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NET STABLE FUNDING RATIO STRESS TEST

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SPECIAL FEATURE 2: NET STABLE FUNDING RATIO STRESS TEST

As part of the global efforts to limit liquidity risk in the banking sector, the BCBS introduced two new liquidity ratios in Basel III, which banks need to comply with. The ratios address both short-term liquidity needs and structural liquidity. The first is the liquidity coverage ratio (LCR) which assesses whether banks can survive through a month-long period of stress, hence short-term, involving high net cash outflows through their reserves of high-quality liquid assets (HQLA). The second is the NSFR which controls for liquidity risk on a structural basis by attempting to prevent a mismatch between long-term assets and short-term sources of finance on the liabilities side, thereby requiring banks to fund their activities with more stable sources of funding on an ongoing basis. The ratios have been included in EU legislation and have been rolled-out in stages, with the 100% LCR requirement applicable from January 2019 (phased-in gradually from 60% as of January 2015) and the 100% NSFR binding requirement applicable as of June 2021 (although monitored since 2018).

In the [Financial Stability Report \(FSR\) 2018](#), the Central Bank of Malta introduced the LCR stress test framework which now forms part of the Bank's liquidity stress testing toolkit.¹ Nonetheless, the Central Bank of Malta also recognised the need to develop a NSFR stress test framework to complement the LCR framework, with the aim of assessing banks' long-term liquidity resilience. The Bank has since been using this framework to monitor the NSFR, and as of June 2021, when the ratio became a binding requirement, the framework was refined further to stress testing the ratio under a range of adverse scenarios.

Article 428 of the [Regulation \(EU\) 2019/876](#) (hereafter, the CRR2 Regulation) establishes the rules for the net stable funding requirement to apply from 28 June 2021. Consequently, the European Banking Authority (EBA) issued [Implementing Technical Standards \(ITS\) framework 3.0](#) which amend the regulation for Supervisory Reporting (COREP and FINREP) to take into account the new reporting requirements.²

The NSFR is defined as the ratio of the banks' holdings of available stable funding (ASF) to their required stable funding (RSF), calculated in the reporting currency for all their transactions, and should be at a minimum of 100%, as follows:

$$\frac{\text{Available Stable Funding (ASF)}}{\text{Required Stable Funding (RSF)}} \geq 100\%$$

The ASF is the portion of a bank's capital and liabilities estimated to remain with the institution for more than one year. In particular, it factors in the extent of liabilities that are bound to mature within the year. An ASF factor is assigned to the carrying value of each element of funding as prescribed in Chapter 3 of Article 428 of the CRR2 Regulation. Institutions shall consider the residual contractual maturity of their liabilities and own funds to determine the ASF factor. ASF factors range from 0% – meaning that funding from a given source is unreliable – to 100% – meaning that funding is expected to be still fully available beyond one year.

The RSF is the amount of stable funding that the bank is required to hold given the liquidity characteristics and residual maturities of its assets and the possible strains on liquidity arising from the sudden materialisation of off-balance sheet exposures. An RSF factor is assigned to the carrying value of each element of funding as prescribed in Chapter 4 of Article 428 of the CRR Regulation, taking into consideration the residual contractual maturity of the assets and off-balance sheet transactions. Institutions must also keep in mind any encumbrance on their assets when applying the RSF factor. RSF factors range from 0% – applicable to fully liquid and unencumbered assets – to 100% – for illiquid assets such as those encumbered for a residual maturity of at least one year.

The CRR2 Regulation also established a simplified version of the NSFR for small and non-complex institutions, whereby, with the prior approval of their competent authority (CA), such banks may use a simplified list of ASF and RSF factors as prescribed in Chapters 6 and 7 of Article 428 in the CRR2 Regulation.³

As per Article 428b (3) of the CRR2 Regulation, if, at any time, the NSFR of an institution falls below the 100% minimum requirement, or is expected to fall below it, the institution will have to immediately notify the CA and submit without undue delay a plan for the timely restoration of the NSFR to the minimum level of 100%. CAs are expected to assess the reasons for the institution's failure to maintain the minimum level before taking any supervisory measures.

Data Overview

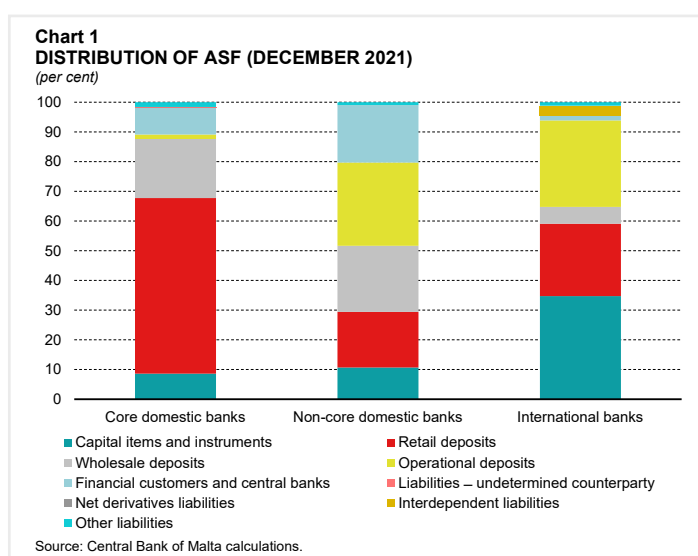
Chart 1 shows the distribution of the ASF held by the three bank categories as at December 2021.

A large share of banks' ASF is in the form of retail and wholesale deposits. Retail deposits make up 59%, 19% and 24% of the ASF held by core domestic, non-core domestic and international banks, respectively. Retail deposits with a residual maturity of less than one year attract a 95% or 90% ASF factor depending on whether they classify as stable or other retail deposits, respectively. Both stable and other retail deposits with a residual maturity greater than one year attract a 100% ASF factor since they are expected to be still fully available beyond one year. Wholesale deposits also represent a significant portion of their ASF, with non-operational wholesale deposits making up 20%, 22% and 6% of the ASF held by the three respective bank categories. To note that while operational deposits are presented separately from non-operational deposits in Chart 1, these are reported at the aggregate as operational deposits from wholesale, financial customers and central banks. Wholesale deposits (both operational and non-operational) with a residual maturity of less than one year attract a 50% ASF factor, while those with a residual maturity of greater than one year, similar to retail deposits, attract a 100% ASF factor.

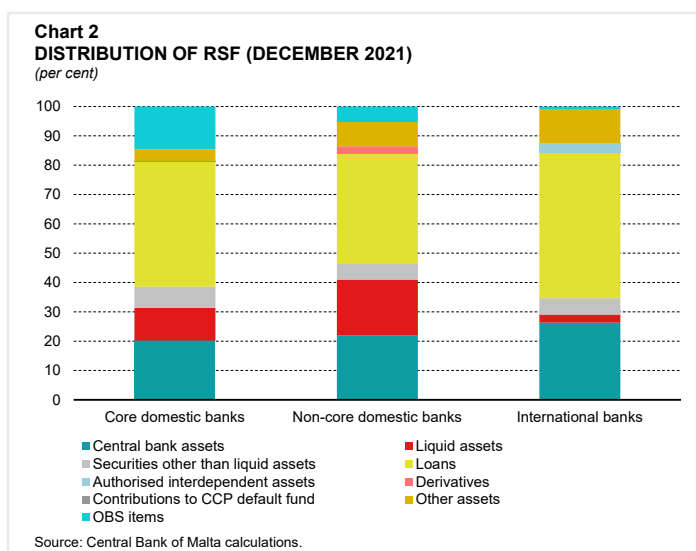
On average, the overall ASF factor as at December 2021 for retail and wholesale deposits is equivalent to 82% for the total banking system, meaning that banks are assuming that 82% of their retail and wholesale deposits will still be available at the end of the 1-year horizon. On an individual bank level, the average ASF factor for retail and wholesale deposits ranges from 50% to 92%, the lowest average ASF factors being applicable to banks which are more reliant on short-term funding. Indeed, for both retail and wholesale deposits, it can be noted that deposits maturing within the year attract a lower ASF factor since they will not be available at the end of the 1-year horizon unless rolled-over. Therefore, an overreliance of the domestic banking system on short-term funding can pose a potential threat when considering such longer-term scenarios, unless the sources of these funds are stable. As at December 2021, the share of retail and wholesale deposits maturing within the year is equivalent to 95%, 88% and 87% for core domestic, non-core domestic and international banks, respectively. In this regard, since the NSFR is more geared towards long-term funding, any stress test impact stemming from the reliance of banks on short-term funding would be more contained when compared to the LCR stress test which specifically targets a 30-day horizon.

On the other hand, Chart 2 presents the distribution of the RSF held by the three bank categories as at December 2021.

For all three bank categories, loans represent the largest portion of banks' assets and off-balance sheet instruments. Indeed, loans make up 43%, 38% and 50% of the RSF held by core domestic, non-core domestic and international banks, respectively. The RSF factors for



loans vary depending on the credit risk associated with the different types of loans. Table 1 below presents the RSF factors prescribed for the different classes of loans in the CRR2 Regulation by encumbrance and residual maturity of the loans. The average resulting RSF factor for December 2021 is equivalent to around 63%, meaning that the banking system is expected to hold stable funding to cover 63% of the total outstanding loans by the end of the 1-year horizon. On an individual bank level, the average RSF factor for loans ranges from 24% to 81%, with banks holding short-term loans to financial customers and trade finance products attracting lower RSF factors.



Central bank assets are the second largest component accounting for 20%, 22% and 26% of the RSF for the respective three bank categories. Such assets attract three different risk factors (0%, 50% or 100%) depending on the residual maturity of the assets and the term of encumbrance. These are followed by liquid assets which represent 11%, 19% and 3% of their RSF, respectively. Liquid assets which are unencumbered or encumbered for a residual maturity of less than six months attract an RSF factor ranging from 0% to 55% as prescribed by the [European Commission Delegated Regulation \(EU\) 2015/61](#) for the LCR. Liquid assets encumbered for a residual maturity of at least six months but less than one year attract a 50% RSF factor, while those encumbered for a residual maturity of one year or more attract a 100% RSF factor.

Table 1
RSF FACTORS FOR LOANS PRESCRIBED IN THE CRR2 REGULATION

Loan Type	Maturity		
	Up to 6 months	6 months to 1 year	Over 1 year
Operational deposits	50%	50%	100%
Securities financing transactions with financial customers			
Collateralized by level 1 assets eligible for 0% LCR haircut			
Unencumbered or encumbered for a residual maturity of less than six months	0%	50%	100%
Encumbered for a residual maturity of at least six months but less than one year	50%	50%	100%
Encumbered for a residual maturity of one year or more	100%	100%	100%
Collateralized by other assets			
Unencumbered or encumbered for a residual maturity of less than six months	5%	50%	100%
Encumbered for a residual maturity of at least six months but less than one year	50%	50%	100%
Encumbered for a residual maturity of one year or more	100%	100%	100%
Other loans and advances to financial customers	10%	50%	100%
Loans to NFCs (other than central banks) eligible for a risk weight of 35% or less			
Unencumbered or encumbered for a residual maturity of less than one year	50%	50%	65%
Encumbered for a residual maturity of one year or more	100%	100%	100%
Other loans to NFCs (other than central banks) eligible for a risk weight higher than 35%			
Unencumbered or encumbered for a residual maturity of less than one year	50%	50%	85%
Encumbered for a residual maturity of one year or more	100%	100%	100%

Source: Central Bank of Malta.

Given that the NSFR is reported on a quarterly basis, as at the reference date (December 2021) only three submissions are available. In the first reporting cycle since becoming a binding requirement, the NSFR stood at 167%, 175% and 153% for core domestic, non-core domestic and international banks, respectively. The NSFR remained almost stable throughout the following two submissions, with a NSFR of 168%, 180% and 153% as at September 2021 and 174%, 178% and 163% as at December 2021 for the three respective bank categories.

NSFR Stress Testing Framework

Stress tests applied to the NSFR can determine potential structural long-term liquidity risks. Shocks can be applied to both the ASF and RSF factors. By applying shocks to the ASF factors, i.e., assuming lower ASF factors, banks would face reductions in the availability of stable funding due to potential run-offs, leading to a decline in their capital and liabilities. On the other hand, increasing the RSF factors would mean that banks suffer impairments in the quality of their assets and off-balance sheet instruments, hence requiring more stable funding to support them.

The Bank's new liquidity stress test draws from the methodology developed during the International Monetary Fund (IMF)'s Financial Sector Assessment Programme for Malta in 2018. The risk factors applied by the IMF were based on those prescribed in the [BCBS standards](#) that form part of Basel III. This new framework further addresses the recommendation included in the IMF's [Financial System Stability Assessment](#) for the Bank to "strengthen the risk analysis by incorporating new dimensions in liquidity stress testing."

The framework is based on a baseline and three adverse scenarios. In the baseline scenario, the ASF and RSF factors applied are those prescribed in the CRR2 Regulation. While the latter provides the magnitude of the risk factors to be applied to the respective class of instruments, it also allows banks to be more conservative in the risk factors they apply on their own instruments. This results in a possible divergence in the degree of conservatism across banks. To counter for this, in order to ensure a level playing field, the baseline scenario applies a common set of risk factors based on those prescribed in the CRR2 Regulation. However, while the baseline scenario is calculated using an internal set of risk factors, the resulting NSFR ratio remains more or less comparable to the NSFR reported by banks in their COREP submissions. The first adverse scenario targets the ASF by considering a higher run-off for retail and wholesale deposits, impacting the banks' availability of stable funding. The second adverse scenario keeps the same assumptions to the first adverse scenario but also considers that some loans become non-performing and require more stable funding to support them. The third adverse scenario keeps both considerations applied in the second adverse scenario and also accounts for increased pressure in the market which reduces the value of liquid assets, mainly bonds and equities, implying the need for more stable funding. The instruments targeted in these shocks were chosen to represent the majority of banks' assets and liabilities as shown in Charts 1 and 2 above, hence assessing any vulnerabilities arising from these relative concentrations in banks' balance sheets. The scenarios are summarised in Table 2 below.

In the first adverse scenario, by targeting retail and wholesale deposits as the main components of the ASF, a highly significant portion of the banks' ASF is impacted by this shock. Indeed, by applying shocks to the

Table 2
DESCRIPTION OF BASELINE AND ADVERSE SCENARIOS

Scenario	Description
Baseline	ASF and RSF factors as prescribed by the CRR2 Regulation
Adverse: Scenario 1	A higher run-off for retail and wholesale deposits impacting the availability of stable funding
Scenario 2	Adverse scenario 1 with some loans become non-performing requiring more stable funding to support them impacting the RSF
Scenario 3	Adverse scenario 2 with pressure in the market reducing the value of bonds and equities (Level 1, 2A and 2B HQLA and other securities) implying the need for further stable funding

Source: Central Bank of Malta.

retail and wholesale deposits by banks, 82%, 50% and 54% of the ASF held by core domestic, non-core domestic and international banks as at December 2021 is captured by this adverse scenario. Under this scenario, stable retail deposits are assumed to contribute less to the NSFR following a contraction of 5 percentage points in the applicable ASF factor prescribed in the CRR2 Regulation, while the ASF factors for other retail deposits and wholesale deposits experience a contraction of 10 percentage points. The magnitudes of the shocks under adverse scenario 1 are summarised in Table 3 below.

The second adverse scenario targets loans as the largest component of the RSF for the three bank categories, assuming higher rates for banks' RSF for loans due to an increase in credit risk. The increment in shocks applied to the RSF factors for loans range between 5 to 15 percentage points, depending on the risk level associated with the type of loans. Loans that attract a 100% RSF factor are not impacted by this shock given that they already attract the highest applicable RSF factor.

The third adverse scenario further stresses banks' RSF by also reducing the value of banks' holding of bonds and equities due to pressure in the market. The impact on the banks' HQLA is lower given the higher liquidity level of such assets. Level 1 assets eligible for a 7% LCR haircut (representing level 1 extremely high-quality covered bonds) receive an increase in the baseline shock ranging between 3 to 5 percentage points. The shock on assets eligible as level 2A increases by between 5 to 10 percentage points, while the impact on level 2B assets, namely corporate debt securities and common equity, attract a shock that is 10 percentage points higher. Finally, the RSF factors for securities other than liquid assets increases further by between 10 to 15 percentage points. All assets which attract a 100% RSF factor, namely those which are encumbered for a residual maturity of one year or more, are not impacted by the shock. The magnitudes of the shocks applied in adverse scenarios 2 and 3 are presented in Table 4 below.

Table 3
SHOCKS TO ASF FACTORS IN ADVERSE SCENARIO 1

Description	CRR2 Regulation	CBM stress test for NSFR
Stable retail deposits	95%-100%	90%-95%
Other retail deposits	90%-100%	80%-90%
Wholesale deposits	50%-100%	40%-90%

Source: Central Bank of Malta.

Table 4
SHOCKS TO RSF FACTORS IN ADVERSE SCENARIOS 2 AND 3

	Description	CRR2 Regulation	CBM stress test for NSFR
Adverse Scenarios 2 and 3	Securities financing transactions to financial customers collateralized by level 1 assets eligible for 0% LCR haircut	0%-50%	5%-60%
	Securities financing transactions to financial customers collateralized by other assets	5%-50%	10%-60%
	Other loans and advances to financial customers	10%-50%	20%-60%
	Loans to NFCs (other than central banks) eligible for a risk weight of 35% or less	50%-65%	60%-75%
	Other loans to NFCs (other than central banks) eligible for a risk weight higher than 35%	50%-85%	65%-100%
Adverse Scenario 3	Level 1 assets eligible for 7% LCR haircut	7%-50%	10%-55%
	Level 2A assets eligible for 15% LCR haircut	15%-50%	20%-55%
	Level 2B assets eligible for 50% LCR haircut	50%	60%
	Securities other than liquid assets	50%-85%	60%-100%

Source: Central Bank of Malta.

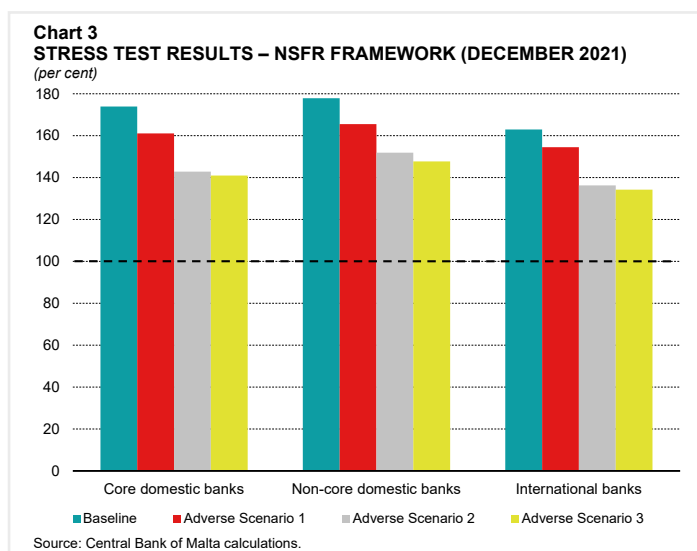
Stress Test Results

Overall, in all three reference dates available, the NSFR ratio for the three bank categories remain well-above the 100% minimum requirement in the three adverse scenarios. Nonetheless, given that the improvements in the NSFR ratio over the past three reference dates was marginal, the impact of the three adverse scenarios is comparable in all three periods, both at the individual bank and aggregate bank category level.

Chart 3 presents the results of the NSFR framework for the core domestic, non-core domestic and international banks (excluding foreign branches) as at December 2021.

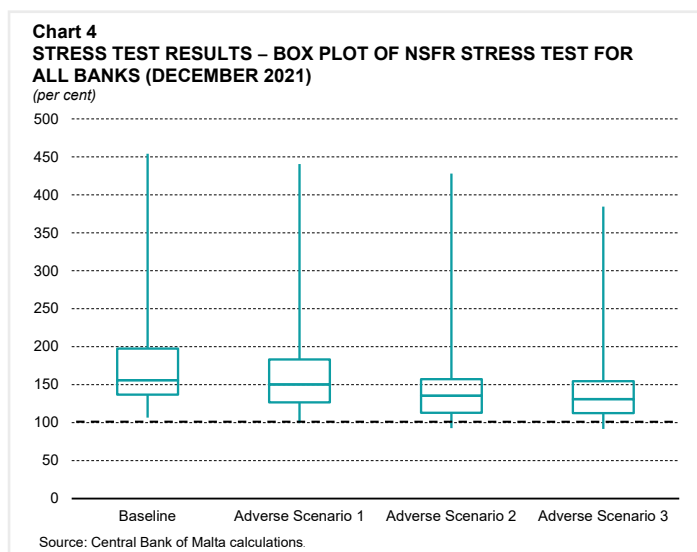
As at December 2021, the baseline NSFR stood at 174%, 178% and 163% for core domestic, non-core domestic and international banks, respectively. On an individual bank level, all banks hold a NSFR above the 100% minimum requirement under the baseline scenario, ranging between 107% to 454%.

Under the first adverse scenario, the NSFR drops to 161%, 166% and 154% for the three respective bank categories. The impact is mainly driven by the banks' high exposures to retail, and to a lesser extent, wholesale deposits, particularly short-term deposits which already attract lower ASF factors. The second adverse scenario leads to a further decline of the NSFR for the three bank categories to 143%, 152% and 136%, respectively. This adverse scenario has a larger significant impact on the three bank categories due to the large concentration of loans for banks in their asset portfolio. Under the third adverse scenario, the NSFR for core domestic, non-core domestic and international banks is equal to 141%, 148% and 134%. The impact is quite marginal due to the lower concentration in banks of these asset classes, and since they are also considered to be fairly liquid and thus even with the assumed shocks, the RSF factors for these assets are still rather low.



Nonetheless, despite an overall positive result at the bank category level, the stress tests revealed some weaknesses in a couple of individual banks. Although banks are operating with ample liquidity, the severity of the test assumptions lead to some vulnerabilities being detected in a couple of banks which fall below the 100% minimum requirement under adverse scenario 2.

Chart 4 shows the interquartile ranges and the maximum and minimum for all banks in the sample under the baseline and the three respective adverse scenarios.



The median baseline NSFR for all banks is 156% with lower and upper quartiles of 137% and 197%, respectively. The whiskers in the box plot show the range of NSFR values that are between the minimum and lower quartile (25th percentile) or between the upper quartile (75th percentile) and the maximum value of the ratios observed. Under adverse scenario 3, the median NSFR goes down to 113% with lower and upper quartiles of 113% and 155% respectively. The box plot also shows the slight dip below the 100% for a couple of banks in the minimum of the whiskers.

Due to the high reliance of the domestic banking system on retail and wholesale deposits as a source of funding, as well as their high exposure to the loan market, reverse stress tests are also carried out to assess the endurance of long-term funding for banks in the case of severe adverse shocks to these particular components of the banks' liabilities and assets. These can also serve as a benchmark to adverse scenarios 1 and 2, by comparing the most severe magnitude of the shocks applied in these two adverse scenarios with break-point shocks that banks can withstand before dipping below the 100% minimum requirement.

Under adverse scenario 1, which targets retail and wholesale deposits by applying lower ASF factors as presented in Table 3, the average ASF factor applied by the total banking system for retail and wholesale deposits declines from 82% to 74%. From the results of the reverse stress test, the average lowest ASF factor that the total banking system could withstand until the 100% minimum requirement is breached is 37%. This means that, at the aggregate level, banks can withstand a contraction of 45 percentage points in the applicable ASF factors prescribed in the CRR2 Regulation. Moreover, five banks would be able to withstand a full withdrawal of their retail and wholesale deposits as these are not their primary sources of funding. For the remaining banks, the minimum ASF factor must range between 22% to 68% of their retail and wholesale deposit to be able to maintain their NSFR above the minimum requirement.

On the other hand, under adverse scenario 2 which targets loans by applying higher RSF factors as presented in Table 4, the average RSF factor applied by the total banking system for loans increases from 63% to 75%. In simpler terms, banks are required to hold, on average, an additional stable funding of 12% of the value of loans under adverse scenario 2. Based on reverse stress test results, the total banking system could maintain stable funding for the entire value of their loans and satisfy the NSFR's minimum requirement due to having sufficient excess ASF holdings to cater for the remaining portion of loans for which the regulation does not require stable funding. However, at the individual bank level, six banks do not have enough excess ASF to cover entirely this remaining portion of loans. This particularly holds for those banks whose loans consist mainly of loans to financials and trade finance instruments, given that these do not attract high RSF factors. Nevertheless, five of these six banks would have enough stable funding at their disposal to cover at least 75% of their total loans. The remaining bank, due to its specific business model, would be able to cater for around half of its loan holdings, thereby effectively being able to withstand a doubling of its current RSF requirements. By design, the reverse stress tests apply severe shocks to reach the break point at which banks breach the 100% minimum requirement. Indeed, the magnitude of shocks required for banks to reach this level is quite severe, reflecting the adequacy of banks' longer-term funding to withstand shocks and thus to still maintain the necessary liquidity.

Conclusion

The NSFR stress testing framework presented in this box has been designed to assess banks' long-term funding. The framework will continue to form part of the Bank's stress testing toolkit, with results being published regularly in Chapter 3 of the FSR. In addition to the adverse scenarios presented which target the current sources of funding and reverse stress tests, the framework is flexible in a way that new scenarios can be considered to target any other components of the banks' ASF and RSF, as deemed necessary, to assess any potential risks stemming from other components of the banks' balance sheets. Although the aim of the framework is to assess resilience against systemic risk, its results can also signal potential vulnerabilities at the individual bank level which, if addressed at the early stages, could prevent the build-up of systemic risks.

Based on December 2021 data, the NSFR framework finds that the domestic banking system has stable sources of funding and concludes that it is in a position to withstand severe funding shocks. Under the adverse scenarios contemplated in the framework, the three bank categories maintain a NSFR well-above the minimum requirement of 100%.

Notes

- ¹ Refer to Box 4 of the FSR 2018 for further information on the LCR stress test.
- ² Refer to Annex 12 (Reporting on NSFR) and Annex 13 (Instructions for Reporting on Stable Funding) in the ITS on supervisory reporting.
- ³ The simplified version of the NSFR reporting does not apply to any bank within the domestic banking system.