

2011 EBA Stress Testing in Europe

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Abstract—Stress Tests are conducted by national supervisors as well as by the European Banking Authority (EBA). This paper aims to make a critical analysis of the latest edition of the stress tests published on 15th July 2011. To achieve this objective, I have also established a secondary aim: to examine the financial and patrimonial situation of some of the European and Spanish banks in the period 2010-2012, taking into account the relevant EBA index.

Keyword: *Stress Test, Banking, European Banking Authority (EBA), solvency*

I. INTRODUCTION

The latest edition of the stress tests was published on 15th July 2011 (Article 35 (2) (b) of the EU Parliament and Council Regulations N° 1093/2010, dated 24th November 2010). These resistance tests are designed and developed by the EBA, along with national banking supervisors (in our case, the Bank of Spain), the European Commission and the European Central Bank. Their aim is to assess the ability of the European banking system to withstand adverse scenarios, and thus lend transparency to the market, as well as establishing the additional capital required to ensure the solvency of the banking sector and its components in stressful scenarios.

One new feature I can point out, as regards the 2010 analysis, is the strengthening of the methodology of exercise, including macroeconomic assumptions, definitions of Core Tier 1 Capital and the ratio threshold (5% as opposed to a solvency ratio of 6% in 2010).

Significant stress scenarios were taken into account in the evolution of the banking system's balance sheets by assessing the effects of a substantial increase in the risk premium in individual funding costs for each entity.

The European Commission designed, for this latest edition, a macroeconomic profile to calibrate the Spanish banking system's capacity to withstand the following adverse scenarios:

- Reduction in economic activity measured by a decrease of 1% in GDP for the year 2011 and 1.1% for the year 2012 (2.1% in cumulative terms).

- Predicted negative evolution of property prices in the period December 2010 to December 2012 of:

- + Residential property: - 21.9%
- + Commercial property (including land): - 46.7%

- Sudden fall in stock market index of 20.7 %

- Unemployment rate of 21.50%

- Increase in the cost of long-term public debt of 165 basis points (in other words, the stress tests have been performed assuming that the long-term rates in Spain would be around 6.5%).

In any case, these stress tests are theoretical predictions based on statistical simulations, and so should not be considered as economic forecasts. At this point, therefore, it is worth remembering that Stress Tests are not forecasting applications, and consequently these models are more like the antithesis of the financial instability [1], as they have been designed for conditions that do not involve severe macroeconomic shocks. The 2011 Stress Tests were carried out taking into account the static, unchanging balances in the period analyzed, and therefore the initial data on which the estimates are based are the balance sheets at the end of 31st December 2010.

II. EBA REFERENCE POINTS FOR IMPLEMENTING STRESS TESTS

Before developing this point, we must take into account a basic issue of the possible ways there are of processing information, such as the commonest and most accurate software used for empirical analysis in the fields of IT and social sciences.

Scenario map models are processes in which a wide variety of tools and stages are used. Basically, there are two kinds of processes of these types of models, "bottom-up" and "top-down". In the second category, the supervisor evaluates the internal models of each bank to process the information.

A combination of the two was used in the 2011 edition of the Stress Tests by the EBA as well as in other initiatives, such as the Supervisory Capital Assessment Program (SCAP) or the Board of Governors of the Federal Reserve System (2009).

A. *Sovereign Debt and Corporate Financing in the Investment Portfolio*

As far as fundamental credit analysis is concerned, the risk was assessed using one of the following two methods:

- IRB Methodology (Basel), adapted to EBA norms, in which each banking organization must assess these types of scenarios based on the evolution of the probability of default (PD) for its loss given default (LGD) and carried out through two possible approaches, unexpected losses (UL) and expected losses (EL).

- Standard Method: like the Basel provisions, banks base their analysis and valuation on rating established by the ECAI. Depending on the starting qualification level, the following options could be used to evaluate the rating:

* AAA / Aaa: rating would be unchanged

* AA / Aa2 to A- / A3: rating would be lowered two categories.

* BBB + / Baa1 or less: rating would be lowered four categories with minimum (CCC or junk bond).

In Spain's case, in particular, the sovereign debt rating according to the different agencies was, at that time, as follows:

* Moody's: Aa2 with a negative outlook.

* Standard & Poor's: AA with a negative outlook.

* Fitch: AA +: with a negative outlook.

A guide provided by the European supervisor EBA (2011) quantified the impact of sovereign debt on the investment portfolio, stating that the worst case scenario (the lowest rating, CCC, or equivalent) would involve significant assumptions based on corporate standards with a default probability of around 36.5%.

B. Increases in Sovereign Debt Exposure in the Trading Portfolio

After reading the EBA review, the most striking cases were Greece, Ireland, Portugal and, to a lesser degree, Cyprus. As far as Spain is concerned, the EBA did not alter the initially established rating, which in the author's point of view was an error, because only a few months later, the markets changed the main points of this approach.

III. BASIC ECONOMETRIC PRINCIPLES TO TAKE INTO ACCOUNT

It is very important to bear in mind that Stress Tests are based on non-linear models [3] y [4] and their econometric support is weak. The reason for this assertion lies in the fact that these models do not record satisfactorily the effects of episodes of stress. Linear models, to be exact, tend to show responses to such eventualities [5], but the degree of trust is extremely limited: the relevant episodes (in the present case of a macroeconomic profile designed by the EBA) are rarely completely covered and are therefore inconsistent. That is the reason why models tend to show inaccuracies precisely during episodes of stress.

IV. EMPIRICAL STUDY OF KEY STATISTICS IN THE SPANISH BANKING SYSTEM EXAMINED BY THE STRESS TESTS

A. Preliminary notes on the state of solvency and financial management in the Spanish Financial System

Before discussing the statistical analysis of the results of the Stress Test, I will analyze the usual ratios in the banking industry. As reference, we will cite two different sources from the Consolidated Balance Sheet of Credit Institutions of Spain, as well as Banking Supervision Records from the Bank of Spain (2007) to 2010), [2], [6] y [7]. For this analysis, the comparative table is shown below for the years 1985 to 2010.

TABLE I. SOLVENCY AND FINANCIAL MANAGEMENT RATIOS OF THE SPANISH CREDIT SYSTEM

		SOLVENCY AND FINANCIAL MANAGEMENT RATIOS							
		29/11/1985	30/04/1996	31/12/2000	31/05/2006	31/03/2008	31/12/2010	31/12/2010 + Recapitalization	
SOLVENCY RATIO	Net Equity / Total Liabilities	x100	9.55%	9.98%	7.59%	8.03%	7.94%	5.95%	6.84%
	LEVERAGING		10.47	10.02	13.18	12.46	12.59	16.79	14.61
PASSIVE RATIO	Total Liabilities / Total assets	x100	91.28%	90.92%	92.95%	92.57%	92.64%	94.38%	93.60%
	NET EQUITY RATIO	Net Equity / Total assets	x100	8.72%	9.08%	7.05%	7.43%	7.36%	5.62%

Compiled by the authors from the Bank of Spain Banking Supervision Records and the Manual of the Spanish Financial System (CALVO, J, 2010)

From the above table, it can be deduced, among other points, that:

1. - In 1985, the Spanish credit system had a solvency of 9.55%, and went on to raise this level to nearly 10% in 1996. Between 2000 and 2008, it remained at around 8%; however, at the end of 2010, it fell to 5.95%. We must remember that these solvency ratios, from the general public's perspective, and even more so from clients, investors and the State's point of view, were not exactly ideal: only 5.95% of equity and 94.05% of external funds does not exactly reflect a situation of "solvency" for an organization belonging to the financial sector.

2. - The leverage of the Spanish financial system in 1985 and 1996 was rated at around 10. Already in 2000, this indicator rose significantly to stand at 13.18, showing that debt was gaining ground in the economic balance. However, from 2006, this figure improved and settled at around 12.5. However, in 2010, it rose again to 16.79, which shows that equity itself had lost prominence at the expense of debt. Therefore, if we take the first scenario as a reference point and compare it with the year-end 2010, the credit system had increased its leverage significantly.

3. - As for the ratio of liabilities in the year 1985, for every € 100 of economic structure of the Spanish credit system balance, borrowed funds accounted for € 91.28 of that figure, and remained in the range of € 90-92.6 for the period 1996 to 1998. However, at the end of 2010, for every € 100 of assets, € 94.38 was financed by external sources.

4. - Finally, as regards the net equity ratio, starting at figures of around 9% until 1996, this ratio shows us that the equity financed total investment in 2000 at a rate of € 7.05 for

every € 100; and 10 years later, this occurred at a rate of € 5.62 in € 100. The ratio also indicates that for every € 100 of total financial structure in 2000, € 7.05 was equity in 2000 and a decade later, € 5.62. This means that the participation of debt in the financial structure is becoming greater and greater. It must also be remembered that this ratio also shows unmistakable signs of weakness.

B. Data Source for Statistical Analysis of Stress Test Results

Results of the stress tests can be viewed on the EBA website, with a sample of Spanish banks EBA (2011 a). A statistical analysis of this data is shown below, taking into account the solvency ratios with different elements of loss absorption.

C. Regulatory Capital Reconciliation and Extraction of Core Tier 1

It should be noted that these stress tests were implemented on the basis that banks, savings banks and SIPs were able to strengthen their balance sheets during the first four months of the year 2011 by increasing their capital and obligatory restructuring plans.

The Spanish banking system made significant increases in equity before the end of April 2011 to ensure its resilience in the EBA stress tests of that year. In the Spanish banking system sample analyzed, equity was increased by € 41,208 million. This was achieved by different means: Ordinary Capital gains (Common Equity) derived from RDI 2/2011, private market funding, general provisions, convertible bonds, divestitures or capital gains, in the following way:

- Ordinary Capital increases (Common Equity) derived from RDI 2/2011 to the value of € 14,472 million.

- Amounts derived from general provisions up to December 31, 2010 of € 17,752 million.

- Convertible bonds and other instruments amounting to € 9,164 million.

Equity, as measured by the estimated regulatory capital according to the definition of the EBA to December 2010, for the sample we analyzed, amounted, in the baseline scenario, to € 139,863 million (Core Tier 1 of 7.4% of the sum of weighted assets based on static balance in an unstressed scenario, amounting to € 1,900,519 million).

After discounting the net damage or surpluses and the effects of dividends and other items, we arrive at a net regulatory capital in absolute terms amounting to € 130,064 million.

If we add to this figure the RDI 2/2011 capital of € 14,472 million or capital increases, equity for the sample tested in the stressed scenario would amount to € 144,536 million (Core Tier 1 of 7.3% of € 1,991,274 million). We can illustrate this in the table below, which shows the figures discussed above:

TABLE II. RECONCILIATION OF REGULATORY CAPITAL IN THE BASE AND STRESS SCENARIOS

REGULATORY CAPITAL RECONCILIATION IN BOTH SCENARIOS	
In millions of euros	
I-REGULATORY CAPITAL (SCENARIO NOT STRESSED: 31-12-2010)	139,963
II.- Net Deterioration	-13,598
III.-Dividends & others	3,799
IV.-Regulatory Capital without RDL 2/2011 and with no increases in capital * (I+II+III)	130,064
V.- Increase in capital derived from RDI 2/2011 + private emissions	14,472
VI.- REGULATORY CAPITAL IN STRESSED SCENARIO WITHOUT RDL 2/2011 OR INCREASES OF CAPITAL (IV + V)	144,536

* Includes emissions of capital and debentures converted during the period of stress, where the decision was taken between 01.01.2011 and 30.04.2011.

Compiled by the authors from EBA information

The addition of the sample considered would evolve in the following way: starting from a solvency as measured by Core Tier 1 of the initial stage at the year-end 2010 of 7.4%, it would decrease to 7.3% in a stressed scenario two years later (a fall of 0.1%).

The volume of final Regulatory Capital, as defined by the EBA, would be € 171,271 million, a figure which represents a Core Tier 1 of 8.6% of the € 1,991,274 million weighted assets mentioned above. The table below illustrates the different factors involved in obtaining the final Regulatory Capital.

TABLE III. OBTAINING THE FINAL REGULATORY CAPITAL

OBTAINING THE FINAL REGULATORY CAPITAL	
In millions of euros	
I.- Regulatory capital without RDL 2/2011 or increases in Capital	144,536
II.- General provisions *	17,572
III.- Regulatory capital with general provisions (I+II)	162,108
IV.- Divestments and other business decisions up to 30.04.2011	2,483
V.- Other mandatory convertible bonds	5,417
VI.- Others	1,264
VII.- Regulatory capital as of Dec 2012, with other elements which absorb losses (III+IV+V+VI)	171,272

Compiled by the authors from EBA information

In addition, risk assets (the denominator of Core Tier 1) would rise from € 1,900,519 million in an unstressed baseline scenario to € 1,991,274 million in the adverse scenario (a rise of 4.8%). This increase is particularly important in light of the rationale used by the EBA for considering balance in static terms, which leads to zero growth in nominal terms. Moreover, it should be noted that this increase in RWA is basically due to the change in valuation of assets of credit risk (IRB approach) and in particular because of assets which are considered to have failed.

In this adverse scenario, there would be 7 financial institutions with a Core Tier 1 in the range of 5-6%.

While the aggregate capital shows an average well above the 5% threshold even in a stressed scenario, the dispersion, in the case of financial institutions in the analyzed sample, shows quite different results, with a considerable degree of dispersion.

If we apply the Core Tier 1 differential to both scenarios (baseline and stressed), the following conclusions can be reached:

1. The largest negative differential would be that of BBVA and Banca March, which would accumulate a -1.3 percentage point difference, which would indicate that despite the impact of the macroeconomic table designed by the EBA, they would improve their solvency as measured by Core Tier 1.

2. At the other extreme would be Colonya-Caixa: what is most noticeable is the baseline scenario with a Core Tier 1 of 11.2% from 6.2% in the stressed scenario, which would mean a loss of solvency of 500 basis points. Another entity that shows a decline in solvency in these circumstances would be Banco Pastor, by 4.3% (we should remember they have already been absorbed by Banco Popular).

V. EUROPEAN BANKS, A CASE STUDY: DEXIA

What happened in 2011 to the French-Belgian bank Dexia has a special relevance. Here below there is an analysis of its capital structure, its risk and its solvency.

First, solvency will be analyzed through the Core Tire 1 (expressed in millions of euros) in EBA base and stress scenarios (2011 d). The analysis uses the Core Tier 1 ratio:

$$\text{Core Tier 1} = \frac{\text{Tier 1 Ordinary Capital or Basic Capital}}{\text{Risk-weighted Assets (RWA)}} \times 100$$

December 2010 = $\frac{17,002}{140,835} \times 100 \Rightarrow 12.1\%$

December 2012 = $\frac{15,204}{146,439} \times 100 \Rightarrow 10.4\%$

However, in order to analyze the situation in greater detail, the attached table shows the different components of this financial entity's capital up to 30 June 2010, compared with the same period of 2011, by cumulative quarterly periods (latest data provided 30/06/2011) by Dexia and CreditSights (2011):

TABLE IV. RECONCILIATION OF DEXIA CAPITAL

CONCILIATION OF CAPITAL					
	30/06/11	31/03/11	31/12/10	30/09/10	30/06/2010
I BASIC CAPITAL	14,426	18,635	18,743	18,903	18,852
II Minority participations	679	663	660	645	644
III Deduction of trading fund and other intangible assets	-1,941	-2,169	-2,262	-2,422	-2,492
IV Regulatory adjustments	-139	-139	-139	-139	-139
V CORE TIER 1 (I+II+III+IV)	13,025	16,990	17,002	16,987	16,865
VI Hybrid debt/capital instruments	1,423	1,452	1,423	1,431	1,351
VII TIER 1 CAPITAL (V+VI)	14,448	18,442	18,425	18,418	18,216
VIII Supplementary capital	3,215	3,063	3,417	3,198	3,617
IX Regulatory adjustments	-1,191	-1,250	-1,206	-955	-1,125
X TOTAL REGULATORY CAPITAL (VII+VIII+IX)	16,472	20,255	20,636	20,661	20,708

Millions of euros

Compiled by the authors from CreditSights and Dexia data

From the above, it follows that:

- By 30/06/11, the Core Tier 1 decreased compared with the previous quarter by € 3,965 million (down 23.33%).

- In this case, Total Regulatory Capital fell in the same time period by the sum of € 3,783 million (a decrease of 18.67%).

The table below analyzes the Risk-Weighted Assets during this same period (30/06/2010 to 30/06/2011) provided by Dexia and Creditsights, relating them to the capital figures in the table above, resulting in solvency ratios which are also presented below:

TABLE V. RISK-WEIGHTED ASSETS AND CAPITAL RATIOS OF DEXIA

Risk-weighted assets (RWA)					
(Millions of euros)					
	30/06/11	31/03/11	31/12/10	30/09/10	30/06/2010
Credit risk	110,169	125,499	128,240	130,292	135,537
Market risk	7,183	2,983	2,945	3,251	3,298
Operative risk	9,650	9,650	9,650	10,419	10,419
TOTAL RWA	127,002	138,132	140,835	143,962	149,254
Capital Ratios					
	30/06/11	31/03/11	31/12/10	30/09/10	30/06/2010
Core Tier 1 capital ratio	10.3%	12.3%	12.1%	11.8%	11.3%
Tier 1 capital ratio	11.4%	13.4%	13.1%	12.8%	12.2%
Total capital ratio	13.0%	14.7%	14.7%	14.4%	13.9%

Compiled by the authors from CreditSights and Dexia data

Therefore, it can be stated that Dexia's solvency was affected primarily because the effect of the deterioration of the different components of capital exceeded the reduction of the risk weighted assets.

What happened in August 2001 was particularly interesting: this entity published quarterly losses as a result of the deterioration of its Greek debt portfolio.

Next, I will analyze its credit risk: this entity on 31/12/2010 had a direct position of exposure to gross sovereign debt amounting to € 56,245 million EBA (2011 c). Of this sum, € 3,462 million (i.e. 6.15%) was Greek debt, € 1,927m (3.42%) Portuguese, € 15,009m (26.68%) Italian and € 1,443m (2.56%) was Spanish.

Even more surprising was the European supervisor EBA ruling (2011 b). The sovereign debt rating according to ECAI (this brought the possibility of PD default at each step in the ECAI ratings which were assigned by the EBA at the time) was:

* Greece:

- Moody's: B1.

- Standard & Poor's: B.

- Fitch: B+

This step in the ECAI ratings was assigned by the EBA a PD of 5.78%.*

*Italy:

- Moody's: Aa2, stable outlook.

- Standard & Poor's: A+, negative outlook.
- Fitch: AA-, negative outlook.

This step in the ECAI ratings was assigned by the EBA a PD of 0.18%.

* Portugal:

- Moody's: Baa1, stable outlook.
- Standard & Poor's: BBB-, negative outlook.
- Fitch: BBB-

This step in the ECAI ratings was assigned by the EBA a PD of 1.17%.

If we analyze the events now with hindsight (the publication date of the Stress Test was July 11 and the publication date of the company's losses was 15 August 2011), the supervisor undoubtedly made a serious error. In particular, the rationale used by the EBA to consider this asset at a fair value and not to have accounted for it at market value was a mistake. The above statements are supported by the following arguments:

a. - This bank revealed, after bank stress tests, € 10,000 m of unrealized losses to date in its trading portfolio, of which € 7,000m was sovereign debt. This was due primarily to a reclassification carried out by the bank on its financial situation. We must bear in mind that the assets that any bank has in its trading portfolio may lead to losses in recessionary periods as a result of their adjustment to a fair value. Banks are able to transfer those assets to their investment portfolio and avoid future losses, according to the provisions of an amendment by the International Accounting Standards Board to the International Accounting Standard No. 39: Recognition and Measurement and IFRS 7 Financial Instruments: Disclosures (IASB 2008).

The above legislation establishes that such transfers between trading and investment portfolios as a result of unrealized losses (as might be the case of differential market value and fair value) must be deducted from the total equity of the entity in question (and not on Core Tier 1). It is precisely at this point where some of the triggers of the current situation of Dexia can be found, since this option was used widely and continuously, leading to the situation that its Core Tier 1 showed robustness when analyzed by the EBA in the Stress Test.

b. - Similarly, we can state that the trigger may have been the risk weighting: government debt is not always without risk and even more so in the case of the Greek government (with a 5.78% possibility of default)

c. - It should be added that the impact on tangible equity of this entity was not actually taken into account: it was based on total tangible assets, not adjusted assets, as in the case of Basel II. The tangible common equity of a bank can be defined as the sum of total equity plus the non-controlling participation in the subsidiaries, minus mercantile credit and unamortized intangible assets.

Tangible common equity is calculated by dividing tangible common equity by risk-weighted assets. In the financial sector, this difference in concept and approach may be considerable. The table below shows the data from this entity for the period 30/06/2010 to 30/06/2011, by cumulative quarters, provided by Dexia and CreditSights (2011):

TABLE VI. RATIO OF DEXIA'S TANGIBLE CAPITAL

Tangible Capital Ratio					
	30/06/11	31/03/2011	31/12/10	30/09/10	30/06/2010
Total consolidated assets (millions of euros)	517,747	526,636	566,735	588,054	608,510
RWA/Total consolidated assets	24.5%	26.2%	24.9%	24.5%	24.5%
Consolidated equity; including minority (millions of euros)	8,761	11,453	10,728	10,830	9,331
Tangible Capital Ratio	1.7%	2.2%	1.9%	1.8%	1.5%
Core Tier 1 / tangible assets	2.5%	3.2%	3.0%	2.9%	2.8%
Tangible Capital Ratio / Core Tier 1 capital ratio	16.5%	17.7%	15.7%	15.6%	13.6%

Compiled by the authors from CreditSights data

From the above, it can be deduced that, regarding Tangible Capital Ratio, for every € 100 of total assets, including risk-weighted assets, Dexia had € 1.9% of Tangible Common Equity available on 31/12/2010 (and 1.7% six months later). What is most striking is not how this coefficient has evolved, but its amount, which is clearly lower than the European sector average (average of 4%) or the American sector average (average ranging from 6% to 7%).

It is also vital to analyze the relationship between Tangible Capital Ratio and Core Tier 1 Capital Ratio, since, as of 30/06/2011, it stood at 16.5%, which resulted in a low level of the highest quality capital among all the equity considered by the EBA for the implementation of the Stress Tests.

Finally, as of September 30th, 2011, other information must be added which attests to the weakness of the financial institution analyzed and the inadequacy of the solvency ratios used by Dexia (2011). At that date, the entity's balance, € 412,000 million, was backed by a net equity of as little as € 1,100 million. However, the Core Tier 1 calculation made at the same date produced a score of € 7,800 million, or 9.9%.

VI. CONCLUSIONS

From the study of the regulations and economic data analyzed, it can be concluded that European supervision and standards seek to strengthen the foundations of the European system and try to implement an improvement in regional financial stability. It also pursues the incentive of establishing new liquidity standards and tries to avoid accumulation as well as leverage in the banks.

However, the application of the Stress Tests may have suffered a weaknesses or inconsistencies in the following areas:

- Some lobbyists in the industrial sector have argued that given the diversity of the sector, the Minimum Total Capital Ratio does not apply uniformly to all of them.

- It can be stated that there are certain gaps in the basic considerations, such as deferred assets or the discount on financial holdings in insurance companies.

- It is a fact that, due to the diversity of regulations and supervision of domestic banking systems of each country, certain differences do exist as regards areas such as preferred stock or countercyclical provisions.

- The preponderance of the EBA Core Tier 1, without considering other solvency ratios which are very common in this sector, such as tangible capital.

- Evaluation criteria followed by the EBA of the sovereign debt on the balance sheets in banks, starting from its fair value and not updating to their market value at the time of the initial estimates.

Since the launching of banking supervision on a national level with the birth of the Basel Supervisory Committee in February 1974, it can be seen, just as we have discussed in section IV-A of this study, that there has been a significant decline in the % of Net Equity of the Spanish Credit System over total assets. Thus, it fell from levels of around 9% in 1985 and 1996, to about half that figure (5.62%) in 2010.

It should be added that the aggregate Net Asset Value in the year 2010 and the recapitalization estimated by the EBA, would reach a level of Equity / Assets which would not

even exceed the level analyzed in March 2008, when it stood at 7.43%, as we have shown, nor even the 1985 records.

Given that Equity constitutes, or at least should constitute, a security strip for creditors in general, we can say that this basic criterion of solvency has deteriorated.

Therefore, all the financial engineering that the EBA proposes is carried out on the basis of a net equity which is obviously insufficient.

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