De-mystifying Seasonal Adjustment: A visual tool to understand the process

Presented at the 3rd Seasonal Adjustment Practitioners Workshop
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Outline

• Context
• Seasonal Adjustment Dashboard
  • Objective
  • Approach and Content
  • Programming Platform
• Next Steps
Context

Seasonal Adjustment at Statistics Canada is done for many using X-12-ARIMA
  • According to published Quality Guidelines (revision strategy, raking, …)
  • Analysis in Win X-13, X13graphjava, Production using SAS PROC X12

Responsibilities:

• Time Series Research and Analysis Centre - Responsible to develop and maintain processing environment for Seasonal Adjustment
  • Regularly scheduled update of Seasonal Adjustment Options
  • Periodic review of diagnostics
  • Ongoing Support for Analysis and Interpretation of results

• Subject Matter Experts - Responsible for the statistical project
  • Co-ordinate with various groups (collection, statistical methods, dissemination)
  • Execute processing of steps
  • Validation, analysis and dissemination of statistical outputs
Seasonal Adjustment Dashboard - Objectives

• Build Capacity - to better interpret seasonally adjusted data
  • Help analysts to understand concepts - avoid treating process as a black box
  • Training tool for seasonal adjustment courses
  • Tool for briefing to senior management

• Increase Efficiency - Reduce resources needed to support seasonal adjustment
  • Automated tool, intended to respond to most common questions
  • Avoid effort to gather relevant info from listings
Seasonal Adjustment Dashboard - Approach

Guiding Principles:

One automated page:
  • As intuitive and visual as possible (with supporting numeric detail)
  • Avoid over-simplification and approximations

Respond to most common questions for a specific series:
  • Is the seasonal adjustment process working as it should?
  • Is the seasonal pattern changing?
  • Why is the effect of seasonal adjustment different this year than last year?
  • Do we see an effect from <insert event here> in our estimates
Seasonal Adjustment Dashboard - Content
Seasonal Adjustment Dashboard - Content

Trading Day Component (includes leap year effect)

- Populated from Regression Table (daily regression parameters) and A6 (monthly factors)
- Identifies “Extra days from each month” – lighter shading

Effect of trading day component on month-to-month movement
Seasonal Adjustment Dashboard - Content

Moving Holiday Component

- Populated from A7 (monthly factor)
- Developed for Easter, Labour Day
- Displays date of relevant holiday in current year

Effect of moving holiday component on month-to-month movement
Seasonal Adjustment Dashboard - Content

**Seasonal Component**

- Populated from D10 (monthly factor)
- Line represents last complete year
- Bars represent months in current year

*Effect of seasonal component on month-to-month movement*
Seasonal Adjustment Dashboard - Content

Summary of Key Diagnostics – color coded to indicate acceptable ranges

- Primary diagnostics - Residual seasonality, smoothness relative to raw, presence and stability of seasonal pattern
- Also includes forecast error, autocorrelation measures, outlier status for current and previous month
- Several X-12-ARIMA parameters (extreme value tolerances, length of seasonal and trend-cycle filter, decomposition mode)
- Hover function for description of validation, statistic and desired ranges
Net Effect of Seasonal Adjustment

• Relationship between Raw and SA
  • Purple line represents no-change in SA
  • Black lines represent upper and lower bounds (correspond to sigmalimit)
  • Green line represents observed raw values
  • Red represents seasonally adjusted movement
  • Blue represents published SA movement (after raking)
Net Effect of Seasonal Adjustment

How components are presented

• Multiplicative adjustment = compounded multiplicative factors
  • \((1 + \text{trading day}) \times (1 + \text{moving holiday}) \times (1 + \text{seasonal}) = (1 + \text{no change SA})\)

• Additive adjustment = additive factors
  • \(\text{trading day} + \text{moving holiday} + \text{seasonal} = (\text{no change SA})\)

High and Low bounds are based on extreme value identification
Programming Platform - Automation

- Excel workbook (manual copy-paste of input data)
- Excel workbook with VisualBasic Macros (reformat of input data)
- Evaluated Power BI, SAS-JMP
  - Issues with customizing, locking content, interactivity
- Currently programmed in R-Shiny
  - Automatic - draws directly from Time Series Processing System outputs
  - Html format output – no user knowledge of special software required
  - Interactive features – hover, zoom, series selector, tabs
Seasonal Adjustment Dashboard - Content
Next Steps

Gradual rollout to programs
• Pilot with four key monthly economic surveys

Ongoing content development
• Incorporate feedback from pilot
• Incorporate survey specific features
  • Reference week adjustment (Labor Statistics)
  • Additional calendar effects (Chinese New Year effects in International Trade Programs, …)
• Add second page for advanced users?
Thank you!

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