

BOX 1: FORECASTING SOME KEY FINANCIAL INDICATORS FOR CORE DOMESTIC BANKS IN MALTA¹

This box documents a framework which was recently developed to forecast key balance sheet items of selected Maltese core domestic banks, with particular interest in bank profitability. A Factor-Augmented Vector Autoregression (FAVAR) and a Bayesian Vector Autoregression (BVAR) are employed to produce forecasts for both bank-level and aggregate variables, such as loans, deposits and profitability. Both the FAVAR and BVAR models used in this analysis possess numerous shared characteristics. While the former generates bank-level forecasts, allowing for the examination of dynamics within individual banks' balance sheets, the latter is based on aggregate bank time series and provides forecasts that serve as a cross-check for the FAVAR's output. Bayesian methods are used to estimate probabilistic density forecasts, and to overcome short data samples. The full methodology is explained in Andreani (2024).²

The Maltese core domestic banks represent a category of credit institutions with the highest domestic relevance for Malta's financial system, with balance sheets collectively equivalent to 151% of domestic GDP in 2023. Despite adverse conditions between 2020 and 2022,³ the core domestic banking sector continues to exhibit resilience and sustained recovery, with a 144% profit growth in 2023 compared to the previous year, and an increasing trend in domestic lending.⁴ On the other hand, deposits continue to constitute the primary funding source, financing more than 80% of overall core domestic banks' assets (Central Bank of Malta, 2024).⁵

The relationship between profitability of the international banking sector and financial stability has been extensively analysed and strengthened by various studies (Aspachs et al., 2006; ECB, 2016; TengTeng et al., 2019).⁶ Previous research related to the Maltese banking sector has analysed banks' heterogeneity in generating profits (Camilleri, 2005),⁷ and the significance of real activity cycles in determining banking activity performance (Attard, 2014).⁸

The analysis in this box employs key macroeconomic variables and confidential bank-level time series data to capture the interaction between real macroeconomic aggregates for both Malta and the euro area, along with bank-level information specific to selected Maltese core domestic banks.⁹ All data is in quarterly frequency, using a sample ranging from 2006Q4 to 2023Q3.¹⁰

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² Andreani, M. (2024). [A forecasting framework for core domestic banks in Malta](#), Central Bank of Malta *Working Paper* WP/05/2024.

³ Such as the COVID-19 pandemic, the monetary policy tightening subsequent to the recent surge in inflation, and bank-specific events which likely have impacted the overall profitability of core domestic banks.

⁴ Placements with the Central Bank have recently emerged as a key component driving interest income and, consequently, banks' earnings.

⁵ Central Bank of Malta (2024). [Financial Stability Report 2023](#).

⁶ Aspachs, O., Goodhart, C., Segoviano, M., Tsomocos, D., Zicchino, L., et al. (2006). Searching for a metric for financial stability. Special paper-LSE financial markets group, 167. ECB (2016). *Financial Stability Review*. TengTeng, X., Kun, H., and Udaibir S, D. (2019). Bank Profitability and Financial Stability. IMF *Working Papers*, WP/19/5.

⁷ Camilleri, S. J. (2005). An analysis of the profitability, risk and growth indicators of banks operating in Malta. *Bank of Valletta Review*, (31).

⁸ Attard, A. A. (2014). Economic, business cycles and banks' profitability: evidence from Maltese banks from the periods 2003-2013. B.Com. thesis, University of Malta.

⁹ Only four core domestic banks out of six are considered in this study, as for two of these banks the data are available only for a shorter time period, which is not ideal for the estimation of a model.

¹⁰ I consider macroeconomic data starting from 2006Q4, as this aligns with the first observation available for bank-level data.

The macroeconomic block utilized in the models comprises real GDP and real house prices for Malta, real GDP and the HICP for the euro area, the monetary policy stance (measured by the Shadow Short Rate, as per Krippner (2020)),¹¹ and the Interest Rate Spread.¹² The inclusion of these variables captures the dynamics between economic activity of both the Maltese and euro area economies, the stance of conventional and unconventional monetary policy, and the banking sector.

Confidential bank-level data is collected for the Maltese core domestic banks and includes key balance sheet variables essential for contributing to the overall profitability of banks. The bank-level block includes a measure of profitability, interest income and expenses, loans to residents, total deposits, total assets, and capital plus reserves. Bank profitability in this context is calculated as the ratio of profits before tax (computed as a four-quarter moving sum of flows) to total assets, which can be conveniently interpreted as the ROA.

Forecasting models

These two models offer distinct perspectives on the core domestic banking environment: while the BVAR, despite being less computationally intensive, is estimated for and produces forecasts for aggregates, the FAVAR enables the examination of bank-level projections, that is, forecasts for each bank balance sheet included in the dataset. Both models are equipped with an identical macroeconomic block, with the main difference in the transformation applied to bank-level data. The BVAR model is estimated using *aggregated* bank-level series, whereas the FAVAR model utilizes four bank-level *factors* derived through Principal Component Analysis.¹³ Both the FAVAR and the BVAR are estimated using Bayesian methods, where *block exogeneity* is imposed on equations concerning euro area variables, under the small country assumption that domestic variables have neither contemporaneous nor lagged effects on the euro area block.

To evaluate the predictive accuracy of the two models, in-sample unconditional forecasts are estimated across many subsamples, and subsequently compared with the observed data, to obtain a metric to quantify forecast errors. To enhance the validation of this measure, a comparison is conducted between the forecasting accuracy of the Vector Autoregression (VAR) models and a naive benchmark model, namely the Random Walk (RW).¹⁴ This comparison assesses whether the VAR models provide added value to forecasts when compared to the simpler RW model. The forecasting evaluation exercise indicates that neither of the two models demonstrates superior performance over the other. While they may yield comparable outcomes from an aggregate perspective, it is noteworthy that one of the two models, namely the FAVAR, possesses the capability to forecast at bank-level. In this instance, the model generates interesting outcomes, demonstrating its capacity to provide reasonably accurate forecasts for selected Maltese core domestic banks' balance sheets items. However, results are heterogeneous across banks. Additional details regarding the forecast evaluation results can be found in Andreani (2024).¹⁵

Moreover, the two models are capable to provide out-of-sample predictions of selected balance sheet items of the banks included in the sample, conditional on the projected macroeconomic scenario and the monetary policy stance. An illustration of how these models can be used in practice follows. In this

¹¹ Krippner, L. (2020). Documentation for Shadow Short Rate estimates.

¹² Computed as the difference between the average interest rate on loans and deposits, which serves as a proxy for the interest rate margin for core domestic banks.

¹³ When estimated over the entire sample, the first four principal components cumulatively represent 61% of the dataset's cumulative explained variance.

¹⁴ The RW model extends the last observed value of a variable into the future.

¹⁵ See footnote 2.

Table 1
MACROECONOMIC CONDITIONING PATHS

Variables	Source
Real GDP (MT)	CBM projections
Real house prices (MT)	CBM projections
Real GDP (EA)	ECB projections, Dec. 2023
HICP (EA)	ECB projections, Dec. 2023
Shadow Short Rate	Capital market, short-term forecasts

Sources: Central Bank of Malta, Economic Analysis Department; ECB Macroeconomic projections; LJK macro finance analysis; ECB Data Portal.

Note: All conditioning paths are in quarterly frequency. Projection horizon: 2023Q4 - 2025Q4.

analysis, a forecasting horizon from 2023Q4 to 2025Q4 is adopted. In this scenario, HICP inflation for the euro area is assumed to reach the target level of 2% by mid-2025, while the real estate market in Malta is assumed to maintain its robust growth trajectory. The monetary policy is assumed to remain steady throughout 2024, with a possible easing in 2025.¹⁶ Finally, Malta's GDP is forecasted to grow at a rate below 5% from 2024 onwards.¹⁷ Table 1 lists the sources of the conditioning paths used to derive the conditional forecasts.

Cross-checking forecasts across models

The conditional forecasts from the two models are illustrated in Charts 1 to 4, specifically comparing the outlooks for selected core domestic banks provided by the FAVAR and the BVAR. The comparison between the two models' output aims to evaluate the extent to which they offer a similar outlook. Aggregated forecasts are computed for the FAVAR to directly compare bank-level forecasts with those from the BVAR.¹⁸ Since the models are estimated using data available up to 2023Q3, the charts also incorporate observations for 2023Q4 and 2024Q1 to further illustrate the forecasting performance.

Both models predict that profitability for the core domestic banks included in the sample will surpass the level recorded prior to the COVID-19 pandemic (see Chart 1), while the interest rate spread is projected to remain stable, although the FAVAR model predicts the spread to peak in 2025Q1 (see Chart 2). Additionally, both loans and deposits are expected to experience growth over the forecast horizon (see Charts 3 and 4, respectively). The credible sets, which represent probability distributions over expected outcomes, largely overlap, except for deposits in the very short-term forecast horizon, indicating similar forecast uncertainty between the two models. Notably, the median forecast for loans from the FAVAR (see Chart 3, black solid line) is strongly in line with actual data for 2023Q4 and 2024Q1 (see Chart 3, teal solid line).

To summarize, the two models predict a stable outlook for the sampled Maltese core domestic banks for the next two years. Profitability is expected to exceed 2019 levels, while the interest rate margin is forecasted to remain stable, accompanied by an increase in the growth of loans and deposits.

¹⁶ This assumption is based on the ECB forecasts for Capital markets – short-term interest rates – Winter, published in March 2024, and is used here for illustration purposes. However, it should be noted that this conditioning path is outdated by the time of this publication.

¹⁷ This indicates that the Maltese economy will continue to expand, albeit at a slower pace compared to the last two years.

¹⁸ In this case, ROA is the weighted average of bank-level ROA, where the weight is the share of total assets for each core domestic bank. Loans and deposits are the year-on-year growth rate of the sum of loans and deposits across banks, respectively.

Chart 1
ROA FORECASTS
(ratio; per cent)

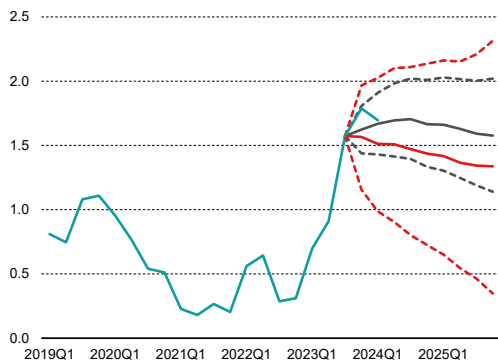


Chart 2
INTEREST RATE SPREAD FORECASTS
(per cent)

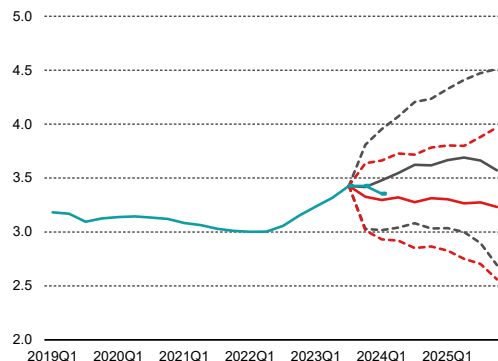


Chart 3
LOANS TO RESIDENTS FORECASTS
(year-on-year growth rate; per cent)

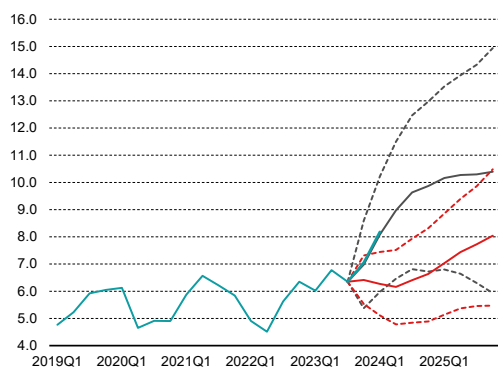
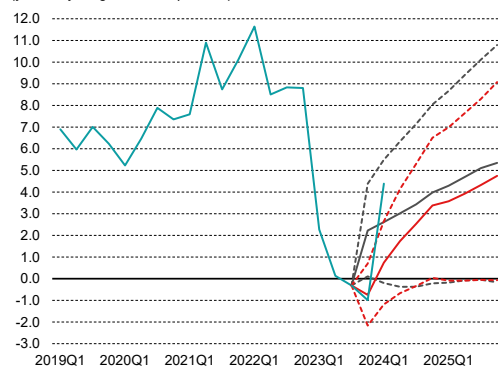


Chart 4
TOTAL DEPOSITS FORECASTS
(year-on-year growth rate; per cent)



— Actual data — FAVAR — BVAR

Note: the dashed lines in red and grey each represent 68% credible sets around the central forecast.

Applications of the framework

The framework presented in this box allows for the formation of an outlook for the core domestic banking system in Malta, which is useful as part of the Central Bank of Malta’s task to monitor and maintain financial stability. These models can be utilised to provide an outlook for the aggregate banking sector, focus on a specific bank of interest, and potentially inform stress testing scenarios. The estimated conditional density forecasts, driven by official macroeconomic projections, can offer a range of plausible trajectories for the Maltese core domestic banking system. Further extensions of these models could include additional balance sheet items and expand the sample of banks involved in the analysis. Finally, these models are sufficiently flexible to accommodate further developments in both local and euro area macroeconomic conditions, as well as future changes in monetary policy decisions.