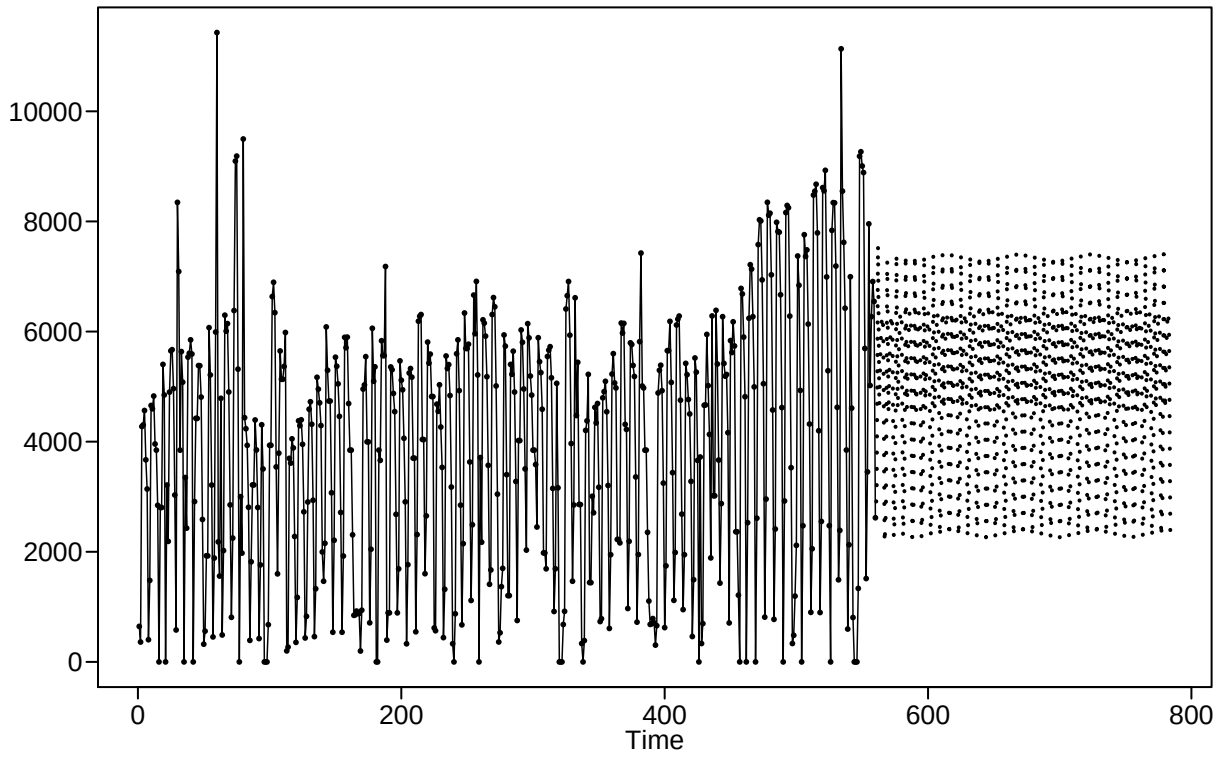
```
#forecasting using the ARIMA(5,0,2), s=7 model (Spring 2020 semester)
X.fore.sem = fore.aruma.wge(X$visitors, phi = Xs.arma$phi, theta = Xs.arma$theta, s = 7, n.ahead = 112,

#ASE of ARIMA(5,1,2), s=7 for Spring 2020 semester
ASE.arima.112 = mean((X.fore.sem$f-X$visitors[(560-112+1):560])^2)
ASE.arima.112
```

```
## [1] 5143247
```

```
#forecasting using the ARIMA(5,0,2), s=7 model (Spring 2020 semester)
X.fore.yr = fore.aruma.wge(X$visitors, phi = Xs.arma$phi, theta = Xs.arma$theta, s = 7, n.ahead = 112,
```




```
#forecasting using the ARIMA(5,0,2), s=7 model (Spring 2020 & Fall 2020 semesters)
X.fore.yr = fore.aruma.wge(X$visitors, phi = Xs.arma$phi, theta = Xs.arma$theta, s = 7, n.ahead = 224, l
```

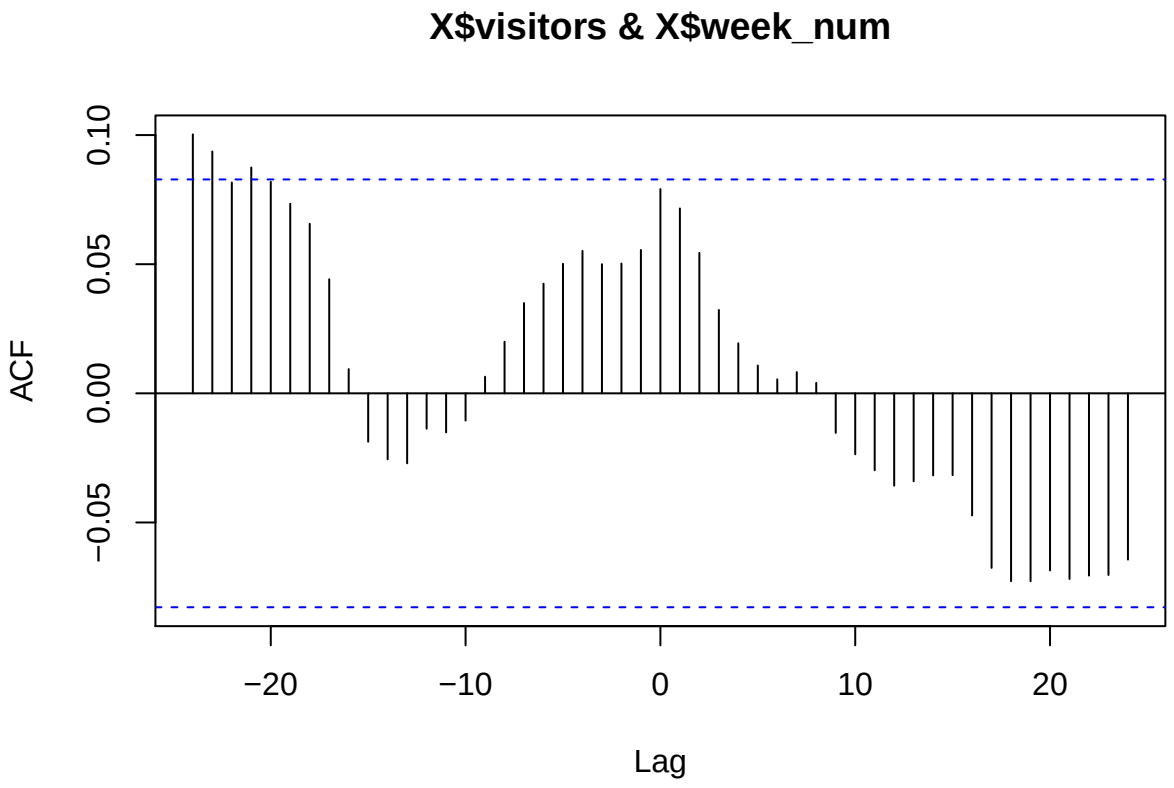



```
#ASE of ARIMA(5,0,2), s=7 for Spring & Fall 2020 semesters
ASE.arima.224 = mean((X.fore.yr$f-X$visitors[(560-224+1):560])^2)
ASE.arima.224
```

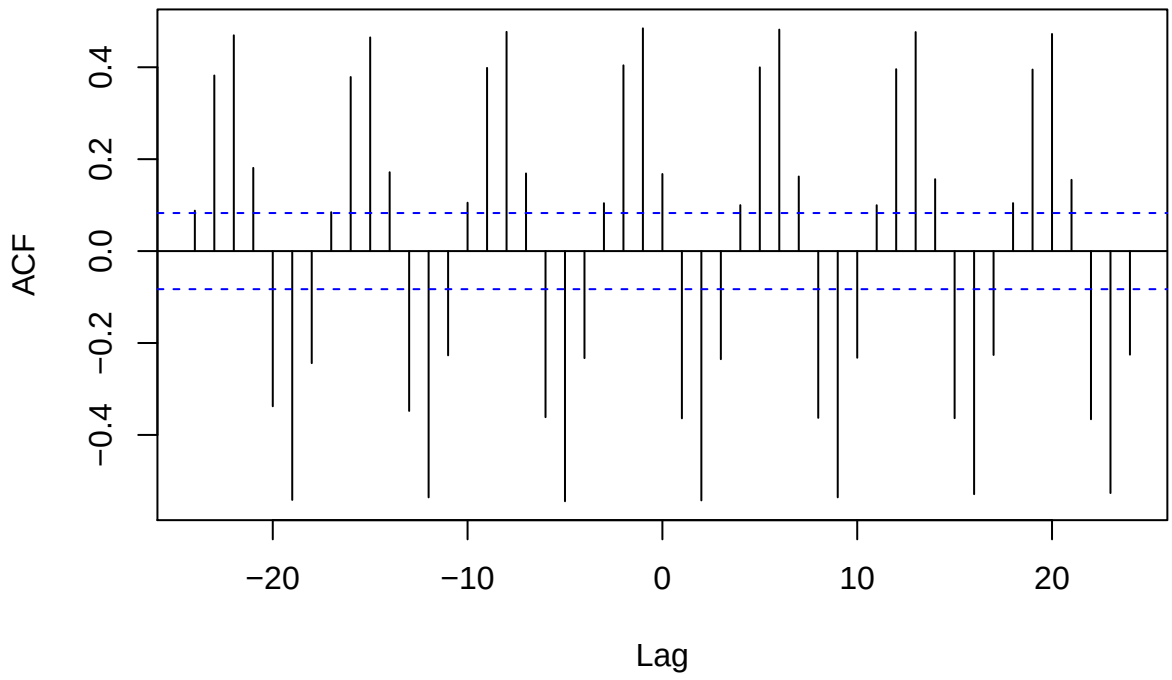
```
## [1] 6257223
```

#Final Project: Slides 19-20 - VAR Model

```
#ccf plots
ccf(X$visitors, X$week_num, type = "correlation", plot = T)
```




```
ccf(X$visitors, X$weekday, type = "correlation", plot = T)
```




```
#change to factor
X$weekday = as.factor(X$weekday)
X$week_num = as.factor(X$week_num)

#VAR Select
VARselect(cbind(X$visitors, X$weekday), type="trend", exogen = NULL, lag.max = 25)
```

```
## $selection
## AIC(n)  HQ(n)  SC(n) FPE(n)
##      9      7      7      9
##
## $criteria
##                  1            2            3            4            5
## AIC(n) 1.647517e+01 1.641779e+01 1.626709e+01 1.619436e+01 1.601086e+01
## HQ(n)  1.649396e+01 1.644910e+01 1.631093e+01 1.625074e+01 1.607976e+01
## SC(n)  1.652319e+01 1.649783e+01 1.637915e+01 1.633844e+01 1.618695e+01
## FPE(n) 1.429141e+07 1.349444e+07 1.160671e+07 1.079259e+07 8.983243e+06
##                  6            7            8            9
## AIC(n) 1.584872e+01 -5.449490e+01 -5.449667e+01 -5.450793e+01
## HQ(n)  1.593015e+01 -5.440095e+01 -5.439019e+01 -5.438893e+01
## SC(n)  1.605683e+01 -5.425477e+01 -5.422452e+01 -5.420377e+01
## FPE(n) 7.638729e+06  2.153667e-24  2.149892e-24  2.125848e-24
##                 10            11            12            13
## AIC(n) -5.450103e+01 -5.448761e+01 -5.447324e+01 -5.447236e+01
## HQ(n)  -5.436950e+01 -5.434355e+01 -5.431666e+01 -5.430325e+01
## SC(n)  -5.416485e+01 -5.411941e+01 -5.407303e+01 -5.404013e+01
```

```
## FPE(n)  2.140614e-24  2.169591e-24  2.201057e-24  2.203070e-24
##                   14            15            16            17
## AIC(n) -5.447454e+01 -5.446921e+01 -5.445688e+01 -5.444829e+01
## HQ(n)  -5.429291e+01 -5.427504e+01 -5.425019e+01 -5.422907e+01
## SC(n)  -5.401030e+01 -5.397294e+01 -5.392860e+01 -5.388799e+01
## FPE(n)  2.198358e-24  2.210229e-24  2.237753e-24  2.257201e-24
##                   18            19            20            21
## AIC(n) -5.443753e+01 -5.442414e+01 -5.441387e+01 -5.440165e+01
## HQ(n)  -5.420578e+01 -5.417987e+01 -5.415707e+01 -5.413233e+01
## SC(n)  -5.384522e+01 -5.379981e+01 -5.375752e+01 -5.371329e+01
## FPE(n)  2.281780e-24  2.312713e-24  2.336789e-24  2.365722e-24
##                   22            23            24            25
## AIC(n) -5.440697e+01 -5.439737e+01 -5.439554e+01 -5.438484e+01
## HQ(n)  -5.412511e+01 -5.410299e+01 -5.408863e+01 -5.406541e+01
## SC(n)  -5.368659e+01 -5.364498e+01 -5.361112e+01 -5.356841e+01
## FPE(n)  2.353424e-24  2.376376e-24  2.381036e-24  2.406958e-24
```

```
fit.v = VAR(cbind(X$visitors, X$weekday), p=7, type = "trend", exogen = NULL, season = NULL)
```

```
## Warning in VAR(cbind(X$visitors, X$weekday), p = 7, type = "trend", exogen = NULL, : No column names
```

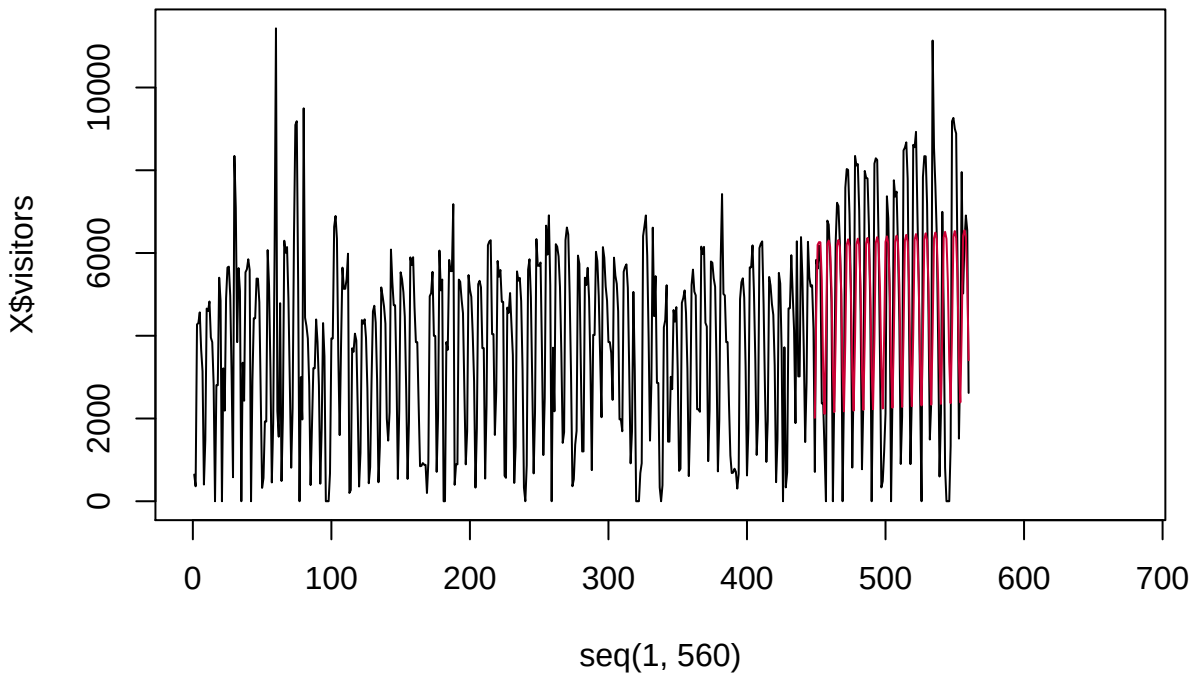
```
#forecast for Spring 2020 semester
preds.112= predict(fit.v,n.ahead=112)
```

```
## Warning in summary.lm(x): essentially perfect fit: summary may be
## unreliable
```

```
preds.112$fcst$y1[1:112]
```

```
##   [1] 2016.722 4558.874 6197.371 6263.589 6258.811 5357.062 3164.838
##   [8] 2110.121 3971.828 6208.827 6301.271 6152.129 5141.550 3178.303
##  [15] 2153.931 3896.482 6192.225 6315.810 6146.459 5113.306 3178.391
##  [22] 2171.746 3899.694 6199.355 6330.505 6159.585 5122.136 3190.256
##  [29] 2187.930 3914.987 6214.836 6347.434 6176.669 5138.506 3206.847
##  [36] 2205.348 3932.570 6232.491 6365.368 6194.719 5156.463 3224.797
##  [43] 2223.435 3950.737 6250.697 6383.637 6213.028 5174.768 3243.096
##  [50] 2241.754 3969.077 6269.051 6402.007 6231.411 5193.153 3261.481
##  [57] 2260.141 3987.469 6287.447 6420.407 6249.815 5211.559 3279.887
##  [64] 2278.548 4005.876 6305.855 6438.816 6268.225 5229.969 3298.298
##  [71] 2296.959 4024.287 6324.267 6457.228 6286.637 5248.381 3316.710
##  [78] 2315.371 4042.700 6342.679 6475.640 6305.049 5266.794 3335.123
##  [85] 2333.784 4061.112 6361.092 6494.053 6323.462 5285.207 3353.535
##  [92] 2352.196 4079.525 6379.505 6512.465 6341.874 5303.619 3371.948
##  [99] 2370.609 4097.938 6397.917 6530.878 6360.287 5322.032 3390.361
## [106] 2389.022 4116.351 6416.330 6549.291 6378.700 5340.445 3408.774
```

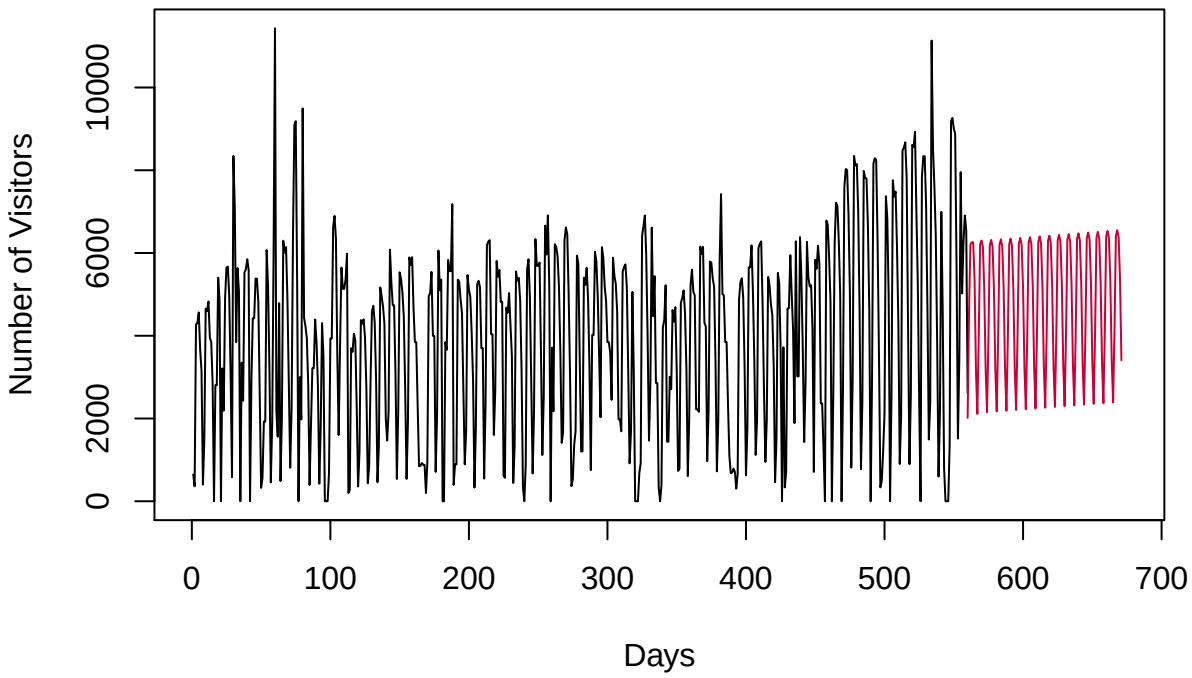
```
plot(seq(1,560),X$visitors, type = "l",xlim = c(0,675))
points(seq(449,560,1),preds.112$fcst$y1[1:112,1],type = "l", col = "#cc0035")
```




```
ASE.var.112 = mean((X$visitors[449:560]-preds.112$fcst$y1[1:112,1])^2)
ASE.var.112
```

```
## [1] 5504134
```

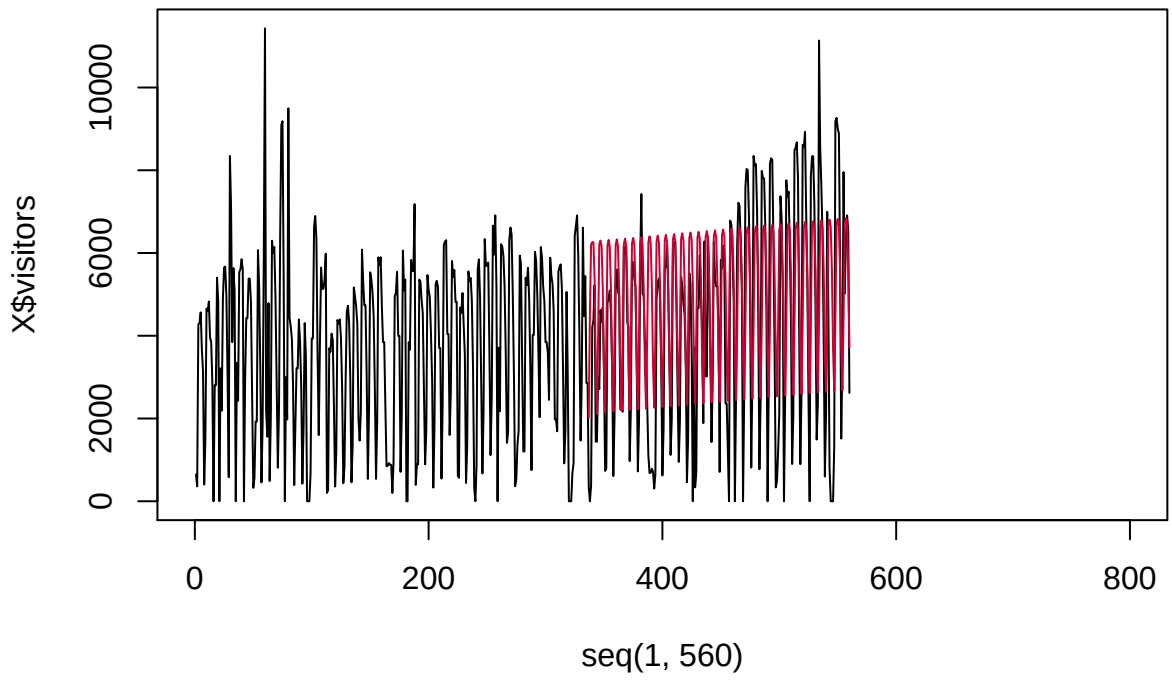
```
plot(seq(1,560),X$visitors, type = "l",xlim = c(0,675), ylab = "Number of Visitors", xlab = "Days")
points(seq(560,671,1),preds.112$fcst$y1[1:112,1],type = "l", col = "#cc0035")
```




```
#Spring and Fall preds
preds= predict(fit.v,n.ahead=224)
```

```
## Warning in summary.lm(x): essentially perfect fit: summary may be
## unreliable
```

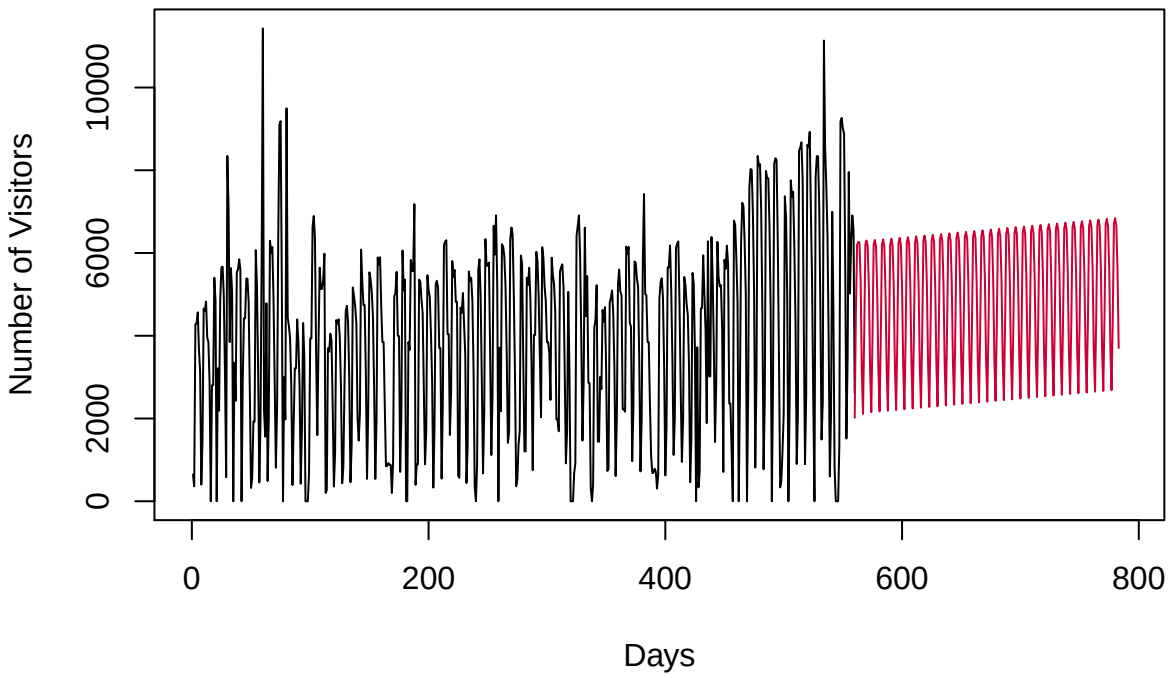
```
plot(seq(1,560),X$visitors, type = "l",xlim = c(0,800))
points(seq((560-224+1),560,1),preds$fcst$y1[1:224,1],type = "l", col = "#cc0035")
```




```
ASE.var.224 = mean((X$visitors[(560-224+1):560]-preds$fcst$y1[1:224,1])^2)
ASE.var.224
```

```
## [1] 4547001
```

```
plot(seq(1,560),X$visitors, type = "l",xlim = c(0,790), ylab = "Number of Visitors", xlab = "Days")
points(seq(560,(560+224-1),1),preds$fcst$y1[1:224,1],type = "l", col = "#cc0035")
```

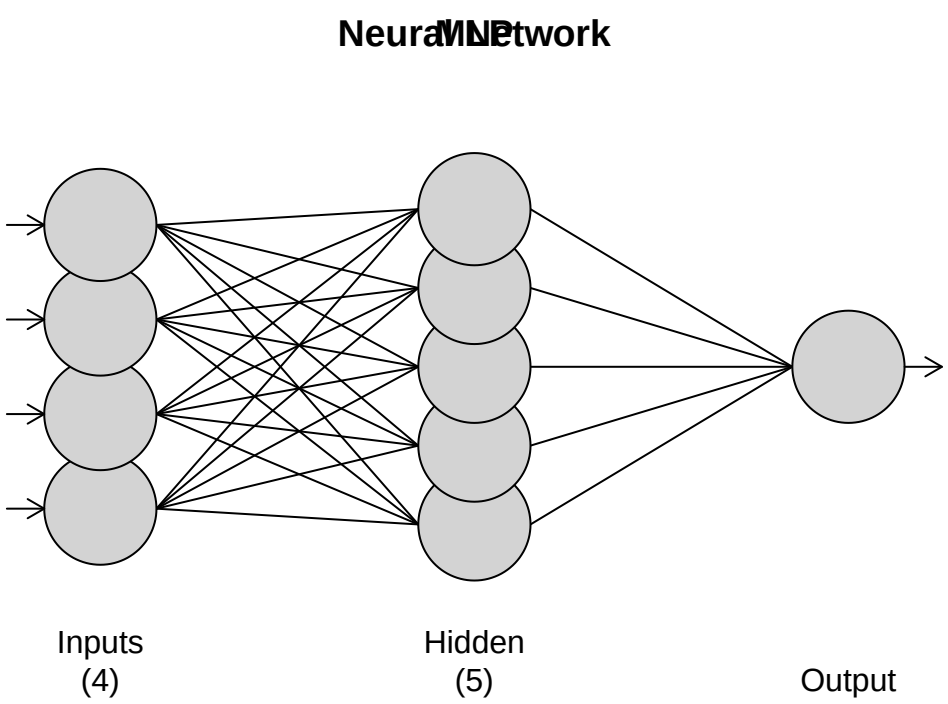


#Final Project: Step 3 - Neural Network Model

```
GC = X$visitors

tGC = ts(GC[1:560])
fit.GC= mlp(tGC, seasonal(7), reps=10, comb=c("mean"))
fit.GC
```

```
## MLP fit with 5 hidden nodes and 10 repetitions.
## Univariate lags: (1,2,3,4)
## Forecast combined using the mean operator.
## MSE: 1883775.2348.
```

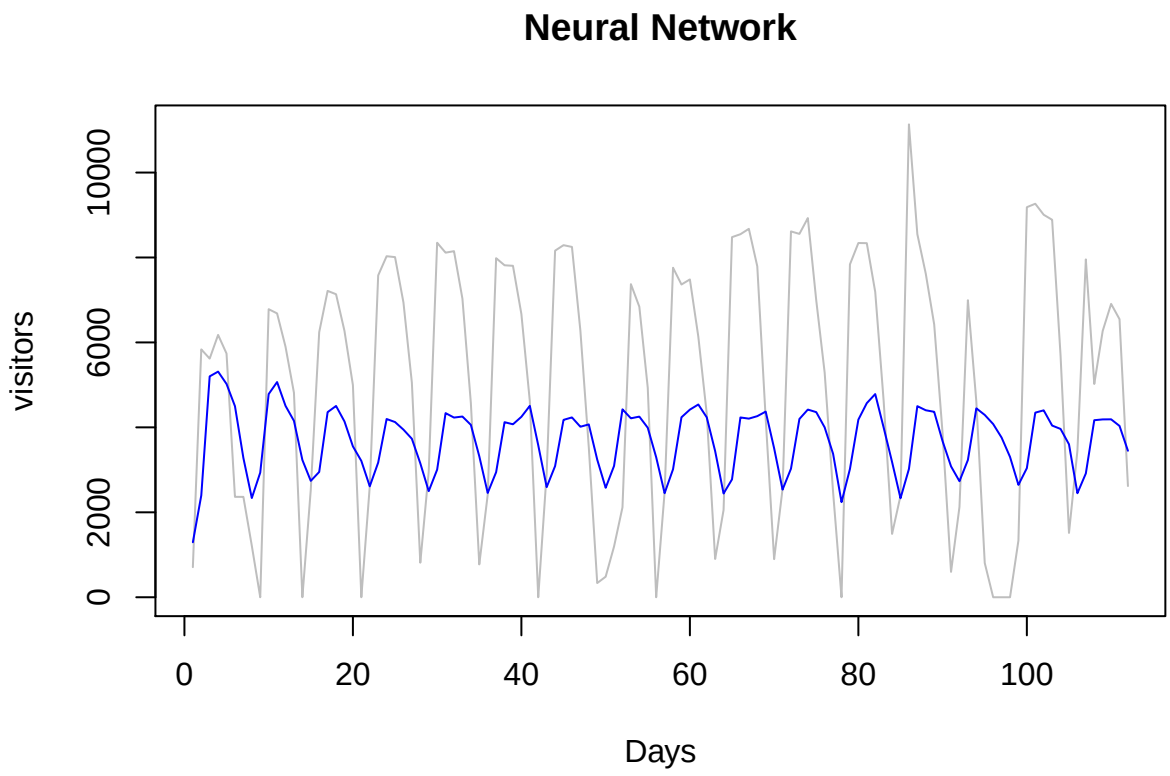
```
plot(fit.GC)

f = forecast(fit.GC, h = 112)
plot(GC[449:560],type = "l", ylab="visitors", col="gray", xlab = "Days", title(main="Neural Network"))
```



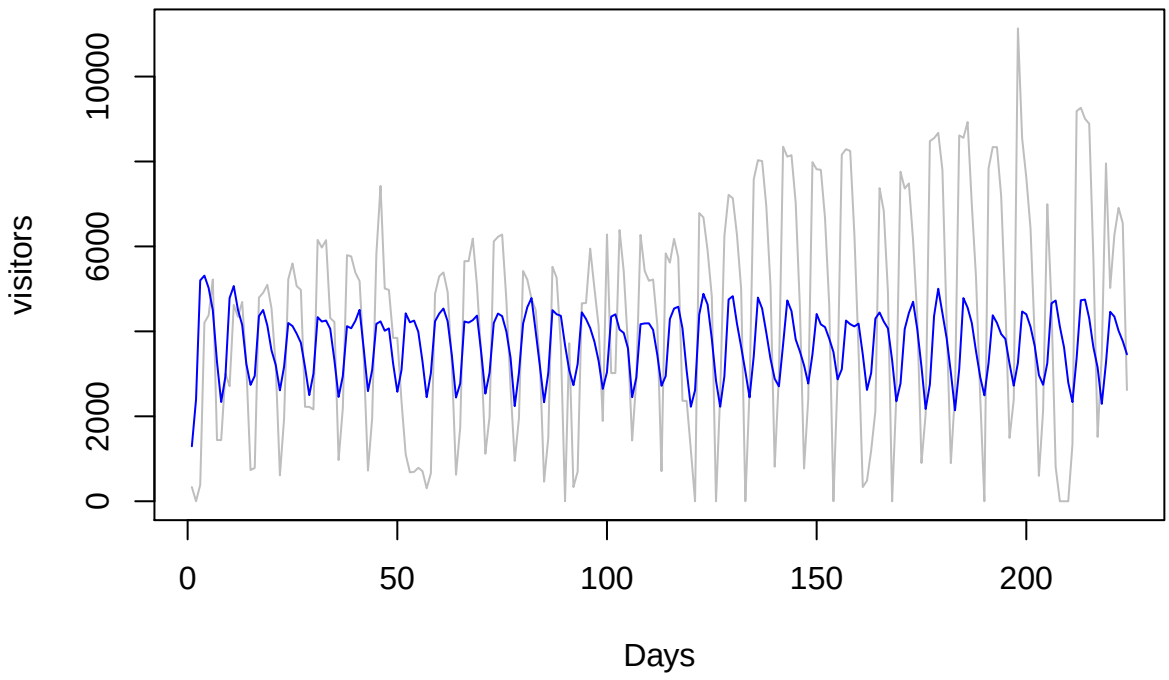

```
lines(seq(1,112,1),f$mean, col = "blue")
ASE.mlp = mean((GC[449:560]-f$mean)^2)
ASE.mlp
```

```
## [1] 9272584
```

```
f.224 = forecast(fit.GC, h = 224)
plot(GC[337:560],type = "l", ylab="visitors", col="gray", xlab = "Days", title(main="Neural Network"))
```




```
lines(seq(1,224,1),f.224$mean, col = "blue")
```



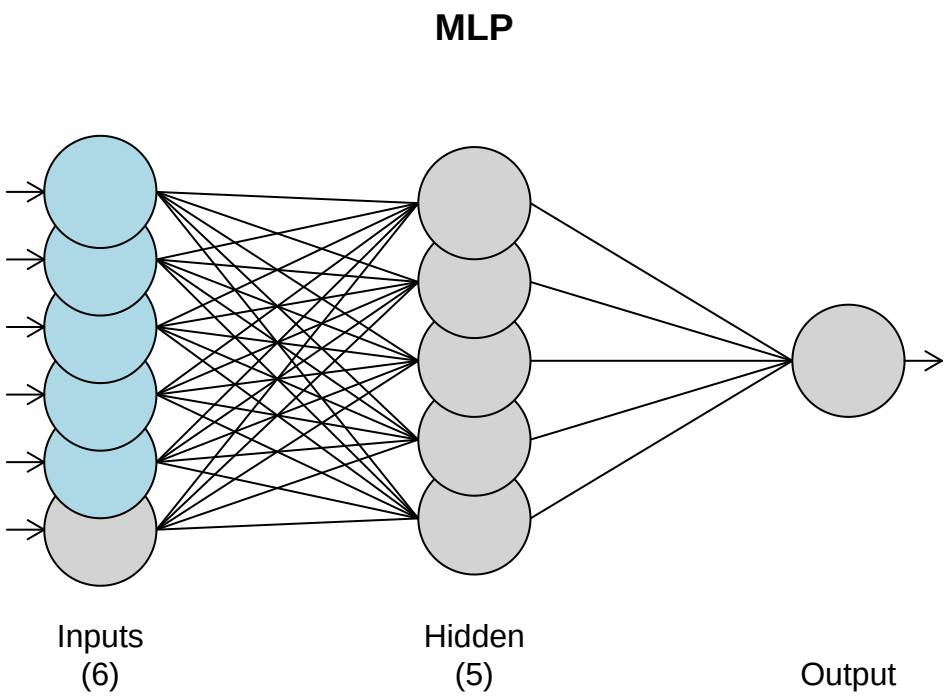

```
ASE.mlp.224 = mean((GC[337:560]-f.224$mean)^2)
ASE.mlp.224
```

```
## [1] 5618616
```

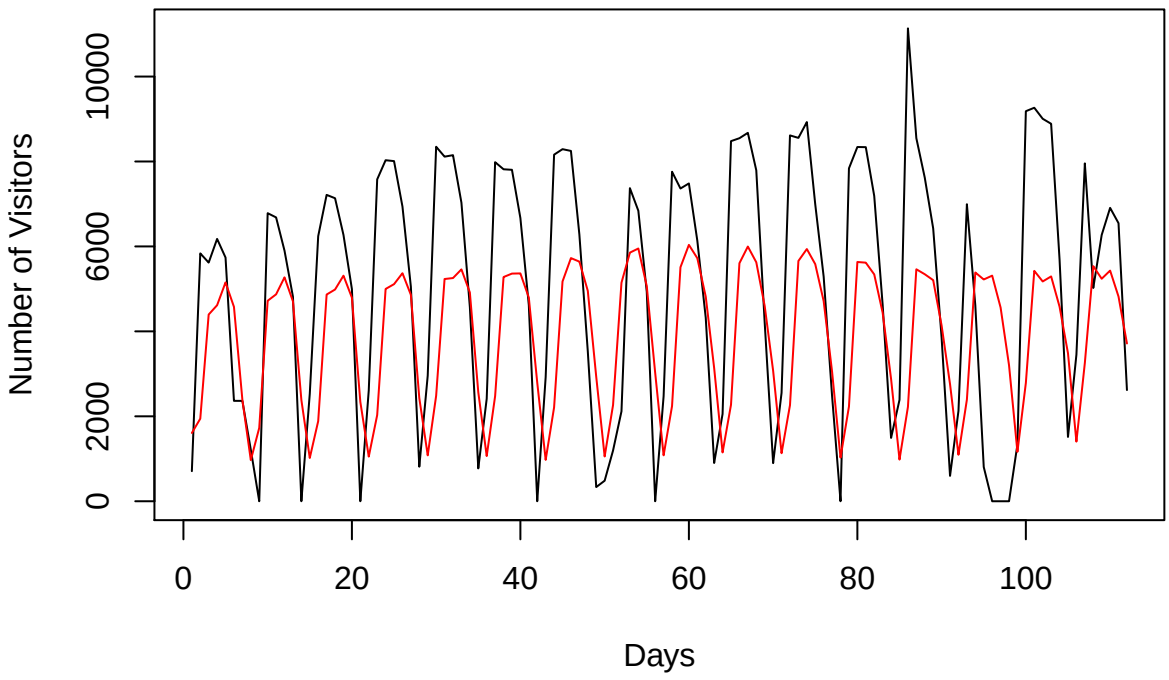
```
##NN of visitors, multiple regressors - Spring 2020
set.seed(45)
tGC = ts(X$visitors[1:448])
tGCx = data.frame(week = ts(X$week_num), day = ts(X$weekday))
fit.nn = mlp(tGC, xreg = tGCx, reps = "7", comb = "mean")
fit.nn
```

```
## MLP fit with 5 hidden nodes and 7 repetitions.
## Univariate lags: (1)
## 2 regressors included.
## - Regressor 1 lags: (1,3)
## - Regressor 2 lags: (1,2,4)
## Forecast combined using the mean operator.
## MSE: 1176407.7762.
```

```
plot(fit.nn)
```




```
f.nn = forecast(fit.nn, h=112, xreg = tGCx)
plot(X$visitors[449:560],type = "l", ylab="Number of Visitors", xlab ="Days")
lines(seq(1,112),f.nn$mean, col = "red")
```



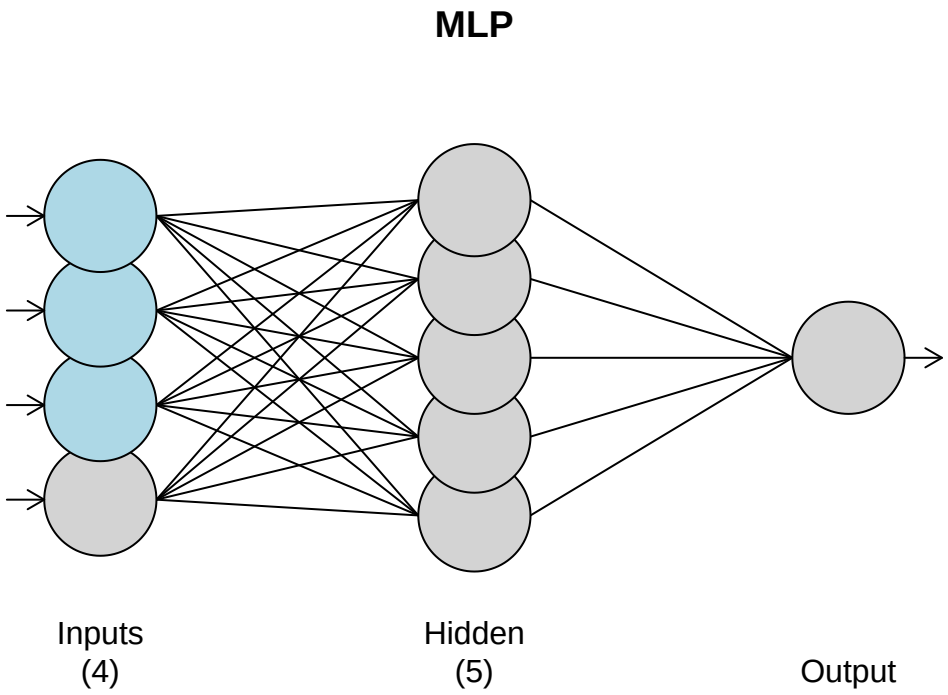

```
ASE.nn.112 = mean((X$visitors[449:560]-f.nn$mean)^2)
ASE.nn.112
```

```
## [1] 7918749
```

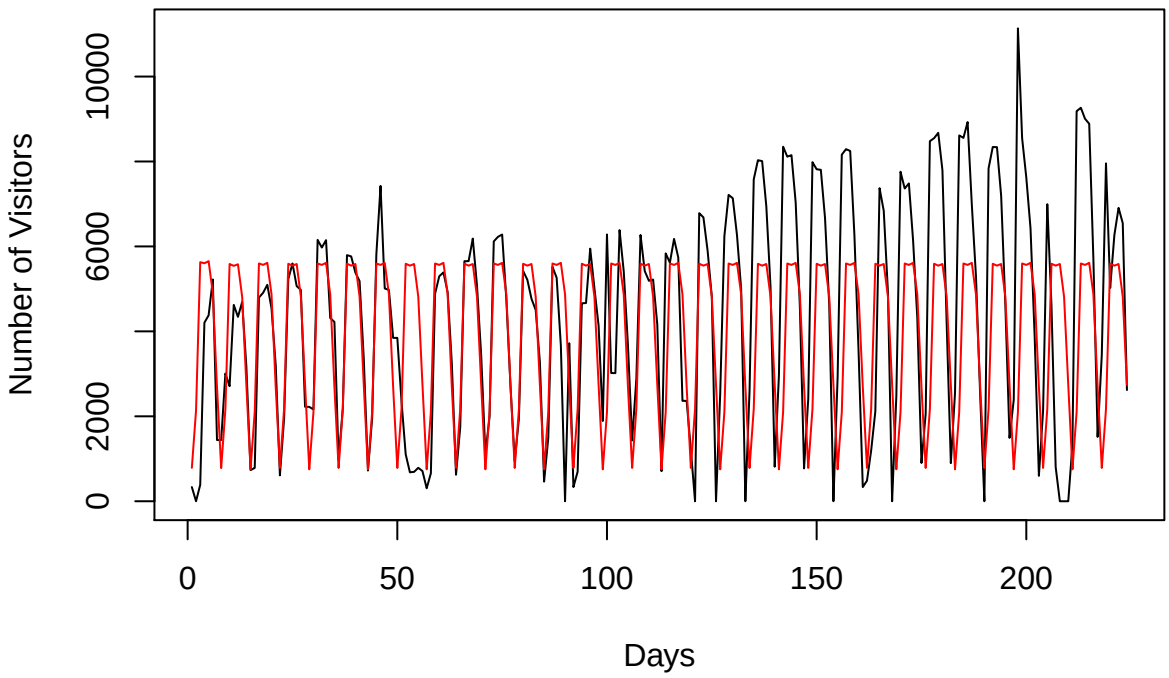
```
#Fall and Spring 2020
set.seed(45)
tGC = ts(X$visitors[1:336])
tGCx = data.frame(week = ts(X$week_num), day = ts(X$weekday))
fit.nn.224 = mlp(tGC, xreg = tGCx, reps = "7", comb = "mean")
fit.nn.224
```

```
## MLP fit with 5 hidden nodes and 7 repetitions.
## Univariate lags: (1)
## 1 regressor included.
## - Regressor 1 lags: (1,2,4)
## Forecast combined using the mean operator.
## MSE: 1331676.6262.
```

```
plot(fit.nn.224)
```




```
f.nn.224 = forecast(fit.nn.224, h=224, xreg = tGCx)
plot(X$visitors[337:560],type = "l", ylab="Number of Visitors", xlab ="Days")
lines(seq(1,224,1),f.nn.224$mean, col = "red")
```

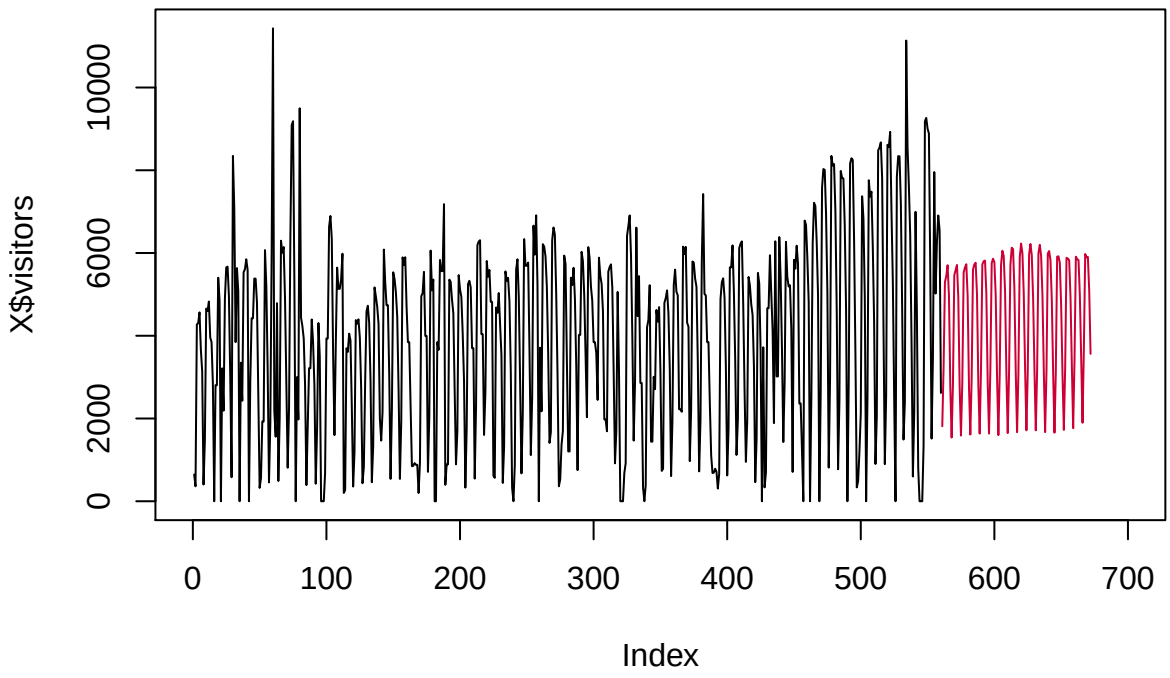



```
ASE.nn.224 = mean((X$visitors[337:560]-f.nn.224$mean)^2)
ASE.nn.224
```

```
## [1] 5141396
```

#Ensemble models

```
#ensemble forecast for Spring 2020
ensemble = (f.nn$mean + preds.112$fcst$y1[1:112])/2
plot(X$visitors, type = "l", xlim = c(0,700))
lines(seq(561,672,1), ensemble, col="#cc0035")
```



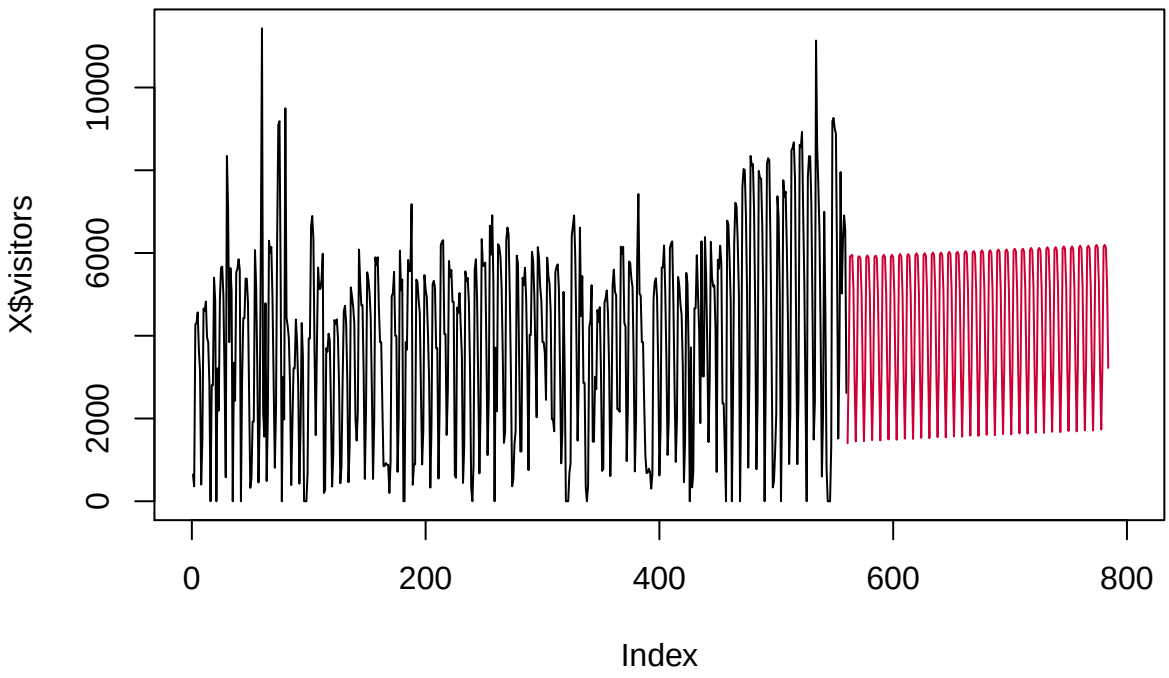

```
ASE.ens.112 = mean((X$visitors[449:560]-ensemble)^2)
ASE.ens.112
```

```
## [1] 6421264
```

```
sum(ensemble)
```

```
## [1] 486532.3
```

```
#ensemble forecast for Spring 2020 and Fall 2020
ensemble.224 = (f.nn.224$mean + preds$fcst$y1[1:224])/2

plot(X$visitors, type = "l", xlim = c(0,800))
lines(seq(561,784,1), ensemble.224, col="#cc0035")
```




```
ASE.ens.224 = mean((X$visitors[337:560]-ensemble.224)^2)
ASE.ens.224
```

```
## [1] 4487149
```

```
sum(ensemble.224)
```

```
## [1] 990900.7
```

```
springcounts = sum(ensemble.224[1:112])
springcounts
```

```
## [1] 487626.9
```

```
fallcounts = sum(ensemble.224[113:224])
fallcounts
```

```
## [1] 503273.8
```

```
(503273.8-172405)/503273.8
```

```
## [1] 0.657433
```