A Comparison of Weighted Time Dummy Hedonic and Time-Product Dummy Indexes

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Background

• Aizcorbe, Corrado and Doms (2003)
• Aizcorbe and Pho (2005)
• Silver and Heravi (2005)
  – “A Failure in the Measurement of Inflation: Results from a Hedonic and Matched Experiment Using Scanner Data”
• Krsinich (2016)
  – “The FEWS Index: Fixed Effects with a Window Splice”
The TDH and TPD models

- The Time Dummy Hedonic model:

\[
\ln p_i^t = \delta^0 + \sum_{t=1}^{T} \delta^t D_i^t + \sum_{k=1}^{K} \beta_k z_{ik} + \varepsilon_i^t
\]

- The Time Product Dummy model:

\[
\ln p_i^t = \alpha + \sum_{t=1}^{T} \delta^t D_i^t + \sum_{i=1}^{N-1} \gamma_i D_i + \varepsilon_i^t
\]
Weighted TDH and TPD Indexes

\[ P^{0t} = \exp(\hat{\delta}^t) \]

\[ P_{TDH}^{0t} = \prod_{i \in S^t} (p_i^t)^{s_i^t} \frac{\prod_{i \in S^0} (p_i^0)^{s_i^0}}{\exp \left[ \sum_{k=1}^{K} \hat{\beta}_k (\bar{z}^0_k - \bar{z}^t_k) \right]} \]

\[ P_{TPD}^{0t} = \prod_{i \in S^t} (p_i^t)^{s_i^t} \frac{\prod_{i \in S^0} (p_i^0)^{s_i^0}}{\exp(\hat{\gamma}^0 - \hat{\gamma}^t)} \]
Decomposition in regression residuals (1)

- Weighted TDH and TPD sum to zero in each period.

\[ \prod_{i \in S^0} \left( \frac{\hat{p}_i^0}{p_i} \right)^{s_i^0} = \prod_{i \in S^t} \left( \frac{\hat{p}_i^t}{p_i} \right)^{s_i^t} = 1 \]

- The TDH and TPD indices can be written as:

\[ P^{0t} = \prod_{i \in S^0} \left( \frac{\hat{p}_i^t}{p_i} \right)^{s_i^0} = \prod_{i \in S^t} \left( \frac{p_i^t}{\hat{p}_i^0} \right)^{s_i^t} = \prod_{i \in S^0} \left( \frac{\hat{p}_i^t}{p_i^0} \right)^{s_i^0} \prod_{i \in S^t} \left( \frac{p_i^t}{\hat{p}_i^0} \right)^{s_i^t} \]
Decomposition in regression residuals (2)

\[ \frac{P_{TPD}^{0t}}{P_{TDH}^{0t}} = \exp \left[ \frac{s_D}{s_M} \left( u_{D(TPD)}^0 - u_{D(TDH)}^0 \right) \right] \cdot \exp \left[ \frac{s_N^t}{s_M^t} \left( u_{N(TDH)}^t - u_{N(TPD)}^t \right) \right] \cdot \exp \left[ \left( u_{M(TPD)}^0 - u_{M(TPD)}^{0(t)} \right) - \left( u_{M(TDH)}^0 - u_{M(TDH)}^{0(t)} \right) \right] \]
Empirical Illustration (1)
Weighted TPD & TDH Indexes
Empirical Illustration (2)
Weighted Average Residuals
Empirical Illustration (3)
Aggregate Expenditure Shares

Disapp.  New  Matched (0)  Matched (t)
Empirical Illustration (4)
Decomposition of TPD-TDH Ratio

Ratio   Disapp.   New   Third term
Empirical Illustration (5)

TPD-TDH Indexes – Group Level
Empirical Illustration (6)
Decomposition – Group Level

Ratio  Disapp.  New  Third term
Questions?