GDP at Constant Prices

Subregional Workshop on the
1993 SNA

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Constant price estimates

- Movements in current prices are affected by:
  - changes in prices
  - changes in volumes
- This can be written as: $Vn = \Sigma PnQn$
- To analyse 'real' changes in economic activities, it is useful to focus on changes in volumes
- Constant prices remove the effect of price changes

Definitions

- Base period
  - the period on which the price (or volume) movements are determined
  - ie. the period to which the price weights of a volume index refer
- Reference period
  - the period which is set to 100 or if expressed in dollars when the constant price estimates equal the current price estimates
  - ie. the current price estimates equal the constant price estimates in dollar terms

Approaches: Quantity revaluation

- constant price estimates are estimated as the current period quantity times the base period price
- This can be written as $VKn = \Sigma PoQn$
- individual commodities need to be homogenous, not subject to quality change, and quantity data must be available in each period

Approaches: price deflation

- Divide the current price estimate by a price index to calculate the constant price estimate
- the price index measures the change from the base year in the price component of the current price value
- Advantages of price deflation
  - price competition causes prices to move in similar ways. This is generally not true for quantities
  - quality changes are easier to take into account
  - price movements of similar items can be used as substitutes for items which are not directly priced

Approaches: price deflation

- Price indexes
  - Laspeyres price index (fixed weights)
    - $\frac{\Sigma PnQo}{\Sigma PoQo}$
  - Paasche price index (current weights)
    - $\frac{\Sigma PnQn}{\Sigma PoQn}$
    - deflation using a paasche price index will give the same result as quantity revaluation
  - Fisher price index
    - geometric average of laspeyres and paasche

Approaches: price deflation

- Price indexes
  - Implicit price deflators (IPDs)
    - divide a current price by its corresponding constant price value
    - $\frac{\Sigma Vn}{\Sigma VKn} = \frac{\Sigma PnQn}{\Sigma PoQn}$
    - This is the formula for a paasche (current weighted) price index

Approaches: price deflation

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Data requirements

- Appropriate price indexes
- GDP(E)
  - final expenditures
    - household final consumption
    - government final consumption
    - gross fixed capital formation
  - change in inventories
  - exports
  - Imports
- GDP(P)
  - domestic output
  - intermediate inputs

Constant price GDP(P)

- GDP(P)
- double deflation
  - $\Sigma GPKn = \Sigma PoQn - \Sigma poqn$
- gross output
  - $\Sigma GPKn = \Sigma GPo \times \frac{OKn}{Oko}$
- input indicator method
  - $\Sigma GPKn = \Sigma GPo \times \frac{Ikn}{IKo}$

Compilation issues

- availability of price and quantity data for revaluation
  - appropriate degree of disaggregation
  - eg. where the input method is used as a proxy for output there is no change in productivity
- systems
- timeliness
  - revisions

Changing and linking base years

- Impact of base year change
  - the base weights will be more appropriate, the closer the base year is to the year under analysis
  - substitution effect
    - tendency to substitute *relatively* less expensive goods for *relatively* more expensive goods
    - lower price weights in terms of a later base period for items experiencing the stongest growth
    - implies artificially strong estimates of overall growth when based on earlier base periods (ie. growth tends to be revised down when the base period is updated)

Changing and linking base years

- eventually it will be necessary to change the base year and link the estimates of the different base years. This is known as chaining.
- annual chaining is the limiting case. Annual linked and reweighted chain volume measures are better indicators than constant price estimates, as they take into account the changes of price relativities that occur from one year to the next.
- the preferred index type in SNA93 is the annually rebased chained fisher index. Alternatively chained laspeyres or paasche can also be used.

Changing and linking base years

- Selection of a base year
  - the base year should be as recent as possible
  - 'normal' prices and price relationships should prevail in the chosen year
  - if possible, the base year should fit in with international recommendations (by the UN statistical office) that base years be those ending in zero and five

Linking estimates on different base years

- Linking Laspeyres
  - Calculate a link factor as the ratio of the constant price estimates on neighbouring base years at a chosen base period in between.

Changing and linking base years

- Non-additivity
  - when the extrapolated values of the components of an aggregate do not sum to the extrapolated value of the aggregate
  - chained indexes produce estimates which are additive only for those periods for which the base period and the reference period correspond
    - additivity achieved when using chain laspeyres volume estimates for the part of the series derived using the reference period weights
  - by publishing the indexes as dollar values instead of index numbers, non-additivity is transparent

Chain volume measures

- For annual estimates chain volume measures can be calculated easily and no extra data are required.
- Advantages of chain volume measures
  - best estimates of growth
  - minimum revisions

Australian experience

- Australia has published annual constant price estimates of GDP since 1963 and quarterly constant price estimates since 1970.
- Over time various constant price estimates have also been developed for other important series.
- Several different base years have been used, the earliest being 1953-54 for GDP. Constant price estimates were last rebased to the year 1989-90.
- In the September quarter 1998 Australian National Accounts (5206.0) chain volume measures were introduced, using laspeyres indexes.

Australian experience

- The supply use framework is now used to compile the annual accounts at current and constant prices. Constant price supply use tables are compiled and balanced so that GDP(E) and GDP(P) are balanced.
- The reference year is the latest year but one, eg. the new reference year introduced in the June quarter 2000 was 1998-99. The reference year coincides with the latest base year.

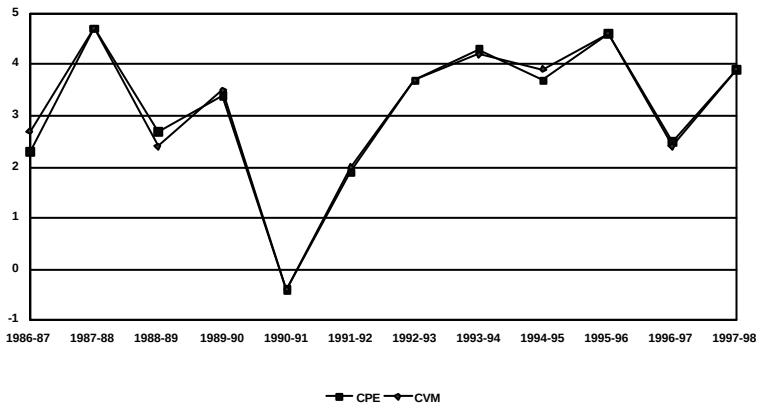
Australian experience

- In general ABS price and volume indexes are fixed weighted laspeyres.
- Whilst annually rebased chain volume measures are used for all the volume measures in the national accounts, the frequency with which price indexes are updated varies.
  - CPI every four or five years
  - The latest base years for the APMI and MUMI are 1993-94 (1993-94 quantities at June quarter 2000 prices) and 1989-90, respectively
  - Wage cost index every year
  - Export price index and import price index every year
  - National accounts every year

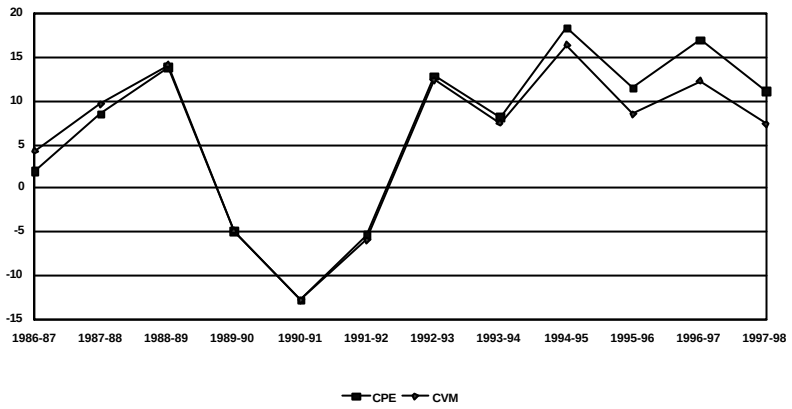
Australian experience

- For GDP the move to CVMs did not significantly alter growth rates. The series where the most significant changes are experienced are imports and capital expenditure on machinery and equipment. This is mostly due to computer prices, which have been falling rapidly.

GDP(E) - annual % change



Private gross fixed capital formation: machinery and equipment - annual % change



Linking estimates on different years

- Linking Laspeyres
  - Assume
    - new basket to be representative of expenditure in period K
    - to be introduced by linking at period L
    - no change in index reference base
  - Steps
    - calculate new weights at period 0 prices
    - calculate the index for period L using the old weights
    - calculate the index for period L using the new weights
    - the link factor to be used in periods L+i is the ratio of (a) to (b)