Discussion of 'Learning and Shifts in Long-Run Productivity Growth' by R. Edge, T. Laubach, and J. Williams

James Bullard

6 May 2004

1 Permanent changes in productivity growth

- Shifts in trend productivity growth are not well-addressed by existing theory. "Nonstationarity."
- Yet such shifts are important events from a welfare perspective ...
- ... and from a policymaker's perspective.
- How to address this properly? Many recent papers.

2 A role for learning

- Unlike business cycle shocks, important, permanent trend productivity shifts are rare.

- Much existing research assumes that trend productivity shifts are immediately recognized. We "tell the agents" that a shift has occurred.

- The authors argue convincingly that this assumption is counterfactual.

- Instead, the trend shift is gradually revealed to market participants and policymakers—it has to be disentangled from business cycle noise.

3 A stationary approach

- Allow regime-switching in productivity growth.
- Endow agents with rational expectations.
- Regime shifts still need to be inferred.
- Interesting, but informationally demanding. See Andolfatto-Gomme (2003, *IER*).

4 The authors use a nonstationary approach

- Allow the productivity growth rate to shift permanently.
- Endow agents with a Kalman filter, as they understand the world they live in is nonstationary. Sargent (1999).
- Allows agents to track changes in underlying productivity growth. "Learning."
- Agents optimally solve signal extraction problem.

5 Real time data

- The problem of inferring trend shifts is exacerbated by data revisions.
- Great discussion in the paper about vintage data concerning labor productivity growth.
- The authors estimate a Kalman gain of $\lambda = 0.115$.
- Kalman filter estimates using real time data closely mimic SPF—why not just use SPF?

6 A two-sector model

- Consumption and investment goods are produced using identical technology, but the investment goods sector may be subject to a sector-specific shock.

- Capital and labor are mobile across sectors.

- Solve via social planner with complete information; then with Kalman filter expectations.

7 Remarks

- This model is known to have a "comovement" problem. See DiCecio (2003).

- "Nominal" quantitities?

8 Transitions after permanent productivity shocks

- Main result: Economy's reaction is far different if the private sector is assumed to "know" when a permanent productivity growth shift has occurred, versus when such information is gradually revealed.

- Since the gradual revelation hypothesis is more plausible, we should look at those implied dynamics as the prediction of the model.

- Increases in productivity growth create "booms."

- No "frictions."

9 Learning

- The macroeconomic learning literature would talk about convergence to rational expectations.

- Where is the convergence element in this analysis?

10 Incorporating learning more fully

- Replace rational expectations in the model with a learning algorithm, what Evans and Honkapohja call a perceived law of motion.

- Agents update the coefficients in their perceived law of motion recursively using incoming data.

- This creates a more complicated dynamic system; one with possibly different dynamics.

- See Collard and Dellas (2003), Bullard and Eusepi (2003) for monetary policy examples.

11 Expectational stability

- The expectational stability condition governs convergence under real-time learning (Evans and Honkapohja (2001)).
- A Kalman filter or related algorithm prevents full convergence to REE. "Alert to structural change."
- Is the present system expectationally stable, or nearly so?
- Gain parameter values as high as $\lambda = 0.115$ may render the system expectationally unstable.
- This suggests that the authors' story is incomplete.

12 Conclusion

- This is a very nice paper which discusses both learning and the implications of real time data for the learning problem.

- The authors go a long way toward dethroning the "agents know the permanent productivity growth shifts" assumption.

- The authors also show that such assumptions are critical to the implied dynamics of the model following shocks.

- Fully incorporating learning might create an unstable system, but this is left to future research.