



BANK ĊENTRALI TA' MALTA
EUROSISTEMA
CENTRAL BANK OF MALTA

MACRO STRESS TESTING FRAMEWORK

BOX 3: MACRO STRESS TESTING (MST) FRAMEWORK

The Central Bank of Malta, in its task of ensuring the stability of the financial system, regularly monitors and assesses risks prevalent both in the domestic economy as well as those emerging from the international environment. In order to improve further its financial stability toolkit, the Bank is introducing a new methodological framework, based on a top-down approach, which seeks to assess the impact of movements in the macro-economic and financial environment on banks' balance sheets under different scenarios. In particular, adverse macroeconomic shocks are translated into capital adequacy ratios to assess financial sector resilience following which, resulting ratios are gauged against regulatory thresholds. The framework is built on the basis of international standards and work on the model is at an advanced stage. The purpose of this Box is to broadly introduce this methodological framework, including the modules that test for various sources of risk, and the assumptions that will be adopted.

The exercise is run on a two-year time horizon and employs two macroeconomic scenarios, namely the baseline and adverse scenarios where shocks in the latter scenario are by definition more adverse than the baseline.¹ In line with the overarching principle of stress testing, the magnitude of the shocks under the adverse scenario is set to be extreme yet plausible. The macroeconomic scenario is developed in line with the risks perceived by the ECB and European Systemic Risk Board (ESRB), highlighted in the Risk Analysis reports. The scenario is fine-tuned in line with domestic specificities and vulnerabilities.

The test assumes a static balance sheet, implying that assets and liabilities which mature within the time horizon of the exercise are replaced with similar financial instruments in terms of type, credit quality, and date of maturity as at the start of the exercise so that the structure of the balance sheet remains similar to its position at the reference date. Whilst it is acknowledged that a static balance sheet assumption is quite restrictive, this assumption, similar to the EBA EU-wide stress testing exercises, allows for ease of comparability across the results of banks within the sample.

The framework is based on a number of modules which test for various sources of risk including market, credit and sovereign risk.² The risks arising from sovereign exposures are covered in credit and market risk depending on the securities' accounting treatment. The framework is flexible in a way that additional modules can be incorporated, and the magnitude of shocks can be easily modified. Modules can also be run individually so as to assess a particular source of risk, such as the module on credit risk in the securities portfolio.³

The rest of the information presented in this Box includes an overview of the methodology currently adopted for the various sources of risk being tested.

Credit risk is quantified, both in the loans and securities portfolios, albeit a different methodology is adopted in the quantification of the two sources of risk. Credit risk in the loan book is quantified via

¹ The baseline scenario reflects shocks which are in line with business as usual, and normally such shocks follow a similar profile to the macroeconomic projections from a survey of economic forecasters. For instance, the baseline scenario of the 2016 EBA EU-wide stress test was based on 2015 autumn forecast of macroeconomic variables. Conversely, the magnitude of the shocks contemplated in an adverse scenario should reflect extreme yet plausible events to determine bank resilience to such unexpected events over a stipulated time horizon (for instance of around 2 to 3 years). The adverse scenario in the 2016 EU-wide stress test reflected the systemic risks that were assessed by the ESRB General Board as representing the most pertinent threats to banking sector stability, the magnitude of which were derived as deviations from baseline. As an example, the adverse scenario in the 2016 EU-wide stress test implied a deviation of EU GDP from its baseline level by 3.1% in 2016, 6.3% in 2017 and 7.1% in 2018, with resulting growth rates of -1.2%, -1.3% and +0.7% for the three years respectively.

² Foreign exchange risk is currently outside the scope of the framework. Derivatives, including hedging positions, are also not considered.

³ The stress test which tests for credit quality deterioration in the securities portfolio, presented in Chapter 3, employs one of the modules of the MST.

the assessment of macro-financial linkages including the impact of a macroeconomic shock on NPLs. The impact of the increase in NPLs is then translated into a higher level of provisions which in turn, adversely impacts the profit and loss account and ultimately the capital ratio via retained earnings.

The market price of credit risk in the securities portfolio is quantified by way of widening of credit spreads in marked-to-market securities and a three-notch rating downgrade in HTM securities. The type and magnitude of the shocks applied differ between both the accounting treatment of securities as well as by the sector of exposure, i.e. whether financial or otherwise.

Credit risk of securities that are HTM is quantified via the increase in the probabilities of default following a three-notch rating downgrade. A LGD of 40% is assumed on both the sovereign and non-sovereign portfolio, while a lower LGD is assumed on covered bonds. HTM securities are amortised and therefore not affected by market price movements. However, in the case that the amortised cost is above nominal value, the difference has to be also provided for. In contrast, if the amortised cost is below par, the booked difference may be released to absorb the expected losses.

The rating grades are based on a composite index estimated internally, on the basis of the second best rating of the three main External Credit Assessment Institutions (ECAI), namely Fitch, Moody's and Standard and Poor's. As aforementioned, credit risk of securities that are marked-to-market is expressed in terms of widening of credit spreads, where the shock is sourced from the largest increase in the iTraxx European Senior Financials CDS index.⁴

Market risk, including the impact on cost of funding, is quantified via a change in the risk-free rate. The impact of an increase in interest rates is assumed to be twofold, namely marked-to-market losses given the inverse relationship between prices and yields, and higher coupons earned on floating rate notes which would be reflected in the calculation of net interest income. Moreover, given the static balance sheet assumption, securities which mature during the time-horizon are rolled over, at the new interest rates. To note that the accounting treatment of fair value changes on securities accounted for as available for sale (AFS) and fair value through profit and loss (FVTPL) differs. While fair value changes on AFS securities are reserved in the statement of financial position (balance sheet) and thus not recognised in the statement of profit or loss (profit and loss account), similar changes on the FVTPL are not reserved in the balance sheet but taken directly to the statement of profit or loss.

Given the flexibility of the model, including on the assumptions applied, the framework can cater for both an increase or decrease in the risk-free rate, as well as a flattening or steepening of the curve. A flattening of the yield curve would capture the scenario where banks ride the curve, namely that of funding themselves in the short term and investing in the medium-to-long term. Banks which are holding a higher proportion of floating rate notes would be more negatively impacted by a flattening of the curve than by a parallel shift given that less income would be earned from rising interest rates. However, the additional holding of floating rate notes would assist banks in insulating their portfolios from valuation losses arising from positive shifts in the risk-free rate.

The change in interest rates will also have an impact on both the loan book and the banks' liabilities, including deposits. The change in the margin of re-priced instruments is subject to 'pass-through' constraints, which provide floors to interest-bearing liabilities and caps in the case of interest-earning assets. While an increase in the risk-free rate is reflected in higher interest expense paid on deposits, the extent to which this expense is reflected in interest income is asymmetric. The assumption on the magnitude of the margin paid on deposits currently follows the EBA 2016 stress test methodology

⁴ The European CDS Index is selected given that the vast majority of the portfolio under review is exposed to Europe. The North American CDS Index was also considered.

which is broadly based on the change in the sovereign spread and an idiosyncratic component which reflects a shock to the margin following a rating downgrade of the bond issuer.

Non-interest income components, the majority of which include net fee and commission income, and administrative expenses, are currently assumed to remain constant over the two-year horizon.

The model also assumes a shock to the bid-ask spread as a measure for quantifying the **market price of liquidity**. Moreover, the framework also quantifies **operational risk**, using the Basic Indicator Approach which assumes that banks must hold capital for operational risk equal to the average fixed percentage of positive annual gross income over the previous three years.

The impact of the materialisation of shocks listed above is primarily absorbed via the profit and loss account, with the exception of fair value changes on AFS securities which are reserved in the balance sheet.

The dividend pay-out ratio, when a bank remains profitable, is based on individual bank's publicly declared projected dividend policies.

Results are produced under two scenarios – baseline and adverse – and for a two-year horizon; however assuming a static balance sheet. The ultimate aim of the Framework is to determine whether, following the materialisation of the contemplated scenario, individual and aggregate banks' capital positions remain sound. The resulting capital ratios are assessed against the respective regulatory thresholds. A warning signal follows for in-depth review of the particular case when a bank's capital position is close to or below the stipulated regulatory thresholds. The MST framework acts as a tool for assessing bank's potential sources of vulnerabilities inherent in their balance sheets, and their ability to absorb these losses should they materialise.

The framework is flexible and dynamic in nature and will benefit from further refinements in both the methodology and assumptions applied on the basis of new data availability, changes in the risk profiles or business models of banks, and developments in the domestic and international markets. The magnitude and direction of shocks are also revised on the basis of emerging risks. The model will undergo a thorough testing phase before outcomes are published.