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What can keep euro area inflation high?

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Abstract

A central bank going through an episode of inflation above target may fail to bring it down. This article discusses five ways in which this is due to the central bank becoming dominated by: misjudgment, incredibility, fiscal policy, financial markets, or recession fears. It applies this approach to the challenge facing the ECB in 2023-24. While there are good reasons to be optimistic about euro area inflation, the hope is that the factors identified here serve as warning posts for what should be avoided.

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1 Introduction

Inflation was 10.0% in the euro area in September of 2022. Relative to the previous twenty one years of non-overlapping 12-month inflation rates between 1999 and 2020, this is almost three times larger than the previous record in 2008 (3.6%). In this short annual sample, it is an 8-sigma event. At the same time, between September of 2021 and 2022, the unemployment rate fell from 7.5% to 6.6%. This is the lowest recorded euro area unemployment rate since we have measured it (1998). It is well below the two previous minima, 7.2% in March of 2020 and 7.3% in March of 2008.¹

What was the stance of monetary policy during this remarkable time? An often-used measure of it is the difference between a 1-year safe nominal rate (from locking in the deposit rate at the ECB or buying a 1-year bond of a AAA-sovereign) and a 1-year expected inflation. This gives a measure of the key real interest rate through which monetary policy affects savings and investment decisions and via them inflation. In July of 2022, the last date for which data is available, its value was -6.9%.² One year earlier, in July of 2021, this measure of the stance was -3.9%. During these 12 months when inflation was exploding and unemployment steadily falling, monetary policy went through a 300 basis point loosening cycle. This is the loosening that usually happens when inflation is well below target and unemployment has risen.

The debate on what could have caused this unusual combination of indicators has already started. For sure, there was a great deal of bad luck creating such a large deviation from the ECB's mandate of price stability. For instance, a rapid increase in energy prices has driven inflation up, is expected to lead to low real GDP growth in 2023, and may have caused an over-reaction of inflation expectations to these visible prices lowering real interest rates. Just as surely, there were some policy mistakes, since as late as June of 2022, the ECB's policy rate was fixed at -0.5%, as low as it can get. Importantly, the ECB's mandate has not changed during this time, neither has the clear commitment of its policymakers to achieve it. While it is likely too late for policy to be able to drive down inflation to 2% by the end of 2023, it should be credibly expected to get there by the end of 2024. The goal of this paper is to look forward and ask: what could prevent the ECB from achieving its inflation target?

¹Data from the ECB Statistical Warehouse: inflation is annual change in the harmonized index of consumer prices, and the unemployment rate is for euro area 19, fixed composition, seasonally adjusted.

²The average daily spot rate on 1-year AAA government bonds reported by the ECB's database was 0.2%, and the mean expected inflation in the ECB's Survey of consumer expectations was 7.1%.

To do so, I do not contribute to the discussion of why inflation is so high in 2022, but take this starting point as given. The two questions are surely related, but they can be taken in turn. After identifying the future obstacles, I ask whether they are likely, informed by the recent past.

Likewise, I do not question the ability in theory of a central bank to deliver on its mandate. There is a healthy academic debate on whether an independent central bank that sets a policy interest rate with a numerical target for inflation can uniquely implement an equilibrium where it delivers that rate of inflation. Given the success that dozens of countries had in the past two decades achieving price stability with this institutional arrangement, I assume it is so. Instead, I ask what reasons may stop the central bank from raising interest rates enough to bring down inflation.

Finally, while the euro area is the application in mind, I use economic theory to ask what are the key forces in existing models that will push against the central bank's mandate. In some contexts, the literature has said that in this case the central banks is dominated by another force or economic agent. I ask when is it so, to then discuss whether in the context of the euro area this force is likely.

A more accurate (but lengthier) description of this paper is that it provides some answers to the question: starting from high inflation, when would an interest-rate setting central bank fail to raise policy rates because it is dominated by other factors or agents, with an application to the challenges facing the ECB in 2023-24?³

2 Evolution of the real economy

The starting point for much modern thinking about what drives inflation is the Fisher equation. Approximately, it states that the nominal interest rate that the central bank pays to banks that are holdings deposits at the central bank (i for short) will be equal to the real return on private investments in the economy (r for short) plus the rate of inflation that people expect during the time of the investment (π^e for short):

$$i = r + \pi^e. \tag{1}$$

³The paper covers much ground, drawing on many literatures, but I keep references to the literature to a minimum. Because each equation is stated rather than derived, I refer the readers every time to a previous paper of mine where a full model behind that equation is derived. To make these self-references less obnoxious, I keep them to footnotes and add complements to other models in the literature.

Keeping in mind that the perspective in this paper is over the next two years, the policy rate more accurately reflects the expected average path for the deposit rate over the next two years. Also, the rate of return is adjusted for the large risk differences between keeping resources in a safe deposit as opposed to in investment projects that may fail or succeed to varying degrees.

This equation is crucial because it captures what is unique about the central bank and what gives it the power to control inflation. Deposits at the central bank define what the unit of account is in an economy. A euro is nothing more nor less than an entry in a spreadsheet in Frankfurt. The real value of a deposit is then the inverse of the price level, since this measures how many goods this unit of account can buy. Inflation is the loss in real value of a euro at the central bank, or equivalently, the increase in nominal value of a real good in the private economy.

A bank can choose to either hold a deposit at the central bank, earning i , or invest in the real economy earning r plus whatever is the expected rate of inflation. Say that the price level right now is “too low” relative to where it should be. Then, it must be expected to rise, so inflation is too high. But then the return in the real economy will be too high, and banks will shift away from deposits at the central bank and towards investing in the real economy. This undesirability of deposits will make their value fall. Since their value is the inverse of the price level, it must rise. The price level is no longer too low, and an equilibrium is reached.

This logic is much broader than the direct actions of banks. The forces of arbitrage in financial markets mean that the policy rate will be tightly linked to all other nominal returns in the economy. Competition will make banks reflect in their deposit rates what they are earning at the central bank, and investors can move their funds between their bank deposits and all kinds of bonds, investment contracts, or deposits in financial institutions. The same logic therefore will create an excess demand or supply for all manner of nominal investments as opposed to real investments. The price level is what connects the two, since it is what translates goods into euros.

Even more broadly, the return captured in r can be interpreted as the growth rate in aggregate consumption. The higher it is, the more it means that households want to delay their spending. Start again with a “too low” price level. It would induce people to want to spend more today. That reduction in savings creates an excess demand for goods. It is this demand that pushes for the rise in the price level back into equilibrium.⁴

⁴For the Fisher equation and the logic behind it, see Hall and Reis (2016) or Woodford (2003).

2.1 Monetary policy: setting interest rates to track the economy

Because the central bank controls the policy rate i , this gives it the power to control inflation. That it controls i is beyond doubt: after all, since euros are entries in its spreadsheet, it can multiply these entries by whatever rate it so pleases. For a given target inflation rate (call it $\bar{\pi}$) the central bank will be tracking the real economy to try to estimate what will be the real return on investment over the next two years (call this \hat{r}). Then, choosing policy rates over these two years according to a standard policy rule: $i = \bar{\pi} + \hat{r} + \phi(\pi - \bar{\pi})$, where $\phi > 0$, will deliver inflation:

$$\pi = \bar{\pi} + \frac{r - \hat{r}}{\phi} + \frac{\pi^e - \bar{\pi}}{\phi}. \quad (2)$$

The second term on the right-hand-side captures a source of failure to hit the inflation target: mis-estimating where the economy will be over the next two years. A virtue of this simple model is that, in its generality, it focus attention on r as the key variable to track. It is sometimes referred to as the “neutral rate” in the sense that, if it is accurately forecasted, inflation will be on track. At the same time, r is not something that is observed. So, central banks turn to tens of models curated by hundreds on economists using thousands of data series to track the state of the economy captured in this neutral interest rate.

What can make the ECB fail to hits its target? The first candidate is a misjudgment of r , namely under-estimating where it is. This would show up as setting too low nominal interest rates for too long, being slow to react to a steady rise in inflation because the policy rate was in fact below its neutral level.⁵

2.2 Misjudgment dominance?

Misjudgment dominance happens when central banks cling to outdated theories or measurements of the economy, finding excuses for why inflation is rising that absolve monetary policy from responsibilities. Arguably, the most famous instance where misjudgment dominated the central banks of advanced economies took place in the 1970s. Following an energy shock in 1972 that persisted and intensified, production costs were higher, potential output was lower, and the natural rate of unemployment was higher than before. In modern terms, r rose. Struggling to judge in real time with imperfect data whether this

⁵For how policy rules setting interest rates determine inflation and their limitations, as well as alternative policy regimes, see Castillo-Martinez and Reis (2019) or McCallum (1999).

was a temporary or a persistent change, central bankers persistently believed in a \hat{r} that was too low. They set policy too loose and spent too many years one step behind, chasing a rising inflation that was expected to start falling any time. It took a long time before accepting that a high-energy costs economy would be a lower-growth economy, and that monetary policy could not avoid it.

Is this a danger for the ECB in 2023-24? One year ago, the answer was a resolute and confident no. The 1970s have not been forgotten among central bankers. Today, in October of 2022, confidence has been slightly dented by the events of the last 12 months, as the ECB was slow to rise rates even as the fast-rising inflation signaled that \hat{r} was well below r . At the same time, every forecast comes with temporary errors, the shocks of the last 12 months were exceptional, and the ECB is already raising policy rates aggressively to make up for the lost ground. With a track record of impeccable inflation control over slightly more than two decades, the institution has earned the benefit of the doubt.

The second source of misjudgment dominance is conceptual. It comes from confusing the return on private investment r , with the return on government bonds. In an efficient frictionless financial market, the two would be the same (once adjusted for risk). Given the extensive evidence that there is some misallocation of capital in the euro area, there are multiple r . The relative lower depth of euro area financial markets implies that the sovereign bonds of the most creditworthy regions are particularly special in terms of their provision of safety, store of value, liquidity, or collateral. This specialness implies that governments get a discount when borrowing, so the return on their bonds is conceptually below the correct measure of r for monetary policy. Policy itself has contributed to this, since continuous large purchases of government bonds by the ECB have enhanced the ease with which they are sold, their scarcity as collateral, or their perceived safety, all contributing to it being an even more distorted measure of r .

The ECB's mission review in 2020-21 justified some of its policy framework with the state-of-the-art estimates of a lower long-run trend in r , sometimes called r -star, justified by evolutions in demography and productivity. Yet, the current art leans heavily on government bond returns that are subject to the distortions above. Complementing those measures with observations on the marginal returns to capital in different sectors of the private economy raises many conceptual doubts, and changes the focus to the efficiency of financial markets and the allocation of capital. While having a view on r is inevitable to guide monetary policy, the misjudgment would be to let policy become too dominated

by some particular estimates of r -star.⁶

3 Expectations and credibility

The previous section took π^e as given. Even if expectations are not fully rational, surely there is some feedback between actual and expected inflation. At the same time, both the measurement and the modeling of inflation expectations has extensively documented several several important features of inflation expectations away from a rational benchmark. For the challenges facing a central bank in 2022, two of these are particularly pressing.

First, after two decades of stable inflation very close to target, the ECB enjoys a capital of inattention and credibility. No matter what happens, what happens, or what the central bank does, a share of agents believe that over the next two years, the ECB will bring inflation back on target. Of course, this share may fall if inflation persists for much longer, but as of the end of 2022, it is likely positive and large. This group of economic agents may come to this conclusion from two very different perspectives. Some of them may have rationally chosen to not pay attention to inflation for a long time because its variance was so low. Others may be perfectly attentive, listening to the speeches of ECB policymakers, and trusting that they will deliver. Either way, I capture them by having a share λ_i of economic agents believe that inflation will be $\bar{\pi}$. This share is a measure of the central bank's reputation.

Second, another share of agents, λ_b , expect inflation in the next two years to be as high as it was in the last twelve months, say π_0 . This behavior could be the result of looking backwards, as in adaptive theories of expectations. It can also be micro-founded as resulting from these people paying attention, believing that the past is gone, and thinking that the ECB will never go back to the good old days of inflation control. The presence of these agents reflects both the way in which agents learn about the future by observing the present, as well as their over-reaction to present events in their diagnostics of the future. It imparts persistence to expectations, one of its key properties in the data. The parameter λ_b is then a measure of the credibility that has been lost.

Finally, the remainder agents get their expectations about right. Ignore shocks, so that $r = \hat{r}$ and we can focus on the role of expectations. Then, approximately these agents

⁶On how to measure r , see Reis (2022c). On misjudgments of the state of the economy, see Orphanides (2001).

will expect inflation to be about equal to the actual inflation π . Their rationality gives the power to policy in affecting outcomes via this expectations channel.

Combining all the ingredients, average expected inflation then is:⁷

$$\pi^e = \lambda_i \bar{\pi} + \lambda_b \pi_0 + (1 - \lambda_i - \lambda_b) \pi. \quad (3)$$

3.1 Monetary policy: asserting credibility

Replacing expectations into equation (2) gives the effect of expectations on inflation:

$$\pi = \bar{\pi} + \frac{\lambda_b (\pi_0 - \bar{\pi})}{\phi - 1 + \lambda_i + \lambda_b}. \quad (4)$$

The best case scenario is the one in which the central bank has lost no credibility, so $\lambda_b = 0$. In that case, since inattentive agents expect inflation to be on target, and the central bank is committed to delivering it inducing rational agents to expect inflation on target as well, then expectations are under control. They are not a source of inflation. (Of secondary interest, in this case, if there are mis-forecasts of the state of the economy $r \neq \hat{r}$, then the stronger the reputation of the central bank λ_i , the closer inflation will be on target.)

However the legacy of the high inflation of 2022 is $\lambda_b > 0$. Even if only little, even if unfairly, and even if this is an irrational over-reaction, some credibility may have been lost. More colorfully, one may call the presence of $\lambda_b > 0$ an animal spirit, to borrow Keynes' famous statement. The central bank then has two paths to bring inflation close to target.

The first of these is to react aggressively by raising interest rates well above the neutral rate as long as inflation is above target. In the model, this is a higher ϕ . Intuitively, a central bank that has lost some credibility as an inflation-fighter must compensate by fighting inflation harder. This means raising the policy rate more, all else equal.

The second is to use communication policy to reassure agents that inflation will be back on target. Beyond trying to regain credibility this way (lowering λ_b), the central bank can try to convince people that they should trust monetary policy. They can re-focus their attention on their individual lives, and stop worrying about inflation (raising λ_i). This re-anchoring of expectations will by itself bring inflation down: expecting less inflation, people will move towards nominal investments and choose to save more, bringing down

⁷A parsimonious model of inflation expectations close to this one is in Reis (2020) and see Weber et al. (2022) for a survey.

inflation in the process.⁸

3.2 Incredibility dominance

To fight animal spirits and a lack of credibility from dominating inflation, the central bank has to act tough and to talk tough. This is not easy to do, especially when the economy is entering a recession, as seems likely for the euro area in 2023.

Talking tough about inflation runs the risk of being perceived as less caring about unemployment, falls in real wages, or loss of income. Some will label the central banker an inflation nutter. It is tempting to deny the loss in credibility and so to not feel the need to do something painful to get it back. The mandate in the Maastricht Treaty may be clear, but policymakers are human, and they can become dominated by the media amplifying the animal spirits. The dominance in this case is of feelings towards popularity.

Second, acting tough is a result of the initial conditions. Even returning to equation (2) for inflation, if expected inflation π^e is above target, then bringing actual inflation back on target requires setting the policy rate *above* its neutral rate. Current empirical measures of expected inflation are well above target. It would be quite unusual that the current very high inflation would not have increased expectations of future inflation. Therefore, it would be a misjudgment to raise the ECB's policy rate to approach the neutral rate from below. Rather, the current tightening cycle has to peak above the neutral rate, and then approach it from above.

This prediction from theory is well grounded in experience. In the early 1980s, the Fed led by Paul Volcker raised policy rate aggressively in the United States. Quickly, just as inflation started falling, the Fed likewise lowered rates at a fast aggressive pace. This experience is seen as a success, whereas the Burns period of the 1970s, where the central bank was always trying to approach a neutral interest rate from below were a failure. There is a natural human tendency to see gradualism as desirable, and to avoid overshooting long-run steady states. But both experience and practice of monetary policy say that, when inflation is as high above target as it has been in the euro area, bringing it down requires policy rates to rise above their neutral level, and even if this is just as quickly followed by a cut in those same rates.⁹

⁸On the capital of inattention, see the model in Reis (2006) or more recently Beaudry, Carter and Lahiri (2022).

⁹On the contrast between US policy in the late 1960s, early 1970s, and early 1980s, see the facts and models in Mankiw, Reis and Wolfers (2004) and Reis (2021c), as well as Taylor (1999).

4 Fiscal policy and debt crises

Central banks interact with fiscal authorities. Directly, their actions leave fiscal footprints, tightening or loosening the budget constraint of the fiscal authority. Indirectly, because a large component of the public debt is denominated in euros, higher inflation than expected will lower the amount of goods the government has to give back to pay for this debt. One way or another, all of these interactions appear in the budget constraint of the government.

In 2022, inheriting a public debt from the past that promises to pay b , a country in the euro area may end up repaying only δ cents per each promised euro. These total payments come from three sources. The first is running fiscal surpluses (or deficits); let f be the primary balance. The second is the debt revenue from selling new debt at price q , which is at a discount relative to private assets in the economy that give a return r . Third and finally, comes the debt issuance itself that will be left for tomorrow b' . Combining all three is the accounting identity for the flow of funds of the government:

$$\delta b = f + \left(q - \frac{1}{1+r}\right) b' + \left(\frac{1}{1+r}\right) b' \quad (5)$$

A similar equation would connect b' to future debt issuances. To keep the analysis simple and focussed, I assume that the public debt from 2024 onwards is at a sustainable level, fully backed by future surpluses and debt revenues. Therefore, b' can simply be taken as given, fixed by those future policies, independently of what inflation or monetary policy do today. The third term on the right-hand side is ignored.

In many countries in the euro area, public debt b is high entering 2023 and future primary surpluses f are low. Taking Italy as an example, the IMF forecasts its general government debt will be 151% of GDP at the end of 2022, and its primary balances to be -3.9% and -3.3% in 2023 and 2024.¹⁰ In this case, imagine that the price of the government bonds falls (or equivalently that yields rise). This has already been happening: from the start of August to the end of September, the yield on Italian 10-year government bonds increased from 3.0% to 4.5%. With a lower q , the debt revenue falls. Being an accounting identity, equation (5) says that on the fiscal side, there are two scenarios. The first is that f is just high enough or is raised through austerity or increases in taxes to make sure that all debts are honored and so $\delta = 1$. The second is that it is not, in which

¹⁰Data from the IMF Fiscal Monitor, April 2022.

case there would be a debt crisis with default $\delta < 1$. An alternative is to ask the central bank to do something about the problem.¹¹

4.1 Monetary policy: the balance sheet

Conventional analyses of debt sustainability often leave out the debt revenue term. This is a result of making the strong assumption that there is nothing special about government debt. Since bonds are denominated in euros, then their real price would just be equal to their (gross) nominal return divided by (gross) inflation. From the Fisher equation (1), it would then follow that $q = 1/(1+r)$ and debt revenue is approximately zero. However, as already discussed in section 2, government bonds collect a premium (or their buyers offer a discount) relative to other nominal investments. Therefore, q is higher, and debt revenues are positive. In the last decade they account for as much as three quarters of the present value of revenues that have kept the public debt sustainable in the G-7 countries.

Monetary policy can affect the government bond prices, whose fall was at the root of the fiscal crisis. First, these bonds are denominated in euros. The return they offer is nominal. Therefore, it depends on the policy rate set by the central bank, just as all other nominal investments, by the same arbitrage arguments of section 2. A lower policy rate, all else equal, raises bond prices q . Deposits at the central bank and government bonds are different in a few ways. Deposits are overnight, while the average maturity of public debt is often somewhere between 4 and 10 years, depending on the country in the euro area. Deposits can only be held by banks, whereas anyone can buy government bonds. Deposits are the unit of account, so their nominal value is fixed and they never default, whereas the price of government bonds in euros fluctuates in markets, and default can happen. Therefore, the link between policy rates i and the nominal yield on government bonds will not be one-to-one, even if it is positive.

Second, central banks can often raise government bond prices by buying them. They pay for these purchases by borrowing more from banks, in fact typically buying these bonds from banks themselves and paying them by crediting their account at the central bank. If government bonds were a pure financial asset, that provide no special service to their holders, then the demand curve for them would be horizontal, and these balance sheet policies by the central bank would have not effect on prices. Yet, experience with

¹¹On debt revenue and debt sustainability, see the derivations and explanations in Reis (2023) and on fiscal policy when debt revenue is high, see Blanchard (2023).

quantitative easing has convincingly shown that it is not so, at least for a short period of time.

In sum, letting v denote the size of the bank deposits at the central bank, which is a close proxy for the size of its balance sheet, we have that:

$$q = Q(i, b/v) \tag{6}$$

where the function $Q(.,.)$ decreases with both of its arguments.¹²

4.2 Fiscal dominance

Fiscal dominance happens when the central bank does not bring inflation under control because of the impact this would have on the fiscal position of the government. Raising policy rates is feared to break the government's budget.

This is perhaps the most famous type of dominance behind inflation disasters. Historically, the channel through which this happens is that the central bank prints banknotes to pay for government bills, therefore raising primary surpluses (f) directly through transfers of resources. This printing of banknotes loses the control over the interest rate on deposits, which at first fall causing a rise in inflation. The ECB is strictly forbidden from this direct monetary financing of government expenses.

However, facing a sharp decline in government bond prices, the central bank can be tempted to halt a planned hike in its policy rates. Central banks are also in charge of preventing financial crises, and falling government bond prices put in danger their full repayment by the government as well as the many financial markets that rely on them for collateral. Higher inflation by itself can also temporarily leave a positive fiscal footprint. Indirectly, because that higher inflation may come with a less deep recession, and higher primary balances. Directly, government bonds are predominantly nominal, so their real value b falls when inflation unexpectedly rises.

However, these gains are short-lived. Higher expected inflation raises the nominal return that bonds must offer, and so leaves their real price q unchanged. Worse, the future risk of inflation makes public debt less safe, and so worse as a store of value or collateral. Therefore it can persistently lower debt revenue.

Higher inflation by itself can also temporarily leave a positive fiscal footprint. In-

¹²For a model of the debt revenue and what drives it, see Reis (2021a) and for measurement, see Jiang et al. (2019).

directly, because that higher inflation may come with a less deep recession, and higher primary balances. Directly, government bonds are predominantly nominal, so their real value b falls when inflation unexpectedly rises.

Again, these gains are short-lived. Higher expected inflation raises the nominal return that bonds must offer, and so leaves their real price q unchanged. Worse, the future risk of inflation makes public debt less safe, and so worse as a store of value or collateral. Therefore it can persistently lower debt revenue.

An alternative response to falling bond prices is to keep raising interest rates to control inflation, but complement it with purchases of government bonds. At first, this seems ideal, using balance-sheet policy to focus on preventing a financial crisis, while using interest rates to fight inflation. However, as the central bank holds more government bonds that pay according to long-term yields and has more liabilities to banks that pay the overnight interest rate, it will start incurring losses. As the policy rate rises, the central bank's expenses rise, even as the high-price government bonds it bought give a low return. Perhaps more simply, the buyer of the government bonds that pays a premium that generated a debt revenue will suffer a corresponding loss in its assets holdings. If the government bears that loss by not collecting dividends from the central bank for many years, or even recapitalizing it, then the increase in debt revenues is offset by a fall in the primary balances. The central bank's actions have not helped prevent a fiscal crisis. If, instead, the government refuses to fiscally back the central bank, then these losses cause a fall in the real value of the currency. Inflation arises now through the economic solvency of the central bank.

There is a third type of fiscal dominance that is specific to the ECB. Each country in the euro area has a budget constraint like the one in equation (5). When the central bank buys government bonds of all regions using deposits of all banks, then the total amount of public debt b does not change, but its composition does, from debts of the national Treasuries to debts of the ECB. Some countries collect higher debt revenues than others, because their debt is a better store of value, collateral, liquidity, or safe asset. An expansion in the ECB's balance sheet therefore loosens the budget constraint of countries with lower prices of national debt.

Moreover, deposits at the ECB are like a perpetuity with a floating rate: they do not need to be rolled over. If the increase in the price of the government bond in one region is due to fears of not being able to roll it over, then the ECB's balance sheet policy will have a further positive fiscal footprint that is larger in these countries. Of course, if the

purchases are of one country's bonds alone, then these effects will be larger. However, then, the implicit fiscal transfers risk violating the Maastricht Treaty. If the legality of the euro were questioned, its value would decline, which means inflation.¹³

5 Financial intermediaries and credit

Financial intermediaries collect resources from households who wish to save and give them to firms that have projects to invest. Among them, banks provide households with deposits that are useful to make payments. Credit to firms must trade off returns with the chance of default, and can be excessive if lenders expect to be bailed out. Central banks can affect all three of these activities by setting interest rates, which influence intermediation margins, by providing reserves that are the ultimate means of settlement of payments, and by requiring that a share of assets are held in government bonds or reserves as part of macroprudential regulation.

Starting with the investment decisions of financial intermediaries (banks for short), they can either lend to the private economy or deposits assets at the central bank. Because each individual bank has some market power, as a result of superior private information about some of the borrowers, the interest rate on credit (i^c) can have a markup (μ^c) over the central bank's policy rate. Tighter macro prudential policy, that constrains banks from lending to some projects and lowers their profits and net worth, raises that markup. Letting β stand for such policies, and $\alpha_c > 0$ be a parameter, the transmission of monetary policy to credit rates can be written as:

$$i^c = i + \mu^c + \alpha_c \beta \quad (7)$$

Banks also have market power when collecting deposits, and so can pay depositors and interest rate i^d below the return banks get at the central bank by a markup μ^d . An increase in the liquidity provided by the central bank, proxied by the quantity of reserves v , can lower some of the markup in two ways. It may reduce the scarcity of reserves as the ultimate source of liquidity in the economy, or it may reduce the risk of providing checking accounts by providing lending of last resort to banks. All combined:

$$i^d = i - \mu^d + \alpha_d v \quad (8)$$

¹³For the formal channels through which central banks leave a fiscal footprint, see Reis (2019), and for much more on fiscal-monetary interactions, see Cochrane (2023).

5.1 Monetary policy: macro-prudential and lender of last resort

Policy rates have a particularly visible role over credit costs in the euro area. When the ECB tightens, because many mortgages have either short duration or are indexed to an interbank rate that moves almost one-to-one with the rate set by the central bank, the costs of credit increase, as in equation (7). Within days, or months, of the policy change, there is a strong impact on household spending for those who borrow. If, on the other hand, this raises deposit rates proportionately, as in equation (8), then households who are net savers benefit. Monetary policy can have large redistributive effects between borrowers and lenders. These both change the balance of saving and borrowing, as well as the demand for goods by borrowing-constrained households, in a way that typically implies that the policy tightening has a larger impact on lowering inflation.

At the same time, higher policy rates affect the market power of banks. It has been well documented that increases in policy rates pass through to deposit rates only incompletely and slowly. In terms of the notation, μ^d seems to rise with i . All else equal, this lowers the private provision of liquidity in the economy, which may depress economic activity and lower inflation.

Combining equations (7) and (8), the intermediation margin between credit and deposit rates is:

$$i^c - i^d = \mu^l + \mu^d + \alpha_c \beta - \alpha_d v \quad (9)$$

A financial crisis is an increase in either μ^c or μ^d , reducing the amount of credit and the access to liquidity and means of payments. It may be triggered by a hiking cycle to control inflation. The central bank has two direct levers to offset some of this.

Loosening macro-prudential regulation will lower the costs of intermediation. A particular way of doing so is to lower the requisite that banks hold government bonds as assets or as collateral in credit. However, this may lower the demand for these bonds, and the debt revenue collected by the government, as well as increase the potential fiscal cost of bailing out banks if the crisis spreads. Often, instead, during financial crises macro-prudential policy tightens, either as an ex post reaction to the crisis, or because the financial crisis has fiscal roots that are fought by financial repression that lowers borrowing costs to the government.

Another direct channel is to increase liquidity in the economy by expanding the central bank balance sheet. This makes deposits less scarce. Often the expansion of the balance sheet arises because the central bank purchased financial assets during a fire sale, to pre-

vent contagion and a systemic crises. Again, this may have fiscal consequences, since the assets bought or credits given may make losses, exposing the central bank to fiscal dominance. Moreover, understanding the central bank will step in, financial institutions will tend to be under-capitalized, and hold very leveraged investments, knowing that. Because the financial sector is flexible, this fragility can change quickly with the perception that the central bank will perform this role.¹⁴

5.2 Financial dominance

Financial dominance happens when a central bank resists bringing inflation down because it fears causing a financial crisis. Raising interest rates as needed might break parts of the financial system along the way. Guided by the simple model and economic channels described so far, there are three ways in which this may affect the ECB.

First, since the increase in policy rates raises the cost of credit, and potentially raises intermediation margins, it will negatively affect the financial sector. This is not unusual: it is part of the transmission mechanism of monetary policy. It is a complementary channel through which it brings down inflation. However, because it comes with large redistribution across lenders and borrowers, it affects the popularity of the ECB and so brings with it heightened political pressure over the institution. The banking sector and the housing sector are powerful interest groups that try to slow down policy hikes to favor them in these redistributions.

Related, these financial effects make it more difficult to measure the key neutral interest rate r of section 2. On the one hand, the increase in risk associated with private investments raises r ; on the other hand, the transmission from financial stress into lower spending raises current real interest rates relative to neutral r . Financial dominance can be a source of mis-judgement dominance. The influence of financial industry commentators and lobbyists will tend to over-state the dangers of hiking rates too much or too fast.

Second, as the increase in policy rates raises the intermediation margin, it will cause an increase in inefficiency in the financial sector, with too little credit and too few payment services supplied. The answer to this side effect of bringing down inflation is to use the two other policy tools of the central bank: macro-prudential policy and lending

¹⁴For a model of macroprudential policy and credit rates, see Reis (2021*b*), while for a model and discussion of how the scarcity of deposits affects inflation, see Reis (2016). On financial dominance, see Brunnermeier (2016)

of last resort. If controlling inflation puts stress on the financial system, then adjusting macro-prudential regulations and providing stability by being ready to step in with asset purchases and loans of last resort should control this damage. These other tools are there in part to allow monetary policy to not be financially dominated.

At the same time, as discussed in the previous sub-section, these policies can spill over to provoke fiscal dominance. Changes in macroprudential policies affect the demand for government bonds so they have a direct impact on the debt revenue of the government. Lending of last resort and interventions in asset markets may create losses for the central bank, which needs to be recapitalized, subtracting from primary balances. Financial dominance can be a source of fiscal dominance.

Third, one peculiarity of the euro area is that banks are still mostly national and they hold a large share of their assets in sovereign bonds of the country they are based. This creates a diabolic loop: when government bond prices fall, banks suffer losses, this raises the probability they will be bailed out or that deposit insurance payments will be made, which puts pressure on public finances, justifying the initial fall in bond prices and lowering them further. (A complementary form of the loop is that banks cut credit following losses, which lowers economic activity and tax revenues, again affecting the solvency of the government.) Macro prudential policy that forces banks to hold more sovereign bonds enhances the loop, and lending and bailout policies do so as well by creating a stronger link from the financial sector to the fiscal resources. As a result, raising policy rates and the inevitable associated fall in bond prices may trigger a joint fiscal-financial crisis.

The diabolic loop was already at the heart of the sovereign debt crisis of 2010-11. Since then, the needed reforms to attenuate it—create a euro-wide safe asset, some euro-wide deposit insurance, and risk-weighted sovereign bonds in financial regulation—were persistently delayed and never implemented. It would be tragic if it was at the heart of the financial dominance that leads the ECB to lose control over inflation.¹⁵

6 Phillips curves and real activity

The analysis so far has mostly taken the state of the economy r as given. I have discussed the difficulties in measuring it, as well as how financial policies may affect the, but the link between the setting of policy rates, inflation, and r was missing. This section shows

¹⁵For a model of the interaction between financial and fiscal dominance, see Reis (2017), for redistribution between financial groups, see Brunnermeier and Sannikov (2013). For a model of the diabolic loop see Brunnermeier et al. (2016) and for a proposed solution see Brunnermeier et al. (2017).

that the conclusions so far are robust to this link. Considering it uncovers a last source of dominance.

The Phillips curve is a key relationship linking expected inflation, an output gap (y), and markups (ε) to inflation:

$$\pi = \pi^e + \kappa y + \varepsilon. \quad (10)$$

This equilibrium relationship captures how prices and wages are determined in product and labor markets. When the economy is running “hot” (y is high) workers ask for higher wages, which raises marginal costs of production, and leads firms to raise prices beyond expected inflation. Likewise high output raises the demand for firm’s goods, and producing more may require higher prices, either through imperfect competition or because of increasing costs of producing. The markup shocks raise inflation for a given level of the output gap, and so taking as given the productive capacity of the economy. A leading example is an increase in the market power of firms.

In turn, the real interest rate is connected to the output gap according to:

$$y = -\omega(r - r^*), \quad (11)$$

where r^* is now, appropriately, the neutral interest rate and the parameter $\omega > 0$. In this paper, so far, the output gap was zero so I referred to r as the r -star in the key Fisher equation. As economic activity rises or falls, r^* will change, but this equation shows how output *gaps*, understood as differences between output and a potential level, will vary with the gap between r and r^* . The relation is negative, because temporarily higher interest rates encourage more savings and less spending, therefore lowering demand for goods and potentially inducing production below potential.¹⁶

6.1 Trade-offs and balanced mandates

It is straightforward to see that the conclusions from sections 2 and 3 still hold. It is still the case that if $\hat{r} = r$ inflation will be on target. Also, current inflation π_0 that raises expected inflation will still require tightening beyond r to lower inflation, and more policy aggressiveness ϕ and policy communication λ_i still have benefits in bringing inflation down. If the main shocks affecting the euro area now are heightened inflation expectations, or a higher r^* because of war uncertainty or high energy prices raising costs of

¹⁶For more on this simple model, see Reis (2022b), which is a simplified version of Galí (2008).

production, then the conclusions in the previous sections are unaltered. Note that this does not preclude a recession in the euro area understood as fall in output; just that this happens because potential output has fallen just as much.

However, perhaps some of the challenges facing the ECB in 2023-24 may involve the markups ε . Changes in energy markets, bargaining over wage increases to adjust to the 2021-22 inflation experience, de-globalization, and differential adjustments across sectors to the pandemic and the energy crisis, are all plausible candidates. To complicate matters, it may also depend on: primary balances achieved through distortionary taxation and useful public spending (f), sovereign default and the panic and erratic expropriations that often accompany it (δ), and intermediation margins as different firms have closer connection to banks and access to stable funding than others ($i^c - i^d$). We can write all of these as a function:

$$\varepsilon = \mathcal{E}(\text{shocks}, f, \delta, i^c - i^d) \quad (12)$$

These channels are important because they temper the impetus to keep inflation always on target. With a positive markup movement ε , bringing down inflation quickly comes with a negative output gap y . Furthermore, if balance-sheet, macro-prudential, or liquidity policies do not fully prevent the spillovers of raising policy rates to the fiscal situation or to financial conditions, then the responses of fiscal authorities and banks to rising policy rates can deepen this recession. A trade-off between stabilizing real activity and inflation emerges.

6.2 Recession dominance

Recession dominance happens when the central bank is so worried about causing a recession by raising interest rates that it allow inflation to get out of control. The concern is now with breaking the real economy.

The ECB's mandate privileges price stability so, unlike what happens at other central banks with dual mandates, recession dominance might seem ruled out. However, the mandate calls for price stability in the medium term. It justifies preventing large recessions by trying to achieve it too fast. It is defensible to delay reaching the inflation target to 2025-26, if this allows for a much smaller recession in 2023-24. As with the other types of dominance, this becomes harder to evaluate in real time, especially as there is uncertainty and healthy disagreement on the slope of the Phillips curve κ , which drives the "sacrifice ratio" of how large will the recession be relative to the needed reduction in

inflation.

The reference to the medium-term perspective points to a source of recession dominance: the role of expectations, discussed in section 3. As stabilizing inflation gets delayed, the inertia from backward-looking expectations rises (higher λ_b) and more of the capital of inattention gets lost (lower λ_i). Bringing inflation down requires even higher interest rates. With it comes the fear of prolonging a recession. In the end, being too slow at bringing inflation down dominated by concerns of recession infuse persistence into inflation that require a larger cession down the road. The window in which to stabilize inflation is narrow, and well-intended concerns about a recession may cause the central bank to miss it.

Related, a guiding principle of monetary policy for many decades is that only partly unanticipated monetary policy can affect real activity, and only temporarily. In the long run, when economic agents catch on and wages and prices adjust, κ is very high and the Phillips curve is vertical. Remarkably, nominal wage increases in 2022 in the euro area have been well below actual and expected inflation. But, if record-high inflation persists for another 12 months or more, wages and prices will likely start adjusting. At that point, attempts to exploit the Phillips curve to soften the recession prove fruitless, and recession dominance leads to inflation alone.

A final form of recession dominance comes from the interpretation of the state of the economy. It is tempting to see all shocks as ε 's that leave the productive capacity of the economy unchanged. But, it is unlikely that a rise in energy prices, to pick the most relevant shock right now in the euro area, does not reduce the productive use of other factors. If so, it also raises r^* . Both shocks will lower output, but while the former creates an output gap when the central bank hikes policy rates, the latter does not. A recession dominance emerges if the central bank refuses to accept the inevitability of a recession given the external supply shocks.¹⁷

7 Conclusion

Bringing inflation down after it rose sharply but only recently is relatively easy. Raise policy interest rates, quickly, and persist until inflation starts coming down and expectations are solidly re-anchored. If the central bank yields to misjudgment, incredibility, fiscal,

¹⁷For a review of the argument against letting recessions dominate, see Mankiw and Reis (2018), and for the interpretation of the shocks, see Reis (2022a), while a classic on recession dominance is Sargent (1999).

Table 1: Signs of dominance preventing the central bank from lowering inflation

Type of dominance	Obstacle to raising policy rates
Misjudgment	<ul style="list-style-type: none"> - persistent underestimate of how high must rise - excessive reliance on a persistent low r-star
Incredibility	<ul style="list-style-type: none"> - desire to be popular - converge to neutral rate from below
Fiscal	<ul style="list-style-type: none"> - tempted by short-term fiscal benefit of higher inflation, neglecting long-term fall in debt revenue - overuse balance-sheet policy leading to large losses that require recapitalization - jeopardize legality of euro by engaging in large transfers across regions
Financial	<ul style="list-style-type: none"> - groups lobbying for respite from redistribution caused - unwilling to use macroprudential and liquidity policies to handle financial stress - diabolic loop between banks and sovereigns
Recession	<ul style="list-style-type: none"> - delay bringing inflation down and letting expectations entrench - over-rely on Phillips curve, which gets steeper as inflation persists - over-estimate potential output

financial, or recession dominance, it will not follow through with raising rates as high or for as long as necessary. At the same time, if it raises rates too much, for too long (and forgets to cut rates just as sharply as inflation starts coming down), the central bank can break the fiscal budget, the financial system or the real economy. Economic policy always requires a balancing act.

The ECB's mandate is clear: to deliver price stability. While it can, and should, consider all of these factors, it is instructed to have the control of inflation dominate them all. This article took a gloomy precautionary perspective of imagining scenarios under which it becomes dominated by the other factors. Doing so, the hope is that these unwanted dominances are spotted early enough to be stopped, and inflation comes down on target. The table above summarizes the signs of such fears.

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