Metafiles and Composite Adjustments

Seasonal Adjustment With X-13ARIMA-SEATS

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Objectives

- **At the end of this unit, you should understand**
  - How to create a metafile and how to run a composite adjustment to aggregate multiple series

Running Multiple Spec Files

- Up to this point, examples have been individual series
- With X-13A-S, we can run multiple series with one call using *metafiles*

Metafiles

- Can adjust multiple series using a *metafile*, a text file containing a list of input spec files

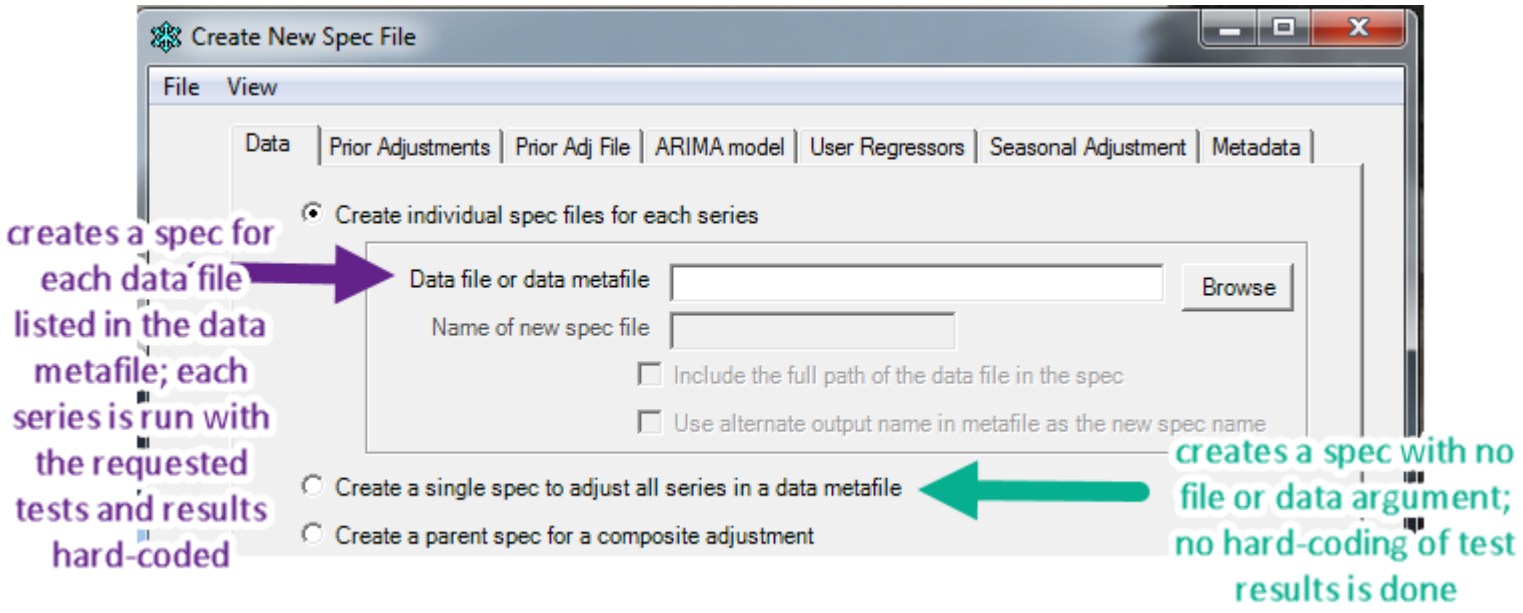
- ***Rule*** – Metafiles have .mta extension

Side Note: Data Metafiles

- We can also adjust multiple series using a *data metafile*, a list of data files, and one spec file
  - Remember data files can have various file extensions, so the list must show the extensions
- All series use the same spec file, which has no **`file`** or **`data`** argument in the **`series{}`** spec
- Not for production but good for research or experiments when you want to run the same settings for multiple series
- ***Rule*** – Data metafiles have .dta extensions

Data Metafiles and Win X-13

- Within Win X-13, data metafiles allow creating multiple spec files at once
  - Win X-13 creates a separate spec file for each data file listed – from that point forward, run those series with a metafile



Metafile Structure

- Specify one or two names per line
  - 1st: file name of a spec file
  - 2nd: file name for the output files (optional)
  - If only one name, the output name is the same as the spec file name
- If the spec file name or output name has spaces, it must be enclosed in quotation marks

- (For data metafiles, two names also are allowed, 1st is the name of the data file, 2nd is the new output name)

Metafile Contents

starts.mta:

hs_ne
hs_mw
hs_s
hs_w
hs_tot

Runs these spec files:

hs_ne.spc
hs_mw.spc
hs_s.spc
hs_w.spc
hs_tot.spc

Renaming Metafile Output

starts.mta:

hs_ne “NE Starts”
hs_mw “MW Starts”
hs_s “S Starts”
hs_w “W Starts”
hs_tot “US Total Starts”

Runs the same spec files, but renames the output. Output files are ‘NE Starts.html’, ‘MW Starts.html’, etc.

Advantages of Metafile

- Saves time
- Creates one log file for all the series
  - At the bottom of the log file is a summary of series that had run-time errors, best feature of the log file
- Computes diagnostics for **`composite`** runs

Definitions – Direct and Indirect Adjustments

- Options for adjusting a sum (or other composite) of component series
  - Direct = seasonally adjust the aggregated component series
    - Aggregate then adjust
  - Indirect = seasonally adjust each component series and aggregate those adjustments
    - Adjust then aggregate

Example – Direct Versus Indirect Adjustment

US = NE + MW + S + W

- Indirect seasonal adjustment of US

  SA(NE) + SA(MW) + SA(S) + SA(W)

- Direct seasonal adjustment of US

  SA (NE + MW + S + W)

Slightly Different Example

Ratio of Inventory to Sales

Indirect seasonal adjustment of ratio

$$\frac{SA(\text{Inventory})}{SA(\text{Sales})}$$

Direct seasonal adjustment of ratio

$$SA(\text{Inventory} / \text{Sales})$$

Direct Versus Indirect

- Indirect generally is better when the components have
  - Distinct seasonal patterns
  - Adjustments of good quality

- Direct generally is better when the components have
  - Similar seasonal patterns (summing the series may cancel some noise)

Aggregate Series' Spec File

- Generates indirect *and* direct adjustments of a series from a set of component series
- Spec file for the aggregate series must have a **`composite`** spec (in place of the **`series`** spec)
  - Looks a lot like a **`series`** spec
  - But no **`file`** statement, no **`data`** statement, no **`span`** statement
  - (**`modelspan`** statement is allowed)

`Composite` Spec

- Controls
  - Tables to print or save for the ***indirect*** seasonal adjustment of the aggregate series
  - Global options for output
  - ***Direct*** regARIMA model span

- Can save (implicit) adjustment factors from the indirect adjustment

Composite Spec Syntax

```
composite{
 title = "My Total Series"
 name = "MyName"
 decimals = integer from 0 to 5
#  default: 0
 modelspan = (yyyy.mm, yyyy.mm)
#  default: span of the components
 savelog = all    # new option in 0.3
 print = See Manual/Quick Reference
 save = See Manual/Quick Reference
}
```

`X11` Spec for the Aggregate Series

- **`X11`** spec controls the ***direct*** seasonal adjustment of the series
  - Seasonal moving average, sigma limits, etc.
- Same syntax as for any other adjustment

- Can save adjustment factors from the direct adjustment

Composite and **X11** Specs for the Aggregate Series

```
composite {title="US Total HS"
   save=(indseasonal i18)
}
. . .
x11 {seasonalma=s3x9 save=e18}
. . .
```

How to Perform a **`Composite`** Seasonal Adjustment

1) Create spec files for component series
2) Create spec file for the aggregate (parent) series
3) Create a metafile
4) Run the adjustment

Step 1 - Create Spec Files for Component Series

Example: Single-Family Housing Starts

- U.S. Total Single-Family Housing Starts = Sum of (Northeast, Midwest, South, and West)

Component Series

- Each component series must specify the composite type in the **`series`** spec to tell X-13A-S how to calculate the composite

```
comptype =
  add
  sub
  mult
  div
```

  - First series in metafile must be **`add`** or **`sub`**. (X-13A-S initializes the aggregate series as a vector of zeroes.)

Spec File for Northeast *(ne1hs.spc)*

```
series {
 title="Northeast Single-Family HS"
 file="ne1hs.dat" format="datevalue"
 comptype = add
}
. . . # other specs
x11 {seasonalma=s3x9}
sliding spans {savelog=percents length=132}
history {start=2007.Jan
 estimates=(sadj sadjchng)}
```

`Type` Argument in **`X11`** Spec

- If the component is seasonal
  - **`type=sa`** (default), Table D11 is the seasonally adjusted series
- If the component is not seasonal
  - **`type=trend`**, Table D11 is adjusted for any specified trading day, moving holidays
    - Like B1 except contains outlier effects

Spec File for a Nonseasonal Component

If the South had no significant seasonal or calendar effects

```
series {title="South Single-Family HS"
 file="so1hs.dat" format="datevalue"
 comptype=add
}
… # may want additional specs
x11 { type = trend }
sliding spans {length=132}
history {start=2007.Jan
  estimates=(sadj sadjchng)}
```

Spec File for a Nonseasonal Component With Trading Day

If the South were not seasonal but had trading day effects

```
series {title="South Single-Family HS"
  file="so1hs.dat" format="datevalue"
  comptype = add}
regression{ variables = td } # plus outliers
… # other modeling specs go here also
x11 { type = trend }
sliding spans {length=132}
history {start=2007.Jan
  estimates=(sadj sadjchng)}
```

Step 2 - Create Spec File for the Aggregate Series

- Use **`composite`** spec (in place of the **`series`** spec) for the aggregate series
- Save the implicit factors from the indirect adjustment with the **`composite`** spec
- Save the direct factors with the **`x11`** spec
  - If indirect adjustment preferred, no need to save the direct factors from **`x11`**

Step 2

Spec file for U.S. *(us1fhs.spc)*

```
composite {title="US Single-Family HS"
    save = i18 }
transform{}…regression{}…arima{}…outlier{}…
# etc. - Use all specs needed
x11 {seasonalma=s3x9 save = e18}
slidingspans {length=132 savelog=percents}
history {start=2007.Jan
  estimates=(sadj sadjchng)}
```

Step 3 - Create a Metafile

Metafile *hs1ftot.mta*

ne1hs
mw1hs
so1hs
we1hs
us1fhs

Aggregate spec file is always last

Step 4 - Run X-13ARIMA-SEATS

- Single output file for both the direct and indirect adjustments
- Many diagnostics available for both adjustments
  - Spectrum (monthly series)
  - Sliding Spans
  - Revisions History

Step 4

- Log is ***hs1ftot_log.html*** (or ***hs1ftot.log***)
  - Named after the metafile
- Output for both the direct and indirect U.S. adjustments is in ***us1fhs.html*** (***us1fhs.out***)

Diagnostics to Compare Direct and Indirect Adjustments

- Spectral graphs
- Sliding spans
  - Set the same sliding spans length for all components
- Revisions history
  - Set the same history span for all components
- Smoothness measures (Statistics Canada introduced in X-11-ARIMA)
  - (We don't use these much)

Spectrum for Aggregate Adjustment

```
composite{ … }
spectrum{ savelog = peaks }
```

. . .

Look in log file:

```
Seasonal Spectral Peaks : none
      TD Spectral Peaks : none
```

Same Lengths for All Components

```
slidingspans { … length=132 }

history { … start = 2007.Jan }
```

Comparing Direct and Indirect Adjustments

Keep in mind –

Smoothness may mean bigger revisions, so don't choose direct over indirect (or vice versa) by the smoothness measures without looking at the revisions history diagnostic

Summary

- Metafiles are useful in most situations and are necessary for composite adjustments
- Indirect adjustments of series are combinations of other adjustments
  - Often sums but other composites are possible
  - Diagnostics available for comparing direct and indirect adjustments
- Composite diagnostics are not available if the aggregation occurs in the production system and not within X-13A-S