BOX 2: BANK PROFITABILITY-AT-RISK: LINKING CYCLICAL SYSTEMIC RISK TO FUTURE BANK PROFITABILITY IN MALTA[1]

Introduction

The *at-risk* concept has become widely used as a forward-looking framework for quantifying the potential adverse impact of uncertain future events. This article applies it to bank profitability in Malta, measuring how weak profitability could become under adverse outcomes, given the prevailing level of cyclical systemic risk and other macro-financial conditions, thereby providing an input to the assessment of the capital banks may need to address the materialisation of such a scenario.

Cyclical systemic risk typically builds during periods of buoyant credit growth, rising leverage and stretched asset valuations. When these imbalances unwind, credit losses, weaker business volumes and asset repricing can reduce bank earnings and, in turn, capital. This can weaken banks' ability to absorb shocks and sustain credit supply at a time when the economy needs it most. Building on the Growth-at-Risk literature (Adrian et al., 2019), Lang and Forletta (2020) examine how cyclical systemic risk affects the lower tail of future bank profitability in a large panel of European banks, using quantile regressions that estimate this effect separately at different percentiles of the profitability distribution rather than only at its mean. The authors express low-end profitability outcomes in risk-weighted capital-ratio units through their Bank Capital-at-Risk (BCaR) measure, thereby linking cyclical-risk assessment to capital-buffer calibration.[2]

This article adapts the *at-risk* framework to Malta. Using data on core domestic banks, it estimates a location-scale panel quantile local projection (QLP) model (Koenker and Bassett, 1978; Jordà, 2005; Machado and Santos Silva, 2019) that relates banks' future pre-tax returns on assets (ROA) to the cSRI (Vella, 2024) which takes the place of the domestic cyclical systemic risk indicator (d-SRI) (Lang et al., 2019) used by Lang and Forletta (2020).[3] The cSRI is a summary indicator with forward-looking properties that provides information about the accumulation of cyclical systemic risk over time. It captures domestic credit, debt-servicing and housing-market developments and is already used within the Bank's broader risk-regime assessment.[4]

These quantile bank-level forecasts are aggregated into Bank Profitability-at-Risk (BPaR), which is a measure of downside bank profitability. Negative values indicate projected losses, whereas positive values indicate that profitability remains positive even in case of adverse outcomes. In other words, BPaR indicates how low the profitability of the core domestic banking sector could fall in case of unfavourable circumstances, given current macro-financial conditions. Unlike traditional regression models, which estimate the effect of cyclical systemic risk on average profitability, it captures the fact that this effect is stronger and more persistent for weak outcomes.

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[2] BCaR measures the change in banks' capital ratio implied by a low quantile of future profitability, given the prevailing level of cyclical systemic risk.

[3] The analysis focuses on core domestic banks, the main providers of credit to Maltese households and firms and whose business model centres on traditional intermediation with the domestic economy.

[4] The cSRI combines four sub-indicators using principal component weights estimated on Maltese data: two-year real bank credit growth, the four-quarter change in the debt-service-to-income ratio, the house-price-to-income-per-capita ratio and two-year real total debt growth. The indicator is available at quarterly frequency from 2006Q1, and its first principal component accounts for a large share of the common variation in the four sub-indicators. Vella (2024) shows that it is a suitable forward-looking gauge of cyclical systemic risk in Malta. Real GDP growth and the spread of government bond yields capture business-cycle conditions.

Estimating how cyclical systemic risk affects future bank profitability

The approach builds on a strand of research that models how cyclical systemic risk shapes future bank profitability in case of adverse events. This method was originally applied to the Growth-at-Risk concept, where systemic financial conditions are linked to the distribution of future GDP growth (Adrian et al., 2019) and has since been extended to BCaR (Lang and Forletta, 2020; Passinhas and Pereira, 2023; De Nora et al., 2025). In this latter framework, cyclical systemic risk is treated as a state variable that shifts the conditional distribution of future pretax ROA, with particular attention to downside profitability where losses erode capital and therefore threaten bank resilience.

Building on these contributions, the framework estimates a location-scale panel QLP model that links several quantiles of future bank profitability to the current level of cyclical systemic risk. The object of interest is the conditional quantile function of bank-level pre-tax ROA at a given horizon h, evaluated at quantiles τ. It is conditioned on the current value of the cSRI, bank characteristics, and macro-financial variables.

Bank profitability is projected on the basis of the current cSRI, while controlling for bank-specific and macro-financial factors. The QLP model is estimated based on a panel formed by considering six core domestic banks observed over 31 quarters (2018Q4–2026Q2). The dependent variable is pre-tax ROA for each quarter, while bank-specific controls, commonly found to influence profitability, include the logarithm of total assets (size), the net interest margin (business model), the cost-to-income ratio (efficiency), NPLs over total loans (asset quality), RWA over total assets (risk-taking), and the Tier 1 capital ratio (capitalisation).[5] The model also includes bank fixed effects, which absorb unobserved bank characteristics that are broadly stable over the sample period, such as business models, risk appetite and the quality of management and risk controls.

Furthermore, country-level macro-financial variables are included to capture aggregate drivers of bank profitability. Besides the cSRI (in real terms), which is the main variable of interest, the explanatory variables also include real GDP growth and the spread of government bond yields, measured as the difference between the three-month Euribor and the ten-year Maltese government bond yield. Relying on bank-level and macro-financial information together helps limit the extent to which losses arising from cyclical systemic risk are confounded with unrelated macroeconomic shocks or structural changes in the banking sector.

Over the estimation window, from 2018Q4 to 2026Q2, the cSRI completed approximately one full financial cycle (Chart 2a). It rose from around zero in late 2018 to approximately 1.9 in 2021Q1. It then declined steadily, reaching a trough of about -1.1 in 2024Q3, before rising again to around 0.5 in 2026Q1. The underlying drivers of the two increases differ. During the COVID-19 pandemic, the cSRI increase was initially driven by the house-price-to-income ratio component, and from 2021Q2 by stronger growth in total debt. The more recent increase is driven instead by strong bank credit and total debt growth, partly offset by a smaller contribution from the house-price-to-income ratio. This recent trend therefore suggests a more conventional and credit-driven build-up of vulnerabilities.

Chart 2b shows that developments in bank profitability have been far from uniform across institutions. During the COVID-19 pandemic, the median bank's quarterly pre-tax ROA decreased and turned marginally negative in late 2020. At the same time, the weakest banks recorded sizeable losses, pulling the lower end sharply into negative territory and turning the average profits negative. In other words, the shock did not weigh evenly on the system. Most banks remained profitable, while

[5] These variables separate the contribution of cyclical systemic risk from that arising from each bank's business model and other forms of idiosyncratic risk.

Chart 2a
cSRI OVER TIME
(index)

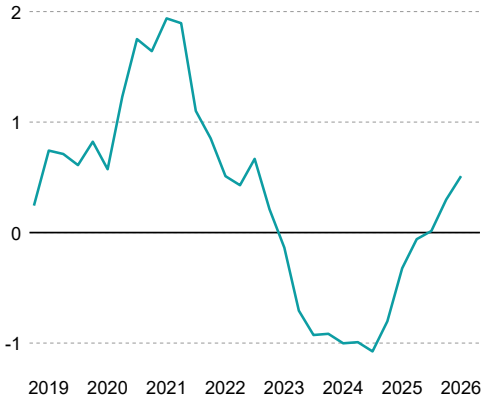
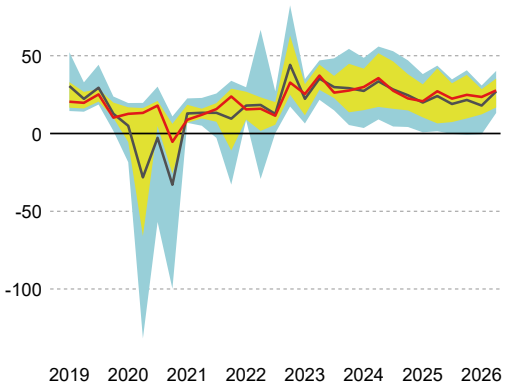


Chart 2b
ROA DISTRIBUTION OVER TIME
(basis points of quarterly pre-tax ROA)





Sources: Central Bank of Malta; ECB Statistical Data Warehouse; Eurostat; authors' calculations.
Notes: Chart 2a shows the real cSRI. Chart 2b shows the mean, median, 25th – 75th and 10th – 90th percentile ranges of quarterly pre-tax ROA across Maltese core domestic banks.

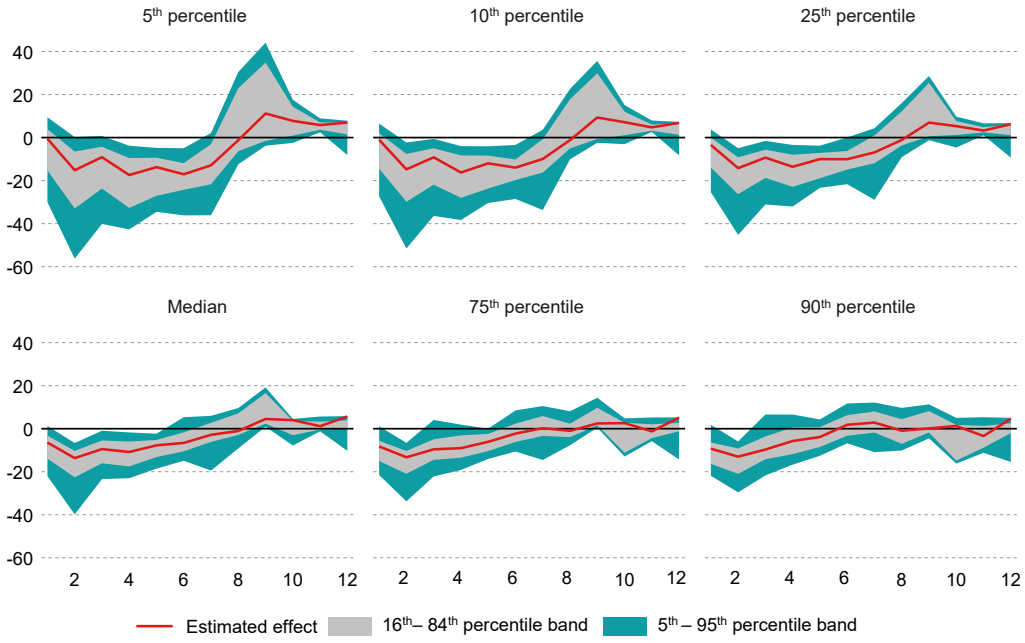
the deterioration was concentrated among a small number of institutions. Looking at the average alone would therefore give an incomplete picture, which is why this article models the full distribution of profitability, with particular attention to its lower end and expresses results in terms of quantiles. Profitability subsequently recovered, peaking in 2023–2024 as monetary policy tightening boosted net interest income (NII). It has since moderated, and estimated outcomes at the lower end of the distribution have moved closer to zero.

Chart 2c illustrates how future bank profitability responds when cyclical systemic risk rises, distinguishing between weak, typical and strong profitability outcomes. Specifically, it reports the effect of a one-unit increase in the cSRI on selected quantiles of future pre-tax ROA. The main insight is that higher cyclical risk does not affect all outcomes in the same manner. Whilst profitability initially falls across the board, the decline is larger and more persistent at the weak end of the distribution. This justifies the use of quantile techniques, as they capture the asymmetric nature of adverse or extreme impacts.

The response unfolds in three stages. In the short run, the decline is broadly uniform. Two quarters ahead, quarterly pre-tax ROA is about 13–15 basis points lower at each quantile considered. However, as the horizon lengthens, the responses start to diverge. Six quarters ahead, the estimated effect is around -17 basis points at the 5th percentile and -14 basis points at the 10th, compared with -6 basis points at the median and negligible effects at the 75th and 90th percentiles. In other words, while typical and strong outcomes are already recovering, weak outcomes remain depressed. By the end of the second year, the negative effects have disappeared, and the estimated responses turn positive, consistent with the subsequent recovery in profitability, although the estimates remain imprecise.

The key takeaway is that weak outcomes take longer to recover, with the largest lower-tail effects four to six quarters ahead. An analysis based only on average profitability would understate the losses that could arise in adverse outcomes. The timing is also relevant for policy considerations. Because these effects build over several quarters, the cSRI provides an early signal, leaving time to assess emerging vulnerabilities and, where warranted, to act before the effects on profitability materialise.

Chart 2c
MARGINAL EFFECT OF CYCLICAL SYSTEMIC RISK ON SELECTED QUANTILES OF THE DISTRIBUTION OF FUTURE BANK PROFITABILITY
(basis points of quarterly pre-tax ROA; horizon in quarters)



Sources: Central Bank of Malta; authors' calculations.
Notes: Panel QLP with bank fixed effects for the bank-level pre-tax ROA at horizon t+h on the cSRI, controlling for several other bank-specific and macro-financial variables at time t. Bands from a time-block bootstrap.

Some caveats apply when interpreting the results. First, the sample period does not include a domestic banking crisis. The estimates therefore reflect how profitability has responded to cyclical risk in the absence of such an event. This implies that losses in a systemic crisis, when shocks would be larger and spread across many banks at once, could be more severe than those captured in these results. Second, some of the weakest outcomes in the sample reflect bank-specific events, such as one-off impairments or provisions, which add to the variation in the lower end of the distribution without being directly related to systemic risk. Third, the relatively short time span also leaves fewer projection origins at longer horizons; thus, estimates beyond two years should be interpreted with greater caution. Finally, the results show that profitability tends to move together with the cSRI, which makes the analysis useful for anticipating risks, but it does not isolate the effect of systemic risk on its own. Although the model controls for bank-specific characteristics and macro-financial conditions, periods of rising cyclical risk tend to coincide with other developments that also affect bank profits, and such controls can only partly disentangle these effects. The results should therefore be read as indicating what typically happens to profitability when the cSRI rises, rather than as a precise measure of what an increase in systemic risk would cause in isolation.

Translating the estimates into a forward-looking measure of downside risk to banks' profitability

The second part of the framework turns the estimated model into a forward-looking measure of downside risk to bank profitability, which is called BPaR. While the previous section examined how profitability responds to a change in the cSRI, this section uses the same estimates to summarise, at the level of the core domestic banking sector, how weak bank profitability could become in adverse

outcomes, given the conditions observed today. Since the responses to cyclical risk differ across the distribution, the measure is built from the predicted lower quantiles of profitability rather than from its expected value, which would miss the asymmetry documented above.

BPaR at time t and horizon h is defined as the asset-weighted average of banks' predicted 5th percentiles for quarterly pre-tax ROA h quarters ahead:

$$BPaR_{t+h} = \sum_{i=1}^{N_t} \frac{a_{i,t}}{\sum_{k=1}^{N_t} a_{k,t}} \widehat{Q}_{\pi_{i,t+h}}\left(0.05 \,\middle|\, \Omega_{i,t}\right) \quad (1)$$

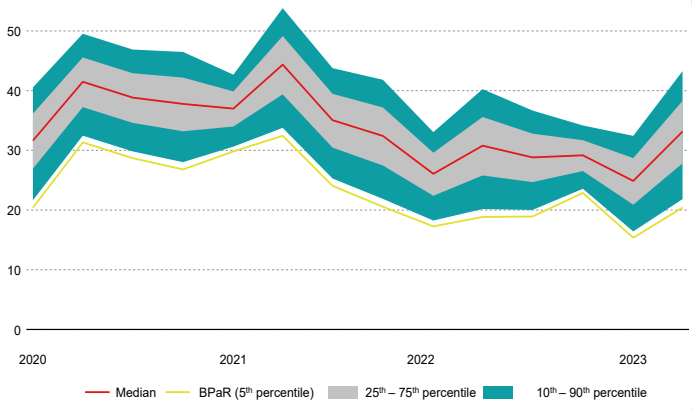
where $\pi_{i,t+h}$ denotes the quarterly pre-tax ROA of bank i in quarter $t + h$, $\widehat{Q}_{\pi_{i,t+h}}\left(0.05 \middle| \Omega_{i,t}\right)$ is its predicted 5th percentile, obtained from the QLP model estimated at horizon h. $\Omega_{i,t}$ is the information set available at t, comprising the cSRI, the bank-specific and macro-financial controls and bank fixed effects. N_t is the number of banks at t and $a_{i,t}$ denotes the total assets of bank i, so that each bank is weighted by its share of sector assets at each point in time. BPaR is a measure of conditional downside profitability. A negative value denotes a projected loss, whereas a positive value indicates that the model projects banks to remain profitable even at the adverse conditional quantile, that is, under severe scenarios.

Dividing each bank-level quantile by the bank's average risk weight (RWA over total assets), $\overline{rw}_{i,t}$, before aggregation, translates BPaR into percentage points of the risk-weighted capital ratio, giving the Malta-only equivalent of BCaR of Lang and Forletta.[6] Intuitively, a loss equal to 1% of total assets reduces capital by the same amount. For a bank whose RWA are half of its total assets, that loss lowers the capital ratio by 2 percentage points.

Chart 2d shows the 12-quarter-ahead BPaR for Malta between 2020Q1 and 2023Q2. It also shows the median, the 25th–75th and 10th–90th percentile ranges of the conditional distribution. For each origin quarter t, BPaR shows the asset-weighted average across banks of the predicted 5th percentile of quarterly pre-tax ROA twelve quarters ahead, conditional on the cSRI and the bank-level variables observed at t.

BPaR remained positive throughout the period. Even under an adverse outcome, the core domestic banking sector was projected to remain profitable three years ahead. Its level nonetheless varied considerably. BPaR peaked at about 31–33 basis points of total assets for origins in 2020Q2 and 2021Q2, then declined from mid-2021. It reached its lowest level, about 15 basis points, in 2023Q1, before recovering to around 20 basis points in 2023Q2. Notably, the highest readings coincide with the quarters when the cSRI peaked. At this horizon,

Chart 2d
THREE-YEAR-AHEAD BPaR OF CORE DOMESTIC BANKS
(basis points of total assets; quarterly pre-tax ROA, 12 quarters ahead)



Sources: Central Bank of Malta; authors' calculations.
Notes: Asset-weighted averages of the bank-level conditional quantiles of quarterly pre-tax ROA 12 quarters ahead, dated at the forecast origin. BPaR is the 5th percentile.

[6] BPaR describes downside risk to earnings, while BCaR expresses the same risk in capital-ratio units.

the estimated effect of the cSRI turns slightly positive, consistent with the recovery in profitability that follows the initial adverse impact (see Chart 2c). Over the period shown, the gap between typical and weak profitability outcomes remained broadly stable, at around 6 to 13 basis points. Movements in BPaR therefore mainly reflected changes in overall profitability rather than a disproportionate worsening of the weakest outcomes. In other words, downside risk to profitability rose and fell with the system as a whole, with no sign of weaker outcomes becoming detached from the rest.

Conclusions

This article examines whether Malta's cSRI provides early information on the distribution of future profitability of core domestic banks. It looks not only at typical outcomes, but also at the weakest ones, by considering the lower end of the profitability distribution of banks, thereby capturing the potential behaviour of bank profitability under adverse macro-financial conditions.

When cyclical systemic risk rises, profitability tends to fall across the board in the following quarters. Two quarters ahead, a one-unit increase in the cSRI is associated with quarterly pre-tax ROA roughly 13 to 15 basis points lower, in typical and weak outcomes alike. Over time, however, the picture changes. While typical and strong outcomes recover relatively quickly, weak outcomes remain depressed for longer. In practical terms, a build-up in cyclical risk does not simply dent profitability for a short while. It leaves banks exposed to poor results for an extended period, reducing the earnings they can rely on to absorb losses, thereby weakening their first line of defence.

The difference in scale is substantial. Six quarters ahead, the estimated decline at the 5th percentile is around 17 basis points, nearly three times the 6 basis points for the median, while in the upper part of the distribution, that is, in favourable outcomes, the effect is negligible. An assessment based only on average or typical profitability would therefore understate the risks stemming from cyclical vulnerabilities, which is why estimates across the whole distribution are particularly useful for financial stability analyses.

Bringing these estimates together, BPaR offers a simple gauge of how weak the profitability of the core domestic banking sector could become if conditions turned out to be unfavourable. Over the period examined, the measure remained positive: even in an adverse outcome, the sector was expected to stay profitable, rather than record losses that would erode its capital. Its movements also largely mirrored those of overall profitability, suggesting that the weakest outcomes have so far not drifted away from the rest of the system.

The timing of these effects is also informative. Since the strongest impacts on weak outcomes emerge four to six quarters ahead, current readings of the cSRI shed light on the resilience of bank profitability over the following one to two years. They thus provide an early indication of how today's cyclical risk could weigh on banks' capacity to absorb losses, before such a potential adverse outcome occurs. This analysis could accordingly serve as one of several inputs into macroprudential policy assessments, including assessments of the level of loss-absorbing capacity that may be appropriate to preserve financial-system resilience, though it should not be used mechanically or in isolation to determine a capital-buffer requirement.

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