

FORWARD-LOOKING STRESS-TESTING EXERCISE FOR SPANISH BANKS FLESB

Jesús Saurina

Director. Financial Stability Department

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OUTLINE

1. Introduction
2. General remarks
3. Main elements of the FLESB tool
4. Results
5. Final remarks

INTRODUCTION



- **The Spanish banking sector has been subject to a number of stress tests (ST) the last 5 years**
- **Banco de España has been deeply involved in them, providing expert analysis, support, and performing (some of) them**
- **IMF FSAP in April 2012: joint effort BdE/IMF on a top-down ST**
- **Troika-led ST from mid-May 2012 to end-September 2012**
 - **First step: a top-down ST to bound the aggregate capital needs for Spanish banks**
 - **Second step: a detailed AQR + a very granular ST performed by an external consultant**
- **Development of an internal tool to perform granular top-down ST**
 - **FLESB developed in 2013 as a precondition to exit the financial sector aid program**
 - **Further enhanced in 2014, 2015, 2016, ...**
- **Comprehensive Assessment of the ECB/SSM 2014**
 - **AQR + bottom-up ST + QA of ST + join-up**

INTRODUCTION



- **Very useful during banking crisis to assess problems and to regain confidence**

- **A crucial step in the nascent Euro zone Banking Union**
 - Increase transparency of balance sheets
 - Repair bank capital, if needed
 - Regain confidence in European banks

- **Used elsewhere**
 - For instance, US SCAP (crisis ST)
 - CCAR ST once US banking sector has normalized

- **ST is here to stay**
 - Basel discussions
 - Capital ratio + leverage ratio + ST to assess resilience to shocks yearly?

INTRODUCTION

- **If ST is here to stay we better try to do it properly**
- **Stress testing needs data, methodologies and resources**
- **Stress testing is becoming a regular tool for central banks and supervisors to monitor the banking sector ...**
- **... at both micro and macroprudential levels**
- **Step by step approach**
- **Adapt the ST methodology to each particular environment**
 - **Be modest and be realistic in targets**

GENERAL REMARKS



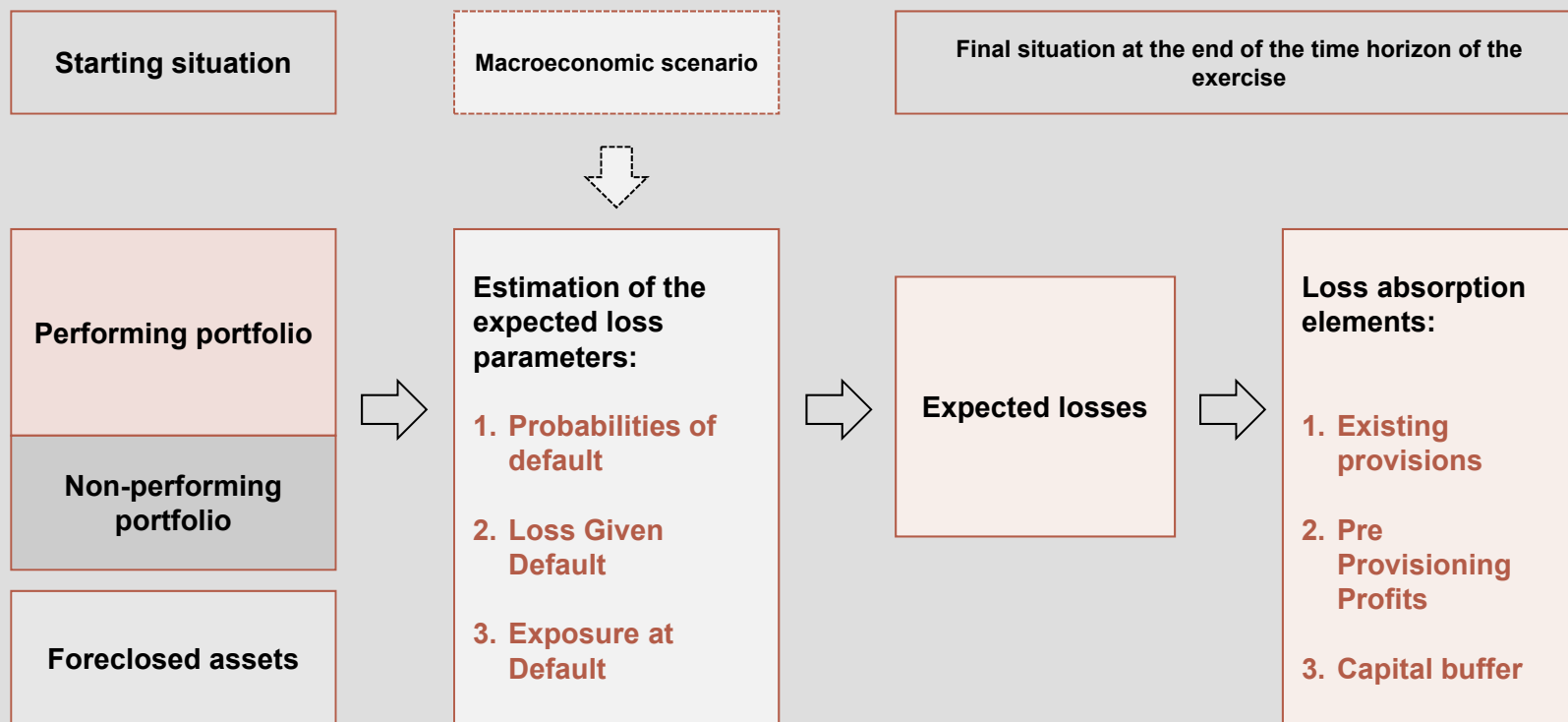
- **We have an internal tool that allows us to regularly assess the solvency position of Spanish banks under different macroeconomic scenarios**
 - **Forward looking exercise on Spanish banks (FLESB)**

- **It is a Top-Down (TD) framework based on the very granular databases we have**

- **The development of such a tool requires**
 - **An evolutionary approach**
 - **Learning by doing**
 - **Interaction with third parties (supervisors, consultants,...)**

GENERAL REMARKS

- Target: sensitivity analysis of capital ratios to different scenarios over a specific time horizon



GENERAL REMARKS

- **Thus, the basic building blocks of FLESB are**
 - **Macroeconomic scenarios**
 - **Data needed for the analysis**
 - **Models to project losses and pre provisioning profits**

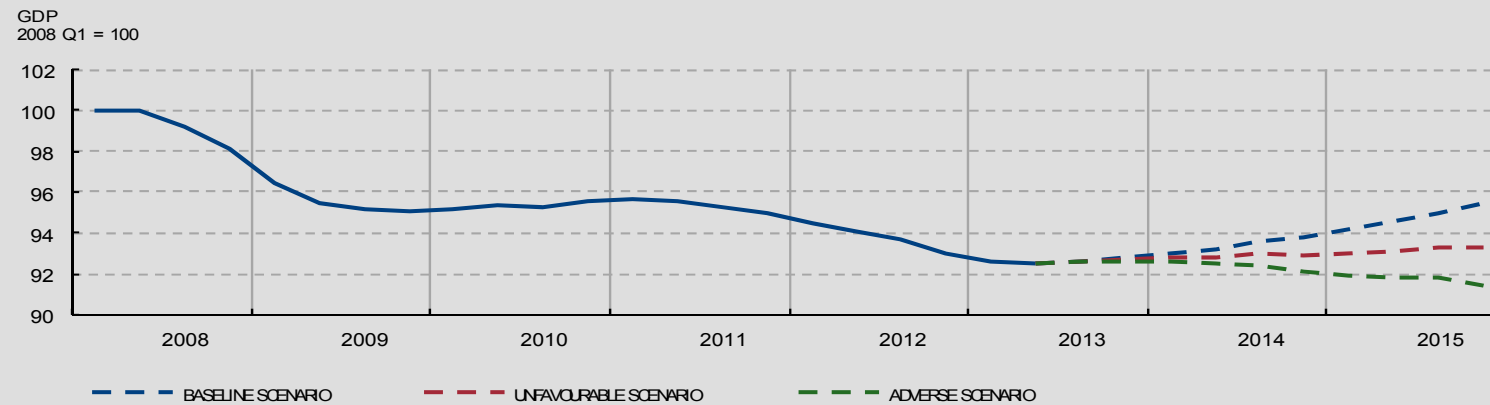
- **The internal structure and organisation is also relevant**

MAIN ELEMENTS OF THE FLESB TOOL SCENARIOS



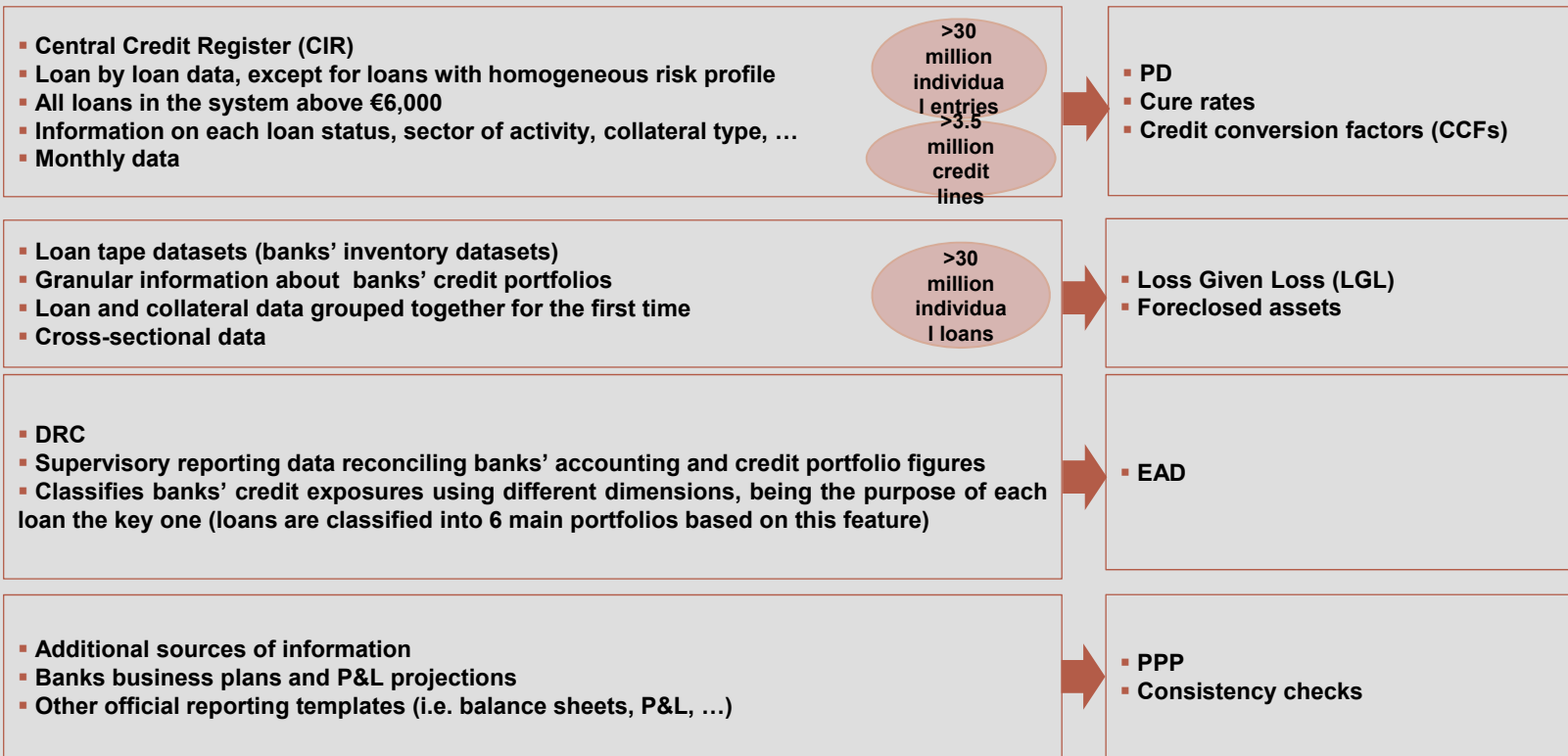
- **Macroeconomic scenarios must be demanding but plausible**
- **FLESB uses a baseline scenario plus two alternative ones**

PATH OF GDP UNDER DIFFERENT SCENARIOS



MAIN ELEMENTS OF THE FLESB TOOL

INPUT DATA



MAIN ELEMENTS OF THE FLESB TOOL

EXPECTED LOSSES

$$EL = PD \times LGD [\text{Loss Given Loss} \times (1 - \text{Cure Rate})] \times EAD \text{ (adjusted by CCFs)}$$

- **Probability of Default (PD)**
 - **Models estimated using loan by loan information both for households and firms**
 - **Six portfolios: real estate developers, public works, corporates, SMEs, mortgages, consumption loans**
 - **One econometric model for each of the six portfolios**
 - **Modelling PDs with macroeconomic variables enables the former to be linked to the macroeconomic scenarios used in the exercise**

$$PD_{\text{bank, time}}^{\text{sector}_i} = F[\sum \alpha_{\text{variable } j} * \text{Macro-Variables}_{\text{variable } j, \text{time}}]$$

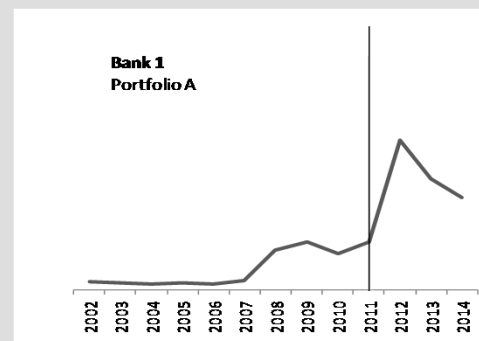
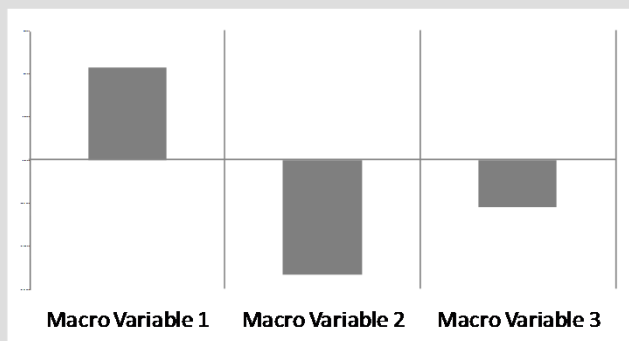
MAIN ELEMENTS OF THE FLESB TOOL

EXPECTED LOSSES

$$EL = PD \times LGD \text{ [Loss Given Loss x (1-Cure Rate)]} \times EAD \text{ (adjusted by CCFs)}$$

- Probability of Default (PD) - Example:

$$PD_{\text{bank, time}}^{\text{sector}_i} = F[\sum \alpha_{\text{variable } j} * \text{Macro-Variables}_{\text{variable } j, \text{time}}]$$



MAIN ELEMENTS OF THE FLESB TOOL

EXPECTED LOSSES

$$EL = PD \times LGD [\text{Loss Given Loss} \times (1 - \text{Cure Rate})] \times EAD \text{ (adjusted by CCFs)}$$

- **Cure Rate**
 - Possibility that defaulted loans may recover (or “cure”) prior to foreclosure/liquidation
 - We estimate the proportion of cure loans by portfolio and bank using historical data from the credit register

Time	t	t+3	...	t+n-1	t+n
Default situation	Default	Default	...	Default	Normal

MAIN ELEMENTS OF THE FLESB TOOL

EXPECTED LOSSES

$$EL = PD \times LGD \text{ [Loss Given Loss} \times (1 - \text{Cure Rate)]} \times EAD \text{ (adjusted by CCFs)}$$

- **LGL**
 - For operations that default and do not cure, the associated losses must be calculated

$$LGL = 1 - \frac{\text{Adjusted Collateral Value}}{\text{Exposure}}$$

- To compute the adjusted value of the collateral we index forward its value considering different macroeconomic scenarios and different valuation haircuts

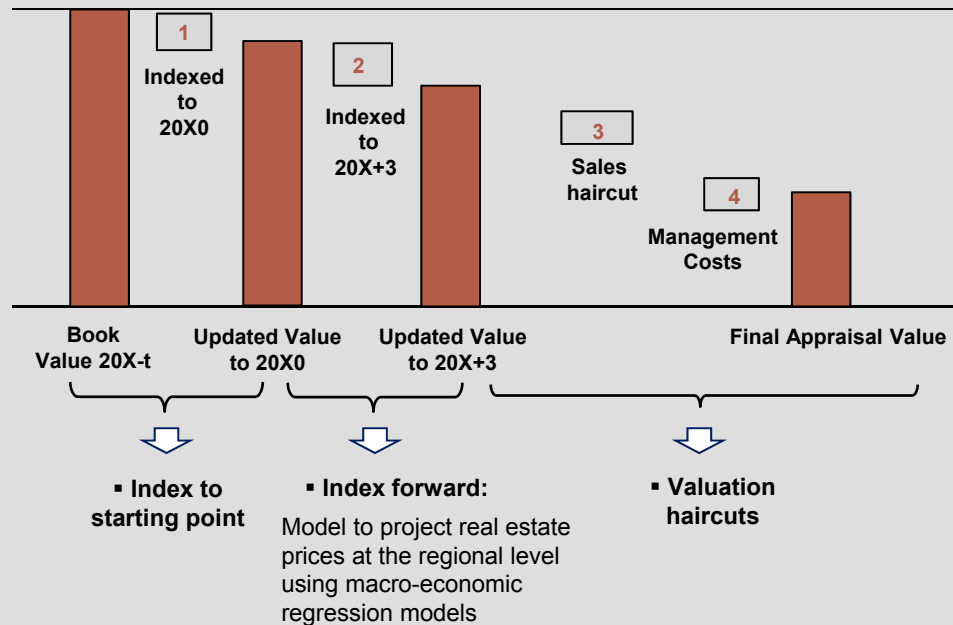
⇒ Granular information: banks' inventory datasets + collateral location databases + information on sales discounts and haircuts

MAIN ELEMENTS OF THE FLESB TOOL

EXPECTED LOSSES

$$EL = PD \times LGD [\text{Loss Given Loss} \times (1 - \text{Cure Rate})] \times EAD \text{ (adjusted by CCFs)}$$

Price Projection Diagram



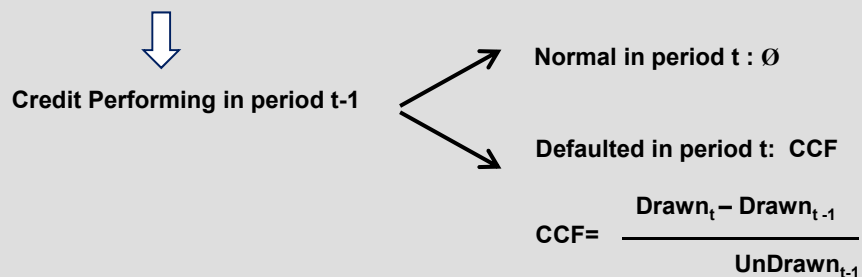
MAIN ELEMENTS OF THE FLESB TOOL

EXPECTED LOSSES

$$EL = PD \times LGD [\text{Loss Given Loss} \times (1 - \text{Cure Rate})] \times EAD \text{ (adjusted by CCFs)}$$

- EAD adjusted by CCFs
 - Credit register information allow us to calculate credit conversion factors, that is, the additional amount of credit a company has by using its credit facility precisely at the moment prior to default

$$EAD_t_Adjusted = EAD_t + CCF * Undrawn\ part_{t-1}$$



MAIN ELEMENTS OF THE FLESB TOOL

PPP PROJECTION

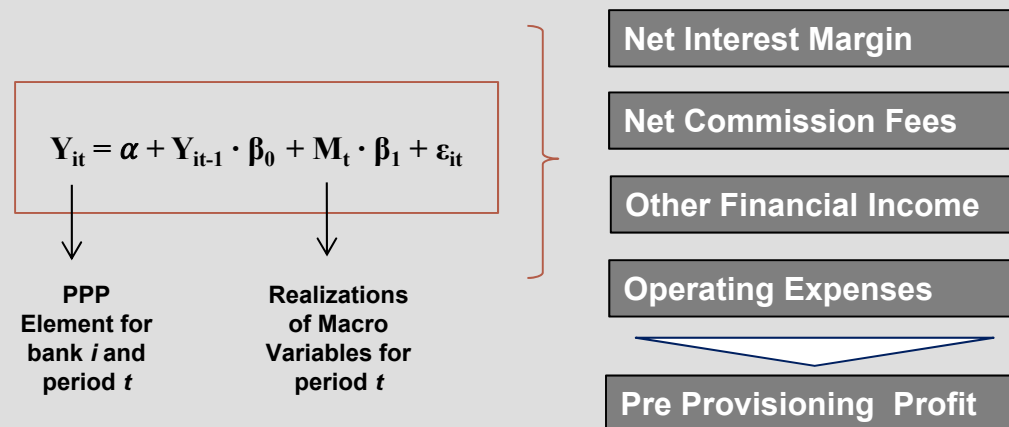


- **Pre-Provisioning Profit**
 - Top-down econometric modelling
 - Bottom-up approach, using business plans of each bank subject to expert judgement by Supervision teams, outliers analysis and additional general coherence checks

MAIN ELEMENTS OF THE FLESB TOOL PPP PROJECTION

TOP-DOWN ECONOMETRIC MODELLING

- Econometric models based on own PPP past evolution and past and present realizations of macro variables
- PPP elements estimated using the data in regulatory reports of banks to Banco de España and time series of macroeconomic variables



MAIN ELEMENTS OF THE FLESB TOOL

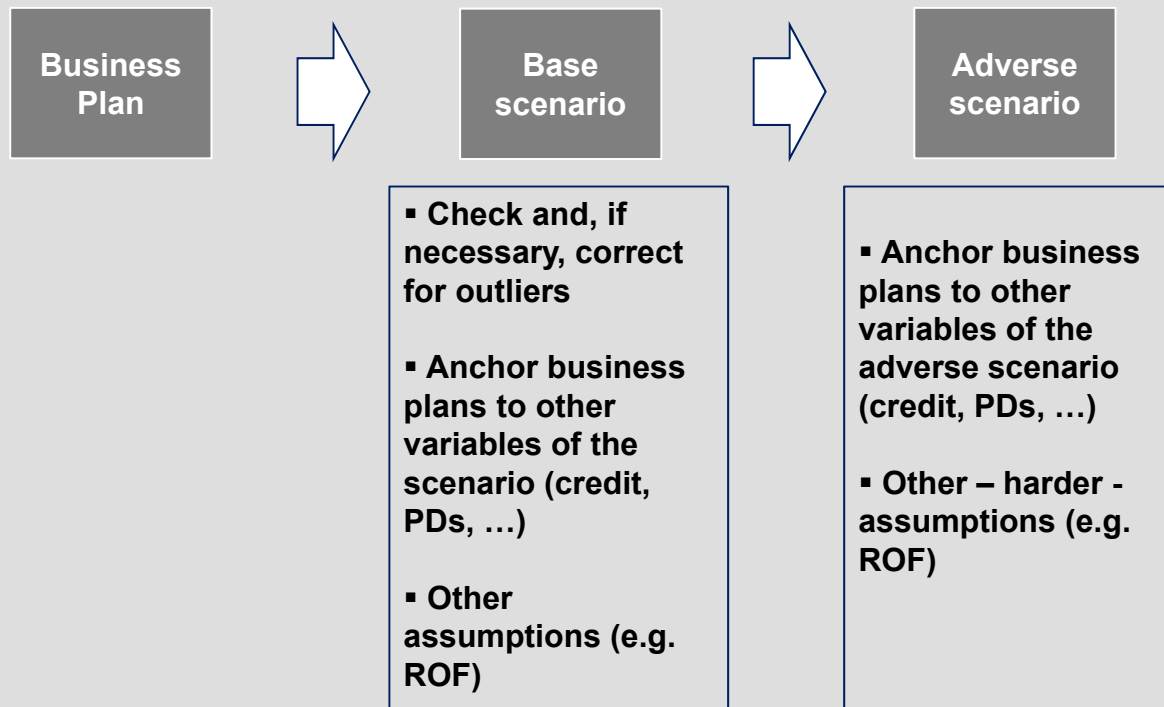
PPP PROJECTION

EXPERT MODEL

- **Model inputs**
 - **Business plans (3 year horizon)**
 - **Expert judgement from inspection teams. Assessment reports**
 - **Official confidential statements**
 - **Alternative source of information and cross checking**

MAIN ELEMENTS OF THE FLESB TOOL PPP PROJECTION

EXPERT MODEL



MAIN ELEMENTS OF THE FLESB TOOL

RWA



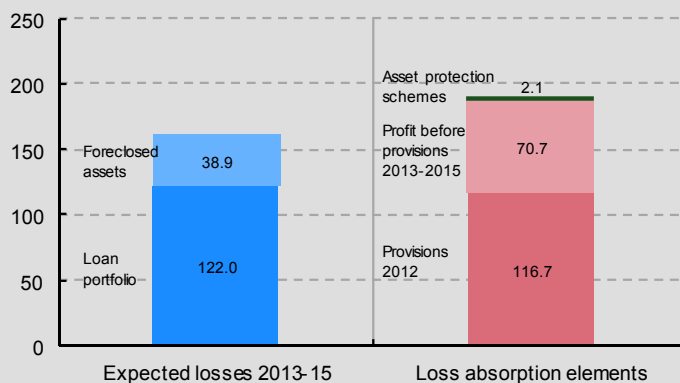
- **RWA are calculated and adjusted in accordance with the evolution of credit in each scenario:**
 - Dynamic balance sheet
 - Reconciliation between banks' projections (business plans) and scenario credit growth rates
 - Additional correction based on increase on NPL and estimated expected losses based on results from the different scenario models
 - Maintain constant the elements not in the focus of the analysis (other risks, risks abroad,...)
 - Take into account other elements (franchises)

- **Analysis of numerator taking into account phase in elements of capital**

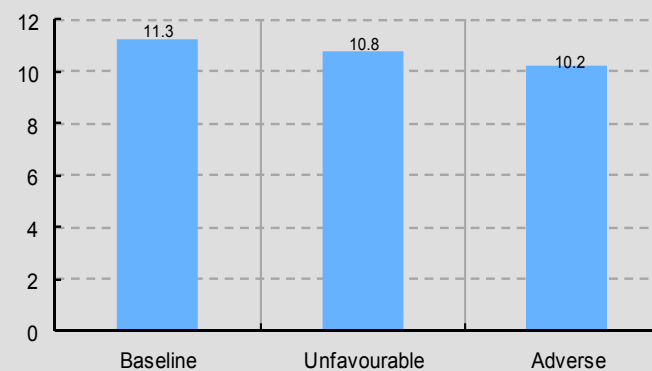
RESULTS



ADVERSE SCENARIO
€bn



CET1 CAPITAL RATIO UNDER THE THREE SCENARIOS IN 2015



Source: Financial Stability Report, Banco de España, November 2013

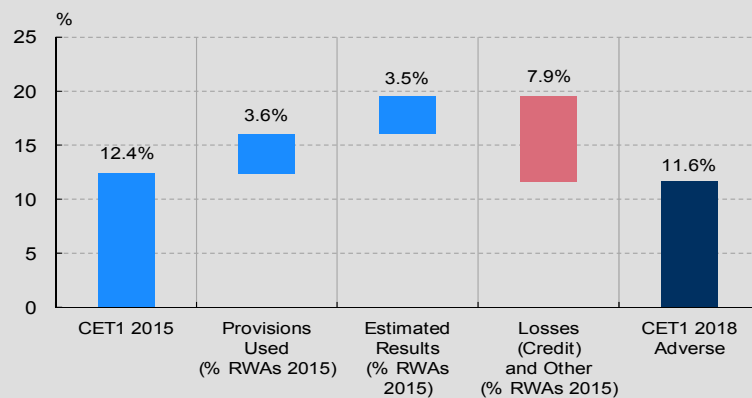
RESULTS



IMPACT ON TRANSITIONAL CET1 RATIO. INSTITUTIONS WITH SIGNIFICANT INTERNATIONAL ACTIVITY

CHART 2.32

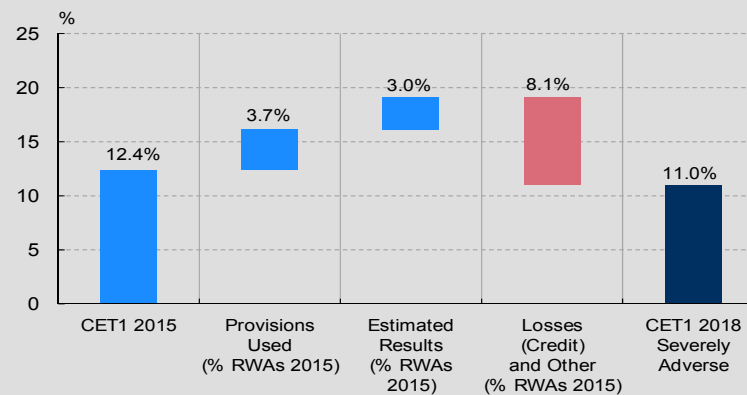
A ADVERSE SCENARIO



Source: Financial Stability Report, Banco de España, November 2016

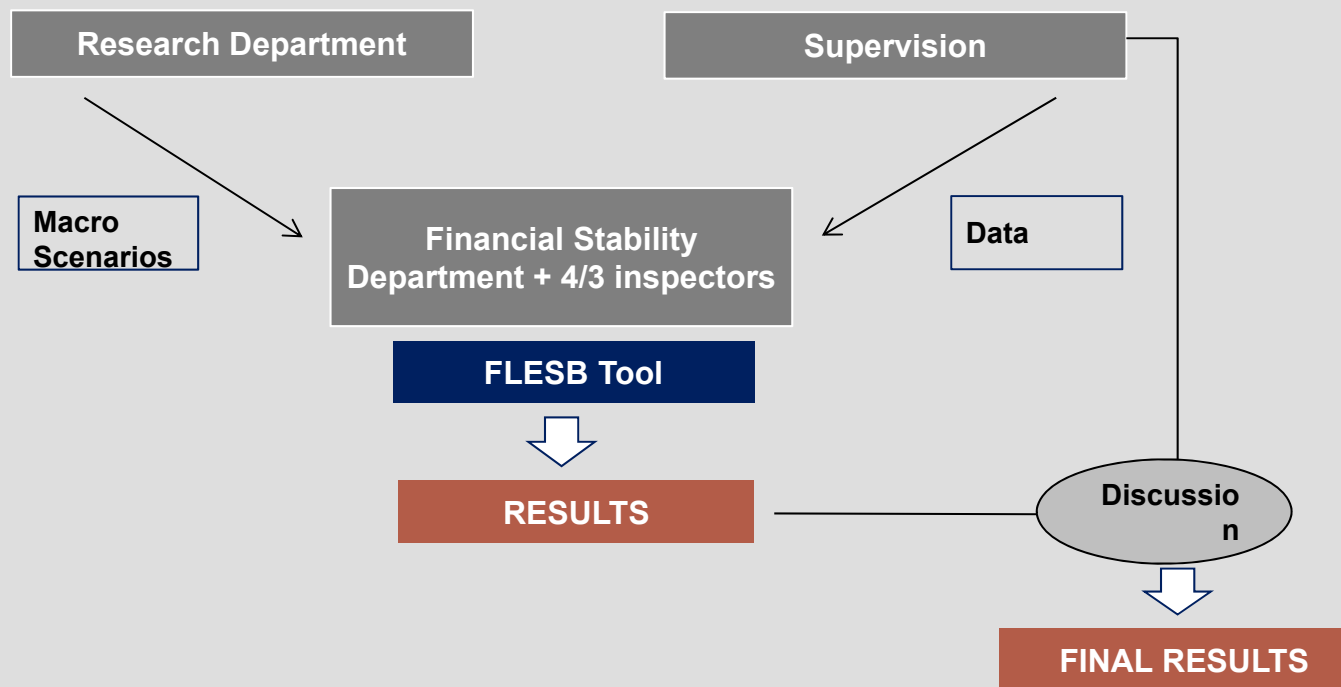
SOURCE: Banco de España.

B SEVERELY ADVERSE SCENARIO



FINAL REMARKS

- Organisation of the exercise



FINAL REMARKS



- **Evolutionary approach**
- **Importance of databases**
- **Communication policy and disclosure: internal vs. external**
- **The detail and rigor of the exercise. Stress scenarios must be demanding but plausible. Moreover, granular data must be used and the methodology must be explained with sufficient detail**
- **Strong governance of the exercise**
- **The credibility of these exercises should not be “bought” by simply meeting market expectations. Instead, credibility should be built through the rigor of the process as a whole, which has to be convincingly explained**

FINAL REMARKS

- Stress testing is becoming a regular tool for central banks and supervisors to monitor the banking sector ...
- ... at both micro and macroprudential levels
- Stress testing needs data, methodologies and resources
- But we need to be realistic:
 - Adjust our methodologies to the data we have
 - Proceed step by step:
 - *Credit risk, first*
 - *Start with PD, simple models,*
 - *Move to LGD as data permits,*
 - *Advance in P&L*
 - *Move to market risk*
 - *Integrated scenario*
 - *Second round effects*
 - ...
 - *FLESB is an example of this approach*

FINAL REMARKS

- **But we need to be realistic:**
 - We need to know which are the limits of stress testing
 - Stress testing is not going to replace a proper surveillance of lending standards, asset classification and provisioning
 - Stress testing cannot be the only determinant of capital requirements
 - Stress testing results are dependent on the size of the shock, that can be arbitrary,..
 - ... the model accuracy, that can be low and biased, ...
 - ... and the starting point or the lending/business cycle position

- **All in all, keep working to improve stress testing while at the same time being conscious of potential limits of this tool for both micro and macro prudential supervision**



THANK YOU

jsaurina@bde.es

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FINANCIAL STABILITY DEPARTMENT