Discussion of Household Inventory, Temporary Sales, and Price Indices by Ueda, Watanabe and Watanabe

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NBER Japan Conference
December 15th 2021
What the paper does

- Construct model of household inventory decisions
  - differentiate household purchasing and consumption decisions

- Use model & scanner (purchasing) data to estimate consumption quantities and prices under temporary sales
  - induce consumers to purchase more than they consume initially $\Rightarrow$ stockpiling

- Main application to intertemporal bias in chained superlative price indices
  - Result with estimated consumption data the chain bias is lower, even at low frequencies

- Other applications: price elasticity, inference on stockpiling behaviors
Intuition

Figure 1: Pattern of Price and Quantity Changes during a Sales Event

Note: The solid dots represent observable posted prices (top) and quantities purchased (bottom). The circles represent unobservable consumption prices (top) and quantities consumed (bottom).
Application: Intertemporal bias in chained superlative indices

- Price indices constructed as weighted average of price relatives
- Chain drift occurs whenever prices bounce around and quantities adjust (temporary sales, seasonal products, product turnover with clearance sales)

Reason for the Intertemporal Substitution Bias

- $\pi^P < \pi^T < 0 < \pi^L$.
- Suggestive thought experiment (Haan and van der Giessen 2011)
  - Natural to observe $W_1 < W_2$ and $W_3 < W_1 \rightarrow \pi^P < \pi^T < 0 < \pi^L$.

<table>
<thead>
<tr>
<th>Product</th>
<th>Price $t=1$</th>
<th>Price $t=2$</th>
<th>Price $t=3$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product A</td>
<td>$p_A$</td>
<td>$(1-r)p_A$</td>
<td>$p_A$</td>
</tr>
<tr>
<td>Share</td>
<td>$W_1$</td>
<td>$W_2$</td>
<td>$W_3$</td>
</tr>
<tr>
<td>Product B</td>
<td>$p_B$</td>
<td>$p_B$</td>
<td>$p_B$</td>
</tr>
<tr>
<td>Share</td>
<td>$1-W_1$</td>
<td>$1-W_2$</td>
<td>$1-W_3$</td>
</tr>
</tbody>
</table>
CPIs tend to use fixed weights = average quantities
  - similar to what the stockpiling model is doing in practice
  - chain bias should tend to disappear at lower frequencies (eg. if temporary sales last few days, and data is monthly)
Measuring Chain drift

- Ivancic, Diewert, and Fox (2011) $\Rightarrow$ chained price index should take same value if prices and quantities for all products are equal at the beginning (0) and the end (tau)

$$d_{0,\tau,dt}^X = \frac{(\tau-1)/dt}{\sum_{s=1}^{\tau-1} \pi_{(s-1)dt,sdt}^X - \pi_{0,\tau-1}^X}$$

- Difference between calculating chained vs directly is the chain bias
- As dt increases, chain bias tends to 0

- If you have the P and Q at all time periods, then why use a chained index at all? $\Rightarrow$ chaining has many practical advantages, including the ability to account for changes in product mix
In Japan, the chain bias is still significant at monthly frequency
But the importance of stockpiling around sales fell dramatically over time

Figure 3: Asymmetry in the Quantity Purchased When the Price Increases and When It Decreases

- The numbers in the previous slide are an average for the chain drift over the 1990-2020 period
- What is the chain drift at monthly frequency if we only look at the recent period?
What is driving the decrease in stockpiling over time?
- Predictability or size of sales?
- Increase in cost of stockpiling?
- Lower inflation?

Is Japan the best environment to look at this?
- Yes: detailed and long data, change over time
- But low inflation & low panic/volatility
Covid stockouts (shortages) were relatively low in Japan

- Cavallo & Kryvtsov (2021) What can stockouts tell us about Inflation?

![Image of products with stockout notice](image_url)

Figure 1: Identifying Stockouts on a Retailer’s Website
Covid stockouts (shortages) were relatively low in Japan

- Cavallo & Kryvtsov (2021) What can stockouts tell us about Inflation?...

(a) Temporary Stockouts
More connected to “Stockpiling” behaviors

(b) Permanent Stockouts
Net discontinued goods
More connected to supply disruptions
In the US, temporary sales were countercyclical during Covid

Clothing: back to normal

Furniture: low sales

Electronics: low sales
In Japan, some evidence of large price discounts when Covid hit
Summary

- Great paper $\rightarrow$ simple method, great data, important applications

- Suggestions:
  - What drives changes over time in the degree of stockpiling?
  - Event studies around big shocks (earthquake, covid)

- Extensions: results may be even larger in countries with volatile sales and higher inflation