
The Hutchins Center on Fiscal and Monetary Policy, Brookings

The Equilibrium Real Funds Rate: Past, Present and Future

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Discussion by Anna Cieślak

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What is the value of the equilibrium real rate (ERR), or natural rate, i.e. steady-state real rate consistent with full employment and stable inflation?

- ERR ranges from little over **0%** to **2%**, but varies considerably over time
- There is little support for the *secular stagnation* view, i.e. that real rate will remain below or close to zero in the long run due to weak growth
- While most structural models assume a strong positive relation between trend growth and ERR, empirically this link is weak
- There are many determinants of ERR, and they change over time
- Given uncertainty about the level of ERR, inertial/gradual monetary policy may lead to better outcomes in terms of welfare

Comments

This paper
▷ Comments

Estimates

Growth

Rates and growth

- i. Estimates of ERR by policymakers, private sector vs models
- ii. How much uncertainty is there about long-run growth?
- iii. A stable link between growth and interest rates?

This paper

Comments

▷ Estimates

Overview

Model estimates

Survey estimates

Forecasting FFR

FFR errors

Ex-ante FFR

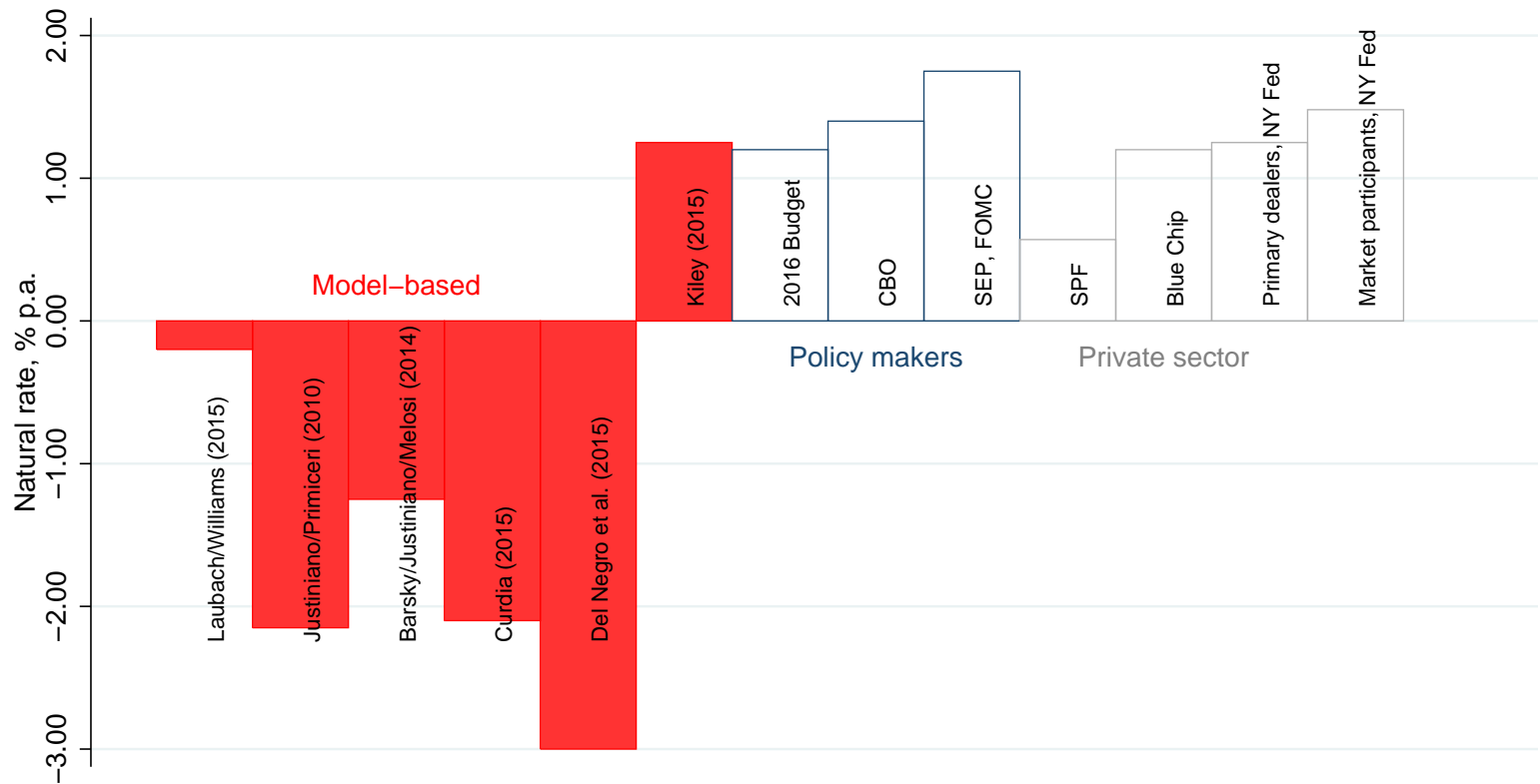
Growth

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i. Estimates of ERR: Agents vs models

Overview of recent ERR estimates

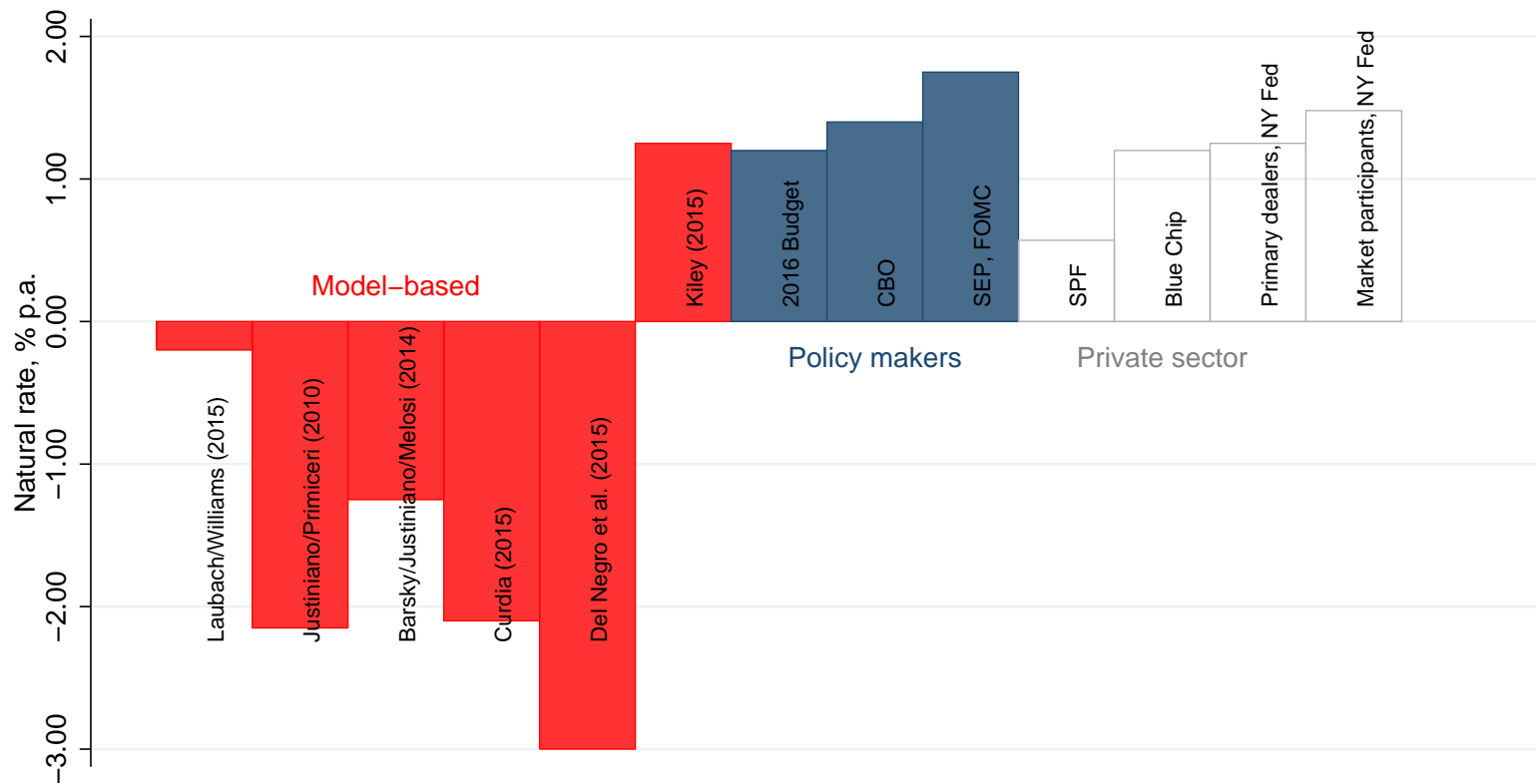
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- Recent estimates of ERR are widely dispersed
- Model-based estimates are typically negative
- Closer alignment between policymakers' and private-sector forecasts

Overview of recent ERR estimates

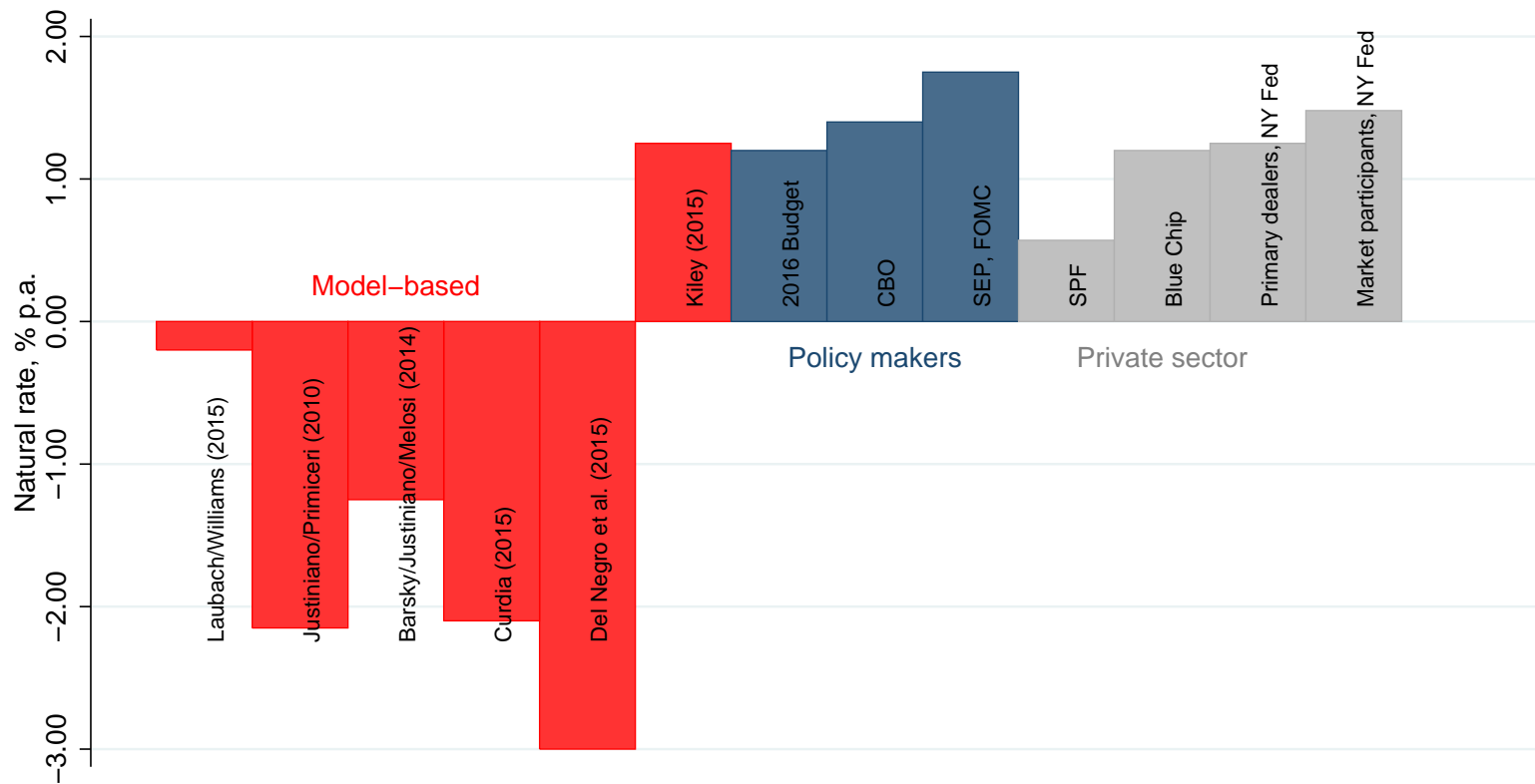
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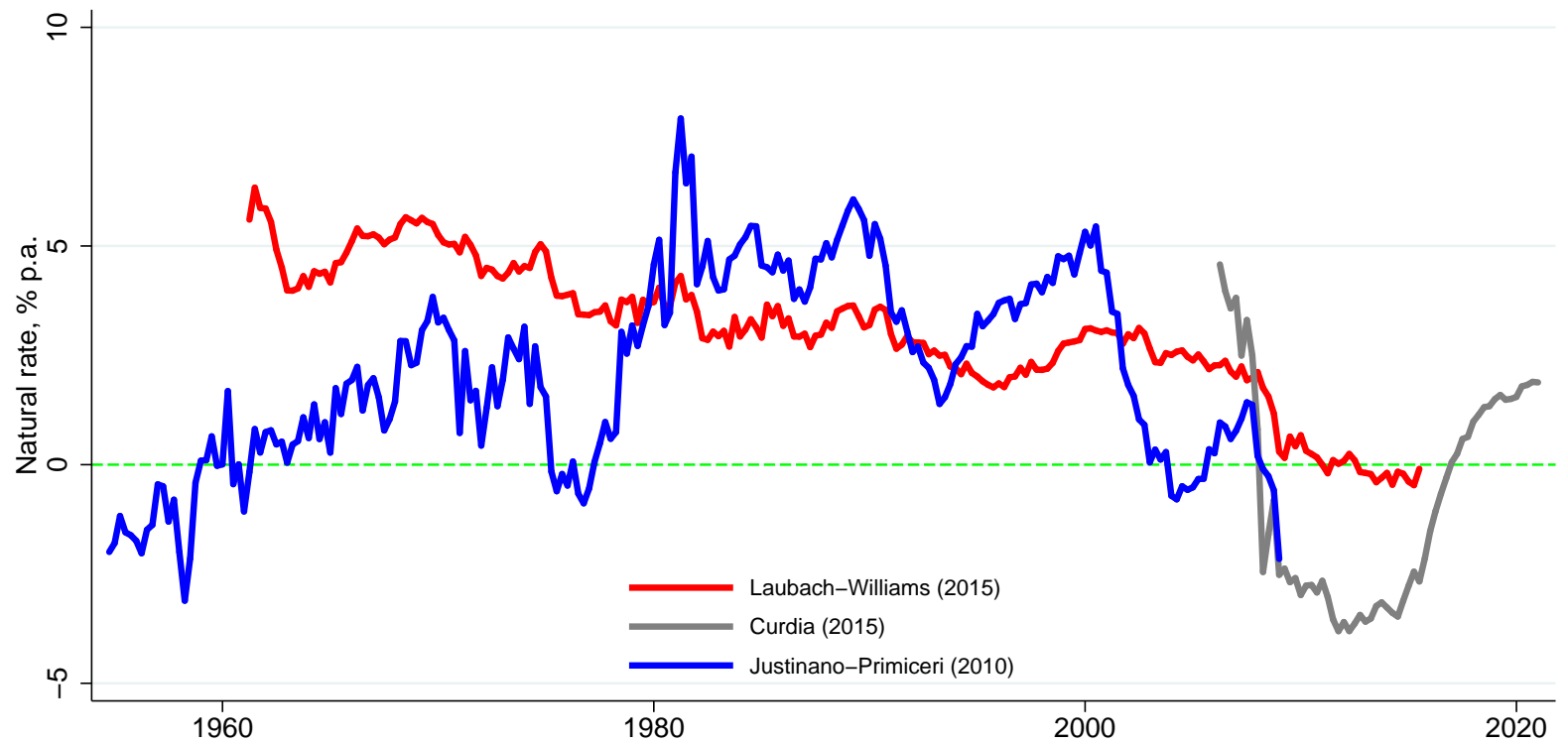
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Model-based estimates of ERR

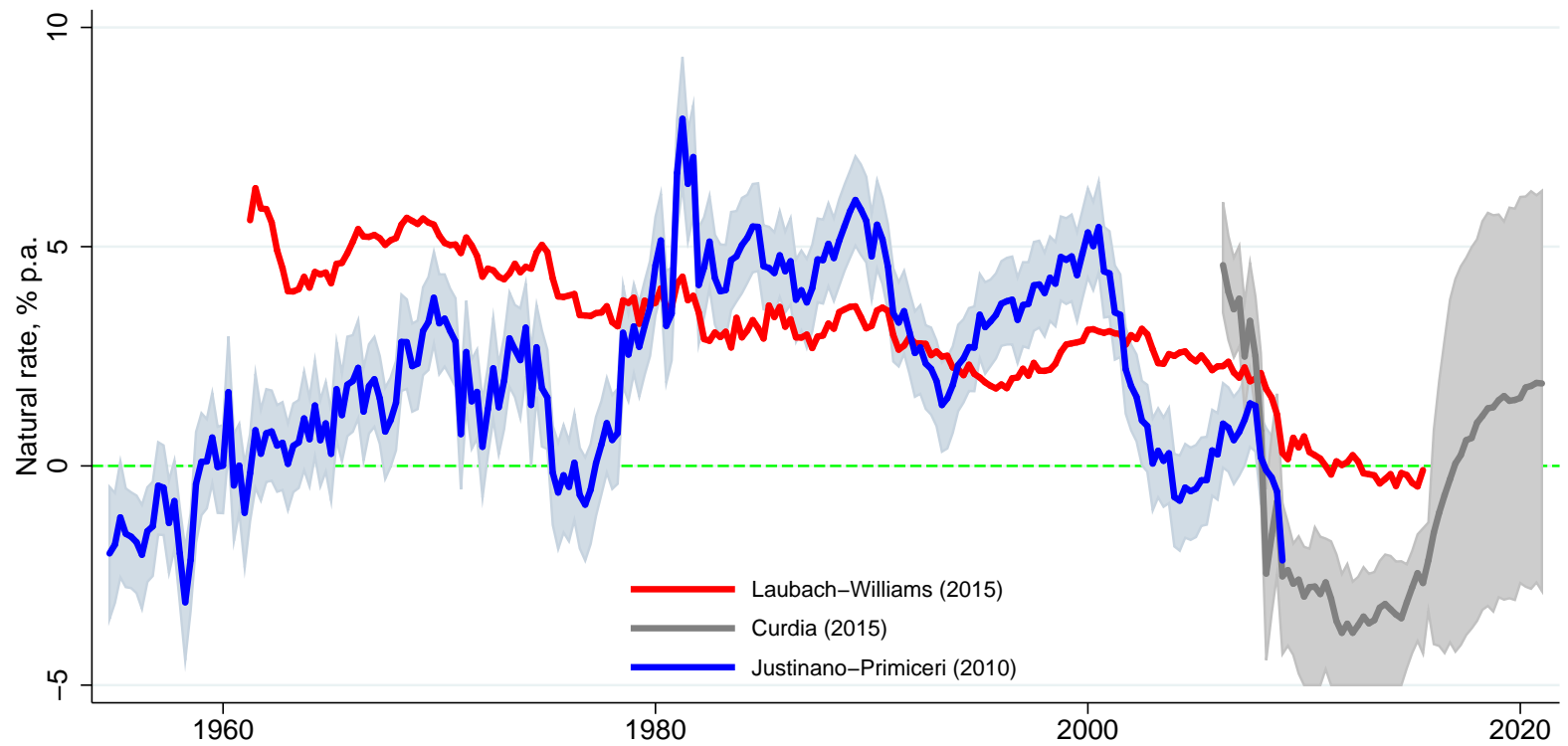
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- Discrepancies between ERR estimates are large both in levels and time-series dynamics
- Differences in model assumptions and horizons being modeled (short/mid- vs long-term dynamics)

Model-based estimates of ERR

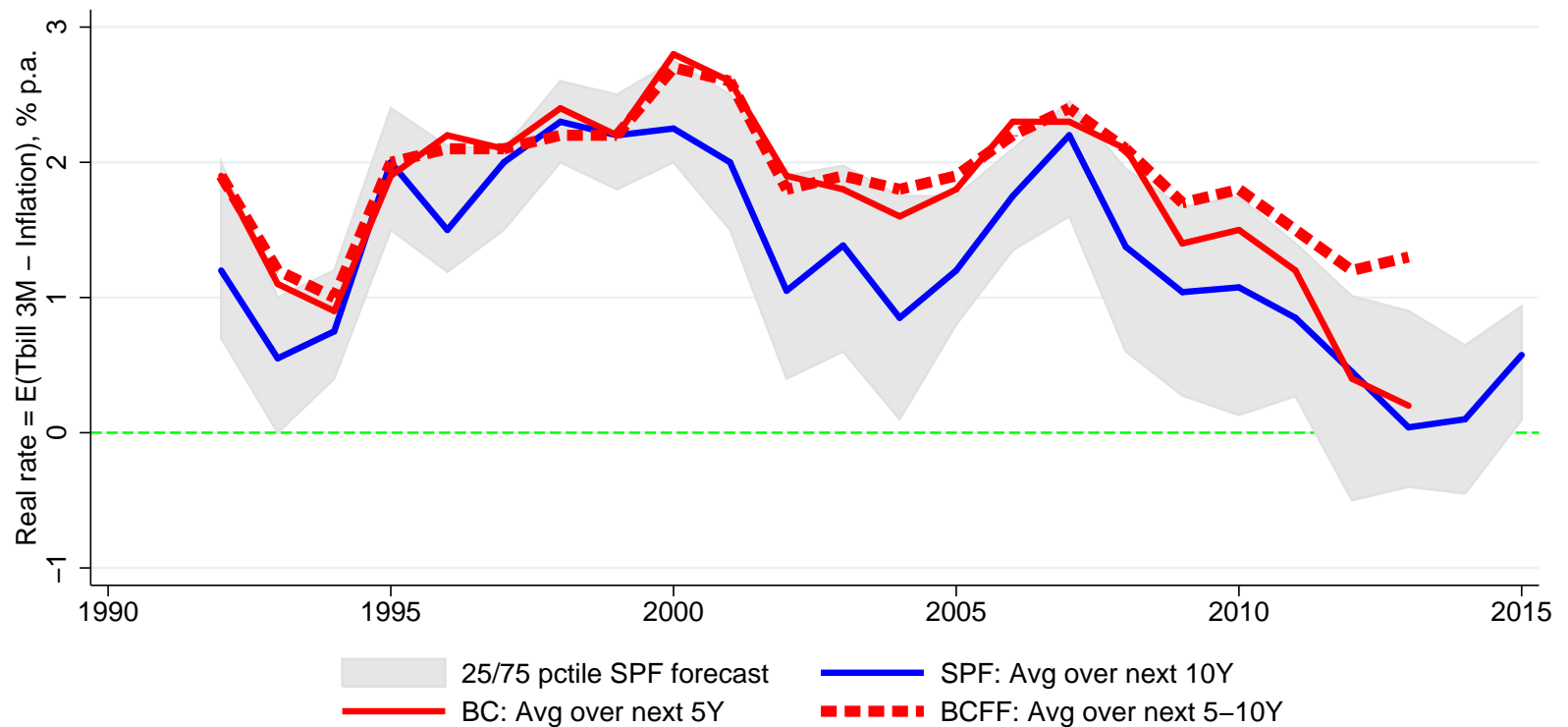
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- Discrepancies between ERR estimates are large both in levels and time-series dynamics
- Differences in model assumptions and horizons being modeled (short/mid- vs long-term dynamics)
- Uncertainty *within a model* (5–95% confidence bounds) would suggest that estimates are precise

Survey-based estimates of ERR

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- Various survey estimates more closely aligned than model estimates
- Long-term expectations (5-10 years ahead) suggest that ERR is positive, point estimate above 1% (as of 2013Q1)
- High-low range for long-term forecasts in BC survey from -0.3% to 2.2% (as of 2013Q1, not shown)

Term structure of short-run FFR survey forecasts

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- Key to understand how agents form short-rate expectations in real time as this determines borrowing costs for households and firms

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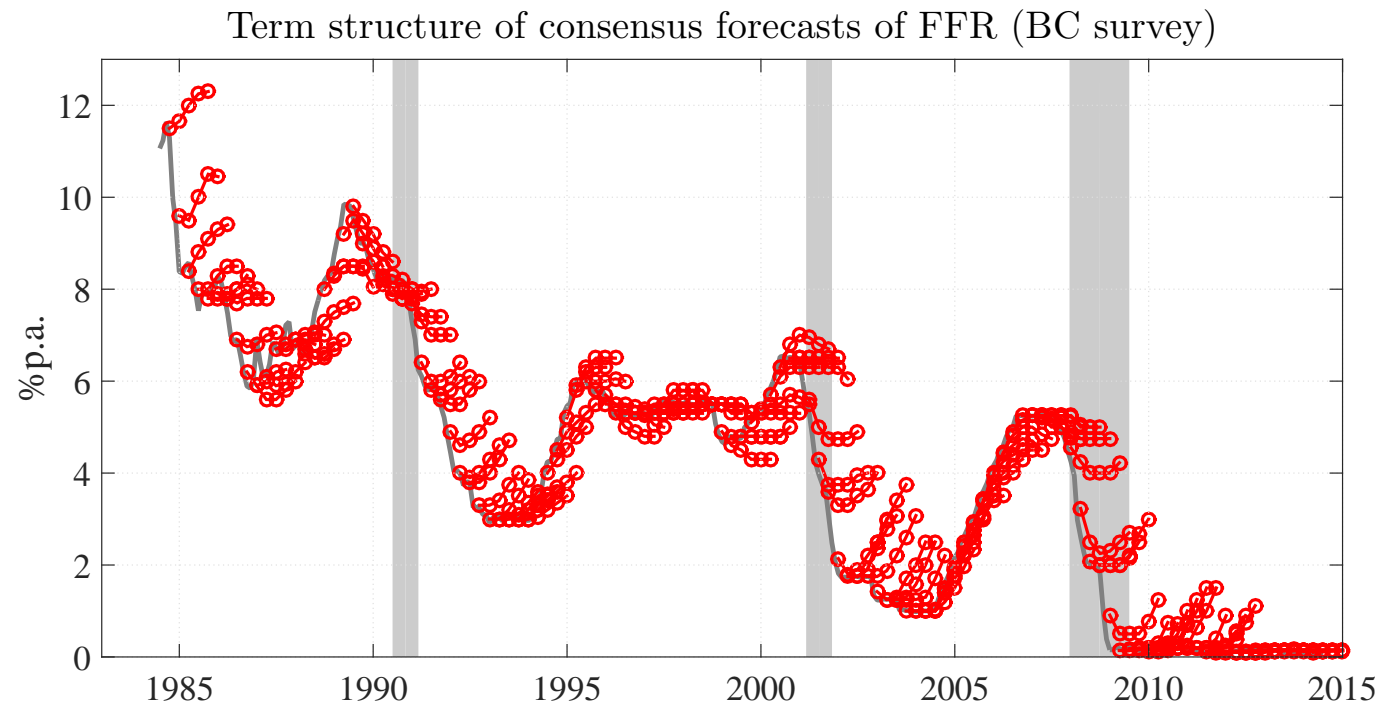
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- Key to understand how agents form short-rate expectations in real time as this determines borrowing costs for households and firms



- Above: Forecasts of effective FFR from BC survey, from current quarter to 5Q ahead
- Similar: Greenbook forecasts of FFR, SPF/BC forecasts of 3m Tbill

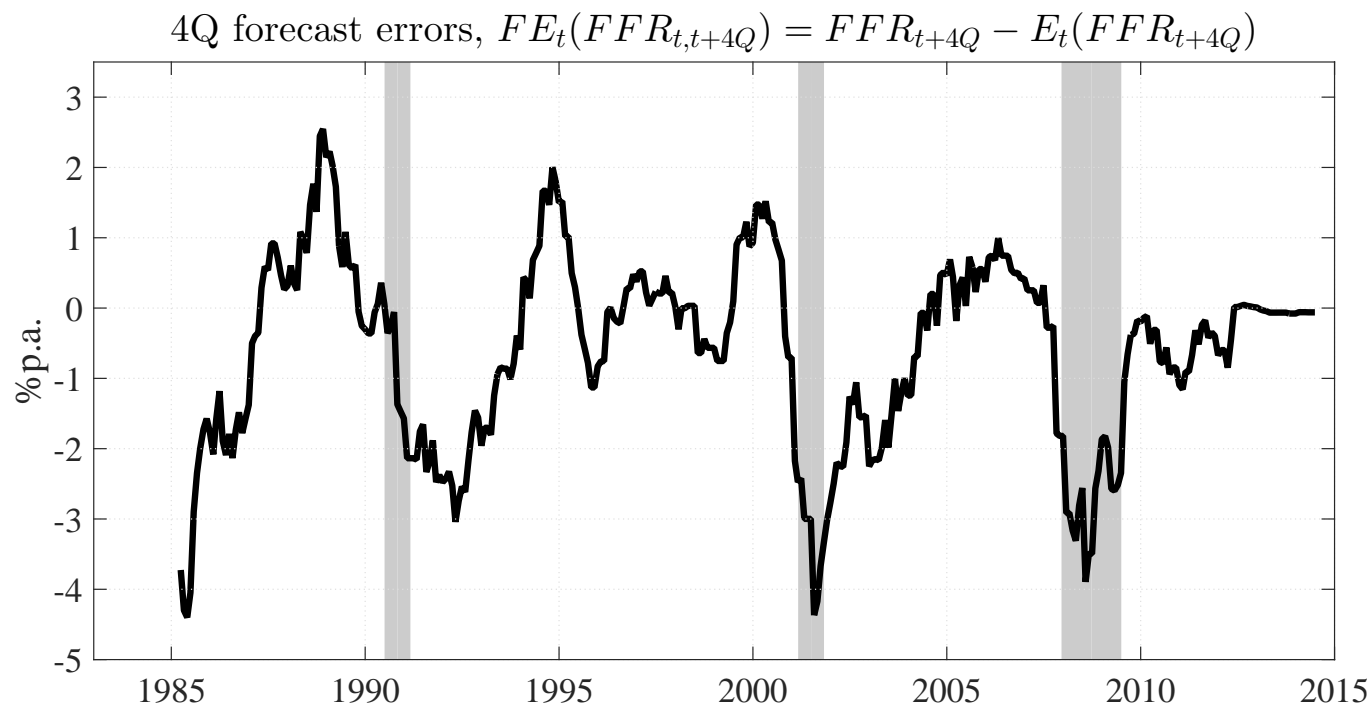
Forecast errors about short-run FFR dynamics

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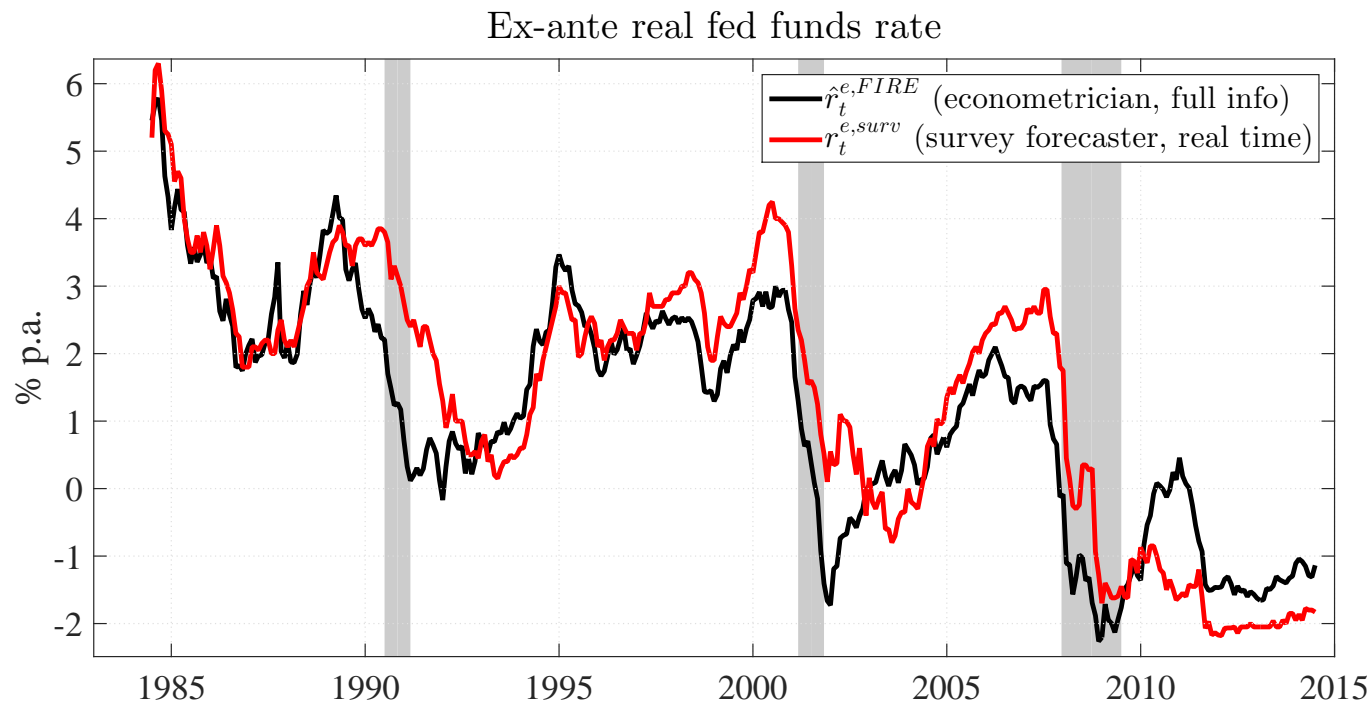
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- Forecasters predict about **18%** of subsequent changes in FFR 4Q ahead; forecast errors (FE) reach **-400bps**
 - FFR FEs are strongly negatively correlated with unemployment/output gap FEs (corr=-0.7 at 4Q), much less with inflation FEs (corr=0.3)
- *Post 1985, FEs about FFR driven mainly by expectations of real short rate rather than inflation*

Real FFR: Econometrician vs survey

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- Ex-post real FFR: $r_{t+4} = FFR_{t+4} - \Delta CPI_{t,t+4}$
- Ex-ante real FFR: $r_t^e = E_t(r_{t+4})$
 - Econometrician (Full Info RE): $\hat{r}_t^{e, FIRE} = \text{Proj}[r_{t+4} | \text{Instruments}_t]$
 - Survey forecaster (real time): $r_t^{e, surv} = E_t^s(FFR_{t+4}) - E_t^s(\Delta CPI_{t,t+4})$

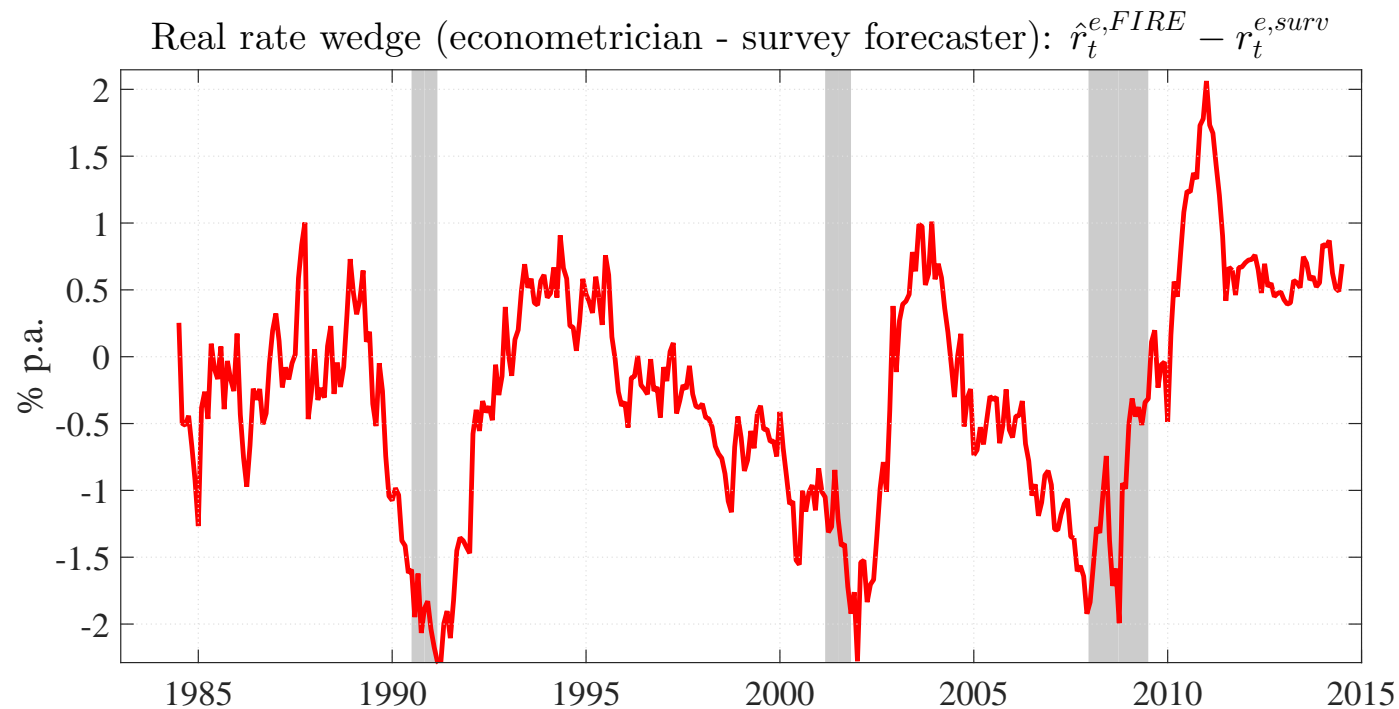
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- Real rate wedge = $\hat{r}_t^{e,FIRE} - r_t^{e,surv}$: difference in info set between econometrician and real-time forecaster
- Negative wedge in NBER recessions $\approx -200\text{bps}$, i.e. agents expect higher real FFR than econometrician

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Comments

Estimates

▷ Growth

Expected growth

Growth uncertainty

Rates and growth

ii. Level and uncertainty about long-run growth

Expected RGDP growth

This paper

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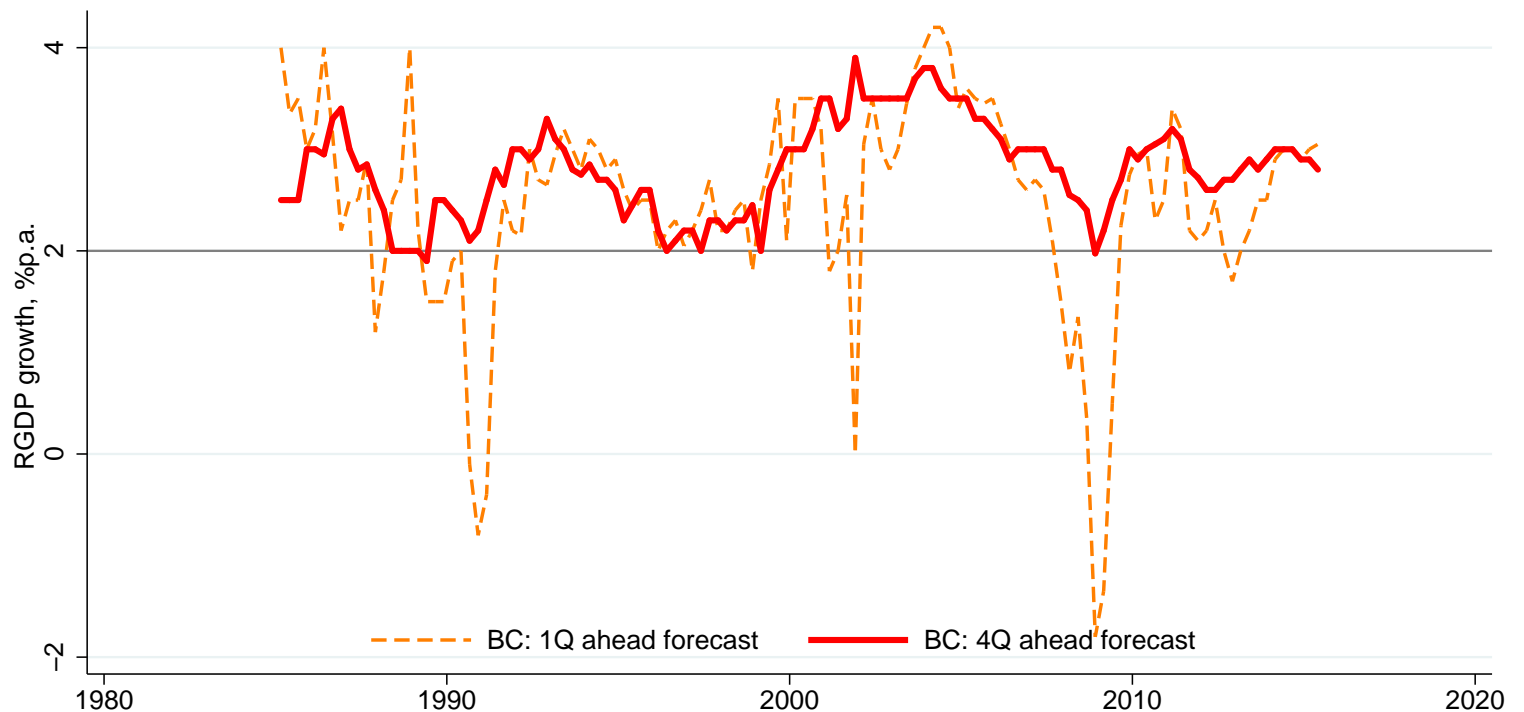
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▷ Expected growth

Growth uncertainty

Rates and growth



- Expected level of RGDP growth in mid/long-run does not seem that different today from 20 years ago
- Reversion of expectations to “normal” level is fast; volatility of expectations steeply downward sloped with forecast horizon

Expected RGDP growth

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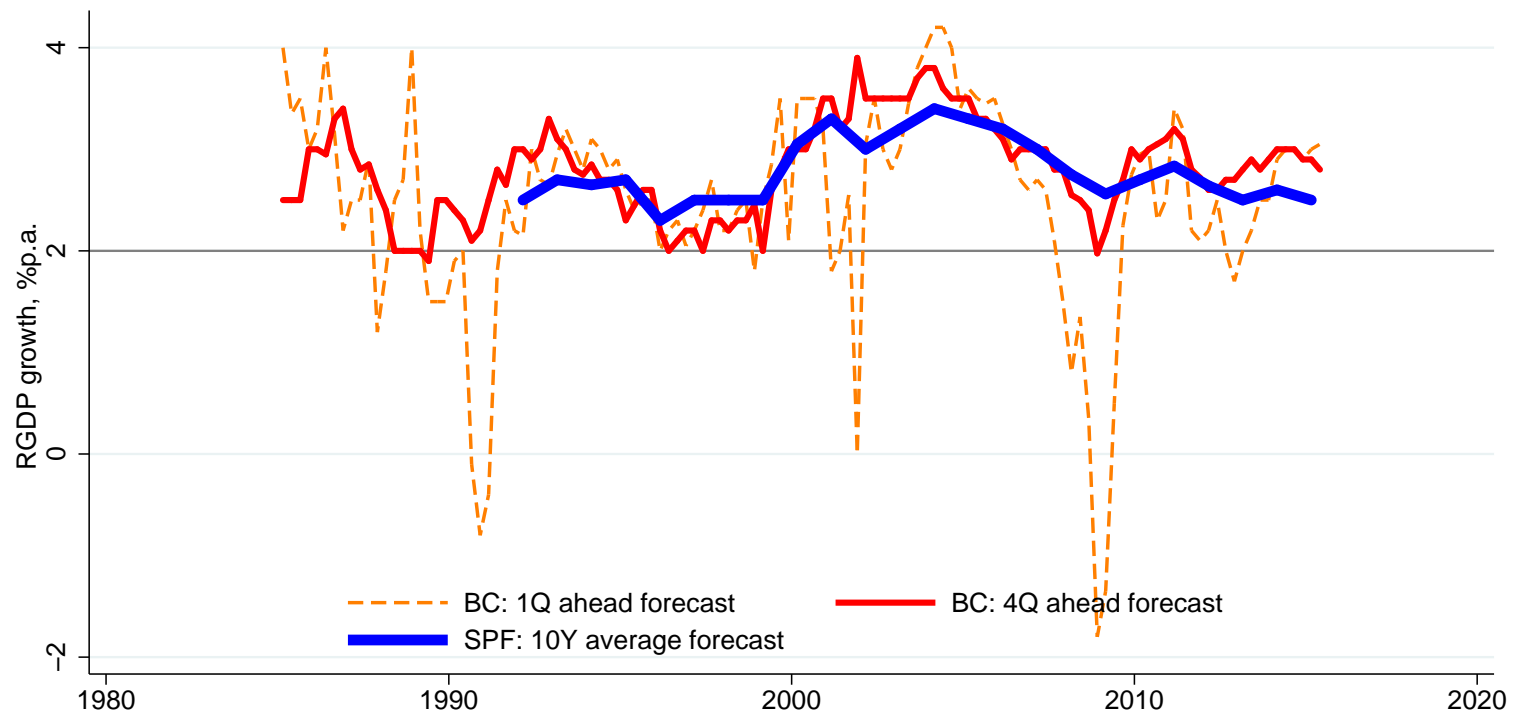
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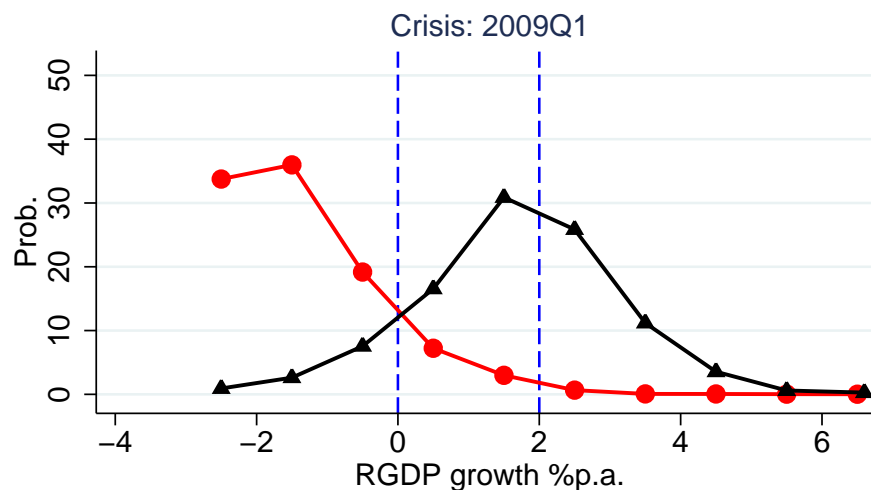
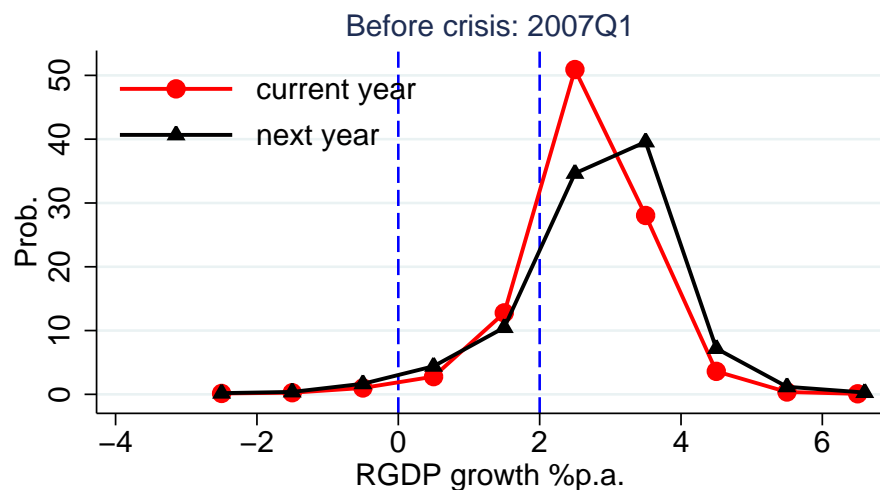
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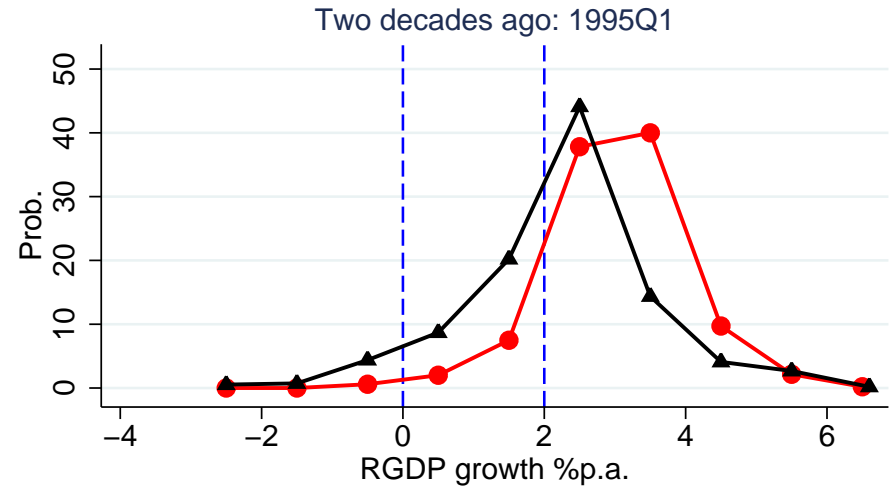
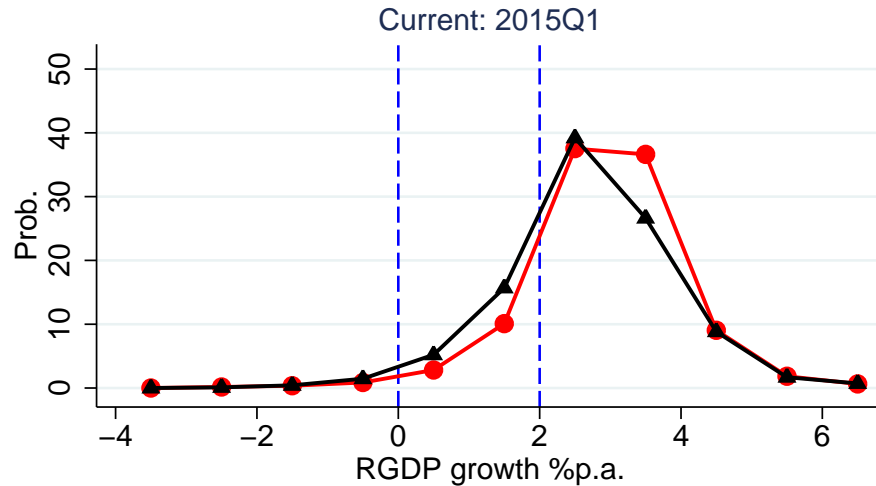
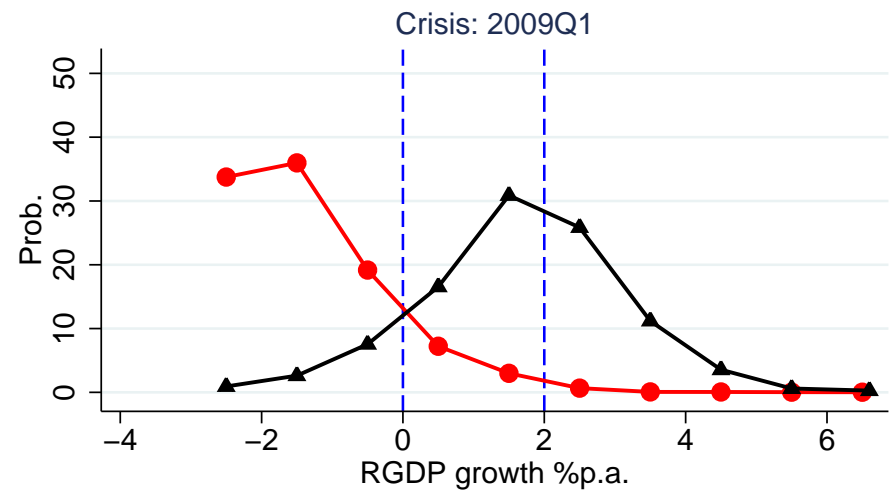
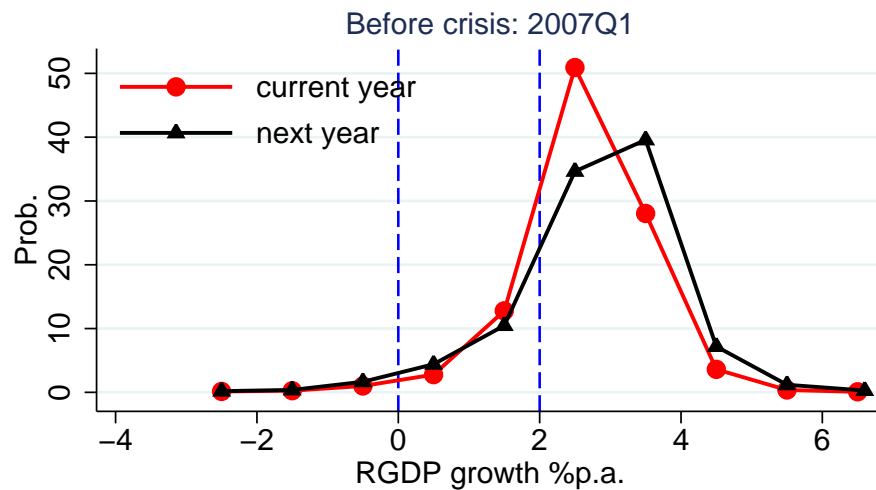
- Expected level of RGDP growth in mid/long-run does not seem that different today from 20 years ago
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Uncertainty about RGDP growth



Based on subjective probabilities of RGDP growth from the SPF survey (average across forecasters)

Uncertainty about RGDP growth



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Growth-ERR (LT)

Growth-ERR (ST/MT)

Decomposing slope

Conclusions

iii. Interest rates – growth link

Link between real rate and growth

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Decomposing slope

Conclusions

- Positive link between ERR and consumption/output growth is central in many asset pricing and NK macro models via representative agent's Euler equation:

$$E_t \underbrace{\Delta y_{t+1}}_{\Delta \text{output gap}} = \overbrace{\sigma}^{\text{EIS} > 0} \underbrace{(i_t - E_t \pi_{t+1} - r_t^n)}_{\text{real rate gap}} \quad (\text{in gaps})$$
$$r_t^n = \text{const} + \frac{1}{\sigma} E_t \Delta y_{t+1}^n \quad (\text{in natural levels})$$

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- EIS is notoriously hard to estimate:
 - Aggregate consumption/output data: $\text{EIS} \approx 0$ or even negative (Hall'88, Campbell'03)
 - Household-level data: $\text{EIS} \geq 1$ (Vissing-Jorgensen and Attanasio'03)
 - Consumption-based models calibrated with $\text{EIS} \approx 1$ imply real rate that is negatively correlated with proxies in the data (Canzonieri, Cumby and Diba'07)

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 - Consumption-based models calibrated with $\text{EIS} \approx 1$ imply real rate that is negatively correlated with proxies in the data (Canzonieri, Cumby and Diba'07)
- HHHW bring this crucial tension to light in the context of recent ERR estimates

Link between real rate and growth: long-term

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Decomposing slope

Conclusions

- Use individual long-term forecasts (10-year ahead) to measure perceived correlation between ERR and output/productivity growth in the long run (panel of survey forecasts)

dependent var	$E(\text{Tbill3m 10Y} - \text{Inflation 10Y})$	
regressor	$E\Delta\text{RGDP 10Y}$	$E\Delta\text{Prod 10Y}$
coeff	0.229	-0.138
t-stat	(1.86)	(-1.87)
year fixed eff.	Y	Y
id fixed eff.	Y	Y
N (id x year)	739	686

- Forecasters predict positive (negative) correlation between long-term RGDP (productivity) growth and ERR
- Necessary to decompose long-run RGDP growth into components: labor, capital, productivities

Link between real rate and growth: short/medium-term

This paper
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(ST/MT)

Decomposing slope

Conclusions

- Robust empirical fact*: Nominal **term spread**, or yield curve **slope**, predicts **real activity with a positive sign** (Harvey'88; Estrella and Hardouvelis'91)
- Sources of slope variation: **i.** expected inflation, **ii.** term premium, and/or **iii.** real rate (gap)

Link between real rate and growth: short/medium-term

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Conclusions

- **Robust empirical fact: Nominal term spread, or yield curve slope, predicts real activity with a positive sign** (Harvey'88; Estrella and Hardouvelis'91)
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How does this fact help understand real-rate variation in short/medium run?
(Cieslak and Povala'14 WP, '15 RFS)

- (Minus) slope reflects variation in **real rate (gap)**
- Growth predictability by slope empirically captures aggregate Euler equation in rep agent models
- Estimates of aggregate "EIS" significant but negative ≈ -0.5
- Model with heterogeneous agents (limited participation) can explain the empirical result

Decomposing slope of the nominal yield curve

Decompose slope into risk premium, expected inflation and a residual, slope_t^\perp :

$$\text{slope}_t = \alpha_0 + \underbrace{\alpha_1}_{\substack{1.25 \\ (4.88)}} RP_t + \underbrace{\alpha_2}_{\substack{-0.13 \\ (-1.22)}} E_t^s \pi_{t+1} + \text{slope}_t^\perp, \quad \bar{R}^2 = 0.36$$

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Use slope_t^\perp to forecast output growth $\Delta y_{t+k/4}$:

horizon, qtr:	k=1	k=2	k=3	k=4	k=5	k=6	k=7	k=8
A. $\Delta y_{t+k/4} = \alpha_0 + \alpha_1 \text{slope}_t + \varepsilon_{t+k/4}$								
slope_t	0.19 (3.76)	0.38 (3.91)	0.55 (4.02)	0.78 (4.45)	0.94 (4.54)	1.10 (4.78)	1.23 (4.98)	1.33 (5.04)
\bar{R}^2	0.09	0.13	0.15	0.20	0.22	0.24	0.25	0.25
B. $\Delta y_{t+k/4} = \alpha_0 + \alpha_1 \text{slope}_t^\perp + \alpha_2 RP_t + \varepsilon_{t+k/4}$								
slope_t^\perp	0.28 (3.15)	0.57 (3.33)	0.82 (3.54)	1.12 (3.82)	1.33 (4.04)	1.52 (4.26)	1.65 (4.36)	1.72 (4.27)
RP_t	0.03 (0.32)	0.03 (0.17)	0.06 (0.24)	0.21 (0.66)	0.35 (0.94)	0.56 (1.27)	0.80 (1.57)	1.08 (1.91)
\bar{R}^2	0.12	0.18	0.20	0.26	0.28	0.30	0.30	0.29

Sample 1972–2013, quarterly data; RP_t is bond risk premium measure from Cieslak and Povala'15 RFS

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- I broadly agree with the conclusions reached by the authors:
 - ERR point estimate in 0–2% range; negative ERR inconsistent with survey evidence
 - Support for secular stagnation view seems weak (in the data I have considered)
- Real-time perceptions of ERR are basis for agents' decision making
- Discrepancies between model and survey estimates are large. Common model assumptions:
 - Info set of agents and econometrician are the same + FIRE
 - Representative agent + positive growth–ERR link
- Long-run relationship between RGDP growth and ERR is ambiguous; further decomposition of RGDP growth into components necessary
- Slope of nominal yield curve useful to understand dynamic properties of real rate gap, key variable for monetary policy