

Monetary Policy Rules and the Policy Stance

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From Taylor's 1993 rule to the natural rate of interest and the question every central-bank watcher asks: is policy tight or loose? Eight lessons with the original sources, the equations, and flashcards.

Why rules? Time inconsistency and the case for commitment

Why a central bank that is free to do the best thing each period can end up with higher inflation and nothing to show for it.

A monetary policy *rule* is a systematic description of how the policy instrument, usually a short-term interest rate, responds to the state of the economy. The alternative is *discretion*: the central bank re-optimises every period, unconstrained by what it said before. Intuition suggests discretion must be at least as good, because a discretionary policymaker can always choose to follow the rule. The point of this lesson is that this intuition is wrong.

The time-inconsistency problem

Kydland and Prescott showed that when private agents are forward-looking, the plan that is optimal today is in general not the plan the policymaker will want to carry out tomorrow (Kydland & Prescott, 1977). Their examples came from patent policy and flood insurance as much as from money, but monetary policy is where the idea took hold.

Barro and Gordon built the canonical monetary version (Barro & Gordon, 1983). Strip it to the essentials. The economy has a natural rate of output, y^n , and the central bank would like output to be higher than that, say because taxes or market power keep it inefficiently low. Output responds to *surprise* inflation:

$$y_t = y^n + a(\pi_t - \pi_t^e), \quad a > 0. \quad (1)$$

The central bank dislikes inflation and likes output above the natural rate:

$$L_t = \frac{1}{2}\pi_t^2 - b(y_t - y^n), \quad b > 0. \quad (2)$$

Definition 1 (Discretionary equilibrium). Under discretion the central bank chooses π_t *after* expectations π_t^e have been formed, taking them as given. Substituting (1) into (2) and minimising over π_t gives $\pi_t = ab$. Private agents know this, so in equilibrium $\pi_t^e = ab$, the surprise is zero, and output stays at y^n .

The outcome is the worst of both worlds: inflation is positive ($ab > 0$) and output is exactly where it would have been with zero inflation. The bank's willingness to exploit surprises is fully anticipated, and the anticipation removes the benefit while leaving the cost. This is the *inflation bias* of discretion.

Theorem 1 (Commitment beats discretion). *If the central bank can commit to $\pi_t = 0$ before expectations are formed, the loss is $L = 0$, which is strictly below the discretionary loss $\frac{1}{2}(ab)^2$. Commitment is valuable even though the committed policymaker has fewer options.*

Proof. Under commitment agents set $\pi^e = 0$, output is y^n by (1), and (2) equals zero. Under discretion output is also y^n but $\pi = ab$, so the loss is $\frac{1}{2}(ab)^2 > 0$. $\square$

What the argument does and does not say

The model does not say that discretionary central bankers are careless. The bias arises precisely because the policymaker is doing the best thing each period. It says that a *mechanism* that ties the bank's hands, a rule, a reputation, an independent conservative central banker, or an explicit target, can raise welfare.

Three caveats matter for the rest of this course.

- The bias depends on the bank wanting output above its natural rate ($b > 0$). Central banks that aim at the natural rate itself have no inflation bias in this model, but they may still have a *stabilisation bias*: under discretion they respond to shocks less efficiently than under commitment, a point developed in the New Keynesian literature (Clarida et al., 1999).
- “Rule” does not have to mean a fixed formula. Taylor's rule, the subject of the next lesson, is a *guideline* with judgment around it; an inflation-forecast target is a rule about the objective rather than the instrument (Svensson, 1997).
- Reputation can substitute for a formal rule when the game is repeated, which is why the credibility of a central bank is discussed as if it were an asset.

Continue with The Taylor rule.

The Taylor rule

Taylor's 1993 formula, what each term means, and why a simple rule described Fed policy so well.

In 1993 John Taylor proposed a rule that has since become the reference point for every discussion of the interest-rate stance. He did not claim central banks should follow it mechanically; the point was to show that a simple formula tracked the Federal Reserve's actual decisions between 1987 and 1992 remarkably well, and that it could serve as a benchmark for judging policy (Taylor, 1993).

The rule

In Taylor's notation the federal funds rate r is set as

$$r = p + 0.5y + 0.5(p - 2) + 2, \quad (3)$$

where p is inflation over the previous four quarters and y is the percentage deviation of real GDP from its trend. Two constants are hidden in the formula: an inflation target of 2 percent and an equilibrium real interest rate of 2 percent. Taylor chose both as round numbers that fitted the period; he did not derive them.

It is clearer to write the rule with the constants named. With the nominal policy rate i_t , inflation π_t , the inflation target π^* , the equilibrium real rate r^* and the output gap x_t :

$$i_t = r^* + \pi_t + \phi_\pi(\pi_t - \pi^*) + \phi_x x_t, \quad \phi_\pi = \phi_x = 0.5. \quad (4)$$

Definition 2 (Reading the rule). The first two terms, $r^* + \pi_t$, are the nominal rate that keeps the *real* rate at its equilibrium value when inflation is at target. The third term raises the rate when inflation exceeds the target, the fourth when output is above potential. With $\phi_\pi = 0.5$ the total response of the nominal rate to inflation is $1 + \phi_\pi = 1.5$: a one-point rise in inflation raises the nominal rate by 1.5 points and therefore the real rate by 0.5 points.

That last observation is the *Taylor principle*, the subject of The Taylor principle and determinacy. Here it is enough to note that the rule reacts to inflation *more than one for one*, so the real rate leans against inflation rather than accommodating it.

A worked example

Suppose inflation is running at 4 percent, the output gap is -1 percent, and $r^* = \pi^* = 2$. Then

$$i = 2 + 4 + 0.5(4 - 2) + 0.5(-1) = 6.5 \text{ percent.}$$

Inflation two points above target adds one point; a mild recession subtracts half a point. Compare the case of inflation at target and a closed gap: $i = 4$ percent, which is just $r^* + \pi^*$, the *neutral* nominal rate.

What made the rule persuasive

- **It is transparent.** Anyone with two published series can compute the prescription and compare it with the actual rate. This turned the abstract case for rules from Why rules? Time inconsistency and the case for commitment into something operational.
- **It fitted.** Taylor showed that the prescription tracked the funds rate closely over 1987–1992, with the deviations explainable by events such as the 1987 stock market crash (Taylor, 1993).
- **It is robust.** Later work found that rules of this form perform well across a range of models, even when they are not optimal in any single one (Taylor, 1999).

What the rule leaves open

Every ingredient except the current policy rate is measured with error or has to be estimated: which inflation index, which measure of potential output, and above all what r^* is. Lessons The natural rate of interest and Real-time data and the Taylor rule show that these choices change the prescription by percentage points, not decimals. The rule is a benchmark, not an oracle.

The Taylor principle and determinacy

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.

$$x_t = \mathbb{E}_t x_{t+1} - \frac{1}{\sigma} (i_t - \mathbb{E}_t \pi_{t+1} - r_t^n) \quad (5)$$

$$\pi_t = \beta \mathbb{E}_t \pi_{t+1} + \kappa x_t \quad (6)$$

$$i_t = \phi_\pi \pi_t + \phi_x x_t \quad (7)$$

Equation (5) 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 (6) is the New Keynesian Phillips curve with slope κ and discount factor β . Equation (7) 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 (5) unless the central bank raises i_t enough. A higher gap raises inflation through (6), 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 2 (Determinacy condition). *The system (5)–(7) has a unique bounded rational-expectations equilibrium if and only if*

$$\kappa(\phi_\pi - 1) + (1 - \beta)\phi_x > 0. \quad (8)$$

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 (8) 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 (8) 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.

Variants of the Taylor rule

Balanced-approach, inertial, forward-looking and first-difference rules, and the five rules the Fed publishes twice a year.

The original rule from The Taylor rule is one point in a family. Every variant changes one of three things: how strongly the rate reacts to the gap, whether the rate adjusts gradually, and whether the inputs are current, expected or lagged values. Knowing the family matters because the prescriptions can differ by several percentage points at the same moment.

Stronger response to the gap: the “balanced approach”

Taylor himself examined a version with a coefficient of 1.0 instead of 0.5 on the output gap (Taylor, 1999):

$$i_t = r^* + \pi_t + 0.5 (\pi_t - \pi^*) + 1.0 x_t. \quad (9)$$

In Federal Reserve publications this is the **balanced-approach rule**. It prescribes lower rates in recessions and higher rates in booms than the 1993 rule, and it was the version most often cited by FOMC members after 2010, when the output gap was large and negative.

Gradual adjustment: inertial rules

Estimated rules almost always find that the rate moves slowly toward the prescription:

$$i_t = \rho i_{t-1} + (1 - \rho) [r^* + \pi_t + \phi_\pi (\pi_t - \pi^*) + \phi_x x_t], \quad 0 < \rho < 1. \quad (10)$$

Values of ρ around 0.7 to 0.9 per quarter are typical in estimates (Clarida et al., 2000). Two explanations compete. One is pure smoothing: central banks dislike reversals and move in small steps. The other is that with forward-looking agents a *promise* of persistence is powerful, because long rates respond to the expected path of short rates; Woodford shows that inertia can be part of an optimal rule for exactly that reason (Woodford, 2003).

Forward-looking rules

Clarida, Galí and Gertler replaced current inflation with the expected inflation rate k periods ahead (Clarida et al., 2000):

$$i_t^* = r^* + \pi^* + \phi_\pi (\mathbb{E}_t \pi_{t+k} - \pi^*) + \phi_x \mathbb{E}_t x_{t+q}. \quad (11)$$

The appeal is that policy works with a lag, so reacting to forecasts is more sensible than reacting to the past. The cost is that forecasts are not observable, which makes such rules harder to verify from outside. Inflation-forecast targeting, the framework several central banks describe themselves as using, is the limit case: the instrument is set so that the forecast hits the target at the policy horizon (Svensson, 1997).

First-difference rules

A first-difference rule reacts with the *change* in the rate rather than its level:

$$i_t = i_{t-1} + 0.5 (\pi_t - \pi^*) + 0.5 (x_t - x_{t-4}). \quad (12)$$

Its virtue is that it needs neither r^* nor the *level* of the output gap, the two quantities that the natural rate of interest and Real-time data and the Taylor rule show to be the least reliable inputs. Orphanides argued for rules of this kind on exactly those grounds (Orphanides, 2003). The price is that the rule can drift: nothing anchors the level of the rate except the history of past changes.

The Fed's published set

Since 2017 the Federal Reserve's semi-annual *Monetary Policy Report* has carried a section on policy rules that reports the prescriptions of a fixed set of rules alongside the actual funds rate (Board of Governors of the Federal Reserve System, 2024). The set is:

Rule	What distinguishes it
Taylor (1993) rule	Coefficients 0.5 and 0.5, the rule of the previous lesson
Balanced-approach rule	Coefficient 1.0 on the gap, (9)

Rule	What distinguishes it
Balanced-approach (shortfalls) rule	Reacts to the gap only when it is negative, in line with the 2020 strategy statement's focus on employment <i>shortfalls</i> (Federal Open Market Committee, 2020)
Adjusted Taylor (1993) rule	Makes up for the period when the lower bound kept rates above the rule's prescription
First-difference rule	(12), no r^* or gap level needed

The report is explicit that the FOMC does not follow any of them, and that they disagree with each other by percentage points at turning points. That disagreement is the honest summary of this lesson: the *form* of the rule is a choice with consequences, not a technical detail.

The natural rate of interest

Wicksell's idea, the Laubach–Williams estimate, and why a number nobody can observe decides whether policy is tight.

The constant r^* in The Taylor rule is doing more work than its modest appearance suggests. It is the real interest rate at which the economy neither overheats nor slackens, the level against which any actual real rate is judged tight or loose. It is also unobservable. This lesson is about what it means and how economists try to measure it.

Wicksell's distinction

Knut Wicksell distinguished the *money* rate of interest, set by banks, from the *natural* rate, the return that would prevail if capital were lent in kind, without money (Wicksell, 1898). When the money rate is below the natural rate, borrowing to invest is profitable, demand expands and prices rise; when it is above, the reverse. Prices are stable only when the two coincide. Modern usage keeps the idea and drops the metaphysics: the natural rate is the real rate consistent with output at potential and stable inflation.

Definition 3 (Natural rate of interest). The real short-term interest rate r_t^* at which, absent transitory shocks, output equals potential and inflation is stable. In the three-equation model of The Taylor principle and determinacy it is the term r_t^n in the IS curve: the rate that closes the output gap when expectations are anchored.

Two versions travel under the same name and should be kept apart.

- The **short-run** natural rate moves with every shock to demand and supply; it is what an optimal rule would track period by period.
- The **longer-run** natural rate is the level to which the short-run rate converges once shocks fade. It is what people mean by “ r^* ” in the Taylor rule and in discussions of the neutral rate.

Why it matters for the stance

With the policy rate i_t and expected inflation π_t^e , the real policy rate is $i_t - \pi_t^e$. Policy is *accommodative* when

$$i_t - \pi_t^e < r_t^* \quad (13)$$

and *restrictive* when the inequality is reversed. A 3 percent real rate is tight if r^* is 1 percent and loose if r^* is 4 percent. Every statement about the stance therefore contains a hidden assumption about r^* ; Measuring the policy stance makes those assumptions explicit.

Measuring it: Laubach and Williams

Laubach and Williams proposed the estimate that has become the standard reference (Laubach & Williams, 2003). The model is small. Output relative to potential depends on the lagged real-rate gap, inflation depends on the lagged output gap, and the natural rate is tied to the trend growth rate of potential output plus an additional slow-moving component:

$$r_t^* = c g_t + z_t, \quad (14)$$

where g_t is trend growth and z_t captures everything else, such as demographics or the demand for safe assets. Potential output, trend growth and z_t are unobserved states estimated with the Kalman filter. The identifying idea is Wicksell's: if inflation keeps rising while the real rate is at some level, that level must be below the natural rate.

The international version of the model found that natural rates fell across the United States, Canada, the euro area and the United Kingdom over the previous quarter-century, to levels close to zero by the mid-2010s, and that the common decline pointed to global rather than country-specific causes (Holston et al., 2017). Hamilton and co-authors reached a similar conclusion with very different methods, while stressing how wide the uncertainty bands are (Hamilton et al., 2016).

The uncertainty problem

The published Laubach–Williams estimates come with standard errors of a percentage point or more, and revisions of the same magnitude as new data arrive. That is the same order as the distance between “tight” and “loose”. The lesson for the Variants of the Taylor rule is direct: rules that do not need the level of r^* , such as first-difference rules, avoid this error at the cost of others. The lesson for the practitioner is to state the assumed r^* whenever quoting a Taylor-rule prescription, and to show how the prescription changes with it.

Measuring the policy stance

Real rate gaps, shadow rates at the lower bound, and financial conditions: three ways to answer “is policy tight?”

“Is policy tight?” sounds like a question with a number for an answer. It is not; it is a comparison, and the answer depends on what the policy rate is compared with. This lesson sets out the three comparisons in common use and what each hides.

The real rate gap

The most direct measure follows from The natural rate of interest. Define the stance as the gap between the real policy rate and the natural rate:

$$s_t = (i_t - \pi_t^e) - r_t^*. \quad (15)$$

Positive s_t is restrictive, negative is accommodative. Three choices hide inside the formula.

- **Which inflation expectation.** Surveys, market-implied break-evens and the central bank's own forecast can differ by a percentage point at turning points. Realised inflation is a poor substitute because it is backward-looking, which is why the Taylor rule's use of past inflation is a simplification, not a recommendation.
- **Which r^* .** As the previous lesson showed, estimates carry uncertainty of the same order as the stance itself.
- **Which horizon.** A short-run natural rate that has fallen after a demand shock can make an unchanged policy rate restrictive even though nothing about the central bank has changed.

A useful discipline is to report s_t for a *range* of r^* values rather than a point, and to say which inflation measure was used.

The Taylor-rule deviation

An alternative compares the policy rate with a rule prescription rather than with r^* alone:

$$d_t = i_t - i_t^{\text{rule}}. \quad (16)$$

This folds in the output gap and the inflation gap, so it answers “is policy tight *relative to the state of the economy?*” rather than “is the real rate above neutral?”. A negative d_t during a boom is a stronger statement than a negative s_t . The cost is that d_t inherits every choice from Variants of the Taylor rule: with the balanced-approach rule and a large negative gap the deviation can flip sign relative to the 1993 rule.

At the lower bound: shadow rates

From 2009 to 2015 in the United States, and for longer in the euro area, Japan and Switzerland, the policy rate sat at or near its effective lower bound while central banks eased further through asset purchases and forward guidance. The policy rate stopped measuring the stance.

A **shadow rate** is the short rate that would be consistent with the observed yield curve if the lower bound did not exist. Krippner and, separately, Wu and Xia estimated shadow-rate term structure models in which the observed short rate is the maximum of a latent shadow rate and the lower bound (Krippner, 2013; Wu & Xia, 2016). When the latent rate is deep in negative territory, long yields are lower than they would be with the short rate at zero, and the model reads the difference as additional easing. The Wu–Xia estimate for the United States fell to roughly minus three percent in 2014 before rising as the Fed signalled and then began normalisation (Wu & Xia, 2016).

Definition 4 (Shadow rate). The latent short-term rate $\tilde{i}_t$ in a model where the observed rate is $i_t = \max(\tilde{i}_t, \underline{i})$ and the yield curve is priced off the shadow rate. Below the bound, $\tilde{i}_t$ summarises the easing delivered by unconventional tools in policy-rate units.

Shadow rates are model-dependent: different bound values and different numbers of factors give estimates that disagree by a percentage point or more. They are best read as a direction and an order of magnitude.

Financial conditions

The third approach skips the policy rate and asks what borrowers actually face. A **financial conditions index** combines mortgage and corporate bond rates, equity prices, the exchange rate and credit spreads into one series, weighted by their estimated effect on activity. The logic is that policy works through these channels, so measuring them directly captures transmission as well as intent. The cost is symmetric: financial conditions move for reasons that have nothing to do with the central bank, and an index can read “loose” while the central bank is tightening, as happened in the United States during much of 2023.

Putting the three together

Measure	Compares the policy rate with	Best for	Blind spot
Real rate gap s_t	the natural rate	medium-run stance	depends on r^* and π^e
Rule deviation d_t	a Taylor-type prescription	stance given the cycle	depends on the rule’s form
Shadow rate	a yield curve without the lower bound	the lower-bound period	model-dependent
Financial conditions	the rates borrowers face	transmission	moves without the central bank

When the measures agree, the stance is not in doubt. When they disagree, the disagreement itself is the information: it says which assumption the judgment rests on.

Real-time data and the Taylor rule

Orphanides' finding that the data available at the time change the verdict on the 1970s, and what it means for judging policy today.

Everything in The Taylor rule is computed from data. The data that exist today for, say, 1975 are not the data the Federal Open Market Committee saw in 1975. GDP is revised for years, and estimates of *potential* output are revised for decades. Athanasios Orphanides showed that this changes the history of monetary policy (Orphanides, 2001).

The experiment

Orphanides rebuilt the Taylor-rule prescription using only the information available at each meeting: the inflation and output-gap estimates in the Fed staff's briefing documents, not the revised series in today's databases. Two results stand out.

- With **real-time** data the rule tracks actual Fed policy in the 1970s much more closely than with revised data. The Fed of the 1970s looks, by its own lights, roughly like a Taylor-rule follower.
- The reason is the output gap. In real time the staff believed that the economy was operating far below potential for most of the decade, so the rule prescribed low rates. Later revisions lowered the estimate of potential, and with it the gap; the same rule computed on revised data prescribes much higher rates.

Example 2 (Orders of magnitude). Real-time estimates of the US output gap in the mid-1970s were more negative than today's estimates by amounts of the order of several percentage points. With a coefficient of 0.5 on the gap, a mismeasurement of 4 points moves the rule prescription by 2 percentage points; with the balanced-approach coefficient of 1.0 it moves it by 4.

The conclusion is not that the 1970s inflation was an accident. It is that a large part of the policy error was a measurement error about potential output, compounded by the productivity slowdown that was not recognised until later, and that the estimated shift in the inflation response after 1979 reported by Clarida, Galí and Gertler is smaller once real-time data are used (Clarida et al., 2000; Orphanides, 2003).

The same problem, thirty years later

The debate about whether Fed policy was too loose in 2002–2006 replayed the argument. Taylor argued that the funds rate sat well below the rule's prescription and that this fed the housing boom (Taylor, 2007). Bernanke replied that with the data and forecasts available at the time, and with forecast inflation rather than realised inflation in the rule, the deviation was small (Bernanke, 2010). Both computed a Taylor rule; they disagreed about the inputs.

Implications for anyone computing a rule

1. **State the vintage.** A prescription computed from today's data is a statement about what policy *should have been*, not about what the central bank could have known.
2. **Prefer inputs that are revised less.** Inflation is revised little; output gaps are revised a lot. This is one argument for rules with a larger weight on inflation and for the first-difference rules in Variants of the Taylor rule.
3. **Show the range.** Report the prescription under two or three gap estimates, for example the central bank's own, the OECD's and a statistical filter, rather than one number.
4. **Treat r^* the same way.** The natural rate of interest is revised as heavily as the gap, and its revisions move the prescription one for one.

Real-time databases now exist for exactly this purpose: the Federal Reserve Bank of Philadelphia’s *Real-Time Data Set for Macroeconomists* and the ECB’s real-time database make the vintages available, so the experiment can be repeated for later periods and other economies.

Rules in practice: Fed, ECB and SNB

How three central banks describe their own frameworks, how they use rules without following them, and how to compute a prescription yourself.

No major central bank follows a Taylor rule. All of them use rules as benchmarks, and their frameworks can be read as answers to the questions raised in this course: what is the target, how much weight goes on activity, and how is the stance communicated.

Federal Reserve

The FOMC’s *Statement on Longer-Run Goals and Monetary Policy Strategy* sets a 2 percent inflation objective measured by the PCE price index. The August 2020 revision introduced two changes: inflation would be allowed to run moderately above 2 percent after periods below it, and policy would respond to *shortfalls* of employment from its maximum level rather than to deviations in either direction (Federal Open Market Committee, 2020). The “balanced-approach (shortfalls)” rule in Variants of the Taylor rule was added to the Monetary Policy Report to reflect that asymmetry. In August 2025 the Committee revised the statement again, returning to a flexible inflation-targeting formulation and dropping the shortfalls language, after the inflation of 2021–2023 had shown the limits of the 2020 design.

The Fed’s practice with rules is transparent and non-binding: the Monetary Policy Report shows the prescriptions of five rules against the actual rate and discusses the differences (Board of Governors of the Federal Reserve System, 2024).

European Central Bank

The ECB’s 2021 strategy review replaced “below, but close to, 2 percent” with a symmetric 2 percent target over the medium term, measured by the HICP, and stated that when rates are near the lower bound, forceful or persistent action may be needed to avoid inflation settling below target (European Central Bank, 2021). The ECB has never published rule prescriptions the way the Fed does; its communication runs through the staff projections and, since 2022, a “data-dependent, meeting-by-meeting” formulation that is close to inflation-forecast targeting in the sense of (Svensson, 1997).

Swiss National Bank

The SNB defines price stability as a rise in the Swiss CPI of less than 2 percent per year, communicates through a *conditional inflation forecast* over three years, and since June 2019 implements policy with the SNB policy rate (Swiss National Bank, 2024). Three episodes make it a case study for this course.

- **2011–2015:** with the policy rate at zero and the franc appreciating, the SNB set a minimum exchange rate of 1.20 francs per euro. The stance was defined by the exchange rate, not by any interest-rate rule.
- **2015–2022:** a policy rate of minus 0.75 percent, well below any Taylor-rule prescription for a small open economy with low inflation, together with foreign-exchange interventions. The shadow-rate logic of Measuring the policy stance applies: the interventions eased beyond what the rate alone shows.
- **2022–2024:** rate increases to 1.75 percent and back down to 0.25 percent within two years as inflation rose above 2 percent and fell back. A first-difference rule on Swiss inflation would have prescribed a similar path, which is a reminder that simple rules often describe behaviour they were never used to set.

Compute a prescription yourself

The exercise below computes the Taylor (1993) and balanced-approach prescriptions for the United States from FRED series and lets you vary r^* . It needs `pandas` and `pandas-datareader`; the output-gap series is

the CBO's, which is itself revised, so treat the result in the spirit of Real-time data and the Taylor rule.

```
import pandas as pd
from pandas_datareader import data as pdr

start = "2000-01-01"
cpi = pdr.DataReader("PCEPILFE", "fred", start).resample("QE").mean()      # core PCE
    ↪ index
gdp = pdr.DataReader("GDPC1", "fred", start)                                # real GDP
pot = pdr.DataReader("GDPPOT", "fred", start)                              # CBO potential
ffr = pdr.DataReader("FEDFUNDS", "fred", start).resample("QE").mean()

infl = 100 * (cpi / cpi.shift(4) - 1)                                       # four-quarter
    ↪ inflation
gap = 100 * (gdp["GDPC1"] / pot["GDPPOT"] - 1)                             # percent
    ↪ output gap
df = pd.concat({"pi": infl.iloc[:, 0], "gap": gap, "ffr": ffr.iloc[:, 0]},
    ↪ axis=1).dropna()

def taylor(df, r_star=2.0, pi_star=2.0, phi_pi=0.5, phi_x=0.5):
    return r_star + df["pi"] + phi_pi * (df["pi"] - pi_star) + phi_x * df["gap"]

df["taylor93"] = taylor(df)
df["balanced"] = taylor(df, phi_x=1.0)
df["taylor93_rstar1"] = taylor(df, r_star=1.0)
print(df.tail(8).round(2))
```

Three things to check in the output. First, the sign of the gap between the actual rate and the prescriptions in 2021–2022, when every rule called for increases long before they came. Second, how much the prescription moves when r^* drops from 2 to 1: exactly one percentage point, at every date. Third, the difference between the two rules whenever the gap is large; that is the *form* choice from Variants of the Taylor rule made visible.

What to take away

- Rules discipline the conversation more than the decision: they force the assumptions about r^* , the gap and the inflation measure into the open.
- The Taylor principle from The Taylor principle and determinacy is the one element every framework shares in practice: no central bank with a credible target lets the real rate fall as inflation rises for long.
- The stance is a comparison, not a number. State what the policy rate is being compared with, and the result becomes defensible.

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