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Abstract

In a liquidity stress scenario, banks may need to urgently monetise assets to meet deposit outflows. This can be done by either selling the assets or using them as collateral in financing operations. In a context of crisis, executing these financing transactions with private counterparties may be constrained, making the transactions with the central bank particularly relevant. The sale of assets classified at amortised cost will result in the materialisation of any accumulated unrealised losses, adversely affecting the banks' profitability. Alternatively, central bank financing prevents the materialisation of unrealised losses, which, however, limit the amount of financing that can be obtained through this mechanism, as it is based on the market value of the collateral provided. In this case, the increase in interest expenses associated with the funds obtained from the central bank will also impact the bank's profitability. All these negative effects on profitability ultimately affect solvency and can exacerbate the initial liquidity crisis. Thus, there is a link between liquidity stress and solvency deterioration in which unrealised losses play a significant role. Drawing on Spanish banking system data, we examine this connection in various simulation exercises, looking at its nature and strength under each mechanism (asset sale and pledge). The data show a growing weight of government debt classified at amortised cost on the balance sheets of Spanish banks in recent years, as well as an increase in the associated unrealised losses during the period of rising interest rates, especially in 2022, and in 2023. This trend is also observed among major European banks. There is some heterogeneity in the volume of unrealised losses among Spanish banks, which would be partly related to their level of solvency and liquidity. The simulation exercises carried out, based on the situation of the main Spanish banks in December 2023, show that the aggregate impact of a liquidity stress scenario would be limited in terms of solvency. However, it could lead to a greater deterioration of solvency if accompanied by an increase in short and long-term interest rates. In this context, the use of assets as collateral in financing operations with the central bank avoids the materialisation of unrealised losses and can reduce the financial cost of asset monetisation. This mechanism can largely prevent liquidity stress situations from ultimately weakening banks' solvency.

Keywords: government debt, debt held at amortised cost, unrealised losses, LCR, liquidity stress, central bank liquidity facilities.

JEL classification: E43, G17, G21.

Resumen

En un escenario de tensión de liquidez, las entidades bancarias pueden necesitar monetizar activos de forma urgente para responder a las salidas de fondos. Ello puede canalizarse a través de su venta, o bien por medio de su pignoración como garantía en operaciones de financiación. En este entorno de crisis, la posibilidad de recurrir a operaciones de financiación con contrapartes privadas puede verse limitada, resultando entonces especialmente relevantes las operaciones llevadas a cabo con el banco central. En el caso de recurrir a la venta de activos clasificados a coste amortizado, se materializarán las pérdidas latentes que estos pudieran haber acumulado, lo que impactará negativamente en la rentabilidad de las entidades. Por su parte, el recurso a la financiación del banco central evita la materialización de las pérdidas latentes, aunque estas limitan la cantidad de financiación que se puede obtener a través de dicho mecanismo, ligada al valor de mercado de los colaterales aportados. En todo caso, el incremento del gasto por intereses debido a esta forma de financiación impacta negativamente en la rentabilidad. Estos efectos negativos sobre la rentabilidad acaban repercutiendo en la solvencia y pueden agravar la crisis de liquidez inicial. De esta forma, existe un vínculo entre tensiones de liquidez y deterioro de la solvencia en el que las pérdidas latentes desempeñan un papel importante. A través de diversos ejercicios de simulación, este trabajo estudia dicho vínculo y la forma y magnitud en que se puede materializar bajo ambos mecanismos, venta y pignoración, usando para ello información para el sistema bancario español. Los datos muestran un peso creciente de la deuda soberana a coste amortizado en los últimos años en el balance de las entidades españolas, así como un aumento de las pérdidas latentes asociadas durante el período de incremento de los tipos de interés, especialmente en 2022 y también en 2023. Esta tendencia se observa igualmente para el conjunto de las principales entidades bancarias europeas. Por entidades, se detecta cierta heterogeneidad en las pérdidas latentes que estaría relacionada, en parte, con su nivel de solvencia y liquidez. Los ejercicios de simulación llevados a cabo, partiendo de la situación de las principales entidades españolas en diciembre de 2023, muestran que el impacto agregado de un escenario de tensión de liquidez sería acotado en términos de solvencia. Sin embargo, este podría dar lugar a un deterioro notablemente mayor si fuera acompañado de un incremento de los tipos de interés a corto y largo plazo. En ese contexto, el mecanismo de pignoración permite evitar la materialización de pérdidas y puede reducir el coste financiero de la monetización de activos. Esto puede impedir, en gran medida, que las tensiones de liquidez terminen debilitando la solvencia.

Palabras clave: deuda pública, deuda a coste amortizado, pérdida latente, LCR, tensiones de liquidez, facilidades de liquidez del banco central.

Códigos JEL: E43, G17, G21.

Content

1 Introduction

The collapse of several medium-sized banks in the United States (Silicon Valley Bank, Signature Bank of New York and First Republic Bank) and the Swiss bank Credit Suisse in March 2023 led to significant turmoil in the global financial system amid fears that some of the weaknesses revealed in these banks were common to banks in other jurisdictions.

The rapid collapse of the US banks was driven by various factors,[1] notably their fragile business model, a sharp increase in policy interest rates that cut the value of their assets, poor interest rate risk management, some regulatory weaknesses and, by historical standards, a very significant and quick outflow of deposits.[2] Leaving aside these banks' idiosyncratic factors and the supervisory differences between the United States and the euro area, the episode highlights the nexus between liquidity and solvency: as is well known, doubts emerging about a bank's solvency can trigger a liquidity crisis, with sudden and intense fund outflows that can ultimately exacerbate its initial solvency crisis. The nexus also operates in the opposite direction: a sudden liquidity crisis may require the hasty monetisation of assets to absorb fund outflows, which can negatively impact the bank's financial situation and thus its solvency, exacerbating the initial liquidity crisis.

Given this mutual propagation mechanism between solvency and liquidity crises, and in the context of the rapid and significant reference interest rate hikes in the euro area in 2022 and 2023, we address, using data on Spanish banks, the extent to which urgent asset monetisation motivated by a sudden liquidity crisis can damage a bank's financial position and ultimately its solvency, depending on the mechanism the bank uses to monetise assets and thus obtain liquidity.

One of the channels through which a hike in reference interest rates can affect banks' financial situation is through a decline in the value of debt securities, attributable to the higher applicable discount rate.[3] In the case of loans, this effect can be mitigated by periodic interest rate review clauses applicable to a portion of such instruments. In contrast, in the case of debt security holdings, there are generally no direct re-pricing mechanisms for this fall in value, although other types of hedges (e.g. derivatives) may exist.[4]

The impact on banks' financial situation of the valuation loss of debt instruments depends on their accounting classification, which is based on the purpose of these investments. In certain cases, for example, when they are held primarily for trading, banks

1 For a detailed analysis of the global banking turmoil of March 2023, see Banco de España (2023).

2 For example, Basel Committee on Banking Supervision (BCBS, 2024).

3 The discount increases owing to both the rise in the risk-free rate and, in some cases, the increase in the risk premium if the latter worsens on the back of the rise in the former.

4 Interest rate risk hedges can help offset this type of loss, at least in part. Specifically, the impact of interest rate changes on the value of debt instruments held at amortised cost that are hedged using derivatives would be neutralised by the opposite-sign changes in the latter's valuation since, in this case, the hedged item would be classified like the hedging instrument, i.e. at market value. However, in order to focus the analysis on the mechanics of the liquidity-solvency nexus through the monetisation channels available in liquidity crises, we will not consider the additional impact channel of hedging instruments.

must record them at their fair (or market) value at all times, such that losses or gains resulting from valuation changes are directly reflected on the balance sheet, either through profit or loss or directly reducing equity. In the case of debt securities that banks hold to collect the associated contractual cash flows and that are, therefore, recorded at amortised cost, any changes in their market value are not immediately recognised.[5] As a result, changes in market value remain unrealised, and unrecognised in the accounts, as they will not materialise if the bank holds the investment to maturity.

In general, this accounting classification is permanent, although banks can make reclassifications if they justify them to the supervisor. Thus, a liquidity stress scenario could force banks to dispose of part of their asset portfolio held at amortised cost, thereby realising the associated unrealised losses. As already mentioned, this causes a deterioration in the bank's profitability, which is how the liquidity crisis ultimately weakens solvency.

As an alternative or complement to asset sales, banks could opt to use these assets in repurchase agreements (repos) with private counterparties or, in a severe liquidity stress scenario,[6] may prefer to pledge them to the central bank.[7] This means that the banks do not have to sell the assets and realise any unrealised losses, but instead make interest payments for the financing received. As a result, profitability is not affected via the realisation of losses, but rather in the form of higher financial costs. This difference also reflects the varying role of unrealised losses in the sale and pledge mechanisms. In the pledge mechanism, unrealised losses mean that a greater volume of assets (based on their carrying amount) must be provided as collateral to obtain the same level of liquidity since, regardless of their accounting classification, the central bank funding is tied to the assets' fair value. In the sale mechanism, there is an additional direct impact: unrealised losses are materialised at the moment of the affected assets' sale.

In recent years, various organisations have analysed some of these issues. For example, in January 2024, the G30 Working Group on the 2023 Banking Crisis published a comprehensive analysis[8] of the vulnerabilities that led to the March 2023 bank collapse, along with some regulatory policy recommendations and the role that, in its opinion, central banks should play in providing liquidity in times of stress (G30 Working Group on the 2023

5 Under this method, an asset is accounted for at its purchase price, adjusted over time for any interest accrued, coupon payments and principal repayments, as well as potentially for changes in credit quality, but not for changes in market value. It should be noted that unrealised gains may arise on an asset recorded at amortised cost if its market value increases. For its part, the carrying amount of an asset classified at fair value will be updated to reflect changes in market value. Banks may opt for this accounting classification to provide greater stability to the income statement for exposures that are held not for balance sheet management or speculative purposes, but simply to collect the associated coupon and principal payments.

6 While obtaining financing through repos is a routine operation for banks when managing their ordinary liquidity needs, this market can experience significant turmoil in stressed periods, which can result in the operations becoming substantially more expensive or even impossible owing to a lack of counterparties, thus ruling them out as a liquidity-raising mechanism.

7 According to Article 18.1 of the Statute of the European System of Central Banks and of the European Central Bank, the European Central Bank (ECB) and the national central banks of the Member States may conduct credit operations with credit institutions and other market participants, with lending being based on adequate collateral. The use of government debt securities as collateral in ECB lending operations and the applicable valuation haircuts are regulated by Guideline (EU) 2015/510 of the European Central Bank on the implementation of the Eurosystem monetary policy framework and Guideline (EU) 2016/65 of the European Central Bank on the valuation haircuts applied in the implementation of the Eurosystem monetary policy framework.

8 G30 Working Group on the 2023 Banking Crisis (2024).

Banking Crisis, 2024). The Basel Committee also published reports in October 2023 and October 2024[9] that examine the causes of the 2023 crisis, identifying among them poor management of liquidity risk and interest rate risk. Meanwhile, following the turmoil in spring 2023, the ECB and the European Banking Authority (EBA) published an analysis[10] in July 2023 of the unrealised losses on the main European banks' bond holdings, concluding that these remained at contained levels despite the increase in interest rates.

In this setting, the International Monetary Fund (IMF), in its October 2023 Global Financial Stability Report,[11] conducted an exercise to quantify the loss of value in the debt portfolios of banks in various regions. It concluded that the regions where banks held a greater volume of debt at amortised cost on their balance sheet (Belgium, Italy, Portugal and Greece) were more affected. Additionally, this IMF report also analysed the potential impact on solvency of unexpected deposit outflows in stress scenarios for a sample of over 850 banks. It considered both asset sale scenarios and the use of central bank facilities, concluding that the availability of the latter would alleviate the impact on banks.

In the wake of the turmoil of March 2023, the academic literature has also examined the impact of rising interest rates on the value of bank assets (for example, in Jiang, Matvos, Piskorski and Seru (2024)) and the related effect on banks' profitability, solvency and, ultimately, the confidence of market participants. For instance, Dursun-de Neef, Ongena and Schandlbauer (2024) analyse the relationship between unrealised losses and the risk of deposit withdrawals, while Dick-Nielsen and Thimsen (2023) show that the cost of capital only began to price in the risk associated with banks' unrealised losses from March 2023. Meanwhile, Cookson, Fox, Gil-Bazo, Imbet and Schiller (2023) examine the amplifying effect of social media on liquidity outflows in stress scenarios.

This paper builds on this literature and, in particular, follows the line of analysis in the IMF (2023b) report. First, we present evidence of the importance of the government debt holdings on Spanish banks' balance sheets, as well as the accumulated unrealised losses on these exposures following the hike in interest rates that began in mid-2022. This evidence provides context for the second part of this paper, in which we present a simulation exercise to study, under different scenarios of unexpected outflows of funds and varying degrees of unrealised losses, the effectiveness of selling or pledging assets to monetise the government debt held on the balance sheet. The analysis examines the extent to which these methods can exacerbate or mitigate the propagation of a liquidity crisis to a more broad-based deterioration of the bank's financial position and, ultimately, its solvency.

It should be noted that this analysis assumes optimal behaviour by banks in obtaining liquidity, as it considers that the sale or pledge of debt instruments occurs sequentially, based on a criterion that minimises the unrealised loss on each bond at amortised cost

9 BCBS (2023 and 2024).

10 EBA (2023).

11 IMF (2023a and 2023b).

(sale mechanism) and the credit risk haircut applied by the central bank to each instrument (pledge mechanism). The inclusion of this optimisation criterion represents a methodological contribution that enhances the analysis when compared with the simpler approach followed in IMF (2023a and 2023b), in which aggregate values of portfolios are considered with a preference for liquidating the portfolio at fair value.

The remainder of this paper is structured as follows. Section 2 contains a descriptive analysis of the volume of government debt holdings on Spanish banks' balance sheets in the recent period, their accounting classification and the accumulated unrealised losses in 2022 and 2023, coinciding with monetary tightening, as well as their importance in covering the banks' liquidity needs. This description is supplemented by a comparative analysis of changes in the government debt held by banks in major European countries, as well as an analysis of the heterogeneity in the volume of unrealised losses based on banks' characteristics.

Section 3 sets out the simulation exercise, which is the key contribution of this paper. Different scenarios and assumptions are considered to determine the potential impact of a liquidity stress scenario on the main Spanish banks' solvency, with special attention paid to the materialisation of unrealised losses in the portfolio of government debt held at amortised cost. As mentioned, the simulation compares the two possible response mechanisms available to banks: recourse to Eurosystem funding through asset pledging (pledge mechanism) and sale of the assets on the secondary market (sale mechanism). Lastly, Section 4 sets out the study's main conclusions.

2 Unrealised losses on government debt holdings

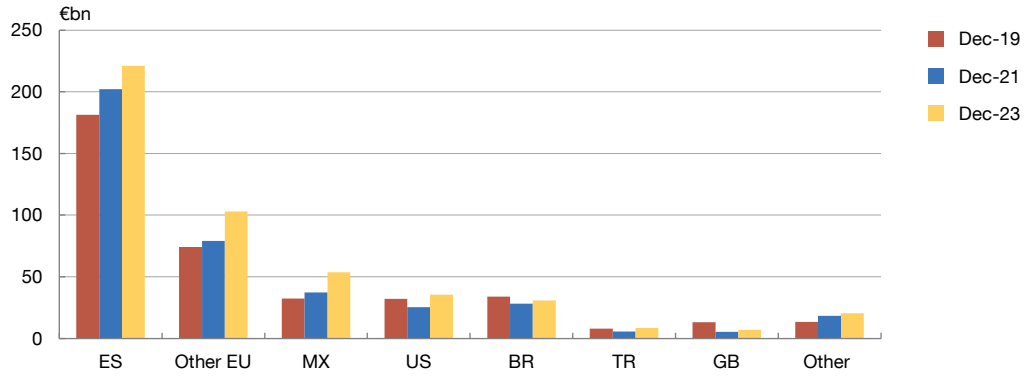
2.1 Breakdown by geography and maturity

After credit, debt securities holdings are the second most important investment for Spanish deposit institutions. At December 2023 these investments accounted for 14.3% of consolidated assets, a year-on-year increase of 8.3% as a result of a growing trend – both in absolute terms and as a percentage of assets – that began in 2022. The great majority of these investments in debt securities were government debt holdings, which accounted for 80.8% of the total at end-2023, amounting to more than €480 billion.

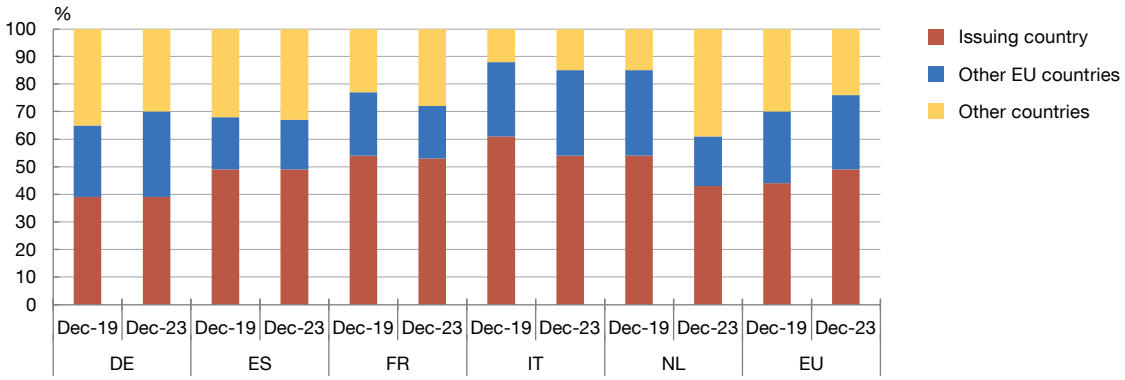
By geographical area, almost half (46.1%) of the sovereign debt held by banks at end-2023 was Spanish government debt, while 21.4% was other EU Member States' government debt. Of the remaining 32.5% from other jurisdictions, Mexican government debt made up a large share, accounting for 11.2% of total sovereign debt holdings. The

Chart 1
Distribution of debt holdings and sovereign exposures by country

1.a Government debt holdings held by Spanish banks by issuing country. Consolidated data



1.b Sovereign exposures by counterparty country. European comparison. Consolidated data

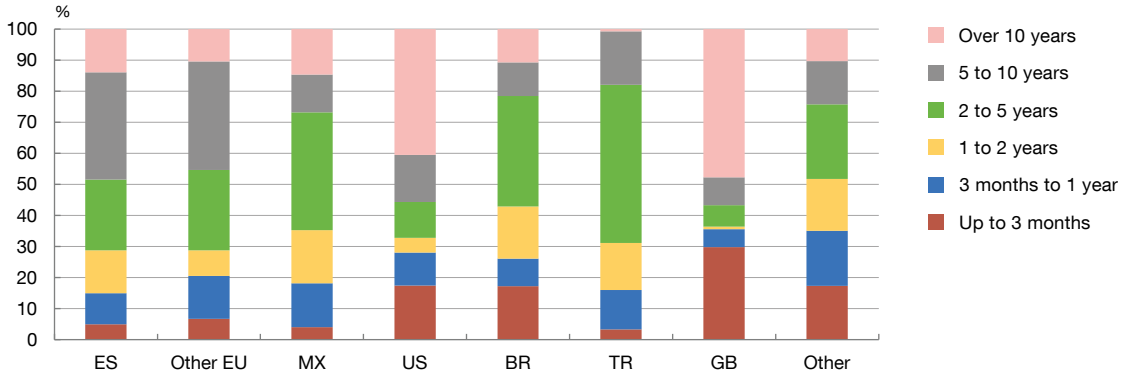


SOURCES: EBA and Banco de España.

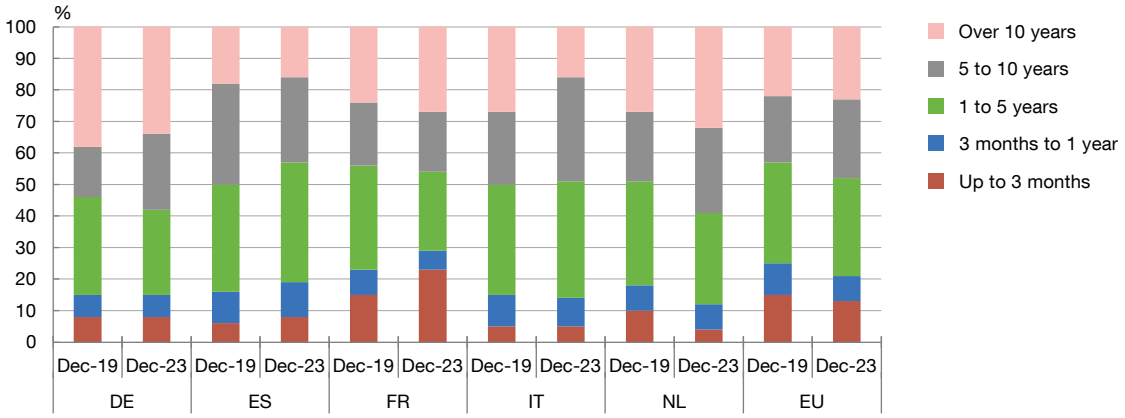
Chart 2

Distribution by maturity of sovereign exposures

2.a Sovereign exposure of Spanish deposit institutions by issuing country and residual maturity. Consolidated data. December 2023



2.b Residual maturity of sovereign exposures. European comparison. Consolidated data



SOURCES: EBA and Banco de España.

composition by jurisdiction has remained relatively stable in recent years, with a slight increase in Mexico's share (+2.8 percentage points (pp)), offset by declines in the shares of Brazil, the United Kingdom and the United States (Chart 1.a).

The EBA data for all sovereign exposures[12] allow us to compare the geographical distribution of these assets held by Spanish banks with that of those held by their main European peers. According to these data, the exposures to Spanish general government of the main banks operating in Spain are similar to the exposures of French, Italian and EU banks overall to their respective general governments, and between 5 pp and 10 pp higher than those of Dutch and German banks. However, German banks' balance sheets record higher exposure to other EU general governments, so the share of sovereign exposure to European countries on Spanish banks' balance sheets is similar to that of German banks.

12 The EBA data consider all sovereign exposures of the major European banks, that is, both loans to general government and sovereign debt securities. The latter account for most of the exposures.

Moreover, save in the Netherlands, in recent years there have been no major changes in the aggregate geographical composition of these portfolios among the banks of the various European countries or the EU banks overall (Chart 1.b).

An analysis of the residual maturity of Spanish banks' sovereign exposures shows that residual maturities between two and five years and between five and ten years make up a significant share of the portfolios, accounting for 25.3% and 28.1%, respectively. Exposure to higher credit quality jurisdictions (Spain, the United States, the rest of the EU and the United Kingdom) is somewhat more concentrated in the longer maturities (government debt with a residual maturity of more than five years makes up between 45% and 56% of the total), while exposures to lower credit quality jurisdictions (Mexico, Brazil and Türkiye) have mostly shorter residual maturities (Chart 2.a).

The maturity structure of the main Spanish banks is similar to the average of the European banks considered by the EBA, albeit with a certain predominance of shorter maturities compared with banks in other countries such as Germany or the Netherlands (the share of sovereign exposures with a residual maturity of less than five years is 5 pp higher for Spain than for the EU overall). Between 2019 and 2023, the proportion of shorter residual maturities increased slightly (+3 pp) at the main Spanish banks, by contrast to the pattern observed in other comparable jurisdictions, with the exception of France (Chart 2.b).

2.2 Accounting classification and unrealised losses

In recent years, the share of Spanish deposit institutions' sovereign debt holdings held at amortised cost has increased notably, from 39.3% of the total at December 2019 to 53.8% at end-2021. In the period following the outbreak of the COVID-19 pandemic, the Eurosystem provided vast amounts of long-term funding, part of which was used by banks to purchase government debt.[13] This explains much of the rapid increase in sovereign debt holdings held at amortised cost since early 2022.

In 2022 and 2023, rising monetary policy rates, which passed through to government debt yields, further encouraged banks to increase their long-term investments in government bonds. Accordingly, at December 2023, investments in sovereign bonds at amortised cost amounted to 63.4% of the total. The distribution by bank of the share of government debt held at amortised cost has shifted to the right at end-2023 (Chart 3.a), although it remains bimodal, with a first group consisting of a few large banks with a share of around 40% of debt held at amortised cost, and a second group of smaller banks with shares over 90%.

The EBA data[14] enable a European-wide comparison of these metrics (with some limitations). As Chart 3.b shows, in recent years the share of sovereign exposures – loans

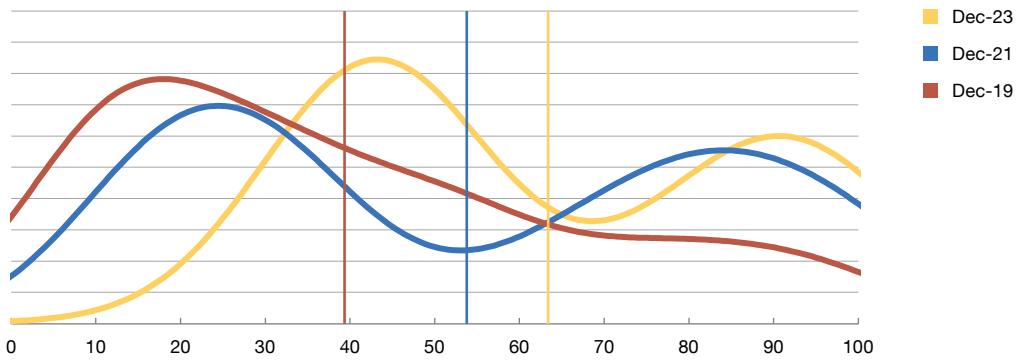
13 For a detailed discussion on the use of funding obtained from the Eurosystem's TLTRO III liquidity-providing programmes, see Castillo Lozoya, Esteban García-Escudero and Pérez Ortiz (2022).

14 EBA Risk Dashboard.

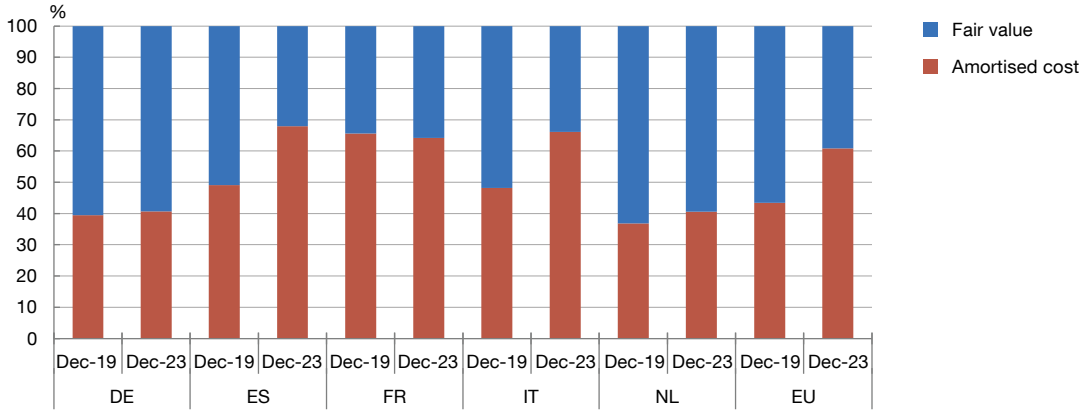
Chart 3

Classification of sovereign debt holdings at amortised cost

3.a Distribution by banks of percentage of sovereign debt classified at amortised cost. Spanish deposit institutions. Consolidated data (a)



3.b Accounting classification of sovereign exposures. European comparison. Consolidated data



SOURCES: EBA and Banco de España.

a The chart shows the density functions of the percentage of sovereign debt holdings classified at amortised cost as a proportion of total sovereign debt holdings for all Spanish deposit institutions, weighted by each one's total volume of sovereign debt holdings. These density functions are proxied by a kernel estimator, which enables a non-parametric estimation of the density functions and provides a continuous and smoothed graphic representation of such functions. The vertical lines denote the weighted average percentage of the Spanish banking system overall on each of the dates considered.

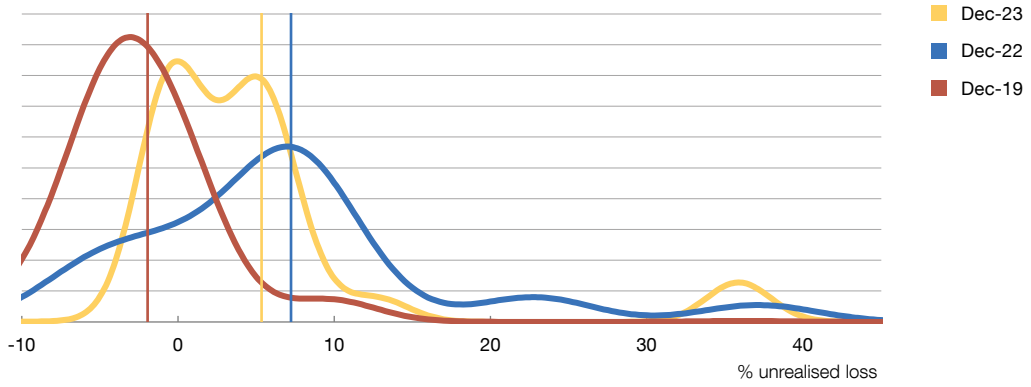
and debt holdings – classified at amortised cost by the major Spanish (and Italian) banks has grown more than in the other main European countries. Accordingly, at December 2023, 67.9% of Spanish banks' sovereign exposures were held at amortised cost, similar to the figure for the major Italian and French banks and somewhat above the average for all European banks considered in the exercise (60.8%).

The growth in the volume of sovereign debt classified at amortised cost, together with the rapid and substantial increase in monetary policy rates in 2022 and 2023, led to a build-up of unrealised losses on banks' balance sheets that they could have been forced to realise had they needed to liquidate some of these assets under hypothetical scenarios of large liquidity outflows.

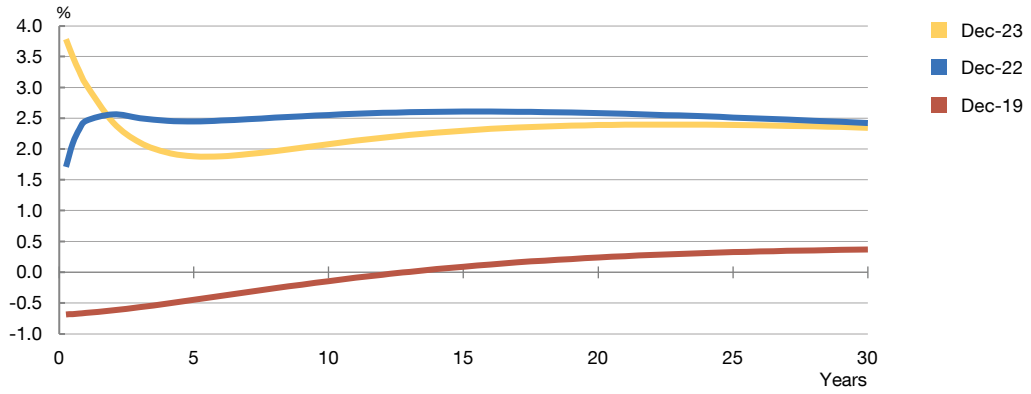
Chart 4

Percentage of unrealised losses on sovereign debt holdings held at amortised cost and risk-free interest rates

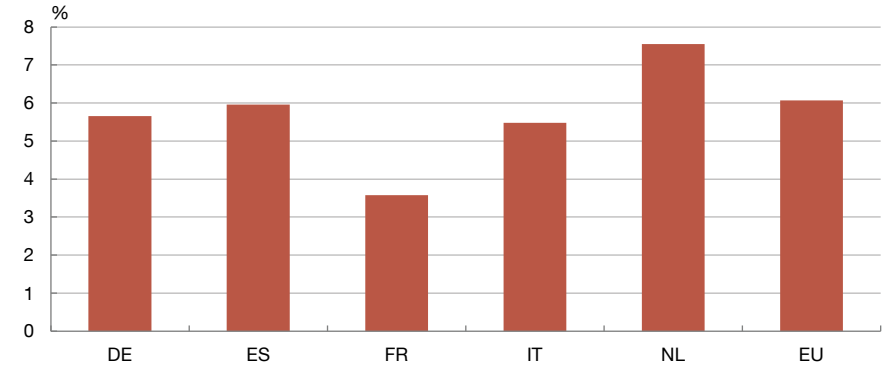
4.a Distribution by banks of percentage of unrealised losses on sovereign debt portfolios held at amortised cost. Spanish deposit institutions. Consolidated data (a) (b)



4.b Yield curve for highest credit quality European government debt



4.c Unrealised losses on bond portfolios held at amortised cost. European comparison. Consolidated data. December 2022



SOURCES: EBA, Banco de España and ECB.

a Negative unrealised loss values are gains on sovereign debt portfolios held at amortised cost.
b The chart shows the density functions of the percentage of unrealised losses on sovereign debt portfolios held at amortised cost for all Spanish deposit institutions, weighted by each one's total volume of sovereign debt classified at amortised cost. These density functions are proxied by a kernel estimator, which enables a non-parametric estimation of the density functions and provides a continuous and smoothed graphic representation of such functions. The vertical lines denote the weighted average percentage of the Spanish banking system overall on each of the dates considered.

Chart 4.a shows how the proportion of unrealised losses on Spanish banks' government debt holdings has evolved in recent years, as a result of monetary tightening.[15] At December 2019 these holdings accumulated unrealised gains of around 2% on average. However, the rapid increase in interest rates reversed this situation and by December 2022 the unrealised losses amounted to 7.2%. At December 2023, the prospect of monetary policy moderation in the near future (Chart 4.b) led to a revaluation of banks' debt holdings, reducing the unrealised losses accumulated in the previous year and even resulting in gains being recorded on some bonds, particularly those purchased in the previous year.[16] Consequently, at end-2023 banks' unrealised losses had fallen, amounting to 5.2% on average, although some banks recorded significantly higher rates.

In July 2023 the EBA published an analysis of unrealised losses on the main European banks' portfolios of debt securities held at amortised cost. Although the analysis covers more than just government debt portfolios, it is still a useful benchmark for analysing such losses in the European setting at December 2022,[17] when losses on Spanish banks' government debt holdings were at their peak. According to this analysis, unrealised losses on bonds held at amortised cost by the main Spanish banks amounted to 6%. This figure is similar to the European average (6.1%), albeit somewhat higher than the average for the main German and Italian banks and significantly lower than for the Dutch banks (7.5%) (Chart 4.c).

The term structure of sovereign bonds held at amortised cost is one of the key factors behind larger unrealised losses. In a rising interest rate environment, the more distant in time the bond repayments, the greater the negative adjustment of their net present value. Given that the highest payment occurs upon maturity, with the repayment of principal, residual maturity is a reasonable proxy for the level of sensitivity to variations in interest rates.

Chart 5 confirms this relationship between unrealised loss and average maturity. The left-hand panel shows, for the main Spanish banks, the unrealised losses at December 2022 on general government bonds held at amortised cost and the average residual maturity of the sovereign exposures.[18] According to this analysis, on average, each additional year of residual maturity of the portfolio is associated with increases of 2.4 pp in the cumulative loss. This relationship reflects the bivariate correlation between the two variables, and not necessarily a causal component, as other factors may also influence either variable.

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15 The unrealised loss on an exposure classified at amortised cost can be calculated as the difference between its carrying amount and its fair market value. For Spanish banks, the Banco de España can obtain this information, at various levels of disaggregation, from regulatory reporting and also from specialised databases such as the ECB's Securities Holdings Statistics (SHS) database.

16 The prices of bonds acquired when interest rates are rising already reflect upside expectations. In consequence, these bonds generate limited unrealised losses and may even produce gains if expectations are corrected downwards. Depending on the scale of this process, and the pace of maturity of older bonds, unrealised losses on portfolio may decrease overall even if interest rates remain high.

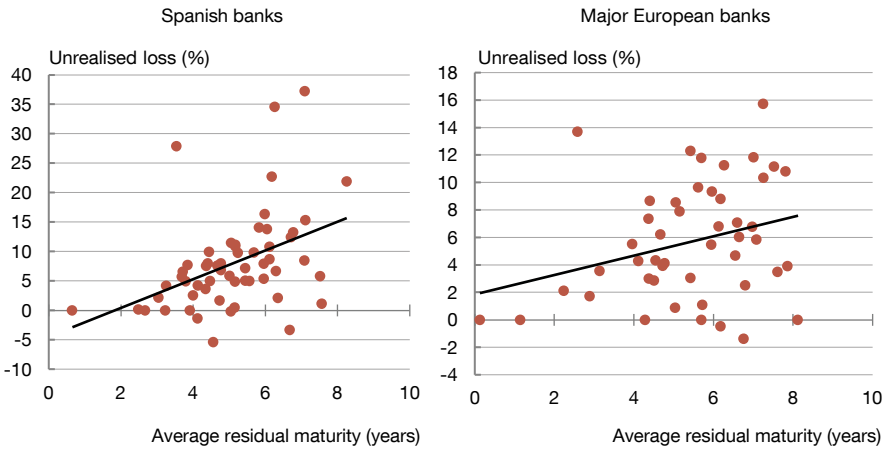
17 This analysis is conducted on an annual basis, using data at December of each year.

18 The average maturity of the portfolio has been calculated considering the mid-point of each reported maturity bracket.

Chart 5

Relationship between the percentage of unrealised losses and average residual maturity

5.a Unrealised loss on debt held at amortised cost and residual maturity. Consolidated data. December 2022 (a) (b)



SOURCES: EBA and Banco de España.

a Negative unrealised loss values are gains on portfolios held at amortised cost.
b Left-hand panel: the analysis for Spanish banks considers the percentage of losses (or gains) on each banks' sovereign debt holdings classified at amortised cost, while average residual maturity corresponds to all sovereign exposures (loans and debt). Right-hand panel: the analysis for major European banks, which also include Spain's significant institutions, considers the percentage of losses (or gains) on all the debt holdings classified at amortised cost of each one, while average residual maturity corresponds to all sovereign exposures (loans and debt).

The right-hand panel of Chart 5 contains a similar analysis for all major European banks, in this case considering the unrealised losses at December 2022 on the bonds held at amortised cost and the average maturity of sovereign exposures.[19] According to this analysis, each additional year of residual maturity in banks' sovereign debt exposures is empirically related, on average, to an increase of 0.7 pp in the unrealised losses on their total debt securities holdings held at amortised cost.

2.3 The relationship between unrealised losses and banks' other financial characteristics

The build-up of unrealised losses on banks' balance sheets is due to a series of factors that are both exogenous and derived from their business decisions. As analysed in the previous subsection, the exogenous factors include changes in market expectations as to the future course of interest rates. In turn, time dynamics[20] and the rebalancing of debt securities portfolios – with investments reaching maturity without their unrealised losses materialising, while banks purchase fresh bonds with yields already aligned with new interest rate expectations – also explain the developments in unrealised losses.

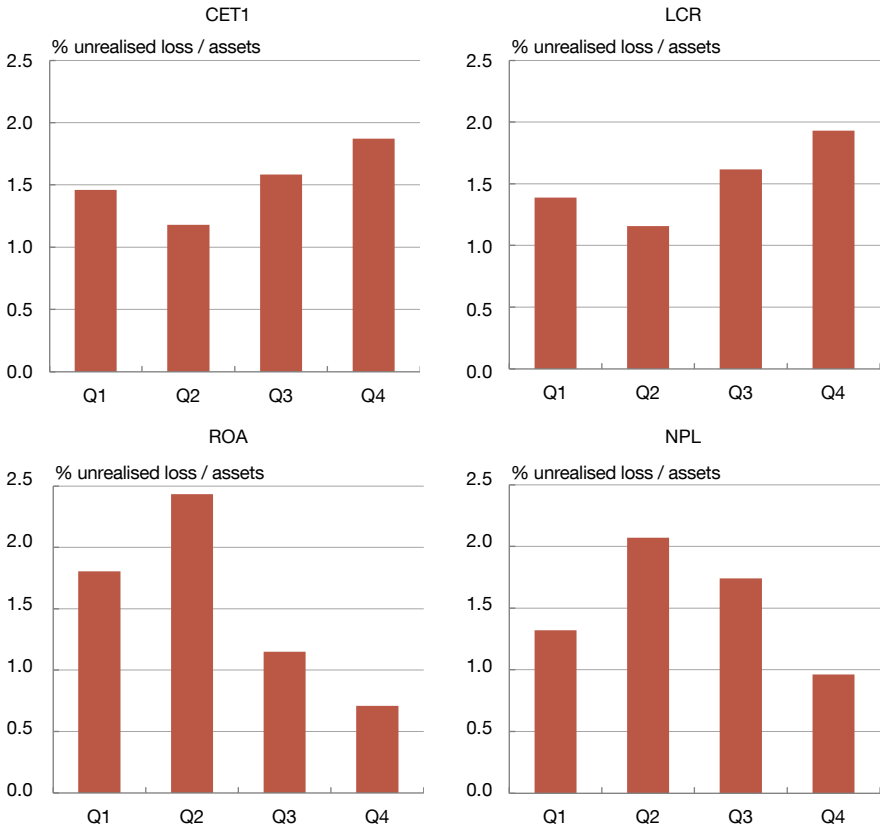
19 The percentage of unrealised loss for the entire amortised cost bond portfolio is obtained from the EBA exercise (EBA, 2023). Average residual maturity refers to the sovereign exposures held at amortised cost and thus includes loans to general government, taken from the EBA's 2023 EU wide transparency exercise. Average portfolio maturity has been calculated considering the mid-point of each reported maturity bracket.

20 All other things being equal, as time passes the flows already amortised increase and the discount period for the remaining flows narrows, resulting in fewer unrealised losses. In addition, bonds' fair values become less sensitive to fresh increases in interest rates, which also reduces the potential for generating further unrealised losses.

Chart 6

Heterogeneity in unrealised losses by bank characteristics

6.a Percentage of unrealised losses on the sovereign debt portfolio held at amortised cost by quartile by bank characteristics. Consolidated data. December 2022 (a)



SOURCE: Banco de España.

a In each panel, banks are grouped by quartile according to their CET1, LCR, ROA and NPL ratios, respectively. The chart depicts the simple average of the unrealised losses on the sovereign debt portfolio held at amortised cost of the group of banks in each quartile.

The volume of banks' unrealised losses may also depend on their individual business models. For banks that choose to allocate a larger share of their funds to investments in the form of debt holdings classified at amortised cost, and the longer the duration of those holdings, the more likely it is that the banks will build up unrealised losses. By contrast, they will be less exposed to changes in the market value of their balance sheets in the face of price variations on the financial markets.

The design of banks' debt portfolios may depend on multiple factors, some of which are easily observable – such as their size or their solvency, profitability, NPL or liquidity levels – while others are more difficult to quantify or are not directly observable. The panels in Chart 6 examine the extent to which certain financial characteristics of banks appear to be related to the heterogeneity in the build-up of unrealised losses (relative to their total assets) observed among banks at December 2022 when (as discussed above) such unrealised losses peaked.

The top left-hand panel of Chart 6 shows the percentage of unrealised losses on assets for different sets of banks, grouped by solvency level quartiles (measured by the CET1 ratio). Save in the first quartile, the chart depicts a growing relationship between solvency level and unrealised losses as a proportion of assets. This pattern mitigates to some extent concerns about the impact of unrealised losses on solvency, as unrealised losses are higher at banks with higher CET1 ratios. It should be noted that the first quartile mainly comprises the significant institutions. These are the larger banks with more sophisticated and diversified business models and which can thus afford to have tighter solvency ratios.

Similarly, the top right-hand panel of Chart 6 depicts the relationship between unrealised losses as a proportion of assets and banks' liquidity levels, measured by the liquidity coverage ratio (LCR). Again excluding the first quartile comprising the significant institutions, which operate with tighter levels of liquidity, a positive relationship is observed between unrealised losses and available liquidity. Government debt holdings classified at amortised cost, which are in turn LCR-eligible high-quality liquid assets (HQLAs) (for these purposes classified at market value), help define this pattern.[21]

The bottom panels of Chart 6 present equivalent analyses considering profitability levels (measured by return on assets (ROA)) and non-performing credit rates at the consolidated level (captured by the non-performing loan (NPL) ratio). When related to a higher share of government debt holdings as a proportion of assets, a higher level of unrealised losses in the bottom quartiles of the ROA distribution may signal the cost in terms of profitability of holding such assets rather than other more profitable investments (corporate debt, loans, etc.). In the case of non-performing credit rates, no stylised patterns are identified.

2.4 The importance of government debt holdings as a source of liquidity for banks

As discussed above, government debt holdings are a highly liquid asset for banks. Prudential regulations support this view, classing unencumbered sovereign debt holdings[22] as HQLAs for the purposes of calculating their LCR.[23]

In Chart 7.a we analyse how the share of general government assets in the composition of the LCR has evolved. In the pre-pandemic period, unencumbered general government assets eligible as liquid assets accounted for around 55% of the total, covering some 90%-95% of the outflows envisaged in the scenario considered for the purposes of

21 Although debt instruments classified at amortised cost are computed for the purposes of the LCR at market value, in the sample analysed banks with a larger volume of these assets on their balance sheets tend to present higher LCRs even after discounting any unrealised losses on these assets.

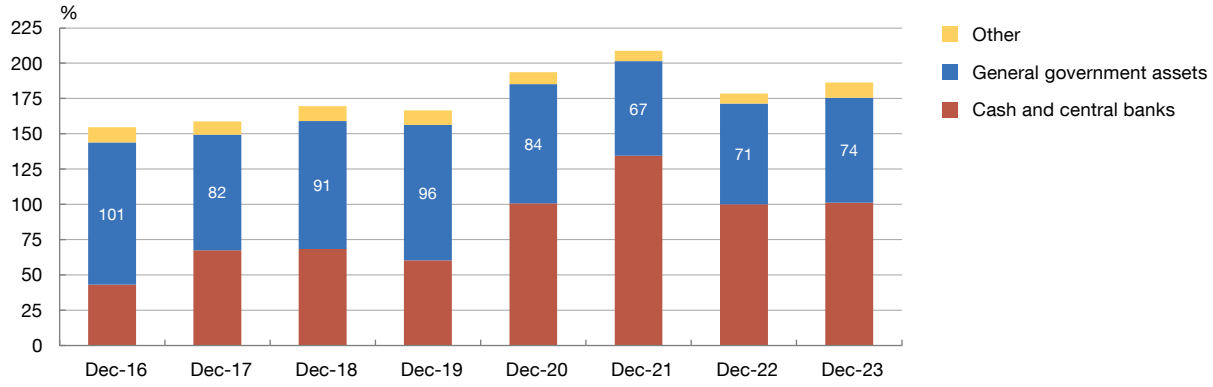
22 In opposite terms to the definition of encumbered assets given in Annex XVII of Commission Implementing Regulation (EU) No 680/2014, an unencumbered asset is one that has not been pledged or is not subject to any form of arrangement to secure, collateralise or credit enhance any transaction.

23 In particular, Regulation (EU) No 575/2013 of the European Parliament and of the Council, with regard to the liquidity coverage requirement for credit institutions, establishes that unencumbered assets representing claims on or guaranteed by the central government of a Member State or of a third country, to reflect their real value, must be computed at market value at the time of calculation of the LCR. For more information on liquidity requirements, see for example Wildman, Scheubel, Fascione and Leitner (2023).

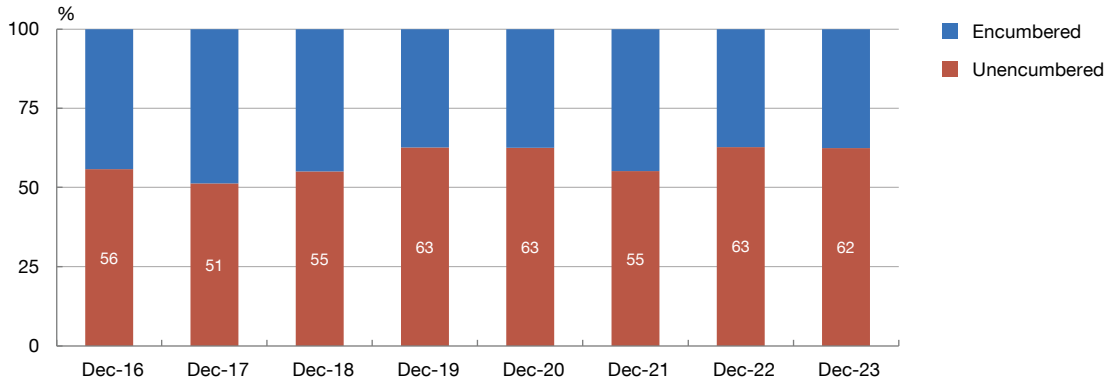
Chart 7

Importance of general government assets in the provision of liquidity and level of encumbrance

7.a LCR composition by type of liquid asset. Spanish deposit institutions. Consolidated data



7.b Encumbrance of sovereign holdings. Spanish deposit institutions. Consolidated data



SOURCE: Banco de España.

calculating the LCR. In the following years these percentages fell markedly, despite the growth in the LCR. Banks' increased recourse to Eurosystem funding led them to use part of their debt holdings as collateral to obtain these funds, meaning that the share of available debt holdings to cover outflows decreased, standing at 67% at December 2021, while the level of reserves held at central banks increased. Chart 7.b depicts the level of encumbrance of general government debt securities held by Spanish banks overall and shows that, at December 2021, unencumbered assets accounted for 55% of the total, a drop of 8 pp compared with a year earlier.[24]

In December 2023, once the Eurosystem had started to withdraw liquidity, the level of encumbrance of sovereign debt securities observed in the post-pandemic years began to decrease, thereby driving up the share of general government assets in the coverage

24 For a more detailed analysis of Spanish deposit institutions' encumbered asset holdings, see Cáceres and San Vicente (2024).

of banks' liquidity ratios, which stood at 74% of LCR-eligible outflows (Chart 7.a). The proportion of LCR coverage provided by general government assets is expected to increase again in the coming quarters, as monetary policy loans continue to mature and collateral becomes available.

3 Comparison of monetisation mechanisms through simulations

3.1 Rationale

This section presents several simulation exercises that study the potential impact of unexpected outflows of funds on banks' profitability and solvency. Two different liquidity-raising mechanisms are considered: (i) one where banks have instant access to the Eurosystem's liquidity facilities; and (ii) another in which banks resort to selling assets, particularly government bond holdings.

Although these mechanisms are not mutually exclusive and could be applied in combination, this exercise considers them separately in order to better compare them. In addition, banks could also choose to obtain liquidity through market repos and/or secured or unsecured interbank lending. These options are not considered in the simulation exercise because, in practice, these markets may experience significant turbulence or even lose much of their effectiveness in periods of high liquidity stress, especially for distressed banks, as evidenced during the 2008 financial crisis and, more recently, albeit to a lesser extent, during the March 2023 crisis in the United States.[25]

The design of the simulation exercises presented below also allows for additional stress analyses by considering, in combination with the unexpected outflow of funds, various interest rate hike scenarios and their consequent impact on the market value of the bonds.

3.2 Mechanisms for obtaining liquidity in stressed periods

Figure 1 summarises the main features of the two above-mentioned liquidity-raising mechanisms: (i) recourse to Eurosystem funding through asset pledging; and (ii) asset sales on the secondary market. The functioning of both mechanisms is explained in more depth below.

Asset pledging to obtain liquidity from the Eurosystem

Under this mechanism, banks need to be able to immediately access the Eurosystem's credit facilities via the Banco de España. For this, they need to have assets that are eligible as collateral in lending operations.[26] These refinancing operations are part of the central bank's regular operations and are implemented via the marginal lending facility, which is permanently open for overnight refinancing. These loans can subsequently be replaced or complemented by main refinancing operations (MROs), with a maturity of one week, as well as by longer-term operations (LTROs), with a maturity of three months.[27,28] Moreover,

25 For a more detailed discussion on the vulnerability of repo markets, see Section 2 of BCBS (2024). Moreover, it should be noted that repo agreements somewhat resemble the pledge mechanism, as they also entail discounts on the market value of the bonds in question due to counterparty risk. Thus, even if the repo market remained operational under a severe liquidity stress scenario, the counterparty risk discounts applied in this market would probably be higher than the haircuts applied by the central bank. This means that, in practice, the pledge mechanism would prevail over this option.

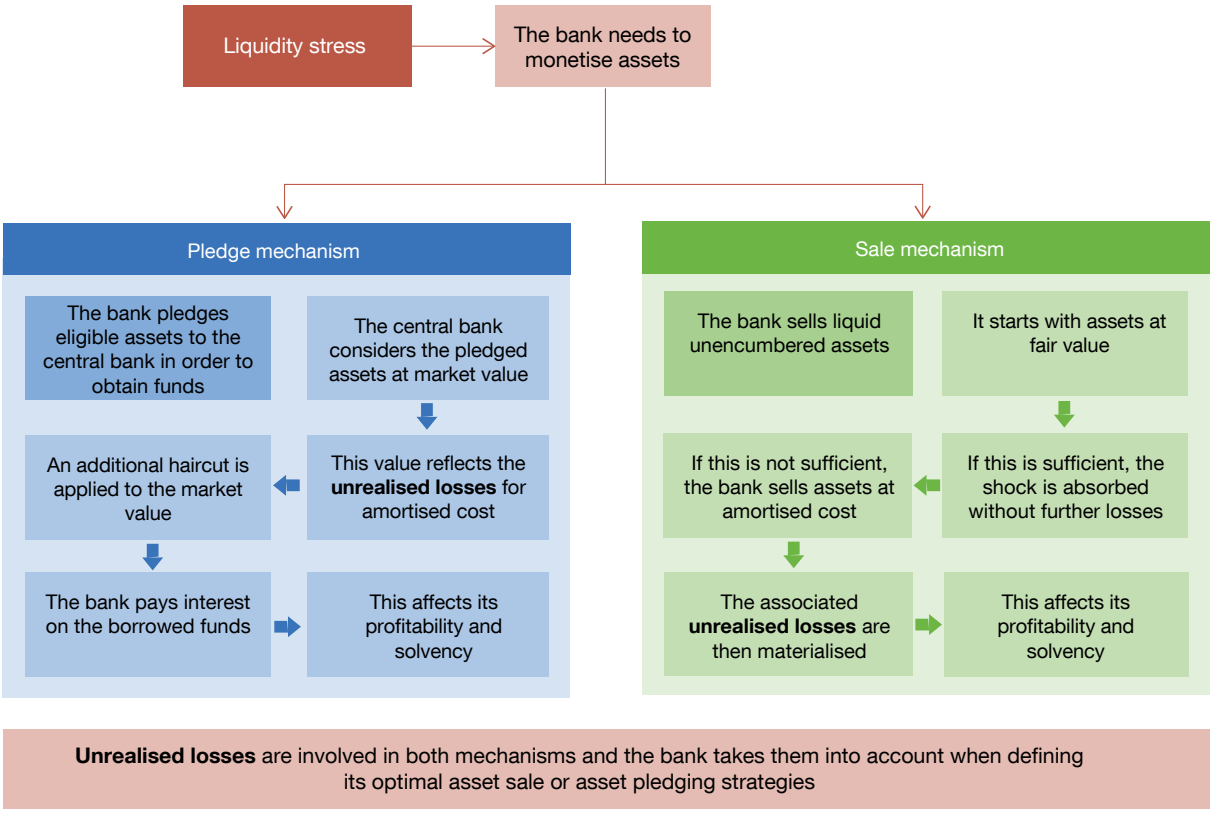
26 For further details on the ECB's collateral framework, see Bindseil, Corsi, Sahel and Visser (2017).

27 For more details, see the ECB's description of its monetary policy instruments.

28 Targeted longer-term operations (TLTROs) are similar but have a conditionality clause that requires the funding received to be used to lend to households and firms.

Figure 1

Mechanisms for obtaining liquidity under stress scenarios



SOURCE: Devised by authors.

outside the Eurosystem's monetary policy framework, the emergency liquidity assistance (ELA) programme is an additional exceptional and discretionary mechanism for the provision of liquidity by each Eurosystem central bank in extreme situations, for instance in the event of a bank running out of eligible collateral.[29]

As indicated above, obtaining liquidity from the Eurosystem under its regular operations requires that various types of unencumbered assets held by banks (including sovereign bonds) be pledged as collateral. These bonds are considered at market value[30] and haircuts are applied to them depending on the asset type, the payer's solvency and the residual maturity. This mechanism is not automatic, as it requires banks to identify various attributes of the assets pledged to the central bank, incorporate them into the communication systems used for this purpose and, most importantly, determine their value. However, these are procedures that banks, together with the Banco de España, can carry out in advance

29 According to ELA procedures, responsibility for the provision of ELA lies with the national central bank(s) concerned. This means that any costs of, and the risks arising from, the provision of ELA are incurred by the relevant central bank(s).

30 For a detailed analysis of the impact of interest rates on the availability of collateral for Spanish banks, see Macías and de la Peña (2024).

and keep up to date so that liquidity can be raised immediately.[31] Since the pledging of bonds as collateral does not entail their sale or any change in their accounting classification (in particular, those classified at amortised cost will remain so throughout the process), the pledge does not entail the materialisation of potential unrealised losses.

The cost of raising liquidity through this mechanism is the interest banks pay on the borrowing obtained,[32] which will increase the longer the duration of the liquidity stress episode and the higher the interest rate set by the central bank for this type of funding, which will also reflect the general monetary policy stance at the time.

In order to minimise the impact of asset pledging, banks can be expected to pursue a strategy in which they first use the assets that will least affect their balance sheet.[33] Thus, the simulation exercises considered assume that, in order to address an unexpected outflow of funds, banks will use the assets on their balance sheets in the following order.

(i) First they will use cash and excess reserves held with central banks.

(ii) They will then turn to Eurosystem refinancing operations, using as collateral those assets that can provide them with the highest volume of funds relative to their carrying amount. In practice, sovereign debt is the optimal choice. Banks will first pledge debt securities with the lowest discount on their carrying amount. As mentioned above, in the case of debt recorded at amortised cost, this option does not entail the materialisation of any unrealised losses (or gains), but rather allows funding to be obtained based on its market value, as with debt classified at fair value. Therefore, under this option, amortised cost and fair value portfolios are equally useful and will be ranked equally in order of preference.

(iii) Lastly, if necessary, they will resort to pledging other assets on their balance sheets, such as corporate bonds and loan portfolios to which the central bank applies higher haircuts and whose value as collateral takes longer to determine.[34]

Obtaining liquidity through the sale of public debt and other assets

A second alternative for banks to obtain liquidity is to sell part of the assets on their balance sheets. A priori, this alternative may seem less attractive, especially when banks have built up significant unrealised losses on their debt holdings at amortised cost, or when they need

31 In this respect, a lack of operational preparedness may be a crucial factor in limiting banks' ability to use lending facilities. This issue became evident with the failure of various US banks in March 2023. For a more detailed discussion, see, for example, BCBS (2023).

32 The interest rates applied by the ECB on monetary policy loans are the marginal lending rate and the MRO rate, depending on the loan maturity.

33 Pledging to the central bank does not automatically lead to a loss but involves an interest payment. All other things being equal, this payment will increase the bank's financial costs, thereby reducing its profitability. This will in turn implicitly affect its solvency due to the lower organic capacity to generate capital.

34 In this regard, there are a number of European and international initiatives under way to improve operational readiness for the use of these assets as collateral in refinancing operations with the central bank.

to conduct fire sales of large amounts of debt in a very short period of time or in the event of systemic liquidity stress, when banks may incur additional losses due to insufficient market liquidity.[35,36] However, banks could choose to use this mechanism for various reasons: (i) because there are outflows of funds that are expected to be unrecoverable in the short term, making the reduction of equivalent assets the best alternative for the bank; (ii) because they wish to avoid the possible stigma[37] of resorting to central bank funding and prefer not to reveal their liquidity problems, opting instead to sell assets on organised markets; and (iii) because they are unable to quickly access large amounts of Eurosystem funding due to the unavailability of assets, as they may have failed to pledge them to the central bank beforehand, and, therefore, they are not operationally prepared.[38]

To minimise the impact of the sale of assets on their financial position,[39] banks can be expected to dispose first of those assets whose sale has less of an impact. It is reasonable to assume that they will begin by selling assets that have deep and liquid markets and whose sale does not result in the recognition of further losses in value. Thus, the simulation exercises consider that, in order to cope with an unexpected outflow of funds, banks will use the assets on their balance sheet in the following order.

(i) First they will use cash and excess reserves held with central banks.

(ii) They will then resort to the sale of sovereign bonds classified at fair value, whose impairment was already recorded by the bank at the time it occurred.[40]

(iii) They will subsequently sell government bonds holdings recorded at amortised cost, which may incur unrealised losses that will have to be recognised at the time of sale, directly impacting banks' profitability and solvency.[41]

(iv) Lastly, if necessary, they will resort to the sale of other assets on their balance sheets, such as corporate bonds and loan portfolios. Owing to their lower liquidity, these operations may take longer and entail greater discounts.

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35 By contrast, the pledge mechanism inherently provides a stabilising element in liquidity stress scenarios by avoiding the sale of the assets on the market and thus the risk of a further fall in asset prices as a result of fire sales.

36 In this paper, the quantification of costs under the sale mechanism does not take into account any additional losses due to fire sales at times of market illiquidity. In other words, no additional reductions in the market value of the assets sold are considered as a result of the fire sale.

37 See Armantier and Holt (2024) for a discussion on the stigma associated with the liquidity facility of the US Federal Reserve System.

38 In this respect, for example, the BCBS report on the March 2023 turbulence highlights that in 2022 Silicon Valley Bank had not tested its ability to obtain funding from the Federal Reserve and had no collateral or operational procedures in place to obtain such liquidity.

39 Unlike the pledge mechanism, the sale mechanism entails sustaining a loss due to the materialisation of the accumulated impairment. This loss is reflected in the income statement and reduces the bank's profitability, which, as in the case of the pledge mechanism, will ultimately affect its solvency.

40 In this case, unlike with the asset pledge mechanism, it is considered that banks would first resort to the sale of sovereign debt holdings recorded at fair value. This is due to regulatory restrictions on the sale of assets recorded at amortised cost. In addition, potential unrealised losses on investments held at amortised cost are also a disincentive to the early disposal of these assets.

41 It should also be noted that selling assets at amortised cost requires that they be reclassified, the need for which must be justified by the bank to obtain the supervisor's authorisation.

3.3 Simulation of the impact on solvency under liquidity stress scenarios

The simulation model developed seeks to draw a comparison between the two above-mentioned mechanisms – asset pledging to the Eurosystem and asset sales – that could be used by a financial institution facing an unexpected outflow of funds that requires additional liquidity, assuming they are mutually exclusive. In general, the model follows optimality criteria (as described in the previous subsection) to establish the order in which unencumbered sovereign bonds in the bank's portfolio are pledged or sold.

The exercises were conducted based on a sample comprising the ten Spanish significant deposit institutions.[42]

First, the volume of net outflows under stress conditions is determined, separately for each bank, starting from their liquidity position in December 2023, taking into account the composition of their funding sources and considering different outflow rates for each. These percentages are calibrated based on past stress liquidity episodes that affected certain Spanish banking sector institutions.[43] On aggregate, this simulation assumes a volume of net outflows of €506 billion, 31% higher than that already considered in LCR requirements. To cover these outflows, this stylised exercise assumes that banks will first draw on the cash and excess reserves deposited with central banks,[44] which would enable them to raise up to €362 billion (Table 1).

To cover the rest of their liquidity needs (€144 billion), two orders of preference are established for unencumbered sovereign bonds held by banks (as listed in the ECB's SHS database), on the basis of either the unrealised losses at December 2023[45] or the haircuts

Table 1
Liquidity outflows under a stress scenario. Significant institutions. December 2023

Metric	Value
LCR ex ante	178%
Net liquidity outflows under the stress scenario (€m)	506,340
Net outflow multiplier	1.31
Cash and reserves with central banks (€m)	362,036
Additional liquidity needed (€m)	144,304

SOURCE: Authors' calculations.

42 Banco Santander, BBVA, CaixaBank, Banco Sabadell, Bankinter, Unicaja Banco, Abanca, Kutxabank, Banco de Crédito Cooperativo and Ibercaja Banco.

43 In particular, the stress episodes considered to determine the outflow rates for the different sources of funding are the resolution of Banco Popular in June 2017 and the political crisis in Catalonia in October 2017. For this purpose, the outflow percentage applied to each source of funding is the highest between that applied in the LCR calculation itself and the actual outflow rates based on the monthly LCR reporting during those episodes.

44 It is considered that they will use up to 95% of these assets for these purposes, always keeping at least 5% on their balance sheets.

45 Based on information from the Centralised Securities Database (CSDB).

Table 2

Solvency impact of obtaining liquidity under the two asset monetisation mechanisms. Significant institutions. December 2023

Metric	Pledge mechanism			Sale mechanism
	3 months	6 months	12 months	
Impact (€m)	-1,533.0	-3,066.0	-6,133.0	101
Impact (% of RWAs)	-0.1	-0.2	-0.4	0.0
Mobilisation of government debt holdings (carrying amount, €m) (a)	146,913	146,913	146,913	144,202
At fair value	44,093	44,093	44,093	78,576
At amortised cost	102,820	102,820	102,820	65,626
Other assets (carrying amount, €m)	0	0	0	0

SOURCE: Authors' calculations.

a The "mobilisation" of debt holdings referred to in this row should be understood as pledge or sale, depending on the mechanism.

applicable by the Eurosystem.[46] In both cases, it is considered that up to 95% of the unencumbered market value of each bond can be monetised.[47]

When obtaining liquidity by pledging assets to the central bank, the cost is determined by the unit cost of said funding (considered to be the MRO interest rate, which was 4.25% at the time of the simulations)[48] and the duration of the liquidity crisis. For the latter, three different scenarios are considered, with durations of three, six and 12 months, which would reflect the persistence of the stress scenario.

When resorting to the sale of debt securities, the cost for banks would be equal to the unrealised losses (or gains) that would materialise at the time of the sale.

Table 2 summarises the aggregate impact of these mechanisms on the 10 significant institutions. As can be seen, the cost of Eurosystem funding to cover the remaining liquidity needs amounts to €1,533 million per quarter, equivalent to 10 basis points (bp) of the banks' solvency ratio.[49] Over the course of one year, the funding cost would exceed €6 billion, equivalent to 42 bp of the banks' average CET1 ratio. Under the asset sale mechanism, and

46 For more information on the applicable methodology and the haircuts established, see Guideline (EU) 2016/65 of the European Central Bank of 18 November 2015, on the valuation haircuts applied in the implementation of the Eurosystem monetary policy framework (ECB/2015/35) and Guideline (EU) 2022/988 of the European Central Bank of 2 May 2022 amending Guideline (EU) 2016/65 on the valuation haircuts applied in the implementation of the Eurosystem monetary policy framework (ECB/2015/35) (ECB/2022/18).

47 This "unavailable" 5%, similar to that considered for cash and excess reserves, seeks to capture the technical need to retain at least a small fraction of these exposures. The results are not qualitatively altered if this limit is ignored and full monetisation is allowed.

48 The MRO interest rate stood at 4.25% in the period when the simulation exercises presented were conducted and very close to that value (4.5%) in December 2023. In the simulation exercise, it was decided to consider the prevailing rate at the time of the analysis (4.25%) in combination with the holdings portfolio at the nearest available December (2023).

49 Solvency ratios, such as the CET1 ratio, are defined in terms of a bank's risk-weighted assets (RWAs). Consequently, by presenting the results as a fraction of RWAs, the impact can be interpreted in terms of a hypothetical decrease in the bank's solvency.

in the absence of market tensions that make it necessary to sell the assets at a discount, the banks would obtain gains of €101 million.[50] This would be attributable to their significant holdings of debt at amortised cost whose market value at December 2023 exceeded their carrying amount,[51] and these debt holdings would be the first to be sold and generate this gain.

The government bond holdings that would be sold would have a carrying amount of €144.2 billion, slightly less than the remaining liquidity needs calculated (€144.3 billion) owing to the €101 million in gains mentioned above, which would increase the amount obtained upon sale. With the pledge mechanism, the carrying amount of the assets mobilised would be higher (€146.9 billion) as the valuation haircut for credit risk[52] would in practice imply mobilising a higher volume of assets. In this case, debt holdings at amortised cost would be used to a greater extent (€102.8 billion, compared with €44.1 billion classified at fair value). Although a priori there is no single reason why a smaller haircut should be applied to bonds at amortised cost than to bonds at fair value, the results show that, under the optimality criterion established, banks prefer to use the former. This is largely due to the existence of gains on some bonds at amortised cost, which makes them particularly effective in obtaining central bank funding.

One noteworthy aspect of these findings is that having bonds classified at amortised cost with gains (or small losses) provides an added buffer to neutralise, or at least mitigate, the solvency impact of liquidity outflows. Even when there are unrealised losses on the portfolio of debt securities held at amortised cost in aggregate terms (as shown in subsection 2.2), if the liquidity needs to be covered with asset sales do not exceed the part of this portfolio that generates gains, the solvency impact of the liquidity stress episode could be neutralised.

3.4 Additional sensitivity analysis

We consider a broader simulation exercise which envisages, along with the outflow of funds described in the previous subsection, a hypothetical scenario of a parallel increase of the yield curve, which would reduce the market value of the debt instruments held by the banks.[53] We envisage three possible increases (of 2 pp, 3 pp and 4 pp) from the baseline level and, as in the previous case, compare the pledge and sale mechanisms.

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50 Although at December 2023 the main banks had unrealised gains on some bonds in their sovereign debt portfolio at amortised cost, it is considered that in a stress scenario their first option would still be to sell their debt holdings classified at fair value, as the premature sale of assets held at amortised cost requires an accounting reclassification following supervisory authorisation.

51 Despite interest rates being at high levels in December 2023, market expectations of a gradual normalisation of the monetary policy stance, along with the new debt securities purchased by banks in previous quarters (with a higher return), gave rise to gains in part of their government debt portfolio at amortised cost.

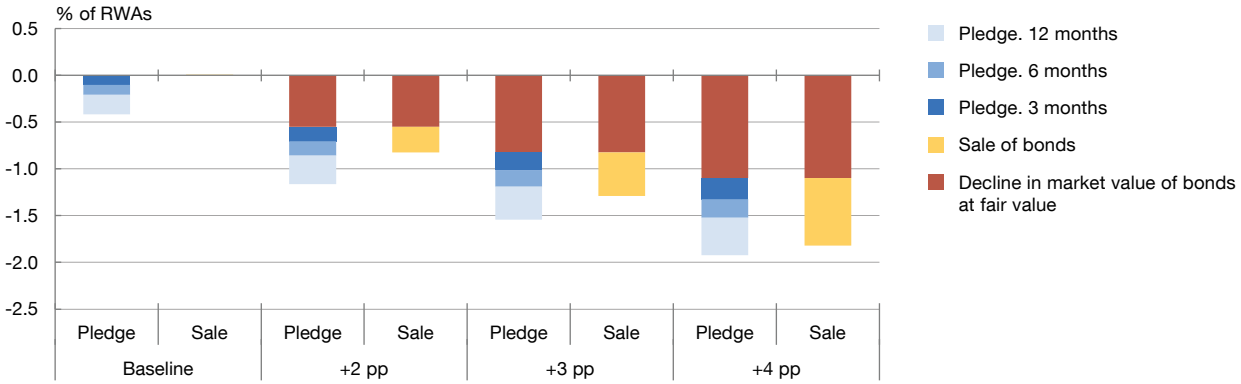
52 The average haircut applied by the Eurosystem for credit risk is 2% on bonds at fair value and 1.8% on those held at amortised cost. In the case of bonds held at amortised cost, the gains generated in part of this portfolio would reduce the final haircut to 1.7%.

53 The CSDB information (footnote 45) allows the decline in market value to be estimated for each bond held by the main Spanish banks in the event of interest rate hikes. To avoid the complexities of a full revaluation of the bonds in the different stress scenarios, the decline in value is proxied as the product of the bond term and the interest rate hike considered.

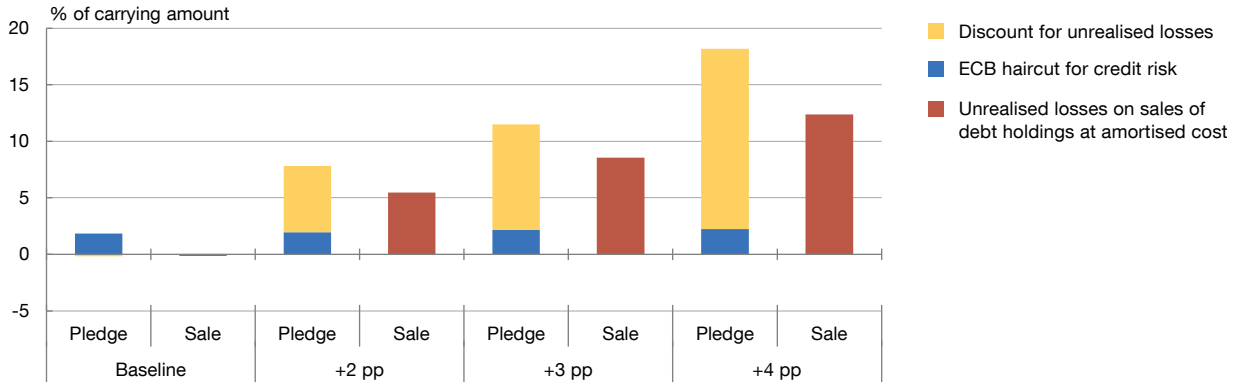
Chart 8

Impact on bank solvency of liquidity outflows under the asset pledge and sale mechanisms in scenarios of liquidity stress and interest rate hikes

8.a Solvency impact of the pledge and sale mechanisms for government bonds under liquidity stress and interest rate hike scenarios. Significant institutions. Consolidated data



8.b Percentage of central bank discount and unrealised losses materialised under the pledge and sale mechanisms. Significant institutions. Consolidated data



SOURCE: Authors' calculations.

It should be noted that, unlike the simulation exercise set out in the previous subsection, the introduction here of an interest rate hike has the effect of devaluing both the bonds held at amortised cost (thus increasing unrealised losses) and those classified at fair value. In the case of bonds held at fair value, the banks would have to record this loss either directly under equity or through profit or loss, depending on their accounting classification. The exercise also captures the impact of these additional losses, which are not connected to the liquidity stress scenario, but which nevertheless affect the banks' solvency.

Chart 8.a shows the solvency impact of the scenarios considered. The results for the baseline scenario are the same as those presented in Table 2. Under the three new monetary tightening scenarios, if interest rates were to increase by 200 bp, 300 bp and 400 bp, the losses associated with sovereign bonds held at fair value (the brown bars) would amount to approximately €8 billion, €12 billion and €16 billion, reducing solvency ratios by 0.5 pp, 0.8 pp and 1.1 pp.

Subsequent to these losses (attributable to the interest rate hikes), the scenario of liquidity outflows and the consequent need for asset monetisation would further push down the banks' solvency. The extent of this decline would depend on how the assets are monetised.

In aggregate terms for the significant institutions as a whole, if interest rates were to rise by 2 pp, pledging assets to the central bank would be the most efficient option in a stress scenario lasting up to three months, entailing an aggregate solvency impact of 0.7 pp. For longer stress scenarios, asset sales would be the preferred option, with an impact of 0.8 pp in RWA terms. When larger interest rate hikes are considered, and in scenarios lasting up to six months, pledging the assets would be less detrimental (impacts of 1.2 pp and 1.5 pp on solvency ratios in the event of 3 pp and 4 pp hikes in official rates) than selling them (impacts of 1.2 pp and 1.7 pp on solvency ratios, respectively).

A more in-depth analysis is provided in Chart 8.b, which shows, for debt holdings at amortised cost mobilised under the different policy rate hike scenarios, the average discount applied (under the pledge mechanism) and the unrealised losses materialised (under the sale mechanism), relative in both cases to the corresponding carrying amount. Note that, unlike the unrealised losses materialised under the sale mechanism, the discounts applied by the central bank have no direct impact on the banks' profit and loss or solvency, as they only reduce the value of the collateral received (requiring the mobilisation of a greater volume of assets to obtain the funding needed).

The average discount applied to these assets is the sum of their unrealised loss and the haircut applied by the central bank for credit risk. Consequently, the discount is higher under scenarios of policy rate hikes due to: (i) the decline in the assets' market value (larger unrealised loss) and (ii) albeit very slightly, the need to mobilise additional debt holdings (with, therefore, a higher haircut for credit risk) given their loss in value as collateral and, as a result, their reduced capacity to provide the bank with liquidity. Thus, the average discount of 1.7% in the baseline scenario would increase to 18.2% under a scenario of a 4 pp hike in interest rates.

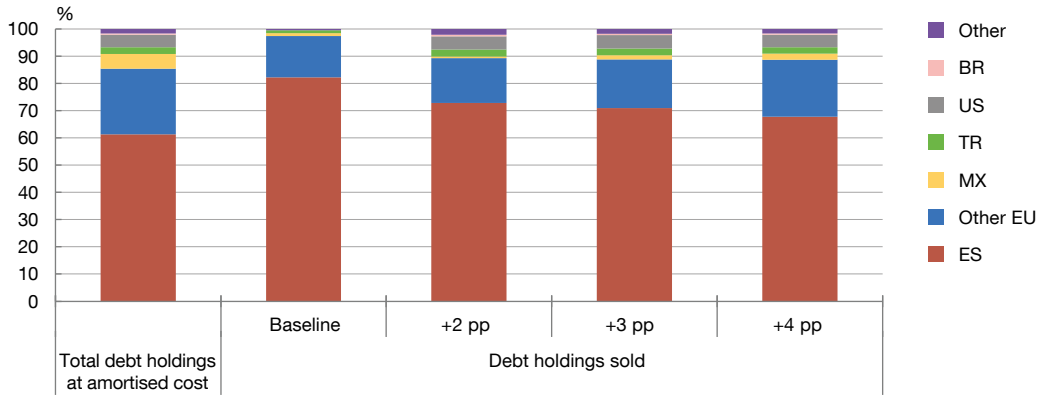
If the sovereign debt holdings are sold, the average gain would stand at 0.2% under the baseline scenario, but under the scenarios of an interest rate hike of between 2 pp and 4 pp the unrealised loss materialised would be between 5.5% and 12.4%. The unrealised losses materialised under the sale mechanism (in brown) are somewhat smaller than those under the pledge mechanism (in yellow) as the two mechanisms follow different optimisation criteria. Under the sale mechanism it is the amount of unrealised losses that is minimised, whereas under the pledge mechanism the element to be minimised is the total discount, comprising both the discount for unrealised losses and the haircut applied for credit risk. In other words, it may be preferable to pledge a bond with a larger unrealised loss than another if, in terms of the total discount, the former is less penalising.

Turning to the geographical dimension, Chart 9.a shows that, under the baseline scenario, with the effective interest rate level of December 2023, Spanish government bonds

Chart 9

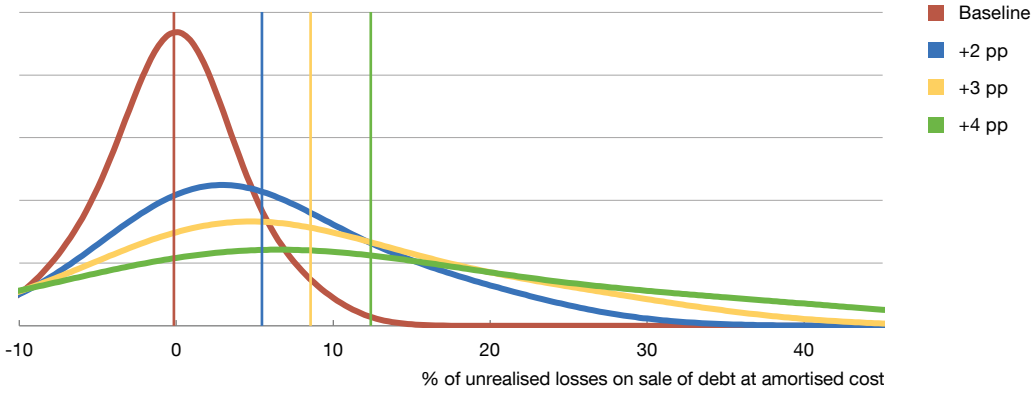
Impact on geographical distribution, maturity distribution and distribution of percentage of unrealised losses materialised under the sale mechanism in different interest rate hike scenarios

9.a Geographical distribution of sales of government bond holdings classified at amortised cost. Significant institutions. Consolidated data



9.b Distribution by maturity of sales of government bond holdings classified at amortised cost. Significant institutions. Consolidated data

9.c Distribution of the percentage of unrealised losses on sales of government debt holdings classified at amortised cost. Significant institutions. Consolidated data (a)



SOURCE: Authors' calculations.

a Negative values for unrealised losses reflect gains accumulated in overall sales of sovereign debt holdings at amortised cost.

would account for 82% of sales, more than 20 pp higher than their share in the banks' government debt holdings at amortised cost as a whole. Although the weight of Spanish debt securities in sales gradually decreases as the assumptions envisage increasingly higher interest rate hikes, they would continue to be overrepresented in sales, compared with their weight in total debt holdings.

Conversely, in the baseline scenario, and compared with their weight in the overall portfolio, the government debt securities of other EU countries would be underrepresented in sales, and this proportion would gradually increase as interest rates rise. Given that Spain's credit rating is not significantly different to that of other EU countries, the reason for these divergences is chiefly attributable to the differing maturities between Spanish and other EU countries' debt and the different composition of the banks' debt portfolios, as the banks will generally have different asset monetisation needs.[54]

Chart 9.b shows the composition of sales of debt holdings at amortised cost by residual maturity. As can be seen, holdings with a residual maturity of between one and two years account for the largest volume of sales (around 50%, 25 pp higher than their share in government debt holdings at amortised cost as a whole). Very short-term debt holdings are also overrepresented in sales. By contrast, debt holdings with longer residual maturities (which accumulate larger unrealised losses in scenarios of interest rate hikes) account for a much smaller share of sales than their weight in the portfolio as a whole.

Meanwhile, given the differing composition of the banks' sovereign bond portfolios, the unrealised losses materialised in the event of sale vary widely across banks. Chart 9.c shows the distribution of the average percentage of unrealised losses realised by the banks under the various interest rate hike scenarios. In the baseline scenario, with the balance sheet position at December 2023, selling debt holdings classified at amortised cost would largely result in very contained gains or losses for the banks, meaning that the distribution is centred at values close to 0%. Under the scenario of a 2 pp hike in interest rates, the distribution shifts slightly to the right and the right tail widens. These effects are amplified under the scenarios of 3 pp and 4 pp interest rate hikes, with some banks facing quite significant percentages of unrealised losses (exceeding 20% in some cases).

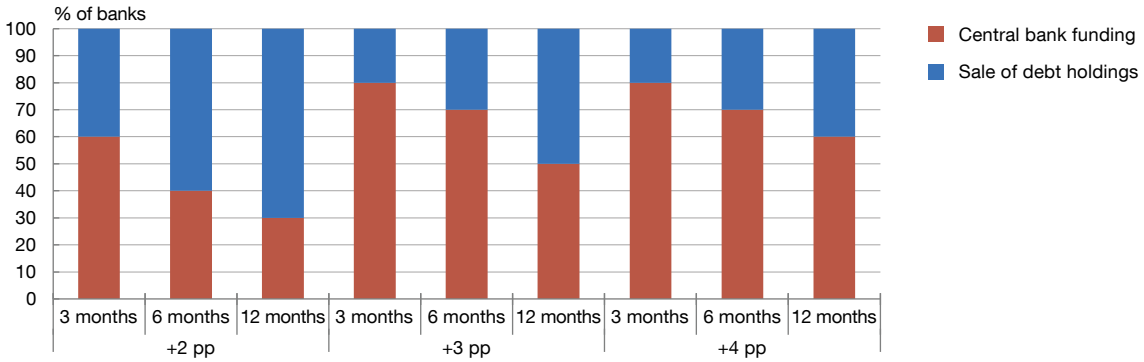
Chart 10.a shows, for the different scenarios considered, the proportion of banks for which each mechanism (pledging or sale) would have a smaller impact on capital. As can be seen, the percentage of banks for which the pledge mechanism is the better option under the criteria considered grows as the interest rates increase and decreases with the duration of the stress episode. The reason for the second relationship is clear: longer-term Eurosystem funding entails a higher borrowing cost.

54 These differences stem from the differing levels of outflows, depending on the composition of the banks' funding sources (entailing different outflow coefficients), and the availability of other sources of liquidity (such as cash, reserves and bonds held at fair value).

Chart 10

Distribution among banks of the mechanism with the smaller solvency impact under different scenarios of liquidity crisis duration and interest rate hikes

10.a Distribution among banks of the mechanism with the smaller solvency impact. Significant institutions. Consolidated data



SOURCE: Authors' calculations.

In any event, the fact that the hike in interest rates tends to benefit the pledge mechanism reveals one very significant aspect: in general, the increase in the unrealised losses materialised outweighs the higher cost of funding, a fact that also helps reinforce the pledge mechanism as the preferred option.

It is worth noting that, even when a 4 pp rate hike is considered, the sale mechanism is less costly for some banks which hold a significant volume of bonds at fair value that enables them to cover a substantial part of the liquidity outflows, and bonds at amortised cost with incipient gains that limit the impact of their decline in value in the event of an interest rate hike.

One of the main conclusions of this analysis is that using the pledge mechanism to cover liquidity needs generally has a smaller solvency impact. Having this mechanism available to banks in the event of a liquidity crisis, especially when these are short-lived and when the banks have a large volume of unrealised losses in their bond portfolios, may significantly limit the impact on solvency.

4 Conclusions

This paper has analysed how an initial liquidity crisis can develop into a solvency crisis due to the costs associated with an urgent need to monetise assets to mitigate fund outflows.

The evidence available shows that government debt holdings have grown significantly in recent years. As regards their accounting classification, those recorded at amortised cost have become considerably more important in relative terms since 2020, a trend which is also observed at European level.

The swift interest rate hike in 2022 and 2023 led to a build-up of unrealised losses on sovereign debt holdings at amortised cost, both in Spain and at European level. Although these losses may not ultimately materialise (as was the case with the recent monetary tightening cycle in the euro area), they could impact bank solvency under alternative scenarios in which such assets have to be mobilised to address unexpected and significant liquidity outflows.

In this context, simulation analysis shows that the aggregate unrealised losses that would materialise under the sale mechanism in liquidity stress scenarios are generally limited, based on the balance sheet at December 2023. This is in part due to the existence of gains on some holdings, attributable to the rearrangement undertaken by banks of their government debt portfolios in recent years. However, if we consider adverse scenarios of additional significant interest rate hikes, the materialisation of unrealised losses could ultimately have a more marked impact on solvency. This suggests that unrealised losses ought to continue to be monitored on a regular basis, both by the banks themselves and by the supervisor.

The simulation exercise also highlights that pledging assets to the central bank to obtain liquidity has a comparatively contained funding cost (except in persistent liquidity crises) and, in any event, does not entail realising losses. Having such a mechanism available to banks is thus borne out by its ability to largely prevent a liquidity crisis from becoming a solvency crisis, helping to make the financial system more resilient and, therefore, more stable.

Some of the weaknesses of the pledge mechanism (lack of operational preparedness and the possible stigma associated with it) were brought to light during the March 2023 liquidity stress episode in the United States, when banks made very limited use of the country's lending facilities that had specifically been designed to provide liquidity in stress scenarios.

Central banks and working groups at the international level are currently working to draw up proposals that could help mitigate these issues. In this respect, for example, the changes to the monetary policy operational framework announced by the ECB in

March 2024 seek, inter alia, to normalise European banks' use of the Eurosystem's main refinancing operations in their liquidity management.[55]

As regards the ability to effectively use this mechanism in an emergency, it is essential that banks have properly identified the collateral available and have the legal and IT infrastructure needed to mobilise it in a short space of time. Similarly, central banks also need to have the human and technological capital to ensure swift operational access to their lending facilities. In this respect, reinforcing the mechanisms to pre-position collateral could contribute positively to the operational preparedness of both parties.[56]

55 Statement by the Governing Council "Changes to the operational framework for implementing monetary policy", of 13 March 2024.

56 Restoy (2024).

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