Indra Astrayuda, Laurence Ball and Sandeep Mazumder: “Inflation Dynamics and the Great Recession: An Update”

Discussion by Henrik Jensen

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Sveriges Riksbank Workshop on Inflation, Unemployment and Monetary Policy
February 15, 2013
Objective of paper

- Examination of one of the most central relationships in macroeconomics:
  - The Phillips Curve

- Focus is a price-inflation Phillips curve with backward-looking expectations for the US economy
- Focus is the issue of “missing deflation” in the recent crises: Dynamic forecasts of inflation for recent years based on pre-crisis estimations suggest lower inflation than experienced
New approaches and results

- Paper extends Ball and Mazumder (2011, BPEA) who suggested two major explanations for the “puzzle”:
  - “Core inflation” should be measured by median inflation across industries
  - The slope of the Phillips curve should be allowed to be time-varying (it turns out to be much flatter recently) (so, robust estimations should start in 1980s)

- So, with lower median inflation in 2007q4, and a flatter (and more robustly estimated) Phillips curve, there is no “missing deflation”
  - Except for “now,” 2011q1-2012q4, where the model “breaks down”, and there is again “missing inflation”

- Current paper suggests, and analyze, three different explanations
  - Anchoring of inflation expectations: Backward-looking expectations seem to be replaced by constant expectations
  - Use of short-term unemployment as driving variable: In 2010-2012 it is lower than long-term unemployment
  - Downward nominal wage rigidity (still in progress)
The central equation throughout is

$$\pi_t = \pi_t^e + \alpha (u - u^*)_t + \epsilon_t$$

Apart from timing issues, completely conventional

Expectations modelling “follow a long tradition in applied work that assumes backward-looking expectations”

$$\pi_t^e \equiv \frac{1}{4} (\pi_{t-1} + \pi_{t-2} + \pi_{t-3} + \pi_{t-4})$$

Could also be a place to rethink
All estimations I do is on core inflation measured as prices on all items excl. food and energy; “XFE” (I call it “XPE” in database for unknown reasons.)

Dependent Variable: XPE
Method: Least Squares
Date: 02/15/13  Time: 00:11
Sample (adjusted): 1959Q1 2012Q4
Included observations: 216 after adjustments
XPE=C(1)+0.25*(XPE(-1)+XPE(-2)+XPE(-3)+XPE(-4))+C(2)*UNGAPSR

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C(1)</td>
<td>0.113931</td>
<td>0.065092</td>
<td>1.750324</td>
</tr>
<tr>
<td>C(2)</td>
<td>-0.280891</td>
<td>0.042676</td>
<td>-6.582003</td>
</tr>
</tbody>
</table>

R-squared 0.877326  Mean dependent var 3.900637
Adjusted R-squared 0.876753  S.D. dependent var 2.626568
S.E. of regression 0.922098  Akaike info criterion 2.684885
Sum squared resid 181.9565  Schwarz criterion 2.716138
Log likelihood -287.9676  Hannan-Quinn criter. 2.697511
F-statistic 1530.464  Durbin-Watson stat 0.393812
Prob(F-statistic) 0.000000
Phillips curve with core inflation 1958q1-2012q4
Astrapuña et al. (2013) inflation expectations

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\[ \pi^e_t \equiv c_2 \pi_{t-1} + c_3 \pi_{t-2} + c_4 \pi_{t-3} + (1 - c_2 - c_3 - c_4) \pi_{t-4}, \] where \( c_i \)'s are estimated

**Dependent Variable:** XPE  
**Method:** Least Squares  
**Date:** 02/15/13  
**Sample (adjusted):** 1959Q1 2012Q4

<table>
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<tbody>
<tr>
<td>C(1)</td>
<td>0.036764</td>
<td>0.033423</td>
<td>1.099951</td>
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<tr>
<td>C(2)</td>
<td>1.378024</td>
<td>0.068235</td>
<td>20.19532</td>
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<tr>
<td>C(3)</td>
<td>-0.381102</td>
<td>0.116852</td>
<td>-3.261396</td>
</tr>
<tr>
<td>C(4)</td>
<td>0.033715</td>
<td>0.116341</td>
<td>0.289799</td>
</tr>
<tr>
<td>C(5)</td>
<td>-0.087193</td>
<td>0.023200</td>
<td>-3.758290</td>
</tr>
</tbody>
</table>

**R-squared**  
Mean dependent var  3.900637  
**Adjusted R-squared**  
S.D. dependent var  2.626568  
**S.E. of regression**  
Akaike info criterion  1.356644  
**Sum squared resid**  
Schwarz criterion  1.434775  
**Log likelihood**  
Hannan-Quinn citer.  1.388209  
**F-statistic**  
Durbin-Watson stat  1.957610  
**Prob(F-statistic)**  
0.000000
Comments: Estimated “adaptiveness”

Phillips curve for core inflation 1958q1 - 2012q4
Inflation expectations as 4 lags with estimated weights

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Alternative would be a bit less traditional:

\[ \pi_t^e = \beta c_2 E_t \pi_{t+1} + (1 - c_2) \pi_{t-1} \]

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Comments: “Hybrid” “New Keynesian” GMM example

"Hybrid" "New-Keynesian" Phillips curve 1958q1-2012q4

Residual  Actual  Fitted
There is something schizophrenic about the dynamic forecasts

- Your inflation brain is stuck in 2007q4
- Your unemployment brain keeps track of time and process new information
- With this “mixed” mind you assess inflation in, say, 2012q1. Would a policymaker do this?

One could consider static forecasts (one-step ahead forecasts), where your inflation brain is rebooted.

- Then, a model estimated up until 2007q4 does not look that bad
Comments: Static forecasts do not perform too bad

Phillips curve for core inflation 1958q1 - 2007q4 (w. estimated lags)
Static (one-step ahead) forecasts

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It is hard to reject a unit root in core inflation
I would therefore be executed at my department for even contemplating OLS in levels

I therefore tried an estimation in first differences:

$$\Delta \pi_t = \Delta \pi_t^e + \alpha \Delta (u - u^*)_{t-1} + \Delta \epsilon_t$$

with $\pi_t^e$ being backward looking but with estimated weights
And took it to the authors’ dynamic forecast test
### Regression Results

**Dependent Variable:** D(XPE)  
**Method:** Least Squares  
**Date:** 02/15/13  **Time:** 00:35  
**Sample (adjusted):** 1959Q2 2012Q4  
**Included observations:** 215 after adjustments

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.001009</td>
<td>0.038088</td>
<td>0.026478</td>
<td>0.9789</td>
</tr>
<tr>
<td>D(XPE(-1))</td>
<td>0.187876</td>
<td>0.119268</td>
<td>1.575240</td>
<td>0.1167</td>
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<tr>
<td>D(XPE(-2))</td>
<td>0.171731</td>
<td>0.076205</td>
<td>2.253543</td>
<td>0.0253</td>
</tr>
<tr>
<td>D(XPE(-3))</td>
<td>0.280224</td>
<td>0.061651</td>
<td>4.545338</td>
<td>0.0000</td>
</tr>
<tr>
<td>D(XPE(-4))</td>
<td>-0.387396</td>
<td>0.064996</td>
<td>-5.960341</td>
<td>0.0000</td>
</tr>
<tr>
<td>D(UNGAPSR(-1))</td>
<td>-0.348385</td>
<td><strong>0.103766</strong></td>
<td><strong>-3.357396</strong></td>
<td>0.0009</td>
</tr>
<tr>
<td>MA(1)</td>
<td>0.308939</td>
<td>0.132034</td>
<td>2.339844</td>
<td>0.0202</td>
</tr>
</tbody>
</table>

**Summary Statistics**

- **R-squared:** 0.403193  
- **Adjusted R-squared:** 0.385977  
- **S.E. of regression:** 0.426975  
- **Sum squared resid:** 37.91992  
- **Log likelihood:** -118.5419  
- **F-statistic:** 23.42019  
- **Prob(F-statistic):** 0.000000
Comments: Dynamic forecast for difference specification

Phillips curve estimated in differences 1958q1-2007q2
Dynamic forecast for core inflation 2008q1-2012q4
Concluding comments

- A lot of interesting results is presented for a relationship that is crucial for monetary policymaking
- Some more structure, however, would be welcome to better distinguish the various competing theories
- Also, it could be valuable to reconsider expectations formation; as seen, different specifications change a lot
- I like the parsimonious approach, but since this is about forecasting, a better lag-structure could be considered (unemployment gap and inflation are positively correlated contemporaneously, but the gap leads inflation)
- For how long should an empirical model be expected to be able to do well in dynamic simulations?
  - The current relationship may very well “break down” (from a 2007q4 perspective) again in 2015 (or later); if so, then what?
- The approach take by the authors, however, is gutsy and makes the paper a very informative and stimulating read