

Discussion of  
“Heterogenous Expectations and the Effective Lower Bound”  
by Tolga Özden

Jacek Suda

NBP and SGH

3rd Behavioral Macroeconomics Workshop  
7-8 July 2021

# What Author Do

- Take a version of NK model with ELB constraint on nominal interest rates and heterogeneous expectations
- Use endogenous regime switching model to capture ELB
  - 2 regimes: normal times and ELB
- For expectations agents
  - choose between a “rational expectation” (with anchored expectations about monetary policy) and an adaptive learning
  - use past predictive performance of these two models to determine the choice
- Cast the model in state-space and Bayesian estimate it as Markov-switching system
  - 1982Q1-2019Q4

# What Authors Find

- Data like learning and regime-switching models
  - though not 4-state model
- Before the GFC, equal number of RE and AL agents
- Post GFC / at the ELB, more ( $2\times$ ) RE than AL agents
  - expectations based on “shadow rate” closer to realized outcomes
- Counterfactual: more RE agents imply more stable economy
- Out-of-sample forecast: ELB episode likely to reappear within 5 years (with 32% probability)

# What Authors Do: Details

- A 3-equation NK model with
  - indexation ( $\pi_{t-1}$  in Phillips curve)
  - adjustment costs ( $y_{t-1}$  in IS curve)
  - interest rate smoothing and growth rate of output gap ( $r_{t-1}, y_{t-1}$  in MP rule)
- 2-regime monetary policy subject to **endogenous** changes between
  - contemporaneous policy rule with smoothing and  $\Delta y$
  - ELB

with **probabilities** of switching regime depending on *shadow rate*,  $r^*$

- $r^*$  based on contemporaneous policy rule with smoothing and  $\Delta y$
- $r_t^* \downarrow \Rightarrow q_t^T \downarrow, q_t^{ELB} \uparrow$
- Phillips and IS curves feature expectations subject to **endogenous** switches
  - anchored “rational expectation”
  - adaptive learning (constant gain)

where the **probability** agents use a particular rule depends on current and past forecasts errors

- Formulate 4-regime model, solve it and estimate it (using Özden and Wouters, 2020)

# Comments: #1 - model

- Only 3 equations but a lot of dynamics due to lagged values
  - Great, since the question is empirical
- But **why not apply the extended regime switching to model from Ozden and Wounters (2020)** ?
  - richer structure could generate different forecast errors
  - empirically can make a difference
- Which of these lags are important?
  - Why  $\Delta y$  in monetary policy rule
- Is adaptive learning e-stable (with these dynamics)?
  - Evans and McGough (2018, JMCB), McClung (2020, JEDC), Eo and McClung (2021)

## Comments: #2 - regimes

- Model cast as an endogenous 4-state regime switching model
  - Great idea - can apply solution and estimation methodology
- But **can we interpret it as 4-state model with heterogeneous beliefs?**
- It works when thinking about future i.e. weighting possible outcomes but in regime switching model the state is realized:
  - for MP: it is clear—it is either normal policy or ELB
  - for expectations: if treated literally either RE or AL, not both
- For heterogeneous beliefs the actual realization corresponds to a  $2 \times 2$  block (from transition matrix).

## Comments: #3 - rational expectations

- Agents are assumed to either have “rational expectations” or use adaptive learning
- But **these rational agents do not have rational expectations.** They ignore
  - ① existence ELB (?)  $\implies$  their PLM  $\neq$  ALM
  - ② regime switching (?)
  - ③ existence of AL agents (as noted by the author)
- Is there evidence that supports the postulated effectiveness of non-conventional measures (and supports anchoring of expectations)?
  - observed expectations
  - shadow rates (Krippner, Christensen and Rudebusch, Lombardi and Zhu)
  - yield curve
  - ...
- In learning models new tools / policies can be difficult to learn:
  - Mitra and Honkapohja (2020, JME) on PLT
  - McClung and Honkapohja (2021, WP) on AIT
  - Pintus, Suda and Turgut (2021, WP) on LtV

# Overall

- Well executed paper
- Nice application of existing methodology and creative extension
- Interesting results