LAMPIRAN

Lampiran 1

Kasus Positif Covid Harian
1445
373
1920
2872
2720
2471
782
782
1581
1661
1737
2098
2048
578
1437
2008
1159
1616
1834
1783
867
1754
1873
1040
1204
934
1109
927
1330
1092
1588

1638
1937
1474
762
1381
1726
1304
815
890
762
198
965
1337
1240
510
676
523
281
651
1239
1013
977
1031
778
827
661
1330
979
1037
750
973
762
602
1266
884
907

896
749
918
639
987
789
926
554
757
521
845
905
783
732
809
694
489
656
785
632
227
161
421
397
539
695
856
932
867
819
406
617
940
693
807
984

726
755
601
714
906
1317
1019
1197
519
1371
2096
2293
2455
2769
2722
2119
2376
4144
4737
4895
5582
3221
3789
7505
7502
6934
9271
9394
8348
6213
7680
7541
9399
9702
10485
10903

9439
9366
12974
13112
12920
13133
14619
9439
10092
11876
10421
10001
9128
5000
7379
5904
2160
8033
8360
5393
5432
1980
5525
3845
3454
3327
2701
1410
3567
1789
2311
2185
2008
1649
727
1601

1679
1172
1210
1363
1182
513
655
1029
731
969
891
701
485
484
789
574
638
468
474
341
399
673
430
343

Lampiran 2

1. Persiapkan Data dan Identifikasi Model

- Memanggil data kemudian membuat plot grafik

  >DataCovid <- ts(datauji$`Kasus Positif Covid Harian`)

  >ts.plot(DataCovid, col="blue", ylab="Jumlah Kasus Covid", xlab="Hari" , main="Plot Peramalan Kasus Positif Covid-19")

  >DataCovid

Time Series:

Start = 1

End = 199

Frequency = 1

[1] 1445 373 1920 2872 2720 2471 782 782 1581 1661 1737

[12] 2098 2048 578 1437 2008 1159 1616 1834 1783 867 1754

[23] 1873 1040 1204 934 1109 927 1330 1092 1588 1638 1937

[34] 1474 762 1381 1726 1304 815 890 762 198 965 1337

[45] 1240 510 676 523 281 651 1239 1013 977 1031 778

[56] 827 661 1330 979 1037 750 973 762 602 1266 884

[67] 907 896 749 918 639 987 789 926 554 757 521

[78] 845 905 783 732 809 694 489 656 785 632 227

[89] 161 421 397 539 695 856 932 867 819 406 617

[100] 940 693 807 984 726 755 601 714 906 1317 1019

[111] 1197 519 1371 2096 2293 2455 2769 2722 2119 2376 4144

[122] 4737 4895 5582 3221 3789 7505 7502 6934 9271 9394 8348

[133] 6213 7680 7541 9399 9702 10485 10903 9439 9366 12974 13112

[144] 12920 13133 14619 9439 10092 11876 10421 10001 9128 5000 7379

[155] 5904 2160 8033 8360 5393 5432 1980 5525 3845 3454 3327

[166] 2701 1410 3567 1789 2311 2185 2008 1649 727 1601 1679

[177] 1172 1210 1363 1182 513 655 1029 731 969 891 701

[188] 485 484 789 574 638 468 474 341 399 673 430

[199] 343

- Uji Augmented Dickey Fuller terhadap data asli

  > library(tseries)

  > adf.test(DataCovid)

Augmented Dickey-Fuller Test

data: DataCovid

Dickey-Fuller = -1.0056, Lag order = 5, p-value = 0.9352

alternative hypothesis: stationary

> acf(DataCovid)

> pacf(DataCovid)

- Transformasi akar terhadap data asli

  > DataCovid_trans=sqrt(DataCovid)

- Proses differencing terhadap data hasil transformasi akar

  > DataCovid_diff=diff(DataCovid_trans)

- Membuat plot grafik berdasarkan data hasil differencing

  > ts.plot(DataCovid_trans, col="blue", ylab="Jumlah Kasus Covid", xlab="Hari" , main="Plot Peramalan Kasus Positif Covid-19")

- Kembali menguji Uji Augmented Dickey Fuller terhadap data hasil differencing

  > adf.test(DataCovid_diff)

Augmented Dickey-Fuller Test

data: DataCovid_diff
Dickey-Fuller = -7.2057, Lag order = 5, p-value = 0.01
alternative hypothesis: stationary

Warning message:
In adf.test(DataCovid_diff) : p-value smaller than printed p-value

- Membuat plot garfik ACF berdasarkan data hasil differencing
  > acf(DataCovid_diff)

- Membuat plot garfik PACF berdasarkan data hasil differencing
  > pacf(DataCovid_diff)

2. Estimasi Model

- Hasil
  Model 2 ARIMA (0,1,1)
  > dugaan1=arima(DataCovid_trans, order=c(0,1,1))
  > summary(dugaan1)

  Call:
  arima(x = DataCovid_trans, order = c(0, 1, 1))

  Coefficients:
  ma1
  -0.4892

s.e. 0.0629

sigma^2 estimated as 71.19: log likelihood = -703.36, aic = 1410.71

Training set error measures:

	ME	RMSE	MAE	MPE	MAPE	MASE
Training set	-0.1553466	8.416208	6.032274	-3.831606	15.97542	0.9582944

	ACF1
Training set	0.05135507

Model 2 ARIMA (0,1,2)

```
> dugaan2=arima(DataCovid_trans, order=c(0,1,2))
> summary(dugaan2)
```

Call:

arima(x = DataCovid_trans, order = c(0, 1, 2))

Coefficients:

ma1	ma2
-0.4067	-0.108
s.e. 0.0796	0.074

sigma^2 estimated as 70.42: log likelihood = -702.28, aic = 1410.55

Training set error measures:

	ME	RMSE	MAE	MPE	MAPE	MASE
Training set	-0.1674454	8.370787	6.009805	-3.835606	15.90933	0.9547249

	ACF1
Training set	-0.01642667

Model 3 ARIMA (0,1,3)

```
> dugaan3=arima(DataCovid_trans, order=c(0,1,3))
> summary(dugaan3)

Call:
arima(x = DataCovid_trans, order = c(0, 1, 3))

Coefficients:
         ma1      ma2     ma3
      -0.4314  -0.2278  0.1619
s.e.   0.0750   0.0788  0.0758

sigma^2 estimated as 68.71:  log likelihood = -699.91,  aic = 1407.82

Training set error measures:
                     ME     RMSE      MAE       MPE    MAPE      MASE
Training set -0.1584297 8.268303 5.986859 -3.767288 15.9441 0.9510798
                    ACF1
Training set 0.007416635
```

Model 4 ARIMA (1,1,0)

```
> dugaan4=arima(DataCovid_trans, order=c(1,1,0))
> summary(dugaan4)

Call:
arima(x = DataCovid_trans, order = c(1, 1, 0))

Coefficients:
```

```
         ar1
      -0.3094
s.e.   0.0682

sigma^2 estimated as 76.83:  log likelihood = -710.82,  aic = 1425.63

Training set error measures:
                    ME     RMSE      MAE       MPE     MAPE      MASE
Training set -0.1200146 8.743159 6.116516 -3.417508 16.18709 0.9716771
                    ACF1
Training set -0.08588393
```

Model 5 ARIMA (1,1,1)

```
> dugaan5=arima(DataCovid_trans, order=c(1,1,1))
> summary(dugaan5)

Call:
arima(x = DataCovid_trans, order = c(1, 1, 1))

Coefficients:
         ar1      ma1
      0.1311  -0.5724
s.e.  0.1130   0.0832

sigma^2 estimated as 70.72:  log likelihood = -702.7,  aic = 1411.39

Training set error measures:
                    ME     RMSE      MAE       MPE     MAPE      MASE
Training set -0.1634915 8.388535 6.017337 -3.843398 15.92477 0.9559214
```

```
                    ACF1
Training set 0.01195282
```

Model 6 ARIMA (1,1,2)

```
> dugaan6=arima(DataCovid_trans, order=c(1,1,2))
> summary(dugaan6)

Call:
arima(x = DataCovid_trans, order = c(1, 1, 2))

Coefficients:
          ar1     ma1      ma2
      -0.5374  0.1414  -0.3872
s.e.   0.1908  0.1751   0.0825

sigma^2 estimated as 69.21:  log likelihood = -700.57,  aic = 1409.15

Training set error measures:
                     ME     RMSE      MAE       MPE     MAPE      MASE
Training set -0.1648895 8.298047 6.003189 -3.789105 15.92022 0.9536739
                    ACF1
Training set -0.01859072
```

Model 7 ARIMA (1,1,3)

```
> dugaan7=arima(DataCovid_trans, order=c(1,1,3))
> summary(dugaan7)

Call:
arima(x = DataCovid_trans, order = c(1, 1, 3))
```

Coefficients:

	ar1	ma1	ma2	ma3
	0.9217	-1.4019	0.2287	0.2524
s.e.	0.0502	0.0897	0.1379	0.0755

sigma^2 estimated as 64.4: log likelihood = -693.81, aic = 1397.62

Training set error measures:

	ME	RMSE	MAE	MPE	MAPE	MASE
Training set	-0.1008231	8.004761	5.751517	-2.923203	15.29945	0.913693

	ACF1
Training set	-0.01618221

Model 8 ARIMA (2,1,0)

```
> dugaan8=arima(DataCovid_trans, order=c(2,1,0))
> summary(dugaan8)
```

Call:

arima(x = DataCovid_trans, order = c(2, 1, 0))

Coefficients:

	ar1	ar2
	-0.3951	-0.3002
s.e.	0.0681	0.0691

sigma^2 estimated as 70.09: log likelihood = -701.82, aic = 1409.65

Training set error measures:

```
                    ME     RMSE      MAE       MPE     MAPE     MASE
Training set -0.137493 8.351028 5.996561 -3.612058 16.04876 0.952621
                    ACF1
Training set -0.009988643
```

Model 9 ARIMA (2,1,1)

```
> dugaan9=arima(DataCovid_trans, order=c(2,1,1))
> summary(dugaan9)

Call:
arima(x = DataCovid_trans, order = c(2, 1, 1))

Coefficients:
         ar1      ar2      ma1
      -0.0340  -0.1810  -0.3938
s.e.   0.1856   0.1016   0.1825

sigma^2 estimated as 69.57:  log likelihood = -701.1,  aic = 1410.19

Training set error measures:
                    ME     RMSE      MAE       MPE     MAPE      MASE
Training set -0.1603611 8.319727 5.996637 -3.801064 15.94177 0.9526331
                    ACF1
Training set 0.004125804
```

Model 10 ARIMA (2,1,2)

```
> dugaan10=arima(DataCovid_trans, order=c(2,1,2))
> summary(dugaan10)
```

```
Call:
arima(x = DataCovid_trans, order = c(2, 1, 2))

Coefficients:
         ar1      ar2      ma1     ma2
      1.0423  -0.4839  -1.5180  0.7861
s.e.  0.0992   0.1035   0.0779  0.0657

sigma^2 estimated as 65.3:  log likelihood = -695.09,  aic = 1400.19

Training set error measures:
                    ME     RMSE     MAE       MPE     MAPE     MASE
Training set -0.1347265 8.060256 5.85129 -3.447529 15.52803 0.929543
                    ACF1
Training set -0.01839295
```

Model 11 ARIMA (2,1,3)

```
> dugaan11=arima(DataCovid_trans, order=c(2,1,3))
> summary(dugaan11)

Call:
arima(x = DataCovid_trans, order = c(2, 1, 3))

Coefficients:
         ar1      ar2      ma1      ma2     ma3
      0.6083  0.2976  -1.1007  -0.2476  0.4455
s.e.  0.2271  0.2147   0.2084   0.3119  0.1284

sigma^2 estimated as 64.01:  log likelihood = -693.21,  aic = 1398.42
```

Training set error measures:

	ME	RMSE	MAE	MPE	MAPE	MASE
Training set	-0.1007652	7.980211	5.800393	-2.899139	15.38367	0.9214575

	ACF1
Training set	0.003525919

3. Pemeriksaan Diagnostik dan Pemilihan Model

- Nilai residual Model

> residual_1=resid(dugaan1)

> residual_1

Time Series:

Start = 1

End = 199

Frequency = 1

[1] 0.03801313 -16.79795454 16.74117366 17.68624915 7.15961523 1.05301691

[7] -21.22843985 -10.38310047 6.71863103 4.28001821 3.01555813 5.60167573

[13] 2.19099724 -20.14146391 4.01383407 8.86632124 -6.42960957 3.01033122

[19] 4.09824535 1.40503982 -12.09343725 6.52034187 4.58685129 -8.78545312

[25] -1.84778509 -5.04114476 0.27433174 -2.72078589 4.69160158 -1.12881664

[31] 6.25212696 3.68076051 5.33961563 -3.00674942 -12.25912973 3.56083381

[37] 6.12515109 -2.43806148 -8.75532777 -2.99805831 -3.69503856 -15.34055054

[43] 9.48927927 10.14229950 3.60978994 -10.86470368 -1.89771474 -4.05908533

[49] -8.09166465 4.79356059 12.02952917 2.51254567 0.65836512 1.17423276

[55] -3.64215434 -0.91662538 -3.49606024 9.04912589 -0.75375499 0.54480489

[61] -4.54986191 1.58122772 -2.81513339 -4.44569862 8.87056523 -1.50966591

[67] -0.35415896 -0.35642059 -2.73974000 1.59049014 -4.24206767 4.06307390

[73] -1.33993529 1.68566689 -6.06848942 1.00799029 -4.19514405 4.19137934

[79] 3.06457262 -0.60202662 -1.22112358 0.79010684 -1.71256005 -5.06824441

[85] 1.01999032 2.90428890 -1.45759088 -10.78608036 -7.65401773 4.08569817

[91] 1.40511816 3.97883669 5.09275102 5.38577482 3.90568152 0.82667630

[97] -0.42231400 -8.67531180 0.44646206 6.03832434 -1.38084359 1.40740431

[103] 3.64946914 -2.63922733 -0.75811777 -3.33279985 0.57521799 3.66042680

[109] 7.98118052 -0.46467276 2.44861091 -10.61836353 9.05140927 13.18262670

[115] 8.55154816 5.84571822 5.93280013 2.45356625 -4.94001600 0.29519473

[121] 15.77407361 12.16794247 7.09043163 8.21683407 -13.93961507 -2.01764748
[127] 24.08960509 11.76625878 2.41209274 14.19527880 7.58032338 -1.84729854
[133] -13.44842184 2.23464716 0.29641326 10.25450087 6.56634184 7.10952365
[139] 5.49880876 -4.57314000 -2.61339835 15.84701168 8.35583486 3.24584313
[145] 2.52084770 7.54284263 -20.06491377 -6.51044255 5.33349283 -4.28485238
[151] -4.17426077 -6.50629734 -28.01248367 1.48795291 -8.33577397 -34.43918468
[157] 26.30507034 14.67331415 -10.81844785 -5.02685363 -31.66382786 14.34460093
[163] -5.30553190 -5.83255582 -3.94361822 -7.63805130 -18.15737787 13.29260956
[169] -10.92563499 0.43194932 -1.11758719 -2.47994506 -5.41591204 -16.29416944
[175] 5.07916952 3.44761077 -5.05469741 -1.92196692 1.19363394 -1.95472979
[181] -12.68689140 -3.26240477 4.88923716 -2.64941843 2.79577420 0.08842805
[187] -3.32996341 -6.08256068 -2.99803669 4.62263613 -1.86965644 0.38581108
[193] -3.43663241 -1.54281602 -4.06003348 -0.47719076 5.73383846 -2.40106061
[199] -3.39067542

> residual_2=resid(dugaan2)

> residual_2

Time Series:

Start = 1

End = 199

Frequency = 1

[1] 0.03801313 -17.23644256 18.15859989 14.87820222 6.37558638 1.71986044

[7] -20.35268945 -8.08333736 6.31446876 2.68845961 2.69690695 5.51353934

[13] 1.98416344 -19.81105000 6.02418045 7.21371130 -7.18273462 4.01339199

[19] 3.48227039 1.24974909 -11.89653361 7.73310434 3.25762131 -8.86949172

[25] -0.80540422 -5.42243177 0.44823768 -3.25815038 4.74595266 -1.84556762

[31] 6.56620273 3.09339136 5.50602409 -3.04563136 -11.43239651 4.57962351

[37] 5.01132528 -2.90189723 -8.20173366 -2.36390044 -4.07533135 -15.44556760

[43] 10.27222591 8.01015181 3.01504047 -10.53954049 -0.54357551 -4.48978795

[49] -7.99060841 5.01749644 10.86237317 1.58716409 1.24755246 1.53087235

[55] -3.45930918 -0.37649288 -3.57428435 9.26510593 -1.79842525 1.18251237

[61] -4.52965830 2.09249951 -3.22674052 -4.15489603 9.00722364 -2.63454807

[67] 0.28545285 -0.35154905 -2.67753300 1.80387039 -4.57560654 4.47218826

[73] -2.00280836 2.00951253 -6.29211099 1.63469280 -4.70280547 4.50754923

[79] 2.33958434 -0.66301232 -0.94365317 0.93210417 -1.82188814 -4.87077207

[85] 1.32173776 2.41695323 -1.75267695 -10.52486638 -6.84713216 3.90895669

[91] 0.25688656 3.81802110 4.72682032 5.22902045 3.90793486 1.06992582

[97] 0.03033238 -8.34088168 1.30148237 5.44863509 -1.97830963 1.86664815

[103] 3.50651040 -2.79691928 -0.22590484 -3.35580495 0.81644201 3.34874296

[109] 7.64058327 -0.90009960 3.13482115 -10.63851737 10.25773310 11.77778077

[115] 8.00015315 6.18758040 6.45328548 2.84380422 -4.28700465 1.27535501

[121] 15.68544274 10.96817271 7.29216686 8.89809428 -13.55317963 0.25028372

[127] 23.71501549 9.65346287 3.14262317 15.33560986 7.21217595 -0.96665597

[133] -12.15921153 3.76408875 -0.57881205 10.28053538 5.66839724 7.31259354

[139] 5.60682936 -4.19335991 -1.47629803 16.07228227 6.98060502 3.73250803

[145] 3.20463891 8.01591955 -20.14885244 -4.02367449 4.70644474 -5.41430656

[151] -3.77189127 -6.58285233 -27.91406304 3.12838170 -10.80528369 -34.41791436

[157] 27.98846665 9.47155439 -11.12249766 -3.23530320 -31.72143045 16.58426226

[163] -9.00316324 -5.10790373 -4.13978263 -7.94394845 -18.09856591 13.95688976

[169] -13.70626838 1.70950922 -2.11354366 -2.60817453 -5.49164668 -16.15973207

[175] 5.88525121 1.61161604 -5.45033024 -1.49181527 0.93866375 -2.31796219

[181] -12.57198152 -2.41922218 4.14390656 -3.61708968 3.06826681 -0.42195577

[187] -3.21353242 -5.80603599 -2.73071054 4.35182788 -2.65599742 0.69015733

[193] -3.63146368 -1.26399324 -4.21144361 -0.34026367 5.37418834 -3.05711582

[199] -2.87912278

>

> residual_3=resid(dugaan3)

> residual_3

Time Series:

Start = 1

End = 199

Frequency = 1

[1] 0.03801313 -16.63147935 17.70172388 12.81082191 10.52946744 2.42107840

[7] -20.35708373 -9.92875115 2.48531874 3.09987455 4.43303340 6.34265923

[13] 2.69493561 -19.32352714 5.11742898 4.27165436 -4.62894349 4.30312675

[19] 2.73565192 2.31038208 -11.85766168 7.40423813 1.51575738 -6.76825661

[25] -1.32362625 -6.49569438 0.73264016 -3.80447930 5.60013613 -1.99340145

[31] 7.83632487 2.64185805 6.78688055 -3.35807769 -11.11852190 2.89717426

[37] 3.64381305 -1.40186636 -7.80645848 -2.99225284 -5.07078806 -15.13806989

[43] 9.79237473 7.09700722 6.39238072 -9.84180924 -0.52155079 -6.63314277

[49] -7.49258235 4.09282615 10.81738886 3.44028689 2.71508257 1.05547812

[55] -3.69977023 -0.93021627 -4.46277371 9.22132617 -2.06847635 2.84475208

[61] -5.55370986 2.39417396 -4.28175985 -3.47089854 8.18477083 -2.41548031

[67] 1.76908767 -1.29574792 -2.33015183 1.34381173 -4.76142574 4.76765130

[73] -2.57316748 3.08834180 -6.91909955 2.11201548 -5.85359835 5.31999481

[79] 1.63362138 0.76354026 -1.08657746 0.82812383 -2.11300976 -4.77740500

[85] 0.82282146 2.01405107 -1.04835503 -10.19971219 -7.34278473 2.50825800

[91] 0.46737282 5.25361579 5.11304287 6.22146441 4.26909627 1.34718265

[97] -0.28041149 -8.97408530 0.53684502 4.05240059 -1.01092313 2.48307451

[103] 3.14561996 -2.33804904 -0.16113297 -4.07351885 0.79017924 2.81795893
[109] 8.24590961 -0.29762550 3.96982313 -11.50674955 10.23439042 9.90551785
[115] 10.57112242 6.82218095 6.82054890 2.33612755 -4.68330605 0.11914172
[121] 14.23579875 11.37839748 9.27069683 9.03464016 -13.79210026 -0.59143364
[127] 20.21622127 10.80203742 6.01777544 14.79856446 6.64207002 -0.29306223
[133] -13.55438295 1.82371468 -3.05055197 11.40399194 5.47932703 9.35328300
[139] 5.45751066 -3.66508118 -2.22868476 14.44522805 6.92117458 5.79601379
[145] 2.67099967 7.66165032 -20.77957883 -4.34628298 0.66846516 -4.23067927
[151] -3.04718724 -6.85100224 -27.79434679 2.13337034 -13.36618043 -31.14058777
[157] 26.32744749 8.23275547 -3.40384669 -3.59094418 -32.86258486 15.39028348
[163] -12.58878516 0.16010245 -6.38177495 -6.38689137 -18.65615208 13.70501236
[169] -14.73193693 5.56477104 -4.50400901 -0.22277377 -6.22618154 -15.65213812
[175] 4.91527911 0.52569320 -2.85991208 -1.35929835 0.81072674 -2.03544455
[181] -12.20393457 -2.91596638 2.77644461 -2.53144001 4.10450138 -0.53490565

[187] -2.25892687 -6.21464720 -3.13155386 3.68822735 -2.24693717 1.67847711

[193] -4.01046595 -0.84551008 -4.85557121 -0.12895059 4.94232962 -2.31692176

[199] -2.06876660

> residual_4=resid(dugaan4)

> residual_4

Time Series:

Start = 1

End = 199

Frequency = 1

[1] 0.03801313 -17.78226206 18.71851047 17.35538411 1.58658399 -2.88922917

[7] -22.50125084 -6.72824422 11.79752780 4.64393554 1.22939409 4.41186962

[13] 0.72774460 -21.38310319 7.30242141 11.19335674 -8.63073834 2.82403435

[19] 4.53031476 0.21280264 -12.96626037 8.48134405 5.24527471 -10.59676345

[25] -0.96293361 -3.37931877 1.46008931 -2.00710003 5.13911128 -1.56027943

[31] 5.74492967 2.72786100 3.73176016 -4.52358066 -12.52686874 6.21935624

[37] 7.34059097 -4.07793260 -9.24417544 -1.05537776 -1.83102344 -14.22264280

[43] 12.80582733 10.75855109 0.35059167 -13.04859345 -0.49125985 -2.07358360

[49] -7.07486422 6.86230246 12.39264064 -0.37514840 -1.61394575 0.67561693

[55] -3.95285523 -0.43971303 -2.78005502 9.81623776 -1.85109353 -0.68933122

[61] -4.53370117 2.31655631 -2.41070468 -4.17903404 10.09570940 -2.43117926

[67] -1.42540282 -0.06427156 -2.62207427 2.13687309 -4.11327172 4.58481201

[73] -1.42817626 1.31154556 -6.16866549 1.84360189 -3.45783306 4.79284673

[79] 2.94616815 -1.78722826 -1.57674925 1.10070882 -1.66975179 -4.88001624

[85] 2.19015199 3.48805263 -2.13398312 -10.96366848 -5.49472965 7.09393085

[91] 1.82922065 3.10789855 4.16493051 3.86819991 2.16684426 -0.69048093

[97] -1.16203759 -8.72452579 2.06967060 7.27111490 -2.53373813 0.74167510

[103] 3.60549926 -3.50819373 -0.83610549 -2.79708091 1.28899498 4.06146809

[109] 7.23619875 -2.45321806 1.32415258 -10.98814410 10.58933557 13.16286189

[115] 4.81215828 2.31343931 3.58779283 0.50244325 -6.27896590 0.81175180

[121] 16.46870342 9.28805110 2.51592238 5.10075026 -16.48965902 -0.75580312

[127] 26.56206139 7.74180028 -3.34880154 11.98087006 4.66380314 -5.35827894

[133] -14.26369766 4.93144477 1.93022360 9.86300268 4.67834729 4.37724482

[139] 3.22711415 -6.63753905 -2.62369065 17.00890055 5.90305886 -0.65452198
[145] 0.67276062 6.59847947 -21.80219370 -4.04563368 9.54056281 -4.25811086
[151] -4.21134841 -5.10749425 -26.21126159 7.50763202 -4.36343483 -33.16612946
[157] 33.75677415 15.15775743 -17.43717068 -5.30321364 -29.12289951 20.79664948
[163] -3.09138793 -7.05004877 -2.09227199 -6.04645359 -16.18764424 17.71223873
[169] -10.56665321 0.38382919 0.45840573 -2.34444827 -4.80101924 -14.94537216
[175] 8.82757976 5.00086346 -6.44311584 -1.53524908 2.30413108 -1.87837604
[181] -12.51621111 -0.68622364 7.39582074 -3.03442818 2.53197522 -0.01308275
[187] -3.76900702 -5.49742101 -1.40076372 6.08211523 -2.24676063 0.02220959
[193] -3.22299895 -0.98351370 -3.26258395 0.48606499 6.43410762 -3.35942932
[199] -3.82694712

> residual_5=resid(dugaan5)
> residual_5
Time Series:
Start = 1
End = 199
Frequency = 1

[1] 0.03801313 -17.08336702 17.55233340 16.21147152 6.46683896 1.43440243

[7] -20.59821692 -8.93687582 6.68213689 3.27232036 2.66487391 5.53119364

[13] 2.07627319 -19.95273512 5.22482915 8.07652876 -7.04809231 3.53193323

[19] 3.84079181 1.25480301 -11.98385830 7.25105097 3.91827776 -8.96936167

[25] -1.23918214 -5.16766382 0.32435847 -3.02842519 4.66310715 -1.54374431

[31] 6.36931457 3.37670555 5.39047120 -2.99684655 -11.76747687 4.23534771

[37] 5.55521520 -2.82874016 -8.46979552 -2.57251353 -3.86944457 -15.45600123

[43] 9.91940297 8.95162820 3.05186694 -10.70639412 -1.05649194 -4.18335339

[49] -8.09048013 4.92070681 11.35451738 1.85858979 0.93511983 1.46226039

[55] -3.49118930 -0.58088590 -3.49355527 9.15886612 -1.34748783 0.82105941

[61] -4.46608237 1.88153568 -3.01046507 -4.32161755 8.97357379 -2.15959641

[67] -0.08539707 -0.28242915 -2.70305688 1.71956454 -4.41982078 4.26600045

[73] -1.68987962 1.80984901 -6.16385574 1.35145799 -4.43572936 4.31875540

[79] 2.66825821 -0.70664216 -1.05578205 0.90451289 -1.76310952 -4.96469110

[85] 1.21167934 2.64037004 -1.68206485 -10.65873848 -7.15912674 4.04330033

[91] 0.69493803 3.76708343 4.87147698 5.27080997 3.90897589 0.98717904

[97] -0.11956678 -8.42883659 0.97504689 5.76342595 -1.79813598 1.62161461

[103] 3.61631193 -2.74238285 -0.45709298 -3.29344765 0.70840987 3.49552921

[109] 7.74874233 -0.74447032 2.82229317 -10.55126007 9.75421353 12.47168762

[115] 8.09487568 6.02073495 6.30183565 2.75604192 -4.50379508 0.93825494

[121] 15.81138592 11.45442434 7.11173300 8.67022949 -13.61820445 -0.64078247

[127] 24.08056254 10.48056299 2.65813518 14.97513597 7.50300614 -1.34380140

[133] -12.58598941 3.25256406 -0.08981658 10.16250310 6.04264724 7.15333347

[139] 5.60508161 -4.31931917 -1.89706264 16.08878116 7.56940967 3.41225690

[145] 2.99665333 7.90281704 -20.05770763 -5.06393051 5.18634969 -5.04131010

[151] -4.06060532 -6.51644530 -27.97496821 2.43097745 -9.66283085 -34.70509149

[157] 27.26424389 11.75757035 -11.50237777 -3.96072300 -31.50685531 15.62533402

[163] -7.28773320 -5.79410454 -3.98300069 -7.84604000 -18.16424194 13.66672960

[169] -12.51068959 0.89886711 -1.57135021 -2.65859231 -5.47130760 -16.22604598
[175] 5.54962823 2.42964291 -5.47655327 -1.70088487 1.08799691 -2.19544837
[181] -12.65475414 -2.76304587 4.51768074 -3.30488781 2.86060535 -0.17790645
[187] -3.30741991 -5.90485761 -2.81911604 4.47839551 -2.36531751 0.48776674
[193] -3.51656322 -1.39961017 -4.12463999 -0.41905829 5.52964712 -2.82253956
[199] -3.14962748

> residual_6=resid(dugaan6)
> residual_6
Time Series:
Start = 1
End = 199
Frequency = 1
[1] 0.03801313 -17.07362658 18.18411262 13.64905479 8.44669655 0.81774139
[7] -19.90629215 -8.55331163 5.30344500 3.27191071 3.04663461 5.45821103
[13] 2.07640491 -19.68830551 6.05449748 5.87451275 -5.54343514 3.42828881
[19] 3.30221587 1.67192873 -12.06065155 7.92058321 2.29010943 -7.53507205
[25] -1.52487030 -5.52303519 0.70740861 -3.62108615 5.27419555 -2.33528303

[31] 7.33690338 2.33732594 6.38414341 -3.71438316 -10.81044529 3.85034529

[37] 4.78883215 -2.26492170 -8.30834687 -2.48163200 -4.40444848 -15.06885107

[43] 10.14601018 7.36273546 4.49212609 -11.14075381 -0.05580680 -5.60069495

[49] -7.01831497 4.29403792 11.06283495 1.93107277 1.62815244 1.06309874

[55] -3.27846500 -0.52568797 -3.77803889 9.45211695 -2.19783462 2.10058849

[61] -5.47346922 2.80590054 -4.05905407 -3.33669431 8.29625754 -2.37843977

[67] 0.79009769 -1.00932997 -2.21520253 1.47447129 -4.51146932 4.64928423

[73] -2.43324739 2.69735337 -6.95855295 2.30061704 -5.57112970 5.40266020

[79] 1.44829244 0.33119450 -1.54168936 1.23568833 -2.12515738 -4.57955504

[85] 1.05039772 2.36388711 -1.51317830 -10.49048058 -6.89360897 3.46445088

[91] 0.45483939 4.24980585 4.49050034 5.59613472 3.77426581 1.23257758

[97] -0.12189396 -8.41845837 1.28227611 4.89915121 -1.40325662 1.84906410

[103] 3.27549472 -2.58035444 -0.21148715 -3.64486135 1.04724841 3.00479549

[109] 7.98711928 -1.00780980 3.56353755 -11.27222735 10.86943315 10.50855396

[115] 9.53090029 5.51445111 6.87765295 2.36591212 -4.05256896 0.90120593

[121] 15.39017984 11.02383460 7.93146276 8.50749242 -13.53887838 0.35891776

[127] 22.36324475 10.43509155 3.83130532 14.71771601 7.03332876 -0.50863201

[133] -12.73465693 3.67540738 -1.51156337 11.31826081 4.79729017 8.43495977

[139] 4.78060179 -3.58658552 -1.92102941 15.80591707 6.82819209 4.63809354

[145] 2.46921135 8.25801353 -20.57532038 -3.35378652 2.80091203 -4.01111603

[151] -4.13108392 -6.55034038 -27.90243126 3.25626615 -12.16544832 -32.25133894

[157] 26.68509506 8.73289130 -7.92734645 -4.90297787 -31.43889167 16.68589057

[163] -10.82372370 -1.86761550 -6.75720748 -6.06291729 -19.24826866 14.79867302

[169] -15.05755786 4.27032600 -4.65912024 -0.33516183 -6.99836019 -15.04375457

[175] 5.13433130 1.42437864 -4.43688925 -1.89300698 0.97923363 -2.26343996

[181] -12.39569369 -2.48410267 3.61818195 -3.02962842 3.21224795 -0.70765061

[187] -2.71671116 -6.15624235 -2.59753890 4.06039492 -2.43864539 0.99762443

[193] -4.01190442 -0.85640089 -4.66345628 0.06033009 4.96374886 -2.67765003

[199] -2.71297681

```
> residual_7=resid(dugaan7)
> residual_7
Time Series:
Start = 1
End = 199
Frequency = 1
  [1]          0.038013131  -16.422128738   17.558818309   12.848247548
7.892654164   3.209006507
  [7] -19.141468670  -8.761382711   2.750721007   0.422316047   2.123312442
5.391335746
 [13]   2.595867083  -18.626947419    5.393702531    5.160716553   -
6.428647389   4.540728417
 [19]  3.474226930   2.433102196 -10.745161253   7.719848705   2.588206805
-7.734201596
 [25]   -0.761731466   -6.348523792   -0.220632302   -4.047537189
4.631497610  -1.501344114
 [31]  7.817879067   4.484681271   7.843744392  -0.883534286  -9.773372721
4.022013860
 [37]   3.670059364   -2.781841246   -8.308052118   -3.681963180   -
5.972359379 -16.912371630
 [43]  8.052558690   6.501455297   5.121062322  -7.725112337   1.416428465
-3.820710170
 [49] -6.950407929   5.152130841  11.394820612   4.252480033   4.592429376
3.967349015
 [55] -1.563855346   0.492492973  -3.798431201   8.525486567  -2.401029129
1.331515594
 [61] -5.394855226   0.984725506  -4.819410034  -5.380607254   7.184043919
-3.510983269
```

[67] 0.568661451 -0.750887236 -2.692936839 1.548144836 -4.745595424 4.438134502

[73] -2.068820183 2.690874776 -5.925832007 1.929374268 -4.972778079 4.648065946

[79] 2.425837339 0.557233576 0.063062171 1.590125428 -1.303753659 -4.503077946

[85] 0.982361646 1.916149429 -1.496916480 -10.204850921 -7.540992912 2.161232174

[91] -0.479809739 4.575305775 6.090898282 7.608180548 6.721266069 3.889668350

[97] 2.167608233 -7.254191844 0.848570940 3.798277347 -2.736841078 1.158501164

[103] 2.332316511 -3.457972124 -1.062617323 -4.740846417 -0.594698291 1.864868302

[109] 7.023267701 -0.505150824 3.917659494 -10.447841700 9.721392076 10.653362687

[115] 9.382897105 7.987791424 7.903917489 3.604014436 -4.498222604 -0.754351841

[121] 12.191577186 8.445205811 6.276829810 7.489821261 -15.403024964 -3.536731439

[127] 17.324702064 5.853798494 1.810081127 12.922533405 4.864514456 -2.734473990

[133] -15.632495894 -2.142157626 -7.657902936 4.544342324 0.894800807 4.617053662

[139] 3.549531324 -5.431438550 -3.273631169 13.228972056 5.484821832 4.092127485

[145] 2.851674410 7.127064629 -21.264064296 -6.960355913 -1.222054338 -9.498672026

[151] -7.003850785 -9.886945750 -30.575994069 -0.758969972 -14.641112691 -34.640707609
[157] 26.112941253 10.257999967 -2.506407096 4.400847426 -25.296046440 20.915700137
[163] -5.824724113 1.557647633 0.128942745 -3.408786461 -14.360546162 16.081565578
[169] -11.177174896 6.118339444 0.420574917 1.303703101 -2.233926500 -13.307138664
[175] 7.152803536 2.569538478 -2.302931988 1.142255490 3.105603513 0.168572804
[181] -10.153034954 -1.300189951 4.228453373 -2.230156545 4.972997258 1.363607618
[187] -0.856760064 -4.112835032 -1.831767031 4.698905591 -1.698784862 2.114225568
[193] -2.657723454 -0.300691857 -3.780276931 -0.004481036 5.510647553 -2.025217899
[199] -1.516051658

> residual_8=resid(dugaan8)
> residual_8
Time Series:
Start = 1
End = 199
Frequency = 1
[1] 0.03801313 -16.99377117 17.95354175 13.84205333 9.78061163 -0.07849919
[7] -23.14229560 -9.32594487 5.26968312 5.65516371 4.85619203 4.78916915

[13] 1.35823188 -20.19135900 5.31928682 6.01366627 -3.87641489 3.97343901

[19] 1.82577308 2.28573037 -12.22941311 7.20582805 2.47443371 -6.74370684

[25] -1.48880179 -6.48030639 1.84085523 -3.01423953 5.71701922 -1.90112789

[31] 7.25942221 2.28328112 5.82777554 -4.03334773 -11.94601589 3.60790172

[37] 4.92113144 -0.83305059 -8.39408395 -3.33497831 -3.99125122 -14.02800352

[43] 10.97682942 8.15247349 5.92345509 -11.51315134 -1.97956762 -5.57238875

[49] -6.31748819 5.39904093 11.30971957 3.08223662 1.00441065 -0.38550751

[55] -4.05112297 -0.54530623 -3.97172508 9.81466546 -1.84378180 2.09658682

[61] -6.01049913 2.17795755 -3.53027861 -3.34381952 8.75537595 -2.40565209

[67] 1.38905459 -1.78713517 -2.52240741 1.86198826 -4.63220510 5.03430088

[73] -2.40907704 2.86900321 -6.96689064 1.95556543 -5.18629312 5.58472470

[79] 2.07392157 0.17401028 -1.45233948 0.39053456 -1.82900627 -4.64342915

[85] 1.19739433 2.51797118 -0.87735737 -10.48828712 -7.22219906 3.86614991

[91] 1.78648484 5.40752116 4.26891639 5.12601819 3.35953493 0.28745029

[97] -0.87332166 -9.12074711 1.09559811 5.13079807 -0.62692387 2.11729205
[103] 2.48280105 -2.62911341 -0.32643826 -4.07961207 1.19507976 3.36132628
[109] 8.18792247 -0.90818711 2.80813144 -12.07027192 10.37982527 10.83670047
[115] 9.83910321 5.12199959 4.36168910 1.26501250 -5.39479084 0.15080371
[121] 14.85783792 11.44178882 7.58957276 6.53481336 -15.74088755 -0.86964947
[127] 21.58228641 11.33250944 4.17772702 11.68908750 4.77571451 -1.39647433
[133] -14.54875480 2.18846747 -1.08033249 12.44039641 5.30572272 7.54501606
[139] 4.02659375 -5.29424429 -2.63948372 14.79629899 7.25796293 4.53832369
[145] 0.78200808 6.42585392 -20.98122638 -4.18756370 2.69265888 -2.53598400
[151] -2.24509984 -7.35515272 -27.21783979 4.03910311 -10.51534845 -29.38283336
[157] 28.43340486 9.74185506 -4.32831838 -6.30357164 -34.50259922 18.37291274
[163] -9.30158416 0.84969518 -6.06892442 -7.11178225 -17.00438931 14.76227233
[169] -12.99522549 5.54678505 -4.27832487 -0.72430376 -5.36566088 -15.88598935
[175] 6.39630423 2.02318012 -2.44306801 -1.82394047 0.32763112 -1.53019746

[181] -12.09324590 -2.45381760 4.12654205 -1.59492752 4.04670713 -1.17567729
[187] -2.65029936 -6.17055733 -2.79515744 4.74316490 -1.73164732 1.49610190
[193] -4.35162341 -0.90389068 -4.33907130 0.24424341 5.57116262 -2.39500070
[199] -2.48178483

> residual_9=resid(dugaan9)
> residual_9
Time Series:
Start = 1
End = 199
Frequency = 1
[1] 0.03801313 -16.93978231 17.91438259 13.82218454 8.72212553 2.70556992
[7] -21.02239747 -9.45909707 4.13729683 3.02368677 4.28158417 6.02369008
[13] 2.12993662 -19.64630542 5.30975564 5.62564739 -5.80718974 4.75216278
[19] 2.75751913 1.68948252 -11.66061842 7.30145898 2.38194296 -7.79294548
[25] -0.74086549 -6.34191343 0.54576997 -3.29574014 5.12366635 -1.71825160
[31] 7.10134847 3.03035497 5.98505707 -3.02900252 -11.53149562 3.63317366
[37] 4.18622919 -1.90704132 -7.70502411 -2.98988273 -4.73093716 -15.23920206

[43] 10.12924543 7.61732301 4.91060231 -9.74723043 -1.09516871 -5.73189041

[49] -7.85114798 4.88596708 10.80095995 2.79438652 2.16789487 1.07617154

[55] -3.86709947 -0.64684492 -4.03614164 9.22292107 -1.73444262 2.00179052

[61] -4.93463862 1.86537223 -3.59640494 -3.91776900 8.74873053 -2.58380378

[67] 1.16716987 -0.76909761 -2.80490781 1.70583108 -4.71307091 4.64206237

[73] -2.19948920 2.47286474 -6.44197615 1.62924137 -5.15908703 4.77234560

[79] 2.25720170 -0.04779875 -0.83329161 0.64753680 -1.96462342 -4.82436669

[85] 1.07579573 2.18221453 -1.30389746 -10.24900351 -7.27693227 3.06036961

[91] 0.44738180 4.86460460 5.06645247 5.59228391 4.14109840 1.11390386

[97] -0.19483907 -8.76971283 0.79938431 4.76136134 -1.41301022 2.43248073

[103] 3.20513900 -2.68470279 -0.13872777 -3.79924491 0.70524504 3.19563344

[109] 7.96300476 -0.41118684 3.48595287 -11.14321822 9.94034660 11.01481607

[115] 9.31627627 6.98714490 6.26177737 2.42254476 -4.64528786 0.59261396

[121] 14.84388187 11.31895511 8.57552590 8.96968135 -14.05956246 -0.48612204

[127] 21.79793346 10.28717774 5.24527576 14.96400363 6.36614442 -0.67121734
[133] -12.88270724 2.30845220 -1.85862431 10.94564175 6.05970603 8.16605674
[139] 5.64969436 -4.26416028 -1.93654620 15.03552275 7.03856262 5.05011399
[145] 3.00241715 7.37141438 -20.46859933 -4.42075151 2.59037361 -4.98617038
[151] -2.73429236 -6.85943758 -28.05877584 2.48994823 -12.06080365 -32.66954028
[157] 27.61474698 8.65123294 -6.71813518 -2.66510588 -33.50241461 15.69645515
[163] -10.41336967 -2.35705103 -4.35895244 -8.04839061 -17.98176824 13.57040522
[169] -13.94065788 3.70795349 -2.82674432 -2.04605458 -5.31471701 -16.23043661
[175] 5.43416100 1.07683088 -3.92252595 -1.04879359 0.51943949 -2.16189261
[181] -12.28209105 -2.75095163 3.37874609 -2.95742953 3.92961497 -0.50510158
[187] -2.87502045 -5.93193191 -3.12038749 4.05360732 -2.33182915 1.34384410
[193] -3.79964117 -1.24579571 -4.44735745 -0.32973374 5.29047043 -2.64670850
[199] -2.35528825

> residual_10=resid(dugaan10)
> residual_10
Time Series:

Start = 1

End = 199

Frequency = 1

[1] 0.03801313 -16.41285662 17.61969743 12.75649804 6.89241682 4.64857926

[7] -17.69711135 -8.67587078 1.68318517 -2.04835884 1.17207269 6.98358293

[13] 5.24701240 -16.06851514 7.19403887 5.66725540 -8.26949400 3.71491919

[19] 3.12477777 1.46708386 -11.10250980 7.45671051 2.28983384 -8.84735418

[25] -0.60703634 -5.99559566 -0.38621126 -3.58756756 5.18151708 -0.39743373

[31] 8.61083645 5.25665002 7.39436770 -1.91336947 -11.93568274 1.46889659

[37] 0.81226779 -5.29939338 -8.46017148 -2.13931691 -3.82474052 -14.71282784

[43] 10.69290495 9.03600233 6.45034623 -5.87112034 1.94508782 -5.23687933

[49] -10.66787471 1.52371841 8.30632281 2.18017483 4.41085757 4.79723368

[55] -1.56595096 -0.47570519 -5.48099319 6.40825096 -3.83352857 0.66313938

[61] -4.25536347 2.28817096 -3.06891070 -3.94318253 8.93367097 -2.18551822

[67] 1.48573143 0.55912366 -2.50761204 1.26989332 -5.41739855 3.56703256

[73] -2.48150769 2.20895203 -5.63966286 1.99674445 -4.70453331 4.34335762

[79] 2.52913483 0.28818793 0.20365479 1.41910532 -1.99950925 -5.52200021

[85] 0.08224405 1.17627966 -1.97107379 -9.82571499 -6.63750535 3.08141362

[91] -0.01018031 5.26151671 7.42350091 8.34089738 6.60294295 2.45882454

[97] -0.53966698 -10.88358552 -2.98000809 0.86456605 -4.47619805 1.94283420

[103] 5.16020738 -0.19672482 2.22259641 -2.12996988 0.57026233 2.18677528

[109] 6.60717475 -0.87535173 3.70296932 -10.41025700 9.14303138 10.25073834

[115] 8.24514371 8.16583053 8.27265948 3.29179209 -5.69131074 -2.33236623

[121] 10.76497636 7.64771282 7.20913397 10.64830847 -11.86014240 -0.55602941

[127] 19.86010336 6.75299345 3.44986780 16.42059543 7.66707807 -1.18916924

[133] -14.27834214 -1.53949449 -7.16689837 5.53560555 4.66410328 9.90284197

[139] 10.07517290 0.02648089 0.29245416 14.42603234 4.24071745 1.91404245

[145] 1.67462868 5.96744626 -22.13753272 -7.17782073 0.08364530 -8.40405539

[151] -3.59366409 -4.48337839 -25.16319921 4.23705894 -10.70131004 -33.13848224

[157] 28.51922194 11.47665941 -3.99222882 4.81512012 -27.74260195 14.50395444

[163] -13.72692203 -8.19471268 -5.32883280 -7.78653846 -16.62951055 15.32017723
[169] -11.19166280 5.64109580 1.57698228 0.20682352 -3.75648247 -16.06475812
[175] 3.80453482 -0.83883722 -5.69376755 0.05930290 2.86332298 -0.19631543
[181] -10.60082100 -1.99563945 3.04360589 -4.18718755 3.73585787 0.97884673
[187] -1.51050803 -4.61912226 -2.83745844 3.28115563 -3.27746257 0.99841159
[193] -2.88793271 -0.62238868 -3.87857380 -0.37751283 5.27075755 -2.39766101
[199] -1.68507918

> residual_11=resid(dugaan11)
> residual_11
Time Series:
Start = 1
End = 199
Frequency = 1
[1] 0.03801313 -16.14889138 17.20509964 12.44624219 9.81246333 2.61727653
[7] -19.11584143 -9.80331126 1.46072923 1.02291696 2.49749314 5.55361435
[13] 2.91735109 -18.46317831 4.94360077 4.25667834 -4.98766408 4.02709504
[19] 3.38236843 2.91034832 -10.94416155 7.55930823 1.94395283 -6.69139337

[25] -1.50419147 -6.52300613 -0.04360487 -4.28435762 5.12254009 -1.64117261

[31] 8.46522885 4.13118749 8.50959467 -1.33908266 -9.63111583 3.06902201

[37] 3.37007225 -2.18510626 -8.49948365 -3.89503523 -6.17725089 -16.53657558

[43] 7.89340832 6.53684094 6.76173683 -7.90117226 1.56758364 -4.69361350

[49] -6.47638152 4.40906272 11.51881499 4.78767249 4.75538864 3.49045871

[55] -1.67888323 0.07398329 -4.20827407 8.49012796 -2.54822342 2.03474205

[61] -6.00421809 1.49518767 -5.21832311 -4.71710236 6.82982715 -2.98008719

[67] 1.16742854 -1.17198098 -2.24157243 1.26822447 -4.67627114 4.48531579

[73] -2.35321661 3.14219990 -6.44927646 2.20067518 -5.63011046 5.13317395

[79] 1.88717530 1.28014506 -0.36106065 1.65519833 -1.50515158 -4.45258175

[85] 0.68645163 1.85956380 -1.18241285 -10.18494484 -7.72520764 1.77636260

[91] -0.06851348 5.12842221 6.15717884 8.07828150 6.70508961 3.91845960

[97] 1.82827771 -7.64806072 0.37662660 3.19374679 -2.25485338 1.12858592

[103] 2.24505317 -3.09045790 -1.00549627 -4.84146468 -0.35226664 1.78049754

[109] 7.50823748 -0.27837642 4.25033227 -10.87950017 9.83857292 9.84778017

[115] 10.65978177 7.56544648 8.01485231 3.13275052 -4.72013557 -1.41023464

[121] 11.69094220 8.75873971 6.94184786 7.33166756 -15.30011895 -3.80550565

[127] 16.25765568 7.06795030 2.70399466 12.53739048 5.03424546 -2.37570574

[133] -16.30911415 -2.68455898 -8.35866974 5.37241465 0.67735915 5.74536627

[139] 3.28672493 -4.91410202 -3.71456318 12.74638244 5.59776061 4.66626740

[145] 2.10835081 6.97450655 -21.75090073 -7.27633618 -2.92375885 -8.38811792

[151] -7.13453962 -9.77546843 -30.28448948 -0.95142610 -15.10451684 -32.73730729

[157] 24.96942917 10.69980333 0.60726582 2.86807436 -25.47000570 19.92559609

[163] -7.43068962 3.48177906 -2.33861119 -2.48352300 -15.48742355 16.02661900

[169] -11.71281782 7.75451134 -1.16081600 3.01658875 -3.05317098 -12.60938162

[175] 6.62219723 2.61300981 -1.07731775 0.87556308 3.33797857 0.37032422

[181] -9.97749853 -1.54239390 3.85280515 -1.55800723 5.15448610 1.30324154

[187] -0.40808710 -4.44392483 -1.88248884 4.43800801 -1.42962901 2.36495351

[193] -2.91511260 -0.02952058 -4.11834739 0.23685542 5.28736840 -1.57170387

[199] -1.35170600

- Hasil Uji White Noise

Model 1 ARIMA (0,1,1)

> Box.test(residual_1,type="Ljung")

Box-Ljung test

data: residual_1

X-squared = 0.53278, df = 1, p-value = 0.4654

Karena p-value > 0,05 maka residualnya tidak white noise

Model 2 ARIMA (0,1,2)

> Box.test(residual_2,type="Ljung")

Box-Ljung test

data: residual_2

X-squared = 0.054511, df = 1, p-value = 0.8154

Karena p-value > 0,05 maka residualnya tidak white noise

Model 3 ARIMA (0,1,3)

> Box.test(residual_3, type="Ljung")

Box-Ljung test

data: residual_3

X-squared = 0.011112, df = 1, p-value = 0.916

Karena p-value > 0,05 maka residualnya tidak white noise

Model 4 ARIMA (1,1,0)

> Box.test(residual_4,type="Ljung")

Box-Ljung test

data: residual_4

X-squared = 1.4901, df = 1, p-value = 0.2222

Karena p-value > 0,05 maka residualnya tidak white noise

Model 5 ARIMA (1,1,1)

> Box.test(residual_5,type="Ljung")

Box-Ljung test

data: residual_5

X-squared = 0.028862, df = 1, p-value = 0.8651

Karena p-value > 0,05 maka residualnya tidak white noise

Model 6 ARIMA (1,1,2)

> Box.test(residual_6,type="Ljung")

Box-Ljung test

data: residual_6

X-squared = 0.069819, df = 1, p-value = 0.7916

Karena p-value > 0,05 maka residualnya tidak white noise

Model 7 ARIMA (1,1,3)

> Box.test(residual_7, type="Ljung")

Box-Ljung test

data: residual_7

X-squared = 0.0529, df = 1, p-value = 0.8181

Karena p-value > 0,05 maka residualnya tidak white noise

Model 8 ARIMA (2,1,0)

> Box.test(residual_8,type="Ljung")

Box-Ljung test

data: residual_8

X-squared = 0.020156, df = 1, p-value = 0.8871

Karena p-value > 0,05 maka residualnya tidak white noise

Model 9 ARIMA (2,1,1)

> Box.test(residual_9,type="Ljung")

Box-Ljung test

data: residual_9

X-squared = 0.0034388, df = 1, p-value = 0.9532

Karena p-value > 0,05 maka residualnya tidak white noise

Model 10 ARIMA (2,1,2)

> Box.test(residual_10,type="Ljung")

Box-Ljung test

data: residual_10
X-squared = 0.068342, df = 1, p-value = 0.7938
Karena p-value > 0,05 maka residualnya tidak white noise

Model 11 ARIMA (2,1,3)
> Box.test(residual_11,type="Ljung")

Box-Ljung test

data: residual_11
X-squared = 0.0025115, df = 1, p-value = 0.96
Karena p-value > 0,05 maka residualnya tidak white noise

- Hasil Uji Normalitas

#Model 1 ARIMA (0,1,1)
> ks.test(residual_1,"pnorm", mean(residual_1),sd(residual_1))

One-sample Kolmogorov-Smirnov test

data: residual_1
D = 0.099253, p-value = 0.03965
alternative hypothesis: two-sided
Karena p-value < 0,05 maka data tidak berdistribusi normal

Model 2 ARIMA (0,1,2)

> ks.test(residual_2,"pnorm", mean(residual_2),sd(residual_2))

One-sample Kolmogorov-Smirnov test

data: residual_2

D = 0.09865, p-value = 0.04158

alternative hypothesis: two-sided

Karena p-value < 0,05 maka data tidak berdistribusi normal

Model 3 ARIMA (0,1,3)

> ks.test(residual_3,"pnorm", mean(residual_3),sd(residual_3))

One-sample Kolmogorov-Smirnov test

data: residual_3

D = 0.094482, p-value = 0.05728

alternative hypothesis: two-sided

Karena p-value > 0,05 maka data berdistribusi normal

Model 4 ARIMA (1,1,0)

> ks.test(residual_4,"pnorm", mean(residual_4),sd(residual_4))

One-sample Kolmogorov-Smirnov test

data: residual_4

D = 0.11129, p-value = 0.01446

alternative hypothesis: two-sided

Karena p-value < 0,05 maka data tidak berdistribusi normal

Model 5 ARIMA (1,1,1)

> ks.test(residual_5,"pnorm", mean(residual_5),sd(residual_5))

One-sample Kolmogorov-Smirnov test

data: residual_5

D = 0.10185, p-value = 0.03221

alternative hypothesis: two-sided

Karena p-value < 0,05 maka data tidak berdistribusi normal

Model 6 ARIMA (1,1,2)

> ks.test(residual_6,"pnorm", mean(residual_6),sd(residual_6))

One-sample Kolmogorov-Smirnov test

data: residual_6

D = 0.093295, p-value = 0.0626

alternative hypothesis: two-sided

Karena p-value > 0,05 maka data berdistribusi normal

Model 7 ARIMA (1,1,3)

> ks.test(residual_7,"pnorm", mean(residual_7),sd(residual_7))

One-sample Kolmogorov-Smirnov test

data: residual_7

D = 0.087741, p-value = 0.09339

alternative hypothesis: two-sided

Karena p-value > 0,05 maka data berdistribusi normal

Model 8 ARIMA (2,1,0)

> ks.test(residual_8,"pnorm", mean(residual_8),sd(residual_8))

One-sample Kolmogorov-Smirnov test

data: residual_8

D = 0.096278, p-value = 0.04998

alternative hypothesis: two-sided

Karena p-value < 0,05 maka data tidak berdistribusi normal

Model 9 ARIMA (2,1,1)

> ks.test(residual_9,"pnorm", mean(residual_9),sd(residual_9))

One-sample Kolmogorov-Smirnov test

data: residual_9

D = 0.095469, p-value = 0.05317

alternative hypothesis: two-sided

Karena p-value > 0,05 maka data berdistribusi normal

Model 10 ARIMA (2,1,2)

> ks.test(residual_10,"pnorm", mean(residual_10),sd(residual_10))

One-sample Kolmogorov-Smirnov test

data: residual_10

D = 0.074857, p-value = 0.2147

alternative hypothesis: two-sided

Karena p-value > 0,05 maka data berdistribusi normal

Model 11 ARIMA (2,1,3)

> ks.test(residual_11,"pnorm", mean(residual_11),sd(residual_11))

One-sample Kolmogorov-Smirnov test

data: residual_11

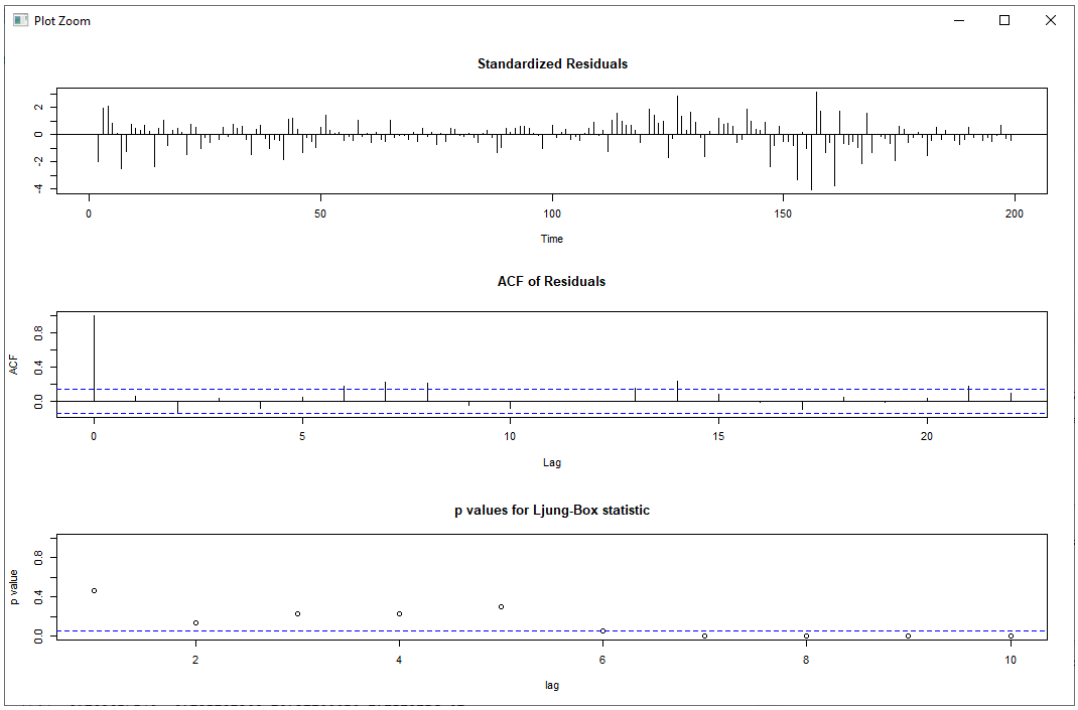
D = 0.087973, p-value = 0.09189

alternative hypothesis: two-sided

Karena p-value >0,05 maka data berdistribusi normal

- Hasil Pemeriksaan Diagnostik

  Model ARIMA 1 (1,1,0)



hasil_1=acfStat(dugaan1$residuals)

> hasil_1

	ACF	PACF	Q-Stats	P-Value
[1,]	1.000000000	1.0000000000	NA	NA
[2,]	0.051355075	0.0513550748	0.5327834	**4.654390e-01**
[3,]	-0.131972567	-0.1349658617	4.0690926	**1.307398e-01**
[4,]	0.039001011	0.0547637446	4.3795091	**2.232929e-01**
[5,]	-0.079421775	-0.1055342732	5.6733882	**2.249037e-01**
[6,]	0.046562953	0.0743298122	6.1204097	**2.946783e-01**
[7,]	0.172043394	0.1401603940	12.2547495	**5.652106e-02**
[8,]	0.219943827	0.2383056501	22.3326823	**2.225629e-03**
[9,]	0.206539036	0.2409248031	31.2661498	**1.259734e-04**
[10,]	-0.052644522	0.0046989131	31.8495974	**2.114059e-04**
[11,]	-0.082906587	-0.0156723890	33.3042705	**2.420968e-04**
[12,]	0.002203773	-0.0192501256	33.3053038	**4.694405e-04**
[13,]	-0.006088148	-0.0495122170	33.3132321	**8.648137e-04**
[14,]	0.152739097	0.0586831781	38.3301458	**2.555742e-04**
[15,]	0.238111053	0.1281633883	50.5886228	**4.864556e-06**
[16,]	0.078856762	0.0517496717	51.9404127	5.778072e-06
[17,]	-0.016537902	0.0160758402	52.0001931	**1.095315e-05**
[18,]	-0.098731345	-0.0593684915	54.1425304	**9.400378e-06**
[19,]	0.050670514	0.0928224206	54.7099198	**1.421665e-05**
[20,]	-0.012405969	-0.0927009111	54.7441207	**2.543624e-05**
[21,]	0.028503501	-0.0503286773	54.9256691	**4.212487e-05**
[22,]	0.171740368	0.0002526202	61.5535381	**7.411217e-06**
[23,]	0.096285833	0.0318359274	63.6486182	**6.345649e-06**
[24,]	-0.096467571	-0.0731396870	65.7635636	**5.384440e-06**
[25,]	-0.110458460	-0.0871684754	68.5523102	**3.614648e-06**
[26,]	-0.068967855	-0.0842295879	69.6457461	**4.342916e-06**

[27,] -0.072624973 -0.1476467678 70.8652270 **4.960101e-06**

[28,] 0.086308446 0.0070084084 72.5975437 **4.742459e-06**

[29,] 0.180134320 0.0925285983 80.1876167 **6.258714e-07**

[30,] -0.064958691 -0.1120280492 81.1804463 **7.772037e-07**

[31,] -0.093826615 -0.0308300596 83.2640472 **6.635318e-07**

[32,] -0.061649227 0.0058614790 84.1689358 **8.392542e-07**

[33,] -0.088880069 -0.0176020961 86.0610242 **7.601809e-07**

[34,] -0.046403694 -0.0356975757 86.5798794 **1.078752e-06**

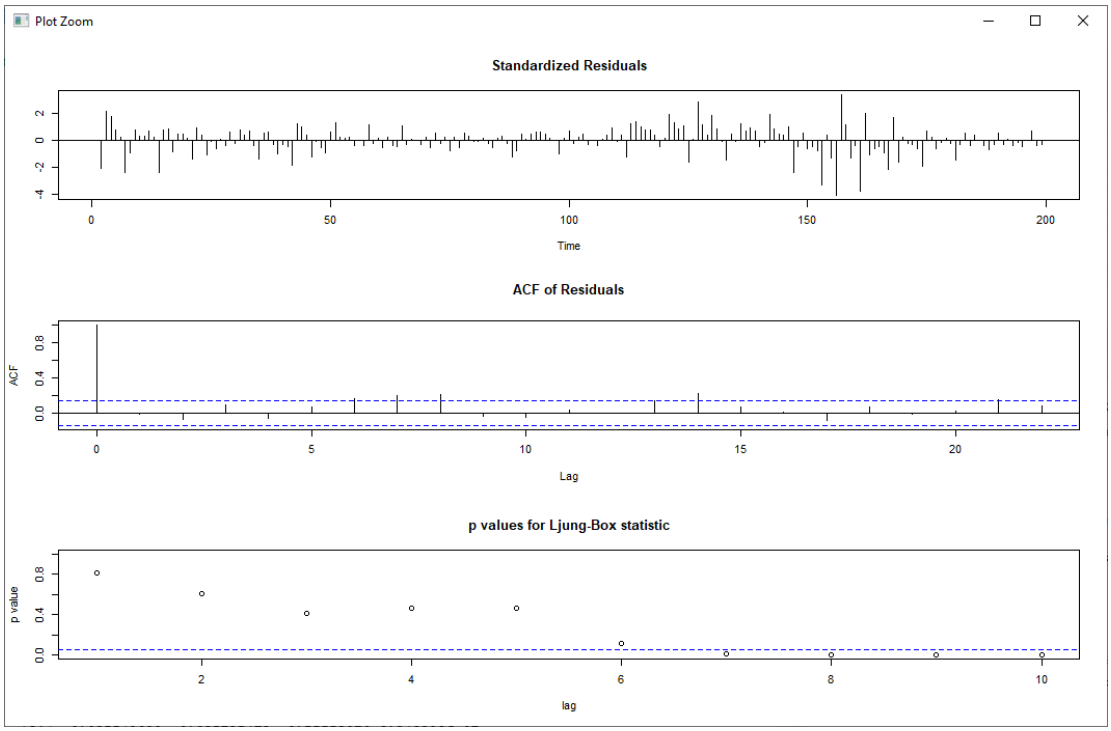
[35,] 0.001016543 -0.0632884534 86.5801299 **1.790576e-06**

[36,] 0.065153713 -0.0133496804 87.6154714 **2.109395e-06**

[37,] -0.014092689 -0.0745508310 87.6642074 **3.367979e-06**

Berdasarkan perintah diatas , p-value tidak signifikan (< 0,05)

Model 2 ARIMA (0,1,2)

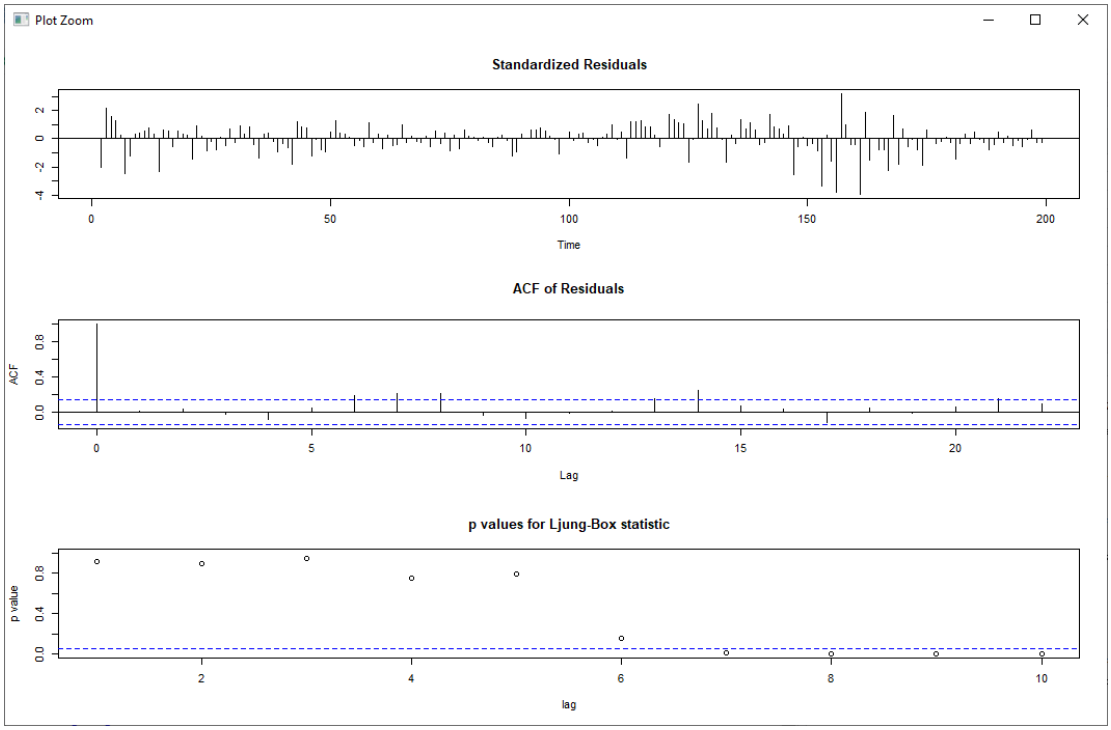


> hasil_2=acfStat(dugaan2$residuals)

> hasil_2

Berdasarkan perintah diatas , p-value tidak signifikan (< 0,05)

Model 3 ARIMA (0,1,3)

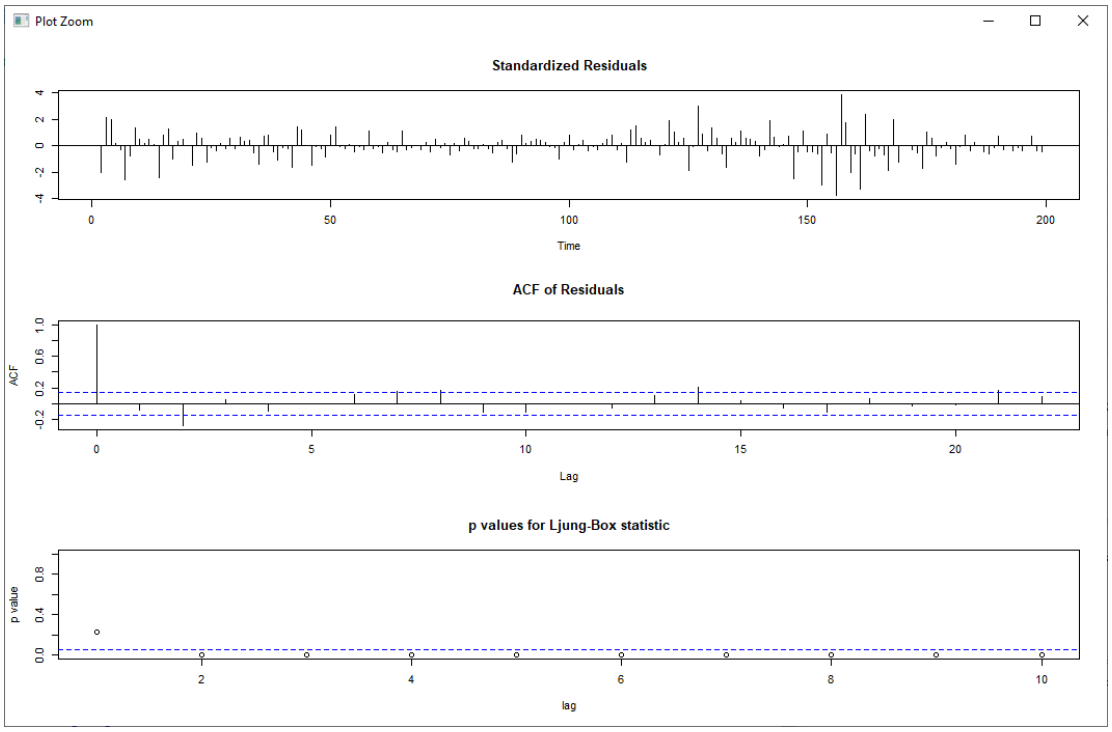


> hasil_3=acfStat(dugaan3$residuals)

> hasil_3

Berdasarkan perintah diatas , p-value tidak signifikan (< 0,05)

Model 4 ARIMA (1,1,0)

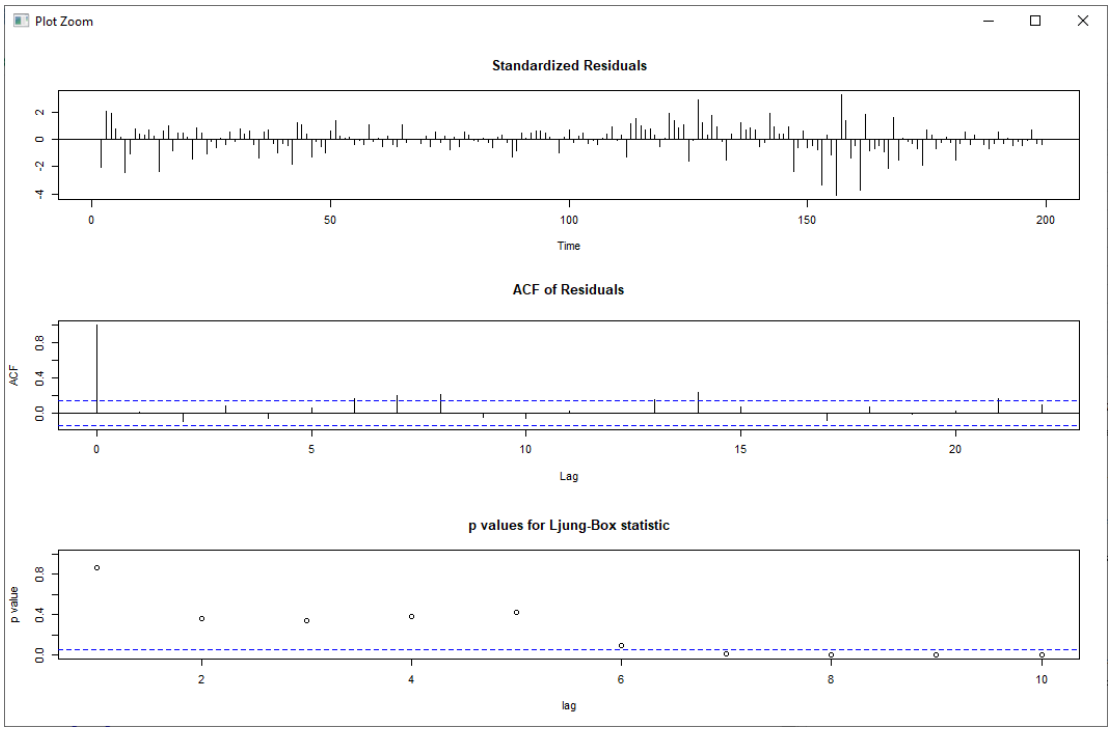


> hasil_4=acfStat(dugaan4$residuals)

> hasil_4

Berdasarkan perintah diatas , p-value tidak signifikan (< 0,05)

Model 5 ARIMA (1,1,1)

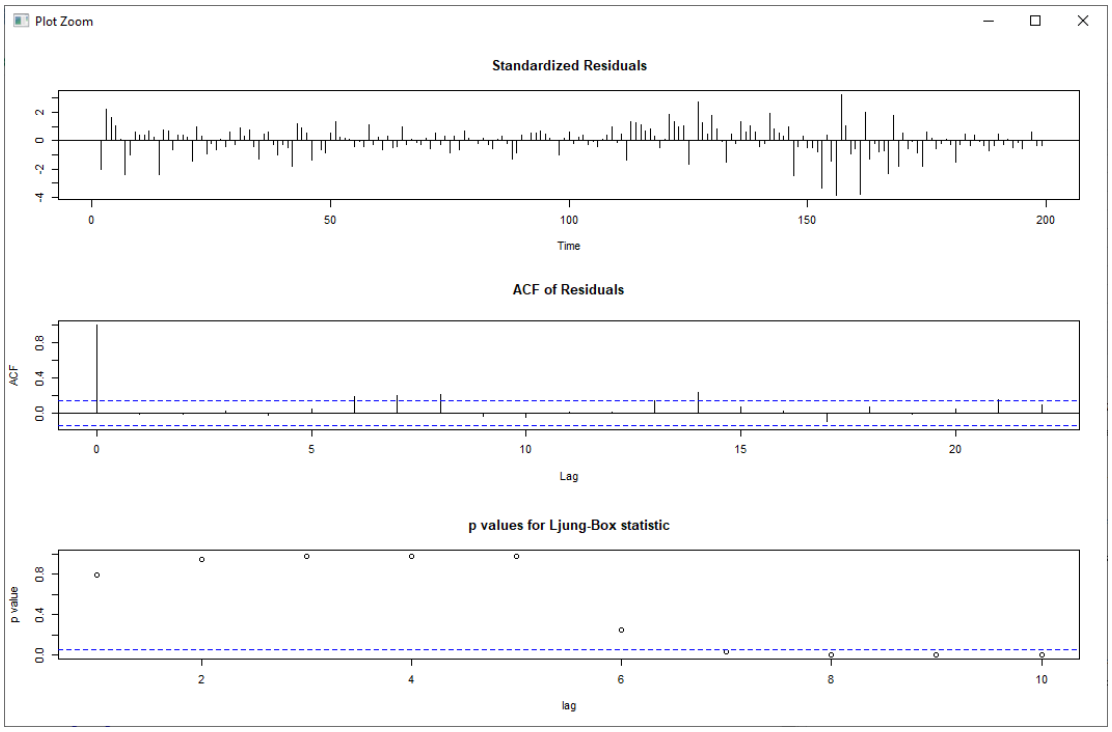


> hasil_5=acfStat(dugaan5$residuals)

> hasil_5

Berdasarkan perintah diatas , p-value tidak signifikan (< 0,05)

Model 6 ARIMA (1,1,2)

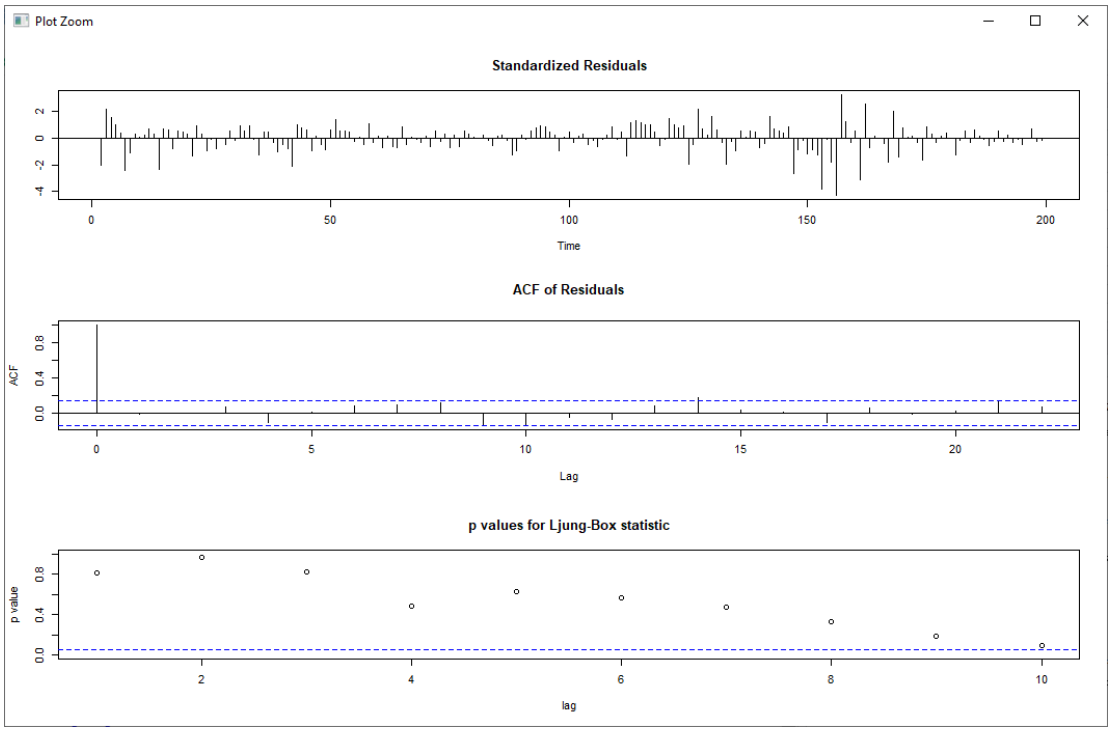


> hasil_6=acfStat(dugaan6$residuals)

> hasil_6

Berdasarkan perintah diatas , p-value tidak signifikan (< 0,05)

Model 7 ARIMA (1,1,3)

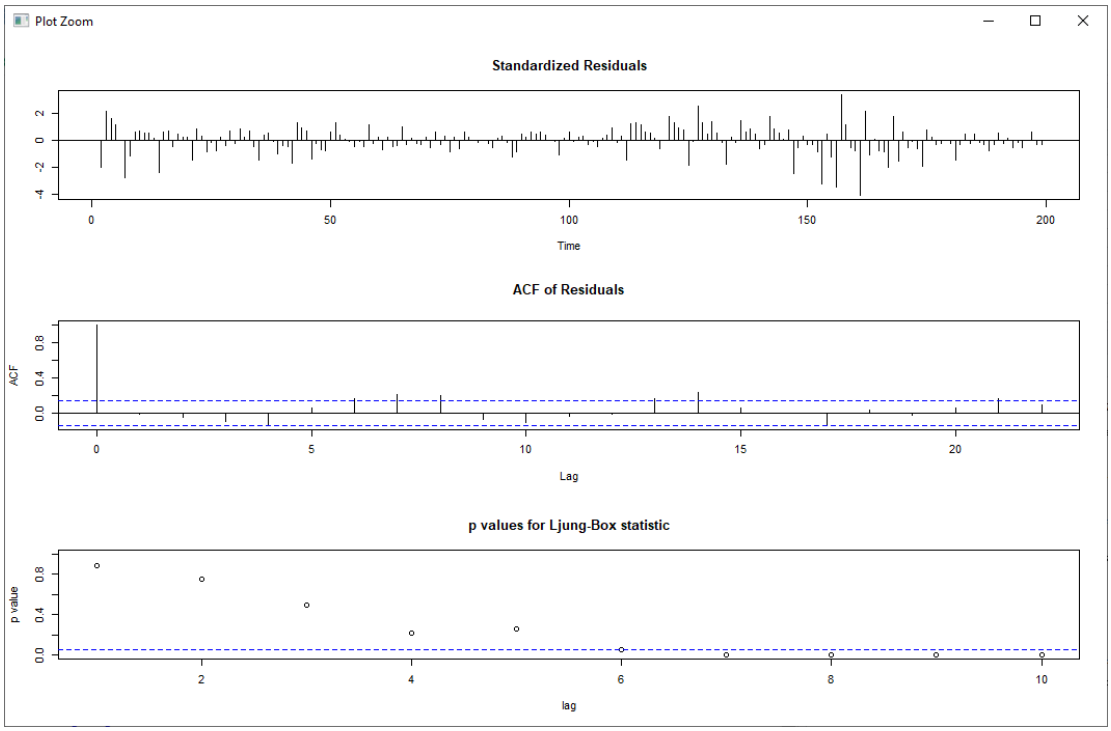



```
> hasil_7=acfStat(dugaan7$residuals)
> hasil_7
> hasil_7=acfStat(dugaan7$residuals)
> hasil_7
              ACF        PACF     Q-Stats    P-Value
 [1,]  1.000000000  1.000000000          NA         NA
 [2,] -0.016182207 -0.016182207  0.05290046 0.91809099
 [3,] -0.004880546 -0.005143757  0.05773684 0.97154429
 [4,]  0.064967961  0.064824030  0.91911040 0.93481375
 [5,] -0.111005999 -0.109433165  3.44670500 0.48602810
 [6,]  0.008770577  0.006731719  3.46256503 0.62905943
 [7,]  0.081255111  0.077526085  4.83090244 0.56567709
 [8,]  0.092455939  0.110429603  6.61171224 0.47039507
 [9,]  0.111097646  0.104332965  9.19650351 0.32599145
[10,] -0.126777439 -0.136838596 12.58010713 0.18254432
```

[11,] -0.134488410 -0.144595403 16.40797596 0.08853409
[12,] -0.052387383 -0.056086825 16.99188433 0.10811588
[13,] -0.069596284 -0.036972429 18.02793174 0.11484505
[14,] 0.083152884 0.066628227 19.51486277 0.10798480
[15,] 0.171800364 0.146304834 25.89640376 0.26682851
[16,] 0.033131147 0.046890194 26.13502234 0.36627191
[17,] 0.007650801 0.022474563 26.14781650 0.05198352
[18,] -0.105809004 -0.069143130 28.60831438 0.03831310
[19,] 0.061182790 0.110032691 29.43554978 0.04330906
[20,] -0.017094562 -0.032553278 29.50048683 0.05850964
[21,] 0.027005508 -0.019923252 29.66345426 0.07549353
[22,] 0.138640773 0.034587125 33.98273146 0.03639382
[23,] 0.071582250 0.065009134 35.14067279 0.03745353
[24,] -0.090111482 -0.042618583 36.98609920 0.03262263
[25,] -0.096709166 -0.072236529 39.12379726 0.02650325
[26,] -0.057590082 -0.024666765 39.88621900 0.02995877
[27,] -0.070046700 -0.071967609 41.02065082 0.03088597
[28,] 0.054661531 0.033560623 41.71548995 0.03510313
[29,] 0.162327751 0.142430957 47.87914839 0.01104168
[30,] -0.064550223 -0.086494084 48.85953123 0.01194956
[31,] -0.059395196 -0.054716134 49.69449007 0.01333967
[32,] -0.048168756 0.004796315 50.24691175 0.01582786
[33,] -0.085595658 -0.033914398 52.00174613 0.01416391
[34,] -0.033479327 -0.052207580 52.27182742 0.01777597
[35,] -0.013991818 -0.092649980 52.31928586 0.02316966
[36,] 0.047557816 -0.027877236 52.87091739 0.02681882
[37,] -0.027504038 -0.094920880 53.05655008 0.03325049

Berdasarkan perintah diatas , p-value tidak signifikan (< 0,05) pada lag k 18, 19 dan lag k ≥22

Model 8 ARIMA (2,1,0)

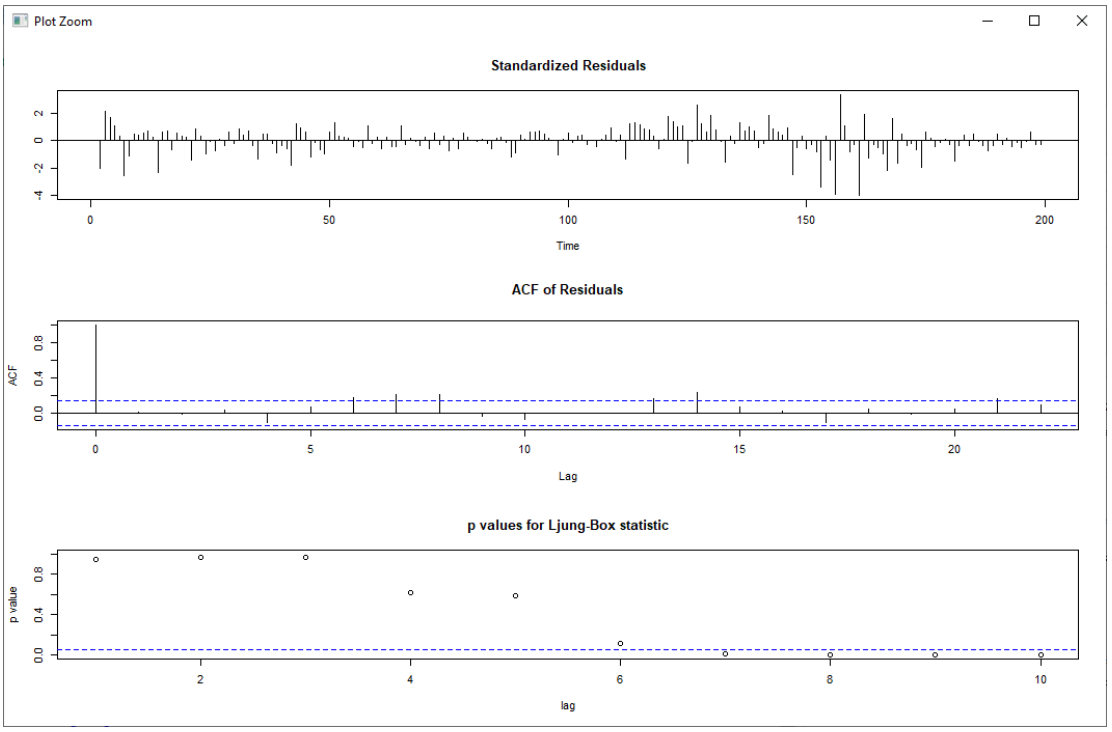


> hasil_8=acfStat(dugaan8$residuals)

> hasil_8

Berdasarkan perintah diatas , p-value tidak signifikan (< 0,05)

Model 9 ARIMA (2,1,1)

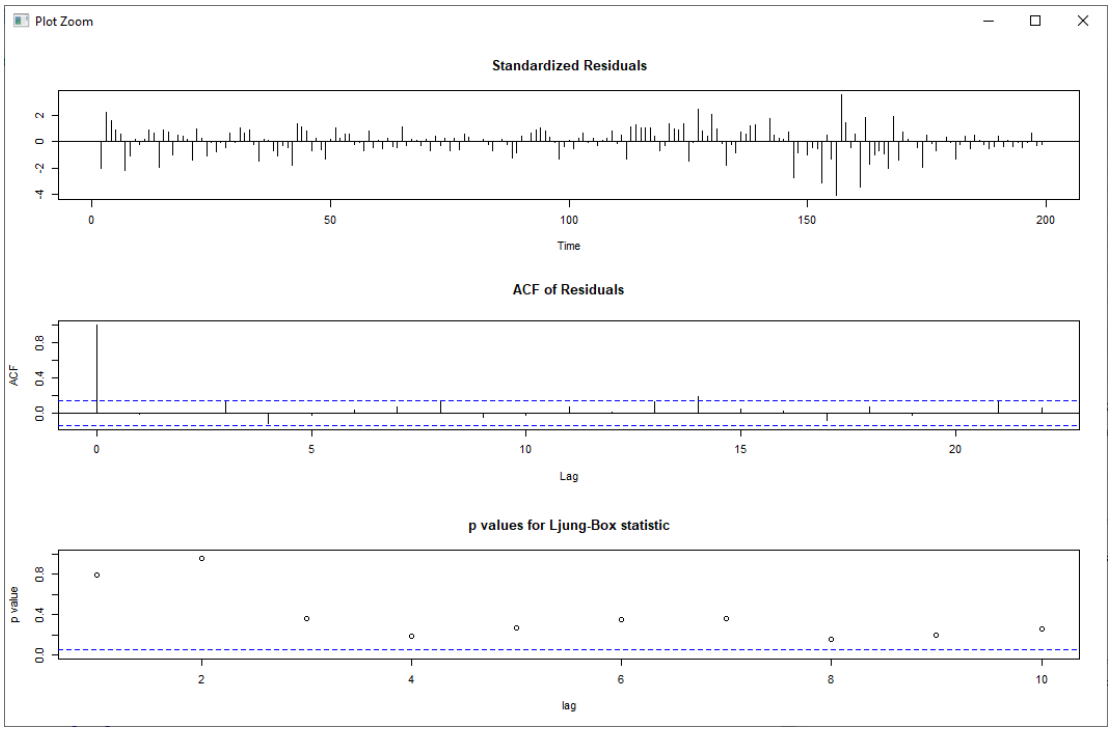


> hasil_9=acfStat(dugaan6$residuals)

> hasil_9

Berdasarkan perintah diatas , p-value tidak signifikan (< 0,05)

Model 10 ARIMA (2,1,2)



> hasil_10=acfStat(dugaan10$residuals)

> hasil_10

	ACF	PACF	Q-Stats	P-Value
[1,]	1.000000000	1.000000e+00	NA	NA
[2,]	-0.018392946	-1.839295e-02	0.06834182	0.79376656
[3,]	-0.005272905	-5.613105e-03	0.07398707	0.96368237
[4,]	0.124063439	1.239085e-01	3.21507932	0.35963797
[5,]	-0.120488551	-1.178712e-01	6.19295174	0.18519447
[6,]	-0.030644416	-3.306643e-02	6.38657168	0.27039942
[7,]	0.038351465	2.253098e-02	6.69140030	0.35033125
[8,]	0.070297332	1.030303e-01	7.72089851	0.35784697
[9,]	0.140205144	1.408408e-01	11.83754583	0.15860070
[10,]	-0.049221974	-6.456798e-02	12.34759682	0.19441512
[11,]	-0.021765981	-4.331855e-02	12.44786055	0.25620001

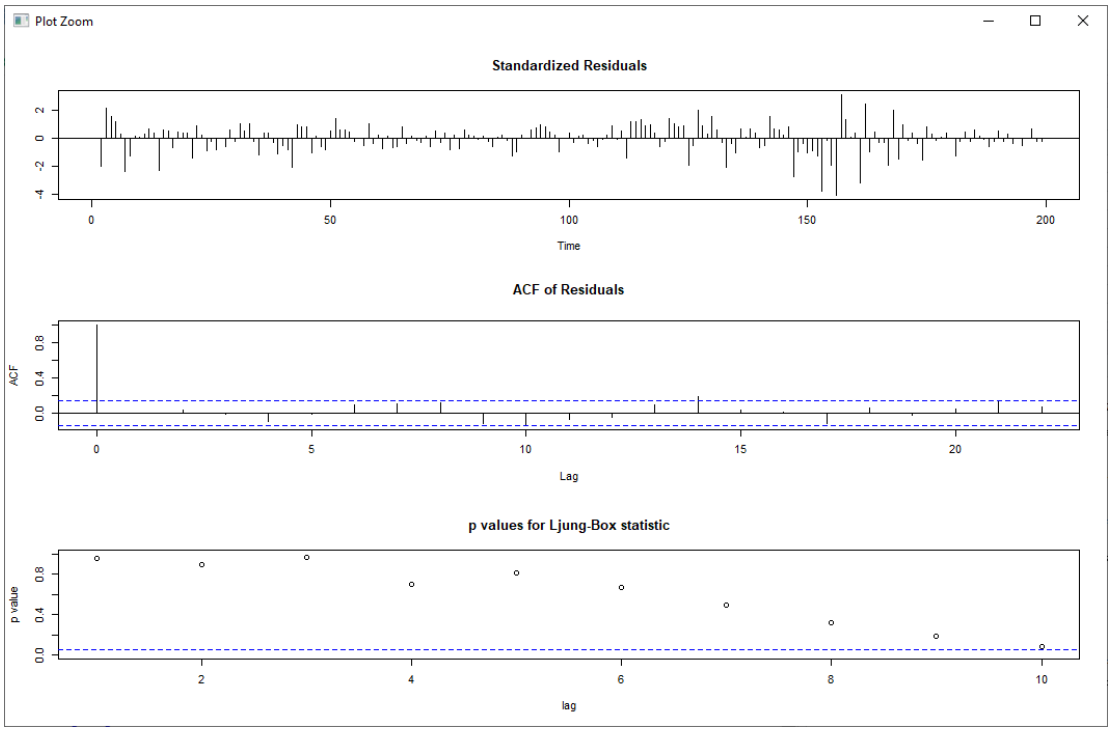
[12,] 0.064942164 5.509692e-02 13.34517528 0.27136477
[13,] 0.005992152 6.714324e-02 13.35285550 0.34392373
[14,] 0.125305826 1.361177e-01 16.72944850 0.21196914
[15,] 0.190965878 1.641963e-01 24.61421711 0.13857251
[16,] 0.048688823 4.149158e-02 25.12955236 0.14823038
[17,] 0.019452936 -7.847807e-03 25.21226433 0.06616978
[18,] -0.086309125 -9.165437e-02 26.84942451 0.06031338
[19,] 0.072318991 1.168511e-01 28.00520477 0.06197604
[20,] -0.019728551 -8.679310e-03 28.09169499 0.08167976
[21,] 0.002114565 -1.979829e-03 28.09269416 0.10722320
[22,] 0.122454718 2.050899e-02 31.46230833 0.06630065
[23,] 0.059352285 3.812284e-02 32.25837741 0.07309644
[24,] -0.092347600 -8.314307e-02 34.19652878 0.06236938
[25,] -0.076774432 -1.103814e-01 35.54376675 0.06073496
[26,] -0.036482462 -6.125151e-02 35.84972923 0.07391110
[27,] -0.076553453 -1.133419e-01 37.20470832 0.07163805
[28,] 0.044572799 -9.185298e-05 37.66672802 0.08327962
[29,] 0.158220577 1.131735e-01 43.52242980 0.30961841
[30,] -0.061476533 -1.115436e-01 44.41166970 0.33531652
[31,] -0.039926427 -8.112692e-02 44.78896668 0.40382100
[32,] -0.018188371 -1.909929e-02 44.86773062 0.05121697
[33,] -0.072574412 -2.500760e-02 46.12926682 0.05066103
[34,] -0.036037970 -3.102497e-02 46.44220726 0.06039539
[35,] -0.024462126 -6.596595e-02 46.58726923 0.07363126
[36,] 0.035123518 -3.732749e-03 46.88815477 0.08633735
[37,] -0.027629833 -7.271134e-02 47.07548939 0.10238333

Berdasarkan perintah diatas , semua nilai p-value signifikan (>0,05)

Model 11 ARIMA (2,1,3)

> hasil_11=acfStat(dugaan11$residuals)

> hasil_11

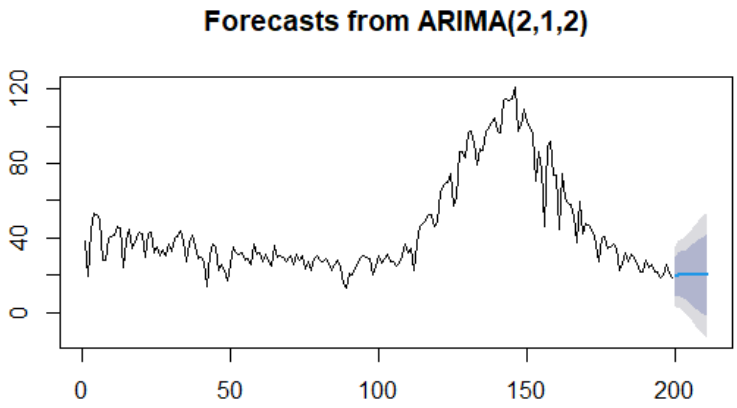


Berdasarkan perintah diatas , nilai p-value tidak signifikan (>0,05) pada lag k ≥ 18

4. Peramalan

> Prediksi=forecast(dugaan10,h=12)

> plot(Prediksi)


Forecasts from ARIMA(2,1,2)
0
40
80
120
0
50
100
150
200