

Handling seasonal breaks in monthly or quarterly time series

Dimitrios	Nikolakis	—	ONS
(dimitrios.nikolakis@ons.gov.uk)			

Matthew	Whipple	—	ONS
(Matthew.Whipple@ons.gov.uk)			

11-12 September 2024 (*SAPW*)

Outline

1. Seasonal Adjustment Diagnostics Criteria
2. Diagnostics for Seasonality and Seasonal Breaks
3. Decisions based on SI Ratios
4. Decisions based on Overlay Graphs
5. How to introduce a seasonal break – Example 1
6. How to introduce a seasonal break – Example 2
7. Change the data point of a seasonal break – Example 3 (*demonstration in Win-X13*)

Seasonal Criteria

Adjustment

Diagnostics

Model Info

Coded Outliers	
	LS1991.2[6.84] AO2022.3[5.72] AO2022.4[3.97] LS2023.2[6.32]
	LS1991.2[5.97] AO2022.3[5.57] AO2022.4[3.45] LS2023.2[6.02]
	LS1991.2[3.04] AO2022.3[10.60] AO2022.4[6.53] LS2023.2[13.28]

Model Info		Model Diagnostics	x11	Spectrum & QS	Stability Diagnostics											
Series Name	#	Regressors	Trading Day	Holiday	Seasonal	Constant	User	Coded Outliers	Auto Outliers	Variance	Phi1	Sum NS AR	Theta1	Sum NS MA	Sum Seas AR	Sum Seas MA
ANLW		Trading Day + Leap Year	$TDNoLeapYear \cdot 0.89[LeapYear \cdot 1.94]$							0.96783753141737E+08		0.298	0.298	-0.118	0.619	
GZSL		LS1991.2 + AO2022.3 + AO2022.4 + LS2023.2						LS1991.2[3.05] AO2022.3[10.48] AO2022.4[6.58] LS2023.2[13.39]		0.53864733191145E+06	-0.983	-2.95	0.033	0.002	-0.354	0.355
EX_SA_0_V_NSA_Q		Trading Day + LS2007.1 + LS2009.1 + AO2010.4	$TD \cdot 0.16[$					$LS2007.1[5.67] LS2009.1[2.77] AO2010.4[5.42]$		0.16405904713622E-01		0.227	0.227			0.657

Seasonal Adjustment Diagnostics

Criteria

Model Diagnostics

Model Info	Model Diagnostics	x11	Spectrum & QS	Stability Diagnostics												
Series Name	AICC	aa FcE (3-yr)	Normal?	# LBQ Fail	Sig LBQ	Sig Seas LBQ	# BPQ Fail	Sig BPQ	Sig Seas BPQ	Sig ACF	Sig Seas ACF	Sig PACF	Sig Seas PACF	Resid Peaks	QS Resid	QSS Resid
NLW	2814.28613	11.9018	failed	0			0								1.000	1.000
NLW	2809.91675	7.328	failed	0			0			6		6			1.000	1.000
NLW	2812.02759	7.4286	failed	0			0								1.000	1.000
NLW	2814.40918	7.4363	failed	1	6		1	6				6			1.000	1.000
NLW	2805.22656	6.8789	ok	0			0								0.392	1.000
NLW	2821.36621	7.5492	ok	0			0								0.543	1.000
NLW	2827.46362	8.0693	ok	0			0								0.447	1.000
NLW	2831.311	12.0994	ok	0			0								0.260	1.000
NLW	2820.54541	14.2893	failed	0			0								1.000	1.000
NLW	2824.219	14.1069	failed	0			0								1.000	1.000
NLW	3072.782	76.6014	skewed -	0			0					5			1.000	1.000

Model Info	Model Diagnostics	x11	Spectrum & QS	Stability Diagnostics													
Series Name	AICC	aa FcE (3-yr)	Normal?	# LBQ Fail	Sig LBQ	Sig Seas LBQ	# BPQ Fail	Sig BPQ	Sig Seas BPQ	Sig ACF	Sig Seas ACF	Sig PACF	Sig Seas PACF	Resid Peaks	QS Resid	QSS Resid	Avg Sq Fcst Err 1 Period
T_O_K66_V_F_S12_	4610.227	5.2546	failed	19	6-24	s12s24	19	6-24	s12s24	2-3 9		2-3 8-9 16		t1	1.000	0.171	
T_O_K66_V_F_S12_	4609.302	5.3881	failed	18	7-24	s12s24	18	7-24	s12s24	1-2 8-9		1 3 8-9		t1	0.968	0.101	
T_O_K66_V_F_S12_	4493.36865	5.9239	failed	18	7-24	s12s24	18	7-24	s12s24	5 9		5			1.000	1.000	

Seasonal Adjustment Diagnostics Criteria

x11

Model Info		Model Diagnostics		x11		Spectrum & QS		Stability Diagnostics																
Series Name	/	Sigma Lim	Seasonal MA	Trend MA	I/S Ratio	I/C Ratio	D8F	D8F p-val	D11F	D11F 3 yr	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	Q	Q2	MCD
ANLW		1.50 2.50	3x3	5	2.38	0.64	65.147	0.000	0.791	0.897	0.102	0.064	0.465	0.986	0.684	0.649	0.355	0.733	0.418	1.503	1.238	0.52	0.59	2
ANNV		1.50 2.50	3x3	5	1.53	0.73	142.187	0.000	0.434	0.108	0.050	0.201	0.602	1.517	0.766	0.989	0.273	0.711	0.367	1.635	1.635	0.61	0.67	2
GZSL		1.50 2.50	3x3	5	2.21	0.34	80.208	0.000	0.306	0.480	0.087	0.019	0.009	0.834	0.200	0.715	0.337	0.598	0.282	0.570	0.570	0.30	0.34	1
T_O_K66_V_F_S12_		1.50 2.50	3x3	5	1.77	0.81	14.222	0.000	1.000	0.951	0.030	0.012	0.000	1.504	0.000	0.890	1.358	1.856	0.350	1.502	1.423	0.71	0.81	1

Spectrum & QS

Model Info		Model Diagnostics		x11		Spectrum & QS		Stability Diagnostics														
Series Name	/	Sig Ori Peaks	QS Ori	QSS Ori	QS Ori Adj Ext	QSS Ori Adj Ext	Tukey Ori Peaks	Sig SAdj Peaks	Sig Irr Peaks	Noneig Seasonal Peaks	Noneig TD Peaks	QS Sadj	QSS Sadj	QS Sadj Adj Ext	QSS Sadj Adj Ext	QS Irr	QSS Irr	QS Irr Adj Ext	QSS Irr Adj Ext	Tukey Sadj Peaks	Tukey Irr Peaks	Tukey Rsd Peaks
T_O_B09_V_F_S1V_		s1 s5	0.203	1.000	0.000	0.832	(p> 90)[s1 s5]					0.655	1.000	1.000	1.000	1.000	1.000	1.000	1.000			(p> 90)[s4 s5]
T_O_K66_V_F_S12_			0.000	0.000	0.000	0.000	(p> 90)[s2]			sa irr [3.5]		1.000	1.000	1.000	1.000	0.000	0.376	1.000	1.000			
T_O_K66_V_F_S12_			0.000	0.000	0.000	0.000	(p> 90)[s2]			sa irr [2]		1.000	1.000	1.000	1.000	0.000	0.449	1.000	1.000			

Seasonal Criteria

Adjustment

Diagnostics

Colour:

- White: The SPEC file does not produce any warnings (ideal).
- *Yellow: The SPEC file produces minor warnings (e.g., at least one insignificant regressor or failure of residuals to pass normality tests).*
- **Red: The SPEC file produces large warnings (e.g., visual trading day peaks).**

When there are errors, Win-X13 doesn't run!

Seasonal Criteria

Adjustment

Diagnostics

T-values of regressors:

- $|t| < 1.96$: Not acceptable.
- $1.96 \leq |t| < 3.00$: Acceptable.
- $|t| \geq 3.00$: Ideal.

P-values of regressors:

- $P > 0.05$: Not acceptable.
- $0.00 < P \leq 0.05$: Acceptable.
- $P = 0.00$: Ideal.

Both T-values and P-values depend on the length of the series

Seasonal Criteria

Adjustment

Diagnostics

Model Diagnostics

Aa FcE (3-yr): Average absolute percentage error of forecasts in the last 3 years – We try to **minimize** it.

Normal?: Indicates whether residuals pass normality tests.

- OK (ideal)
- *Failed*
- *Skewed-*
- *Skewed+*

Seasonal Criteria

Adjustment

Diagnostics

The following columns ideally should contain a zero (**0**) (*but if it's not possible, we try to **minimize** this number*):

- **# LBQ Fail:** Number of the lags (1-24 for monthly series and 1-8 for quarterly series) with significant Ljung-Box Q statistic.
- **# BPQ Fail:** Number of the lags with significant Box-Pierce Q statistic.

Seasonal Criteria

Adjustment

Diagnostics

The following columns ideally should be **empty**:

- **Sig LBQ:** List of lags with significant LBQ.
- **Sig Seas LBQ:** Seasonal lags with significant LBQ.
- **Sig PBQ:** List of lags with significant BPQ.
- **Sig Seas PBQ:** Seasonal lags with significant PBQ.
- **Sig ACF:** List of lags with significant autocorrelation in the residuals.

Seasonal Criteria

Adjustment

Diagnostics

- **Sig Seas ACF:** Seasonal lags with significant autocorrelation in the residuals.
- **Sig PACF:** List of lags with significant partial autocorrelation in the residuals.
- **Sig Seas PACF:** Seasonal lags with significant partial autocorrelation in the residuals.
- **Resid Peaks:** Indicates the visually significant seasonal and trading day peaks in the spectrum of the model residuals.

Spectrum & QS

- **Tukey Ori Peaks:** Lists the statistically significant seasonal frequencies of the Tukey spectrum of the original series (*at 1% and 10% level*).
- **Sig SAdj Peaks:** Indicates the visually significant seasonal and trading day peaks in the spectrum of the seasonally adjusted series.
- **Sig Irr Peaks:** Indicates the visually significant seasonal and trading day peaks in the spectrum of the modified irregular.

Seasonal Criteria

Adjustment

Diagnostics

Model Diagnostics

The following columns can take values between **0.000** and **1.000** (*they should be at least 0.050, but the higher the better*):

- **QS Resid:** P-value for the QS statistic of the residuals.
- **QSS Resid:** P-value for the QS statistic of the residuals on the last 8 years (*96 observations for monthly series and 32 observations for quarterly series*).

Seasonal Criteria

Adjustment

Diagnostics

x11

- **D11F:** The p-value of D11F statistic for residual seasonality.
- **D11F 3yr:** The p-value of D11F statistic for residual seasonality in the last 3 years.

Spectrum & QS

- **QS Sadj:** The p-value for the QS statistic of the seasonally adjusted series.
- **QSS Sadj:** The p-value for the QS statistic of the seasonally adjusted series calculated using the spectrum span.
- **QS Sadj Adj Ext:** The p-value for the QS statistic of the seasonally adjusted series adjusted for extreme values.

Seasonal Criteria

Adjustment

Diagnostics

- **QSS Sadj Adj Ext:** The p-value for the QS statistic of the seasonally adjusted series adjusted for extreme values calculated using the spectrum span.
- **QS Irr:** The p-value for the QS statistic of the irregular component.
- **QSS Irr:** The p-value for the QS statistic of the irregular component calculated using the spectrum span.

Seasonal Criteria

Adjustment

Diagnostics

- **QS Irr Adj Ext:** The p-value for the QS statistic of the irregular component adjusted for extreme values.
- **QSS Irr Adj Ext:** The p-value for the QS statistic of the irregular component adjusted for extreme values calculated using the spectrum span.

Seasonal Adjustment Diagnostics

Criteria

The following columns ideally should be **empty** (*but if it's not possible, we try to make the number in the bracket smaller than or equal to 3.0*):

- **Nonsig Seasonal Peaks:** Indicates whether there is a nonsignificant peak at any of the S1, S2, S3, or S4 in the spectrum of the seasonally adjusted series (“*sadj*”), irregular (“*irr*”), or residuals (“*rsd*”). Also gives the heights in “stars” of the tallest of these peaks.
- **Nonsig TD Peaks:** Indicates whether there is a nonsignificant peak at T1 in the spectrum of the seasonally adjusted series (“*sadj*”), irregular (“*irr*”), or residuals (“*rsd*”). Also gives the heights in “stars” of the tallest of these peaks.

Seasonal Criteria

Adjustment

Diagnostics

x11

The **M1-M11** columns can take values between 0.000 and 3.000. Values higher than **1.000** suggest a potential problem.

Diagnostics for seasonality and seasonal breaks

X11

- **M7:** The amount of moving seasonality present relative to the amount of stable seasonality.

Out file

- **Identifiable Seasonality Test**
- **Moving Seasonality Test**

Diagnostics for seasonality and seasonal breaks

Seasonally adjust when:

- M7 is lower than 0.800.
- Identifiable seasonality present.
- No evidence of moving seasonality at the 5% level.

Do not seasonally adjust when:

- M7 is higher than 1.200.
- Identifiable seasonality not present.
- No evidence of moving seasonality at the 5% level.

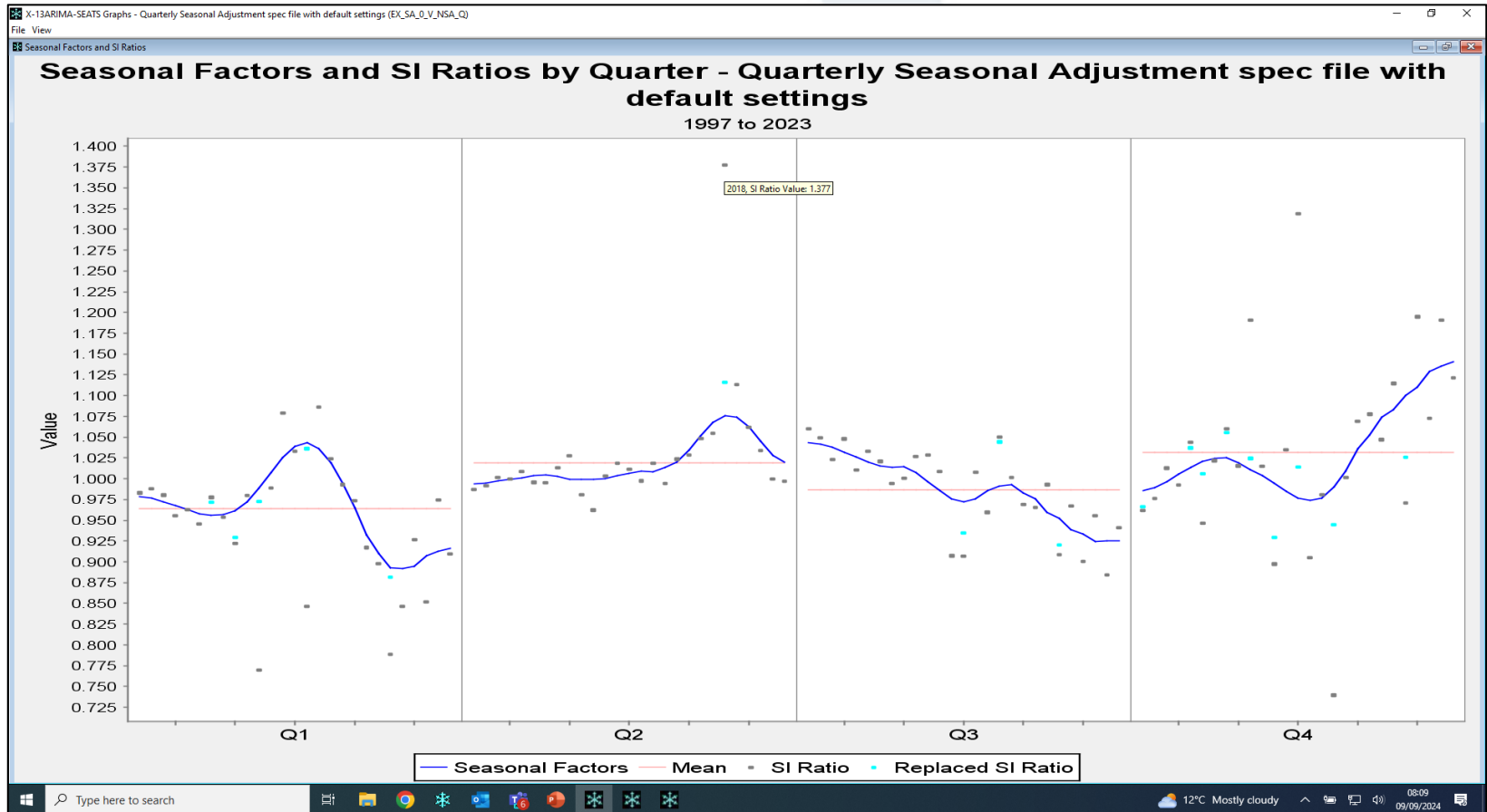
Diagnostics for seasonality and seasonal breaks

Investigate potential **seasonal breaks** when:

- M7 lies between 0.800 and 1.200.
- Identifiable seasonality probably not present.
- Moving seasonality present at the 1% or at the 5% level.

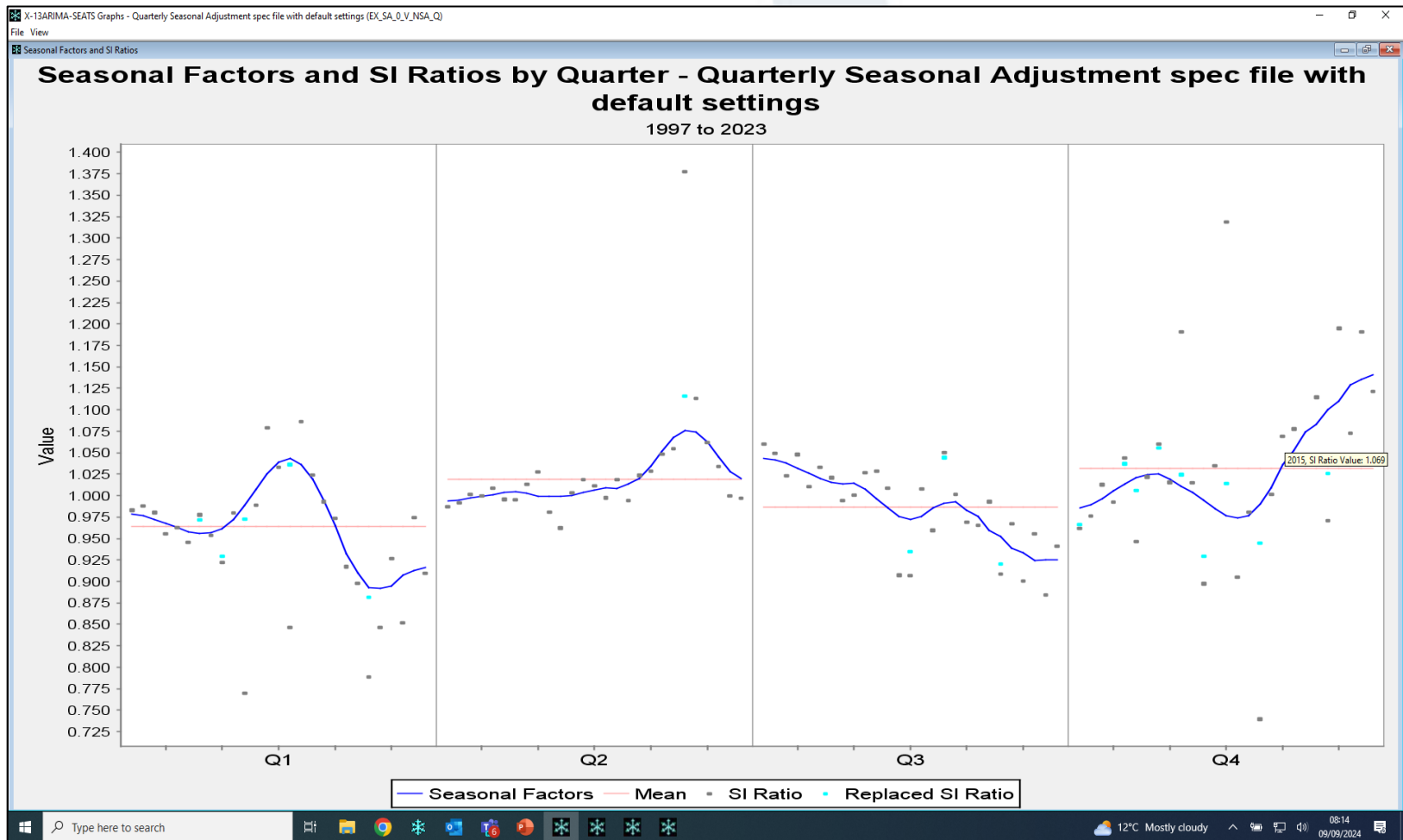
Decisions based on SI Ratios

2018 Q2: Potentially Significant Additive Outlier



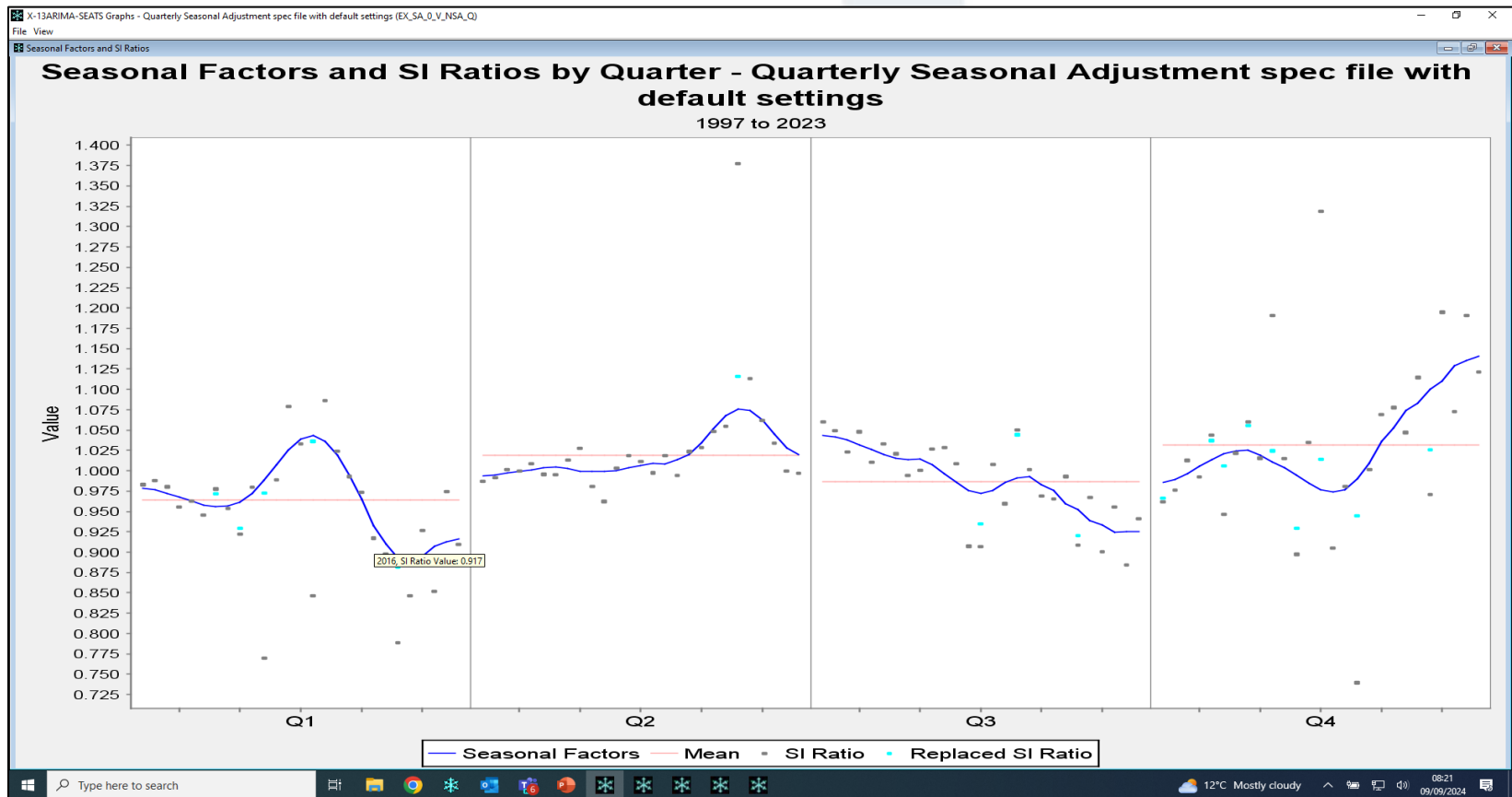
Decisions based on SI Ratios

2015 Q4: Potentially Significant Seasonal Break



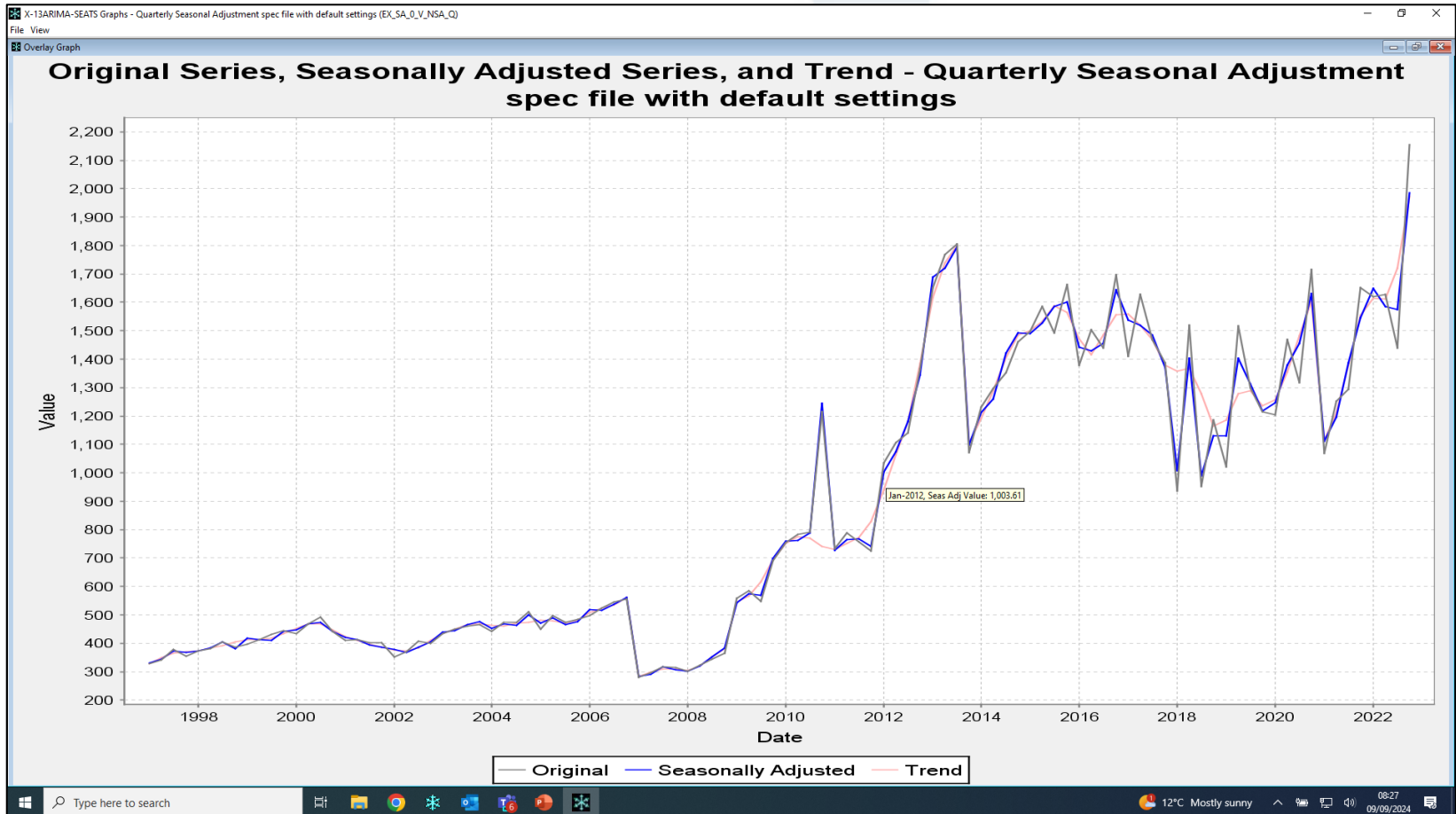
Decisions based on SI Ratios

2016 Q1: Potentially Significant Seasonal Break



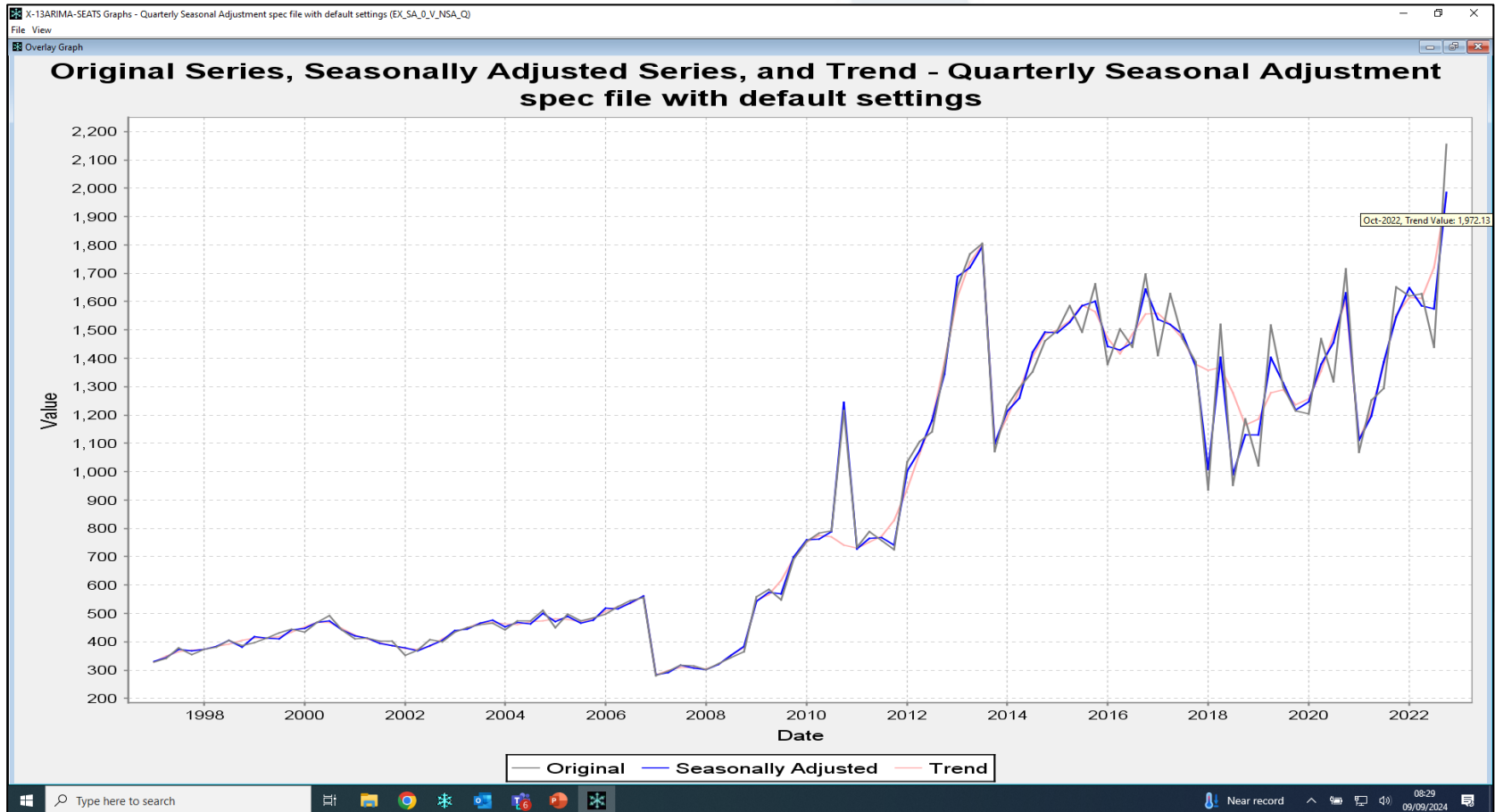
Decisions based on Overlay Graphs

2012 Q1: Potentially Significant Level Shift



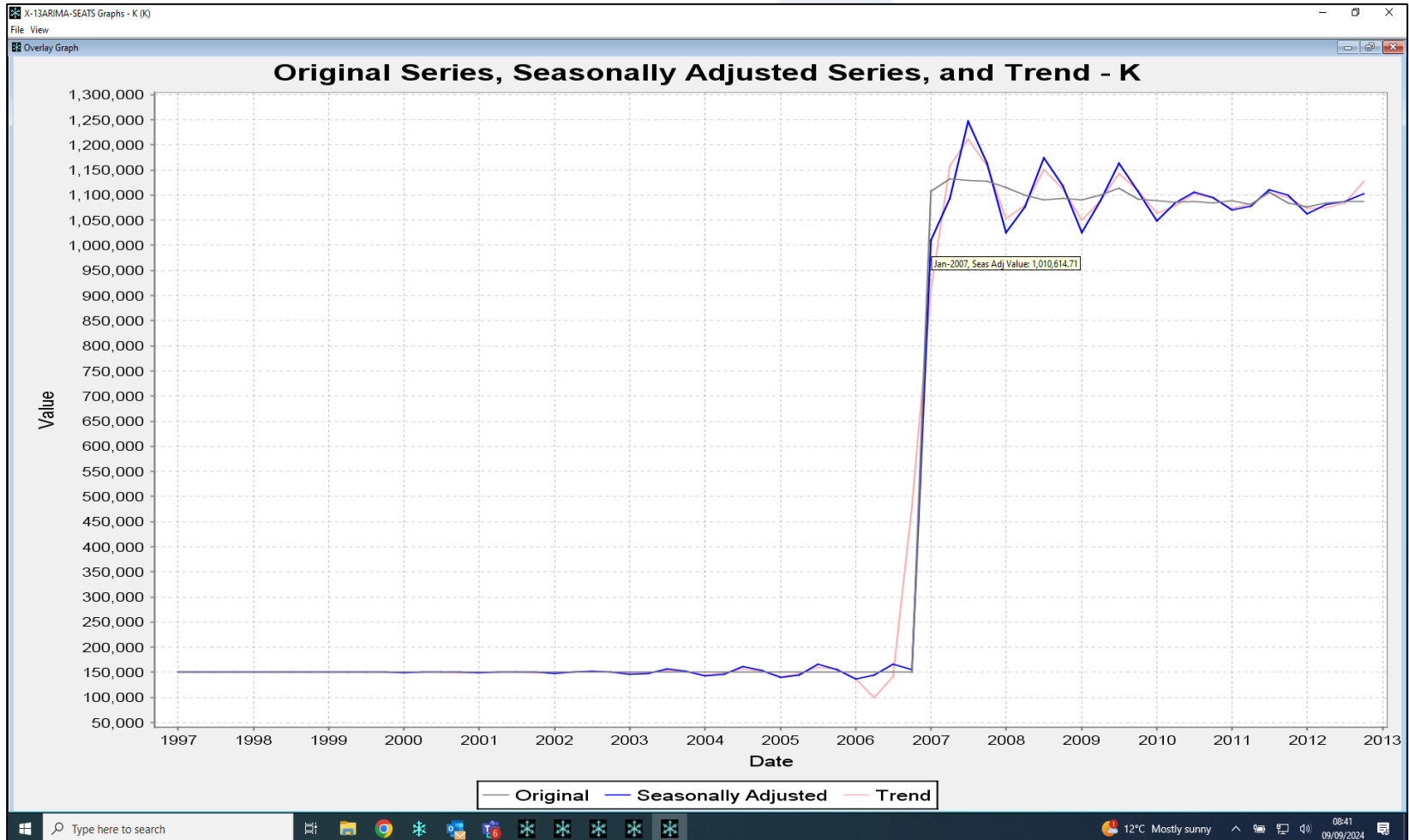
Decisions based on Overlay Graphs

2022 Q4: Potentially Significant Additive Outlier



Decisions based on Overlay Graphs

2007 Q1: A non-seasonal to seasonal break



How to introduce a seasonal break – Example 1

Let assume that based on SI Ratios, 2012 Q2 is a potential data point for a seasonal break.

```
View File: C18_GOSSE_R4_1_Q_NSA.spc

Comment Uncomment Run Save

#Time stamp 2019-06-21 09:45:57 ping
series{
title="12976115"
file="C18_GOSSE_R4_1_Q_NSA.dat"
format="datevalue"
period=4
decimals=2
}

transform{
function=auto}

automdl{}

regression{
variables=(seasonal/2012.2//)
}

force{
type=denton
rho=1
lambda=1
round=no
usefcst=no
mode=ratio
save=saa
}

x11{
appendfcst=yes
save=(d10 d11 d12 d13)
}
```

Diagnostics							
File Help							
General	Model Info	Model Diagnostics	x11	Spectrum & QS	Stability Diagnostics		
	Series Name	Model Span	ARIMA Model	Regressors	Trading Day	Holiday	Seasonal
	C18_GOSSE_R4_1_Q	1997.01 to 2024.02	(1 1 0)**	Seasonal (before 2012.2)			SR[F<p0.00]
	C18_GOSSE_R4_1_Q	1997.01 to 2024.02	(1 1 0)(0 1 1)	Seasonal (before 2012.2)			SR[F<p0.01]

The seasonal break is statistically significant.

How to introduce a seasonal break – Example 1

How to decide the type of seasonal break

```
View File: C18_GOSSE_R4_1_Q_NSA.spc
Comment  Uncomment  Run  Save
#Time stamp 2019-06-21 09:45:57 ping
series{
title="12976115"
file="C18_GOSSE_R4_1_Q_NSA.dat"
format="datevalue"
period=4
decimals=2
span=(,2012.2)
}

transform{
function=auto}

automdl{}

regression{
aictest=(easter td)
}

outlier{}

force{
type=denton
rho=1
lambda=1
round=no
usefcst=no
mode=ratio
save=saa
}

x11{
appendfcst=yes
save=(d10 d11 d12 d13)
}
```

```
View File: C18_GOSSE_R4_1_Q_NSA.spc
Comment  Uncomment  Run  Save
#Time stamp 2019-06-21 09:45:57 ping
series{
title="12976115"
file="C18_GOSSE_R4_1_Q_NSA.dat"
format="datevalue"
period=4
decimals=2
span=(2012.2,)
}

transform{
function=auto}

automdl{}

regression{
aictest=(easter td)
}

outlier{}

force{
type=denton
rho=1
lambda=1
round=no
usefcst=no
mode=ratio
save=saa
}

x11{
appendfcst=yes
save=(d10 d11 d12 d13)
}
```

Span	M7
(,2012.2)	0.571
(2012.2,)	1.766

A seasonal to non-seasonal break seems reasonable.

How to introduce a seasonal break – Example 1

View File: C18_GOSSE_R4_1_Q_NSA.spc

Comment Uncomment Run Save Save As

```
#Time stamp 2019-06-21 09:45:57 ping
series{
title="12976115"
file="C18_GOSSE_R4_1_Q_NSA.dat"
format="datevalue"
period=4
decimals=2
modelspec=(,2012.2)
}

transform{
function=auto()

automdl{

regression{
aictest=(easter td)
}

outlier{

force{
type=denton
rho=1
lambda=1
round=no
usefcst=no
mode=ratio
save=saa
}

x11{
appendfcst=yes
save=(d10 d11 d12 d13)
}

}
```

Diagnostics

File Help

General Model Info Model Diagnostics x11 Spectrum & QS Stability Diagnostics

Series Name	Model Span	ARIMA Model	Regressors	Trading Day	Holiday	Seasonal	Constant	User	Coded Outliers	Auto Outliers
C18_GOSSE_R4_1_Q	1997.01 to 2012.02	(0 1 1)(1 1) **	Constant + Easter[15]	**	E15#-2.17**		C1-1.73			

Diagnostics

File Help

General Model Info Model Diagnostics x11 Spectrum & QS Stability Diagnostics

Series Name	View Spec	Filename	Period	Transform	Mode	Span	Outlier Span	AO/LS/TC Crit Val	# Outliers	# Auto
C18_GOSSE_R4_1_Q	View	C18_GOSSE_R4_1_Q_NSA	4	Log(y)**	multiplicative	1997.01 to 2024.02	1997.01 to 2012.02	3.695 */3.695 */-	0	0

C18_GOSSE_R4_1_Q_NSA.d10 - Notepad

File Edit Format View Help

date	C18_GOSSE_R4_1_Q.d10
-----	-----
199701	+0.941918377340086E+00
199702	+0.100491203743540E+01
199703	+0.102814122465347E+01
199704	+0.102497906733801E+01
199801	+0.940075165671223E+00
199802	+0.100858851008114E+01
199803	+0.102840313692886E+01
199804	+0.102178883807154E+01
199901	+0.939886896276071E+00
199902	+0.100943336367190E+01
199903	+0.103217537145382E+01
199904	+0.101698438882621E+01
200001	+0.940559705179083E+00
200002	+0.100999615800639E+01
200003	+0.103476317953123E+01
200004	+0.101405286865007E+01
200101	+0.938764762826878E+00
200102	+0.101351901844536E+01
200103	+0.103684188716800E+01
200104	+0.100803336820296E+01
200201	+0.941270539877720E+00
200202	+0.101399329355338E+01
200203	+0.103941738571166E+01
200204	+0.100365681106359E+01

	A	B	C
1	date	C18_GOSSE_R4_1_Q.ppp	
2			
3	199701	9.42E-01	
4	199702	1.00E+00	
5	199703	1.03E+00	
6	199704	1.02E+00	
7	199801	9.40E-01	
8	199802	1.01E+00	
9	199803	1.03E+00	
10	199804	1.02E+00	
11	199901	9.40E-01	
12	199902	1.01E+00	
13	199903	1.03E+00	
14	199904	1.02E+00	
15	200001	9.41E-01	
16	200002	1.01E+00	
17	200003	1.03E+00	
18	200004	1.01E+00	
19	200101	9.39E-01	
20	200102	1.01E+00	
21	200103	1.04E+00	
22	200104	1.01E+00	
23	200201	9.41E-01	
24	200202	1.01E+00	
25	200203	1.04E+00	
26	200204	1.00E+00	
27	200301	9.42E-01	
28	200302	1.02E+00	
29	200303	1.04E+00	
30	200304	9.99E-01	
31	200401	9.44E-01	
32	200402	1.01E+00	
33	200403	1.05E+00	
34	200404	9.99E-01	
35	200501	9.44E-01	
36	200502	1.01E+00	

Sheet1 Sheet2 Sheet3

How to introduce a seasonal break – Example 1

Since the default transformation suggests a log transformation -> 1s from 201202 and onwards.

	A	B
48	200802	1.00411
49	200803	1.03857
50	200804	1.00590
51	200901	0.94876
52	200902	1.01429
53	200903	1.02709
54	200904	1.00820
55	201001	0.94885
56	201002	1.02345
57	201003	1.01561
58	201004	1.00995
59	201101	0.94821
60	201102	1.03681
61	201103	0.99922
62	201104	1.01345
63	201201	1.00001
64	201202	1.00000
65	201203	1.00000
66	201204	1.00000
67	201301	1.00000
68	201302	1.00000
69	201303	1.00000
70	201304	1.00000
71	201401	1.00000
72	201402	1.00000
73	201403	1.00000
74	201404	1.00000
75	201501	1.00000
76	201502	1.00000
77	201503	1.00000
78	201504	1.00000
79	201601	1.00000
80	201602	1.00000
81	201603	1.00000
82	201604	1.00000
83	201701	1.00000

	A	B
100	202102	1.00000
101	202103	1.00000
102	202104	1.00000
103	202201	1.00000
104	202202	1.00000
105	202203	1.00000
106	202204	1.00000
107	202301	1.00000
108	202302	1.00000
109	202303	1.00000
110	202304	1.00000
111	202401	1.00000
112	202402	1.00000
113	202403	1.00000
114	202404	1.00000
115	202501	1.00000
116	202502	1.00000
117	202503	1.00000
118	202504	1.00000
119	202601	1.00000
120	202602	1.00000
121	202603	1.00000
122	202604	1.00000
123	202701	1.00000
124	202702	1.00000
125	202703	1.00000
126	202704	1.00000
127	202801	1.00000
128	202802	1.00000
129	202803	1.00000
130	202804	1.00000
131		

PPP files need to be extended by at least 2 years to avoid future errors.

How to introduce a seasonal break – Example 1

Copy/Paste the updated Excel columns in a Notepad and save as “**Series Name.ppp**”.

```
C18_GOSSE_R4_1_Q_NSA.ppp - Notepad
File Edit Format View Help
date C18_GOSSE_R4_1_Q.ppp
-----
199701 0.94192
199702 1.00491
199703 1.02814
199704 1.02498
199801 0.94008
199802 1.00859
199803 1.02840
199804 1.02179
199901 0.93989
199902 1.00943
199903 1.03218
199904 1.01698
200001 0.94056
200002 1.01000
200003 1.03476
200004 1.01405
200101 0.93876
200102 1.01352
200103 1.03684
200104 1.00803
200201 0.94127
200202 1.01399
200203 1.03942
200204 1.00366
200301 0.94163
200302 1.01502
200303 1.04281
200304 0.99911
200401 0.94366
200402 1.01226
200403 1.04604
200404 0.99866
200501 0.94400
200502 1.00928
200503 1.04790
200504 0.99830
200601 0.94843
200602 1.00323
200603 1.04753
200604 1.00179
200701 0.94905
200702 1.00341
```

```
View File: C18_GOSSE_R4_1_Q_NSA.spc
Comment Uncomment Run Save Save As

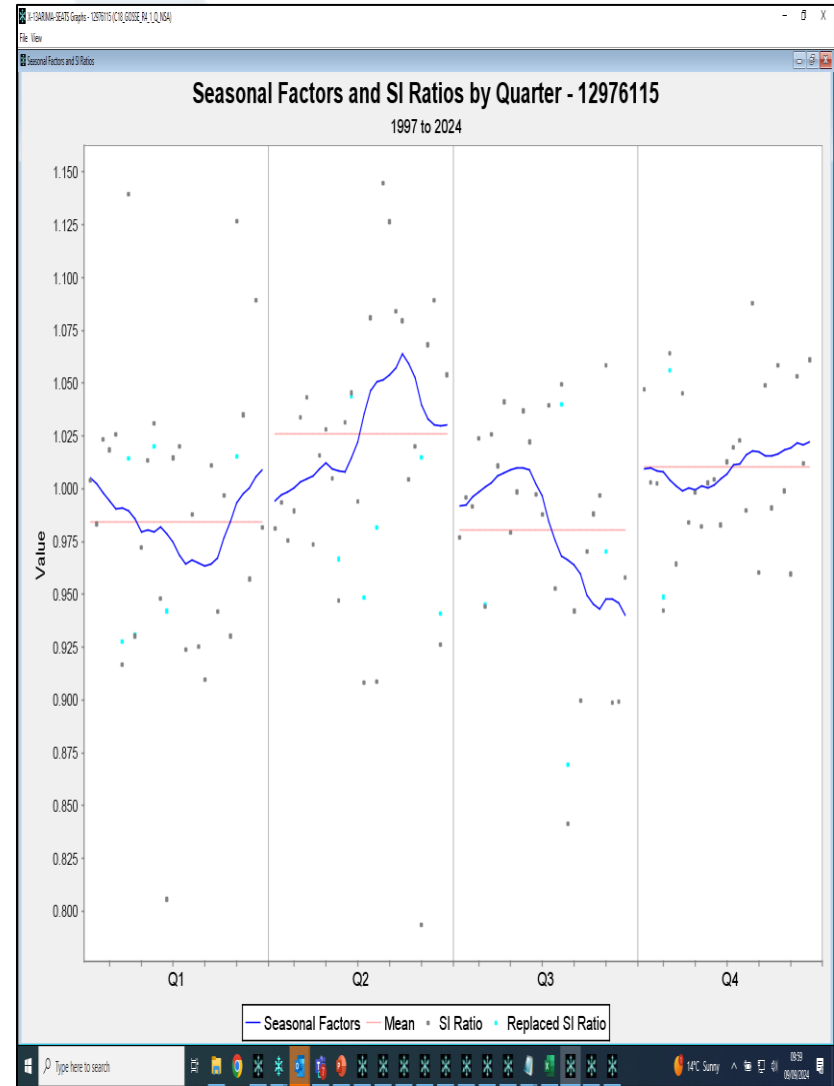
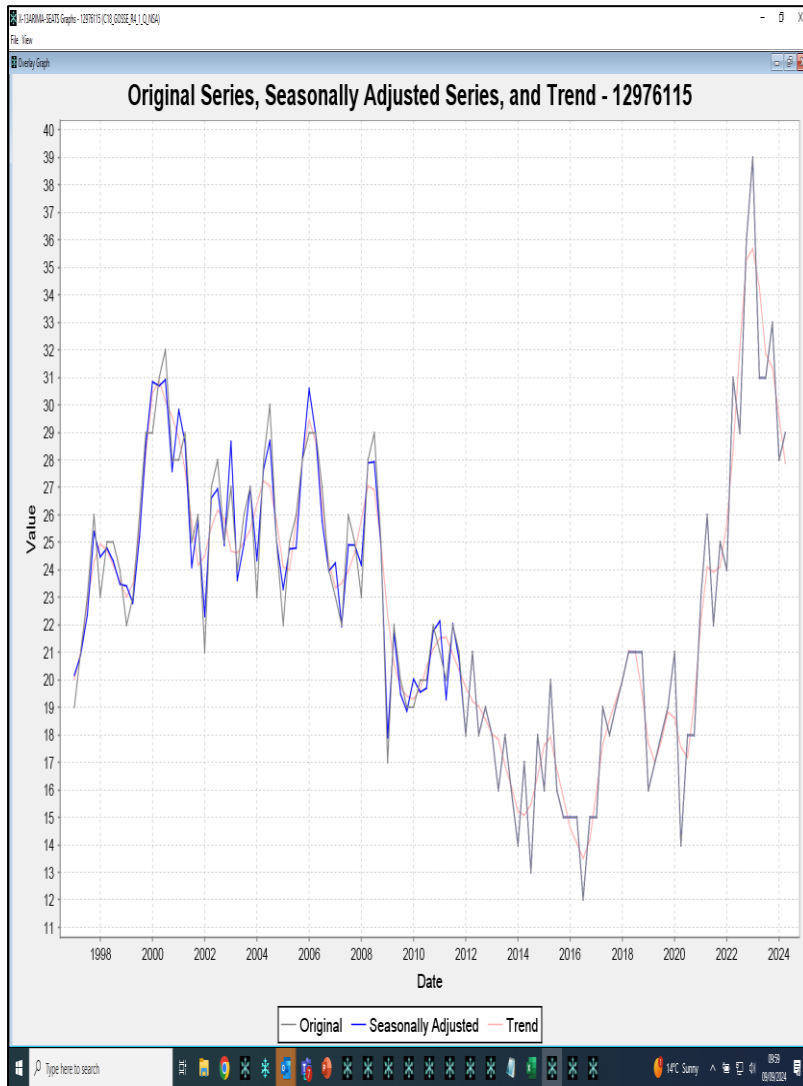
#Time stamp 2019-06-21 09:45:57 ping
series{
title="12976115"
file="C18_GOSSE_R4_1_Q_NSA.dat"
format="datevalue"
period=4
decimals=2
#modelspan=(,2012.2)
}

transform{
function=log
format="xl2save"
file="C18_GOSSE_R4_1_Q_NSA.ppp"
type=(permanent)
mode=ratio
}

force{
type=denton
rho=1
lambda=1
round=no
usefcst=no
mode=ratio
save=saa
}

x11{
type=summary
appendfcst=yes
save=(d10 d11 d12 d13)
}
```

How to introduce a seasonal break – Example 1



How to introduce a seasonal break – Example 2

Let assume that based on SI Ratios, 2012 Q4 and 2020 Q1 are potential data points for a seasonal break.

Diagnostics											
File Help											
General Model Info Model Diagnostics x11 Spectrum & QS Stability Diagnostics											
	Series Name	Model Span	ARIMA Model	Regressors	Trading Day	Holiday	Seasonal	Constant	User	Coded Outliers	Auto Outliers
▶	P_3_S_1311_59_TO	1997.01 to 2023.02	(2 0 0)(0 1 1)**	Seasonal (before 2012.4) + Constant			SR[F-p0.00]	C#1.87			
	P_3_S_1311_59_TO	1997.01 to 2023.02	(2 1 0)(0 1 1)	Seasonal (before 2012.4)			SR[F-p0.00]				
	P_3_S_1311_59_TO	1997.01 to 2023.02	(1 0 1)(0 1 1)**	Seasonal (before 2020.1)			SR[F-p0.01]				

Both seasonal breaks are statistically significant.

```
transform{function=auto}
automdl{}
regression{
variables=(seasonal/2012.4//)
}
```

```
transform{function=auto}
arima{model=(2 1 0)(0 1 1)}
regression{
variables=(seasonal/2012.4//)
}
```

```
transform{function=auto}
automdl{}
regression{
variables=(seasonal/2020.1//)
}
```

How to introduce a seasonal break – Example 2

How to decide the type of seasonal break

```
View File: P_3_S_1311_59_TOTAL_CP_NSA_R4_2_Q_V.spc
Comment Uncomment Run Save Save As Font
#Time stamp 2020-02-05 10:40:29 Atanaska Nikolova
series(
title="P_3_S_1311_59_CP"
file="P_3_S_1311_59_TOTAL_CP_NSA_R4_2_Q_V.dat"
format="datevalue"
period=4
decimals=2
span=(,2012.4)
)

transform(function=auto)

automdl()

regression(
aictest=(easter td)
)

estimate(maxiter=5000)

outlier()

forecast(
maxlead=4
save=fct
)

force(
type=denton
rho=1
lambda=1
round=no
usefcst=no
mode=ratio
save=saa
)

x11(
appendfcst=yes
save=(d8 d9 d10 d11 d12 d13 d18)
)
```

```
View File: P_3_S_1311_59_TOTAL_CP_NSA_R4_2_Q_V.spc
Comment Uncomment Run Save Save As Font
#Time stamp 2020-02-05 10:40:29 Atanaska Nikolova
series(
title="P_3_S_1311_59_CP"
file="P_3_S_1311_59_TOTAL_CP_NSA_R4_2_Q_V.dat"
format="datevalue"
period=4
decimals=2
span=(2012.4,2020.1)
)

transform(function=auto)

automdl()

regression(
aictest=(easter td)
)

estimate(maxiter=5000)

outlier()

forecast(
maxlead=4
save=fct
)

force(
type=denton
rho=1
lambda=1
round=no
usefcst=no
mode=ratio
save=saa
)

x11(
appendfcst=yes
save=(d8 d9 d10 d11 d12 d13 d18)
)
```

```
View File: P_3_S_1311_59_TOTAL_CP_NSA_R4_2_Q_V.spc
Comment Uncomment Run Save Save As Font
#Time stamp 2020-02-05 10:40:29 Atanaska Nikolova
series(
title="P_3_S_1311_59_CP"
file="P_3_S_1311_59_TOTAL_CP_NSA_R4_2_Q_V.dat"
format="datevalue"
period=4
decimals=2
span=(2018.1,)
)

transform(function=auto)

automdl()

regression(
aictest=(easter td)
)

estimate(maxiter=5000)

outlier()

forecast(
maxlead=4
save=fct
)

force(
type=denton
rho=1
lambda=1
round=no
usefcst=no
mode=ratio
save=saa
)

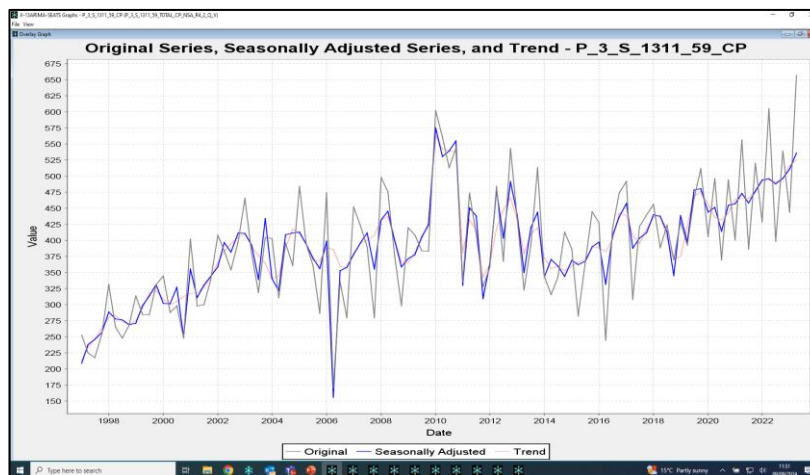
x11(
appendfcst=yes
save=(d8 d9 d10 d11 d12 d13 d18)
)
```

How to introduce a seasonal break – Example 2

Span	M7
(,2012.4)	0.504
(2012.4,2020.1)	0.489
(2018.1,)	0.729

Last data point: 2023 Q2. We can't test the **span=(2020.1,)** because we need at least 5 years.

A seasonal to seasonal to seasonal break seems reasonable.



The type of break is also obvious from the overlay graph.

How to introduce a seasonal break – Example 2

Initially, create an RMX file with the latest break.

```
View File: P_3_S_1311_59_TOTAL_CP_NSA_R4_2_Q_V.spc
Comment Uncomment Run Save Save As Font

#Time stamp 2020-02-05 10:40:29 Atanaska Nikolova
series{
title="P_3_S_1311_59_CP"
file="P_3_S_1311_59_TOTAL_CP_NSA_R4_2_Q_V.dat"
format="datevalue"
period=4
decimals=2
}

transform(function=auto)

automdl{

regression{
variables=(seasonal/2020.1//)
save=rmx
}

estimate(maxiter=5000)

forecast{
maxlead=4
save=fct
}

force{
type=denton
rho=1
lambda=1
round=no
usefcst=no
mode=ratio
save=saa
}

x11{
appendfcst=yes
save=(d8 d9 d10 d11 d12 d13 d18)
}
```

P_3_S_1311_59_TOTAL_CP_NSA_R4_2_Q_V.rmx - Notepad

Date	1st I	2nd I	3rd I
199701	+0.100000000000000E+01	+0.000000000000000E+00	+0.000000000000000E+00
199702	+0.000000000000000E+00	+0.100000000000000E+01	+0.000000000000000E+00
199703	+0.000000000000000E+00	+0.000000000000000E+00	+0.100000000000000E+01
199704	-0.100000000000000E+01	-0.100000000000000E+01	-0.100000000000000E+01
199801	+0.100000000000000E+01	+0.000000000000000E+00	+0.000000000000000E+00
199802	+0.000000000000000E+00	+0.100000000000000E+01	+0.000000000000000E+00
199803	+0.000000000000000E+00	+0.000000000000000E+00	+0.100000000000000E+01
199804	-0.100000000000000E+01	-0.100000000000000E+01	-0.100000000000000E+01
199901	+0.100000000000000E+01	+0.000000000000000E+00	+0.000000000000000E+00
199902	+0.000000000000000E+00	+0.100000000000000E+01	+0.000000000000000E+00
199903	+0.000000000000000E+00	+0.000000000000000E+00	+0.100000000000000E+01
199904	-0.100000000000000E+01	-0.100000000000000E+01	-0.100000000000000E+01
200001	+0.100000000000000E+01	+0.000000000000000E+00	+0.000000000000000E+00
200002	+0.000000000000000E+00	+0.100000000000000E+01	+0.000000000000000E+00
200003	+0.000000000000000E+00	+0.000000000000000E+00	+0.100000000000000E+01
200004	-0.100000000000000E+01	-0.100000000000000E+01	-0.100000000000000E+01
200101	+0.100000000000000E+01	+0.000000000000000E+00	+0.000000000000000E+00
200102	+0.000000000000000E+00	+0.100000000000000E+01	+0.000000000000000E+00
200103	+0.000000000000000E+00	+0.000000000000000E+00	+0.100000000000000E+01
200104	-0.100000000000000E+01	-0.100000000000000E+01	-0.100000000000000E+01
200201	+0.100000000000000E+01	+0.000000000000000E+00	+0.000000000000000E+00
200202	+0.000000000000000E+00	+0.100000000000000E+01	+0.000000000000000E+00
200203	+0.000000000000000E+00	+0.000000000000000E+00	+0.100000000000000E+01
200204	-0.100000000000000E+01	-0.100000000000000E+01	-0.100000000000000E+01
200301	+0.100000000000000E+01	+0.000000000000000E+00	+0.000000000000000E+00
200302	+0.000000000000000E+00	+0.100000000000000E+01	+0.000000000000000E+00
200303	+0.000000000000000E+00	+0.000000000000000E+00	+0.100000000000000E+01
200304	-0.100000000000000E+01	-0.100000000000000E+01	-0.100000000000000E+01
200401	+0.100000000000000E+01	+0.000000000000000E+00	+0.000000000000000E+00
200402	+0.000000000000000E+00	+0.100000000000000E+01	+0.000000000000000E+00
200403	+0.000000000000000E+00	+0.000000000000000E+00	+0.100000000000000E+01
200404	-0.100000000000000E+01	-0.100000000000000E+01	-0.100000000000000E+01
200501	+0.100000000000000E+01	+0.000000000000000E+00	+0.000000000000000E+00
200502	+0.000000000000000E+00	+0.100000000000000E+01	+0.000000000000000E+00
200503	+0.000000000000000E+00	+0.000000000000000E+00	+0.100000000000000E+01
200504	-0.100000000000000E+01	-0.100000000000000E+01	-0.100000000000000E+01
200601	+0.100000000000000E+01	+0.000000000000000E+00	+0.000000000000000E+00
200602	+0.000000000000000E+00	+0.100000000000000E+01	+0.000000000000000E+00
200603	+0.000000000000000E+00	+0.000000000000000E+00	+0.100000000000000E+01
200604	-0.100000000000000E+01	-0.100000000000000E+01	-0.100000000000000E+01
200701	+0.100000000000000E+01	+0.000000000000000E+00	+0.000000000000000E+00
200702	+0.000000000000000E+00	+0.100000000000000E+01	+0.000000000000000E+00
200703	+0.000000000000000E+00	+0.000000000000000E+00	+0.100000000000000E+01
200704	-0.100000000000000E+01	-0.100000000000000E+01	-0.100000000000000E+01
200801	+0.100000000000000E+01	+0.000000000000000E+00	+0.000000000000000E+00
200802	+0.000000000000000E+00	+0.100000000000000E+01	+0.000000000000000E+00
200803	+0.000000000000000E+00	+0.000000000000000E+00	+0.100000000000000E+01
200804	-0.100000000000000E+01	-0.100000000000000E+01	-0.100000000000000E+01
200901	+0.100000000000000E+01	+0.000000000000000E+00	+0.000000000000000E+00
200902	+0.000000000000000E+00	+0.100000000000000E+01	+0.000000000000000E+00
200903	+0.000000000000000E+00	+0.000000000000000E+00	+0.100000000000000E+01

	A	B	C	D
1	Date	1st I	2nd I	3rd I
2	----	-----	-----	-----
3	199701	1.00E+00	0.00E+00	0.00E+00
4	199702	0.00E+00	1.00E+00	0.00E+00
5	199703	0.00E+00	0.00E+00	1.00E+00
6	199704	-1.00E+00	-1.00E+00	-1.00E+00
7	199801	1.00E+00	0.00E+00	0.00E+00
8	199802	0.00E+00	1.00E+00	0.00E+00
9	199803	0.00E+00	0.00E+00	1.00E+00
10	199804	-1.00E+00	-1.00E+00	-1.00E+00
11	199901	1.00E+00	0.00E+00	0.00E+00
12	199902	0.00E+00	1.00E+00	0.00E+00
13	199903	0.00E+00	0.00E+00	1.00E+00
14	199904	-1.00E+00	-1.00E+00	-1.00E+00
15	200001	1.00E+00	0.00E+00	0.00E+00
16	200002	0.00E+00	1.00E+00	0.00E+00
17	200003	0.00E+00	0.00E+00	1.00E+00
18	200004	-1.00E+00	-1.00E+00	-1.00E+00
19	200101	1.00E+00	0.00E+00	0.00E+00
20	200102	0.00E+00	1.00E+00	0.00E+00
21	200103	0.00E+00	0.00E+00	1.00E+00
22	200104	-1.00E+00	-1.00E+00	-1.00E+00
23	200201	1.00E+00	0.00E+00	0.00E+00
24	200202	0.00E+00	1.00E+00	0.00E+00
25	200203	0.00E+00	0.00E+00	1.00E+00
26	200204	-1.00E+00	-1.00E+00	-1.00E+00
27	200301	1.00E+00	0.00E+00	0.00E+00
28	200302	0.00E+00	1.00E+00	0.00E+00
29	200303	0.00E+00	0.00E+00	1.00E+00
30	200304	-1.00E+00	-1.00E+00	-1.00E+00
31	200401	1.00E+00	0.00E+00	0.00E+00
32	200402	0.00E+00	1.00E+00	0.00E+00
33	200403	0.00E+00	0.00E+00	1.00E+00
34	200404	-1.00E+00	-1.00E+00	-1.00E+00
35	200501	1.00E+00	0.00E+00	0.00E+00
36	200502	0.00E+00	1.00E+00	0.00E+00

Sheet1 Sheet2 Sheet3

How to introduce a seasonal break – Example 2

	A	B	C	D	E	F	G
1	Date	1st I	2nd I	3rd I	1st II	2nd II	3rd II
2	----						
3	199701	1.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00
4	199702	0.00E+00	1.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00
5	199703	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00	1.00E+00
6	199704	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00
7	199801	1.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00
8	199802	0.00E+00	1.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00
9	199803	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00	1.00E+00
10	199804	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00
11	199901	1.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00
12	199902	0.00E+00	1.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00
13	199903	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00	1.00E+00
14	199904	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00
15	200001	1.00E+00	0.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00
16	200002	0.00E+00	1.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00
17	200003	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00	1.00E+00
18	200004	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00
19	200101	1.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00
20	200102	0.00E+00	1.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00
21	200103	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00	1.00E+00
22	200104	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00
23	200201	1.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00
24	200202	0.00E+00	1.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00
25	200203	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00	1.00E+00
26	200204	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00
27	200301	1.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00
28	200302	0.00E+00	1.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00
29	200303	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00	1.00E+00
30	200304	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00
31	200401	1.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00
32	200402	0.00E+00	1.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00
33	200403	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00	1.00E+00
34	200404	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00
35	200501	1.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00
36	200502	0.00E+00	1.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00

	A	B	C	D	E	F	G
63	201201	1.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00
64	201202	0.00E+00	1.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00
65	201203	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00	1.00E+00
66	201204	-1.00E+00	-1.00E+00	-1.00E+00	0.00E+00	0.00E+00	0.00E+00
67	201301	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
68	201302	0.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
69	201303	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00
70	201304	-1.00E+00	-1.00E+00	-1.00E+00	0.00E+00	0.00E+00	0.00E+00
71	201401	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
72	201402	0.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
73	201403	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00
74	201404	-1.00E+00	-1.00E+00	-1.00E+00	0.00E+00	0.00E+00	0.00E+00
75	201501	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
76	201502	0.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
77	201503	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00
78	201504	-1.00E+00	-1.00E+00	-1.00E+00	0.00E+00	0.00E+00	0.00E+00
79	201601	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
80	201602	0.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
81	201603	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00
82	201604	-1.00E+00	-1.00E+00	-1.00E+00	0.00E+00	0.00E+00	0.00E+00
83	201701	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
84	201702	0.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
85	201703	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00
86	201704	-1.00E+00	-1.00E+00	-1.00E+00	0.00E+00	0.00E+00	0.00E+00
87	201801	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
88	201802	0.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
89	201803	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00
90	201804	-1.00E+00	-1.00E+00	-1.00E+00	0.00E+00	0.00E+00	0.00E+00
91	201901	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
92	201902	0.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
93	201903	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00
94	201904	-1.00E+00	-1.00E+00	-1.00E+00	0.00E+00	0.00E+00	0.00E+00
95	202001	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
96	202002	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
97	202003	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
98	202004	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Columns **1st I**; **2nd I**; **3rd I**: Seasonal break in 2020 Q1 -> 0s from 202001 and onwards.

Columns **1st II**; **2nd II**; **3rd II**: Seasonal break in 2012 Q4 -> 0s from 201204 and onwards.

How to introduce a seasonal break – Example 2

	A	B	C	D	E	F	G
98	202004	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
99	202101	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
100	202102	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
101	202103	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
102	202104	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
103	202201	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
104	202202	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
105	202203	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
106	202204	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
107	202301	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
108	202302	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
109	202303	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
110	202304	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
111	202401	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
112	202402	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
113	202403	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
114	202404	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
115	202501	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
116	202502	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
117	202503	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
118	202504	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
119	202601	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
120	202602	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
121	202603	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
122	202604	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
123	202701	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
124	202702	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
125	202703	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
126	202704	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
127	202801	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
128	202802	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
129	202803	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
130	202804	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
131							

RMX files need to be extended by at least 2 years to avoid future errors.

How to introduce a seasonal break – Example 2

Copy/Paste the updated Excel columns into the RMX file.

P_3_S_1311_59_TOTAL_CP_NSA_R4_2_Q.V.rmx - Notepad							
File Edit Format View Help							
Date	1st I	2nd I	3rd I	1st II	2nd II	3rd II	
199701	1.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00	
199702	0.00E+00	1.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00	
199703	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00	1.00E+00	
199704	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	
199801	1.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00	
199802	0.00E+00	1.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00	
199803	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00	1.00E+00	
199804	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	
199901	1.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00	
199902	0.00E+00	1.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00	
199903	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00	1.00E+00	
199904	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	
200001	1.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00	
200002	0.00E+00	1.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00	
200003	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00	1.00E+00	
200004	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	
200101	1.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00	
200102	0.00E+00	1.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00	
200103	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00	1.00E+00	
200104	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	
200201	1.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00	
200202	0.00E+00	1.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00	
200203	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00	1.00E+00	
200204	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	
200301	1.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00	
200302	0.00E+00	1.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00	
200303	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00	1.00E+00	
200304	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	
200401	1.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00	
200402	0.00E+00	1.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00	
200403	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00	1.00E+00	
200404	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	
200501	1.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00	
200502	0.00E+00	1.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00	
200503	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00	1.00E+00	
200504	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	
200601	1.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00	
200602	0.00E+00	1.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00	
200603	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00	1.00E+00	
200604	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	
200701	1.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00	
200702	0.00E+00	1.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00	
200703	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00	1.00E+00	
200704	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	
200801	1.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00	
200802	0.00E+00	1.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00	

```
View File: P_3_S_1311_59_TOTAL_CP_NSA_R4_2_Q.V.spc
Comment Uncomment Run Save Save As Font
#Time stamp 2020-02-05 10:40:29 Atanaska Nikolova
series{
title="P_3_S_1311_59_CP"
file="P_3_S_1311_59_TOTAL_CP_NSA_R4_2_Q.V.dat"
format="datevalue"
period=4
decimals=2
}

transform(function=auto)

automdl{}

regression{
#variables=(seasonal/2020.1//)
#variables=(seasonal/2012.4//)
#save=rmx
aictest=(easter td)
format="xl2save"
file="P_3_S_1311_59_TOTAL_CP_NSA_R4_2_Q.V.rmx"
user=(Q1 Q2 Q3 P1 P2 P3)
usertype=(seasonal)
}

estimate(maxiter=5000)

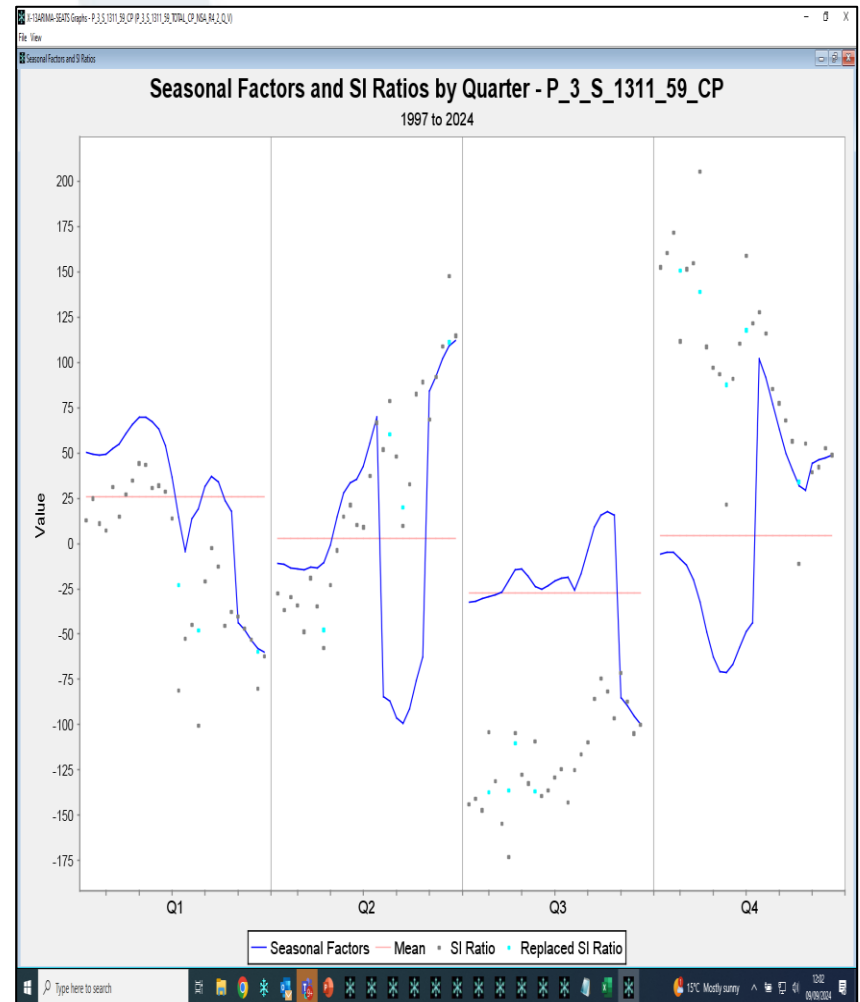
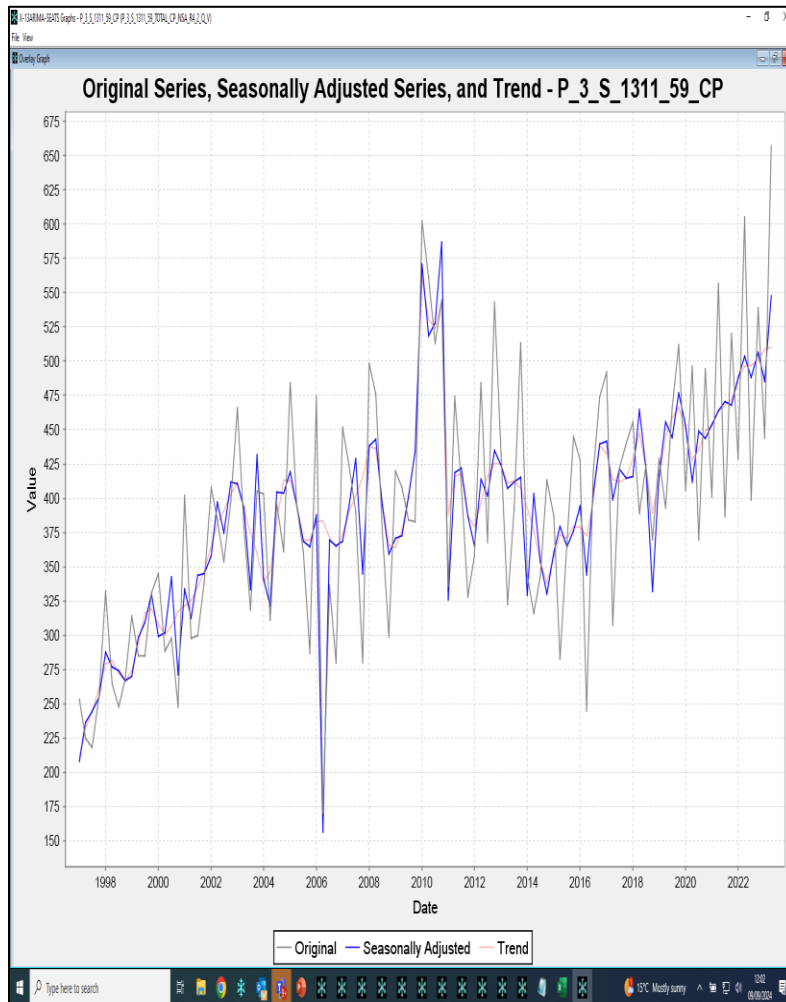
outlier{}

forecast{
maxlead=4
save=fcst
}

force{
type=denton
rho=1
lambda=1
round=no
usefcst=no
mode=ratio
save=saa
}

x11{
appendfcst=yes
save=(d6 d9 d10 d11 d12 d13 d18)
}
```

How to introduce a seasonal break – Example 2



Change the data point of a seasonal break –
Example 3 (*demonstration in Win-X13*)

Questions?

