Reading input spec file from *./X-13-ARIMA-SEATS/x13as/specfiles/tramo_only.spc*

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U. S. Department of Commerce, U. S. Census Bureau

X-13ARIMA-SEATS monthly regARIMA model estimation Method, Release Version 1.1 Build 61

This software application provides an enhanced version of
Statistics Canada's X-11-ARIMA extension (Dagum, 1980)
of the X-11 variant of the Census Method II of
Shiskin, Young and Musgrave (1967).

It also provides an ARIMA model-based method following
Hillmer and Tiao (1982) and Burman (1980) that is very similar
to the update of the method of SEATS (Gómez and Maravall, 1996)
produced at the Bank of Spain by G. Caporello and
A. Maravall for TSW (Caporello and Maravall, 2004).
The present application includes additional enhancements.

X-13ARIMA-SEATS includes an automatic ARIMA model selection procedure
based largely on the procedure of Gómez and Maravall (1998)
as implemented in TRAMO (1996) and subsequent revisions.

Primary Programmers: Brian Monsell, Mark Otto and,
for the ARIMA model-based signal extraction,
Gianluca Caporello and Víctor Gómez

Series Title- Consumer Food Price Index - All India Combined
Series Name- CPI
Nov 1, 2024 05.14.12

- Period covered- 1st month,2013 to 8th month,2024
- Spectral plot of the original series generated

FILE SAVE REQUESTS (* indicates file exists and will be overwritten)

./X-13-ARIMA-SEATS/x13as/specfiles/CPI.html* program output file
./X-13-ARIMA-SEATS/x13as/specfiles/CPI_err.html* program error file

LINKS TO OTHER HTML FILES

- Error file for CPI
- Log entry for CPI

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Contents of spc file ./X-13-ARIMA-SEATS/x13as/specfiles/tramo_only.spc

```
Line #
------
     1: series{
     2:   title = "Consumer Food Price Index - All India Combined"
     3:   start = 2013.01
```

Index for CPI.html

- Program Header
- Content of input specification file
- AIC test for transformation
- A 1 Time series data (for the span analyzed)
- Prior-adjusted and transformed data
- Automatic ARIMA model selection
- Outlier detection
- ARIMA model
- Outlier identification: Forward addition pass 1
- Additive Outlier t-values
- Level Change Outlier t-values
- Regression model
- ARIMA model
- Outlier identification: Forward addition pass 2
- Additive Outlier t-values
- Level Change Outlier t-values
- Regression model
- ARIMA model
- Outlier identification: Forward addition pass 3
- Additive Outlier t-values
- Level Change Outlier t-values
- Regression model
- ARIMA model
- Outlier identification: Forward addition pass 4
- Additive Outlier t-values
- Level Change Outlier t-values
- Regression model
- ARIMA model
- Outlier identification: Forward addition pass 5
- Additive Outlier t-values
- Level Change Outlier t-values
- Regression model
- ARIMA model
- Outlier identification: Forward addition pass 6
- Additive Outlier t-values
- Level Change Outlier t-values
- Outlier identification: Backward deletion pass 1
- Regression model
- ARIMA model
- Final Additive Outlier t-values
- Final Level Change Outlier t-values
- Outlier detection
- ARIMA model
- Outlier identification: Forward addition pass 1
- Additive Outlier t-values
- Level Change Outlier t-values
- Regression model
- ARIMA model
- Outlier identification: Forward addition pass 2
- Additive Outlier t-values
- Level Change Outlier t-values
- Regression model
- ARIMA model
- Outlier identification: Forward addition pass 3
- Additive Outlier t-values
- Level Change Outlier t-values
- Regression model
- ARIMA model
- Outlier identification: Forward addition pass 4
- Additive Outlier t-values
- Level Change Outlier t-values
- Regression model
- ARIMA model
- Outlier identification: Forward addition pass 5

```
  span = (2013.01, 2024.08)
  data = (
    105.4 106.4 106.5 107.5 109.1 112.4 115.2 117.3 119.0 121.1 12
    115.6 114.8 115.7 117.4 118.8 120.5 125.4 127.5 126.4 125.8 12
    122.7 122.7 122.8 123.4 124.5 127.1 128.1 130.3 131.3 132.4 13
    131.1 129.2 129.2 131.3 133.8 137.0 138.8 138.0 136.5 136.8 13
    131.9 131.8 131.8 132.1 132.4 134.1 138.3 140.1 138.2 139.4 14
    138.1 136.1 135.5 135.8 136.5 138.0 140.1 140.5 138.9 138.2 13
    135.0 135.1 135.9 137.3 139.0 141.1 143.4 144.7 146.0 149.1 15
    153.4 149.7 147.8 153.4 151.8 153.4 156.7 157.8 161.6 165.5 16
    156.4 155.5 155.0 156.4 159.4 161.3 162.9 162.7 162.7 166.9 16
    164.9 164.6 166.9 169.4 172.1 173.8 173.8 175.1 176.7 178.6 17
    174.8 174.4 174.9 175.9 177.2 181.7 193.8 192.5 188.4 190.4 19
    189.3 189.5 189.8 191.2 192.6 198.7 204.3 203.4
  )
}

transform{
  function = auto
  print = all
}

automdl{print = all
maxdiff = (2 1)}

outlier{types = (ls ao)
method = addone
print = all
}

estimate{
    print = all
}

regression {
  variables = (td1nolpyear)
  user = (diwali)
  aictest = (user td1nolpyear)
  start = 2013.01
  data = (
   0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0405 -0.0405  0.0
   0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.3405 -0.3405  0.0
   0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0 -0.6595  0.6595  0.0
   0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.3405 -0.3405  0.0
   0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.3405 -0.3405  0.0
   0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0 -0.3595  0.3595  0.0
   0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.3405 -0.3405  0.0
   0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0 -0.6595  0.6595  0.0
   0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0 -0.0595  0.0595  0.0
   0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.3405 -0.3405  0.0
   0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0 -0.6595  0.6595  0.0
   0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.3405 -0.3405  0.0
   0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.3405 -0.3405  0.0)
   print = all
}
```


- Additive Outlier t-values
- Level Change Outlier t-values
- Final Additive Outlier t-values
- Final Level Change Outlier t-values
- Regression model
- Correlation matrix of regression parameter estimates
- ARIMA model
- Correlation matrix of ARMA parameter estimates
- Maximized log-likelihood and model selection criteria
- Roots of the AR and MA operators
- Matrix of regression variables
- Residuals from the estimated model
- QS Statistic for regARIMA Model Residuals
- Plot of Spectrum of the regARIMA model residuals
- Estimated regression effects (X'beta)
- Residuals from the estimated regression effects
- A 8 RegARIMA combined outlier component
- A 8.AO RegARIMA AO outlier component
- A 8.LS RegARIMA level change outlier component
- B 1 Original series (prior adjusted)
- QS diagnostic to detect seasonality
- Plot of Spectrum of the original series
- Peak probabilties for the Tukey spectrum

- Error Messages
- Log Entry

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Likelihood statistics for model fit to untransformed series.

Likelihood Statistics

Number of observations (nobs)	140
Effective number of observations (nefobs)	127
Number of parameters estimated (np)	5
Log likelihood (L)	-261.3694
AIC	532.7389
AICC (F-corrected-AIC)	533.2347
Hannan Quinn	538.5167
BIC	546.9598

Likelihood statistics for model fit to log transformed series.

Likelihood Statistics

Number of observations (nobs)	140
Effective number of observations (nefobs)	127
Number of parameters estimated (np)	5
Log likelihood	381.5430
Transformation Adjustment	-635.4861
Adjusted Log likelihood (L)	-253.9431
AIC	517.8862
AICC (F-corrected-AIC)	518.3821
Hannan Quinn	523.6640
BIC	532.1071

---

nobs = number of observations
nefobs = nobs - total order of differencing operators
np = number of estimated regression and ARIMA model parameters including the variance
V = Covariance matrix of z's
z = Vector of data - regression values
c = Vector of prior adjustment factors
Log likelihood = -[nefobs*log(2*pi)+log|V|+z'(V-inverse)z]/2
Transformation Adjustment = sum(ln(|(ci*(ci*yi)^(lam-1))|)) where the sum is over the last nefobs observations
AIC = -2*L+2*np
AICC = -2*L+2*np*[nefobs/(nefobs-np-1)]
Hannan Quinn = -2*L+2*np*log[log(nefobs)]
BIC = -2*L+np*log(nefobs)

***** AICC (with aicdiff=-2.00) prefers **log transformation** *****

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A 1 Time series data (for the span analyzed)

From 2013.Jan to 2024.Aug
Observations 140

A 1 Time series data (for the span analyzed)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
2013	105.	106.	107.	108.	109.	112.	115.	117.	119.	121.	124.	119.	1363.
2014	116.	115.	116.	117.	119.	121.	125.	128.	126.	126.	125.	123.	1457.
2015	123.	123.	123.	123.	125.	127.	128.	130.	131.	132.	133.	131.	1530.
2016	131.	129.	129.	131.	134.	137.	139.	138.	137.	137.	136.	133.	1610.
2017	132.	132.	132.	132.	132.	134.	138.	140.	138.	139.	142.	140.	1631.
2018	138.	136.	136.	136.	137.	138.	140.	141.	139.	138.	138.	136.	1652.
2019	135.	135.	136.	137.	139.	141.	143.	145.	146.	149.	152.	155.	1713.
2020	153.	150.	148.	153.	152.	153.	157.	158.	162.	166.	166.	161.	1878.
2021	156.	156.	155.	156.	159.	161.	163.	163.	163.	167.	169.	167.	1935.
2022	165.	165.	167.	169.	172.	174.	174.	175.	177.	179.	177.	174.	2067.
2023	175.	174.	175.	176.	177.	182.	194.	193.	188.	190.	192.	191.	2207.
2024	189.	190.	190.	191.	193.	199.	204.	203.					1559.
AVGE	143.	142.	143.	144.	146.	148.	152.	152.	148.	149.	150.	148.	

Table Total- 20601. Mean- 147. Standard Deviation- 24.
Minimum- 105. Maximum- 204.

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Transformed (prior-adjusted) data for regARIMA modeling

From 2013.Jan to 2024.Aug
Observations 140

Data

Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	4.658	4.667	4.668	4.677	4.692	4.722	4.747	4.765	4.779	4.797	4.819	4.777
2014	4.750	4.743	4.751	4.766	4.777	4.792	4.832	4.848	4.839	4.835	4.831	4.815
2015	4.810	4.810	4.811	4.815	4.824	4.845	4.853	4.870	4.877	4.886	4.890	4.877
2016	4.876	4.861	4.861	4.877	4.896	4.920	4.933	4.927	4.916	4.919	4.910	4.891
2017	4.882	4.881	4.881	4.884	4.886	4.899	4.929	4.942	4.929	4.937	4.952	4.939
2018	4.928	4.913	4.909	4.911	4.916	4.927	4.942	4.945	4.934	4.929	4.926	4.913
2019	4.905	4.906	4.912	4.922	4.934	4.949	4.966	4.975	4.984	5.005	5.021	5.045
2020	5.033	5.009	4.996	5.033	5.023	5.033	5.054	5.061	5.085	5.109	5.112	5.079
2021	5.052	5.047	5.043	5.052	5.071	5.083	5.093	5.092	5.092	5.117	5.130	5.119
2022	5.105	5.104	5.117	5.132	5.148	5.158	5.158	5.165	5.174	5.185	5.176	5.160
2023	5.164	5.161	5.164	5.170	5.177	5.202	5.267	5.260	5.239	5.249	5.260	5.251
2024	5.243	5.244	5.246	5.253	5.261	5.292	5.320	5.315				

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Automatic ARIMA Model Selection

Procedure based closely on TRAMO ,method of Gomez and Maravall (2000)
"Automatic Modeling Methods for Univariate Series",
A Course in Time Series (Edited by D. Pena, G. C. Tiao, R. S. Tsay),
New York : J. Wiley and Sons

Maximum order for regular ARMA parameters : 2

Maximum order for seasonal ARMA parameters : 1

Maximum order for regular differencing : 2

Maximum order for seasonal differencing : 1

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OUTLIER DETECTION

From 2013.Jan to 2024.Aug
Observations 140

Types : AO and LS
Method : add one
Critical |t| for AO outliers : 3.88
Critical |t| for LS outliers : 3.88

Estimation converged in 30 ARMA iterations, 91 function evaluations.

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ARIMA Model

ARIMA Model: (0 1 1)(0 1 1)

Nonseasonal differences: 1
Seasonal differences: 1

ARIMA Model

	Estimate	Standard Error
Nonseasonal MA		
Lag 1	-0.33035	0.07440
Seasonal MA		
Lag 12	0.99871	0.06210

Model Innovation Variance

Variance	0.11474E-03
Standard Error of Variance	0.14399E-04

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Forward addition pass 1

Robust root mse : 6.75E-03
Normal root mse : 1.07E-02

Outliers flagged as significant this pass

	t(AO)	t(LS)
AO2013.Nov	5.33*	3.96
LS2013.Dec	-2.51	-4.73*
AO2019.Nov	-3.97*	-0.65
LS2019.Dec	4.60	5.82*
AO2020.Mar	-5.46*	-3.20
AO2020.Apr	6.21*	5.70
LS2020.May	-2.92	-4.42*
AO2023.Jun	-4.92*	-1.21
LS2023.Jul	6.10	6.81*

Add +LS2023.Jul (6.81)

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AO Outlier t-values

AO Outlier t-values

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	-2.2065	1.7104	-0.2908	-0.2340	-0.8652	1.3768	-1.0952	-0.4052	1.6644	-2.9485	5.3280	-2.5121
2014	-0.1569	-0.8525	0.6733	-0.5255	1.3642	-2.3799	0.9224	1.1162	0.4060	-0.4655	-0.5001	-0.2544
2015	-0.0511	0.2968	0.4912	-0.3258	-0.9503	2.6307	-3.1487	0.9702	0.6560	-0.2844	0.0990	-1.1985
2016	2.2445	-1.3605	0.0257	-0.3783	0.0339	1.2832	-0.2183	0.0807	-0.4485	0.9296	-1.1208	0.0259
2017	-0.3606	0.3460	0.6499	-0.4233	0.3050	-1.1324	-0.1536	2.0337	-1.2409	-0.8646	0.9804	-0.3436
2018	1.0289	-0.8554	0.7440	-0.7199	0.4104	0.0855	-0.5759	0.6952	0.3382	-0.4955	-0.7070	0.1849
2019	-0.2778	-0.0414	0.6730	-0.6753	0.5687	0.3499	-0.8085	-0.1764	-0.3720	1.2186	-3.9715	4.6008
2020	-0.3478	1.2819	-5.4565	6.2071	-2.9203	0.2230	0.4963	-2.4974	1.5238	0.4502	1.1924	-0.1006
2021	-1.4357	0.7000	0.0479	-1.4519	1.6443	0.1842	-0.4723	-0.0659	-1.4374	1.0298	-0.0908	0.6063
2022	-0.3686	-1.0558	1.3109	-0.8934	0.9647	1.5910	-2.3869	-0.0785	0.4135	1.3342	-0.9746	-1.4897
2023	1.5880	-0.7087	1.0547	-0.8811	0.9850	-4.9175	6.0956	-0.7091	-1.5030	0.0961	-0.2352	0.4810
2024	-0.5826	0.6019	0.0756	0.3013	-1.5411	0.7082	1.3962	-1.6608				

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LS Outlier t-values

LS Outlier t-values

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013			-0.607795	-0.131860	0.249780	1.661063	-0.584731	1.201702	1.868028	-0.846903	3.962553	-4.728263
2014	-0.630548	-0.372954	1.017382	-0.080961	0.776223	-1.449052	2.432940	0.929081	-0.890771	-1.553002	-0.793729	0.022043
2015	0.437071	0.518670	0.034428	-0.766772	-0.235359	1.314671	-2.976503	2.159194	0.582423	-0.487561	-0.023588	-0.185130
2016	1.769758	-1.889512	0.329883	0.287973	0.905011	0.849748	-1.243427	-0.887855	-1.022954	-0.291446	-1.807845	0.020290
2017	-0.021925	0.565006	0.000475	-1.059531	-0.369057	-0.866504	0.980697	1.231707	-2.085716	-0.061568	1.348782	-0.250455
2018	0.309998	-1.365554	0.029951	-1.183609	-0.009395	-0.678850	-0.818330	0.120866	-1.014284	-1.565889	-0.757690	0.395509
2019	0.093940	0.545711	0.613056	-0.484650	0.616881	-0.310753	-0.881573	0.437007	0.726707	1.333554	-0.654217	5.823981
2020	-1.680732	-1.108457	-3.198547	5.701808	-4.423000	0.340431	-0.023301	-0.833050	3.243223	0.757577	0.023223	-1.921857
2021	-1.757714	0.585209	-0.556532	-0.634627	1.733670	-0.948501	-1.248977	-0.478919	-0.373055	1.971640	0.291872	0.439915
2022	-0.549090	0.052768	1.774484	-0.363844	1.093514	-0.480059	-3.075274	0.817473	0.948651	0.274132	-1.902115	-0.312448
2023	2.117418	-0.474723	0.681222	-1.039094	0.398131	-1.208513	6.812796	-3.128903	-1.982252	0.469465	0.312758	0.696407
2024	-0.088175	0.860247	-0.121605	-0.244923	-0.736431	1.777482	0.629418					

Average absolute percentage error in within-sample forecasts:

Last year: 0.92
Last-1 year: 0.74
Last-2 year: 2.84
Last three years: 1.50

Estimation converged in 37 ARMA iterations, 130 function evaluations.

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Regression Model

Regression Model

	Parameter Estimate	Standard Error	t-value
Automatically Identified Outliers			
LS2023.Jul	0.0450	0.00962	4.68

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ARIMA Model

ARIMA Model: (0 1 1)(0 1 1)

Nonseasonal differences: 1
Seasonal differences: 1

ARIMA Model

	Estimate	Standard Error
Nonseasonal MA		
Lag 1	-0.36483	0.07355
Seasonal MA		
Lag 12	0.99863	0.06151

Model Innovation Variance

Variance	0.97957E-04
Standard Error of Variance	0.12293E-04

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Forward addition pass 2

Robust root mse : 6.34E-03
Normal root mse : 9.90E-03

Outliers flagged as significant this pass

	t(AO)	t(LS)
AO2013.Nov	5.76*	4.40
LS2013.Dec	-2.86	-5.13*
AO2019.Nov	-4.35*	-0.96
LS2019.Dec	5.01	6.24*
AO2020.Mar	-5.98*	-3.63
AO2020.Apr	6.70*	6.25
LS2020.May	-3.13	-4.82*

Add +AO2020.Apr (6.70)

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AO Outlier t-values

AO Outlier t-values

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	-2.3388	1.8202	-0.3540	-0.2292	-0.7583	0.9318	-0.5859	-0.6995	1.9938	-3.3760	5.7631	-2.8580
2014	0.0609	-0.9948	0.8272	-0.7459	1.7464	-3.1129	1.5905	0.8553	0.5030	-0.5076	-0.4817	-0.2482
2015	-0.0558	0.2893	0.5058	-0.3395	-0.9094	2.3383	-2.8532	0.9173	0.6960	-0.3486	0.1990	-1.3493
2016	2.4252	-1.5218	0.1451	-0.4801	0.2098	0.7871	0.2690	-0.0700	-0.4424	0.9982	-1.2010	0.0968
2017	-0.3976	0.3400	0.7037	-0.5499	0.5666	-1.7134	0.3589	1.9157	-1.2251	-0.9045	1.0649	-0.4472
2018	1.1380	-0.9806	0.8762	-0.8748	0.6559	-0.4650	-0.0569	0.5134	0.4107	-0.5163	-0.7147	0.2167
2019	-0.2890	-0.0709	0.7493	-0.8084	0.7988	-0.1854	-0.3028	-0.3071	-0.4289	1.4641	-4.3548	5.0077
2020	-0.7420	1.7111	-5.9811	6.6990	-3.1268	-0.1590	1.0936	-2.8454	1.7486	0.3139	1.2450	-0.0947
2021	-1.4853	0.7347	0.1066	-1.6207	1.9402	-0.4121	0.0622	-0.2037	-1.4502	1.1016	-0.1602	0.6455
2022	-0.3543	-1.1393	1.4495	-1.0612	1.1671	1.1359	-1.9668	-0.1888	0.4282	1.3598	-0.9736	-1.5533
2023	1.6898	-0.7645	0.9326	-0.3003	-0.9094	1.1589	0.8803	1.2854	-2.2470	0.4159	-0.3861	0.5839
2024	-0.6681	0.6604	0.0376	0.3089	-1.4240	0.2008	1.9856	-1.9702				

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LS Outlier t-values

LS Outlier t-values

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013			-0.69610	-0.10876	0.26982	1.52282	-0.01310	0.95283	2.11273	-1.18136	4.39642	-5.12514
2014	-0.40332	-0.50224	1.14101	-0.22565	1.00669	-1.87868	3.26432	0.63197	-0.78061	-1.61156	-0.77288	0.02293
2015	0.43296	0.52344	0.04538	-0.79030	-0.22944	1.27318	-2.59061	2.12155	0.61117	-0.53877	0.03720	-0.29161
2016	1.93767	-2.06705	0.44737	0.20769	1.00090	0.65471	-0.64514	-1.08656	-0.97412	-0.24316	-1.89230	0.09193
2017	-0.06804	0.58768	0.02588	-1.13664	-0.22816	-1.16458	1.66573	1.06884	-2.09609	-0.07199	1.42237	-0.33699
2018	0.40184	-1.47544	0.14490	-1.30272	0.14257	-0.94124	-0.17536	-0.08108	-0.93041	-1.60885	-0.75582	0.42505
2019	0.06709	0.54318	0.66000	-0.57800	0.75754	-0.56206	-0.25740	0.24258	0.75115	1.45974	-0.95915	6.23573
2020	-2.03782	-0.80742	-3.63315	6.24840	-4.81937	0.34521	0.60953	-1.19530	3.50670	0.61761	0.09903	-1.95795
2021	-1.80149	0.65340	-0.56033	-0.73646	1.94115	-1.26394	-0.58682	-0.68752	-0.35277	2.04320	0.22324	0.48783
2022	-0.57870	0.00736	1.88903	-0.50586	1.24746	-0.68046	-2.56226	0.68839	1.00282	0.29529	-1.95130	-0.34282
2023	2.22341	-0.57000	0.69297	-0.84774	-0.35681	1.15894	0.00000	-0.88029	-2.87569	0.84083	0.15323	0.79105
2024	-0.17360	0.92826	-0.16299	-0.22510	-0.73556	1.61729	1.30251					

LS Outlier t-values have been set to zero for the following observations:

2023.Jul

Average absolute percentage error in within-sample forecasts:

Last year: 0.94
Last-1 year: 0.69
Last-2 year: 3.14
Last three years: 1.59

Estimation converged in 70 ARMA iterations, 239 function evaluations.

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Regression Model

Regression Model

	Parameter Estimate	Standard Error	t-value
Automatically Identified Outliers			
AO2020.Apr	0.0247	0.00487	5.08
LS2023.Jul	0.0433	0.00837	5.17

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ARIMA Model

ARIMA Model: (0 1 1)(0 1 1)

Nonseasonal differences: 1
Seasonal differences: 1

ARIMA Model

	Estimate	Standard Error
Nonseasonal MA		
Lag 1	-0.47280	0.07060
Seasonal MA		
Lag 12	0.95353	0.05510

Model Innovation Variance

Variance	0.86086E-04
Standard Error of Variance	0.10803E-04

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Forward addition pass 3

Robust root mse : 7.02E-03
Normal root mse : 9.28E-03

Outliers flagged as significant this pass

	t(AO)	t(LS)
AO2013.Nov	5.60*	4.58
LS2013.Dec	-3.20	-5.04*

AO2019.Nov	-4.29*	-1.62
LS2019.Dec	4.64	5.74*

Add +LS2019.Dec (5.74)

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AO Outlier t-values

AO Outlier t-values

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	-2.23889	1.90635	-0.96305	0.63260	-1.19001	1.03392	-0.43541	-0.94808	2.33892	-3.74414	5.60278	-3.19632
2014	0.74175	-1.12521	0.72826	-0.56008	1.57002	-2.81271	1.62220	0.35616	0.50190	-0.42747	-0.38097	-0.08777
2015	-0.18639	0.46380	-0.14088	0.55231	-1.55493	2.59453	-2.84379	1.10581	0.38613	-0.33862	0.38998	-1.39370
2016	2.24548	-1.40895	-0.00476	0.07119	-0.23754	0.82853	0.03136	0.08904	-0.55589	1.05709	-1.21600	0.36694
2017	-0.53988	0.48068	0.18219	-0.00526	0.22893	-1.25659	0.19663	1.58792	-1.02966	-0.73343	1.00693	-0.59971
2018	1.09994	-0.90834	0.58271	-0.37439	0.29534	-0.28238	-0.08201	0.39161	0.31647	-0.37014	-0.59676	0.28668
2019	-0.34632	0.08770	0.27989	-0.20693	0.31136	0.01971	-0.38596	0.02400	-0.77769	1.89355	-4.28722	4.63762
2020	-0.88820	0.51736	-1.90937	0.00000	2.07409	-2.08734	2.05821	-3.07742	2.01676	-0.23438	1.15380	-0.07657
2021	-1.29811	0.82060	-0.23202	-0.92551	1.36050	-0.34334	0.01477	-0.00188	-1.31206	1.08541	-0.34398	0.63728
2022	-0.32651	-0.85973	0.96683	-0.48457	0.52677	1.18859	-1.81529	0.10654	0.16972	1.12702	-0.71893	-1.33954
2023	1.52154	-0.71890	0.50589	0.26904	-1.16445	1.21699	0.46661	1.34263	-2.08990	0.68206	-0.60139	0.76952
2024	-0.88285	0.94239	-0.62756	1.04368	-1.66703	0.37212	1.56161	-1.69395				

AO Outlier t-values have been set to zero for the following observations:

2020.Apr

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LS Outlier t-values

LS Outlier t-values

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013			-1.04346	0.60741	-0.47665	1.56306	-0.20866	0.53774	2.16697	-1.84716	4.57870	-5.03717
2014	0.44849	-0.82308	1.10761	-0.14075	0.81950	-1.87291	2.95294	0.16677	-0.44444	-1.30565	-0.57197	0.08187
2015	0.23251	0.55086	-0.24501	-0.00359	-0.95052	1.71621	-2.73533	2.14301	0.24904	-0.41362	0.16753	-0.50177
2016	1.89019	-1.96130	0.45650	0.46567	0.34367	0.75027	-0.67072	-0.72277	-0.87735	0.07675	-1.73744	0.34953
2017	-0.28022	0.64525	-0.17959	-0.49290	-0.48394	-0.87553	1.28032	0.94025	-1.78431	-0.01703	1.24169	-0.48645
2018	0.54280	-1.34273	0.21600	-0.78431	-0.14257	-0.64853	-0.16534	-0.02444	-0.69697	-1.23990	-0.60461	0.41958
2019	-0.07243	0.52095	0.37040	-0.10946	0.24528	-0.28878	-0.32347	0.33848	0.29810	1.63261	-1.61715	5.74151
2020	-2.20826	-0.70497	-1.66675	1.35098	1.35098	-1.87587	1.67262	-1.84784	3.42718	-0.03517	0.36705	-1.61316
2021	-1.48178	0.74608	-0.66201	-0.26508	1.32154	-1.01241	-0.42578	-0.44987	-0.44784	1.80378	-0.05909	0.53126
2022	-0.56246	-0.00156	1.47358	-0.18350	0.64721	-0.25670	-2.29931	0.81605	0.63533	0.34395	-1.59028	-0.35641
2023	1.94264	-0.66902	0.56433	-0.30210	-0.77258	1.21699	0.00000	-0.46661	-2.58678	1.00452	-0.16710	0.86457
2024	-0.45612	1.05747	-0.55963	0.51689	-1.27240	1.58560	0.97896					

LS Outlier t-values have been set to zero for the following observations:

2023.Jul

Average absolute percentage error in within-sample forecasts:

Last year: 1.08
Last-1 year: 0.82
Last-2 year: 3.32
Last three years: 1.74

Estimation converged in 97 ARMA iterations, 326 function evaluations.

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Regression Model

Regression Model

	Parameter Estimate	Standard Error	t-value
Automatically Identified Outliers			
LS2019.Dec	0.0361	0.00759	4.75
AO2020.Apr	0.0235	0.00435	5.39
LS2023.Jul	0.0427	0.00755	5.65

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ARIMA Model

ARIMA Model: (0 1 1)(0 1 1)

Nonseasonal differences: 1
Seasonal differences: 1

ARIMA Model

	Estimate	Standard Error
Nonseasonal MA		
Lag 1	-0.50574	0.06811
Seasonal MA		
Lag 12	0.98166	0.05732

Model Innovation Variance

Variance	0.71352E-04
Standard Error of Variance	0.89540E-05

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Forward addition pass 4

Robust root mse : 7.55E-03
Normal root mse : 8.45E-03

Outliers flagged as significant this pass

	t(AO)	t(LS)
AO2013.Nov	4.83*	4.12
LS2013.Dec	-2.70	-4.26*

Add +AO2013.Nov (4.83)

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AO Outlier t-values

AO Outlier t-values

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	-2.06091	1.76710	-0.93617	0.63574	-1.10173	0.93813	-0.36262	-0.91920	2.21236	-3.42289	4.82968	-2.70231
2014	0.71086	-1.07514	0.77143	-0.66154	1.54623	-2.59819	1.51694	0.25448	0.39558	-0.19479	-0.75032	0.38254
2015	-0.42119	0.56455	-0.25434	0.62064	-1.53479	2.47443	-2.69121	1.15666	0.17273	-0.10072	-0.02132	-0.88585
2016	1.85202	-1.22545	0.02808	0.04958	-0.22718	0.76339	-0.06127	0.20109	-0.66762	1.22971	-1.60148	0.86294
2017	-0.75795	0.56115	0.09863	-0.00767	0.22206	-1.08403	0.12565	1.45640	-1.01572	-0.42720	0.47696	-0.15100
2018	0.81861	-0.77305	0.54566	-0.38232	0.29972	-0.25491	-0.09421	0.39295	0.15395	-0.07371	-1.00313	0.74794
2019	-0.54971	0.18385	0.22272	-0.22333	0.34888	-0.10940	-0.09208	-0.46557	0.32570	-0.45009	1.12247	-0.53472
2020	1.40802	-0.52216	-1.26612	0.00000	1.87259	-1.96813	1.98115	-2.83635	1.81997	-0.10973	0.59484	0.39215
2021	-1.37296	0.84298	-0.23372	-0.83407	1.22517	-0.32007	-0.01274	0.09530	-1.32620	1.27055	-0.85601	1.07604
2022	-0.52653	-0.65470	0.83396	-0.44102	0.43031	1.10223	-1.66761	0.22304	-0.04512	1.25791	-1.09939	-0.72456
2023	1.15257	-0.58477	0.43581	0.23571	-1.03561	1.10181	0.32652	1.32506	-2.06599	0.98131	-1.13104	1.26763
2024	-1.12164	1.04252	-0.70218	1.02002	-1.52441	0.37009	1.36890	-1.53748				

AO Outlier t-values have been set to zero for the following observations:

2020.Apr

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LS Outlier t-values

LS Outlier t-values

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013			-1.0107	0.6111	-0.4902	1.4187	-0.2066	0.4219	2.0187	-1.8202	4.1197	-4.2565
2014	0.4371	-0.7949	1.0703	-0.2670	0.8798	-1.8013	2.7057	0.0717	-0.3699	-1.0563	-0.7192	0.5818
2015	-0.0825	0.6467	-0.3327	0.1082	-0.9677	1.6936	-2.5987	2.0688	0.0655	-0.2342	-0.0596	-0.0228
2016	1.5107	-1.7005	0.4257	0.3779	0.2920	0.6853	-0.6385	-0.5308	-0.8812	0.2773	-1.8570	0.9186
2017	-0.5786	0.7355	-0.2381	-0.4099	-0.3967	-0.7809	1.0994	0.8791	-1.6474	0.1151	0.8567	0.0312
2018	0.2925	-1.1255	0.2159	-0.7312	-0.0685	-0.5879	-0.1468	0.0167	-0.6655	-0.9326	-0.8055	0.9344
2019	-0.3637	0.5891	0.2700	-0.1162	0.2710	-0.3341	-0.1451	0.0146	0.8247	0.2757	1.1225	0.0000
2020	0.5347	-1.7952	-0.9819	1.1304	1.1304	-1.7545	1.6200	-1.8031	3.1103	-0.0489	0.1415	-0.8915
2021	-1.5669	0.8154	-0.6471	-0.2426	1.2033	-0.9218	-0.3686	-0.3456	-0.5118	1.7893	-0.4145	1.0713
2022	-0.7954	0.1190	1.2545	-0.1909	0.5736	-0.1730	-2.0875	0.8059	0.4206	0.4988	-1.6842	0.2196
2023	1.4731	-0.5271	0.4871	-0.2671	-0.6861	1.1018	0.0000	-0.3265	-2.4317	1.1544	-0.5481	1.4139
2024	-0.7857	1.1587	-0.6501	0.5677	-1.2005	1.4413	0.8337					

LS Outlier t-values have been set to zero for the following observations:

2019.Dec 2023.Jul

Average absolute percentage error in within-sample forecasts:

Last year: 1.08
Last-1 year: 0.70
Last-2 year: 3.36
Last three years: 1.71

Estimation converged in 31 ARMA iterations, 141 function evaluations.

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Regression Model

Regression Model

	Parameter Estimate	Standard Error	t-value
Automatically Identified Outliers			
AO2013.Nov	0.0183	0.00348	5.25

LS2019.Dec	0.0316	0.00635	4.98
AO2020.Apr	0.0218	0.00349	6.25
LS2023.Jul	0.0410	0.00624	6.56

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ARIMA Model

ARIMA Model: (0 1 1)(0 1 1)

Nonseasonal differences: 1
Seasonal differences: 1

ARIMA Model

	Estimate	Standard Error
Nonseasonal MA		
Lag 1	-0.62768	0.06023
Seasonal MA		
Lag 12	0.99977	0.06449

Model Innovation Variance

Variance	0.58785E-04
Standard Error of Variance	0.73770E-05

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Forward addition pass 5

Robust root mse : 6.34E-03
Normal root mse : 7.67E-03

Outliers flagged as significant this pass

	t(AO)	t(LS)
AO2020.Aug	-3.89*	-2.88
LS2020.Sep	2.91	4.10*

Add +LS2020.Sep (4.10)

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AO Outlier t-values

AO Outlier t-values

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	-2.5196	2.2649	-1.5020	1.2603	-1.7413	1.6659	-1.2344	0.3051	0.2402	0.3650	0.0000	1.4961
2014	-1.1907	-0.2857	0.6564	-1.0033	2.1002	-3.1656	2.1452	-0.4420	0.9390	-0.7750	-0.1071	0.0561
2015	-0.4176	0.7647	-0.6799	1.2194	-2.2641	3.2334	-3.3161	1.5897	0.0771	-0.5272	0.8228	-1.7280
2016	2.4859	-1.7596	0.4645	-0.1716	-0.1783	0.7888	-0.2297	0.3755	-0.7969	1.2159	-1.4458	0.8545
2017	-0.8480	0.6290	0.0571	-0.0801	0.3387	-1.1032	0.1883	1.2344	-0.6781	-0.9614	1.3011	-0.9903
2018	1.4438	-1.3221	1.0358	-0.7985	0.6196	-0.4731	0.0928	0.1712	0.3794	-0.4292	-0.4736	0.4011
2019	-0.3798	0.0625	0.3475	-0.3948	0.5121	-0.2849	0.1237	-0.6828	0.6281	-0.8480	1.5540	-0.6624
2020	1.5164	-0.5580	-1.4261	0.0000	2.5688	-2.8639	3.0460	-3.8895	2.9101	-1.2943	1.5643	-0.2847

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2021	-0.9779	0.6325	-0.0253	-1.0325	1.3956	-0.4895	0.0536	0.1434	-1.2925	1.1376	-0.6124	0.8297
2022	-0.3755	-0.7488	0.9469	-0.5325	0.3443	1.2136	-1.7825	0.4038	-0.0801	0.9098	-0.4866	-1.2272
2023	1.5470	-0.9468	0.6718	0.1005	-1.0125	1.1809	0.0378	1.7005	-2.3839	1.2396	-1.2494	1.4987
2024	-1.5503	1.5332	-1.2267	1.4772	-1.8464	0.6249	1.2432	-1.5911				

AO Outlier t-values have been set to zero for the following observations:

2013.Nov 2020.Apr

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LS Outlier t-values

LS Outlier t-values

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013			-1.52947	1.16170	-1.10189	2.02916	-0.96635	1.25376	0.75131	0.39964	-0.12327	-0.12327
2014	-1.96701	0.24248	0.73323	-0.44889	1.35503	-2.42839	3.27835	-0.59130	0.20514	-1.48897	-0.09488	0.09798
2015	-0.00332	0.74762	-0.63127	0.59450	-1.60327	2.47790	-3.35141	2.62618	-0.23671	-0.37604	0.57454	-0.90767
2016	2.20197	-2.27788	0.89536	0.05867	0.36795	0.68888	-0.73299	-0.31806	-0.99616	0.44055	-1.75366	0.84840
2017	-0.69179	0.83608	-0.29831	-0.40186	-0.25760	-0.86761	1.12119	0.78010	-1.44538	-0.22356	1.51179	-0.83013
2018	0.95382	-1.64647	0.73787	-1.12995	0.30900	-0.80765	0.04422	-0.12298	-0.43207	-1.11703	-0.34608	0.50703
2019	-0.21666	0.46731	0.35418	-0.27241	0.43923	-0.48392	0.02820	-0.19500	1.04028	-0.05591	1.55403	0.00000
2020	0.66244	-1.89472	-1.02551	1.48860	1.48860	-2.48706	2.55663	-2.88469	4.09829	-1.15108	1.18119	-1.63631
2021	-1.11442	0.64931	-0.49137	-0.44639	1.41478	-1.10123	-0.22043	-0.31651	-0.57589	1.75534	-0.29223	0.81139
2022	-0.68401	-0.00571	1.34366	-0.36273	0.59708	-0.02398	-2.21397	1.00026	0.27360	0.41840	-1.22327	-0.34988
2023	1.85736	-0.93031	0.77414	-0.42942	-0.63680	1.18089	0.00000	-0.03775	-2.78571	1.50488	-0.72777	1.51802
2024	-1.18314	1.60964	-1.15482	1.05589	-1.60537	1.71304	0.66167					

LS Outlier t-values have been set to zero for the following observations:

2019.Dec 2023.Jul

Average absolute percentage error in within-sample forecasts:

Last year: 1.21
Last-1 year: 0.77
Last-2 year: 3.61
Last three years: 1.86

Estimation converged in 34 ARMA iterations, 149 function evaluations.

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Regression Model

Regression Model

	Parameter Estimate	Standard Error	t-value
Automatically Identified Outliers			
AO2013.Nov	0.0186	0.00303	6.13
LS2019.Dec	0.0299	0.00568	5.27
AO2020.Apr	0.0231	0.00313	7.38
LS2020.Sep	0.0212	0.00567	3.73
LS2023.Jul	0.0407	0.00553	7.35

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ARIMA Model

ARIMA Model: (0 1 1)(0 1 1)

Nonseasonal differences: 1
Seasonal differences: 1

ARIMA Model

	Estimate	Standard Error
Nonseasonal MA		
Lag 1	-0.69023	0.05578
Seasonal MA		
Lag 12	0.99930	0.06242

Model Innovation Variance

Variance	0.53182E-04
Standard Error of Variance	0.66739E-05

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Forward addition pass 6

Robust root mse : 6.92E-03
Normal root mse : 7.29E-03

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AO Outlier t-values

AO Outlier t-values

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	-2.3681	2.1785	-1.5708	1.3752	-1.7182	1.5760	-1.1000	0.1616	0.3672	0.2098	0.0000	1.2716
2014	-0.9192	-0.3990	0.8141	-1.2170	2.2121	-3.1460	2.3973	-1.1030	1.4002	-1.0591	0.1873	-0.0519
2015	-0.3862	0.7859	-0.8370	1.3566	-2.2259	2.9586	-2.8818	1.2618	0.2473	-0.6783	0.9944	-1.7557
2016	2.3510	-1.7334	0.6284	-0.3067	-0.0258	0.5213	-0.0625	0.1097	-0.4862	0.9585	-1.2163	0.7921
2017	-0.7859	0.5747	0.0180	-0.1077	0.3978	-1.0822	0.4525	0.5350	-0.0399	-1.2250	1.5010	-1.2510
2018	1.5842	-1.4668	1.2065	-0.9873	0.8345	-0.7283	0.4671	-0.3458	0.7578	-0.6594	-0.1475	0.1699
2019	-0.1934	-0.0557	0.3941	-0.4626	0.6022	-0.4873	0.4467	-1.0193	0.9875	-1.0426	1.5525	-0.6315
2020	1.3696	-0.5694	-1.0729	0.0000	1.6620	-1.4602	0.8854	-0.4636	-1.6211	1.1291	-0.0283	0.6590
2021	-1.3912	0.8983	-0.2377	-0.7413	1.1376	-0.5007	0.2112	-0.1261	-0.8126	0.8135	-0.4565	0.6449
2022	-0.2775	-0.6348	0.8031	-0.4667	0.2973	0.9232	-1.3136	0.0975	0.2036	0.5014	-0.1673	-1.1918
2023	1.4436	-0.9419	0.6604	0.0324	-0.8416	1.0228	0.0184	1.4051	-2.0122	1.2219	-1.3114	1.5777
2024	-1.6674	1.6695	-1.4290	1.6034	-1.8347	0.7577	0.8922	-1.2884				

AO Outlier t-values have been set to zero for the following observations:

2013.Nov 2020.Apr

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LS Outlier t-values

LS Outlier t-values

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013			-1.57036	1.28481	-1.22558	1.91598	-0.96507	1.04472	0.80775	0.22828	-0.07566	-0.07566
2014	-1.65522	0.10490	0.80321	-0.68654	1.53916	-2.51789	3.25834	-1.14432	0.87984	-1.69062	0.25263	-0.09079
2015	0.00475	0.71219	-0.73124	0.80604	-1.68505	2.40267	-3.03048	2.25949	-0.05052	-0.50410	0.74128	-1.08347
2016	2.13614	-2.17988	1.00450	-0.14922	0.41395	0.46122	-0.49597	-0.38132	-0.58492	0.30783	-1.45276	0.77796
2017	-0.67639	0.76614	-0.28973	-0.32323	-0.12549	-0.85581	1.13163	0.30103	-0.68161	-0.60724	1.64253	-1.11060
2018	1.18542	-1.72179	0.97277	-1.24344	0.56924	-0.96322	0.37320	-0.48430	0.14945	-1.24072	-0.03155	0.23928
2019	-0.07314	0.28149	0.38353	-0.34050	0.50905	-0.59676	0.29577	-0.52388	1.35047	-0.40602	1.55248	0.00000
2020	0.63149	-1.69559	-0.79053	1.10617	1.10617	-1.54232	1.04942	-0.46357	0.00000	1.62106	-0.48745	-0.40573
2021	-1.57362	0.97976	-0.66972	-0.23244	1.12839	-0.96123	-0.04297	-0.43086	-0.20095	1.29037	-0.20157	0.63648
2022	-0.54766	-0.03682	1.12842	-0.34613	0.51089	-0.03529	-1.73262	0.67934	0.50320	0.12898	-0.79255	-0.48776
2023	1.69768	-0.94950	0.77534	-0.42530	-0.51745	1.02277	0.00000	-0.01842	-2.28944	1.38835	-0.84990	1.54712
2024	-1.34799	1.71135	-1.35418	1.26803	-1.67239	1.67875	0.38019					

LS Outlier t-values have been set to zero for the following observations:

2019.Dec 2020.Sep 2023.Jul

No more outliers identified

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Backward deletion pass 1

Backward deletion results

	Parameter Estimate	Standard Error	t-value
-LS2020.Sep	0.0212	0.00567	3.73

Estimation converged in 25 ARMA iterations, 116 function evaluations.

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Regression Model

Regression Model

	Parameter Estimate	Standard Error	t-value
Automatically Identified Outliers			
AO2013.Nov	0.0183	0.00348	5.25
LS2019.Dec	0.0316	0.00635	4.98
AO2020.Apr	0.0218	0.00349	6.25
LS2023.Jul	0.0410	0.00624	6.56

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ARIMA Model

ARIMA Model: (0 1 1)(0 1 1)

Nonseasonal differences: 1
Seasonal differences: 1

ARIMA Model

	Estimate	Standard Error
Nonseasonal MA		

Lag 1	-0.62767	0.06024
Seasonal MA		
Lag 12	0.99964	0.06448

Model Innovation Variance

Variance	0.58792E-04
Standard Error of Variance	0.73779E-05

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Final AO Outlier t-values

Final AO Outlier t-values

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	-2.3681	2.1785	-1.5708	1.3752	-1.7182	1.5760	-1.1000	0.1616	0.3672	0.2098	0.0000	1.2716
2014	-0.9192	-0.3990	0.8141	-1.2170	2.2121	-3.1460	2.3973	-1.1030	1.4002	-1.0591	0.1873	-0.0519
2015	-0.3862	0.7859	-0.8370	1.3566	-2.2259	2.9586	-2.8818	1.2618	0.2473	-0.6783	0.9944	-1.7557
2016	2.3510	-1.7334	0.6284	-0.3067	-0.0258	0.5213	-0.0625	0.1097	-0.4862	0.9585	-1.2163	0.7921
2017	-0.7859	0.5747	0.0180	-0.1077	0.3978	-1.0822	0.4525	0.5350	-0.0399	-1.2250	1.5010	-1.2510
2018	1.5842	-1.4668	1.2065	-0.9873	0.8345	-0.7283	0.4671	-0.3458	0.7578	-0.6594	-0.1475	0.1699
2019	-0.1934	-0.0557	0.3941	-0.4626	0.6022	-0.4873	0.4467	-1.0193	0.9875	-1.0426	1.5525	-0.6315
2020	1.3696	-0.5694	-1.0729	0.0000	1.6620	-1.4602	0.8854	-0.4636	-1.6211	1.1291	-0.0283	0.6590
2021	-1.3912	0.8983	-0.2377	-0.7413	1.1376	-0.5007	0.2112	-0.1261	-0.8126	0.8135	-0.4565	0.6449
2022	-0.2775	-0.6348	0.8031	-0.4667	0.2973	0.9232	-1.3136	0.0975	0.2036	0.5014	-0.1673	-1.1918
2023	1.4436	-0.9419	0.6604	0.0324	-0.8416	1.0228	0.0184	1.4051	-2.0122	1.2219	-1.3114	1.5777
2024	-1.6674	1.6695	-1.4290	1.6034	-1.8347	0.7577	0.8922	-1.2884				

AO Outlier t-values have been set to zero for the following observations:

2013.Nov 2020.Apr

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Final LS Outlier t-values

Final LS Outlier t-values

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013			-1.57036	1.28481	-1.22558	1.91598	-0.96507	1.04472	0.80775	0.22828	-0.07566	-0.07566
2014	-1.65522	0.10490	0.80321	-0.68654	1.53916	-2.51789	3.25834	-1.14432	0.87984	-1.69062	0.25263	-0.09079
2015	0.00475	0.71219	-0.73124	0.80604	-1.68505	2.40267	-3.03048	2.25949	-0.05052	-0.50410	0.74128	-1.08347
2016	2.13614	-2.17988	1.00450	-0.14922	0.41395	0.46122	-0.49597	-0.38132	-0.58492	0.30783	-1.45276	0.77796
2017	-0.67639	0.76614	-0.28973	-0.32323	-0.12549	-0.85581	1.13163	0.30103	-0.68161	-0.60724	1.64253	-1.11060
2018	1.18542	-1.72179	0.97277	-1.24344	0.56924	-0.96322	0.37320	-0.48430	0.14945	-1.24072	-0.03155	0.23928
2019	-0.07314	0.28149	0.38353	-0.34050	0.50905	-0.59676	0.29577	-0.52388	1.35047	-0.40602	1.55248	0.00000
2020	0.63149	-1.69559	-0.79053	1.10617	1.10617	-1.54232	1.04942	-0.46357	3.73203	1.62106	-0.48745	-0.40573
2021	-1.57362	0.97976	-0.66972	-0.23244	1.12839	-0.96123	-0.04297	-0.43086	-0.20095	1.29037	-0.20157	0.63648
2022	-0.54766	-0.03682	1.12842	-0.34613	0.51089	-0.03529	-1.73262	0.67934	0.50320	0.12898	-0.79255	-0.48776
2023	1.69768	-0.94950	0.77534	-0.42530	-0.51745	1.02277	0.00000	-0.01842	-2.28944	1.38835	-0.84990	1.54712
2024	-1.34799	1.71135	-1.35418	1.26803	-1.67239	1.67875	0.38019					

LS Outlier t-values have been set to zero for the following observations:

2019.Dec 2023.Jul

ARIMA Estimates (H-R) for Unit Root Identification : Model No. 1

Model Estimated : (2 0 0) (1 0 0)

Regular AR : 1.3937 -0.4091
Seasonal AR : 0.4728

ARIMA Estimates (H-R) for Unit Root Identification : Model No. 2

Model Estimated : (1 1 1) (1 0 1)

Regular AR : 0.0905
Seasonal AR : 0.8439
Regular MA : -0.5307
Seasonal MA : 0.6423

ARIMA Estimates (H-R) for Unit Root Identification : Model No. 3

Model Estimated : (1 1 1) (1 1 1)

Regular AR : 0.0558
Seasonal AR : -0.4146
Regular MA : -0.7034
Seasonal MA : 0.2763

Results of Unit Root Test for identifying orders of differencing:

Regular difference order : 1 Seasonal difference order : 1

Mean is not significant.

ARIMA Estimates and Likelihood Values for ARMA Order Identification

Model Estimated : (3 1 0) (0 1 0)

Regular AR : 0.5119 -0.4035 0.0375

BIC : 501.0285
BIC2 : -6.0625

Model Estimated : (3 1 0) (0 1 1)

Regular AR : 0.5925 -0.4415 0.0449
Seasonal MA : 0.9921

BIC : 442.7914
BIC2 : -6.5211

Model Estimated : (3 1 0) (1 1 0)

Regular AR : 0.5105 -0.4266 0.0521
Seasonal AR : -0.5384

BIC : 465.2397
BIC2 : -6.3444

Model Estimated : (3 1 0) (1 1 1)

Regular AR : 0.6015 -0.4464 0.0450
Seasonal AR : -0.0640
Seasonal MA : 0.9873

BIC : 447.2201
BIC2 : -6.4862

Model Estimated : (0 1 0) (0 1 1)

Seasonal MA : 0.9716
BIC : 473.1318
BIC2 : -6.2822

Model Estimated : (0 1 1) (0 1 1)

Regular MA : -0.6276
Seasonal MA : 0.9938

BIC : 438.5922
BIC2 : -6.5542

Model Estimated : (0 1 2) (0 1 1)

Regular MA : -0.6086 0.0323
Seasonal MA : 0.9918

BIC : 443.3736
BIC2 : -6.5165

Model Estimated : (1 1 0) (0 1 1)

Regular AR : 0.4001
Seasonal MA : 0.9887

BIC : 456.4050
BIC2 : -6.4139

Model Estimated : (1 1 1) (0 1 1)

Regular AR : -0.0288
Regular MA : -0.6460
Seasonal MA : 0.9932

BIC : 443.4008
BIC2 : -6.5163

Model Estimated : (1 1 2) (0 1 1)

Regular AR : 0.6867
Regular MA : 0.1390 0.5367
Seasonal MA : 0.9929

BIC : 445.5434
BIC2 : -6.4994

Model Estimated : (2 1 0) (0 1 1)

Regular AR : 0.5746 -0.4161
Seasonal MA : 0.9929

BIC : 438.1908
BIC2 : -6.5573

Model Estimated : (2 1 1) (0 1 1)

Regular AR : 0.4845 -0.3795
Regular MA : -0.1081
Seasonal MA : 0.9918

BIC : 442.7914
BIC2 : -6.5211

Model Estimated : (2 1 2) (0 1 1)

Regular AR : 0.4962 -0.3732
Regular MA : -0.0967 0.0157
Seasonal MA : 0.9946

BIC : 447.6345
BIC2 : -6.4830

Model Estimated : (2 1 0) (0 1 0)

Regular AR : 0.4971 -0.3845

BIC : 496.3625
BIC2 : -6.0993

Best Five ARIMA Models

Model # 1 : (2 1 0)(0 1 1) (BIC2 = -6.557)
Model # 2 : (0 1 1)(0 1 1) (BIC2 = -6.554)
Model # 3 : (2 1 1)(0 1 1) (BIC2 = -6.521)
Model # 4 : (0 1 2)(0 1 1) (BIC2 = -6.517)
Model # 5 : (1 1 1)(0 1 1) (BIC2 = -6.516)

Preliminary model choice : (2 1 0)(0 1 1)

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OUTLIER DETECTION

From 2013.Jan to 2024.Aug
Observations 140

Types : AO and LS
Method : add one
Critical |t| for AO outliers : 3.88
Critical |t| for LS outliers : 3.88

Estimation converged in 48 ARMA iterations, 193 function evaluations.

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ARIMA Model

ARIMA Model: (2 1 0)(0 1 1)

Nonseasonal differences: 1
Seasonal differences: 1

ARIMA Model

	Estimate	Standard Error
Nonseasonal AR		
Lag 1	0.27238	0.07653
Lag 2	-0.27955	0.07644
Seasonal MA		
Lag 12	0.99754	0.06069

Model Innovation Variance

Variance	0.10940E-03
Standard Error of Variance	0.13729E-04

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Forward addition pass 1

Robust root mse : 7.55E-03
Normal root mse : 1.05E-02

Outliers flagged as significant this pass

	t(AO)	t(LS)

AO2013.Nov	4.70*	3.52
LS2013.Dec	-2.40	-4.07*
LS2019.Dec	3.94	5.07*
AO2020.Mar	-4.69*	-3.15
AO2020.Apr	5.43*	4.42
LS2020.May	-3.20	-4.34*
AO2023.Jun	-4.37*	-1.39
LS2023.Jul	5.12	5.66*

Add +**LS2023.Jul** (5.66)

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AO Outlier t-values

AO Outlier t-values

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	-1.9381	1.3694	-0.4436	0.0228	-0.8590	1.1362	-1.0654	-0.2533	1.9593	-2.8425	4.7024	-2.4032
2014	0.3490	-0.7315	0.3326	-0.8330	1.3501	-1.8590	0.9979	0.7088	0.3059	-0.2349	-0.3599	-0.2204
2015	-0.1125	0.0939	0.4802	-0.0944	-1.0683	2.3476	-2.7613	1.0400	0.2725	-0.3371	0.4355	-1.1551
2016	1.8661	-1.3573	0.2940	-0.1959	-0.0374	1.0975	-0.1185	0.3068	-0.4461	0.7040	-1.0946	0.1638
2017	-0.3497	0.2125	0.5024	-0.5011	0.4470	-0.8177	-0.3354	1.5389	-1.0280	-0.4765	0.8686	-0.4915
2018	1.0370	-0.7311	0.8043	-0.6806	0.3506	0.1501	-0.4414	0.5230	0.1503	-0.4237	-0.6356	0.1019
2019	-0.3522	-0.1023	0.6701	-0.5713	0.4651	0.1841	-0.6567	-0.2761	-0.6713	1.4631	-3.3125	3.9362
2020	-0.9013	2.0637	-4.6941	5.4301	-3.1960	0.3418	0.6006	-2.2179	1.5904	0.0858	0.9934	0.2320
2021	-1.1648	0.5136	0.0322	-1.2299	1.4178	-0.1168	-0.4237	0.1175	-1.2825	0.8545	-0.3806	0.5311
2022	-0.1573	-0.8902	1.3614	-0.7934	0.6752	1.3492	-1.8328	0.2696	-0.0739	0.8500	-0.6547	-1.1005
2023	1.3650	-0.8667	0.7842	-1.0121	1.5999	-4.3652	5.1184	-1.0990	-0.7765	0.3572	-0.5620	0.4056
2024	-0.4575	0.5158	-0.1295	0.4589	-1.1450	0.5594	0.9827	-1.1375				

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LS Outlier t-values

LS Outlier t-values

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013			-0.26822	0.44757	0.41085	1.79718	-0.03640	1.68315	2.09867	-1.06354	3.52415	-4.06534
2014	-0.18671	-0.74807	0.43249	-0.10432	1.24014	-0.93891	2.06173	0.45171	-0.69220	-1.18590	-0.80681	-0.22599
2015	0.12972	0.31035	0.15878	-0.61628	-0.46389	1.26035	-2.52898	1.92709	0.25324	-0.18657	0.35745	-0.34543
2016	1.51884	-1.49174	0.69884	0.22417	0.54042	0.60082	-1.17059	-0.97959	-1.47898	-0.75898	-1.89522	-0.12856
2017	-0.39289	0.17174	-0.17113	-0.98188	-0.17314	-0.89454	0.42513	0.96653	-1.51720	0.14203	0.91107	-0.49083
2018	0.30239	-1.36863	-0.18854	-1.48639	-0.38790	-0.95383	-1.19643	-0.48428	-1.33136	-1.57396	-0.89012	0.13567
2019	-0.02885	0.53849	0.70337	-0.37826	0.54376	-0.20688	-0.50408	0.55570	1.00400	2.08740	-0.27408	5.07225
2020	-1.28067	0.17538	-3.15456	4.42169	-4.34237	0.81590	0.26433	-0.70490	2.87708	0.31027	0.17179	-1.43156
2021	-1.80593	0.07629	-0.75247	-0.80422	1.18073	-1.10750	-0.91929	-0.23567	-0.42649	1.64343	0.26434	0.87864
2022	0.02153	0.27482	1.71109	-0.48644	0.79413	-0.29559	-2.47363	0.48379	0.04974	0.16908	-1.20281	-0.14612
2023	1.63001	-0.57399	0.82470	-0.44106	1.19246	-1.38976	5.65636	-2.60328	-0.83649	0.41673	-0.15975	0.74724
2024	0.09256	0.82892	-0.00352	0.20541	-0.53519	1.31279	0.43683					

Average absolute percentage error in within-sample forecasts:

Last year: 1.00
Last-1 year: 0.71
Last-2 year: 2.47
Last three years: 1.40

Estimation converged in 53 ARMA iterations, 231 function evaluations.

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Regression Model

Regression Model

	Parameter Estimate	Standard Error	t-value
Automatically Identified Outliers			
LS2023.Jul	0.0422	0.00933	4.52

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ARIMA Model

ARIMA Model: (2 1 0)(0 1 1)

Nonseasonal differences: 1
Seasonal differences: 1

ARIMA Model

	Estimate	Standard Error
Nonseasonal AR		
Lag 1	0.33159	0.07701
Lag 2	-0.26931	0.07702
Seasonal MA		
Lag 12	0.99731	0.06048

Model Innovation Variance

Variance	0.94636E-04
Standard Error of Variance	0.11876E-04

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Forward addition pass 2

Robust root mse : 6.68E-03
Normal root mse : 9.73E-03

Outliers flagged as significant this pass

	t(AO)	t(LS)
AO2013.Nov	5.42*	4.24
LS2013.Dec	-2.84	-4.69*
AO2019.Nov	-3.96*	-0.78
LS2019.Dec	4.49	5.74*
AO2020.Mar	-5.50*	-3.62
AO2020.Apr	6.32*	5.44
LS2020.May	-3.53	-4.97*

Add +AO2020.Apr (6.32)

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AO Outlier t-values

AO Outlier t-values

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	-2.19783	1.58223	-0.49204	-0.06792	-0.75444	0.88820	-0.73901	-0.50219	2.31309	-3.46464	5.42009	-2.84003
2014	0.42324	-0.74094	0.42622	-1.02502	1.82494	-2.69367	1.61775	0.53110	0.36891	-0.27333	-0.34813	-0.19184
2015	-0.13054	0.09426	0.54544	-0.23886	-1.02236	2.31083	-2.73174	0.99799	0.43294	-0.40534	0.48699	-1.35817
2016	2.18501	-1.57297	0.36599	-0.30035	0.11685	0.71307	0.28895	0.08109	-0.42015	0.87151	-1.22062	0.24412
2017	-0.39799	0.22577	0.54988	-0.66528	0.78472	-1.44403	0.10781	1.59255	-1.12289	-0.54875	1.03087	-0.61340
2018	1.14477	-0.88089	0.93246	-0.87573	0.63114	-0.32545	-0.05240	0.36629	0.28138	-0.45470	-0.66368	0.19826
2019	-0.39485	-0.11984	0.76173	-0.79502	0.74263	-0.25552	-0.22856	-0.48663	-0.56337	1.75104	-3.96297	4.49008
2020	-1.11204	2.31183	-5.50435	6.32314	-3.53366	-0.06670	1.34421	-2.78545	1.90080	-0.01216	1.05205	0.23129
2021	-1.34509	0.69858	0.07917	-1.55443	1.84562	-0.65665	0.02916	-0.00893	-1.34323	1.01773	-0.46320	0.61044
2022	-0.18491	-1.01753	1.58192	-1.11179	0.92893	1.09032	-1.63402	0.10900	0.03137	1.01146	-0.75417	-1.25069
2023	1.61743	-1.04444	0.88852	-0.16320	-0.45409	0.46869	0.90723	1.03476	-1.89675	0.50715	-0.57718	0.47993
2024	-0.57418	0.57398	-0.14048	0.47288	-1.13957	0.17479	1.59186	-1.54092				

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LS Outlier t-values

LS Outlier t-values

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013			-0.41480	0.39919	0.51114	1.75370	0.29571	1.50901	2.34169	-1.46768	4.23779	-4.68788
2014	-0.01098	-0.70638	0.51368	-0.18828	1.49989	-1.50493	2.93178	0.26410	-0.61050	-1.21780	-0.76770	-0.19441
2015	0.12152	0.33559	0.18028	-0.71791	-0.32466	1.35884	-2.44704	2.04943	0.41097	-0.30203	0.36548	-0.43648
2016	1.80012	-1.79644	0.79379	0.19093	0.68565	0.49343	-0.68069	-1.15323	-1.29062	-0.59846	-2.03364	-0.02355
2017	-0.42555	0.22989	-0.14187	-1.04728	0.04822	-1.24402	1.13270	0.95186	-1.67022	0.17918	1.08284	-0.61476
2018	0.39537	-1.48703	-0.03626	-1.57167	-0.12968	-1.16908	-0.63692	-0.54875	-1.15432	-1.61735	-0.86856	0.22438
2019	-0.10211	0.54704	0.74412	-0.51034	0.79894	-0.42377	-0.00401	0.37155	1.17491	2.10227	-0.78130	5.74482
2020	-1.64933	0.18369	-3.62228	5.44222	-4.97082	0.84681	0.96014	-1.25165	3.33582	0.20507	0.22510	-1.50740
2021	-1.88829	0.32850	-0.82169	-0.95184	1.60809	-1.43074	-0.35337	-0.40013	-0.38670	1.82520	0.14922	0.91201
2022	-0.09325	0.21091	1.88596	-0.71934	1.11161	-0.41779	-2.21770	0.47437	0.29623	0.24449	-1.42116	-0.17921
2023	1.88040	-0.78385	0.93589	-0.52740	-0.26829	0.46869	0.00000	-0.90723	-2.51214	0.64710	-0.18806	0.76243
2024	-0.02790	0.91566	-0.02962	0.20172	-0.57708	1.29937	1.05160					

LS Outlier t-values have been set to zero for the following observations:

2023.Jul

Average absolute percentage error in within-sample forecasts:

Last year: 0.96
Last-1 year: 0.65
Last-2 year: 2.76
Last three years: 1.46

Estimation converged in 36 ARMA iterations, 168 function evaluations.

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Regression Model

Regression Model

	Parameter Estimate	Standard Error	t-value
Automatically Identified Outliers			
AO2020.Apr	0.0248	0.00469	5.29

LS2023.Jul	0.0418	0.00810	5.17

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ARIMA Model

ARIMA Model: (2 1 0)(0 1 1)

Nonseasonal differences: 1
Seasonal differences: 1

ARIMA Model

	Estimate	Standard Error
Nonseasonal AR		
Lag 1	0.46011	0.07866
Lag 2	-0.33278	0.07882
Seasonal MA		
Lag 12	0.90090	0.05423

Model Innovation Variance

Variance	0.85627E-04
Standard Error of Variance	0.10745E-04

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Forward addition pass 3

Robust root mse : 7.08E-03
Normal root mse : 9.25E-03

Outliers flagged as significant this pass

	t(AO)	t(LS)
AO2013.Oct	-4.02*	-2.12
AO2013.Nov	5.57*	4.76
LS2013.Dec	-3.14	-4.78*
AO2019.Nov	-4.34*	-1.69
LS2019.Dec	4.58	5.74*

Add +LS2019.Dec (5.74)

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AO Outlier t-values

AO Outlier t-values

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	-2.24805	1.78978	-1.03876	0.66962	-1.23486	1.22372	-0.77869	-0.60654	2.52198	-4.01890	5.57429	-3.14340
2014	0.68673	-0.45381	0.05105	-0.61140	1.71121	-2.69783	1.76522	0.19864	0.15275	-0.07383	-0.39038	0.05870
2015	-0.25610	0.22545	0.09121	0.40612	-1.63915	2.82349	-2.94101	1.11432	0.29624	-0.38408	0.52430	-1.45178
2016	2.24721	-1.53492	0.10587	0.36433	-0.43392	0.79827	0.17926	0.01926	-0.50976	1.06998	-1.32262	0.49618
2017	-0.51813	0.39085	0.02812	-0.12959	0.55708	-1.23627	0.02028	1.56223	-1.20037	-0.43569	1.12162	-0.81991
2018	1.10831	-0.79810	0.59029	-0.32928	0.23929	-0.11654	-0.12811	0.26986	0.27335	-0.40532	-0.52445	0.30129

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2019	-0.47696	0.06119	0.32779	-0.28414	0.29322	-0.04770	-0.20650	-0.42243	-0.53839	2.12585	-4.33979	4.58351
2020	-1.09935	0.55361	-1.25943	0.00000	1.61271	-2.29923	2.32497	-2.93988	2.11088	-0.47143	1.01137	0.20085
2021	-1.39624	1.10037	-0.31983	-1.06843	1.46665	-0.64540	0.00531	0.21412	-1.27570	1.02604	-0.54872	0.55670
2022	-0.16537	-0.82846	1.27409	-0.75594	0.34200	1.36539	-1.72192	0.30647	-0.02432	0.87636	-0.56413	-1.29412
2023	1.74888	-1.09481	0.44178	0.49766	-0.89787	0.67318	0.53469	1.12400	-1.81814	0.66044	-0.48848	0.46905
2024	-0.73835	0.81350	-0.73633	1.26574	-1.59612	0.37977	1.35128	-1.45089				

AO Outlier t-values have been set to zero for the following observations:

2020.Apr

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LS Outlier t-values

LS Outlier t-values

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013			-0.8346	0.9523	-0.1924	1.9183	-0.1730	1.1578	2.1979	-2.1173	4.7589	-4.7785
2014	0.5998	-0.5743	0.2021	0.1150	1.1603	-1.7658	2.8495	-0.1719	-0.5122	-0.7734	-0.6471	0.0209
2015	-0.0796	0.3576	-0.0281	-0.1843	-0.8786	1.9238	-2.9063	2.1242	0.2206	-0.2863	0.3708	-0.5262
2016	1.9577	-1.8849	0.7410	0.5609	-0.0618	0.6798	-0.6855	-0.9904	-1.0252	-0.1528	-1.9835	0.2795
2017	-0.5695	0.3170	-0.3517	-0.4004	-0.1790	-1.1305	0.9836	0.9468	-1.7255	0.3286	1.0741	-0.8450
2018	0.5578	-1.3364	0.0289	-0.9817	-0.4191	-0.8271	-0.6297	-0.4094	-0.8722	-1.3396	-0.6461	0.2512
2019	-0.2643	0.5510	0.4464	-0.1138	0.3718	-0.1298	-0.0485	0.3043	1.0282	1.9489	-1.6883	5.7369
2020	-2.1053	-0.2317	-1.2360	0.6105	0.6105	-1.6800	2.2101	-1.7749	3.2534	-0.3590	0.4476	-1.2828
2021	-1.6265	0.7626	-1.1199	-0.5752	1.2505	-1.2570	-0.1564	-0.1649	-0.5321	1.6505	-0.1050	0.8338
2022	-0.1187	0.1641	1.5817	-0.5961	0.6957	0.1103	-2.2292	0.7171	0.1951	0.2366	-1.2629	-0.2976
2023	1.9166	-1.0756	0.7973	0.0428	-0.8250	0.6732	0.0000	-0.5347	-2.3005	0.8499	-0.2801	0.5557
2024	-0.2468	1.0153	-0.3763	0.8836	-1.2796	1.4492	0.8509					

LS Outlier t-values have been set to zero for the following observations:

2023.Jul

Average absolute percentage error in within-sample forecasts:

Last year: 1.04
Last-1 year: 0.74
Last-2 year: 3.05
Last three years: 1.61

Estimation converged in 27 ARMA iterations, 137 function evaluations.

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Regression Model

Regression Model

	Parameter Estimate	Standard Error	t-value
Automatically Identified Outliers			
LS2019.Dec	0.0351	0.00730	4.81
AO2020.Apr	0.0248	0.00421	5.89
LS2023.Jul	0.0418	0.00731	5.72

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ARIMA Model

ARIMA Model: (2 1 0)(0 1 1)

Nonseasonal differences: 1
Seasonal differences: 1

ARIMA Model

	Estimate	Standard Error
Nonseasonal AR		
Lag 1	0.49526	0.07776
Lag 2	-0.35426	0.07767
Seasonal MA		
Lag 12	0.92077	0.05592

Model Innovation Variance

Variance	0.71499E-04
Standard Error of Variance	0.89725E-05

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Forward addition pass 4

Robust root mse : 7.75E-03
Normal root mse : 8.46E-03

Outliers flagged as significant this pass

	t(AO)	t(LS)
AO2013.Nov	4.76*	4.26
LS2013.Dec	-2.57	-3.96*

Add +AO2013.Nov (4.76)

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AO Outlier t-values

AO Outlier t-values

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	-2.042472	1.632971	-0.979500	0.648015	-1.141465	1.148111	-0.729858	-0.548035	2.310980	-3.630801	4.763231	-2.565750
2014	0.490144	-0.300230	0.037966	-0.586514	1.602535	-2.466496	1.611319	0.127629	0.065802	0.116438	-0.701342	0.470837
2015	-0.449313	0.271865	0.062947	0.388087	-1.538943	2.641699	-2.727090	1.061873	0.194099	-0.180057	0.113131	-0.954351
2016	1.859945	-1.348805	0.126732	0.350759	-0.427137	0.709454	0.127914	0.028412	-0.541492	1.205378	-1.640163	0.926955
2017	-0.696338	0.425322	0.000294	-0.130804	0.551826	-1.116658	-0.002757	1.424545	-1.179473	-0.151193	0.589477	-0.339414
2018	0.787816	-0.669112	0.554850	-0.312731	0.233050	-0.108227	-0.122703	0.226850	0.159942	-0.110823	-0.943263	0.792722
2019	-0.681614	0.136791	0.296564	-0.280825	0.273714	-0.051693	-0.162063	-0.380012	0.291857	-0.255001	0.922257	-0.609469
2020	1.279988	-0.300640	-1.110486	0.000000	1.521077	-2.156223	2.225532	-2.720169	1.860162	-0.246938	0.377776	0.705404
2021	-1.521170	1.128904	-0.279647	-0.995043	1.349332	-0.631613	0.030055	0.224256	-1.255238	1.224687	-1.051935	1.009642
2022	-0.380090	-0.668981	1.187304	-0.735355	0.273148	1.256243	-1.541952	0.306753	-0.163816	1.059348	-1.000090	-0.675174
2023	1.380832	-0.965323	0.401921	0.472808	-0.820944	0.607025	0.449554	1.019108	-1.756547	0.932722	-0.958588	0.927833
2024	-0.931764	0.824789	-0.697610	1.198860	-1.461058	0.359651	1.205240	-1.354545				

AO Outlier t-values have been set to zero for the following observations:

2020.Apr

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LS Outlier t-values

LS Outlier t-values

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013			-0.8014	0.8999	-0.2174	1.7506	-0.2284	1.0298	1.9778	-2.0110	4.2551	-3.9604
2014	0.4713	-0.3742	0.1440	0.0787	1.0901	-1.6739	2.5823	-0.1996	-0.4203	-0.5339	-0.7354	0.4739
2015	-0.3385	0.4361	-0.0331	-0.1419	-0.8112	1.8428	-2.7156	1.9893	0.1596	-0.1754	0.1353	-0.0597
2016	1.5837	-1.6238	0.7040	0.4864	-0.1184	0.6180	-0.6058	-0.8250	-0.8756	0.0590	-2.0218	0.8050
2017	-0.7939	0.4079	-0.3261	-0.3272	-0.1018	-1.0527	0.8734	0.8762	-1.5816	0.4542	0.7156	-0.3003
2018	0.2851	-1.0722	0.0827	-0.8754	-0.3364	-0.7374	-0.5524	-0.3397	-0.7321	-1.0083	-0.8179	0.8089
2019	-0.5588	0.6167	0.3805	-0.1308	0.3533	-0.1190	-0.0300	0.2492	0.9059	0.4220	0.9223	0.0000
2020	0.6095	-1.5175	-1.0715	0.5930	0.5930	-1.5903	2.0920	-1.7558	2.9369	-0.2739	0.1522	-0.5001
2021	-1.7120	0.9131	-1.0350	-0.5545	1.1609	-1.1663	-0.0791	-0.1306	-0.5182	1.6484	-0.4643	1.3518
2022	-0.3915	0.2643	1.4186	-0.6288	0.6389	0.1672	-2.0032	0.6579	0.1302	0.4129	-1.4155	0.3072
2023	1.4681	-0.9146	0.7514	0.0589	-0.7733	0.6070	0.0000	-0.4496	-2.0508	1.0158	-0.5935	1.0608
2024	-0.5405	1.0659	-0.3576	0.8465	-1.2204	1.2994	0.7262					

LS Outlier t-values have been set to zero for the following observations:

2019.Dec 2023.Jul

Average absolute percentage error in within-sample forecasts:

Last year: 0.97
Last-1 year: 0.77
Last-2 year: 2.59
Last three years: 1.44

Estimation converged in 21 ARMA iterations, 118 function evaluations.

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Regression Model

Regression Model

	Parameter Estimate	Standard Error	t-value
Automatically Identified Outliers			
AO2013.Nov	0.0184	0.00365	5.05
LS2019.Dec	0.0317	0.00642	4.94
AO2020.Apr	0.0248	0.00362	6.85
LS2023.Jul	0.0417	0.00637	6.55

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ARIMA Model

ARIMA Model: (2 1 0)(0 1 1)

Nonseasonal differences: 1
Seasonal differences: 1

ARIMA Model

	Estimate	Standard Error
Nonseasonal AR		
Lag 1	0.58028	0.07350
Lag 2	-0.41506	0.07320
Seasonal MA		
Lag 12	0.99927	0.06455

Model Innovation Variance

Variance	0.56106E-04
Standard Error of Variance	0.70408E-05

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Forward addition pass 5

Robust root mse : 6.53E-03
Normal root mse : 7.49E-03

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AO Outlier t-values

AO Outlier t-values

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	-2.35229	1.89681	-1.22775	0.85897	-1.37783	1.43074	-0.90143	-0.12683	0.93044	-0.39006	0.00000	1.76515
2014	-1.36669	0.26046	0.02152	-0.76958	1.99460	-2.90778	1.90705	-0.05323	0.27866	-0.37368	-0.01850	0.06624
2015	-0.32858	0.24729	0.02193	0.50433	-1.92013	3.27213	-3.30964	1.30261	0.42277	-0.77249	0.91802	-1.74619
2016	2.45308	-1.69681	0.22843	0.45901	-0.57966	0.78701	0.06700	0.00317	-0.43001	0.98963	-1.28669	0.69192
2017	-0.61883	0.42840	-0.06590	-0.18774	0.76026	-1.27833	-0.05534	1.60763	-1.18696	-0.58020	1.37571	-1.00932
2018	1.14912	-0.88876	0.69440	-0.39958	0.30893	-0.12861	-0.15360	0.16041	0.38101	-0.53342	-0.44171	0.53465
2019	-0.61091	0.10345	0.34240	-0.38320	0.33301	-0.08139	-0.12057	-0.48400	0.49472	-0.47693	1.14037	-0.80115
2020	1.36941	-0.28443	-1.19904	0.00000	1.90363	-2.68973	2.88609	-3.33975	2.45289	-0.90636	0.92414	0.42596
2021	-1.58320	1.37444	-0.29928	-1.21856	1.60922	-0.85608	0.10030	0.29216	-1.28344	1.11254	-0.80551	0.76163
2022	-0.21511	-0.82527	1.45842	-0.97872	0.21944	1.49680	-1.73566	0.38744	-0.13357	0.85058	-0.58860	-1.17536
2023	1.87487	-1.30915	0.46808	0.60237	-0.96364	0.68619	0.40733	1.13110	-1.88375	0.88891	-0.62604	0.69161
2024	-0.95280	0.92444	-0.89164	1.52000	-1.72277	0.46188	1.30470	-1.61776				

AO Outlier t-values have been set to zero for the following observations:

2013.Nov 2020.Apr

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LS Outlier t-values

LS Outlier t-values

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013			-1.0328	1.1446	-0.3634	2.0555	-0.4555	1.1269	1.3681	-0.2013	0.5515	0.5515
2014	-1.9589	0.5201	0.0578	0.0200	1.3715	-2.1314	2.9774	-0.3747	-0.2818	-0.7722	-0.1178	-0.0858
2015	-0.2010	0.3756	-0.0591	-0.0978	-0.9834	2.3882	-3.3608	2.4528	0.1677	-0.5756	0.7815	-0.8287
2016	2.2314	-2.0771	0.9052	0.5052	-0.3007	0.7171	-0.6652	-0.7814	-0.7885	-0.0332	-1.7750	0.4792
2017	-0.7345	0.3533	-0.3996	-0.2844	0.0452	-1.2893	0.9557	1.0507	-1.7734	0.3120	1.3344	-1.0779
2018	0.6950	-1.3215	0.2407	-0.9799	-0.2785	-0.8204	-0.5964	-0.3256	-0.6083	-1.2790	-0.3456	0.4292
2019	-0.5089	0.5638	0.3817	-0.2197	0.4532	-0.1319	0.0109	0.2224	1.0737	0.2234	1.1404	0.0000
2020	0.8012	-1.5225	-1.1108	0.7828	0.7828	-2.0113	2.6728	-2.4089	3.4576	-0.8521	0.7394	-0.8817

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2021	-1.6207	1.1609	-1.2544	-0.7304	1.4092	-1.4173	0.0847	-0.0915	-0.6053	1.6510	-0.2999	1.1145
2022	-0.2255	0.1524	1.6021	-0.9595	0.7589	0.3727	-2.2591	0.7908	0.1112	0.3462	-1.1493	-0.1194
2023	1.9373	-1.3568	0.9439	0.1226	-0.9590	0.6862	0.0000	-0.4073	-2.1871	1.1660	-0.3934	0.7052
2024	-0.5095	1.1622	-0.4626	1.1045	-1.5644	1.4616	0.7089					

LS Outlier t-values have been set to zero for the following observations:

2019.Dec 2023.Jul

No more outliers identified

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Final AO Outlier t-values

Final AO Outlier t-values

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	-2.35229	1.89681	-1.22775	0.85897	-1.37783	1.43074	-0.90143	-0.12683	0.93044	-0.39006	0.00000	1.76515
2014	-1.36669	0.26046	0.02152	-0.76958	1.99460	-2.90778	1.90705	-0.05323	0.27866	-0.37368	-0.01850	0.06624
2015	-0.32858	0.24729	0.02193	0.50433	-1.92013	3.27213	-3.30964	1.30261	0.42277	-0.77249	0.91802	-1.74619
2016	2.45308	-1.69681	0.22843	0.45901	-0.57966	0.78701	0.06700	0.00317	-0.43001	0.98963	-1.28669	0.69192
2017	-0.61883	0.42840	-0.06590	-0.18774	0.76026	-1.27833	-0.05534	1.60763	-1.18696	-0.58020	1.37571	-1.00932
2018	1.14912	-0.88876	0.69440	-0.39958	0.30893	-0.12861	-0.15360	0.16041	0.38101	-0.53342	-0.44171	0.53465
2019	-0.61091	0.10345	0.34240	-0.38320	0.33301	-0.08139	-0.12057	-0.48400	0.49472	-0.47693	1.14037	-0.80115
2020	1.36941	-0.28443	-1.19904	0.00000	1.90363	-2.68973	2.88609	-3.33975	2.45289	-0.90636	0.92414	0.42596
2021	-1.58320	1.37444	-0.29928	-1.21856	1.60922	-0.85608	0.10030	0.29216	-1.28344	1.11254	-0.80551	0.76163
2022	-0.21511	-0.82527	1.45842	-0.97872	0.21944	1.49680	-1.73566	0.38744	-0.13357	0.85058	-0.58860	-1.17536
2023	1.87487	-1.30915	0.46808	0.60237	-0.96364	0.68619	0.40733	1.13110	-1.88375	0.88891	-0.62604	0.69161
2024	-0.95280	0.92444	-0.89164	1.52000	-1.72277	0.46188	1.30470	-1.61776				

AO Outlier t-values have been set to zero for the following observations:

2013.Nov 2020.Apr

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Final LS Outlier t-values

Final LS Outlier t-values

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013			-1.0328	1.1446	-0.3634	2.0555	-0.4555	1.1269	1.3681	-0.2013	0.5515	0.5515
2014	-1.9589	0.5201	0.0578	0.0200	1.3715	-2.1314	2.9774	-0.3747	-0.2818	-0.7722	-0.1178	-0.0858
2015	-0.2010	0.3756	-0.0591	-0.0978	-0.9834	2.3882	-3.3608	2.4528	0.1677	-0.5756	0.7815	-0.8287
2016	2.2314	-2.0771	0.9052	0.5052	-0.3007	0.7171	-0.6652	-0.7814	-0.7885	-0.0332	-1.7750	0.4792
2017	-0.7345	0.3533	-0.3996	-0.2844	0.0452	-1.2893	0.9557	1.0507	-1.7734	0.3120	1.3344	-1.0779
2018	0.6950	-1.3215	0.2407	-0.9799	-0.2785	-0.8204	-0.5964	-0.3256	-0.6083	-1.2790	-0.3456	0.4292
2019	-0.5089	0.5638	0.3817	-0.2197	0.4532	-0.1319	0.0109	0.2224	1.0737	0.2234	1.1404	0.0000
2020	0.8012	-1.5225	-1.1108	0.7828	0.7828	-2.0113	2.6728	-2.4089	3.4576	-0.8521	0.7394	-0.8817
2021	-1.6207	1.1609	-1.2544	-0.7304	1.4092	-1.4173	0.0847	-0.0915	-0.6053	1.6510	-0.2999	1.1145
2022	-0.2255	0.1524	1.6021	-0.9595	0.7589	0.3727	-2.2591	0.7908	0.1112	0.3462	-1.1493	-0.1194
2023	1.9373	-1.3568	0.9439	0.1226	-0.9590	0.6862	0.0000	-0.4073	-2.1871	1.1660	-0.3934	0.7052
2024	-0.5095	1.1622	-0.4626	1.1045	-1.5644	1.4616	0.7089					

LS Outlier t-values have been set to zero for the following observations:

2019.Dec 2023.Jul

Final Checks for Identified Model

Checking for Unit Roots.

No unit root found.

Nonseasonal MA not within 0.001 of 1.0 - model passes test.

Checking for insignificant ARMA coefficients.

Final automatic model choice : (2 1 0)(0 1 1)

End of automatic model selection procedure.

Average absolute percentage error in within-sample forecasts:

Last year: 0.97
Last-1 year: 0.77
Last-2 year: 2.59
Last three years: 1.44

Estimation converged in 21 ARMA iterations, 118 function evaluations.

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Regression Model

Regression Model

	Parameter Estimate	Standard Error	t-value
Automatically Identified Outliers			
AO2013.Nov	0.0184	0.00365	5.05
LS2019.Dec	0.0317	0.00642	4.94
AO2020.Apr	0.0248	0.00362	6.85
LS2023.Jul	0.0417	0.00637	6.55

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Regression Parameter Correlation Matrix

Regression Parameter Correlation Matrix

	AO2013.Nov	LS2019.Dec	AO2020.Apr	LS2023.Jul
AO2013.Nov	1.0000			
LS2019.Dec	-0.0879	1.0000		
AO2020.Apr	0.0000	0.0000	1.0000	
LS2023.Jul	-0.0000	-0.0000	-0.0142	1.0000

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ARIMA Model

ARIMA Model: (2 1 0)(0 1 1)

Nonseasonal differences: 1
Seasonal differences: 1

ARIMA Model

	Estimate	Standard Error
Nonseasonal AR		
Lag 1	0.58028	0.07350
Lag 2	-0.41506	0.07320
Seasonal MA		
Lag 12	0.99927	0.06455

Model Innovation Variance

Variance	0.56106E-04
Standard Error of Variance	0.70408E-05

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ARMA Parameter Correlation Matrix

ARMA Parameter Correlation Matrix

	Nonseasonal AR Lag 1	Nonseasonal AR Lag 2	Seasonal MA Lag 12
Nonseasonal AR Lag 1	1.0000		
Nonseasonal AR Lag 2	-0.4195	1.0000	
Seasonal MA Lag 12	-0.0558	0.0662	1.0000

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Likelihood Statistics

Number of observations (nobs)	140
Effective number of observations (nefobs)	127
Number of parameters estimated (np)	8
Log likelihood	426.4309
Transformation Adjustment	-635.4861
Adjusted Log likelihood (L)	-209.0552
AIC	434.1104
AICC (F-corrected-AIC)	435.3308
Hannan Quinn	443.3549
BIC	456.8639

---

nobs = number of observations
nefobs = nobs - total order of differencing operators
np = number of estimated regression and ARIMA model parameters including the variance
V = Covariance matrix of z's
z = Vector of data - regression values
c = Vector of prior adjustment factors
Log likelihood = -[nefobs*log(2*pi)+log|V|+z'(V-inverse)z]/2
Transformation Adjustment = sum(ln(|(ci*(ci*yi)^(lam-1))|)) where the sum is over the last nefobs observations
AIC = -2*L+2*np
AICC = -2*L+2*np*[nefobs/(nefobs-np-1)]

Hannan Quinn = -2*L+2*np*log[log(nefobs)]
BIC = -2*L+np*log(nefobs)

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Roots of ARIMA Model

	Real	Imaginary	Modulus	Frequency
Nonseasonal AR				
Root 1	0.699036	1.38588	1.55219	0.175649
Root 2	0.699036	-1.38588	1.55219	-0.175649
Seasonal MA				
Root 1	1.00073	0.00000	1.00073	0.00000

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Regression Matrix

From 2013.Jan to 2024.Aug
Observations 140

Regression Matrix

	AO2013.Nov	LS2019.Dec	AO2020.Apr	LS2023.Jul
2013.Jan	0.00000	-1.00000	0.00000	-1.00000
2013.Feb	0.00000	-1.00000	0.00000	-1.00000
2013.Mar	0.00000	-1.00000	0.00000	-1.00000
2013.Apr	0.00000	-1.00000	0.00000	-1.00000
2013.May	0.00000	-1.00000	0.00000	-1.00000
2013.Jun	0.00000	-1.00000	0.00000	-1.00000
2013.Jul	0.00000	-1.00000	0.00000	-1.00000
2013.Aug	0.00000	-1.00000	0.00000	-1.00000
2013.Sep	0.00000	-1.00000	0.00000	-1.00000
2013.Oct	0.00000	-1.00000	0.00000	-1.00000
2013.Nov	1.00000	-1.00000	0.00000	-1.00000
2013.Dec	0.00000	-1.00000	0.00000	-1.00000
2014.Jan	0.00000	-1.00000	0.00000	-1.00000
2014.Feb	0.00000	-1.00000	0.00000	-1.00000
2014.Mar	0.00000	-1.00000	0.00000	-1.00000
2014.Apr	0.00000	-1.00000	0.00000	-1.00000
2014.May	0.00000	-1.00000	0.00000	-1.00000
2014.Jun	0.00000	-1.00000	0.00000	-1.00000
2014.Jul	0.00000	-1.00000	0.00000	-1.00000
2014.Aug	0.00000	-1.00000	0.00000	-1.00000
2014.Sep	0.00000	-1.00000	0.00000	-1.00000
2014.Oct	0.00000	-1.00000	0.00000	-1.00000
2014.Nov	0.00000	-1.00000	0.00000	-1.00000
2014.Dec	0.00000	-1.00000	0.00000	-1.00000
2015.Jan	0.00000	-1.00000	0.00000	-1.00000
2015.Feb	0.00000	-1.00000	0.00000	-1.00000
2015.Mar	0.00000	-1.00000	0.00000	-1.00000
2015.Apr	0.00000	-1.00000	0.00000	-1.00000
2015.May	0.00000	-1.00000	0.00000	-1.00000
2015.Jun	0.00000	-1.00000	0.00000	-1.00000
2015.Jul	0.00000	-1.00000	0.00000	-1.00000
2015.Aug	0.00000	-1.00000	0.00000	-1.00000
2015.Sep	0.00000	-1.00000	0.00000	-1.00000
2015.Oct	0.00000	-1.00000	0.00000	-1.00000
2015.Nov	0.00000	-1.00000	0.00000	-1.00000

2015.Dec	0.00000	-1.00000	0.00000	-1.00000
2016.Jan	0.00000	-1.00000	0.00000	-1.00000
2016.Feb	0.00000	-1.00000	0.00000	-1.00000
2016.Mar	0.00000	-1.00000	0.00000	-1.00000
2016.Apr	0.00000	-1.00000	0.00000	-1.00000
2016.May	0.00000	-1.00000	0.00000	-1.00000
2016.Jun	0.00000	-1.00000	0.00000	-1.00000
2016.Jul	0.00000	-1.00000	0.00000	-1.00000
2016.Aug	0.00000	-1.00000	0.00000	-1.00000
2016.Sep	0.00000	-1.00000	0.00000	-1.00000
2016.Oct	0.00000	-1.00000	0.00000	-1.00000
2016.Nov	0.00000	-1.00000	0.00000	-1.00000
2016.Dec	0.00000	-1.00000	0.00000	-1.00000
2017.Jan	0.00000	-1.00000	0.00000	-1.00000
2017.Feb	0.00000	-1.00000	0.00000	-1.00000
2017.Mar	0.00000	-1.00000	0.00000	-1.00000
2017.Apr	0.00000	-1.00000	0.00000	-1.00000
2017.May	0.00000	-1.00000	0.00000	-1.00000
2017.Jun	0.00000	-1.00000	0.00000	-1.00000
2017.Jul	0.00000	-1.00000	0.00000	-1.00000
2017.Aug	0.00000	-1.00000	0.00000	-1.00000
2017.Sep	0.00000	-1.00000	0.00000	-1.00000
2017.Oct	0.00000	-1.00000	0.00000	-1.00000
2017.Nov	0.00000	-1.00000	0.00000	-1.00000
2017.Dec	0.00000	-1.00000	0.00000	-1.00000
2018.Jan	0.00000	-1.00000	0.00000	-1.00000
2018.Feb	0.00000	-1.00000	0.00000	-1.00000
2018.Mar	0.00000	-1.00000	0.00000	-1.00000
2018.Apr	0.00000	-1.00000	0.00000	-1.00000
2018.May	0.00000	-1.00000	0.00000	-1.00000
2018.Jun	0.00000	-1.00000	0.00000	-1.00000
2018.Jul	0.00000	-1.00000	0.00000	-1.00000
2018.Aug	0.00000	-1.00000	0.00000	-1.00000
2018.Sep	0.00000	-1.00000	0.00000	-1.00000
2018.Oct	0.00000	-1.00000	0.00000	-1.00000
2018.Nov	0.00000	-1.00000	0.00000	-1.00000
2018.Dec	0.00000	-1.00000	0.00000	-1.00000
2019.Jan	0.00000	-1.00000	0.00000	-1.00000
2019.Feb	0.00000	-1.00000	0.00000	-1.00000
2019.Mar	0.00000	-1.00000	0.00000	-1.00000
2019.Apr	0.00000	-1.00000	0.00000	-1.00000
2019.May	0.00000	-1.00000	0.00000	-1.00000
2019.Jun	0.00000	-1.00000	0.00000	-1.00000
2019.Jul	0.00000	-1.00000	0.00000	-1.00000
2019.Aug	0.00000	-1.00000	0.00000	-1.00000
2019.Sep	0.00000	-1.00000	0.00000	-1.00000
2019.Oct	0.00000	-1.00000	0.00000	-1.00000
2019.Nov	0.00000	-1.00000	0.00000	-1.00000
2019.Dec	0.00000	0.00000	0.00000	-1.00000
2020.Jan	0.00000	0.00000	0.00000	-1.00000
2020.Feb	0.00000	0.00000	0.00000	-1.00000
2020.Mar	0.00000	0.00000	0.00000	-1.00000
2020.Apr	0.00000	0.00000	1.00000	-1.00000
2020.May	0.00000	0.00000	0.00000	-1.00000
2020.Jun	0.00000	0.00000	0.00000	-1.00000
2020.Jul	0.00000	0.00000	0.00000	-1.00000

2020.Aug	0.00000	0.00000	0.00000	-1.00000
2020.Sep	0.00000	0.00000	0.00000	-1.00000
2020.Oct	0.00000	0.00000	0.00000	-1.00000
2020.Nov	0.00000	0.00000	0.00000	-1.00000
2020.Dec	0.00000	0.00000	0.00000	-1.00000
2021.Jan	0.00000	0.00000	0.00000	-1.00000
2021.Feb	0.00000	0.00000	0.00000	-1.00000
2021.Mar	0.00000	0.00000	0.00000	-1.00000
2021.Apr	0.00000	0.00000	0.00000	-1.00000
2021.May	0.00000	0.00000	0.00000	-1.00000
2021.Jun	0.00000	0.00000	0.00000	-1.00000
2021.Jul	0.00000	0.00000	0.00000	-1.00000
2021.Aug	0.00000	0.00000	0.00000	-1.00000
2021.Sep	0.00000	0.00000	0.00000	-1.00000
2021.Oct	0.00000	0.00000	0.00000	-1.00000
2021.Nov	0.00000	0.00000	0.00000	-1.00000
2021.Dec	0.00000	0.00000	0.00000	-1.00000
2022.Jan	0.00000	0.00000	0.00000	-1.00000
2022.Feb	0.00000	0.00000	0.00000	-1.00000
2022.Mar	0.00000	0.00000	0.00000	-1.00000
2022.Apr	0.00000	0.00000	0.00000	-1.00000
2022.May	0.00000	0.00000	0.00000	-1.00000
2022.Jun	0.00000	0.00000	0.00000	-1.00000
2022.Jul	0.00000	0.00000	0.00000	-1.00000
2022.Aug	0.00000	0.00000	0.00000	-1.00000
2022.Sep	0.00000	0.00000	0.00000	-1.00000
2022.Oct	0.00000	0.00000	0.00000	-1.00000
2022.Nov	0.00000	0.00000	0.00000	-1.00000
2022.Dec	0.00000	0.00000	0.00000	-1.00000
2023.Jan	0.00000	0.00000	0.00000	-1.00000
2023.Feb	0.00000	0.00000	0.00000	-1.00000
2023.Mar	0.00000	0.00000	0.00000	-1.00000
2023.Apr	0.00000	0.00000	0.00000	-1.00000
2023.May	0.00000	0.00000	0.00000	-1.00000
2023.Jun	0.00000	0.00000	0.00000	-1.00000
2023.Jul	0.00000	0.00000	0.00000	0.00000
2023.Aug	0.00000	0.00000	0.00000	0.00000
2023.Sep	0.00000	0.00000	0.00000	0.00000
2023.Oct	0.00000	0.00000	0.00000	0.00000
2023.Nov	0.00000	0.00000	0.00000	0.00000
2023.Dec	0.00000	0.00000	0.00000	0.00000
2024.Jan	0.00000	0.00000	0.00000	0.00000
2024.Feb	0.00000	0.00000	0.00000	0.00000
2024.Mar	0.00000	0.00000	0.00000	0.00000
2024.Apr	0.00000	0.00000	0.00000	0.00000
2024.May	0.00000	0.00000	0.00000	0.00000
2024.Jun	0.00000	0.00000	0.00000	0.00000
2024.Jul	0.00000	0.00000	0.00000	0.00000
2024.Aug	0.00000	0.00000	0.00000	0.00000

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Model Residuals

From 2013.Feb to 2024.Aug
Observations 139

Model

Model

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013		-0.01261667	0.00572145	0.00636211	0.00305530	0.01005357	-0.00000507	0.01371999	0.01080782	0.00283398	0.00280707	-0.006184
2014	-0.01056367	0.00497611	0.00048046	0.00080979	-0.00005604	-0.00167524	0.02308319	-0.00306938	-0.00507717	-0.00664668	-0.00226823	-0.001359
2015	0.00140304	0.00366869	-0.00192147	-0.00196187	-0.00030323	0.00248416	-0.01394101	0.01861635	-0.00229821	-0.00283075	0.00465264	0.002748
2016	0.00694575	-0.01203457	0.00746512	0.00370205	0.00281800	0.00432256	-0.00629095	-0.00600148	-0.00547053	-0.00766472	-0.01207288	0.000998
2017	-0.00204323	0.00348900	-0.00369795	-0.00440571	-0.00574035	-0.00267706	0.01092443	-0.00212100	-0.01166761	0.00813899	0.00682464	-0.004307
2018	0.00198945	-0.00650439	-0.00111051	-0.00764080	-0.00466104	-0.00619704	-0.00256640	-0.00382712	-0.01014009	-0.01102610	-0.00216882	0.000022
2019	-0.00108121	0.00628352	0.00203573	0.00077460	0.00212700	-0.00294793	-0.00088399	0.00341816	0.00712466	0.00577121	0.01070179	0.005048
2020	-0.00111984	-0.01371732	-0.00409168	0.00328847	-0.00482380	-0.00775573	0.00769212	-0.00345390	0.02527195	-0.00085706	0.00160071	-0.011341
2021	-0.00618371	0.00260327	-0.01124478	0.00210656	0.00576559	-0.01049224	-0.00258359	-0.00448576	0.00149249	0.01117819	0.00085025	0.004671
2022	-0.00103550	0.00765278	0.00906656	-0.00030033	0.00626080	-0.00821595	-0.01260303	0.00908742	0.00145357	-0.00529689	-0.00888608	0.006728
2023	0.00974274	-0.00476025	0.00548532	-0.00327086	-0.00144537	0.00813687	-0.00218063	-0.01198497	-0.01149229	0.00645590	-0.00206370	0.003026
2024	0.00199058	0.00836740	-0.00246564	0.00051187	-0.00300011	0.01495699	-0.00072374	-0.01004348				

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QS Statistic for regARIMA Model Residuals

QS Statistic for regARIMA Model Residuals (full series): 0.00 (P-Value = 1.0000)

QS Statistic for regARIMA Model Residuals (starting 2016.Sep): 0.00 (P-Value = 1.0000)

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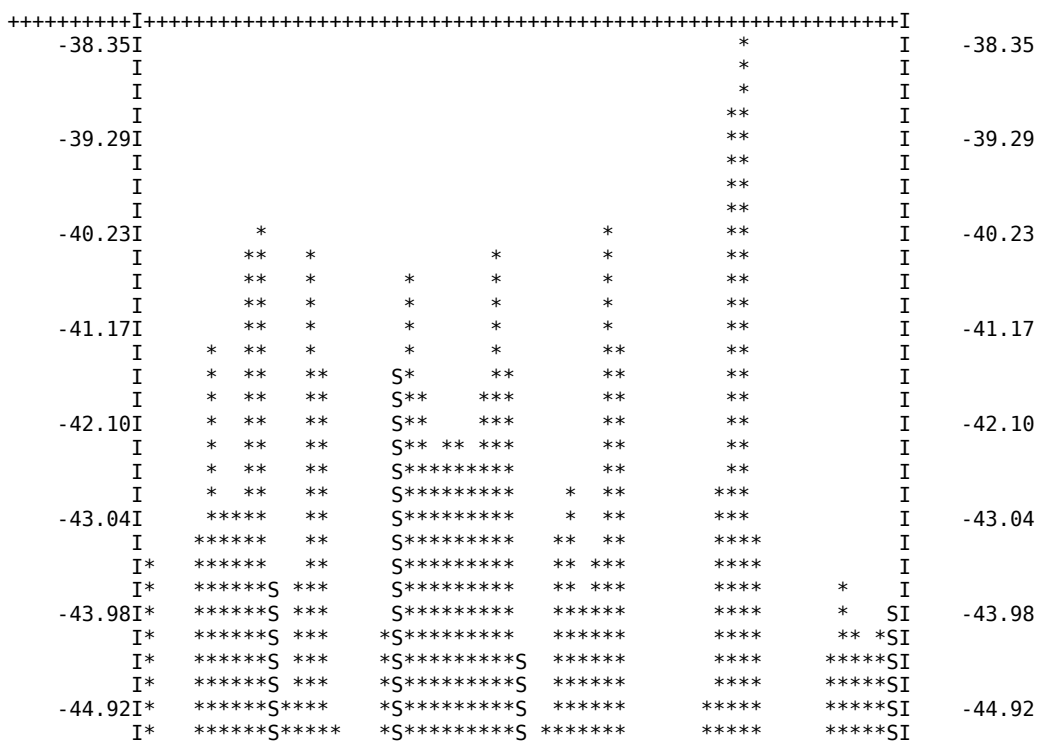
10*LOG(SPECTRUM) of the regARIMA model residuals

Spectrum estimated from 2016.Sep to 2024.Aug.



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Regression Effects

From 2013.Jan to 2024.Aug
Observations 140

Regression Effects

	AO	LS and Ramp	Total Reg	Reg Resids
2013.Jan	0.00000	-0.734234E-01	-0.734234E-01	4.73119
2013.Feb	0.00000	-0.734234E-01	-0.734234E-01	4.74063
2013.Mar	0.00000	-0.734234E-01	-0.734234E-01	4.74157
2013.Apr	0.00000	-0.734234E-01	-0.734234E-01	4.75091
2013.May	0.00000	-0.734234E-01	-0.734234E-01	4.76569
2013.Jun	0.00000	-0.734234E-01	-0.734234E-01	4.79549
2013.Jul	0.00000	-0.734234E-01	-0.734234E-01	4.82009
2013.Aug	0.00000	-0.734234E-01	-0.734234E-01	4.83816
2013.Sep	0.00000	-0.734234E-01	-0.734234E-01	4.85255
2013.Oct	0.00000	-0.734234E-01	-0.734234E-01	4.87004
2013.Nov	0.184240E-01	-0.734234E-01	-0.549994E-01	4.87447
2013.Dec	0.00000	-0.734234E-01	-0.734234E-01	4.85002
2014.Jan	0.00000	-0.734234E-01	-0.734234E-01	4.82356
2014.Feb	0.00000	-0.734234E-01	-0.734234E-01	4.81661
2014.Mar	0.00000	-0.734234E-01	-0.734234E-01	4.82442
2014.Apr	0.00000	-0.734234E-01	-0.734234E-01	4.83901
2014.May	0.00000	-0.734234E-01	-0.734234E-01	4.85086
2014.Jun	0.00000	-0.734234E-01	-0.734234E-01	4.86507
2014.Jul	0.00000	-0.734234E-01	-0.734234E-01	4.90493
2014.Aug	0.00000	-0.734234E-01	-0.734234E-01	4.92154
2014.Sep	0.00000	-0.734234E-01	-0.734234E-01	4.91287
2014.Oct	0.00000	-0.734234E-01	-0.734234E-01	4.90812
2014.Nov	0.00000	-0.734234E-01	-0.734234E-01	4.90413
2014.Dec	0.00000	-0.734234E-01	-0.734234E-01	4.88885
2015.Jan	0.00000	-0.734234E-01	-0.734234E-01	4.88317
2015.Feb	0.00000	-0.734234E-01	-0.734234E-01	4.88317
2015.Mar	0.00000	-0.734234E-01	-0.734234E-01	4.88398
2015.Apr	0.00000	-0.734234E-01	-0.734234E-01	4.88885
2015.May	0.00000	-0.734234E-01	-0.734234E-01	4.89773
2015.Jun	0.00000	-0.734234E-01	-0.734234E-01	4.91840
2015.Jul	0.00000	-0.734234E-01	-0.734234E-01	4.92623

2015.Aug	0.00000	-0.734234E-01	-0.734234E-01	4.94326
2015.Sep	0.00000	-0.734234E-01	-0.734234E-01	4.95091
2015.Oct	0.00000	-0.734234E-01	-0.734234E-01	4.95925
2015.Nov	0.00000	-0.734234E-01	-0.734234E-01	4.96302
2015.Dec	0.00000	-0.734234E-01	-0.734234E-01	4.95091
2016.Jan	0.00000	-0.734234E-01	-0.734234E-01	4.94938
2016.Feb	0.00000	-0.734234E-01	-0.734234E-01	4.93479
2016.Mar	0.00000	-0.734234E-01	-0.734234E-01	4.93479
2016.Apr	0.00000	-0.734234E-01	-0.734234E-01	4.95091
2016.May	0.00000	-0.734234E-01	-0.734234E-01	4.96977
2016.Jun	0.00000	-0.734234E-01	-0.734234E-01	4.99340
2016.Jul	0.00000	-0.734234E-01	-0.734234E-01	5.00646
2016.Aug	0.00000	-0.734234E-01	-0.734234E-01	5.00068
2016.Sep	0.00000	-0.734234E-01	-0.734234E-01	4.98975
2016.Oct	0.00000	-0.734234E-01	-0.734234E-01	4.99194
2016.Nov	0.00000	-0.734234E-01	-0.734234E-01	4.98313
2016.Dec	0.00000	-0.734234E-01	-0.734234E-01	4.96452
2017.Jan	0.00000	-0.734234E-01	-0.734234E-01	4.95547
2017.Feb	0.00000	-0.734234E-01	-0.734234E-01	4.95471
2017.Mar	0.00000	-0.734234E-01	-0.734234E-01	4.95471
2017.Apr	0.00000	-0.734234E-01	-0.734234E-01	4.95698
2017.May	0.00000	-0.734234E-01	-0.734234E-01	4.95925
2017.Jun	0.00000	-0.734234E-01	-0.734234E-01	4.97201
2017.Jul	0.00000	-0.734234E-01	-0.734234E-01	5.00285
2017.Aug	0.00000	-0.734234E-01	-0.734234E-01	5.01578
2017.Sep	0.00000	-0.734234E-01	-0.734234E-01	5.00213
2017.Oct	0.00000	-0.734234E-01	-0.734234E-01	5.01077
2017.Nov	0.00000	-0.734234E-01	-0.734234E-01	5.02572
2017.Dec	0.00000	-0.734234E-01	-0.734234E-01	5.01292
2018.Jan	0.00000	-0.734234E-01	-0.734234E-01	5.00140
2018.Feb	0.00000	-0.734234E-01	-0.734234E-01	4.98681
2018.Mar	0.00000	-0.734234E-01	-0.734234E-01	4.98240
2018.Apr	0.00000	-0.734234E-01	-0.734234E-01	4.98461
2018.May	0.00000	-0.734234E-01	-0.734234E-01	4.98975
2018.Jun	0.00000	-0.734234E-01	-0.734234E-01	5.00068
2018.Jul	0.00000	-0.734234E-01	-0.734234E-01	5.01578
2018.Aug	0.00000	-0.734234E-01	-0.734234E-01	5.01863
2018.Sep	0.00000	-0.734234E-01	-0.734234E-01	5.00718
2018.Oct	0.00000	-0.734234E-01	-0.734234E-01	5.00213
2018.Nov	0.00000	-0.734234E-01	-0.734234E-01	4.99923
2018.Dec	0.00000	-0.734234E-01	-0.734234E-01	4.98608
2019.Jan	0.00000	-0.734234E-01	-0.734234E-01	4.97870
2019.Feb	0.00000	-0.734234E-01	-0.734234E-01	4.97944
2019.Mar	0.00000	-0.734234E-01	-0.734234E-01	4.98534
2019.Apr	0.00000	-0.734234E-01	-0.734234E-01	4.99559
2019.May	0.00000	-0.734234E-01	-0.734234E-01	5.00790
2019.Jun	0.00000	-0.734234E-01	-0.734234E-01	5.02289
2019.Jul	0.00000	-0.734234E-01	-0.734234E-01	5.03906
2019.Aug	0.00000	-0.734234E-01	-0.734234E-01	5.04809
2019.Sep	0.00000	-0.734234E-01	-0.734234E-01	5.05703
2019.Oct	0.00000	-0.734234E-01	-0.734234E-01	5.07804
2019.Nov	0.00000	-0.734234E-01	-0.734234E-01	5.09467
2019.Dec	0.00000	-0.417011E-01	-0.417011E-01	5.08706
2020.Jan	0.00000	-0.417011E-01	-0.417011E-01	5.07475
2020.Feb	0.00000	-0.417011E-01	-0.417011E-01	5.05033
2020.Mar	0.00000	-0.417011E-01	-0.417011E-01	5.03756

2020.Apr	0.248223E-01	-0.417011E-01	-0.168788E-01	5.04993
2020.May	0.00000	-0.417011E-01	-0.417011E-01	5.06426
2020.Jun	0.00000	-0.417011E-01	-0.417011E-01	5.07475
2020.Jul	0.00000	-0.417011E-01	-0.417011E-01	5.09603
2020.Aug	0.00000	-0.417011E-01	-0.417011E-01	5.10303
2020.Sep	0.00000	-0.417011E-01	-0.417011E-01	5.12683
2020.Oct	0.00000	-0.417011E-01	-0.417011E-01	5.15067
2020.Nov	0.00000	-0.417011E-01	-0.417011E-01	5.15369
2020.Dec	0.00000	-0.417011E-01	-0.417011E-01	5.12062
2021.Jan	0.00000	-0.417011E-01	-0.417011E-01	5.09412
2021.Feb	0.00000	-0.417011E-01	-0.417011E-01	5.08835
2021.Mar	0.00000	-0.417011E-01	-0.417011E-01	5.08513
2021.Apr	0.00000	-0.417011E-01	-0.417011E-01	5.09412
2021.May	0.00000	-0.417011E-01	-0.417011E-01	5.11312
2021.Jun	0.00000	-0.417011E-01	-0.417011E-01	5.12497
2021.Jul	0.00000	-0.417011E-01	-0.417011E-01	5.13484
2021.Aug	0.00000	-0.417011E-01	-0.417011E-01	5.13361
2021.Sep	0.00000	-0.417011E-01	-0.417011E-01	5.13361
2021.Oct	0.00000	-0.417011E-01	-0.417011E-01	5.15910
2021.Nov	0.00000	-0.417011E-01	-0.417011E-01	5.17219
2021.Dec	0.00000	-0.417011E-01	-0.417011E-01	5.16029
2022.Jan	0.00000	-0.417011E-01	-0.417011E-01	5.14704
2022.Feb	0.00000	-0.417011E-01	-0.417011E-01	5.14522
2022.Mar	0.00000	-0.417011E-01	-0.417011E-01	5.15910
2022.Apr	0.00000	-0.417011E-01	-0.417011E-01	5.17396
2022.May	0.00000	-0.417011E-01	-0.417011E-01	5.18978
2022.Jun	0.00000	-0.417011E-01	-0.417011E-01	5.19961
2022.Jul	0.00000	-0.417011E-01	-0.417011E-01	5.19961
2022.Aug	0.00000	-0.417011E-01	-0.417011E-01	5.20706
2022.Sep	0.00000	-0.417011E-01	-0.417011E-01	5.21615
2022.Oct	0.00000	-0.417011E-01	-0.417011E-01	5.22685
2022.Nov	0.00000	-0.417011E-01	-0.417011E-01	5.21785
2022.Dec	0.00000	-0.417011E-01	-0.417011E-01	5.20133
2023.Jan	0.00000	-0.417011E-01	-0.417011E-01	5.20534
2023.Feb	0.00000	-0.417011E-01	-0.417011E-01	5.20305
2023.Mar	0.00000	-0.417011E-01	-0.417011E-01	5.20592
2023.Apr	0.00000	-0.417011E-01	-0.417011E-01	5.21162
2023.May	0.00000	-0.417011E-01	-0.417011E-01	5.21898
2023.Jun	0.00000	-0.417011E-01	-0.417011E-01	5.24406
2023.Jul	0.00000	0.00000	0.00000	5.26683
2023.Aug	0.00000	0.00000	0.00000	5.26010
2023.Sep	0.00000	0.00000	0.00000	5.23857
2023.Oct	0.00000	0.00000	0.00000	5.24913
2023.Nov	0.00000	0.00000	0.00000	5.25958
2023.Dec	0.00000	0.00000	0.00000	5.25070
2024.Jan	0.00000	0.00000	0.00000	5.24333
2024.Feb	0.00000	0.00000	0.00000	5.24439
2024.Mar	0.00000	0.00000	0.00000	5.24597
2024.Apr	0.00000	0.00000	0.00000	5.25332
2024.May	0.00000	0.00000	0.00000	5.26062
2024.Jun	0.00000	0.00000	0.00000	5.29180
2024.Jul	0.00000	0.00000	0.00000	5.31959
2024.Aug	0.00000	0.00000	0.00000	5.31517

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Residuals from the Estimated Regression Effects

From 2013.Jan to 2024.Aug
Observations 140

Data

Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	4.731	4.741	4.742	4.751	4.766	4.795	4.820	4.838	4.853	4.870	4.874	4.850
2014	4.824	4.817	4.824	4.839	4.851	4.865	4.905	4.922	4.913	4.908	4.904	4.889
2015	4.883	4.883	4.884	4.889	4.898	4.918	4.926	4.943	4.951	4.959	4.963	4.951
2016	4.949	4.935	4.935	4.951	4.970	4.993	5.006	5.001	4.990	4.992	4.983	4.965
2017	4.955	4.955	4.955	4.957	4.959	4.972	5.003	5.016	5.002	5.011	5.026	5.013
2018	5.001	4.987	4.982	4.985	4.990	5.001	5.016	5.019	5.007	5.002	4.999	4.986
2019	4.979	4.979	4.985	4.996	5.008	5.023	5.039	5.048	5.057	5.078	5.095	5.087
2020	5.075	5.050	5.038	5.050	5.064	5.075	5.096	5.103	5.127	5.151	5.154	5.121
2021	5.094	5.088	5.085	5.094	5.113	5.125	5.135	5.134	5.134	5.159	5.172	5.160
2022	5.147	5.145	5.159	5.174	5.190	5.200	5.200	5.207	5.216	5.227	5.218	5.201
2023	5.205	5.203	5.206	5.212	5.219	5.244	5.267	5.260	5.239	5.249	5.260	5.251
2024	5.243	5.244	5.246	5.253	5.261	5.292	5.320	5.315				

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A 8 RegARIMA combined outlier component (AO, LS outliers included)

From 2013.Jan to 2024.Aug
Observations 140

A 8 RegARIMA combined outlier component

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	AVGE
2013	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	94.6	92.9	93.1
2014	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9
2015	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9
2016	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9
2017	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9
2018	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9
2019	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	95.9	93.2
2020	95.9	95.9	95.9	98.3	95.9	95.9	95.9	95.9	95.9	95.9	95.9	95.9	96.1
2021	95.9	95.9	95.9	95.9	95.9	95.9	95.9	95.9	95.9	95.9	95.9	95.9	95.9
2022	95.9	95.9	95.9	95.9	95.9	95.9	95.9	95.9	95.9	95.9	95.9	95.9	95.9
2023	95.9	95.9	95.9	95.9	95.9	95.9	100.0	100.0	100.0	100.0	100.0	100.0	98.0
2024	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0					100.0
AVGE	94.5	94.5	94.5	94.7	94.5	94.5	94.8	94.8	94.4	94.4	94.5	94.7	

Table Total- 13241. Mean- 95. Standard Deviation- 6.
Minimum- 93. Maximum- 100.

A 8.A RegARIMA outlier component

From 2024.Sep to 2025.Aug
Observations 12

A 8.A RegARIMA outlier component

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	AVGE
2024									100.0	100.0	100.0	100.0	100.0

2025	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0					100.0

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A 8.AO RegARIMA AO outlier component

From 2013.Jan to 2024.Aug
Observations 140

A 8.AO RegARIMA AO outlier component

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	AVGE
2013	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	101.9	100.0	100.2
2014	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
2015	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
2016	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
2017	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
2018	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
2019	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
2020	100.0	100.0	100.0	102.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.2
2021	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
2022	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
2023	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
2024	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0					100.0
AVGE	100.0	100.0	100.0	100.2	100.0	100.0	100.0	100.0	100.0	100.0	100.2	100.0	

Table Total- 14004. Mean- 100. Standard Deviation- 0.
Minimum- 100. Maximum- 103.

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A 8.LS RegARIMA level change outlier component

From 2013.Jan to 2024.Aug
Observations 140

A 8.LS RegARIMA level change outlier component

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	AVGE
2013	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9
2014	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9
2015	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9
2016	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9
2017	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9
2018	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9
2019	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	95.9	93.2
2020	95.9	95.9	95.9	95.9	95.9	95.9	95.9	95.9	95.9	95.9	95.9	95.9	95.9
2021	95.9	95.9	95.9	95.9	95.9	95.9	95.9	95.9	95.9	95.9	95.9	95.9	95.9
2022	95.9	95.9	95.9	95.9	95.9	95.9	95.9	95.9	95.9	95.9	95.9	95.9	95.9
2023	95.9	95.9	95.9	95.9	95.9	95.9	100.0	100.0	100.0	100.0	100.0	100.0	98.0
2024	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0					100.0
AVGE	94.5	94.5	94.5	94.5	94.5	94.5	94.8	94.8	94.4	94.4	94.4	94.7	

Table Total- 13237. Mean- 95. Standard Deviation- 6.
Minimum- 93. Maximum- 100.

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B 1 Original series (prior adjusted) (adjusted for regARIMA factors)

From 2013.Jan to 2024.Aug
Observations 140

B 1 Original series (prior adjusted)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
2013	113.	115.	115.	116.	117.	121.	124.	126.	128.	130.	131.	128.	1464.
2014	124.	124.	125.	126.	128.	130.	135.	137.	136.	135.	135.	133.	1568.
2015	132.	132.	132.	133.	134.	137.	138.	140.	141.	142.	143.	141.	1646.
2016	141.	139.	139.	141.	144.	147.	149.	149.	147.	147.	146.	143.	1733.
2017	142.	142.	142.	142.	142.	144.	149.	151.	149.	150.	152.	150.	1756.
2018	149.	146.	146.	146.	147.	149.	151.	151.	149.	149.	148.	146.	1777.
2019	145.	145.	146.	148.	150.	152.	154.	156.	157.	160.	163.	162.	1839.
2020	160.	156.	154.	156.	158.	160.	163.	165.	168.	173.	173.	167.	1954.
2021	163.	162.	162.	163.	166.	168.	170.	170.	170.	174.	176.	174.	2018.
2022	172.	172.	174.	177.	179.	181.	181.	183.	184.	186.	185.	182.	2155.
2023	182.	182.	182.	183.	185.	189.	194.	193.	188.	190.	192.	191.	2252.
2024	189.	189.	190.	191.	193.	199.	204.	203.					1559.
AVGE	151.	150.	151.	152.	154.	156.	159.	160.	156.	158.	159.	156.	

Table Total- 21720. Mean- 155. Standard Deviation- 22.
Minimum- 113. Maximum- 204.

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QS Statistics for seasonality

QS statistic for seasonality (Full series)

	QS	p-value
Original Series	10.02	0.0067
Original Series (extreme value adjusted)	36.58	0.0000
Residuals	0.00	1.0000

QS statistic for seasonality (Series start in 2016.Sep)

	QS	p-value
Original Series	5.66	0.0589
Original Series (extreme value adjusted)	26.78	0.0000
Residuals	0.00	1.0000

Visually significant residual seasonal peaks have been found in the spectral plot of the following series starting in 2016.Sep:

- differenced, transformed prior adjusted series (Table B1) (3 Seasonal peak(s))

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G 0 10*LOG(SPECTRUM) of the differenced, transformed Prior Adjusted Series (Table B1)

Spectrum estimated from 2016.Sep to 2024.Aug.

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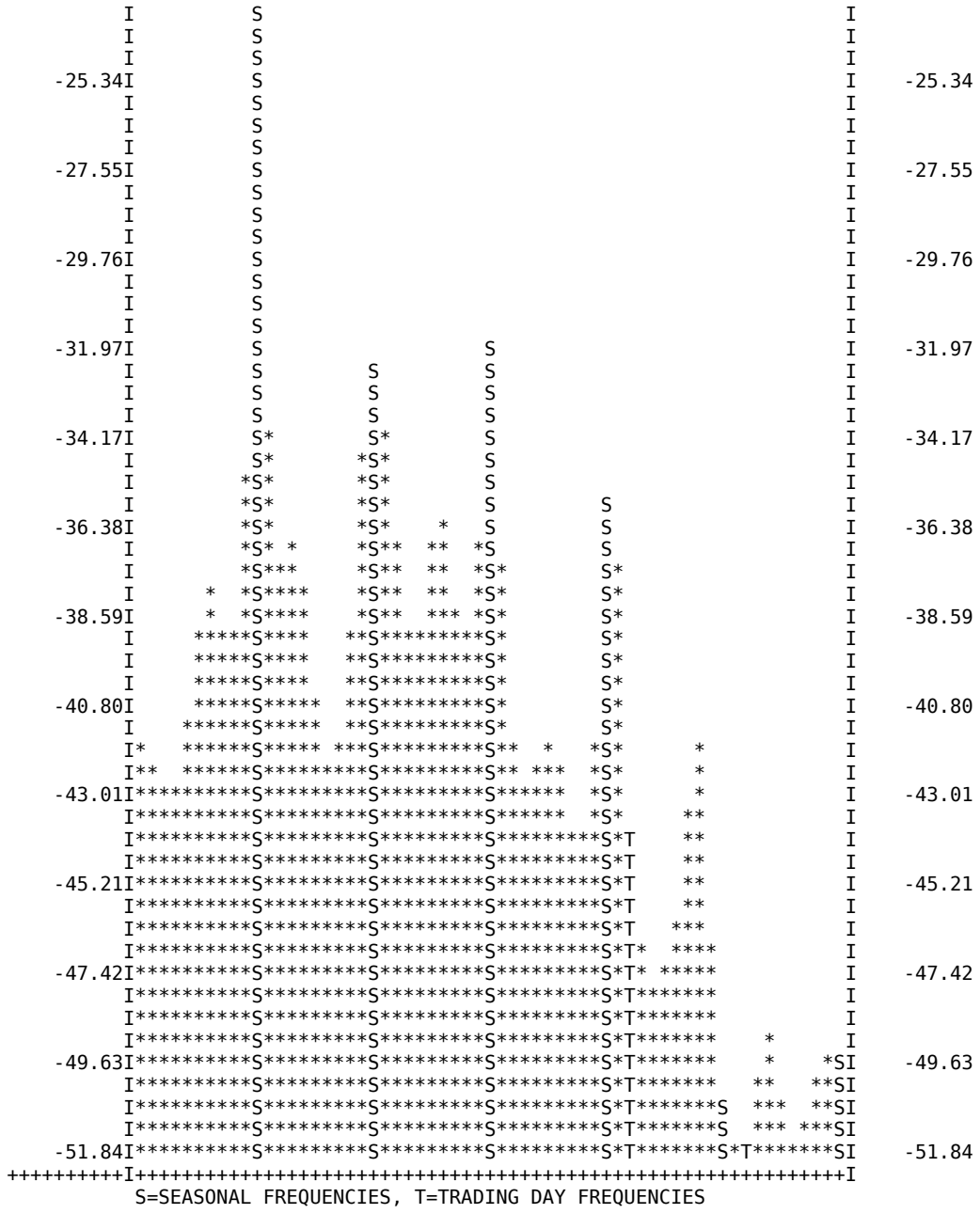
+++++++++I++++++++++++++++++++++++++++++++++++++++++++++++++++++++++I
    -23.13I          S                                              I    -23.13
```



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Peak probabilities for Tukey spectrum estimator

Tukey spectrum estimated from 2016.Sep to 2024.Aug.

Peak probabilities for Tukey spectrum estimator

	S1	S2	S3	S4	S5	S6	TD
Model Residuals	0.798	0.107	0.592	0.000	0.336	0.772	0.107
Prior Adjusted Series (Table B1)	0.969 *	0.780	0.980 *	0.857	0.062	0.830	0.057

** - Peak Probability > 0.99,
* - 0.90 < Peak Probability < 0.99