Long-term drivers of inflation in Austria and the effects of EU accession

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Austrian rate of inflation was exposed to several trend developments:

- Oil price shocks of the 70’s
- “Great Moderation“ from the 80’s onwards
- EU accession 1995
- Introduction of a common currency 1999
- Financial crisis 2008
Estimation of an extended Phillips Curve for Austria

- Simple, backward-looking Phillips Curve for small open economy (Gordon, 2011)

\[ \pi_t = \mu + \rho \pi_{t-1} + \gamma \text{gap}_t + \delta X_{t-1} + \epsilon_t \]

- Inflation driving variable
  - Output gap

- Control variables (elements of \(X_t\)):
  - Crude oil price
  - Productivity
  - Integration (trade openness)
  - Monetary policy

- Tests for structural breaks (Bai-Perron, 2003)
- Estimation with OLS with robust S.E.
## Results I: Phillips Curve estimations and structural breaks

<table>
<thead>
<tr>
<th>Estimation periods</th>
<th>Q1 80–Q3 19</th>
<th>Q1 80–Q4 85</th>
<th>Q1 86–Q4 94</th>
<th>Q1 95–Q2 00</th>
<th>Q3 00–Q3 19</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inflation(-1)</strong></td>
<td>0.3159***</td>
<td>0.0325</td>
<td>-0.4493***</td>
<td>-0.0954</td>
<td>0.2373**</td>
</tr>
<tr>
<td></td>
<td>-0.0796</td>
<td>-0.1395</td>
<td>-0.1657</td>
<td>-0.1813</td>
<td>-0.0957</td>
</tr>
<tr>
<td><strong>Inflation(-2)</strong></td>
<td>0.1761***</td>
<td>0.0409</td>
<td>-0.5207***</td>
<td>0.3382**</td>
<td>-0.0258</td>
</tr>
<tr>
<td></td>
<td>-0.0652</td>
<td>-0.1171</td>
<td>-0.1594</td>
<td>-0.1693</td>
<td>-0.093</td>
</tr>
<tr>
<td><strong>Inflation(-3)</strong></td>
<td>0.1448*</td>
<td>0.1018</td>
<td>-0.0451</td>
<td>0.1426</td>
<td>0.0381</td>
</tr>
<tr>
<td></td>
<td>-0.0804</td>
<td>-0.1686</td>
<td>-0.1786</td>
<td>-0.2822</td>
<td>-0.0812</td>
</tr>
<tr>
<td><strong>Output gap</strong></td>
<td>0.0819***</td>
<td>0.4178***</td>
<td>-0.0163</td>
<td>0.3451***</td>
<td>0.1248***</td>
</tr>
<tr>
<td></td>
<td>-0.0313</td>
<td>-0.114</td>
<td>-0.0221</td>
<td>-0.0614</td>
<td>-0.0308</td>
</tr>
<tr>
<td><strong>Δ crude oil price</strong></td>
<td>0.0071***</td>
<td>-0.0341***</td>
<td>-0.002</td>
<td>-0.0033</td>
<td>0.0083***</td>
</tr>
<tr>
<td></td>
<td>-0.0012</td>
<td>-0.0112</td>
<td>-0.0043</td>
<td>-0.0002</td>
<td>-0.0013</td>
</tr>
<tr>
<td><strong>Δ productivity</strong></td>
<td>-0.0419</td>
<td>-0.5203***</td>
<td>0.0444</td>
<td>-0.0828</td>
<td>-0.0705*</td>
</tr>
<tr>
<td></td>
<td>-0.0406</td>
<td>-0.1452</td>
<td>-0.0497</td>
<td>-0.053</td>
<td>-0.0382</td>
</tr>
<tr>
<td><strong>Trade openness</strong></td>
<td>0.00040*</td>
<td>0.0081</td>
<td>0.0353***</td>
<td>-0.0296***</td>
<td>-0.0160***</td>
</tr>
<tr>
<td>(exports+imports)/GDP</td>
<td>-0.0022</td>
<td>-0.0026</td>
<td>-0.0102</td>
<td>-0.0094</td>
<td>-0.006</td>
</tr>
<tr>
<td><strong>Policy rate(-2)</strong></td>
<td>-0.0173</td>
<td>0.1830***</td>
<td>0.1391***</td>
<td>-0.0867</td>
<td>-0.1015**</td>
</tr>
<tr>
<td></td>
<td>-0.0193</td>
<td>-0.0677</td>
<td>-0.0364</td>
<td>-0.1151</td>
<td>-0.0405</td>
</tr>
<tr>
<td><strong>Constant</strong></td>
<td>0.0014**</td>
<td>0.0072***</td>
<td>0.0265***</td>
<td>-0.0064***</td>
<td>0.0037***</td>
</tr>
<tr>
<td></td>
<td>-0.0006</td>
<td>-0.0152</td>
<td>-0.007</td>
<td>-0.0022</td>
<td>-0.0006</td>
</tr>
<tr>
<td>Adj. R²</td>
<td>0.54</td>
<td>0.45</td>
<td>0.44</td>
<td>0.38</td>
<td>0.58</td>
</tr>
<tr>
<td>Obs.</td>
<td>159</td>
<td>24</td>
<td>36</td>
<td>22</td>
<td>77</td>
</tr>
</tbody>
</table>

1 dependent variable: Austrian CPI inflation (quarterly); number of significant structural breaks 3: Q1 86, Q1 95, Q3 00.

Note: *** p-value<0.01, ** p-value<0.05, * p-value<0.1; Bai-Perron (2003) test for multiple structural breaks, sequential procedure; OLS estimations of subperiods as suggested by structural breaks, HAC-robust standard errors in brackets.

Source: authors' calculations.
Extension: Time-varying coefficient estimation

- Structural break tests highlight time-varying determinants of the inflation in Austria
- Estimation of same model with time-varying coefficients

\[ y_t = X_t' \beta_t + \epsilon_t, \ t = 1, ..., T \]

where \( X_t = (X_{0t}, X_{1t}, ... X_{dt})' \) and \( \beta_t = (\beta_{0t}, \beta_{1t}, ... \beta_{dt})' \) are time-varying and \( \epsilon_t \) the error term

- Application of kernel smoothing techniques with Nadaraya–Watson/ local constant estimator
- A local constant estimation for each time-intervall, \( t \pm h \) (h „bandwidth“)
Results II: Phillips Curve estimation with time-varying coefficients

Note: time-varying estimations (excl. Inflation(-2) und Inflation(-3)) using Nadaraya-Watson estimator from Q1/80 to Q3/19. Pseudo R²: 0.64. The "bandwith" is set to 0.4. The solid line reflects the time-varying coefficients, the dashed line the respective 80% confidence intervals. The latter are estimated using wild bootstrap residual resampling.

Source: OeNB, authors' calculations.
Conclusions

• Relatively stable Phillips Curve for Austria for most of the past 40 years
• External effects on PC during the 1990s:
  - Temporary weakening of PC relationship between economic activity and inflation during the 1990s
  - EU accession, EMU implementation and globalization may have resulted in stronger non-domestic drivers of Austrian inflation
  - After the financial and economic crisis of 2008/09 the PC relationship has strengthened again
• Monetary policy did not start to have a measurable impact on inflation developments in Austria before the EMU participation → transmission of the Eurosystem’s stability-oriented monetary policy has been working effectively in Austria
• Economic framework conditions in Austria will continue to change in the future: expansion of the internal market, digitalization, (de-) globalization, climate change, Covid-19…
Danke für Ihre Aufmerksamkeit

Thank you for your attention

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