Monetary policy announcements and sacrifice ratios

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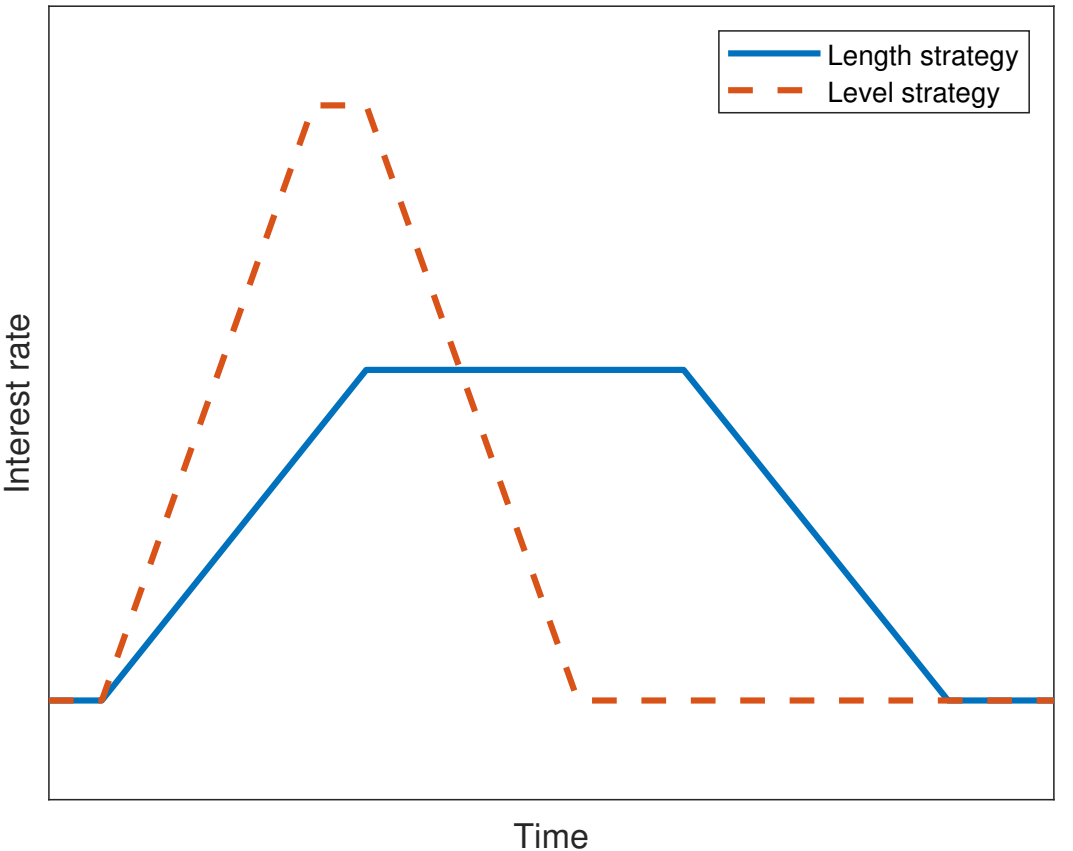
Background

- Recent monetary policy hiking cycle to curb inflation.
- Key question for central banks: How to lower inflation while minimizing costs to the real economy?
- The sacrifice ratio is a useful summary statistic, when trying to answer this question.
- Sacrifice ratio $= \dfrac{\text{cumulative change in output}}{\text{cumulative change in inflation}}$

Comparing monetary policy strategies

- Level strategy, also known as 'cold turkey': high peak rate, but short hiking cycle.
- Length strategy, also known as gradualism: lower peak rate, but longer duration.
- In this paper we suggest that length strategies give rise to lower sacrifice ratios.
  - theory results
  - some empirical evidence
- Central bank communication is important. $=>$ Monetary policy announcements and sacrifice ratios.

Level strategy and length strategy



"While higher interest rates. . . will bring down inflation, they will also bring some pain to households and businesses. These are the unfortunate costs of reducing inflation." - *Jerome Powell (Jackson Hole, Aug. 26, 2022)*

"Setting the right 'level' and 'length' will be critical for our monetary policy as we continue our tightening cycle." - *Christine Lagarde (Sintra, Jun. 27, 2023)*

Methodological issues

- In a wide class of linearized macro models, policy affects private-sector behavior only through the current and future expected path of the policy instrument.
  - For monetary policy, the private sector only cares about the expected future path of the nominal rate...
  - ... and not whether this path is the result of the systematic component of policy—that is, the policy rule—or due to shocks to a given rule.
- Impulse responses to policy news shocks are sufficient to construct policy rule counterfactuals that are robust to the Lucas critique.
- Laséen and Svensson (2011), McKay and Wolf (2023), Barnichon and Mesters (2023)

Comparing monetary policy strategies: Our approach

- A monetary policy strategy can be decomposed into the contributions of news shocks at different horizons $H = 0, 1, 2, ...\infty$
- A level strategy assigns higher weights to short horizons H.
- A length strategy assigns higher weights to longer horizons H.
- **We can focus on sacrifice ratios associated to news shocks at different horizons** H.

Road map

1. Analytical results from the canonical New Keynesian model, with and without cognitive discounting.
2. Simulation results from a model with additional real and nominal rigidities.
3. Some empirical evidence.

New Keynesian Model

- IS curve

$$y_t = \mathbb{E}_t[y_{t+1}] - \sigma(i_t - \mathbb{E}_t[\pi_{t+1}])$$

- New Keynesian Phillips curve

$$\pi_t = \beta \mathbb{E}_t[\pi_{t+1}] + \kappa y_t$$

- ... features the forward guidance puzzle.

New Keynesian Model

- IS curve

$$y_t = M_h \mathbb{E}_t[y_{t+1}] - \sigma(i_t - \hat{M}_h \mathbb{E}_t[\pi_{t+1}])$$

- New Keynesian Phillips curve

$$\pi_t = M_f \beta \mathbb{E}_t[\pi_{t+1}] + \kappa y_t$$

- where $M_h, \hat{M}_h, M_f \in (0, 1)$
- Resolving the FG puzzle:
  - cognitive discounting (Gabaix 2020)
  - finite planning horizons (Woodford 2019)
  - lack of common knowledge about future economic conditions (Angeletos and Lian 2018)
  - heterogeneous agent structure with procyclical inequality (Bilbiie 2025)
  - imperfectly credible policy announcements

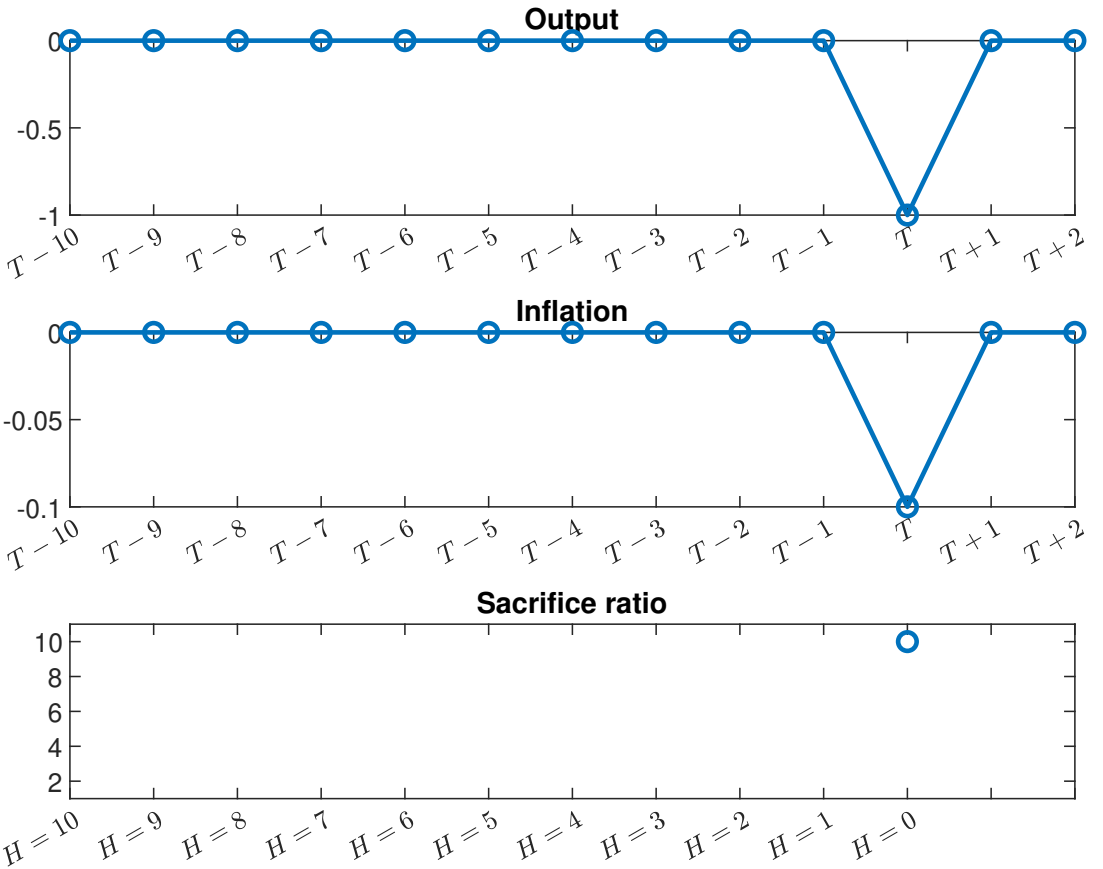
Monetary policy announcements and sacrifice ratios

- News shock, with horizon H
- Assume that a monetary policy shock (monetary tightening) is implemented in period T
- ... but announced in period $T - H$, where $H = 0, 1, 2, ..., \infty$

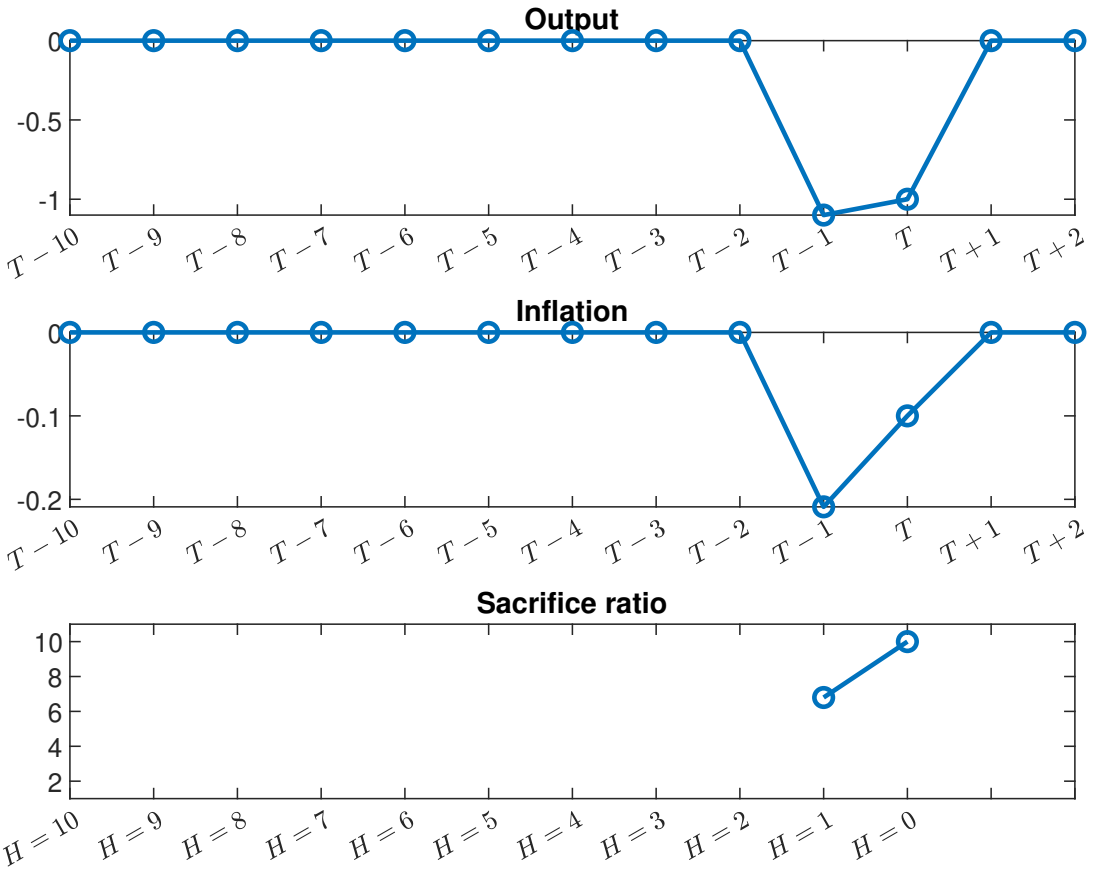
- Sacrifice ratio $= \dfrac{\text{cumulative impulse response of output}}{\text{cumulative impulse response of inflation}}$

- We compute sacrifice ratios for news shocks with different horizons H.

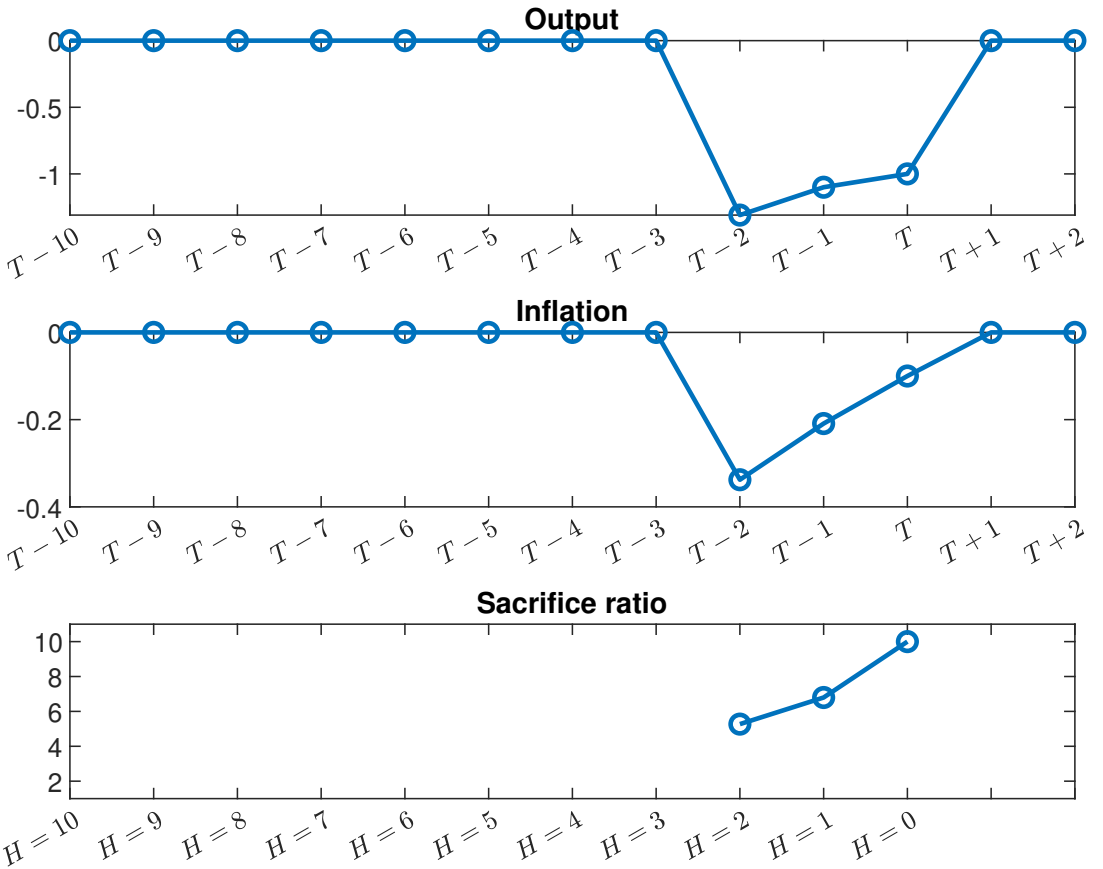
Canonical New Keynesian Model, $H = 0$



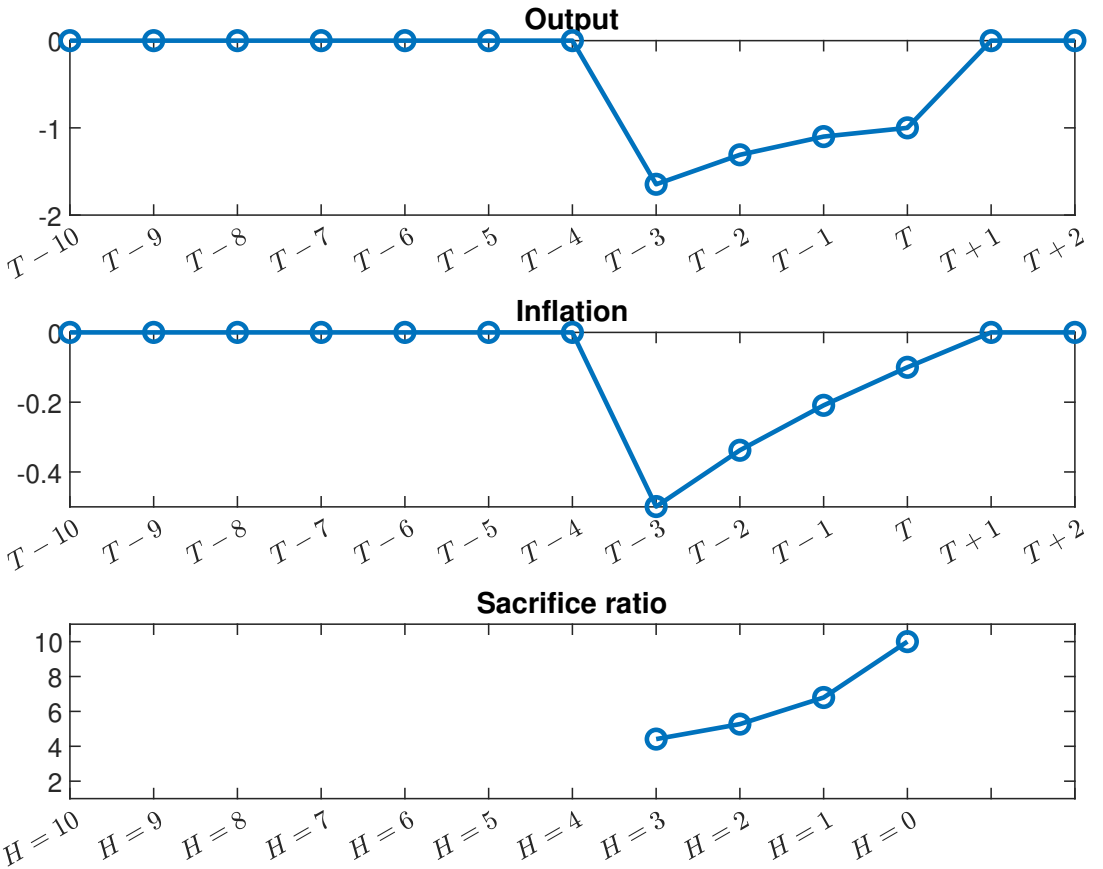
Canonical New Keynesian Model, $H = 1$



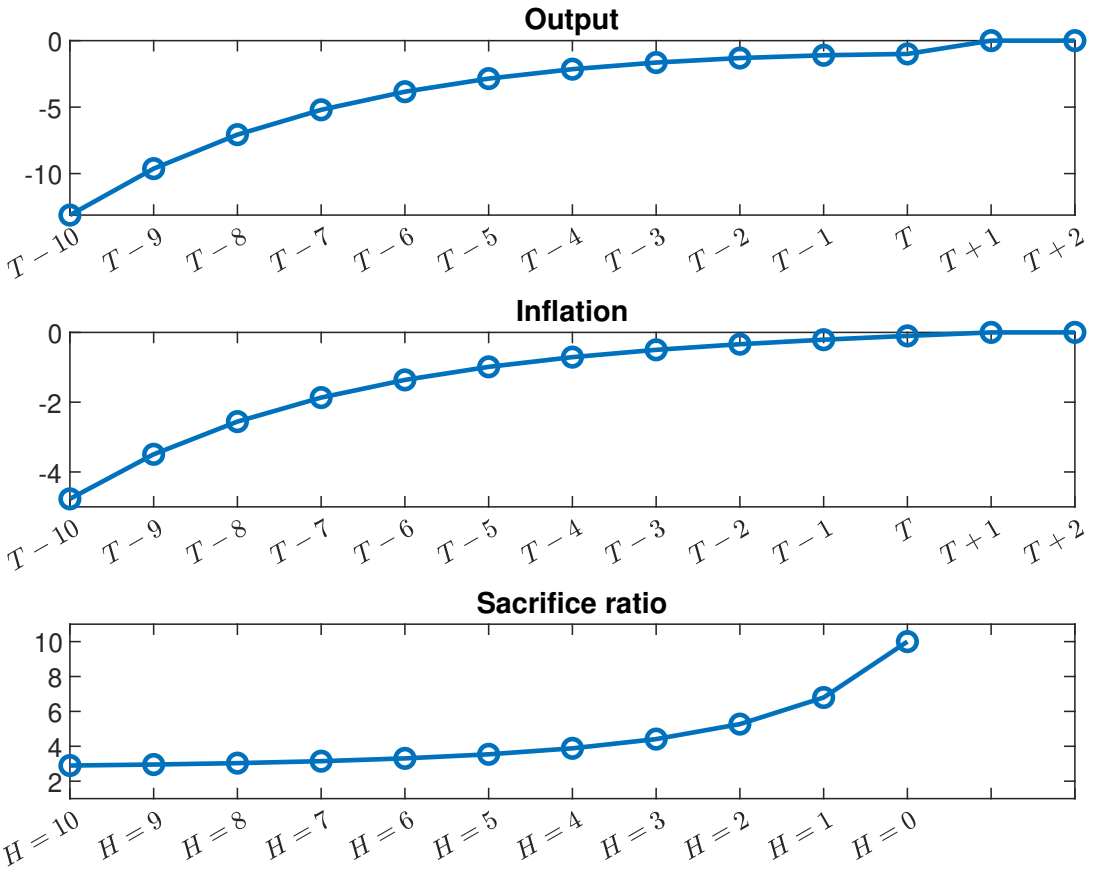
Canonical New Keynesian Model, $H = 2$



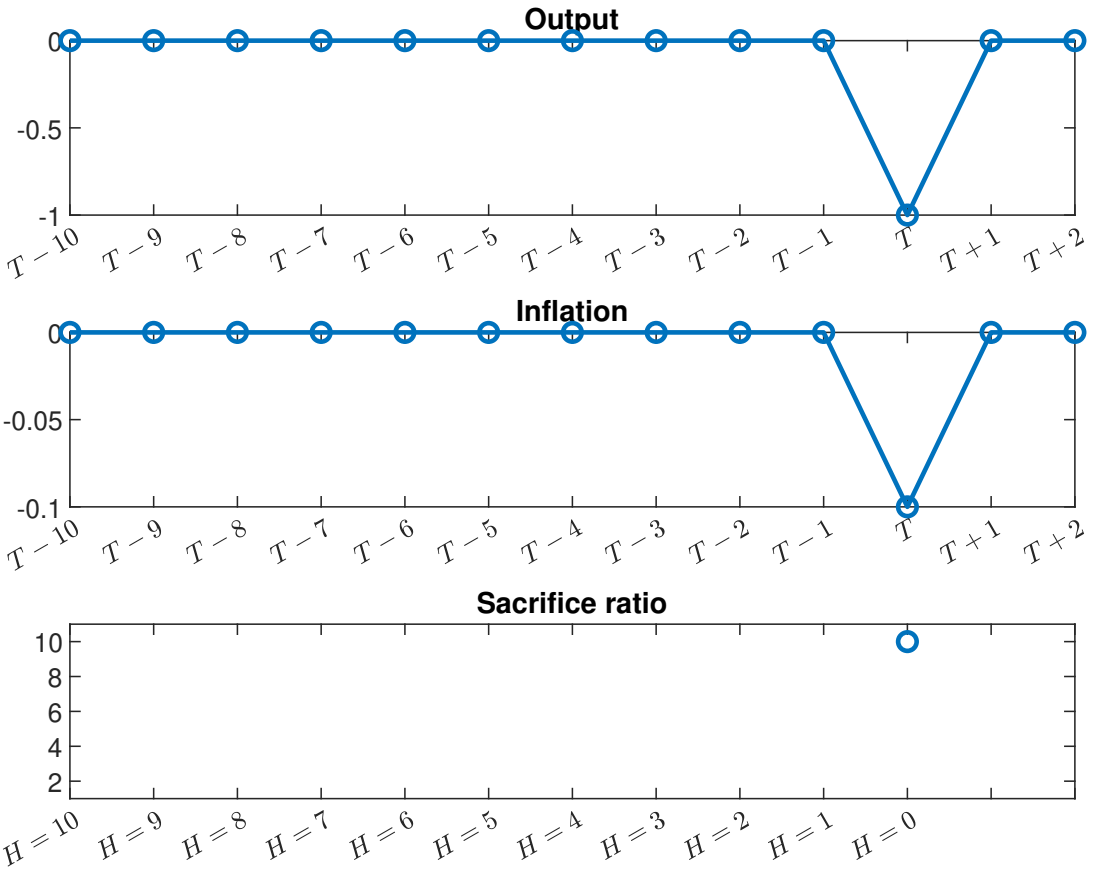
Canonical New Keynesian Model, $H = 3$



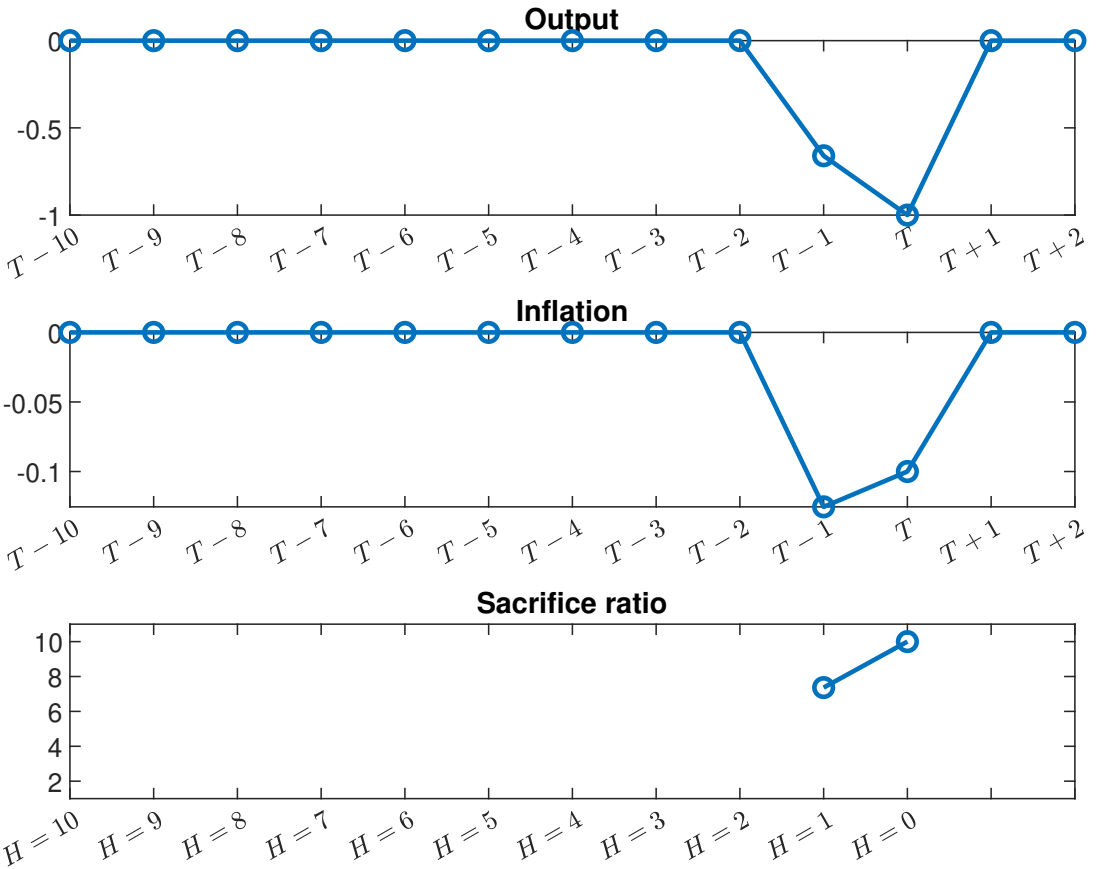
Canonical New Keynesian Model, $H = 10$



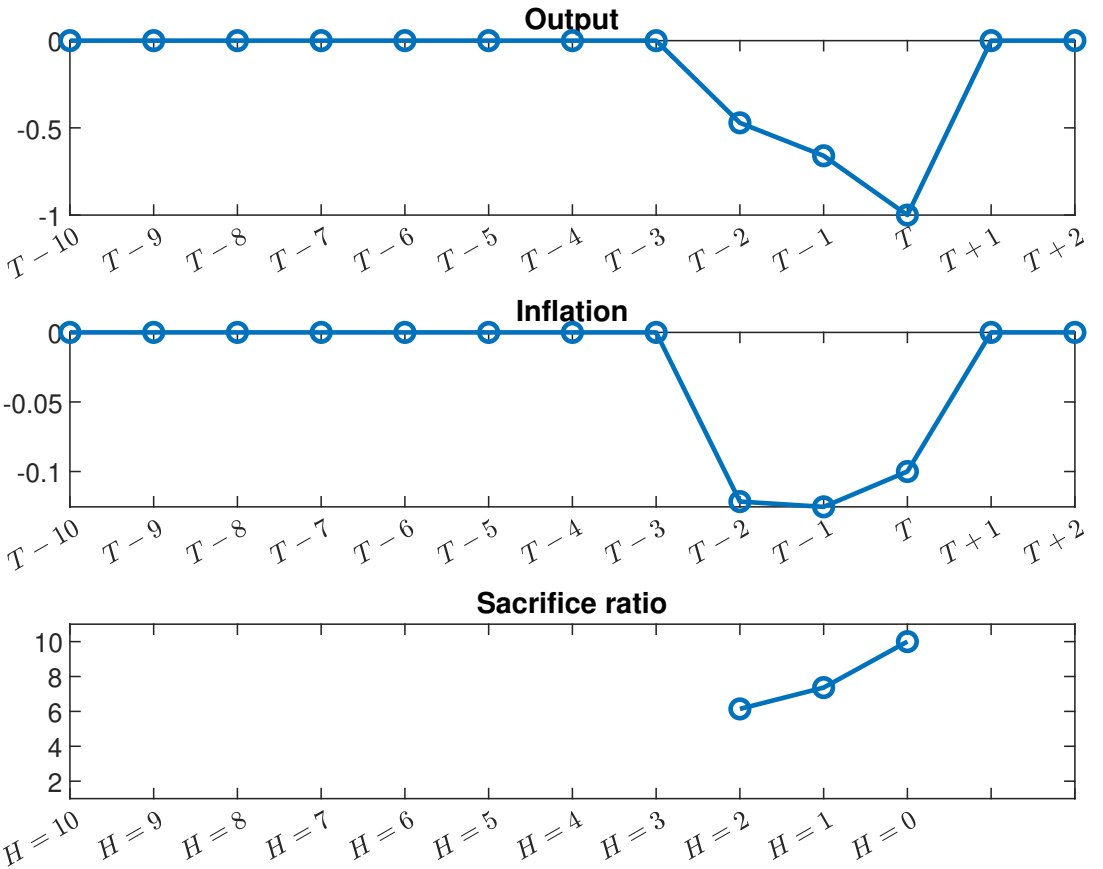
NK Model with Cognitive Discounting, $H = 0$



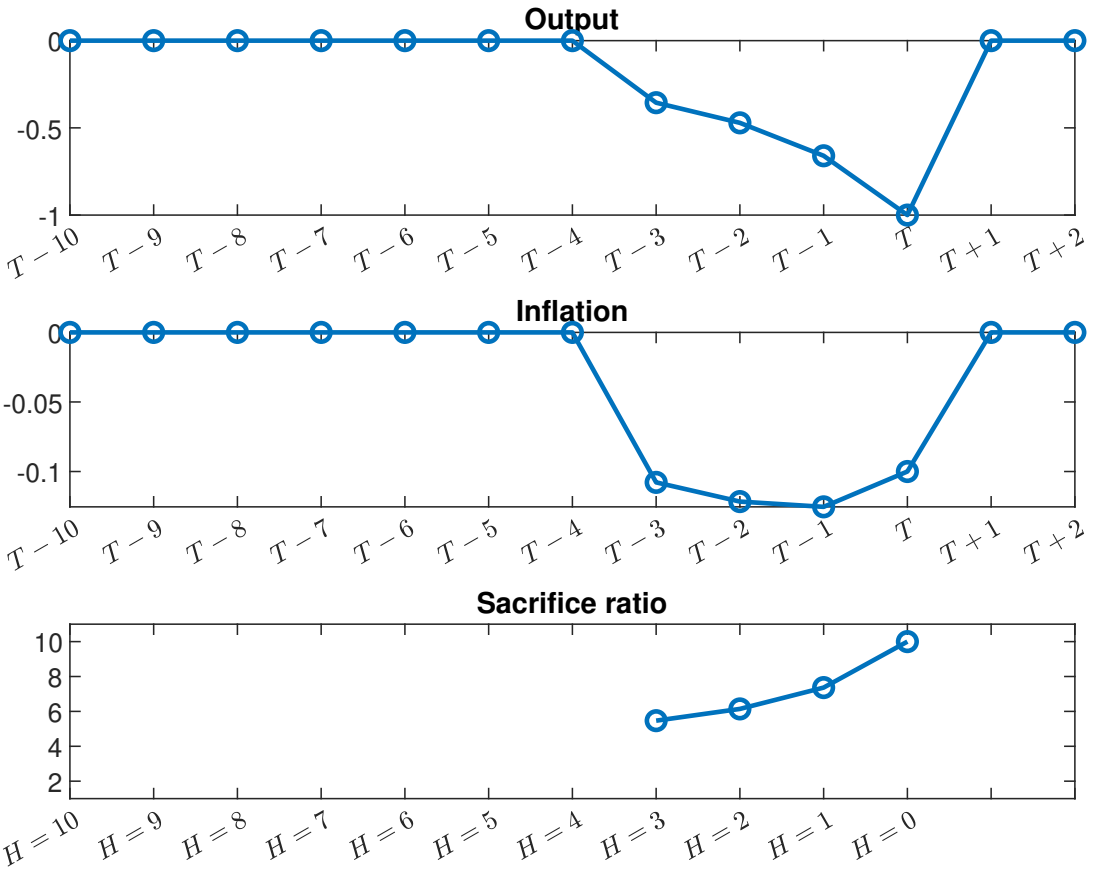
NK Model with Cognitive Discounting, $H = 1$



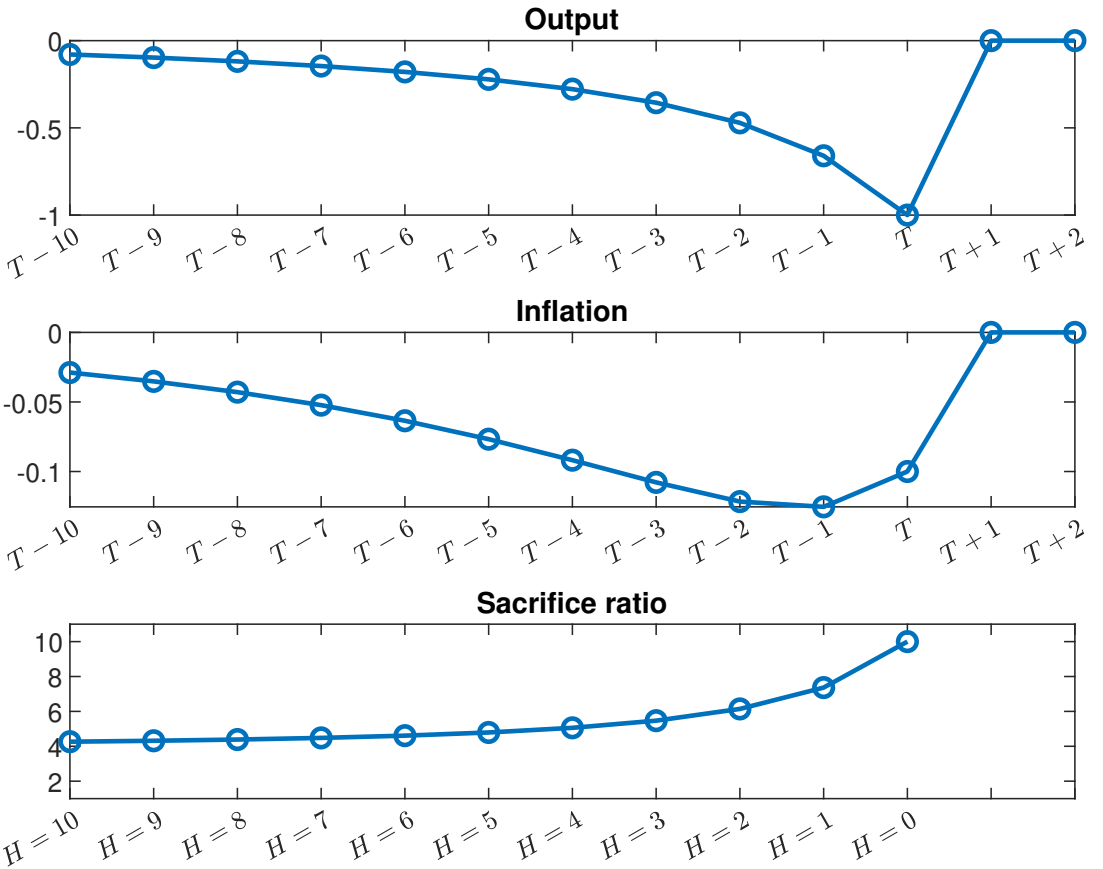
NK Model with Cognitive Discounting, $H = 2$

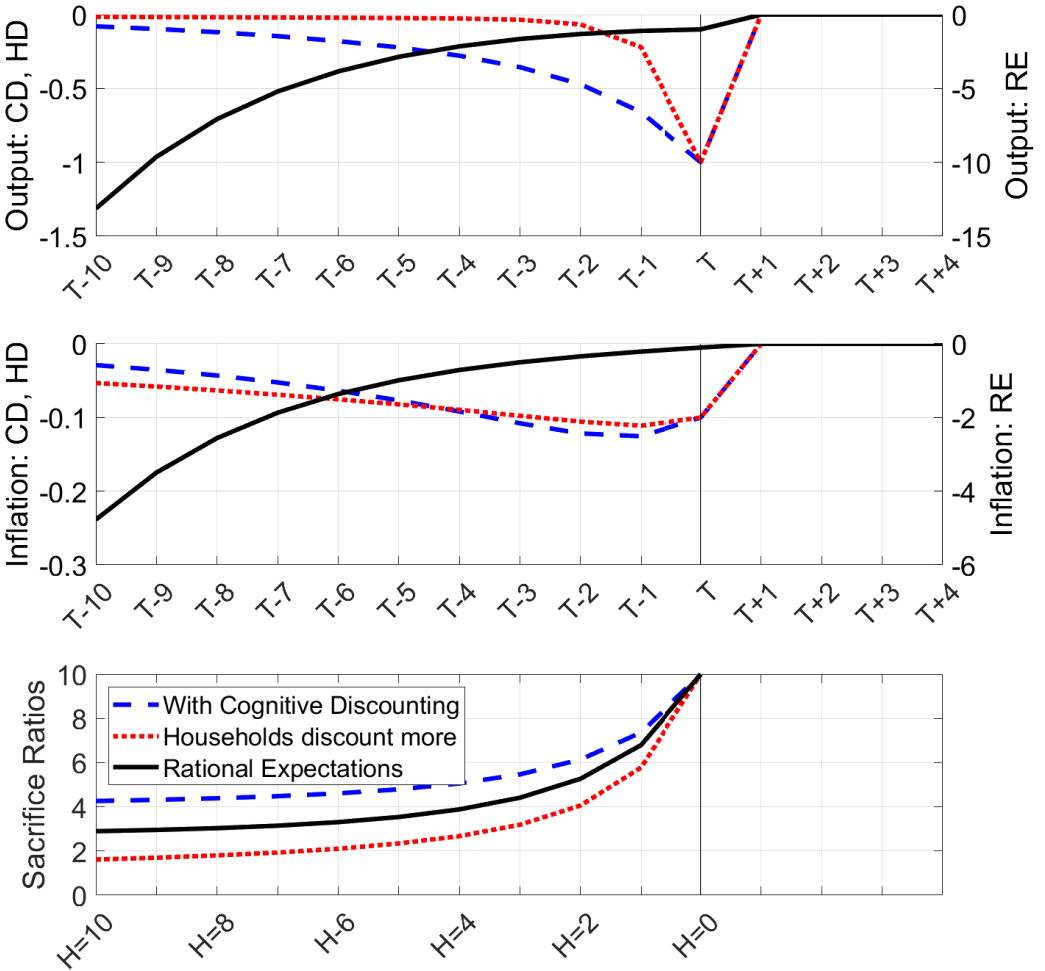


NK Model with Cognitive Discounting, $H = 3$



NK Model with Cognitive Discounting, $H = 10$




Output: CD, HD
Output: RE
0
-0.5
-1
-1.5
-5
-10
-15
T-10
T-9
T-8
T-7
T-6
T-5
T-4
T-3
T-2
T-1
T
T+1
T+2
T+3
T+4
Inflation: CD, HD
Inflation: RE
-0.1
-0.2
-0.3
-2
-4
-6
Sacrifice Ratios
10
8
6
4
2
With Cognitive Discounting
Households discount more
Rational Expectations
H=10
H=8
H-6
H=4
H=2
H=0

Why is the sacrifice ratio falling in H?
Inflation is more forward-looking than output

- Express current inflation π_t and output y_t in terms of
  - current monetary policy i_t
  - ... and future inflation $\mathbb{E}_t[\pi_{t+1}]$ and output $\mathbb{E}_t[y_{t+1}]$...
  - ... which depend on future monetary policies $\{i_{t+h}\}_{h=1}^{\infty}$

$$y_t = \sigma \left\{ \frac{M_h}{\sigma} \mathbb{E}_t[y_{t+1}] + \hat{M}_h \mathbb{E}_t[\pi_{t+1}] - i_t \right\} \tag{1}$$

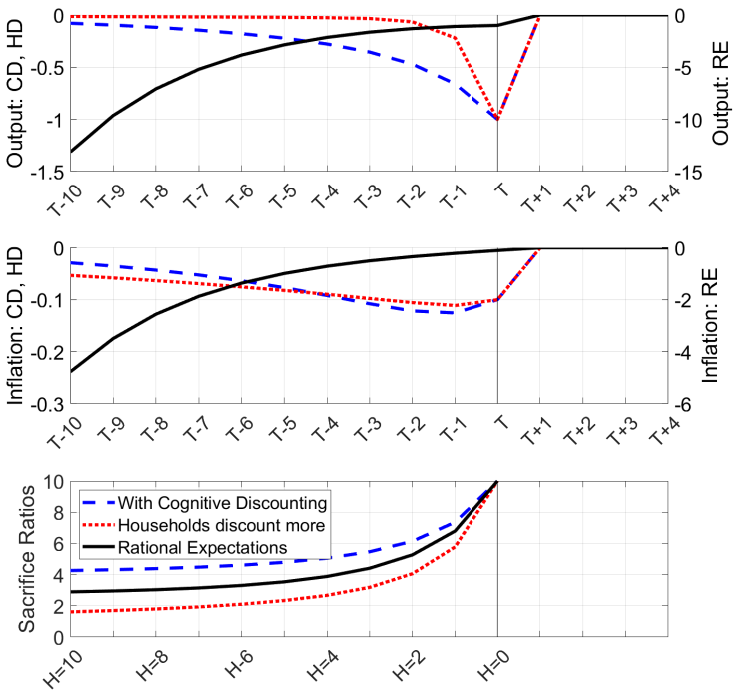
$$\pi_t = \kappa\sigma \left\{ \frac{M_h}{\sigma} \mathbb{E}_t[y_{t+1}] + \left(\hat{M}_h + \frac{M_f \beta}{\kappa\sigma} \right) \mathbb{E}_t[\pi_{t+1}] - i_t \right\} \tag{2}$$

- The relative weight assigned to the future is higher in eq. (2).

Why is inflation more forward-looking than output?

- IS curve: Output is forward-looking since households care about their expected future consumption and the real interest rate.
- NKPC: Inflation depends on current demand y_t, which is forward-looking, due to the IS curve.
- NKPC: But firms also care about their future profits in their pricing decisions since prices are sticky
- $=>$ additional source of forward-lookingness, which is captured by the term $M_f \beta \mathbb{E}_t[\pi_{t+1}]$

Analytical results

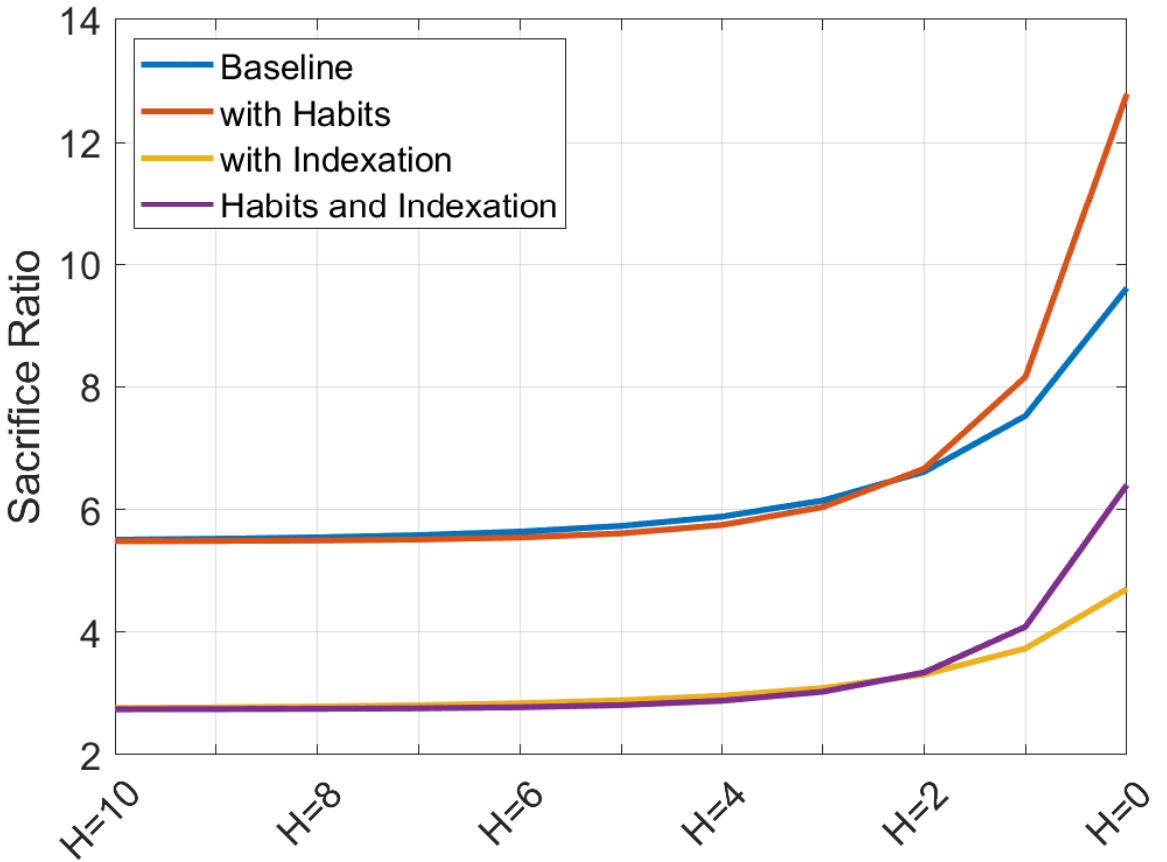


1. The sacrifice ratio is decreasing in H.
2. The benefits are concentrated at short horizons.
   - More than $1/3$ of the maximum reduction in sacrifice ratios is achieved by shifting H from 0 to 1
   - and more than $1/2$ of the reduction is achieved when moving to $H = 2$.
3. Cognitive discounting attenuates the rate at which the sacrifice ratio falls.
4. However, the opposite is true when households' expectations feature stronger cognitive discounting relative to firms.

Model with additional rigidities

- Model by Afsar et al. (2024)
- Additional real rigidity: habit persistence
- Additional nominal rigidity: price indexation
- These additional rigidities introduce backward-looking elements.
- Cognitive discounting $=>$ no forward guidance puzzle.

Sacrifice ratios with additional rigidities



Estimating the sacrifice ratio: Estimation strategy 1

1. Estimate the (cumulative) impulse responses of inflation and output (growth) to monetary policy shocks.
   - i standard monetary policy shock (unanticipated)
   - ii forward guidance shock (anticipated)
   - ▶ local projections, proxy VAR
2. Divide the cumulative impulse response of output (growth) by the cumulative impulse response of inflation.

Results using estimation strategy 1

	MoPo shock		FG shock	
Median SR over 12 months	5.40		1.29	
68% Interval	2.42	14.22	-1.89	4.21
90% Interval	-30.55	40.53	-10.33	11.48
Median SR over 24 months	5.54		1.20	
68% Interval	3.77	10.03	-1.77	4.09
90% Interval	2.99	19.14	-10.34	12.13
Median SR over 36 months	4.73		0.77	
68% Interval	3.45	7.12	-2.02	3.34
90% Interval	2.93	10.51	-9.67	9.57

- Sample: US 1991-2019. Inflation measure: CPI. Output measure: Industrial production.
- Shocks from Jarocinski (2024)
- Our theory results suggest that sacrifice ratios associated to FG shocks should be lower than sacrifice ratios associated to standard MoPo shocks.

Estimating the sacrifice ratio: Estimation strategy 2

- Based on Ramey and Zubairy (2018); Stock and Watson (2018).
- The sacrifice ratio can be estimated in a single step.
- Regress cumulative output (growth) on cumulative inflation, using monetary policy surprises as instruments.
  - i surprises in short rates
  - ii surprises in long rates

Estimating the sacrifice ratio: Estimation strategy 2

- IV estimation

$$\sum_{j=0}^{J} y_{t+j} = \alpha + \delta \sum_{j=0}^{J} \pi_{t+j} + u_t \tag{3}$$

-

IV estimate of δ

$$= \frac{\text{variation of output explained by monetary policy surprises}}{\text{variation of inflation explained by monetary policy surprises}}$$

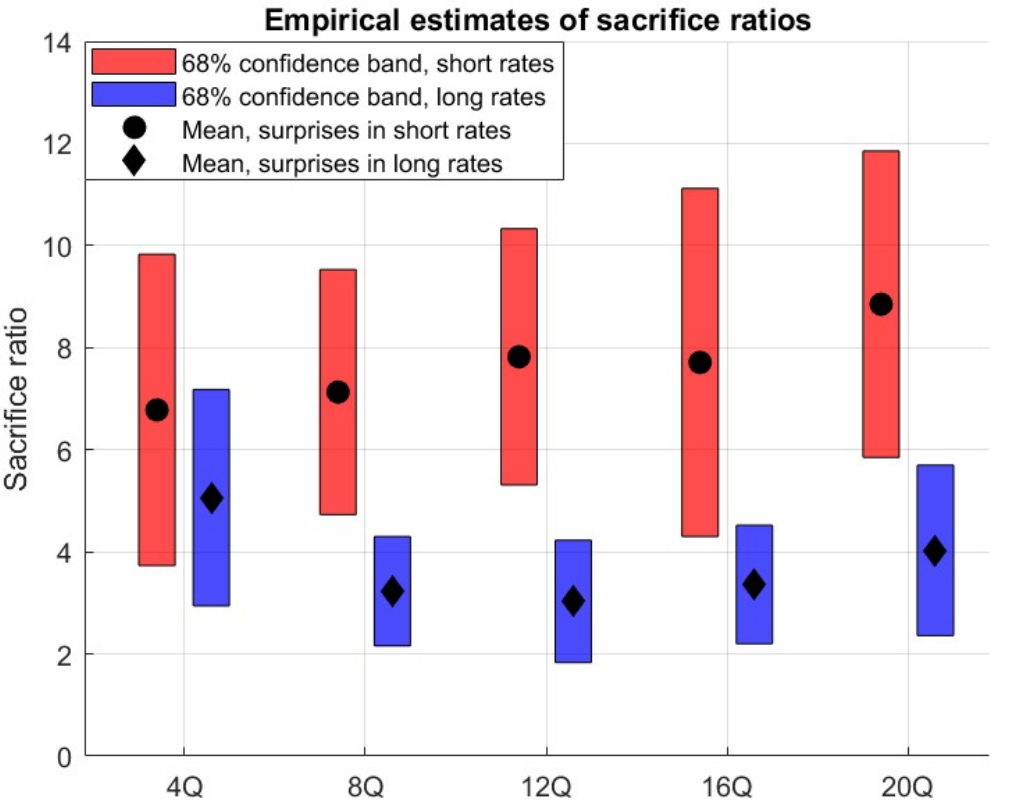
$$= \text{sacrifice ratio}$$

Results using estimation strategy 2

	Instruments	
	Surprises in short rates	Surprises in long rates
SR over 4Q	6.78** (3.05)	5.06** (2.12)
SR over 8Q	7.13*** (2.40)	3.23*** (1.07)
SR over 12Q	7.82*** (2.51)	3.03** (1.20)
SR over 16Q	7.71** (3.41)	3.36*** (1.16)
SR over 20Q	8.85*** (3.00)	4.03** (1.67)

- Sample: US, 1991-2024. Inflation measure: CPI excluding food and energy. Output measure: GDP growth.
- Monetary policy surprises from Bauer and Swanson (2023).
- Our theory results suggest that estimates of sacrifice ratios using surprises in long rates as instruments should be lower than estimates using surprises in short rates as instruments.

Empirical estimates of sacrifice ratios (Strategy 2)



Note: The x-axis denotes the period over which the sacrifice ratio is computed (J in equation (3)).

Results with restrictive (positive) monetary policy surprises as instruments (Strategy 2)

	Instruments	
	Positive surprises in short rates	Positive surprises in long rates
SR over 4Q	6.30 (3.92)	1.92 (1.94)
SR over 8Q	7.43*** (2.48)	2.29 (1.93)
SR over 12Q	7.10*** (2.99)	3.36** (1.46)
SR over 16Q	7.20*** (1.86)	4.63*** (1.50)
SR over 20Q	8.27*** (1.44)	6.48*** (1.28)

- Our paper is about monetary policy strategies that lower inflation with a minimum impact on the real economy.
- Hence, one could argue that sacrifice ratios associated with **restrictive monetary policy shocks** should be of essence.
- Our theory results suggest that estimates of sacrifice ratios using surprises in long rates as instruments should be lower than estimates using surprises in short rates as instruments.

Conclusions

- We show that sacrifice ratios fall as an announced monetary policy action is implemented further out into the future.
  - Theory results from a class on New Keynesian models
  - Some empirical evidence
- Our results suggest that the benefits in terms of lower sacrifice ratios are concentrated in short announcement horizons.
- Near-term signaling (i.e. making announcements about the most likely course of monetary policy in the near future) could be a viable strategy, improving the inflation-output trade-off, while retaining the flexibility to react to new information.