Balancing the SUT

Regional Course on Supply and Use Table

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Chiba, Japan

Objectives of Balancing SUT

- Different sources create discrepancies in the SUT estimates

- GDP from the three (3) approaches must coincide

- Economic identities must be met

Implicit and Explicit Constraints

- Explicit Constraints – control/target totals
- Implicit Constraints – identities implicit in the SUT framework

    (1) Supply = Use

    (2) Output = Input

    (3) Use TTM = Supply (Domestic & Imported) TTM

    (4) Value change = volume change * price change

Types of Discrepancies

- Commodity levels

- Unwanted negative values

- Domestic supply and use of products from domestic origin and use of imported products

- Plausibility of volume changes

- Implicit price indices vs. observed price indices

Sources of Discrepancies

- Data inconsistency at the unit level (statistical unit, mapping of business concepts, bookkeeping year vs. calendar year, different sources, no response)

- Inconsistencies in processing data (assumptions in disaggregating totals, allocation of valuation, informal economy estimation)

- Inconsistencies in volume data (choice of price index)

General Procedures in Balancing

- Select the large discrepancies

- Critical search for results of data processed

- Expert knowledge of statisticians

- Contact reporting companies

Investigative Aspect of Balancing

- Business concept to SNA concept
- Product/activity mapping and classification
- Unit level analysis
- Expert knowledge
- Time series perspective analysis
- Check other data sources
- Reliability assignments

Balancing Method Considerations

- Level of aggregation
- Centrality of balancing procedure
- Sequential/simultaneous options
- Manual/Automatic balancing
- Vertical/Horizontal balancing

Automatic Balancing: RAS Method

- Pro-rated adjustments according to proportional distributions

- Iterative apportioning of discrepancies on double-entry data

	Industry 1	Industry 2	Industry 3	
Product 1	$a_{1,1}$	$a_{1,1}$	$a_{1,1}$	P_1
Product 2	$a_{1,1}$	$a_{1,1}$	$a_{1,1}$	P_2
Product 3	$a_{1,1}$	$a_{1,1}$	$a_{1,1}$	P_3
	I_1	I_2	I_3	Total

With $\sum_j a_{i,j} = P_i$ and $\sum_i a_{i,j} = I_j$

Automatic Balancing: Optimization Method

- Non-iterative that uses linear constraints

- Not limited to explicit restrictions

- Allows setting of reliability coefficients

Other Automatic Balancing Methods

- RAS variants – GRAS, TRAS, KRAS

- Stone Method (relative variance minimization)

- Convex Quadratic Constrained Optimization (loss function minimization)

Two Ways of Balancing

- Sequential Balancing

  Steps:

  - balance SUT in current prices

  - deflate balanced SUT in current prices

  - balance deflated SUT

Two Ways of Balancing

- Simultaneous Balancing

    - analysis of relationships of value, volume, and price data

    - feedback mechanism for the SUT current price estimate

    - more complicated to implement

    - demands more information (CV_t, CV_{t-1}, $kV_{t,t-1}$, price index, volume index, value index)

Simultaneous Balancing

Consider the following simplified table of supply at basic prices.

	Supply-Use	Domestic Production	Exports	Other Uses		Domestic Production	Exports	Other Uses
Value t at current prices	-10	525	420	115	Price Index	102.9	100.0	103.6
Value at constant prices of t-1	-21	510	420	111	Volume Index	102.0	105.0	111.0
Value t-1 at current prices	0	500	400	100	Value Index	105.0	105.0	115.0

The first step is to determine reliability of initial estimates. Here we assume that domestic production and exports at current prices are reliable. Suppose that price index for Other Uses is found to be 102.9. Hence, adjustments must be made on both at current and constant prices.

	Supply-Use	Domestic Production	Exports	Other Uses		Domestic Production	Exports	Other Uses
Value t at current prices	0	525	420	105	Price Index	102.9	100.0	102.9
Value at constant prices of t-1	-12	510	420	102	Volume Index	102.0	105.0	102.0
Value t-1 at current prices	0	500	400	100	Value Index	105.0	105.0	105.0

Finally, suppose that the price of domestic production and price of other uses are reliable, and that the difference between volume index of domestic production and exports must not be too large.

	Supply-Use	Domestic Production	Exports	Other Uses		Domestic Production	Exports	Other Uses
Value t at current prices	0	525	420	105	Price Index	102.9	102.7	104.0
Value at constant prices of t-1	0	510	409	101	Volume Index	102.0	102.3	101.0
Value t-1 at current prices	0	500	400	100	Value Index	105.0	105.0	105.0

Canadian Balancing

- Investigating inconsistencies (IT Tool for flagging)
- Industry level adjustments (IT Tool/INDCOM or manual)
    - $\sum outputs = \sum inputs$
- Adjusting negative cells in SUT at basic prices
- Implicit ratios derived from SUT in volume terms are checked
- Product level adjustments using the investigative aspect of balancing
    - $\sum supply = \sum use$
- Rebalance industry outputs and inputs to match control totals
- Refer again to the SUT in volume terms and adjust current price SUTs accordingly.
- Repeat the whole process until table is completely balanced