Discussion of "Demand Stimulus and Inflation: Empirical Evidence"

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Overview

- Very interesting paper
- Highly policy relevant question: what is channel through which demand stimulus might have big effects at ZLB?
- In NK model, it's an interaction between inflation (really, expected inflation) and the Fisher relationship: passive policy plus inflationary shock $\Rightarrow$ expansionary effect on real rates and economic activity
- This paper looks at this channel empirically:
  - Exploits statewide variation in extension of unemployment benefits as proxy for "demand" shock
  - Finds no effects on inflation & implied marginal cost from simple NK model
  - Calls into question mechanism generating large multipliers in the NK model

Outline of Discussion

- Discussion divided into parts:
  1. Brief review of intuition from NK model
  2. Discussion of their empirical exercises and how to interpret
  3. Place paper in broader literature, think about stimulus in depressed economies

Basic NK Model

- Equations log-linearized about zero inflation SS:

$$c_t = E_t c_{t+1} - \frac{1}{\sigma}\left(i_t - E_t \pi_{t+1}\right) \tag{1}$$

$$\eta n_t = -\sigma c_t + w_t \tag{2}$$

$$mc_t = w_t - a_t \tag{3}$$

$$\pi_t = \gamma mc_t + \beta E_t \pi_{t+1} \tag{4}$$

$$y_t = a_t + n_t \tag{5}$$

$$y_t = \left(1 - \frac{g}{y}\right) c_t + \frac{g}{y} g_t \tag{6}$$

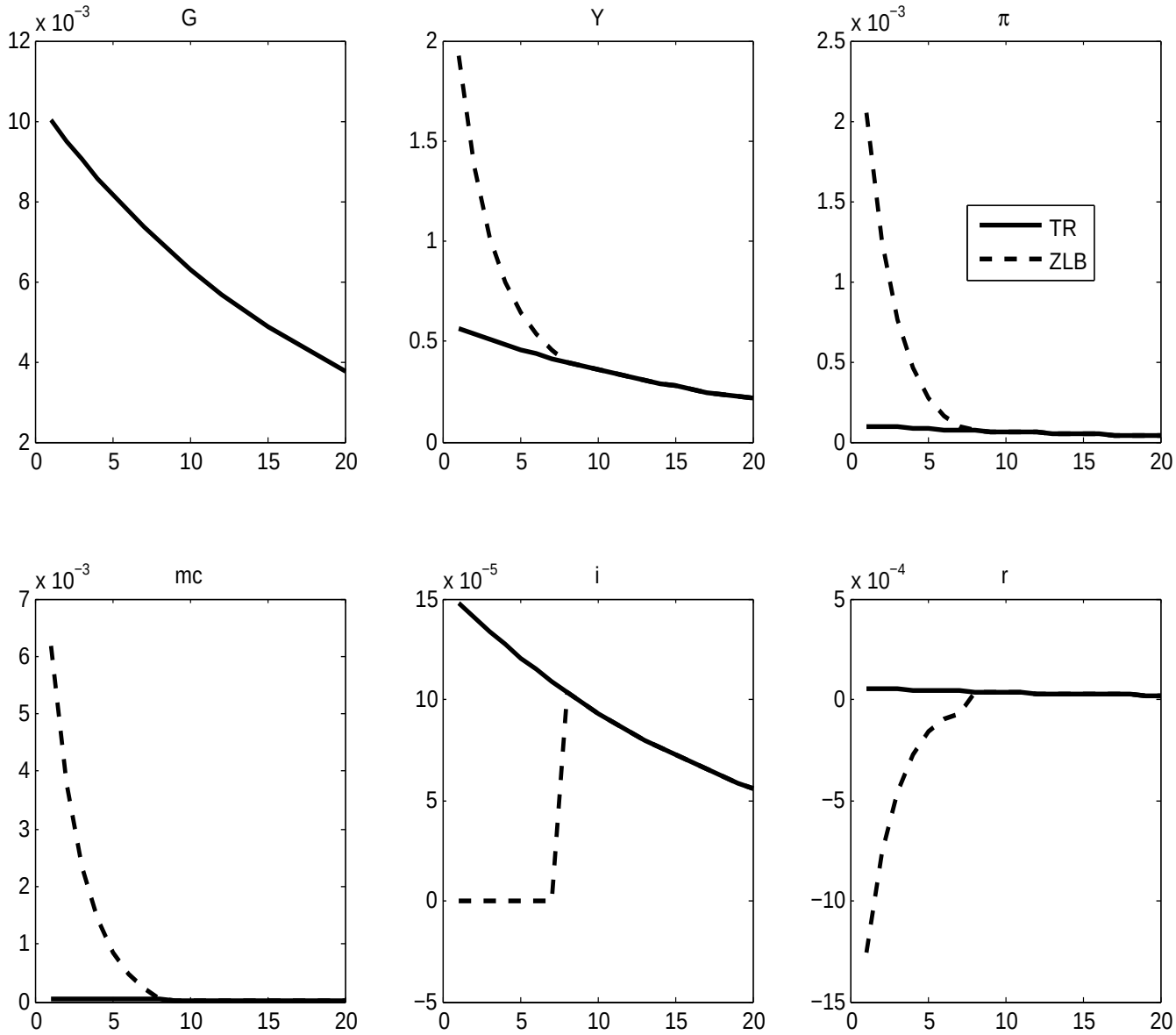
$$i_t = \phi_\pi \pi_t \tag{7}$$

- g_t, a_t follow exogenous AR(1)

Intuition

- Consider sufficiently transitory change in g_t that we can ignore wealth effects (no effect on c_t holding r_t fixed)
- $\uparrow g_t \Rightarrow \uparrow y^d \Rightarrow \uparrow n_t \Rightarrow \uparrow w_t \Rightarrow \uparrow mc_t \Rightarrow \uparrow \pi_t$
- If Taylor principle satisfied ($\phi_\pi > 1$), this will raise real interest rate (ignoring distinction b/w π_t and π_{t+1}) $\Rightarrow \downarrow c_t$, so $\frac{dY_t}{dG_t} < 1$
- But under passive policy (like ZLB), this works in reverse. $\uparrow \pi_t \Rightarrow \downarrow r_t \Rightarrow \uparrow c_t$, so $\frac{dY_t}{dG_t} > 1$

IRFs to $\uparrow g_t$



Inflation Key to the Story

- The rise in inflation combined with passive policy is key to the story here
- $\uparrow \pi_t$ with no change in $i_t \Rightarrow \downarrow r_t \Rightarrow$ bigger change in y_t than under TR
- There is feedback here: bigger change in y_t necessitates bigger change in mc_t, meaning bigger change in π_t, which means bigger fall in r_t, which means . . .

How Would You Investigate this Empirically?

- In principle, something like a regression of π_t on a measure of demand stimulus (e.g. g_t)
- Two obvious problems:
  - Demand stimulus might occur when the economy is depressed (e.g. inflation low) $\Rightarrow$ downward bias of effect of demand stimulus on inflation
  - Phillips Curve says inflation forward-looking. Such a regression would have omitted variable (e.g. $E_t \pi_{t+1}$ correlated with measure of current demand stimulus)

What Do They Do?

- Transform Phillips Curve into estimable relationship by psuedo-differencing (requires knowing β):

$$\widetilde{\pi}_t = \pi_t - \beta\pi_{t+1} = \gamma mc_t + \eta_{t+1}$$

- η_{t+1} is RE error term: mean-zero and uncorrelated with stuff known at t
- If model is correct, $\widetilde{\pi}_t$ is a noisy measure of model-implied marginal cost
- Project $\widetilde{\pi}_t$ onto some measure of demand stimulus, what they call b_t
- With no other endogeneity issue, coefficient on demand stimulus recovers effect of stimulus on inflation; in essence controls for $E_t\pi_{t+1}$
  - Alternative approach would be to use GMM as in Gali and Gertler (1999)

Actual Application

- What they do is more complicated than this, and needs to be. In aggregate data stimulus may occur when π_t is low $\Rightarrow$ bias regression described on previous page
- Exploit policy discontinuity at state borders: compare inflation in counties that border each other but in different states. Treatment is differential extension of unemployment benefits
  - Really, kind of both a positive demand shock (more income for unemployed) but also negative supply shock (less incentive to work)
  - Shouldn't matter for empirical application: both channels ought to raise marginal cost and inflation in the model
- Identifying assumption: differential extension of unemployment benefits exogenous with respect to local economic conditions for counties bordering each other
- Bottom line result: no significant effect of this stimulus on inflation

What do we learn from this?

- Evidently, this demand stimulus has no effect on inflation *as viewed through lens of NK model*
  - If you estimate $\pi_t - \beta\pi_{t+1} = \gamma b_t + e_t$, find $\widehat{\gamma} = 0$
- Alternative test: regress actual inflation (not psuedo-differenced) on demand stimulus, $\pi_t = \theta b_t + u_t$
  - If NK model correct, this regression is mis-specified
  - They estimate a positive coefficient on demand stimulus, e.g. $\widehat{\theta} > 0$
- What does this mean?
  - If NK model is correct, since $E_t\pi_{t+1}$ is functionally omitted variable here, must mean that that $\text{cov}(b_t, \pi_{t+1}) > 0$
- So does demand stimulus raise expected inflation? This is what is relevant in Fisher relationship, after all

What else do they find?

- They also find:
  - Stimulus raises sales
  - Stimulus lowers unemployment
- How big are these effects?
- Not clear that we can rule out: (i) that the effects of stimulus are large or (ii) that part of what is going on is expected inflation rises, driving down real rates
- What we can conclude: there is something wrong with the NK model of inflation. Calls into question whether we should use this model to draw conclusions about multiplier at ZLB

Inflation Channel

- There is a broader literature that questions the inflation mechanism by which stimulus has big effects at ZLB in NK models
  - Dupor and Li (2014): no evidence that fiscal stimulus raises expected inflation
  - Wieland (2014): negative supply shocks, which raise expected inflation, are contractionary at the ZLB, not expansionary as simple NK model would suggest (Eggertson, 2012, "paradox of toil")
  - Bachmann, Berg, and Sims (2014): at micro level, higher expected inflation does not correlate with more favorable attitude towards spending on durable goods, even at ZLB
- The current paper fits in with these papers, questioning basic logic and mechanisms for large multipliers at ZLB

Broader Literature

- But this doesn't necessarily mean that there aren't larger multipliers in times of weak demand
- There is some literature that looks at how effects of fiscal shocks vary with state of business cycle (not just stance of monetary policy):
  - Auerbach and Gorodnichenko (2012): multipliers significantly bigger in downturns than in expansions in time-varying VAR
  - Nakamura and Steinnson (2014): multiplier bigger when unemployment is high
  - Shoag (2013): multiplier bigger when there is labor market "slack"
  - Sims and Wolff (2014): look at state-dependence in conventional medium-scale DSGE model; multiplier is higher in severe downturn, even outside of ZLB