Is food special?

Rudrani Bhattacharya
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November 18, 2013
Outline

- Food inflation has high pass-through into non-food inflation in India
- Monetary policy response: Theory and international evidence
- India differs from the world in terms of food inflation’s source
- Establishes strong case for including food in inflation target
Food and overall WPI inflation

![Graph showing the percentage year-over-year change in WPI food and all commodities from 2006 to 2012. The graph indicates that food inflation is generally higher than overall commodity inflation.](image-url)
CPI-IW inflation

Index

% YOY change

CPI–IW

2006 2008 2010 2012

4 6 8 10 14

2006 2008 2010 2012

Index
Monetary policy

![Graph showing monetary policy trends]

<table>
<thead>
<tr>
<th>Year</th>
<th>Call rate</th>
<th>Repo rate</th>
<th>Reverse repo rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>3%</td>
<td>4%</td>
<td>5%</td>
</tr>
<tr>
<td>2010</td>
<td>6%</td>
<td>8%</td>
<td>7%</td>
</tr>
<tr>
<td>2011</td>
<td>8%</td>
<td>9%</td>
<td>8%</td>
</tr>
<tr>
<td>2012</td>
<td>7%</td>
<td>6%</td>
<td>5%</td>
</tr>
<tr>
<td>2013</td>
<td>4%</td>
<td>3%</td>
<td>4%</td>
</tr>
</tbody>
</table>

Apr–Jun 2013

Rudrani Bhattacharya National Institute of Public Finance and Policy

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Inflation expectations

% YOY change

Index

2008 2009 2010 2011 2012 2013

4 6 8 10 12 14

Inflation expectation
CPI–IW

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Questions

- What is the degree of transmission of food inflation to non-food inflation and aggregate CPI inflation?
- What should a central bank do when inflation pressure is originated from food component?
  - Theory
  - Practice
Part I

Transmission of food to non-food inflation in India
Transmission of food to non-food inflation in India (Bhattacharya, Rao and Sen Gupta, 2013)

- Structural Vector Error Correction Model (SVECM) which identifies long-run and short-run relationships
- Structure of the model:

\[ \Delta y_t = \mu + \alpha \beta y_t + A_1 \Delta y_{t-1} + \ldots + A_{p-1} \Delta y_{t-p+1} + u_t \]  

where,

\[ y_t = \begin{bmatrix} \ln(\text{food})_t \\ \ln(\text{non-food non-oil})_t \\ \ln(\text{cpi})_t \end{bmatrix} \]
Estimation strategy

Shock structure underlying the structural VECM model

\[
\begin{bmatrix}
    u_{t}^{\text{food}} \\
    u_{t}^{\text{non-food}} \\
    u_{t}^{\text{cpi}}
\end{bmatrix}
= 
\begin{bmatrix}
    1 & 0 & 0 \\
    b_{t}^{\text{food}} & 1 & 0 \\
    b_{t}^{\text{non-food}} & b_{t}^{\text{cpi}} & 1
\end{bmatrix}
\begin{bmatrix}
    \epsilon_{t}^{\text{food}} \\
    \epsilon_{t}^{\text{non-food}} \\
    \epsilon_{t}^{\text{cpi}}
\end{bmatrix}
\]

(2)

where \( u_t \) is the reduced form error and \( \epsilon_t \) denotes structural error.
Data

- WPI (monthly frequency) at disaggregated level from Office of Economic Advisors
- WPI food is proxied by an weighted average of WPI food articles and food products
- WPI non-food non-oil index is derived as follows:

\[
WPI_{nfo} = \frac{\text{WPI} - w_{fa}\text{WPI food articles} - w_{fm}\text{WPI food products} - w_{fu}\text{WPI fuel}}{1 - w_{fa} - w_{fm} - w_{fu}},
\]

- CPI-IW (monthly frequency) from Labour Bureau
- Span of analysis: January, 1999-September, 2012
- Price series are seasonally adjusted (Authors’ estimate)
Co-movement in prices

- WPI Food
- WPI non-food non-oil
- CPI

<table>
<thead>
<tr>
<th>Year</th>
<th>Price Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apr 1994</td>
<td>50</td>
</tr>
<tr>
<td>Jan 1997</td>
<td>100</td>
</tr>
<tr>
<td>Jan 2000</td>
<td>150</td>
</tr>
<tr>
<td>Jan 2003</td>
<td>200</td>
</tr>
<tr>
<td>Jan 2006</td>
<td>250</td>
</tr>
<tr>
<td>Jan 2009</td>
<td>300</td>
</tr>
<tr>
<td>Jan 2012</td>
<td>350</td>
</tr>
</tbody>
</table>
Series are I(1)

One co-integration relation at 5% and 10% level of significance detected by Johansen co-integration trace test

<table>
<thead>
<tr>
<th></th>
<th>test statistics</th>
<th>10pct</th>
<th>5pct</th>
<th>1pct</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trace r ≤ 2</td>
<td>5.85</td>
<td>6.50</td>
<td>8.18</td>
<td>11.65</td>
</tr>
<tr>
<td>test r ≤ 1</td>
<td>15.68</td>
<td>15.66</td>
<td>17.95</td>
<td>23.92</td>
</tr>
<tr>
<td>r = 0</td>
<td><strong>32.56</strong></td>
<td>28.71</td>
<td>31.52</td>
<td>37.22</td>
</tr>
</tbody>
</table>
Transmission of food to non-food inflation

Response of Non-food to food (%)

Response of CPI to food (%)

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## Forecast Error Variance Decomposition

<table>
<thead>
<tr>
<th>Horizon</th>
<th>Food</th>
<th>Non-food</th>
<th>CPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>FEVD for non-food inflation</td>
<td>1 54.292</td>
<td>45.708</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>5 48.834</td>
<td>50.923</td>
<td>0.242</td>
</tr>
<tr>
<td></td>
<td>10 46.116</td>
<td>53.567</td>
<td>0.317</td>
</tr>
<tr>
<td>FEVD for CPI inflation</td>
<td>1 46.013</td>
<td>1.284</td>
<td>52.702</td>
</tr>
<tr>
<td></td>
<td>5 63.468</td>
<td>0.503</td>
<td>36.029</td>
</tr>
<tr>
<td></td>
<td>10 72.099</td>
<td>0.761</td>
<td>27.14</td>
</tr>
</tbody>
</table>
Findings

- 1 month out, 54% of variation in non-food inflation is due to variation in food inflation
- Variation in non-food inflation due to variation in food inflation falls to 48% after 5 months
- 1 month out, food inflation contributes 46% in variation of aggregate inflation which increases to 63% after 5 months
Part II

Implications for recent inflation episodes
Recent food and non-food inflation episodes

SAAR (%)

WPI food

WPI non-food non-oil

Index

2010 2011 2012 2013
Annualised impact of food inflation on non-food non-oil inflation

Assumption: food inflation is due to orthogonalised shock to food prices, no other shock affects rest of the system at period 0 and afterwards

<table>
<thead>
<tr>
<th>Date</th>
<th>Food inflation</th>
<th>Non-food non-oil Inflation</th>
<th>Impulse response</th>
<th>Predicted non-food non-oil inflation due to food inflation Annualised</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jun, 2013</td>
<td>19.26</td>
<td>17.89</td>
<td>0.61</td>
<td>11.75</td>
</tr>
<tr>
<td>Jul, 2013</td>
<td>16.46</td>
<td>17.89</td>
<td>0.72</td>
<td>13.86</td>
</tr>
<tr>
<td>Aug, 2013</td>
<td>28.31</td>
<td>17.89</td>
<td>0.55</td>
<td>10.59</td>
</tr>
<tr>
<td>Sep, 2013</td>
<td>11.43</td>
<td>17.89</td>
<td>0.55</td>
<td>10.59</td>
</tr>
</tbody>
</table>
Recent food and CPI inflation episodes

![Graph showing SAAR (SAAR (%)) with years 2010 to 2013 on the x-axis and SAAR (%) on the y-axis. The graph compares WPI food and CPI-IW indices.](image)

- **WPI food**
- **CPI–IW**

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Is food special?

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Annualised impact of food inflation on CPI inflation

Assumption: food inflation is due to orthogonalised shock to food prices, no other shock affects rest of the system at period 0 and afterwards

<table>
<thead>
<tr>
<th>Date</th>
<th>Food inflation SAAR</th>
<th>CPI inflation SAAR</th>
<th>Impulse response</th>
<th>Predicted CPI inflation due to food inflation Annualised</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jun, 2013</td>
<td>19.26</td>
<td><strong>12.44</strong></td>
<td>0.49</td>
<td>9.44</td>
</tr>
<tr>
<td>Jul, 2013</td>
<td>8.75</td>
<td>0.65</td>
<td></td>
<td>12.52</td>
</tr>
<tr>
<td>Aug, 2013</td>
<td><strong>11.19</strong></td>
<td>0.55</td>
<td></td>
<td>10.59</td>
</tr>
</tbody>
</table>
Part III

What should a central bank do?
Broad CPI targeting is welfare superior to PPI targeting under imported food inflation shock (Catao Chang, 2010, Pesenti 2013)
- If food constitutes a large portion of the basket of importables
- Stabilises volatility of real effective exchange rate and consumption

Stabilising headline inflation is optimal compared to core inflation targeting under food inflation shock (Anand and Prasad, 2010)
- In the scenario when a fraction of households are credit constrained weakening monetary policy transmission
- Real wage of credit constrained households depends on food prices
“Because shocks to commodity price inflation are typically beyond the control of policymakers, hard to predict, and often not sustained, central banks seeking to establish credibility are generally better off setting and communicating their monetary policy in terms of underlying inflation rather than headline inflation. A headline framework may be preferred, however, if economic agents place a much higher value on the stability of headline inflation than on the stability of output”
CPI net of volatile components can be used as an operational target (Waiquamdee, Sutthasri and Tanboon, 2009)

- Setting a target by the central bank involves medium to long term inflation forecasting
- Inflation forecast may be affected by large swings in commodity prices

<table>
<thead>
<tr>
<th>No smoothing across time</th>
<th>CPI</th>
<th>Fixed-item exclusion (Core CPI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No smoothing across items</td>
<td>Simple averaging; moving average</td>
<td>Trimmed mean</td>
</tr>
<tr>
<td></td>
<td>Exponential smoothing</td>
<td>Unobserved component model</td>
</tr>
</tbody>
</table>
Targeting core inflation taking into account the degree of transmission of food to core inflation can be an operational procedure (Gregorio, 2012)

- **Aggregate demand**

  \[ y - \bar{y} = A - \phi(i - \pi^e) + \delta\epsilon^y \]  

- **Phillips curve:** A negative supply shock affecting potential output

  \[ \pi = \pi^e + \theta[y - (\bar{y} - \gamma\epsilon^s)] + \alpha\epsilon^s \]  

- **Central bank’s loss function**

  \[ min[\lambda(y - \bar{y})^2 + (\pi - \bar{\pi})^2] \]
Practice

- Optimal policy rule

\[ i = \bar{i} + \frac{\theta}{\phi(\theta^2 + \lambda)}[\pi^e - \bar{\pi}] + \epsilon^s \left( \frac{\alpha \theta + \gamma \theta^2}{\phi(\theta^2 + \lambda)} \right) \] (5)

- Core, food and aggregate inflation

\[ \pi = \beta \pi^c + (1 - \beta) \pi^f \] (6)
\[ \Delta \pi^c = \sigma \Delta \pi^f \] (7)
\[ \Delta \pi = [\beta \sigma + (1 - \beta)] \Delta \pi^f \] (8)

- Implication:
  - If \( \sigma \) is high, core inflation targeting is consistent with aggregate inflation targeting
  - Respond to food inflation if it is persistent and \( \sigma \) is high, otherwise no monetary policy action needed
<table>
<thead>
<tr>
<th>Country</th>
<th>Food</th>
<th>Target</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>22.54 (2005)</td>
<td>Headline CPI (YOY)</td>
<td>4.5% (+/−2%)</td>
</tr>
<tr>
<td>Chile</td>
<td>16.5</td>
<td>CPI (YOY)</td>
<td>3% (+/−1%)</td>
</tr>
<tr>
<td>Colombia</td>
<td>28%</td>
<td>CPI excluding agri. food, public services, transport (YOY)</td>
<td>2-4%</td>
</tr>
<tr>
<td>Hungary</td>
<td>17.6</td>
<td>CPI (YOY)</td>
<td>3% (+/−1%)</td>
</tr>
<tr>
<td>Israel</td>
<td>–</td>
<td>CPI (YOY)</td>
<td>3% - 5%</td>
</tr>
<tr>
<td>Mexico</td>
<td>16.9</td>
<td>CPI (YOY)</td>
<td>3% (+/−1%)</td>
</tr>
<tr>
<td>Peru</td>
<td>21.2*</td>
<td>CPI excluding food, fruits &amp; vegetables, urban transport (YOY)</td>
<td>1-3%</td>
</tr>
<tr>
<td>Poland</td>
<td>22</td>
<td>Headline CPI (YOY)</td>
<td>2.5% (+/−1%)</td>
</tr>
<tr>
<td>South Korea</td>
<td>13.6**</td>
<td>Headline CPI (YOY)</td>
<td>3% (+/−1%)</td>
</tr>
<tr>
<td>South Africa</td>
<td>16.9</td>
<td>Headline CPI for urban areas (YOY)</td>
<td>3% - 6%</td>
</tr>
<tr>
<td>Thailand</td>
<td>23***</td>
<td>CPI excl. food &amp; energy prices (YOY)</td>
<td>0 - 3.5%</td>
</tr>
<tr>
<td>Turkey</td>
<td>22.3</td>
<td>Headline CPI (YOY)</td>
<td>5%</td>
</tr>
</tbody>
</table>

Source: OECD, Central Banks, BIS
Food inflation and monetary policy in Indian perspective

- Food inflation in India—supply shock in non-traded sector
- Stabilising an indicator that includes non-traded goods is optimal under negative productivity shock in non-traded sector (Soto, 2003)
  - Index of non-traded and domestically produced goods prices
  - CPI when share of non-traded sector is very high
Food inflation and monetary policy in Indian perspective

Establishes a strong case for India to include food in the inflation target of the central bank

- Food has 46% share in CPI basket
- Food inflation has high pass-through to non-food inflation
- Food inflation originates from a negative productivity shock in non-traded food sector
Thank you