

PRICE INDEX THEORY

Course lectures at Stockholm University

Part 4

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Methods for seasonal products – ideas

- Seasonal basket / Rothwell index
 Øut-of-season products excluded
- Counter-seasonal imputation
 Øut-of-season products represented by in-season seasonal products
- All-seasonal imputation
 Øut-of-season products represented by available products





Methods for seasonal products – properties

Seasonal basket index *and* Counterseasonal imputation index *tend to have similar outcome – under condition of similarity in price curves for seasonal products*





Approaches to coping with seasonal variation in index

- Allow for seasonal pattern in interpretation of monthly change
- Focus on 12-month change figures
 Eliminates season
 Disturbed by old conditions



Seasonal adjustment of index Solution of the season of th





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Index = function $P(p^0, p^1, q^0, q^1)$ of price & volume vectors p, q given for times (periods) 0 & 1 Axioms state desirable properties of *P* **Examples of axioms (tests):** P > 0, continuous function Identity test (unchanged prices) $P(p, p, q^0, q^1) = 1$

Axiomatic index theory 1

Axiomatic index theory 2



Further tests:

Proportionality in current prices

$$P(p^{0}, \lambda p^{1}, q^{0}, q^{1}) = \lambda P(p^{0}, p^{1}, q^{0}, q^{1})$$

Invariance under proportional volume changes

$$P(p^0, p^1, q^0, \lambda q^1) = P(p^0, p^1, q^0, q^1)$$



Further tests (continued): Invariance in units of measurement Time reversal test $P(p^0, p^1, q^0, q^1) = 1/P(p^1, p^0, q^1, q^0)$ **Volume symmetry test** $P(p^0, p^1, q^0, q^1) = P(p^0, p^1, q^1, q^0)$ Monotonicity test $P(p^0, p^1, q^0, q^1) < P(p^0, p^2, q^0, q^1)$ if $p^1 < p^2$

Axiomatic index theory 3

Axiomatic index theory 4

Even more tests:

Fixed basket test

 $P(p^{0}, p^{1}, q, q) = \text{Lowe index, or}$ = $q p^{1} / q p^{0}$ (vector notation)

Transitivity (in full form – too demanding)

 $P(p^{0}, p^{2}, q^{0}, q^{2}) = P(p^{0}, p^{1}, q^{0}, q^{1}) \times P(p^{1}, p^{2}, q^{1}, q^{2})$

Consistency in aggregation

Stepwise aggregation should yield equal index number as direct aggregation



- Lots of reasonable axioms can be posed – choice among them may be considered arbitrary
- Impossible to pass all desirable tests
 - "Number of tests passed" is not really a valid quality score for an index

Axiomatic index theory 6

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> Actually, for Carli index, $P(p^0, p^1) \times P(p^1, p^0) \ge 1$ with equality only exceptionally



Quality Adjustment, QA *(Kvalitetsvärdering)*

- To be made at product replacement in price collection
- Generally a difficult task, controversial
- ► Fashion variation is not quality change
- QA may have great impact on index
- Particularly difficult for unique products

 A top issue in international harmonisation (HICP)



Value of quality difference

- Value of quality change shall not be shown as price change in index

 shall be adjusted away
- Consumer (buyer) perspective (CPI):
 Value of quality change is value of change in consumer utility
- Producer (seller) perspective (PPI, SPPI):
 Value of quality change is change in production cost at unchanged technology





A view of quality

- A product may be viewed as a bundle of (quality) characteristics
 – analogous to a basket of products
- The bundle may be regarded from buyers' or sellers' perspective
- Buyers and sellers may be expected to agree on value of quality under suitable market conditions



Output index





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QA methods 1: "Explicit" methods

- Solution The second state of the second sta
- Direct price comparison (same quality)
- Judgmental QA
- Quantity adjustment
- Production cost adjustment (suits PPI)
 - "Option pricing"
 - Hedonic regression
 - Series Presently highly regarded method



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QA methods 2: "Implicit" methods

- These methods take value of quality difference as a diference in price
 Rely on "revealed preference"
 "Objective" yet controversial
- "Bridged overlap"/Form of imputation
- > Monthly chaining at EA level
- "Class mean imputation"
- "Link to show no price change"
 "Banned" metod!



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- Often used for cars
- Useful when a car model is replaced by a similar model differing in the set of features – such as stereo, side airbags
- The value of an included feature is set to 50% (for cars; or other fixed %-age) of the price for the feature separately \$\$ The reduction to 50% is motivated as assumed value to the average buyer



Judgmental QA – issues

- © Flexible applicable in various areas
- © Consumer perspective (though not ideal)
- ⊗ "Subjective" lacking control
- Support for judgments is essential
 May resemble option pricing
 Criteria for appropriate support?
 Empirical issue how the method performs





Product areas with Price Collector QA in Sweden

- Clothing material etc.
- Furniture, furnishings
- "Other medical" goods
- Bicycles, car accessories
- **Tv, radio, cameras, sports equipmt. etc.**
- Canteen services etc. (some)
- "Other effects" etc.



QA impact overall (per cent)



Year	Judg- mental	Bridged overlap	"Autom. linking"
1997	-0.69	0.08	-0.68
1998	-0.70	-0.44	-1.44
1999	-1.89	-1.24	-2.09
2000	-1.53	-2.33	-1.91
2001	-2.23	-2.50	-3.03
2002	-1.49	-0.79	-1.82

