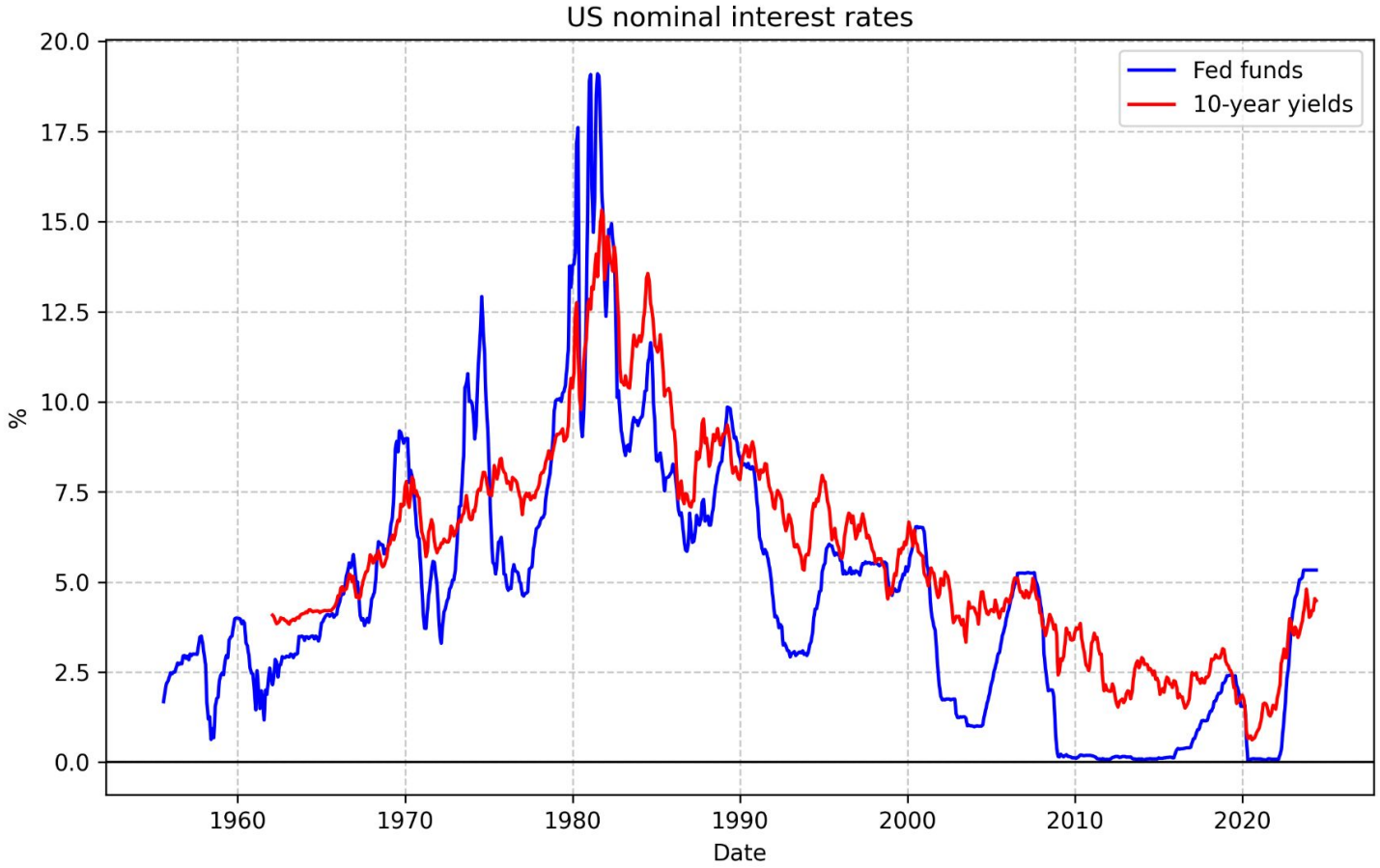
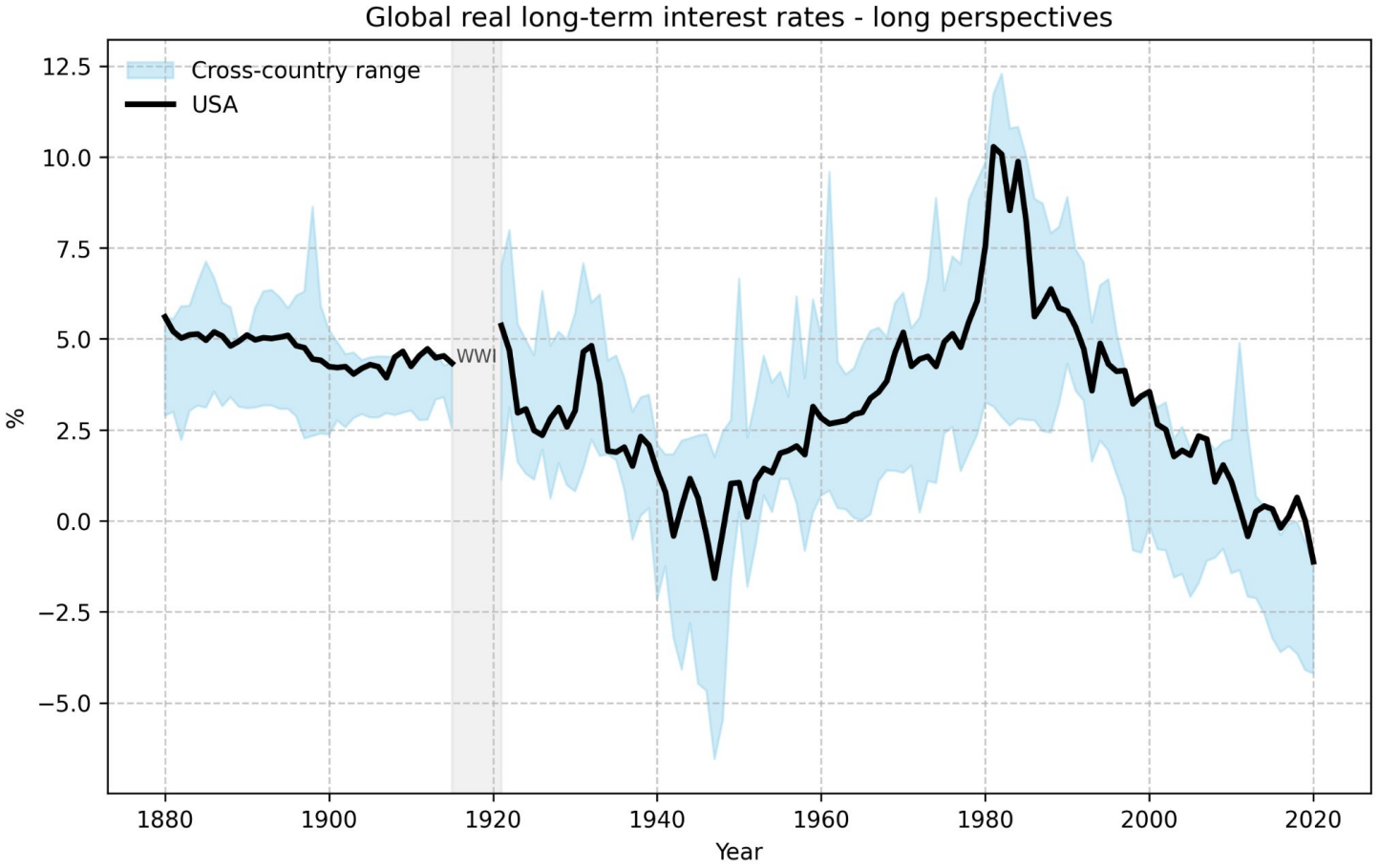
Guiding star?
The natural rate of interest and monetary policy

Phurichai Rungcharoenkitkul, BIS

1st Annual Czech National Bank Workshop, Prague, 14 June 2024


US nominal interest rates
Fed funds
10-year yields
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
%
1960
1970
1980
1990
2000
2010
2020
Date


Global real long-term interest rates - long perspectives
Cross-country range
USA
12.5
10.0
7.5
5.0
2.5
0.0
−2.5
−5.0
%
WWI
1880
1900
1920
1940
1960
1980
2000
2020
Year

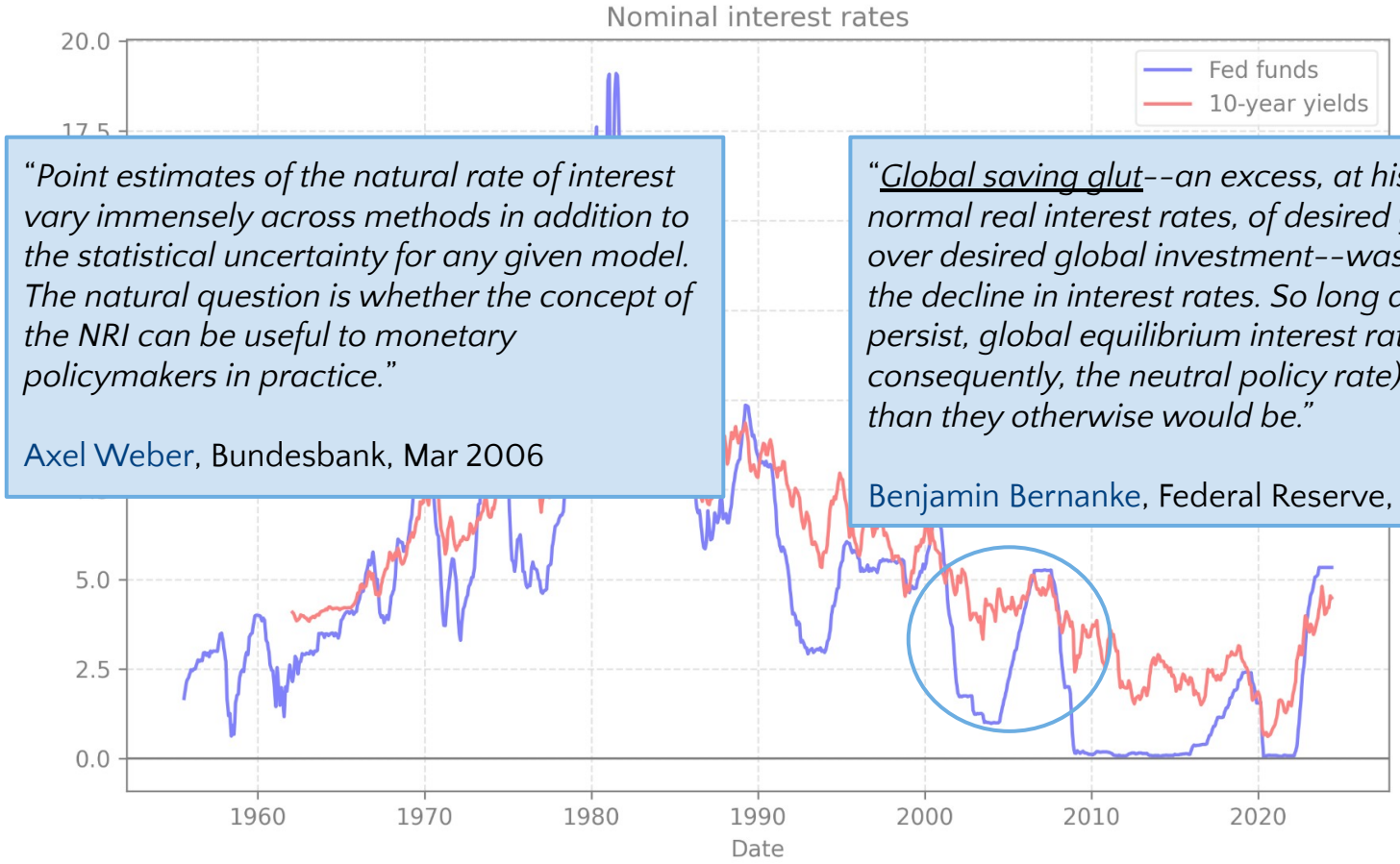
R-star deja vu

- Broad consensus on r-star's limitations, notably its large model and statistical uncertainties
- Yet, for better or worse, r-star narratives have had a powerful influence on monetary policy conduct and frameworks
- We see this most clearly in the post-GFC decade
- New post-pandemic narratives already emerging

Plan for today

1. The evolution of r-star policy debate
2. Prevailing r-star analytical framework
3. Critiques on the conceptual foundation of r-star
4. Some thoughts on policy implications

A brief history of r-star debate

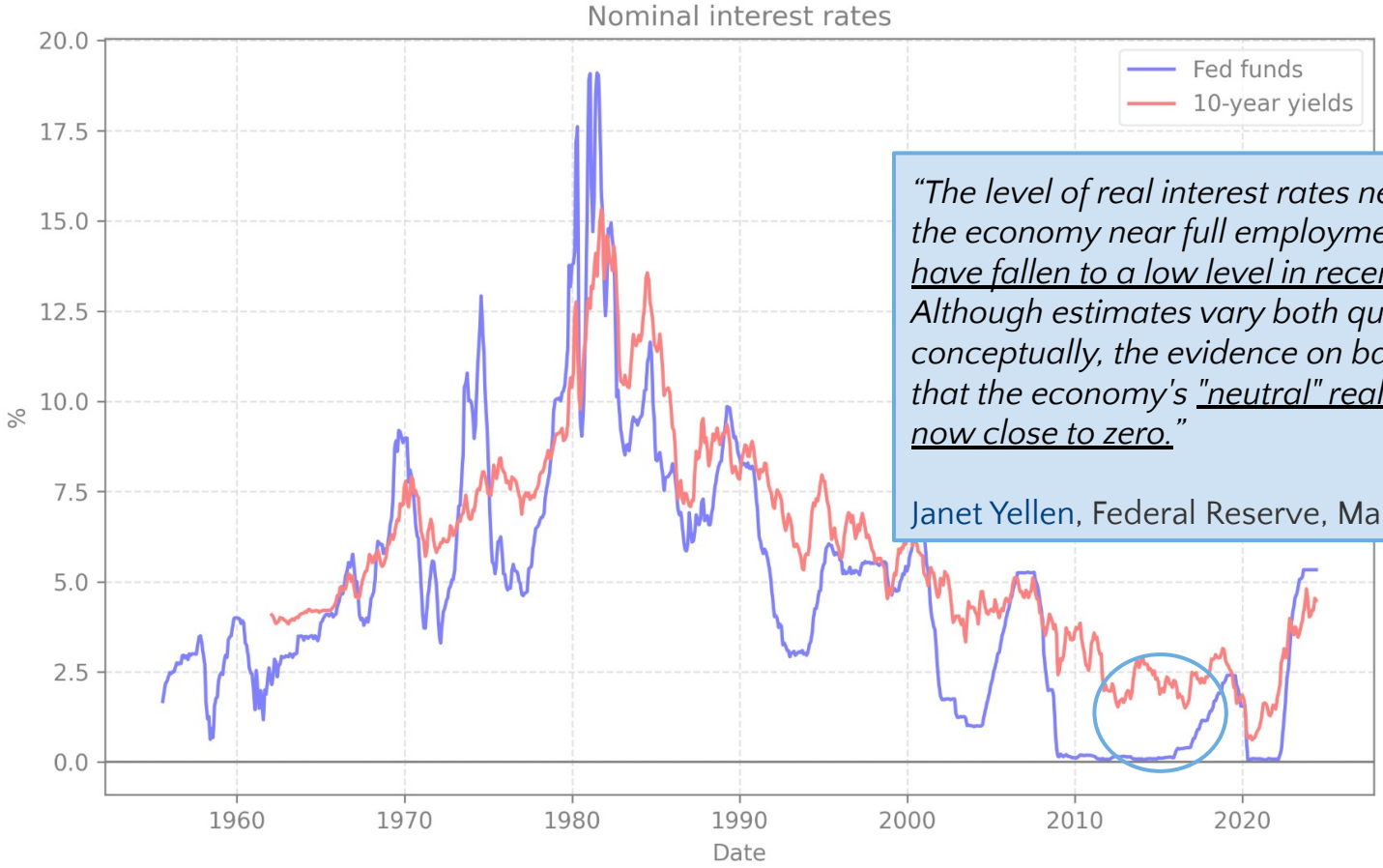


"Point estimates of the natural rate of interest vary immensely across methods in addition to the statistical uncertainty for any given model. The natural question is whether the concept of the NRI can be useful to monetary policymakers in practice."

Axel Weber, Bundesbank, Mar 2006

"Global saving glut--an excess, at historically normal real interest rates, of desired global saving over desired global investment--was contributing to the decline in interest rates. So long as these factors persist, global equilibrium interest rates (and, consequently, the neutral policy rate) will be lower than they otherwise would be."

Benjamin Bernanke, Federal Reserve, Mar 2006

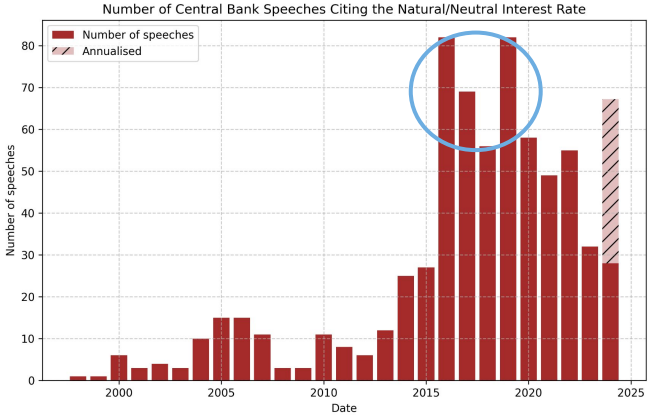


"The level of real interest rates needed to keep the economy near full employment appears to have fallen to a low level in recent years. Although estimates vary both quantitatively and conceptually, the evidence on balance indicates that the economy's "neutral" real rate is likely now close to zero."

Janet Yellen, Federal Reserve, Mar 2016

"This unprecedented desire for safety has helped to drive down the equilibrium interest rate. In this sense, low policy interest rates are not the caprice of central bankers, but rather the consequence of powerful global forces, including debt, demographics and distribution."

Mark Carney, Bank of England, Dec 2016



"Global shifts in demographics and productivity have contributed to dramatic declines in the longer-term normal or "neutral" real rate of interest or r-star. I see no reason to expect r-star to revert to higher levels in the foreseeable future. Central banks should revisit and reassess their policy frameworks, strategies, and toolkits, to maximize efficacy in a low r-star world."

John Williams, Federal Reserve, May 2019

Post-pandemic great reversal?

"*The strength of the economy suggests that perhaps productivity growth and potential output growth have increased and the [interest rate] level would be higher. The jury's still out.*"

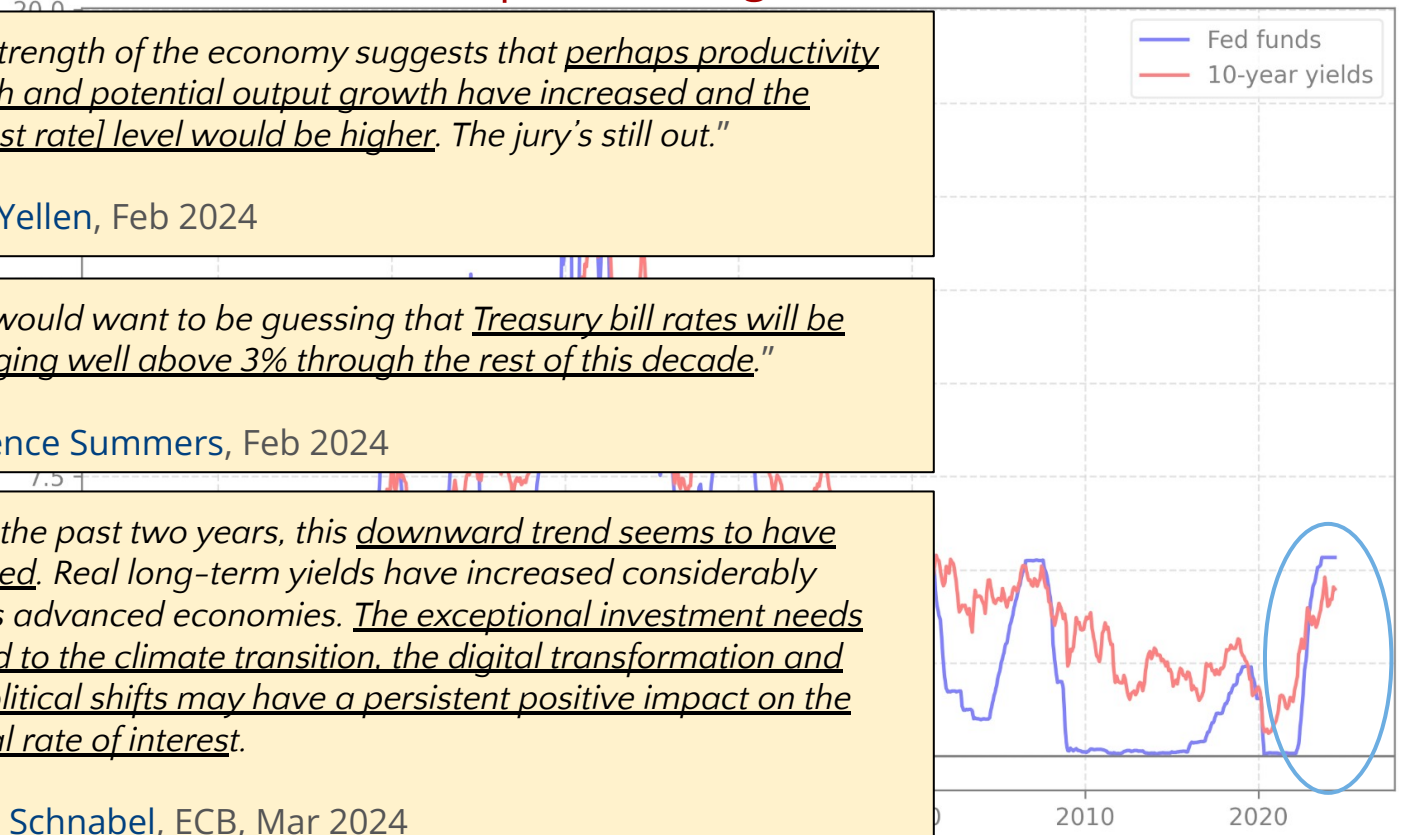
Janet Yellen, Feb 2024

"*One would want to be guessing that Treasury bill rates will be averaging well above 3% through the rest of this decade.*"

Lawrence Summers, Feb 2024

"*Over the past two years, this downward trend seems to have reversed. Real long-term yields have increased considerably across advanced economies. The exceptional investment needs related to the climate transition, the digital transformation and geopolitical shifts may have a persistent positive impact on the natural rate of interest.*

Isabel Schnabel, ECB, Mar 2024



Or a rethink?

It is possible, however, that the determined monetary policy response to the inflation burst may have shifted market participants' beliefs about r"*

Isabel Schnabel, ECB, Mar 2024

Analytical framework and the narratives

Knut Wicksell's (equivalent) definitions of the natural interest rate

1. The real rate of interest that equates saving with investment

2. The marginal product of capital

3. The real interest rate that is consistent with price stability

The modern building blocks

Demand side: Euler equation

$$c_t = E_t(c_{t+1}) - \frac{1}{\sigma}(r_t - \rho)$$

Supply side:

$$Y_t = A_t K_t^{\alpha} N_t^{1-\alpha}$$

$$\pi_t = A_t K_t^{\alpha} N_t^{1-\alpha} - (r_t + \delta) K_t - W_t N_t$$

$$r_t + \delta = \alpha A_t \left(\frac{N_t}{K_t}\right)^{1-\alpha} \quad \text{(r=MPK)}$$

Goods market equilibrium

$$c_t = y_t$$

$$r^* = \rho + \sigma g_y$$

$$= \rho + \sigma \left(g_n + \frac{1}{1-\alpha} g_a\right)$$

Productivity growth

Demographics

Demand side: Euler equation

$$c_t^Y = E_t(c_{t+1}^O) - \frac{1}{\sigma}(r_t - \rho)$$

1 3

Supply side:

2

$$Y_t = A_t K_t^{\alpha} N_t^{1-\alpha}$$

$$\pi_t = A_t K_t^{\alpha} N_t^{1-\alpha} - (r_t + \delta)K_t - W_t N_t$$

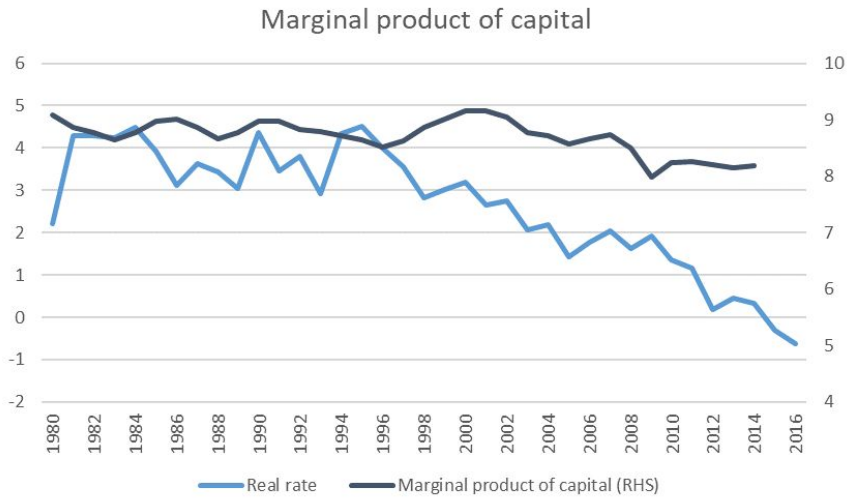
$$r_t + \delta = \alpha A_t \left(\frac{N_t}{K_t}\right)^{1-\alpha}$$ (r=MPK)

Demographics & r*

1. Longevity raises saving (↓r*)
2. Aging lower N viz K (↓r*)
3. Smaller working-age population lowers aggregate saving (↑r*)

Krueger and Ludwig (2007)
Carvalho, Ferrero and Nechio (2016)
Gagnon, Johannsen, Lopez-Salido (2021)
Sudo and Takizuka (2020)
Papetti (2021)
Goodhart and Pradhan (2020)

Safe asset and risk premium



Safe asset demand/supply & r*

Higher demand for safe assets lowers equilibrium safe rates (↓r*) while driving up risk premium

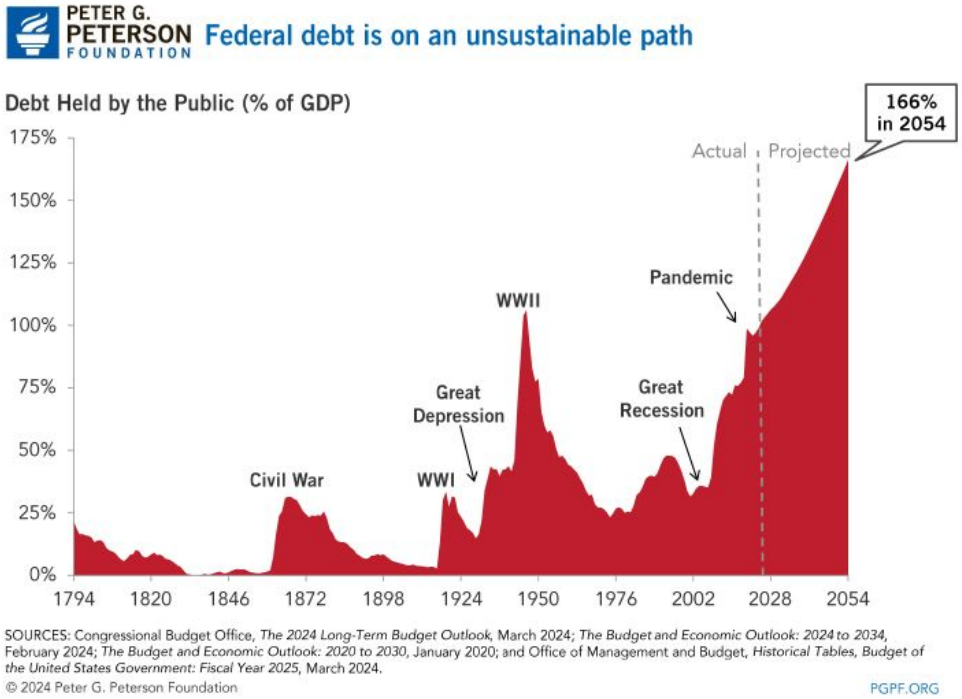
Supply side:

1

$$r_t + \delta = \alpha A_t \left(\frac{N_t}{K_t}\right)^{1-\alpha} \qquad \tilde{r}_t = r_t - \psi_t$$ (MPK vs safe rate)

Bernanke (2005)
Caballero, Farhi and Gourinchas (2016,2017)
Del Negro et al (2019)
Ferreira and Shousha (2023)

Fiscal policy



Fiscal spending & r*

1. Higher public spending implies lower aggregate saving (↑r*)
2. Greater borrowing means more supply of safe asset (↑r*)

1

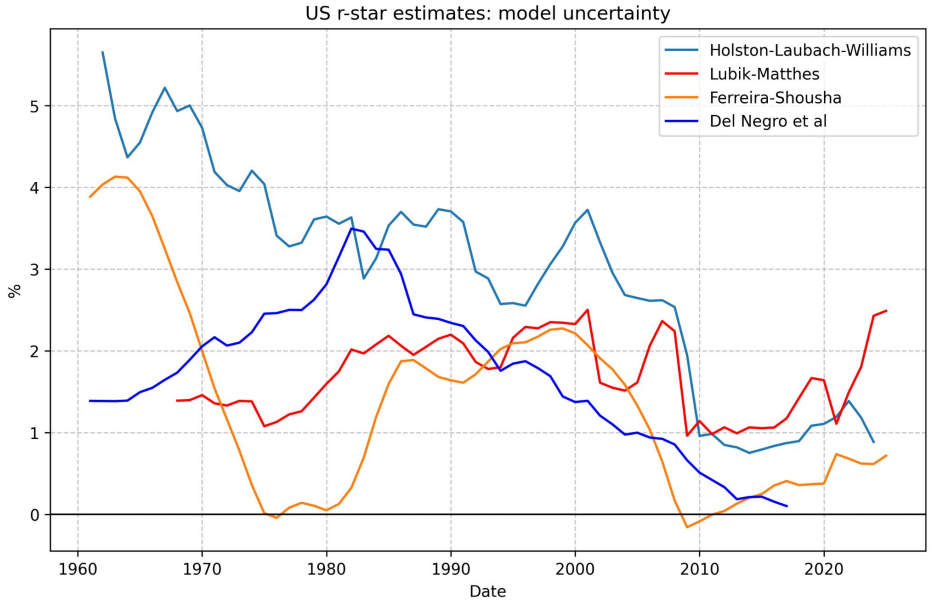
$$c_t = E_t(c_{t+1}) - \frac{1}{\sigma}(r_t - \rho) \qquad c_t^{gov} = G_t$$

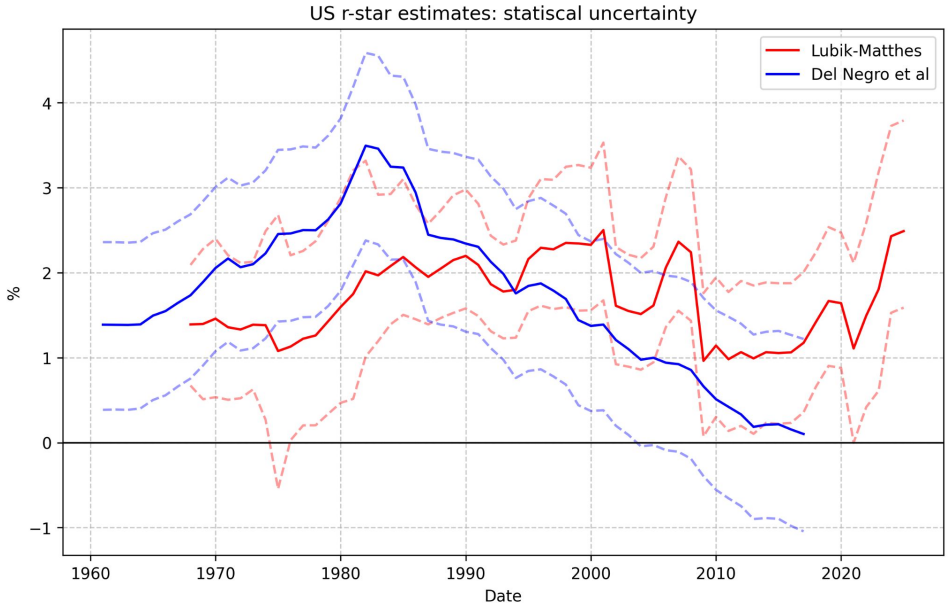
2

$$r_t + \delta = \alpha A_t \left(\frac{N_t}{K_t}\right)^{1-\alpha} \qquad \tilde{r}_t = r_t - \psi_t$$

Eggertsson, Mehrotra and Robbins (2019)
Campos, Fernandez-Villaverde, Nuno and Paz (2005)

Different perspectives add model uncertainty on top of statistical uncertainty

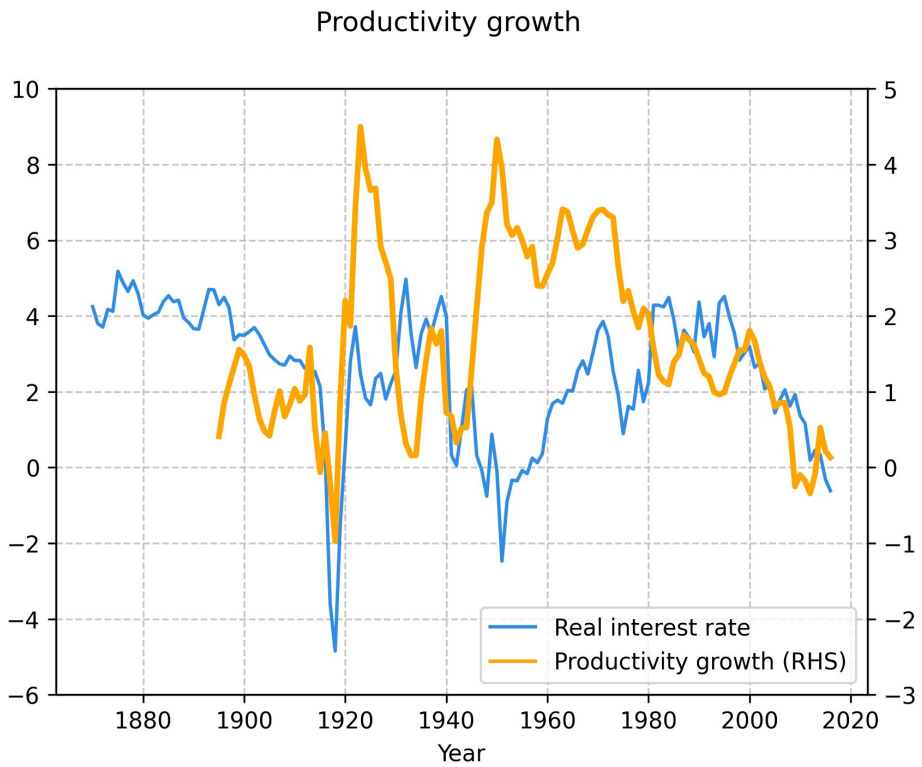


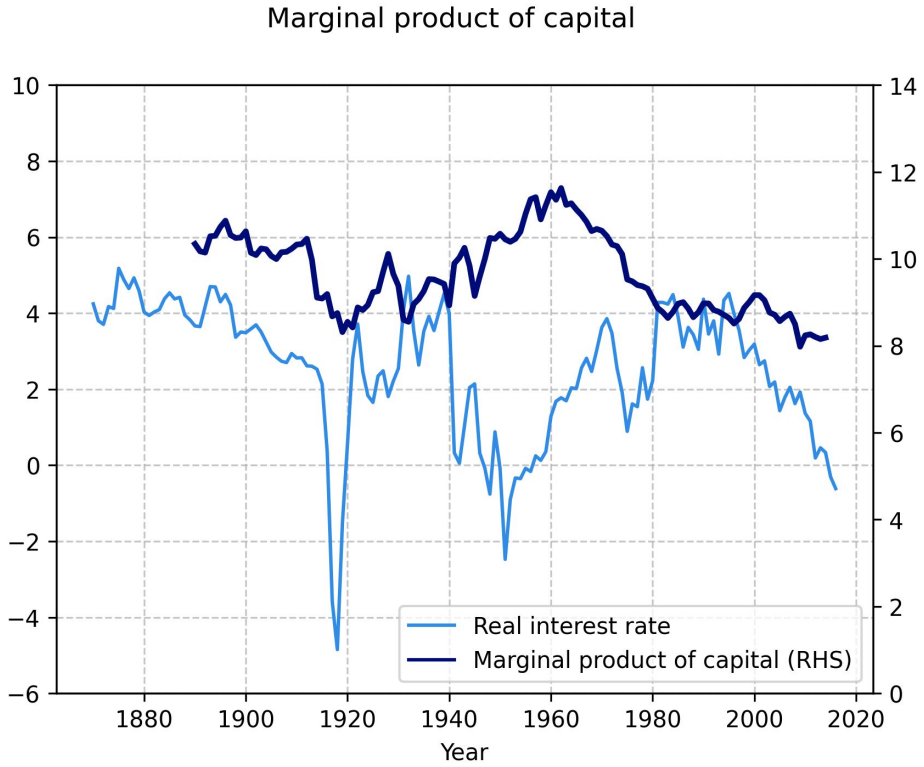


Source: Holston, Laubach and Williams (2023), Lubik and Matthes (2015), Ferreira-Shousha (2023), Del Negro, Giannone, Giannoni and Tambalotti (2019)

Conceptual uncertainty

Problems with the “usual suspects”: No stable relationships with real interest rate trends in long sample

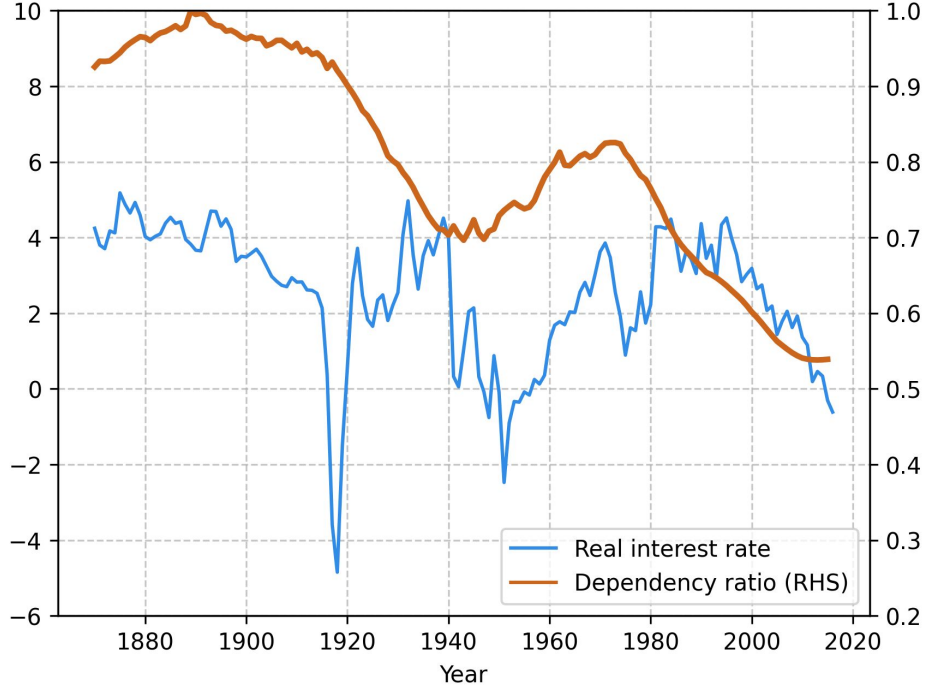




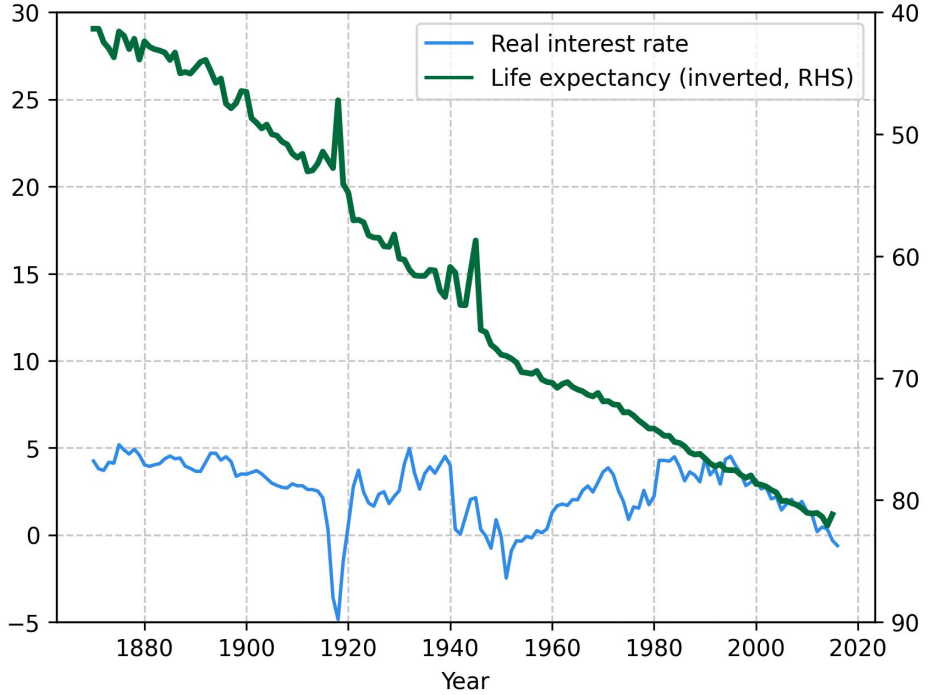
Source: Borio, Disyatat, Juselius and Rungcharoenkitkul (2022)

Demographics: no systematic relationships either
Life expectancy has always been on the up

Dependency ratio



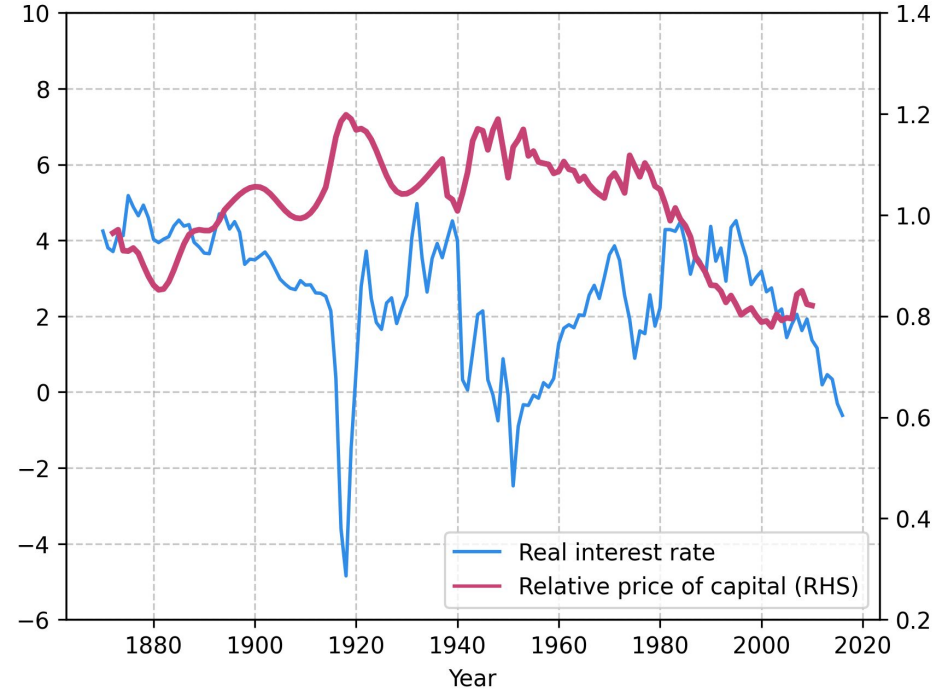
Life expectancy



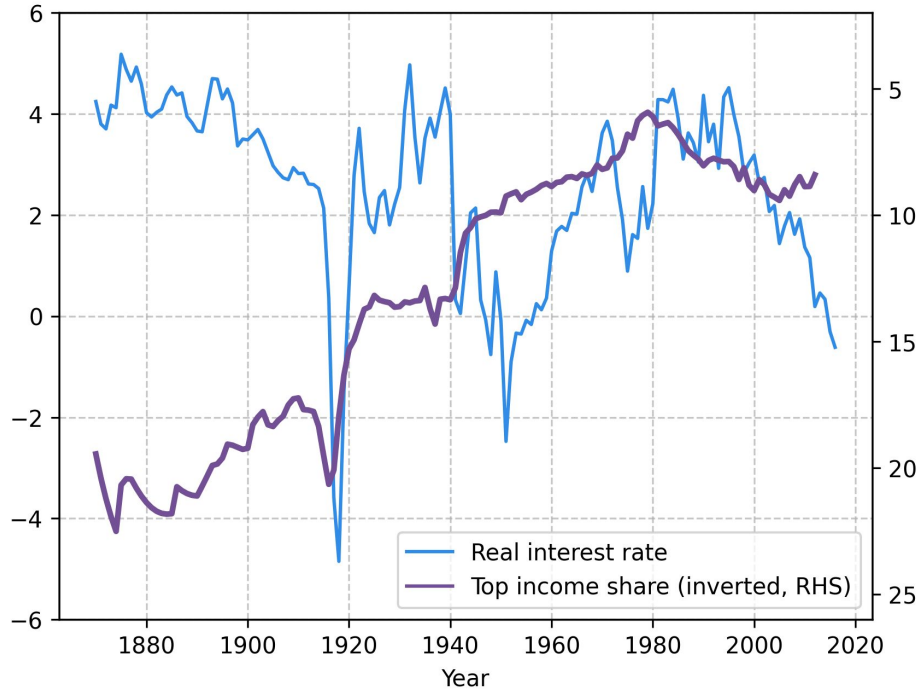
Source: Borio, Disyatat, Juselius and Rungcharoenkitkul (2022)

Similarly for other saving–investment factors
Confirmed when tested in a joint dynamic specification

Relative price of capital

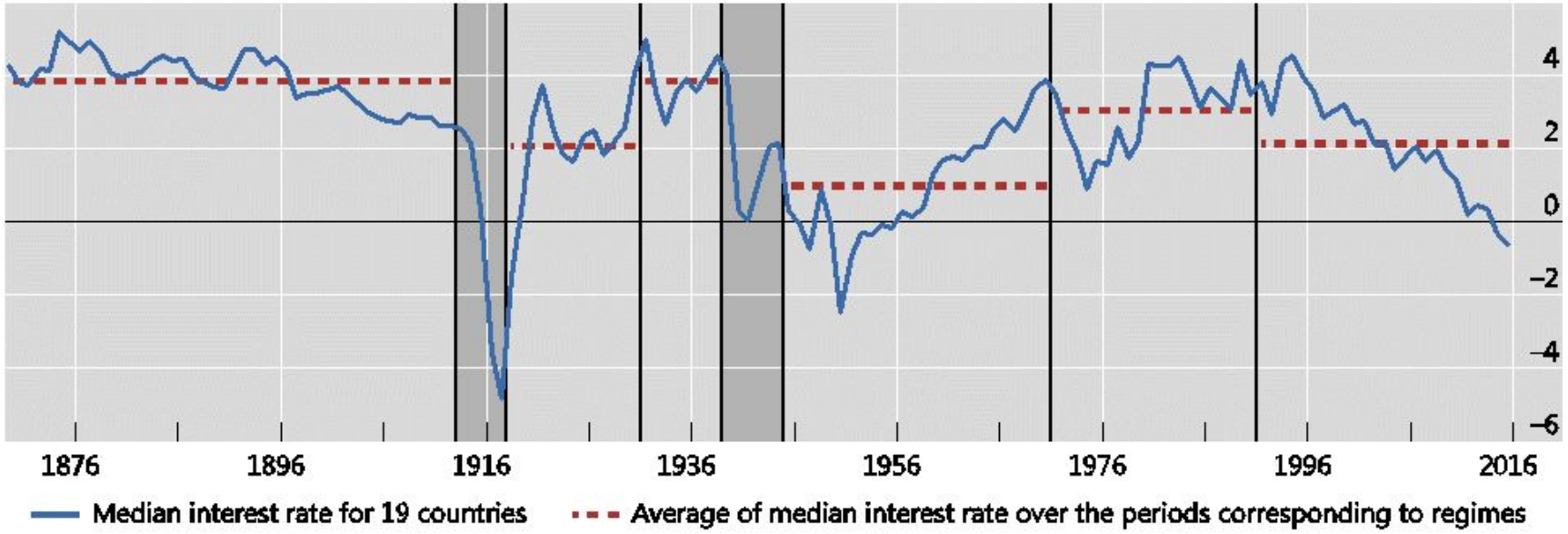


Inequality



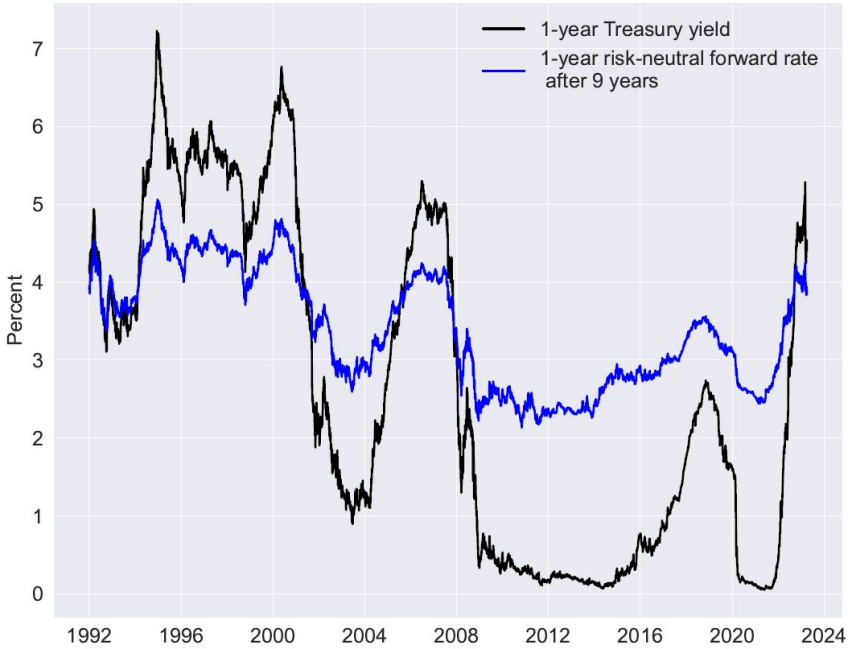
Source: Borio, Disyatat, Juselius and Rungcharoenkitkul (2022)

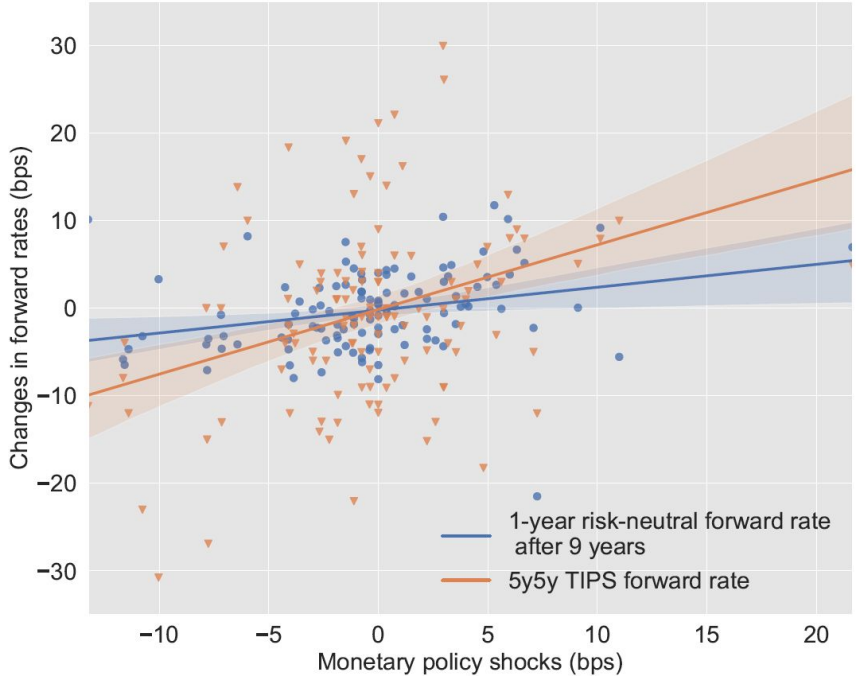
Monetary policy regimes appear more consistently linked to real interest rate trends



Source: Borio, Disyatat and Rungcharoenkitkul (2019)

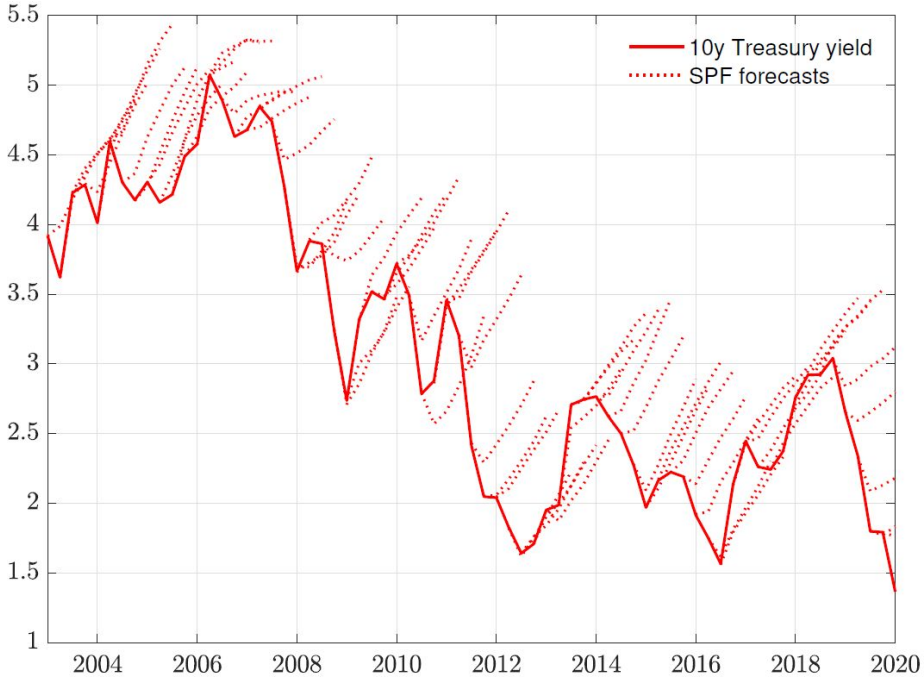
Over cyclical frequency, the effect of monetary policy on perceived r-star seems palpable





Source: Rungcharoenkitkul and Winkler (2021)

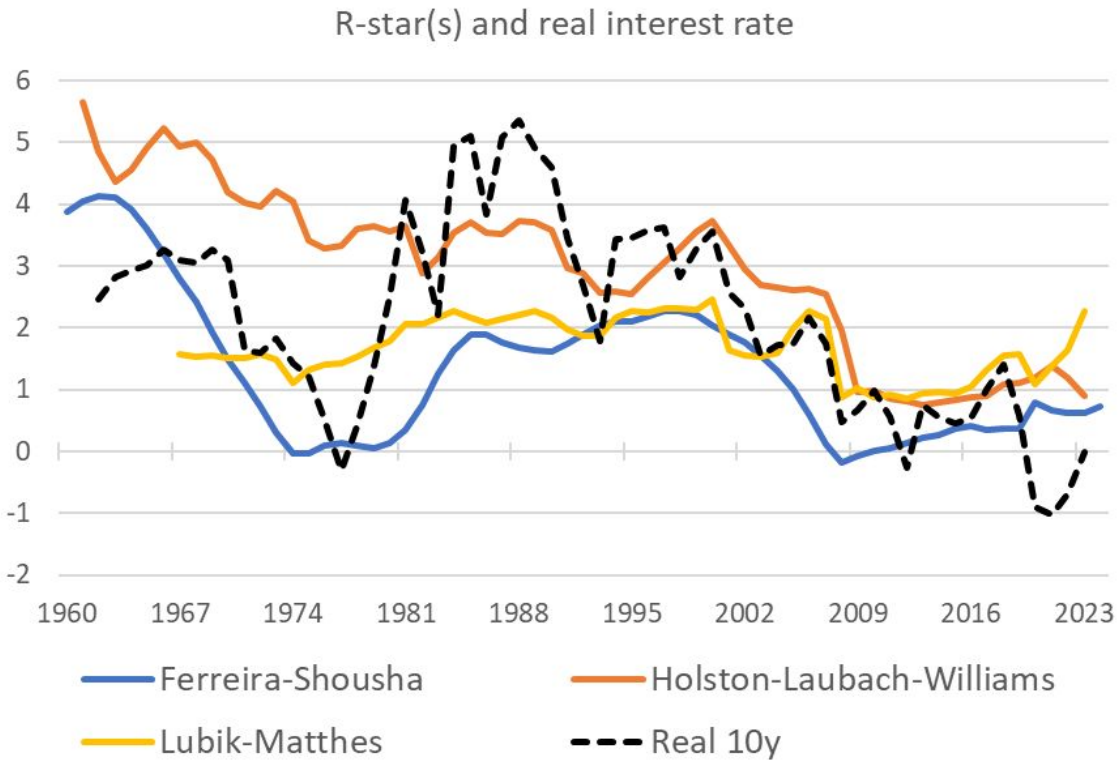
Despite predictable S&I trends, nobody anticipated the secular yield decline
It was instead driven by monetary policy surprises



Source: Rungcharoenkitkul and Winkler (2021)

Source: Replicating Hillenbrand (2022)

Could r* be endogenous to monetary policy?



Some possible mechanisms for r-star endogeneity and/or (persistent) money non-neutrality

- Financial cycle
- Hall-of-mirrors effect
- Supply-side channel of monetary policy

Financial cycle and real interest rate

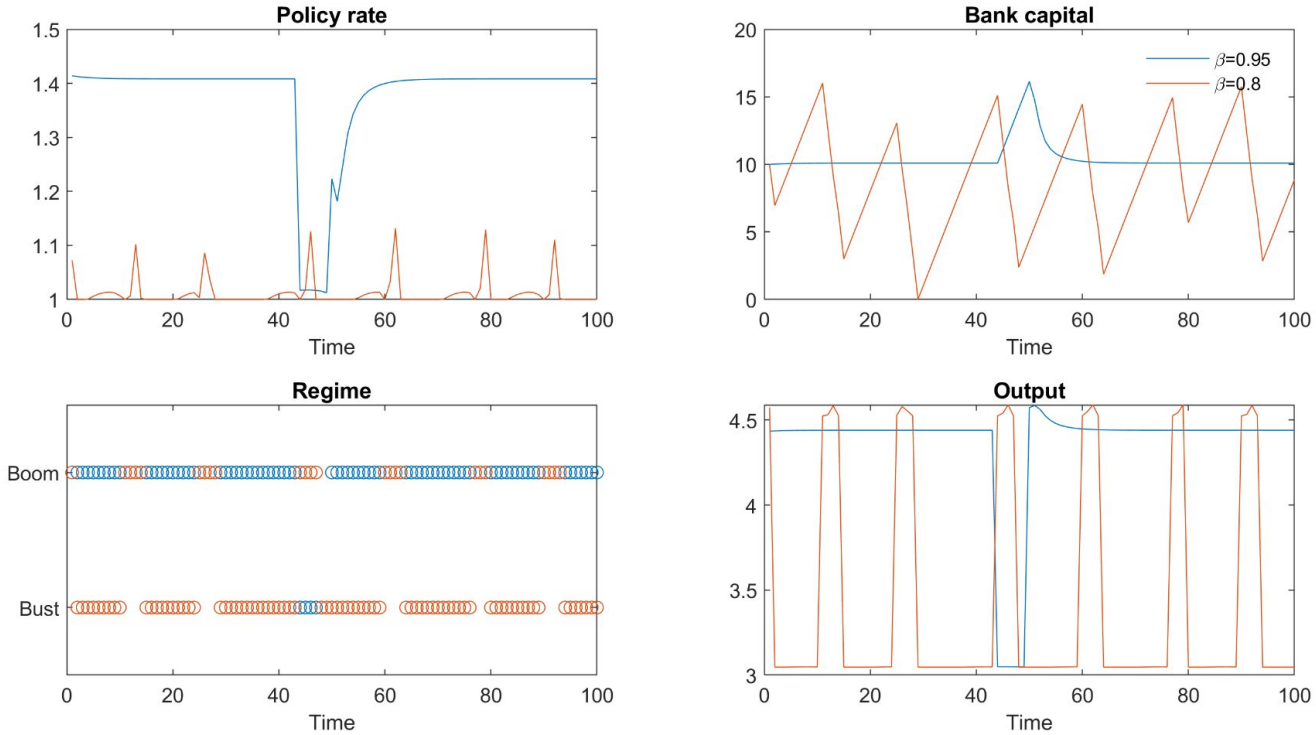
“Monetary policy hysteresis” model

1. OLG consumers/savers
   - Euler equation does not pin down r-star for given steady-state output growth
2. Firms need financing from bank loans to begin production
   - Monetary policy affects bank rates, and hence output supply

⇨ 1& 2 permit multiple real rate steady states ⇒ MP selects which one obtains

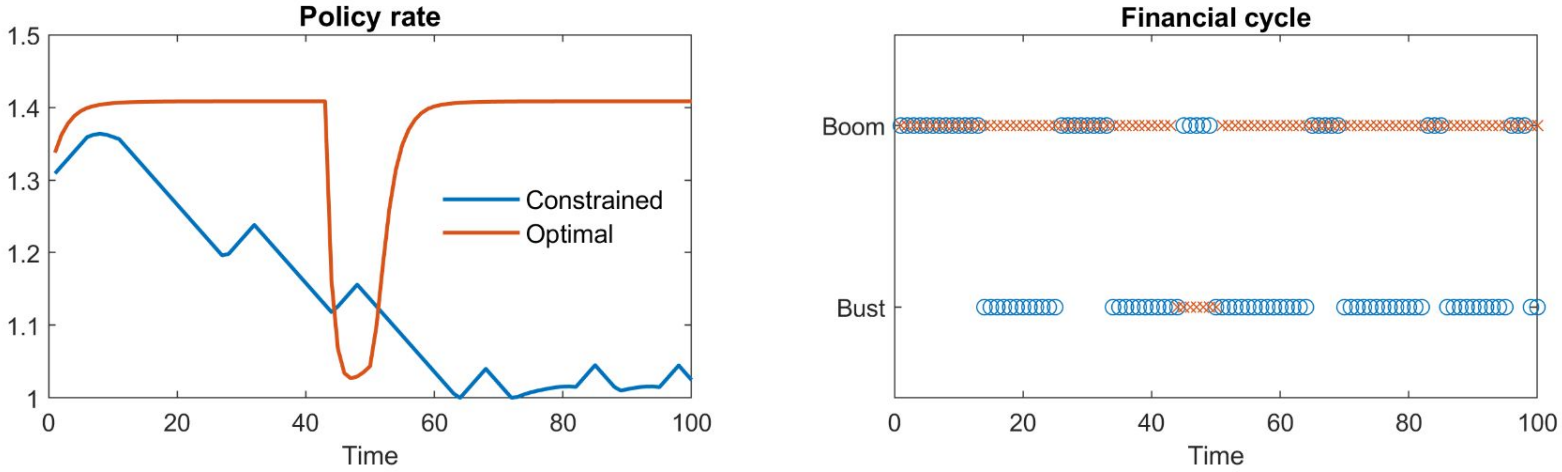
3. Financial cycle introduces intertemporal policy tradeoffs
   - Bank lending is subject to boom-bust cycle
   - Low rate ⇒ worsen boom-bust cycle ⇒ open door to low-for-long rate

Monetary policy dictates the long-run equilibrium of the economy by shaping the financial boom-bust cycle



Source: Rungcharoenkitkul, Borio and Disyatat (2019)

Failing to get FC under control (eg constrained by "gradualism") could lead to a low-rate trap

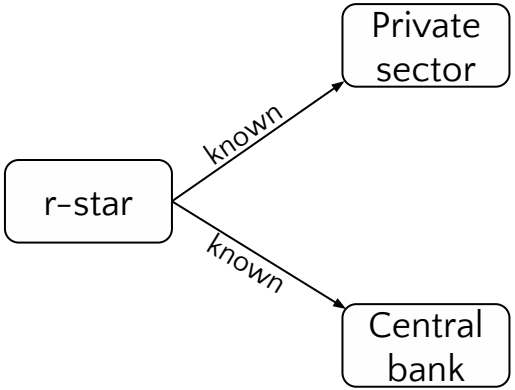


Source: Rungcharoenkitkul, Borio and Disyatat (2019)

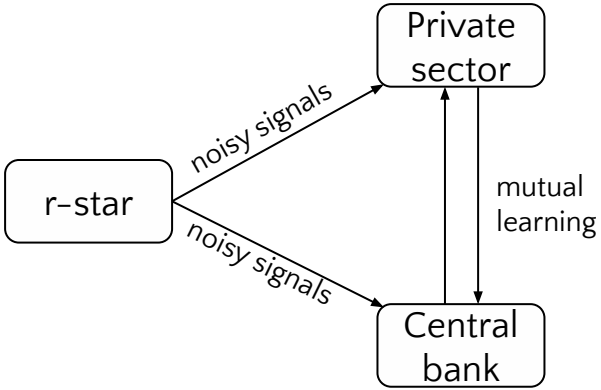
⇨ Low rate can beget low rate

Hall-of-mirrors effect

Standard NK model



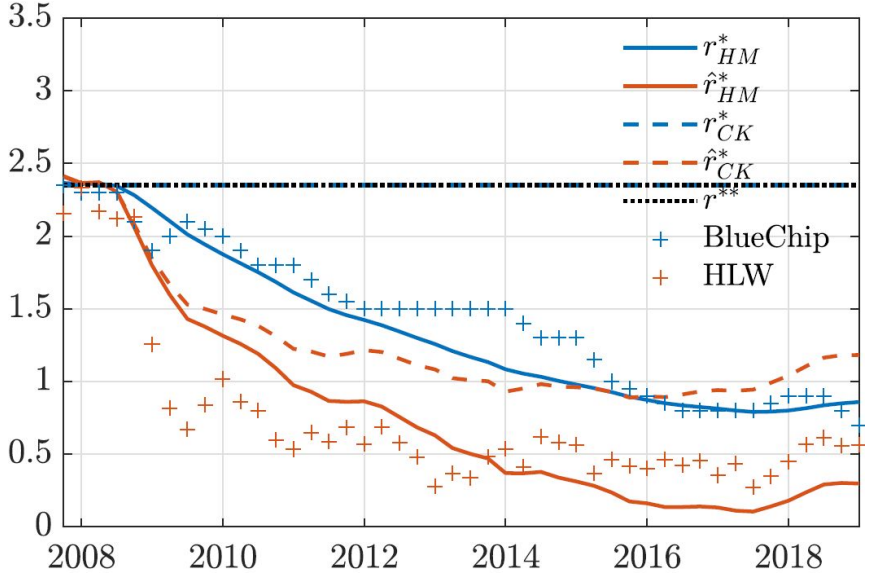
NK model with 2-sided learning about r-star

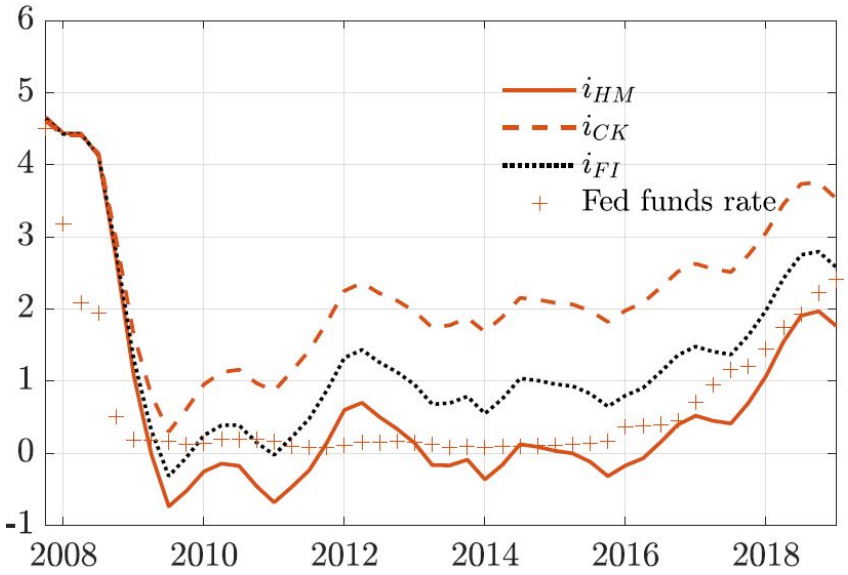


Key implications

- Private sector's *belief* of r-star is *the* relevant r-star for the economy
- This belief can deviate persistently from the "true" r-star, when each agent under-appreciates that the other is also learning from itself
- "Hall-of-mirrors': agents confuse the effects of own actions as r-star signals

The hall-of-mirrors effect can account for the post-GFC decline in the relevant r-star without appealing to fundamental shifts

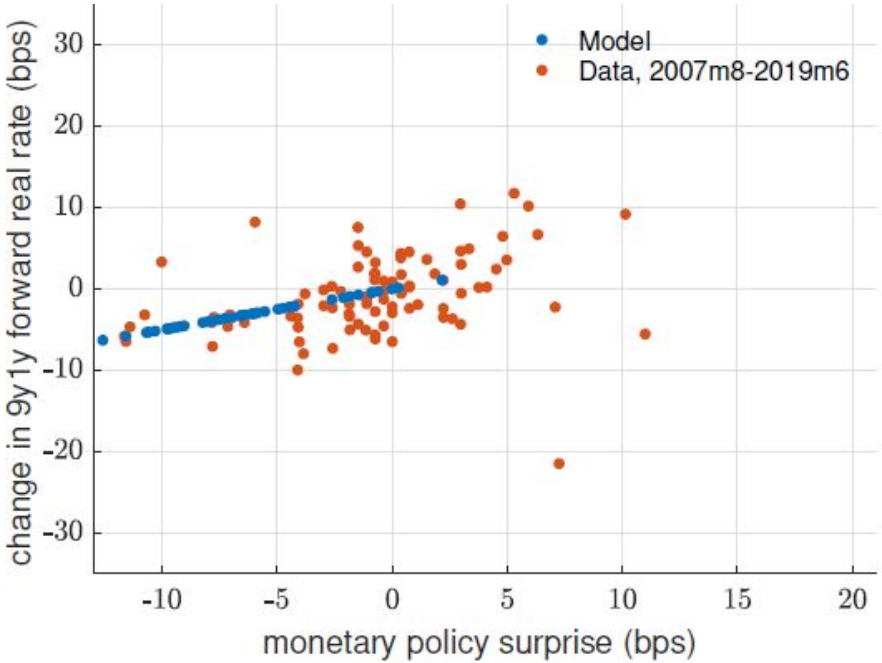


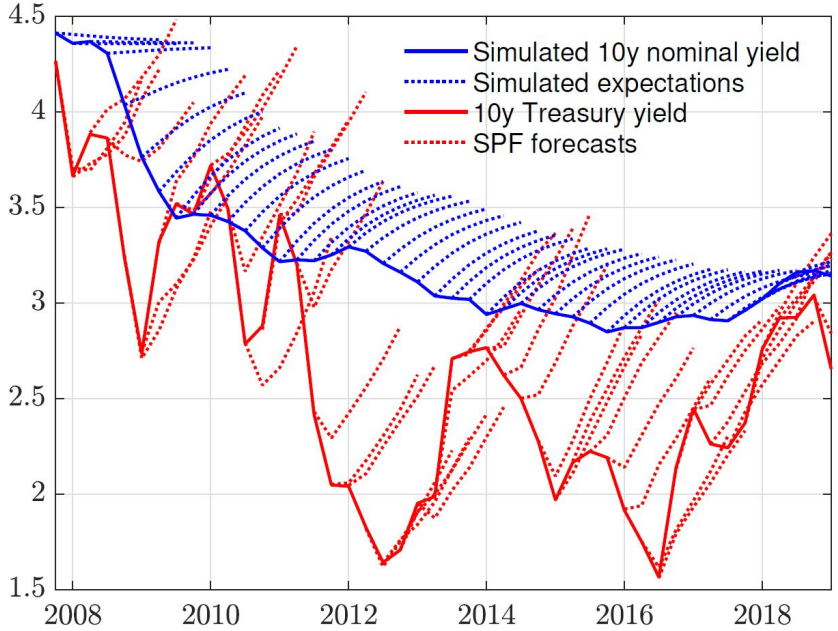


Source: Rungcharoenkitkul and Winkler (2021)

⇨ Aggressive monetary policy may have moved the goal post and made it harder to stimulate economy

The model explains excess sensitivity of long rates to monetary policy





Source: Rungcharoenkitkul and Winkler (2021)

Related works

Financial cycle and r-star

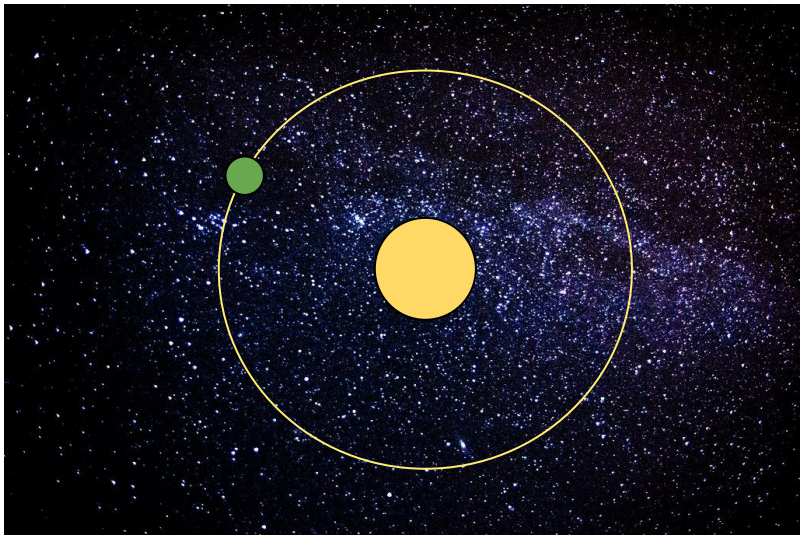
- Juselius, Borio, Disyatat and Drehmann (2017)
  - Taking the financial cycle into a/c implies higher (finance-neutral) r-star
- Mian, Straub and Sufi (2021)
  - Large debt ⇒ weakens aggregate demand ⇒ lower r-star

Supply-side effects of monetary policy

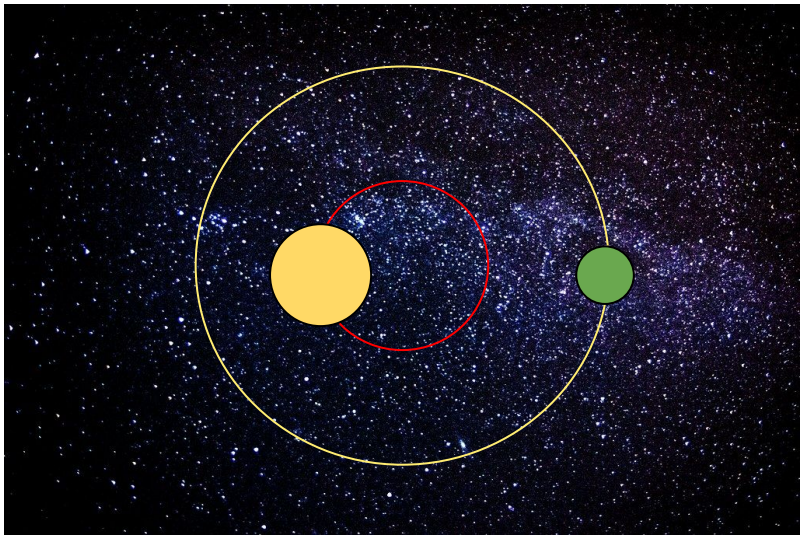
- Banerjee and Hofmann (2018)
  - The rise of zombie firms preceded by low rates
- Borio, Kharroubi, Upper and Zampolli (2022)
  - Credit booms ⇒ labour misallocations ⇒ lower productivity
- Garga and Singh (2021):
  - Hysteresis effects of monetary policy ⇒ run the economy hot
- Tobin (1964):
  - Money substitutes for capital as a store of value ⇒ real long-run effects

R-star's role in monetary policy

Possibly less Copernican



and more Newtonian



Some thoughts on policy implications

The dilemma

- As a concept, r-star appears fundamental to monetary policy
  - To steer policy, one needs to have some idea of where "neutral" is
  - Knowing what policy is doing today is important for planning ahead…
  - …and for communicating with the public

- But large uncertainty makes it hard to operationalise the concept
  - Point estimates give a misleading sense of precision
  - Accounting for the full range of uncertainty leaves little useful signals
  - Communicating too much about r-star may put central bank credibility on the line…
  - …or, worse, may inadvertently condition public expectations

Approaches of dealing with r-star uncertainty (and their limits)

- Use model averaging
  - Known to work well in many context in mitigating model uncertainty
  - But less helpful if all models suffer from same weakness (eg MP endogeneity)
  - Also large statistical uncertainty likely remains
- Infer policy stance "by its work" rather than through r-star
  - Adapt as needed to meet policy objectives (e.g. if inflation is too high, policy is too loose); An example is the 1st-diff rule
  - But may add short-term volatility, as policy is reactive rather than proactive
  - Policy reaction function fuzzier
- Follow a risk management approach
  - Choose policy that is robust to the risk of getting r-star wrong (as any other risks)
  - But, with unobserved r-star, difficult to assess the errors even in hindsight

What could be done more

- Broaden the concept of the "equilibrium interest rate" to consider:
  - Intertemporal tradeoffs, e.g. financial stability considerations
  - Open-economy dimensions
  - Wider policy configurations e.g. medium-term fiscal and balance sheet policies
  - Room for manoeuvre for monetary policy
  - Any factors important to keep the economy in a good place sustainably
- Communicate r-star with care
  - Discuss estimates and hypotheses, but with a healthy dose of caution
  - Leave room for revising views as facts change - estimates are inputs, not opinions
  - Beware of the hall-of-mirrors effects and the power of narratives

Concluding thoughts

- R-star deja vu: History offers lessons in humility
- Many questions remain about r-star, not just where it is going, but also the underlying concept itself
- More blue-sky research would be helpful
- In the meantime, policymakers must exercise healthy caution, and keep the big picture in mind