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Economic Synopsis
Monetary policy and the recent inflation surge

Bruno Freitas
Banco de Portugal

Pedro Teles
Banco de Portugal, Catolica-Lisbon SBE and CEPR

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Abstract
Monetary policy in the euro area responded to the recent inflation surge in a passive, gradual and slow manner, possibly even contributing to the inflationary process by employing an expansionary stance. We discuss three justifications for the moderate response of monetary policy: (1) The weak theoretical support of active feedback rules in the conduct of monetary policy; (2) an optimal inflationary bias when there are large relative price movements and prices are downward rigid; (3) optimal debt depletion in response to a large negative fiscal shock, such as the one observed after the outbreak of the COVID-19 pandemic. (JEL: E12; E4; E5; E62)

Introduction

After a long period of an apparent inability of monetary policy in the euro area, and also in the US, to raise inflation back to target, we are now observing inflation far exceeding the objective of 2% in both economies. As can be seen in Figure 1, HICP inflation in the euro area started to deviate from target in July 2021 and was 8.5% in February 2023. In the US, PCE inflation has noticeably surpassed 2% since March 2021, and was 5.0% in February 2023.

What was the response of monetary policy to the inflation surge? As seen in Figure 1, policy rates were raised in response to the substantial rise in inflation. However, as we argue in this note, interest rate policy in the euro area was passive, inertial and slow in its response. It was passive, and not active, because it did not follow the Taylor principle according to which the policy rate ought to respond more than one-to-one to deviations of inflation from target. It was inertial because the fit with an interest rate rule with built-in gradualism is remarkable. It was slow to respond because it took longer to adjust than what the inertial rule would have prescribed. Overall, rather than tightening to fight the surge in inflation, monetary policy took a loose stance, possibly also contributing to the inflationary process. The stance was loose, and not tight, because the resulting real rate

E-mail: bfreitas@bportugal.pt; pteles@bportugal.pt

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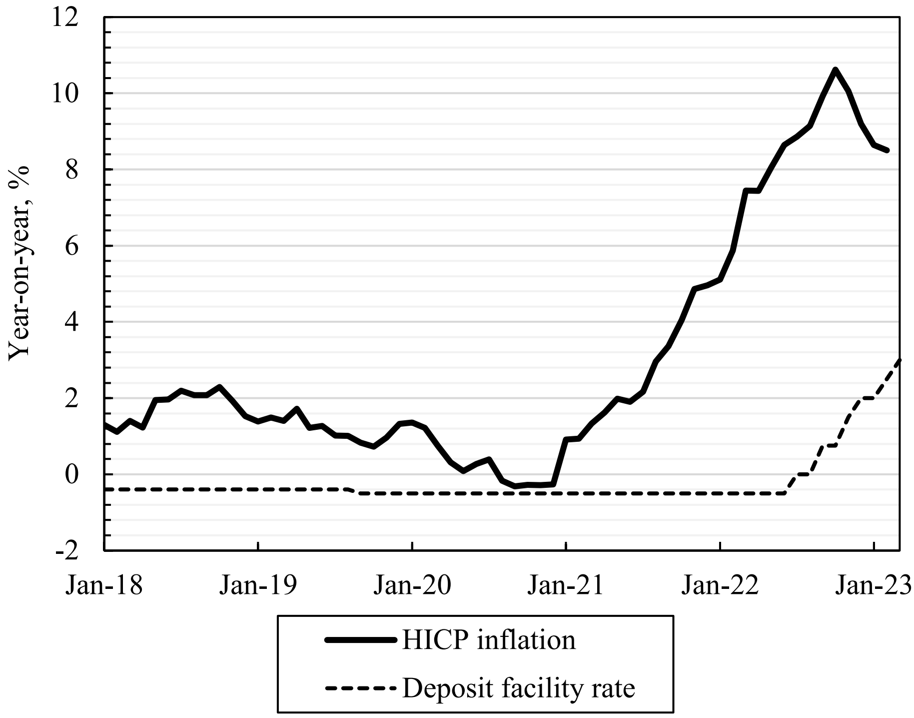
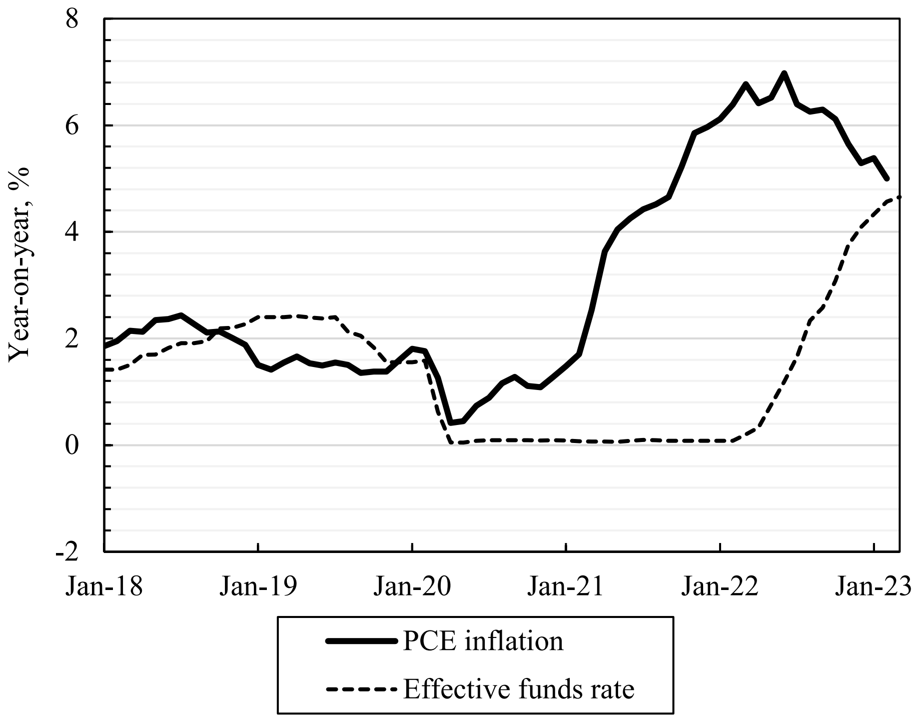


(A) Euro area. Notes: End-of-month deposit facility rate, until Mar-23. Data for HICP inflation until Feb-23.



(B) United States. Notes: Monthly averages of daily data for the effective funds rate, until 31 March 2023. Data for PCE inflation until Feb-23.

FIGURE 1: Inflation and policy rates.

Sources: Eurostat, Refinitiv and authors' calculations.

is lower than an estimated natural/neutral rate. The underlying quantity of money is also consistent with high inflation, even considerably higher than the one observed.

We discuss three justifications for the moderate response of monetary policy. We do not perform a quantitative evaluation of monetary policy. We simply discuss three arguments why it may be admissible or even desirable to allow for a deviation of inflation from target in the current conditions in the euro area, as well as in the US.

The first justification for a moderate response of policy is the weak theoretical support to the belief that interest rates ought to respond in an aggressive manner to deviations of inflation from target. The theoretical support is based on a local determinacy argument. Indeed, an interest rate policy that follows the Taylor principle and responds more than one-to-one to deviations of inflation from target is able to achieve local determinacy. Yet, that is all it achieves. While there is a single equilibrium in the neighbourhood of a particular steady state, there is an infinite number of other equilibria. Some of those converge to the zero bound steady state. The alternative is a passive interest rate policy that responds less than one-to-one to deviations of inflation from target, giving rise to local indeterminacy. While this is the case under rational expectations, recent work by Angeletos and Lian (2021) shows that, with a small departure from rational expectations, equilibria are determinate.

Even with no theoretical support, active rules appear to work in practice. The disinflation of the 1970s and 1980s in the US and in Germany is often seen as proof of the success of monetary policy that follows the Taylor principle in taming inflation. The case of Japan is a useful comparison. Japan virtually did not respond to the surge in inflation, inflation was a lot higher than in the US or Germany, but it was short-lived. While realised real rates during the inflation surge in the 1980s were positive in the US and Germany (reaching around 5% and 8%, respectively), they were considerably negative in Japan in the 1970s (as negative as around -18%). The possible deviation of real interest rates from their natural levels (either above or below) did not occur without costs. We also explore the case of current day Turkey, which is an even more extreme case of non-responsive policy, with added risks that we also discuss.

The second justification for relatively high inflation is that, in a world where some prices, possibly wages, are downward rigid, it is optimal to allow for an inflation bias that can be very large if relative price movements are also very large.[1,2]

Another normative justification for high inflation is the optimal policy response to a large negative fiscal shock, such as the one that occurred during and in the aftermath of the COVID-19 pandemic. The surge in inflation has allowed for substantial debt depletion, dispensing tax hikes. Teles and Tristani (2021) make the case for an optimal response of inflation in the euro area to the large fiscal shock that is of a similar order

1. The inflation bias, resulting in a departure of inflation from target, happens here under full commitment. It is not the result of discretionary policy.

2. Inflation also reduces the minimum wage in real terms. Minimum wages are one of the reasons for downward wage rigidity in response to shocks. The reduction of the real value of the minimum wage through surprise inflation penalizes those receiving the minimum wage but benefits those that can be formally employed at a lower minimum wage.

of magnitude to the observed inflation. The surprise inflation also has a large effect on the wages of civil servants and pensions measured in real terms. This can be welfare improving given the downward rigidity of both wages in the public sector and pensions.

In what follows we first describe the conduct of monetary policy in response to the surge in inflation. We proceed to discuss the three justifications for the timid response.

Interest rate policy and the surge in inflation

How should monetary policy respond to positive deviations of inflation from target? The conventional view is to follow the Taylor principle, which calls for an increase of interest rates more than one-to-one to a rise in inflation in order to ensure local price determinacy. The question thus arises of what policy rates would have been consistent with the Taylor principle in the euro area during the recent inflation surge. To tackle this issue, we consider the following policy rule, where the policy rate reacts positively to deviations of the natural rate (r_t) – the real interest rate in response to shocks that would prevail in an economy without nominal rigidities – from its long-term levels (r^*) and to deviations of inflation (π_t) from target (π^*) with a given coefficient ($\rho > 1$ to be consistent with the Taylor principle):

$$i_t - i^* = r_t - r^* + \rho(\pi_t - \pi^*) \tag{1}$$

Since $i^* = r^* + \pi^*$, equation (1) becomes:

$$i_t = r_t + \pi^* + \rho(\pi_t - \pi^*) \tag{2}$$

To estimate the natural rate in response to shocks, we consider the DSGE-model based estimates of the Federal Reserve Bank of New York for the US. We calculate the corresponding rate for the euro area assuming covered interest rate parity. We use the forward discount and forecast nominal and real exchange rates assuming they follow a random walk. Our estimates yield that, in the last quarter of 2022, the natural rate in the euro area was approximately 0.3%.[3] Given that $\pi_{2022Q4} = 10\%$ and $\pi^* = 2\%$, it directly follows from equation (2) that the policy rate in the euro area consistent with the Taylor principle in the last quarter of 2022 would have been at least 10%, approximately (as shown in equation (3)). The actual average policy rate was 1.4%.

$$i_{2022Q4} \approx 0.3\% + 2\% + 1.01(10\% - 2\%) = 10.4\% \tag{3}$$

In practice, central banks appear to follow rules with built-in gradualism.[4] To show this, we consider the following Taylor rule with built-in gradualism for the US while

3. See Appendix A for a detailed breakdown of this estimation.

4. Bernanke (2004) argues for a gradualist approach to monetary policy, highlighting policymakers' uncertainty, a greater influence over the long-term interest rate, and reduced risks to financial stability.

removing any direct considerations of the unemployment gap ($u_t - u_t^*$) for the euro area to reflect the fact that the ECB does not follow a dual mandate:[5]

$$i_t = 0.85 i_{t-1} + 0.15 \left(r_t^* + \pi^* + 1.5 \left(\pi_t - \pi^* \right) - 2 \left(u_t - u_t^* \right) \right) \tag{4}$$

As shown in Figure 2, the prescriptions from the above inertial rule have closely followed the actions of both the Fed and the ECB. During the recent high inflation episode, there were negative deviations in both economies, showing a slow response of policy even taking gradualism into account.

Overall, the stance of monetary policy in the euro area was expansionary, possibly contributing to the inflationary process. In order to assess the monetary policy stance, we need to compute the real rate using inflation expectations. Atkeson *et al.* (2001) show that a naive forecast of one-year-ahead inflation that uses the inflation rate over the previous year is at least as accurate as NAIRU Philips curve-based inflation forecasts. Thus, in the assessment of the monetary policy stance in the last quarter of 2022, we can consider $\pi_t^e = 8.4\%$, which is the annual HICP change in 2022 for the euro area. The policy stance is very expansionary:

$$r_{2022Q4} = i_{2022Q4} - \pi^e_{2022Q4} = 1.4\% - 8.4\% = -7\% < 0.3\% \tag{5}$$

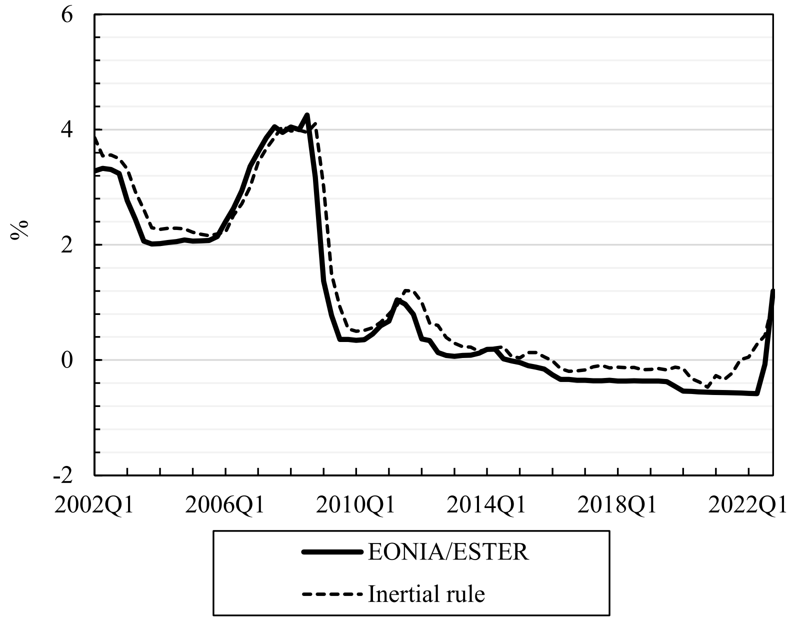
The special nature of the shocks, with the end of the pandemic and the outbreak of the war in Ukraine in February 2022, may justify using other forecasts, possibly with more judgement. Using the December 2022 ECB projections for the inflation rate in the euro area in 2024, $\pi_t^e = 3.4\%$, the stance is less expansionary:

$$r_{2022Q4} = i_{2022Q4} - \pi^e_{2022Q4} = 1.4\% - 3.4\% = -2\% < 0.3\% \tag{6}$$

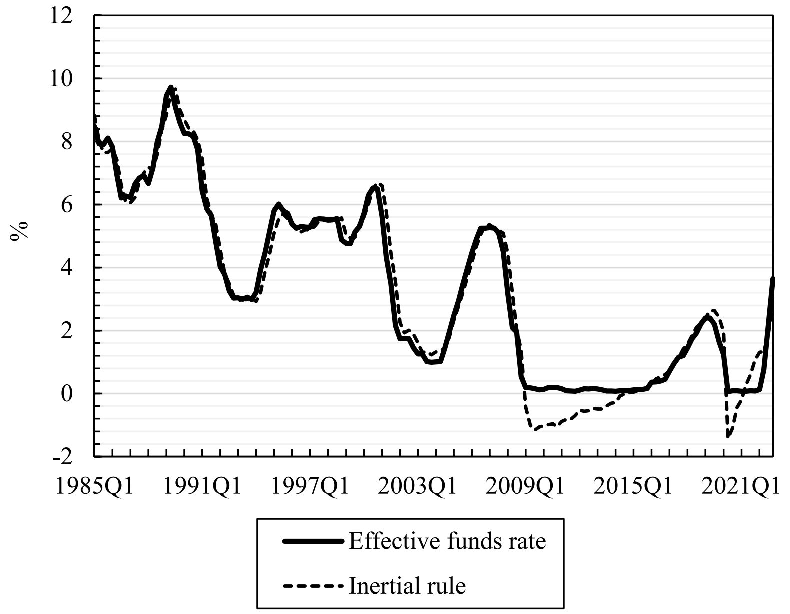
Alternatively, we can consider the expected inflation rate in the euro area for 2024 in the Survey of Professional Forecasters of the last quarter of 2022, $\pi_t^e = 2.4\%$, which yields broadly similar results:

$$r_{2022Q4} = i_{2022Q4} - \pi^e_{2022Q4} = 1.4\% - 2.4\% = -1\% < 0.3\% \tag{7}$$

5. See Appendix B for a detailed analysis with other illustrative practical policy rules.



(A) Euro area. Notes: We employ EONIA until 2019Q4 and ESTER thereafter (quarterly averages of daily data). We consider HICP excluding food and energy, and 2% as the inflation target. Data until 2022Q4.



(B) United States. Notes: Quarterly averages of daily data for the effective funds rate. We consider PCE inflation excluding food and energy, and 2% as the inflation target. We consider the Congressional Budget Office estimates of the noncyclical rate of unemployment as a measure of u*. Data until 2022Q4.

FIGURE 2: Inertial rule prescriptions.

Sources: Congressional Budget Office, ECB, Eurostat, Federal Reserve Bank of New York, Federal Reserve Economic Data (FRED), Refinitiv and authors' calculations. Notes: The natural interest rate is estimated from the Holston, Laubach and Williams (HLW) model. The New York Fed suspended the publication of the HLW estimates of the natural interest rate after releasing estimates for the second quarter of 2020. Beyond this period, we follow the procedure of the Federal Reserve Bank of Atlanta and assume that the HLW estimates remain at their last published values.

Monetary aggregates and inflation

How much of the inflation surge can be explained by an expansion of monetary aggregates? What implications does that have for policy? Since the financial crisis of 2008 and through the sovereign debt crisis in Europe, money supply has expanded considerably without that translating into noticeably higher inflation. Figure 3 shows the ratio of the monetary aggregate M2 to GDP for the US and the euro area since the first quarter of 2002. The reason why such an expansion of the money supply did not translate into high inflation is that interest rates on nominal assets such as government bonds paid interest rates that were actually lower than the zero interest paid on money. As shown in Figure 4, short-term risk-free interest rates remained close to 0% since 2011 in the euro area and for a large period of time since 2008 in the US.

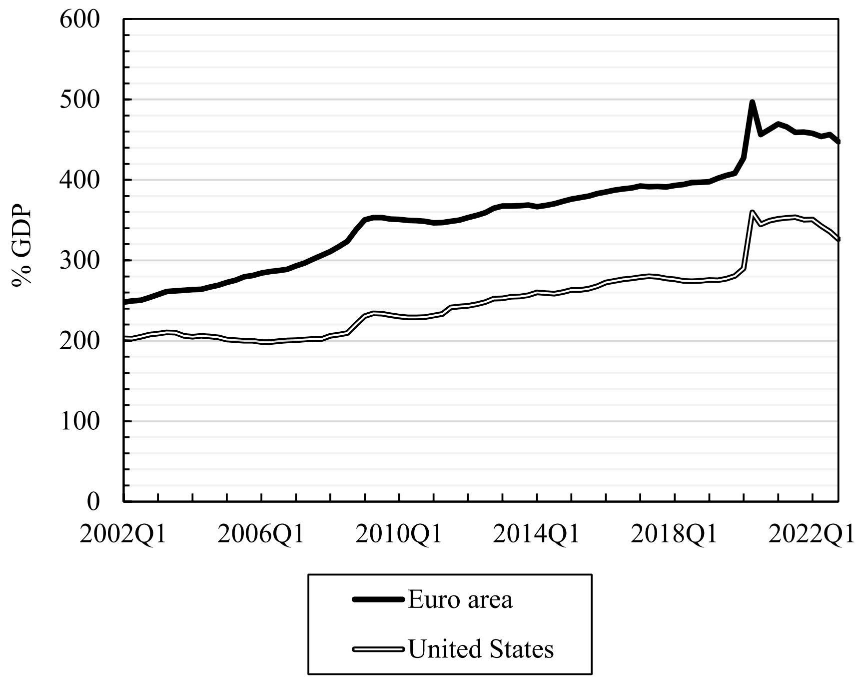


FIGURE 3: Monetary aggregate M2.

Source: ECB, Eurostat, Federal Reserve Economic Data (FRED) and authors' calculations. Notes: Quarterly averages of monthly data. Data until 2022Q4. Monetary aggregate M2 was chosen due to a structural break in M1 for the US after Apr-20 and a discontinuation of Money Zero Maturity (MZM) for the US in Feb-21.

When interest rates are at the zero bound, there is no reason for the quantity theory equation, $MV = PY$, to hold with equality. In that condition, M is some monetary aggregate, V is a measure of velocity for that monetary aggregate, P is the price level and Y is a measure of transactions in real terms, possibly GDP. When money is not dominated in rate of return, in the sense that the interest rate on alternative assets is less than or equal to the rate of interest on money, then people are willing to hold more money than the one they want to use for transactions so that the quantity condition holds with inequality, $MV \geq PY$. In that case, an increase in the monetary aggregate does not necessarily translate into an increase in prices, or output for that matter.

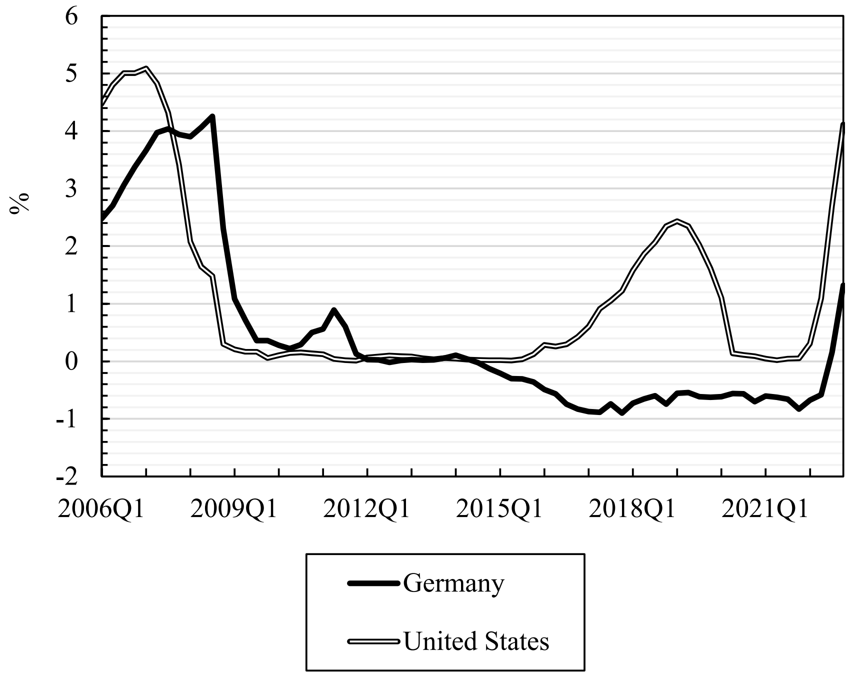


FIGURE 4: 3-month sovereign bond yields.

Source: Refinitiv and authors' calculations. Notes: Quarterly averages of daily data. Data until 2022Q4. We employ Germany as the risk-free benchmark for the euro area.

Once interest rates have risen to levels way above zero, then it is no longer the case that the money demand is indeterminate as when interest rates are at the zero bound. In order to understand how the growth rate of money balances can translate to inflation outside the zero bound, we can turn to Lucas (2000), where the following theoretical equilibrium relationship between real money demand $\left(\frac{M_t}{P_t}\right)$, a nominal interest rate (i_t) as a measure of the opportunity cost of money, and real output (Y_t) is derived,

$$\frac{M_t}{P_t} = \alpha Y_t i_t^{-\gamma} \tag{8}$$

Using data from 1900 through 1994 and the monetary aggregate M1 as the measure of money, Lucas (2000) reports an interest elasticity for the US, γ, of 0.5. Using Money Zero Maturity (MZM) as an alternative monetary aggregate to account for regulatory reforms and innovation in electronic payments in the US since the early 1980s, Teles and Zhou (2005) propose an interest elasticity of 0.2 for the period 1980-2003. For simplicity, we avoid the need to estimate γ by calculating the implied growth rate of prices between two periods where the interest rate was roughly identical. Formally, from equation (8):

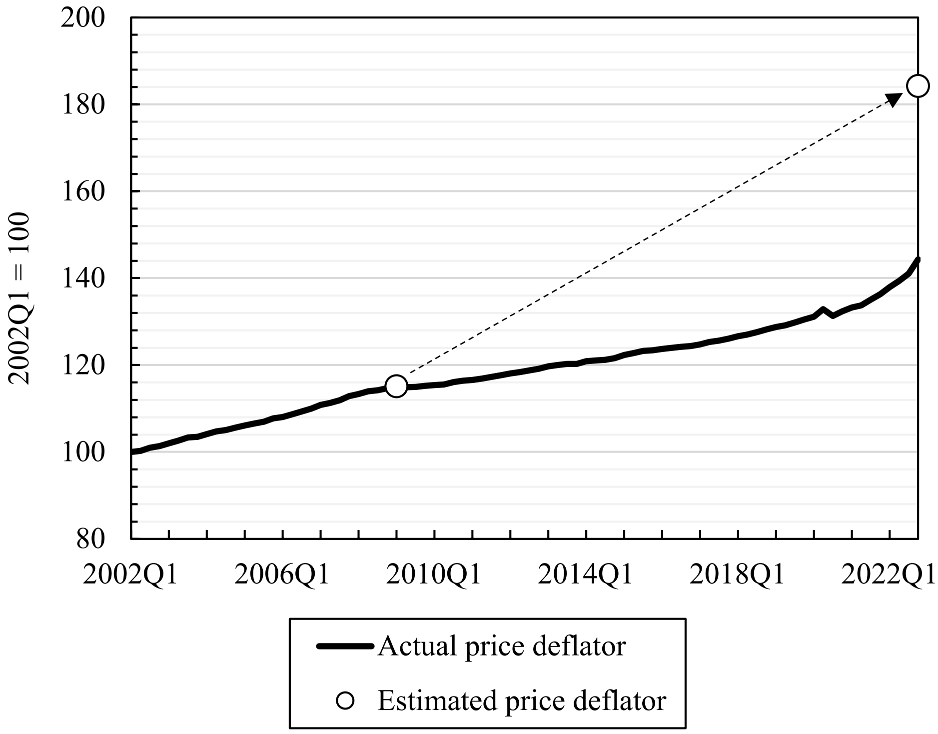
$$\frac{\hat{M}}{\hat{P}} = \hat{Y}\hat{i}^{-\gamma} \Leftrightarrow \frac{\hat{M}}{\hat{P}} = \hat{Y} \cdot 1 \Leftrightarrow \hat{P} = \frac{\hat{M}}{\hat{Y}} \tag{9}$$

The periods chosen for the euro area were the first quarter of 2009 and the fourth quarter of 2022, where the German 3-month sovereign yield was 1.1% and 1.3%, respectively.[6] For the US, we chose the third quarter of 2007 and the fourth quarter of 2022, where the 3-month sovereign yield was 4.3% and 4.1%, respectively. We consider the monetary aggregate M2 for both economies. The growth rate of the price deflator that would be consistent with equation (9) is 60% for the euro area and 125% for the US, as Figure 5 illustrates. The high money supply is certainly consistent with an elevated price level in both economies, substantially higher than the one that has been observed. While part of the extra money demand may be explained by bad data,[7] it is too large to be that. The excessive money demand is an embarrassment for the simple money demand theory implicit in these calculations.

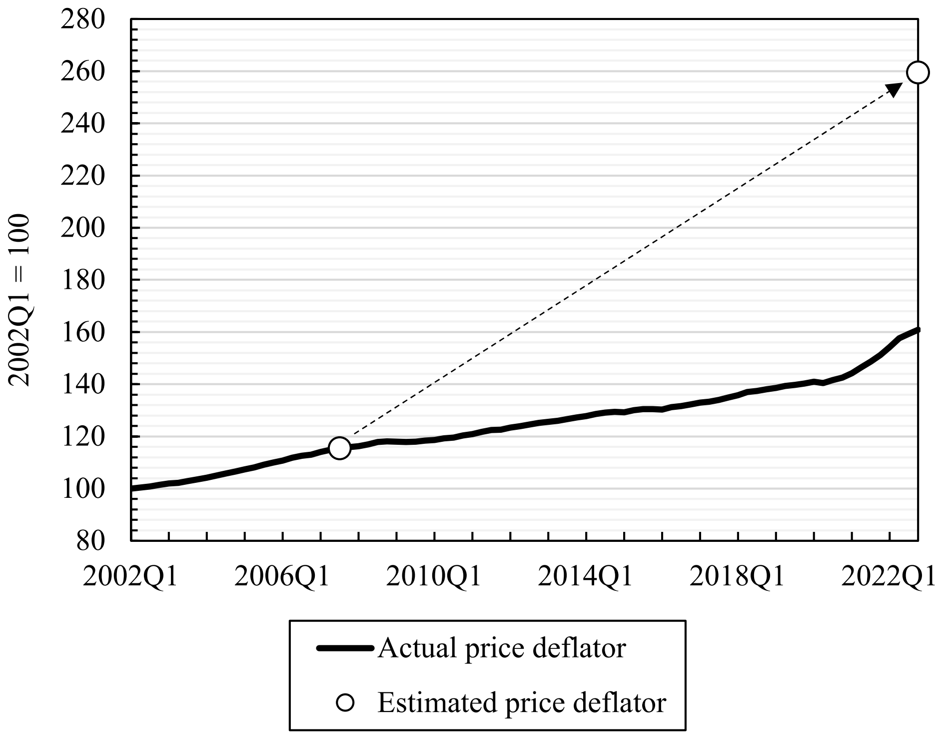
The inquiry into the underlying quantity of money in explaining the high inflation is of theoretical interest, but of no practical interest. In a context of an enlarged balance sheet with interest-bearing reserves, central banks are not able to control the quantity of money. They can control total liabilities but not the way they are distributed across the different monetary aggregates and interest-bearing reserves.

6. We use German sovereign yields to eliminate default risk premia.

7. We are using a measure for money that aggregates many different assets with different liquidity characteristics and different returns. We are also using a rough measure for the opportunity cost of money.



(A) Euro area.



(B) United States.

FIGURE 5: Price levels consistent with the money demand equation derived in Lucas (2000).

Sources: ECB, Eurostat, Federal Reserve Economic Data (FRED), Refinitiv and authors' calculations. Notes: We consider the GDP deflator as the price deflator.

Inflation and the Taylor principle

The theoretical support for monetary policy to follow the Taylor principle is to ensure local price determinacy. However, as shown in Benhabib *et al.* (2001), active interest rate feedback rules lead to global indeterminacy. We illustrate this source of multiplicity using a simple flexible price model. In that model, the real interest rate, r_t, does not depend on the nominal rate, i_t, or inflation, π_t. The following approximated dynamic equations must hold: the Fisher equation (equation (10)) and a policy rule (equation (11)),

$$i_t = r_t + \pi_{t+1} \tag{10}$$

$$i_t - i^* = r_t - r^* + \rho(\pi_t - \pi^*) \tag{11}$$

where

$$i^* = r^* + \pi^* \tag{12}$$

with the superscript * denoting the long run values.

These equations together imply that:

$$\pi_{t+1} - \pi^* = \rho(\pi_t - \pi^*) \tag{13}$$

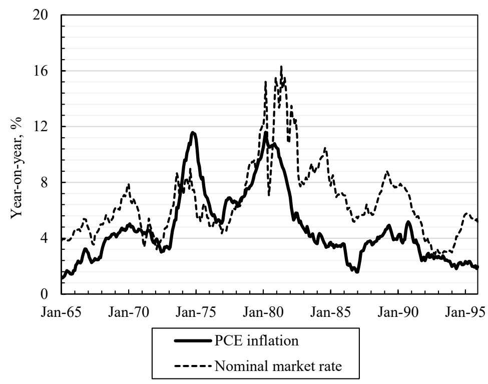
One solution to this dynamic equation is $\pi_t = \pi^*$. But, if monetary policy follows the Taylor principle ($\rho > 1$), there is also a continuum of explosive solutions and a continuum of solutions converging to the zero bound. If, instead, policy does not follow the Taylor principle ($\rho < 1$), there is a continuum of solutions converging to target. In this model with rational expectations, the convergence to target is gained at the expense of local indeterminacy. Yet, as shown in Angeletos and Lian (2021), the introduction of a friction in social memory to a baseline New Keynesian model may remove local price indeterminacy, yielding a unique equilibrium regardless of monetary policy.

Even if there is no theoretical support for active rules that follow the Taylor principle, there appears to be some empirical support. They seem to work in practice. The disinflation of the 1970s and 1980s in the US and in Germany is often seen as proof of the success of monetary policy that follows the Taylor principle in taming inflation. For example, Clarida *et al.* (2000) show how US monetary policy changed from passive in the pre-1979 period to active after 1979, which coincided with the beginning of the disinflation process, as shown in Figure 6. In Germany, the surge in inflation was also met with a strong interest rate response, and inflation did go down. The case of Japan in the 1970s is an interesting contrasting case. The response of interest rate policy to inflation in Japan was basically non-existent. Inflation was a lot higher in Japan but it was short-lived and returned fast to target.

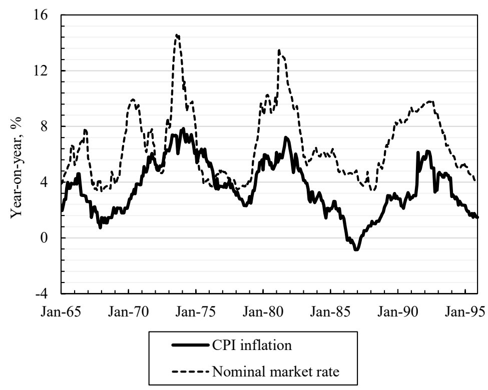
Current day Turkey is an even more extreme case of non responsive policy with very large inflation, which has recently started to come down. As shown in Figure 7, the Central Bank of the Republic of Turkey (CBRT) has kept policy rates low or even decreased them despite very high inflation and a huge depreciation of the lira. In a related recent paper, Gürkaynak *et al.* (2022) argue that the current high inflation in Turkey is a case study example of the use of a passive interest rate rule, which does not follow the Taylor principle. But the case of Turkey has more than meets the eye.

As shown in Figure 8, the commercial loans rate in Turkey started to diverge significantly from the policy rate at the beginning of 2022, suggesting that the policy rate was no longer reflecting market equilibrium conditions. In this context, the CBRT imposed strict bank lending requirements. This was followed by a convergence of the two rates. The case of Turkey is impressively well explained by the analysis in Bassetto and Phelan (2015). They show that there can be equilibria with high inflation and low nominal rates as long as there are quantity restrictions on credit, which they interpret as financial repression. When real rates are that low, as low as -70%, the demand for central banking lending is basically unbounded so quantity restrictions have to be imposed. Rather than a textbook case of a passive interest rate rule, the case of Turkey seems to be a case study of these types of equilibria.

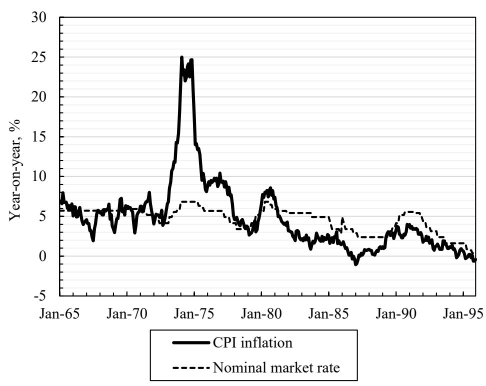
Both the case of Japan in the 1970s and current Turkey are important to keep in mind as possible risks of non-responsive policies.



(A) United States. Notes: We consider 3-month sovereign yields as the market rate.



(B) Germany. Notes: We consider 3-month interbank rates as the market rate.



(C) Japan. Notes: We consider 13-week treasury bill rates as the market rate.

FIGURE 6: Market rates and inflation in the 1970s and 1980s.

Sources: Federal Reserve Economic Data (FRED), Refinitiv and authors' calculations.

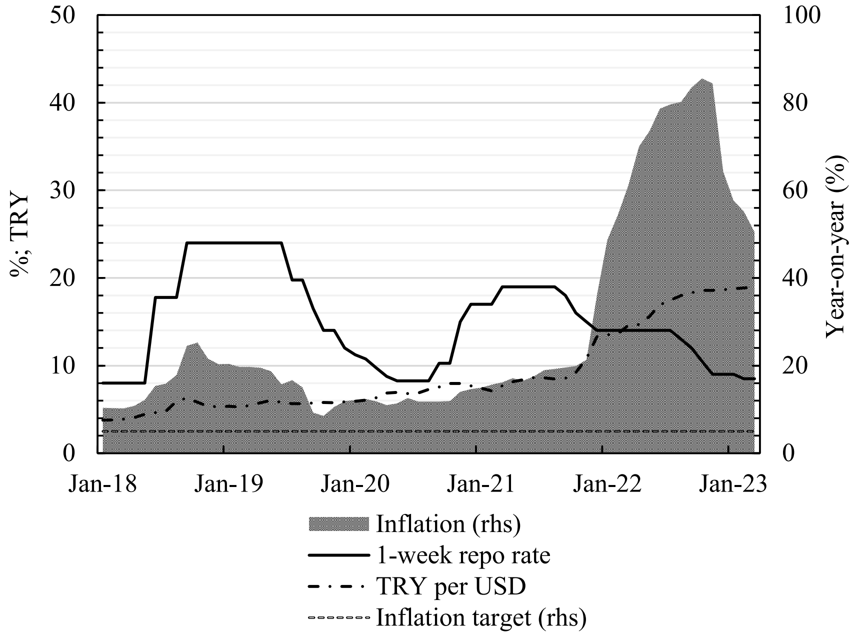


FIGURE 7: Inflationary developments in Turkey.

Sources: CBRT, Refinitiv and authors' calculations. Notes: End-of-month 1-week repo rate. The inflation target is a 5% year-on-year change in the CPI as of year-end. Data until Mar-23.

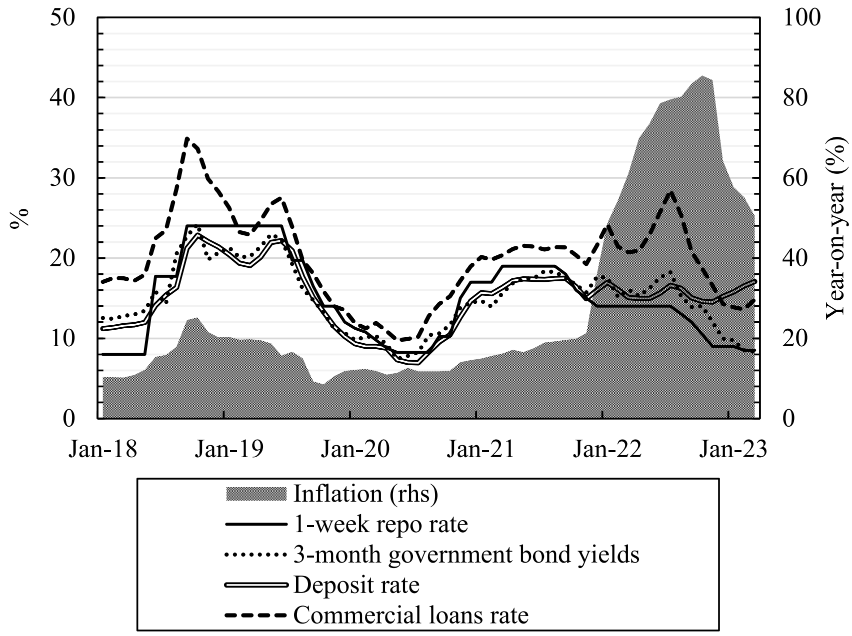


FIGURE 8: Interest rates in Turkey.

Sources: CBRT, Refinitiv and authors' calculations. Notes: End-of-month 1-week repo rate. The deposit rate is the weighted average of new, up to one-month lira deposits. The commercial loans rate is the weighted average of new commercial loans denominated in liras. In Aug-22, the CBRT introduced requirements for banks to hold securities as collateral equal to 20% of commercial loans extended with an interest rate 1.4x the CBRT reference rate, with the requirement rising to 90% of commercial loans with an interest rate more than 1.8x the reference rate. Data until Mar-23.

Inflation and structural shocks

Some of the public health measures during the COVID-19 pandemic, followed by the war in the Ukraine, caused significant supply and demand disruptions that have translated into large movements in relative prices. Figure 9 shows the extent of those price movements in the euro area by comparing total HICP inflation with a measure of core inflation, which excludes energy and food prices. Relative price movements were also significant within core inflation, as shown in Figure 10. How should monetary policy deal with inflation that is so unequally distributed across sectors? Should it aim at stabilising total inflation by inducing deflation in the sectors where relative prices are falling? Should it allow for relatively high total inflation by stabilising prices in the sectors with decreasing relative prices?

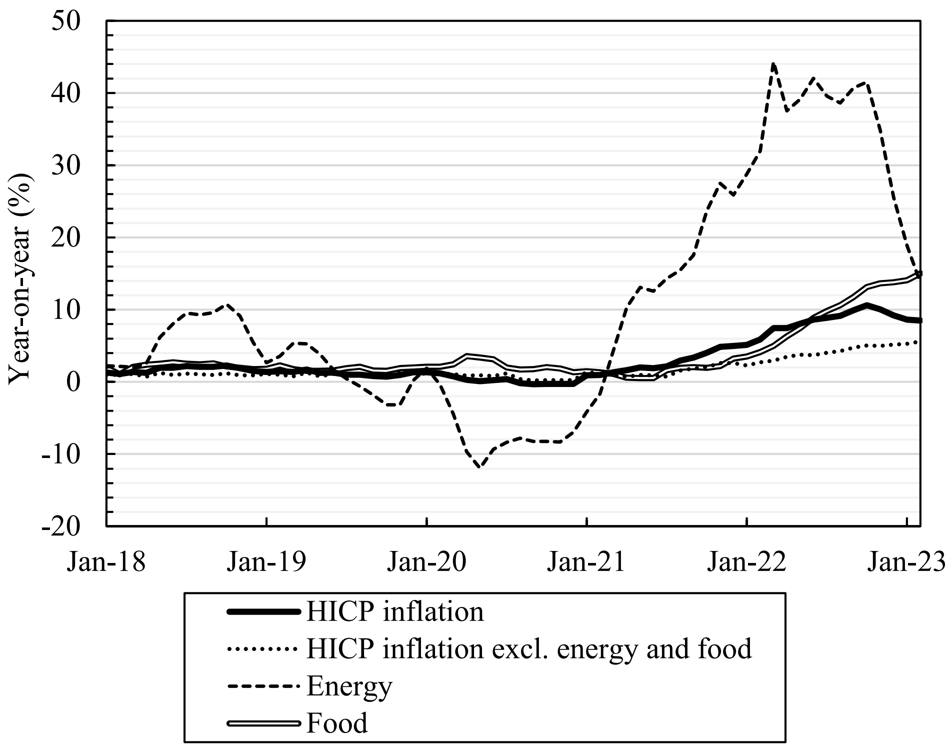
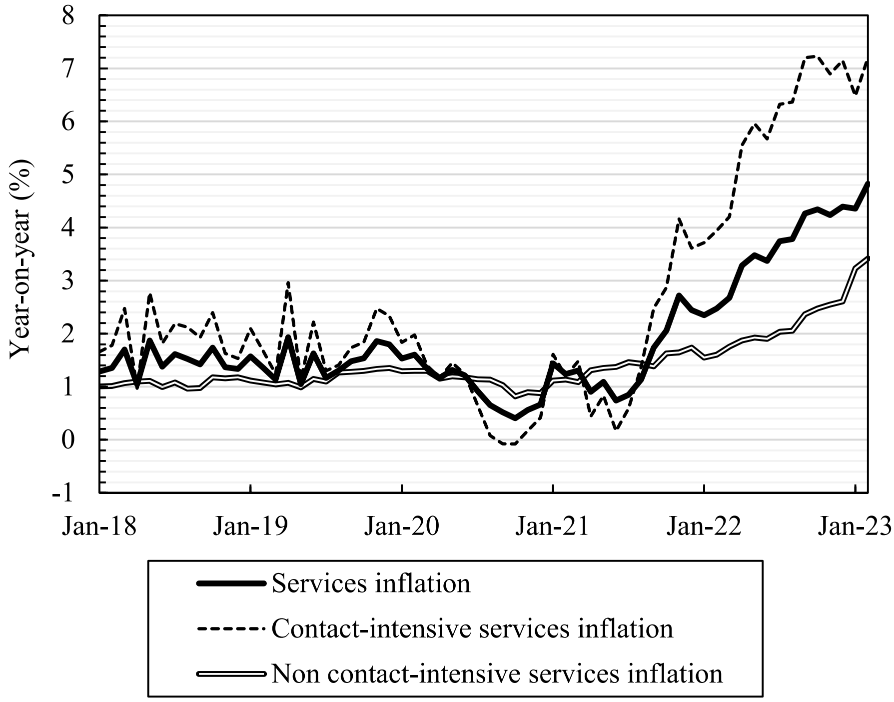


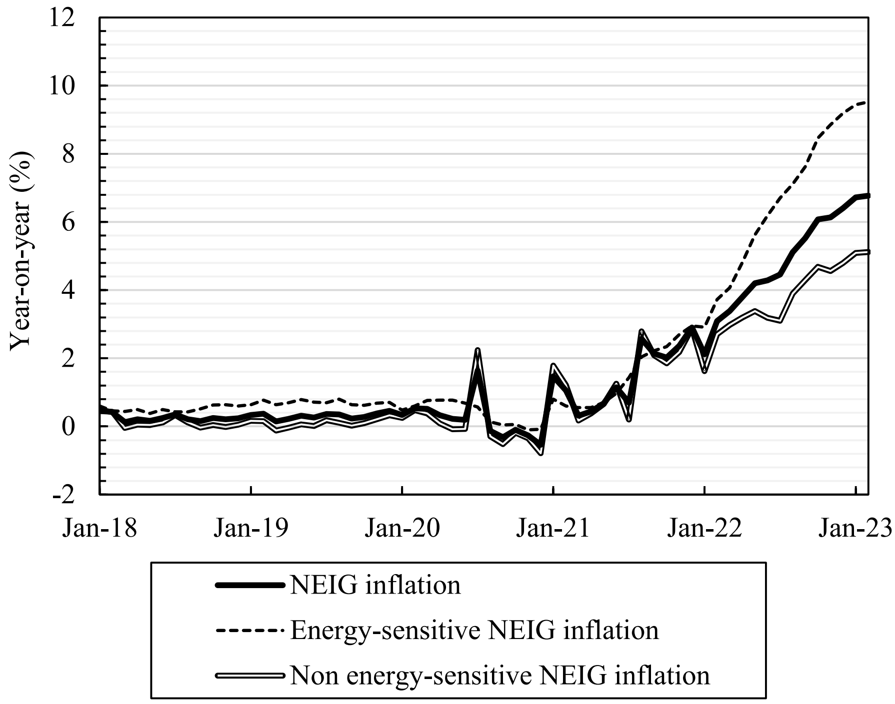
FIGURE 9: Euro area HICP inflation.
Source: Eurostat. Notes: Data until Feb-23.

A good benchmark to tackle these questions is to consider the premise that the goal of monetary policy is to implement the allocations that would take place without nominal rigidities. Under this premise, simple arguments from a model with downward wage rigidities suggest that stabilising total inflation is not the right goal for policy. Furthermore, allowing for some inflation in the sectors with decreasing relative prices may also be desirable. The allocations under flexible prices and wages may not be the second best optimum, but they should be close to it.

To discuss these arguments, let us consider a world with two sectors, A and B. Suppose that, under flexible prices and wages, real wages in sector A measured in



(A) Euro area services inflation. Notes: Contact-intensive services identified by the ECB. These items had a 39% weight on the HICP basket of services in 2022. Data until Feb-23.



(B) Euro area non-energy industrial goods (NEIG) inflation. Notes: Energy-sensitive goods identified by the ECB. These items have a share of energy in total costs (direct and indirect) above the average energy cost share across all NEIG items, and had a 37% weight on the HICP basket of NEIG in 2022. Data until Feb-23.

FIGURE 10: Euro area core inflation.

Sources: ECB, Eurostat and authors' calculations.

units of good A would decrease (possibly because of supply chain disruptions) and the relative price of good B would increase (possibly because of shifting demand). That is,

$$\frac{W_A}{P_A}\downarrow \ , \quad \frac{P_B}{P_A}\uparrow$$

In order to implement this allocation in an alternative world with downward wage rigidities, it is necessary to have inflation in sector A and even higher inflation in sector B. Illustratively,

$$\frac{\overline{W_A}}{P_A \uparrow}\downarrow \ , \quad \frac{P_B \uparrow\uparrow}{P_A \uparrow}\uparrow$$

Under this implementation, the nominal wage does not have to go down, but the real wage in units of A goods decreases and the real wage in units of B goods decreases even further. Optimality in such a world introduces an inflation bias. Both the need for an adjustment in real wages and relative price movements give rise to an inflation bias that could be large when those adjustments are also large.

The argument is not very different from the one that is normally used to justify that central banks pay attention to core inflation. The reason to exclude food and energy prices in core inflation is that those prices are very volatile. Monetary policy aims at stabilising prices in sectors where nominal rigidities are present, precisely because those sectors are the ones where price volatility is costly.[8] The difference with the argument above is that targeting core inflation does not necessarily generate an inflation bias, as total inflation under the optimal policy would deviate down from target when food and energy prices are relatively cheaper and would go above target when those goods are relatively more expensive. Instead, if the main source of inefficiency is downward wage rigidities, as illustrated above, optimal monetary policy will include an inflation bias that can be very large in response to large asymmetric shocks.

The issue of optimal monetary policy in a two-sector model with downward wage rigidities is also explored in a recent paper by Guerrieri *et al.* (2021). Under this framework, policy can address labour reallocation inefficiencies following a sectoral preference shock by allowing inflation to temporarily run above target, supporting stronger real wage growth in the labour-constrained sector, which sends the right price incentive for workers to move. The fact that real wages in the euro area in contact-intensive sectors such as the aggregate of wholesale and retail trade, repair of motor vehicles and motorcycles, transportation and storage and accommodation and food service activities has not decreased as much as in other sectors, as shown in Figure 11, supports this framework in thinking through the recent inflationary process.

8. See Aoki (2001) for a seminal analysis of optimal monetary policy in a two-sector dynamic general equilibrium model with a flexible-price sector and a sticky-price sector.

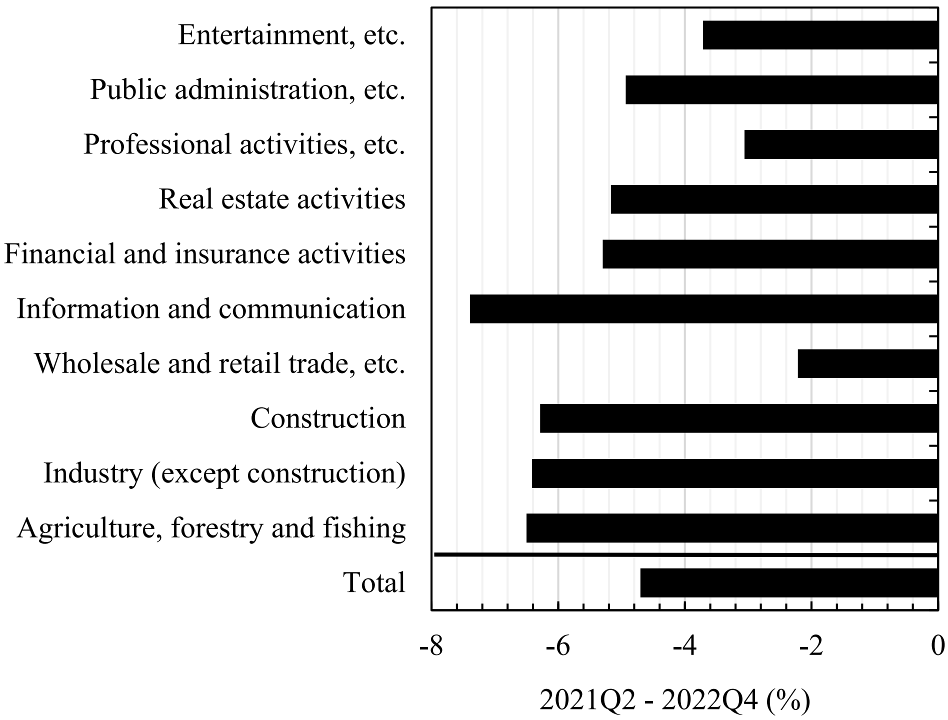


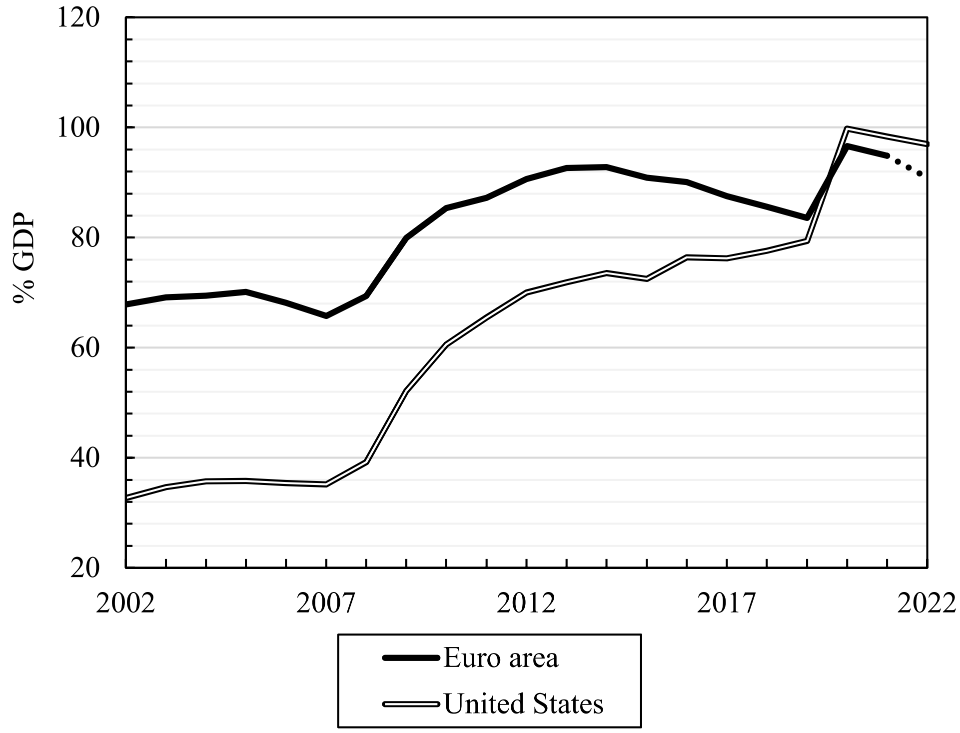
FIGURE 11: Euro area real compensation per employee.

Sources: ECB and authors' calculations. Notes: Nominal compensation per employee deflated by headline HICP. Seasonally adjusted data. Entertainment, etc. - Arts, entertainment and recreation; other service activities; activities of household and extra-territorial organizations and bodies. Public administration, etc. - Public administration, defence, education, human health and social work activities. Professional activities, etc. - Professional, scientific and technical activities; administrative and support service activities. Wholesale and retail trade, etc. - Wholesale and retail trade; repair of motor vehicles and motorcycles; transportation and storage; accommodation and food service activities.

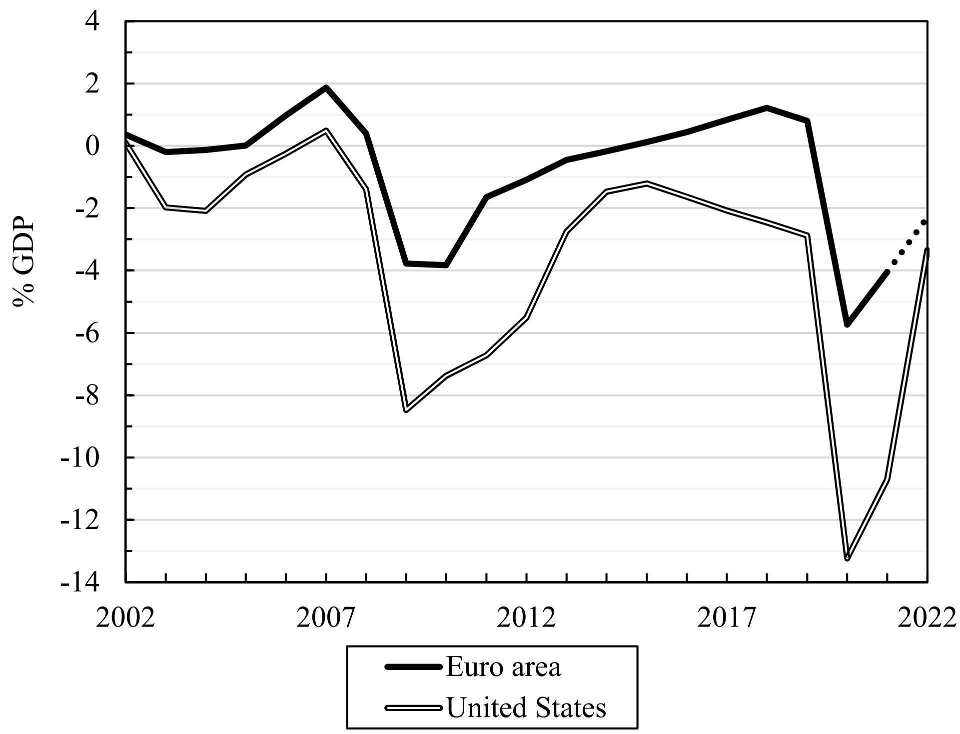
Inflation and debt depletion

The policy response to the pandemic included a significant expansion of public spending, both health and non-health related, including transfers. Both in the euro area and in the US, this translated into a large increase in debt levels, especially when measured as a share of a depressed GDP. As shown in Figure 12, the level of debt as a percentage of GDP increased in both economies by roughly twenty percentage points at the outbreak of the pandemic. Since then, and in spite of large fiscal deficits (as shown in Figure 12), debt as a share of GDP has decreased in both economies. A large part of this is explained by the nominal appreciation of GDP due to inflation.

The contribution of inflation to debt financing is not limited to the real depletion of the debt. The wages of civil servants are a large part of government spending, as are pensions. The depletion of the real value of those obligations through surprise inflation also amounts to a large cut in public spending. Figure 13 shows the evolution of real wages in the public administration in the euro area as well as in Portugal, one example where those wages are downward rigid. In the euro area, the fall in real wages through the pandemic is the largest since its inception; in Portugal, it is the largest cut in a decade.



(A) Debt. Notes: For the United States, we consider federal debt held by the public. For the euro area, we consider consolidated gross debt. Projected data for 2022 for the euro area.



(B) Primary balance. Notes: Projected data for 2022 for the euro area.

FIGURE 12: General government finance.

Sources: Congressional Budget Office and IMF.

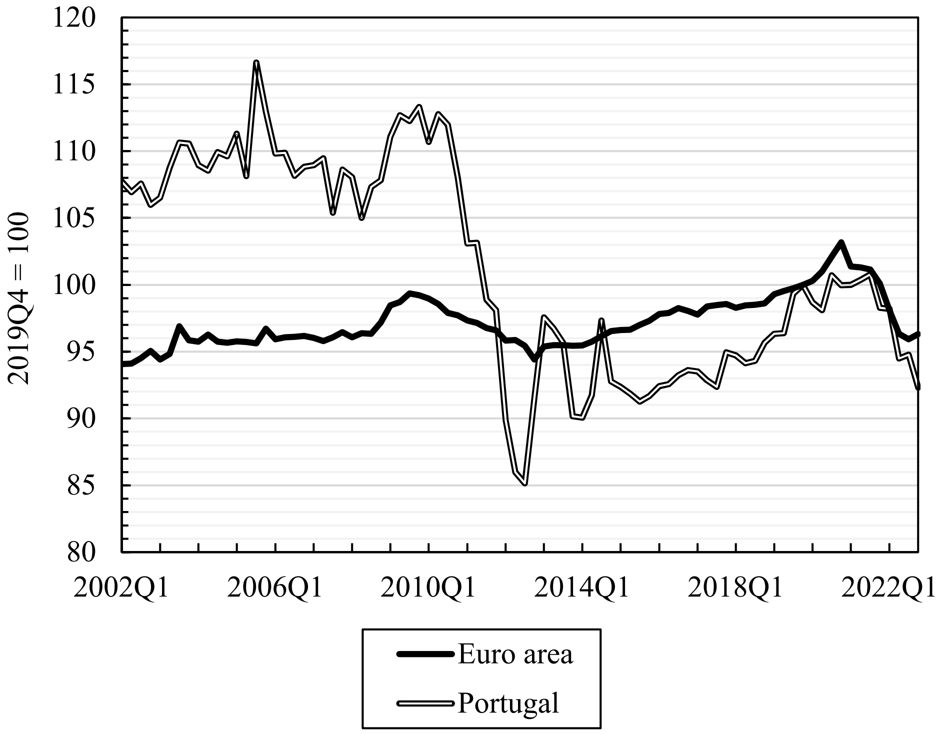


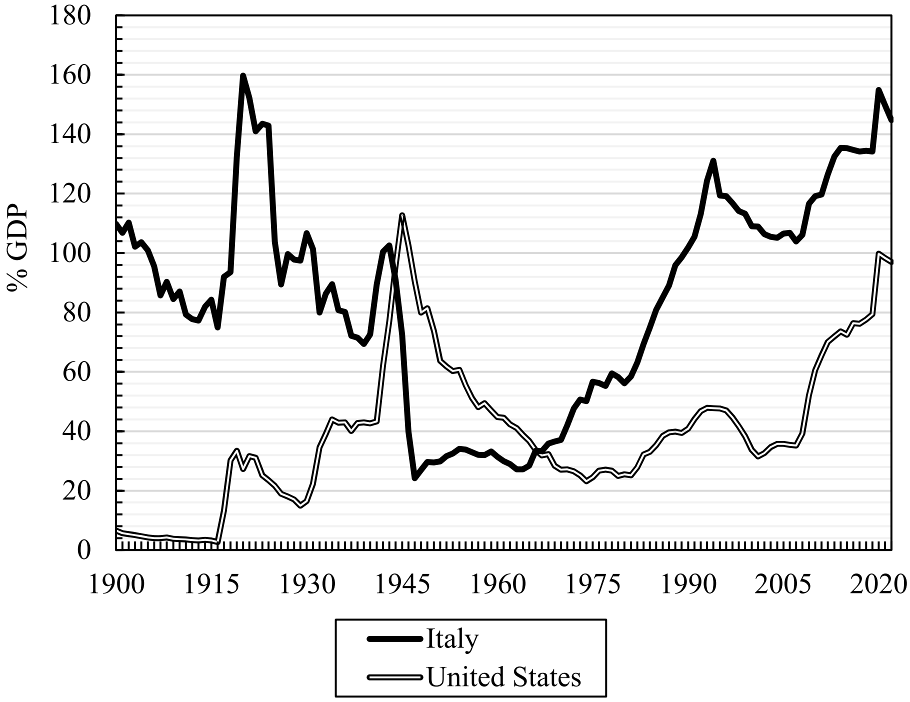
FIGURE 13: Real compensation per employee in the public sector.

Sources: ECB and authors' calculations. Notes: Compensation per employee of public administration, defence, education, human health and social work activities deflated by headline HICP. Data until 2022Q4.

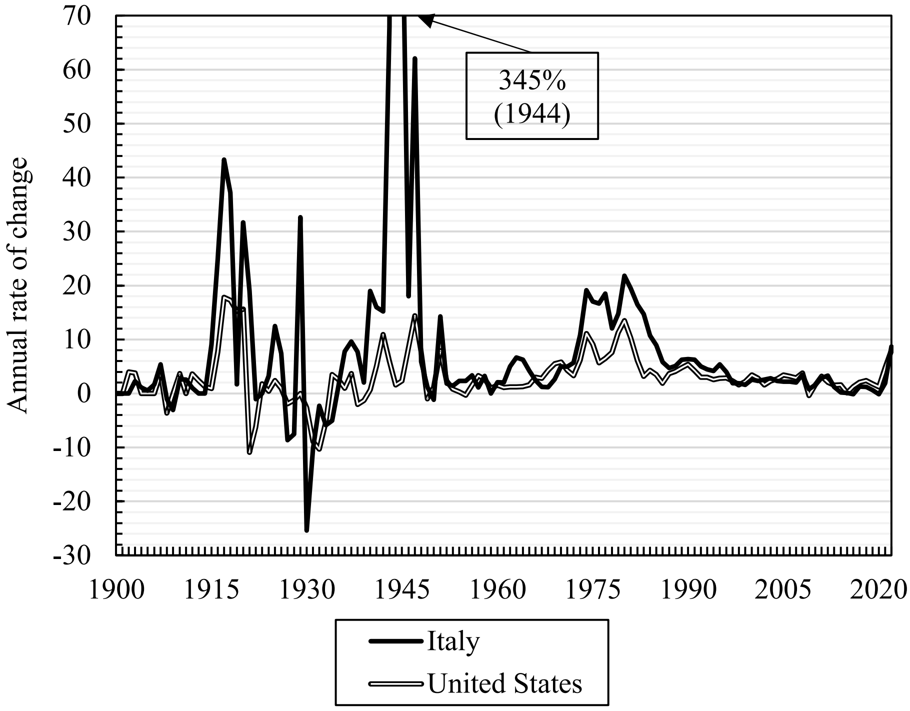
The use of inflation to deplete debt in response to a large fiscal shock is certainly not new. Hall and Sargent (2022) show that the US federal government financed its wartime expenditures during WWI and WWII primarily by issuing debt and printing money, rather than explicit taxation. Both during and after the wars, price levels rose significantly, eroding the real value of debt as creditors suffered large real losses. In the case of Italy, a key European player in both world wars, the stylized facts are broadly similar, as shown in Figure 14.

Is it optimal for policy to let inflation run high to deplete elevated nominal debt, rather than impose higher taxes? Under Calvo price setting, as is standard in the literature, the answer is no. Regardless of the maturity of the debt, which may smooth down inflation over time, the Calvo sticky price friction generates too much price dispersion. However, as shown in Teles and Tristani (2021), under alternative price setting assumptions such as sticky information as in Mankiw and Reis (2002), a significant inflation response is desirable if the maturity of debt is sufficiently long. The optimal response of inflation calibrated to the debt levels and maturity structure of the euro area is very close to the one that has been observed.

Interestingly, the war on COVID-19 and the two world wars of the 20th century share in common not only a large increase in the level of debt, which may be optimally depleted with surprise inflation, but also large structural shocks, giving rise to relative price movements that should be accommodated with higher than usual inflation.



(A) Debt. Notes: For the United States, we consider federal debt held by the public. For Italy, we consider consolidated gross debt.



(B) Inflation.

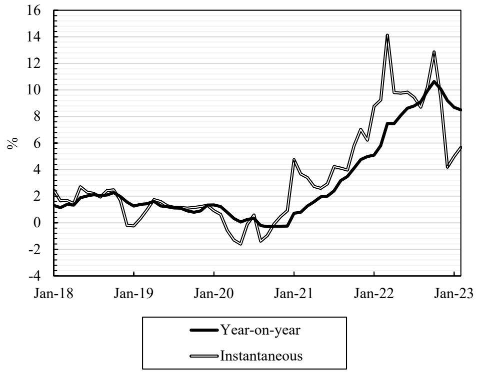
FIGURE 14: Historical evolution of debt and inflation.

Source: Congressional Budget Office, Eurostat, Federal Reserve Bank of Minneapolis, IMF, Reinhart and Rogoff (2011) and authors' calculations. Notes: We do not consider other European key players, such as Germany and France, due to data constraints. Data until 2022.

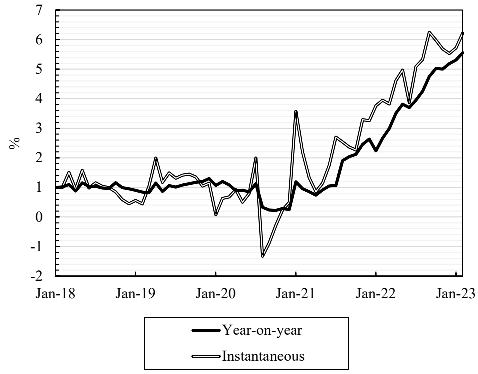
Concluding remarks

In this synopsis, we discuss reasons for current inflation to be tolerated. Large structural shocks and relative price movements with downward wage rigidity induce an inflationary bias that may be quite large given the size of the shocks. Furthermore, the large accumulation of debt during the pandemic could be more efficiently financed with surprise inflation than with higher taxes.

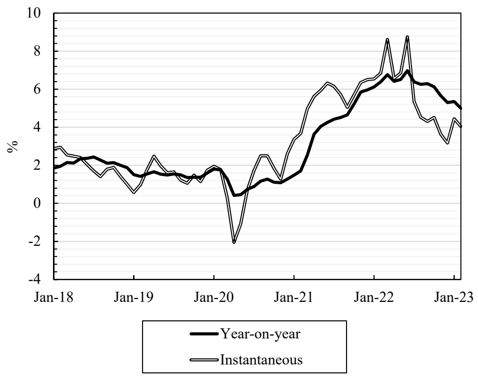
The risks of allowing for some inflation is that you may get a lot of it. Could this surge in inflation not be short lived, but rather have induced a very persistent deviation of inflation from target? In a recent work, Eeckhout (2023) highlights that when inflation is either going up or down, the annual average inflation rate can hide this information, since it implicitly uses equal weights for inflation within the year. He proposes a measure of instantaneous inflation that gives a higher weight to more recent data as a more adequate measure of the price changes. Employing such measure, headline inflation in the euro area and in the US appears to be closer to target, as shown in Figure 15. However, if we consider core inflation, the signs of a sustained disinflation process are less evident in both economies.



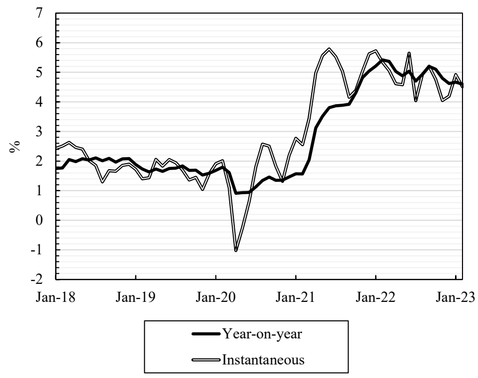
(A) Euro area - Headline HICP inflation.



(B) Euro area - Core HICP inflation.



(C) United States - Headline PCE inflation.



(D) United States - Core PCE inflation.

FIGURE 15: Instantaneous inflation.

Sources: ECB, Refinitiv and authors' calculations. Notes: Data until Feb-23.

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Appendix A: Estimation of the natural rate in the euro area

To estimate the natural rate in response to shocks, we consider the Federal Reserve Bank of New York estimates for the US and calculate the corresponding rate for the euro area.

From:

$$\frac{1+r^e_{t+1}}{1+r^{*e}_{t+1}} \approx \frac{\frac{1+i_t}{P^e_{t+1}/P_t}}{\frac{1+i^*_t}{P^{*e}_{t+1}/P^*_t}}$$

where P is the price level and the superscript e denotes the expectation, we get:

$$\frac{1+r^e_{t+1}}{1+r^{*e}_{t+1}} \approx \left[\frac{1+i_t}{1+i^*_t} \cdot \frac{F_{t,t+1}}{E_t}\right] \cdot \left[\frac{E^e_{t+1}}{F_{t,t+1}}\right] \cdot \left[\frac{\frac{E_t \cdot P_t}{P^*_t}}{\frac{E^e_{t+1} \cdot P^e_{t+1}}{P^{*e}_{t+1}}}\right]$$

Given the covered interest parity condition, $\frac{1+i_t}{1+i^*_t} \cdot \frac{F_{t,t+1}}{E_t} = 1$, where E is the nominal exchange rate and F is the forward exchange rate, and assuming that the nominal exchange rate follows a random walk, $E^e_{t+1} = E_t$, we have

$$\frac{1+r^e_{t+1}}{1+r^{*e}_{t+1}} \approx \frac{E_t}{F_{t,t+1}} \cdot \frac{e_t}{e^e_{t+1}}$$

or

$$r^e_{t+1} \approx r^{*e}_{t+1} + i_t - i^*_t + \ln e_t - \ln e^e_{t+1}$$

Assuming that the real exchange rates also follow a random walk,

$$r^e_{t+1} \approx r^{*e}_{t+1} + i_t - i^*_t$$

The Federal Reserve Bank of New York estimates for the US natural rate in the last quarter of 2022 was 2.6%. Given that the policy rates in the euro area and in the US in the third quarter of 2022 were, on average, -0.1% and 2.2%, respectively, it follows that the natural rate in the last quarter of 2022 in the euro area was approximately 0.3%, on average, as shown below:

$$r^e_{2022Q4} \approx 2.6\% - 0.1\% - 2.2\% = 0.3\%$$

Appendix B: Other illustrative practical policy rules

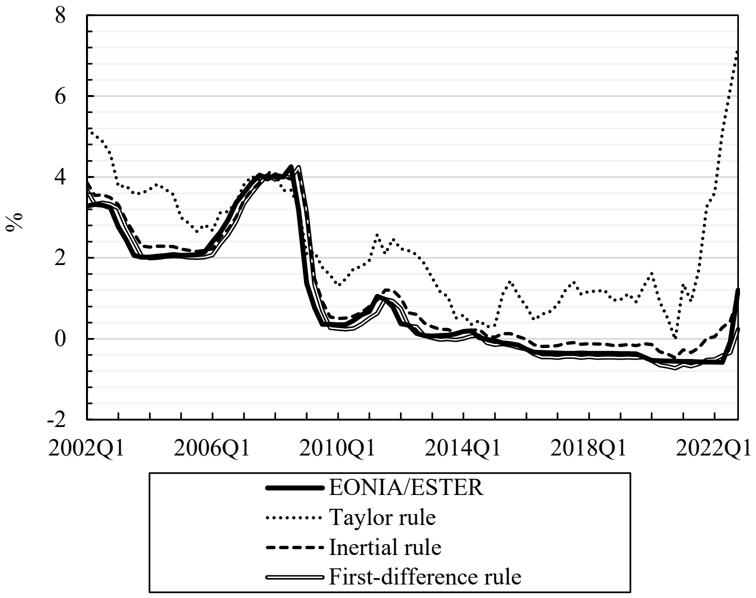
In this section, we consider four illustrative practical policy rules similar to those presented and extensively discussed in the Federal Reserve Board website, with minor modifications:[9]

9. See https://www.federalreserve.gov/monetarypolicy/policy-rules-and-how-policymakers-use-them.htm. We do not consider the ELB-adjusted rule due to the large uncertainty regarding where this bound lies, especially in the euro area.

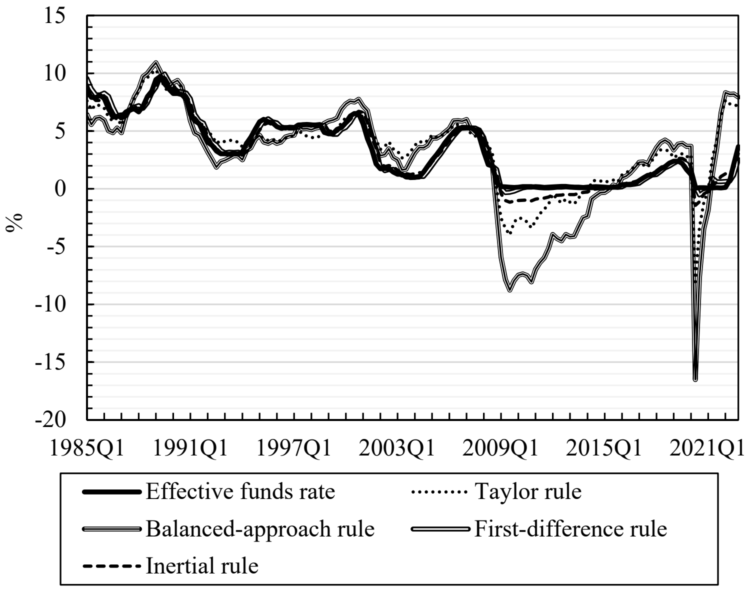
$$\begin{aligned} \text{Taylor rule:} \quad & i_t^T = r_t^* + \pi^* + 1.5\left(\pi_t - \pi^*\right) - \left(u_t - u_t^*\right) \\ \text{Balanced-approach rule:} \quad & i_t^{BT} = r_t^* + \pi^* + 1.5\left(\pi_t - \pi^*\right) - 2\left(u_t - u_t^*\right) \\ \text{Inertial rule:} \quad & i_t^I = 0.85 i_{t-1} + 0.15 i^{BT} \\ \text{First-difference rule:} \quad & \Delta i_t^{FD} = 0.1\left(\pi_t - \pi^*\right) - 0.1\left(u_t - u_{t-4}\right) \end{aligned}$$

For the euro area, we remove any direct considerations of the unemployment gap to reflect the fact that the ECB does not follow a dual mandate, which effectively eliminates the distinction between the Taylor rule and the Balanced-approach rule.

As shown in Figure B.1, the prescriptions from the Taylor rules with built-in gradualism, such as the inertial rule and the first-difference rule, have closely followed the actions of both the Fed and the ECB. During the recent high inflation episode, there were negative deviations from the inertial rule in the euro area and from both gradualist rules in the US, showing a slow response of policy even taking gradualism into account.



(A) Euro area. Notes: We employ EONIA until 2019Q4 and ESTER thereafter (quarterly averages of daily data). We consider HICP excluding food and energy, and 2% as the inflation target. Data until 2022Q4.



(B) United States. Notes: Quarterly averages of daily data for the effective funds rate. We consider PCE inflation excluding food and energy, and 2% as the inflation target. We consider the Congressional Budget Office estimates of the noncyclical rate of unemployment as a measure of u*. Data until 2022Q4.

FIGURE B.1: Rules prescriptions.

Sources: Congressional Budget Office, ECB, Eurostat, Federal Reserve Bank of New York, Federal Reserve Economic Data (FRED), Refinitiv and authors' calculations. Notes: The natural real interest rate is estimated from the Holston, Laubach and Williams (HLW) model. The New York Fed suspended the publication of the HLW estimates of the natural real interest rate after releasing estimates for the second quarter of 2020. Beyond this period, we follow the procedure of the Federal Reserve Bank of Atlanta and assume that the HLW estimates remain at their last published values.