Adjusting for Inflation

Price Deflators and Real Estimates

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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.

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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:

$$I_t = \sum Q_{io} \times P_{it} / \sum Q_{io} \times P_{io}$$

- Paasche indexes are ratios of the cost of a current period market basket relative to its cost in the reference period:

$$I_t = \sum Q_{it} \times P_{it} / \sum Q_{it} \times P_{io}$$

- A major concern when using Paasche or Laspeyres indexes is that weights become outdated.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

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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.

$$I_t = I_0^{\ 1} . I_1^{\ 2} . I_2^{\ 3} . I_3^{\ 4} \ldots . I_{t-2}^{\ t-1} . I_{t-1}^{\ t}$$

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BEA chain-type indexes

- A "Fisher-Ideal" index is the geometric mean of Laspeyres and Paasche indexes.

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

- 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.

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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

Real estimates	Source	Primary Indexes
Compensation	BLS, NCES	None, IPD
Durable goods	*GF*	Producer price indexes
Nondurable goods	*GF*	Producer price indexes
Services	*GF*	Consumer price indexes
Construction	Census VIP	Census 1-unit, Turner,FHWA,Grimm
Net purchases	*GF*	Census 1-unit, Turner
Equipment	*GF*	Producer price indexes
Computers	ASM, Census foreign trade data	Producer price index
Software	SAS, Census foreign trade data, BLS employ.	PPI, weighted-average PPI & input cost indexes

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

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