OENB
OESTERREICHISCHE NATIONALBANK
EUROSYSTEM

OeNB Bulletin Q3 25
20 pages

Understanding central bank balance sheets

Drivers, determinants, and projections of the OeNB's profits and losses

This paper examines the OeNB's balance sheet and profit trends in light of Eurosystem losses from unconventional monetary policy during the low inflation period. Simulations show that future demand for central bank money is a key profit factor. Losses and negative capital do not necessarily prevent a central bank from ensuring price stability. Financial strength supports independence, but credibility depends on consistent policy performance.

Authors

Claudia Kwapil
OeNB, REFGP
claudia.kwapil@oenb.at

Matthias Meiksner
OeNB, REFGP
matthias.meiksner@oenb.at

Anna Stelzer
OeNB, REFGP
anna.stelzer@oenb.at

JEL classification
E42, E52, E58

Keywords
Monetary policy, net interest income, Eurosystem, central bank losses, negative capital

Central bank success defined

A central bank's success is measured by how well it fulfills its mandate, not by profits. Price stability, the ECB's mandate, anchors expectations and supports monetary policy transmission and the economy. Financial strength helps but cannot replace consistent and credible policy.

Determinants of a central bank's income

Central bank profits depend on various factors, many beyond its control. Net interest income mainly reflects monetary policy decisions, not a "business strategy". Profitability is not the goal, but a side effect of policy implementation.

Common policy, stronger central banks

Monetary unions can help central banks stay resilient during prolonged losses. A shared monetary policy, like in the Eurosystem, strengthens independence and shields central banks from national political pressure.

Abstract

This paper examines the evolution of the Oesterreichische Nationalbank's (OeNB) balance sheet and its profit and loss dynamics. Following a decade of unconventional monetary policy, Eurosystem central banks have experienced sustained financial losses in recent years. This study explores the drivers behind these losses. Using a simulation, the paper illustrates the OeNB's projected balance sheet and net interest income over a 15-year horizon across 32 scenarios, varying assumptions regarding demand for banknotes, excess reserves, and asset yields. The results highlight that the future usage of central bank money (whether in the form of banknotes or the digital euro) is the most influential factor for profitability. The analysis underscores that central bank losses and negative capital are not inherently problematic, provided the institution fulfils its price stability mandate and thereby maintains public trust. The paper concludes that financial strength can support central bank independence, but credibility ultimately hinges on consistent policy performance.

1 Introduction

Over the past decade, central banks worldwide have faced considerable challenges. A prolonged period of below-target inflation, followed by the COVID-19 pandemic and an inflation surge, necessitated decisive and forceful monetary policy action. As a result, the European Central Bank (ECB) and the Eurosystem first engaged in extensive expansionary monetary policy, before finally raising interest rates in 2022. These developments have led Eurosystem central banks, which have historically been profitable, to incur financial losses since 2023. This has not only sparked academic interest in the financial stability and sustainability of central banks but has also raised public awareness of central bank dividends as a source of government income.

This paper examines the factors driving the evolution of central bank balance sheets, using the Oesterreichische Nationalbank (OeNB)[1] as a case study. To this end, we first review the role of central bank balance sheets in general, with a particular focus on the last decade. We also explain the role of central bank profits, losses and capital in pursuing their respective mandates. Having provided this context, we simulate the balance sheet of a small- to medium-sized Eurosystem central bank (such as the OeNB) and project the resulting profits and losses over the coming 15 years, based on different assumptions regarding the development of bank liquidity, demand for banknotes, and interest rates. Our focus is on net interest income (NII) as the main determinant of central bank profits and losses. NII represents the difference between the income earned from interest-bearing assets and the expenses incurred from interest-bearing liabilities.

The paper is structured as follows: Section 1 provides an overview of the fundamentals of central bank balance sheets and their historical development. Section 2 discusses the significance of central bank profits and losses in evaluating their performance and financial sustainability. Section 3 presents a projection of possible future balance sheet developments and their impact on the profit/loss situation of a Eurosystem central bank, such as the OeNB. Section 4 concludes by discussing the policy implications.

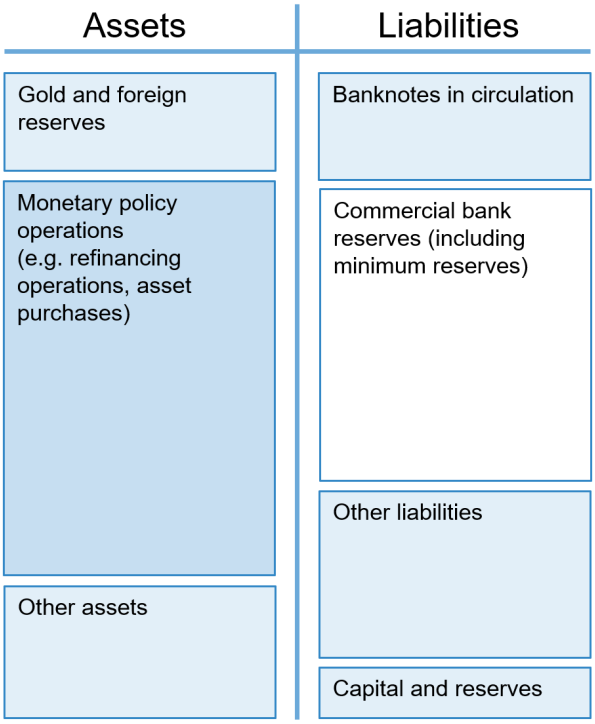
[1] The authors would like to thank Lenka Krsnakova, Julyian Marquez, Jannik Pointecker, Joanna Czurda, Bianca Schönhofer (all Oesterreichische Nationalbank), and an anonymous referee for helpful comments and valuable suggestions.

2 The bread and butter of central banks' balance sheets

A typical central bank's balance sheet includes assets – such as gold and foreign reserves. On the liabilities side, key items include banknotes in circulation and general government deposits (the latter of which are categorized under "other liabilities" in figure 1). These so-called "autonomous factors" may change with the gold price (e.g., gold) or fluctuate with exchange rates (e.g., foreign reserves). They may expand or shrink, but they are not purposely steered by the Eurosystem. Capital and reserves supplement the liabilities side. While the role of the former will be discussed in further detail in section 2, the latter provide financial buffers for e.g., exchange rate risks. These items are illustrated in light blue in figure 1.

Figure 1

Simplified central bank balance sheet



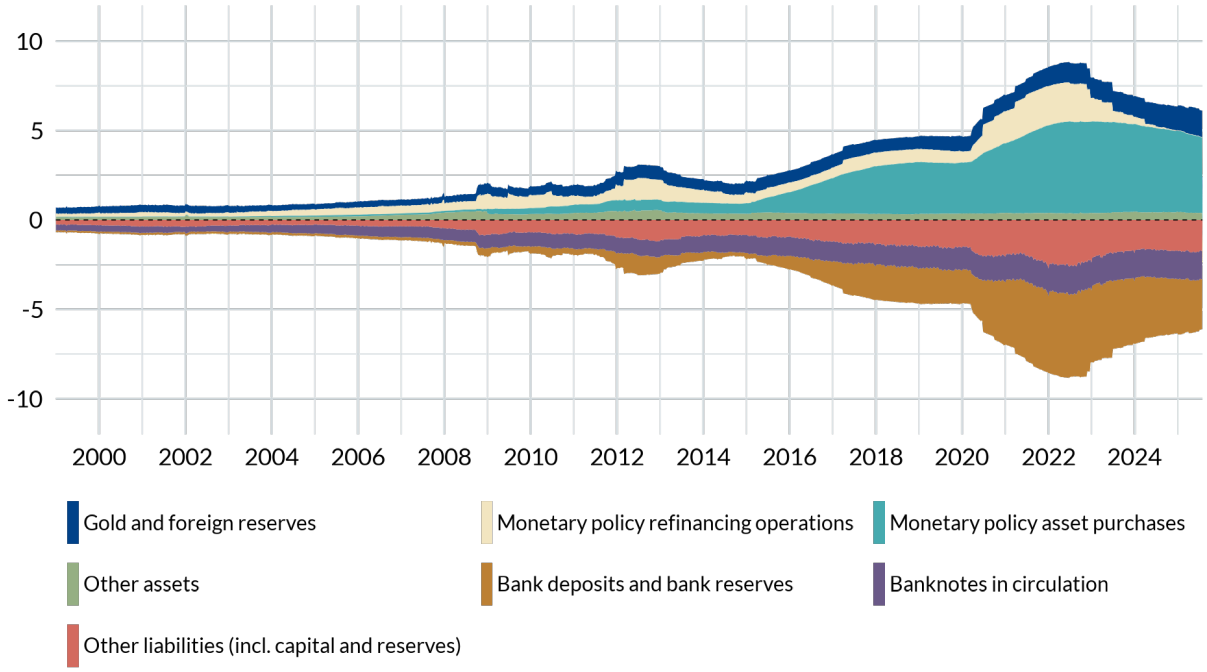
Source: Authors' compilation.

Major changes in the size of the Eurosystem's balance sheet are primarily caused by deliberate monetary policy operations, as can be seen in chart 1, which shows the main asset categories (positive) and liability categories (negative) corresponding to figure 1. Central banks typically use instruments such as refinancing operations and purchases of safe assets (which are shown in dark blue in figure 1). These tools are employed under normal conditions but can also be adapted and expanded during times of crisis.

When a central bank employs monetary policy tools, its balance sheet expands or contracts. Ceteris paribus, every euro the central bank spends on asset purchases or credit provision results in a corresponding credit to a commercial bank's account at the central bank. As a result, bank reserves increase on a one-to-one basis with the central bank's monetary policy tools (as illustrated by the white block in figure 1). In the end, the additional liquidity created in monetary policy operations can show up on the liability side of the central bank's balance sheet in three ways: (1) it remains a commercial bank reserve, (2) it is transformed into banknotes, or (3) it is recognized as other liabilities such as general government deposits.

Chart 1

Consolidated financial statement of the Eurosystem: assets vs. liabilities
EUR trillion



Note: Latest historical observation: July 31, 2025.
Source: ECB SDW (public).

2.1 Central bank losses are a by-product of crisis-fighting monetary policy …

In general, the expansion of a central bank's balance sheet is considered profitable ex ante: If a central bank provides a collateralized loan to a commercial bank and credits its central bank account accordingly, it receives the interest rate on the main refinancing operations (MRO rate) and pays the interest rate on the deposit facility (DF rate) for the reserves it created. As the MRO rate is strictly higher than the DF rate, this deal earns a positive NII and hence is profitable for the Eurosystem.[2] Under normal circumstances – characterized by an upward sloping yield curve, where short-term interest rates are lower than long-term interest rates – asset purchases are also an interest-earning transaction for the central bank.[3] If it buys e.g., a one-year sovereign bond, it will earn the yield of that bond and will pay the (overnight) DF rate for the reserves it created (see e.g. Cecchetti and Hilscher, 2024).

However, circumstances in the euro area (EA) have not been exactly normal in the past years. In 2015, when the Eurosystem started its first large-scale asset purchase programme (APP), short-term interest rates were below zero. Moreover, markets expected them to remain low for quite some time, resulting in a flat yield curve.[4] Expanding their balance sheets still earned the central banks in the Eurosystem a

[2] In this discussion (sections 1.1 and 1.2), we refer to the Eurosystem as a whole rather than to individual national central banks. This approach allows us to abstract from the redistribution of monetary income between national central banks, which we introduce at a later stage.

[3] Looking at historical data, we observe that the spread between euro area government bonds (across all maturities) and the DF rate varied substantially. However, on average, it amounted to 2.76 percentage points between 1999 and 2016.

[4] This was the result of the expansionary monetary policy at that time, which was deliberately brought about to support the economy and bring inflation from below 2% back to target.

positive net interest margin in 2015: The Eurosystem bought low-yielding bonds, but the DF rate was even lower.

This only changed in January 2017, when the ECB Governing Council opened up to the possibility of purchasing securities "with a yield to maturity below the interest rate on the ECB's deposit facility [...]" (ECB, 2016). In what followed, only a fraction of the bonds purchased featured yields below the DF rate. Consequently, the overall NII remained positive until 2022 (see, e.g., Belhocine et al., 2023; Cecchetti and Hilscher, 2024; El Joueidi et al., 2024).

2.2 ... TLTROs III and the interest rate surge being the main contributors

In response to the economic consequences of the COVID-19 pandemic, the Eurosystem changed specific terms and conditions of the third series of its targeted longer-term refinancing operations (TLTROs III). TLTROs III were central bank loans to commercial banks with a three-year maturity. The maximum maturity remained unchanged even after COVID-19 hit. However, the maximum amount banks could borrow was increased and the interest rate charged was lowered. For taking up a TLTRO III loan between June 24, 2020, and June 23, 2022, banks paid the average DF rate over that period minus 50 basis points, i.e., −1% (ECB, 2019). A lending rate below the DF rate, however, proved costly for the Eurosystem: Under the TLTRO III framework, every euro borrowed by commercial banks – provided they met their lending benchmarks – incurred a cost of 0.5 cents for the Eurosystem.

The Eurosystem's NII came under additional pressure due to the increase in the DF rate from −0.5% in mid-2022 to 4% by September 2023, through a series of ten increases aimed at curbing surging inflation. While the interest income from the Eurosystem's long-term asset holdings remained unchanged, the interest expenses on the corresponding reserves rose by 450 basis points. This mismatch between the stable returns on assets and the rising costs on liabilities proved financially burdensome, especially in 2023 and 2024 (Belhocine et al., 2023; Cecchetti and Hilscher, 2024). When policy rates increase more quickly than anticipated at the time of asset purchases, interest rate risk materializes and leads to balance sheet losses (Donnery et al., 2017; Karadi et al., 2024). In the same vein, Del Negro and Sims (2015) conclude that the larger a central bank's balance sheet and the longer the duration of its nominal assets, the greater the likelihood of experiencing periods of negative net income.

Summing up, El Joueidi et al. (2024) show that the interest expense of the six largest Eurosystem central banks started to increase substantially from approximately EUR 20 billion in 2021, ballooning to nearly EUR 200 billion in 2023. According to their estimates, this led to a NII of EUR −50 billion and an overall accounting loss of EUR 6 billion in 2023. The annual reports of the six largest Eurosystem central banks suggest that their accounting loss increased to EUR 33.5 billion in 2024.

3 Profits and losses are poor measures of a central bank's success

A firm's success is usually measured by its profits. However, central banks serve different purposes than firms. They pursue national welfare, not profits. Consequently, Stella (2008) as well as Archer and Moser-Boehm (2013) argue that conventional measures of private enterprises' success – profitability and capital – can be very misleading when applied to central banks.[5] In this strand of literature, the term "capital" is not used in an accounting sense – which can vary across countries – but rather in a broader sense. It

[5] Central banks pursue stability objectives. For example, the primary goal of the Eurosystem is to maintain price stability. Therefore, consumer price increases at 2% serve as the benchmark by which the Eurosystem's performance is to be assessed.

typically refers to shareholder equity (Wessels and Broeders, 2022) or conventional net worth (El Joueidi et al., 2024). In other words, capital is defined as the value of total assets minus the value of total liabilities. This form of capital is available to absorb losses and generally comprises statutory capital, retained earnings, and other provisions and reserves. We use the terms capital and capital base interchangeably.

For central banks, there may occasionally even be a trade-off between macroeconomic stability and profitability. The Eurosystem's experience in 2022–2023 can serve as an example in this respect: Gebauer et al. (2024) show that had the ECB adopted a loss-mitigating strategy, it would have needed to implement significantly lower policy rates – rather than raising them from –0.5% to 4%. This, however, would have resulted in considerably higher inflation rates, overshooting the inflation target for a longer period and to a larger extent.[6] Consequently, we argue that central bank losses are not a sign of weakness, but rather a sign that the central bank is carrying out its mandate uncompromisingly. Only a central bank that enjoys public trust – and according to Stella and Lönneberg (2008) therefore does not need to be concerned with its financial position – can operate independently and focus solely on fulfilling its stability mandate (Ehrmann, 2025). Accordingly, Gebauer et al. (2024) conclude that the ability to report losses is a precondition for successfully committing to a monetary policy that targets inflation.

3.1 Central bank losses: the OeNB as an example

Buiter (2008) argues that central banks typically have a relatively thin capital base. As a result, even modest losses can push them into net negative capital. This raises the question: If losses are not problematic (see above), is negative capital equally unproblematic?

Central banks are special by design. In contrast to commercial banks, no minimum capital requirements apply to them; they are not subject to the Basel prudential capital requirements and are protected from court-ordered bankruptcy. Hence, there are no constraints on the capital base from a legal perspective. Consequently, following Karadi et al. (2024), there is no reason why a central bank cannot operate with negative capital while maintaining control of inflation.

In 2022, the OeNB's financial statements reported a zero gain/loss. In 2023 and 2024, they reported a loss of EUR 2.06 billion and EUR 2.12 billion, respectively. Hence, the financial year 2024 closed with a loss of EUR 4.18 billion. The statutory capital of EUR 12 million remained untouched. On December 31, 2024, the OeNB recorded negative own funds for the first time, given that the loss for the year (including the loss carried forward from the previous year) exceeded its statutory capital and reserves. Hence, in 2022–2024, there was no profit distribution to the government.

Examining the OeNB's historical profit distributions, we find that it has traditionally allocated a significant portion of its profits to its sole owner, the Austrian federal government. Long and Fisher (2024) and Bunea et al. (2016) highlight that the OeNB's 90% profit distribution to the state is high by international standards. Furthermore, the OeNB did not establish a reserve buffer to cover risks arising from monetary policy – particularly interest rate risk. As a result, losses from monetary policy quickly translated into overall financial losses, ultimately leading to negative own funds (i.e., statutory capital and reserves). However, at the end of 2024, the OeNB's capital position (net equity), including funds earmarked for

[6] Friedman and Schwartz (1963) even go so far as to argue that the US Federal Reserve's fear of losses was one factor that prevented it from pursuing its stability objective, i.e., an aggressive expansionary response to the emergence of the Great Depression.

specific purposes such as risk provision for market, liquidity and credit risks, as well as revaluation accounts, stood at EUR 24.3 billion and remained positive.

Central banks have various options for dealing with losses. Long and Fisher (2024) conclude that currently there is no single recognized model of best practice concerning negative capital and recapitalization arrangements. The OeNB, for example, accumulates its losses as a negative liability on its balance sheet. Once it returns to profitability and generates positive net income, this income is used to reduce the loss carried forward until it reaches zero. Only after this point will the OeNB resume profit distribution to the government.

What sets central banks apart is that they do not need to borrow from external investors to cover their losses. Instead, they can create money directly by crediting the current accounts of credit institutions held at the central bank (see Bindseil et al., 2004).

3.2 How other central banks in advanced economies deal with losses

The OeNB and the Eurosystem are not the only institutions to have incurred losses in recent years. The US Federal Reserve System (Fed) has also experienced negative NII since 2022. It records its losses as a deferred asset on its balance sheet. During periods of losses, the Fed suspends remittances to the US Treasury. In essence, this "deferred asset" reflects the future net earnings that the Federal Reserve Banks must generate before resuming payments to the Treasury. We refer to this mechanism as intertemporal smoothing of profits and losses. As of 2024, the Fed's deferred asset stood at USD 216 billion (Fed, 2025).

Similarly, the Swedish Riksbank has also experienced losses since 2022 (see Nordström and Vredin, 2022). However, the Swedes took another route for dealing with central bank losses. The Riksbank has a target equity level of SEK 60 billion for 2023.[7] If equity falls below one third of the target, the Riksbank requests a capital injection from the state as the Riksbank's owner. In 2023, the Riksbank's equity fell below the minimum level. Consequently, the Riksdag approved a capital injection of SEK 25 billion, bringing the Riksbank's equity to SEK 23 billion in 2024. Essentially, as long as the Riksbank's capital remains between SEK 20 billion and SEK 60 billion, its approach also serves as a form of intertemporal smoothing of profits and losses.

Among the various approaches to recapitalization, the Reserve Bank of Australia's (RBA) strategy falls somewhere between the previously mentioned examples. Its target balance is not a mandatory minimum level of capital but rather a soft benchmark. As of June 30, 2024, the target was AUD 20.1 billion, compared with an actual total equity of AUD −20.4 billion (RBA, 2024). The RBA plans to restore its capital through all future retained profits. However, the Treasurer has responded by noting that, under the Reserve Bank Act 1959, the retention of earnings ultimately lies at the Treasurer's discretion.

Long and Fisher (2024) provide a survey of how central banks treat losses and arrange recapitalization across 70 jurisdictions and find nearly as many different approaches. Some authors (e.g. Buiter, 2008; Cecchetti and Hilscher, 2024) argue that the fiscal authority and the central bank should be viewed as a single consolidated government entity. Central bank losses lead to fiscal costs – either immediately through recapitalization, or later through suspended remittances to the government. Recapitalization through future retained profits (US Federal Reserve, OeNB) functions as a gradual, automatic mechanism. Aside from the legal framework underpinning this process, it involves no further political engagement.

[7] The target level for the Riksbank's equity will be adjusted for inflation over time.

By contrast, direct recapitalization by the government (Swedish Riksbank) requires both governmental and parliamentary approval and may therefore be more susceptible to political influence. Hence, the issue of negative central bank capital and its subsequent recapitalization boils down to a matter of timing and political involvement.

3.3 When "printing" money turns problematic

Bell et al. (2024) studied whether low or negative capital levels are inflationary using data from 47 countries between 1950 and 2023. They found no statistically significant relationship between equity levels and subsequent inflation outcomes.

According to Reis (2015), "central banks may be able to print money, but they cannot conjure up free lunches." In other words, while central banks can create money to temporarily cover their losses, this strategy cannot be sustained indefinitely. If they were on a path of issuing an exploding volume of reserves (Hall and Reis, 2015), it would result in inflation. Historical examples – such as the role of central bank financing during 19th- and 20th-century wars (Ferguson et al., 2023; Jobst and Kernbauer, 2016), and the experience of Latin American emerging economies in the 1980s and early 1990s (Bell et al., 2024) – demonstrate that if monetary financing is used to accommodate unsustainable fiscal policies, it will ultimately erode price stability. Put differently, "printing" money is not inherently problematic. However, when fiscal policy begins to dominate and undermines the independence of monetary policy, price stability is put at risk.

Stella (2008) and Bell et al. (2024) argue that if central banks create domestic currency (both in physical and electronic form) without restraint, trust in the central bank deteriorates and the currency may eventually lose its status as money. Reis (2015) describes this scenario as "central bank insolvency" – a state in which reserves and currency become worthless. In such cases, people start resorting to alternatives, such as commodities, foreign currencies or stablecoins.

In summary, (1) a central bank's independence, (2) the ability to achieve its stability target, and related to that, (3) trust in its currency form the holy grail of monetary policy. All of this can be achieved with and without a large capital base. A strong capital position is neither a necessary nor a sufficient condition for achieving price stability and thus preserving trust in money.

Nevertheless, a range of authors (e.g. Bindseil et al., 2004; Ize, 2005; Archer and Moser-Boehm, 2013; Wessels and Broeders, 2022; Nordström and Vredin, 2022; Adrian et al., 2024a; Wessels, 2024; Claessens et al., 2025) argue that financial strength supports central bank credibility. Or, as Bell et al. (2023) and Adrian et al. (2024b) put it, achieving central bank independence has multiple dimensions, and financial independence is one of them: Capital is an interest-free liability that effectively expands the base from which interest income can be earned. Moreover, it enhances the central bank's financial independence and reduces the need for recapitalization. In turn, this lowers the risk of political interference, thereby bolstering confidence in the central bank's ability to meet its inflation target and ultimately strengthening trust in the domestic currency.

In principle, we agree with these points: A strong capital base can indeed have a stabilizing effect. Should central banks therefore go for a swift or a slow recapitalization? On the one hand, one-off government recapitalizations could, in the worst case, open the door to political interference (see e.g. Adrian et al., 2024a). In contrast, "stealth" recapitalizations, i.e. offsetting losses through retained earnings once the central bank returns to profitability, reduce this risk. Since no political approval is required and the recapitalization follows a transparent, rules-based process, there is less room for political influence.

Bindseil et al. (2004) conclude that "[a] fully automated and fully credible rule of re-capitalization by the government of the central bank in case of losses can be regarded as a substitute for positive capital." On the other hand, a central bank with negative capital – one that does not contribute to the national budget – may in general be more vulnerable to political pressure than one with a sound capital base. Since "stealth" recapitalizations often take many years, there is a prolonged risk of political influence. In contrast, immediate recapitalizations offer the advantage of a swift resolution. Once completed, the central bank regains financial independence and may be better shielded from political pressure.

Hall and Reis (2015) suggest that rather than formulating a concept of capital for central banks and raising red flags if capital is depleted, a better approach is to monitor how long it will take the central bank to pay off its deferred obligation. This is what we do in section 3.

4 Profit and loss projections of a euro area central bank such as the OeNB

We examine the development of NII for a small to medium-sized Eurosystem central bank, using the OeNB as an example. NII is determined by both balance sheet composition and the interest rates applied to assets and liabilities. To estimate the magnitude and duration of profits and losses, we first project the future evolution of the balance sheet, which then serves as the basis for our NII calculations.

Before proceeding, it is important to outline the institutional setup of the Eurosystem: Key aspects relevant for profits and losses – such as profit distribution and loss coverage – are not only governed by decisions of the ECB Governing Council but also by national legislation. While the policy rates are set collectively by the ECB Governing Council for the whole Eurosystem, monetary policy is implemented in a decentralized manner. In a monetary union comprising 20 national central banks, clear rules are therefore necessary to ensure fair distribution of NII. Monetary income refers to income and expenses from monetary policy operations on national central banks' balance sheets. This income is pooled and redistributed across the Eurosystem according to each central bank's share in the ECB's statutory capital. Therefore, the financial risk, costs and benefits of monetary policy are shared among all national central banks.

This setup motivates us to base our projections on the consolidated balance sheet of the entire Eurosystem.[8] We then approximate the OeNB's balance sheet – after the monetary income redistribution – by applying its proportional share of the Eurosystem balance sheet. However, not all monetary policy instruments are subject to profit and loss sharing. For example, government bond purchases under the expanded asset purchase programme (APP) and the pandemic emergency purchase programme (PEPP) were conducted by national central banks using domestic bonds only. Consequently, the associated risks and returns are not shared. This means that interest income from these portfolios has an idiosyncratic component – related to the risk premium of the government bond – specific to each national central bank.

Therefore, after simulating the consolidated Eurosystem balance sheet, we calculate the OeNB's NII separately. To this end, we make assumptions about the average interest rate earned on the OeNB's monetary policy portfolio. For confidentiality reasons, we do not use internal OeNB accounting data on the exact securities that are held. Therefore, we cannot replicate its exact financial situation.

[8] The ECB is part of the consolidated balance sheet of the Eurosystem. However, it is not part of the monetary income redistribution among Eurosystem national central banks.

Nonetheless, our goal is to better understand the drivers of losses for central banks such as the OeNB. We do not aim to make precise forecasts about the OeNB's profits or losses over the medium to long term, nor do we extend our projections to other Eurosystem central banks. This is partly because losses vary across countries. For instance, because of higher credit spreads, central banks in Italy and Spain tend to earn higher average interest income from their government bond portfolios. Moreover, national regulations on financial provisions also influence the extent of losses.

Summarizing, our assumptions are based on market expectations at the time of writing regarding the future state of the economy. To assess the future profit and loss situation we make several assumptions about key parameters and analyze different scenarios. This allows us to evaluate the sensitivity of our projections and draw implications for central bank profitability. Assumptions related to demand for banknotes, excess liquidity, and policy interest rates apply to the entire EA, reflecting the shared nature of profits and losses within the Eurosystem. In contrast, assumptions about interest rate income from parts of the monetary policy portfolio are specific to the OeNB.

Finally, we emphasize that these assumptions are not intended as forecasts of the most likely outcomes. Rather, they serve to illustrate and discuss the impact of key parameters on the financial results of Eurosystem central banks.

4.1 Projection assumptions on balance sheet and interest rate developments

We use data from the ECB Data Portal, including data on the consolidated Eurosystem balance sheet, required reserves, and total banking assets. Our primary focus is on the impact of monetary policy on the profits and losses of EA central banks. Accordingly, we concentrate on NII and its drivers.

Interest expenses are largely determined by the DF rate, which is paid on commercial bank reserves held at the central bank in excess of minimum reserve requirements. Interest income, on the other hand, stems from two main sources: interest paid by commercial banks in refinancing operations, and returns on assets held in the monetary policy portfolio. To estimate profits and losses, we must therefore make assumptions about the evolution of both central bank assets and liabilities, as well as the future path of interest rates.

4.1.1 Balance sheet assumptions

We begin by outlining our assumptions for key items of the Eurosystem balance sheet. Regarding liabilities, our first assumption concerns the future circulation of banknotes in the EA. The future of cash is currently uncertain due to the proceeding digitalization of the payment system. To account for this and to evaluate the sensitivity of central bank profitability to different future paths of physical money, we suggest four scenarios: The first scenario assumes that the quantity of banknotes in circulation will grow at the same rate as long-run nominal EA GDP (i.e., 3.2% per year) an assumption discussed in Bindseil et al. (2004).[9] The second scenario assumes that the number of banknotes in circulation will not grow. The third scenario assumes a growth rate of −2.98% per year, which corresponds to a decrease in banknotes in circulation by about 25% by the end of 2033.[10] Lastly, we extrapolate the growth in banknotes in the EA from 1999 to 2025 as a fourth scenario. This results in a higher growth rate than

[9] For this long-run nominal GDP growth rate, we use the median expectation of the ECB Survey of Monetary Analysts (SMA), June 2025, about long-run real growth rates (1.2%), plus the ECB's inflation target of 2%.

[10] This may seem like an extreme assumption at first, but it is only a fraction of the reduction of cash in usage in Sweden observed over the last 15 years: In the beginning of 2010, banknotes and coins in circulation in Sweden stood at around SEK 105,000 million, whereas in the beginning of 2025, this amount had reduced to about SEK 56,000 million.

what we assume in the first scenario (about 6.54% per year). We believe that these four scenarios provide reasonable upper and lower bounds for the future development of this balance sheet item.

Next, we assume that the minimum reserve requirement in the EA (as a proportion of specific liabilities on banks' balance sheets) will grow at the long-run nominal GDP growth rate of 3.2% per annum. The remaining commercial bank reserves, i.e., excess reserves, are initially determined by the run-off of the monetary policy portfolio. In our projections, we assume that – depending on banks' demand – excess liquidity will be reduced to a certain percentage of total banking assets in the EA. Again, we propose four scenarios, which reflect different levels of liquidity in the Eurosystem. The first scenario assumes a reduction to 2%, the second to 2.5%, the third to 3%, and the fourth to 3.5% of total banking assets. Once this minimum amount has been reached, we assume that excess liquidity will grow at the same rate as long-run nominal GDP. Other liabilities, as well as capital and reserves (abstracting from the accounting treatment of incurred losses), are assumed to remain constant after the data cut-off date (July 31, 2025).[11]

We now turn to our assumptions about the development of the asset side. Carpenter et al. (2015) conduct a similar analysis to ours for the Federal Reserve and Kjellberg and Åhl (2022) for the Sveriges Riksbank. While Carpenter et al. (2015) explore various scenarios for the way the Fed's balance sheet is reduced through the asset side, the Eurosystem's path for reducing its monetary policy portfolio is clearly defined. Currently, the consolidated balance sheet of the Eurosystem (see chart 1) shows close to EUR 4 trillion in legacy bond holdings from earlier asset purchase programmes, namely the APP and the PEPP. Reinvestments ended in June 2023 for the APP and in June 2024 for the PEPP. Since then, the legacy portfolios have decreased in line with their maturity distributions. No asset sales are foreseen. The ECB publishes the expected redemption amounts for the APP and PEPP until July and December 2026, respectively. Consequently, the contraction of the asset side that drives the balance sheet volume is transparent and publicly available. From 2027 to 2033, we assume that bond holdings under APP and PEPP will develop in line with median expectation from the ECB Survey of Monetary Analysts (SMA, June 2025).

In 2024, the Eurosystem completed a review of its operational framework for implementing monetary policy, outlining the key features of its balance sheet development (ECB, 2024). An important decision made during this review – besides the passive shrinkage of the asset portfolio – is that the amount of liquidity provided by the Eurosystem will be determined by banks' demand for reserves. Currently, it is the asset side that drives the size of the balance sheet, as the legacy bond holdings provide more reserves than the banks demand. These legacy assets will shrink until the supply of reserves equals their demand. From that point onward, it will be banks' demand for reserves that determines the size of the balance sheet, as long as no further unconventional monetary policy measures are used in the future. The ECB Governing Council has announced that new structural longer-term refinancing operations and a structural portfolio of securities will be introduced at a later stage. "These operations will make a substantial contribution to covering the banking sector's structural liquidity needs […]" (ECB, 2024). This announcement, however, only provides a vague indication of how the structure of the Eurosystem's asset

[11] Assuming that the future volumes of all other assets and liabilities remain constant (see chart 3) is a simplifying assumption. This assumption primarily serves to highlight the impact that developments of monetary policy-related balance sheet items (including banknotes) have on the profit and loss position of a medium-sized central bank in the euro area. Given our focus on the impact of monetary policy on net interest income, we disregard other income and expenses incurred by central banks, such as income from other assets or operating expenses. We assume that, on average, these revenues and expenses cancel each other out and are therefore revenue neutral. Our aim is to avoid obscuring this analysis with additional assumptions concerning balance sheet items that are not related to monetary policy.

side will evolve. We therefore make a few assumptions here, too. For simplicity, we assume that the entire amount of excess reserves will be provided by main and longer-term refinancing operations, while structural operations will provide the remainder, i.e., the structural liquidity needs arising from autonomous factors and from minimum reserve requirements. As with liabilities, we make the simplifying assumption that other assets, gold, and foreign reserves will remain constant after our data cut-off date.

4.1.2 Interest rate path and portfolio yield assumptions

Having completed our projection of the future Eurosystem balance sheet, we also need assumptions about future interest rates (i.e., rates paid on the deposit facility and those to be received for refinancing operations) and the average interest income from the monetary policy portfolio. For the future development of the MRO and the DF rate, we again rely on median SMA expectations from June 2025.[12] As mentioned before, unlike the MRO and the DF rate, which are common for all EA central banks, interest earned on assets in the legacy monetary policy portfolio is in part based on the national government bond yields. Therefore, our assumptions on interest rate income from the monetary policy portfolio rely on the situation of the OeNB, which purchased most bonds in its portfolio during a period of low or negative interest rates (OeNB, 2024).

Specifically, we assume two different scenarios in which the assets purchased during the low-interest-rate period earn an average of either 0% or 0.5%. For future assets, that the Eurosystem might purchase as part of its structural portfolio, we assume that the interest earned will be the MRO rate plus a markup of 1.76 percentage points.[13]

Table 1

Projection results

Scenario	Legacy asset yield	Banknotes demand	Excess reserves	Max. losses (EUR billion)	Max. losses date	Break-even date
1	0.00%	3.20%	2.00%	10.76	July 2030	Feb. 2039
2	0.00%	3.20%	2.50%	10.74	June 2030	Jan. 2039
4	0.00%	3.20%	3.50%	10.69	May 2030	Nov. 2038
5	0.00%	0.00%	2.00%	11.25	Mar. 2031	> Dec. 2040
8	0.00%	0.00%	3.50%	11.16	Feb. 2031	> Dec. 2040
9	0.00%	-2.98%	2.00%	11.81	Jan. 2032	> Dec. 2040
12	0.00%	-2.98%	3.50%	11.71	Nov. 2031	> Dec. 2040
13	0.00%	6.54%	2.00%	10.35	Nov. 2029	Apr. 2037
16	0.00%	6.54%	3.50%	10.29	Oct. 2029	Feb. 2037
17	0.50%	3.20%	2.00%	7.15	July 2029	Sep. 2036
20	0.50%	3.20%	3.50%	7.11	May 2029	July 2036
21	0.50%	0.00%	2.00%	7.46	Mar. 2030	June 2038
24	0.50%	0.00%	3.50%	7.40	Jan. 2030	Mar. 2038
25	0.50%	-2.98%	2.00%	7.83	Jan. 2031	Oct. 2040
28	0.50%	-2.98%	3.50%	7.77	Nov. 2030	May 2040
29	0.50%	6.54%	2.00%	6.91	Dec. 2028	May 2035

[12] This assumption implies that our results will be sensitive to changes in the expected path of interest rates.

[13] This markup is in line with the historical markup of euro area bonds over the MRO rate between January 1999 and February 2016.

32	0.50%	6.54%	3.50%	6.87	Nov. 2028	Apr. 2035

Source: Author's calculations.

4.1.3 Integrating balance sheet and interest rate assumptions to estimate NII

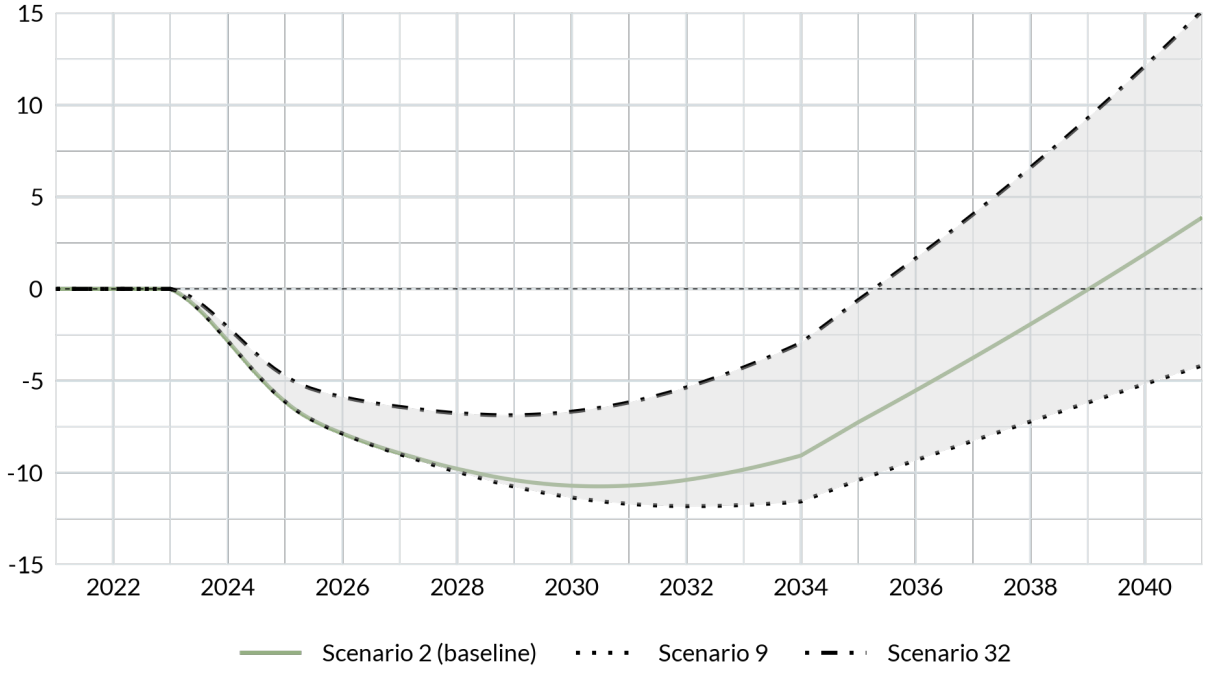
To calculate NII, we compare interest income from monetary policy operations with interest expenses on the deposit facility. While our balance sheet projection covers the entire Eurosystem, we calculate the NII for a central bank representing 2.96% of the ECB's statutory capital – corresponding to the OeNB's capital key.

4.2 Projection results

In the following section, we discuss the resulting projections of future profits and losses under 32 different scenarios.

Chart 2

Simulated cumulative profits/losses - scenario analysis
EUR billion



Note: Latest historical observation: July 31, 2025.
Source: ECB SDW (public), author's projections.

Table 1 summarizes the key parameters of each scenario, the resulting central bank losses, and the projected recovery timelines.[14] Depending on the scenario, cumulative losses of an illustrative central bank could range from approximately EUR 6.87 billion to EUR 11.81 billion. The time required to recover these losses varies accordingly – from around ten years (until mid-2035) to more than 15 years, extending beyond 2040. Chart 2 visualizes the range of our results by plotting the most optimistic scenario (scenario 32) and the most pessimistic scenario (scenario 9). The gray shaded area captures the full range of projections, while the green line represents our baseline scenario, which we discuss in more detail below.

[14] We show only a subset of results in the main part of this paper to increase readability and because the assumptions about excess liquidity levels have limited impact on our results. The full table is in the annex.

The wide range of possible paths of central bank losses shown in chart 2 clearly demonstrates the difficulty in assessing the future of central banks' profits and losses. Demand for banknotes, as well as commercial banks' demand for excess reserves, are taken as a given by monetary policymakers, not to mention the possibility that large exogenous shocks make it necessary to change the monetary policy stance again in the future. Nevertheless, we want to use this range of results to illustrate how different parameters of monetary policy and ingredients of the operational framework influence the profits and losses of a central bank such as the OeNB.

We first highlight the importance of our assumptions about the growth in demand for banknotes for our projections, as illustrated by the results in table 1 (and table 2 in the annex). The development of future banknotes in circulation is by far the most influential assumption in our projections. Holding all other parameters constant, the difference between our most optimistic scenario in terms of future demand for banknotes (extrapolating the historical growth rate from 1999 to the present) and the most pessimistic scenario (a negative growth rate) translates into a three-year difference in the duration of losses, and at least five and a half years in the time to fully recover them.

In contrast, variations in excess reserve levels (ranging from 2% to 3.5% of total banking assets) have a much smaller effect, shifting recovery timelines by only a few weeks (holding all other assumptions constant). While excess liquidity is important for monetary policy transmission, it plays a relatively minor role in profitability. We conjecture that both quantity and price effects are responsible for this result. For one, our banknote scenarios (ranging from –2.98% to 6.54%) provide a much larger variety in future balance sheet sizes than the relatively small variations in possible excess reserves. In addition, the interest rate differential between banknotes (which are by definition unremunerated) and interest-earning assets will be larger than that between excess reserves (which are remunerated) and interest-earning assets.

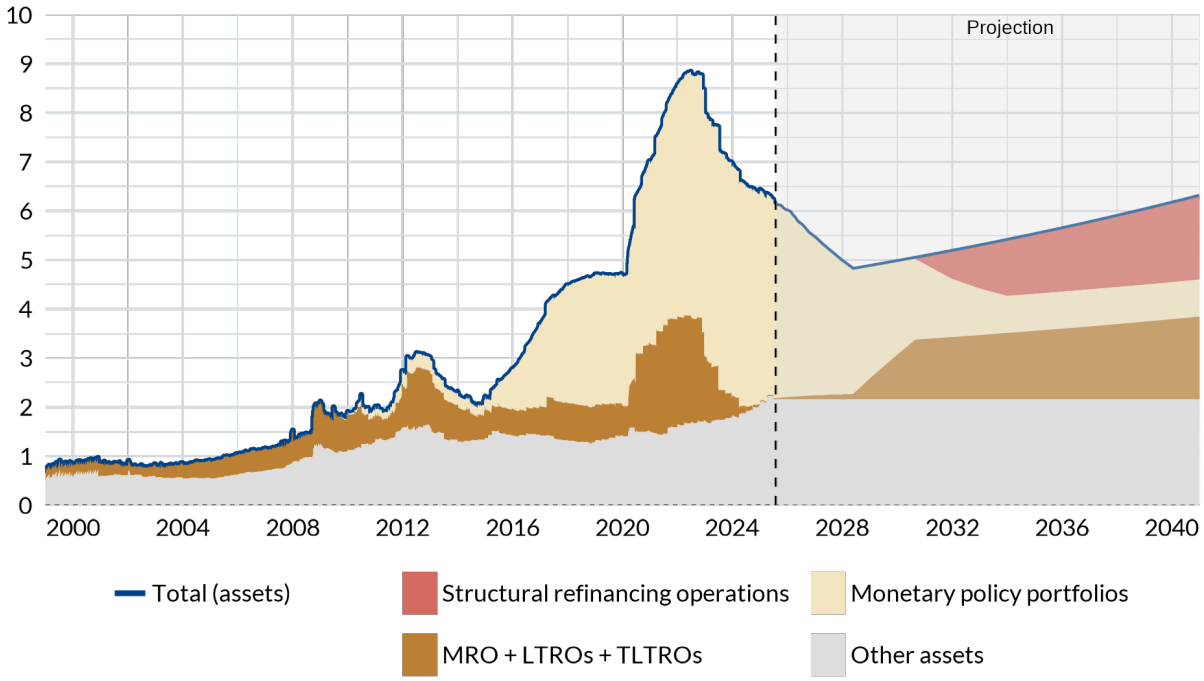
Finally, assuming a higher remuneration of the monetary policy portfolio results in lower cumulative losses and a shorter recovery period. However, since these returns are largely locked in by past purchases made during periods of low interest rates, there is limited flexibility. If future monetary policy again requires large-scale asset purchases in a low-rate environment, central banks may need to accept low returns and losses. In this context, demand for banknotes can significantly offset the impact of low asset yields.

Having discussed the general implications of our assumptions and the resulting range of projections, we now turn to what we consider our baseline projection (scenario 2 in table 1) and discuss it in further detail. We chose this specification to balance both pessimism and optimism about future developments. Specifically, we assume that banknotes in circulation will grow with the growth rate of nominal GDP, and we are less optimistic about the actual remuneration of the legacy monetary policy portfolio, assuming a 0% interest rate. In terms of the level of excess reserves in the system, we choose a level of 2.5% of total EA banking assets, although we would like to emphasize that this assumption has limited impact on the results.

Chart 3 shows the projected development of the asset side of the Eurosystem balance sheet. While the chart depicts the entire consolidated Eurosystem balance sheet, we reiterate that we calculate profit and losses on the basis of about 2.96% of this total to make our projection more comparable to the situation of the OeNB. Chart 3 depicts the consolidated asset side, highlighting the expansion of the monetary policy portfolio from 2015 onward (pale yellow) and the spikes in refinancing operations (brown) during 2008–2009, 2012 and 2020. The latter has declined significantly since the repayment of TLTRO III in 2024. These two balance sheet items have historically been the main drivers of NII.

Chart 3

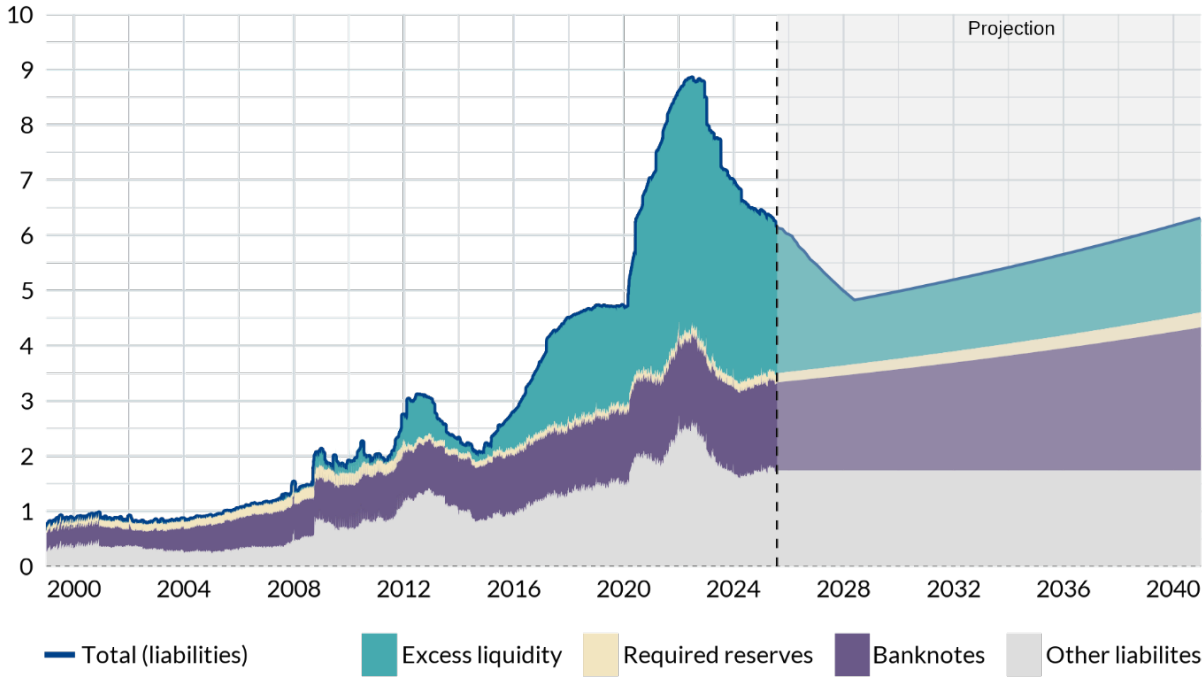
Eurosystem: asset side, historical and projected (baseline scenario)
EUR trillion



Note: Latest historical observation: July 31, 2025.
Source: ECB SDW (public), author's projections.

Chart 4

Eurosystem: liabilities side, historical and projected (baseline scenario)
EUR trillion



Note: Latest historical observation: July 31, 2025.
Source: ECB SDW (public), author's projections.

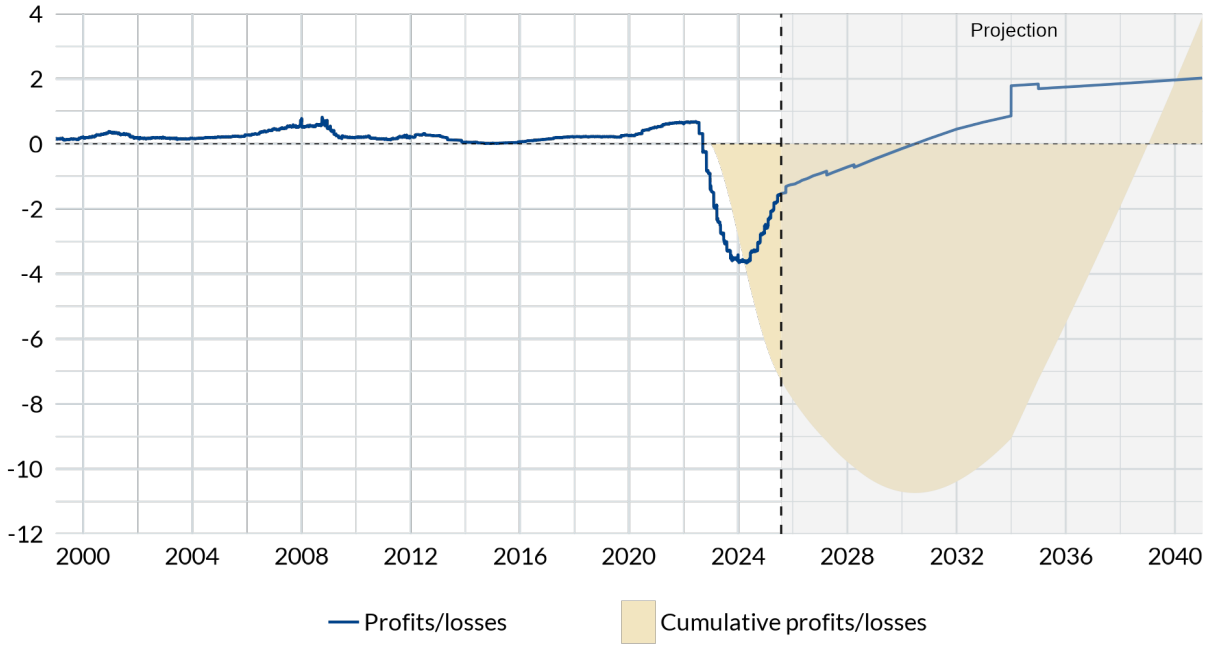
Looking ahead, the monetary policy portfolio will continue to shrink. By mid-2028, excess liquidity is projected to reach 2.5% of total banking assets (turquoise in chart 4). From that point, additional liquidity will be provided through refinancing operations, which will begin to rise again. Around two years later, as the monetary policy portfolio shrinks further, structural operations will be phased in to meet remaining liquidity needs.

On the liability side of the Eurosystem balance sheet depicted in chart 4, once excess liquidity stabilizes, the size of the balance sheet will be determined by banks' demand for reserves. This, in turn, dictates the required size of the asset side to meet liquidity needs.

Chart 5

Simulated cumulative profits/losses (baseline scenario)

EUR billion



Note: Cumulative profits/losses before January 01, 2023 are assumed to be zero, based on the premise that existing reserves were used to cover previous losses. Latest historical observation: July 31, 2025.
Source: ECB SDW (public), author's projections.

Based on these balance sheet developments, chart 5 presents the projected NII and cumulative losses over time. In our baseline scenario, NII remains positive until the end of 2022. After that, losses start to accumulate, peaking around Q2 24. NII turns positive in Q2 30, allowing for a gradual recovery. Full recovery of accumulated losses is projected by Q1 39, approximately ten years after the turning point.

5 Conclusion

Central bank losses or negative capital are not inherently problematic, especially when they arise as a result of the central bank fulfilling its mandate. Unlike commercial banks, central banks can operate effectively with negative capital due to their exemption from capital requirements and their unique ability to create money. Therefore, conventional indicators of private sector success – such as profitability and capital – are not suitable measures of a central bank's performance and can be misleading.

The success of a central bank should be judged primarily by its ability to fulfill its mandate. For the Eurosystem, this means maintaining price stability – specifically an inflation rate of 2% over the medium

term. After the inflation surge in 2021/2022, the Eurosystem successfully managed to bring inflation back to target. Delivering price stability is central to the functioning of the monetary union, as it anchors expectations and enhances the transmission of policy measures. While some academic literature suggests that financial strength supports central bank independence and thus credibility, consistent policy performance remains the most critical factor in ensuring effectiveness. A positive capital base can support credibility, especially when institutional independence is fragile, but it cannot replace sustained policy execution.

Profitability is not among central banks' objectives, and the pursuit of price stability and macroeconomic welfare outweighs concerns about short- or medium-term financial performance. However, there are a few lessons to be learned from the current episode of central bank losses in advanced economies:

First, intertemporal smoothing mechanisms, such as deferred assets and automatic recapitalization through retained earnings, are effective in helping to manage central bank losses and to reduce the likelihood of political influence. However, while these tools may limit interference, they do not eliminate it entirely. If capital-weak central banks are easier targets for political pressure, then prolonging such weakness (through "stealth" recapitalizations instead of one-off recapitalizations) could itself become a source of vulnerability.

Second, demand for banknotes is a key driver of central bank profits. Therefore, future cash usage is a critical variable in long-term financial planning. Generalizing this insight also points to the importance of future use of central bank money by the public, be it via banknotes or a digital currency.

Third, excess liquidity has a limited impact on central banks' profitability. While it is important for a smooth monetary transmission, variations in excess reserves have a smaller influence on profit and losses in our projections, as we have shown in our simulation.

Fourth, asset yield assumptions significantly influence the recovery timelines in our projections. Higher yields on monetary policy portfolios can shorten the duration of losses and accelerate financial recovery, underscoring the importance of asset composition. When designing a structural monetary policy portfolio in the future, the Eurosystem will need to carefully balance the costs and benefits of high-yielding (long-term) versus low-yielding (short-term) assets, i.e., improving the financial recovery time versus a smaller risk of asset-liability mismatches in the future.

Lastly, monetary unions can offer resilience during episodes of longer sustained central bank losses. As also argued by Cardoso da Costa (2022), shared monetary policy across member states enhances independence and offers protection against idiosyncratic national pressures on central banks.

6 References

Adrian, T., C. Erceg, M. Kolasa, J. Lindé, R. McLeod, R. Veyrune and P. Zabczyk. 2024a. New Perspectives on Quantitative Easing and Central Bank Capital Policies. IMF Working Paper 103. Washington: International Monetary Fund.

Adrian, T., A. Khan and L. Menand. 2024b. A new measure of central bank independence. IMF Working Paper 35. Washington: International Monetary Fund.

Archer, D. and P. Moser-Boehm. 2013. Central bank finances. BIS Working Paper No. 71. Basel: Bank for International Settlements

Belhocine, N., A. Bhatia and J. Frie. 2023. Raising Rates with a Large Balance Sheet: The Eurosystem's Net Income and its Fiscal Implications. IMF Working Paper 145. Washington: International Monetary Fund.

Bell, S., M. Chui, T. Gomes, P. Moser-Boehm and A. Tejada. 2023. Why are central banks reporting losses? Does it matter? BIS Bulletin No. 68, Basel: Bank for International Settlements.

Bell, S., J. Frost, B. Hofmann, D. Sandri and H. Shin. 2024. Central bank capital and trust in money: lessons from history for the digital age. BIS Papers No. 146. Basel: Bank for International Settlements.

Bindseil, U., A. Manzanares and B. Weller. 2004. The role of central bank capital revisited. ECB Working Paper Series No. 392. Frankfurt: European Central Bank.

Buiter, W. 2008. Can central banks go broke? CEPR Policy Insight No. 24. London: Centre for Economic Policy Research.

Bunea, D., P. Karakitsos, N. Merriman and W. Studener. 2016. Profit distribution and loss coverage rules for central banks. ECB Occasional Paper Series No. 169. Frankfurt: European Central Bank.

Cardoso da Costa, J. 2022. On the solvency and credibility of a central bank. In: Banco de Portugal Economic Studies, Vol. VIII, No. 3. Lisbon: Banco de Portugal.

Carpenter, S., J. Ihrig, E. Klee, D. Quinn and A. Boote. 2015. The Federal Reserve's Balance Sheet and Earnings: A Primer and Projections. In: International Journal of Central Banking 11(2), 237–283.

Cecchetti, S. and J. Hilscher. 2024. Fiscal Consequences of Central Bank Losses. NBER Working Paper Series No. 32478. Cambridge: National Bureau of Economic Research.

Claessens, S., T. Glaessner and D. Klingebiel. 2025. Future proofing central banks' financial strength. CEPR Discussion Paper Series DP20049. London: Centre for Economic Policy Research.

Del Negro, M. and C. Sims. 2015. When does a central bank's balance sheet require fiscal support? In: Journal of Monetary Economics 73. 1–19.

Donnery, S., D. Doran, R. Gleeson and C. Konstantina. 2017. Non-standard Monetary Policy Measures and the Balance Sheets of Eurosystem Central Banks. In: Quarterly Bulletin 03/2017. Dublin: Central Bank of Ireland. 87–102.

ECB. 2016. Introductory statement to the press conference by Mario Draghi, President of the ECB, 8 December 2016. (Introductory statement to the press conference (with Q&A)]

ECB. 2019. Decision (EU) 2019/1311 of the European Central Bank of 22 July 2019 on the third series of targeted longer-term refinancing operations (ECB/2019/21).

ECB 2024. Statement by the Governing Council about Changes to the operational framework for implementing monetary policy, 13 March 2024.

Ehrmann, Michael. 2025. Trust in central banks. Journal of Economic Surveys.

El Joueidi, S., E. Vincent and J. Wauters. 2024. Central bank losses: causes and consequences. NBB Economic Review No.8. Brussels: National Bank of Belgium.

Fed. 2025. Federal Reserve Banks Combined Financial Statements As of and for the Years Ended December 31, 2024 and 2023 and Independent Auditors' Report.

Ferguson, N., M. Kornejew, P. Schmelzing and M. Schularick. 2023. The safety net: Central bank balance sheets and financial crises, 1587-2020. CEPR Discussion Paper Series DP17858, London: Centre for Economic Policy Research.

Friedman, M. and A. Schwartz. 1963. A Monetary History of the United States, 1867-1960. Princeton: Princeton University Press.

Gebauer, S., S. Pool and J. Schumacher. 2024. The inflationary consequences of prioritising central bank profits. ECB Working Paper Series, No. 2985. Frankfurt: European Central Bank.

Hall, R. and R. Reis. 2015. Maintaining central-bank financial stability under new-style central banking. NBER Working Paper No. 21173. Cambridge: National Bureau of Economic Research.

Ize, A. 2005. Capitalizing Central Banks: A Net Worth Approach. IMF Staff Papers, Vol. 52, No. 2. Washington: International Monetary Fund.

Jobst, C. and J. Kernbauer. 2016. Die Bank. Das Geld. Der Staat. Nationalbank und Währungspolitik in Österreich 1816 - 2016. Campus Verlag.

Karadi, P., D. Thaler and O. Tristani. 2024. The central bank's balance sheet in the long run: a macro perspective. Discussion Paper Series No.25. Frankfurt: European Central Bank.

Kjellberg, D. and M. Åhl. 2022. The Riksbank's financial result and capital are affected by higher interest rates. Economic Commentary 8, Julyy 2022. Stockhol: Sveriges Riksbank.

Long, J. and P. Fisher. 2024. Central bank profit distribution and recapitalisation. Staff Working Paper No. 1069. London: Bank of England.

Nordström, A. and A. Vredin. 2022. Does central bank equity matter for monetary policy? Staff Memo. Stockholm: Sveriges Riksbank.

OeNB. 2024. Oesterreichische Nationalbank, Annual Report 2024.

RBA. 2024. Reserve Bank of Australia, Annual Report 2024.

Reis, R. 2015. Different types of central bank insolvency and the central role of seigniorage. NBER Working Paper No. 21226. Cambridge: National Bureau of Economic Research.

Stella, P. 2008. Central bank financial strength, policy constraints and inflation. IMF Working Paper WP/08/49. Washington: International Monetary Fund.

Stella, P. and A. Lönneberg. 2008. Issues in Central Bank Finance and Independence. IMF Working Paper WP/08/37. Washington: International Monetary Fund.

Wessels, P. and D. Broeders. 2022. On the capitalisation of central banks. DNB Occasional Study 20(4). Amsterdam: De Nederlandsche Bank.

Wessels, P. 2024. On the profitability of central banks. DNB Occasional Study 21(3). Amsterdam: De Nederlandsche Bank.

7 Annex

Table 2

Projection results

Scenario	Legacy asset yield	Banknotes demand	Excess reserves	Max. losses (EUR billion)	Max. losses Date	Break-even Date
1	0.00%	3.20%	2.00%	10.76	July 2030	Feb. 2039
2	0.00%	3.20%	2.50%	10.74	June 2030	Jan. 2039
3	0.00%	3.20%	3.00%	10.71	June 2030	Dec. 2038
4	0.00%	3.20%	3.50%	10.69	May 2030	Nov. 2038
5	0.00%	0.00%	2.00%	11.25	Mar. 2031	> Dec. 2040
6	0.00%	0.00%	2.50%	11.23	Mar. 2031	> Dec. 2040
7	0.00%	0.00%	3.00%	11.20	Feb. 2031	> Dec. 2040
8	0.00%	0.00%	3.50%	11.16	Feb. 2031	> Dec. 2040
9	0.00%	-2.98%	2.00%	11.81	Jan. 2032	> Dec. 2040
10	0.00%	-2.98%	2.50%	11.78	Jan. 2032	> Dec. 2040
11	0.00%	-2.98%	3.00%	11.75	Dec. 2031	> Dec. 2040
12	0.00%	-2.98%	3.50%	11.71	Nov. 2031	> Dec. 2040
13	0.00%	6.54%	2.00%	10.35	Nov. 2029	Apr. 2037
14	0.00%	6.54%	2.50%	10.33	Nov. 2029	Mar. 2037
15	0.00%	6.54%	3.00%	10.31	Nov. 2029	Feb. 2037
16	0.00%	6.54%	3.50%	10.29	Oct. 2029	Feb. 2037
17	0.50%	3.20%	2.00%	7.15	July 2029	Sep. 2036
18	0.50%	3.20%	2.50%	7.14	June 2029	Sep. 2036
19	0.50%	3.20%	3.00%	7.12	June 2029	Aug. 2036
20	0.50%	3.20%	3.50%	7.11	May 2029	July 2036
21	0.50%	0.00%	2.00%	7.46	Mar. 2030	June 2038
22	0.50%	0.00%	2.50%	7.44	Mar. 2030	May 2038
23	0.50%	0.00%	3.00%	7.42	Feb. 2030	Apr. 2038
24	0.50%	0.00%	3.50%	7.40	Jan. 2030	Mar. 2038
25	0.50%	-2.98%	2.00%	7.83	Jan. 2031	Oct. 2040
26	0.50%	-2.98%	2.50%	7.82	Dec. 2030	Sep. 2040
27	0.50%	-2.98%	3.00%	7.79	Nov. 2030	July 2040
28	0.50%	-2.98%	3.50%	7.77	Nov. 2030	May 2040
29	0.50%	6.54%	2.00%	6.91	Dec. 2028	May 2035
30	0.50%	6.54%	2.50%	6.90	Dec. 2028	May 2035
31	0.50%	6.54%	3.00%	6.89	Dec. 2028	Apr. 2035
32	0.50%	6.54%	3.50%	6.87	Nov. 2028	Apr. 2035

Source: Author's calculations.

Address: Otto-Wagner-Platz 3, 1090 Vienna
PO Box 61, 1011 Vienna, Austria
Website: www.oenb.at

Data protection information: www.oenb.at/en/dataprotection
ISSN 2960-5415 (online)