Defining Price Stability in Japan

David E. Weinstein

(with, but not implicating, Christian Broda)

CPI is a Critical Number for Japanese Policy

- Serves as the basis for monetary policy:
  - “Price stability is, conceptually, a state where the change in the price index without measurement bias is zero percent. Currently, there seems to be no significant bias in the Japanese consumer price index.” – Bank of Japan, March 9, 2006

- An upward bias in the CPI could have major fiscal implications
  - Much of the 2004 pension reform surrounded the indexing of pensions
  - If the CPI is biased upwards, then this could have major fiscal implications for Japan
Ministry of Internal Affairs and Communications denies evidence of bias

- From the MIAC website
  "It is said that the Japanese CPI might be 0.9 point higher than the actual situation. What is the truth? [This is based on] a guestimate in a paper written by an official of the Bank of Japan [Shiratsuka] in 1998, in which this official expressed his personal view. However, his guestimate is not well grounded." – MIAC website

- I’ll review some of the evidence

Consider the following

- After 5 straight months of positive year-on-year CPI inflation, the BOJ ended its policy of quantitative easing...
- After four more months of CPI growth of around 0.6 percent per year, the BOJ raised interest rates by 0.25 percent...
- And then MIAC rebased...
There seemed to be consistent inflation when quantitative easing ended

Japan Core CPI comparison, July 2005 - July 2006

But then MIAC did a very simple base update...

Oops!

Japan Core CPI comparison, July 2005 - July 2006

Maybe there isn’t a bias, but it looks suspicious

Source: James Harrigan
Objectives

- Some basic principles behind CPI measurement
- Some differences between the US CPI and the Japanese CPI (JCPI)
- Some estimates of the biases

What should the CPI Measure?

- A theoretic approach
  - The CPI is just a Laspeyres index and you should interpret it at your peril
  - MIAC: “it is necessary to pay attention that the CPI intends to measure the price movements themselves, not to measure movements of living expenses with changes of varieties, qualities or quantities of goods and services.”
The Problem

- MIAC wants to produce a number that is both *correct* and *meaningful*
- Puts a lot of pressure on agency to contradict former statement:
  “The index shows changes in the total amount of expenditure required to purchase the equivalent goods and services purchased by households in the base year”
- So which statement is correct?

A Benchmark

- Most economists and the BLS consider a superlative index to be “unbiased”
  - A superlative index is a second order approximation of an arbitrary unit cost function
- Examples of superlative indexes include the Tornqvist and Fisher Ideal Indexes
Why use Laspeyres?

- Historical Reasons
- Some problems computing Tornqvist in real time
  - Can be mitigated by using geometric averaging until final weights are known
- In practice, we compute Laspeyres indexes but try to make them behave like Tornqvist indexes
  - Result is that the CPI is a mix of Laspeyres indexes, sample rotations, imputations, and hedonics

Comparing the CPI in Japan and US
The US CPI contains two levels of aggregation

- The *Upper* level, 211 strata level price *indexes* in each of 38 areas (or regions) are combined either using a Laspeyres formula in the case of the standard CPI or a Tornqvist formula when using the chained CPI.

- The *Lower* level contains approximately ten price *quotations* per item-area (85,000 price quotes all)
  - Almost all of the deviations from the standard Laspeyres index in the US case – hedonics, geometric averaging of prices, sample rotations, etc. – occurs at this lower level.

The Japanese CPI is closer to a pure Laspeyres

- At the *upper level*, the Japanese CPI uses 598 items in its CPI instead of the 211 strata used in the US, and surveys these prices in 167 municipalities across Japan as opposed to the 38 in the US.

- The lower level of the Japanese CPI is virtually non-existent
  - Typically one price quote per good.
Differences between JCPI and USCPI

Characteristics of JCPI
- No Geometric Averaging of Prices
- Infrequent scheduled sample rotation
- Non-random sampling of goods
  - Largest seller is chosen
- No hedonics before 2000 and now only computers and digital cameras
- “Chained CPI” is not chained in US sense

Geometric Averaging
- Failure to account for lower level substitution among varieties was one of the most important problems in the US CPI
- Probably biased USCPI up by 0.5 percentage points per year prior to Boskin Commission changes
Sampling

- BLS uses much broader definitions of its strata and then samples products based on what consumers say they are purchasing
  - The BLS schedules a rotation of 25 percent of its sample every year
  - Correcting these biases reduces the USCPI by 0.3-4
- MIAC chooses products and then updates these without statistical sampling
  - Until 2000 computers were not part of the JCPI but “Abacus Lesson Fees” were
  - Scheduled rotation rate seems to be around 10 percent every 5 years

Chaining

- USCPI uses a Tornqvist formula for chaining that incorporates base and current weights
  - Estimates of current weights are used until final weights are used
- “chained” JCPI does not use current weights
  - Simply updates the Laspeyres base annually
    - USCPI updates this biannually
- JCPI does not solve substitution bias!
Prior Work

- Boskin Commission Biases

<table>
<thead>
<tr>
<th>Bias</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper and Lower Substitution</td>
<td>0.6</td>
</tr>
<tr>
<td>Sampling Bias</td>
<td>0.3</td>
</tr>
<tr>
<td>Quality Upgrading</td>
<td>0.6</td>
</tr>
</tbody>
</table>

Total: 1.3

It’s hard to see why these don’t matter in Japan.

Prior Work on Japan

- Most of the estimates of bias focus on upper level biases (e.g. Shiratsuka 1999, 2005, 2006)
  - These were small (0.15 percent per year in the US)

- Little attention to lower level biases where difference between Laspeyres and Tornqvist are larger
  - May reflect easier substitutability among similar products than across categories
Prior Work

- Ariga (2003) finds substantial sampling biases
  - In his sample, the biases ranged from 1.5 to 2 percentage points per year

Estimating Biases using the Japanese Import Price Index
Why Look at Import Prices

- Import prices are an ideal place to look at these biases because BOJ uses a similar methodology to compute import price index but we have all the price data.

- Possible Problems with BOJ Methodology
  - Nonrandom sampling
  - Formula Bias (Laspeyres vs. Tornqvist index)
  - No lower level substitution
  - No accounting for new varieties

Replicating the Import Price Index

Estimated vs. Actual Import Price Index

Unit values don’t matter that much
Formula Bias in Japanese Import Price Index base on different index numbers

<table>
<thead>
<tr>
<th>Measured Inflation Relative to Tornqvist</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median Bias of Index Relative to Tornqvist</td>
</tr>
<tr>
<td>----------------------------------------</td>
</tr>
<tr>
<td>1.5</td>
</tr>
<tr>
<td>Standard Dev. of Measurement Error</td>
</tr>
</tbody>
</table>

Source: Broda and Weinstein

Summing Up

Annual Biases in Import Price Index

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Formula Bias</td>
<td>1.5</td>
</tr>
<tr>
<td>Variety Bias*</td>
<td>0.5</td>
</tr>
<tr>
<td>Total</td>
<td>2.0</td>
</tr>
</tbody>
</table>

* Uses methodology to compute the bias due to new goods developed in Broda and Weinstein [QJE 2006]
Conclusion

- The JCPI has not implemented many of the innovations of the USCPI
  - This is likely to produce formula biases which on import data range of as much as 2 percent per year
- In addition there is substantial measurement error meaning that the bias ranges from +/- 0.4 percent per year
  - This means one can't simply adjust the CPI for the bias
- Price stability (at least for imports) probably is probably closer to an inflation rate of 1 percent per year than to a measured rate of 0