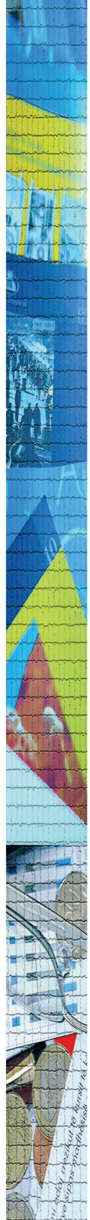
WORKING PAPER

6 (93) 2023

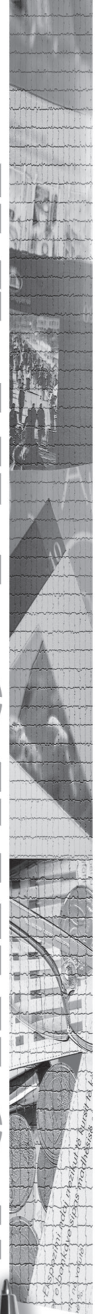
MACRO STRESS TESTING OF THE BANKING SECTOR IN ALBANIA

Juna Bozdo
Arisa Goxhaj (Saqe)
Adam Gersl



BANK OF ALBANIA

WORKING PAPER



MACRO STRESS TESTING OF THE BANKING SECTOR IN ALBANIA

Juna Bozdo
Arisa Goxhaj (Saqe)
Adam Gersl

6 (93) 2023

BANK OF ALBANIA

Juna Bozdo
Financial Stability Department, Bank of Albania, e-mail: jbozdo@bankofalbania.org

Arisa Goxhaj (Saqe)
Resolution Department, Bank of Albania, e-mail: asaqe@bankofalbania.org

Adam Gersl
Charles University, Prague, Czech Republic

NOTES

The thoughts and opinions expressed in this report are those of the authors only and do not reflect the views and opinions of the Bank of Albania.

C O N T E N T

ABSTRACT

This paper describes the evolution of the macro stress testing of the banking sector applied in the Bank of Albania over the past 15 years. It gives details about the stress testing methodologies used over this horizon, with emphasis on the last two approaches: the one used in 2013-2021 and especially the one used currently, i.e. a new approach that started in 2022. We illustrate both stress testing frameworks by showing the results for stress tests conducted at two different points in time (2019 and 2022), and discuss future challenges.

Keywords: stress testing; credit risk; central bank; capital adequacy; financial stability

JEL classification: E44, E58, G21, G28

1. INTRODUCTION

Financial stability represents the ability of the financial system to efficiently carry out its functions, not only under normal circumstances, but also during more adverse economic situations. Financial stability is a necessary condition for the financial system to be able to lend to the real economy and support stable economic growth. If financial stability is maintained, financial institutions are resilient against economic shocks, financial crises are avoided, and economic policies of the central bank and other public authorities are more effective.

Bank of Albania, in cooperation with other authorities, contributes to maintaining financial stability. In 2007, Financial Stability Department was established at the Bank of Albania to monitor and assess risks to financial stability and support institutional and inter-institutional discussions and decision-making on this issue[1].

After the global crisis, the importance of safeguarding financial stability has further increased. The legal framework has been adjusted in 2016, extending the objectives of Bank of Albania beyond the traditional price stability and bank regulation and supervision to also include an objective to prevent and mitigate systemic risk[2]. Systemic risk is the materialization of shocks when financial instability becomes so widespread that it impairs the functioning of the financial system to the extent that economic growth and welfare suffer materially[3].

To assess the risks to the stability of the financial system and the evolution of systemic risk, Bank of Albania uses a variety of analytical tools to regularly analyse the real economy and financial sector and, depending on the results of the analyses, implements

---

1 *The Supervisory Council approved "The organization and functioning of the Financial Stability Department", by Decision no. 52, date 26.09.2007.*

2 *Law no.133/2016, date 22.12.2016 "On the recovery and resolution of banks in the Republic of Albania".*

3 *Hollo et al. (2011).*

macro-prudential instruments with the aim to mitigate the risks[4]. One of such analytical tools are stress tests of the banking sector, aiming at assessing the capacity of the banking sector to absorb losses resulting from the materialisation of extreme, but plausible, unfavourable events in the macroeconomic framework and financial sector. Bank of Albania has been conducting regular stress tests of the banking sector since 2007.

The objective of this working paper is to describe the evolution and experience of the Bank of Albania with macro stress tests, i.e. top down stress tests run at the Bank of Albania to assess the resilience of banks to severe macroeconomic stress. The stress testing methodology has been evolving over the past 15 years and with new data and challenges, the stress testing approach has been continuously adapted. We put emphasis on the current methodology and approach designed during 2021 and illustrate it by presenting the stress test results used in the official Financial Stability Report published in April 2022 (Bank of Albania 2022).

The rest of the paper is organized as follows: Section 2 describes the main feature of the Albanian banking sector and its regulation to provide the reader with an appropriate background. Section 3 reviews the history macro stress tests run at the Bank of Albania since 2007, describing the key blocks of the methodology applied between 2007 and 2021. Section 4 presents the current stress testing methodology in use since early 2022, while Section 5 illustrates its use with results of stress tests run in early 2022 and published in the April 2022 Financial Stability Report. Section 6 concludes the paper with summarizing the challenges for the future in this area.

---

[4] *The Macroprudential Policy Strategy was approved by the Supervisory Council, Decision no. 38, on the 2nd of August, 2017. Its main objective is to offer an overall operational framework for the implementation of the macroprudential policy. Following this, the Bank of Albania approved the regulation no. 41, date 05.06.2019, "On the macroprudential capital buffers", whose purpose is to determine the application method of each of the macro-prudential capital buffers and their combination.*

2. THE ALBANIAN BANKING SECTOR IN A NUTSHELL

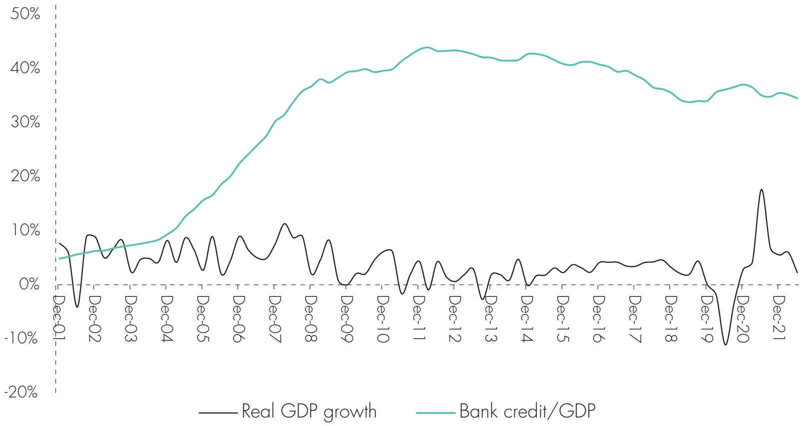
The relationship between economic growth and financial development is discussed broadly in the theoretical literature. The latest has shown that a well-developed financial system supports and promotes financial stability of the country, affecting its macroeconomic stability as well[5].

In such a view, the Albanian banking sector with its share of assets of about 94% of GDP at the end of 2021, is the most important segment of the Albanian financial system (almost 90% in total assets of the financial system, with the remaining 10% representing non-bank financial institutions such as other lenders, savings and loan associations, pension funds or insurance companies).

The sector has undergone dynamic developments over the last three decades. During the 1990s, the relevant legal and institutional infrastructure was established, former state-owned banks privatized, and new players, including foreign capital, entered the market. A turning point for the banking sector in Albania could be considered the privatization of the Savings Bank in 2004, leading to a further liberalization of the market, an increase in competition, and establishing a new benchmark for other market players. Supported also by strong and stable economic growth in 2000s, the sector has experienced a period of rapid expansion demonstrated by high credit growth funded to a large extent by foreign borrowing. Between 2001 and 2007, bank credit to GDP increased from 5% to 30%, amid a high stable GDP growth of about 6% (Figure 1).

[5] *Sejko G., Dushku E. (2018).*

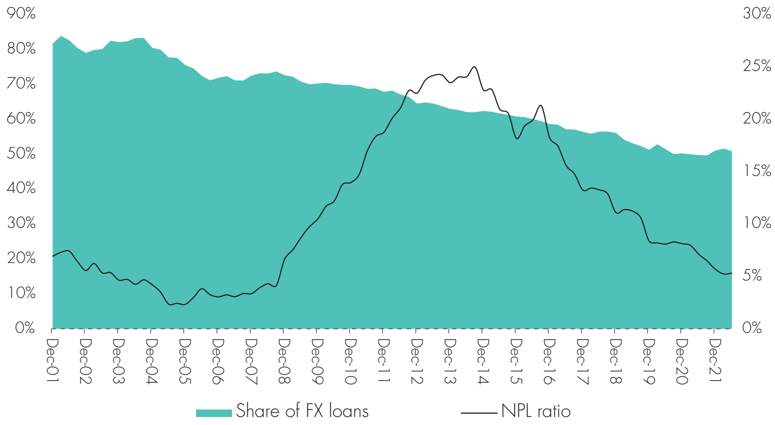
Figure 1. Real GDP growth and bank credit to GDP 2001-2021



Source: Bank of Albania, authors' calculations.

The global financial crisis hit Albania in mid-2009 by a drop in external demand and worsening of financial conditions, leading also to a strong depreciation of the Albanian currency lek. GDP declined in 2009 and non-performing loans (NPLs) started to increase rapidly, reaching almost 25% by the end of 2014. One of the factors behind this deterioration of bank credit portfolio quality were loans provided in foreign currency both to corporations and households that were popular during 2000s due to their low interest rates compared to the lek-denominated loans, but which became problematic to repay at times of currency depreciation (Figure 2).

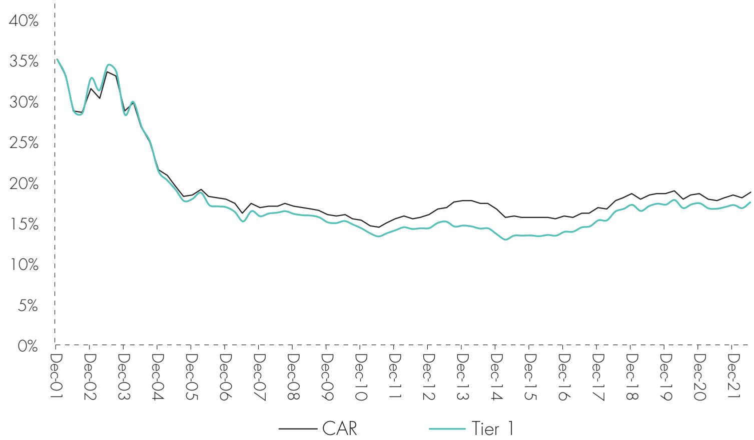
Figure 2. Share of FC loans to total loans and NPL ratio 2001-2021



Source: Bank of Albania, authors' calculations.

Consequently, the attention of the central bank shifted mostly towards resolving the NPLs. Starting from 2013-onwards, Bank of Albania undertook a series of measures including introduction of obligatory write-offs of NPLs and the revision of the legal and regulatory framework with the aim to bring the level of NPLs down and to make banks more resilient in terms of capital adequacy and funding. Despite the credit quality deterioration during the last decade, the banking sector has been always characterized by good levels of capitalization (Figure 3), although the capital adequacy ratio differs significantly from one bank to another.

Figure 3. Capital Adequacy Ratio and Tier 1 Ratio 2001-2021



Source: Bank of Albania, authors' calculations.

Following the global financial crisis, the Albanian banking sector started to take its consolidation path. These years reflected a reduction of exposure of some foreign banks in Albania, decrease in the reliance on foreign funding, and some mergers and acquisitions in the sector. Bank of Albania successfully supervised the consolidation process of the banking sector over these years, which was marked not only by a reduction of the number of commercial banks, but also by the entry of new players and an increase of competition in the domestic market.

In terms of the regulatory capital framework, Bank of Albania as the regulatory and supervisory authority has continuously aligned its framework with Basel principles and standards and with EU law. In 1999, it introduced capital requirements based on Basel I, with the minimum capital adequacy ratio (CAR) set at 12% to cover two types of risks: credit and market risk. In 2013 (with its regulation 48/2013 "On capital adequacy ratio"), it implemented the main blocks of Basel II, such as the standardised methods (STA) for credit risk and market risk, as well as the basic indicator, the standardized approach, and the alternative indicator approach for the operational risk, with the required minimum CAR remaining at 12%. Differently from the Basel II standards, Bank of Albania has chosen not to introduce the Internal Ratings-Based (IRB) approach for credit risk in its regulatory framework, judging from the perspective of its complexity, data needs, and the level of development of the banking sector. However, it has introduced some differences to the Basel STA risk weighting scheme by asking for a higher risk weight for exposures denominated in foreign currency. The capital adequacy regulation further provides the methods for calculating the capital charges for counterparty credit risk (for non-trading and trading book exposures), credit risk mitigation techniques (in the forms of funded and unfunded credit protection), and treatment of securitization exposures, although such exposures are almost non-existent in Albania.

In 2014, Bank of Albania approved the regulation "On banks' regulatory capital", which lays down the structure, components and method of calculating the regulatory capital of the banks and setting out the minimum capital ratios as well (i.e. CET 1 ratio, the Tier 1 ratio, the capital adequacy ratio). The regulation considers the requirements of the EU CRR (Basel III requirements) providing respectively for the definition of regulatory capital; Common Equity Tier 1 (CET1), Additional Tier 1 (AT1) and Tier 2 elements; deductions and adjustments from CET 1 and regulatory capital in general; and the level of capital ratios, which as at end-2021 are as follows: minimum CAR 12%, minimum T1 ratio 9% and minimum CET1 ratio 6.75%.

As per Bank of Albania regulation, for being eligible as regulatory capital element, Tier 2 capital is limited to one third of Tier 1 capital, a requirement in compliance with the EU CRR requirements. In the same year, Bank of Albania has also transposed the Basel requirements on large exposures, by adopting the regulation "On risk management from banks' large exposures" and amending it later in 2020 to reflect the evolving EU CRR requirements.

The capital adequacy regulation has been continuously revised since 2013/2014 in order to align it with the evolving CRR/CRD regulation in the EU reflecting the implementation of Basel III. In the context of Pillar II requirements, in 2017 the Bank of Albania approved the guideline "On the Internal Capital Adequacy Assessment Process

(ICAAP)", which aims to align the supervisory practices with Basel principles and EU law. The Internal Capital Adequacy Assessment Process, which is independently conducted by the bank, shall ensure the assessment of the current and future levels of capital adequacy, based on its risk profile and strategies. At the same time, it allows the Bank of Albania to set Pillar II capital add-ons, which the bank needs to fulfil on top of the minimum capital adequacy[6]. These Pillar II add-ons are actively used, ranging from 0% to 3%.

In the area of capital adequacy, an important step to implement new features from Basel III has been the establishment of official capital buffers. In 2019, the Bank of Albania issued a regulation on "Macroprudential capital buffers", approved with the decision no. 41, date 05.06.2019 of the Supervisory Council of the Bank of Albania (herein, regulation '41/2019'). The regulation '41/2019' required banks to build the conservation buffer (KONS), countercyclical capital buffer (KUNC), and buffer for systemically important banks (SIST)[7].

The approval of regulation "On banks' leverage ratio" in 2020 represents another adoption of Basel III rules. It is partially aligned with Basel III and EU regulation, taking into consideration the characteristics of domestic market and its complexity. The minimum required leverage ratio is set at 5.75%, which differs from the Basel standard of 3%. Setting this limit at higher level was preceded by a quantitative analysis by the Bank of Albania following the methodology presented in a BIS paper on the calibration of leverage ratio. This higher limit is also in line with the higher minimum capital adequacy ratio of 12%, compared to 8% in Basel III and adapted to the situation of the Albanian banking market.

---

[6] *In addition, the Bank of Albania has also drafted a document on the "Supervisory Review and Evaluation Process (SREP)" which is in 2021/2022 under testing and calibration. Considering the broader objective of aligning its regulatory and supervisory frameworks with that of the EU, the document has been prepared based on the Guidelines on Common Procedures and Methodologies for SREP issued by the European Banking Authority (EBA).*

[7] *For the conservation buffer (KONS), regulation 41/2019 stipulates in article 10, paragraph (1), the value that should be met and held from each of the banks for 2023 is 2.0%; for the countercyclical capital buffer (KUNC), the regulation stipulates in its article 12, paragraph (3), that the applied rate should regularly be announced by Bank of Albania and can move between 0% and 2.5%; the actual level (AKUNC) for Albania is 0%, to be fulfilled starting from October 2023; and, for the systemically important banks buffer (SIST), this buffer differs across the institutions; the regulation stipulates in its article 14, paragraph (6), that the values can be up to 1.5% for year 2023.*

3. MACRO STRESS TESTING AT THE BANK OF ALBANIA 2007-2021

Macro stress tests serve to assess resilience of the banking sector against large but plausible shocks and are frequently used by almost all central banks (Budnik et al. 2020; Dent et al. 2016). The shocks are typically expressed as macroeconomic shocks (a large drop in GDP, depreciation of domestic currency, increase in market interest rates) impacting banks' balance sheets, whereby the impact is quantified with the help of satellite models (or other assumptions) transposing the macro shocks into the key balance sheet and profit & loss items (such as increase in NPLs and their higher provisioning, drop in net interest income etc.). Two typical features of such macro stress tests are: (i) it is a top-down exercise conducted by the central bank (or supervisory institution) for all banks in the sector, using available data from regular reporting; and (ii) the set of macro shocks is typically embedded in a macroeconomic scenario, which makes sure that the shocks are mutually consistent and plausible. The scenarios are often prepared with the help of macroeconomic models and are underpinned by a strong narrative of adverse economic developments. The Bank of Albania runs this type of macro stress tests since 2007 annually and since 2010 in semi-annual frequency. They are performed by the Financial Stability Department, with results published in the semi-annual Financial Stability Report.

The macro approach differs from the so-called microprudential stress tests, which are typically run in a bottom-up approach, with the regulator specifying scenarios and shocks as well as key assumptions and constraints, but the calculations of the impact are done by the banks themselves (BCBS 2017, 2018). These stress tests are more precise as the banks have more detailed information about the individual borrowers and their sensitivity to economic shocks. However, they are more costly and time-demanding and are thus run less frequently and often only with selected (usually the largest) banks. These microprudential stress tests, based on the bottom-up approach, are run by the Bank of Albania, since 2013 and for selected banks only. They share the scenarios from the macro stress tests, but only 6 largest banks based on their asset size participate in this exercise, which has a strong supervisory component as the results are used by the supervision in the supervisory review and evaluation process.

During 2007-2013, the macro stress tests were using a very simple framework. Initially, they were based on the IMF technical assistance in connection with the 2005 Financial Sector Assessment Program (FSAP) to Albania, relying on sensitivity analysis only. After 2009, these stress tests were upgraded by following the method for the IMF coordinated ST exercise in Central, Eastern, and South-Eastern Europe. The Financial Stability Department focused on the whole banking sector and applied both sensitivity and scenario analyses.

These approaches were replaced by a more complex framework in 2013 at the occasion of the next IMF FSAP mission in Albania. The stress test exercise started to use explicit macroeconomic scenarios generated by the Bank of Albania macroeconomic model MEAM - one baseline scenario capturing the official macroeconomic forecast and two adverse scenarios that would differ from each other in terms of the intensity of shocks. The key variables in which the scenarios would be defined were real GDP growth, exchange rate to euro and US dollar, interest rates and overall credit growth. The projections were prepared for the next two years.

Macroeconomic variables then entered into two satellite credit risk models - one for loans in domestic currency and one for loans in foreign currency - to generate NPL ratio projections. Credit risk is the most important risk in the Albanian banking sector.

Given the large share of foreign currency (FX) loans in total lending (65.0% of total outstanding loans in 2013, of which 50% was to unhedged borrowers), the stress test had to capture also the so-called indirect FX-induced credit risk, i.e. the risk that borrowers will not be able to repay their FX loans in times of large depreciation of Albanian Lek, in which they typically receive income.

As provided by evidence[8], foreign currency lending was mainly driven by the availability of banking sector's foreign funding deposits and under circumstances such as higher interest rate differentials, inflation volatility and lower exchange rate volatility. That's why the link between macroeconomic variables and the NPL ratio was estimated separately for domestic currency and FX loans.

The credit risk satellite models were estimated through simple OLS and the time series included quarterly data 2002Q1-2012Q3. Dependent variables entered as changes in banking sector domestic currency and FX NPL ratio, respectively, explanatory variables included the traditional macro factors that typically influence credit risk, i.e. economic performance (GDP), exchange rate (ALL to USD and ALL to EUR), and interest rates (3M Euribor and 12M domestic T-bill rate). The estimated specifications that were used during 2013-2021 are given below:

NPL model for FX loans:

D(NPL_RATIO_FOR)=0.0021-0.0186*DLOG(GDP(-2))+0.06*DLOG(ALL_USD (-1)) + 0.19*DLOG (ALL_EURO) + 0.0019*EUR_3*DUMMY_08

R^2-adjusted = 0.36, Durbin-Watson = 2.09

Where: NPL_RATIO_FOR - non-performing loan ratio in foreign currency;

GDP - quarterly GDP as estimated by the Albanian Institute of Statistics (INSTAT);
ALL_USD - exchange rate of ALL vis-à-vis US dollar;
ALL_EURO - exchange rate ALL vis-à-vis euro;
EUR_3 - EURIBOR 3 month;
DUMMY_08 - the dummy variable is "0" for the period 2002Q1-2008Q2 and "1" for the period 2008Q3-2012Q3.

The variable DNPL _RATIO_FOR did not display autoregressive behaviour since none of the time lags were statistically significant. All the estimated coefficients had an expected sign, were statistically

[8] *Shijaku G. (2016): "Foreign currency lending in Albania", BoA Working Paper.*

significant at a 10% confidence interval, and stability tests confirmed that they were stable over time. The estimation results show that the depreciation of ALL vis-à-vis EUR has quite a significant impact on NPL ratio in foreign currency - a depreciation of 10% would increase the FX NPL ratio by 1.9 pp within a quarter, confirming the existence of the indirect FX-induced credit risk.

NPL model for domestic currency loans:

D(NPL_RATIO_ALL) = 0.0029 + 0.33*D(NPL_RATIO_LEK(-1)) - 0.013*DLOG(GDP) + 0.0029*D(TB_12(-2)) + 0.077*DLOG (LEK_EURO (-3))

R^2-adjusted = 0.28, Durbin-Watson = 1.9

Where: NPL_RATIO_ALL - Nonperforming loan ratio in domestic currency;

GDP - quarterly GDP as estimated by INSTAT (Institute of Statistics);

TB_12 - 12 month T-bills interest rate;

ALL_EURO - exchange rate of ALL vis-à-vis EURO.

To explain the variations of NPLs in domestic currency, the same variables as for the NPLs in foreign currency were included, except for the interest rates, where instead of 3M Euribor (which is relevant for FX loans) the domestic 12-months T-bill rate was used, and only one exchange rate (ALL to EUR) was included as a proxy for the general risk and uncertainty (ALL typically depreciates in times of higher economic uncertainty). All the estimated coefficients had an expected sign, were statistically significant at a 10% confidence interval, and stability tests confirmed that they were stable over time. In contrast to the FX NPL ratio model, we had to include here the autoregressive term, as the NPL ratio in domestic currency displayed autoregressive behaviour. Explanatory power of the model is 28%, somewhat lower than in the case of foreign currency equation.

Although two credit risk models were used, the final individual banks' NPLs were projected using an aggregate NPL projection for the total portfolio (i.e. without currency or sectoral breakdown). This was constructed as a weighted average of the two currency-specific NPL ratio projections, with weights being the shares of domestic and foreign currency loans in aggregated banking sector credit portfolio. The increased NPLs would then be provisioned (at initial bank-specific average NPL provisioning rates), which generated the credit losses impacting the banks' profit and loss, and ultimately regulatory capital.

In addition to credit risk, interest rate risk and (direct) exchange rate risk were also included in the stress tests. Banks face interest rate risk, as interest rate sensitive assets and liabilities do not match. An increase in the interest rate affects the value of assets and liabilities differently, and impacts also the net interest income (NII). Moreover, in Albania, given the floating exchange rate regime and the existence of FX exposures and funding, the banks are also exposed to exchange rate risk due to changes in value of FX-denominated items in times of exchange rate movements.

To capture the impact of the changes in interest rates that were part of the scenario (3M Euribor and 12M T-bill rate), a repricing gap model was used separately for FX and domestic currency items to estimate the effect of the change in interest rate on NII. Typically, given the banks' negative repricing gap (i.e. higher level of short-term liabilities such as sight deposits compared to more long-term asset items such as loans), an increase in interest rates would lead to lower NII, reflecting the need to reprice liabilities earlier than assets. In additional, the interest rates also impacted the value of bonds held by the banks, whereby the impact was calculated using the (modified) duration of banks' bond portfolios.

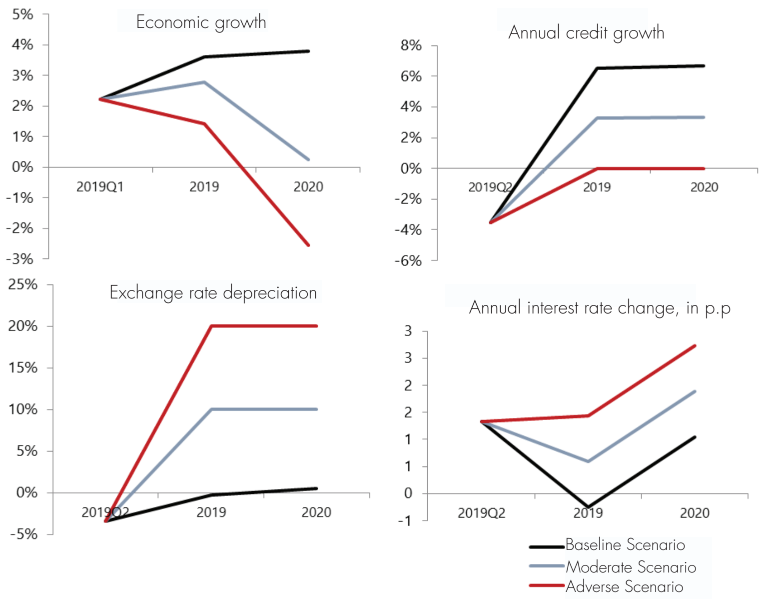
The (direct) exchange rate risk was captured by using information about the net open FX position in EUR and USD which, when multiplied by the change in exchange rate, would generate a revaluation income or loss.

All the four final impacts - credit losses, impact on net interest income, revaluation of bonds, and FX revaluation - were deducted from the initial regulatory capital and risk-weighted assets in each of the two years of the horizon, generating a projection of the overall capital adequacy ratio for the two next year-ends for each bank. In case that some banks were below the regulatory minimum, capital injections that would be needed to bring those banks at least to the regulatory minimum were calculated.

In what follows we demonstrate the use of this methodology with illustrative scenarios and results from 2019H1 published at that time in the Financial Stability Report.

The stress test exercise assesses the banking sector's resilience in terms of capital adequacy for the remaining part of 2019 and for 2020. The assessment of the impact from macroeconomic scenarios on the financial situation of the banking sector excludes the possibility of the increase in paid-in capital during the period. The exercise is conducted by applying three scenarios: the baseline scenario, the moderate scenario, and the adverse scenario (Figure 4).

Figure 4. Macroeconomic scenarios used in 2019H1



Source: Bank of Albania.

The baseline scenario assumes a positive economic growth trending upward throughout the timeframe of the exercise. In this scenario, the economic growth is accompanied with positive growth rates of lending, supported also by a significant improvement of the quality of the credit portfolio by the end of 2020. The moderate scenario assumes again a positive economic growth for the two years of the exercise, but notably lower compared with the baseline scenario, while the adverse scenario assumes again an economic growth during the remaining months of 2019 and its significant contraction in 2020.

To the assumptions on the economic performance in both adverse scenarios are also attached the respective assumptions for a depreciation of the exchange rate of the domestic currency, an increase of the interest rate and a decrease of the lending pace up to its stoppage. These developments, in addition to the downward values in the volume of write-off loans, are reflected in a deterioration in the quality of the loan portfolio. The ratio of non-performing loans by the end of 2020 deteriorates up to 6.3 percentage points (moderate scenario) and 14.8 percentage points (adverse scenario), compared with the June 2019 real data. These assumptions lead to a decline in the indicators' value of the banking sector capitalisation, more sensitive to particular groups of banks and mainly during the second year of exercise.

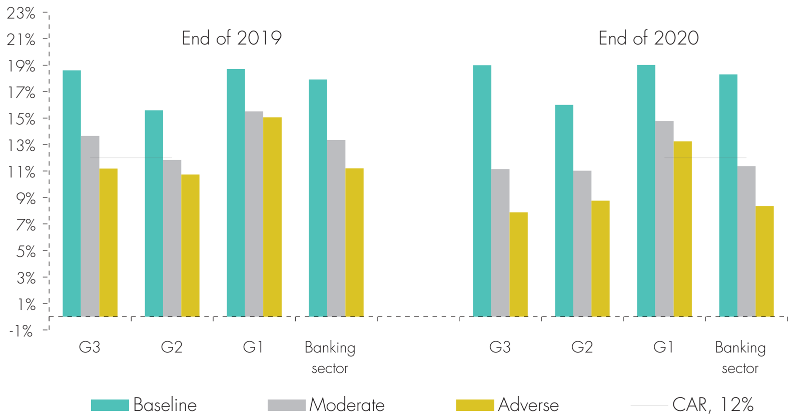
Stress test results in terms of capital adequacy show that in the baseline scenario, the Capital Adequacy Ratio (CAR) of the banking sector appears stable and at comparable levels with the actual values as of June 2019. In concrete terms, this ratio reaches 18.0% at the end of 2019 and increased to 18.3% at the end of 2020. This development reflects the assumption on the economic growth pace, the positive growth of lending to the economy, the further improvement of the non-performing loan portfolio and the favourable performance of the exchange rate. On the other hand, the assumed performance of interest rates (see chart above), given the structure of "the assets and liabilities sensitive to the up-to-12 months interest rate" of the banking sector, has provided an effect on opposite directions. Specifically, it affected the decline of the sector's CAR during the first year of the exercise and its growth during the second year. Developments by banking groups register high levels of capital, significantly above the minimum level required by the regulatory framework.

In the moderate scenario, the banking sector's CAR decreases at 13.3% at the end of 2019 and 11.4% as at end of 2020. This rate is influenced by assumptions for a low growth rate of economic activity, halving of the credit growth rate, depreciation of the domestic currency, growth of the non-performing loans - following a lower level of lost loans write-offs from the bank balance sheets - and portfolio losses on securities. Based on the above assumptions and the results obtained, developments in particular banks evidence the need for capital injection during the two years-time period. The number of banks that are undercapitalised by the end of the period is six, accounting for around 70% of the banking sector's assets. In this case, the need for additional capital amounts up to around ALL 10.6 billion (less than 1% of GDP).

Finally, in the adverse scenario, the banking sector's CAR declines at 11.2% at the end of 2019, and at 8.4% at the end of 2020, driven by the significantly more adverse assumptions included in this scenario. The number of banks that fall into undercapitalisation increases to eight and account for around 2/3 of the sector's assets. The extreme macroeconomic developments included in the scenario, in addition to stopping the lending to the economy, lead to the significant deterioration of the credit quality. Also, this scenario assumes losses in the securities portfolio and increase of the exposure towards operational risk. In this case, the needs for additional capital are about twice as high (about 1.3% of GDP).

Based on the above, but also from a comparative perspective with the previous period, the results indicated a higher sensitivity of the banking sector to the assumed economic and financial developments, reflecting lower levels of the CAR at sector level and in some banks. However, the capital needs were considered manageable by the banking sector.

Figure 5. Capital adequacy ratio by stress test scenarios



Source: Bank of Albania.

4. CURRENT METHODOLOGY FOR MACRO STRESS TESTING SINCE 2022

In 2021, the Bank of Albania revised its macro stress testing approach with the help of the Swiss SECO BCC assistance, addressing the deficiencies of the previous stress test methodology and reflecting the changes in the banking sector and its regulation. The following deficiencies that needed improvements were identified:

- The two currency-based credit risk models were not providing reliable projections of NPLs anymore. Also, the newly established NPL write-off policies have complicated the model-based NPL projections and would need to be considered explicitly.
- The credit risk projections were lacking additional shocks to the structure of NPLs (worsening of the structure of NPLs towards classes with higher days past due, requiring higher provisioning), potentially underestimating credit losses. Moreover, the framework has not explicitly worked with the "watch" (special mention) loans (typically 30-90 days past due), which despite being a part of performing loans, attract higher provisions.
- The framework was lacking a possibility to apply sector-specific shocks to loan quality (i.e. additional increases in NPLs in construction, in trade, in mortgage loans etc.).
- The two-year horizon (which, when the stress tests were run at mid-year data, turned into a 1.5-year horizon only) was considered insufficiently long to fully reflect the overall lagged impact of the macroeconomic developments on banks' balance sheets.
- The framework has not explicitly included a projection of pre-shock (pre-provision) income, overestimating the impact of credit and market risk shocks on regulatory capital.
- The amended capital regulation framework (with Pillar 2 add-ons and various capital buffers) called for revision in order to accommodate different types of regulatory minima (with/without add-ons and buffers).

To tackle the above-mentioned challenges, a completely new stress testing tool was constructed. It works with an extended horizon of up to three years, whereby the projections are always for the nearest three end-years, even if the starting point is any end of quarter. The bank projections are prepared for three macroeconomic scenarios (baseline, moderate and adverse), which can be calibrated assuming specific paths for key macroeconomic variables such as real GDP growth, unemployment, interest rates, exchange rate, house prices, and corporate and household loan growth in quarterly frequency for the next three years. Macroeconomic scenarios are prepared by the BoA's Monetary Policy Department model and are thoroughly discussed before used in stress testing.

3.1 Credit risk

Two new credit risk satellite models were estimated, but instead of constructing currency-specific NPL models, the framework now has a separate credit risk model for corporate loans and another model for household loans. This is more in line with best practices and allows to capture different sensitivity of the two segments to macroeconomic developments. Both models have been estimated for the NPL ratio (with a logistic transformation) as the dependent variable and the key scenario-specific macro-financial factors (GDP growth and interest rate for the corporate model, unemployment rate and interest rates for the household model) as right hand-side variables, allowing their time-contemporaneous and lagged inclusion, as well as an autoregressive term (lagged dependent variable) controlling for the strong persistence of the dependent variable.

The final specification for corporate NPL ratio model is (coefficients are rounded):
NPL_ratio_transformed (t) = - 0.12 + 0.95*NPL_ratio_transformed (t-1) – 1.5*GDP_growth (t) + 2.01*12M_interest_rate

The final specification for household NPL ratio model is (coefficients are rounded):
NPL_ratio_transformed (t) = - 0.17 + 0.96* NPL_ratio_transformed (t-1) + 1.52*the difference between average unemployment rate of past 4Qs and the preceding 4Qs + 2.01*12M_interest_rate

Regarding the banks' loan portfolios, the framework is using a total of 15 different loans (13 corporate loan segments by economic sectors and 2 household loan segments by purpose of the loan, Table 1). As part of all three macroeconomic scenarios, corporate and household credit growth assumptions are provided and applied to all banks and segments in a uniform way. The segment-specific NPL ratio paths for each bank, which are applied onto time-varying gross credit amounts, are generated by applying the model-implied absolute change of the sectoral NPL ratio onto bank-specific and segment-specific initial NPL ratios. This implies that even segments that start with 0% NPL ratio are hit by stress. Moreover, there is a possibility to provide additional (ad-hoc) NPL ratio add-ons for specific sector to capture a possible deterioration of credit quality beyond the model-implied increases of NPLs. This is frequently used either as a part of the scenarios (additional NPLs in construction and real estate sectors to capture the impact of a possible housing market crisis with a drop in house prices etc.) or for additional sensitivity analysis of "vulnerable" sectors (tourism/restaurants for a covid-19-type of simulation etc.).

The previous framework with currency-specific NPL models automatically allowed for the so-called "indirect FX-induced credit risk", i.e. for the deterioration of loans denominated in foreign currency in times of large depreciations (as the debt servicing costs would increase and would be difficult to bear especially if the borrower is not hedged). The new models do not include the exchange rate as one of the dependent variables (as it was not significant), but due to the ongoing existence of FX lending in Albania it was considered important to keep this possible effect in the stress testing. This is now implemented with additional NPL add-ons which are linked to the level of deprecation. The impact is bank-specific and depends on bank-specific share of unhedged FX loans to total loans in both main sectors, i.e., corporations and households (this data is regularly collected by the Bank of Albania). The add-on is a function of the depreciation rate and an elasticity coefficient capturing what proportion of unhedged FX loans will become NPLs in relation to a change in the exchange rate. This elasticity was set by expert judgment at 0.2, meaning that for example a 15% depreciation would generate additional NPLs of 3% of the amount of the unhedged FX loans. Moreover, the effect is set to kick in only if the cumulative depreciation from the start of the scenario is more than 10%. This "non-linearity" of the effect is included to reflect the fact that unhedged FX borrowers are typically able to accommodate some level of exchange rate volatility (estimated at around 5-10%), but once the depreciation becomes large, they would start to have repayment problems.

Table 1: Loan segments in the current stress testing tool

Corporations
A Agriculture, forestry and fishing
B Mining and quarrying
C Manufacturing
D Electricity, gas, steam and air conditioning supply
E Water supply; sewerage, waste management and remediation activities
F Construction
G Wholesale and retail trade; repair of motor vehicles and motorcycles
H Transportation and storage
I Accommodation and food service activities
J Information and communication
K Financial and insurance activities
L Real estate activities
MU Other services
Households
Real estate (housing loans)
Other (consumer loans, credit cards, overdrafts etc.)

The current framework features additional innovations in the credit risk area. First, the impact of the indirect FX-induced credit risk is not the only impact of currency depreciation on credit portfolios. Given the large share of FX loans in banks' portfolios (about 55% for corporate loans and 35% for household loans at the end of 2020), large depreciations can quickly increase the gross loan amounts purely by the accounting effect (converting the FX denominated loans by a more depreciated - i.e. higher - exchange rate level). This would in such situations, ceteris paribus, also increase net loans and risk-weighted assets. This accounting effect is implemented for all banks, using the information about all FX loans, including the hedged ones.

Second, it explicitly projects the watch (special mention) loans as a proportion of performing loans. There is no additional model, the projections are linked to the projections of NPLs with a coefficient of 0.7 (if the NPL ratio increases from 4% to 6%, i.e. by 50% (6/4-1), the increase of special mention to performing loans ratio will be 0.7*50%=35%, i.e. for example from 5% to 6.75%). The coefficient was calibrated by expert judgment based on the analysis of the co-movement between the NPL ratio and the special-mention-to-performing-loans ratio.

The new stress testing framework thus explicitly works with three credit quality classes - standard, special mention and NPLs. One of the reasons to do it this way (rather than using two classes, performing vs. non-performing, or all the five classes as per regulation) is to prepare for a possible switch from the current prudential coefficient-based provisioning system to a future IFRS 9 expected credit loss (ECL) model, which also works with three classes (stages) of loans. While IFRS 9 ECL model is not yet implemented in Albania, once it is, it will not be difficult to adjust the tool, as standard loans will largely correspond to Stage 1 loans, special mention to Stage 2 loans, and NPLs to Stage 3 loans.

Third, the new framework explicitly captures obligatory NPL write-offs when generating the final NPL projections. Per a valid regulation from 2015, banks need to write off NPLs after a pre-determined period (banks need to write off the loans in the "loss" category that stayed there for the last 2 years). As the data on planned write-offs over the next 3 years are available from the Credit Registry, they are used to adjust the satellite-model-based NPL projections. However, as some write-offs were happening during the period over which the NPL models were estimated (2005-2020), the NPL model predictions do implicitly include some write-offs already. On the other hand, the period 2005-2020 is dominated by times in which write-offs were not obligatory and mostly much smaller than what needs to be written off since the new regulation is in place. Thus, it is assumed that about 30% of the planned write-offs are implicitly included in the model projections and 70% needs to be additionally deducted.

Fourth, the stress tests explicitly acknowledge the existence of restructured loans that were previously in NPLs, but were "cured" and moved to performing loans. To account for the fact that these loans were already "bad" during their history, they attract higher provisioning (10%) compared to the regulatory provisioning rates (1% for standard, 5% for special mention loans) even if they are classified as performing loans. At the end of 2020, the average provisioning level reported for standard loans was 1.7% for corporations and 1.2% for households, suggesting that the share of restructured loans in standard loans was about 8% for corporate loans and 2% in households. In case of special mention loans, the average provisioning rates were 8.5% for corporate loans and 5.8% for household loans, indicating that the share of restructured loans here was actually very high in corporate loans (about 70%) and about 15% in household loans. As to the projections, it is assumed that the share of restructured loans in standard loans remains constant in all scenarios, so e.g., if special mention loans grow, the restructured loans (classified as special mention) grow, too. This leads to an unchanged bank-specific average provisioning rate kept at the initial level for all the projections (across all scenarios and years).

Finally, the tool allows to set shocks (increases) to average NPL provisioning rate (NPL coverage ratio), separate for each scenario and year, which are applied as add-ons on the initial bank-specific provisioning rate for non-performing loans (NPLs). These shocks are specified as add-ons in each year over the level of the previous year and can thus be cumulated. An increase in average NPL ratio is equivalent to a worsening distribution of NPLs among the three NPL classes (higher share of worse NPLs such as doubtful or lost loans with higher provisioning rates). As per regulation, provisioning is applied on gross amounts of NPLs. The value of collateral (if any) is not taken into account. The tool then projects the provisions flows that impact, as impairments, the profit and loss (P&L) account and, ultimately, the regulatory capital.

The credit risk-weighted assets (RWAs) projections operate under the assumption that all exposures are under Basel II/III standardized approach (STA), using bank-specific average risk weights applied on time-varying net assets. The net assets, especially net loans, evolve based on the evolution of gross loans (which are also capturing the accounting effect of exchange rate changes), NPLs, and provisioning levels. Typically, in very adverse scenarios, RWAs decline somewhat amid a drop in net loans driven by zero or negative credit growth and an increase in NPLs (and thus also provisioning), improving somewhat the capital adequacy, which is in line with reality.

Thus, the stress testing framework can be considered to be dynamic (in terms of the balance sheet evolution) in the sense that the scenarios include assumptions about the gross credit growth which, jointly with the NPL projections, accounting effects of exchange rate and provisioning assumptions, change the final net assets. Thus, the balance sheet size does not necessarily remain constant as a percent of GDP. However, the tool does not allow for portfolio restructuring, e.g. for increasing securities holdings at the cost of loans or the other way around.

4.2 Market risk

There are two explicit market risk areas (impacts of market risk factors on banks' balance sheets) that are included in the stress tests: FX revaluations due to changes in exchange rate and bond and bills revaluations due to changes in market interest rates.

FX revaluations are based on reported net open FX positions. We are using the starting net FX open position across all currencies and the changes in the ALL/EUR exchange rate (as a proxy for changes of all other relevant exchange rates, such as ALL/USD, ALL/GBP etc.) to calculate the FX revaluations, which impact the P&L. Given that most banks have a positive net open FX position (i.e. earning when there is depreciation) and given that the adverse scenarios typically include depreciation of ALL, banks would typically gain rather than lose in the adverse scenarios.

Revaluations of securities (bills and bonds) is using a rich data source on individual securities held by banks, receiving for each bank the total book and market value of bonds and bills exposures to individual selected countries (Albania, Italy, Greece, Turkey and Kosovo) and two additional groups of countries (Group 1 of high-rating countries and Group 2 of all other countries). In addition to the exposure values, there is security-by-security data allowing to calculate average modified duration for all the selected countries and the two groups. This information is then used to estimate the impact of yield changes (interest rates) on the market value of securities.

Currently, Albanian banks are classifying the securities held into three main accounting categories: marketable, which need to be marked to market, investment, which do not have to be marked to market (and are typically held to maturity), and placement, which also do not have to be marked to market (the requirement here is that they need to be held at least for 6 months). Interest rate shocks would thus directly impact only the marketable securities, which need to be revalued, with gains or losses recorded in P&L. However, only a fraction (typically less than 2%) is held as marketable, with most securities held as placement (often more than 60%) or investment (more than 30%), although there are differences across banks.

The new framework allows to set which accounting categories (on top of the marketable securities) would also be subject to revaluations. This setting can be useful to show an "economic" vulnerability (i.e. how the P&L and the capital adequacy would change if market rather than book values were used). In the future, once these categories are replaced by the traditional IFRS categories (fair value to P&L, fair value to capital, and at amortized costs), the tool can easily be adapted.

Shocks to market interest rates (bills and bond yields) are part of the scenarios, with Albanian 1Y T-bill yield projections received from the Monetary Policy Department, whereby changes in this yield are used to reprice all Albanian bills and bonds (to be revalued). The 1Y yield is used as a proxy - there are also shorter (3M, 6M) and longer (3Y, 5Y) yields of bills and bonds of such maturities, but the analysis of past behaviour has shown a strong co-movement across all those maturities. Shocks to yields to other countries are calibrated by expert judgement for moderate and adverse scenarios only (no change in foreign yields is assumed in the baseline) and would vary by the countries considered (i.e. very small or no shocks for Group 1 and larger shocks for more volatile countries such as Turkey or Group 2 than for countries that are part of the EU). The calibration is typically based on historical volatility of bond yields in selected countries - for example, a shock of about one to three standard deviations of annual changes in the bond yields would be considered. Moreover, the shock can be either concentrated in one period (such as the first year) or spread across all three projected years. Typically, market shocks are frontloaded in stress tests, thus usually assumed to happen early in the horizon.

4.3 Profit and loss (P&L) and final capital adequacy

The new framework includes explicit scenario-specific projections for key components of the profit and loss account: net interest income, other operating (non-interest) income, other (administrative) expenses, revaluations, impairments (provisions), and taxes.

Net interest income is projected for each bank as a product of its net interest margin (NIM) and its interest-bearing assets, which are time-varying and scenario-specific. Net interest margin is defined as net interest income over interest-bearing assets and the tool is using the initial reported level (calculated over the past period or last 2 years) for each bank as a starting point (which can however be adjusted for the different scenarios). Typically, the NIM would be kept constant at last year's level for the baseline scenario and assume a small haircut compared to the last year's level in adverse scenarios. There is a strong link between the credit risk projections and the net interest income projections as interest bearing assets are adjusted by new NPLs (NPLs do not generate interest income). So during recessions, even if the net interest margin remains the same, net interest income would drop as performing loans would decline.

Other operating income and expenses (i.e. P&L items other than net interest income and loan losses) are projected as a function of the observed value in the past period (or average of the last 2 years), whereby the other operating income can be adjusted by a scenario-specific haircut (typically about 10%-20% decline in adverse scenarios). Revaluations and impairments are produced by the market and credit risk part of the stress tests. Tax rate for banks' profits is set at 30 percent and only applies to positive net income.

The tool also requires specifying the dividend pay-out ratio, which is bank-specific and year-specific. This influences what part of profit of which year will be distributed, with the residual kept as retained earnings and added to regulatory capital (current year profit is not part of regulatory capital - only the part that is supposed to be retained is added after the profit is audited and the shareholder meeting decides about the profit distribution). Thus, in case of no dividend pay-outs, all net profit would be kept as retained earnings and increase regulatory capital; in case of 100% dividend pay-out, the regulatory capital would not be changed as all profits would be distributed. In case of negative net income, no dividends would be paid out and the loss would be immediately deducted from the regulatory capital.

The final results of the stress tests are reported in terms of capital adequacy. Explicit scenario-specific projections of total, Tier 1 and Common Equity Tier 1 (CET1) regulatory capital and of risk-weighted assets (RWAs) are prepared, leading to capital adequacy ratios (CAR) for each bank, which are compared with the bank-specific CAR hurdle rates (including Pillar 2 add-ons, and optional with or without capital buffers). The tool would then also calculate capital injections that are needed to bring all banks at their own minimum (or required) CARs. While credit risk RWAs are prepared as part of the credit risk projections, market risk and operational risk RWAs are for simplicity kept constant.

5. RESULTS OF MACRO STRESS TESTS CONDUCTED IN EARLY 2022

For illustration, we report the stress test results from spring 2022, the first time the new framework was used officially in the Financial Stability Report. Three scenarios were constructed: the baseline scenario, the moderate scenario and the adverse scenario, specified in four main macro variables (GDP growth, unemployment rate, 1Y interest rate and exchange rate), house prices, and credit growth in quarterly frequency. Even if stress testing provides for a possibility to run scenarios up to a 3-year horizon, a 2-year horizon was used to test the new framework, i.e. for the period 2022-2023.

The baseline scenario assumes a positive economic growth rate within the timeframe of the exercise. In this scenario, the economic growth is accompanied with considerable growth rate of lending and an improvement of the quality of the credit portfolio as a result of the expected lost loans write-offs from banks' portfolios. In terms of market risk, this scenario has also assumed the re-evaluation of investment and placement securities. In the moderate scenario, the economic growth is assessed to be positive over the timeframe of the exercise, but at a lower growth rate; while in the framework of securities re-evaluation, this scenario has considered only the re-evaluation of investment securities. The adverse scenario assumes a positive growth rate at the end of the first year of the exercise, followed by an economic contraction (Figure 6). Also, all the three scenarios assume the suspension of dividend allocation from banks[9], till the end of 2022.

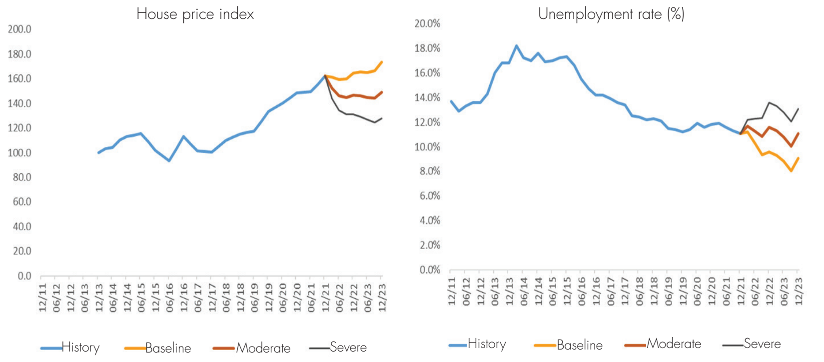
[9] *Pursuant to the Decision No. 6, dated 2.2.2022 of the Supervisory Council "On the suspension of profit allocation from banks".*

Figure 6. Projections of the key macroeconomic indicators

Source: Bank of Albania.

Also, forecasts on the new macroeconomic indicators included in the exercise, show a decrease in housing prices over 2022 under the most unfavourable scenarios, and an increase of unemployment rate. (Figure 7).

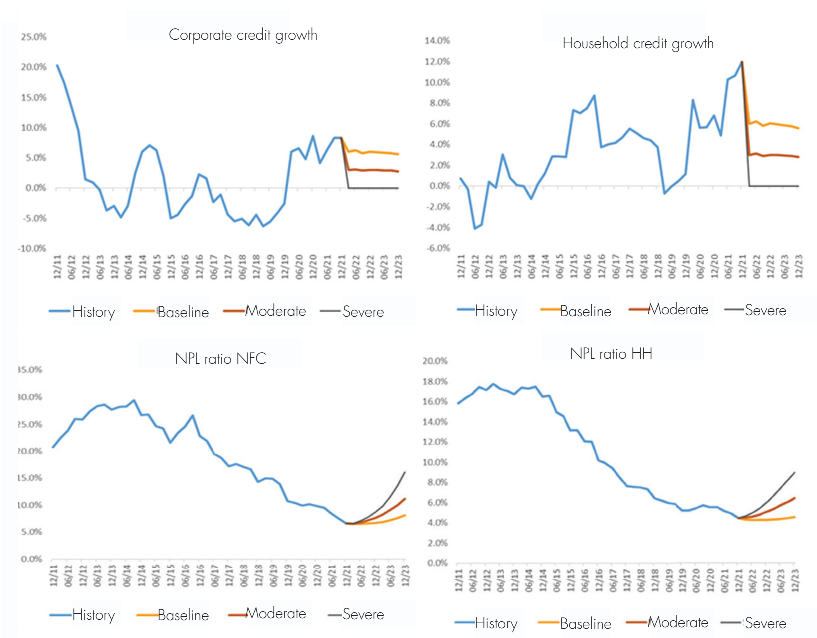
Figure 7. Projections of additional macroeconomic indicators



Source: Bank of Albania.

Assumptions on the weaker economic performance in the moderate and adverse scenarios were coupled with relevant assumptions on depreciation of Albanian Lek exchange rate, increase of interest rates and a decrease in credit growth up to its complete stoppage (Figure 8). These developments are reflected in the deterioration of the credit portfolio quality, for both enterprises and households.

Figure 8. Projections of corporate and household credit portfolios



Source: Bank of Albania.

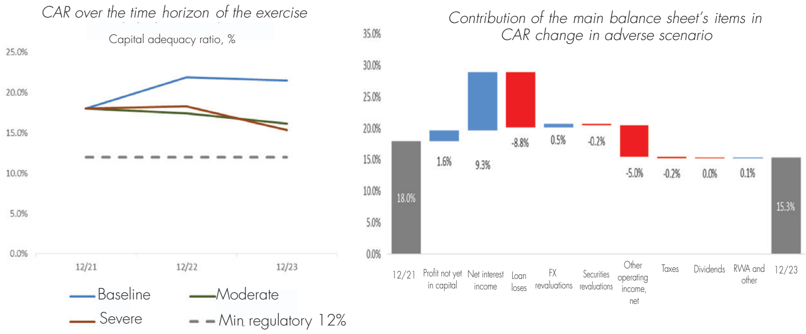
Stress test results in terms of capital adequacy show that:

In the baseline scenario, the Capital Adequacy Ratio (CAR) of the banking sector tends to grow. It increases at 21.9% at the end of 2022 and 21.5% at the end of 2023. Stress test results present a stable situation and high levels of capitalisation for the entire banking sector. Nevertheless, taking into consideration the additional regulatory requirements by individual banks, developments in particular banks indicate the need for capital injection during the period of the exercise. Five banks appear under-capitalised by the end of 2023 in this scenario, accounting for around 17.2% of the sector's assets. In this case, the need for additional capital is assessed to amount up to around ALL 3.5 billion (about 0.1% of GDP).

In the moderate scenario, the banking sector's CAR is slightly lower at 17.5% at the end of 2022, and 16.2% at the end of 2023. Based on the results obtained, developments in particular banks indicate the need for capital injection at the end of the period of the exercise. Eight banks appear under-capitalised by the end of 2023 in this scenario, accounting for around 54.2% of the sector's assets. In this case, the need for additional capital is assessed to amount up to around ALL 16.6 billion (about 0.6% of GDP).

In the adverse scenario, the banking sector remains capitalised, but the sector's CAR falls from 18.3% at the end of 2022 to 15.3% at the end of 2023.

Figure 9. Stress test results - capital adequacy ratio



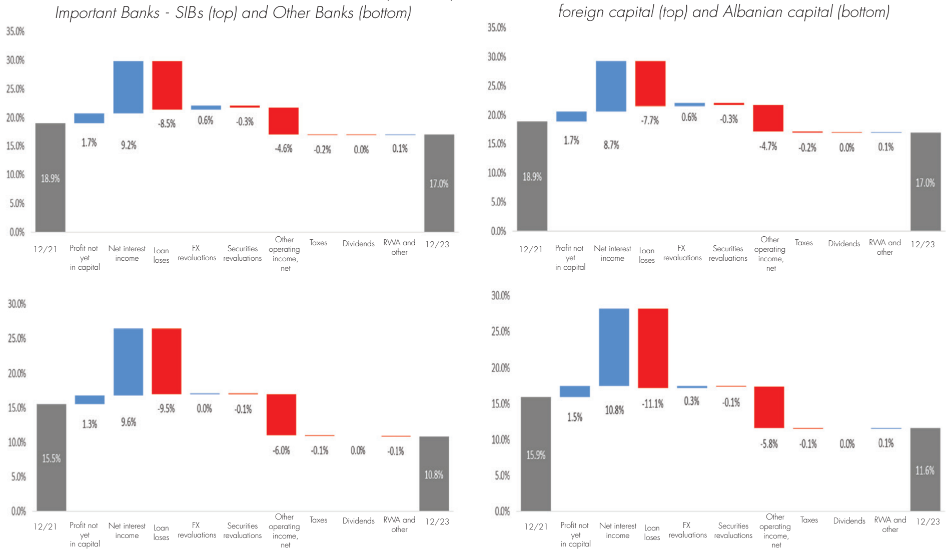
Source: Bank of Albania.

Credit losses (provisions) and lower other (non-interest) net income present the main contribution in the fall of capitalisation in this scenario. Seven banks appear under-capitalised by the end of 2023 in this scenario, accounting for around 48.7% of the sector's assets. In this case, the need for additional capital is assessed to amount up to around ALL 20.1 billion (about 0.8% of GDP).

Figure 10. Stress test results by bank groups

Contribution in CAR in the adverse scenario, for Systemically Important Banks - SIBs (top) and Other Banks (bottom)

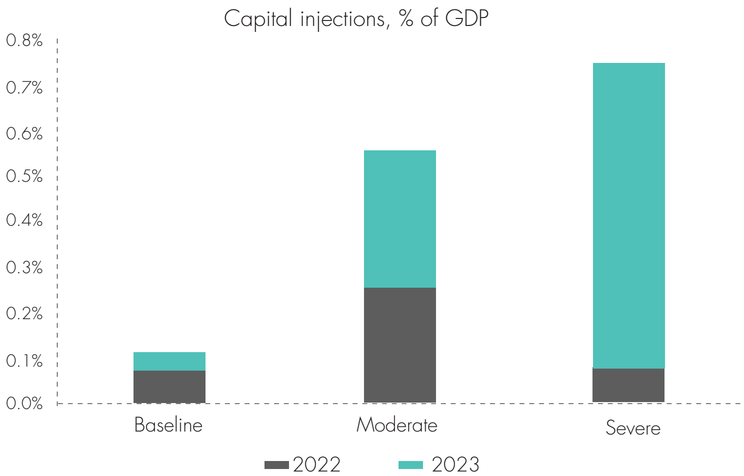
Contribution in CAR in adverse scenario, for Banks with foreign capital (top) and Albanian capital (bottom)



Source: Bank of Albania.

In the adverse scenario, overall, systemic banks (SIBs) show a stable capitalisation ratio of 17% at the end of 2023, while the other banks appears to fall into under-capitalisation, reaching at a CAR of 10.6%. The difference between these two groups originates from a lower contribution of loss from loans and loss from other net income of SIBs, and from a higher undistributed profit for this group of banks. In the adverse scenario, banks with foreign capital show a stable capitalisation ratio of 17% at the end of 2023, while banks with Albanian capital reach at a CAR of 11.6%. The difference between the two groups originates from a higher contribution of loss from loans and the fall in other net income for banks with domestic capital.

Figure 11. Stress test results - capital needs



Source: Bank of Albania.

At the conclusion of the exercise, the analysis shows that the banking sector is resilient to macroeconomic shocks, but individual banks show high sensitivity to assumed scenarios. In higher extreme scenarios, the need for capital injections would reach a maximum of around 0.8% of GDP at the end of 2023, in the most adverse scenario (Figure 11). [10]

[10] *Macroprudential buffers are not included.*

6. CONCLUSIONS AND CHALLENGES

The current revised methodology for stress testing provides a richer framework to test various scenarios and construct reliable and plausible projections for banks' balance sheets, P&L, and capital adequacy. The top-down stress tests are a useful tool to inform the policymakers about the resilience of the banking sector and can play a vital role in calibrating some of the macroprudential instruments, such as the countercyclical capital buffer, as it is done in other countries such as the UK (Kohn 2019).

The new stress testing framework can be relatively easily kept up to date even if new developments in the regulation come up. It can be adapted to a potential future shift to the IFRS 9 expected credit loss provisioning and change in accounting categories in which securities are held. Also, the NPL models can be re-estimated and improved over time with new data. However, even if the stress tests can technically accommodate the IFRS 9 provisioning, the complexity of calculating the scenario-specific expected credit loss provisioning rate will be a challenge and will require additional data and analyses.

In Albania, stress testing exercises combine both macroprudential and microprudential elements and serve to the authority as a tool not only during normal times, but also during stress periods/crisis. In such times, individual and systemic risks tend to influence each other, as the whole banking sector might be affected and problems may be transmitted from bank to bank. Even if the new framework does not have an explicit interbank contagion module, such a tool has been developed in parallel and the Bank of Albania is using it regularly to monitor the interconnectedness risk.

In terms of future plans, Bank of Albania also considers updating the methodology for its microprudential stress tests to be in line with the top-down macro stress tests and to facilitate the comparison. Another important challenge is the integration of solvency and liquidity stress tests, since running a mutual exercise is a complex issue. It is of vital importance to try to link them in a suitable way, as the solvency and liquidity risk do influence each other in reality.

REFERENCES

Bank of Albania (2022): "Financial Stability Report - 2022 H1";

Bank of Albania (2019): "Financial Stability Report - 2019 H1";

Budnik, K. et al. (2020): "Banking euro area stress test model", ECB Working Paper No. 2469;

BCBS (2017): "Supervisory and bank stress testing: range of practices", Basel Committee on Banking Supervision;

BCBS (2018): "Stress Testing Principles", Basel Committee on Banking Supervision;

Dent et al. (2016): "Stress testing of banks: an introduction", Bank of England, Quarterly Bulletin 2016 Q3, pp. 130-143;

Kohn, D. (2019): "Stress tests and the countercyclical capital buffer: the UK experience" Brookings Institution, Working Paper 2019/09;

Sejko, G., Dushku E. (2018): "Financial development and economic growth in Albania: New evidences", Bank of Albania Governor's book "Studies on the banking sector and economic development";

Shijaku G. (2016): "Foreign currency lending in Albania", Bank of Albania Working Paper.

CIP Katalogimi në botim BK Tiranë

Bozdo, Juna
Macro stress testing of the Banking Sector in Albania / Juna Bozdo, Arisa Goxhaj (Saqe), Adam Gers. - Tiranë : Banka e Shqipërisë, 2023.
48 f. ; 21X15 cm
ISBN 9789928262646
I.Goxhaj (Saqe), Arisa
1.Banka dhe veprimtaria bankare 2.Kredia 3.Shqipëri
336.774.3(496.5)

ISBN 9789928262646
9 789928 262646

www.bankofalbania.org

ISBN 9789928262646

9 789928 262646