Annual Review Process for the Seasonal Adjustment of MSA

Jennifer Oh
OEUS/SMS
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Outline

- MSA Data
- SA Method
- Annual Processing Steps
- How to handle bad fitting models
- Tools to evaluate model: Diagnostic Tables and Graphs

Metropolitan Statistical Area (MSA)

- MSA Areas: 428 areas (EM + UN) =856
- Data Span: 1990+
- Series are split into two parts: pre-2000 and 2000+ (methodology and labor market area changes)
- Software: X-13A-S (ARIMA-SEATS)
- Seasonal Adjustment was done with SEATS

SEATS Diagnostics

- Fit of ARIMA model to series
  - Ljung-Box goodness of fit statistics- LB12, LB24
  - MA12 coefficient-stable seasonality
  - Seasonal peak-Spectrum graphs
  - Chi-square-changing seasonality

Annual Processing

- At the beginning of a new year, previous year's data would be revised
  - Population control
  - Data edits
  - Change in Benchmark
- Re-examining historical series with revised data
- Test for new outliers

Annual Processing Steps

- Step1. Add revised data and run with existing ARIMA model
  - For good fits, leave models unchanged
  - For bad fits, manually re-specify models
- Step2. Check for significant change in seasonality using Chi-sq statistics
  - For those MSAs with Seasonal regressor, we want to check they are still significant
- Step3. Clean up bad fitting series
- Step4. Ready for monthly estimates

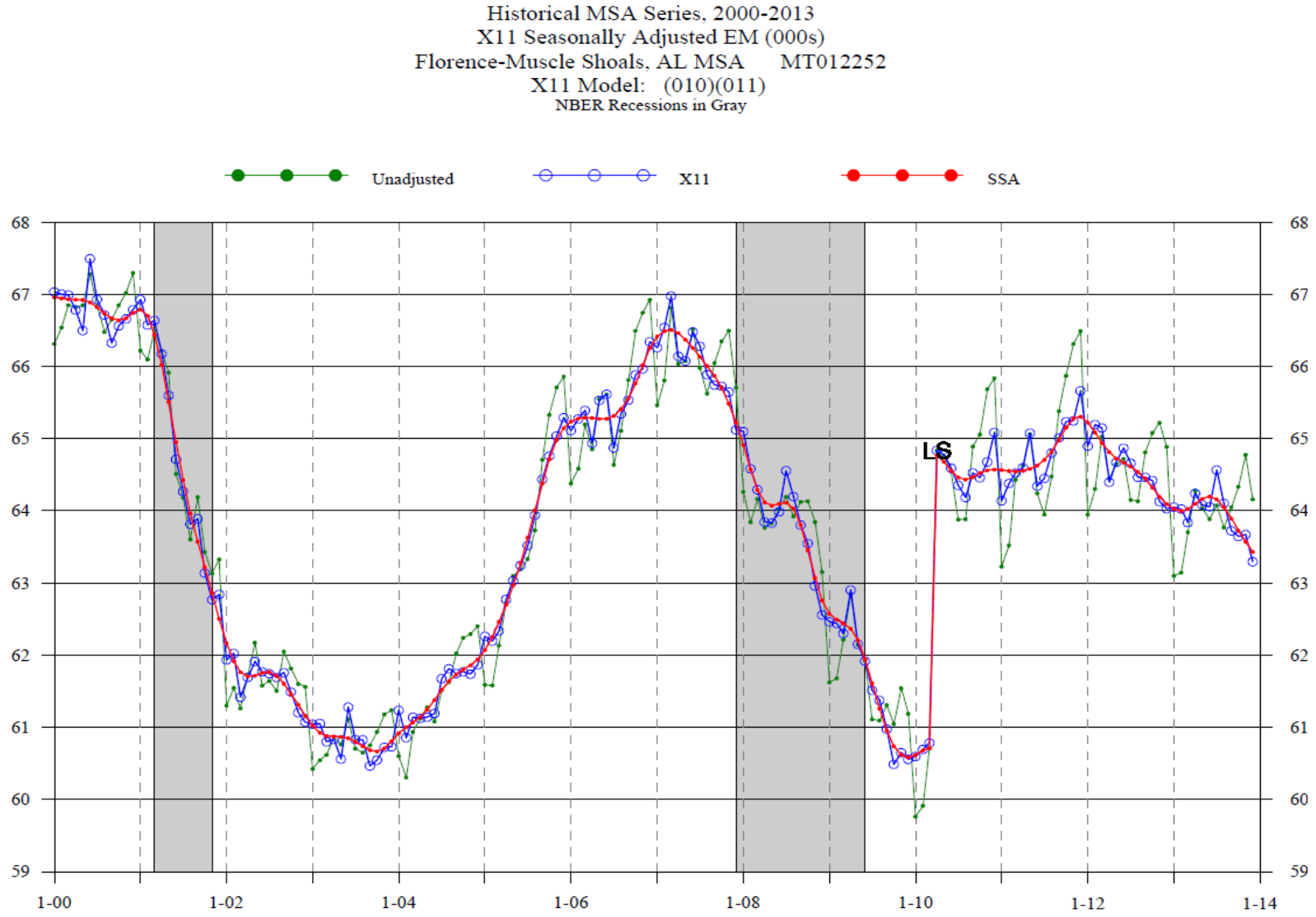
Poor fitting model (1 of 4)

1. My series even seasonal?
   - If my series not seasonal, we do not want to seasonally adjustment them.
   - If series is not seasonal, SEATS will not go through seasonal adjustment process.

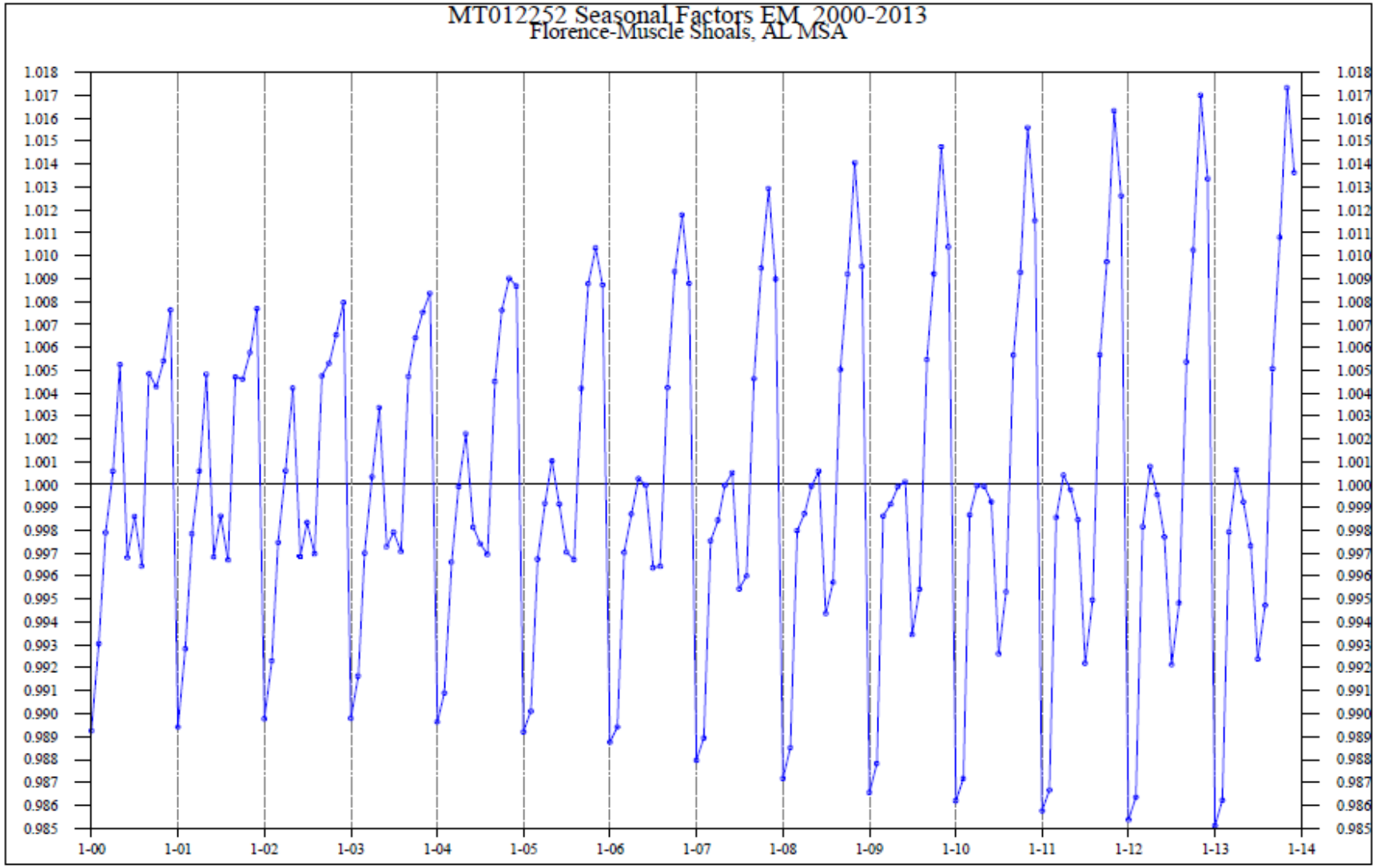
Poor fitting model (2 of 4)

2. Is there changing seasonality?
   - Sometimes seasonality change so much over the span of time, X13 will have hard time finding a good fitting model
   - We need to test for changing seasonality by chi-square test.
   - Chi-square p-value <= 0.01 is considered significant

Seasonal Reg. Example



Example of Seasonal Plot w/o Seasonal Regressor



X13A-S Spec Example (adding in Sea. Reg.)

```
series{
 span            =(2000.1,2023.12)
 title           ='MT0122520000000_EM_Florence-Muscle Shoals, AL MSA'
 file            ='/cpslaus/D10/Stars/SadAreas/Annual/programs/x12_files/AL/EM/x11/MT0122520000000.dat'
 format          ='datevalue'
 precision       =5
 decimals        =2
 }
transform{
 function        =auto
 }
regression{
 variables       =(seasonal//2010.jan/
TC2010.jan
LS2010.apr
LS2017.jan
TC2020.apr
 )
 save            =(ls ao tc a10)
 }
arima{
 model            =(3 1 1)(0 1 1)
 }
```

X13A-S Output Example (Chi-Sq)

Chi-squared Tests for Groups of Regressors

Regression Effect	df	Chi-Square	P-Value
Seasonal (starting 2010.Jan)	11	25.36	0.01

Poor fitting model (3 of 4)

3. My series too long?
   - Our MSA series are already cut pre- and post- year 2000.
   - methodology and labor market area changes
4. My model overly complex?
   - Most of the time simple model (like airline) is better than complex model.
   - Complex high order model tends to change with additional data.

Poor fitting model (4 of 4)

5. Identifying outliers correctly?
   - States may have better information about their local events that need to be tested as outliers.
     - HI requested: Maui Wildfire (Aug. and Sep. 2023)
     - FL requested: Hurricane Ian (Oct. 2022)
   - Drop outliers that are no longer significant
   - Change in Outlier type: Pandemic outliers
   - Add in new outliers

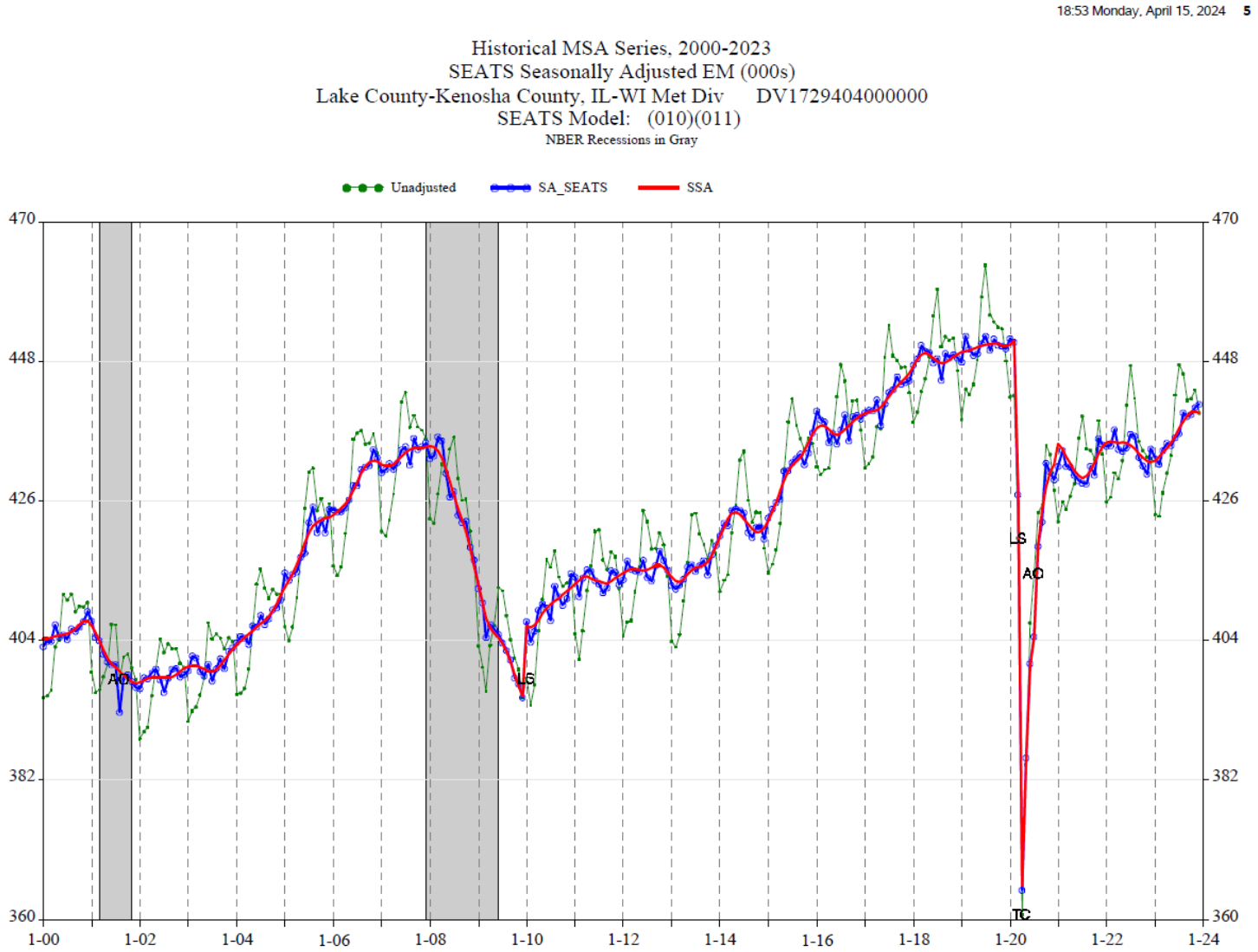
Diagnostic Tables

areacode	modelst	numoutst	modest	lb12st	lb24st	p12st	p24st	chi_sea	chi_sea_p	lamrst	plamrst	skewst	exkst	hetst	ar1cst	ar2cst	ma1cst	ma12cst
DV1720994000000	(010)(011)	17	Mult	25.7	34.3	*0.01	0.06	82.2	0	0.6	0.8	-0.1	0.1	0.6				-0.7481
DV1729404000000	(010)(011)	3	Mult	14.5	25.1	0.21	0.35	.	.	0.0	1.0	0.0	0.0	0.7				-0.8484
MT1714010000000	(011)(011)	4	Mult	10.3	31.8	0.41	0.08	.	.	1.5	0.5	0.2	-0.1	0.7			-0.2200	-0.7567
MT1716060000000	(011)(011)	16	Mult	19.9	30.0	*0.03	0.12	49.7	0	2.6	0.3	0.0	0.5	1.7			-0.3068	-0.5299
MT1716580000000	(011)(011)	20	Mult	12.0	31.1	0.29	0.09	25.8	0.01	8.3	*0.02	0.2	0.8	1.0			-0.3428	-0.1486
MT1716980000000	(211)(011)	3	Mult	8.6	17.7	0.38	0.61	.	.	4.9	0.1	0.0	0.7	0.7	-0.5563	-0.2995	-0.5802	-0.8197
MT1719180000000	(110)(011)	14	Mult	9.7	24.6	0.47	0.32	46.6	0	0.2	0.9	-0.1	0.0	1.5	0.1960			-0.9945

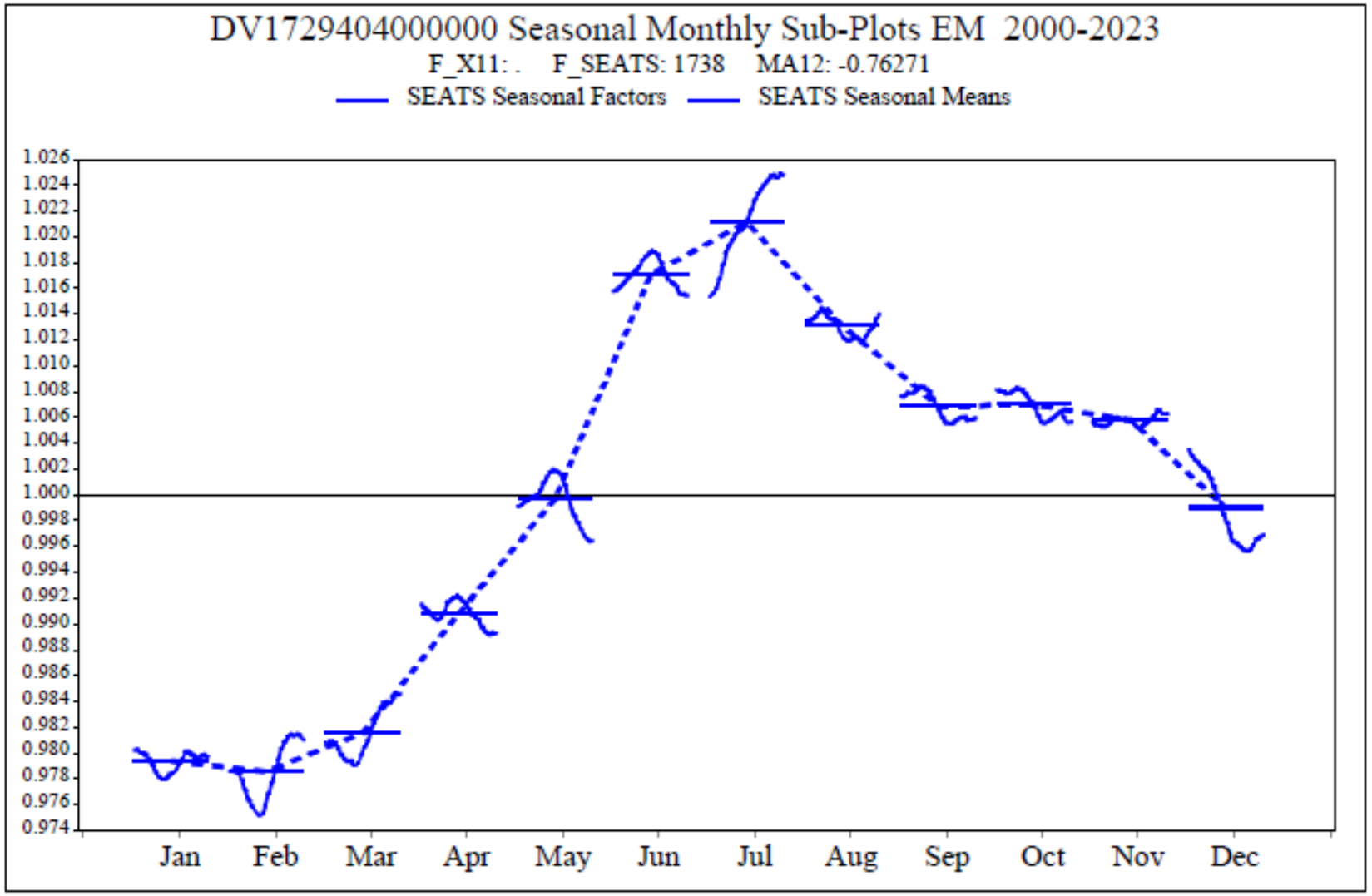
Outlier List

type	st	t	areacode	coef	year	month
LS	IL	(-7.5)	DV1720994000000	-0.037	2008	10
LS	IL	(-5.0)	DV1720994000000	-0.029	2010	1
LS	IL	(-13.0)	DV1720994000000	-0.065	2020	3
TC	IL	(-38.5)	DV1720994000000	-0.178	2020	4
AO	IL	(-5.0)	DV1720994000000	-0.018	2020	7
LS	IL	3.6	DV1720994000000	0.019	2021	11
LS	IL	5	DV1729404000000	0.029	2010	1
LS	IL	(-9.0)	DV1729404000000	-0.053	2020	3
TC	IL	(-30.1)	DV1729404000000	-0.164	2020	4

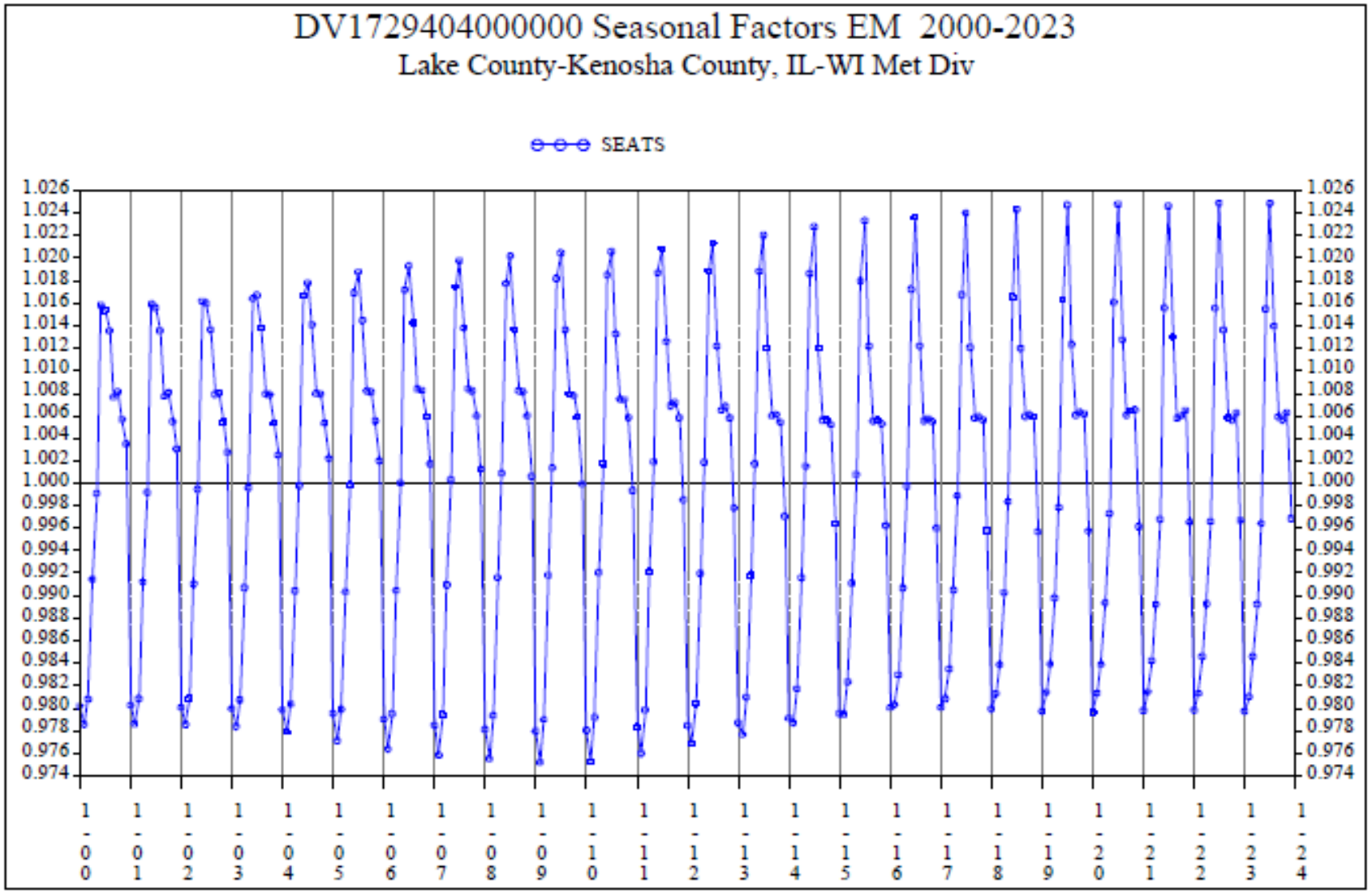
Historical Graph



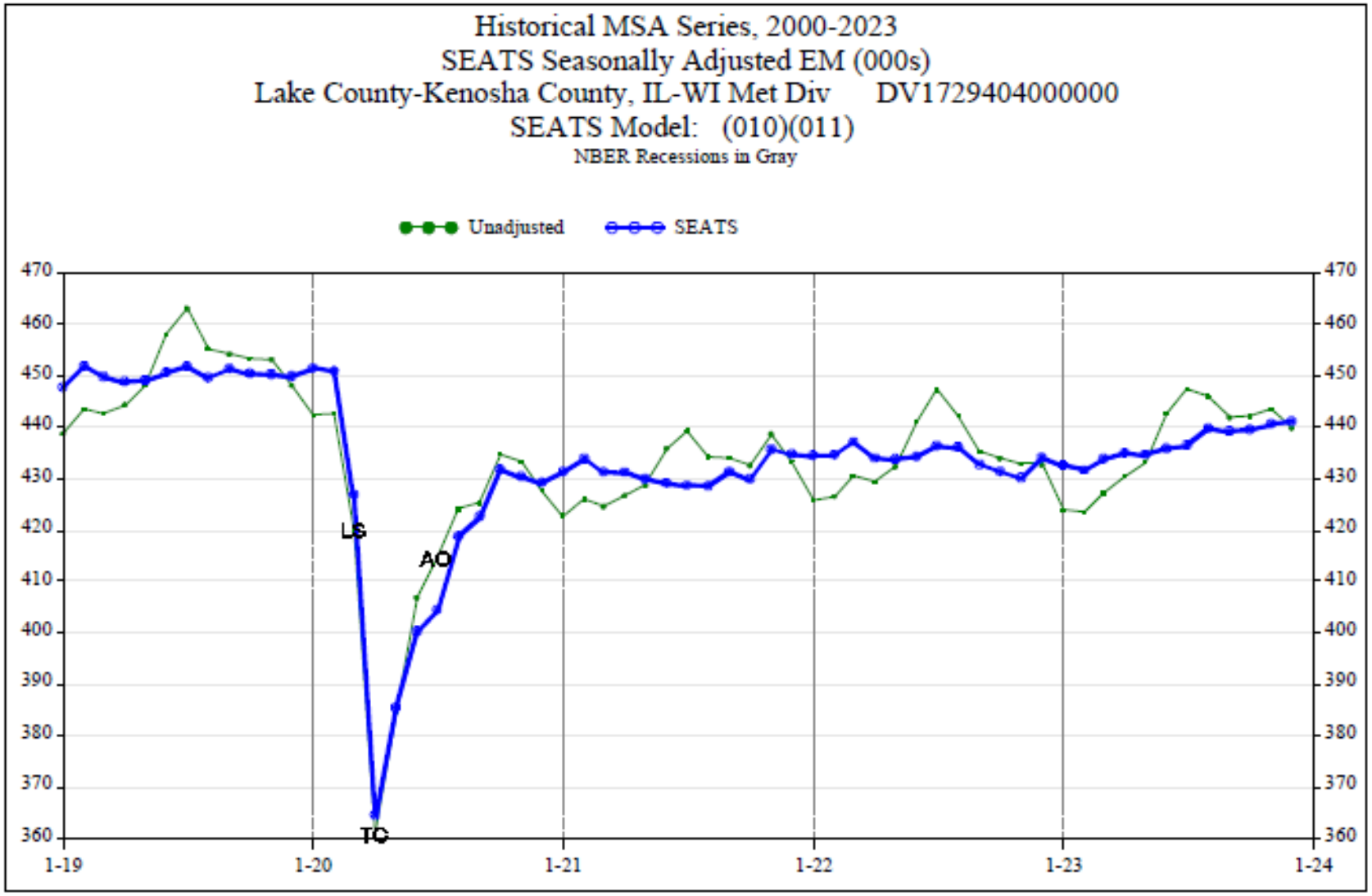
Seasonal Sub-Plot



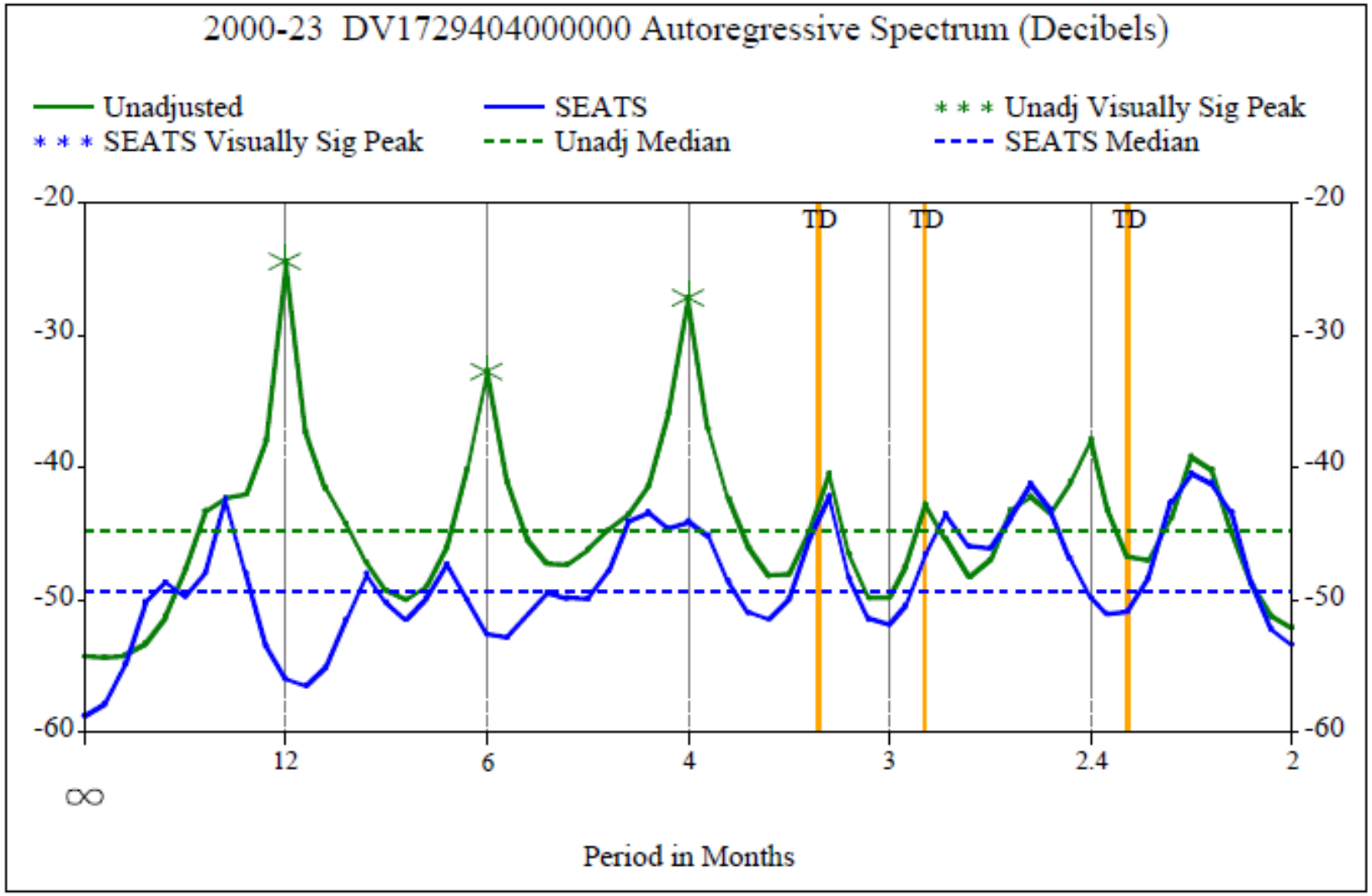
Seasonal Plot



Seasonally Adjusted



Spectrum Graph



Contact Information

Jennifer Oh

OEUS/SMS

oh.Jennifer@bls.gov