Adjusting for Inflation
Price Deflators and Real Estimates

Steven Andrews
State and Local Government Branch
Government Division

BEA State and Local Data Symposium
May 18, 2005
Adjusting for Inflation

- Basic strategy: break down government consumption and investment spending by type and match with available price indexes.
- Source data provide separate estimates for structures (by type), state equipment (total), computers, software, and wages.
- Use I-O table to fill in commodities.
- Special volume measure for compensation based on employment, hours, and quality adjustment.
Index theory

• Index numbers reveal relative changes in prices, quantities, or expenditures as a function of time.

• Price indexes use quantities as weights, and quantity indexes use prices as weights.
Laspeyres and Paasche Indexes

• Laspeyres indexes are ratios of the current cost of a base period market basket relative to its cost in the base period:
  \[ l_t = \frac{\sum Q_{it} \times P_{it}}{\sum Q_{io} \times P_{io}} \]

• Paasche indexes are ratios of the cost of a current period market basket relative to its cost in the reference period:
  \[ l_t = \frac{\sum Q_{it} \times P_{it}}{\sum Q_{it} \times P_{io}} \]

• A major concern when using Paasche or Laspeyres indexes is that weights become outdated.

• The solution is to use updated weights in a chain-linked index.
Chain Linked Indexes

- Chain linked indexes are constructed as a product of indices. They allow for the effects of changes in relative prices and changes in the composition of output over time.

\[ I_t = I_0 \cdot I_1 \cdot I_2 \cdot I_3 \cdot I_4 \cdots I_{t-2} \cdot I_{t-1} \]
BEA chain-type indexes

• A “Fisher-Ideal” index is the geometric mean of Laspeyres and Paasche indexes.

\[ F_{t-1}^t = \sqrt{L_{t-1}^t} \cdot P_{t-1}^t = \sqrt{\left( \frac{\sum_i P_{t-1}^t Q_t^i}{\sum_i P_{t-1}^t Q_{t-1}^i} \right) \cdot \left( \frac{\sum_i P_t^t Q_t^i}{\sum_i P_t^t Q_{t-1}^i} \right)} \]

• BEA Chain-type indexes are “Fisher-Ideal” relatives that are linked (multiplied) together to form a time series.
• They allow for substitution as relative prices and quantities change.
Index weights

Equipment, Durables, Nondurables and Services

- Data source: *Government Finances (GF)*
- S&L government expenditures for durables, nondurables and services are included in *GF* current operating expenditures (COE)
- Estimates are derived from GF COE by subtracting everything that is not a durable, nondurable, or a service, e.g. wages, compensation, software, etc.
- BEA’s Input-Output (I-O) table is used for quinquennial Census years (ending in 2 or 7) for a detailed commodity distribution.
Index Weights-Cont’d

- Roll up commodities into levels of detail that match available deflators: PPI’s, CPI’s, etc.
- Detailed current-dollar weights for I-O years are deflated to produce constant-dollar weights.
- Constant-dollar weights are “wedged” between I-O years; weights are held constant after the most recent I-O year.
- Reflate constant-dollar weights to obtain current dollar weights.
Index Weights-Cont’d

• Current-dollar weights (shares) are applied to annual GF controls to obtain commodity detail for durables, nondurables, and services.
• Constant-dollars obtained by deflating the current-dollar detail calculated during the process described above.
• The same process is used to estimate equipment without computers. Control value: GF equipment estimates (State), GF capital estimates less land & structures (local).
Major deflator series

- The primary price indexes that are used to deflate S&L government expenditures include:
  PPI’s (durables, nondurables, equipment); CPI’s (services); FHWA Indexes; the Census 1-Unit Deflator; and the BEA (Grimm) hedonic structures indexes.
# Real estimate sources and primary indexes

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Acronyms

- ASM    Annual Survey of Manufacturers
- SAS    Service Annual Survey
- NCES   National Center Education Statistics
- FHWA   Federal Highway Works Administration
- VIP    Value of new construction put-in-place