



Independent Analysis of
the Results and Methodology
of the June 2012 Stress Test
on the Spanish Banking System

Prepared for the
Banco de España

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Abbreviations

AIRB	Advanced Internal Ratings-Based
BdE	Banco de España
CCAR	Comprehensive Capital Analysis and Review
CRE	Commercial Real Estate
EAD	Exposure at Default
EBA	European Banking Authority
ECB	European Central Bank
EFSF	European Financial Stability Facility
EL	Expected Losses
ESM	European Stability Mechanism
EU	European Union
FROB	Fondo de Reestructuración Ordenada Bancaria
FSAP	Financial Sector Assessment Program
GDP	Gross Domestic Product
GNP	Gross National Product
IMF	International Monetary Fund
LGC	Loss Given Cure
LGD	Loss Given Default
LGL	Loss Given Liquidation
LGR	Loss Given Restructuring
LTV	Loan-to-Value
NPL	Non-Performing Loans
OW	Oliver Wyman
PCAR	Prudential Capital Assessment Review
PD	Probability of Default
Promontory	Promontory Financial Group
RB	Roland Berger
RDL	Royal Decree Law
SCAP	Supervisory Capital Assessment Program
SME	Small-Medium Size Enterprise

1. Executive Summary

The Spanish Ministry of Economic Affairs and Competitiveness and the Banco de España (“BdE”) have undertaken an initiative aimed at enhancing transparency and credibility of valuations of Spanish banks’ asset portfolios and, ultimately, at restoring investors’ confidence in the Spanish banking sector.

The initiative, coordinated by BdE, consists of two phases involving external independent parties. The first phase is based on a “top-down” approach with the objective of estimating the overall level of losses and additional capital requirements that the Spanish banks may experience under a more unfavorable than expected macroeconomic scenario. BdE engaged Oliver Wyman (“OW”) and Roland Berger (“RB”), to perform independently a stress test of 14 Spanish banks accounting for approximately 90% of total Spanish banking sector assets. The second phase consists of a “bottom-up” assessment of banks’ internal systems for classifying, provisioning for, and measuring their portfolio risks.

In the context of phase one, BdE engaged Promontory Financial Group (“Promontory”) to provide assistance, advisory services, and expert judgment on the evaluation of the results and methodology of the stress tests performed by OW and RB.

The key observations of our analysis relate to the following:

- **The top-down stress test addresses an immediate need** for the BdE, the European Supervisors, and the markets to gain insight into the potential for banking system losses under stresses *in the aggregate*.
- **The governance framework provides for independence** through a Steering Committee made up of senior representatives from the Ministry of Economy and Competitiveness and BdE, supported by an Advisory Panel with representatives from main stakeholders (International Monetary Fund (“IMF”), European Commission, European Central Bank (“ECB”), European Banking Authority (“EBA”), Banque de France and De Nederlandsche Bank), and the involvement of external firms.
- **The aggregate results are valuable** given that the focus on stress testing the Spanish credit portfolios is appropriate in light of the current economic considerations. The second phase will address the need for an evaluation of the banks’ portfolio at the individual bank level.
- **The stress test exercise constitutes a further step to the recent IMF Financial Sector Assessment Program (“FSAP”)** process through utilization of more granular supervisory data provided by BdE and more conservative assumptions. Greater adverse parameters in the stressed scenario are demonstrated from a comparison with other stress test exercises, such as with some of the factors used in the PCAR exercise performed in Ireland.

- **The aggregate capital requirements estimated by OW and RB are aligned**, and show that the requirements **can be addressed with available resources**, including the €100 billion committed already through the European Financial Stability Facility (“EFSF”) and European Stability Mechanism (“ESM”).

Table 1-1 Summary of the Results

in € billion	Oliver Wyman		Roland Berger	
	Base	Adverse	Base	Adverse
Total Stress Losses	170-190	250-270	119.1	169.8
Required Capital	16-25	51-62	25.6	51.8

We note that the total stress losses and the resources available to absorb them, as reported by RB are not directly comparable to those reported by OW. The RB stress losses do not include expected losses on NPLs and foreclosed assets that were already identified as of 31 December 2011. Similarly, RB’s assessment of loss absorption capacity excludes the provisions needed to cover expected losses on NPLs and foreclosed assets identified as of 31 December 2011. However, given that both stress losses and absorptive capacity are impacted symmetrically in the RB methodology, the resulting estimates of capital requirements are comparable to those produced by OW.

The BdE will need to take into consideration these stress tests, the bank by bank reviews, the consideration of factors outside the scope of the stress tests, and new information on macroeconomic conditions and forecasts that will develop over time, in making determinations on the appropriate levels of additional capital needed by individual firms.

2. Introduction

2.1 Background

The Spanish Ministry of Economic Affairs and Competitiveness and the BdE have undertaken an initiative aimed at enhancing transparency and credibility of valuations of Spanish banks’ asset portfolios and, ultimately, at restoring investors’ confidence in the Spanish banking sector.

The initiative, coordinated by BdE, consists of two phases involving external independent parties. The first phase is based on a “top-down” approach for analyzing the balance sheets of the largest Spanish banks in order to assess their resilience at the aggregate level under a more unfavorable macroeconomic scenario than expected. BdE engaged OW and RB, to perform a stress test of Spanish banks accounting for around 90% of total Spanish banking sector assets (excluding foreign assets). The outcome of the first phase is the estimated level of losses and capital requirements that the Spanish banking system overall may experience under the designed stressed conditions. The second phase

consists of a “bottom-up” assessment of banks' internal systems for classifying, provisioning for and measuring their portfolio risks. The reviews conducted at each bank will provide the necessary comfort for using detailed banks' information to determine potential capital requirements at the individual bank level.

2.2 Scope and Objective of Promontory Engagement

BdE engaged Promontory to provide assistance, expert judgment and advisory services on the evaluation of the results and methodology of the stress tests performed by OW and RB. To this end, Promontory performed an analysis of documentation provided by BdE, OW and RB and conducted interviews with BdE senior executives and OW and RB senior representatives.

Promontory did not perform a validation of OW's or RB's methodologies, models, data or the results. It is not responsible for the scenarios used and did not have access to individual bank data delivered by BdE to OW and RB.

Promontory focused on the following key elements:

- **Scenarios:** the stress tests performed by the two external evaluators were driven by scenarios specified by the Steering Committee. As part of our review, we considered the appropriateness of the scenarios in light of the current economic environment in Spain, and we compared the scenarios to those that have been implemented in other stress testing exercises.
- **Data and Assumptions:** we have considered the implications of choices made by the evaluators with respect to segmentation, aggregation or augmentation of the bank data provided by the BdE for the purpose of conducting the stress test.
- **Model Theory:** we reviewed the overall theoretical approaches underlying the stress testing models implemented by the external evaluators, and have considered the reasonableness of the approaches given the requirements of the stress testing exercise.
- **Model Use and Results:** we have analyzed and compared the projections for stress losses and additional capital requirements that results from the stress tests conducted by each of the evaluators. We provide suggestions as to the overall conclusions to be drawn from the exercise.

3. Key Observations

In this section we summarize some key aspects of our assessment of the stress test process undertaken by the BdE at this juncture.

First and foremost, we give weight to the fact that the BdE has taken the proactive steps of subjecting its banking sector to a top-down stress test exercise, carried out substantially by independent parties. In some ways, the BdE action steps to undertake outside stress tests in the current format are counter to the common wisdom for such exercises. The common wisdom would call for an orchestrated institution-by-institution stress test process which completes the audit of the institutions' underlying portfolio data, and then applies a macroeconomic stress to ultimately determine the size of capital needs.

Instead, the BdE is looking to make use of the top-down stress test to meet some near-term identified objectives rather than await the full results of the institution-by-institution, bottom-up exercise which would of course provide the benefit of a full audit of portfolio assets at the bank level. This exercise is planned as a second phase, and will naturally augment the step that is taken now. But taking this step to perform a top-down stress test is important—it addresses an immediate need for the BdE, the European supervisors, and the overall markets to gain insight into the potential for banking system losses under adverse stresses *in the aggregate*. This exercise is an important marker for drawing a line under the amount of capital necessary for what is known now, taking into account the effects of a severely stressed condition. This step is more properly called by what it is: a top-down, aggregate capital assessment, conducted using adverse stress scenarios. It is not “just another stress test.”

The key value of this current exercise is to determine whether the dimension of aggregate losses can be addressed with available resources, including the €100 billion committed already through the EFSF-ESM. It is essential for the market to get good information on this now. Getting independently developed information on overall credit losses in Spain under severe stress conditions has substantial value in making that assessment given the focus on stress testing the Spanish credit portfolios, in line with current economic considerations and the plan for an evaluation of the Spanish credit portfolios in phase two.

This stress test provides an independent view from a top-down perspective about whether the committed funds are sufficient using severely stressed factors for the assessment. It provides the way forward for the next phase, which will delve into the portfolio-level analysis that is needed to finalize a full micro-stress test. The future steps that complete a full micro-stress test will provide the direction for institution-specific actions, and for additional needs if necessary.

Last, this exercise has met the objectives it set forth to achieve, using methodology that is acceptable under international best practices. We reiterate that we have not performed an independent validation of the models, or the inputs. Rather, Promontory has conducted high-level due diligence on the methodologies, models, assumptions, and results.

3.1 Governance

3.1.1 Steering Committee Supported by an Advisory Panel

Current events in Europe are exceptional in historical terms, and no single country can lay claim to a unique intellectual and substantive capacity to anticipate the direction of future market developments. Recognizing the unusual circumstances of this moment, and while no legal or regulatory requirement exists to do so, the BdE took the important step of buttressing the conduct of its own stress tests with an eye toward establishing an independent governance framework. It is not alone in having taken this step; but how it has chosen to do so has unique features which we will discuss.

The governance is designed with the intention to gain from, and contribute to, an international oversight of the process. Thus, a key objective is to introduce an important element of external knowledge to the methods employed in order to benefit from the perspectives of other stakeholders.

The governance framework is anchored by a Steering Committee chaired by Fernando Jiménez, Secretary of State for Economic Affairs and Support for Business, Ministry of Economy and Competitiveness. The vice chairman is the Deputy Governor of the BdE, and members consist of senior leaders from the Economy and Competitiveness Ministry and the BdE. The Steering Committee is supported by an Advisory Panel comprised of senior representatives from key stakeholders in the outcome of the stress tests: the IMF, the EBA, the ECB, the European Commission and representatives from several Eurosystem central banks (France and the Netherlands). As key stakeholders in the outcome of the stress tests, all these parties have reason to ensure that the process is open and fully accountable. These stakeholders defined the scenarios to be utilized for the analytics.

The role played by the Steering Committee is noteworthy. Its main goal consists of making strategic decisions on the entire process in order to ensure the credibility of the results. In particular, the Steering Committee has responsibility for defining the macroeconomic scenarios for the stress test exercise, coordinating the proper implementation of the work, and reviewing the results.

3.1.2 Independence

The BdE undertook this stress test exercise in order to benefit from an independent, expert perspective over the macroeconomic factors affecting the potential outlook. The independence of the firms selected to perform this exercise was paramount in meeting the objective of being able to benefit from analytics and approaches outside BdE and with an international footprint.

The firms each share important characteristics when measuring the standard of independence established. Each is headquartered outside Spain and has a substantial international presence. Neither manages assets or conducts trading activity that could provide the appearance or actuality of conflicts of

interest. The Steering Committee mandated the use of external consultants in order to introduce the use of external models into the stress test. To achieve visibility into possible variances from the use of different models and protect against a potential of tainting of independent outcomes by information flow between the consultants' work, a "Chinese wall" was constructed. The "Chinese wall" serves to prevent model, methodology, preliminary results, and data inputs from flowing freely from one consultant's work to another. Although intuitively a convergence of results between the two projects might aid in zeroing in on the ultimate capital level necessary, the "Chinese wall" helped ensure that each result was achieved completely independently.

In addition, and in the interest of fully establishing an independent stress test, the BdE engaged Promontory to provide assistance and expert judgment on the evaluation of the results and methodology of the stress test performed by OW and RB.

Promontory is an internationally known firm with professionals who hail from numerous key regulatory positions, and the hallmark of its work is the provision of expert independent advice. Several of Promontory's Managing Directors have been in charge of the prudential supervision in their countries and conducted and monitored stress test exercises (macro as well as micro) for their countries or for outside missions. Many have also been part of IMF FSAP missions where stress tests are very frequently part of the exercise. Both from a technical and macroeconomic point of view, the professionals working on this engagement have unique expertise in providing advisory services on the results of stress tests such as the ones being carried out in Spain. Promontory is synonymous with the highest levels of independence and integrity.

3.2 Objectives and Methodology

3.2.1 Meeting the Objectives

The objective of the BdE was to subject the aggregate banking sector to a rigorous adverse stress test in order to determine the overall capital requirement needed to withstand such stresses. The two scenarios set forth by the Steering Committee were used by the external evaluators to deliver the results in one month's time. This objective was achieved with both firms delivering the results of their analytics to the Steering Committee; Promontory then had the opportunity to review the results.

The top-down macroeconomic stress test was designed with the objectives of achieving greater transparency, involving international expertise, and incorporating rigorous methodological approaches. These objectives were met with the design of the governance framework and the engagement of international expert firms.

3.2.2 Going a Step Further than the IMF FSAP

On June 9, 2012, the IMF published the FSAP for Spain.¹ This study included a stress testing exercise on the Spanish banking sector performed in cooperation with the BdE. As a result of the test, capital needs for the overall Spanish banking system were estimated at €37.1 billion in order to match a Core Tier 1 requirement of 7% under the more adverse scenario among the three that were tested.

The methodology of the review was designed to take the Spanish banking sector through *a more granular and even more conservative independent stress test* than previously delivered by the FSAP process, given the continuing focus on Spanish market conditions. More granular bank-specific data from BdE supervisory work was utilized for this top-down test. A severely stressed adverse scenario was developed independently by the Steering Committee and the Advisory Panel, using a three-year timeline. Independent and conservative methodologies applying reasonable assumptions were utilized by the external evaluators when applying the base and stress scenarios.

3.3 The Way Forward

The delivery of the results of the top-down macroeconomic stress test makes available important information about the aggregate need for capital in the banking sector, utilizing some conservative assumptions and relying on granular data supplied by the BdE. The results show that the capital needed, based on the stress testing of the Spanish credit portfolio, is significantly less than the available resources through the €100 billion backstop.

This result sets the stage for the next phase, which will delve into the details of the bank-specific data in the bank portfolios, using external auditing firms to ensure rigor and completeness. The accounting firms will gather and analyze the data, providing methodological completeness for the overall exercise.

4. The June 2012 BdE Stress Test

4.1 The Context for Conducting the Test

The stress testing exercise is taking place amid persistent and acute tension in the financial markets in the Euro area, heavily affecting Spain's banking and financial system.

In the current crisis, sovereign and bank solvency have become tightly linked. This factor has emerged in varying ways across the Euro countries.

¹ IMF Country Report No. 12/137: Spain: Financial Stability Assessment

In Spain's case, fears about the government's ability to honor its sovereign debt as a result of acute recession, coupled with the likely need to grant substantial public support to domestic banks, have led to an increase in the credit spread required by investors. Public borrowing at the current high cost may be unsustainable. On the bank side, investors' fears are focused on uncertainty about the amount of future credit losses. There is particular concern about losses still to be taken on the large real estate related credit portfolios, a result of the persistent decline in real estate prices over several years, compounded by the economic recession. It will likely take several more years for the economy to absorb substantial numbers of unsold properties, and this overhang of real estate inventory could exacerbate an already severe decline in real estate prices.

The Spanish banking sector and its balance sheets have been reshaped by several phenomena in recent years. Major changes included:

- A substantial restructuring of the banking sector, which led to the takeover or merging of many savings banks into larger entities, in cases accompanied by concomitant financial support from the state-owned recapitalization vehicle, Fondo de Reestructuración Ordenada Bancaria ("FROB"). The consolidation process involved approximately 50 institutions being merged into 14, currently accounting for 88% of total domestic assets (excluding assets of Spanish banks' branches abroad and assets of foreign banks' branches in Spain²).
- The Royal Decree Law ("RDL") 02/2012 of February 2012, whereby higher provisions and capital buffers were stipulated for real estate exposures. Banks submitted plans to comply with the new requirements by means of earnings, asset sales, conversion of preferred shares and bonds into common equity, and paying dividends in the form of new shares.
- The RDL 18/2012 of May 2012, which increased to 30%, from 7%, the provision requirement for performing real estate developer loans, with the possibility of FROB support for banks that may be unable to comply with the new requirement.
- A commitment by the Spanish government in May 2012 to inject €19 billion of capital (around 2% of GDP) to Bankia, the country's fourth-largest banking institution.

To successfully deal with a banking crisis, a government must execute a number of inter-related actions, including identifying the weaknesses that caused the crisis, ensuring that it has the resources to deal with the quantified costs of resolving the crisis, addressing management and financial issues at individual problem institutions, and taking steps to prevent similar crises in the future.

In Spain, weak lending has been identified as a principal flaw. Accordingly, determining the amount of loss in the banks' loan portfolios is a critical step in quantifying the costs of resolving the crisis and identifying actions needed to repair or resolve problem institutions. These considerations are consistent with the purposes of the current stress test exercise – to develop a rigorous, independent estimate of

² IMF Country Report No. 12/137: Spain: Financial Stability Assessment

the resources needed to address the key elements of the overall problem and help to direct the review of specific individual institution needs to be carried out in phase two.

4.2 What Is a Stress Test?

Supervisory authorities worldwide have extensively used stress testing techniques since the financial crisis of 2007 to evaluate the adequacy of banks' capital resources to absorb possible losses in case stress scenarios materialized and to measure the amount of new capital they would need to achieve the desired resilience in the face of such stresses. The results of the tests were made public with the goal of restoring investors' confidence; however, in some cases this result was not effectively achieved. In fact, test credibility is critical. It rests on a complex set of factors, including reliable input information, comprehensive risk consideration, sufficient severity of stress scenarios, transparent and sound methodology, and confidence in the ability of the banking sector and government authorities to raise the necessary capital.

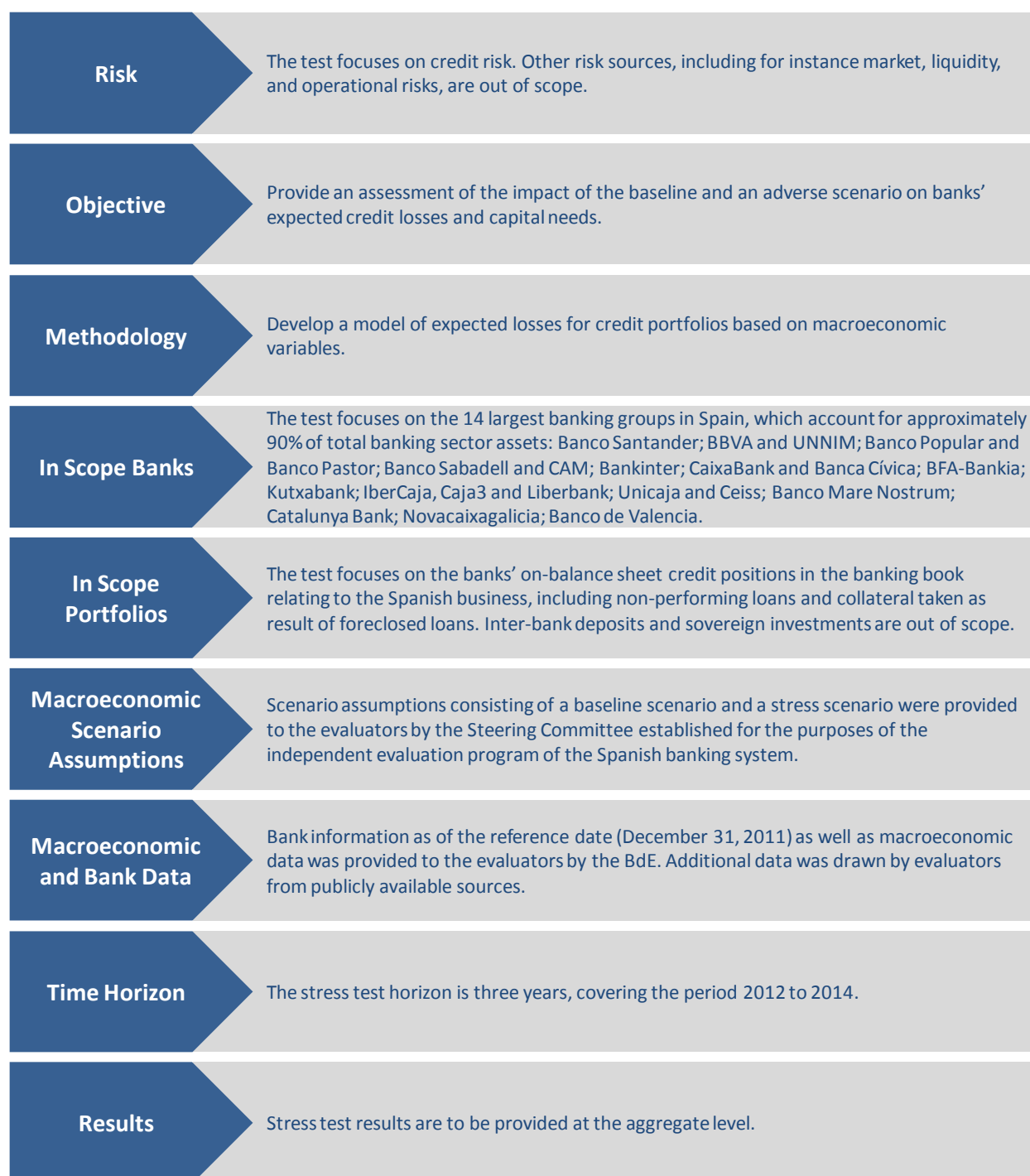
If properly designed and conducted, stress tests provide an effective means of evaluating an institution's ability to withstand adverse developments and giving strong insight into the nature and dimension of appropriate mitigating actions. Key to the stress test analysis is the understanding that if net income is insufficient to fund the needed higher provisions for stress losses, then other available financial resources in the form of capital would be required if the stress scenario in fact occurred. When using a stress test to assess the capital adequacy position of a firm, the supervisory authority will usually look to determine if the "buffer" of capital held by the bank at the start of the planning horizon (i.e., the amount of capital in excess of that minimally required) is large enough to ensure that all stress losses projected over the planning horizon can be funded without depressing capital ratios to less than the required levels.

Stress tests are usually conducted from an economic – as opposed to an accounting – perspective of the bank. As such, stress tests usually focus on the economic concepts of "expected loss" and "stress loss," as opposed to the accounting-based identification of "incurred loss." Incurred losses are those that, as of a specified point in time, have actually been realized by the bank. In contrast, expected losses refer to losses that a bank may reasonably expect to occur over a specified future time period. Expected losses ("ELs") are usually measured relative to a business forecast that is viewed as most likely to occur. Stress losses, which are also occasionally called "stress expected losses", refer to future loss levels that might occur if a stressful—albeit unlikely—macro business environment were to be realized.

4.3 Scope of the Current Stress Test

The scope of the stress test work required of the external evaluators is summarized in the chart below:

Chart 4.3-1 Summary of External Evaluators Work



5. Comparison to Other Stress Tests

5.1 The Macroeconomic Scenarios

Promontory has compared the macroeconomic assumptions employed in this stress test with those employed in earlier stress tests on Spain's banks, and with the macroeconomic assumptions employed in stress testing for four other countries: Ireland, Portugal, the United States and Greece.

Several types of differences are apparent—most of which reflect favorably on the current Spanish test. The scope of other stress tests included sovereign or market exposures. As mentioned above, this stress test is focused purposefully on the Spanish credit portfolio in light of this significantly prevalent risk driven by the current economic situation.

First, the current Spanish stress test is more comprehensive than almost all the others reviewed. It uses 15 macroeconomic factors as compared to a maximum of ten factors in the other tests, with the exception of the PCAR in Ireland. Table 5.1-1 below illustrates the number of factors employed in the current stress test for Spain and eight other stress tests. Only the PCAR in Ireland employed more factors and those were primarily related to foreign trade, which is relatively more predominant in Ireland.

There are also some important differences between the factors utilized in Spain and Ireland that reflect significant aspects of each economy. For example, Spain utilizes land prices and financial factors such as the Madrid stock exchange; Ireland uses government and personal consumption, and commercial property factors.

Table 5.1-1 Stress Test Factors

	Current BdE 2012	IMF FSAP Spain 2012	EBA Spain 2011	CEBS Spain 2010	PCAR Ireland 2011	EBA Ireland 2011	EBA Portugal 2011	EBA Greece 2011	SCAP US 2009
Number of Factors	14	12	6	6	17	6	6	6	3

Source: BdE, Central Bank of Ireland, Banco du Portugal, EBA, U.S. Federal Reserve Board

Table 5.1-2 below illustrates the factors employed in the current stress test. In particular, the additional factors facilitate calculations of projected income as a component of internally generated capital at the sample banks. Various factors also help drive assessments of the losses within individual portfolios.

Table 5.1-1 Stress Test Comparison

Factor	Current BdE Stress Test	CEBS – Spain 2010	EBA – Spain 2011	CBI – Ireland 2010	PCAR – Ireland 2011	EBA – Portugal 2011	EBA – Greece 2011	SCAP – US 2009
Real GDP	✓	✓	✓		✓	✓	✓	✓
GDP Deflator	✓							
Nominal GDP	✓							
Harmonized Index of Consumer Prices	✓		✓					
Unemployment Rate	✓	✓	✓		✓	✓	✓	✓
Exchange Rate Against USD	✓		✓					
Madrid Stock Exchange Index	✓							
Credit to Other Resident Sectors:								
• Households	✓							
• Non-Financial Firms	✓							
• Others	✓							
Short-Term Interest Rate (Euribor, 3 months)	✓	✓	✓			✓	✓	
Euribor, 12 months	✓	✓	✓			✓	✓	
Long-Term Interest Rates (Spanish debt, 10 years)	✓	✓	✓			✓	✓	
Housing Prices	✓					✓		✓
• Commercial Property		✓	✓		✓		✓	
• Residential Property		✓	✓		✓		✓	
Land Prices	✓							
Inflation			✓					

Source: BdE, Central Bank of Ireland, Banco du Portugal, EBA, U.S. Federal Reserve Board

Second, the current stress test covers a three-year period, 2012 through 2014, as compared to a two-year horizon in most of the other stress tests, except for Ireland's PCAR exercise. The three-year scenario recognizes the likelihood that the economic recession will endure for a longer period than is built into the other stress tests, resulting in greater potential losses at the banks in the test and their potential need for more capital.

The test includes a baseline scenario and an adverse scenario. The baseline scenario projects a recession in the first two years and a slight recovery in 2014. The adverse scenario projects a continuing recession over the three-year period with GDP declining 6.5% over the three years. In the baseline case the unemployment rate declines slightly over the three-year period, while in the adverse scenario the unemployment rate is higher and continues to increase over the three-year period. It should be noted that while the baseline unemployment rate has already been exceeded, it is still below the rates employed in the adverse scenario. In both scenarios housing prices, land prices and credit amount decline throughout the three years with the decline greater in the adverse scenario.

Table 5.1-3 below describes the two scenarios.

Table 5.1-3 Macroeconomic Three-Year Scenarios

	2011	Baseline			Adverse		
		2012	2013	2014	2012	2013	2014
Real GDP <i>Growth rate</i>	0.7	-1.7	-0.3	0.3	-4.1	-2.1	-0.3
GDP deflator <i>Growth rate</i>	1.4	1.0	1.0	0.9	0.0	-0.7	0.1
Nominal GDP <i>Growth rate</i>	2.1	-0.7	0.7	1.2	-4.1	-2.8	-0.2
Harmonized Index of Consumer Prices <i>Growth rate</i>	3.1	1.8	1.6	1.4	1.1	0.0	0.3
Unemployment Rate <i>% of labor force</i>	21.6	23.8	23.5	23.4	25.0	26.8	27.2
Short-Term Interest Rates (Euribor, 3 months)	1.4	0.9	0.8	0.8	1.9	1.8	1.8
Euribor, 12 months	2.0	1.6	1.5	1.5	2.6	2.5	2.5
Housing Prices	-5.6	-5.6	-2.8	-1.5	-19.9	-4.5	-2.0
Exchange Rate Against USD <i>Dollars per euro at end of period</i>	1.4	1.3	1.3	1.3	1.3	1.3	1.3
Madrid Stock Exchange Index <i>Growth rate</i>	-14.6	-1.3	-0.4	0.0	-51.3	-5.0	0.0
Credit to Other Resident Sectors							
Households <i>Growth rate</i>	-1.5	-3.8	-3.1	-2.7	-6.8	-6.8	-4.0
Non-Financial Firms <i>Growth rate</i>	-3.6	-5.3	-4.3	-2.7	-6.4	-5.3	-4.0
Long-Term interest rates (10 years)	5.6	6.4	6.7	6.7	7.4	7.7	7.7
Land Prices	-6.7	-25.0	-12.5	-5.0	-50.0	-16.0	-6.0

Source: BdE

Third, and of particular importance, the stress tests incorporate assumptions of much larger degrees of stress than in the other tests. In comparison to the macroeconomic factors employed in the other stress tests, the current test assumes the deterioration in all factors is greater, with the exception of house prices in Ireland. Some differences are particularly striking—for example, the change in unemployment in this stress test at 560 basis points is significantly greater than that employed in all the other tests.

Table 5.1-4 below compares selected common macroeconomic factors.

Table 5.1-4 Adverse Scenario Comparison

(% change over stress period)	Current BdE Stress Test (3 years)	IMF FSAP - Spain (2 years)	EBA - Spain (2 years)	PCAR - Ireland (3 years)	EBA - Portugal (2 years)	EBA - Greece (2 years)	US - SCAP (2 years)
GDP Growth (cumulative)	-6.5	-5.7	-2.2	0.1	-5.7	-5.2	-2.8
House Prices (cumulative)	-26.4	-23.5	-22	-35.7	-14.2	-22.9	-29
Land Prices (cumulative)	-72	N/A	N/A	N/A	N/A	N/A	N/A
Change in Unemployment Rate	5.6	5	2.3	2	1	3.7	3.1
Change in Stock Index	-56.3	-51.7	-20.7	N/A	-11.7	-21.5	N/A

Source: IMF, EBA, Central Bank of Ireland, European Commission, U.S. Federal Reserve Board, U.S. Bureau of Labor Statistics

Finally, in addition to reviewing the individual macroeconomic stress assumptions relative to those of other stress tests, we have also reviewed the analysis in the OW report of the relative of various stress tests. In its report, OW has presented evidence that the macroeconomic factors specified for the current Spanish 2012 adverse scenario correspond to a decline in credit quality that is significantly greater than that implied by other stress tests both in Spain and in other jurisdictions. Using a fitted credit quality index model (described in Section 6.2.1.3), the index values resulting from the macroeconomic factors specified in a number of alternative stress testing programs are presented, and the composite level of macroeconomic activity implied by the Spanish 2012 Adverse scenario certainly ranks among the most severe of stresses contemplated by any of the EBA or US stress tests.

Our overall judgment is that the current stress test is more exacting in its macroeconomic assumptions than the other tests again with the exception of the house price factor in Ireland—reflecting in particular the severity of the factor changes incorporated in the stress test assumptions. We also view the comprehensiveness of the factor specification and the longer term of the stress test as positives in presenting a more accurate picture of potential credit losses in the banking system.

5.2 Elements for Comparing the BdE Stress Test and the IMF 2012 Stress Test

The IMF published the FSAP for Spain on June 9, 2012.³ This study included a stress testing exercise on the Spanish banking sector performed in cooperation with the BdE. As a result of the test, capital needs for the overall Spanish banking system were estimated at €37.1 billion in order to match a Core Tier 1 requirement of 7% under the more adverse scenario of the two that were tested.

Based upon the available documentation and our interviews with BdE staff, we identified several differences between the BdE stress test and the FSAP exercise, as described in the following table:

³ IMF Country Report No. 12/137: Spain: Financial Stability Assessment

Table 5.2-1 Comparison between BdE and FSAP stress test

	BdE Stress Test	FSAP Stress Test
Methodological approach	Two external evaluators were delivered bank data by the BdE and appointed with building and running their own credit models. The evaluators worked independently of the BdE and of one another.	The test was based on credit models developed by both the IMF and the BdE. All models were effectively run by the BdE using agreed-upon assumptions subsequently cross-checked by the IMF.
Risks in scope	The test only focused on credit risk.	The test was focused on banks' credit portfolios; however, it did apply valuation haircuts to sovereign bonds retained in the trading and available for sale books.
Scenarios and time horizons	The test covered three years (2012 to 2014). The adverse scenario implied a larger decline of GDP than the FSAP in the second-year (-2.1% vs. -1.6%) and a further decline of -0.3% in the third year, depicting a full three-year recession.	The time horizon spanned two years.
Data source	The BdE performed a dedicated data request from the banks in the sample in view of the stress test.	The stress test was based on regular supervisory reports provided by Spanish banks to the BdE.
Loan portfolio segmentation	Real Estate Developers; Civil Construction; SME's; Large Corporates; Residential Mortgages; Other Households; Foreclosed Assets	Real Estate Developers; Other Corporates; Residential Mortgages; Other Households
Input data granularity	The test was designed to provide stress test results at the aggregate level.	While the data allowed some segmentation of the banks, the stress test did not entail any analysis at the individual bank level.
Assets in scope	Domestic loan portfolios as at December 31, 2011. NPL and foreclosed loans were included in the test scope. Restructured / refinanced loans were also considered.	Domestic performing loans as of December 31, 2011. Restructured loans were excluded.
Reclassified or incorrectly classified loans	The evaluators were allowed to provide assumptions regarding loans that should be reclassified into more risky categories.	The loan information from banks was taken at face value. No reclassification was performed.

6. Data Sources and Methodology

6.1 Data Provided by BdE

The evaluators that performed the stress tests, OW and RB, were provided by the BdE with data for the formerly 21, now 14 following the mergers, largest individual banks reflecting their portfolio exposures

as of December 31, 2011. This data had been collected by the BdE; it differs in granularity and coverage from the publicly available information for the 21 banks. Appendix 3 includes data templates with the information delivered by the BdE to OW and RB.

Some of the banks covered by the BdE-provided data have been involved in mergers and acquisitions during the first half of 2012; as a result, the actual number of independent banks subjected to the stress tests has been reduced to 14. To develop and implement their stress tests, the evaluators aggregated data relating to banks that have merged during 2012.

The BdE-provided data was segmented into 6 primary segments: Real Estate Property Developers, Civil Construction, Small-Medium Size Enterprises (“SMEs”), Large Corporates, Retail Mortgages and Other Retail. Information was further split into sub-segments (e.g. first residences, second residences and other real estate) and risk classes (performing, substandard and doubtful); guarantees were also reported for each segment and sub-segment. Additionally, information about refinanced loans by segment was provided, which was organized into performing, non-performing and foreclosed categories. The evaluators were provided with supervisory information on foreclosed assets.

The BdE provided estimates for EL, probability of default (“PD”) and loss given default (“LGD”) as at December 31, 2011, for each portfolio. The BdE noted that the PD was the same across banks for all portfolios, with the exception of the large corporate and property developer portfolios, where PDs would differ depending on portfolio mix.

Both evaluators noted that not all the requested additional information was available with the granularity and/or the time spans they would have desired. A significant amount of information—including, for example, expected and realized PDs as well as LGDs—per bank and segment was only available as at end of 2011; longer data series were typically desired.

6.2 Comparison of Methodology Approaches across Consultants

6.2.1 OW Approach

6.2.1.1 General Approach

OW’s stress testing approach is implemented on an institution-specific basis, and determines additional capital requirements at the beginning of the stress period that are sufficient to ensure each institution, given its beginning-of-period levels of exposures, capital, and provisions, can maintain a targeted minimum capital ratio with the projected levels of incomes and credit losses, for the duration of the planning horizon running from January 1, 2012 through December 31, 2014.

The methodology employed by OW for generating estimates of stress losses under both baseline and adverse scenarios is based upon the familiar decomposition of losses into the product of PD, LGD and EAD. Estimates of each of these loss components have been developed using methodologies customized in light of the particular constraints and data limitations presented by the data available for the Spanish banks under review.

OW leveraged the segmentation of data as provided by the BdE. Their model development and implementation largely takes place at the primary segment level. Potential scenario losses for performing and non-performing portfolios are modeled using the PDxLDGxEAD approach detailed below. Foreclosed assets were grouped into four key segments: Housing, Commercial Real Estate, Land, and Other. Losses on foreclosed assets were modeled based upon projections of forecasted housing and land prices, combined with OW assumptions on haircuts and maintenance costs based upon domain experience.

6.2.1.2 Assumptions

As a result of limited availability of data with the desired granularity, OW applied expert judgment-based conservative assumptions that are deemed to have significantly impacted the calculation of future losses on various portfolios. These include:

- Reclassifying up to 10% of total balance of the Civil Construction, Large Corporate and SME's portfolio as Real Estate Developers. According to our interview with OW, this initiative was taken upon the experience made in similar contexts in Spain.
- Setting restructured / refinanced loans to be up to 50% of the total balance of the Real Estate Developers portfolio. A severe, higher PD ranging from 52% to 95% was assigned to these sub-portfolios.
- Up to 15% of other portfolios were similarly deemed to be refinanced, and significantly higher PDs were assigned.
- Assuming a lengthy time-to-asset-sale for foreclosed assets, and applying significant, conservative haircuts on sale prices. Losses relating to declining real estate prices combined with haircut related losses would sum up to a decline in sale prices for foreclosed real estate of 60%-90% compared to peaks (2008).

OW's modeling approach has been widely used by the firm and is reasonably well-documented in public presentations, white papers and other documents. The Vasicek model underlying the methodology is well-understood by academics, supervisors, and practitioners, and has been regularly incorporated into stress testing models to assess portfolio credit risk. Consequently, Promontory deems the general framework to be reliable and appropriate to rely upon for the purposes required by the current stress testing exercise.

6.2.1.3 Probability of Default

OW's approach to developing estimates of default probabilities involves a multi-step process. First, historical data on default rates and PDs (as reported by Spanish Basel II Advanced Internal Ratings-Based ("AIRB") banks) or on non-performing loan rates (a proxy for default rates) is transformed into a time series of "credit quality index" values. These credit quality measures correspond to the "distance to default" measures which result from passing the historical data series through an inversion of the well-known Vasicek formula -- the same formula that lies at the heart of the Basel II AIRB approach to credit. The resulting credit quality index values can therefore also be interpreted as the size of a composite single macroeconomic factor which corresponding to the observed PD in any given period. The asset value correlations required to calibrate the Vasicek formula are similar to those in the Basel II AIRB specification, but reflect OW's own expert judgment and analysis based upon their domain experience.

Next, the observed historical variation in the empirical credit quality index series is modeled using various statistical regression techniques, the purpose being to develop a predictive model for credit quality as a function of various macroeconomic factors (unemployment rates, interest rates, GNP growth rates, etc.) Final model selection is driven by statistical goodness-of-fit and OW's assessment of the reasonableness and homogeneity of identified predictor variables across segments.

The fitted credit quality prediction models are then used to construct predictions of the credit quality index that would result from the specific levels of the macroeconomic factors in the specified baseline and adverse stress test scenarios. Finally, estimates of PD for the baseline and adverse scenarios are constructed using the corresponding predicted levels of the credit quality as input into the aforementioned Vasicek formula.

In the present exercise, OW has reported that the PD estimates produced by the modeling approach described above have on occasion been revised to reflect information where historical performance and default information might not adequately reflect future risk, as would be the case, for example, with refinanced loans.

6.2.1.4 Loss Given Default

OW's estimation of LGD for performing loans is quite conventional; it is based upon loan-to-value ("LTV") and projections of home prices as forecasted for the scenarios, applied to exposures at the BdE sub-segment level. For non-performing loans, portfolios segments differentiate between exposures to residential mortgages, other real estate, land and SMEs. LGD is based upon bank data on time-since-default, and on OW benchmarks or haircuts reflecting collection costs and the time value of money.

6.2.1.5 Exposure at Default

OW's approach to modeling EAD incorporates several key assumptions:

- As mentioned above, OW assumed that up to 10% of loans currently classified as Civil Construction and Large Corporates and SMEs should be reclassified in the Real Estate Developers portfolio. This assumption, which was uniformly applied across the two tested scenarios and across all banks in the sample, indirectly affected all of PD, LGD and EAD for all banks.
- OW also added assumptions about the likely utilization of undrawn committed line volumes; conservative credit conversion factors were applied in both the baseline and stress scenarios. The impact of this assumption was rather small as the utilization of committed lines is already high, as is typically the case during stress periods, and that several such lines have been curtailed by bank management. As a result, the room for an increase in EAD attributable to new utilization is not significant.
- Finally, OW assumed repayments / prepayments to be steady at single digit rates across all the segments, banks and years in the time horizon.

After applying the above adjustment to the balances of existing business, amounts of new business were added to ensure that the overall the credit balance growth rates as specified in the scenarios (which were in fact negative) were achieved.

6.2.1.6 Income Projections

Net Interest Margin is driven by (1) an estimate of percentage profitability over balance sheet size, and (2) a projected decrease in balance sheet size, targeting scenario credit portfolio growth rates.

OW assumes that generated profits will be entirely retained and no dividend distribution will occur. Over the 2012-2014 period, OW's estimated pre-provision profit generation for the whole sample is around €65 billion to €73 billion. Approximately one-fourth of this amount appears to be coming from foreign business, which is rather concentrated in a small number of banks, implying that the total of the domestic business of the sample would generate pre-provision profits of around €50 billion to €58 billion.

6.2.2 RB Approach

6.2.2.1 General Approach

In general, RB's implementation of the stress tests is similar to that employed by OW. It also determines additional beginning-of-period capital requirements at the individual bank level following a dynamic

simulation of credit losses, pre-provision income, provisions and, if required, consumption of beginning of period financial resources.

The RB methodology for loss projection approach also relies upon a PDxLGDxEAD decomposition of loss. Estimation of these parameters is based upon a series of econometric models which attempt to predict these parameters as functions of macroeconomic factors or loan characteristics.

Data utilized for estimation of the models is also based upon a combination of detailed bank information as provided by the BdE, and is supplemented by information from other public and private sources, including information from the proprietary Roland Berger Benchmarking Database.

Although the general modeling approach undertaken by RB is not widely utilized by practitioners, Promontory has found it to be appropriately suited to the purposes required by the current stress testing exercise.

6.2.2.2 Probability of Default

PDs were developed based upon the direct modeling statistical regression modeling of historical NPL rates as a function of macroeconomic factors. The resulting models were used to develop PD estimates for each bank for each product segment as a function of the specified scenario input factors. This is a conventional and widely implemented approach in stress testing model design, and one, that we find entirely reasonable.

6.2.2.3 Loss Given Default

RB has taken a different approach to modeling LGD. They developed a model of loss severity as a probability weighted sum of the loss rate given that a defaulted loan “cured” (“LGC”), the loss rate given that a defaulted loan was restructured (“LGR”) and the loss rate given that a defaulted loan was liquidated. Loss given liquidation (“LGL”) was in turn estimated for collateralized and uncollateralized loans as a function of recovery rates, LTV ratios, and workout costs relative to EAD. LTVs and therefore LGD were modeled as evolving with housing prices and credit growth on both segment and bank-specific level.

RB made assumptions that are deemed to have significantly impacted the estimated credit write-downs. Most importantly, the LTV ratio for retail residential mortgages was adjusted based on a conservative expert-judgment basis. Indeed, the LTV is rather low in Spain (around 60%) compared to other international experiences, offering some apparent risk mitigation. However, RB argued that banks may have failed to adjust this indicator on outstanding loans for declining house prices, which suggests that the actual LTV may be higher than current figures may suggest. RB therefore modeled the LTV

dependent on the valuation of house prices and gross domestic product, which resulted in a higher, and therefore more conservative, LTV on the retail mortgage portfolio.

6.2.2.4 Exposure at Default

EAD was computed by applying the (negative) growth rates defined in each scenario and considering underlying assets and commitment details, collateral and other security, market values and use of open credit lines. Loan redemptions, defaults, kick-in guarantees and drawing of commercial credit lines were assumed to be included in the credit growth figure.

6.2.2.5 Income Projection

To determine the banks' future pre-provision profit generation ability, RM estimated Net Interest Income, Other Operating Income, Other Income and Total Non-Interest Expenses by separately modeling each of them as dependent on key macroeconomic variables. As a result, income projections were inherently dependent on scenarios. Like OW, RB assumed full profit retention and no dividend distribution. RB did not disclose pre-provision profit estimates at the aggregate level.

7. Evaluation of the Results

7.1 Analysis and comparison of OW and RB results

The results obtained by OW and RB in the baseline and the stress scenarios are summarized in the following table:

Table 7.1-1 Summary of results

Credit Portfolio	Oliver Wyman				Roland Berger			
	Baseline Scenario		Adverse Scenario		Baseline Scenario		Adverse Scenario	
	Stress Loss (€bn)	% of Total Stress Loss	Stress Loss (€bn)	% of Total Stress Loss	Stress Loss (€bn)	% of Total Stress Loss	Stress Loss (€bn)	% of Total Stress Loss
Performing and Non-Performing Assets*	135-148	78.4%	210-222	83.3%	119.1	100.0%	169.8	100.0%
Corporate	18-24	11.8%	30-35	12.3%	17.5	14.7%	20.6	12.1%
SME	22-30	14.6%	35-40	14.2%	21.0	17.6%	24.9	14.7%
CRE/Development	65-70	37.8%	100-110	39.8%	37.7	31.7%	55.5	32.7%
Civil Construction	4-6	2.8%	8-10	3.4%	5.6	4.7%	8.9	5.2%
Residential Mortgages	10-15	7.0%	22-25	8.9%	23.9	20.1%	45.4	26.7%
Other Retail Lending	6-10	4.5%	10-15	4.7%	13.4	11.3%	14.5	8.5%
Foreclosed Assets*	35-42	21.6%	40-48	16.7%				
Total	170-190	100.0%	250-270	100.0%	119.1	100.00%	169.8	100.00%

*Reported RB stress losses exclude projected losses for non-performing and foreclosed assets.

Expected losses

Expected losses show significant differences across the two evaluators. In the adverse scenario, losses were estimated at €270 billion by OW and €170 billion by RB over the three-year horizon (2012-2014), a difference of €100 billion. However, recall that stress losses, and the resources available to absorb them, as reported by RB, are not directly comparable to those reported by OW. The RB stress losses do not include expected losses on NPLs and foreclosed assets that were already identified as of 31 December 2011. Similarly, RB's assessment of loss absorption capacity excludes the provisions needed to cover expected losses on NPLs and foreclosed assets identified as of 31 December 2011. However, given that both stress losses and absorptive capacity are impacted symmetrically in the RB methodology, the resulting estimates of capital requirements are comparable to those produced by OW.

Differences in the loss projections between OW and RB will exist for a number of reasons other than the methodological one discussed above, a fact reinforced by the comparison of the distribution of loss projections across segments.

The proportion of OW's total loss estimate is greater than that for RB in the CRE segment, which likely reflects several of the conservative adjustments implemented by OW in their modeling of CRE losses. OW's assumptions impacting the CRE losses include:

- Reclassifying up to 10% of the total balance of the Civil Construction, Large Corporate and SMEs portfolios as CRE/Real Estate Developers.
- Setting restructured / refinanced loans at up 50% of the total balance of the Real Estate Developers performing portfolio and attaching a conservative PD to such loans.
- For foreclosed assets, assuming lengthy times to realize asset-sales in an environment of declining real estate price results, along with the application of haircuts for market illiquidity, results in overall housing and land price cuts of 55% and 90%, respectively, compared to 2008 peak levels.

RB's proportion of total losses projected for the Residential Mortgages segment is higher than that for OW, and reflects several conservative adjustments implemented in the RB modeling process. In particular, the LTV ratio for retail residential mortgages was modeled as being dependent on the valuation of house prices and gross domestic product, which resulted in a conservative upward adjustment to LTV.

Capital needs

The aggregate capital shortfalls estimated by the two evaluators in the baseline and the adverse scenarios are similar:

Table 7.1-2 Aggregate Capital Requirements

in € billion	Oliver Wyman		Roland Berger	
	Base	Adverse	Base	Adverse
Required Capital	16-25	51-62	25.6	51.8

8. Conclusions

- Based on an analysis of methodologies, models, assumptions and results, it is Promontory's opinion that these macro stress tests are comprehensive in scope, appropriately severe in assumptions, and robust in methodologies and results.
- The stress test covers almost 90% of the banking system, and its focused attention on credit portfolios within Spain provides critical input on what is a particularly important driver of capital needs for Spanish banks and the main source of uncertainties regarding Spanish banks balance sheets.
- The BdE has given the two consultants considerable leeway in exercising their independent judgments (based on common macro-scenarios developed by the Steering Committee) and their conclusions on the bottom line need for capital of the overall Spanish banking system from credit losses within Spain are consistent with one another, and in line with the estimates made by other market analysts.
- The conservatism of the assumptions are reflected both in the design of the macro-scenarios (which are more severe than in virtually all other stress tests that have been done), and in the methodologies followed by the consultants in deriving loss estimates under the scenarios.
- The "bottom-up" approach underway will provide important supplements to the results from these current stress tests in order to assess capital needs at individual bank level.

In making determinations on the appropriate levels of additional capital needed by individual firms, the BdE will need to take into consideration these stress tests, the bank-by-bank reviews to be done by October, factors outside the scope of the stress tests, and new information on macroeconomic conditions and forecasts that will develop over time.

Appendices

Appendix 1: Consolidation of the Spanish Banking Sector

2009	2010	2011	2012
Banco Santander	Banco Santander	Banco Santander	Banco Santander
BBVA	BBVA	BBVA	
Caixa Sabadell			BBVA
Caixa Terrassa	UNNIM	UNNIM	
Caixa Manlleu			
La Caixa	La Caixa	La Caixa	
Caixa Girona			
Cajasol	Cajasol-Guadalajara		CaixaBank
Caja Guadalajara		Banca Cívica	
Caja Navarra			
Caja Burgos	Banca Cívica		
Caja Canarias			
Caja Madrid			
Bancaja			
Caja Insular Canarias			
Caixa Laietana	BFA-Bankia	BFA-Bankia	BFA-Bankia
Caja Ávila			
Caja Segovia			
Caja Rioja			
Caixa Catalunya			
Caixa Tarragona	Catalunya Bank	Catalunya Bank	Catalunya Bank
Caixa Manresa			
Caixa Galicia	Novacaixagalicia	Novacaixagalicia	Novacaixagalicia
Caixanova			
Banco Sabadell	Banco Sabadell	Banco Sabadell	Banco Sabadell
Banco Guipuzcoano			
CAM	CAM		
Banco Popular	Banco Popular	Banco Popular	Banco Popular
Banco Pastor	Banco Pastor	Banco Pastor	
Unicaja	Unicaja	Unicaja	
Caja Jaén			Unicaja
Caja Duero	Ceiss	Ceiss	
Caja Espana			
BBK	BBK		
Cajasur		Kutxabank	Kutxabank
Caja Vital	Caja Vital		
Kutxa	Kutxa		
Caja Murcia			
Caixa Penedès	Banco Mare Nostrum	Banco Mare Nostrum	Banco Mare Nostrum
Caja Granada			
Sa Nostra			
IberCaja	IberCaja	IberCaja	
CAI	CAI		IberCaja
Caja Círculo	Caja Círculo	Caja3	
Caja Badajoz	Caja Badajoz		
Cajastur	Cajastur		
CCM		Liberbank	Liberbank
Caja Extremadura	Caja Extremadura		
Caja Cantabria	Caja Cantabria		
Bankinter	Bankinter	Bankinter	Bankinter

Source: IMF

Note: On May 29, 2012, Liberbank, Ibercaja and Caja 3 agreed to a merger.

Appendix 2: Spain – Comparison of Top-Down Banking Sector Stress Tests

Stress Testing Framework	Stress Testing Exercise		
	FSAP	Oliver Wyman	Roland Berger
Scope			
Coverage			
Types of institutions	<ul style="list-style-type: none"> Commercial banks, former savings banks (including those intervened by FROB) and largest credit cooperatives 	<ul style="list-style-type: none"> Commercial banks and former savings banks 	<ul style="list-style-type: none"> Commercial banks and former savings banks
Market share	<ul style="list-style-type: none"> 29 banks + 1 synthetic bank, representing about 96 percent of banking system assets excluding foreign branches 	<ul style="list-style-type: none"> 14 banks, representing 90% of banking system assets 	<ul style="list-style-type: none"> 14 banks, representing 90 percent of banking system assets
Consolidation	<ul style="list-style-type: none"> Solo basis 	<ul style="list-style-type: none"> Merged banking groups 	<ul style="list-style-type: none"> Merged banking group.
Data	<ul style="list-style-type: none"> Regulatory reporting and credit register data 	<ul style="list-style-type: none"> Regulatory reporting and supervisory data 	<ul style="list-style-type: none"> Regulatory reporting, supervisory, publicly available and banks' own data
Data cut-off date	<ul style="list-style-type: none"> End-2011 	<ul style="list-style-type: none"> End-2011, calibrated with specific supervisory information on subsequent mergers and acquisitions 	<ul style="list-style-type: none"> End-2011, calibrated with specific supervisory information on subsequent mergers and acquisitions
Scenario design			
Risk horizon	<ul style="list-style-type: none"> 2012–13 (2 years) 	<ul style="list-style-type: none"> 2012–14 (3 years) 	<ul style="list-style-type: none"> 2012–14 (3 years)
Growth scenarios	<ul style="list-style-type: none"> 1 baseline and 2 adverse 	<ul style="list-style-type: none"> 1 baseline and 1 adverse 	<ul style="list-style-type: none"> 1 baseline and 1 adverse
Baseline	<ul style="list-style-type: none"> IMF WEO January 2012 submission 	<ul style="list-style-type: none"> Provided by Steering Committee: First 2 years identical to FSAP baseline 	<ul style="list-style-type: none"> Provided by Steering Committee: First 2 years identical to FSAP baseline
Adverse	<ul style="list-style-type: none"> Agreed by BdE and FSAP team: Double-dip recession of 1 standard deviation from baseline 	<ul style="list-style-type: none"> Provided by Advisory Panel of Steering Committee: Double-dip recession over 3 years with a 	<ul style="list-style-type: none"> Provided by Advisory Panel of Steering Committee: Double-dip recession over 3 years with a

Stress Testing Framework	Stress Testing Exercise		
	FSAP	Oliver Wyman	Roland Berger
	<i>cumulative over 2 years</i>	<i>bigger contraction in the second year than the FSAP scenario</i>	<i>bigger contraction in the second year than the FSAP scenario</i>
Risk factors assessed	<ul style="list-style-type: none"> Spain businesses only. Haircuts on sovereigns in the trading and AFS books were considered 	<ul style="list-style-type: none"> Credit risk on Spain businesses only 	<ul style="list-style-type: none"> Credit risk on Spain businesses only
Credit losses	<ul style="list-style-type: none"> PDs estimated at the entity level by portfolio: residential mortgages, real estate development and non-real estate corporate (rest of credits to households' PD compatible with other portfolio PDs based on expert judgment) PDs are point-in-time LGDs are based on previous stress test exercises (EBA) and regulatory reporting LGDs 	<ul style="list-style-type: none"> PDs and LGDs differentiated by loan portfolio: real estate development, infrastructure and civil construction, large corporates, SMEs, residential mortgages, other retail PDs and LGDs are point-in-time for credit losses (based on system input PDs/LGD downturn input). Conservative assumptions have been adopted to overcome identified data limitations 	<ul style="list-style-type: none"> PDs and LGDs differentiated by loan portfolio: real estate development, infrastructure and civil construction, large corporates, SMEs, residential mortgages, other retail PDs and LGDs are point-in-time for credit losses; otherwise a blend of through-the-cycle and point-in-time for AIRB banks
Taxes	<ul style="list-style-type: none"> Corporate income tax rate of 30% in case of positive profit, zero otherwise Tax credits for the cumulative result of the exercise are taken into account 	<ul style="list-style-type: none"> Not incorporated—focus on pre-tax and pre-provisioning profit 	<ul style="list-style-type: none"> Corporate income tax rate applied individually to each entity based on previous years' income tax rate. Most tax rates are between 15 and 30%; several are at zero. Tax impact stated as irrelevant
Factors management control			
Balance sheet growth	<ul style="list-style-type: none"> Static balance sheet assumed 	<ul style="list-style-type: none"> Balance sheet decreases in line with credit reduction by segment forecast in the scenario provided 	<ul style="list-style-type: none"> In 2013 and 2014, total RWA assumed to be aligned with credit growth as provided in the scenarios

Stress Testing Framework	Stress Testing Exercise		
	FSAP	Oliver Wyman	Roland Berger
<i>Credit growth</i>	<ul style="list-style-type: none"> <i>Credit growth based on satellite model following macro scenario developments</i> 	<ul style="list-style-type: none"> <i>Credit growth by asset class provided by Steering committee for each scenario</i> 	<ul style="list-style-type: none"> <i>Credit growth by asset class provided by Steering committee for each scenario</i>
Regulatory standards			
Capital definition	<ul style="list-style-type: none"> Basel II transitioning to Basel III according to schedule 	<ul style="list-style-type: none"> EBA 	<ul style="list-style-type: none"> EBA
Consolidation	<ul style="list-style-type: none"> Capital adequacy determined on a group-wide consolidated basis 	<ul style="list-style-type: none"> Capital adequacy determined on a group-wide consolidated basis 	<ul style="list-style-type: none"> Capital adequacy determined on a group-wide consolidated basis
Results			
Capital shortfall			
<i>Baseline</i>	<ul style="list-style-type: none"> €10 billion at CT1 of 4% 	<ul style="list-style-type: none"> €16-25 billion at CT1 of 9% 	<ul style="list-style-type: none"> €26 billion at CT1 of 9%
<i>Adverse</i>	<ul style="list-style-type: none"> €37 billion at CT1 of 7% 	<ul style="list-style-type: none"> €51-62 billion at CT1 of 6%. 	<ul style="list-style-type: none"> €52 billion at CT1 of 6%

Appendix 3: Data Templates

DRC - Risk distribution
by institution

Classification by purpose of the loan

	CREDIT RISK								average LTV weighted by total risk of the operation	LTV		SPECIFIC PROVISIONS (9')				Undrawn Credit (10)
	Drawn Credit (6')				Guarantees (7')					LTV ≤ % (8')	LTV > %	Dinerario dispuesto		Guarantess		
	Total	Normal	Substandard	Doubtful	Total	Normal	Substandard	Doubtful		credit +	credit +	Substandard	Doubtful	Substandard	Doubtful	
I) NON FINANCIAL CORPORATIONS (1')																
1. Construction and property developers																
a) guarantee 1st mortgage (2') (3')																
<i>Construction under development with licence (housing, offices, etc.)</i>																
<i>Finished construction (housing, offices, etc.)</i>																
<i>Urban land</i>																
<i>Other land and developments without licence</i>																
<i>Others</i>																
b) other secured loans (3)																
c) rest (5)																
2. Construction not related with property developmen (civil construction)																
a) real guarantee (3) (2)																
b) rest (5)																
3. Other purposes (4)																
A. Big companies																
a) real guarantee (3) (2)																
b) rest (5)																
B. SMEs																
a) real guarantee (3) (2)																
b) rest (5)																
II) Households																
1. Guarantee first mortgage (2) (3)																
a) first house																
b) second house																
c) other collaterals (garages, storage room, etc.)																
2. other secured loans (3)																
3. Rest (5)																
TOTAL RISK																

**PD LGD EL
by institution**

NOTE: PDs are the same across institutions, except for big companies and guarantee 1st mortgage, where differences appear due to the portfolio mix

	Expected loss (EL)	PD (point in time, frequency of defaults for year 2011)	LGD
I) NON FINANCIAL CORPORATIONS (1')			
1. Construction and property developers			
a) guarantee 1st mortgage (2') (3')			
<i>Construction under development with licence (housing, offices, etc.)</i>			
<i>Finished construction (housing, offices, etc.)</i>			
<i>Urban land</i>			
<i>Other land and developments without licence</i>			
<i>Others</i>			
b) other secured loans (3)			
c) rest (5)			
2. Construction not related with property developmen (civil construction)			
a) real guarantee (3) (2)			
b) rest ('5)			
3. Other purposes ('4)			
A. Big companies			
a) real guarantee (3) (2)			
b) rest ('5)			
B. SMEs			
a) real guarantee (3) (2)			
b) rest ('5)			
II) Households			
1. Guarantee first mortgage (2) (3)			
a) first house			
b) second house			
c) other collaterals (garages, storage room, etc.)			
2. other secured loans (3)			
3. Rest ('5)			
TOTAL RISK			

**Relevant Info Since December 2011
by institution**

CT1 EBA a 31.12.11 (M€)
RWAs 31.12.11
CT1 EBA a 31.12.11 (%)

1. Net Operating Income
NOI projected for year 2012
NOI projected for year 2013
Total NOI 2 years

2. Other variations in EBA CT1 until 30,06,2012

Capital issuances
Buy/sell of own shares
conversion into shares
Conversion into COCOs
Issuance of COCOs
Mergers adjustments
Reduction in Tier1 deductions

Total

Change in RWAs until 30,6,12 (without reductions from the impacts of RDL 2 and 18/2012)

Memorandum items: impact of the RDL 2 & 18/2012
Impact RDL 2/2012 (provisions)
Impact RDL 2/2012 (capital principal buffer)
Impact RDL 18/2012 (data CNMV unless a better estimate is available)

Refinancing

31,12,2011

I) NON FINANCIAL CORPORATIONS (1')	1. Construction and property developers
I) NON FINANCIAL CORPORATIONS (1')	2. Construction not related with property developmen (civil construction)
I) NON FINANCIAL CORPORATIONS (1')	3. Other purposes. Big Companies
I) NON FINANCIAL CORPORATIONS (1')	3. Other purposes. SMEs
II) Households	1. Guarantee first mortgage (2) (3)
II) Households	2. other secured loans (3)
3. Rest ('5)	

Appendix 4: Biographies of Promontory Professionals

Elizabeth McCaul *Partner-in-Charge, New York Office*
Chief Executive Officer, Promontory Europe

Ms. McCaul provides a broad range of financial and regulatory advisory services to clients in the United States and Europe, including assistance with matters related to safety and soundness, risk management, corporate governance, and capital markets.

Ms. McCaul joined Promontory after serving as the Superintendent of Banks of the State of New York, where she was responsible for supervision of some of the world's largest institutions and most of the foreign banks operating in the United States, as well as community banks, mortgage companies, and the overseas banking activities of investment banks and insurance companies. All told, she oversaw financial institutions representing \$2 trillion in assets. She is well recognized for her safety and soundness and risk management credentials. As Superintendent, she introduced capital markets specialists to the examination teams, established targeted hedge fund reviews, opened a Tokyo office, and helped banks and securities firms comply with the Sarbanes-Oxley Act and the USA Patriot Act. In her early days as Superintendent, Ms. McCaul directed a \$22 billion banker's bank, following its liquidity problems. After the 9/11 attacks, she worked with banks, securities firms, and the Federal Reserve to get the U.S. markets reopened and functioning properly. She subsequently worked with federal regulators and top law enforcement officials to create mechanisms to help guard against the use of the U.S. banking system for financial terrorism. She also worked as an investment banker at Goldman Sachs from 1985 to 1995.

Ms. McCaul earned a B.A. at Boston University and was a Scholarship Student, Common Market Program at the Institute of European Studies, Germany.

William Rutledge *Managing Director, New York*

Mr. Rutledge advises major U.S. and foreign banking organizations on risk management, governance, and supervisory issues and contributes to the public dialogue on international supervisory issues. He served a distinguished career in the Federal Reserve's Bank Supervision division and has had extensive involvement in international policy issues, including membership on the Basel Committee on Banking Supervision and chairmanship of the Senior Supervisors Group.

Prior to joining Promontory, Mr. Rutledge was most recently Executive Vice President for Bank Supervision at the Federal Reserve Bank of New York. During his 11 years in that role, he was responsible for supervision of all bank holding companies, state-chartered member banks, and foreign bank offices located in

the Second District.

**Pierre Yves
Thoraval**

Managing Director, Directeur Général, Paris

Mr. Thoraval advises countries, institutions and clients on strategy, risk management, compliance and regulatory matters, as well as on matters related to operational and capital risk, including Basel III.

As part of his 30-year tenure at the Bank of France, the nation's central bank, Mr. Thoraval served as Deputy Secretary General of the French Banking Commission (Commission Bancaire), charged with protecting depositors as well as acting as watchdog over the French banking and financial system to ensure its profitability and financial stability. As Deputy Secretary General, he was in charge of all aspects of five departments, with 600 staff members. For more than 10 years, he was a member of the Basel Committee on Banking Supervision, and participated in or chaired many of its working groups. He also participated in the work of the London-based European Committee of Banking Supervisors, most recently heading its working group on common European reporting (COREP). He has written several White papers (IT/IS risk, analytic accounting, Y2k, Euro changeover) and articles.

Mr. Thoraval earned a Post-Master's Degree in Economics and Econometrics from Paris University, a M.A. and a B.A. in Economics from Paris University and graduated from the Paris Institut d'Etudes Politiques.

Raffaele Cosimo

Managing Director, Milan

Mr. Cosimo advises clients on a wide range of regulatory issues, including internal controls, middle- and back-office operations, accounting standards, and anti-money laundering. He possesses 20 years of experience in financial services, both as a practicing banker and as a consultant.

Prior to joining Promontory, Mr. Cosimo worked for 17 years for Banca Nazionale del Lavoro, the Italian subsidiary of BNP Paribas. At BNL, Mr. Cosimo was Chief Operating Officer of the bank's Corporate Division and also had served as Head of Finance and Administration in the London office. During his career at BNL, he presided over a wide variety of regulatory matters, working with the Bank of Italy, U.S. Federal Reserve, and the United Kingdom's Financial Services Authority. He also served as a member of the Steering Committee for implementing the Market Intermediaries Financial Directive (MiFID), designed internal controls in the Corporate Division, developed middle- and back-office operations in the London branch, and managed the introduction of the euro and International Accounting Standards, including fair valuation of trading and banking books. Mr. Cosimo has also been an instructor on anti-money laundering for banking professionals.

Mr. Cosimo earned a M.B.A., CESCO (Centro Studi sul Commercio) from Bocconi University, Milan and a B.A. in Political Science-Economics and

Statistics, *magna cum laude*, from the University of Milan.

C. Erik Larson

Director, Washington, DC

Dr. Larson provides clients with solutions in areas relating to quantitative risk management. He has vast experience in developing and validating the models used by financial institutions and regulators to measure and manage risk. Recently, he has been working with clients to develop quantitative assessments of systemic risk exposure through the use of stress testing, scenario analysis, and economic capital modeling. He is also an expert in the design and application of risk-scoring models, regulatory capital management, model validation, and governance.

Prior to joining Promontory, Dr. Larson served as Director of Economic Capital for Fannie Mae, where he oversaw the measurement and allocation of capital requirements for a \$2.6 trillion book of business. He earlier served as Senior Financial Economist and Lead Enterprise Risk Expert in the Risk Analysis Division of the Office of the Comptroller of the Currency, and contributed to several efforts to develop the proposed U.S. implementation of the Basel II regulatory capital reforms. At the OCC, Dr. Larson led the quantitative portions of several reviews of bank risk management practices; he also was a member of the interagency Basel II Guidance Development Committee and helped to develop and teach curricula for examiner training in the Basel II Advanced IRB (advanced internal rating-based approach) Credit Risk and Advanced Measurement Approaches for Operational Risk. Dr. Larson has also analyzed and developed individual and corporate income tax policy in the Office of Tax Analysis at the Department of the Treasury, has served as Assistant Professor of statistics on the faculty of the University of Southern California School of Business Administration, and has worked as a private consultant.

Dr. Larson earned a Ph.D. and a M.A. in Economics from Cornell University. He earned a B.A. in Economics and Policy Studies, *summa cum laude*, from Syracuse University.

Fabio Battaglia

Senior Principal, Milan

Mr. Battaglia served more than two decades with several banks. At Italy's Banca Nazionale del Lavoro, he managed asset-liability management and liquidity risks and served as head of corporate division risk management, with responsibilities overseeing a variety of risks, including those related to liquidity, interest rate, markets and foreign exchange. Mr. Battaglia has also worked as a lead analyst at Algorithmics, a leading provider of enterprise-risk solutions, where he held product management responsibility for ALM and liquidity risk. In that role, he helped institute best practices, ensured regulatory intelligence and developed product functional design.

Mr. Battaglia earned a Master of Economics and Enterprise Management (with honors) at SDA Bocconi School of Management, Milano, Italy and an M.S.in

Economic and Social Disciplines at Bocconi University, Milano, Italy.

Lawrence Connell *Consultant*

Lawrence Connell is a nationally renowned expert in bank restructuring. For decades Mr. Connell was general counsel of Hartford National Bank and Trust Company, as well as a partner in the Washington, D.C., law firm of Prather, Seeger, Doolittle & Farmer, where he advised clients on banking law and regulations. In 1977 he was appointed by President Jimmy Carter to lead the National Credit Union Administration, a position he held until 1981.

In 1975 Mr. Connell was appointed Connecticut's Bank Commissioner. In 1998 he joined the U. S. Treasury Department as a senior adviser in the office of technical assistance. Based in Budapest, he helped eastern European governments transition to western banking practices.

Mr. Connell has a Master of Arts degree in economics from Trinity College, Hartford Ct., a Juris Doctor from Georgetown University, and a Bachelor of Arts degree in economics from Harvard University.

Sara Cunningham *Associate, Washington, DC*

Prior to joining Promontory, Ms. Cunningham was an Associate in Goldman Sachs Asset Management's financial institutions group, delivering fixed income and alternative investment asset management services to clients with balance sheet and pension needs. She was previously an Associate Equity Analyst at Centurion Investment Group, a hedge fund in New York. Ms. Cunningham received her Master of Science in Financial Regulation from the London School of Economics and her Bachelor of Arts (with honors) from Brown University.