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Monetary Policy Conditions Indicator in the Euro Area and the United States

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Abstract

This paper assesses the monetary policy stance in the euro area and the United States over the past two decades, a period characterized by challenging crises. Following the Great Financial Crisis, central banks increasingly relied on unconventional tools alongside interest rates. However, compared to approaches that consider only the official policy rate, unconventional instruments complicate the assessment of the monetary policy stance. To address this issue, I construct a Monetary Policy Conditions Index (MCI) that combines medium-term interest rates and central bank balance sheet measures, following the methodology of Mojon et al. (2025), using a Bayesian VAR estimated on monthly data from 2004 to 2025. I find that the euro area MCI is almost entirely driven by the interest rate, while the balance sheet component carries a much larger weight in the US. This difference reflects distinct objectives rather than differences in effectiveness. In the US, balance sheet policy focused on accommodation, while the ECB also used it to preserve monetary transmission across member states, which is reflected in the dynamics of the MCI. The findings have implications for how each central bank calibrates its policy stance going forward.

1 Introduction

Following the Great Financial Crisis (GFC) and the subsequent sovereign bond crisis that affected the euro area in the early 2010s, the European Central Bank (ECB), like many central banks globally, faced significant constraints as interest rates reached the effective lower bound (ELB). In response, the ECB implemented a range of unconventional monetary policy measures, including negative interest rates, forward guidance, and large-scale asset purchases. While negative interest rates have lost their relevance in recent years, the significantly expanded central bank balance sheets remain a prominent feature of monetary policy. The ECB has been reducing the size of its balance sheet since mid-2022, yet it identified the need to have a structural portfolio as part of its future monetary policy toolkit (ECB, 2024).

With the adoption of unconventional or non-standard monetary policy tools, the official interest rate alone has become an insufficient indicator of the overall monetary policy stance. During the period of negative interest rates, so-called shadow rates have been proposed to approximate the stance of monetary policy. However, shadow rates tend to converge to the actual policy rate once they rise above the ELB, limiting their usefulness when both policy rates and asset purchases are actively determining the monetary policy stance.

To address this limitation, Mojon et al. (2025) introduce a Monetary Policy Conditions Index (MCI), which combines information from both the policy interest rate and the size of the central bank's balance sheet. The resulting measure is similar to the shadow rate but without the drawback of converging to the policy rate once it rises above the ELB. It, thus, provides a more comprehensive framework to assess the monetary policy stance across different economic environments.

In this analysis, I extend the analysis of Mojon et al. (2025) by constructing an MCI for the euro area that explicitly incorporates central bank balance sheet size into the measurement of the monetary policy stance. To the best of my knowledge, this is the first such measure for the euro area. Using the same framework for both the US and the euro area allows for a more consistent comparison of how balance sheet developments shape the monetary policy stance in both economies.

The objective is also to examine the results through the lens of distinct objectives for large-scale asset purchases in the euro area and the United States. In the US, asset purchases were primarily aimed at easing financial conditions and providing further policy accommodation when interest rates were at the ELB. In the euro area, the objective was twofold: to provide policy accommodation, like in the US, and to ensure the smooth transmission of monetary policy as the heterogeneous banking systems and segmented financial markets across euro area members posed challenges related to policy transmission.

The main finding is that the euro area's MCI places a smaller weight on the balance sheet component compared to the US MCI. Part of this difference reflects the statistical properties of the underlying series, since the ECB balance sheet is considerably more volatile relative to trend GDP than the Federal Reserve's. The remaining difference is better explained by the additional objectives that motivated ECB balance sheet operations rather than by difference in policy effectiveness. Impulse response analysis indicates broadly similar transmission mechanisms across the two economies, although the US MCI shows a stronger response to demand and risk aversion shocks, reflecting

the greater weight of the balance sheet component and its sensitivity to financial market conditions.

The remainder of the paper is organized as follows. Section 2 describes the data, while Section 3 outlines the methodology. Section 4 presents the empirical results and compares the MCIs and impulse responses between the euro area and the United States. Section 5 concludes.

2 Data

This analysis covers the period from February 2004 to November 2025 and is based on four key variables: financial conditions, inflation, output gap, and monetary conditions. The data selection and processing method described below ensures that the constructed indicators for both economies are methodologically consistent and suitable for direct comparison.

For the euro area, financial conditions are measured using the Bloomberg Euro Area Financial Conditions Index (BFCI). I use the end-of-month BFCI with its sign inverted, so that higher values indicate tighter conditions, consistent with data for the US. The inflation measure is core inflation, specifically the Harmonised Index of Consumer Prices (HICP) excluding energy, food, alcohol, and tobacco. The output gap is constructed from real GDP data by first applying the one-sided Hodrick-Prescott (HP) filter to quarterly GDP to estimate the trend component. Both the actual and trend series are then linearly interpolated to a monthly frequency, and the output gap is calculated as the percentage deviation of actual GDP from its trend.

The monetary policy conditions indicator for the euro area is composed of two elements. The medium-term policy rate is proxied by the 2-year Overnight Index Swap (OIS) rate. The balance sheet component combines the stock of securities held for monetary policy purposes and the outstanding amount of longer-term refinancing operations (LTROs). The combined balance sheet components are normalized by nominal trend GDP, which is derived by applying the one-sided HP filter to quarterly nominal GDP and subsequently interpolating the series to a monthly frequency.

For the United States, financial conditions are measured using the National Financial Conditions Index (NFCI), which is available at a weekly frequency; for each month, the last available weekly observation is used. Inflation is measured by core Personal Consumption Expenditures (PCE), which excludes food and energy components. The output gap is constructed in a manner analogous to the euro area, using quarterly real GDP estimates provided by the Congressional Budget Office.

The US monetary policy conditions indicator also consists of two components. The medium-term policy rate is represented by the market yield on US Treasury securities at 2-year constant maturity from Federal Reserve Economic Data (FRED). The balance sheet component is the total holdings in the System Open Market Account (SOMA), with the last weekly observation in each month used as the respective month's value. Total SOMA holdings are then normalized by quarterly nominal GDP, detrended using the one-sided HP filter, and linearly interpolated to a monthly frequency.

3 Methodology

The empirical framework is based on a vector autoregression (VAR) model by Mojon et al. (2025) that captures the dynamic interactions between monetary policy and key macro-financial variables. The VAR is specified as:

$$X_t = \sum_{\tau=1}^{p} B_\tau X_{t-\tau} + \varepsilon_t\,, \quad \varepsilon_t \sim N(0, \Sigma)$$

where the vector of variables X_t contains financial conditions (f_t), inflation (π_t), output gap (y_t), and the monetary policy conditions index (m_t):

$$X_t = [f_t, \pi_t, y_t, m_t]'$$

B_τ is the matrix of coefficients, and the selected number of lags is $p = 2$. The monetary policy conditions index is constructed as a linear combination of individual policy variables m_{it}:

$$m_t = b\, m_{1t} + (1 - b) m_{2t}$$

where m_{1t} is the medium-term interest rate and m_{2t} is the size of the central bank balance sheet relative to GDP. The weight b reflects the relative importance of each component and is constrained to the interval (0,1). Both weights sum to 1. Lower values of the monetary policy conditions index indicate more accommodative monetary conditions, whereas higher values indicate tighter monetary conditions.

A Bayesian approach is used to estimate b jointly with the VAR parameters. The prior for the US is set at $b = 0.95$ (Mojon et al., 2025)[1]. Literature suggests that $b = 0.95$ is a valid prior also for the euro area. For example, Altavilla et al. (2021) show that the ECB asset purchases amounting to 10 percent of euro area GDP compress 10-year sovereign bond yields by around 65 basis points, which would imply $b = 0.94$[2]. Similarly, ECB calculations (Schnabel, 2021), following the methodology by Eser et al. (2019), point to a 30-basis points reduction in 2-year sovereign bond yields as a result of PEPP purchases of more than €1.3 trillion assets, or nearly 12% of that year's euro area GDP. This would imply $b = 0.98$. Based on these two references, $b = 0.95$ seems an appropriate prior also for the euro area. Thus, the prior suggests that the monetary policy stance is primarily driven by the interest rate component.

The VAR coefficient matrix B is estimated under a flat prior, yielding a Gaussian posterior centered at the OLS estimates. The covariance matrix Σ is updated using standard inverse-Wishart conjugate updating. Estimation is performed using Markov Chain Monte Carlo (MCMC), employing Gibbs sampling for B and Σ, and a Metropolis-Hastings step for b, with 100,000 iterations and a burn-in period of 20,000 draws. The proposal standard deviation for b is set to 0.1, resulting in acceptance rates of 0.29 for the US and 0.20 for the EA. For identification of structural shocks, the same sign restrictions as in Mojon et al. (2025) are imposed (Table 1). The shocks are identified following the algorithm of Rubio-Ramírez et al. (2010).

[1] Mojon et al. (2025) draw on literature indicating that a reduction in the balance sheet of about 8–9% of GDP is roughly equivalent to a 50-basis point increase in the policy rate (Crawley et al., 2022; Wei, 2022).

[2] By solving the equation for m_t: $0.65 * b = (1 - b) * 10$; $b = 0.939$

Table 1: **Sign restrictions**

Variable	Risk aversion shock	Supply shock	Demand shock	Monetary shock
f_t	+			+
π_t		+		- (6m)
y_t		-	+	- (6m)
m_t	-		+	+

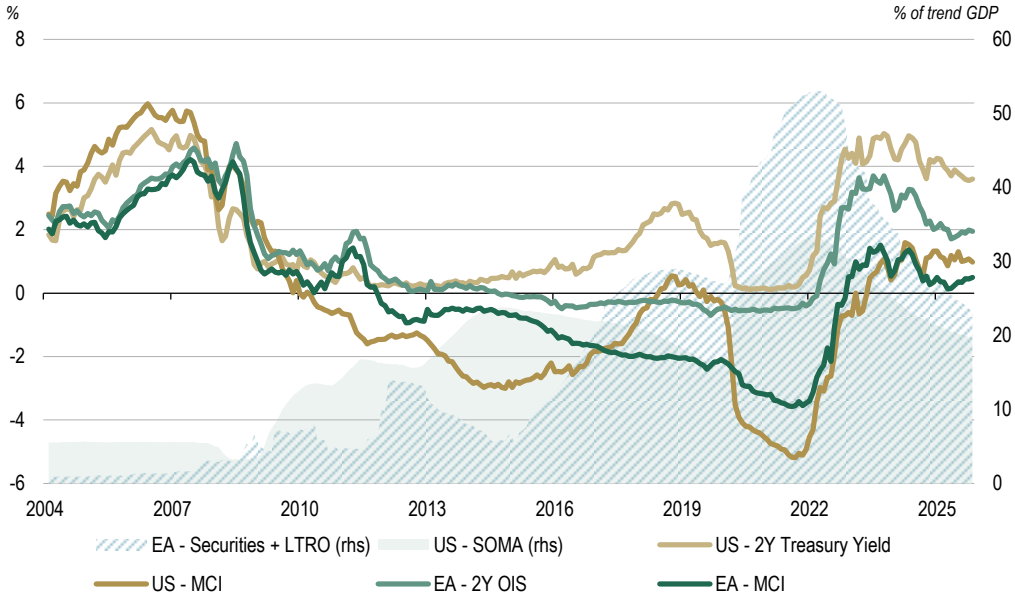
Note: The table shows sign restrictions used to identify risk aversion, adverse supply, positive demand, and contractionary monetary policy shocks. The effects take place on impact, except for the effect of monetary policy shock on inflation and demand, which takes place with a 6-month lag. Empty cells imply no restrictions.

4 Results

4.1 MCI Composition and Dynamics

For the euro area, the median posterior value for the weight b is estimated at 0.95. This means that the MCI is composed of 95% of the 2-year OIS rate and 5% of the negative ECB balance sheet size as a share of nominal trend GDP. Figure 1 shows the MCI[3] for the euro area and the US, alongside the medium-term policy rate proxies and the balance sheet size as a percentage of trend GDP in both economies.

Figure 1: **Comparison between MCI, interest rates, and balance sheet size for the EA and the US**



Note: Dark green and dark gold series represent the MCI for the EA and the US, respectively, based on the estimated value of b. Light green and light gold series correspond to the 2-year policy rate proxies: the 2-year OIS for the EA and the yield on U.S. Treasury securities at 2-year constant maturity for the US. Shaded areas represent size of the central bank balance sheet as a percentage share of trend GDP, shown in light green for US and diagonal pattern for the EA.

The MCI tracks the 2-year OIS rate quite closely until approximately 2012, primarily because the balance sheet relative to euro area GDP was below 10%. The first significant departure from the conventional policy framework occurred when the ECB introduced three-year Longer-Term Refinancing Operations (LTROs) in late 2011. These

[3] In Figure 1, the MCI is normalized to the level of interest rates according to the formula $MCI_t = m_{1t} + (1 - b) * m_{2t}/b$ to facilitate direct comparison with the interest rates.

operations provided additional monetary policy accommodation at a time when policy rates were approaching the effective lower bound. Together with securities market interventions (e.g. SMP, OMT) announced, these measures aimed to counter disinflationary pressures following the global financial crisis and contain sovereign debt market stress (Rostagno et al., 2019). As a result of the large-scale liquidity provision through LTROs, the ECB's balance sheet expanded significantly, and the MCI entered negative territory in November 2011.

In 2014, after inflation failed to pick up, growth remained weak, and countries were still facing the sovereign bond crisis, the ECB further expanded its toolkit by introducing new measures, such as negative interest rates, targeted longer-term refinancing operations (TLTROs), the large-scale Asset Purchase Programme (APP), and forward guidance on the size, duration of the APP, and the policy rate outlook.

The balance sheet expanded substantially between 2015 and 2017, reaching almost 30% of euro area trend GDP. During this period, the APP became an important monetary policy instrument, as the policy rate had reached the ELB. Additionally, because financial conditions were fragmented across the euro area, the APP was deemed highly effective in transmitting monetary policy across member states (Rostagno et al., 2019). The MCI became progressively more accommodative between 2015 and 2019.

In the months prior to the onset of the COVID-19 pandemic, euro area inflation remained persistently below target[4]. In response, the ECB increased its expansionary stance in 2019 by cutting the policy rate further into negative territory, introducing a new series of TLTROs, and resuming asset purchases. When the pandemic hit, the response was forceful. The Pandemic Emergency Purchase Programme (PEPP) and additional LTROs had a threefold objective: to ensure that the overall stance was sufficiently accommodative, to stabilize financial markets in order to safeguard monetary policy transmission, and to provide ample liquidity to stimulate bank lending (Aguilar et al., 2020).

As a result of these measures, the balance sheet expanded rapidly, reaching more than 50% of trend GDP by the turn of 2021–2022. While the 2-year OIS rate remained broadly flat, the MCI moved substantially lower, indicating that although rates were at the effective lower bound, monetary accommodation continued to increase due to the expanding balance sheet.

The commitments made under forward guidance meant that the ECB did not immediately react to the inflation spike in 2021. Consequently, the gap between the MCI and the 2-year interest rate continued to widen until the end of 2021, when expectations of future rate hikes, combined with a balance sheet that stopped expanding and reached its peak[5], led the MCI to tighten significantly. The index became positive in December 2022. Although balance sheet normalization continues, its level remains large enough to provide some accommodative bias, so the MCI remains below the 2-year interest rate.

In a floor system, which the ECB de-facto achieved with ample reserves, Baglioni (2024) demonstrates that interest rate policy and balance sheet policy become two independent instruments for implementing or signaling the monetary policy stance. The central bank can set different interest rates for the same amount of liquidity in the system, and vice versa, it can adjust the size of liquidity operations without changing the level of interest rates. Baglioni (2024) argues that this property is particularly relevant

[4] The mandate at the time was "to maintain inflation rates below, but close to, 2% over the medium term".

[5] The balance sheet peaked at around 53% of trend GDP in May 2022.

for the euro area, as the interest rate can be used to set the monetary policy stance, while balance sheet operations can address additional challenges, such as the fragmentation of financial conditions across member states.

If the ECB intends to use balance sheet operations as an independent instrument alongside interest rates, reserve levels will have to be maintained at a sufficiently high level to support a floor-type operational framework. A return to a corridor system could weaken the balance sheet's role in determining the monetary policy stance[6].

4.2 Comparison with the United States

For the United States, the estimation yields a median posterior value for the weight b equal to 0.81, which is consistent with the findings of Mojon et al. (2025). Therefore, the MCI for the US is composed of 81% yield on US Treasury securities at 2-year constant maturity and 19% negative Federal Reserve SOMA as a share of US nominal trend GDP. The US MCI, thus, places a greater weight on the balance sheet component than the corresponding index for the euro area.

Part of this difference reflects the statistical properties of the underlying variables rather than differences in the importance of balance sheet policies. The ECB balance sheet relative to trend GDP is substantially more volatile than that of the Federal Reserve, exhibiting roughly twice the standard deviation over the sample period and reaching a peak above 50% of trend GDP, compared with less than 35% for the Federal Reserve. Consequently, even the relatively small estimated weight on the ECB balance sheet may imply a sizeable contribution to the overall monetary policy indicator.

The relatively smaller contribution of the balance sheet component to the euro area MCI should not be interpreted as evidence that the ECB's unconventional policies were less effective than those of the Federal Reserve. Rather, it reflects the different objectives and institutional environment in which the ECB operated. In addition to providing monetary accommodation, the ECB's balance sheet policies played a crucial role in compressing sovereign bond spreads (Alberola et al., 2022; Boeckx et al., 2017; Eijffinger & Pieterse-Bloem, 2023) and thus preserving the transmission of monetary policy across member states.

In contrast to the ECB, the Federal Reserve adopted an active balance sheet policy much earlier, initiating large-scale asset purchases already in 2008 in response to the GFC. The ECB lagged behind because of legal and political constraints associated with running monetary policy across multiple sovereign states. While the Federal Reserve continued expanding its balance sheet until 2014, the ECB's balance sheet actually contracted between 2013 and early 2015 as euro area banks repaid the large-scale LTRO funding provided during the sovereign debt crisis. In late 2014 the Fed entered a period where balance sheet size plateaued as the central bank ended quantitative easing and started reinvesting principal payments from maturing securities. In contrast, the ECB began expanding its balance sheet again in 2015 through the APP and TLTRO. This divergence in balance sheet policies is reflected in the MCI dynamics. The US MCI gradually converged toward the 2-year Treasury yield between 2015 and 2020, while the euro area MCI became increasingly accommodative as ECB asset purchases intensified.

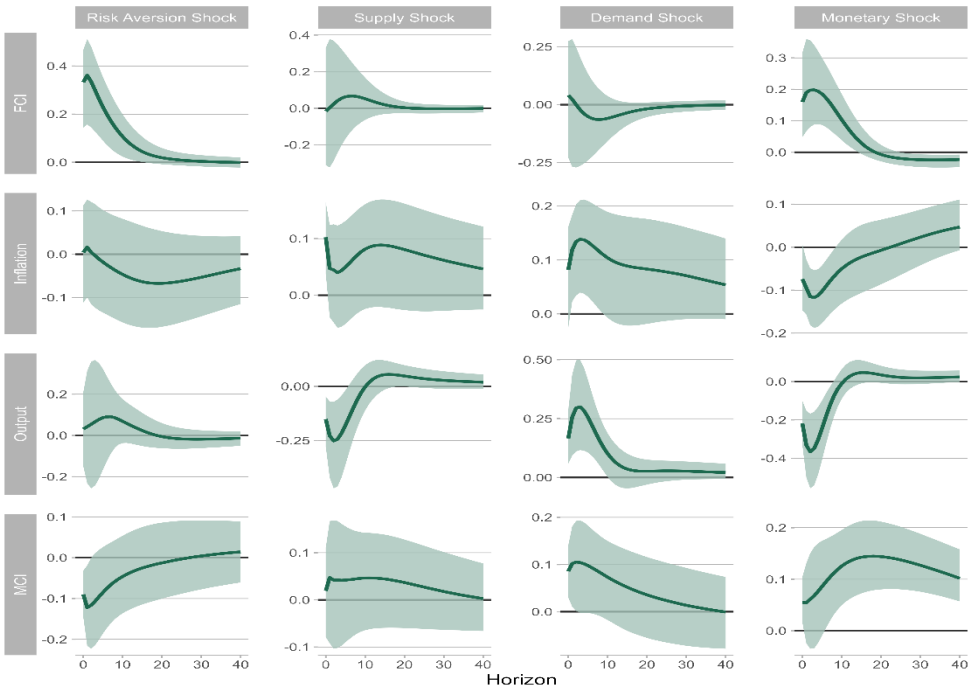
During the COVID-19 shock and the subsequent surge in inflation, the balance sheets of both central banks followed a broadly similar dynamic. The ECB and the Federal

[6] Future research could estimate a time-varying b to trace how the balance sheet's contribution to the MCI evolves over time and potentially offer further evidence on the shift toward a floor-type operational framework.

Reserve substantially expanded their balance sheets to provide additional monetary accommodation, with the US MCI reaching historically low levels because the balance sheet component carries a considerably larger weight than in the euro area. As the pandemic shock subsided and inflation became the primary policy concern, both central banks began normalizing their balance sheets, causing both MCIs to gradually converge toward their respective medium-term interest rates. However, the ECB's balance sheet relative to GDP declined more rapidly than that of the Federal Reserve, meaning that the Fed's balance sheet continues to exert a stronger accommodative influence on the US MCI than the ECB's balance sheet does on the EA MCI.

The impulse response function (IRF) analysis for the euro area (Figure 2) reveals the dynamics in response to identified structural shocks. Financial conditions tighten significantly and for longer than a year following the risk aversion and monetary policy shocks. Inflation in the euro area exhibits a strong and statistically significant negative response to a monetary policy shock, with the effect persisting for almost a year. This result attests to the effectiveness of monetary policy in anchoring inflation expectations over a medium-term horizon. On the other hand, output is also significantly lower for more than a year following a monetary policy shock. This shock also leads to a persistently higher MCI after some months, which may reflect the gradual, but long-lasting transmission of balance sheet policies.

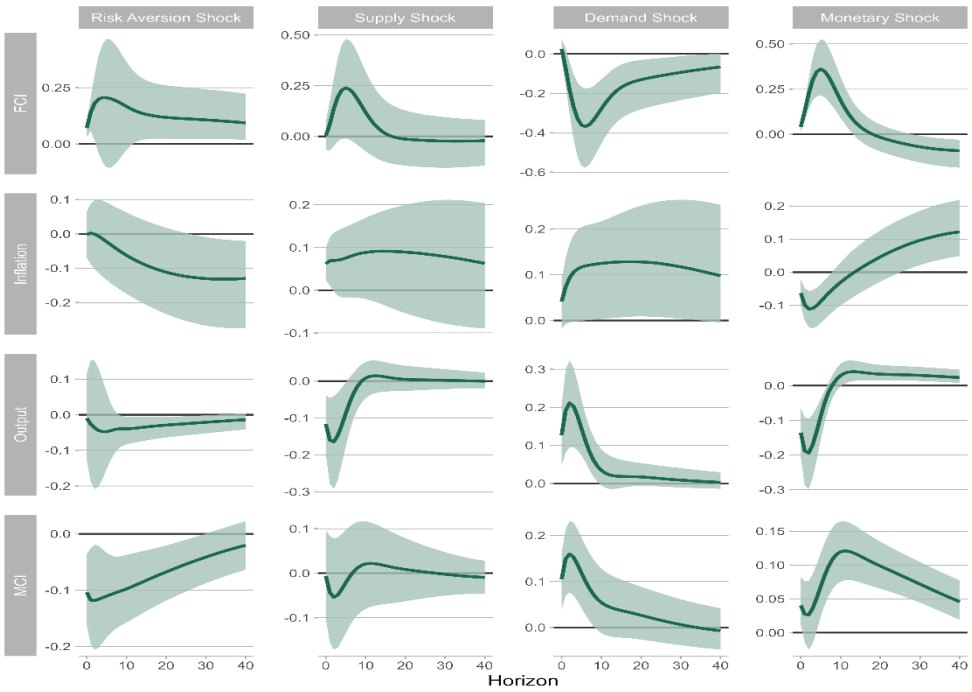
Figure 2: **Impulse response functions for the euro area**



Note: The figure displays impulse response functions (IRFs) to the four identified shocks, shown over a horizon of up to 40 months. The dark green line represents the median IRF, while the green shaded area indicates the 68% credible intervals.

These patterns are broadly observed also for the US (Figure 3), though some differences emerge. In particular, financial conditions in the US remain looser for a much longer period following a demand shock. The responses of inflation and output to the various shocks are broadly similar across the two economies, indicating comparable macroeconomic transmission mechanisms. On the other hand, the MCI is significantly and persistently looser following a risk aversion shock and responds to a demand shock by tightening significantly. This may be attributed to the greater weight assigned to the balance sheet component and its fundamental dependence on financial market conditions in the United States.

Figure 3: **Impulse response functions for the US**



Note: The figure displays impulse response functions (IRFs) to the four identified shocks, shown over a horizon of up to 40 months. The dark green line represents the median IRF, while the green shaded area indicates the 68% credible intervals.

5 Conclusion

This analysis aims to provide a comprehensive assessment of the monetary policy stance in the euro area and the United States. In these two economies central banks have increasingly relied on a combination of conventional and unconventional monetary policy tools. I compute a Monetary Policy Conditions Index that integrates both medium-term interest rates and central bank balance sheet measures (Mojon et al., 2025), allowing for a direct and consistent comparison across the two economies.

The results reveal a significant difference in the composition of the MCI between the euro area and the United States. The estimated coefficients indicate that changes in the balance sheet have a smaller marginal effect on the MCI in the euro area than in the United States. This difference partly reflects statistical properties as the ECB balance sheet is considerably more volatile relative to trend GDP than the Federal Reserve's. The remaining difference is better explained by institutional factors than by differences in policy effectiveness. The Federal Reserve adopted an active balance sheet policy earlier and more consistently, while the ECB's asset purchases were shaped by the euro area's institutional and political constraints, and had an additional aim of containing fragmentation and compressing sovereign spreads alongside providing accommodation. The smaller weight on the ECB's balance sheet should therefore not be read as evidence that its unconventional measures were less effective, but as a reflection of the different objectives and environment in which they were deployed.

Impulse response analysis shows that in both the euro area and the United States, monetary policy shocks lead to tighter financial conditions and lower inflation and output, in line with theoretical expectations. In both economies, the MCI remains persistently tighter following a monetary policy shock, indicating the long-lasting effects of asset purchase programmes on the policy stance. However, unlike in the euro area, financial conditions in the US remain looser for longer following demand shocks, and the MCI responds more strongly to risk aversion shocks, reflecting the greater importance of the balance sheet component and its relationship to financial market conditions.

To summarize, while an expanded balance sheet is a lasting feature of the modern monetary landscape, its accommodative impact differs between the euro area and the United States. For the ECB, the interest rate remains the dominant tool shaping the monetary policy stance, while balance sheet policies play a complementary role. In the US, the balance sheet exerts a larger and more direct influence on financial and macroeconomic conditions, making the overall monetary stance more sensitive to shifts in financial conditions.

Some further conclusions can be drawn for the euro area specifically. First, the evidence indicates that balance sheet policies were effective in providing accommodation and preserving policy transmission. Second, the IRF results show that balance sheet transmission operates persistently and with a lag, implying that the ECB should calibrate the pace of any future balance sheet operations with these effects in mind. Third, if the ECB intends to keep balance sheet policy available as a tool independent of interest rates, which seems prudent given the euro area's exposure to fragmentation risk, it will need to sustain sufficiently ample reserves, since a return to a corridor system would weaken the balance sheet's role in shaping the policy stance.

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7 Abbreviations

APP	Asset Purchase Programmes
BFCI	Bloomberg Euro Area Financial Conditions Index
EA	Euro Area
ECB	European Central Bank
ELB	Effective Lower Bound
FRED	Federal Reserve Economic Data
GDP	Gross Domestic Product
GFC	Global Financial Crisis
HICP	Harmonized Index of Consumer Prices
HP	Hodrick - Prescott
IRF	Impulse Response Functions
LTRO	Longer-Term Refinancing Operation
MCI	Monetary Policy Conditions Index
MCMC	Markov Chain Monte Carlo
NFCI	National Financial Conditions Index
OIS	Overnight Index Swap
OLS	Ordinary Least Squares
OMT	Outright Monetary Transactions
PCE	Personal Consumption Expenditures
PEPP	Pandemic Emergency Purchase Program
SOMA	System Open Market Account
SMP	Securities Markets Programme
TLTRO	Targeted Longer-Term Refinancing Operation
US	United States
VAR	Vector Autoregression