

What can keep euro area inflation high?*

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Abstract

A central bank that faces inflation above target may fail to bring it down. This article discusses six ways in which this happens because the central bank is dominated by: misjudgment, expectations, fiscal policy, financial markets, recession fears, or external forces. It applies this approach to the challenge facing the ECB in 2023-24. The hope is that the factors identified can serve as warning signs for what to avoid.

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1 Introduction

Inflation was 9.9% in the euro area in September of 2022. Relative to the previous 12-month changes in the price level between 1999 and 2020, this is almost three times larger than the previous record in 2008. 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 7.4% to 6.7%. This is the lowest recorded euro area unemployment rate since it has been measured (1998). It is well below the two previous minima, 7.2% in March of 2020 and 7.3% in March of 2008.¹

How tight was monetary policy during this period where inflation was out of control and labor markets were running hot? An often-used measure of the policy stance 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 measure of expected inflation. This gives a measure of a 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 -4.2%. During these 12 months, when inflation was exploding and unemployment steadily falling, monetary policy loosened by 300 basis, the opposite direction of what is usually taught and practiced in monetary economics.

The debate on what could have caused this unusual combination of indicators has already started. For sure, there was some bad luck. For instance, a rapid rise in energy prices has driven inflation up, lowered 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 of price stability has not changed during this time, neither has its policymakers' commitment 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 2% inflation target by the end of 2024?*

To do so, I do not contribute to the discussion of why inflation is so high in 2022, but

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, age 15 to 74, 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%.

take this starting point as given. The two questions are surely related, but they can be taken in turn.³ After identifying the future obstacles, I ask whether they are likely to keep inflation from falling, informed by the recent past.

Likewise, I do not question the ability of a central bank in theory 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 that delivers the target. 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.

Finally, I do not question the desire of policymakers at the ECB to fulfill their mandate and its interpretation as medium-term inflation near 2% that has prevailed for decades. Therefore, I will focus on a medium horizon, and ask as of today (October of 2022) whether inflation by the end of 2024 will be near 2%.

In short, I will take as given that the ECB *can* achieve this goal and *wants* to achieve it, but ask whether it may find itself *dominated* by another force or economic agent that keeps it away from success. The use of the word dominated requires some explanation. It would be equally appropriate to write instead that the central bank faces a trade-off that makes it unbearably costly to achieve the goal. Or, that another economic agent sticks indefinitely to a policy that clashes with the central bank's policy and this paper will lay out scenarios when the central bank is the one to yield. Clearly, therefore, the discussion in this paper is not meant as a forecast of what will happen, nor as a pronouncement that the ECB will be unwilling to act. Rather, the point is the opposite, to start from a presumption that the ECB will succeed in hitting its target in the medium run while balancing trade-offs along the way, and try to imagine what could derail it from this path.

Note that, 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. For other similar advanced economies, most (or all) of the sources of dominance that stop the central bank from raising interest rates enough to bring down inflation will apply as well.⁴

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 enough because it became dominated by other fac-

³And also because I already offered an early diagnosis in Reis (2022a).

⁴The appendix lays out the bones of an economic model, while the main text keeps the discussion entirely verbal.

tors or agents (with an application to the challenges facing the ECB in 2023-24)?⁵

2 The 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 holding deposits at the central bank will be equal to the real return on private investments in the economy plus the rate of inflation that people expect during the time of the investment. 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 private rate of return is adjusted for the large risk differences between keeping resources in a safe deposit as opposed to 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 the policy rate, or it can invest in the real economy earning the private real rate of return 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, expected inflation must be too high. But then the real return in the private economy will be too high, and banks will shift away from deposits at the central bank and towards investing in the 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

⁵I draw on many literatures, and especially on results in my previous work. For the model and channels discussed or referred to, see: Reis (2022a) for section 1; Hall and Reis (2016), and Reis (2022d) for section 2; Reis (2021c) and Reis (2022c) for section 3; Reis (2021a), and Reis (2019) for section 4; Reis (2021b), Reis (2017), and Brunnermeier et al. (2017) on section 5; Castillo-Martinez and Reis (2019), and Mankiw and Reis (2018) on section 6; and finally Bahaj and Reis (2023) on section 7. For alternative discussions of similar topics in each of the seven sections, see Visco (2022), Taylor (1999), Beaudry, Carter and Lahiri (2022), Blanchard (2023) and Cochrane (2023), Brunnermeier (2016), Sargent (1999), and Rey (2016), respectively.

financial markets mean that the policy rate will be tightly linked to all of the 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 private real rate of return 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.

2.1 Monetary policy: setting interest rates to track the economy

Because the central bank controls the policy rate, this gives it the power to control inflation. This control 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, the central bank will be tracking the real economy to try to estimate what will be the private real rate of return over the next two years. This estimate will often not match the actual rate of return.

This creates a source of failure to hit the inflation target: mis-estimating where the economy will be over the next two years. A virtue of modern thinking is that it focusses attention on the private real rate of return on investments 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, it is not something that is observed. So, central banks turn to tens of models curated by hundreds of economists using thousands of data series to track the state of the economy captured in this neutral interest rate.

What can make euro area inflation by the end of 2024 still be above target? The first candidate is under-estimating the real private rate of return. This would show up as the ECB 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.

2.2 Misjudgment dominance

A central bank is *dominated by old ideas* when it clings to outdated theories or measurements of the economy, finding excuses for why inflation is rising that absolve its policymakers from their responsibility. The agent dominating policymakers and making them fail to hit the target is its own staff, or the policymakers' judgment, repeatedly underestimating the neutral rate of interest and setting too-low rates.

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, the real private rate of return rose. Struggling to judge with imperfect real-time data whether this was a temporary or a persistent change, central bankers persistently believed in a neutral rate that was too low. They set policy too loose and spent too many years one step behind, chasing a rising inflation that they expected would start falling any time soon. 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. After all, the 1970s have not been forgotten among central bankers. However, today, in October of 2022, confidence has been slightly dented by the last 12 months, where arguably the ECB was slow to rise policy rates in spite of fast-rising inflation signaling that policy was below the neutral rate. 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 real private rate of return with the return on government bonds. In an efficient frictionless financial market, the two would be the same (once adjusted for risk). Yet, given the extensive evidence that there is some misallocation of capital in the euro area, there are multiple rates of return. The relatively 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 neutral rate 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 the neutral rate.

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 the rate of return, sometimes called r -star, justified by evolutions in demography and productivity. Yet, those estimates leaned 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 -star is necessary to guide monetary policy, the misjudgment would be to let policy become too dominated by some particular estimates.

3 Expectations and credibility

The previous section took expected inflation 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 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 that was very close to target, the ECB enjoys a capital of inattention and credibility. No matter what happens, or what the central bank does, some believe that over the next two years, the ECB will bring inflation back on target. Of course, the share of economic agents that have this resolute faith 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, the inattentive share that believes inflation will be on target is a measure of the central bank's reputation.

Second, another share of agents expect inflation in the next two years to be as high as it was in the last twelve months. 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 expectations 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. It reflects lost credibility.

Finally, the remainder agents get their expectations about right over the next two years. Their rationality gives policy the power to affect outcomes. When the central bank brings inflation down, expected inflation comes down with it, speeding the initial decline on inflation while softening the impact on real activity.

3.1 Monetary policy: asserting credibility

The best case scenario is the one in which the central bank has lost no credibility. In that case, since inattentive agents expect inflation to be on target, and the central bank is committed to delivering it, rational agents expect inflation on target as well. Therefore, expectations are under control and equal to target. They are not a source of inflation.

However the legacy of the high inflation of 2022 implies that some agents expect high inflation above target in 2024. Even if this is only by little, even if unfairly, and even if an irrational over-reaction, some credibility has been lost. More colorfully, one may call the presence of these agents an animal spirit. 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. 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, 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. This would raise the inattentiveness share, re-anchor expectations, and by itself bring inflation down: expecting less inflation, people will move towards nominal investments and choose to save more, bringing down inflation in the process.

3.2 Expectations dominance

A central bank is *dominated by expectations* when expected inflation is persistently high and the central bank does not talk and act tough enough to re-establish its credibility and reputation. The agents dominating are wage-setters, price-setters, consumers, savers, and market participants all through their animal spirits and their lack of trust in the central bank.

Talking tough is not easy, especially when the economy is entering a recession, as seems plausible for the euro area in 2023. The central banker runs the risk of being perceived as not caring about the suffering that comes with unemployment, falls in real wages, and lost income. Some will label him or her 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 unpopularity.

In turn, acting tough is required because of initial conditions. 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 grounded in experience. In the early 1980s in the United States, the Fed led by Paul Volcker raised policy rates aggressively. Quickly, just as inflation started falling, the Fed likewise lowered rates at a fast 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 was a failure. There is a natural human tendency to see gradualism as desirable, and to avoid overshooting long-run steady states. But, 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, even if this is just as quickly followed by a cut in those same rates.

4 Fiscal policy and debt crises

The actions of central banks leave fiscal footprints, tightening or loosening the budget constraint of the fiscal authority. Moreover, because a large component of the public debt is denominated in euros, higher inflation than what was expected lowers 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:

$$\text{Debt repayment} = \text{Primary Balance} + \text{Debt Revenue} + \text{Value of Future Debt}$$

Debt repayment may differ from promised repayment if there is default, and may differ from expected repayment if there is sudden inflation. The primary balance is the difference between tax revenues and public spending, which during the time of the euro has been negative for most regions in most years. The debt revenue arises from selling new debt for a price that is high relative to the private assets that give the private real rate of return. Finally, 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, so the value of future debt is independent of what inflation or monetary policy do today, and the last term can be ignored.

In many countries in the euro area, public debt is high entering 2023 and future primary surpluses 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 will be -3.9% and -3.3% in 2023 and 2024.⁶ 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 of 2022, the yield on Italian 10-year government bonds increased from 3.0% to 4.5%. With a lower price of debt, the debt revenue falls. Being an accounting identity, the government budget constraint says that there are two fiscal scenarios. Either primary balances are just high enough, raised through austerity or increases in taxes, to make sure that all debts are honored. Or, there is a debt crisis with default. An alternative is to ask the central bank to do something about the problem.

4.1 Monetary policy: using the balance sheet

Conventional analyses of debt sustainability often leave out the debt revenue term, as a result of making the strong assumption that there is nothing special about government debt. However, as already discussed in section 2, government bonds pay out at a discount (or their buyers overpay) relative to private investments. In the last decade, debt revenue accounts for as much as three quarters of the present value of revenues that have kept the

⁶Data from the IMF Fiscal Monitor, April 2022.

public debt sustainable in the G-7 countries.⁷

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 arguments of section 2. A lower policy rate, all else equal, raises bond prices. 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 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 provided no special service to their holders, then the private 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 quantitative easing has convincingly shown that this is not the case, at least for a short period of time.

4.2 Fiscal dominance

A central bank is *fiscally dominated* when it does not bring inflation under control because this would break the government's budget. It is the fiscal authority that dominates, forcing the central bank to not harm its fiscal position.

This is the most famous type of dominance behind inflation disasters, and historically it came about as the central bank printed banknotes to pay for government bills, raising the primary balances directly through transfers of resources. This printing of banknotes loses the control over the interest rate on deposits, causing a rise in inflation. This channel is not relevant for the ECB, which is strictly forbidden from this direct monetary financing of government expenses.

⁷The source is Reis (2022b).

However, facing a sharp decline in government bond prices, the ECB 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, because since government bonds are predominantly nominal, their real value falls when inflation unexpectedly rises. (These gains are short-lived. Higher expected inflation raises the nominal return that bonds must offer leaving their real price unchanged. Worse, the future risk of inflation makes public debt less safe, and so worse as a store of value or collateral, persistently lowering 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 put more simply, the buyer of the government bonds that pays a premium that generated a debt revenue will suffer a corresponding loss in its asset 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. When the central bank buys government bonds of all regions using deposits of all banks, then the total amount of public debt 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 would risk violating the Maastricht Treaty. If the legality of the euro were questioned, its value would decline, which means inflation.

5 Financial intermediaries and credit

Financial intermediaries collect resources from households and can either lend them to the private economy or deposit them at the central bank. An increase in the policy rate, almost always, raises the lending rate. The impact is not one-to-one because each individual bank has some market power, as a result of superior private information about its borrowers, and the resulting markup may vary with the policy rate. Another policy set by the central bank, macro prudential policy, constrains banks from lending to some projects and lowers their profits and net worth, raising that markup. The most prevalent form of macro prudential regulation involves forcing banks to hold safe assets, typically government bonds.

Some financial intermediaries (banks for short) provide households with deposits that are useful to make payments and remunerate them with a deposit rate. Banks also have market power when collecting deposits, so increases in policy rates pass through to deposit rates only incompletely and slowly. Moreover, an increase in the liquidity provided by the central bank through the quantity of reserves can lower the markup by reducing the scarcity of reserves as the ultimate means of settlement of payments and the risk of bank runs through lending of last resort to banks.

Policy rates have a particularly visible role in 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. At the same time, higher policy rates affect the market power of banks, and lower the private provision of liquidity in the economy. Both of these channels, by changing the balance of saving and borrowing, as well as spending by borrowing-constrained households, transmit and amplify the impact of a policy tightening on lowering inflation. They also imply that changes in policy rate have large redistributive effects

between borrowers, savers, and the financial institutions that lie in between them.

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

Raising interest rates quickly can lead to large redistributions. If financial intermediaries suffer losses, this can trigger a financial crisis. The central bank has two direct levers to offset some of this.

Loosening macro-prudential regulation lowers 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. This is 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 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 prevent contagion and a systemic crisis. Again, this may have fiscal consequences, since the assets bought or the 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. Because the financial sector is flexible, this fragility can change quickly with the perception that the central bank will perform this role.

5.2 Financial dominance

The central bank is *financially dominated* when it resists bringing inflation down because it fears the redistributions of wealth this will cause in financial markets, which may include the failure of some institutions along the way. It is the financial sector that dominates the central bank, including the fear of a financial crisis. There are three channels through which this may affect the ECB.

First, the increase in policy rates induces a large redistribution across lenders and borrowers and negatively impacts some parts of the financial sector. 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 of section 2. They increase the risk associated with private investments and the transmission from financial stress into lower spending raises current real returns. Financial dominance can be a source of misjudgement 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, the increase in policy rates may raise the intermediation margin leading to 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 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, these policies can spill over to provoke fiscal dominance. Changes in macro-prudential policies affect the demand for government bonds and so the debt revenue, while lending of last resort and interventions in asset markets can lead to 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 in which 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 can 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 per-

sistently delayed and never implemented because of disagreements on the best form to implement them. It would be tragic if it was at the heart of the financial dominance that leads the ECB to lose control over inflation.

6 Phillips curves and real activity

So far, I have taken as given the state of the real economy, and captured its influence on inflation through the real return on private investments. I have discussed the difficulties in measuring this return, as well as how financial policies may affect it, but the link between the setting of policy rates, inflation, and the state of the economy was missing. Yet, there may be a link from inflation to the state of the real economy, even at a medium run horizon. The conclusions so far are robust to this link. Considering it uncovers another source of dominance.

When the real returns on investment are high relative to a neutral rate, this encourages more savings and less spending, lowering demand for goods, potentially inducing production below potential. In turn, this output gap puts upward pressure on inflation relative to expected inflation through a Phillips curve. When the economy is running “hot”, 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 conclusions from sections 2 and 3 still hold. It is still the case that if the estimate of the actual return on private investment is correct, then inflation will be on target. Also, current inflation that raises expected inflation will still require tightening beyond the neutral rate to lower inflation, and more policy aggressiveness and policy communication still have benefits in bringing inflation down. If the main shocks affecting the euro area now are heightened inflation expectations, or a higher r -star because of war uncertainty or high energy prices raising costs of production, the euro area will enter a recession because output will fall as inflation is coming down. As long as inflation is brought back on target, this happens because potential output has fallen just as much.

6.1 Trade-offs and balanced mandates

However, perhaps some of the challenges facing the ECB in 2023-24 involve a different variable: markups. These shocks to markups raise inflation for a given level of the output gap, and so taking as given the productive capacity of the economy. They may be driven by changes in energy markets, or by bargaining over wage increases to adjust to the 2021-22 inflation experience, or de-globalization, or even by differential adjustments across sectors to the pandemic and the energy crisis. They may also depend on the fiscal primary balances, because taxation distort real activity, or on sovereign default and the panic and erratic expropriations that often accompany it. Finally, they may depend on financial intermediation margins, as different firms have closer connection to banks and access to stable funding than others.

These channels are important because they temper the impetus to keep inflation always on target. With an increase in markups, bringing down inflation quickly comes with a negative output gap. 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

The central bank is *dominated by the fear of a recession* if it persistently raises policy rates too little or too late because it will not tolerate even a mild recession along the way. Politicians, whose popularity is particularly affected by recessions, will often be the agents behind this dominance.

The ECB's mandate privileges price stability so, unlike what happens at other central banks with dual mandates, this form of 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, which drives the "sacrifice ratio" of how large will the recession be relative to the needed reduction in inflation.

A guiding principle of monetary policy for many decades is that monetary policy can only affect real activity temporarily. In the long run, when economic agents catch on and wages and prices adjust, the Phillips curve is very steep, and higher inflation comes with little gains in employment. So far, nominal wage increases in 2022 in the euro area have been 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. In the transition, if stabilizing inflation gets delayed, the inertia from backward-looking expectations rises so that recession dominance can amplify expectations dominance. Bringing inflation down requires even higher interest rates, a stronger fear of prolonging a recession, and eventually more inflation and a larger recession 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.

A second form of recession dominance comes from the interpretation of the state of the economy. It is tempting to see all shocks as changing markups while leaving 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 the neutral rate. Both shocks will lower output, but while the former creates an output gap when the central bank hikes policy rates, the latter does not. Recession dominance emerges if the central bank refuses to accept the inevitability of a recession given the external supply shocks.

7 Exchange rates and capital flows

The euro area is one of the world's largest economic units. When it comes to controlling inflation, most of the challenges and trade-offs facing monetary policy are internal. The ECB has a clear mandate to focus on controlling euro inflation, without constraints imposed by foreign policy, without goals of promoting competitiveness, and without attempts to manage the exchange rate with other currencies. Discussing the ECB and inflation while ignoring exchange rates and capital flows is not a bad place to start. Yet, the analysis would be incomplete if it ended without discussing them.

The euro area has suffered so far in 2022 a large adverse shock to the terms in which it trades with the rest of the world. The cost of a major imported input, energy, has spiked. Less important, but not insignificant, as food prices rose throughout the world, and infla-

tion accelerated in the United States, the cost of other imported inputs rose as well. As a result, the euro area imported current inflation, while its firms faced higher marginal costs and became less competitive. All else equal, this should result in a combination of lower future inflation in the euro area and a depreciation of the euro, so that exporting firms regain their competitiveness.

The central bank's actions are an important determinant of how much of the adjustment will take place through the exchange rate, or through the inflation rate. At one extreme, if the ECB were to have done all it could to keep inflation tightly at 2% in 2022 and onwards, then the economy would have gone through a deep recession right away, and the euro would have to devalue significantly in the future.

Changes in exchange rates, and in the monetary policies that accompany them, trigger capital flows. While a flexible exchange rate with the US dollar partly releases the ECB from having to follow the Federal Reserve's interest rate decisions, it does not do so fully because of the outsized influence that the dollar has in the international monetary system. If the Federal Reserve keeps monetary policy too loose, this has a global effect in loosening credit conditions, and contributes to creating more inflation pressure in the euro area.

As the ECB chooses its own policy rates, it must take into account that a large differential with the policy rate set by the Fed can induce large flows of capital between the two areas. These in turn put strains on the financial institutions that intermediate these flows, and can give rise to a very volatile exchange rate. Through its pass-through to prices, this makes the job of controlling inflation challenging.

7.1 External dominance

The central bank is *dominated by external forces* if it resists bringing down inflation because it fears the flows of capital and movements in exchange rates that result. It is an old lesson in monetary economics that the central bank can keep full autonomy to control inflation only if it is willing to let capital flow freely and exchange rates float. Trying to influence either of these two in the medium run will likely lead to failing to hit the inflation target.

One indirect form of this dominance arises with the other channels discussed so far. Following a large negative shock to the terms of trade, and the imported inflation that results, the central bank can under-estimate how persistent this shock may be, or how much of the inflation comes from internal causes. This would lead to a form of the misjudgment dominance, caused by the confusion created by the external shock. Likewise,

the high inflation created by this shock may raise inflation expectations persistently causing expectations dominance. Or, it may create large fiscal deficits in the attempt to use fiscal policy to smooth it out, causing fiscal dominance. Finally, the inevitable fall in real incomes from the external shock can create the recession dominance as the central bank is asked to prevent the inevitable.

More directly, external dominance can arise from the actions of the foreign central bank. Imagine that the Federal Reserve fails to bring inflation down, or is mandated to raise its inflation target. By keeping its interest rates low, relative to those of the ECB, this will trigger capital to flow in the direction of the euro area, stimulating economic activity and inflation. The higher inflation in the United States will trigger a process of adjustment whereby the euro appreciates relative to the US dollar. These movements in capital across borders, and in the exchange rate, can come with financial instability and a recession. Dominance arises if the central bank chooses to simply follow the foreign central bank in letting go of its inflation target.

The final form of dominance is internal, although it works through capital flows. The shocks to food, energy, and supply chains that are behind part of the inflation surge of 2021-22 had an asymmetric impact on different countries within the euro area. Within a currency union, this poses a challenge to monetary policy, which has a single instrument and cannot deliver what would be ideal for each region. Having a medium-term inflation target, the central bank should remain focussed on delivering it, immune to the relative fortunes of different countries. But, these asymmetries also get compounded by flows of capital within the euro area that can trigger financial instability. And, if the adjustment of relative prices across regions requires negative inflation (and wage growth) in some regions, then institutional rigidities can bind making it especially hard to achieve the target for the whole euro area.

8 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. However, in the short run, this involves trade-offs. If the central bank raises rates too much, for too long (and forgets to cut rates 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.

In the medium run, these balances mostly disappear, as monetary policy can mainly affect inflation. Because of that, in the medium run, the ECB's mandate is clear: to deliver price stability. While it can, and should, consider all of these factors and the trade-offs they present, it is instructed to have the control of inflation dominate them all over this longer horizon. Dominance happens when the central bank yields to misjudgment, expectations, fiscal, financial, recession, or external dominance, for too long and so does not follow through with raising rates as high or for as long as necessary.

This article took a precautionary perspective of imagining scenarios under which it becomes dominated by the other factors. Doing so, the hope is that these unlikely and unwanted dominances are spotted early enough to be stopped, and inflation comes down on target. The table below summarizes the signs of such fears.

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"> - persistently underestimate how high they must rise - excessively rely on low r-star |
| Expectations | <ul style="list-style-type: none"> - fail to talk tough because want to be popular - fail to act tough and neglect need to overshoot neutral rate |
| 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"> - yield to groups lobbying for respite from redistribution caused - be unwilling to use macro-prudential and liquidity policies to handle financial stress - get caught in diabolic loop between banks and sovereigns |
| Recession | <ul style="list-style-type: none"> - over-rely on Phillips curve, which gets steeper as inflation persists - over-estimate potential output |
| External | <ul style="list-style-type: none"> - follow foreign central bank that lets inflation drift to prevent the adjustments in exchange rates and capital flows - be too averse to needed relative-price and relative-output adjustments |

A Appendix: the formal model

The discussion in the paper can be expressed more formally with a simple model.

In equations, section 2 discusses the Fisher equation:

$$i = r + \pi^e, \quad (\text{A1})$$

where i is the policy rate, r is the real private return, and π^e is expected inflation.

With an inflation target of $\bar{\pi}$, and an estimate of the real rate of return \hat{r} , if the central bank follows the policy rule: $i = \bar{\pi} + \hat{r} + \phi(\pi - \bar{\pi})$, where $\phi > 0$, this will deliver inflation as:

$$\pi = \bar{\pi} + \frac{r - \hat{r}}{\phi} + \frac{\pi^e - \bar{\pi}}{\phi}. \quad (\text{A2})$$

From here, it is clear that the misjudgment $\hat{r} < r$ causes inflation, taking π^e as given.

Turning to section 3, let λ_i be the share of agents that are inattentive, believing that inflation will be $\bar{\pi}$, while λ_b is the share of agents that expect future inflation to be what it is right now π_0 . Average expected inflation then is:

$$\pi^e = \lambda_i \bar{\pi} + \lambda_b \pi_0 + (1 - \lambda_i - \lambda_b) \pi. \quad (\text{A3})$$

Ignoring shocks, so that $r = \hat{r}$ and we can focus on the role of expectations, replacing expectations into equation (A2) gives the effect of expectations on inflation:

$$\pi = \bar{\pi} + \frac{\lambda_b(\pi_0 - \bar{\pi})}{\phi - 1 + \lambda_i + \lambda_b}. \quad (\text{A4})$$

The dominance of expectations discussed in section 3 then corresponds to $\lambda_b > 0$ when $\pi_0 > \bar{\pi}$. Acting tough is a higher ϕ ; talking tough is trying to regain credibility (lowering λ_b) while encouraging agents to trust the central bank (raising λ_i).

Turning to the dominance of fiscal concerns in section 4, the government budget constraint is:

$$\delta b = f + \left(q - \frac{1}{1+r} \right) b' + \left(\frac{1}{1+r} \right) b', \quad (\text{A5})$$

where the public debt is b that pays δ cents per each promised euro, f is the primary balance, government debt sells for price q , and debt issuance left for tomorrow is b' .

If debt was not special then $q = 1/(1+r)$, but because debt is special, instead $q = Q(i, b/v) > 1/(1+r)$, where v denotes the size of the bank deposits at the central bank,

which is a close proxy for the size of the central bank balance sheet. The function $Q(.,.)$ decreases with both of its arguments. Therefore, raising i lowers q and tightens the government budget constraint. Extending the balance sheet of the central banks by buying government bonds (raising v/b) can attenuate this effect temporarily.

Next, turn to the financial sector discussed in section 5. The interest rate on credit (i^c) has a markup (μ^c) over the central bank's policy rate. Letting β stand for macroprudential policies, and $\alpha_c > 0$ be a parameter, the transmission of monetary policy to credit rates can be written as:

$$i^c = i + \mu^c + \alpha_c \beta. \quad (\text{A6})$$

On the side of deposits, the deposit rate i^d is below the return banks get at the central bank by a markup μ^d , but an increase in the quantity of reserves v , closes some of this gap:

$$i^d = i - \mu^d + \alpha_d v. \quad (\text{A7})$$

Combining equations (A6) and (A7), the intermediation margin between credit and deposit rates is:

$$i^c - i^d = \mu^c + \mu^d + \alpha_c \beta - \alpha_d v. \quad (\text{A8})$$

A rise in policy rates i raises μ^c and μ^d as discussed in section 5; to capture this, define the increasing function $M(i)$ as $M(i) = \mu^c + \mu^d$. Markups can also exogenously increase driving a financial crisis. Either way, loosening macro prudential policy (lower β) or lending to the private sector (raising v) can attenuate or prevent this.

Turning to output gaps in section 6, the real interest rate is connected to the output gap according to an IS or Euler equation:

$$y = -\omega(r - r^*). \quad (\text{A9})$$

The Phillips curve instead is:

$$\pi = \pi^e + \kappa y + \varepsilon, \quad (\text{A10})$$

where ε are markups. These depend on other variables according to a function:

$$\varepsilon = \mathcal{E}(\text{shocks}, f, \delta, i^c - i^d), \quad (\text{A11})$$

where *shocks* refers to the several markup shocks discussed in the text.

Finally considering external effects, the discussion centered around two conditions.

First, a purchasing power condition that links the appreciation of the exchange rate x to foreign inflation π^o , domestic inflation, and a terms of trade shock τ :

$$x = \pi - \pi^o + \tau. \quad (\text{A12})$$

Second, a modified interest parity wedge condition, that link the expected appreciation to the gap in interest rates relative to abroad, and a wedge λ that itself may depend on the value of interest rates and exchange rates:

$$x^e = i - i^o + L(i, i^o, x). \quad (\text{A13})$$

Combining all of the equations gives a system of 8 equations:

$$i = r + \pi^e \quad (\text{A14})$$

$$i = \bar{\pi} + \hat{r} + \phi(\pi - \bar{\pi}) \quad (\text{A15})$$

$$\pi^e = \lambda_i \bar{\pi} + \lambda_b \pi_0 + (1 - \lambda_i - \lambda_b) \pi \quad (\text{A16})$$

$$\delta b = f + \left(Q(i, b/v) - \frac{1}{1+r} \right) b' + \left(\frac{1}{1+r} \right) b'. \quad (\text{A17})$$

$$i^c - i^d = M(i) + \alpha_c \beta - \alpha_d v \quad (\text{A18})$$

$$\pi = \pi^e - \omega \kappa (r - r^*) + \mathcal{E}(\text{shocks}, f, \delta, i^c - i^d) \quad (\text{A19})$$

$$x = \pi - \pi^o + \tau \quad (\text{A20})$$

$$x^e = i - i^o + L(i, i^o, x) \quad (\text{A21})$$

in 8 variables $i, \pi, \pi^e, r, i^c - i^d, x, x^e$, and either δ or f depending on the fiscal regime. Exogenous monetary policy is \hat{r}, v, β , while exogenous features of the economy are $\bar{\pi}, \pi_0, f, b, b', \text{shocks}, r^*, \pi^*, i^o, \tau$ and non-negative parameters are: $\phi, \lambda_i, \lambda_b, \alpha_c, \alpha_d, \omega$ as well as functions $Q(\cdot), M(\cdot), \mathcal{E}(\cdot), L(\cdot)$.

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