Approaches to Stress Testing Credit Risk: Experience gained on Spanish FSAP

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Applications for Supervisors**

**Approaches to Stress Testing Credit Risk
Experience gained on Spanish FSAP**

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PRESENTATION CONTENTS

BANCO DE ESPAÑA

Responsibilities of financial authorities: ensure sound, stable and efficient

financial markets---------→ Financial Stability

Financial Stability: combination of prudential regulation and effective supervision

Stress tests: complementary tool to take measures to cope with plausible adverse events---------→Stress Tests are useful assessment tools →

Financial Stability

1. Introduction (II)

Importance at the individual-institution level and at the system level

* Individual-institution level: facilitating internal controls in the course of risk management (capability of defining risk profiles more accurately).

* System as a whole: identification of vulnerabilities with potential to affect soundness of the financial system.

IMF recommendation to run regularly stress tests (FSAP methodology) and financial stability related issues--------→

Basic principles and guidelines needed for Stress Tests

2. Specific Issues: Preliminaries (Credit Risk)

Scope of application: Bank's loan portfolios.

Less developed than market or interest rate risk stress tests: lesser availability of data.

However, greater importance to be given: significance of credit risk (weight and importance of loan portfolios).

Credit Risk can be analyzed both in Sensitivity and Scenario Analysis.

A) Portfolio differentiation:

By asset types: corporate and individuals (within asset type, for example, between mortgage loans and consumer credit)

Distinction enables to design, calibrate and determine the final impact of defined shocks properly:

- Determine whether or not a shock has an effect

- Different sensitivity: intensity of the impact may differ significantly

- Account for the different levels in the values of risk drivers

B) Variables subject to shock and calibration

   Traditionally Sensitivity Analysis of credit risk entailed :

      * Worsening the credit quality of all borrowers in a fixed amount (downgrading them one or two notches).

      * Increase in Non-performing loans---→ increase in provisions.

   Now, if data availability: Make use of historical or probabilistic calibration Application to Probabilities of Default (PD), Loss given Default (LGD) and Exposure at Default (EAD).

      - Maximum historical variations (usually coincide with downturns)
   **- Translation into current values of risk parameters: percentage-point increase observed.**

3. Sensitivity Analysis (III)

C) Final Impact

    - Impact on profitability and solvency.

    - Estimate of expected losses and recognition of a higher volume of impairment losses

    - Policy measures: if major problems due to the impact detected, revision of adequacy of prudential elements in place.

Sensitivity Analysis Diagram
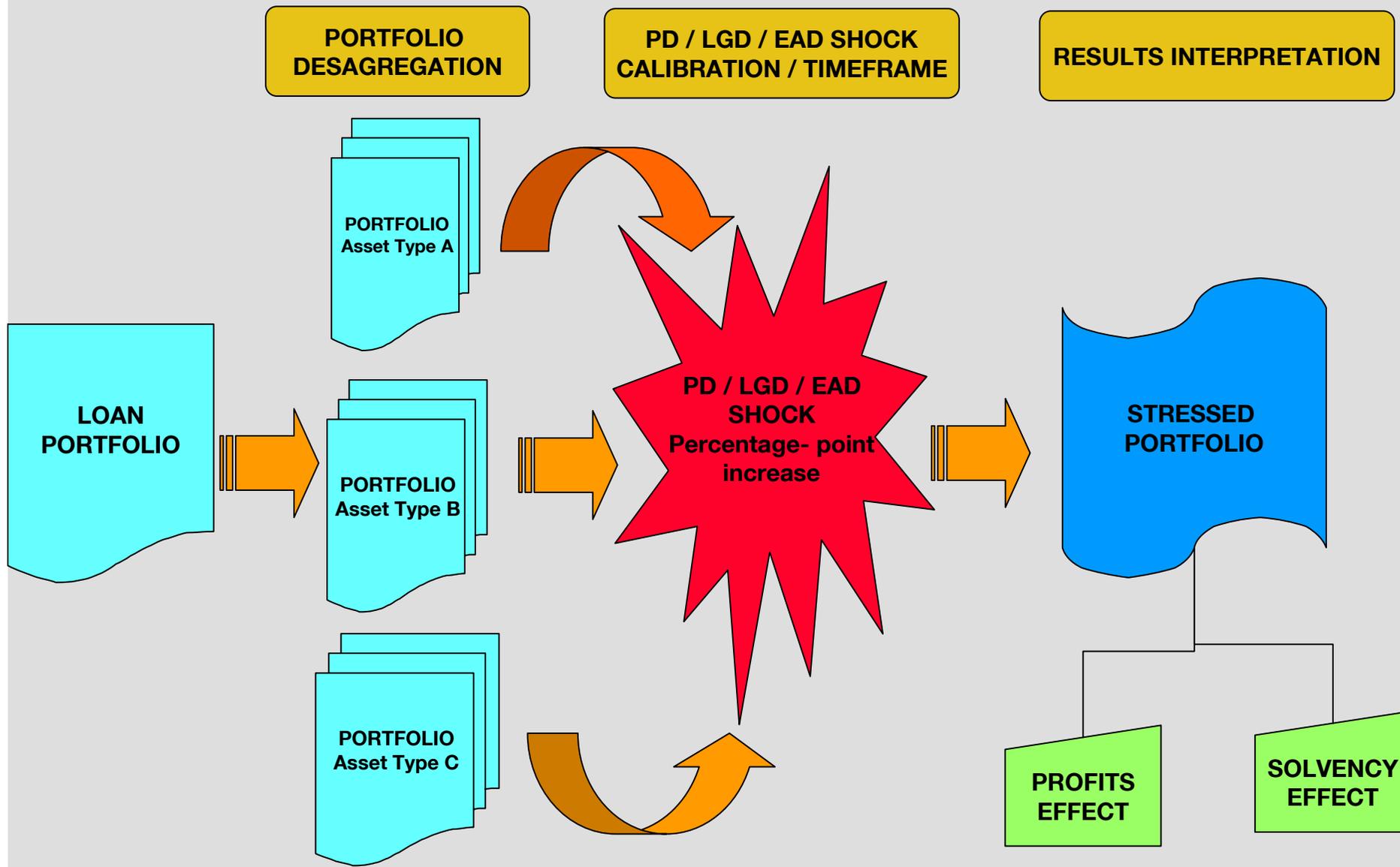
D) Lessons learned

Calibration

Warning: Awareness of possible structural changes

Avoidance of extreme approaches

- Application of maximum recorded highs: Different economic and risk management context

- Substitutes to extreme situations do not offer better solutions:

* e.g. apportion largest observed change among a number of periods (1-3 years)

* Fundamental limitation: Holding unchanged the setting while dynamic characterization of the economy in general and of banks' activity in particular

D) Lessons learned

Final impact

All existing prudential elements must be considered when quantifying shock's impact. Otherwise distortion of the reality is created and could arise competitive disadvantages.

4. Scenario Analysis (I)

A) Scope of application

   -Scope of application of scenario analysis banks' balance sheet and profit and loss account (P&L) .

   Advantages:

      - Detailed monitoring of items liable to be affected by a particular shock.

      - Adequate assessment of impact on banks' main operations

B) Breakdown Analysis: Differentiation between Business and Credit Risk

    -Delimitation of the two basic risks in scenario analysis:
        * Business Risk
        * Credit Risk.

    - Business risk: Included in the banks' balance sheets and P&L account.

    - Credit Risk: Borrowers' financial condition. Borrowers creditworthiness.

B) Breakdown analysis: Differentiation between Business and Credit Risk

- **Approximation to Business Risk:**

Simulation of the main line items of the Balance sheet and the P&L account. Econometric models or internal management information from banks' own risk models.

- **Approximation to Credit Risk:**

Offer an alternative view to traditional approaches in stress tests:
Modeling borrowers PD, LGD and EAD versus modeling an equation for credit loss provisions

C) Modeling of credit Risk Drivers

   - Approximation to Credit Risk:

      Parameterization of main credit risk drivers

         General measure used by banks to evaluate and manage credit risk

         Reference parameter for supervisory authorities to assess credit risk

- Relate PD in terms of macroeconomic variables -----→ Translate the shocks of a stress scenario into credit risk.

$$PD_{it} = F[\ \sum \alpha_j * Macro\_variables_{jt} + \sum \delta_j * borrowers'charact._{jit}\ ]$$

- Full shock effect transferred when LGD and EAD also expressed in terms of macro variables.

$$LGD_{it} = G\ [Macro\_variables\ (\text{hosing prices, interest rates...)}, borrowers'characteristics\ ]$$

4. Scenario Analysis (V)

D) Final Impact

- Analysis of the sensitivity of major line items to the shock (breaking down the effect).

- Assessing credit risk provides an estimate of stressed expected losses which determines the volume of provisions to set aside------$\rightarrow$ Impact on profits.

- Impact on solvency: change in expected losses and coverage thereof by provisions.

- Policy measures: if major problems due to the impact detected, revision of adequacy of prudential elements in place.

Scenario Analysis Diagram
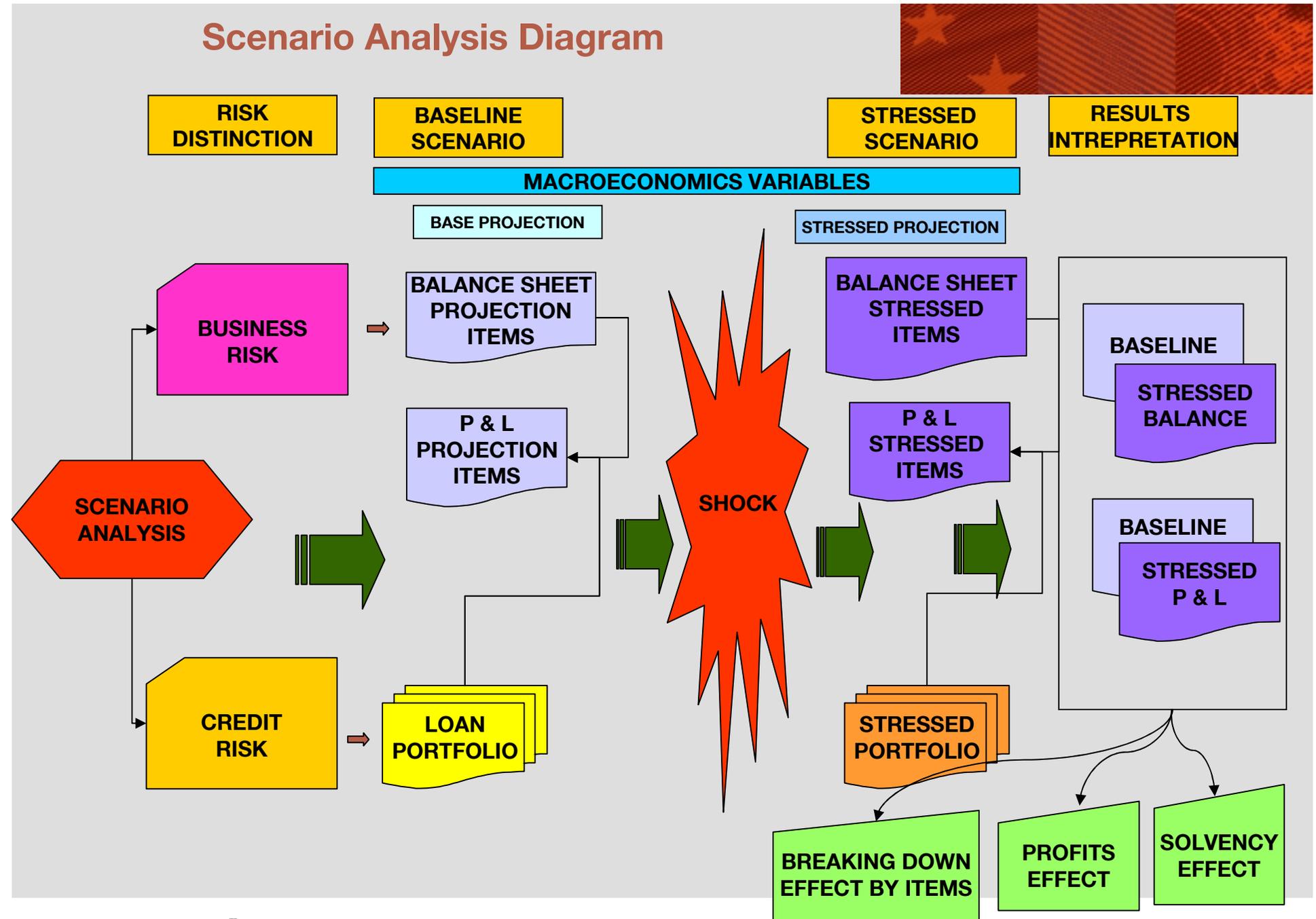
4. Scenario Analysis (V)

E) Lessons learned

- **Analyzing the bottom line of the P&L account may hide significant individual effects.**
- **Avoidance of erratic movement of the P&L bottom line. Individual banks agree on this view.**

- **Banks not allowed to put into practice reactive measures to alter initial hypothesis**

- **Banks not accustomed to this type of exercise. Make of use of their internal budgets which include some type of reactions.**

- **Approximation to banks' internal way of calculating risk drivers (PDs).**

- **Scenario Analysis not reduced to credit risk analysis. Enrichment comes from the inclusion of balance sheet and P&L account items.**

4. Scenario Analysis (V)

F) Final Comments: possible constraints

    The approach takes for granted the following:

    * Data availability
    * Development of banks' internal models
    * Supervisory authorities in possession of borrowers' classification method
    * Convergence between output of both banks' and authorities systems.

    Remaining challenge:

    Among others: Consideration of second-round and feedback effects

F) Final Comments : Basel II purposes

    - Basel II stipulates the performance of stress test to determine capital adequacy

    - That implies:

        Involvement of supervisory authorities in design, calibration and analysis of impact

        Adequate approach to test credit risk: whether the excess of capital large enough to weather an adverse shock

        Development and integration of stress tests as prudential tools: general acceptance of them and setting common grounds

4. Robustness

Spain-FSAP analysis of credit risk has been thorough

Top-down approach (run by Banco de España and IMF)

Bottom-up (run by a significant number of credit institutions)

Comprehensive database

    individual data and models from credit institutions

    aggregated balance sheets, P&L accounts and solvency reporting data

    Credit Register (CIR)

4. Robustness

Credit Register (CIR)

low threshold (any loan above 6.000 euros)

both families and firms

different loan products: mortgages, consumer loans

different types of firms (real estate developers, other firms)

key role in stress testing credit risk

4. Robustness

Additional exercise combining

    scenario analysis

    individual accounting and solvency data

    Credit Register information

    panel data analysis

Simple methodology

    PD modeling bank by bank along time

    expected losses, impact on P&L and solvency ratios

    dispersion analysis

        overall robustness but, maybe, some fragility at particular credit institutions

Complete coverage of credit risk stress testing

5. Issues for discussion

Structural break

    in the economy:

        joining a monetary union, lower levels of interest rates and lower volatility

        change in long-term relationships

        shift in the response to shocks

   **in risk management by banks**

        improvement in measurement of credit risk

        improvement in management of credit risk (securitization, credit derivatives, transfer of risk, more weight to control risk departments,…

        shift in the impact of shock on banks

    Uncertainty about the degree of confidence on stress testing results

5. Issues for discussion

Personas Físicas — Personas Jurídicas — Crecimiento del PIB

1dt — 2dt — Año 93

1dt — 2dt — Año 93
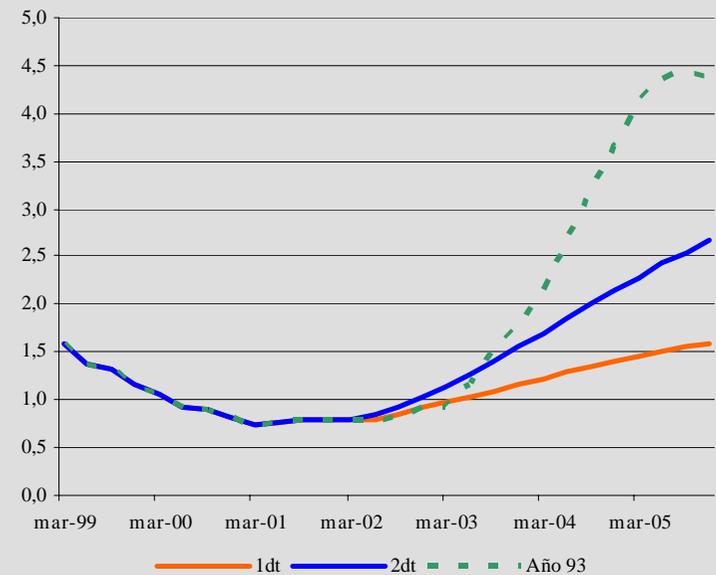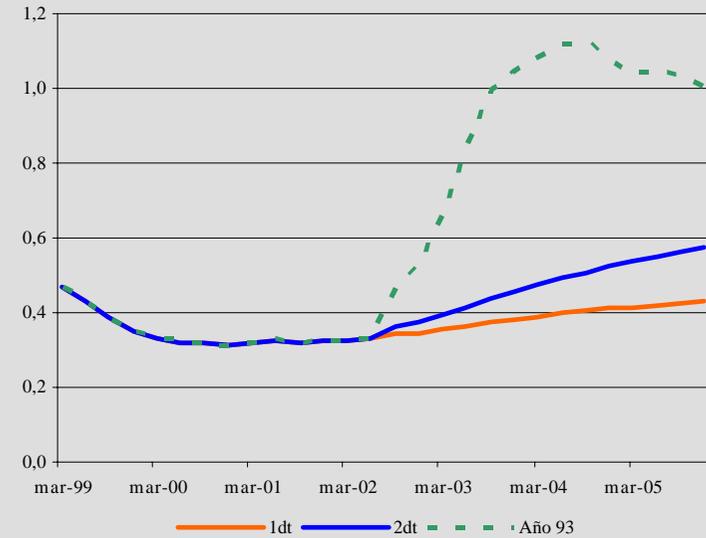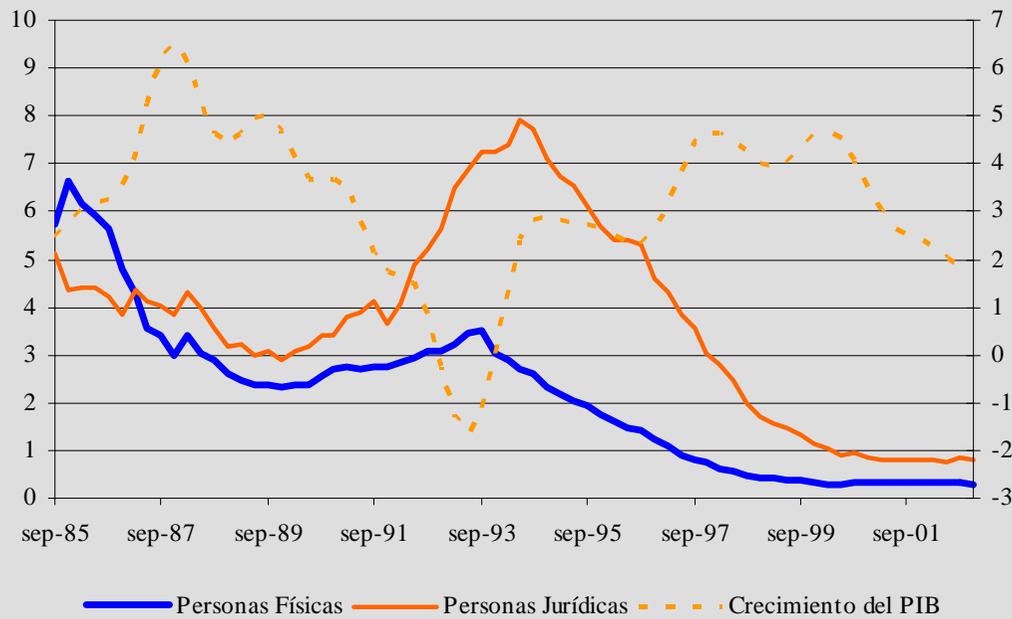
5. Issues for discussion

How to react to a bad news stress testing exercise?

1) We are close to the shock

almost no degree of freedom to react

even counterproductive to react

2) We are far away from the shock

are we going to see the problem (former slide)?

are we going to react?

Prudential tools: proper risk management, solvency requirements, asset classification, moral suasion,…

5. Issues for discussion

Procyclicality

- credit risk is an ex ante concept

- credit risk enters loan portfolios in good times, when problem loans and PDs are low

- an stress test exercise in good times will show, probably, a low impact: do nothing

- However empirical evidence shows that loans granted during good times are riskier than those granted during bad times

Variables	Coefficient	SE	Coefficient	SE	Coefficient	SE
Dependant variable	DEFAULT$_{ijt+2}$ (0/1)		DEFAULT$_{ijt+3}$ (0/1)		DEFAULT$_{ijt+4}$ (0/1)	
Bank characteristics						
LOANG$_{it}$	0.001	0.001	0.002	0.001 ***	0.002	0.001 ***
Province dummies	yes		yes		yes	
Industry dummies	yes		yes		yes	
No. Observations	1,823,656		1,643,708		1,433,074	
Time period	1985-2004		1985-2004		1985-2004	
Wald test [$\chi(2)$] / p-value	8,966	0.00	4,802	0.00	2,987	0.00

5. Issues for discussion

Dynamic provisioning

    take into account when the risk appears in the balance sheet

    countercyclical provisioning

    reinforces solvency of individual institutions and the stability of the financial system

    the mechanism might be incorporated in the Pillar 2

6. Conclusion

Stress testing credit risk is one of the multiple weapons in the hands of bank supervisors (and bank managers)

Importance of databases (in particular, Credit Registers)

Refine methodologies

use in Basel II, Pillar 1 and 2

What to do with stress test results?

risk management

capital adequacy

dynamic provisioning

THANKS FOR YOUR ATTENTION