

### 3. STRESS TESTS

Stress testing forms a central part of licensed credit institutions' risk management and supervisory assessment, as it helps gauge resilience to severe but plausible adverse shocks. The Bank operates a suite of stress-testing frameworks to evaluate banks' capacity to withstand emerging vulnerabilities and to assess the resilience of the banking sector as a whole. The exercise is intended to inform an assessment of whether existing supervisory, regulatory, and management buffers would be sufficient should systemic risks materialize.<sup>1</sup>

This chapter presents the methodology and main findings of the Bank's stress-testing exercises and is structured into three sections. The first section outlines the scenario-based solvency stress test namely the MST framework, which maps macroeconomic and financial shocks under alternative scenarios onto banks' balance sheets over a three-year horizon. The framework comprises several risk modules designed to quantify the impact of different risk sources under both a baseline and an adverse scenario. This section also features a focus Box 5 that discusses a refinement to the credit risk module.

This framework also incorporates a market risk module, primarily assessing the losses that could potentially arise following changes in interest rates, as well as a sensitivity analysis framework that examines credit quality deterioration in isolation to complement the market module of the MST.

The second section reports the results of the interest rate risk framework for the banking book, which encompasses six scenarios reflecting interest rate changes, to evaluate their impact on both NII and the market re-valuation of bonds.

Finally, the third section presents the results of liquidity stress-testing frameworks to assess the robustness of liquidity buffers under elevated withdrawal conditions, including a liquidity-to-solvency channel.

#### 3.1 Scenario-based solvency stress test

##### 3.1.1 Outlook and scenario design

The Bank's MST framework assesses the resilience of the banking sector under a baseline and an adverse macro-financial scenario over a three-year horizon. The latest exercise is based on banks' balance sheet data as of December 2025 and evaluates the impacts of the respective scenario paths on the profitability, asset quality, and capital position of the banks in scope through a set of dedicated satellite models and risk modules.<sup>2</sup>

In this year's exercise, the scenario design departs from the approach adopted in the previous publications in two respects. First, the baseline scenario aligns more closely with the Bank's own macroeconomic projections than in previous iterations.<sup>3</sup> Second, although the adverse scenario retains the broad risk narrative of the 2025 EBA/ECB stress test exercise, it updates the transmission of external shocks to the Maltese economy using the Structural and TRaditional Econometric model for Malta (STREAM), with particular emphasis on higher oil prices and a stronger negative foreign-demand shock.<sup>4</sup>

This approach reflects the assessment that the external environment remains highly uncertain and that downside risks to the domestic outlook continue to stem predominantly from persistent geopolitical tensions,

<sup>1</sup> The Bank does not disclose stress test results for individual institutions, as the primary objective of the exercise is to assess the resilience of the banking system at an aggregate level. Bank-specific findings are instead communicated to the relevant authorities where appropriate. In addition, the coverage of banks may differ across stress-testing frameworks, since certain institutions may fall outside the scope of specific exercises. This is particularly relevant in the case of branches of foreign banks, which do not hold capital locally, as well as banks that do not have exposure to the instrument classes captured by a given framework.

<sup>2</sup> Covers six core and five non-core domestic banks. Merkanti Bank Ltd formally ceased accepting new banking business in December 2025, following its decision to voluntarily surrender its banking license, and was excluded from this year exercise given the forward-looking nature of the exercise.

<sup>3</sup> Central Bank of Malta, [Outlook for the Maltese Economy](#) 2026:1, February 2026.

<sup>4</sup> The [STREAM](#) is the Bank's core model for conducting simulations to assess the potential impact of various economic shocks, generating macroeconomic forecasts and examining the impact of policy actions.

trade fragmentation, and disruptions to energy markets. These risk factors are especially relevant for Malta, as a small and highly open economy, where weaker external demand, higher import costs, and tighter financial conditions can impact exports, especially tourism, as well as private consumption and investment, with relatively strong spillovers to domestic activity.

### *Baseline scenario*

The baseline scenario is based on the Bank's February 2026 central macroeconomic projections for Malta. Real GDP growth is projected to stabilise at 3.7% over 2026-2028, with domestic demand remaining the main driver and net exports continuing to provide a positive, albeit smaller, contribution to growth. Private consumption is expected to remain resilient, supported by continued growth in real disposable income, while investment is projected to recover in 2026 before moderating thereafter, partly reflecting the profile of EU-funded projects. Export growth is also expected to ease from the strong rates recorded in recent years, in line with a more moderate and uncertain external environment, including higher energy costs. At the same time, labour market conditions are projected to remain favourable, with employment growth moderating gradually and the unemployment rate remaining at around 2.8%, while HICP inflation is expected to decelerate only gradually, from 2.3% in 2026 to 2.0% by 2028. Financial conditions are assumed to remain broadly benign. The scenario's short-term interest rates are not model-driven but are assumed to follow a mildly upward path reflecting market expectations over the projection horizon. Domestic sovereign spreads are assumed to remain contained and to narrow slightly over the exercise. RRE prices are assumed to continue rising, albeit at a more moderate pace than in recent years, in line with the expected moderation in overall economic growth and domestic demand. In the baseline scenario, equity prices are kept unchanged over the stress-testing horizon, reflecting the absence of an additional exogenous shock and a prudent treatment of uncertain equity-market developments, as assumed in previous EBA exercises.

Overall, the baseline implies a continued, though more moderate, expansion in nominal incomes, a still supportive domestic demand environment, and broadly stable debt-servicing conditions. These conditions remain consistent with contained credit losses and continued income generation by banks, with NII remaining a strong positive contributor to profitability and broadly in line with the stronger performance observed in recent exercises.

### *Adverse scenario*

The adverse scenario is based on the [EBA 2025 EU-wide stress test](#), with shock magnitudes derived by applying deviations to the Bank's updated baseline projections for the period 2026-2028.<sup>5</sup> The scenario is underpinned by a sharp escalation in geopolitical tensions and the imposition of extensive trade restrictions, which disrupt global supply chains, raise energy and commodity prices, and significantly weaken foreign demand. This external shock is further reinforced by weaker confidence, tighter financial conditions and heightened market volatility.

For this exercise, the broader EBA narrative is retained, but the domestic calibration is updated using the Bank's STREAM to better reflect how the Maltese economy responds to shocks. In addition, the adverse scenario includes a higher oil price and an unprecedentedly strong foreign demand shock than would be implied by mechanically carrying over the previous scenario, reflecting the relevance of energy costs to external demand for the Maltese economy, especially through tourism and other confidence-sensitive components of domestic demand. In this setting, geopolitical tensions and trade fragmentation lead to a marked deterioration in Malta's external environment, with foreign demand weakening sharply, tourism and related service exports declining significantly, and higher oil and commodity prices raising import and production costs, particularly for energy-intensive firms, while tighter financing conditions weigh on investment and household spending.

The combined supply and demand shocks result in a marked deterioration in domestic macroeconomic conditions. GDP growth turns negative in 2026, with the trough reached in 2027, before a partial recovery begins

<sup>5</sup> The adverse scenario is a hypothetical stress scenario rather than a forecast and is calibrated under a no-policy-change convention.

thereafter. Domestic demand weakens as firms cut back on investment and hiring in response to heightened uncertainty, lower external revenues, and tighter financing conditions, while households reduce consumption amid weaker income prospects and precautionary behaviour. Inflation initially rises on the back of imported production costs, but this pressure is gradually offset by weaker demand, so that inflation declines towards the baseline by the end of the horizon. The temporary increase in inflation also feeds into market expectations for interest rates, resulting in tighter financial conditions than under the baseline, including higher short and long-term rates and wider spreads on riskier assets.

Financial markets are assumed to experience a broad-based deterioration in risk sentiment, with equity prices falling sharply, corporate financing conditions tightening and sovereign and corporate risk premia increasing, while lower market liquidity amplifies the repricing of financial assets.<sup>6</sup> For banks, these developments imply weaker earnings capacity, larger valuation losses on market-sensitive exposures and a deterioration in borrowers' repayment capacity, particularly in more vulnerable sectors and portfolios. The adverse scenario also assumes a decline in real estate prices over the stress horizon, with residential prices affected by higher borrowing costs, weaker household income growth, rising unemployment, and lower confidence. These dynamics are reflected in lower collateral values and higher expected losses in banks' credit portfolios.

### Macro-financial model inputs

Table 3.1 summarises the macroeconomic projections over the three-year horizon for both the baseline and adverse scenarios applied in the MST. These shocks are estimated to impact banks' profitability and capital position through the respective risk satellite models, with shocks to GDP, inflation, and RRE prices predominantly affecting banks' credit risk, whilst the interest rate variables primarily drive the NII and market risk modules.

Under the baseline scenario and over the three-year horizon, GDP is projected to grow cumulatively from the starting point by 11.5%, RRE prices are expected to increase by 12.2%, while inflation is anticipated to accumulate to 6.5%. The sovereign spread is forecasted to narrow from 0.8 percentage points to 0.7 percentage points by 2028. The short-term interest rate is expected to remain relatively stable at 1.9% in 2026 before rising gradually to 2.0% in 2027 and 2.2% in 2028, reflecting the continued normalization of monetary policy in the baseline scenario.

Under the adverse scenario, real GDP is assumed to contract cumulatively by 4.7% over the test horizon, whilst inflation increases by a further 9.2% and residential property prices decline by 16.9%. Short-term interest rates and sovereign spreads are assumed to spike in 2026 to 3.6% and 1.6 percentage points, respectively, before moderating to 3.4% and 1.0 percentage points by 2028 under the adverse scenario, reflecting the severe but transient nature of the stress event.

**Table 3.1**  
**SCENARIO-BASED MACROECONOMIC PROJECTIONS FOR 2026 TO 2028**

	Baseline scenario (%)			Adverse scenario (%)		
	2026	2027	2028	2026	2027	2028
MT GDP growth rate	3.7	3.7	3.7	-1.8	-3.9	1.1
MT inflation rate	2.3	2.1	2.0	3.6	4.1	1.2
RRE prices	4.1	3.9	3.7	-3.4	-9.1	-5.4
Short-term rate	1.9	2.0	2.2	3.6	3.4	3.4
Sovereign spread	0.8	0.8	0.7	1.6	1.3	1.0

Source: Central Bank of Malta.

<sup>6</sup> In the adverse scenario, equity prices are assumed to fall by 50% in the first year and then stay at depressed levels, showing only a very limited recovery over the projection horizon, in line with the EBA 2025 specifications.

### 3.1.2 Methodology

The MST framework continues to follow the approach used in the previous exercise, relying on a static balance sheet assumption to evaluate how macroeconomic shocks affect the balance sheets of both core and non-core domestic banks.<sup>7</sup> Losses across different risk types are estimated using dedicated satellite models and risk modules.

For this round, the credit risk methodology has been updated in line with recent literature. Instead of modelling a Z-factor for each loan segment, the approach now estimates default rates directly as a function of macro-financial variables. The remaining elements of the transition matrix are then derived using bridge equations. A detailed explanation of these methodological changes is provided in Box 5.

The projected impact from additional loan loss provisions arising from the Expected Credit Loss (ECL) module is reported under credit risk in Charts 3.2 to 3.5. In addition, newly classified NPLs also affect income streams through missed monthly repayments, as reflected in the reduced NII contribution. Similarly, the increase in RWAs resulting from the higher risk weight corresponding with the newly classified NPLs is presented separately in the aforementioned charts.

The MST's market module primarily assesses the impact on the valuation of marketable debt securities arising from market price movements and issuer defaults. The former is assessed for debt securities accounted for at FV, for which revaluation of sovereign and corporate bond holdings is estimated using interest rate shocks derived from the EBA 2025 EU-wide stress test scenario.<sup>8</sup> For securities accounted for at AMC, the repricing or unrealised loss is determined by taking into account the discrepancy between the AMC and the scenario-based market value.<sup>9</sup> These valuation effects are subsequently incorporated into the MST framework to evaluate their impact on banks' profit and loss (P&L) positions, except for the impact on AMC bonds, which is added to the ECL under credit risk (see Charts 3.2 to 3.5), and the impact on FVOCI instruments, whose impact goes directly to the banks' balance sheet.

The NII and net non-interest income (NNII) module primarily revises the income and expenses generated by interest-bearing instruments in response to scenario-based changes in interest rates. It also incorporates outputs from the other modules, mainly credit and market risk, to assess changes in income streams from floating-rate instruments and income foregone from NPLs and defaulted bonds. The module then adjusts the income earned and expenses incurred on the remaining stock of assets and liabilities in accordance with the scenario.

The net trading income (NTI) module quantifies market risk on derivatives and economic hedges and is based on the simplified approach of the market risk methodology adopted in the 2016 EBA EU-Wide Stress Test (described in Section 3.6 of the 2016 methodological note).

Finally, the operational risk module assumes the materialisation of losses equal to a share of the own funds requirement for operational risk. Under the revised CRR III framework, this requirement is based on a business indicator component (BIC) derived from relevant income-related items.<sup>10</sup> For the purposes of the stress test, operational loss events are assumed at 40% of the requirement under the baseline scenario and 100% under the adverse scenario, with the resulting impact distributed evenly over the three-year projection horizon.

<sup>7</sup> The static balance sheet assumption ensures ease of comparison across banks results by requiring banks to retain the same composition of assets and liabilities over the test horizon. In practice, this is achieved by replacing instruments which mature between 2025 and 2027 with similar instruments in terms of type, credit quality and residual maturity as observed in December 2024, adapted to the prevailing market conditions assumed in each scenario.

<sup>8</sup> To construct the shocks, interest rates for the different maturity buckets are estimated through linear interpolation between the one-month Euro swap rate and the ten-year German government bond yield. The same deviations are applied to the starting points under both the baseline and adverse scenarios.

<sup>9</sup> For more details on the accounting treatment and valuation of bonds, refer to Box 4 in the [Financial Stability Report 2022](#).

<sup>10</sup> Under the CRR III framework, the operational risk capital requirement is based on the BIC, derived from the Business Indicator (BI), which proxies a bank's size and income-generating capacity. The BI combines income elements such as interest, fees, trading, and other operating income. The BIC applies a tiered formula with marginal coefficients of 12% up to €1 billion, 15% between €1–30 billion, and 18% above €30 billion. This structure ensures that larger institutions face higher operational risk capital requirements in line with their scale and activity. <https://eur-lex.europa.eu/eli/reg/2024/1623/oj/eng>

## BOX 5: ENHANCING THE CREDIT RISK MODULE: FROM A Z-FACTOR TO A BRIDGE EQUATION APPROACH<sup>1</sup>

The Bank currently applies an ECL model for credit risk quantification, based on methodologies developed by Gross et al. (2020) and Belkin et al. (1998a). In essence, this approach condenses nine transition probabilities into a single latent variable known as a 'Z-factor', which is in turn linked to macro-financial conditions (see Box 3 in [FSR 2022](#) for more details).

The Bank has updated its framework in line with recent literature by adopting the approach outlined in the ECB Occasional Paper by Budnik et al. (2024). This revised methodology first models the default rate and then uses bridge equations to derive the remaining elements of the transition matrix. The main advantage of this approach over the previous Z-factor methodology is that it models default probabilities directly as the macro-sensitive driver of credit transitions. This allows for more detailed projections of stage-to-stage migrations while preserving the economic structure embedded in historical dynamics.<sup>2</sup>

The purpose of this box is to outline how IFRS9 transition matrices are projected under baseline and adverse macro-financial scenarios and explains how the new approach improves the projections of credit migration dynamics relative to the previous Z-factor methodology.

### Transition matrix structure and stage definitions

Matrix (1) presents the schematic transition probability (TP) parameters aligned with IFRS 9 staging requirements. The framework defines three distinct credit risk categories: Stage 1 for exposures exhibiting no significant deterioration in credit quality since initial recognition; Stage 2 for exposures showing a material increase in credit risk without having defaulted; and Stage 3 for non-performing (defaulted) exposures. This matrix structure captures the full spectrum of credit migration dynamics across these obligor stages over discrete time periods  $t$ .

$$TP_t = \begin{bmatrix} TP_t^{1-1} & TP_t^{1-2} & TP_t^{1-3} \\ TP_t^{2-1} & TP_t^{2-2} & TP_t^{2-3} \\ TP_t^{3-1} = 0 & TP_t^{3-2} = 0 & TP_t^{3-3} = 1 \end{bmatrix} \quad (1)$$

$TP^{1-3}$  and  $TP^{2-3}$  indicate the likelihood of transitioning from a performing category (S1 or S2, respectively) to the non-performing category (S3), thereby, in a combined manner, representing the probability of default (PD). Stage 3 is treated as an absorbing state – meaning that once an exposure reaches S3, in the adverse scenario it cannot return to S2 or S1, and therefore, the cure probabilities ( $TP^{3-1}$  and  $TP^{3-2}$ ) are set to zero.

### Modelling the probability of default (PD)

The PD, expressed in a distance-to-default transformation, is regressed on key macro-financial variables to capture the portfolio's sensitivity to macroeconomic shocks and on its own lag, to account for the persistence of default rates. A Bayesian Model Averaging (BMA) methodology is employed, in which all feasible combinations of default rate and macro-financial drivers are estimated using Autoregressive Distributed Lag (ARDL) specifications. The BMA methodology addresses model uncertainty by incorporating multiple highly probable model specifications, rather than relying on a single model or a fixed

<sup>1</sup> Authored by Mr Kanan Musayev and Mr Pedro Pólvara, Senior Economist and Deputy Head within the Macroprudential Policy, Stress Testing and Research Department. The authors would like to thank Ms Christine Balzan, Mr Alan Cassar, Deputy Governors Oliver Bonello and Rita Schembri, and Governor Alexander Demarco for their valuable suggestions.

<sup>2</sup> The framework retains the LGD modelling block, lifetime ECL calculations and integration with supervisory minimum coverage expectations described in FSR 2022. The methodological change introduced this year is limited to how PDs are projected conditional on macro-financial scenarios.

set of variables. Model coefficients are weighted by their posterior inclusion probabilities, as determined using the Bayesian Information Criterion, and subsequently aggregated to obtain the overall scenario response, following the approach in Raftery (1995).

To ensure economic plausibility, sign restrictions are imposed on macro-financial variables. The estimation is carried out at the portfolio level (mortgages, consumer credit, and NFCs) to account for differential credit risk sensitivity to macro shocks. Following PD estimation and projection under baseline and adverse scenarios, the  $TP^{1 \rightarrow 3}$  and  $TP^{2 \rightarrow 3}$  transition probabilities are derived using equations (2) and (3), respectively.

$$\Phi^{-1}(TP_{T0+h}^{1 \rightarrow 3}) - \Phi^{-1}(TP_{T0}^{1 \rightarrow 3}) = \Phi^{-1}(PD_{T0+h}) - \Phi^{-1}(PD_{T0}) \quad (2)$$

$$\Phi^{-1}(TP_{T0+h}^{2 \rightarrow 3}) - \Phi^{-1}(TP_{T0}^{2 \rightarrow 3}) = \Phi^{-1}(PD_{T0+h}) - \Phi^{-1}(PD_{T0}) \quad (3)$$

where  $\Phi^{-1}$  denotes the standard normal inverse cumulative distribution function. This normal inverse transformation ensures that transition probabilities remain bounded in the  $[0, 1]$  interval.

### Bridge equations for non-default transitions

The projection of the remaining elements of the transition matrices, namely  $TP^{1 \rightarrow 2}$  and  $TP^{2 \rightarrow 1}$ , is based on empirically estimated bridge equations at the portfolio level. These equations capture the historical co-movement between default and non-default transitions. Equation (4) models the relationship between  $TP^{1 \rightarrow 2}$  and  $TP^{1 \rightarrow 3}$ , while equation (5) models the relationships between  $TP^{2 \rightarrow 1}$  and  $TP^{2 \rightarrow 3}$  respectively.

$$\Phi^{-1}(TP_t^{1 \rightarrow 2}) = a + b\Phi^{-1}(TP_t^{1 \rightarrow 3}) + \varepsilon_t \quad (4)$$

$$\Phi^{-1}(TP_t^{2 \rightarrow 1}) = c + d\Phi^{-1}(TP_t^{2 \rightarrow 3}) + \varepsilon_t \quad (5)$$

The coefficients  $b$  and  $d$  are expected to be positive and negative, respectively, reflecting the economic intuition that higher default rates are associated with more downgrades from Stage 1 (coefficient  $b > 0$ ) and fewer cures from Stage 2 (coefficient  $d < 0$ ). Empirically, an increase in transition rates from Stage 1 to Stage 3 is also associated with an increase in transition rates from Stages 1 to 2, since both reflect a deterioration in credit quality. Following the same reasoning, higher transition rates from Stages 2 to 3 are associated with lower transition rates from Stages 2 to 1. Scenario paths of  $TP^{1 \rightarrow 2}$  and  $TP^{2 \rightarrow 1}$  are then constructed by applying the estimated slopes  $b$  and  $d$  to the scenario-conditional changes  $TP^{1 \rightarrow 3}$  and  $TP^{2 \rightarrow 3}$ .

For  $TP^{1 \rightarrow 2}$ :

$$\Phi^{-1}(TP_{T0+h}^{1 \rightarrow 2}) - \Phi^{-1}(TP_{T0}^{1 \rightarrow 2}) = b(\Phi^{-1}(TP_{T0+h}^{1 \rightarrow 3}) - \Phi^{-1}(TP_{T0}^{1 \rightarrow 3})) \quad (6)$$

For  $TP^{2 \rightarrow 1}$ :

$$\Phi^{-1}(TP_{T0+h}^{2 \rightarrow 1}) - \Phi^{-1}(TP_{T0}^{2 \rightarrow 1}) = d(\Phi^{-1}(TP_{T0+h}^{2 \rightarrow 3}) - \Phi^{-1}(TP_{T0}^{2 \rightarrow 3})) \quad (7)$$

### Completing the transition matrix

Lastly, the scenario paths of the transition probabilities  $TP^{1 \rightarrow 1}$  and  $TP^{2 \rightarrow 2}$  are calculated as residuals to ensure that the probabilities in each row sum to one, with a floor at zero in accordance with equations (8) and (9).

$$TP_{T0+h}^{1 \rightarrow 1} = \max(1 - TP_{T0+h}^{1 \rightarrow 2} - TP_{T0+h}^{1 \rightarrow 3}, 0) \quad (8)$$

$$TP_{T0+h}^{2 \rightarrow 2} = \max(1 - TP_{T0+h}^{2 \rightarrow 1} - TP_{T0+h}^{2 \rightarrow 3}, 0) \quad (9)$$

### Integration with lifetime ECL projections and beyond-horizon assumptions

Once scenario-conditional transition matrices are generated over the three-year MST horizon, under both the baseline and adverse scenarios, they are combined with stage-specific loss-given-default

(LGD) values and effective discount rates to produce stage-specific ECL projections, as detailed in FSR 2022. Beyond the three-year stress-test horizon, because the average residual maturity of loans exceeds the projection window, credit-risk parameters are extended to calculate IFRS 9 lifetime provisions. In line with the EBA approach, after 2028, these parameters are held constant under the baseline scenario, while under the adverse scenario, they gradually converge to their 2028 baseline values over a six-year period. Thus from 2034 onwards, all adverse-scenario credit-risk parameters are assumed to equal their 2028 baseline levels. In addition, supervisory minimum coverage expectations for NPEs are applied as an overlay to IFRS 9 provisions, ensuring that provisioning reflects not only model-based estimates but also prudential expectations linked to the age of the exposure, its classification as legacy or newly defaulted, and the presence of collateral as explained in FSR 2022.

### Robustness check: Back testing results for 2025

The performance of the upgraded credit-risk module was assessed using an out-of-sample back-test, comparing projected transition matrices for 2025 with the corresponding observed outcomes, across the three main portfolios. For each portfolio and approach, the Root Mean Squared Error (RMSE) of the transition probabilities serves as an aggregate measure of deviation between estimated and observed migration patterns. This metric confirms that the new approach improves the overall fit for the most significant credit portfolios, notably reducing the error term from 14.9 to 7.5 for NFCs and from 8.0 to 1.8 for Mortgages (see Table 1).

The stage-level results help explain these aggregate patterns (see Table 2). For NFCs and mortgages, the new approach clearly outperforms the Z-factor benchmark across the main stages. In fact, the mean error in Stage 2 falls by 13.4 percentage points for NFCs and 10.4 percentage points for mortgages (see Table 2, column 2). This suggests that modelling default rates directly

**Table 1**  
**DIFFERENCE BETWEEN OBSERVED AND ESTIMATED TRANSITION MATRIX**  
*RMSE*

	New approach	Z-factor	Δ
NFCs	7.5	14.9	-7.4
Mortgages	1.8	8.0	-6.1
Consumer credit	8.4	6.3	2.1

Source: Central Bank of Malta.

Note: RMSE of one year transition probabilities between observed and model implied transition matrices for 2025. RMSE is expressed in percentage points. The "Δ" column represents the percentage point improvement of the new methodology over the previous Z-factor benchmark. Lower values indicate a better fit of the overall transition matrix.

**Table 2**  
**DIFFERENCES BY CREDIT PORTFOLIO AND STAGES**  
*Average absolute deviation; percentage points*

	Stage 1	Stage 2	Stage 3
NFCs	-0.39	-13.42	4.74
Mortgages	-1.35	-10.43	-0.21
Consumer credit	-1.48	2.85	1.74

Source: Central Bank of Malta.

Note: Difference in average absolute deviation (AAD) of stage specific transition probabilities in 2025 under the new framework relative to the Z factor benchmark, by credit portfolio and IFRS 9 stage. Values are expressed in percentage points. Negative numbers indicate an improvement (a smaller average deviation from observed transitions), and positive numbers indicate a deterioration.

as the macro-sensitive driver provides a more reliable and stable basis for identifying deteriorating exposures before they transition to non-performing status.

By contrast, the results for consumer credit are mixed. The bridge equation enhances Stage 1 modelling (-1.48 percentage points), but weaker results in Stages 2 and 3 offset this improvement, leading to an aggregate RMSE slightly higher than under the Z-factor benchmark. However, these results should be interpreted with some caution, as consumer credit is a relatively small portfolio, representing only 3.6% of the total credit as at December 2025.

In addition to the matrix-level diagnostics, a credit-weighted comparison was also conducted between the observed and estimated stage distributions. This analysis is particularly useful, as it scales the estimation error by the relative size of each portfolio segment, distinguishing between differences that are numerically large but economically less significant, as opposed to those more relevant from a portfolio perspective. The results show significant improvements in both Stages 1 and 2, where this new approach reduces the overall credit-weighted difference by 3.3 percentage points (see Table 3). This approach is particularly relevant for modelling the transition probabilities for Stage 1, not only improving the flow for new stages, but also reducing the error in the Stage 1 stock by 1.43 percentage points. Taken together, this suggests that the most relevant effect is concentrated in the largest segment, while the remaining differences are comparatively limited. The out-of-sample fit for Stage 3 exposures is relatively weaker; however, this is of limited significance in the stress-testing framework. First, under the adverse scenario, Stage 3 is treated as a fully absorbing state and therefore does not require further modelling of onward transitions. Second, movements in Stage 3 loans tend to be highly volatile and are less impacted by the macroeconomic variables included in the framework than by bank-specific factors such as balance-sheet dynamics, write-offs, cures, forbearance measures and other resolution actions.

**Table 3**  
**WEIGHTED DIFFERENCE BETWEEN OBSERVED AND ESTIMATED STAGES**

Stages	S1	S2	S3
S1	-1.43%	-0.76%	-0.67%
S2	-0.14%	-0.29%	-0.04%
S3	0.05%	0.06%	0.14%

Source: Central Bank of Malta.

Note: Credit weighted difference between observed and model implied stage distributions at the end of 2025, by originating and destination IFRS 9 stage. Figures are expressed in percentage points of total exposure. Negative values indicate that the model slightly overestimates the corresponding stage share, while positive values indicate underestimation.

Given the weaker results for Stage 3, an additional comparison was conducted to assess how accurately each method replicates the PD ( $TP^{1\rightarrow3}$  and  $TP^{2\rightarrow3}$ ). The RMSE results show that this new method reduces error relative to the Z-factor benchmark across all three portfolios, with the largest improvement in mortgages, followed by consumer credit and NFCs (see Table 4, column 1). The standard deviation of the errors points in the same direction, suggesting that the bridge approach delivers a more stable fit across the two stage-to-default flows (see Table 4, column 2). Finally, the PD bias summarizes how model-implied probabilities of default compare to observed defaults, with negative values indicating a conservative (over-predicting) calibration. Both methods exhibit a small negative PD bias, but the deviation under this new approach remains closer to zero, implying a more balanced PD profile and more realistic results across all three credit segments (see Table 4, column 3). Overall, the evidence points to a more accurate, more balanced, and better-calibrated PD profile under this new framework.

**Table 4**  
**PD ANALYSIS**

	Metrics		
	RMSE	Std. Dev.	PD Bias %
NFCs	-1.54	-2.96	-0.30
Mortgages	-12.01	-11.37	-0.94
Consumer credit	-4.23	-3.26	-0.36

Source: Central Bank of Malta.

Note: RMSE, standard deviation of errors and mean bias of model implied PD in 2025, by credit portfolio. Metrics are computed across the Stage 1 to Stage 3 and Stage 2 to Stage 3 transition flows. PD bias is defined as the percentage deviation between model implied and observed default flows, calculated as  $(\text{estimated } S1 \rightarrow S3 + \text{estimated } S2 \rightarrow S3) / (\text{observed } S1 \rightarrow S3 + \text{observed } S2 \rightarrow S3) - 1$ . Negative PD bias values indicate a conservative (over predicting) calibration on average.

### Summary

This methodological upgrade significantly improves the bank's current credit risk module within the MST framework by delivering more realistic and detailed projections of baseline and adverse transition matrices. By replacing the current latent Z-factor modelling, with direct modelling of default rates and empirically grounded bridge equations, the new approach preserves information on stage-to-stage migration dynamics. The new methodology also offers stronger structural consistency and greater economic interpretability. The 2025 back-testing exercises indicate that the upgraded module provides a materially better fit for the main credit portfolios, particularly for transitions into default and for Stage 1 and Stage 2 loan stock projections, while also highlighting residual complexities in Stage 3 dynamics.

Looking ahead, the Bank intends to refine the credit risk module further by exploring potential extensions to the current framework. One area for further investigation is the development of more granular models for cure and write-off rates, which would enhance the precision of transition projections and better capture the interplay between credit migration and balance-sheet management. This ongoing work, combined with regular back-testing against realised outcomes and sensitivity analyses to alternative macro-financial scenarios, will ensure the framework's predictive performance and robustness remain fit for purpose in assessing systemic risks.

### References:

Budnik, K. et al. (2024). Advancements in stress-testing methodologies for financial stability applications, *ECB Occasional Paper Series* No. 348.

Gross, M. M., Laliotis, D., Leika, M., and Lukyantsau, P. (2020). *Expected credit loss modelling from a top-down stress testing perspective*. International Monetary Fund.

Gross, M., and Población, J. (2019). Implications of model uncertainty for bank stress testing, *Journal of Financial Services Research*, 55, pp. 31-58.

Raftery, A. E. (1995). Bayesian model selection in social research. *Sociological Methodology*, pp. 111-163.

*Financial Stability Report*, Central Bank of Malta, 2022.

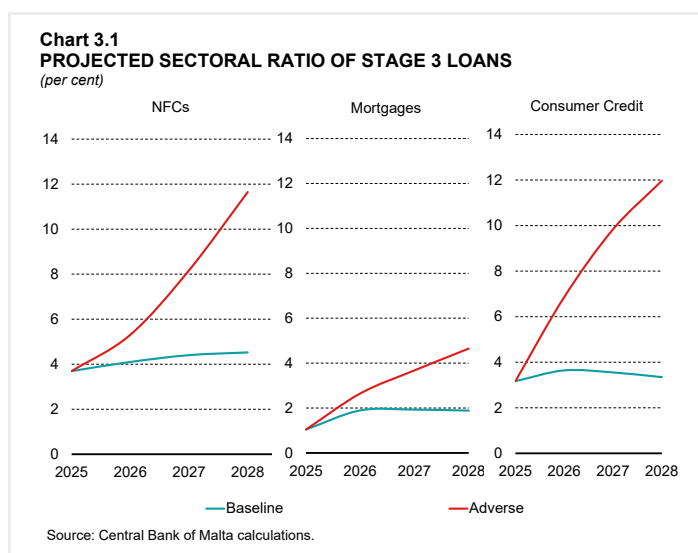
### 3.1.3 Results

#### Credit risk module – Stage 3 loans projections

Chart 3.1 shows the projected Stage 3 loan ratios for the banks tested under the baseline and adverse scenarios. Under the baseline scenario, the projections point to only a limited deterioration in asset quality, in line with previous exercises. This reflects a slowdown in economic growth within an otherwise resilient macroeconomic environment and the inherently more conservative nature of the static balance sheet assumption. For NFCs, the Stage 3 loan ratio increases from 3.7% at end-2025 to 4.5% by end-2028. Over the same horizon, the ratio for mortgage lending rises from 1.0% to 1.9%, while that for consumer credit increases marginally from 3.2% to 3.3%.

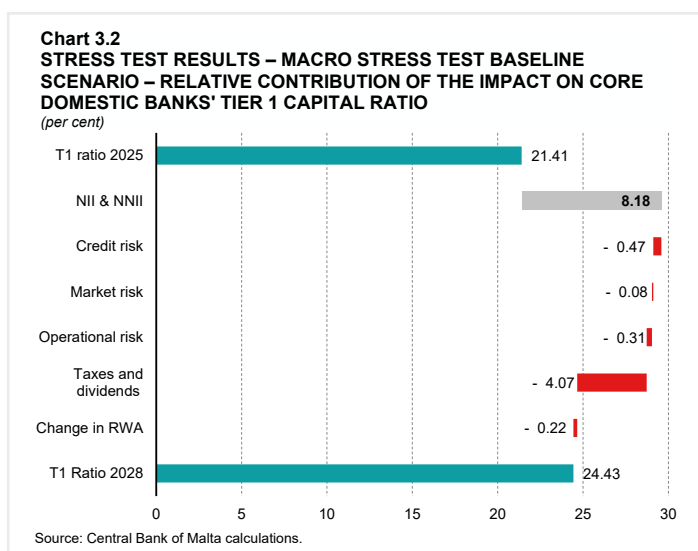
Under the adverse scenario, the deterioration in credit quality is considerably more pronounced. The Stage 3 loan ratio for NFCs rises to 11.6% by end-2028, while the corresponding ratio for mortgages reaches 4.6%. Consumer credit records the sharpest increase, with the Stage 3 ratio climbing to 12.0% by the end of the projection horizon.

These results suggest that NFC and consumer loans are more sensitive to a severe and persistent deterioration in macro-financial conditions than mortgage lending. This is consistent with historical evidence indicating that NPLs in NFC and consumer credit portfolios tend to be more volatile and more reactive to macroeconomic developments, whereas mortgage portfolios have typically exhibited lower and more stable NPLs. As shown in Chart 3.1, these differences are already evident at the starting point, with Stage 3 loan ratios at end-2025 substantially higher for NFC and consumer loans than for mortgage lending.



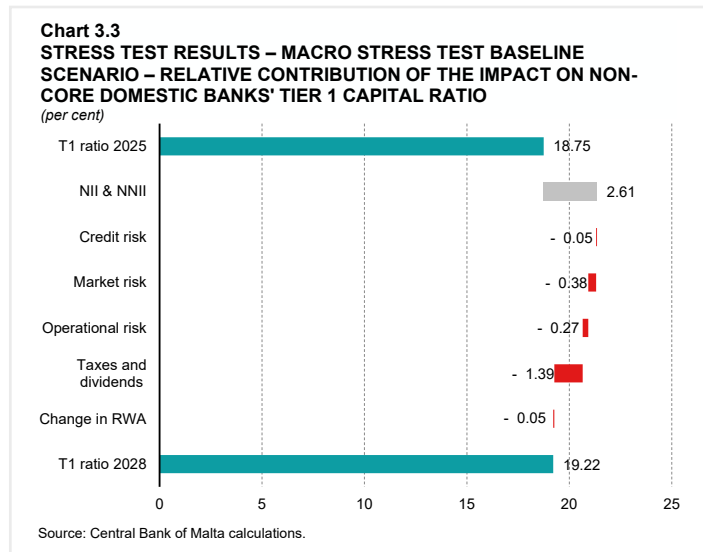
#### Overall results – Impact on banks' capital position

Charts 3.2 and 3.3 illustrate the cumulative three-year effect of the different risk modules on the Tier 1 capital ratio of core and non-core domestic banks under the baseline scenario. At the starting point of the exercise, core domestic banks were in a relatively comfortable solvency position, with a Tier 1 capital ratio of 21.41% at end-2025, compared with 18.75% for non-core domestic banks. The lower aggregate ratio for non-core banks relative to the previous



year is largely explained by the impact of the exit of a credit institution within this category following termination of its operations at end-2025.

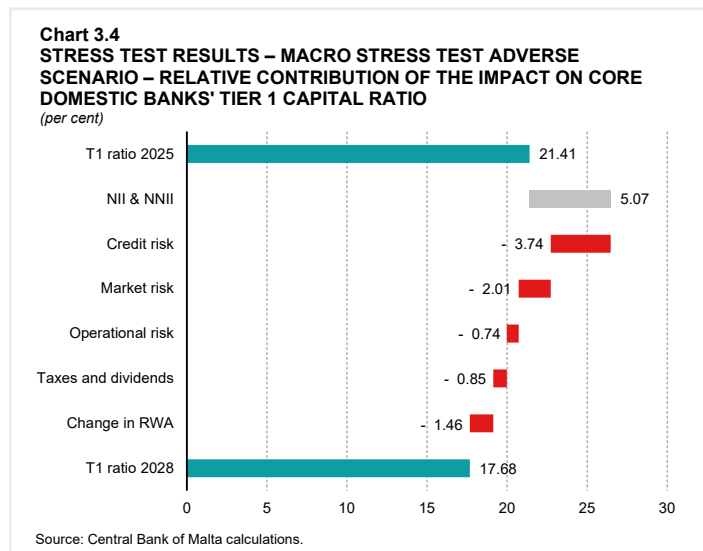
Under the baseline scenario, NII and NNII remain the main drivers of capital generation, contributing 8.18 percentage points for core domestic banks and 2.61 percentage points for non-core domestic banks. For both groups of banks, NII makes a positive contribution, while NNII has a smaller negative effect, resulting in an overall still positive combined income contribution. Positive effects of NII are partly offset by deductions arising from credit risk, market risk, operational risk, taxes and dividends, and changes in RWAs. For both core and non-core banks, taxes and dividends are the main drivers of the decline in the Tier 1 capital ratio, reflecting the impact of profit generation under the baseline scenario. This reduces the Tier 1 capital ratio by 4.07 percentage points for core banks and by 1.39 percentage points for non-core banks.



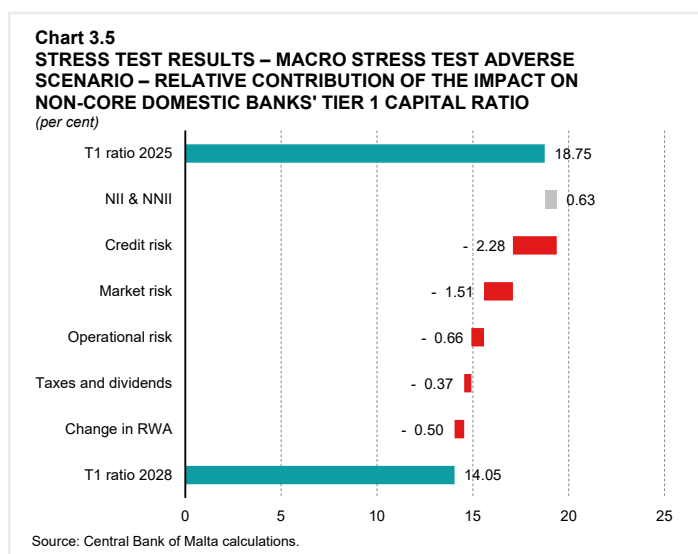
Taken together, the income contribution more than offsets the losses from the other risk components, resulting in an overall improvement in capital positions through retained earnings after applying the 35% corporate tax rate and the assumed 30% dividend payout ratio. Accordingly, the Tier 1 capital ratio of core domestic banks rises by 3.02 percentage points from 21.41% in 2025 to 24.43% in 2028, whereas that of non-core domestic banks increases more modestly by 0.47 percentage points from 18.75% to 19.22%. The stronger increase in Tier 1 capital recorded for core banks is consistent with their higher profitability relative to non-core banks and reflects a business model more focused on traditional lending activities, particularly mortgage lending, which accounts for a substantially larger share of core banks' loan portfolios and supports higher NII.

Charts 3.4 and 3.5 present the corresponding results under the adverse scenario. Relative to the baseline, the stressed macro-financial environment leads to a weaker positive contribution from NII and NNII, amounting to 5.07 percentage points for core domestic banks and 1.21 percentage points for non-core domestic banks, while losses from credit risk, market risk and higher RWAs become more significant.

Credit risk lowers the Tier 1 capital ratio by 3.74 percentage points for core banks and by 2.28 percentage points for non-core banks, while market risk accounts for a further reduction of 2.01 and 1.51



percentage points, respectively. For both groups of banks, the credit risk impact stems mainly from loans to NFCs, in line with the particularly severe effect of the adverse scenario on this segment and the pronounced increase in Stage 3 loan ratios shown in Chart 3.1. Consumer credit also adds to the deterioration, though to a lesser extent, given its smaller share in banks' loan portfolios. Additional negative contributions arise from operational risk, taxes and dividends, and changes in RWAs. As these effects outweigh the income contribution, the Tier 1 capital ratio of core domestic banks declines by 3.73 percentage points to 17.68%, while that of non-core domestic banks falls by 4.7 percentage points to 14.05%.



MST results are subsequently benchmarked against banks' supervisory and regulatory capital requirements to assess the extent to which capital buffers are depleted under stress. On an aggregate basis, both core and non-core domestic banks remain above the regulatory minimum across both scenarios. At the individual bank level, all core domestic banks continue to pass the stress test, whereas one non-core domestic bank breaches the minimum required Tier 1 capital ratio in the final year of the adverse scenario. This mirrors the bank's loss-making position in the last year reported, which is further amplified over the projection horizon mainly by additional impairment charges and the materialization of market risk.

## 3.2. Sensitivity analyses

### 3.2.1. Credit quality deterioration

This sensitivity test aims to assess the vulnerability of portfolios of debt securities across core domestic, non-core domestic, and international banks to adverse shocks in credit-quality. In the context of rising geopolitical tensions and heightened market volatility, deterioration in credit-quality has become a key risk factor for investment holdings, particularly for those with greater exposure to volatile or economically vulnerable markets. Accordingly, banks that do not hold debt securities are excluded from the analysis.

Under this framework, the MST's market risk module is slightly modified and applied in isolation to quantify the impact arising from credit quality deterioration using two different approaches. Bonds accounted at FV are repriced following a widening of credit spreads, as sourced from the EBA's EU-wide stress testing exercise for sovereign securities. For non-sovereign securities, shocks are quantified using the credit spread measured based on the iTraxx European Senior Financial Index 5y.<sup>11,12</sup> For bonds measured at AMC, impairment losses are recognised and quantified using higher probabilities of default associated with a three-notch downgrade in their official rating.

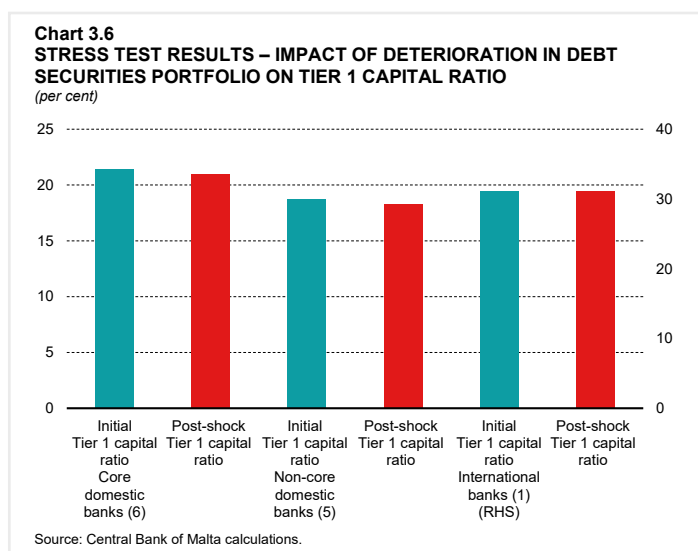
As of December 2025, banks continued to invest in debt securities considered as investment grade bonds,<sup>13</sup> with the share of such bonds in overall bond holdings at 100% in the case of core domestic banks', 97.4%

<sup>11</sup> The Credit spreads applied follow the 2025 EU-wide stress testing haircuts, calibrated by country of exposure and residual maturity of each instrument

<sup>12</sup> The applied shock corresponds to the closest 99<sup>th</sup> percentile of the right tail of the historical distribution of the iTraxx EU Senior Financial five-year index over the 2016-2025 period.

<sup>13</sup> The rating grades are based on an internal index capturing the second-best credit rating of the four major external credit assessment institutions (ECAIs): namely Fitch; Moody's; Standard & Poor's; and DBRS Morningstar. The investment-grade bonds are composed by those rated BBB- or higher by S&P and Fitch, and Baa3 or higher by Moody's. Entities and obligations under this category generally have relatively low to moderate credit risk of default on debt obligations, with stronger capacity to meet their financial commitments.

for non-core domestic banks', and 100% among international banks. In terms of bond accounting treatment classification, the share of total bond holdings measured at FV remained relatively low across banks, at 21% and 33% for core domestic and non-core domestic banks, respectively. Meanwhile, the share of total bonds at AMC accounted for 79%, 67% and 100% for core domestic, non-core domestic, and international banks, respectively. This reflects the banks' preference to insulate these holdings from market movements and to retain these instruments until maturity.



As illustrated in Chart 3.6, the impact of credit quality deterioration in debt securities across bank categories is marginal, resulting in Tier 1 capital ratios of 21.09%, 19.28% and 31.07% for core domestic, non-core domestic and international banks, respectively. At the aggregated level, these results suggest that the direct capital impact from this specific shock remains limited for Maltese banks stemming from market adjustments such as downward repricing of instruments and assumed higher default probabilities. In addition, as USD-denominated debt securities are relatively small in aggregate, any further escalation of geopolitical tensions is unlikely to have a direct material impact due to a deterioration in the USD.

These results are similar to those reported at the end of December 2024. If such an extreme scenario were to materialise, all three categories of banks would have sufficient room to absorb potential capital losses relative to the minimum regulatory requirements. At the individual bank level, all banks in scope would be able to absorb this impact, with the resulting capital ratio exceeding their respective Total SREP Capital Requirements (TSCRs).

### 3.3. Interest Rate Risk in the Banking Book

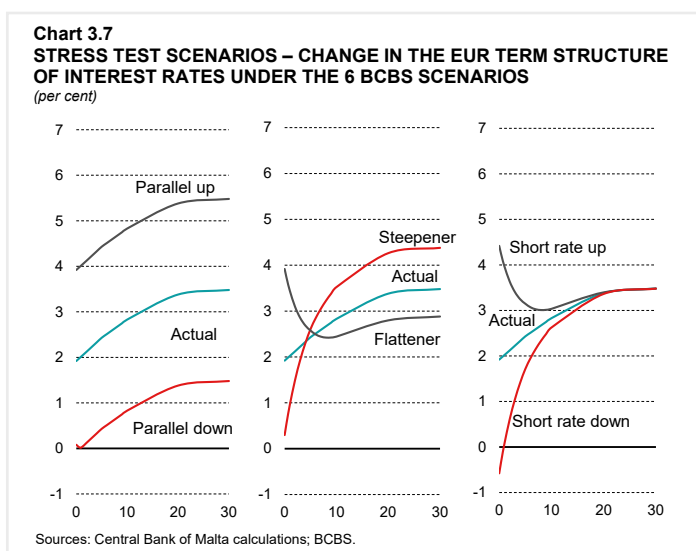
The Interest Rate Risk in the Banking Book (IRRBB) framework assesses the potential risk stemming from shocks that change the shape and slope of the yield curve and affect banks' business models. The stress framework assesses the immediate-term impact of changes in interest rates, which impacts banks' profitability via NII and the revaluation of bonds held by banks at FV in response to different shocks to the yield curve structure.

To capture all potential shifts in the yield curve, the assessment follows the scenarios prescribed in Annex 2 of the 2016 Basel Committee on Banking Supervision (BCBS) standards.<sup>14</sup> These scenarios are designed to capture a range of potential yield curve movements, including parallel upwards and downwards shocks, as well as non-parallel shifts affecting different segments of the curve. In particular, they comprise shocks to short-term rates (*short-rate up* and *down* scenarios) and slope scenarios, namely *steepener* and *flattener* shocks, which reflect opposite movements in short and long-term interest rates. Together, the six scenarios stress the term structure of the yield curve and are applied to the yield curve as at the December 2025 reference date. The scenarios also differ by currency denomination, resulting in different shocks for EUR, GBP, and USD-denominated instruments. Shocks applied to these currencies range from 100 to 250 basis points for EUR and from 150 to 300 for GBP and USD.

<sup>14</sup> These scenarios are also embedded in the European Banking Authority (EBA) Implementing Technical Standards (ITS) on IRRBB (EBA/ITS/2023/03) and corresponding templates as part of EBA reporting framework 3.4.

Chart 3.7 presents the shifts in the EUR term structure under the six tested scenarios as at December 2025.<sup>15</sup>

The first component of this exercise assesses the impact of interest rate movements on NII over a 12-month period. A static balance sheet assumption is adopted, whereby instruments that mature within the one-year horizon are rolled over with similar instruments at the prevailing yield and characteristics under the respective scenario. As such, the composition of the loan portfolio is assumed to remain unchanged, with no effects arising from changes in credit demand or potential deterioration in asset quality due to higher debt servicing costs from additional NPLs.



Within the IRRBB framework, interest rate shocks are applied directly to the reference rates of interest-bearing loans and deposits. For most banks, the loan reference rate is set internally, typically as a margin over deposit rates, while a smaller share of exposures, often linked to NFC lending, is tied to market rates. Consequently, as the vast majority of loans are set at variable rates, there will be an immediate impact on these income-earning instruments. In contrast, if deposits are of a longer and fixed-term nature, they may not be significantly affected by changes in the curve, as these instruments may not mature immediately and therefore are not replaced by instruments with different rates. The pass-through of changes in policy rates to lending and deposit rates in Malta is generally limited.

In the case of NII, the analysis focuses on EUR, GBP and USD, which represent the material currencies in which banks' banking book positions are denominated. Among non-Euro currencies, GBP and USD are the most relevant across the three banking categories. Overall, these three currencies account for 99%, 97% and 88% of the foreign currency banking book of core domestic, non-core domestic and international banks, respectively. The euro remains the dominant currency, representing 96%, 76% and 84% of the banking book across these three categories of banks.

Based on the revaluation analysis for December 2025, core domestic, non-core domestic, and international banks continue to hold relatively small shares of bonds measured at FV, representing 21%, 33% and 0% of their total bond holdings, respectively (see Table 3.4 in Section 3.4). Although core domestic banks retain the largest proportion of bonds measured at FV, accounting for 93% compared to 7% for non-core domestic banks, it is the latter that experience the biggest impact, particularly under both *parallel up* and *parallel down*. This is primarily driven by non-core domestic banks' significant reliance on long-term instruments, making them more vulnerable to changes in interest rates and roll-over risk.

As shown in Table 3.2, the IRRBB exercises have consistently shown that *short-rate-up* scenarios are net positive for capital, with higher NII more than offsetting re-valuation losses on bonds accounted for at FV. The scenarios featuring short-term increases in interest rates, namely, *parallel up*, *flattener* and *short rate up*, all yield positive results for the three bank categories. The most positive impact is observed under the *short-rate-up* scenario for core domestic and international banks, where the Tier 1 capital ratio increases by 2.1 and 1.68 percentage points, respectively. Non-core domestic banks experience the greatest positive impact under the *flattener*, with the Tier 1 capital ratio increasing by 1.93 percentage points. The least positive impact is observed under the *short-rate-down* scenario, in which interest rates decline over the near-term horizon of up to one year. Under this scenario, the Tier 1 capital ratios of the bank categories drop by 1.54, 1.64 and 1.51 percentage points for the respective categories of banks.

<sup>15</sup> The starting yield curve for GBP and USD differs by the respective currency; however, both curves experience similar shifts under the same scenarios.

Overall, non-core domestic banks are the most impacted across the three adverse scenarios: *parallel down*, *steepener*, and *short rate down*. Among these scenarios, the *short rate down* scenario has the largest effect, both in NII alone or when combined with debt securities revaluation effect. The results show that, under this scenario, Tier 1 capital for non-core domestic banks declines by 1.64 percentage points to reach 17.81%. This is primarily explained by a relatively higher exposure to USD-denominated assets and liabilities, compared with other banks segments, reflecting a higher shock on USD exposures compared with the EUR.

The magnitude of these results is in line with previous IRRBB exercises. Since 2022, the *short-rate-up* scenario has typically increased core domestic banks' Tier 1 capital ratio by around 2-3 percentage points and between 1.5-2.3 percentage points for noncore domestic and international banks, while *short-rate-down* scenarios have reduced Tier 1 ratios by about 1.4-2 percentage points across bank categories.

**Table 3.2**  
**STRESS TEST RESULTS – IRRBB FRAMEWORK – RELATIVE IMPACT OF CHANGES**  
**IN INTEREST RATES ON THE TIER 1 CAPITAL RATIO**  
(per cent)

		Core domestic banks	Non-core domestic banks	International banks
Initial Tier 1 capital ratio		21.41	19.45	31.07
Parallel up	<i>NII</i>	2.13	1.80	1.38
	<i>Revaluations</i>	-0.91	-1.26	0.00
	Post-shock Tier 1 capital ratio	22.63	19.99	32.45
Parallel down	<i>NII</i>	-1.69	-1.71	-1.24
	<i>Revaluations</i>	1.24	3.56	0.00
	Post-shock Tier 1 capital ratio	20.96	21.30	29.83
Flattener	<i>NII</i>	2.01	1.59	1.34
	<i>Revaluations</i>	-0.12	0.33	0.00
	Post-shock Tier 1 capital ratio	23.30	21.37	32.41
Steeper	<i>NII</i>	-1.27	-1.24	-0.97
	<i>Revaluations</i>	-0.01	-0.40	0.00
	Post-shock Tier 1 capital ratio	20.13	17.81	30.10
Short rate up	<i>NII</i>	2.52	2.00	1.68
	<i>Revaluations</i>	-0.42	-0.27	0.00
	Post-shock Tier 1 capital ratio	23.51	21.18	32.75
Short rate down	<i>NII</i>	-1.97	-1.92	-1.51
	<i>Revaluations</i>	0.44	0.28	0.00
	Post-shock Tier 1 capital ratio	19.88	17.81	29.56

Source: Central Bank of Malta calculations.

### 3.4 Liquidity stress tests

To assess the liquidity position of domestic banks and to identify potential vulnerabilities, the Bank employs three complementary frameworks in its stress-testing toolkit. The first framework is the persistent deposit withdrawals (PDW) framework, which evaluates banks' ability to meet their financial obligations in a bank-run type scenario over a four-week survival period. This framework includes a liquidity-to-solvency dimension whereby the impact of the bank run also translates into an impact on capital. The second framework studies the LCR, which assesses banks' ability to withstand adverse scenarios involving high outflows during a 30-day period. The third framework relates to the NSFR, which focuses on the longer-term liquidity position across four adverse scenarios by assessing the funding structure and relative stable funding availability.

The latter two frameworks play a pivotal role in evaluating the banking system, benchmarking their assessment against regulatory minimum requirements, while the PDW offers a broader assessment of a bank's liquidity performance.

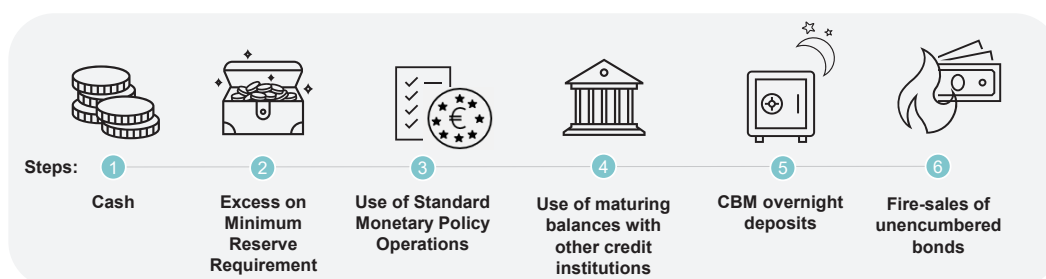
Over the past four FSR vintages, the three liquidity frameworks – PDW, LCR and NSFR – have consistently indicated that all banks operate with ample liquidity buffers, both in the short term, long term and from a structural funding perspective. While the 2023-2024 tightening cycle temporarily improved liquidity ratios via elevated central bank placements and higher corresponding remunerations, the latest results suggest that core domestic and non-core domestic banks continue to maintain sizeable buffers over regulatory minimum requirements, placing the system in a comfortable position to be able to absorb severe system-wide outflows.

### 3.4.1 PDW framework

The PDW framework assumes a bank-run type scenario where a persistent outflow of deposits, in order to assess a bank’s ability to maintain sufficient liquidity buffers, defined as Counterbalancing Capacity (CBC), to meet liquidity needs arising from such outflows. Figure 3.1 presents the assumed hierarchy for the composition of CBC, which comprises liquidity assets such as cash, the use of bonds pledged as collateral for standard monetary policy operations, and the fire-sale of unencumbered and ESCB-ineligible bonds.<sup>16</sup> This hierarchy is based on the assumptions that banks primarily use the instruments that present the least costs e.g. cash, followed by excess on minimum reserve requirements, and then move on to those instruments that are more costly to use.

To assess the bank-run scenario, the framework features an instantaneous 100% withdrawal of all credit lines and deposits with the parent, subsidiaries, and other credit institutions, combined with steady, regular run-off from sight and fixedterm deposits maturing within the test horizon. These cumulative run-off rates are set at up to 10% for retail and corporate customer demand deposits, 25% for fixedterm deposits, and 30% for retail deposits sourced from online deposit platforms (ODPs). The higher outflows assumed for this latter category reflect the generally more rate-sensitive and less relationship-driven nature of deposits. As these funds can be transferred quickly and at low cost, they may exhibit greater volatility and be more prone to rapid withdrawals under stress conditions (see dynamics of ODPs for more details).

**Figure 3.1**  
**ASSUMED HIERARCHY FOR CBC**



Source: Central Bank of Malta.

## DYNAMICS OF ONLINE-DEPOSIT PLATFORMS (ODPs)

As of December 2025, ODP-funded deposits remained limited in core domestic banks but were more significant in non-core domestic and international banks. The share of deposits sourced from ODPs stood at 0.05% for core domestic banks, compared with 23% for non-core domestic banks and 31% for international banks (see Table. 3.3). Participation also differed across categories: two core domestic, four non-core domestic, and three international banks used digital platforms.

Despite a 14 percentage-point decline in ODP participation compared with December 2024, two bank categories continued to rely on this platform. While, ODP volumes remained stable for international banks, core domestic and non-core domestic banks reported substantial declines of 93% and 15%, respectively, in their total ODPs funding. An assessment of the composition indicates that these deposits

<sup>16</sup> Refer to Section 3.2.1 of the [FSR 2023](#) where the list was introduced.

are predominantly fixed-term, accounting for 100%, 73% and 100% of total ODPs across the three categories. Indeed, international banks exhibit a longer maturity profile, maintaining the largest proportion of ODPs in the maturity bucket of more than three months up to two years, which accounts for 78% of their total funding sourced via ODPs (79% in the more than three months to five years bucket). Notably, these deposits offer easy access and an alternative source of flexible funding, but may also increase deposits' competition. Nevertheless, the associated risks arising from liquidity constraints and interest rate movements have so far remained relatively limited, as a large share of these liabilities are fixed-term deposits.

**Table 3.3**  
**COMPOSITION OF ONLINE DEPOSIT PLATFORMS (ODPs)**

	Core domestic banks		Non-core domestic banks		International banks	
	Dec. 2024	Dec. 2025	Dec. 2024	Dec. 2025	Dec. 2024	Dec. 2025
ODPs as a share of total deposits	0.42%	0.05%	25%	23%	36%	31%
ODPs on Demand (% of total deposits)	0%	0%	10%	27%	1%	0%
ODPs on Fixed-term deposit (% of total deposits)	100%	100%	90%	73%	99%	100%
<i>ODPs up to three months (% of total deposits)</i>	76%	92%	74%	57%	9%	21%
<i>ODPs more than three months (% of total deposits)</i>	24%	8%	15%	17%	90%	79%

Source: Central Bank of Malta.

From a geographical perspective, ODPs are third-party providers primarily based in Germany that act as partners to various banks across Europe. Maltese banks are increasingly utilising these digital platforms to connect with a broader client base across Europe. In essence, core domestic and international banks are exclusively linked to German platforms, whereas non-core domestic banks reported 80% of exposures to German ODPs, with the remaining 20% to ODPs based in the UK.

### Overview of composition of liquid assets

Bonds constitute an essential component of total assets, supporting the financial needs of both governments and corporations, and complementing traditional bank lending. Accordingly, Table 3.4 presents an assessment of the bond portfolio composition in terms of credit rating, valuation treatment and overall encumbrance and eligibility for ESCB standard monetary policy operations.

**Table 3.4**  
**ENCUMBRANCE AND ESCB ELIGIBILITY OF THE BOND PORTFOLIO**

	Core domestic banks		Non-core domestic banks		International banks	
	Dec. 2024	Dec. 2025	Dec. 2024	Dec. 2025	Dec. 2024	Dec. 2025
Bonds as a share of total assets	33%	35%	19%	16%	0.1%	0.1%
Bonds at investment grade	100%	100%	96%	97%	100%	100%
Bonds held at AMC	80%	79%	69%	67%	100%	100%
Bonds held at FV <sup>(1)</sup>	20%	21%	31%	33%	0%	0%
Encumbered	11%	11%	45%	39%	0%	0%
Unencumbered and ESCB eligible	80%	84%	24%	28%	78%	100%
Unencumbered and ESCB ineligible	9%	5%	31%	33%	22%	0%

Source: Central Bank of Malta.

<sup>(1)</sup> Bonds at FV can be accounted at FVTPL or at FVOCI. In December 2025, practically all FV bonds were measured at FVOCI as the share of FVTPL amounted to 0.03%.

As of December 2025, debt securities represented 35%, 16% and 0.1% of total assets to core domestic, non-core domestic and international banks, respectively. From a valuation treatment perspective, the bonds are highly concentrated in AMC, followed by FV. The former represented 79%, 67% and 100% for the three categories, respectively, while the latter accounted for 21% of core domestic banks and 33% of non-core domestic banks. All banks hold investment-grade bonds (rated BBB- or better), at 100% for both core domestic and international banks, and 97% for non-core domestic banks.

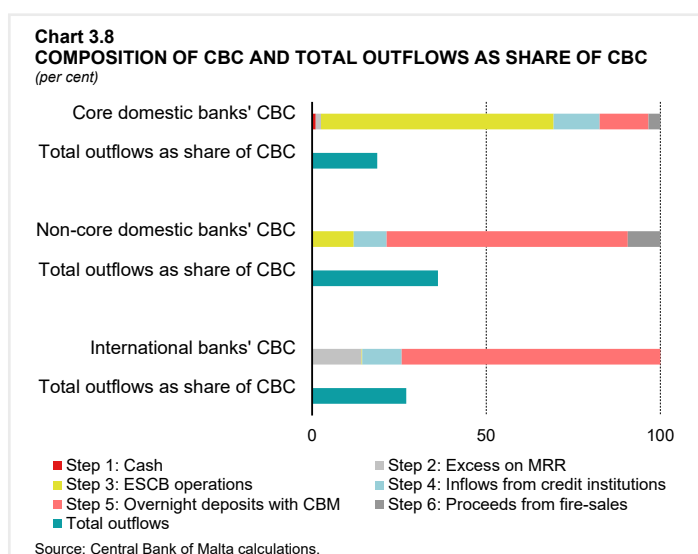
In terms of encumbrance, core domestic and international banks hold a very low share of encumbered instruments, meaning that such instruments can be utilized to generate additional liquidity as needed. The higher share of ESCB-eligible bonds reinforces the prudent strategy followed by banks, which have been mainly investing in instruments eligible for standard monetary policy operations attracting lower haircuts, and thereby mitigating risks during a market stress episode.

### Simulating the liquidity outflows linked to the bank-run scenario

As of December 2025, the largest contributor to the CBC for core domestic banks remained the instruments available for standard monetary operations (step 3), which represents 67% of total CBC. This is followed by 13% of inflows from credit institutions (step 4) and a further 14% of placements held with the Central Bank of Malta (step 5). In contrast, for non-core domestic banks and international banks, the main contributor relates to the placements held with the Central Bank of Malta (step 5), accounting for 69% and 74%, respectively. The second-largest component of their CBC consist of inflows from credit institutions (step 4), which accounted for 9% and 11%, respectively. Overall, all bank categories maintain comparable and relatively small proportions of balances with credit institutions as a complementary source of liquidity, limiting concentration in this funding source (see Chart 3.8).

The PDW test results confirm the banking system’s resilience to a severe bankrun. Banks’ resistance to this adverse scenario has been broadly stable for core domestic banks but has improved for non-core domestic banks when compared with earlier exercises. Combined outflows over the four-week horizon have remained close to 19-20% of CBC for core domestic banks across the 2023-2025 vintages, leaving around four-fifths of their initial buffer intact even under the assumed instantaneous withdrawal of interbank funding. Over the same vintages, the share of CBC consumed by non-core domestic banks ranged from 36% to 43%, reflecting higher levels of central bank placements and unencumbered eligible securities held by these banks. In addition, at the aggregate level international banks had sufficient CBC to cover deposit withdrawals without resorting to the market for additional funding, even when considering that outflows for international banks increased in the test to 27% of CBC available, following a higher share of deposits on ODP platforms. For the remaining two bank categories, the extent of outflows remained relatively stable.

At the individual bank level, one non-core domestic and one international bank would exhaust the CBC before this four-week horizon. This is, however, reflective of the rather strict assumption of a full withdrawal of credit-institution placements, and higher reliance on interbank funding. Nevertheless, most institutions would retain an excess of CBC of at least 11%, allowing them to withstand further withdrawals beyond the four-week horizon considered.



All in all, the exercise results point to a banking system that has a sufficiently strong funding structure and enough liquidity to face a consistent and extreme deposit withdrawal scenario, even when considering that some banks are exposed to more volatile deposits via the ODP platforms.

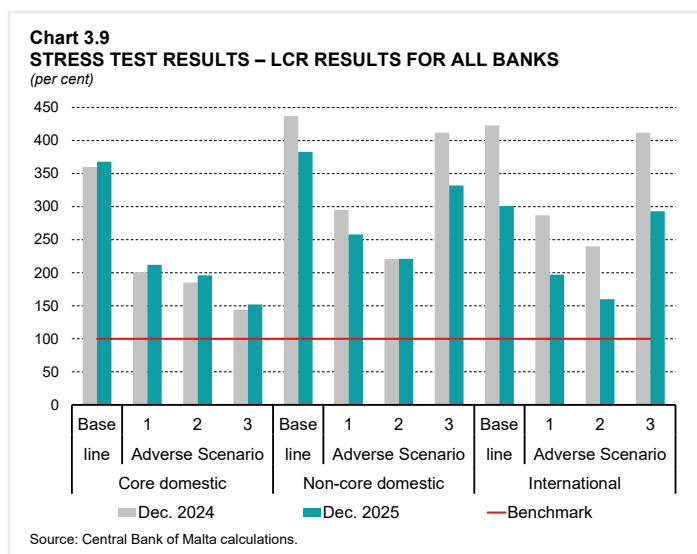
### 3.4.2 LCR framework

This framework assesses banks' resilience in withstanding periods of increased liquidity pressure relative to the 100% minimum LCR requirement. To assess banks' liquidity resilience, the framework considers a baseline and three adverse scenarios, by targeting banks' liquidity buffers of HQLA and net outflows occurring over a 30-day horizon. Detailed information on these scenarios is presented in Table 3.5.

As of December 2025, the LCR for core domestic banks stood at 367%, up from 359% in the previous year, whilst non-core domestic and international banks reported a decrease from 437% to 387% and from 422% to 300%, respectively. The decrease in the latter two categories stems mainly from lower HQLA volumes, which dropped by 14% and 9%, respectively. This decrease was mainly driven by cash and central bank reserves, reflecting the lower remuneration of these assets. The variation in net outflows differs between the two bank categories: non-core domestic banks show results similar to December 2024, while international banks show an increase of 28%. Chart 3.9 presents the results of the LCR framework for the three categories under the assumed scenarios for December 2024 and December 2025.

The LCR stress test framework continues to confirm that all bank categories can absorb substantial outflows. For core domestic banks, the largest impact was observed under adverse scenario 3; however, banks remain comfortably above the 140%-160% level across vintages, while non-core domestic and international banks continue to show higher buffers ranging from 250% to 350%.

Under adverse scenario 1, the LCR for core domestic, non-core domestic, and international banks declines by 156, 127, and 104 percentage points to 212%, 261% and 197%, respectively. All three bank categories show a significant drop in their LCR, demonstrating high sensitivity to outflow shocks. Notably, core domestic banks experience the smallest impact, given that retail deposits are their main



**Table 3.5**

#### DESCRIPTION OF LCR FRAMEWORK'S BASELINE AND ADVERSE SCENARIOS

Scenario	Description
Baseline	Haircuts and outflow/inflow rates set out in the (EU) 2015/61
Adverse: Scenario 1	Higher outflows compared to the LCR Delegated Regulation
Scenario 2	Scenario 1 with additional withdrawals from both resident and non-resident time deposits
Scenario 3	Baseline scenario with full withdrawal of committed facilities to NFCs and households

Source: Central Bank of Malta.

source of funding, which are subject to the least severe shocks compared with other types of outflows. By contrast, non-core domestic banks and international banks appear more structurally exposed to wholesale funding shocks, as their funding structures are more concentrated in wholesale funding, which is subject to greater outflow assumptions.<sup>17</sup>

Under adverse scenario 2, which builds on scenario 1 but includes additional withdrawals from resident and non-resident time deposits exceeding 30 days, the LCR drops by 172, 164 and 141 percentage points to reach 196%, 224% and 160% for core domestic banks, non-core domestic banks and international banks, respectively.

Under adverse scenario 3, the LCR reaches 152%, 336% and 293% for the three categories, respectively, dropping by 216, 52, and 8 percentage points, respectively. The biggest impact is reflected on core domestic banks given their higher share of committed facilities, which represents 17% of total outflows, followed by 6% for non-core domestic banks and 1.3% for international banks.<sup>18</sup>

At the individual bank level, all banks meet the minimum requirement under the baseline scenario. However, four banks would not be able to remain above the 100% minimum requirement in at least one adverse scenario due to the magnitude of the applied shocks and their heavy reliance on the components associated. Three of four banks exhibit vulnerabilities related to their share of non-resident deposits, while two of four show vulnerabilities stemming from committed facilities. These risks are partially mitigated by the availability of HQLA and access to central bank facilities. As in previous exercises, these shortfalls are concentrated in a small group of banks, reflecting specific business models rather than a broad-based erosion of liquidity buffers.

### 3.4.3 Net Stable Funding Ratio

The NSFR stress test framework aims to ensure that banks maintain adequate and stable liquidity positions over a longer-term horizon. The framework comprises one baseline scenario and four adverse scenarios, targeting Available Stable Funding (ASF) and Required Stable Funding (RSF) components, as presented in Table 3.6.

The NSFR stress test framework shows stable or slightly improving outcomes for core domestic banks, with adverse-scenario results broadly remaining unchanged since 2021. By contrast, international banks' long-term liquidity buffers are lower but remain above regulatory minima in all scenarios.

As at December 2025, the NSFR for core domestic banks stood at 189% from 187%, while non-core domestic banks and international banks reported a decrease from 201% to 190% and from 150% to 138%, respectively.

**Table 3.6**  
**DESCRIPTION OF NSFR FRAMEWORK'S BASELINE AND ADVERSE SCENARIOS**

Scenario	Description
Baseline	ASF and RSF factors as prescribed by the Regulation (EU) 2019/876
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
Scenario 4	Baseline with full withdrawal of committed facilities to NFCs and households (Similar to LCR adverse scenario 3).

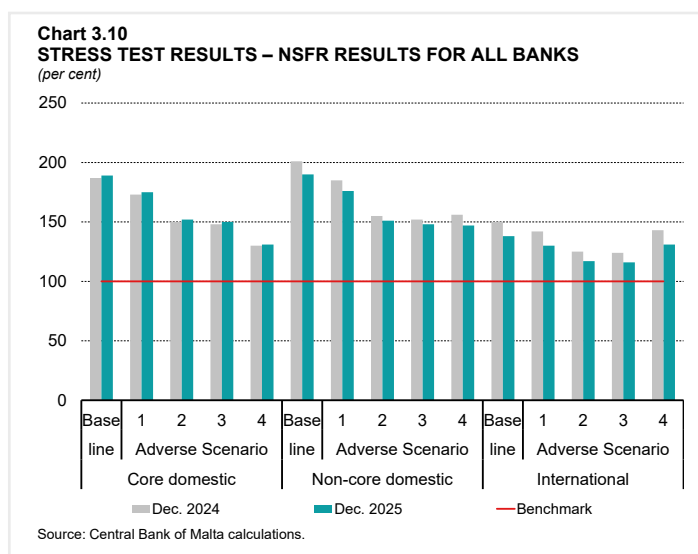
Source: Central Bank of Malta.

<sup>17</sup> Banks' deposit structure is divided into retail and wholesale funding. The former consists of deposits from individual consumers, while the latter is composed of operational and non-operational deposits, whose funds are held for day-to-day business operations and investment purposes, respectively.

<sup>18</sup> The available data does not allow a distinction between revocable and non-revocable committed facilities due data limitations. As a conservative assumption, all commitments are assumed to be withdrawn.

Considering a longer horizon, core domestic banks' NSFR ratios have risen from the mid 170s in 2021 to around 190% in the baseline scenario, non-core banks have remained in the 180-200% range while international banks have consistently remained above 150% in all vintages.

Under adverse scenario 1, the NSFR for both core domestic and non-core domestic banks decline by 14 percentage points, reaching 175% and 176%, respectively. The international banks' NSFR declines by 8 percentage points to reach 130%. The overall impact is less significant, as banks continue to hold the largest proportions of their funding in retail deposits, which receive more favourable ASF treatment than wholesale deposits. Indeed, retail deposits account for 71.5%, 41% and 42% of total ASF for core domestic, non-core domestic, and international banks, respectively (see Chart 3.10).



Under adverse scenarios 2 and 3, which capture the effect of a deterioration in credit quality, some loans transition to non-performing status and consequently require more stable funding. Scenario 3 further incorporates market stress by reducing bond and equity values. Under these conditions, all three categories record the most significant declines in adverse scenario 3, falling by 38, 43, and 21 percentage points to reach 150%, 147% and 116%, respectively.

Under adverse scenario 4, which assumes a full withdrawal of committed facilities, the NSFR reaches 130%, 146% and 130%, respectively. This scenario generates one of the most significant impacts across banks, suggesting heightened sensitivity among those with higher exposure to committed facilities. However, it represents an extreme assumption, as the inability to distinguish between revocable and non-revocable committed facilities may further exacerbate the impact. At the category level, core domestic banks experience the largest decline, while non-core domestic banks also record a sizeable deterioration; by contrast, the impact on international banks is more limited. These results are also observed in the short term across the three bank categories of the LCR framework under adverse scenario 3.

Overall, core domestic banks continue to show more favourable results than last year across all stress scenarios, while non-core domestic and international banks record a slight deterioration. Under the adverse scenarios, the largest impact is observed for core domestic and non-core domestic banks in scenario 4, whereas the largest impact for international banks is observed in adverse scenario 3.

Scenario choice and severity are determined with the aim of identifying sources of vulnerability for individual banks. At the individual bank level, three banks would not meet the minimum requirement under adverse scenario 4 and, similarly, would fall short under adverse scenario 3 for the LCR, exhibiting vulnerabilities associated with committed facilities due to the potential drawdown of these liabilities under stress. Despite this, the impact is mitigated by available liquidity buffers. As in previous scenarios, these effects remain concentrated in a limited number of banks.

In conclusion, the findings generated by both the liquidity and solvency frameworks are submitted to the Financial Stability Committee and shared with the Malta Financial Services Authority (MFSA), after which follow-up engagement with individual banks may take place where warranted. This process strengthens the continuous surveillance of the financial system at both the system-wide and institution-specific levels, while contributing to the broader objective of safeguarding financial stability.

## SPECIAL FEATURE: USING T2 TO ASSESS PAYMENT-SYSTEM FLOWS RELEVANT FOR CYBER STRESS TESTING IN MALTA<sup>1</sup>

In recent decades, the financial services sector has undergone a profound transformation driven by digitalisation and increasing interconnectedness. As a result, dependence on information and communications technology (ICT) infrastructure has become critical for the provision of essential economic functions, including customer services, risk management, and payment settlement. Against this backdrop, cyber incidents have become a growing source of operational disruption. In severe cases, such incidents could impair critical financial functions at increasing speed and scale, trigger second-round effects, and ultimately give rise to financial stability concerns.<sup>2</sup> Rising geopolitical tensions – increasingly manifesting as cyber threats – alongside greater reliance on ICT and a growing concentration among payment infrastructure providers have brought this issue to the forefront of the policy agenda. In response, several international institutions, including the Financial Stability Board (FSB), the European Systemic Risk Board (ESRB), the European Union Agency for Cybersecurity (ENISA), the World Economic Forum (WEF), and the International Monetary Fund (IMF), have developed policy recommendations and analytical frameworks to strengthen cyber resilience and assess cyber-related systemic risk.<sup>3</sup>

Payment infrastructures deserve particular attention in this context. Cyber incidents could result in their partial or complete freeze, preventing a targeted institution from sending and/or receiving payments. Such an event could spread rapidly to other institutions, accelerating the speed at which risks become systemic. In the euro area, these dynamics are especially relevant in the context of T2 (TARGET2), the Eurosystem's real-time gross settlement system, introduced in its current form in March 2023 as part of the TARGET Services consolidation project. By providing transaction-level information of payment flows, T2 offers a useful basis for analysing the financial stability implications of ICT disruptions affecting payment infrastructures and for assessing systemic risk arising from cyber events.

This document provides a first step towards a cyber stress-testing framework for Maltese payment systems. T2 transaction-level data is used to map payment network topologies, identify critical nodes and connections, and detect potential vulnerabilities that could be tested in future scenario-based exercises. The first section introduces T2 and its role in the domestic payment system. The second section uses transaction-level indicators to identify potential cyber vulnerabilities. The third section complements this evidence with a network-based analysis of domestic payment flows, highlighting the centrality and connectivity of key participants. The final section summarises the main findings and outlines the next steps towards a structural framework for assessing payments-related cyber risk and its implications for financial stability.

### T2 and the Maltese payment system

T2 is the Eurosystem's real-time gross settlement (RTGS) system for euro payment transactions supporting monetary policy operations, bank-to-bank transfers, and commercial payments. In 2023, the EU's harmonised market infrastructure, TARGET Services, consolidated T2 with TARGET2-Securities (T2S) and a TARGET Instant Payment Settlement (TIPS). This led to a consolidated Eurosystem market infrastructure for transaction settlement in central bank money. T2 comprises two modules, a central liquidity management (CLM) platform and an RTGS service. The former supports the settlement of central bank operations and the management of participants' liquidity, while the RTGS platform handles payment transactions and

<sup>1</sup> Authored by Matteo Panfilo and Francesco Ricciutelli, Research Economists, and Pedro Polvora, Deputy Head within the Macroeconomic Policy, Stress Testing and Research Department of the Central Bank of Malta. The authors would like to thank Alan Cassar, Christine Balzan, Wendy Zammit, Tiziana Grech, Francesca Bozza, Mariah Dimech, Edward Magro, Claudine Psaila, and Shaun Vella for their helpful inputs and suggestions.

<sup>2</sup> According to the FSB Lexicon 2023, a cyber incident is defined as "cyber event that adversely affects the cyber security of an information system or the information the system processes, stores or transmits whether resulting from malicious activity or not".

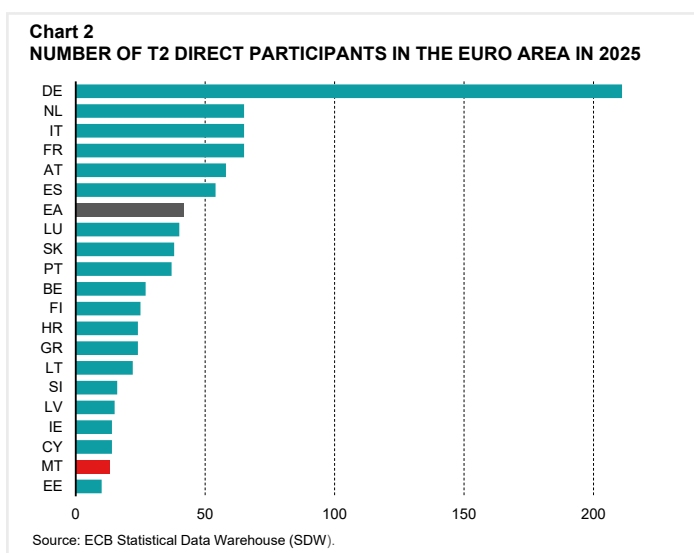
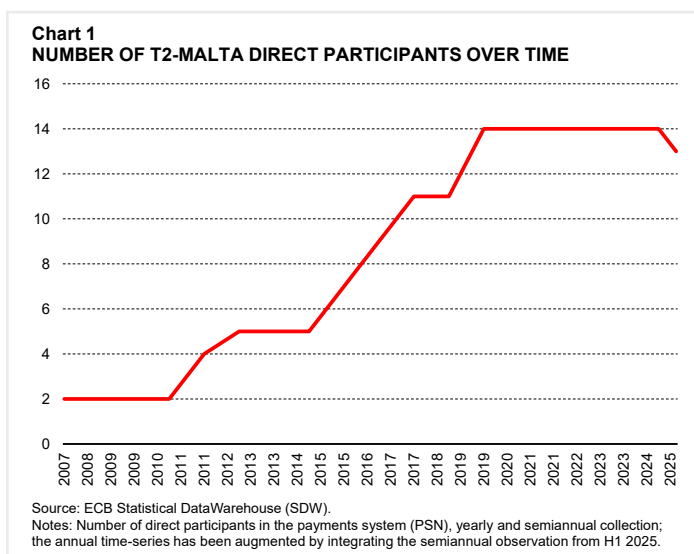
<sup>3</sup> The main bibliographic references involve: ENISA Threat Landscape 2025 (ENISA, 2025), Systemic Cyber Risk (ESRB, 2020), Mitigating Systemic Cyber Risk (ESRB, 2022), Advancing Macroeconomic Tools for Cyber Resilience (ESRB, 2023), Advancing Macroeconomic Tools for Cyber Resilience – Operational Policy Tools (ESRB, 2024), Global Cybersecurity Outlook (WEF, 2025) and Global Financial Stability Report, April 2024 (IMF, 2024).

ancillary system (AS) settlement.<sup>4</sup> By recording the full sequence of payment events, T2 modules enable the detection of potential stress patterns consistent with disruption, such as rising levels of unsettled payments, abnormal delays, and network fragmentation. These patterns are particularly relevant in a small and highly interconnected banking system, where a limited number of participants account for a large share of overall transactions.

Operated by the Central Bank of Malta, the Maltese component of T2 (T2-Malta) provides Maltese participants with access to central bank money settlement. Since its adoption in 2007, the total number of direct participants in T2-Malta has increased, reaching 13 participants by the first quarter of 2025 (see Chart 1).<sup>5</sup> Despite being a small open economy, Malta's participation in T2 reflects the relative complexity and depth of its financial sector (see Chart 2).

T2-Malta also identifies critical participants according to entities' activity. A T2 participant is usually considered critical if it meets at least one of two criteria related to the generated turnover in T2,<sup>6</sup> and the amount of unsettled T2 payments generated by simulating a technical failure of the credit institution, conditional on time dependence.<sup>7</sup>

From an aggregate perspective, both the average daily volume and value of transactions settled by critical participants in T2-Malta declined in the corresponding quarter over the last three years. This decline in transacted value was mainly driven by the four largest domestic banks, while the value transacted by



<sup>4</sup> Ancillary systems (AS) are systems in which payments and financial instruments are exchanged and cleared. In turn, resulting obligations are settled in TARGET. Examples of AS include retail payment systems, large-value payment systems, foreign exchange systems, money market systems, automated clearing houses, central counterparties (CCPs) and securities settlement systems.

<sup>5</sup> "A party owning an RTGS DCA or RTGS CB Account and having direct access to RTGS" as per T2 Glossary definition.

<sup>6</sup> The T2 turnover is computed as the sum of the traffic generated by each credit institution at the technical platform level, where generated means that transactions where the credit institution is debited but that are not initiated by the credit institution have to be filtered out. Notice that the average daily traffic includes customer, interbank and Continuous Linked Settlement (CLS) transactions, as well as liquidity transfers to T2S.

<sup>7</sup> The criteria for determining the criticality of participants are based on the information guides regularly published by the European Central Bank. As a general guideline, the Eurosystem considers a credit institution to be a critical TARGET (CLM and RTGS) participant if it consistently settles at least 1% of the value of the CLM and RTGS turnover as a daily average in the first quarter of the year (so-called Criterion 1). This includes interbank payments, customer payments, liquidity transfers and AS-related transactions where (i) the initiator is the debited participant and (ii) the debited and credited parties are not the same or do not belong to the same technical platform. In addition, criticality depends on the previous year's classification for both critical and non-critical participants. Further details are available at the following link, in the subsection T2 Participation/Registration, Information Guide for TARGET participants, Part 2 CLM and RTGS: [T2 documents and links](#).

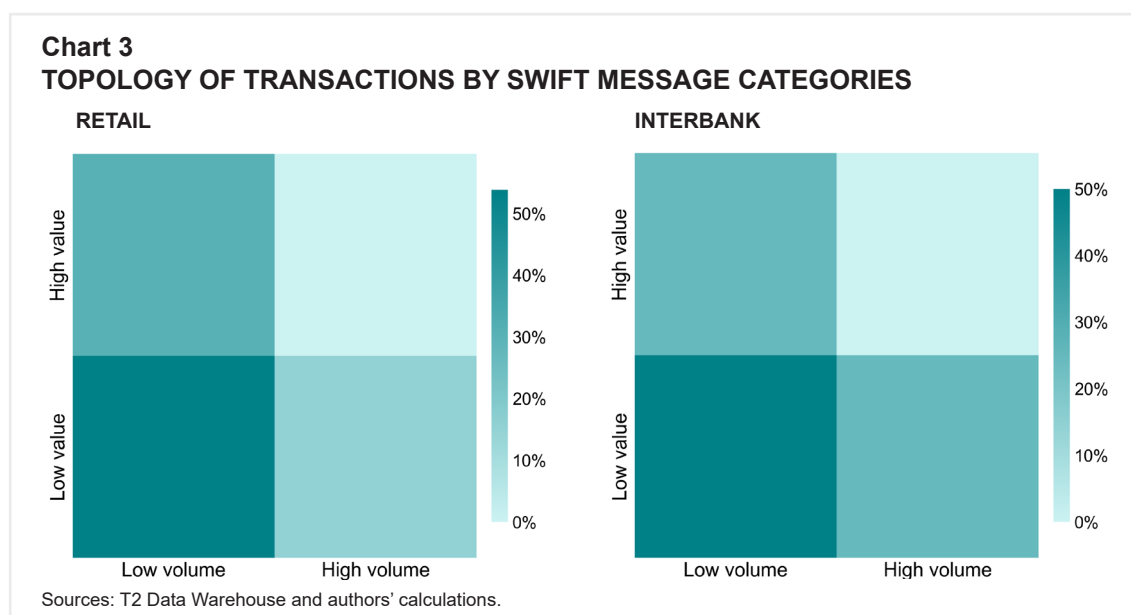
the remaining institutions increased significantly. Nevertheless, in 2025 Q4, around three-quarters of the daily average transacted value was accounted for by the four largest domestic banks, down from 85% and 80% in 2023 and 2024. By contrast, the daily average transacted value of the remaining credit institutions increased from 14% in 2023 to 20% in 2024 and further to 24% in 2025.

### Determining cyber-risk systemic vulnerabilities from payment system activity

The identification of potential transaction-related systemic vulnerabilities involves assessing transactional configurations and financial structures that may trigger or amplify systemic losses due to a cyber threat targeting one or more financial institutions.<sup>8</sup> In the context of payment systems, this includes scenarios in which critical T2-based services are compromised and can no longer guarantee a minimum operational level or be restored within an appropriate recovery window. Such disruptions could generate material second-round effects on counterparties' liquidity and, more broadly, on the functioning of financial intermediation. The potential impact is likely to be greater in high value transactions, even if these are relatively less relevant in terms of volumes.

Chart 3 illustrates the share of participants across transaction-value and transaction-volume categories in 2025. It shows whether institutions are above or below the banking system average in terms of average transaction size and transaction volume, separately for the retail and interbank segments. The darker the colour gradient, the higher the share of participants – expressed as a percentage of the total population – in each quadrant of the matrixes. Most T2-Malta institutions are characterised by low transaction volumes and low average transaction values in both the retail and interbank segments, as illustrated in Chart 3.<sup>9,10</sup> However, a non-negligible share of observations falls within the low-volume, high-value cluster, particularly in the retail segment.

This configuration suggests that potential losses stemming from cyber incidents may be asymmetric. A subset of institutions appears particularly exposed to disruptions affecting low-frequency, high-value



<sup>8</sup> T2 data can help identify operational and systemic vulnerabilities, but not all cyber-control vulnerabilities. It is suitable information for criticality, timing, concentration, substitutability, and contagion assessments. However, it is less appropriate for segmentation quality, threat detection maturity, backup immutability, forensics capability, or governance quality. Those require complementary evidence such as questionnaires, incident reports, DORA third-party information, or TLPT/TIBER-style testing.

<sup>9</sup> TRN stands for Transaction Report; this represents the core T2 data entity for cash transfer orders/cash transfers. See Data Warehouse User Handbook v. R2026.JUN for further details about T2 reporting.

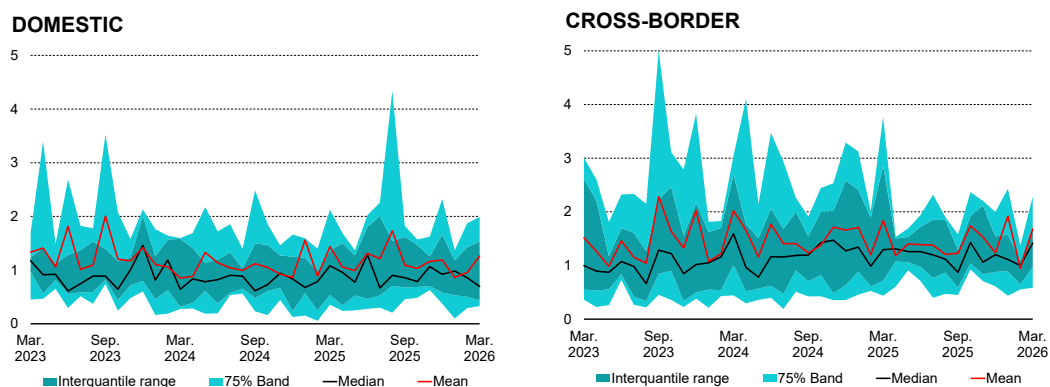
<sup>10</sup> The sample comprises settled 2025 transactions of T2-Malta participants active in 2025, involving Maltese banks and other T2 participants holding a Maltese T2 account; excluding transactions with monetary authorities, direct debit and internal transfers between accounts held by the same entity.

transactions in the retail segment, where even limited operational impairment in sending or receiving payments could generate disproportionately large operational and financial consequences. For instance, a temporary inability to send a small number of large corporate or customer payments could create sizeable liquidity shortfalls for counterparties, while a failure to receive high-value inflows could impair the affected institution's ability to fund subsequent payments. Similarly, in the interbank segment, disruptions to a participant that is mostly engaged in either fewer but larger-value transactions or, additionally, very frequent but low-value transactions could also interfere with liquidity redistribution. This highlights why transaction value, and not only frequency, is relevant for identifying cyber-related systemic vulnerabilities.

The outflow-to-inflow ratio shown in Chart 4 provides a complementary perspective by indicating whether, on average, a bank sends more funds to the financial system than it receives from it, or vice versa. The ratio may therefore signal short-term liquidity imbalances, contingent on the institution's broader funding position. Values above one indicate net outflows, while values below one reflect net inflows. Pronounced imbalances can be relevant in cyber stress scenarios because they help identify institutions or payment corridors where disruptions to outgoing or incoming payments could generate liquidity pressures.

At the domestic level, the outflow-to-inflow ratio remains broadly stable over time and close to one. This means that, on average, the value of payments sent by Maltese participants to other domestic participants is broadly matched by the value of payments received from them. In other words, domestic payment flows appear relatively balanced, with no persistent evidence of large net outflows or inflows at the system level. In contrast, the cross-border outflow-to-inflow ratio shows more volatile episodes and a mild upward trend, reflecting a gradual increase in net outflows abroad relative to the inflows received over the period. Overall, the median of the ratio remains close to unity, suggesting that payment flows are generally balanced on average. The mean, consistently above the median, indicates that the distribution is pulled upward by a relatively small number of high-value transactions from a subset of institutions with comparatively elevated ratios. The dispersion captured by the quantile bands highlights substantial heterogeneity across

**Chart 4**  
**DYNAMIC DISTRIBUTION OF OUTFLOW-TO-INFLOW RATIO**



Sources: T2 Data Warehouse and authors' calculations.

Notes: Quantiles over time of the outflow-to-inflow ratio for T2-Malta participants spanning from March 2023 to March 2026. The ratio is calculated by dividing the total nominal outflow value (debited transactions) by the total nominal inflow value (credited transactions) of transactions excluding monetary authorities and internal transfers. A value equal to one indicates perfect matching between outgoing and incoming payment values; values above one indicate net outflows, while values below one indicate net inflows. Eligible transactions include domestic transactions and cross-border transactions, both excluding T2-relevant authorities, the Central Bank of Malta, and technical or operational transactions.<sup>(1)</sup>

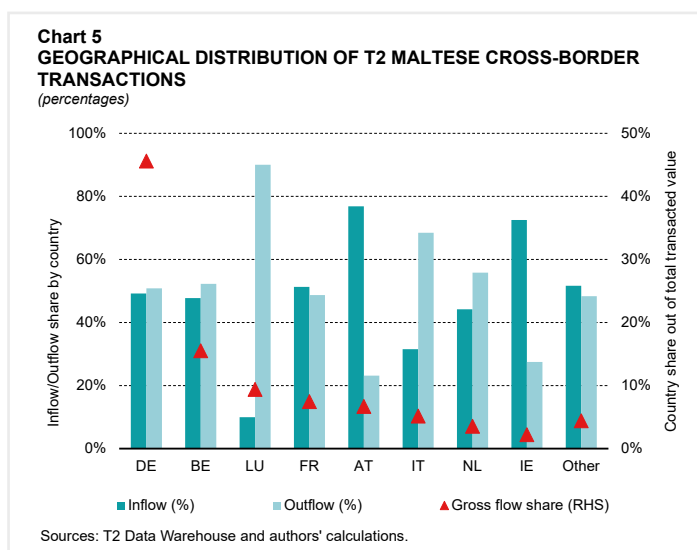
<sup>(1)</sup> For the sake of filtering eligible transactions, this study prioritizes material financial transactions across entities, to represent the network of actual payments on a best effort basis, so as to focus on transactions not involving central bank core operations, technical transfers and operational tests, billing procedures and routing of funds across accounts owned by the same T2 participant. This approach excludes all the transactions involving the Central Bank of Malta and the ECB as main counterparty, EBA Clearing and other related operators, ASs and CCPs.

banks and over time, with occasional spikes in the upper tail. These episodes are notably more frequent in cross-border transactions.

From a Maltese financial stability perspective, however, one vulnerability of particular interest is banks' reliance on sizeable incoming cross-border payments from specific foreign jurisdictions. If a cyber incident were to impair the ability of a foreign counterparty or jurisdiction to execute outgoing payments towards Malta, Maltese recipient institutions could face liquidity pressures, especially where expected inflows are used to fund subsequent payments. In this sense, net inflow patterns are particularly informative for identifying foreign countries and payment corridors that should remain on the Bank's assessment radar. Jurisdictions that act as important sources of inflows for Maltese banks may therefore be especially relevant when designing cross-border variants of cyber stress-test scenarios.

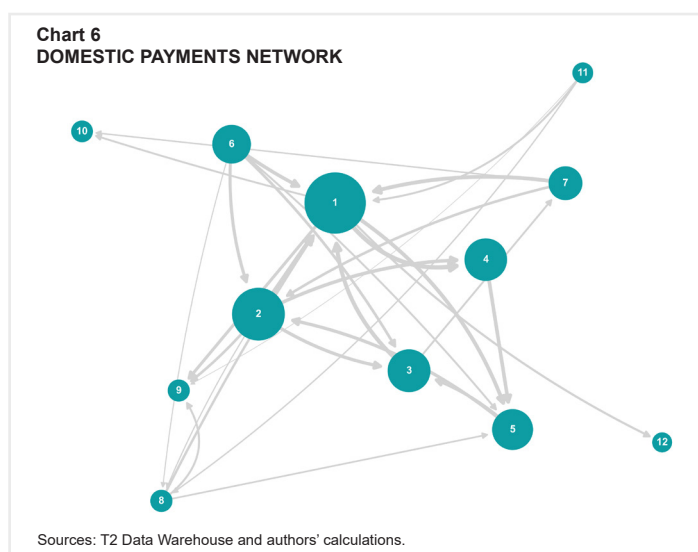
Chart 5 depicts the extent to which the main T2 euro area partners contribute to total cross-border transacted value for the year 2025, by decomposing the total nominal flows exchanged with each country into inflow and outflow percentage shares. For instance, Germany is the most significant jurisdiction in this system, representing 46% of the overall transacted value, of which roughly 51% are outflows and 49% inflows. This deep dive into the geographical distribution of Maltese cross-border financial flows reveals a marked concentration of transacted value with a limited number of euro area jurisdictions, with fewer than five countries accounting for more than 80% of total cross-border activity. This points to a high degree of geographic concentration in payment flows. Moreover, the asymmetry between debited and credited transactions across countries highlights the presence of net-sender and net-receiver jurisdictions, reflecting directional dependencies in liquidity movements. Such a structure implies that ICT disruptions affecting key jurisdictions could have disproportionate systemic effects, particularly when payment activity is concentrated in a small number of systemically relevant institutions.

Malta appears to be strongly interconnected, particularly with a subset of large euro area economies that exhibit relatively high inflows and outflows. Exposure is also pronounced towards a smaller group of mainly unidirectional actors, whose monetary flows are either primarily absorbed by, or channelled outward from, the Maltese economy. However, given the small size of the Maltese payment system, these flows are unlikely to be material from the perspective of the recipient jurisdictions. For Malta, the more relevant vulnerability stems from countries that are important sources of inflows, such as Austria and Ireland. In this context, a payment disruption could propagate and impact the Maltese system as well, since cyber disruptions targeting institutions or payment infrastructure in these countries might critically reduce incoming payments to Maltese banks and cause liquidity pressures for domestic recipients. Overall, Malta's cross-border vulnerabilities appear concentrated along a limited number of critical payment corridors, which can help inform the design of cross-border cyber stress-test scenarios.



## A bird's-eye view of the domestic payment network

Network theory is used to complement the characterisation of T2-Malta and to provide a clearer understanding of its most relevant actors and interdependencies. Chart 6 provides a network perspective of this payment system.<sup>11</sup> Each node represents a bank, and node size is proportional to the total value transacted over the year, considering both sent and received payments.<sup>12</sup> The numbers displayed within the nodes rank institutions by node size, with 1 denoting the bank with the largest total transacted value. Directed edges represent bilateral



payment relationships: edge thickness is proportional to the total transaction volume between each pair of institutions, while arrow direction indicates the direction of the bilateral net inflow, that is, towards the institution receiving the positive net balance of funds from its counterparty. Node positions are arranged to reflect the degree of weighted interconnectedness, with more strongly connected institutions placed closer to the centre and less connected institutions located towards the periphery.

The network displays an uneven, core-periphery structure. A relatively small group of institutions – comprising four banks – occupies a particularly prominent position within the network.<sup>13</sup> A further three institutions, identified by nodes 5 to 7, appear in an intermediate position, while the remaining five institutions, corresponding to nodes 8 to 12, are located in the periphery through fewer and thinner edges. Although the network appears broadly interconnected, payment activity is concentrated among a limited number of larger and more connected institutions. The direction of the arrows indicates that bilateral liquidity flows are asymmetric, with some institutions acting as net recipients (providers) in specific relationships.

Disruptions affecting the more central nodes could therefore have adverse implications for payment continuity, liquidity circulation, and the transmission of operational stress across the domestic network. From a systemic risk perspective, monitoring the evolution of this mapping and these connections over time can help assess the relative importance of individual banks and their activity within the system, and, therefore, the potential for heightened systemic risk.

To assess the relative importance of individual banks in the domestic payment network, the analysis also relies on connectivity and centrality indicators, following Glowka et al. (2024). Chart 7 plots, for each institution, inflow against outflow unique nodes to quantify connectivity, where connectivity is measured as the number of unique counterparties from which an institution receives payments and to which it sends payments. It also reports the normalized in-degree and out-degree centrality measures, calculated for the domestic network only (i.e. excluding cross-border counterparties).

Chart 7 reinforces the uneven structure of the domestic payment network. One institution stands out as a dominant hub, displaying a markedly higher degree of centrality than all others, while most participants are clustered at substantially lower levels. The positive association between in and out-degree suggests that

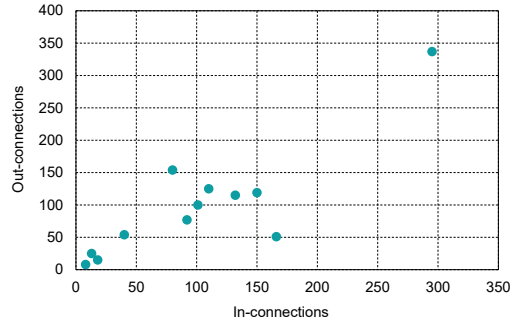
<sup>11</sup> The sample consists of T2-Malta participants active in 2025 and processing payments vs. other T2-Malta credit institutions.

<sup>12</sup> The sample comprises settled domestic transactions involving Maltese banks and other T2 participants holding a Maltese T2 account, excluding transactions with monetary authorities and internal transfers between accounts held by the same entity.

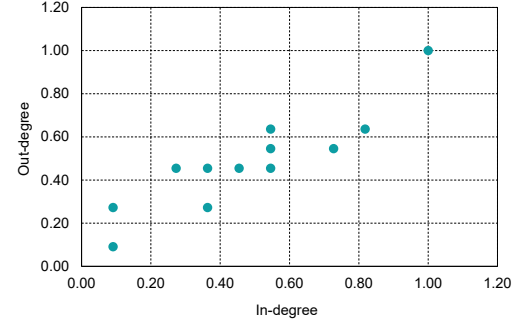
<sup>13</sup> Graph theory and network analysis provide tools to represent and analyse payment systems as networks, in which banks or other participants constitute the nodes, and payment flows the edges connecting them.

**Chart 7  
INTERCONNECTEDNESS OF T2-MALTA DIRECT PARTICIPANTS**

**TOTAL CONNECTIVITY**



**DEGREE CENTRALITY IN THE DOMESTIC PAYMENT NETWORK**



Sources: T2 Data Warehouse and authors' calculations.

institutions that are more connected on the receiving side are also more connected on the sending side, although some asymmetries remain.

Taken together, the chart reinforces the evidence from the network map of a core-periphery configuration, in which a limited number of highly connected institutions coexist with a broader set of more peripheral participants. This concentration of connectivity points to a corresponding concentration of operational relevance, suggesting that disruptions affecting the most connected nodes could have disproportionate implications for payment continuity and the transmission of stress across the domestic payment network. This mapping also provides an empirical basis for designing plausible but severe cyber stress-test scenarios in the next phase of the analysis. In particular, the network indicators help identify which institutions could be selected as shock origins, focusing on participants that combine high connectivity, centrality, and transacted value.

At the same time, the analysis highlights which counterparties should be monitored for second-round vulnerabilities, especially those with strong bilateral exposures to the shocked node or with pronounced outflow-to-inflow imbalances. The cross-border evidence further supports the design of external variants of the shock by identifying the foreign jurisdictions and payment corridors through which disruptions could most strongly propagate to Maltese banks. In this sense, the descriptive indicators developed in this special feature are not only diagnostic but also provide the building blocks for calibrating institution-specific, network-based, and cross-border cyber stress scenarios.

### Way forward and conclusions

The evidence presented in this document suggests that T2 data can serve as a useful operational and analytical tool for assessing potential cyber-related systemic risk in Malta. The Maltese component of T2 combines a manageable number of participants with sufficiently rich transaction-level information to identify critical actors, directional dependencies, concentration patterns, and potential channels of contagion.

Several findings emerge from this initial analysis. First, activity remains concentrated among a relatively small group of institutions. The share accounted for by the four largest domestic banks has decreased, but these institutions continue to represent a sizeable portion of overall transacted value. This justifies continued monitoring of the most active participants, while also recognising the growing relevance of the remaining institutions.

Second, the transaction topology for 2025 shows that most institutions are characterised by low transaction volumes and low average transaction values. However, a non-negligible share of activity is concentrated in low-volume, high-value transactions, especially in the retail segment. This suggests that the operational and financial consequences of a cyber incident may be highly asymmetric, since disruptions affecting a limited number of institutions may disproportionately impair large payment flows.

Third, the analysis of outflow-to-inflow ratios indicates that while domestic payment flows remain broadly balanced over time, cross-border positions display greater volatility and more frequent episodes of pronounced imbalances. This points to heterogeneity across institutions and payment corridors. From a Maltese financial stability perspective, particular attention should be given to sizeable incoming cross-border flows, as disruptions affecting key foreign counterparties or jurisdictions could reduce payments to Maltese institutions and generate liquidity pressures for domestic recipients.

Fourth, cross-border payment flows are geographically concentrated. A small number of euro area jurisdictions account for the bulk of transacted value, while cross-country asymmetries between credited and debited transactions reveal directional liquidity dependencies. This suggests that disruptions such as cyber incidents affecting key foreign jurisdictions could have a relatively large impact on Maltese participants through cross-border payment channels.

Finally, the domestic network analysis confirms that T2-Malta network exhibits a clear core-periphery structure. A limited number of institutions occupy central positions in the network, combining high transacted values with multiple bilateral links, while the remaining institutions are more peripheral. The connectivity and centrality indicators further reinforce this result, showing that one institution clearly acts as a dominant hub and that the most connected participants tend to be prominent on both the sending and receiving sides of payment flows. From a systemic risk perspective, this implies that operational relevance is concentrated in a narrow subset of participants, so that disruptions affecting the most central nodes could generate disproportionate effects, with implications for payment continuity, liquidity circulation, and the propagation of operational stress across the domestic network.

The indicators presented in this special feature provide a descriptive snapshot of payment-system structures that may be relevant under cyber-related disruption scenarios. They do not, on their own, measure all dimensions of cyber resilience, nor do they quantify the full systemic impact of a cyber incident. Rather, they provide a basis for further work by identifying potential shock sources, vulnerable counterparties, key bilateral links, and relevant cross-border corridors. The next phase of the analysis could develop a more structured framework to assess how payment-related operational disruption may translate into financial stability risk. This could include sensitivity analysis and scenario-based stress testing focused on selected critical participants, the transmission of stress through domestic payment links, and shocks originating from highly interconnected foreign jurisdictions. Such exercises could also support the development of dedicated Systemic Impact Tolerance Objectives (SITOs) for payments by linking severe-but-plausible disruption scenarios to measurable indicators such as affected payment values, liquidity shortfalls, unsettled transactions, recovery times and the number of institutions affected. In this way, T2 data could become an important empirical input into the broader assessment of cyber resilience in the Maltese financial system.

## References

Eisenbach T., Kovner A., and Lee M., “Cyber Risk and the U.S. Financial System: A Pre-Mortem Analysis”, *Journal of Financial Economics*, Volume 145, Issue 3, 2022, pp. 802-826.

Glowka M., Müller A., and Weber A., “The Hierarchy of Critical Participants: A Clustering Approach Utilising Network-Based Indicators for Payment Systems”, *Latin American Journal of Central Banking*, Volume 7, Issue 2, 2026, pp. 100-169.

Heijmans R., and Wendt F., “Measuring the Impact of a Failing Participant in Payment Systems”, *Latin American Journal of Central Banking*, Volume 4, Issue 4, 2023, pp. 100-106.

Khiaonarong T., Korpinen K., and Islam E., “Using Simulations for Cyber Stress Testing Exercises”, *Working Paper Series*, No. 85, IMF, 2025.

Koo H., van der Molen R., Pollastri A., Verhoeks R., and Vermeulen R., “A Macroprudential Perspective on Cyber Risk”, *Occasional Studies*, Volume 20, Issue 1, De Nederlandsche Bank, 2022.

Kotidis A., and Schreft S.L., “The Propagation of Cyber-attacks through the Financial System: Evidence from an Actual Event”, *Journal of Finance*, Volume 80, Issue 6, 2025.

“Advancing Macroprudential Tools for Cyber Resilience”, *ESRB Report*, European Systemic Risk Board, February 2023.

“Advancing Macroprudential Tools for Cyber Resilience – Operational Policy Tools: A Review of National and Pan-European Frameworks”, *ESRB Report*, European Systemic Risk Board, April 2024.

“Cyber Lexicon: Updated in 2023”, Financial Stability Board, Basel, April 2023.

“Data Warehouse User Handbook. Version R2026.JUN, 22”. TARGET Services 4CB, January 2026.

“ENISA Threat Landscape 2025”, *ENISA Report*, European Union Agency for Cybersecurity, October 2025.

“Global Cybersecurity Outlook 2026”, *Insight Report*, World Economic Forum, January 2026.

“Information Guide for TARGET Participants: Part 1 – Fundamentals. Version R2025.OCT”, European Central Bank, Frankfurt am Main, October 2025.

“Information Guide for TARGET Participants: Part 2 – CLM & RTGS. Version R2025.OCT”, European Central Bank, Frankfurt am Main, October 2025.

“Information Guide for TARGET Participants: Part 3 – TIPS. Version R2025.OCT”, European Central Bank, Frankfurt am Main, October 2025.

“Mitigating Systemic Cyber Risk”, *ESRB Report*, European Systemic Risk Board, January 2022.

“Steadying the Course: Uncertainty, Artificial Intelligence, and Financial Stability”, *Global Financial Stability Report*, International Monetary Fund, October 2024.

“Systemic Cyber Risk”, *ESRB Report*, European Systemic Risk Board, February 2020.