Remarks on ‘Inflation Persistence and Optimal Monetary Policy in the Euro Area’
by D. Lopez-Salido and P. Benigno

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Telephone: (202) 452-2437. The following is a slightly edited version of my comments/presentation slides for the International Research Forum on Monetary Policy, July 5-6, 2002, at the European Central Bank in Frankfurt. I would like to thank the ECB for hosting me during the time in which I prepared these comments, and to the conference organizers for inviting me to participate. The comments herein are mine alone and do not necessarily reflect the views of the Board of Governors or its staff. I thank Pierpaulo Benigno, Dale Henderson, David Lopez-Salido and Ilian Mihov for helpful comments. All remaining errors are mine.
Introduction:

- This is an ambitious paper
  - Two-region open-economy model
  - Tight theoretical framework
  - Evidence mustered on inflation persistence
  - Care taken to compute loss function that is consistent with the underlying theory
  - Policy implications considered

- This is a quality paper; lots to like, including:
  - Policy implications considered
  - The careful delineation of the effects of differing degrees of persistence for policy
  - The characterization of policy in terms of rules that people can understand
  - The principal result that the ECB should ‘overweight’ those areas of the union that have higher levels of inflation persistence makes sense intuitively.
Four main comments:

• Empirical evidence on ‘stickiness’ is not convincing

• Not clear that the alternative policies matter in quantifiably interesting ways

• More exposition would have been helpful, particularly on the model
  ▪ What, exactly, is the utility function?
  ▪ And what is the consumption-cum-aggregate-demand function?
  ▪ More generally, what does the state-space representation of the model look like?

• How general are the results?
  ▪ The simplicity of the model implies “policy rules” that can be represented by expressions like ‘set the output gap to zero for all periods’. While acknowledging that this is necessary to get tractable results, it does raise the question of the generality of the results.
- At present, the open-economy New Keynesian Phillips curve is a ‘carbon copy’ of the closed-economy (U.S.) version in spite of the presumable importance of exchange-rate shocks, import prices and materials prices for open-economy producers. How would the results change with a Phillips curve that was more tuned to open-economy considerations?

- Suppose there was habit persistence in consumption so that aggregate demand became a state variable. Would the nice intuitive result of the paper still obtain?
On ‘Stickiness’:

- GMM is unreliable
  - Small-sample problems
  - Validity of instruments
  - Interpretation of residual autocorrelation

…we shall return to these issues…

- ‘Stickiness’ may not be structural
  - Persistence seems to be falling (see, e.g., Levin et al. (2002) and Cogley and Sargent (2001))
On Policy Assessment:

• ‘Difficult to tell whether $\frac{\partial \xi}{\partial \omega^H}$ is large; that is, whether the effects of differing stickiness are important. We know the range is from 0.70 to 0.95 in some metric, but what does that mean?

• Metric for welfare comparison is confusing. Are the differences in $\delta$ in Table 5 large?

• Would have liked to have seen the relative performances of the rules traced out against the relative stickiness of the regions.

• We know that when $\omega^H = 0$, output gap stabilization is a special case of inflation targeting and therefore must be weakly dominated by inflation targeting, but in Table 5, the ranking is reversed, so there must be some point at which asymmetric stickiness flips the ranking.
Monte-Carlo Exercise:

**Objective:** what can we expect to glean from GMM estimation of economies that look something like the Benigno-Lopez-Salido model.

New Keynesian model of Amato-Laubach (EER 2002):

\[
\pi_t = \alpha_b \pi_{t-1} + \alpha_f E_t \pi_{t+1} + \kappa y_t + u_t
\]

\[
y_t = (1 - \gamma) y_{t-1} + \gamma E_t y_{t+1} + 1/\sigma (i_t - E_t \pi_{t+1}) + v_t
\]

\[
i_t = \beta_y E_{t-1} y_t + \beta_\pi E_{t-1} \pi_t + \epsilon_t
\]

- Rule-of-thumb behavior amongst price setters
- Habit persistence in consumer behavior
- Taylor rule governs monetary policy

The Experiment:

- Generate 800 samples of 120 observations (about the same size as the B-L-S sample)
- Instruments: lags 1 through 4 of \(i_t, y_t, \) and \(\pi_t\).
- Variance-covariance matrix of forcing shocks: \(\Sigma = diag[1.1^2 \quad 0.65^2 \quad 0.2^2]\)
- Estimate versions of the New Keynesian Phillips curve that differ according the DGP
### Table 1

Two calibrations of the Amato-Laubach (2002) model

<table>
<thead>
<tr>
<th></th>
<th>Forward-looking version</th>
<th>Hybrid version</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\alpha_f$</td>
<td>0.73</td>
<td>0.41</td>
</tr>
<tr>
<td>$\alpha_b$</td>
<td>0.20</td>
<td>0.52</td>
</tr>
<tr>
<td>$\kappa$</td>
<td>0.06</td>
<td>0.06</td>
</tr>
<tr>
<td>$\gamma$</td>
<td>0.90</td>
<td>0.33</td>
</tr>
<tr>
<td>$\beta_y$</td>
<td>0.50</td>
<td>0.50</td>
</tr>
<tr>
<td>$\beta_\pi$</td>
<td>1.50</td>
<td>1.50</td>
</tr>
</tbody>
</table>

### Table 2

Estimates of Phillips Curve Parameters with GMM

<table>
<thead>
<tr>
<th></th>
<th>Forward-looking version</th>
<th>Hybrid version</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>estimate</td>
<td>Std. deviation</td>
</tr>
<tr>
<td>$\alpha_f$</td>
<td>0.26</td>
<td>(0.26)</td>
</tr>
<tr>
<td>$\alpha_b$</td>
<td>0.22</td>
<td>(0.08)</td>
</tr>
<tr>
<td>$\kappa$</td>
<td>-0.03</td>
<td>(0.16)</td>
</tr>
</tbody>
</table>
**Observations:**

- The data nail the ‘stickiness’ in the hybrid specification, but the slope of the Phillips curve is estimated imprecisely.

- For the forward-looking specification, the coefficient estimates of $\alpha_f$ are biased downward.

- That said, the sign of the bias can change with relatively small changes in specification.

- The estimate of the slope of the Phillips curve has the wrong sign.

**Why does this result obtain?**

- As $\alpha_f \to 1$ and $\alpha_b \to 0$, the relevance of lagged data as instruments declines. In the limit, there are no valid instruments.

- If autocorrelated forcing shocks are allowed, performance improves somewhat, but there is still bias and one is left with the problem of explaining why there are autocorrelated disturbances attached to what are supposed to be (solved) Euler equations.
Questions and limitations:

- These GMM estimates are equivalent to two-stage least squares, which side steps the issue of GMM weighting matrix of more general problems. It has been my experience that the weighting matrix does not matter for point estimates in linear equations. It does, of course, matter for test statistics; however what I report in Table 2 are the standard deviations across draws of the estimated coefficients, not the mean of asymptotic standard errors.

- Ilian Mihov has suggested to me that the choice of the weighting matrix in this instance may be more important for the estimated coefficients than I think. This is worth checking out.

- Other issues that could be addressed include the normalization of the estimated equation, which can also matter.

- More generally, and quite apart from the discussion of this paper, it seems clear that a more thorough examination of the reliability of GMM estimators for New Keynesian models is a worthwhile goal--and one which I shall pursue.
What should we do if the data cannot tell us much about inflation persistence?

- We could try for robustness

Robust and Simple policies in the Amato-Laubach model:

- Simple rules with an ad hoc loss function:

\[
\begin{align*}
\min & \quad J = \frac{1}{2} E_t \sum_{i=0}^{\infty} \beta^i \left[ \Gamma_{y} y_{t+i}^2 + \pi_{t+i}^2 + \Gamma_{\Delta i} (\Delta i_t)^2 \right] \\
\text{subject to:} & \quad \text{(i) the model; (ii) the variance-covariance matrix of forcing shocks; and (iii) the two-coefficient form of the policy rule.}
\end{align*}
\]

- The coefficients of the model are taken as fixed and known

- This gives us ‘optimized Taylor rules’

Robust rules within a simple-rules environment:

- At least three classes of robust rules in the sense of Knight exist; we’ll use the Giannoni (2002) type.
\[
\begin{array}{cc}
\text{MIN} & \text{MAX} \\
\langle \beta_y \beta_\pi \rangle & \langle \alpha_f \alpha_b \rangle \mathcal{J}
\end{array}
\]

- The authority chooses policy rule coefficients to minimize the loss function subject to: (i) the model; (ii) the variance-covariance matrix of forcing shocks; (iii) the nature of the rule; and (iv) an unobserved but bounded choice of the parameters \( \langle \alpha_f \alpha_b \rangle \) by a ‘malevolent nature’ who maximizes the loss.

- The min-max problem is a metaphor for preparing for misspecifications that show up in the most inconvenient ways when the monetary authority would otherwise like to exploit the structure of the model.

- I set the boundaries on \( \alpha_f \) and \( \alpha_b \) based on the Benigno-Lopez-Salido (2002) empirical results as follows:

\[
\begin{align*}
\{0 \leq \alpha_b \leq 0.75\} \\
\{0.25 \leq \alpha_f \leq 0.95\} \\
\{\alpha_f + \alpha_b \leq 1\}
\end{align*}
\]

- It turns out that only the boundaries matter so that we need consider only the base case and four possible alternatives: the highest value for \( \alpha_f \) and
the lowest for $\alpha_b$, and vice versa, as well as the highest for both, the lowest for both—given the allowable range.

- Not surprisingly, it is the upper/lower combinations that matter, so the base case is $\alpha_f = 0.41, \alpha_b = 0.51$. The relevant worst-case scenarios are the lower inflation persistence case (L): $\alpha_f = 0.95, \alpha_b = 0$ and the higher inflation persistence case (H): $\alpha_f = 0.25, \alpha_b = 0.75$.

**Results:**

<table>
<thead>
<tr>
<th>Table 3</th>
<th>Optimized Taylor-rule coefficients in the Amato-Laubach model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>coefficients</td>
</tr>
<tr>
<td></td>
<td>$\beta_\pi$</td>
</tr>
<tr>
<td>Base case (B)</td>
<td>3.77</td>
</tr>
<tr>
<td>Higher (H)</td>
<td>3.97</td>
</tr>
<tr>
<td>Lower (L)</td>
<td>1.71</td>
</tr>
</tbody>
</table>

Notes: Policy references put an equal weight of unity on output and inflation stabilization and a weight of 0.2 on the change in the funds rate. The discount factor is set to unity.
Since the worst-case scenarios are defined by the two boundary cases, H and L, now simulate performance when the authority uses the optimal simple rule for the H economy in the L model, and the opposite case. And then compare:

Table 4
Robust responses and performance in Amato-Laubach model

<table>
<thead>
<tr>
<th>Optimum rule for:</th>
<th>Model used in:</th>
<th>losses</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Absolute loss</td>
<td>normalized</td>
</tr>
<tr>
<td>L</td>
<td>L</td>
<td>0.49</td>
<td>1</td>
</tr>
<tr>
<td>H</td>
<td>L</td>
<td>1.83</td>
<td>3.70</td>
</tr>
<tr>
<td>H</td>
<td>H</td>
<td>0.76</td>
<td>1</td>
</tr>
<tr>
<td>L</td>
<td>H</td>
<td>16.2</td>
<td>21.5</td>
</tr>
</tbody>
</table>

Notes: the L|L combination is the performance of the rule optimized for the low-inflation-persistence economy used in that economy. The loss figure for that rule is the same as shown in Table 3. That loss is then normalized to unity in the last column. The H|L combination is then the rule optimized for a high-inflation-persistence economy used in the low-inflation persistence model. It’s loss is shown in absolute terms in the third column and relative to L|L in the fourth column. The other two cases are analogous.
The results show two things:

- The degree of persistence assumed by the monetary authority matters a great deal.

- The authority for this economy and these preferences is better off assuming that inflation is highly persistent, even if that is not true, because being incorrect in the opposite direction is much more costly.
Concluding remark:

- The Benigno-Lopez-Salido paper is a sophisticated and ambitious offering on a complicated and worthwhile subject. It combines some of the best elements of modern macroeconomics in a single paper. It is a nice contribution to the literature.

- However, the premise behind the exposition is suspect because of the unreliability of conventional estimators.

- So while I would argue that ECB decisionmakers should read the paper carefully and absorb its general message, I would take its policy prescriptions with a grain of salt.

- In recognition that the Euroarea economy is not well understood and is in a period of transition, it seems prudent to pay some attention to the robustication of policy to misspecification. The recent paper by Gunter Coenen (2002) is a well-placed step in this direction.