The 2018 EBA/ECB stress test

Prometeia Insights

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Abstract

This year banks under the direct supervision of the SSM are required to perform a stress test exercise to evaluate the impact on profits and capital of a hypothetical adverse scenario set out by the EBA/ESRB and that covers three years. The adverse scenario is more severe than the one outlined in 2016, when the previous EU-wide stress test was conducted. It is possible to evaluate the severity of the EBA adverse scenario by comparing it with the central path of the stochastic distribution of the Prometeia model that identifies a scenario corresponding to the 50th percentile of the distribution. This analysis confirms that, for some key variables such as GDP and long term interest rates, the adverse scenario is more severe now than in 2016.

Although it is too early to assess the impact of the exercise on bank capital, given that the test will run on IFRS9 compliant data that are not yet available, a few considerations could help to shed some light on the possible outcome for Italian banks. As Italian banks face this round of stress tests with a stronger capital position, improved asset quality and a lower probability of loan default than two years ago, and given that the new methodology might not be, on balance, more severe than last time, banks’ capital ratios should remain above the regulatory minimum even in the adverse scenario.
On January 31st, the European Banking Authority (EBA) and the European Systemic Risk Board (ESRB) released the macroeconomic scenarios for the EU-wide stress tests to evaluate the resilience of banks to adverse market developments.

Banks are requested to estimate what the potential impact on their profits and capital may be under an adverse macro-financial scenario. The adverse scenario is set out by EBA-ESRB, starting from a baseline defined by the National Central banks.

The scenario covers three years, starting from the first quarter of 2018 (when the shocks are assumed to materialize) and ending in the last quarter of 2020.

The macro-financial variables included in the scenario are commodity prices, exchange rates, foreign demand, stock prices, interest rates, GDP, inflation, unemployment, residential and commercial real estate prices.

This paper aims at describing the EBA-ECB scenarios with a focus on the estimation of their implicit severity for the Italian Banks. The same analysis could be performed on the banking sectors of all EU countries.

In the second and third part of the paper a brief focus on a possible approach to manage sensitivities of risk parameters (to given scenarios) and bank’s balance sheets (to methodology constraints and simulation rules) is presented.

1. The characteristics and severity of base and adverse scenarios

Focusing on Italy, the deviation of the 2018 EBA-ESRB adverse scenario from the baseline would lead, by 2020, to:

» a real GDP lower by 6.5%;
» an unemployment rate higher by about 2.2 percentage points;
» an Harmonised Index of Consumer Prices (HICP) lower by 2.5%;
» residential real estate prices lower by 17.3% and commercial prices by 18.9%;
» stock prices lower by 24.9%;
» long term interest rates higher by 1.17pp

Figures 1-2 present the paths of some of these variables for Italy in the baseline and stress scenarios.
1.1 A model-based assessment of the stress test scenario severity

The exercise is similar to the one conducted in 2016 but it shows a higher degree of severity. For example, the deviation of the Italian real GDP under the adverse scenario compared to the baseline is higher than in the previous stress test exercise. In particular, GDP level deviation in 2016 exercise was -5.9% and in 2018 is, as mentioned, -6.5%. In Table 1 deviations of the principal macro-financial variables in the two stress test exercises are compared.

Comparing the two scenarios is not sufficient to assess their relative severity, as they can have a different probability. So, in order to properly measure the severity of the adverse scenario, we run stochastic simulations with our proprietary models. Prometeia is equipped with the appropriate tools to account for the uncertainty around the central forecast as they allow to run stochastic...
simulations and calculate the range of uncertainty around the central forecast. In particular, our models provide both short and medium-term deterministic forecasts (i.e. simulations that do not consider the variance associated with estimation errors) and stochastic simulations that assign a probability distribution to alternative scenarios. For each endogenous variable in the model, an interval around the estimated forecast is calculated by running an appropriate large number of simulations in which an innovation is introduced in each stochastic equation. The values of the innovation are randomly drawn from the empirical distribution of the estimation errors of each equation.

It is possible to evaluate the severity of the EBA adverse scenario by comparing it with the central path of the stochastic distribution of the Prometeia model, which identifies a scenario corresponding to the 50\textsuperscript{th} percentile of the distribution. The probability that a given scenario occurs is estimated as the probability that a specific key variable assumes values equal to or worse than a given percentile of the stochastic distribution of the baseline scenario:

$$Pr: Z_t \leq z$$

where $Z_t$ is the value assumed by the variable considered at time $t$ and $z$ is the threshold that identifies the severity of the scenario and coincides, for every time $t$, with the EBA stress scenario.
The scenario is extremely severe for GDP, even more severe for real estate prices, but less for interest rates.

Figures 4 presents the same probability distributions around the baseline in the 2016 Stress Test Exercise.
Compared to the Prometeia baseline scenario, the GDP in the 2018 EBA stress scenario (Prob. 0.27%) is more severe than the 2016 exercise. In both 2018 and 2016 scenarios, the residential house price dynamics have an almost null probability. The difference in the long term rate in the adverse and baseline scenarios is greater in 2018 than two years ago but the long term rate profile is
more probable in the 2018 scenario than in 2016. This is due to the difference between Prometeia forecasts and EBA interest rates in 2016 (about 70 basis points), whereas now the baseline rates are quite similar.

2. The sensitivity of banks’ main risk parameters in the baseline and adverse scenarios

The sensitivity of banks’ main risk parameters to macro-economic and financial variables in the given scenarios is the key factor of the stress test exercise.

(Many) Banks have developed proprietary satellite models that transmit shocks of significant exogenous variables to the most important risk parameters in the following areas:

» **Credit risk**: credit satellite models for the estimation of the reaction of PDs and LGDs to the scenarios;

» **Net fees and commission income**: NFCI satellite models for the estimation of the reactions of NFCI items or NFCI drivers to the scenarios;

» **Financial risks**: financial satellite models for the estimation of reactions of specific interest rates or market risk factors to which the structure of asset and liabilities of the bank is sensitive.

The banks need to feed these model library with a set of data that cover all exogenous variables (that are bank-specific inputs to the satellite models). However, the macro-financial variables presented in the EBA stress test cover a limited number of variables that banks need to perform the exercise, both in the baseline and adverse scenarios; so the given dataset needs to be extended to fill the gaps, depending on bank’s specific needs.

2.1 Extension of the macro-financial set of variables of the stress test scenario

In order to provide banks with the variables not included in the EBA macro-economic scenarios, Prometeia estimates the “missing” variables through a model-based approach that guarantees the internal coherence of the entire dataset.
Prometeia uses proprietary models in its analysis, forecasting and simulation activities on a regular basis. In particular, the Quarterly Model simulates a complete adverse scenario starting from the information incorporated in the EBA explanatory document.

The Prometeia Quarterly Model (PQM) is currently used to forecast the short and medium-term evolution of Italy’s economy. It includes nearly 1000 equations, more than 150 of which are stochastic. The current version of the model reflects mainly neo-Keynesian features and the VECM-cointegration approach is used to estimate its long-term structure. The model presents details on five sectors (agriculture, industry, construction, services, public administration), on the household saving behaviour and their financial investments (volumes), on the public sector accounts and on the Italian banking system (assets and liabilities, interest rates). All accounting schemes are fully generated by the model: national accounts, flow of funds, through institutional sectors (including financial intermediaries), and balance of payments.

More in detail, the financial model is characterized by a direct link between real and financial flows and it explains, the flow of funds of six operators (non-financial corporations, financial and monetary institutions, with a focus on banks, other financial corporations, government, households and non-profit institutions, and the rest of the world), with a portfolio choice approach, and it considers all financial instruments (deposits, short and medium-term securities, foreign securities, loans, shares in mutual funds, stocks, etc.). In particular, the PQM presents a high level of detail on the banking sector: banks’ balance sheets and some items of the income statement are modelled. Moreover, it accounts for Basel III capital requirements and allows simulating scenarios of financial fragility and credit rationing.

Government interest rates (3-month and 10-year), swap rates (3-month, 1-year), and banking rates (on different types of loans and on deposit and bonds) are linked to the ECB policy rate (REFI) and to other relevant variables through structural equations.

2.2 The procedure to extend the macroeconomic scenario

The baseline scenario is extended incorporating the (limited) information included in the ECB December 2017 forecast into the (much richer) dataset of
Prometeia December 2017 Forecasts, by simulating the Prometeia macroeconomic model in order to assure the coherence of the entire scenario.

The stress scenario is implemented in two steps following the information included in the EBA document:

» First, the exogenous shocks (oil and commodity prices, exchange rate, foreign GDP growth rate, stock prices, etc.) we applied to the baseline previously defined;

» Second, in order to reach the required path for the endogenous variables (Italy’s GDP, unemployment and inflation), starting from the results obtained from the first step running the Prometeia quarterly model, additional shocks are applied in line with the “narrative” of the EBA document, reflecting the four systemic risks identified.

3. The sensitivity of banks’ balance starting point to static balance sheet constraints and stress testing rules according to EBA/ECB methodology

3.1 The rules for the 2018 EBA stress tests and their likely impact

The outcome of the exercise, as was the case for the 2016 stress test, will feed into the 2019 SREP requirements. There will be no “pass or fail” outcome based on a target level of CET 1 ratio triggering the need to implement remedial actions. The methodology covers all relevant risk areas and, for the first time, will incorporate IFRS 9 accounting standards. The starting point for the exercise are the end-of-year 2017 balance sheets, restated to reflect the full IFRS9 effect.

The exercise was launched at the beginning of 2018 and the results will be published by 2 November 2018 (Fig.6).

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1 For more details, see Prometeia, Quarterly Economic Outlook, December 2017 issue.
The 2018 EU-wide stress test will be carried out at the highest level of consolidation on a sample of 49 EU banks, 35 of which falling under the jurisdiction of the Single Supervisory Mechanism (SSM). There are four Italian banks involved in the exercise, namely Unicredit, Intesa Sanpaolo, Banco BPM and UBI Banca.

The exercise must follow precise and restrictive assumptions outlined in the EBA methodological notes, so that the simulation has no relevance in terms of giving forward-looking indications to investors. The main assumptions are the following:

» **Static balance sheet, that is zero growth and a stable business mix:** “Assets and liabilities that mature within the time horizon of the exercise should be replaced with similar financial instruments in terms of type, currency, credit quality at date of maturity, and original maturity as at the start of the exercise. No capital measures taken after the reference date 31 December 2017 are to be assumed”.

» **Cure rate limits:** ”No workout or cure of Stage 3 assets is assumed in the exercise”, 3 Thus no negative impairments are permitted, except and exclusively in the case of transitions within performing loans (that is from Stage 2 to Stage 1 loans).

» **Net interest income constraint (NII):** NII cannot increase, compared with the 2017 value, under the adverse scenarios. Banks are required to project income on nonperforming exposures net of provisions, subject to a cap on the applicable effective interest rate (EIR) under the adverse scenario.

» **NII, interest rate pass through:** Under the baseline scenario, banks are required to incorporate a proportion of the changes in the sovereign bond spread of the country of exposure in the EIR of their repriced liabilities.

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3 The three impairment stages defined in IFRS 9 are Stage 1 (S1), Stage 2 (S2) and Stage 3 (S3): Stage 1 assets are performing, Stage 2 assets are still performing but there has been a significant increase in their credit risk since the time they were originally recognized. Stage 3 assets are non-performing and therefore impaired.
Under the adverse scenario, the margin paid on liabilities cannot increase less than the highest amount between a proportion of the increase in the sovereign spread and that of an idiosyncratic component. The increase of the margin on repriced assets is capped at a proportion of the increase in sovereign spreads.

» **Non-interest income:** it cannot exceed the 2017 level in the baseline scenario, while a minimum reduction of net income from each item compared with 2017 is prescribed for the cumulative projections in the adverse scenario.

» **Expenses:** Administrative expenses, other operating expenses, depreciation and provisions cannot fall below the 2017 value, unless an adjustment for one-offs is permitted. One-off adjustments are subject to a threshold of 5bps of 2017 risk exposure amounts (REA).

» **Market risk:** simplified approach for Trading Exemption banks.\(^4\)

The new methodological framework contains some elements that could limit the negative impact of the stress test on Italian banks compared to the 2016 exercise. However, there are some challenges, mainly related to data and modelling requirements. The main positive elements of the new framework are:

1. **NII:** Possibility to project income on net non performing exposures. This was not allowed in the previous stress test.

2. **NII:** Mitigation of the shock to the idiosyncratic component for banks with a non investment grade rating, that is with a rating on 31st December 2017 ranging from B to CC- (according to S&P classification).

At the same time, there are a few requirements that are more challenging than in 2016, namely:

1. **Data granularity:** EBA requires historical data on 3 years (2015-2017) on NII and credit risk instead of one year as it was the case in the 2016 stress test; for market risk the requirement is 5 years of historical data.

2. **Credit risk:**
   - need to develop a transitional matrix defining exposure transitions between the three impairment stages defined in IFRS9 (S1, S2 and S3), in

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\(^4\) Institutions can request the trading exemption of their competent authorities provided that neither of the following conditions holds: the institution has at least one VaR model in place, approved by the competent authority under the CRR; the institution’s total market risk capital requirement is greater than 5% of the total capital requirement. Competent authorities can reject the request for the trading exemption even if the previous conditions are fulfilled.
the absence of historical data. The challenge is to estimate the parameters of migration within performing loan buckets;

» the assumption of perfect foresight of macroeconomic projection together with the IFRS9 accounting standard imply that all provisions on S2 and S3 loans will be accrued on the first year of the projection (2018) while in 2019 and 2020 provisions will only be linked to migration of credit to S2 and S3;

3. Dividend income and Net fees and commission income (NFCI): Banks shall project dividend income, NFCI and the share of the profit of investments in subsidiaries, joint ventures and associates outside the scope of consolidation by making use of their own models. A minimum reduction of each item compared with 2017 is prescribed for the cumulative projections in the adverse scenario. The reduction is larger for banks that do not have their own models (20% vs 10% reduction for NFCI, 50% vs 25% reduction for the remaining items);

4. Market risk: Special treatment for Level 2 (L2) and Level 3 (L3) instruments to take into account modelling uncertainty.

3.2 Potential impact of the exercise on involved Italian banks

Although an estimate of the results is premature, given that the test will run on IFRS9 compliant data that are not yet available, a few considerations could help to shed some light on the possible outcome for Italian banks.

Based on the results of the previous stress test exercises, banks with a stronger initial capital position should be the least affected (Fig.7): those are usually the ones characterized by low RWA density meaning that their use of internal models is intensive, their asset quality is usually good and that their business model is less focused on loans.

Italian banks face this round of stress tests in a better shape than two years ago thanks to a stronger capital position, improved asset quality (resulting from NPL management actions, including disposals and improved in-house strategies to tackle the legacy issue) and a lower probability of loan default (due to better macroeconomic conditions).

Given the macroeconomic scenarios and the new methodology, we think
that the impact on NII should be less strong than in 2016 because of a lower stock of NPE and given that they can contribute to interest accrual. Higher market rates could help the margin due to the floating rate volumes although a cap on pass-through is still imposed.

The increase in sovereign bond yields in the adverse scenario, which is higher than in 2016, can put pressure on funding costs. However, given that the EBA methodology\(^5\) imposes to take the maximum between the increase in the sovereign spread and the idiosyncratic component,\(^6\) the latter will be the one Italian banks (given their ratings) will need to apply. Therefore, the increase in funding costs for Italian banks is linked to their rating at the end of 2017 rather than to the sovereign bond yield. The impact of the increase in the sovereign bond yield is positive for loan rates, but the pass-through is capped,\(^7\) and for the return on bonds held by banks. The increase in yields will however have a negative impact on capital through the increase in the FV OCI reserve.

For credit risk, the Probability of Default (PD) should worsen more than in the 2016 stress test, given that the adverse scenario is more severe and that the IFRS9 accounting standard imposes to provision performing loans in S2 according to their lifetime expected loss. However, the starting PD level is lower than in the previous exercise. The impact on Loss Given Default (LGD) should also be lower than in 2016 thanks to a milder shock in the residential and commercial real estate market.

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5. See Box 26, EBA Methodological Note, 2018 EU-wide stress test.
6. That is a bank’s increase in the cost of funding due to its credit rating.
7. Banks are required to cap the margin on their repriced assets by the sum of the margin starting value and a proportion of the change in the sovereign bond spread in the country of exposure.
Moving to market risk, the impact could be a little stronger than in 2016 because the stock market is assumed to fall more than last time in the adverse scenario and interest rates on government securities rise more sharply. Moreover modelling uncertainty for L2 and L3 assets will be factored in.

As far as non interest income is concerned, the introduction of a prescribed level of contraction of net commissions in the adverse scenario will penalise many banks as in the 2016 stress test exercise the reduction projected was mild and below 10% for the majority of the countries (Fig.8). In this year stress test, the contraction will be 10% instead of 20% only for banks that have internal models. In the 2016 exercise the hypothesis on NFCI was far milder: NFCI had to remain constant in the baseline, while in the adverse scenario it had to equal the minimum of the ratio to total assets of 2015 and the average of the 2 years with the smallest value that occurred in 2011-2015. For Italian banks, NFCI represents an important share of total revenues and thus the impact of this assumption will not be negligible.

However, in addition to the scenario assumptions, the big challenge is represented by the application of the IFRS9 accounting standards and the requested reconstruction of IFRS9-compliant data starting form 2015. This seems to be also the main reason behind the postponement of the closing of the exercise, that was shifted from the usual July deadline to the beginning of November.

Given that the exercise is still strongly focused on credit risk, the outcome will probably be more penalising for traditional banks. However, we expect only
limited stock price reactions, as in the previous run of the exercise, given that there will not be a “pass or fail” outcome and that there was a very muted reaction to the release of the macroeconomic scenarios at the end of January.

3.3 Operational approach to 2018 EU wide stress test and simulation tools

To estimate the impact of the regulatory scenarios and the risk parameters of the satellite models on banks’ balance sheets Prometeia developed a proprietary calculation engine specifically dedicated to perform simulations consistent with the stress test methodology outlined by EBA.

The Stress test engine works at a differentiated granularity level depending on the complexity of the simulation rules required by the EBA/ECB methodology.

In particular, a granular (deal by deal) approach is used for NII and Credit risk calculation because of the need to apply methodological rules based on the characteristics of a specific customer and/or position (e.g. static balance sheet, pass-through, break down of margin into reference rate component and margin component, break down of asset and liabilities into existing, maturing and new production, ECL calculation and application of transition matrices between provisioning stages, etc.). The simulation of the granular NII and credit risk items is performed with the Prometeia proprietary enterprise risk management platform (ERMAS suite); ERMAS allows for the full application of the EBA/ECB stress test methodology and provides the banks with a comprehensive set of measures and attributes needed to fill up EBA/ECB templates (according to FINREP and COREP classifications).
Prometeia track record on EBA/ECB Stress Testing

Prometeia is a global provider of consulting services and FinTech solutions focused on Risk & Performance Management. Since 1974, the firm supplies highly specialized advisory, analytical tools and research programs, integrating quantitative models, market and customer data, financial and economic scenarios. With over 150 industry experts, Prometeia serves over 200 financial institutions in 20 different countries, through a consolidated network of foreign branches and subsidiaries located in Europe, Africa and the Middle East.

With particular reference to the European market, Prometeia works with over 10 banking groups operating within the SSM regulatory space, in particular in the areas of:

- **Asset Liability Management**
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- **Capital Management and Optimization**
- **Compliance with ICAAP and ILAAP requirements**
- **Regulatory Stress Testing**

In the specific field of Regulatory Stress Testing, the company has assisted a large number of clients in performing the exercises required by the European regulator in 2014 and 2016, leveraging the capabilities of ERMAS, the integrated SW platform developed by Prometeia to support Holistic Balance Sheet Management.

ERMAS v.5. has been enhanced to cover the extensive requirements set by the European Central Bank for integrated stress testing: the solution supports the projection of net interest income, REAs and loss provisions, under multiple scenarios and consistent with new IFRS9 principles.
About us

We are a leading provider of consulting services and software solutions focused on Enterprise Risk & Performance Management

Founded in 1974 as an independent institute for economic research by a group of young university professors in Bologna, in 1981 Prometeia began offering analysis services to businesses and financial intermediaries. Since the '90s, the company’s activities have focused increasingly on the integration of research, analysis, consultancy and software system development. This distinctive mix of services has made Prometeia a leading European company in risk and wealth management solutions, business consulting and advisory services for institutional investors. Prometeia collaborates closely with its clients to help them maximize their performance, be they banks, insurance companies, institutional investors, businesses, or public authorities.

Our combination of tech proposition, quantitative advisory, training and economic research makes our business model unparalleled in today’s market

Prometeia’s approach to Enterprise Risk Management is based on the development of quantitative models and analysis methodologies. The production of highly specialized software applications leverages leading technologies, the knowledge of our subject matter experts and our ability to successfully respond to the growing demands of regulation. Our deep understanding of international markets, derived from proprietary economic research, adds a unique element to Prometeia’s business model and value proposition.
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