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A NEW MEASURE OF THE STANCE OF EUROZONE MONETARY POLICY

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ABSTRACT

We present a new measure of the stance of monetary policy for the eurozone. We call this measure the NGDP gap, as it is the percentage difference between actual nominal GDP and an estimated neutral level of nominal GDP based on a rolling average of forecasts. Using a vector autoregression and local projections, we show that changes in the NGDP gap affect unemployment and core inflation. By comparing the NGDP gap with an analogous measure for the United States, we show how eurozone inflation has been driven more by supply shocks than US inflation.

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DISCLAIMER

A New Measure of the Stance of Eurozone Monetary Policy

Introduction

Central bankers face a critical question: What is the current stance of monetary policy? An excessively contractionary monetary policy can produce a recession, while an excessively expansionary monetary policy leads to inflation.

While understanding the stance of monetary policy may be straightforward in theory, many economists disagree over how to gauge the stance in practice. For example, early monetarists such as Friedman and Schwartz (1963) look at money growth. However, several studies showed that by the 1980s the relationship between money supply measures and economic activity had seemingly weakened, so central banks turned away from money growth and toward short-term interest rates in gauging policy (Thorton 2006). Bernanke (2003) cautions against looking at both nominal and real interest rates and money supply measures and instead suggests looking at nominal spending growth and inflation. Beckworth (2020) proposes a measure of the stance of monetary policy, the *NGDP gap*, for the case of the United States. This measure takes the percentage difference between actual nominal GDP (NGDP) and an estimated "neutral" level of NGDP based on a rolling average of forecasts for a given quarter. A negative (positive) NGDP gap indicates that NGDP is lower (higher) than what the public expected it to be and that monetary policy is contractionary (expansionary). An NGDP gap of zero implies that monetary policy is neutral (i.e., neither inflationary nor disinflationary).[1]

In this paper, we create a parallel NGDP gap for the eurozone by using forecasts from the European Central Bank (ECB) Survey of Professional Forecasters (SPF).[2] This measure indicates that eurozone monetary policy was more contractionary than US monetary policy in the aftermath of the Great Recession. More recently, it shows that eurozone monetary policy has been excessively expansionary, but less so relative to the United States.

Measuring the Stance of Monetary Policy and the Eurozone NGDP Gap

Most central banks have some sort of flexible inflation-targeting framework where they work to stabilize inflation around a given numerical target while accounting for developments in the real economy. The Federal Reserve specifically has a mandate to minimize inflation and unemployment, but even central banks such as the ECB, which do not have such dual mandates, still consider unemployment in setting policy. As Beckworth (2020) points out, NGDP includes both real GDP and the price level, so it is a variable, which is relevant to central banks' objectives. Unlike the output gap, which is based on ever-changing estimates of potential output, the NGDP gap is a directly observable variable, making it easily calculated from publicly available forecasts. Those features make the NGDP gap a potentially useful metric. While Beckworth and Horan (forthcoming a, forthcoming b) show how the US NGDP gap could be used to implement an NGDP targeting regime, such a regime is not necessary for the metric to simply serve as a cross-check on the stance of monetary policy.

Beckworth (2020) justifies his US NGDP gap with two reasons. First, households and firms make economic decisions on the basis of forecasts of their nominal incomes. Second, nominal

[1] Schibuola and Martinez (2021) present modifications of the NGDP gap proposed by Beckworth at different horizons and at higher frequencies.

[2] For more information about the ECB SPF, see the survey's website at https://www.ecb.europa.eu/stats/ecb_surveys/survey_of_professional_forecasters/.

income may turn out to be very different from what households and firms expect. These disruptions can be destabilizing, as households and firms may not be able to quickly adjust their plans. By keeping NGDP on its expected growth path, the monetary authority can minimize such disruptions.

Beckworth creates an average forecast of NGDP for a given quarter that is based on forecasts for that quarter from the previous 20 quarters. NGDP forecast data come from the Federal Reserve Bank of Philadelphia's SPF. Whereas the SPF provides growth rate forecasts, Beckworth calculates an NGDP-level series by taking current NGDP at time *t* and using the growth rate forecasts to expand NGDP for periods *t* + 1 to *t* + 20. Beckworth bases the forecast on 20 quarters on the assumption that "all constraints created by decisions based on a forecast can be unwound within five years" (Beckworth 2020, 3). The neutral level, *NGDP**, can be summarized as:

$$NGDP_t^* = \frac{\sum_{i=1}^{20} NGDP_{t-i}^{forecast(t)}}{20}. \quad (1)$$

The NGDP gap can then be expressed as:

$$NGDP_t^{Gap} = 100 * \frac{NDGP_t - NGDP_t^*}{NGDP_t^*}. \quad (2)$$

Our methodology closely follows Beckworth's. We use quarterly forecasts from the ECB SPF. These quarterly forecasts have horizons of the current calendar year, the next calendar year, one year ahead, two years ahead, and five years ahead. Technically, the SPF provides separate forecasts of inflation as measured by the Harmonized Index of Consumer Prices (HICP) and real GDP growth, so we add the mean forecasts of each together to get implicit NGDP growth forecasts.[3] We use these implicit forecasts and interpolation to create a neutral-level series. We then take the percentage difference between actual and neutral to create the gap.[4] The calculation of the NGDP gap is described in greater detail in the appendix.

Figure 1 shows the eurozone NGDP gap as well as the eurozone real output gap, as measured by the International Monetary Fund's World Economic Outlook and the Organisation for Economic Co-operation and Development from 2004:Q1 to 2024:Q1.[5] The output gap measures are published annually, so we use cubic interpolations to create quarterly series. All three series follow somewhat similar trends, indicating that the NGDP gap tracks well with the output gap measures.[6] Noticeably, the NGDP gap falls much more steeply than the output gap series during the late 2000s and early 2010s, as the eurozone suffered from two recessions during that time. The NGDP gap plausibly gives a better sense of the economic fallout facing the eurozone during that period. Finally, we see the NGDP gap surges, beginning in 2021, while the output gaps come close to zero. These developments suggest that the eurozone real economy has been close to potential, while nominal spending is well above its expected level.

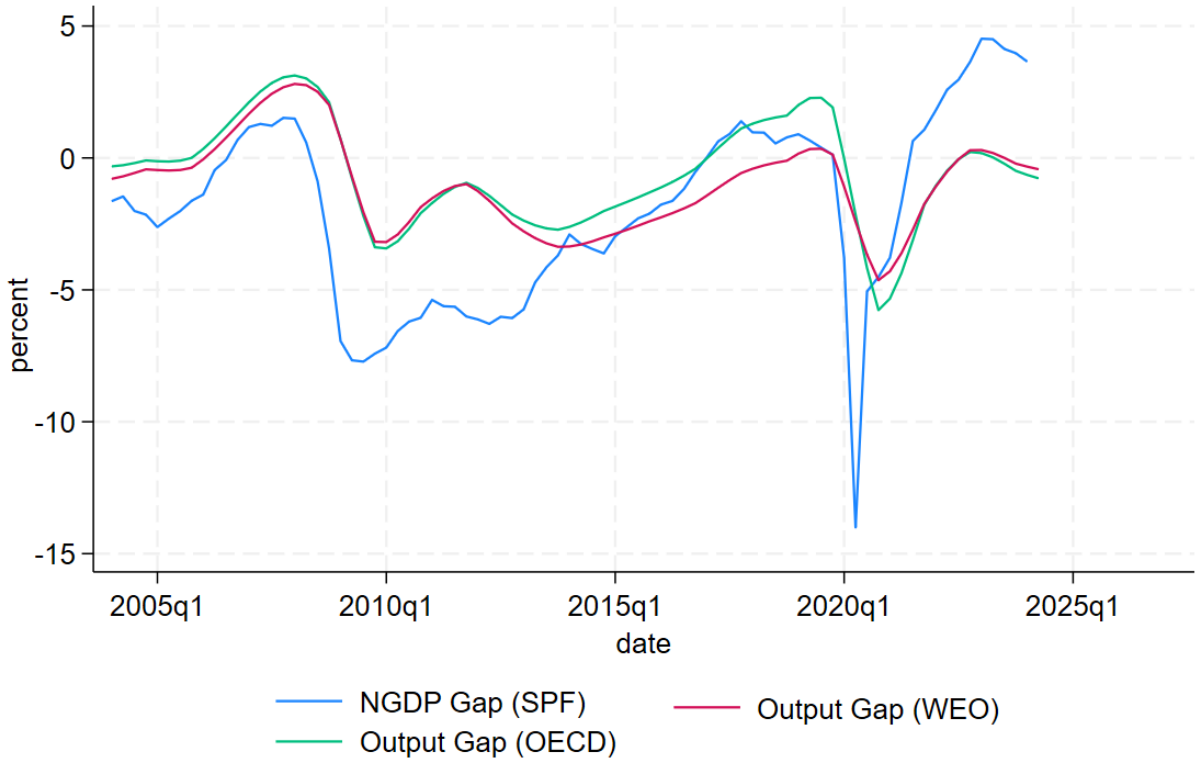
[3] Although the HICP measures only consumer prices, unlike the GDP deflator, which also includes the prices of investment goods, government services, and exports, the R^2 between the eurozone's quarterly HICP and GDP deflator is 99 percent for the period 1996:Q1 through 2023:Q4. Given the unavailability of GDP deflator forecasts and the close overlap between the HICP and GDP deflator, we consider the inclusion of the HICP in the implicit NGDP forecast to be appropriate.

[4] We use final rather than vintage NGDP data.

[5] The NGDP gap series also does not change dramatically when calculated using 12- and 16-quarter rolling averages.

[6] The R^2 between the NGDP gap and an average of the output gaps is only 0.32, but the R^2 rises to 0.54 when a two-quarter lag of the NGDP gap average is used.

FIGURE 1. Eurozone NGDP and output gaps



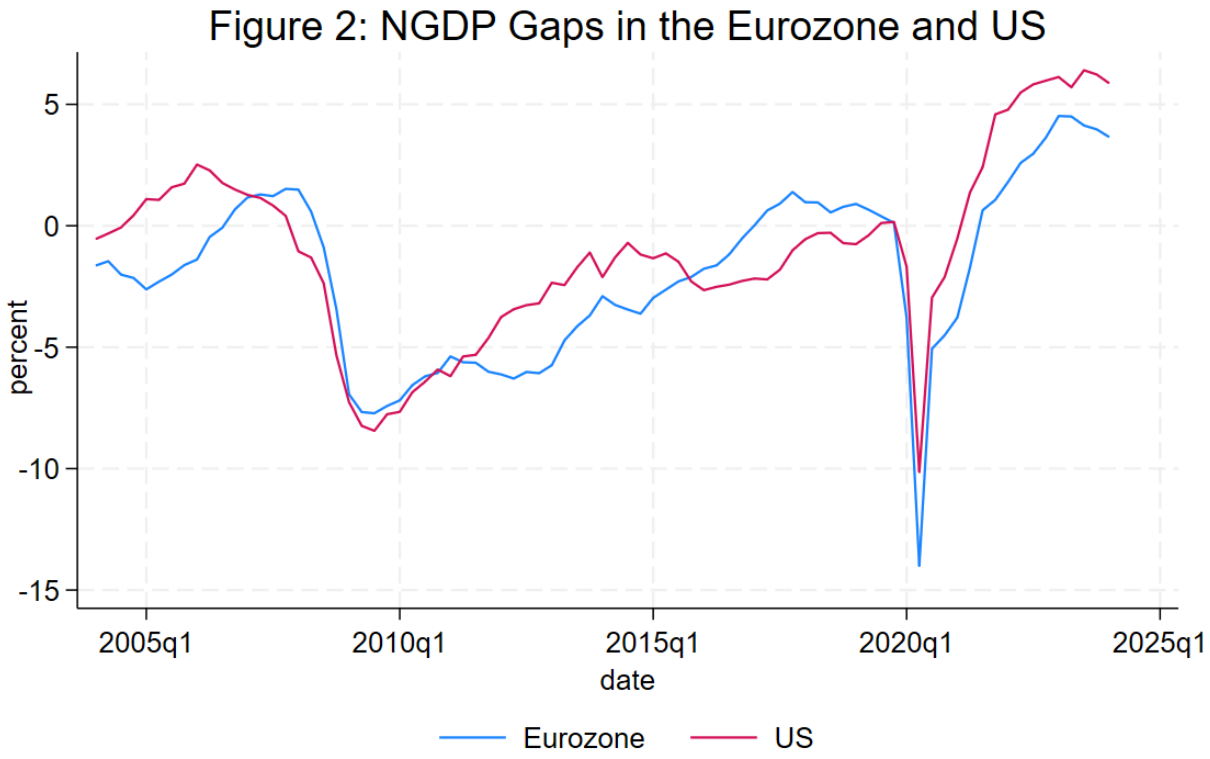
Note: NGDP = nominal GDP; OECD = Organisation for Economic Co-operation and Development; SPF = Survey of Professional Forecasters; WEO = World Economic Outlook.

Comparing the Eurozone and US NGDP Gaps

Figure 2 compares the eurozone NGDP gap and Beckworth's US NGDP gap. The two gaps follow similar trends, but they show some noteworthy differences. While monetary policy became contractionary in both areas during the Great Recession, US monetary policy became less restrictive during the early 2010s. This result is also consistent with the fact that the eurozone experienced two recessions between 2008 and 2013, while the United States experienced only one.

Another noteworthy difference occurs in 2021 at the onset of the recent inflation surge. While both the eurozone and the United States experienced steep contractions in 2020 as a result of the COVID-19 pandemic, both areas also recovered swiftly. However, the US gap recovered faster and has been more positive than the eurozone gap. Put differently, unexpected NGDP growth was much higher in the United States than in the eurozone, despite the eurozone experiencing higher inflation than the United States in much of 2022 and 2023.

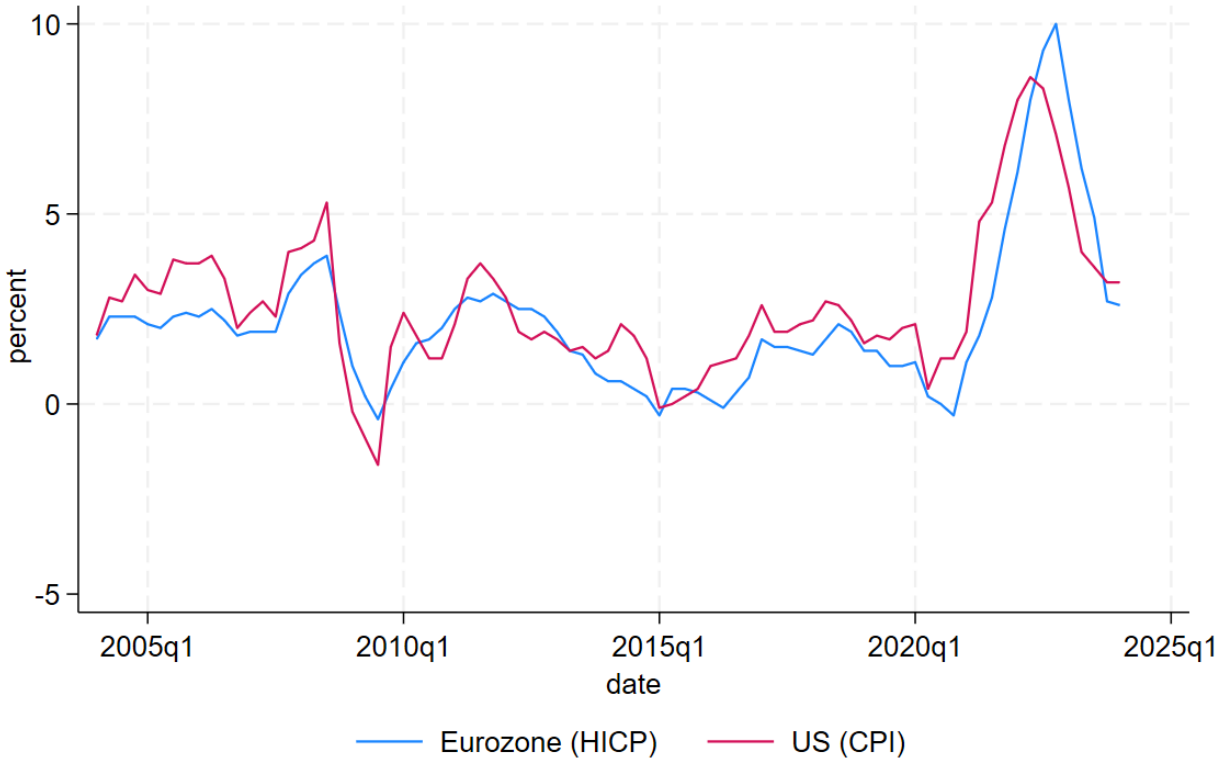
FIGURE 2. NGDP gaps in the eurozone and the United States



Note: NGDP = nominal GDP.

Figure 3 shows year-over-year inflation in the eurozone as defined by the HICPs and in the United States as defined by the Consumer Price Index. This contrast underscores the different roles supply and demand shocks have played in contributing to recent inflation. As one can observe from a standard aggregate demand–aggregate supply model, a temporary positive aggregate demand shock will temporarily raise the price level, real output, and aggregate demand (i.e., nominal income). A temporary negative supply shock will temporarily raise the price level and lower real output, leaving an ambiguous effect on nominal income. The comparatively large NGDP gap in the United States suggests that while demand heavily contributed to inflation in both areas, it was a greater contributor in the United States. The difference is plausible given that the Russia-Ukraine War, a large negative supply shock, has affected the eurozone more than the United States.

FIGURE 3. Eurozone and US year-over-year inflation



Note: CPI = Consumer Price Index; HICP = Harmonized Index of Consumer Prices.

The NGDP Gap and Economic Activity

To further investigate the usefulness of the eurozone NGDP gap as a measure of the stance of policy, we consider a three-variable vector autoregression (VAR), which takes the following formal model:

$$x_t = (n_t, u_t, \pi_t), \tag{3}$$

where x is a vector of variables, n is the NGDP gap, u is the unemployment rate, and π is the core inflation rate taken from the HICP. We consider unemployment and core inflation because they are easily observable and directly relevant to the ECB's goal of macroeconomic stability. Following the likelihood ratio test, we use six lags. Our sample spans 2004:Q1 to 2024:Q1.

Table 1 reports the *p*-value Granger causality test results from the VAR. The NGDP gap predicts both unemployment and core inflation at the 1 percent confidence level. Unemployment predicts the NGDP gap at the 5 percent confidence level and core inflation at the 1 percent confidence level. Core inflation predicts the NGDP gap at the 10 percent confidence level and unemployment at the 5 percent confidence level. Although these tests do not necessarily imply true causality, the results suggest that the NGDP gap performs just as well, if not slightly better, than unemployment and core inflation at prediction.

TABLE 1. Results of Granger causality tests

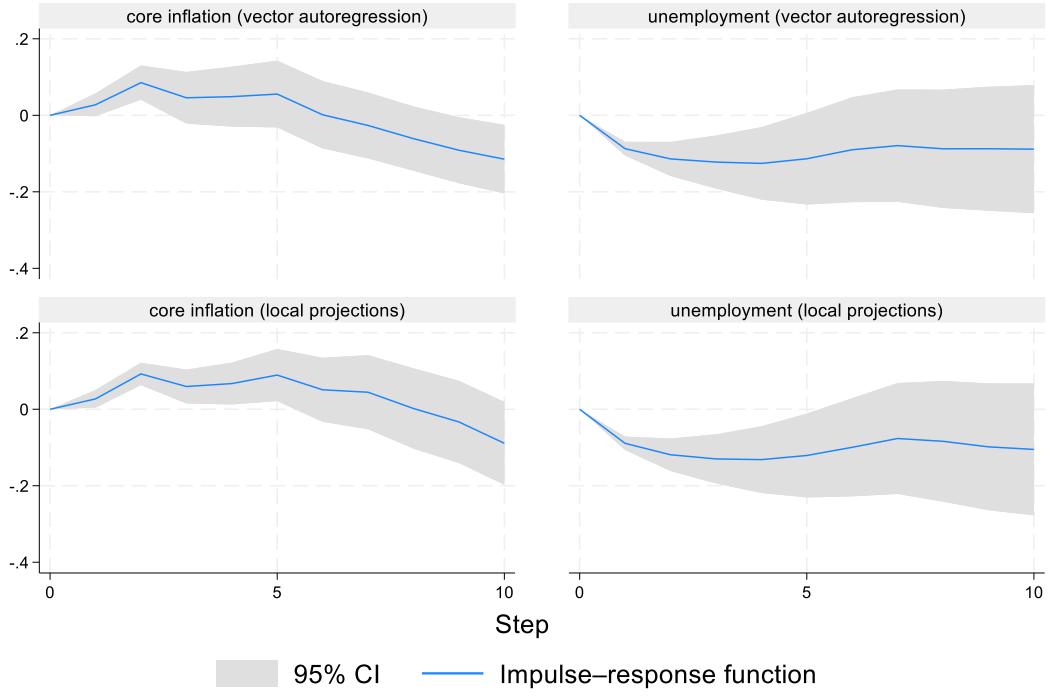
	Dependent variables		
Regressor	NGDP gap	Unemployment	Core inflation
NGDP gap	0.000	0.000***	0.006***
Unemployment	0.039**	0.000	0.001***
Core inflation	0.068*	0.035**	0.000

* significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.

Next, we show the impulse response functions (IRFs) estimated from the VAR with the NGDP gap as the impulse and unemployment and core inflation as the responses. A shock to the NGDP gap can be thought of as a monetary policy shock. A positive shock should temporarily lower unemployment because of sticky prices, while it should temporarily raise the inflation rate even as it permanently raises the price level.

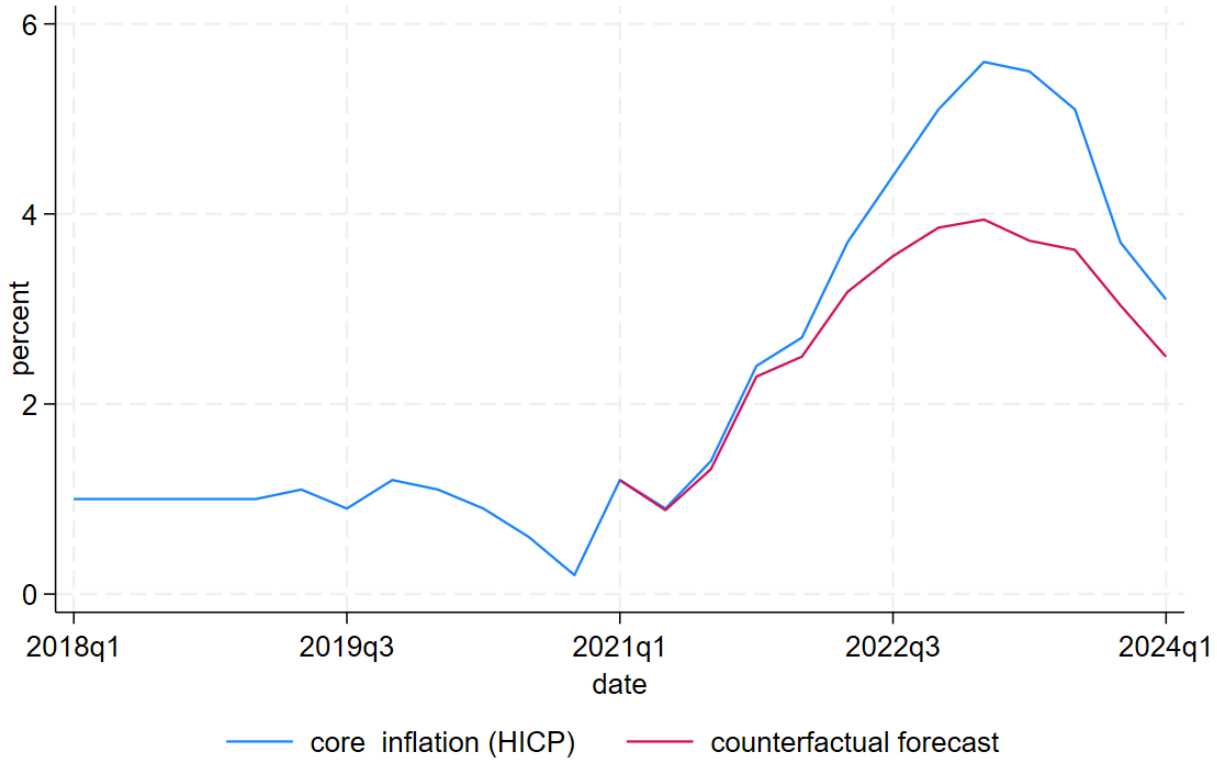
The IRFs substantiate these predictions. The unemployment rate falls by 0.13 percentage points four quarters after the shock. The inflation rate rises by 0.08 percentage points five quarters after the shock. For robustness, we also estimate IRFs using local projections. As Jordà (2005) explains, local projections are robust to the ordering of variables and nonlinearities in data. As figure 4 shows, the IRFs from the VAR model and from the local projections model are very similar.

FIGURE 4. Impulse response functions from NGDP gap shock



Note: CI = confidence interval.

FIGURE 5. Inflation and counterfactual forecast



Note: HICP = Harmonized Index of Consumer Prices.

Finally, we consider the usefulness of the NGDP gap in predicting the recent inflation surge by using the VAR to create a counterfactual inflation given the actual path of the NGDP gap. We do this by adding the path of the NGDP gap from 2021:Q1 through 2024:Q1 as an exogenous variable into the VAR and then dynamically forecasting core inflation beginning in 2021:Q1. If the NGDP gap explains the rise in core inflation, then we should see the rise in the NGDP gap leading to a forecast close to reality. We see this counterfactual in figure 5. Although actual core inflation rose more than the forecast, both rise noticeably in 2021 and 2022 and then fall. The similar shapes suggest that the NGDP gap explains a sizable portion of core inflation.

Conclusion

We have provided a new way to assess the stance of monetary policy for the eurozone by taking the percentage difference between actual NGDP and an estimated neutral level based on implicit NGDP forecasts. This NGDP gap's performance over the past 20 years as well as the fact that it is derived from directly observable data suggests that it could be of use to policymakers.

By no means do we argue that our calculation of the NGDP gap is the best one. First, although we follow Beckworth (2020) in using a five-year rolling average and observe little graphical difference when using different horizons, further empirical research could determine the optimal rolling average length. Second, we also use consumer price inflation as a proxy for GDP deflator inflation because we lack the latter. Forecasts of GDP deflator inflation would help with the creation of a more "genuine" NGDP gap. Third, we rely on interpolation to create our rolling

average of forecasts because we lack forecasts for the entire horizon. We hope that our study will prompt the ECB and other forecasters to produce explicit NGDP forecasts for the entire horizon, so a more accurate gap can be created.

Appendix: Calculating the NGDP Gap

The neutral level of NGDP, NGDP*, is calculated in three steps. First, for every period, we create a five-year (20-quarter) NGDP forecast. To do this, we add the SPF's mean real GDP growth forecast and inflation forecast (as measured by the HICP) for a given quarter to create implicit NGDP forecasts. Each quarter, the SPF provides forecasts for year-over-year real GDP growth and inflation for the current calendar year, the next calendar year, one year ahead, two years ahead, and five years ahead.

For Q1 forecasts, quarters $t + 1$ through $t + 3$ are equal to the current calendar-year forecast because there are three quarters remaining in the year. Quarter $t + 7$ is equal to the next calendar year forecast because it is equal to Q4 of next calendar year.

For Q2 forecasts, quarters $t + 1$ and $t + 2$ are equal to the current calendar-year forecast because there are two quarters remaining in the year. Now quarter $t + 6$ is equal to the next calendar-year forecast.

For Q3 forecasts, quarter $t + 1$ is equal to the current calendar-year forecast because there is one remaining quarter left in the year. Now quarter $t + 5$ is equal to the next calendar-year forecast.

For Q4 forecasts, only quarter t is in the current calendar year. However, we linearly interpolate between the current calendar-year forecast and the one-year-ahead forecast, which is equal to $t + 4$, to create forecasts for $t + 1$ through $t + 3$.

In the case of all forecasts, quarters $t + 4$, $t + 8$, and $t + 20$ are respectively equal to the one-year-ahead, two-years-ahead, and five-years-ahead forecasts. We then use linear interpolation to solve for all missing values.

Second, we transform the NGDP growth rate forecasts into level forecasts by taking the current level of NGDP at time t and sequentially expanding it by the forecasted growth for periods $t + 1$ to $t + 20$.

Third, we create an average NGDP-level forecast by using all the forecasts from the previous 20 quarters. This average level forecast is the neutral level. The NGDP gap is the percentage difference between actual and neutral NGDP.

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