

The Taylor principle and determinacy

@econcortex

2026-09-22

Abstract

Why the coefficient on inflation has to exceed one, shown in the three-equation New Keynesian model.

The most important number in The Taylor rule is not 2 percent for r^* but the *total* response of the nominal rate to inflation. Woodford gave the requirement its name: the **Taylor principle** says the nominal rate must rise by more than one for one with inflation, so that the real rate rises when inflation rises (Woodford, 2001). This lesson shows where the requirement comes from.

The three-equation model

The workhorse New Keynesian model has three log-linear equations (Clarida et al., 1999; Galí, 2015). Variables are deviations from steady state; x_t is the output gap, π_t inflation, i_t the nominal rate and r_t^n the natural real rate, which moves with shocks.

$$x_t = \mathbb{E}_t x_{t+1} - \frac{1}{\sigma} (i_t - \mathbb{E}_t \pi_{t+1} - r_t^n) \quad (1)$$

$$\pi_t = \beta \mathbb{E}_t \pi_{t+1} + \kappa x_t \quad (2)$$

$$i_t = \phi_\pi \pi_t + \phi_x x_t \quad (3)$$

Equation (1) is the dynamic IS curve: demand today depends on expected demand tomorrow and on the gap between the real rate and its natural level. Equation (2) is the New Keynesian Phillips curve with slope κ and discount factor β . Equation (3) is a Taylor-type rule without the constants, which drop out in deviations.

Why “more than one” matters

Consider a self-fulfilling burst of inflation expectations with no change in fundamentals. Higher expected inflation lowers the real rate in (1) unless the central bank raises i_t enough. A higher gap raises inflation through (2), which confirms the expectation. If instead the rule raises the nominal rate by *more* than the increase in inflation, the real rate rises, the gap falls, inflation falls, and the expectation is refuted. The Taylor principle is what makes sunspot expectations fail.

Theorem 1 (Determinacy condition). *The system (1)–(3) has a unique bounded rational-expectations equilibrium if and only if*

$$\kappa (\phi_\pi - 1) + (1 - \beta) \phi_x > 0. \quad (4)$$

With $\phi_x = 0$ this reduces to $\phi_\pi > 1$, the Taylor principle in its simplest form. A positive response to the output gap relaxes the requirement on ϕ_π slightly, because $1 - \beta$ is small (Bullard & Mitra, 2002; Woodford, 2003).

The proof works by writing the system as $\mathbb{E}_t z_{t+1} = Az_t$ with $z_t = (x_t, \pi_t)'$ and checking that both eigenvalues of A lie outside the unit circle, which is the Blanchard–Kahn condition for two non-predetermined variables. Galí works through the algebra in chapter 4 of his textbook (Galí, 2015); the condition in (4) is his equation for the contemporaneous rule.

Example 1 (The Taylor coefficients). With Taylor’s values the total inflation response is $\phi_\pi = 1.5$ and the gap response $\phi_x = 0.5$ (per year, so 0.125 per quarter in quarterly models). Any plausible κ and β satisfy (4) with room to spare.

Evidence

Clarida, Galí and Gertler estimated a forward-looking version of the rule for the United States and found that the inflation response was *below one* in the pre-Volcker period and *well above one* after 1979 (Clarida et al., 2000). Their reading: before 1979 policy accommodated inflation and left the door open to self-fulfilling fluctuations, afterwards it did not. Their baseline estimates put the response at roughly 0.8 before and roughly 2.2 after; the exact numbers vary with the specification, the sign of the difference does not.

The interpretation is contested. Real-time data and the Taylor rule shows that with the data the Fed actually saw at the time, the 1970s look less like a failure of the Taylor principle and more like a measurement problem.

Caveats

- Determinacy is a property of the *model*. Under learning rather than rational expectations the same condition governs whether agents can learn the equilibrium, which is reassuring (Bullard & Mitra, 2002), but other frictions change the boundary.
- At the effective lower bound the rule cannot deliver a nominal rate below zero (or slightly below), so the principle cannot be satisfied for large negative shocks. This is why Measuring the policy stance needs tools beyond the policy rate.

Bullard, J., & Mitra, K. (2002). Learning about monetary policy rules. *Journal of Monetary Economics*, 49(6), 1105–1129. [https://doi.org/10.1016/S0304-3932\(02\)00144-7](https://doi.org/10.1016/S0304-3932(02)00144-7)

Clarida, R., Galí, J., & Gertler, M. (1999). The science of monetary policy: A New Keynesian perspective. *Journal of Economic Literature*, 37(4), 1661–1707. <https://doi.org/10.1257/jel.37.4.1661>

Clarida, R., Galí, J., & Gertler, M. (2000). Monetary policy rules and macroeconomic stability: Evidence and some theory. *Quarterly Journal of Economics*, 115(1), 147–180. <https://doi.org/10.1162/003355300554692>

Galí, J. (2015). *Monetary policy, inflation, and the business cycle: An introduction to the new keynesian framework and its applications* (2nd ed.). Princeton University Press.

Woodford, M. (2001). The Taylor rule and optimal monetary policy. *American Economic Review*, 91(2), 232–237. <https://doi.org/10.1257/aer.91.2.232>

Woodford, M. (2003). *Interest and prices: Foundations of a theory of monetary policy*. Princeton University Press.