Central Bank Balance Sheets and Long-Term Forward Rates

CIMF - MMF Workshop on New Monetary Policy Instruments

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12 March 2010

Motivation

- Assessing the impact of the Fed's and other central banks' balance sheet expansion on longer-term interest rates.
- Recent extraordinary measures:
- By looking farther into the future, the effect of balance sheet innovations is less sensitive to current policy rates.
- Gauge consequences for term structure transmission (Kozicki and Tinsley 2007), inflation and growth in a *post-exit strategy* world.

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  - Asset purchases = quantitative easing
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Methodology

- Use expected forward rates to deal with endogeneity (Laubach 2009).
- Main regression:

$$E_t i_{t+k} = \beta_0 + \beta_1 E_t \pi_{t+k} + \beta_2 E_t f_{t+k} + \beta_3 u_{t+k} + \beta_4 cb_t + \varepsilon_t \quad (1)$$

$E_t i_{t+k}$ is 5-year forward 10-year Treasury yield.

- Baseline β_4 estimates using $E_t f_{t+k}$ for projected budget deficits:

Fed claims OLS	Claims GMM	Fed assets OLS	Assets (GMM)	R2	DW OLS
-1.089***	-0.941**	-1.200***	-1.167***	0.73-0.99	0.85

- Main finding: decline in long-term forward rates.

The natural rate of interest

Standard assumptions

The canonical DSGE structure follows Woodford 2003:

$$x_t = E_t x_{t+1} - \frac{1}{\sigma}\left(i_t - E_t \pi_{t+1} - r_t^n\right) \tag{2}$$

with some interest rate inertia

$$r_t - r_t^n = \gamma(r_{t-1} - r_{t-1}^n) + \varepsilon_t, \quad \gamma > 0 \tag{3}$$

and typical long-run restriction

$$r_t^n = r_{t-1}^n = r^n = -\log\beta, \quad \text{all } t$$

- Woodford's 2003 *neo-Wicksellian* approach, also Amato 2005: setting $i_t = r_t^n$ fixes $\pi_t = 0$, $x_t = 0$ but is indeterminate.

The natural rate of interest

What if the US natural rate is lower post-crisis?

The "Japan scenario" (Krugman 1998):

- Higher savings chases too little investment.
  - Firm and household deleveraging is under way and takes time.

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  - Future nominal policy rates constrained by the zero lower bound: $\bar{i}_{t+j} \geq 0$, all j.
  - In practice the policy rate can't perfectly track the natural rate.
  - Because it is only driven by real factors, Δr_t^n affects expected long-term forward rates regardless of short-run policy changes.

The natural rate of interest

Policy implications

$r^n_{t+j} - \bar{i}_{t+j}$ drives inflation, output gap and nominal rate dynamics...

$$\pi_t = \overline{\pi} + \sum_{j=0}^{\infty} \psi^{\pi}_j \; E_t \left(r^n_{t+j} - \bar{i}_{t+j} + \overline{\pi} \right) \tag{4}$$

$$x_t = \overline{x} + \sum_{j=0}^{\infty} \psi^{x}_j \; E_t \left(r^n_{t+j} - \bar{i}_{t+j} + \overline{\pi} \right) \tag{5}$$

$$i_t = \bar{i}_t + \sum_{j=0}^{\infty} \psi^{i}_j \; E_t \left(r^n_{t+j} - \bar{i}_{t+j} + \overline{\pi} \right) \tag{6}$$

... for a class of determinate policy rules:

$$i_t = \bar{i}_t + \phi_{\pi} \left(\pi_t - \overline{\pi} \right) + \phi_x \left(x_t - \overline{x} \right)$$

$$i_t = \bar{i}_t + \phi_{\pi} \left(E_t \pi_{t+1} - \overline{\pi} \right) + \phi_x \left(x_t - \overline{x} \right)$$

Conclusion

Where can KSS go from here

- Examine whether main finding $\beta_4 < 0$ is sensitive to omitted variable bias.
- Identify r_t^n (Benati and Vitale 2007, Clark and Kozicki 2005, Laubach and Williams 2003)
- Allow for a time-varying natural rate to affect the intercept of (1). Get drifting coefficients:

$$\beta_{0t} = \beta_0 + \Delta r_t^n$$

- Conjecturing $\Delta r_t^n < 0$ may pick up (some of) the negative impact of balance sheet expansion on long-term forward rates.
- Is inference based on quiet periods relevant following a structural break?
- KSS raise key policy question: what is *risk free* in the post-exit strategy world?

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