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Session 2: Volume Estimates Part II

Economic Statistics and National Accounts Section
ACS, ECA

Content of the presentation

- Volume estimates of output by activities
- Using SUTs framework for constant price estimates



Volume measurement in national accounts: output by activities (1/13)

Agriculture, forestry and fishing

- The recommended method for estimating volume measures of value added of these activities is the double indicator method
 - by deflating the current price estimates of output and the intermediate consumption (at product level) by the respective PPIs that are appropriate to these measures and then deriving the value added in volumes as a residual
- Alternatively, output may be estimated by extrapolating base year data with a volume index (such as index of agriculture production) or
- by revaluing the current year production in quantities with base year prices, at detailed product level



Volume measurement in national accounts: output by activities (2/13)

Mining and quarrying

- Generally, detailed data is available on both production and prices in the case of products of mining and quarrying, as this is a regulated activity and the activity is undertaken by major companies
- Therefore, it is possible to adopt the double indicator method or the other methods of extrapolation with volume index or quantity revaluation, mentioned earlier



Volume measurement in national accounts: output by activities (3/13)

Manufacturing

- Preferred method to estimate value added in volumes is the double deflation
- Manufactured products change in quality and specifications quickly, so, price indices applied as deflators should have factored these changes
- Extrapolation with a volume index (such as the production index of manufactured goods) of output is also a method used by some countries.
 - It should be ensured that the volume index used is not a quantity index and includes the quality changes in products
- The next best alternative is to use single indicator method, that is, by extrapolating the value added directly with a volume index
 - This method is preferred in cases where the value added in relation to output is very small
- In general, quantity revaluation methods should be avoided for manufacturing due to rapid changes in the quality and characteristics of manufactured products over time, except for few homogeneous products such as bulk chemicals, wood pulp and petroleum



Volume measurement in national accounts: output by activities (4/13)

Electricity, gas, and water supply

- Products in this activity are relatively homogeneous, and the activities are carried out by few large companies or the government units
 - The methods for volume estimates for production could include double indicator methods, extrapolation with volume indices or even quantity revaluation
 - The next best alternative is to use single indicator method
- For distribution activities, the methods for volume estimation should be based on whether output is estimated on net basis (i.e., margins earned is the output) or on gross basis
 - If output is estimated on net basis, then the methods suggested under trade activity, should be followed
 - To properly account for quality changes, both sales and purchases may be deflated separately
 - Alternatively, quantity of the product distributed can be assumed to be the same as quantity of output (e.g., electricity output = electricity distribution) and output can be used to extrapolate base year value



Volume measurement in national accounts: output by activities (5/13)

Construction

- Estimating volumes of construction is complicated as the activity covers a broad range of products
 - dwellings, non-non-residential buildings, civil engineering, repair and maintenance, and own account construction by households;
 - and covers both new construction as well as major renovation and minor repair and maintenance of structures.
- The best option for volume estimates is to deflate the output by output price indices.
 - However, very few developing countries compile these type of indices, though many of them compile input price indices and use these indices to estimate volumes of construction
- The second best method is to extrapolate the base year estimates with hours of work in construction, if such data is available
- Generally, use of other volume indicators such as number of building permits issued or the square meters involved in the permits, should be avoided



Volume measurement in national accounts: output by activities (6/13)

Trade

- For estimating volumes of margin services, the best method is to deflate sales and purchases with corresponding price indices, and then deriving the margins
- However, in practice, the base year margin proportion multiplied by volume of sales at basic prices (current values deflated by an appropriate price index) provides a simpler alternative.
 - This method is similar to extrapolating the base year estimates with volume of sales or a volume index of sales (which is computed by deflating sales at detailed level)
- A reasonable approximation to total wholesale and retail margins may be to use the total supply of goods and services available for domestic use, less margins, in the current year; deflated by a general wholesale or producer price index, then apply the average margin rate from the base year



**Table 1: Estimating volumes of margin:
wholesale/retail trade**
(example taken from WB compilation in brief)

	Year 1	Year 2	Growth
1. Basic item price	100	110	10.0
2. Number of items	80	90	12.5
3. Value (1*2)	8000	9900	23.8
4. Margin%	5	6	20.0
5. Margin value (3*4)	400	594	48.5
6. Item plus margin (3+5)	8400	10494	24.9
7. Volumes of margin (2*4 of Year 1)	400	450	12.5
Estimating volumes of margin for year 2			
8. Remove the margin from the current value for year 2 (divide by the margin %)		9900	
9. Deflate by price growth	8000	9000	12.5
10. Apply the base year margin rate (5%)	400	450	12.5



Volume measurement in national accounts: output by activities (7/13)

Financial services: FISIM

- For estimating FISIM in volumes, data on deposits and loans at base year prices is needed
- However, it is difficult to find a price for deposits and loans
- Therefore, a general inflation index is used as the appropriate deflator for deflating loans and deposits in the current year to derive volumes of loans and deposits
- These volumes multiplied by the difference between the bank interest rate and the reference rate in the base year, provides the estimates of FISIM in volume terms



Table 1: Estimating FISIM in volumes (*example taken from WB compilation in brief*)

	Year 1	Year 2	Growth
1. Value of loans	10000	15000	50.0
2. Bank interest	7.0	5.0	-28.6
3. Reference rate	5.0	3.5	-30.0
4. FISIM $(1 \times (2-3)/100)$	200	225	12.5
5. General inflation index	100	105	5.0
6. Value of loans at year 1 prices $(1/5 \times 100)$	10000	14286	42.9
7. FISIM $((6 \times (2-3 \text{ of year 1}))/100)$	200	286	42.9



Volume measurement in national accounts: output by activities (8/13)

Financial services: Foreign exchange margins

- Foreign exchange margin is the financial service charge associated with converting foreign currency
- The margin rate is the different between buying/selling rate and the average of buying and selling exchange rates
- The actual margins of the forex dealers is calculated by the difference between value of items at the buying or selling rate and the value of items at the mid-point rate between buying and selling (margin rate)
- For estimating volumes of these margins, the base year margin rate is applied on the current year value of items



**Table 1: Estimating foreign exchange margins in volumes:
(example taken from WB compilation in brief)**

	Year 1	Year 2	Growth
1. Number of items the importer buys	500	600	20.0
2. Purchase price (\$)	2.0	2.25	12.5
3. Exchange rate of local currency (\$): buying	1.2	1.5	25.0
4. Exchange rate of local currency (\$): selling	1.1	1.3	18.2
5. Average exchange rate (average of 3 and 4) (\$)	1.15	1.4	21.7
6. Margin in exchange rate for financial services (\$) (3-5 or 5-4)	0.05	0.1	100.0
7. Total value of items which the importer pays (in local currency units) (1*2*3)	1200	2025	68.8
7.1 Value of imports (SNA) (in local currency units) (1*2*5)	1150	1890	64.3
7.2 Charges for financial services (in local currency units) (1*2*6 or 7-7.1)	50	135	170.0
8. Value of items at year 1 margin and exchange rate (in local currency units) (7.1)	1150	1380	20.0
9. Service margin (in local currency units) (7.2)	50	60	20.0



Volume measurement in national accounts: output by activities (9/13)

Dwelling services of owner-occupiers

- The use of the same price, quality and quantity information for the estimation at constant prices as for current prices would be the best method for estimating volumes of these services
- Alternatively, CPIs for privately rented dwellings (index of market rentals) would be an appropriate price index that can be used as deflator; or
- the stock of owner-occupied dwellings, broken down in sufficient detail (volume index of dwellings compiled with appropriate weights for different types and structures of such dwellings) can be used as volume indicator to extrapolate base year estimates



Volume measurement in national accounts: output by activities (10/13)

Public services (1/2)

- Value of output of government units or NPISHs is estimated by summing the costs of production, namely, IC, COE and CFC
- For volume estimates, preferably, each of these costs are deflated separately
- For deflating COE
 - wage index if available, can be used
 - Otherwise, the estimates could be compiled using the number of hours worked by employees as a volume indicator.
 - Another alternative is to have numbers of staff in different grades and the average rates of pay for each grade. This year's volume terms figure is obtained by multiplying the number in each grade in this year by the average pay in the base year



Volume measurement in national accounts: output by activities (11/13)

Public services (2/2)

- For deflating IC
 - a general price index (WPI/PPI/CPI as appropriate)
- For deflating CFC
 - the deflator for gross fixed capital formation
- For individual services, SNA recommends the “output volume method,” especially for health and education.
 - It is based on the calculation of a volume indicator of output using adequately weighted measures of output of the various categories of non-market goods and services produced
 - for example, number of health procedures or number of students, etc. with suitable weighting method for aggregation of these volumes



Volume measurement in national accounts: output by activities (12/13)

Other private services (1/2)

- Most likely, developing countries may not have service price indices
 - In such cases, available CPIs adjusted to basic prices may be used
- Alternatively, availability of appropriate single indicator may have to be explored for each of the services
 - For hotels and restaurants, these could be bed nights (occupancy) and meals served, respectively. Data available for different compositions should be aggregated with appropriate weights
 - For transportation, the indicators could be passenger kilometers, and freight tonne kilometers
 - For transport support services, indicators based on cargo handled in ports, time the service has been used, or time and volume of the service used, could be used with suitable adjustment for different price bands



Volume measurement in national accounts: output by activities (13/13)

Other private services (2/2)

- For postal, and telecommunication services, volumes of range of different products offered may be available which could be aggregated with corresponding prices in the base year
- For some services, for example, film admissions or entry to sporting events, it is possible to think of using the number of attendees times the average price in the base year
- For many professional services, such as the services provided by lawyers or accountants, charges may be made on the basis of the number of hours the work takes
 - Here, and more generally for services, the largest cost item to the enterprise providing the service is likely to be compensation of employees and so a measure of changes in wage rates may be the best way to derive a volume measure



Volume measurement in national accounts: use of SUTs framework (1/3)

- SNA recommends compilation of GDP estimates using the framework of supply and use tables (SUTs), both at current and constant prices
- The framework is based on the two following identities

Products		
Domestic production + imports + trade margins + separately invoiced transport costs + taxes less subsidies on products	=	Intermediate consumption + final consumption + gross fixed capital formation + change in inventories + acquisition less disposals of valuables + exports
Industries		
Output	=	intermediate consumption + gross value added (or total inputs)



Volume measurement in national accounts: use of SUTs framework (2/3)

- The advantage of compiling price and volume measures through SUTs
 - provides consistency to a set of independent measures (components of production, income, and expenditure aggregates), whose estimation is more difficult in volume terms than at current prices, as they are not based on direct evidence.
 - ensures that the flows covered in the two tables are broken into their price and volume components in a consistent and systematic manner.
- SUTs at constant prices can be compiled in two ways.
 - *Sequential approach*: SUTs at current prices are compiled in the first instance and then the two tables are deflated at product level to obtain SUTs at constant prices.
 - *Simultaneous approach*: SUTs both at current and constant prices are compiled at the same time.
- The first approach is easier to manage, whereas the second approach facilitates making corrections in the SUTs at current prices, when problems are encountered while compiling constant price SUTs



Volume measurement in national accounts: use of SUTs framework (3/3)

- Dimension
 - If complete set of prices are available, SUTs at current and constant prices can have the same dimension for industries and products.
 - However, if prices are only available at an aggregated level, one may decide to compile the SUTs at constant prices at that aggregation level only.
- For compiling SUTs at constant prices, it is necessary to have in place SUTs at current prices for the years t and $t-1$
- Generally, deflation at product level is undertaken on the SUTs at basic prices; then the valuation matrices (TTMs and net taxes) at constant prices are compiled using the base year rates and ratios
- The methods for deriving values of products at constant prices in the SUTs are same as those mentioned earlier



Volume measurement in national accounts: SNA recommendations

SNA recommendations on volume measures: Summary

- Volume estimates are best compiled in a supply and use framework, preferably along with current value estimates
- In general, it is best to derive volume estimates by deflating the current value with an appropriate price index, rather than constructing the volume estimates directly. It is, therefore, important to have a comprehensive set of price indices available
- The price indices used as deflators should match the values being deflated as closely as possible in terms of scope, valuation and timing
- If it is not practical to derive estimates of value added in real terms from a S-U framework or the estimates of output and /or IC are not robust, then
 - satisfactory estimates can often be obtained using an indicator of output. For quarterly data this is the preferred approach
 - An output indicator derived by deflation is generally preferred to one derived by quantity extrapolation
- Estimates of output/value added in volume/real terms should only be derived using inputs as a last resort since they do not reflect any productivity change



Suggested reading material

- *The 2008 SNA* (Chapter 15 – Price and volume measures) European Commission, IMF, OECD, UN, World Bank, 2009;
- *Handbook on price and volume measures in national accounts*- Eurostat, Office for Official Publications of the European Communities, Luxembourg 2016;
- *National Accounts: A practical introduction*, Studies in Methods, Serie F, No.85, UN 2003; chapter XV:Price and volume measurement;
- *ESA 2010*, Chapter 10 – Price and Volume Measures - Regulation (EU) No 549/2013 of the European Parliament and of the Council of 21 May 2013 on the European system of national and regional accounts in the European Union;
- *Towards Measuring the Volume Output of Education and Health Services*, OECD, 2010
- *Manual on measuring Research and Development in ESA 2010*, Eurostat, Office for Official Publications of the European Communities, Luxembourg 2014



THANKS / MERCI