Discretion Rather than Rules: Equilibrium Determinacy and Forward Guidance with Inconsistent Optimal Plans

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Introduction

- Environment
- Motivation
- Modification
- Results

Introduction

- Environment:
  - Standard NK model with a one-time cost-push "shock."
  - No ZLB.
  - Policy set by Ramsey planning.
  - Price-level targeting is the full-commitment optimal response to cost-push shocks.
- Motivation
- Modification
- Results

Introduction

- Environment
- Motivation:
  - We seek *credible* optimal monetary policy calculations which can inform *forward guidance*.
  - Ramsey plans *do not* implement the Tinbergen-Theil policy program using only interest rates (Campbell & Weber, 2018).
    - "Active" interest-rate rules (King, 2000; Cochrane, 2011)
    - Fixed terms in office (Campbell & Weber, 2018)
  - Monetary policy committees adjust policy slowly, so their forward guidance embodies some commitment (Blinder, 1998).
- Modification
- Results

Introduction

- Environment
- Motivation
- Modification:
  - Central bankers face a constant hazard of replacement (Schaumberg and Tambalotti, 2007).
  - All CBs minimize the usual quadratic loss function of output gap and inflation.
  - Each CB chooses a sequence of *interest rates* at the start of her tenure.
  - Central bankers' tenures stochastically end a la Calvo.
- Results

Introduction

- Environment
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- Modification
- Results:
  - With short average CB tenures, there exists exactly one Symmetric Markov Perfect Equilibrium.
  - Virtually by assumption, there is no forward guidance puzzle.
  - *Equilibrium policy promises price level targeting but fails to deliver it.*
  - *Observationally, equilibrium policy resembles inflation targeting.*

The NK Model with Quasi-Commitment

- Phillips Curve

$$\pi_t = \kappa y_t + \beta \mathbb{E}\left[\pi_{t+1}\right] + m_t \tag{1}$$

  $m_0 \neq 0$ and $m_t = 0$ for all $t > 0$.

- IS Curve

$$y_t = -\frac{1}{\sigma}(i_t - \mathbb{E}\left[\pi_{t+1}\right] - i^\natural) + \mathbb{E}\left[y_{t+1}\right]. \tag{2}$$

- Social Welfare Function

$$\mathbb{E}\left[\sum_{t=0}^{\infty} \beta^t \left(\frac{1}{2}\pi_t^2 + \frac{\lambda}{2} y_t^2\right)\right].$$

- Upper and lower bounds for the output gap, $y_t \in (\hat{y}, \check{y})$.
- Probability of Central Banker Replacement: α.
- New central bankers discard their predecessors' promises.

Monetary Policy with Quasi-commitment

- Notation:
  - CB who takes office in period t is named t.
  - i^t_{t+j} interest rate chosen by CB t for period $t+j$.
  - (π^t_{t+j}, y^t_{t+j}), inflation and output in $t+j$ given CB t is in office.
- Assume $\pi^t_{t+j} = y^t_{t+j} = 0$ for all $t \geq 1$. (Proven later.)
- Initial central banker's objective:

$$\sum_{t=0}^{\infty} \left(\beta\left(1-\alpha\right)\right)^t \left(\frac{1}{2}\left(\pi^0_t\right)^2 + \frac{\lambda}{2}\left(y^0_t\right)^2\right)$$

- Initial central banker's constraints:

$$\pi^0_j = \kappa y^0_j + \beta(1-\alpha)\pi^0_{j+1} + m_j, \tag{3}$$

$$y^0_j = -\frac{1}{\sigma}(i^0_j - (1-\alpha)\pi^0_{j+1} - i^\natural) + (1-\alpha)y^0_{j+1}. \tag{4}$$

- Ramsey Computation
- Private-Sector Equilibrium

Implementation of Initial CB's Choices

- Given any interest rate sequence $i_0, i_1, \ldots$, characterize the bounded equilibrium solutions.
- If $\alpha > \alpha^\star \in (0,1)$, then there exists exactly one bounded solution.
- If

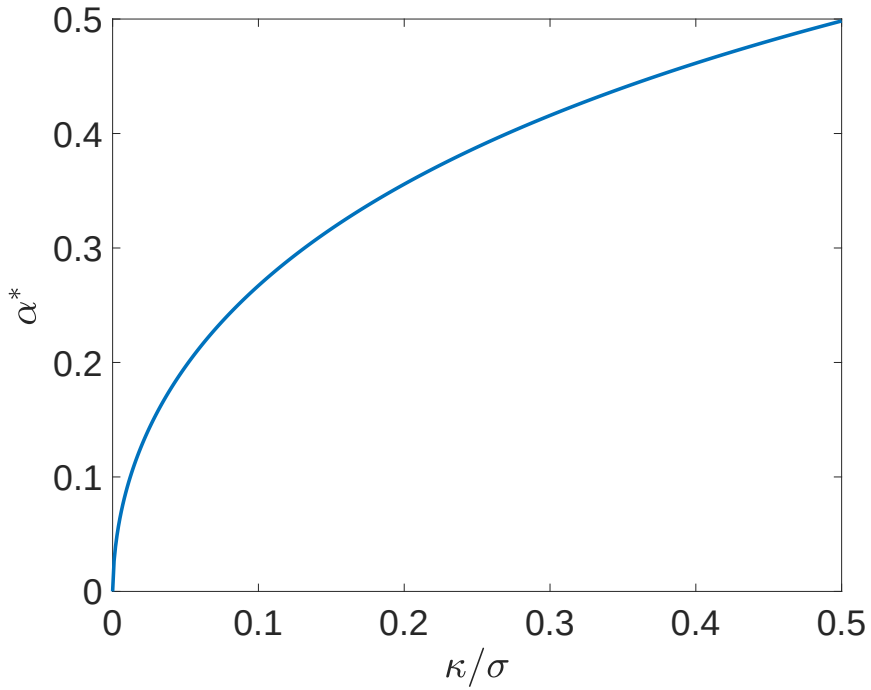
$$|-\frac{\kappa}{\sigma}(i_j^0 - i^\natural) + m_j| < \max\{-\hat{y}, \check{y}\}\frac{\kappa(1-\psi^{-1})(1-\varphi^{-1})}{1-\beta(1-\alpha)} \quad (5)$$

  then this solution satisfies the bounds on y_t.
- In this solution y_t and π_t depend only on the *remaining* interest rates in the given sequence. (Not true of solutions with $\alpha < \alpha^\star$.)

Proposition

If $\alpha > \alpha^\star$ and (5) holds,then the only outcome consistent with the initial CB's interest rate choices i_t^0 and the constraints in (3) and (4) are the initial CB's choices of π_t^0 and y_t^0.

Quantifying $\alpha^\star$ (Parameter Recycling with $\beta = 0.99$)

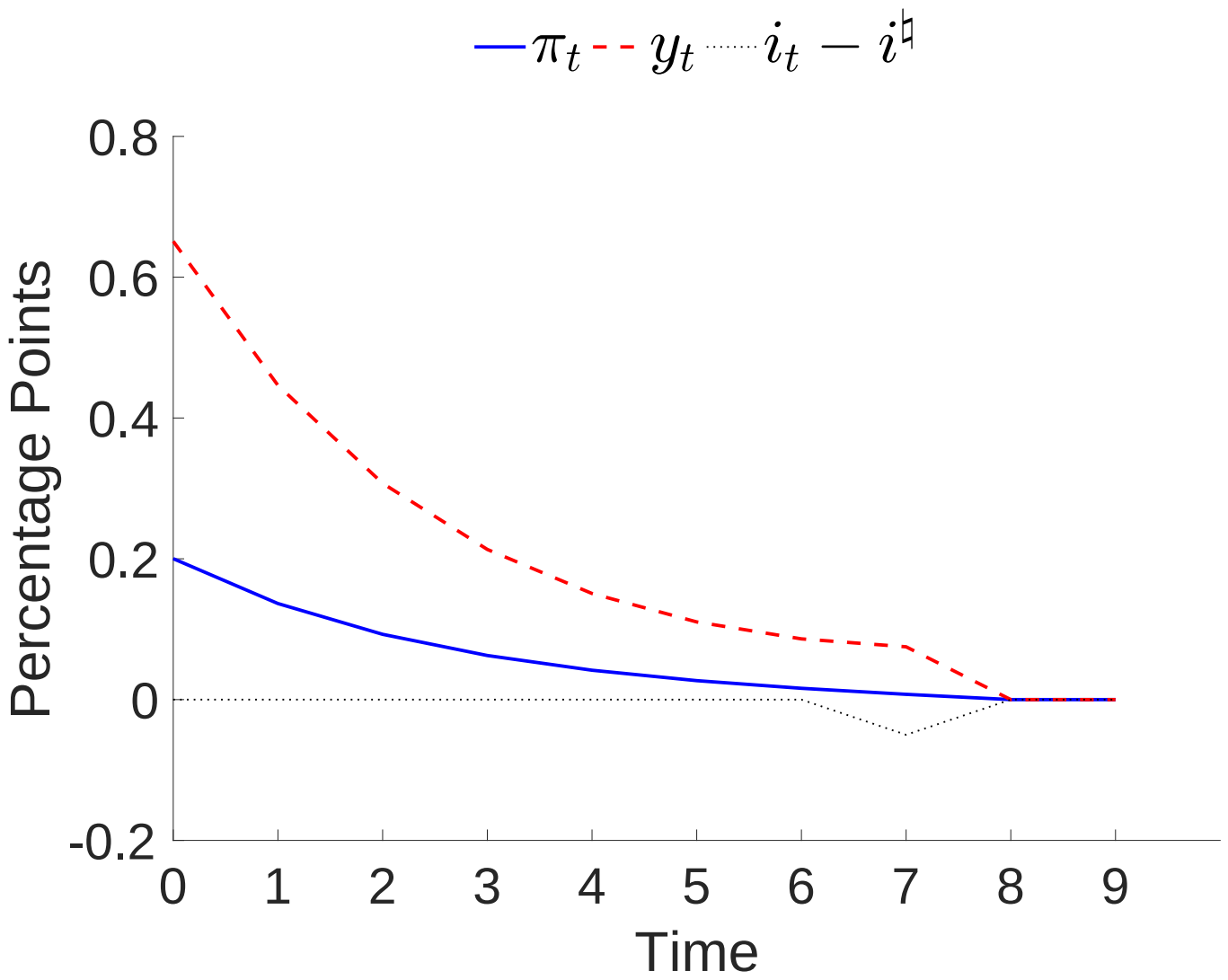


- Schaumberg and Tambalotti (2007): $\kappa = 0.1$ and $\sigma = 2/3$ so $\alpha^\star \approx 0.32$.
- Galí and Gertler: $\kappa = 0.023$. With $\sigma = 2/3$, $\alpha^\star \approx 0.17$.

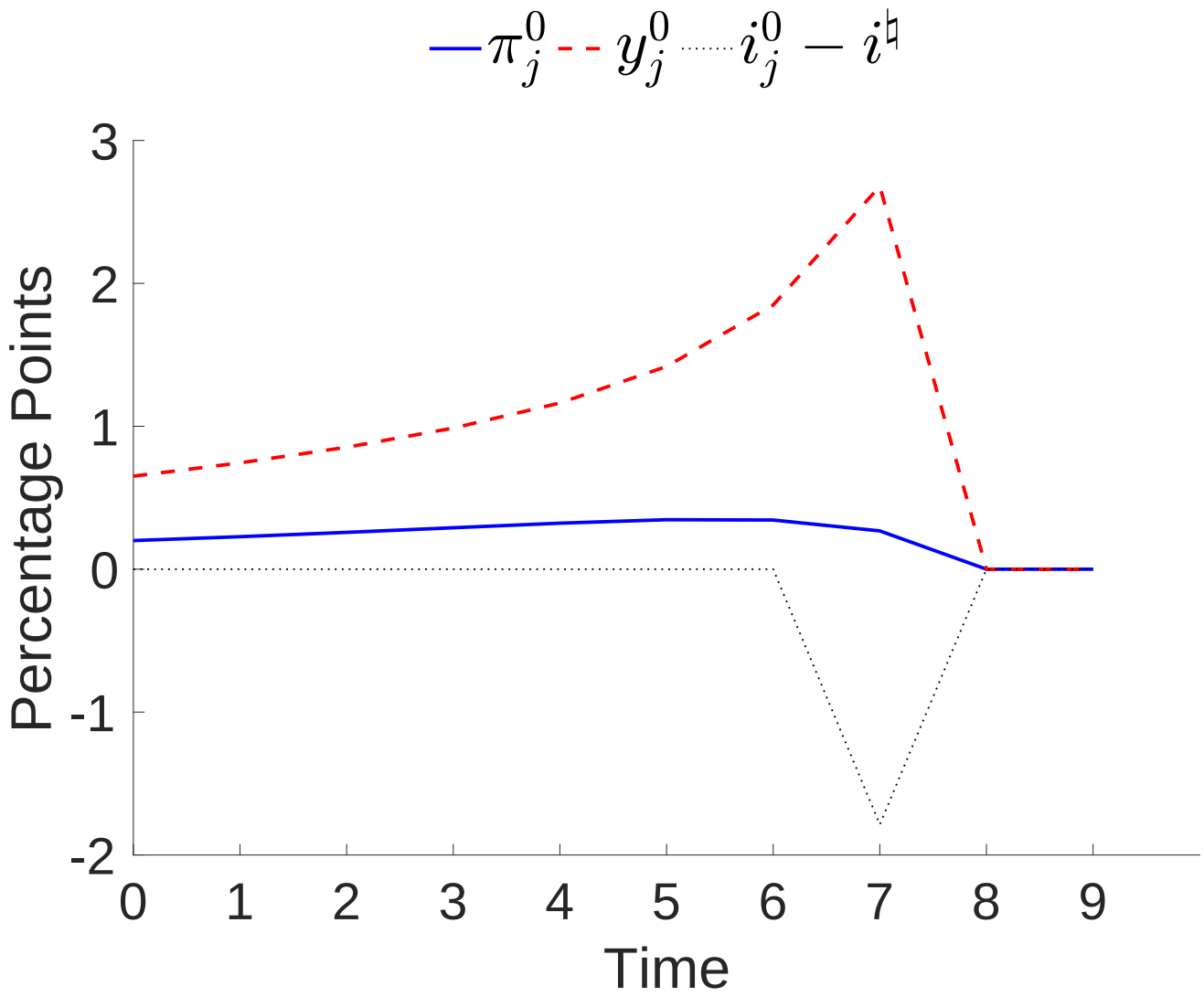
Two Games

- Allocation Game
  - CBs choose *allocations* directly with no concern for Tinbergen-Theil implementation.
  - Restrict attention to Symmetric Markov Perfect Equilibria.
  - There *always* exists a unique Symmetric Markov Perfect Equilibrium, regardless of α. Outline of Proof
- Interest Rate Game
  - CBs choose sequences of interest rates.
  - Private sector follows a Markov strategy, mapping remaining interest rates from the current CB's promised path into values for y_t and π_t.
  - There exists a unique Symmetric Markov Perfect Equilibrium if $\alpha > \alpha^\star$. Outline of Proof
  - Intuition: Private agents take future CB actions and their best responses to them as given, leaving less room for self-fulfilling prophecies.

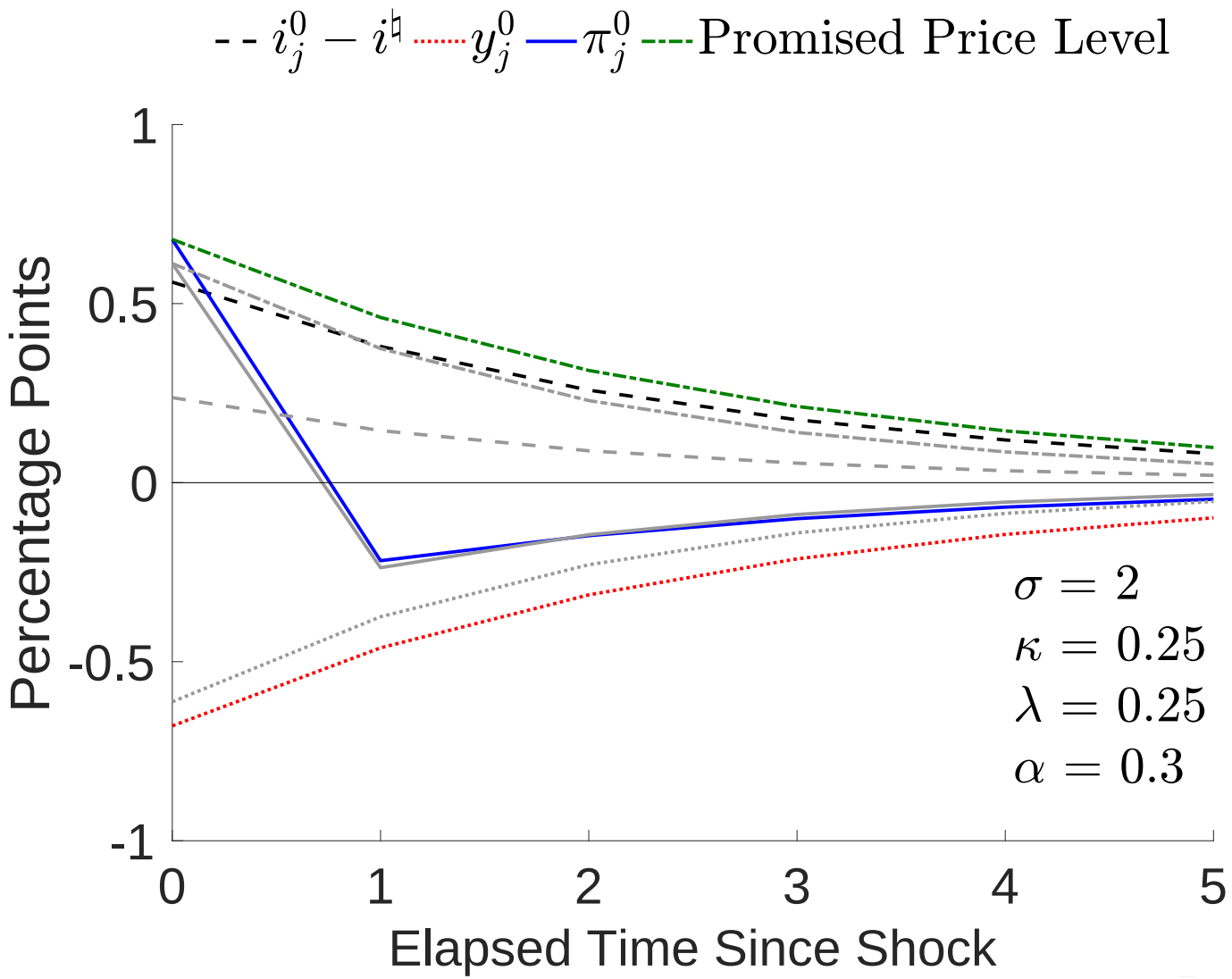
The Usual Forward Guidance Puzzle



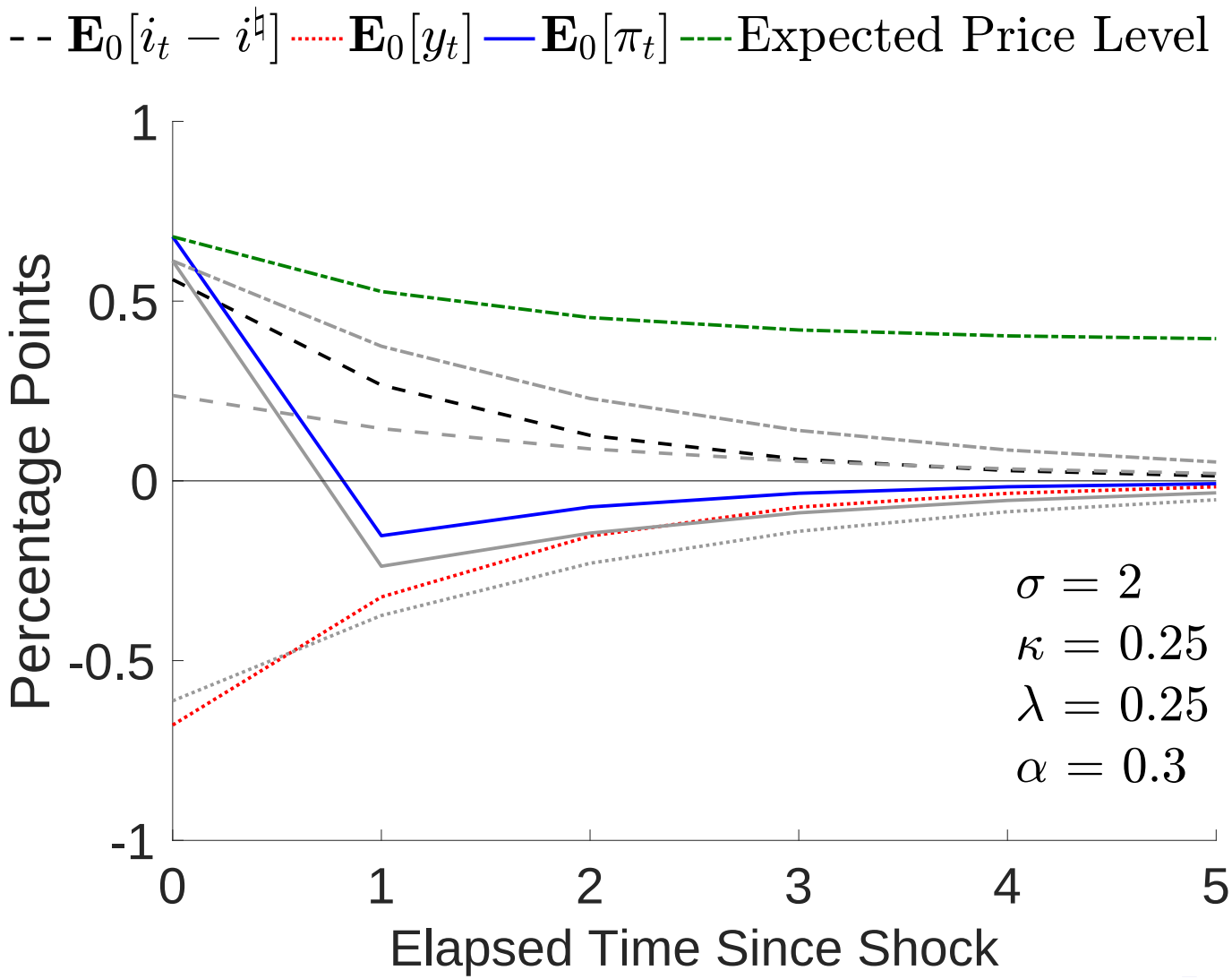
Mitigation of the Forward Guidance Puzzle



The Initial Central Banker's Optimal Promises



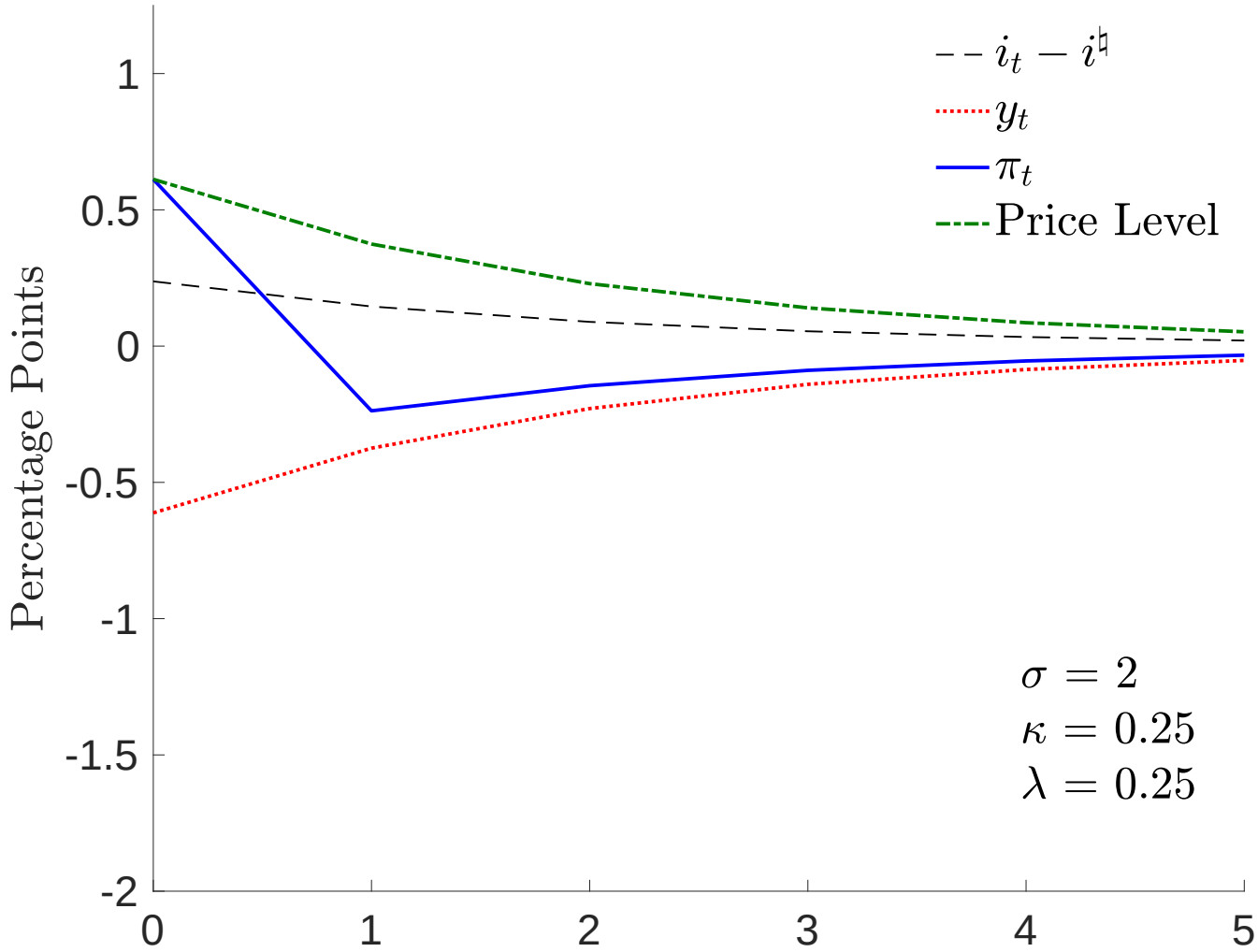
Private Expectations under Equilibrium Monetary Policy



Parting Shots

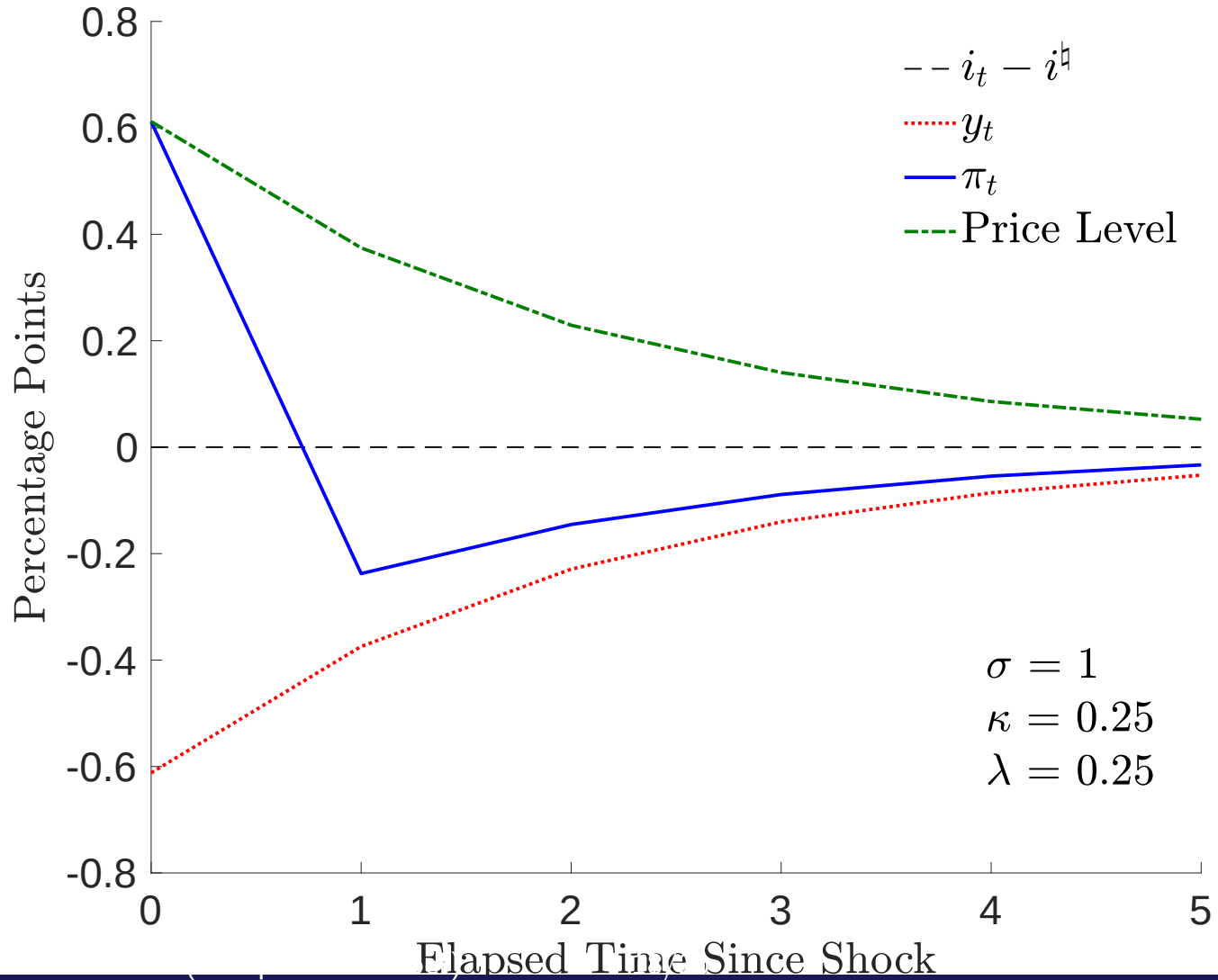
- Quasi-commitment enables Tinbergen-Theil implementation of Ramsey monetary policy.
- Quasi-commitment makes the NK model less "forward-looking" only for monetary policy, not for general asset pricing.
- The Quasi-commitment NK model allows policy makers to combine old Keynesian intuition with information from asset prices.
- Quasi-commitment introduces monetary policy shocks as a byproduct.

Full Commitment ($\alpha = 0$) Solution



A Different Forward Guidance "Puzzle"

Back



Uniqueness Proof Outline for Allocation Game

Back

- Each CB optimizes taking choices of potential successors as given.
- Only policy relevant aspects of potential successors' choices are their *initial* inflation rates, $\pi_{t'}^{t'}$.
- Without cost push shocks, best response curve is increasing out of the origin with a slope less than one.
- CBs $1, 2, \ldots$ *must* set $\pi_{t'}^{t'} = 0$.
- CB 0 implements her unique best response.

Uniqueness Proof Outline for Interest Rate Game

Back

- Construct one equilibrium from the Allocation Game's unique equilibrium.
  - Interest rates equal those set in the Allocation Game's equlibrium.
  - Inflation and output are set to the first elements of the unique equilibrium solutions given current interest rates and expectations of outcomes under successor CBs.
- Since there is a *unique* private sector response to a given CB's interest-rate path, each CB can guarantee implementation of her cost-minimizing allocation.
- Therefore, all equilibrium allocations must mimic that from the Allocation Game's unique equilibrium.