Impact of monetary policy

Lecture 11

Readings

Adão, Gomes and Alpizar (2025) "On how to assess the impact of monetary policy" Revista do Banco de Portugal, (only parts treated in the class notes)

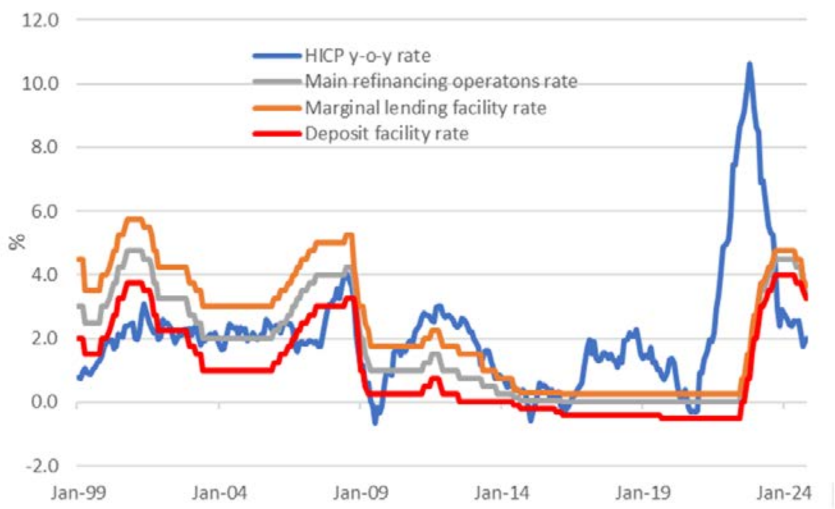
MOTIVATION

Post-pandemic recovery & supply chain disruptions & geopolitical tensions → inflation surge

Central banks' response:

- ECB - Rates ↑ from -0.5% to 4.0% (Jul 2022 – Sep 2023); Inflation peak: 10.6% (Oct 2022)
- BoE - Rates ↑ from 0.1% to 5.25% (Jan 2022 – Aug 2023); Inflation peak: 9.6% (Oct 2022)
- Fed - Rates ↑ from 0%-0.25% to 5.25%-5.5% (Mar 2022 – Jul 2023); Inflation peak: 9% (Jun 2022)

Chart 1 – Euro area inflation rate and policy rates



Sources: Eurostat and ECB.
Notes: Rates – end of period.

MOTIVATION

Why is this question difficult?

- Changes in interest rates often reflect policymakers' responses to economic developments, and economic developments reflect the impact of policy choices.
- There is a **problem of simultaneity**, i.e. the fact that the policy variable of interest (in this case, the policy interest rates) is influenced by the variable they aim to affect, making it **difficult to establish a causal relationship between them.**

MOTIVATION

Taylor-type rule (Taylor, 1993) - describes policy interest rate behaviour as a combination of two components (equation 1):

- a **systematic component** - **“usual” reaction** of the interest rate to macroeconomic developments
- and an **unsystematic (or exogenous) component**: part of the policy rate movements that **deviates from the systematic component**, usually named in the literature monetary policy shocks (or innovations).

$$\underbrace{i_t}_{Policy\ rate} = i^* + \underbrace{\gamma_1(\pi_t - \pi^*) + \gamma_2(y_t - y^*)}_{Systematic\ component} + \underbrace{\varepsilon_t}_{Unsystematic\ component} \qquad (1)$$

$$Policy\ rate = Systematic\ component + Unsystematic\ component$$

where i_t is the key policy interest rate, i^* is the equilibrium interest rate, π_t is current inflation, π^* is the inflation target, y_t is current output, y^* is potential output, ε_t is a monetary policy shock, and γ_1 and γ_2 are parameters.

MOTIVATION

- Researchers analyze **exogenous monetary policy shocks** (ε_t) to be able to causally estimate the macroeconomic impact of monetary policy.
- Though shocks explain only a **small fraction** of economic fluctuations (Leeper et al., 1996; Smets & Wouters, 2003), they provide a **clean identification** of policy effects.
- However, the approach focuses on the exogenous part of monetary policy, so it **does not address systematic policy responses**.
- **Counterfactual analysis** evaluates alternative policy paths by comparing actual vs. hypothetical economic outcomes. This includes **both systematic and exogenous policy changes**.
- We will explore these two approaches to answer our question of interest.

IMPACT OF MONETARY POLICY SHOCKS & STATISTICAL MODELS

Since the seminal work of Sims (1980), VAR models became a core tool in the macroeconomic literature.

A simple two-dimensional VAR(1) setup

$$x_t = \beta_{11}x_{t-1} + \beta_{12}y_{t-1} + \varepsilon_{xt}$$

$$y_t = \beta_{21}x_{t-1} + \beta_{22}y_{t-1} + \varepsilon_{yt}$$

Matrix representation:

$$\begin{bmatrix} x_t \\ y_t \end{bmatrix} = \begin{bmatrix} \beta_{11} & \beta_{12} \\ \beta_{21} & \beta_{22} \end{bmatrix} \begin{bmatrix} x_{t-1} \\ y_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{xt} \\ \varepsilon_{yt} \end{bmatrix}$$

To be able to extract an economic interpretation from the residuals in VAR models, it is essential to identify the structural shocks.

IMPACT OF MONETARY POLICY SHOCKS & STATISTICAL MODELS

There are several types of identification assumptions that can be used and eventually combined to identify structural shocks in VAR models (see Ramey, 2016, for a survey).

Short-run restrictions

Restrict the contemporaneous interaction among some model variables.

E.g. Prices (which are sticky) do not respond to the shock within the period, while financial variables do.

Sign restrictions

Restrict the sign of the response of certain variables.

E.g. Monetary stimulus will not have a negative effect on economic activity in the short run.

Long-run restrictions

Restrict the long-run response of the model variables to some shocks.

E.g. The long-run response of real GDP to a monetary policy shock is assumed to be null

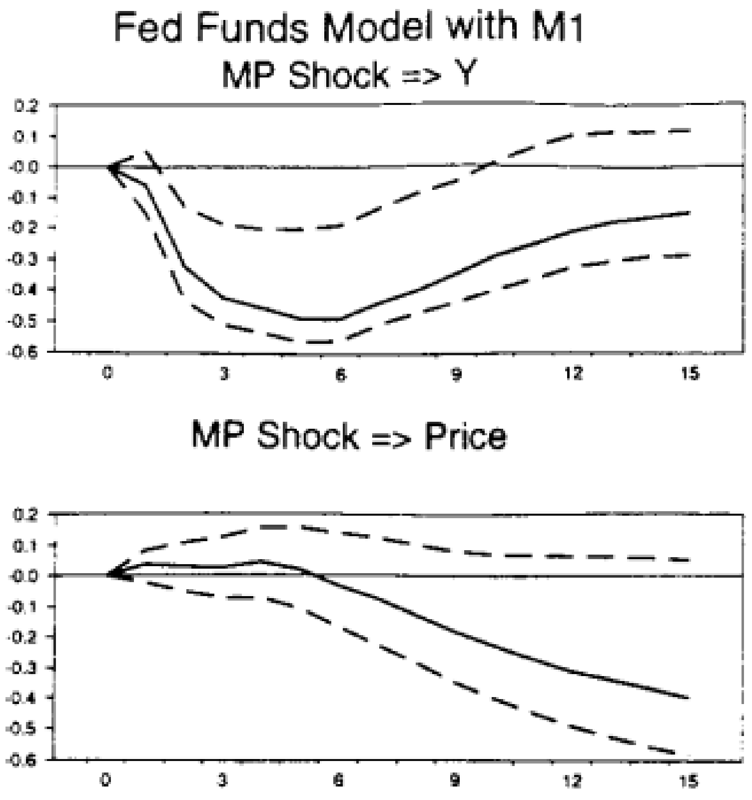
External instruments

Rely on external data that correlates with specific shocks but is exogenous to the other variables in the model.

E.g. Narrative approach; High Frequency Identification

IMPACT OF MONETARY POLICY SHOCKS & STATISTICAL MODELS: **MAIN RESULTS**

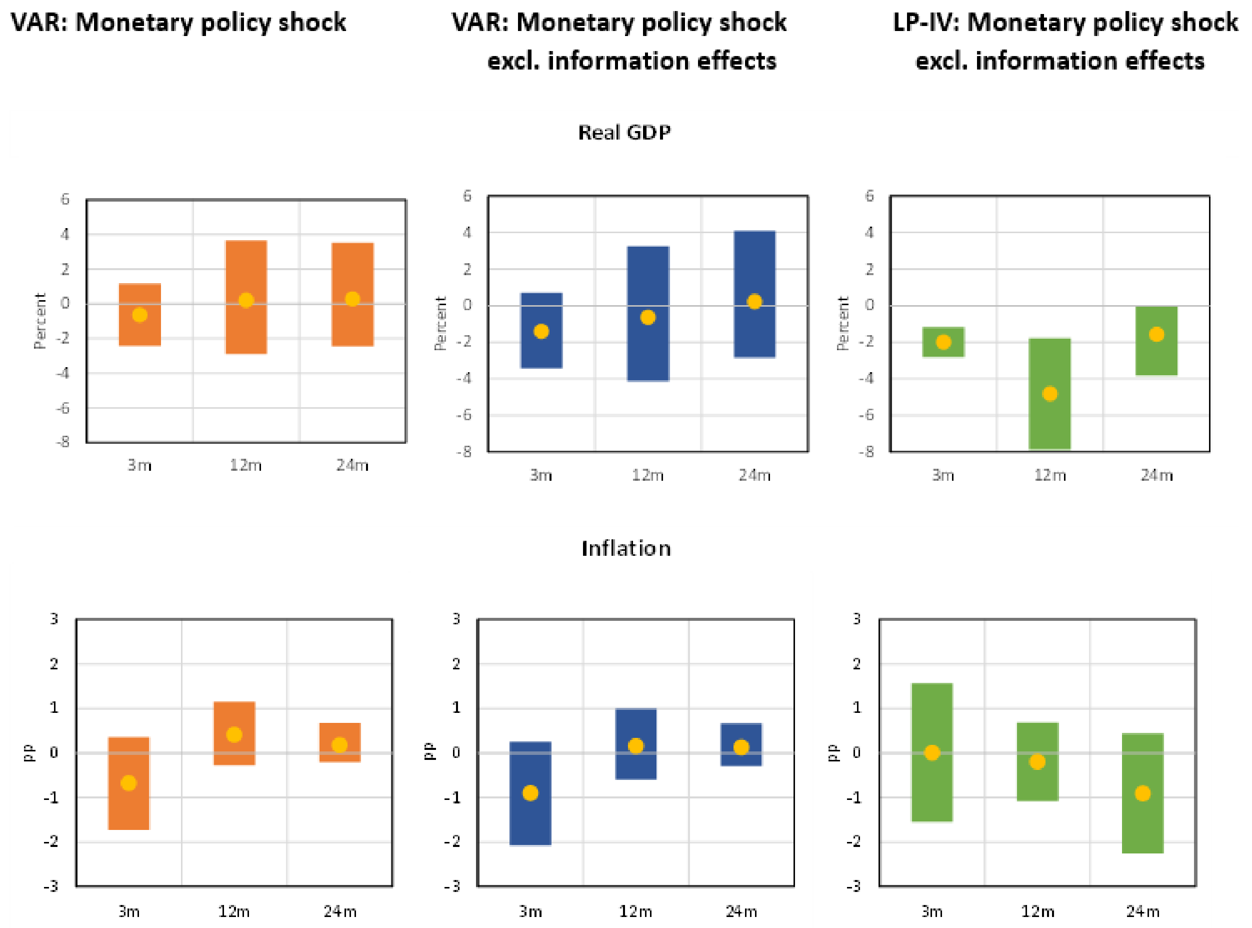
In the past and using US data …



CEE 1999 (SVAR, 1965q3–1995q3) – contractionary FF rate policy shock

IMPACT OF MONETARY POLICY SHOCKS & STATISTICAL MODELS: **MAIN RESULTS**

Chart 2 – Monetary policy shock in statistical models - euro area main variables



THE MACROECONOMIC IMPACT OF SYSTEMATIC MONETARY POLICY

- Researchers have isolated the unsystematic (i.e., exogenous) part of monetary policy to understand its effects.
- However, policymakers are often interested in understanding the **impact of systematic actions, that is, of pursuing a different policy or even of implementing a specific interest rate path** (as most monetary policy actions are not exogenous).
- **Counterfactual analysis** helps explore the impact of both systematic and unsystematic policy through “what if” scenarios.

➔ Models where counterfactuals are implemented should be invariant to changes in policy, to render the analysis meaningful.

IMPACT OF SYSTEMATIC MONETARY POLICY

Statistical models, such as VAR models, have been used in the literature to build policy counterfactuals.

- **Sims and Zha (1998)** – Compares the responses of the macroeconomy to a non-policy shock with and without a monetary policy response.
- This method is **subject to the Lucas critique**, though the authors argued that it **would take time for individuals to realize** that policy is not responding as usual and as such their results are of interest.
- **Leeper and Zha (2003)** - Propose a counterfactual framework that mitigates the Lucas critique if policy changes are modest and do not alter expectations significantly.

IMPACT OF SYSTEMATIC MONETARY POLICY

IS equation and Phillips curve

$$y_t = E_t y_{t+1} - \frac{1}{\sigma}\left(i_t - \pi_{t+1}\right) \tag{1}$$

$$\pi_t = \beta E_t \pi_{t+1} + \kappa y_t + \varepsilon_t + \rho_\varepsilon \varepsilon_{t-1} \tag{2}$$

and monetary policy

$$i_t = \theta \pi_t + v_t \tag{3}$$

ε_t is a cost-push shock that induces a first-order moving average wedge in the Phillips curve implying that the effects of the shock will fully die out after two periods

IMPACT OF SYSTEMATIC MONETARY POLICY

We wish characterize the behavior of this economy in response to the cost-push shock ε_0 but not under the baseline policy rule (3), but instead under some counterfactual policy rule of the form

$$i_t = \widetilde{\theta}\pi_t \tag{4}$$

Assume an econometrician can in principle estimate how the macroeconomic aggregates $\{y_t, \pi_t, i_t\}$ respond to the cost-push shock ε_t as well as the policy shocks v_t under the baseline rule (3).

Let those functions be

$$y_t = a_y\varepsilon_t + b_y\varepsilon_{t-1} + c_y v_t$$

$$\pi_t = a_\pi\varepsilon_t + b_\pi\varepsilon_{t-1} + c_\pi v_t$$

$$i_t = a_i\varepsilon_t + b_i\varepsilon_{t-1} + c_i v_t$$

IMPACT OF SYSTEMATIC MONETARY POLICY

The impulse responses to a time 0 cost-push shock will die at $t = 2$: $\varepsilon_0 = 1$, $\varepsilon_t = 0$, for $t \geq 1$.

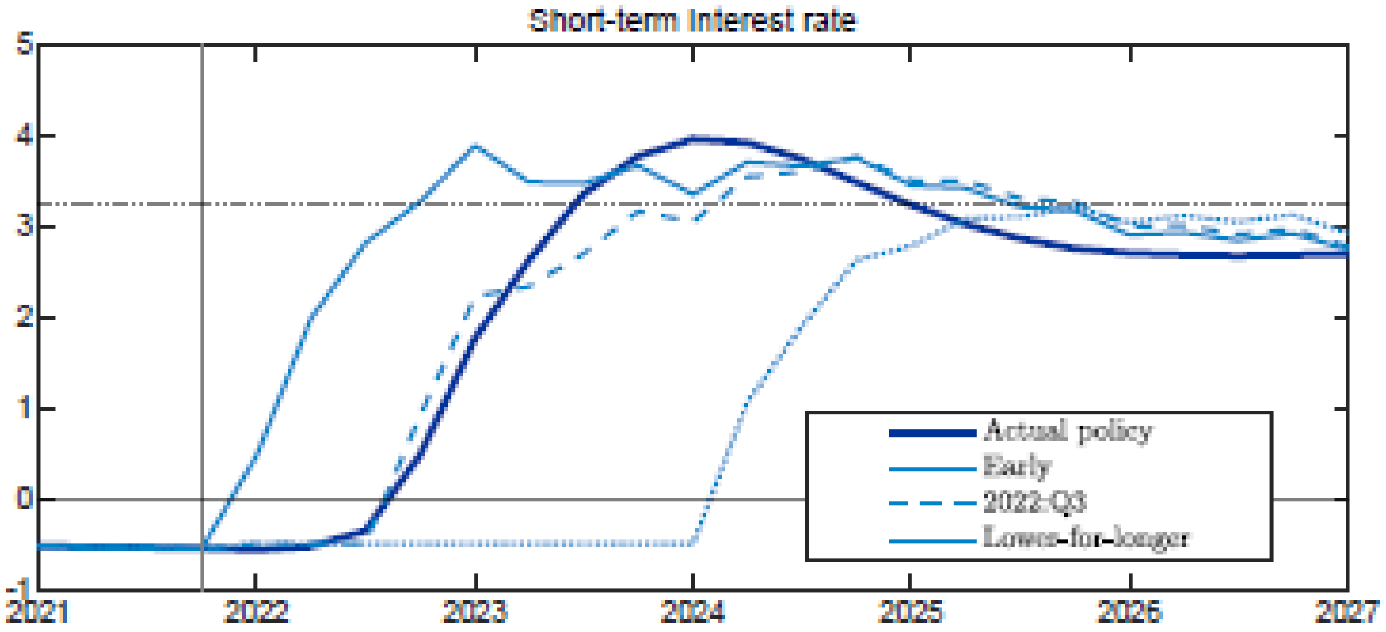
The key idea is to choose policy shocks $\widetilde{v}_0$ and $\widetilde{v}_1$ to the baseline rule in order to mimic the desired counterfactual rule

$$i_0 = a_i \varepsilon_0 + c_i \widetilde{v}_0 = \widetilde{\theta}\left(a_\pi \varepsilon_0 + c_\pi \widetilde{v}_0\right)$$

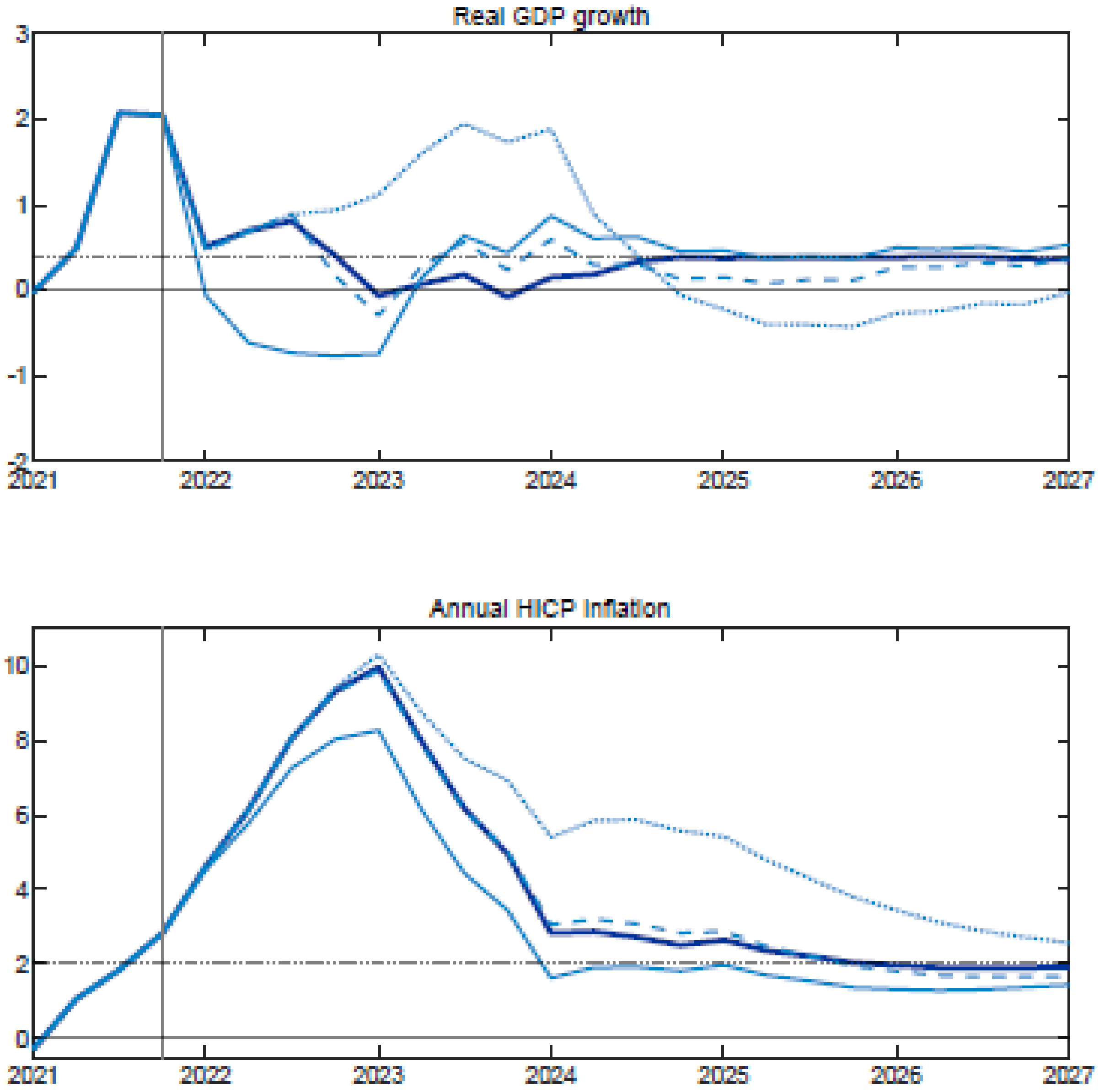
$$i_1 = b_i \varepsilon_0 + c_i \widetilde{v}_1 = \widetilde{\theta}\left(b_\pi \varepsilon_0 + c_\pi \widetilde{v}_1\right)$$

Figure 2 depicts the rule-based policy counterfactuals whereby the ECB ended its lower-for-longer policy and followed the historical reaction function since 2021:Q4 (solid light blue lines), 2022:Q3 (dashed light blue lines), or extended the lower-for-longer policy until 2024:Q1 (dotted light blue lines), compared with historical data and baseline projections (solid dark blue lines).

Figure 2: Rule-based counterfactuals in 2021:Q4, 2022:Q3, and 2024:Q1



IMPACT OF SYSTEMATIC MONETARY POLICY



KEY MESSAGES

- ➔ **Estimating the impact of monetary policy on the real economy is not straightforward:** Monetary policy and the economy influence each other, making it difficult to measure the true effect of policy changes.
- ➔ **Shocks help studying causality**: Researchers focus on unexpected policy changes since it helps them to identify a causal impact, but these seem to have become harder to detect, arguably due to more systematic policy approaches.
- ➔ **The magnitude of the estimated effects of monetary policy depends on the model used, the sample period, the countries being analysed, among other factors**. Results must be interpreted with caution. However, there is a general qualitative consensus: an unexpected increase in the policy rate induces a reduction in real activity and prices.
- ➔ **Counterfactuals are useful to include the effects of systematic monetary policy, but the literature still must face many challenges.**