Lower for Longer?
Neutral Rates in the United States

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Secular Stagnation, Growth and Real Interest Rates
Florence, June 19, 2015

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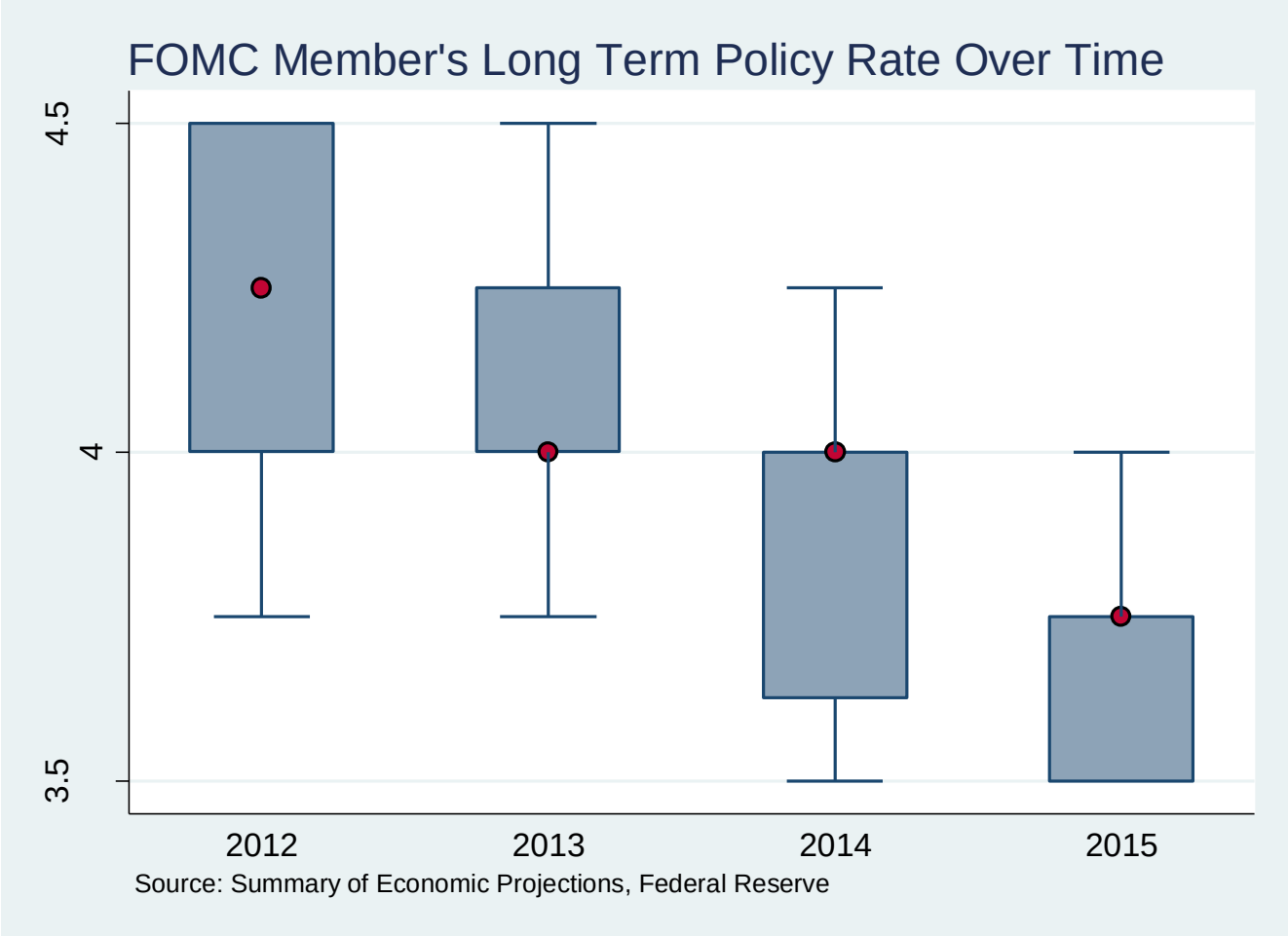
Neutral rate of interest

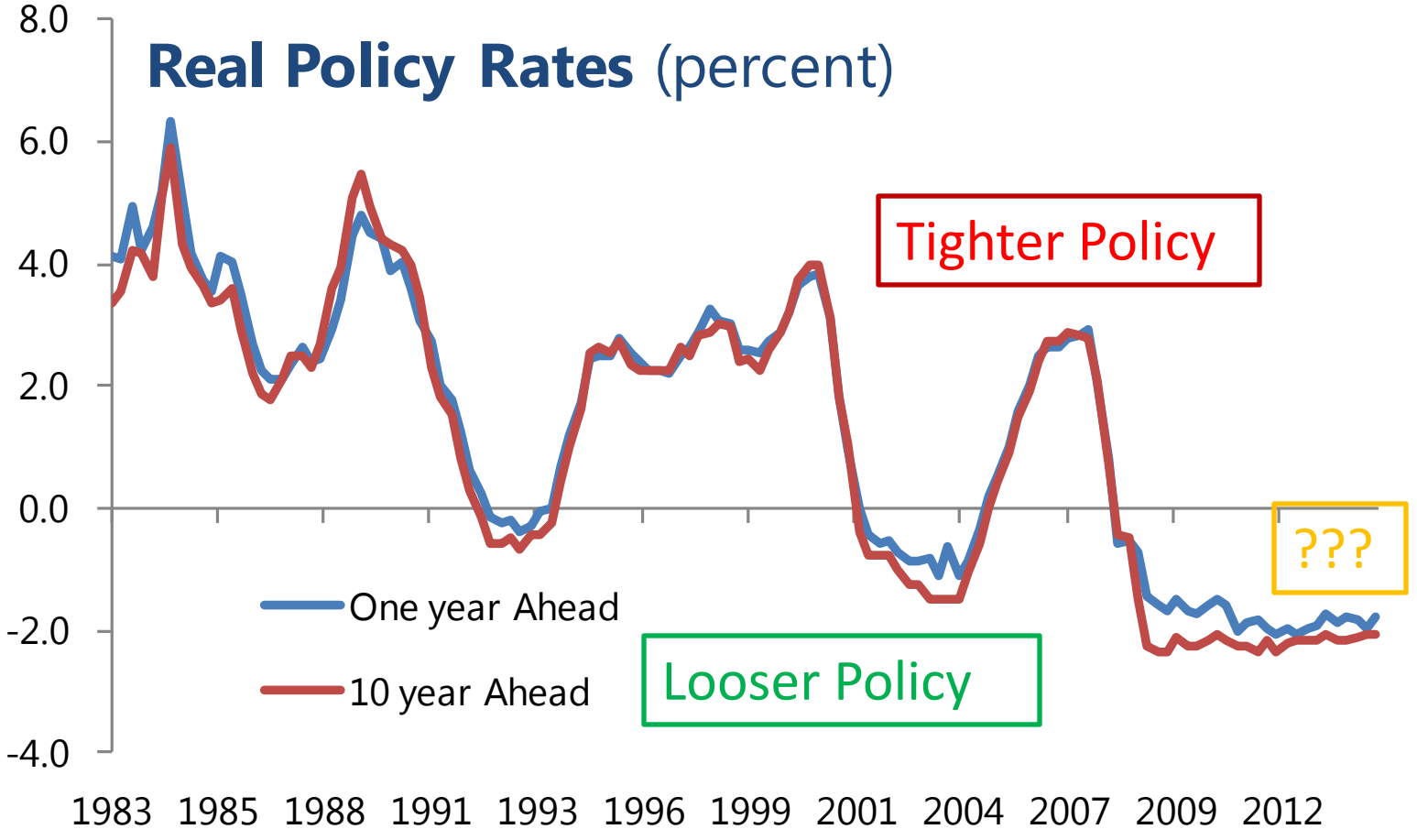
Neutral (natural, equilibrium) interest rate helps understand the degree of monetary policy accommodation associated with a given policy rate

"*The natural rate is an abstraction; like faith, it is seen by its works.*" (Williams, J. H. 1931)

View from the FOMC



Policy stance?



Neutral rate of interest

"…the equilibrium real federal funds rate is at present well below its historical average and is anticipated to rise only gradually over time […]. If incoming data support such a forecast, the federal funds rate should be normalized, but at a gradual pace" (Chair Yellen, March 27, 2015)

Definitions

- New Keynesian (Barsky et al., 2014, Curdia et al., 2015):
  - Consistent with output at potential
  - Also consistent with price stability in benchmark models without policy trade-offs (divine coincidence)
- Operational (Laubach and Williams, 2003): rate consistent with output at potential and stable inflation on average

Different ways to estimate

- DSGE models: e.g. Barsky et al. (2014); Curdia et al. (2015)
- Empirical: uni- or multi-variate filters, monetary policy rules (Hamilton et al., 2015)
- Semi-structural: Laubach and Williams (2003);
  - Applications: Clark and Kozicki (2005) and Trehan and Wu (2009)

What we do

- Estimate neutral rate using a semi-structural model and assess policy stance using rate gaps
- Our contributions:
  - incorporate prior information on output gap and potential ("robust" Bayesian approach)
  - account for unconventional monetary policy (UMP)
  - explore determinants (global savings, risk premia and uncertainty)
- Neutral rate has declined, is now close to zero and lower when accounting for UMP, likely to increase only gradually

Model: key equations

(IS equation) $x_t = a_1 x_{t-1} + a_2 x_{t-2} - a_r (r_{t-1} - r^n_{t-1} + r_{t-2} - r^n_{t-2}) + \epsilon^s_t$

(Phillips curve) $\pi_t = \sum_{j=1}^{8} b_j \pi_{t-j} + b_y x_{t-1} + b_i \pi^m_{t-1} + b_o \pi^o_{t-1} + \epsilon^p_t$

(Neutral rate) $r^n_t = c g_{t-1} + z_t$

x : output gap (difference between actual and potential output: $(y_t - y^n_t)$

r : real (policy) interest rate

r^n : neutral rate

π : core inflation

π^m, π^o : oil and non-oil import relative price inflation, respectively

What is z?

$$r_t^n = cg_{t-1} + z_t$$
$$z_t = d_1 z_{t-1} + d_2 z_{t-2} + \epsilon_t^z$$

- Time preference (demographics)
- Risk premia
    - Equity premium
    - Higher uncertainty
    - Regulation → higher demand for safe assets
- Global saving shifts (emerging market growth/oil revenue)/demand for safe assets

What is z?

$$r_t^n = cg_{t-1} + z_t$$
$$z_t = d_1 z_{t-1} + d_2 z_{t-2} - d_c \Delta S_t - d_e \Delta E_t - d_p \Delta P_t + \epsilon_t^z$$

- Empirical measures for other determinants:
  - Emerging market current account over US GDP
  - Equity risk premia (Duarte and Rosa, 2015)
  - Policy uncertainty (Baker, Bloom and Davis, 2013)

“Robust” Bayesian approach

- Kalman filter estimates
  - Observable: real GDP, core PCE inflation, relative oil import price and non-oil import price inflation, real policy rate, other determinants
- Prior information on unobservable variables
  - Use information from production function based potential output estimates
  - Restrictions on output gap and trend growth
- Benefit: more robust to model misspecification

A robust Bayesian approach

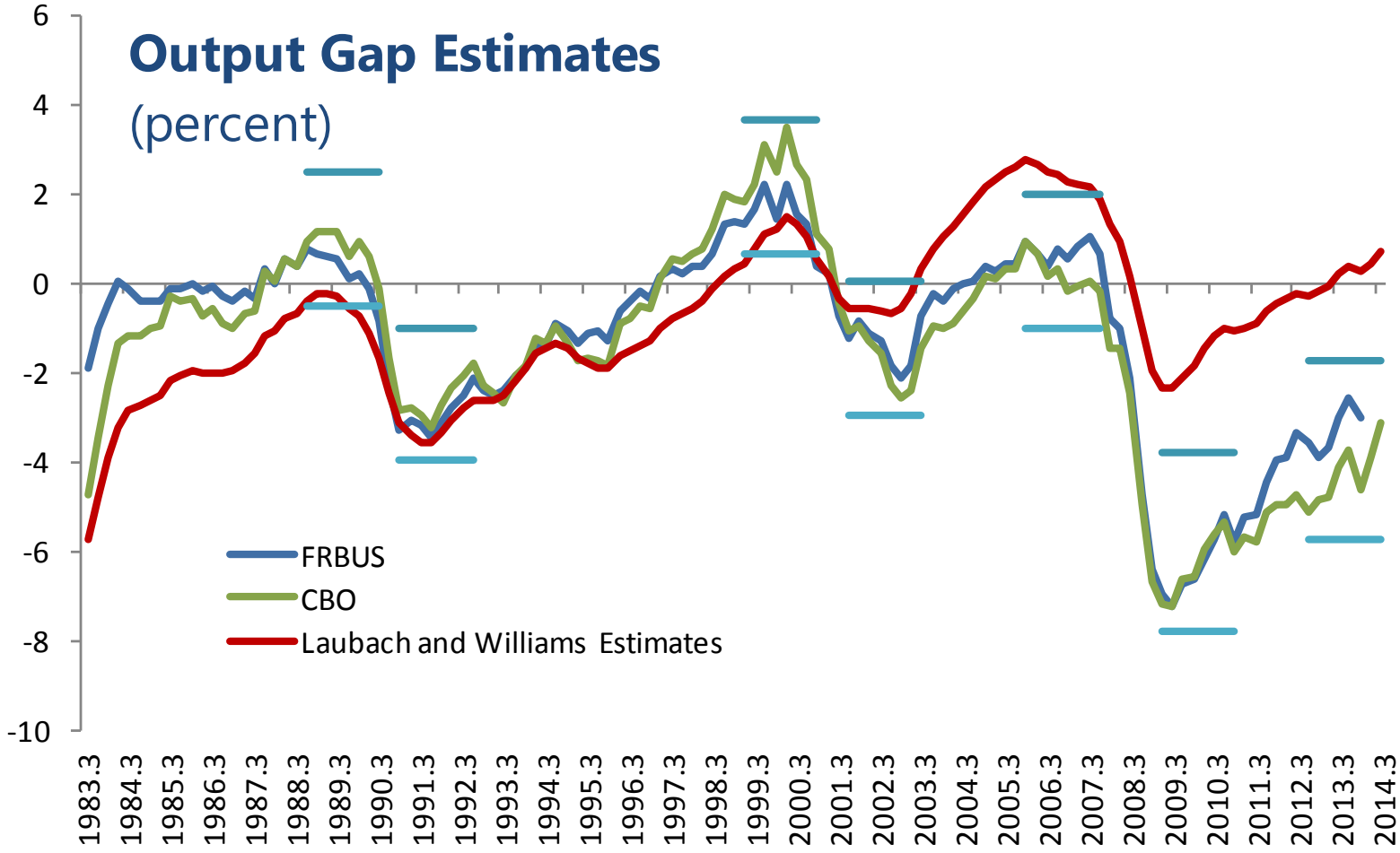
- Traditional Bayesian approach

$$p(\theta|y, I_0) = p(\theta|I_0)p(y|\theta)$$

- Prior information on unobservable variables
  - *x*: smoothed estimates
  - rewrite prior based on a mapping of parameters to smoothed estimates

$$p\big(x(\theta)|I_0\big) \rightarrow \tilde{p}(\theta|I_0)$$
$$p(\theta|y, I_0) = \tilde{p}(\theta|I_0)p(y|\theta)$$

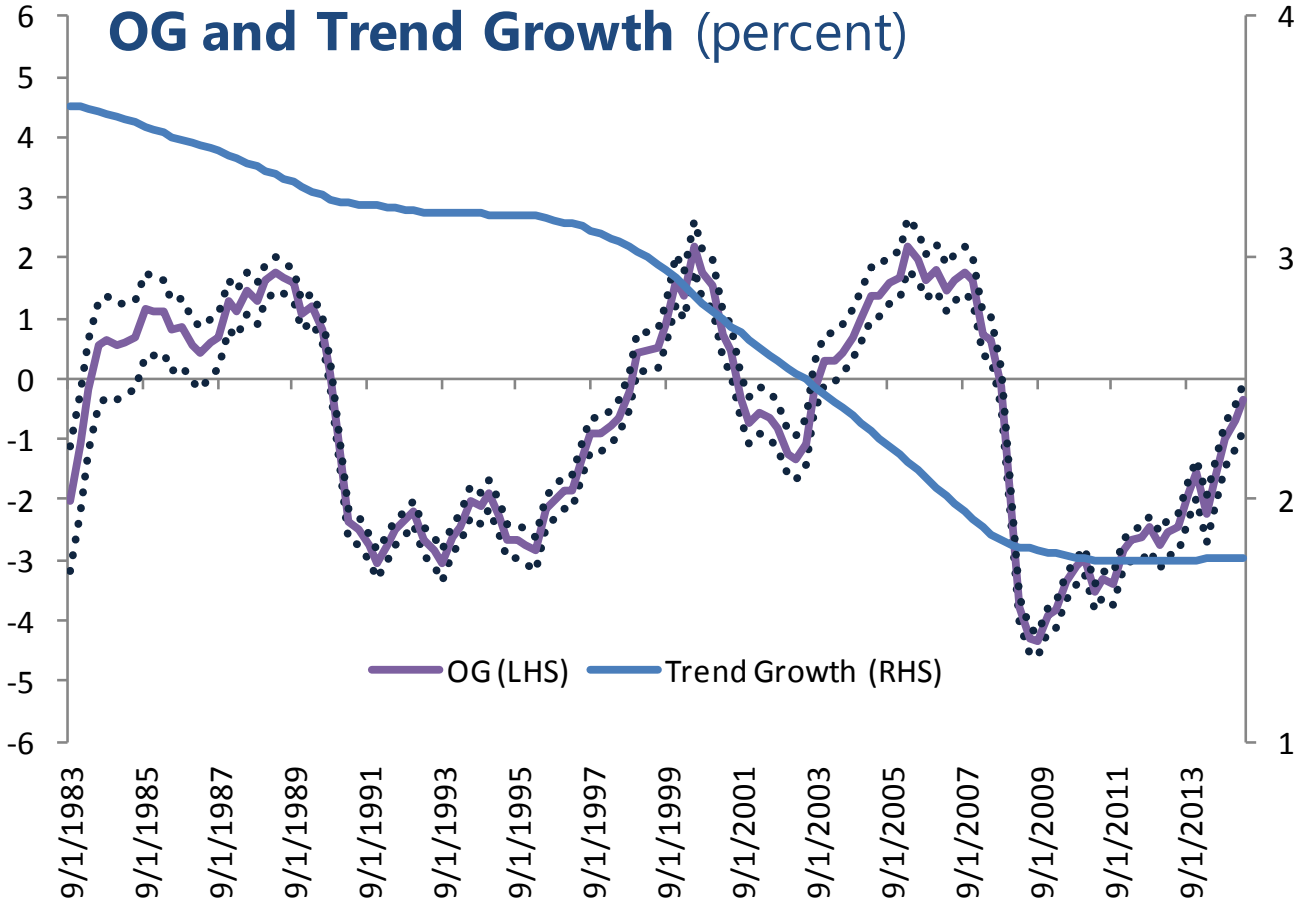
Constraints on OG



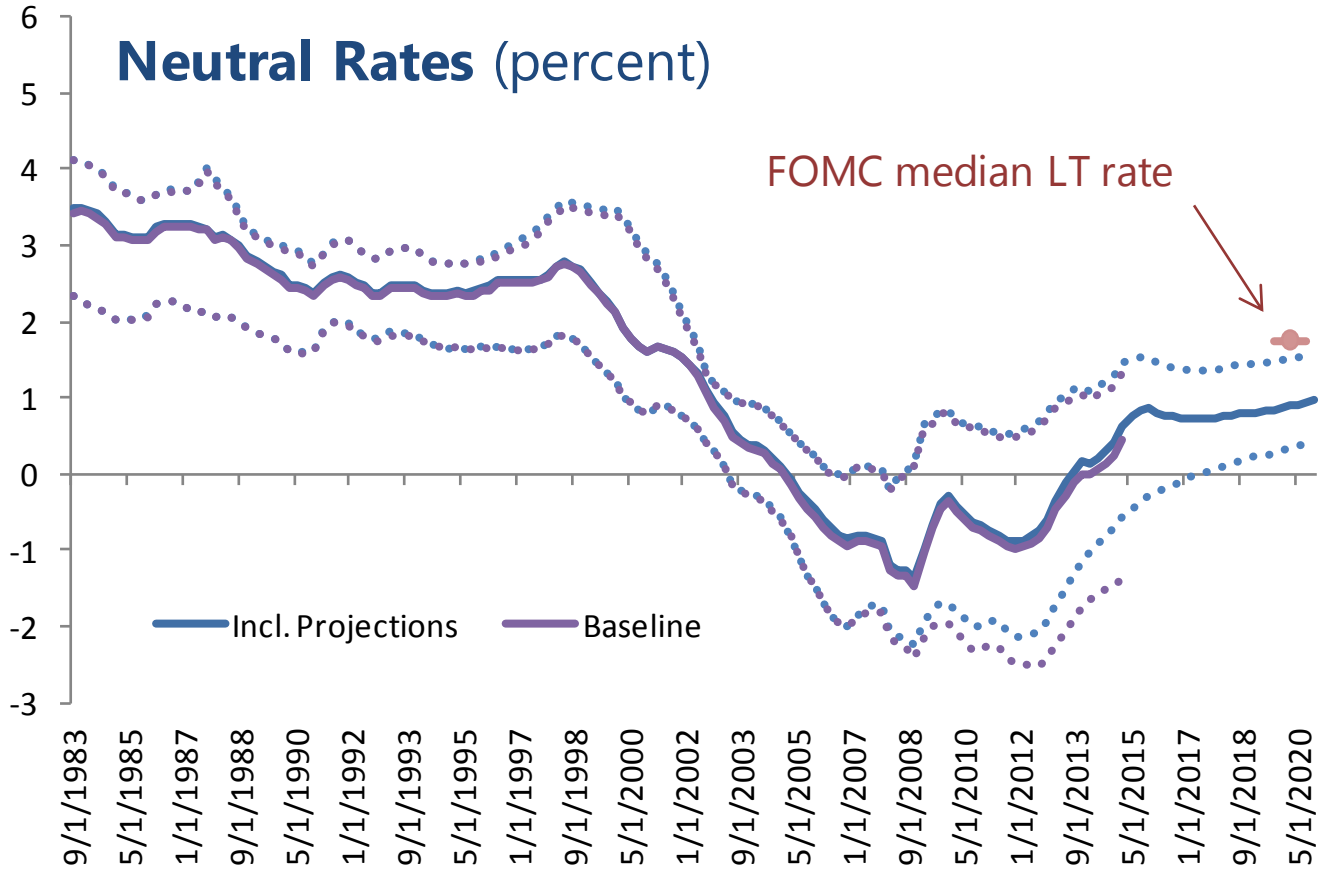
Some key parameters

	with z-determinants			without z-determinants		
		percentile			percentile	
Parameter	10th	Median	90th	10th	Median	90th
c	0.23	0.58	0.98	0.21	0.90	1.68
$d_1 + d_2$	0.959	0.989	0.998	0.990	0.997	1.000
a_r	0.05	0.06	0.08	0.04	0.05	0.07
d_c	0.20	0.32	0.41	-	-	-
d_e	0.01	0.07	0.21	-	-	-
d_p	-0.01	0.00	0.01	-	-	-

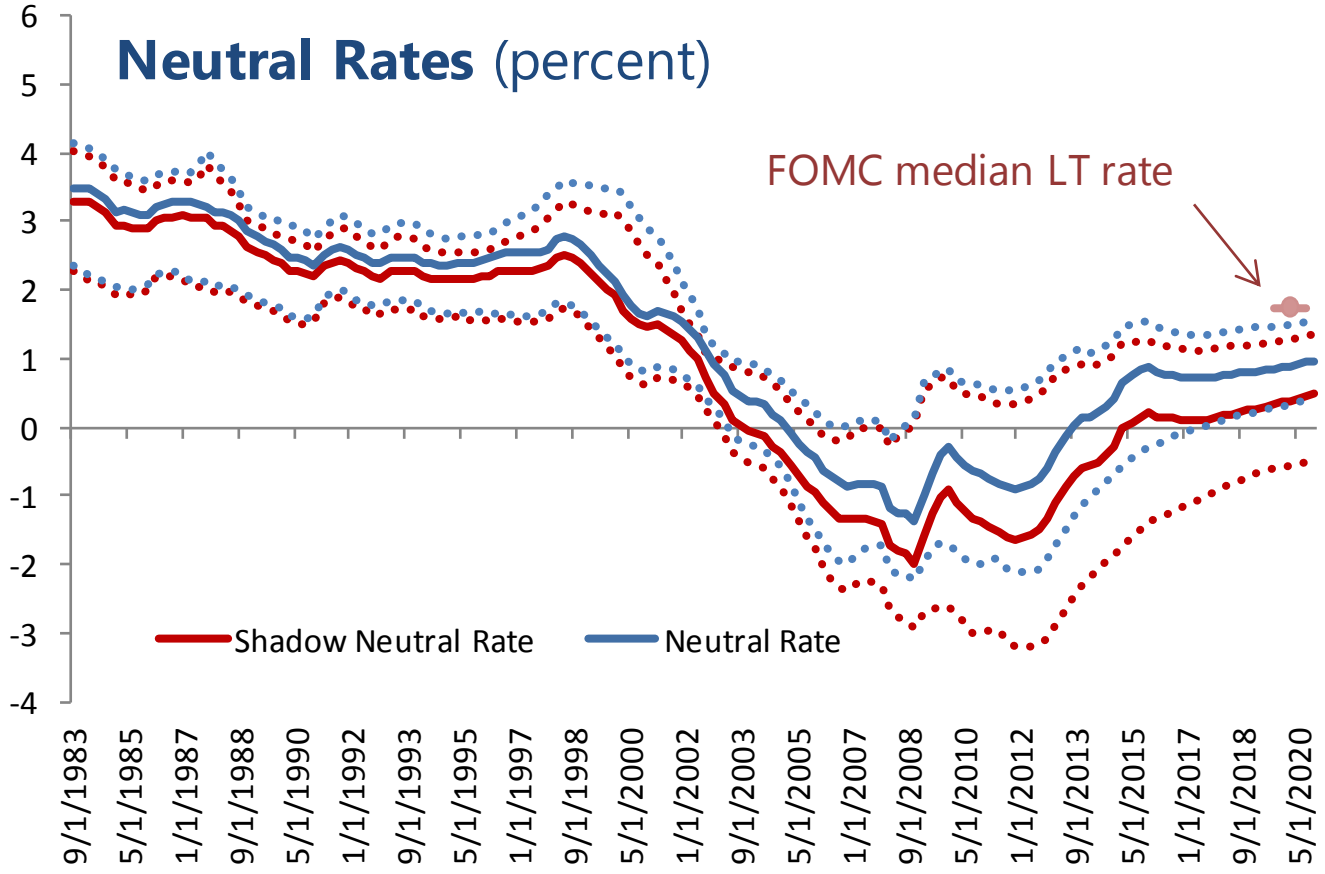
More plausible OG estimates



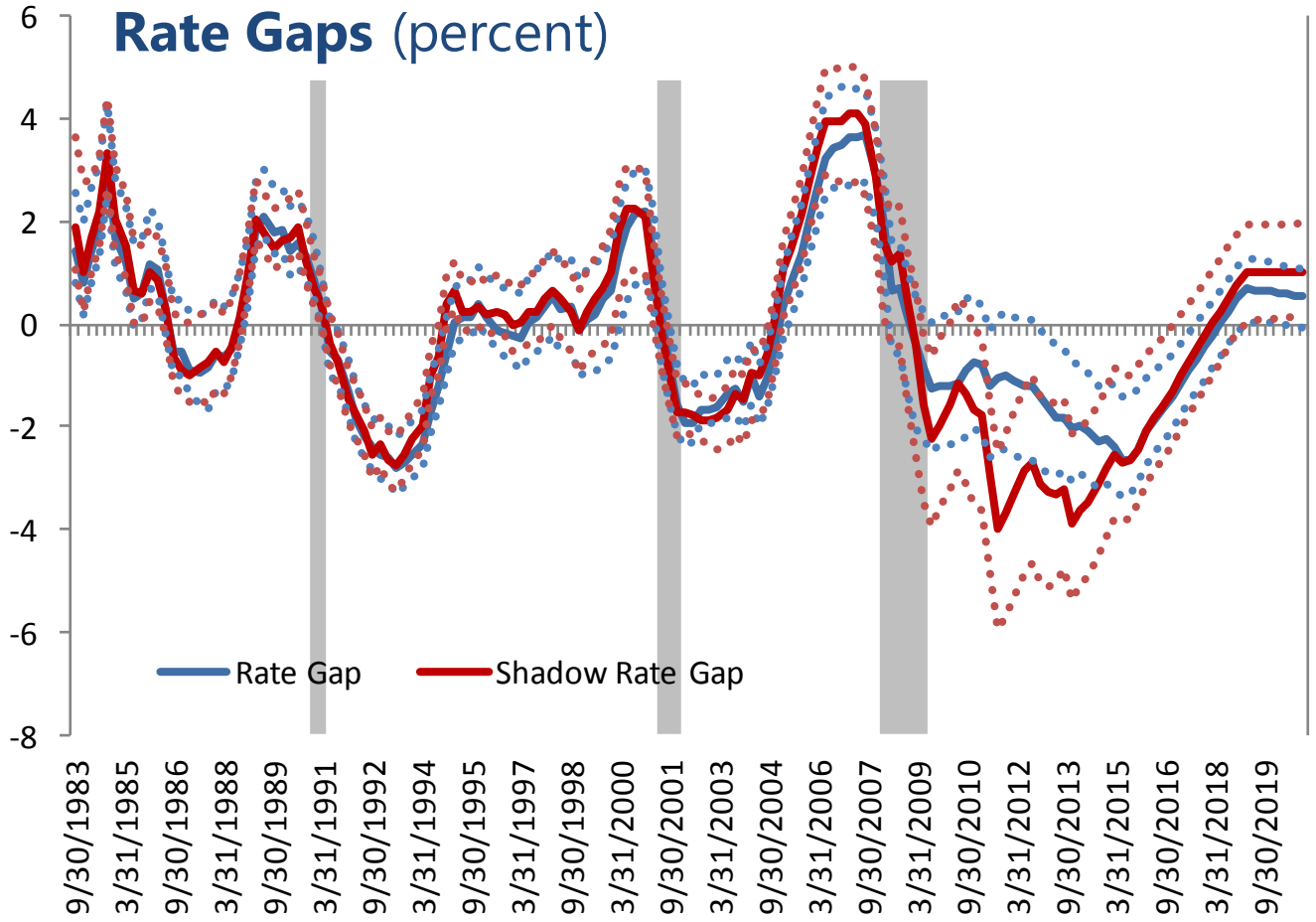
Lower for longer?



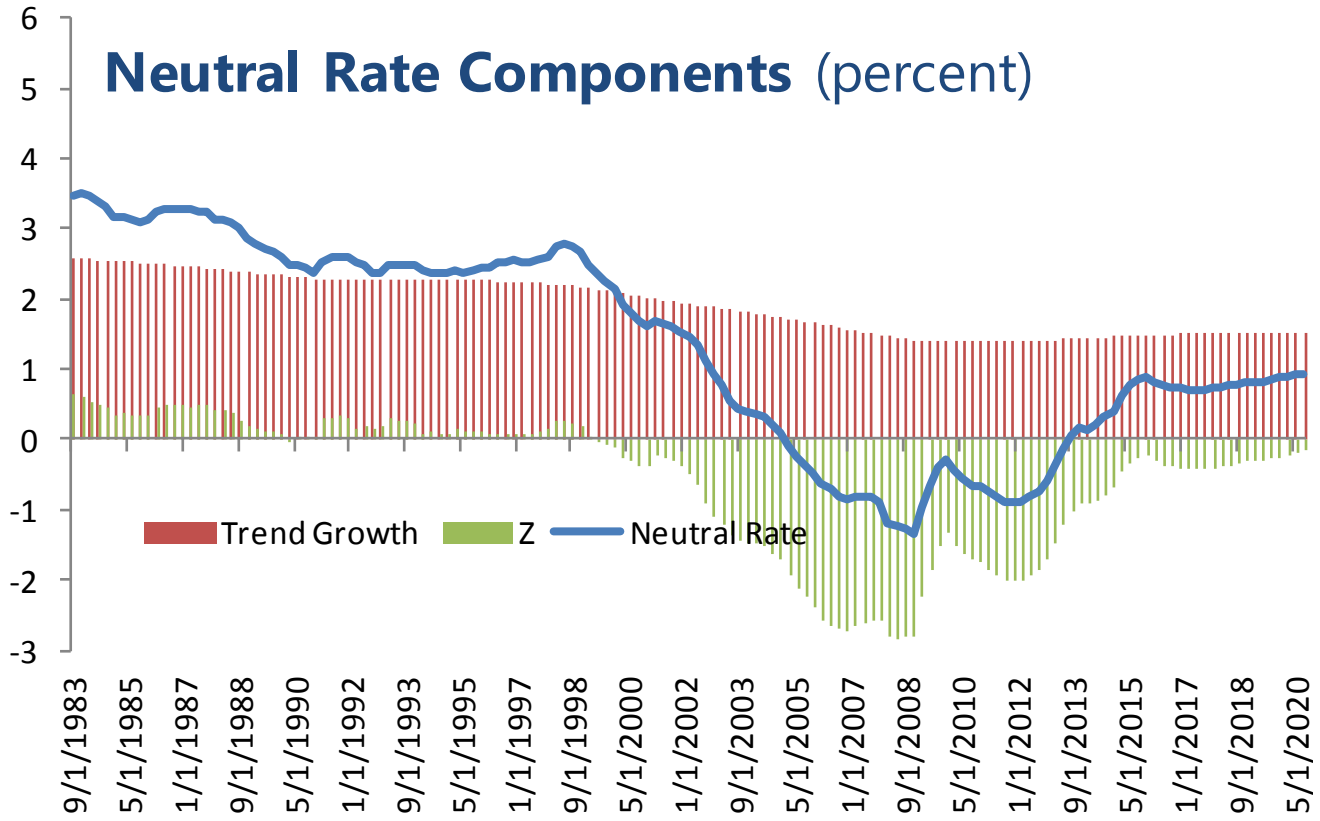
Lower “shadow” neutral rates



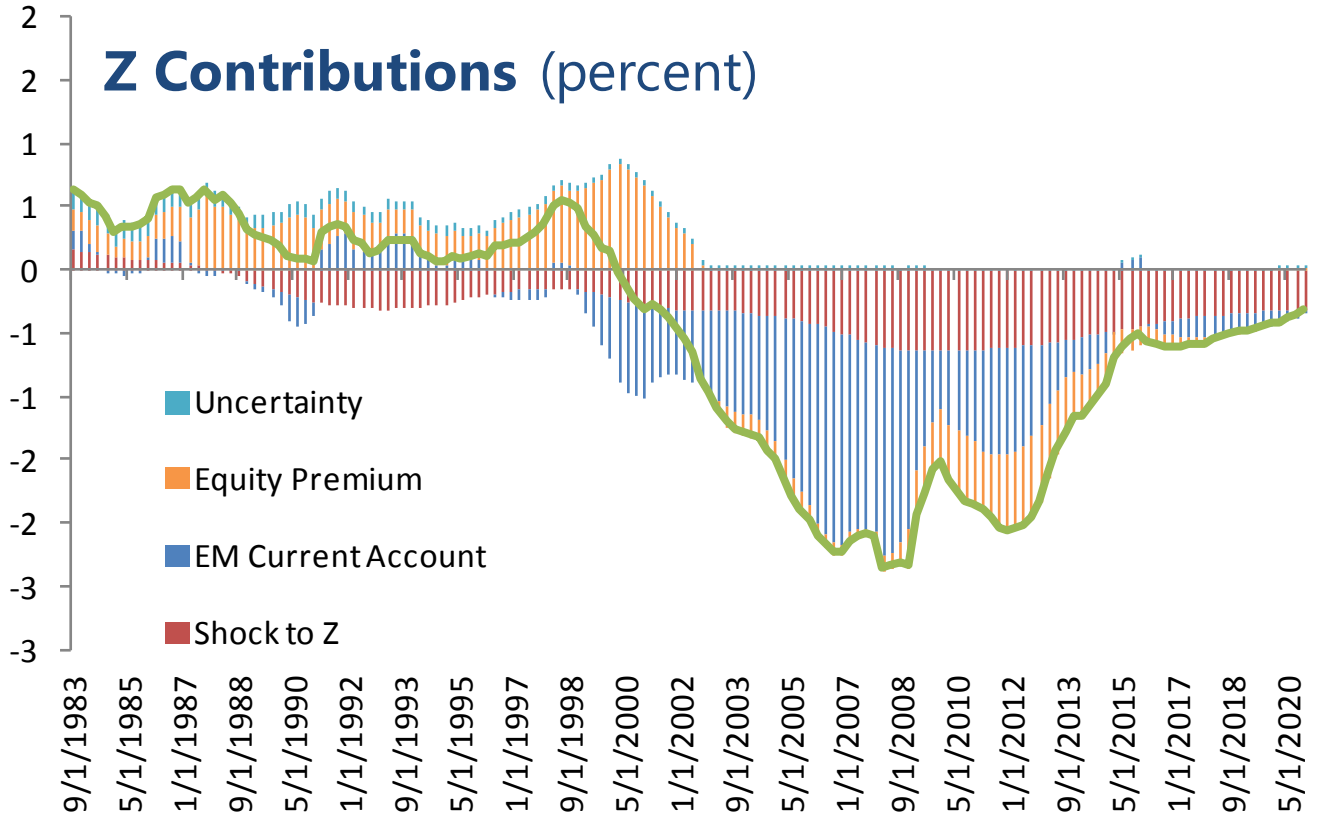
Policy remains accommodative



Drivers: not just trend growth



Higher global savings and equity premium depress neutral rates



Conclusions

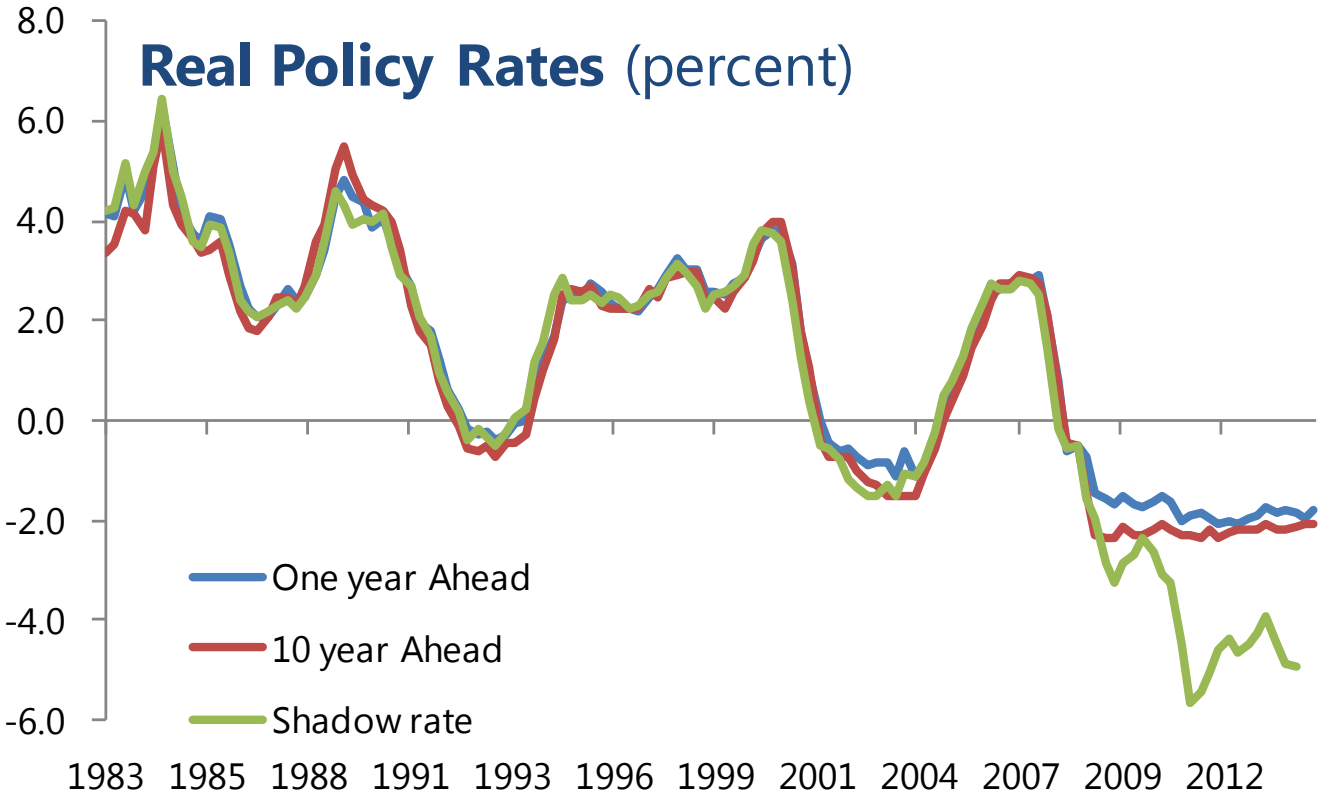
- Estimate neutral rate using a semi-structural model and assess policy stance using rate gaps
- Our contributions:
  - incorporate prior information on output gap and potential ("robust" Bayesian approach)
  - account for unconventional monetary policy (UMP) by using shadow policy rates
  - explore determinants (global savings, risk premia and uncertainty)

Conclusions: Lower for longer

- Neutral rate has declined
  - Likely negative during and after the GFC
  - Now positive, but close to zero, and lower when accounting for UMP
  - Increasing only gradually over time
  - raising over time to 0.2-1.4%.
- Even with a gradual increase in policy rates, policy remains accommodative for some time
- Highlight: Significant uncertainty

Extra slides

UMP adds policy accommodation



Equity risk premium and EM current account