# Expectations and the Neutrality of Interest Rates

by

**John Cochrane**
**Hoover Institution**

A comment by

**Andy Neumeyer**
**Universidad Torcuato Di Tella**

22nd BIS Annual Conference
Basel, June 23rd 2023

# Roadmap: Monetary Policy under Interest Rate Targets

1. Central Bank wisdom
2. The problem of indeterminacy under Interest Rate Targets
3. The Taylor principle's bad fix
4. The Fiscal Theory of the Price Level
   - FTPL and Central Bank Wisdom
   - A neutrality proposition
   - Some questions

# Conventional Central Bank Wisdom

- The interest rate is the best monetary instrument.
  - allowing liquidity to be endogenous
- Inflation doesn't jump around erratically.
- Inflation is stable: small deviations of inflation from the target do not lead to hyperinflation or deflation.
- Central banks control inflation
  - Inflation = Inflation Target $\Rightarrow$ Neutral Policy Interest Rate
  - Inflation > Inflation Target $\Rightarrow$ $\uparrow$ policy interest rate $\Rightarrow$ $\downarrow$ Inflation $\rightarrow$ Inflation Target
  - Inflation < Inflation Target $\Rightarrow$ $\downarrow$ policy interest rate $\Rightarrow$ $\uparrow$ Inflation $\rightarrow$ Inflation Target
- Transmission mechanism
  - Aggregate demand management with sticky prices
  - Anchoring of expectations

Contemporary Monetary Theory

**does not support**

Conventional Central Bank Wisdom

# Two Pillars of Monetary Theory

**The Quantity Theory of Money**:

$$\frac{M_t}{P_t} = \ell(i_t) y_t \tag{1}$$

- **Under interest rate targets $M$ is endogenous and $P$ is indeterminate.**
  - An interest rate peg is analogous to a peg on the rate of growth of $M$
- Need another equilibrium condition for $P$.

**No Arbitrage: Fisher Effect**:

$$1 + i_t = R_t E_t \left[ \frac{P_{t+1}}{P_t} \right] \tag{2}$$

- Interest rate targets peg the rate of expected inflation
- Permanent increases in $i$ raise inflation.
- Risk neutrality for simplicity: real interest factor is outside expectation.

Assuming rational expectations and monetary targets, (1) and (2) are a complete theory of interest and prices (Sargent and Wallace (1973), Obstfeld and Rogoff (1986), Nicolini (1996))

Empirical support: Gao, Kulish, and Nicolini (2021), Benati et al. (2021), Uribe (2022)

# Indeterminacy of Prices is a Serious Problem: Every Day is a New Day

If the central bank follows an interest rate target, the indeterminacy of the price level is amplified by sunspots at every future date. (Sargent and Wallace, 1975)

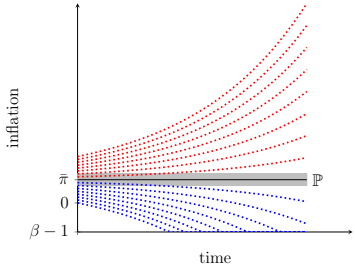
**But inflation is not jumping around all the time**.

Sunspot Equilibria

# The Taylor Principle is a Bad Fix

## Proposed solution in conventional Central Bank modeling (Woodford, 2003)

- Assumptions
  - Taylor Principle
  - Intertemporal balanced budgets (for all $P$).
  - Adhoc restrictions on equilibrium
    - Bounded inflation
    - Local Uniqueness




Source: Neumeyer and Nicolini (2022)

Problems

- Instability: small deviations from the inflation target result in hyperinflation/deflation.
- **The Taylor Principle is not credible**. Neumeyer and Nicolini (2022), Afrouzi et al. (2023)
- $\pi_0 < \bar{\pi}$ & long term debt: **Either** the Taylor Principle **or** repay debt for all $P$.
  Endowment $= 1$, nominal consol pays coupon $\times e^{rt}$ units of goods at the zero bound.

# The Fiscal Theory of the Price Level (FTPL) is a Better Fix

The intertemporal government budget constraint is the missing equation.

$$\frac{\text{Nominal Value of Public Debt}_t + M_t}{P_t} = E_t\left[\text{Present value of fiscal surpluses}\right] \tag{3}$$

- Necessary assumption: the right hand side of (3) does not fully offset changes in $P_t$.
  - Balanced budgets at the inflation target.
  - Relation to Sargent and Wallace's unpleasant monetarist arithmetic.
- Convenient assumption: abandon Taylor principle

Assuming rational expectations and interest rate targets, (1),(2) and (3) are a complete theory of prices (Cochrane, 2023).

**Equilibria have desirable properties**.

- Determinacy
- Stability

# FTPL challenges Conventional Central Bank Wisdom

- In general, assuming fiscal policy is constant, transitory increases in interest rates increase inflation.
  - Even with a Phillips Curve
- Increasing the interest rate can lower inflation through valuation effects on long-term debt.
  - No Phillips curve logic.
- The role of monetary and fiscal policy in the determination of $P_t$.
  - The monetary authority (interest rate) controls expected inflation (2).
  - The fiscal authority controls the realization of inflation (surprise).

# A Neutrality Proposition for Interest Rates

Assumptions:

- Frictionless economy
- Constant Fiscal Policy

$$\frac{\sum_{s=t}^{\infty} Q_{t,s}(\mathbf{i})\ B_{t,t+s} + M_t}{P_t} = E_t\left[\text{Present value of fiscal surpluses}\right]; \quad Q_{t,s}(\mathbf{i}) = (1+\mathbf{i})^{-s}$$

**Neutrality proposition**: A permanent increase in the interest rate target at $t$ **lowers** $P_t$ and **increases inflation** thereafter while real allocations, real interest rates, and relative prices are unchanged.

**Comments**

- Analogous to neutrality under monetary targets: increase $\mu$ with $M$ constant.
- Trace fiscal impact of Seignorage (Sargent and Wallace, 1981)
- The fall in P is through a wealth effect on nominal bond contracts.
- No Inflation output tradeoff.

# Questions

- Defaultable debt: cost of default v costs of inflation.
  - Germany after the Versailles treaty V Paraguay's Constitution.
- Do sunspots in public debt prices translate to consumer prices?

$$\frac{\sum_{s=t}^{\infty} Q_{t,j}(\textbf{sunspots})\ B_{t,t+j} + M_t}{P_t} = E_t\left[\text{Present value of fiscal surpluses}\right]$$

  - European debt crisis and deflation. (Calvo, 1988)
- Money as Stock: volatility of prices and volatility of stocks
  - Are price changes consistent with the volatility of stocks?
  - Average size of firm price changes conditional firms changing prices is $15\%$ for $\pi < 20\%$. Alvarez et al. (2019)
  - Should it be correlated to fiscal news?

# Wanted: A Theory of Inflation under Interest Rate Targets

"Thus, basic questions are still up for grabs. In the long run, is inflation stable or unstable, determinate or indeterminate under a peg? If the central bank raises rates persistently, and there is no fiscal news or other shocks, does inflation rise or decline in the long run? If not this, what is the neutral, frictionless benchmark on which we build a theory of inflation under interest rate targets?"

"This is all great news for young researchers. These are the good old days. Low-hanging fruit abounds. We're really at the beginning stages where simple models need exploration, not, as it appears, in a mature stage where essentials are settled and all there is to do is to add to the immense stock of complicated epicycles."

John Cochrane
Cochrane (2022)

# References


Afrouzi, Hassan, Marina Halac, Kenneth S. Rogoff, and Pierre Yared. 2023. "Monetary Policy without Commitment." NBER Working Papers 31207, National Bureau of Economic Research, Inc.

Alvarez, Fernando, Martin Beraja, Martín Gonzalez-Rozada, and Pablo Andrés Neumeyer. 2019. "From Hyperinflation to Stable Prices: Argentina's Evidence on Menu Cost Models." *The Quarterly Journal of Economics* 134 (1):451–505.

Benati, Luca, Robert E. Lucas, Juan Pablo Nicolini, and Warren Weber. 2021. "International evidence on long-run money demand." *Journal of Monetary Economics* 117 (C):43–63.

Calvo, Guillermo A. 1988. "Servicing the Public Debt: The Role of Expectations." *The American Economic Review* 78 (4):647–661.

Cochrane, John H. 2022. "Expectations and the Neutrality of Interest Rates." NBER Working Papers 30468, National Bureau of Economic Research, Inc.

———. 2023. *The Fiscal Theory of the Price Level*. Princeton University Press.

Gao, Han, Mariano Kulish, and Juan Pablo Nicolini. 2021. "Two Illustrations of the Quantity Theory of Money Reloaded." Staff Report 633, Federal Reserve Bank of Minneapolis.

Neumeyer, Pablo Andrés and Juan Pablo Nicolini. 2022. "The Incredible Taylor Principle." Working Papers 790, Federal Reserve Bank of Minneapolis.

Nicolini, Juan Pablo. 1996. "Ruling out speculative hyperinflations The role of the government." *Journal of Economic Dynamics and Control* 20 (5):791–809.

Obstfeld, Maurice and Kenneth Rogoff. 1986. "Ruling out divergent speculative bubbles." *Journal of Monetary Economics* 17 (3):349–362.

Sargent, Thomas and Neil Wallace. 1973. "The Stability of Models of Money and Growth with Perfect Foresight." *Econometrica* 41 (6):1043–48.

Sargent, Thomas J. and Neil Wallace. 1975. " 'Rational' Expectations, the Optimal Monetary Instrument, and the Optimal Money Supply Rule." *Journal of Political Economy* 83 (2):241–24.

———. 1981. "Some unpleasant monetarist arithmetic." *Quarterly Review* 5 (Fall).

Uribe, Martín. 2022. "The Neo-Fisher Effect: Econometric Evidence from Empirical and Optimizing Models." *American Economic Journal: Macroeconomics* 14 (3):133–62.

Woodford, Michael. 2003. *Interest and Prices: Foundations of a Theory of Monetary Policy*. Princeton University Press.

# APPENDIX

# Indeterminacy of Prices is a Serious Problem: Sunspots

If the central bank follows an interest rate target, the indeterminacy of the price level is amplified by sunspots: every day is a new day. (Sargent and Wallace, 1975)

Let $P_t(s)$ be a function of a "sunspot" $s \in \mathbb{S} = \{1, \ldots, S\}$ for all $t$

For each $P(s)$, the monetary authority will accommodate the money demand consistent with $P(s)$ and $i$.

The Fisher Equation restricts expected inflation

Any inflation rate, $\pi_{t+1}(s) = \dfrac{P_{t+1}(s)}{P_t}$, satisfying $1 + i_t = R_t E[\pi_{t+1}(s)]$ is an equilibrium.

There are $S - 1$ degrees of indeterminacy per period in inflation.

**But inflation is not jumping around all the time**.

Back