BASIC ICP CONCEPTS AND PPP METHODS

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Presentation Outline

- Background
- BH Level: The Country-Product-Dummy (CPD) Method
- BH Level: The EKS(Jevons) Method
- BH Level: CPD vs EKS (Jevons)
- Aggregate level: The EKS Method
- Conclusion

Background

ICP Basic Headings and GDP Expenditure Aggregates

Basic heading is the lowest level of final expenditures on GDP for which weights will be applied under the 155 basic heading structures (for ICP)

A higher level aggregate is an expenditure class, group or category obtained by combining two or more basic headings.

ICP PPP Estimation:

Stages in Aggregation Process

Computing

Computing national/regional/provincial annual averages of price observations

Aggregating

Aggregating prices to basic heading level parities

Aggregating

Aggregating basic heading parities to GDP/HH and other sub-aggregates

Data Requirements for PPP Calculation (above BH)

Complete set of basic heading expenditures in national/regional/provincial currencies

Basic heading PPPs, with area 1 acting as the reference area and its currency as the numeraire

PPP Calculation:
Properties of Price and Volume Indices

Base country invariant

- all participating countries are symmetrical so the results are no different to the chosen base country

Commensurability

- All produce results that are invariant to changes in the units of measurement for prices and quantities

Transitivity

- Requires that every indirect parity I PPP_{jk} should equal the corresponding direct parity PPP_{jk}

PPP Calculation:
Properties of Price and Volume Indices

Characteristicity

- requires the transitive multilateral comparisons between members of a group of countries to retain the essential features of the intransitive binary comparisons that existed between them before transitivity

Additivity

- values of the expenditure aggregates of participating countries are equal to the sum of the values of their components when both aggregates and components are valued at international prices

BH Level Aggregation: The CPD Method

Example of price data

Table: Incomplete Tableau with Representativity

Product	Country A		Country B		Country C		Country D	
	R/I	N	R/I	N	R/I	N	R/I	N
1	2			100			25	
2				250	12			60
3	6			270	15		22	
4	8					70		
5				280		100	120	
6		6	120		12			100

R/I – representative (important)

N – non-representative (not-important)

Features of the CPD Method

Salient Features:

- It is multilateral.
- Estimates PPPs by statistical inference rather than by a price index
- It is transitive, not affected by change of base country
- It works on all observations -- does not discard any available price
- Used mostly on basic heading PPP
- May be subject to large residual errors (it explicitly estimates them)

CPD Method

The PPPs is log of price observations against a set of dummy variables define with respect to the products price and the participating countries.

$$\ln p_{cp} = y_{cp} = x_{cp}\beta + \varepsilon_{cp} \qquad (1)$$

where p_{cp} - price of product p in country c;

Dc_j and Dp_i - country and product dummies;

Np and Nc – number of products and countries, respectively;

$$x_{cp} = \left[Dc_2 \ldots Dc_{Nc} Dp_1 Dp_2 \ldots Dp_{Np} \right]$$

$$\beta = \left[\alpha_2 \ldots \alpha_{Nc} \gamma_1 \gamma_2 \ldots \gamma_{Np} \right]^T \qquad (2)$$

Dp_{ij} and Dc_{ij} are equal to 1 when product i is priced in country j, otherwise they equal 0.

Once this regression equation is estimated, the PPP for currency of country k with country j as base can be obtained by the exponential of the difference in the estimates of π_j and π_k taken from the regression equation

BH Level Aggregation: The Jevons Method

Geometric Laspeyres, Paasche and Fisher Indexes

$$L_{AB} = \prod_{i \in R_A} \left[\frac{p_{iB}}{p_{iA}} \right]^{\frac{1}{n_A}}$$

Geometric Laspeyres index between country A & B: L_{AB}

$$L_{AB} = \frac{\sum p_{\boldsymbol{B}}\, Q_A}{\sum p_A\, Q_A}$$

$$P_{AB} = \prod_{i \in R_B} \left[\frac{p_{iB}}{p_{iA}} \right]^{\frac{1}{n_B}}$$

Geometric Paasche index between country A & B: P_{AB}

$$P_{AB} = \frac{\sum p_{\boldsymbol{B}}\, Q_B}{\sum p_A\, Q_B}$$

$$F_{AB} = \sqrt{L_{AB}\, P_{AB}}$$

L_{AB} and P_{AB} are given equal weight in calculating Fisher Index F_{AB}

Aggregate Level Aggregation: The EKS Method

Laspeyres, Paasche and Fisher Indexes

Laspeyres index between country A & B: L_{AB}

$$L_{AB} = \frac{\sum p_{\boldsymbol{B}} \, Q_A}{\sum p_A \, Q_A}$$

Paasche index between country A & B: P_{AB}

$$P_{AB} = \frac{\sum p_{\boldsymbol{B}} \, Q_B}{\sum p_A \, Q_B}$$

L_{AB} and P_{AB} are given equal weight in calculating Fisher Index F_{AB}

$$F_{AB} = \sqrt{L_{AB} \, P_{AB}}$$

EKS Method

Background:

- named after Elteto, Koves, Szulc
- used by Lazlo Drechsler in the "Weighting of the index numbers in multilateral comparisons
- used in the 1960s for comparisons between the centrally planned economies of eastern Europe
- Formula was proposed 40 years earlier by Gini in "On the circular test of index numbers", international review of statistics, Vol. 9, No. 2., 1931

Salient features of the EKS Method

- EKS is a multilateral index; comparison between two countries will be affected by a third country.
- It is transitive. Not affected by change of base.
- It is based on binaries so it is most characteristic of the two countries being compared. Gives equal weight to all countries. Least affected by a third country.
- May discard prices even if they are available

EKS PPP

$$EKS_{jk} = \left\{ F_{jk}^2 \cdot \prod_{l \neq j,k} \frac{F_{jl}}{F_{kl}} \right\}^{\frac{1}{n}}$$

$$EKS_{jk} = \left\{ F_{jk}^2 \cdot \prod_{l \neq j,k} {}_l F_{jk} \right\}^{\frac{1}{n}}$$

$$EKS_{jk} = j,k,l \in N$$

- EKS PPP is the geometric mean of the direct PPP and all the indirect PPPs between a pair of countries.
- Direct PPP must have twice the weight of each indirect PPP.

BH Level: EKS(Jevons) vs. CPD

EKS(Jevons)

EKS(JEVONS) METHOD:

Applying the EKS formula to geometric Fisher indexes at BH level one can obtain BH PPPs.

$$EKS_{jk} = \left\{ F_{jk}^{2} \cdot \prod_{l \neq j,k} \frac{F_{jl}}{F_{kl}} \right\}^{\frac{1}{n}}$$

$$EKS_{jk} = \left\{ F_{jk}^{2} \cdot \prod_{l \neq j,k} {}_{l}F_{jk} \right\}^{\frac{1}{n}}$$

$$EKS_{jk} = j,k,l \in N$$

EKS(Jevons) vs. CPD

EKS(JEVONS) METHOD:

Fisher type PPPs are intransitive to begin with however transitivity is achieved through applying the EKS procedure.

CPD METHOD:

CPD method produces transitive PPPs to begin with unlike EKS (Jevons).

Considered to be more transparent.

CPD does not require direct matches because missing prices can be estimated using regression coefficients of the respective dummy variables based on prices collected of the basic heading.

Sampling errors can be estimated for the PPPs computed using CPD.

EKS (Jevons) vs. CPD

What is the best method to use for PPP calculation at the BH level?

- CPD and EKS methods give same results at basic heading PPPs on the condition that all products have been priced and representivity is not taken into account.
- Experiments with actual data suggest that the differences in results are not usually significant, but it seems that EKS (Jevons) is more susceptible to sampling errors and can be more unstable under certain conditions.

Thank you