A New Estimation System for the US CPI – Capabilities and Impacts

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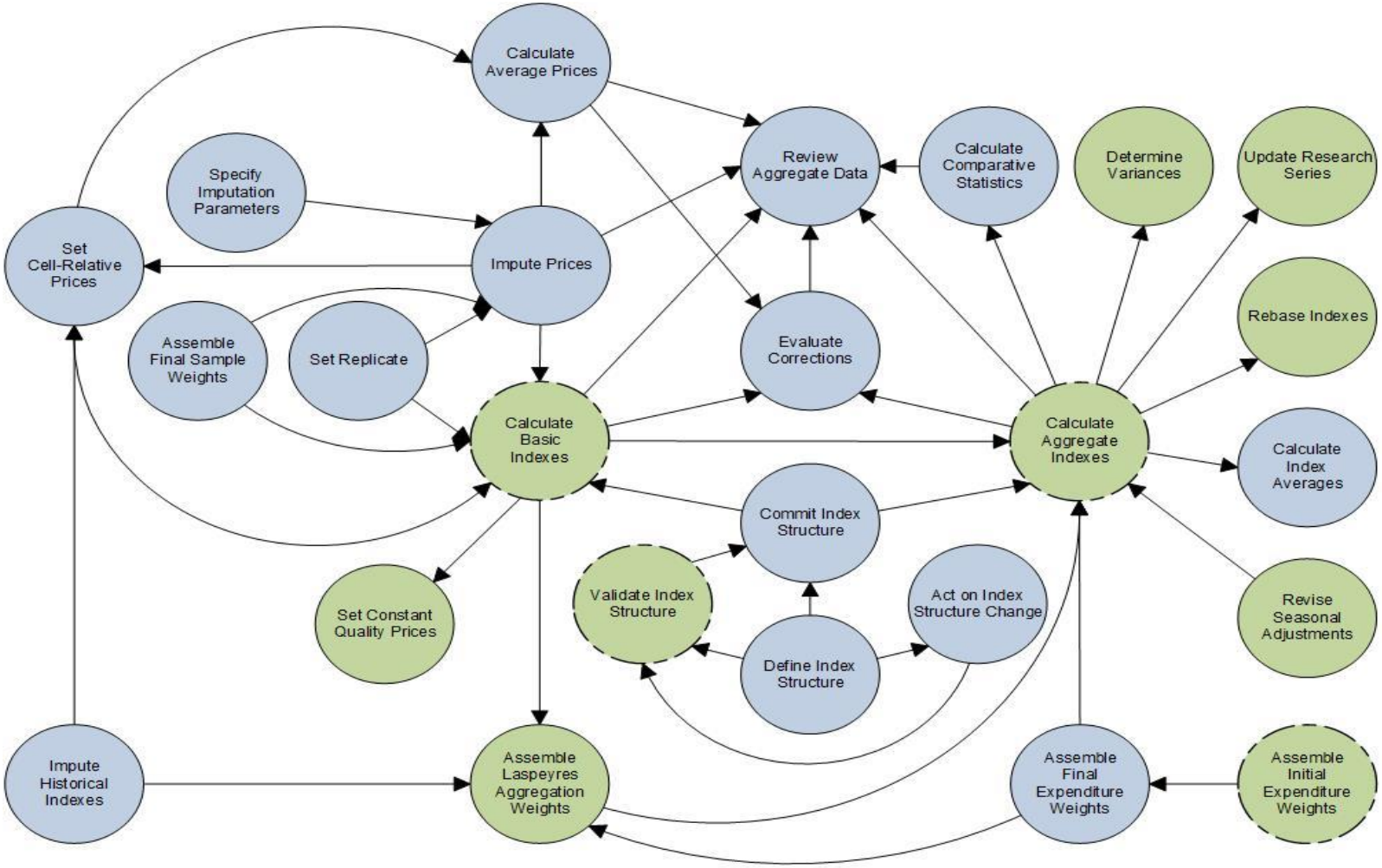
Agenda

- New Estimation System for US CPI – why and objectives
- Operational improvements - summary
- Methodology improvements
  - Imputation improvements
  - Calculation of annual averages for bimonthly areas
  - Chained CPI for all Urban Consumers enhancements

New Estimation System (NewEst)

- Redesigned, state-of-the-art system
- Improved flexibility and review capabilities
- More efficient processing - elimination of reliance on paper in *all* production steps
- Better support for BLS research efforts
- Incorporate methodology improvements
- Deployed with release of January 2015 CPI

Estimation Subsystems



NewEst Project Scope

- Creation of several new interactive subsystems
- Introduce significant flexibility in batch applications
- Add new functionality to CPI's Modern Review Analysis System (MARS) – new tools & elimination of paper-based review of estimates
- Other changes to existing functionality

Operational Improvements

- Replacement of old labor-intensive processes and tools
- Parameter-driven interactive systems (e.g. Define Index Structures, Evaluate Corrections)
- User Interface designed to meet job needs of users (economists, statisticians, etc.) – typical flow of activities

Operational Improvements

- More flexibility built into both interactive and batch subsystems (e.g. easier to change formulas)
- Fully automated review of index estimates & new analysis tools - eliminates reliance on paper
- New tools to help evaluate and decide on corrections & formalized process for updating the CPI-U-RS

Methodology Improvements: Imputation

- Implement recommendations from Imputation Methodology Improvements Team
  - All price imputation is explicit
  - Allow flexibility in source information
  - Parameter-driven
- Missing prices can now be imputed by narrower set of item and geographic source data
- Off-cycle imputations will be done directly (more prices used in calculation of basic indexes)

Change in calculation of some annual averages

- Annual averages for bimonthly areas
- Based on average of 12 monthly indexes, including six on-cycle published indexes & estimate of off-cycle indexes
- NewEst calculates (instead of interpolates as was former practice) unpublished off-cycle indexes
- Net impact on CPI-U minimal

Methodology improvements: Chained CPI

- New formula for initial and interim C-CPI-U indexes

- More frequent weight updates and index revisions –> shorter lag between initial and final

Price Index Formula Relationships

	Modified Laspeyres (Lowe)	Geomeans (Young)	Superlative (Tornqvist)	CES (Lloyd Moulton)
Consumer Response to Price Δ	No substitution across Items	Substitution across all Items	Substitution based on Monthly Weights	Parameter defines level of substitution
Weights Quantified as:	Fixed Base Period Quantities	Fixed Base Period Shares	Current & previous month reflect substitution	σ Represents degree of substitution
Substitution Elasticity	σ = 0	σ = 1	σ = Observed	σ = Evaluated
Price Index Formula	$IX_{[0,t]} = \sum_i s_i^0 \left(\frac{p_i^t}{p_i^o} \right)$	$IX_{[0,t]} = \prod_i \left(\frac{p_i^t}{p_i^o} \right)^{s_i^o}$	$IX_{[0,t]} = \prod_i \left(\frac{p_i^t}{p_i^o} \right)^{\left(\frac{s_i^o + s_i^t}{2} \right)}$	$IX_{[0,t]} = \left[\sum_i s_i^o \left(\frac{p_i^t}{p_i^o} \right)^{1-\sigma} \right]^{\left(\frac{1}{1-\sigma} \right)}$

Chained CPI-U: New revision process

- Move from annual revision to quarterly revision basis (NewEst calculates monthly expenditure weights and revised C-CPI-U on quarterly basis)
  - Improved lag between CPI-U and final C-CPI-U from 13-24 months to 10-12 months
  - Initial C-CPI-U indexes still released concurrent with CPI-U and updated as interim C-CPI-U indexes with every quarterly revision until final is published

Chained CPI-U: Use of CES Formula

- Starting with release on 26 February 2015, Constant Elasticity of Substitution (CES) formula replaced geometric mean formula for initial and interim C-CPI-U indexes
- CES formula more closely models consumer substitution behavior
  - Better job of capturing amount of substitution as consumers respond to changing relative prices
  - Preliminary C-CPI-U is expected to be closer estimate of Final C-CPI-U

Why move to CES formula?

- Geomeans chosen in 2002 as "plausible, simpler approximate of the Tornqvist in real time"; CES considered but more research on issues needed
- Research done by John Greenlees indicated weaknesses could be addressed & that CES use would improve accuracy of preliminary values of C-CPI-U
- Smaller index revisions between preliminary and final C-CPI-U releases → could increase usefulness of C-CPI-U to data users

NewEst: Research Support

- New system includes separate Research Environment (insulated from production)
- Designed to allow for greater ease and efficiency for BLS staff to perform CPI program research
  - More control of data used for each research project – can edit data in database tables
  - Use of same code as that used in production

Contact Information

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