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France: Financial Sector Assessment Program—Technical Note on Stress Testing the Banking Sector

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FINANCIAL SECTOR ASSESSMENT PROGRAM UPDATE

FRANCE

STRESS TESTING THE BANKING SECTOR

TECHNICAL NOTE

JUNE 2013

INTERNATIONAL MONETARY FUND
MONETARY AND CAPITAL MARKETS DEPARTMENT

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GLOSSARY

ACP	*Autorité de Contrôle Prudentiel*
AFS	*Available-for-sale*
ASRF	Asymptotic Single-Risk-Factor
BdF	Banque de France
BIS	Bank for International Settlements
BU	Bottom up (stress test)
CDC	*Caisse des Dépots et Consignations*
CDS	Credit default swaps
CET1	Common equity Tier 1
CIB	Corporate and investment banking
CRD	Capital Requirements Directive
CRR	Capital Requirements Regulation
EAD	Exposures at Default
EBA	European Banking Authority
ECB	European Central Bank
FSAP	Financial Sector Assessment Program
FSB	Financial Stability Board
FSIs	Financial soundness indicators
FSSA	Financial System Stability Assessment
FVO	For Valuation Only
GCC	Gulf Cooperation Council
GDP	Gross Domestic Product
G-SIBs	Global systemically important banks
HTM	Hold to maturity
IMF	International Monetary Fund
IRB	Internal Ratings-Based
LCR	Liquidity Coverage Ratio
LGD	Loss Given Default
LTRO	Long term refinancing operations
NPL	Nonperforming Loan
NSFR	Net Stable Funding Ratio
OTC	Over-the-Counter
ROA	Return on Assets (Average Assets)
ROE	Return on Equity (Average Equity)
RWA	Risk-weighted assets
SIFIs	Systemically important financial institutions
TD	Top down (stress test)
WEO	World Economic Outlook

EXECUTIVE SUMMARY

1. **Stress testing analysis was used to capture the most salient risks for banks.** The findings support the current focus of *Autorité de Contrôle Prudentiel* (ACP) to require banks to build up adequate capital and liquidity buffers. They suggest that the banking system would be able to meet regulatory ratios under most scenarios, but that there are pockets of vulnerabilities that need to be addressed, in particular regarding liquidity risks.

2. **Solvency stress tests indicate that banks could cope with deterioration in the economic environment while phasing in capital requirements under Capital Requirements Directive (CRD) IV.** The tests covered the largest French banks[1] and were conducted by the banks' bottom up (BU), and by the authorities' top down (TD). The BU tests represented the core element of the analysis and were cross-validated by the TD tests. In general, TD results were more macro-sensitive and characterized by lower Common Equity Tier 1 (CET1) ratios than banks' results due to differences in models and assumptions.

3. **The adverse scenario has its largest impact in 2012 and 2013.** Changes in capital ratios in 2012 and 2013 are largely driven by credit risk. In particular, the adverse scenario affects the probability of default of corporate and retail customers, forcing higher provisions. Changes in risk-weighted assets (RWA) are limited by a mild deleveraging effect embedded in the scenario (credit growth follows nominal Gross Domestic Product (GDP), which is projected to decline by 0.7 percent in 2012) and also by the use of through-the-cycle probabilities of default (PDs) by the authorities' and banks' models. The recovery phase during 2014–16 helps smooth out the impact of the introduction of CRD IV. The largest impact from the introduction of the new regulation takes place in 2015 and 2016 (a reduction in CET1 ratio of about 43 bps and 82 bps, respectively, above the impact of the adverse scenario). Sensitivity tests of concentration also point to the predominance of credit risk from name concentrations in France, Italy, and the United States.

4. **Banks appear resilient to market risk and reductions in exposures have limited the impact of sovereign risk.** BU stress tests indicate that shocks to equity and real estate prices have a negligible impact on CET1 ratios. Exposures to sovereigns in the European periphery were cut substantially in the second half of 2011 and have reduced French banks' vulnerability to a sovereign shock.[2] Nevertheless, non-AAA sovereign debt holdings in

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[1] Banks' BU stress tests included the eight largest French banks—BNPP, Société Générale, Groupe Crédit Agricole, Groupe BPCE, HSBC France (French subsidiary), Groupe Crédit Mutuel, La Banque Postale, and CDC. ACP's TD stress tests included the first five banks. Moreover, due to its specific profile, the CDC has been excluded from the aggregated analysis, therefore all numbers given in this report are without CDC.

[2] In the second half of 2011, cross-border public sector exposures of French banks fell by 38 percent to Italy, 39 percent to Spain, 39 percent to Greece, 32 percent to Portugal, and 26 percent to Ireland.

available for sale (AFS) and trading accounts remain sizeable, in particular to Italy, and a worsening of the euro crisis would cause losses of about 5 percent of the initial CET1 capital level. Prudential filters would allow capital charges to be phased in over the risk horizon (a cumulative 20 percent each year starting in 2014), thereby smoothing the impact. In addition, sensitivity analysis showed that an extreme shock affecting all sovereign holdings (including France) in all books would impact the initial aggregate CET1 capital level by an additional 5 percent.

5. **Despite improvements in bank funding profiles during 2011, vulnerability to liquidity shocks were material.** Liquidity stress tests assessed resilience to a strong shock characterized by run-off rates and haircuts on assets calibrated by type on French historical data, and no market access. Assuming no recourse to European Central Bank (ECB) liquidity, the significant reliance on short-term funding would result in difficulties for two banks to meet liquidity needs from outflows (mostly unsecured wholesale funding from banks and other institutions) with available buffers, standby liquidity from inflows, and asset sales. A two-notch bank downgrade under these circumstances could impose added stress through collateral and margin calls, with a significant effect on some banks. All banks would pass the test, assuming access to ECB liquidity. A reverse stress test on the maximum potential loss of wholesale funding, by currency, that each bank could suffer while still meeting contractual obligations, shows similar dependence on ECB funding in the event of a closure of funding markets, with three of the banks recurring to central bank liquidity above a 5 percent loss of wholesale funding. With ECB support, four banks would be able to address up to a maximum loss of about 15 percent of all wholesale funding.

6. **Contagion risk appeared limited among French banks, but larger with non-French bank counterparties.** The French banking network is moderately concentrated, with most interbank exposures within it relatively small. In terms of net exposures, while two banks lend 60 percent of all interbank net flows and one bank receives over 40 percent of French interbank flows, these exposures are relatively small (under 3 percent of total assets). Therefore, contagion risk among French banks appears limited and failure of a single bank would result in a CET1 ratio decline to 8.5 percent from 9.9 percent. Larger contagion effects may instead emerge from exposures to non-French bank counterparts in the interbank market. These counterparts include other European banks, U.S. investment banks, and banks from Japan and Gulf Cooperation Council (GCC) countries.

7. **Going forward, more regular stress testing by the ACP is needed to help monitor banks' capital and liquidity plans.** The ACP has started using bank-by-bank TD stress tests, including as a benchmarking tool for BU tests run by banks, and should refine further the toolkit to assess risks to financial stability to allow projections of losses by risk type and RWAs by asset class, and through collection of more granular bank-by-bank data (for instance, for the calculation of risk parameters related to retail lending).

I. INTRODUCTION

8. **France's financial system is large, sophisticated, and diversified.** It is dominated by five banking groups that are regionally and globally systemic and among the largest in the world, and of which four have been identified as global systemically important banks (G-SIBs). Total assets of the system amounted to about six times France's GDP at end-2011. French banks are among the largest counterparties in a number of international derivatives markets.

9. **The evolution of the French financial system in the years before the crisis created a robust income generating capacity, but made the system more vulnerable to shocks.** Rapid balance sheet growth during the second half of the 2000s was driven by the banks' expansion into international corporate and investment banking (CIB) and derivatives products, funded in the wholesale market; and a more limited international retail expansion, particularly in peripheral Europe. When the global financial crisis hit in 2008, margins from domestic retail activity and asset gathering operations covered losses on CIB activities, helping French banks weather the turmoil. But with the worsening of the European sovereign debt crisis in 2011, market perceptions of French banks deteriorated sharply due to high leverage and reliance on wholesale funding, high exposure to potential losses in peripheral Europe, and capital levels below the international average.

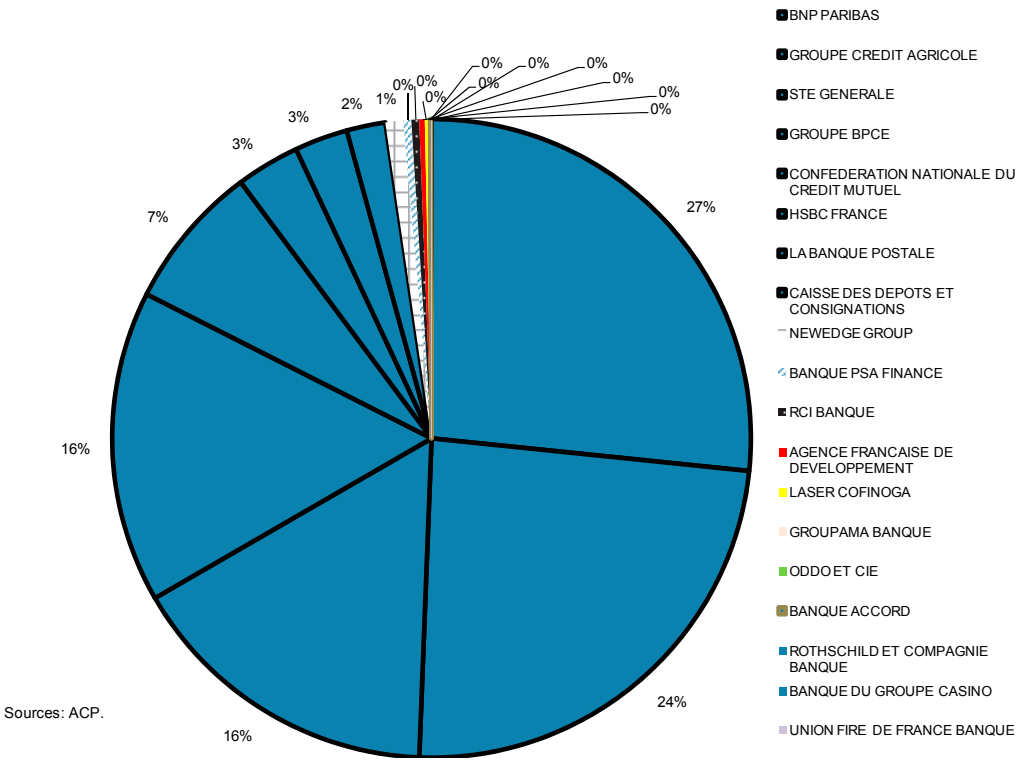
10. **As a result, the large French banks are in the midst of significant balance sheet adjustments.** Deleveraging plans were announced by the five largest banks in mid-2011, which focused primarily on disposing of noncore, dollar-funded international assets. Disposal of remaining legacy assets from the first phase of the crisis were also accelerated to free up regulatory capital. Domestic credit activity was largely maintained and continues to grow, albeit at declining rates owing to slower demand for bank loans.

11. **Against this background, the report assesses financial stability in the French banking system, using a combination of stress tests.** The stress tests are mainly confined to the banking sector as part of the Financial Sector Assessment Program (FSAP) Update, to identify potential vulnerabilities in the banking system. The stress tests were based on a proposal jointly prepared by the ACP, Banque de France (BdF), and the FSAP team.[3] The objective of the exercise was to assess the resilience of the French banking system by subjecting banks to a variety of severe, but plausible shocks. The tests were based on information for the major eight banking groups. The exercises comprised single-factor stress tests and macroeconomic scenario analysis and analyzed the effects on key variables, such as the valuation of bank assets, liabilities, and profits. The stress testing exercise focused not only on credit risk and market risk, but also incorporated liquidity and contagion risks.

[3] On the authorities' side, stress testing was conducted by the ACP in collaboration with the BdF.

12. **The results primarily relied on BU stress tests and were cross-validated by TD tests.** These tests covered the major banks in the system and were based on end-2011 data. Supervisory data for the individual eight largest bank groups accounting for 97 percent of banking assets (BNP Paribas, 27 percent; Groupe Crédit Agricole, 24 percent; Société Générale, 16 percent; Groupe BPCE, 16 percent; Groupe Crédit Mutuel, 7 percent; HSBC France, 3 percent; La Banque Postale, 3 percent; and Caisse des Dépôts et Consignations,[4] 2 percent) to assess the impact of the stress scenario and single-factor shocks on banks' earnings and capital. The analysis was done at the consolidated group level.

Figure 1. France: Banking Sector Market Shares, 2011
(In percent)



Sources: ACP.

13. **Stress tests covered the major risks faced by financial institutions.** For banks these consisted of credit and market risks as well as concentration, liquidity, and contagion risks through the interbank market, foreign sovereign, and corporate holdings. Market risks were analyzed by applying shocks to interest rates, equity prices, foreign exchange rates, and real estate prices. Credit risk was assessed by applying sensitivity analysis and macroeconomic scenarios.

[4] The exercise included the on-balance sheet part of the Caisse des Dépôts et Consignations only.

14. **The tests covered the largest French banks and were conducted by the banks BU, and by the authorities TD on bank' portfolios as of end-December 2011.** The BU tests represented the core element of the analysis and were cross-validated by the TD tests. The remainder of the technical note describes the coverage, methodology, shocks, and the macroeconomic scenario, as well as the outcomes of the stress testing exercise and some recommendations summarized in Table 1.

15. **Owing to insufficient public disclosure and legal constraints on the authorities' ability to provide supervisory data, the FSAP team could only conduct a partial TD exercise.**[5] Although these constraints limited the confidence that could be placed in the results (hence they are not reported), they broadly supported the conclusion that the system was resilient to a wide range of adverse shocks. They also illustrated that this conclusion was sensitive to assumptions, including probabilities of default and the use of capital measures as defined under CRD IV (in some aspects less stringent than Basel III). The exercise also underscored the importance of improving public disclosure of French financial institutions.

Table 1. France: Main Recommendations on Stress Testing

Recommendations and Authority Responsible for Implementation	Priority	Timeframe 1/
ACP to undertake frequent "bank-by-bank" solvency and liquidity stress tests of the largest French banks (including subsidiaries) and made results publicly available in the Financial Stability Report.	High	Immediate
ACP to enhance current approaches to TD stress tests by introducing methodologies that can project risk losses by type or risk.	High	Immediate
ACP to use more granular bank-by-bank data for the calculation of risk parameters related to retail lending in TD stress testing.	High	Immediate

1/ "Immediate" is within one year; "near-term" is 1–3 years; "medium-term" is 3–5 years.

[5] This partial exercise used publicly available information, estimated RWA based on point-in-time PDs, and applied full Basel III with no filters on AFS positions.

II. SOLVENCY STRESS TESTS

Solvency stress tests comprised an assessment of banks' resilience under baseline and on stress macroeconomic scenarios as well as supplementary sensitivity tests.

16. **Solvency stress tests were based on banks' and ACP's models:**

- Banks used their own models and guidelines developed by the IMF and ACP to undertake the bottom-up stress tests. The banks translated key macro-economic variables of the macro-economic scenarios provided into income, expense, loan loss and capital requirements (disaggregated into Regulatory probability of default (PD) and downturn loss given default (LGD)) forecasts. These forecasts differed according to the bank's business model, loan portfolio, and internal models. The banks have to add all the impact of the different satellite models (including sovereign risk; counterparty and market risk; funding cost) to assess the global impact on the solvency position.

- The ACP's top-down using authorities' two models using supervisory data: (1) return on asset ratio regression to calculate the stressed capital level; and (2) transition matrices model for calculate the stressed RWA model. See Appendix V for more details.

17. **The sample of banking groups in the stress testing exercise account for 97 percent of banking assets:**

- BU stress tests included the following eight banks/banking groups: BNP Paribas, Groupe Crédit Agricole, Société Générale, Groupe Crédit Mutuel, Groupe BPCE, HSBC France, Caisse des Dépôts et Consignations, and La Banque Postale.

- TD stress tests bank-by-bank conducted by the authorities covered the largest potential sample that could be stressed by the authorities' model, constrained by tool availability. This sample included BNP Paribas, Groupe Crédit Agricole, Société Générale, Groupe BPCE, and HSBC France. Stress tests are based on banks' consolidated exposures, including overseas, and covered only banking operations.

18. **Tests of solvency were based on bank' portfolios as of end-December 2011.** The risk-horizon for the solvency tests was five years (2012–2016), except for market and sovereign risks and for the sensitivity stress tests that assessed the instantaneous impact of a shock on banks' solvency position as of December 2011. The scope of consolidation (for

RWA and own funds, profit and loss (P&L), and Balance Sheet (BS)) was the perimeter of the banking group as defined by the CRD.[6]

19. **The general principle applied in the conduct of this exercise was that future regulatory changes would only be captured if they actually came into force during the period of the assessment (2012 to 2016).** It took into account the phase-in, and then only reflected the reality of meeting regulatory solvency requirements at that time. Therefore, all the new rules that would become applicable between 2012 and 2016 were taken into consideration.

20. **An institution's solvency was assessed in terms of CET1 plus conservation buffer, and loss absorbency requirement for G-SIBs, for each year of the risk horizon; these ratios will be phased in line with Title I of Part Ten of** Capital Requirements Regulation **(CRR) below.**

Table 2. France: Solvency Measures Under Stress

(In percent)

Forecast Year	2012	2013	2014	2015	2016
Minimum total capital	8.0	8.0	8.0	8.0	8.0
Minimum tier 1 capital	4.0	4.5	5.5	6.0	6.0
Minimum common equity tier 1	2.0	3.5	4.0	4.5	4.5
Conservation Buffer	0.0	0.0	0.0	0.0	0.625
Additional Loss Absorbency for G-SIBs	0.0	0.0	0.0	0.0	0.5[1/]

1/ Assumption of 2.0 percent Common Equity Tier 1 requirements in 2019 for BNP Paribas, Groupe Crédit Agricole, Société Générale, and Groupe BPCE.

A. Stress Test Scenarios and Shocks

21. **The macro-scenario stress tests were based on a baseline and one adverse scenario.** The baseline scenario followed the February 2012 World Economic Outlook update. The adverse scenario was based on a cumulative deviation from the baseline of 2.1 standard deviation of GDP growth for 2012–13 over the last 10 years.

22. **The adverse scenario used for the BU and the TD stress testing was generated by the authorities' Mascotte macroeconomic model and calibrated to illustrate the combined impact of four adverse shocks:** (1) a reduction in external demand caused by a

[6] Bank employees' defined-benefit pension funds shall be taken into account. Material insurance holdings should be deducted for the calculation of the capital in accordance with the CRD rules and accounted for by using the equity method.

global recessions starting in 2012Q1; (2) a worsening of the European debt crisis that pushes up sovereign spreads (90 bps for France and 160bps for the euro area) and motivates fiscal consolidation to achieve a reduction of the fiscal deficit to 3 percent of GDP by 2013; (3) a worsening in banking funding costs that leads to a credit contraction by -0.8 percent in 2012 (in addition to current deleveraging bank plans); and (4) an increase in sovereign risk that leads to a repricing of bond holdings in bank portfolios (through haircuts, see Appendix II). The latter shock was assumed to affect only non-AAA sovereign bonds in the trading and AFS accounts in the case of BU stress tests implemented by the banks.[7] The authorities did not include explicitly sovereign risk in their TD stress tests, the return on asset is assumed to be stressed globally.

Table 3. France: Macroeconomic Variables Under the Scenarios Used for the Solvency Tests

(Annual percentage change unless otherwise indicated)

	2011	2012	2013	2014	2015	2016
Real GDP growth						
Baseline	1.7	0.5	1.0	1.8	1.9	1.9
Adverse	1.7	-1.8	0.2	2.4	2.5	2.3
Long-term Interest rate						
Baseline	3.3	3.4	3.4	3.5	3.6	3.7
Adverse	3.3	4.4	4.1	3.5	3.7	4.1
Inflation rate						
Baseline	2.0	2.0	1.3	1.3	1.5	1.7
Adverse	2.0	1.9	1.0	0.6	1.1	1.7
Unemployment rate						
Baseline	9.7	9.9	10.1	10.0	9.7	9.3
Adverse	9.7	10.2	11.0	11.1	10.8	10.5
Fiscal balance (percent of GDP)						
Baseline	-5.7	-5.0	-4.8			
Adverse	-5.7	-3.6	-3.1			
Housing prices						
Baseline	6.2	1.2	0.4	0.2	0.9	0.4
Adverse	6.2	0.1	-4.4	-1.9	2.0	0.1
US dollar per EUR						
Baseline	1.4	1.3	1.3	1.3	1.3	1.3
Adverse	1.4	1.3	1.2	1.2	1.2	1.2

Source: Staff estimates based on analysis from Banque de France.

[7] All sovereign holdings (AAA and non-AAA in banking and trading book) were stressed separately and added to the BU results, see Figure 3.

23. **Balance sheets were assumed to grow with nominal GDP.** The funding structure of the banks (wholesale, deposits, short and long term, official financing) and the hedging strategy did not change over the time horizon of the exercise. Maturing liabilities were assumed to be replaced by similar ones.

24. **Single-factor tests in the BU exercise were also implemented to supplement the scenario analysis.** These are:

i. liquidation of non-AAA sovereign bonds in the hold-to-maturity (HTM) portfolio, by country, assuming that bonds are sold at market values as of December 2011; and applying in addition the haircuts listed in Appendix II;

ii. failure of the largest five corporate exposures by name, and the largest five corporate exposures for the five countries where each bank is the most exposed;

iii. an exchange rate shock (U.S. dollar/euro) of +/- 20 percent;

iv. an interest rate shock of 200 bps affecting positions in the banking book including income and valuation effects;

v. 25 percent shock to real estate prices; and

vi. a reverse liquidity test that assesses the maximum potential loss of wholesale funding, by currency, that each bank can suffer while still meeting contractual obligations, and without access to ECB funding.

B. Satellite Models

Sovereign risk in the banks' BU tests

25. **Sovereign risk was measured in the baseline and adverse scenarios through changes in sovereign yields leading to a repricing of all affected bonds.** The methodology was as follows:

- The term structure of sovereign risk was assumed to shift upward for all countries to which French banks were exposed in a parallel fashion in the baseline and in the adverse scenarios.

- For the baseline scenario, the shock was derived from the fiftieth percentile of the historical distribution of annual changes of daily yields (see Appendix II for a sample of countries).

- For the adverse scenario the shock was derived from the ninetieth percentile of the historical distribution of annual changes of daily yields (see Appendix II for a sample of countries).

26. **In the BU stress testing, haircuts were not applied to the AAA rated countries, the AFS filter[8] was taken into account, and HTM holdings were stressed as a sensitivity test.** Holdings of government bonds in AFS, For Valuation Only (FVO), and trading accounts were repriced.[9] Haircuts were not applied to AAA rated countries[10] in the BU stress tests, since the scenario included a flight to quality aspect. For AFS position, the regulatory filter was taken into account, as well as transitional provisions required for additional filters and deductions in CRR (notably articles 449 and 450) published by the Council of European Union on January 9, 2012. Thus, the table below for this phase-out in the stress-test horizon was used.

27. **For stress testing purposes, the exposures to be stressed were all direct and indirect sovereign exposures.** The net direct exposure comprises gross exposures (long) net of cash short position of sovereign debt (without derivative hedges such as credit default swaps (CDS)). This was referred to as the "net direct position." The indirect sovereign exposures includes both on and off balance sheet exposures.

28. **Sovereign risk was concentrated only during the first year of the adverse scenario, and consequently, haircuts were not applied to the following years.** Moreover, during the first year, and given a general assumption of no change in the risk-free rate, the haircut defined above was the only change made to the value of the sovereign portfolio.

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[8] The AFS portfolio comprises equities, loans, and receivables, as well as other financial instruments (other available-for-sale assets). According to CEBS guidelines issued in 2004, fair-value revaluation reserves on AFS assets are subject to prudential filters. So far, there is no harmonized application of CEBS guidance on prudential filters for regulatory capital across EU jurisdictions. It is worth noting that prudential filters will be removed under Basel 3 rules. Consequently, the filter mitigated and postponed the impact of the 2012 shock. By 2016, only about 80 percent of the impact of the 2012 sovereign shock was taken into account (as well as the initial reserve of 2011).

[9] The sensitivity of the HTM portfolio to changes in market conditions was examined through sensitivity analysis. See section IV.

[10] AAA-rated countries were determined by the authorities as countries rated AAA on December 31, 2011 by at least two main rating agencies; the countries are: Australia, Austria, Canada, Denmark, Finland, France, Germany, Luxembourg, Netherlands, Norway, Singapore, Sweden, Switzerland, United Kingdom, and the United States.

Table 4. France: Phase-out of AFS Regulatory Filter in the Stress Test Horizon

2011	2012	2013	2014	2015	2016
Phase-in of Basel 3 regulation for AFS filter (in percent)					
0	*0*	*0*	*20*	*40*	*60*
Impact on AFS reserve					
Reserve of AFS (negative or positive)	Reserve of 2011 + Losses on AFS portfolio due to haircut	Reserve of 2012	80% of reserve of 2013	60% of reserve of 2014	40% of reserve of 2015
Impact on Capital					
None if no credit default event	None if no credit default event	None if no credit default event	20% of reserve of 2013	40% of reserve of 2014	60% of reserve of 2015

Source: ACP.

Bank funding costs

29. **The stress tests incorporated an increase in funding costs under stress scenarios.** The increase in funding costs for each year of the risk horizon was included in the solvency stress tests as higher interest payments made on corporate deposits and on short- and long-term debt.

30. **The evolution of the economy envisaged in the scenarios (baseline and adverse) caused an increase in the cost of funding of the banks, due to the following main drivers:**

- Higher sovereign risk;
- The evolution of short-term and long-term interest rates (wholesale);
- The rise in the banks' credit spreads;
- The drop in the value of the sovereign assets used as collateral in the funding transactions (central banks, wholesale funding); and
- Deposits (retail), but one has to take into account that these are pretty insensitive.

Counterparty risk

31. **Expected credit value adjustments (CVA) losses associated with counterparty credit risk in the trading book were calculated.** Banks modeled the PD and LGD of its

counterparties (or model the CDS-spread) using the macro-scenario and market risk shocks, and subsequently calculate the CVA for the derivatives outstanding.

Securitization

32. **All exposures (traditional and synthetic, re-securitizations, as well as liquidity lines on securitization transactions), for which there was a significant risk transfer (as in the meaning of the CRD, see part 2 subsection 4 and, notably, Annex IX part 2), were in the scope of the exercise.**

Credit losses and income projections in TD stress tests

33. **The ACP's TD model focused on credit risk for the corporate sector.** The ACP's TD model was based on (i) a single equation on the net return on asset (ROA) to derive the stressed capital level; and (ii) a transition matrix model to calculate the stressed RWA model for corporate claims. Therefore, credit and market risk are implicitly captured in the ROA equation. Stressed RWA for retail was not calculated due to the lack of data (see Appendix V for details), and BU results were used instead.

C. Results

34. **The findings support the current ACP focus to require banks to build up adequate capital and liquidity buffers.** They suggest that the banking system would be able to meet regulatory ratios under scenarios characterized to most of the macro-financial risks described above, but that there are pockets of vulnerabilities that need to be addressed.

35. **Solvency stress tests indicate that all banks have enough capital to cope with deterioration in the economic environment, while meeting the new requirements by CRD4.** These conclusions are based on scenario and sensitivity stress tests conducted by banks themselves (bottom up, BU, stress tests), and by TD stress tests undertaken for validation by the authorities. Following several rounds of corrections, and reconciliation of data and assumptions, the methodologies agreed on the final assessment made above, although the TD results were more macro-sensitive and characterized by lower CET1 ratios than banks' results due to differences in models and assumptions (see Appendix I for a full explanation of differences among methodologies).

36. **As expected, the adverse scenario has its largest impact in 2012 and 2013, while implementation of CRD 4 does not start until 2013 (Figure 3).** To a large extent, changes in capital ratios in 2012 and 2013 are driven by credit risk and, in particular, by credit losses (the numerator of the capital ratio) because the adverse scenario affects the probability of default of corporate and retail customers, forcing higher provisions. Changes in RWA are limited by a mild deleveraging effect embedded in the scenario (credit growth follows nominal GDP, which is projected to decline by 0.7 percent in 2012) and also by the use of

regulatory through-the-cycle PDs by the authorities and banks' models. The recovery phase during 2014–16 will help smooth out the impact of the introduction of CRD IV.[11] The largest impact from the introduction of the new regulation will take place in 2015 and 2016 (a reduction in CET1 ratio estimated by the authorities of about 43 bps and 82 bps, respectively, above the impact of the adverse scenario).

37. **Sensitivity tests of concentration point to the predominance of credit risk from concentrated exposures (CTP below) to large domestic and/or nonresident borrowers in other countries such as France, Italy, and the United States.** The rest of the concentration credit risk comes from Belgium, Germany, Spain, Switzerland, Netherlands, and the United Kingdom.

38. **Market risk is in general limited but sovereign risks are sizable.** BU stress tests indicate that shocks to equity and real estate prices have a negligible impact on CET1 ratios. Exposures to sovereigns in the European periphery were cut substantially in the second half of 2011, and have reduced French banks' vulnerability to a sovereign shock.[12] Nevertheless, non-AAA sovereign debt holdings in AFS and trading accounts remain sizeable, in particular to Italy, and a worsening of the euro crisis would cause cumulated losses of capital of about 5 percent of the initial amount of CET1 capital. Prudential filters would allow capital charges to be phased in over the risk horizon (a cumulative 20 percent each year starting in 2014), thereby smoothing the impact. A more extreme shock affecting all sovereign holdings (including France) in all books would impact the initial aggregate CET1 capital by an additional 5 percent. This would be significant for a smaller bank with sizeable hold-to-maturity holdings of French bonds.

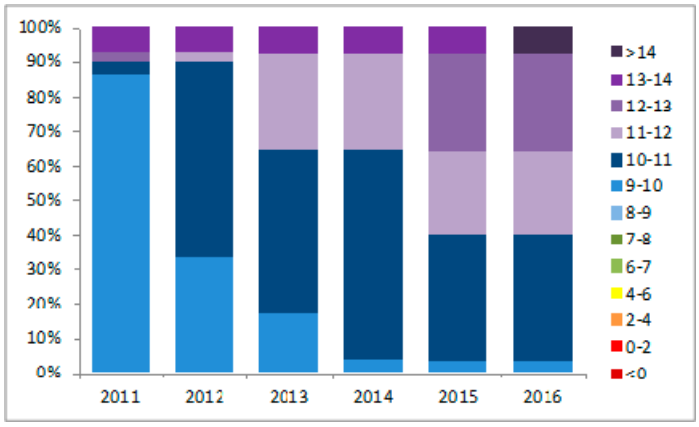
39. **The aggregate results presented in Figure 2 are based on BU stress tests (i.e., conducted by each individual bank on the basis of a common guidance agreed between staff and French authorities) and stress tests undertaken by the ACP at an individual bank level.** ACP results show a higher decline in CET1 for all banks, due to more conservative (higher) and cyclical default probabilities (for claims other than retail) than those used by banks in general.

[11] Like previous versions of CRD, the CRD IV/CRR proposals give competent authorities the possibility to permit banks not to deduct insurance holdings under certain conditions. For some banks, this can result in higher Tier 1 capital than would be the case under Basel III.

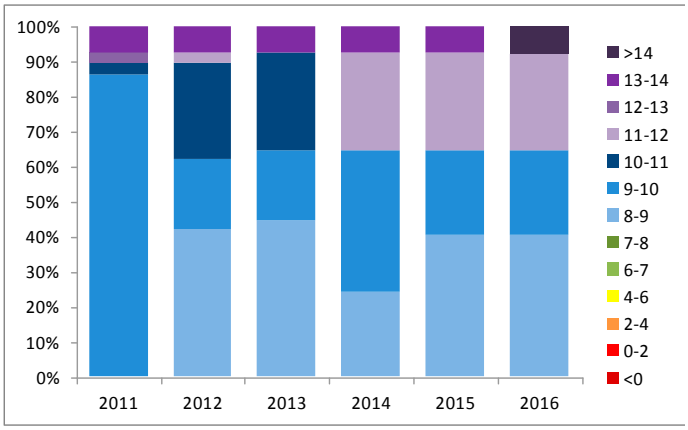
[12] In the second half of 2011, cross border public sector exposures of French banks fell by 38 percent to Italy, 39 percent to Spain, 39 percent to Greece, 32 percent to Portugal, and 26 percent to Ireland.

Figure 2. France: Bank Solvency Stress Test Results, CET1 Ratios

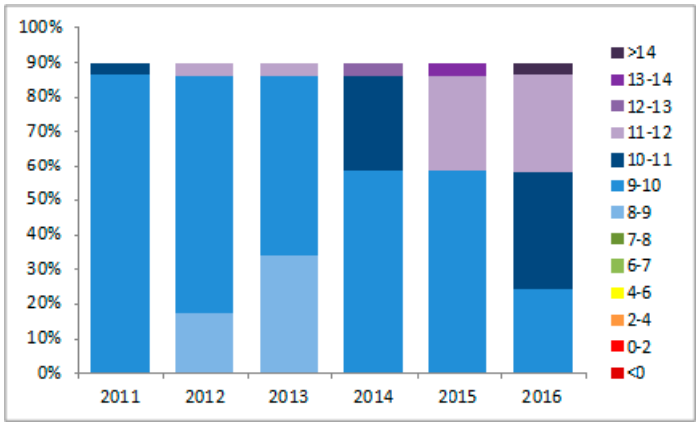
BU: **Baseline Scenario**
(In percent of total assets)



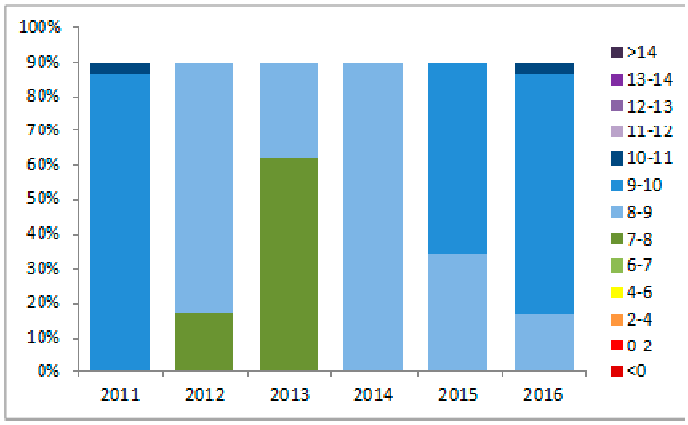
BU: **Adverse Scenario**
(In percent of total assets)



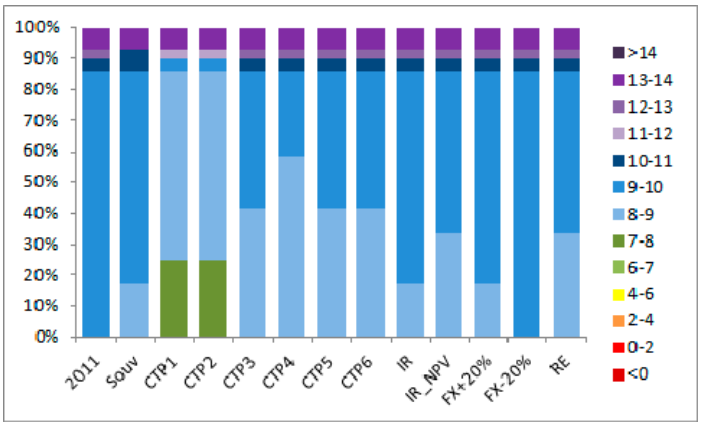
TD: **Baseline Scenario**
(In percent of total assets)



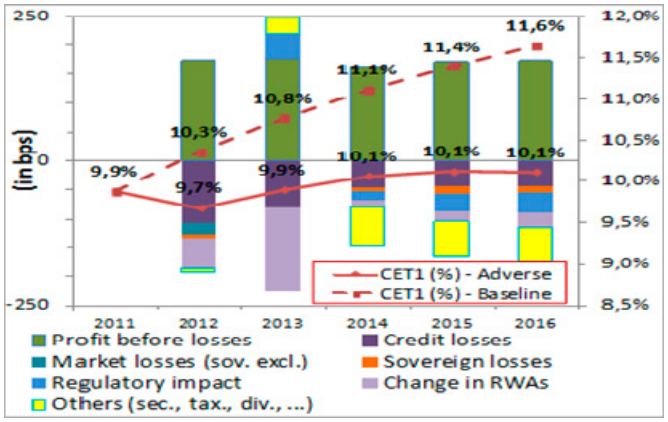
TD: **Adverse Scenario**
(In percent of total assets)



Sensitivity Analysis
(In percent of total assets) 1/



BU: **Adverse Scenario 1/**
(Contribution to the changes in CET1 ratio)



Source: ACP. The results do not include Caisse des Dépôts et Consignations.
1/ "Others" corresponds to the effect of taxes and dividends and the losses due to securitization.

40. **The differences among the two methodologies can be summarized as follows:**

- BU stress tests were based on (i) banks' own granular information; and (ii) sovereign risk limited to non-AAA holdings of sovereign bonds (in any book) and non-HTM holdings of any rating category; (iii) the application of the filters on AFS holdings; (iv) stressed risk-weighted assets estimated using through-the-cycle PDs; and (v) the application of draft transitional provision of Title I of Part Ten of CRR, instead of Basel III.

- TD stress tests by the ACP were based on (i) supervisory data; (ii) bank capital projections based on an income model (that only implicitly includes funding and sovereign risks); (iii) the application of the filters on AFS holdings; (iv) TTC parameters for the calculation of stressed risk-weighted assets; and (v) the application of draft transitional provision of Title I of Part Ten of CRR, instead of Basel III. The TTC PDs were, however, more conservative and cyclical, for claims other than retail, than those used by banks.

III. LIQUIDITY STRESS TESTS

41. **Liquidity stress tests were undertaken by the banks.** The BU stress tests involved the same sample of eight banks as for the solvency stress tests at end-December 2011. The run-off rates and haircuts on assets were calibrated by type using banks' historical data during the different crisis they experienced over the past few years (see Appendix IV). The exercise was performed under two scenarios, with and without banks' access to ECB facilities.

42. **From a methodological point of view, the exercise was similar to the 2011 EBA liquidity risk assessment (unpublished).** It was based on a maturity ladder analysis, in order to capture (i) the bank's liquidity needs derived from outflows; (ii) the available standby liquidity from inflows; and (iii) the available liquidity buffers to counterbalance liquidity gaps:

(i) the bank's liquidity needs derived from outflows. During the stress test, banks are facing a lack of funding on every usual source of market liquidity: the unsecured wholesale funding market is partly closed, especially funding provided by financial institutions; the sources of secured funding are impacted as well. Moreover, banks are facing extra cash-outflows due to drawings of granted credit and liquidity lines, and a run-off of retail deposits. In consequence, a run-off rate is to be applied to every source of funding;

(ii) the available standby liquidity from inflows, which comes mainly from loans maturing, reverse repos, and available credit lines. During the stress, although banks are facing a lack of funding, they are not supposed to cut off funding to customers,

either retail customers or corporate, they keep fulfilling their role of financing the economy; and

(iii) the available liquidity buffers to counterbalance liquidity gaps under two scenarios: with and without banks' access to ECB facilities. In the first case, the stress test assumes haircuts on assets due to massive and sudden sales on the market; in the second one, the stress test assumes that the ECB plays its role of lender of last resort and that current ECB's haircuts are applied.

43. **The unit of measurement was the survival horizon of institutions (up to two years), which was assessed through the construction of the residual stressed funding gap after sales of liquid assets.** The liquidity stress test will be implemented under two assumptions:

- Without banks' access to ECB facilities.
- With banks' access to ECB facilities, based on the bank's ability to provide adequate collateral.

44. **The results showed that despite improvements in bank funding profiles during 2011, vulnerability to liquidity shocks was material.** Assuming no recourse to ECB liquidity, the significant reliance on short-term funding would result in difficulties for two banks to meet liquidity needs from outflows (mostly unsecured wholesale funding from banks and other institutions) with available buffers, standby liquidity from inflows, and asset sales. One of the banks cannot meet contractual obligations at one day to one week, and the other from three months to six months. A two-notch bank downgrade under these circumstances could impose added stress through collateral and margin calls, with a significant effect on some banks. All banks would pass the test assuming access to ECB liquidity. A reverse stress test on the maximum potential loss of wholesale funding, by currency, which each bank could suffer, while still meeting contractual obligations, shows similar dependence on ECB funding in the event of a closure of funding markets, with three of the banks recurring to central bank liquidity above a 5 percent loss of wholesale funding. With ECB support, four banks would be able to address up to a maximum loss of about 15 percent of all wholesale funding.

Table 5. France: Bank Liquidity Stress Test Results

Survival period	Up to 1 day	Greater than 1 day up to 1 week	Greater than 1 week up to 1 month	Greater than 1 month up to 2 months	Greater than 2 months up to 3 months	Greater than 3 months up to 6 months	Greater than 6 months up to 1 year	Greater than 1 year up to 2 years
Number of banks which still meet their contractual obligations without ECB support	7	6	6	6	6	5	5	5
Number of banks which still meet their contractual obligations with ECB support	7	7	7	7	7	7	7	7

Source: ACP. The results do not include Caisse des Dépôts et Consignations.

IV. CONTAGION RISK

Network analysis was used by the authorities to examine contagion risk among French financial institutions.

45. **The ACP followed two complementary approaches for implementing network stress tests.** These two techniques focused on solvency impacts. The network stress test was made of two components: an initial shock and a contagion mechanism. It considered the following shock: "one of the seven banks fails." The net exposures were used for a direct network stress test, while bilateral exposures were used to carry out a reverse network stress test. For the contagion process, the threshold was a CET1 equivalent to 7.0 percent (minimum CET1 + conservation buffer).

46. **The direct network stress test approach was based on Cont et al. (2010).** The model assumed that, when an institution failed, the loss was incurred by the whole system as a proportion of net exposures applying all the possible contagion effects. In this approach, the useful information is on the risk-weighted assets, the own funds, and the net exposures of each bank. At the end, this model computes the amount of losses in capital for each bank and the banks that could fail due to contagion effects for a given initial shock ("an institution fails"). Contagion effects begin when net exposure losses drive a bank below its required regulatory capital (here fixed at 7 percent of RWA), which can then itself imply further losses through net exposures and so on.

47. **The reverse network stress test used the model by Gouriéroux, Héam, and Monfort (2012).** The initial shock was defined as the loss value on non-interbanking assets for a given bank that triggers at least another bank's default. The contagion mechanism was based on a structural framework in which bilateral exposures are analyzed through Merton's

model for the Value-of-the-Firm. The new equilibrium is obtained after possible second round effect mechanisms. The operational output is the capital ratio of every bank implied by the specified magnitude of shock and contagion effect.

48. **Contagion risk among French banks, using information as of December 2011, appeared limited.** The French banking network is moderately concentrated, with most interbank exposures within it relatively small (Figure 3). In terms of net exposures, while two banks lend 60 percent of all interbank net flows and one bank receives over 40 percent of French interbank flows, these exposures are relatively small (under 3 percent of total assets).

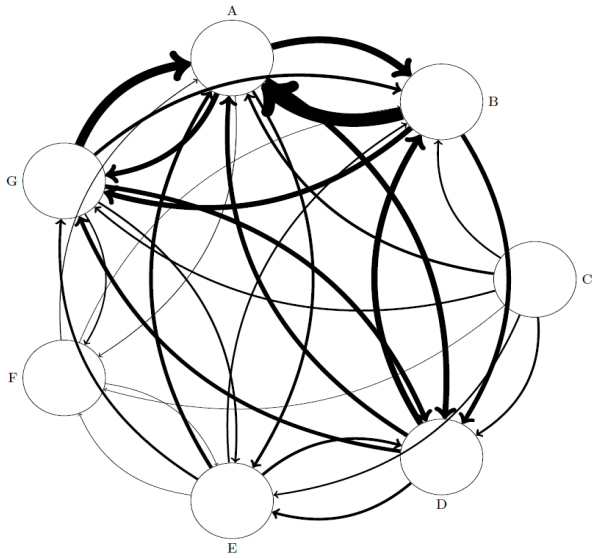
49. **As a result, a failure of a single bank would result in a CET1 ratio decline to 8.5 percent from 9.9 percent.** The two stress test contagion methods (a direct stress test and a reverse stress testing) showed that, in the worst case, the seven banking groups would see their Common Tier 1 capital to risk weighted assets decline to 8.5 percent from 9.9 percent:

- Over the seven scenarios under which the initial shock was implemented (failure of a single bank), only three scenarios led to the failure of other banks (expressed as: capital ratio below 7 percent) due to contagion effects. For the worst case initial shock from the first technique, the capital ratio of the French banking system (RWA weighted average) would move from 9.9 percent to 9.1 percent, due to contagion effects.

- From the second technique, no bank loss would trigger the default of another bank, nor drive another bank to a prudential ratio below 7 percent. As a reverse stress test, the risk of contagion within the French banking system was null. In the worst case, the French banking system capital ratio was 8.48 percent, representing a loss of 140 basis points.

50. **Larger contagion effects may instead emerge from exposures to non-French bank counterparts in the interbank market.** These counterparts include other European banks, U.S. investment banks, and banks from Japan and Gulf Cooperation Council (GCC) countries. The network topology picture of the Euro money market (including French banks) is highly concentrated with relatively few, highly connected players in the core and many less connected banks.

Figure 3. France: Interbank Network of French Banks, December 2011



Source: ACP. The results do not include Caisse des Dépôts et Consignations.

V. Conclusion and Recommendations

51. **Solvency stress tests indicate that banks could cope with deterioration in the economic environment while phasing in capital requirements under CRD IV.** Solvency stress tests of the largest French banks indicate that all banks have enough capital to cope with a deterioration in the economic environment, as described by the adverse scenario, while simultaneously meeting the new capital requirements to be introduced by CRD IV, if sovereign risks are limited to the impact of the shock on non-AAA holdings in the trading and AFS books. These conclusions are based on scenario and sensitivity stress tests conducted by banks BU and TD stress tests undertaken for validation by the authorities and the FSAP team. Following several rounds of corrections, and reconciliation of data and assumptions, the two methodologies agreed on the final assessment made above, although the TD results were more macro-sensitive and characterized by lower CET1 ratios than banks' results, due to differences in models and assumptions.

52. **Under no recourse to ECB liquidity, two large French banks appear to be vulnerable to a liquidity shock characterized by run-off rates and haircuts on assets similar to what French banks have experienced during past crises.** Liquidity stress tests assessed resilience to a strong shock characterized by run-off rates and haircuts on assets calibrated by type on French historical data, and no market access. Assuming no recourse to ECB liquidity, the significant reliance on short-term funding would result in difficulties for two banks to meet liquidity needs from outflows (mostly unsecured wholesale funding from banks and other institutions) with available buffers, standby liquidity from inflows, and asset sales. A two-notch bank downgrade under these circumstances could impose added stress through collateral and margin calls, with a significant effect on some banks. All banks would

pass the test, assuming access to ECB liquidity. A reverse stress test on the maximum potential loss of wholesale funding, by currency, that each bank could suffer while still meeting contractual obligations, shows similar dependence on ECB funding, in the event of a closure of funding markets, with three of the banks recurring to central bank liquidity above a 5 percent loss of wholesale funding. With ECB support, four banks would be able to address up to a maximum loss of about 15 percent of all wholesale funding.

53. **ACP's TD stress testing approaches should be strengthened and stress tests results disseminated.** The ACP started using bank-by-bank TD stress tests, including as a benchmarking tool for BU stress tests run by banks. The ACP is currently limited in its ability to monitor financial stability and validate BU stress tests, due to the use of methodologies that cannot project losses and RWAs by risk type. While some of these limitations can be overcome by adopting available methodologies, others are due to the lack of the necessary data (e.g., for the calculation of risk parameters related to retail lending). The mission strongly recommends that methodologies to conduct bank-by-bank stress tests be enhanced and that the necessary data be collected to improve ACP's stress testing capabilities. Furthermore, liquidity stress tests—which have remained so far unpublished, both in France and in other countries—should be undertaken frequently, and both solvency and liquidity results be made publicly available in the Financial Stability Report.

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APPENDIX I. STRESS TEST MATRIX: SOLVENCY, LIQUIDITY, AND CONTAGION RISKS

Domain	Assumptions		
	Bottom-Up by Banks	Top-Down by Authorities	Top-down by FSAP Team
Banking Sector: Solvency Risk			
Institutions included	• Eight major banks (BNP Paribas, Groupe Crédit Agricole, Société Générale, Groupe Crédit Mutuel, Groupe BPCE, HSBC France, Caisse des Dépôts et Consignations, and La Banque Postale).1/	• Five banks (BNP Paribas, Groupe Crédit Agricole, Société Générale, Groupe BPCE, and HSBC France).	• Eight major banks (BNP Paribas, Groupe Crédit Agricole, Société Générale, Groupe Crédit Mutuel, Groupe BPCE, HSBC France, Caisse des Dépôts et Consignations, and La Banque Postale).
Market share	• 97 percent of the banking system.	• 85 percent of the banking system.	• 97 percent of the banking system.
Data and baseline date	• December 2011. • Source: institutions' own granular data. • Scope of consolidation: consolidated banking group.	• December 2011. • Supervisory data. • Scope of consolidation: consolidated banking group.	• December 2011 when available. • Public data: Bankscope, Bloomberg, SNL, Annual Reports, EBA, Fitch Reports. • Scope of consolidation: consolidated banking group.
Methodology	• Banks' internal models with FSAP team guidance. • Sensitivity tests.	• Macro stress tests: Authorities' models.	• Balance sheet-based approach by Schmieder et al. (2011).
Horizon	• 2012–16	• 2012–16	• 2012–16
Shocks	*Scenario analysis* • **Baseline**: February 2012 WEO, real GDP growth rate for 2012 is 0.5 percent and for 2013 is 1.0 percent. • **Adverse**: Cumulative deviation from baseline of 2.1 standard deviation of GDP growth for 2012–13, driven by: (1) reduction of external demand caused by a euro area recession; (2) a fiscal shock resulting from a temporary rise in sovereign spreads and funding cost; and (3) worsening in banking funding costs that leads to a credit contraction. • Shocks to sovereign spreads. Size of parallel shift by country: 90 bps for France and 160bps for Euro area (weighted average by gross debt). • Additional assumption of investors' flight to AAA sovereign bonds (haircuts only apply to non-AAA sovereigns—France is excluded—in the trading and AfS books—HTM excluded).	*Scenario analysis* • **Baseline**: February 2012 WEO, real GDP growth rate for 2012 is 0.5 percent and for 2013 is 1.0 percent. • **Adverse**: Cumulative deviation from baseline of 2.1 standard deviation of GDP growth for 2012–13, driven by: (1) reduction of external demand caused by a euro area recession; (2) a fiscal shock resulting from a temporary rise in sovereign spreads and funding cost; and (3) worsening in banking funding costs that leads to a credit contraction.	*Scenario analysis* • **Baseline**: February 2012 WEO, real GDP growth rate for 2012 is 0.5 percent, for 2013 1 percent. • **Adverse**: Cumulative deviation from baseline of 2.1 standard deviation of GDP growth for 2012–13, driven by: (1) reduction of external demand caused by a euro area recession; (2) a fiscal shock resulting from a temporary rise in sovereign spreads and funding cost; and (3) worsening in banking funding costs that leads to a credit contraction. • Shocks to sovereign spreads. Size of parallel shift by country: 90 bps for France and 160bps for Euro area (weighted average by gross debt). • Haircuts applied to all sovereign holdings in all portfolios.

Domain	Assumptions		
	Bottom-Up by Banks	Top-Down by Authorities	Top-down by FSAP Team
	<u>*Sensitivity analysis*</u> • *Souv*: Liquidation of non-AAA sovereign bonds in the HTM portfolio, by country, assuming that bonds are sold at market values as of December 2011; and (ii) assuming that market values deteriorated as per agreed haircuts. • *CTP1–6*: Failure of largest five corporate exposures by name, and the largest five corporate exposures for the five countries where the bank is most exposed. Exposures comprise lending to the private sector and counterparty risk from derivatives. • *FX*: A U.S. dollar/euro exchange rate shock of +/- 20 percent; • *IR*: an interest rate shock of 200 bps affecting positions in the banking book (in order to stress IRBB). This shock will assess the impact of changes in interest rate on solvency due to banks' duration mismatches (including income and valuation effects). • *RE*: A shock to real estate prices of -25 percent. The maximum potential loss of wholesale funding, by currency that each bank can suffer while still meeting contractual obligations, without access to ECB funding (reverse stress tests of liquidity concentration).	<u>Sensitivity *analysis*</u> • Haircuts applied to AAA sovereign debt holdings in all books.	n.a
Risks/factors assessed	• Credit risk (households and corporates, domestic and foreign exposures). • Sovereign risk for non-AAA government bonds (AfS and TB in scenario and HTM in sensitivity analysis). • Counterparty risk in the banking book. • Funding risk. • Market risk, including equity and exchange rate risks. • Interest rate risk in the banking book.	• Credit risk (households and corporates, domestic and foreign exposures). • Counterparty risk in the banking book. • Sovereign risk for AAA government bonds in all books.	• Credit risk (to the extent of data availability: households and corporates, domestic and foreign exposures) • Sovereign risk for GIIPS, Belgium, and France government bonds (AfS, TB, and HTM). The inclusion of government bonds was limited to publicly available data for all banks. • Counterparty risk in the banking book. • Funding risk.

Domain	Assumptions		
	Bottom-Up by Banks	Top-Down by Authorities	Top-down by FSAP Team
Calibration of risk parameters	• Banks' models for point in time PDs and income. • RWAs were estimated using through-the-cycle PDs. • Change in valuation due to upward shift of the term structure of sovereign risk. • Sovereign risk shock: ninetieth percentile of historical distribution of changes of daily bonds yields for the adverse scenario, and fiftieth percentile for the baseline, using actual maturities.	• Model for income (ROA). • Transition matrices model and stressed PDs for RWA. • RWAs were estimated using through the cycle PDs.	• Models for credit losses (loss loan provisions) and income. • Quasi-IRB approach for RWA. • RWA were estimated using point in time PDs. • Change in valuation due to upward shift of the term structure of sovereign risk. • Sovereign risk shock: ninetieth percentile of historical distribution of changes of daily bonds yields for the adverse scenario, and fiftieth percentile for the baseline, using an assumption of five-year maturity.
Behavioral adjustments	• Deleveraging assumption. • Zero payout under stress.	• Deleveraging assumption. • Zero payout under stress.	• Deleveraging assumption. • Zero payout under stress.
Regulatory standards	• CRD IV (Common Equity Tier 1, Tier 1, Total Capital, conservation buffer, loss absorbency requirement for G-SIBs) for each year of the risk horizon. • Capital ratios phased in line with Title I of Part Ten of CRR. • Regulatory filter for AfS positions.	• CRD IV (Common Equity Tier 1, conservation buffer, loss absorbency requirement for G-SIBs) for each year of the risk horizon. • Capital ratios phased in in line with Title I of Part Ten of CRR.	• Basel III (Common Equity Tier 1, Tier 1, Total Capital, conservation buffer, loss absorbency requirement for G-SIBs) for each year of the risk horizon. • Capital ratios phased in in line with Basel III.
Banking Sector: **Liquidity Risk**			
Institutions included	• Eight major banks (BNP Paribas, Groupe Crédit Agricole, Société Générale, Groupe Crédit Mutuel, Groupe BPCE, HSBC France, Caisse des Dépôts et Consignations, and La Banque Postale).	n.a.	n.a.
Market share	• 97 percent of the banking system.		n.a.
Data and baseline date	• December 2011. • Source: institutions' own data (including off-balance sheet funding activities of banks). • Scope of consolidation: consolidated banking group.	n.a.	n.a.

Domain	Assumptions		
	Bottom-Up by Banks	Top-Down by Authorities	Top-down by FSAP Team
Methodology	• Cash flow-based liquidity stress test using maturity buckets. • Assumption on withdrawals based on banks' past crisis experiences, benchmarks from previous EBA exercises, and LCR weights, by source of funding. • Assessment of liquidity buffers. • Haircut on assets if sold.	n.a.	n.a.
Risks	• Funding liquidity. • Market liquidity.	n.a.	n.a.
Regulatory standards	• Ability to respond to withdrawals without having access to ECB facilities.	n.a.	n.a.
Banking Sector: **Financial Contagion and Spillover Risks**			
Institutions included	n.a.	• Seven major banks (BNP Paribas, Groupe Crédit Agricole, Société Générale, Groupe Crédit Mutuel, Groupe BPCE, HSBC France, and La Banque Postale).	• Sovereigns to which French banks are exposed.
Market share		• 95 percent of the banking system.	• 100 percent of the banking system.
Data and baseline date	n.a.	• December 2011. • Source: Large exposures database by the ACP. • Scope of consolidation: Consolidated banking group.	• September 2011. • BIS data on cross-border consolidated banking exposures.
Methodology	n.a.	• Network analysis model developed by the authorities for French banks.	• Network model for spillovers by Espinosa-Vega and Solé (2010).

1/ The results for CDC are excluded from figures and charts included in the document.

APPENDIX II. SAMPLE SHOCKS TO SOVEREIGN YIELDS

	Change in Yield (bps)		Tentative Haircut (percent) 1/	
	50th Pctile	90th Pctile	50th Pctile	90th Pctile
Australia	15.20	83.20	0.76	4.16
Austria	3.20	93.00	0.16	4.65
Belgium	26.20	108.90	1.31	5.44
Canada	-16.80	72.80	-0.84	3.64
Chile	59.70	81.90	2.98	4.09
China	87.10	126.40	4.35	6.32
Croatia	72.70	157.70	3.63	7.88
Czech Republic	2.30	96.00	0.11	4.80
Denmark	-3.40	89.50	-0.17	4.47
Finland	-3.70	80.20	-0.18	4.01
France	2.10	90.40	0.10	4.52
Germany	-9.80	86.60	-0.49	4.33
Greece	72.80	869.50	3.64	43.44
Hong Kong	-37.20	62.00	-1.86	3.10
Hungary	16.00	228.00	0.80	11.39
India	38.60	118.00	1.93	5.90
Indonesia	-141.10	321.00	-7.05	16.04
Ireland	23.60	540.60	1.18	27.02
Israel	23.00	94.00	1.15	4.70
Italy	33.40	127.20	1.67	6.36
Japan	-9.90	46.20	-0.49	2.31
Korea	-46.50	-16.10	-2.32	-0.80
Lebanon	11.30	26.00	0.56	1.30
Lithuania	0.00	0.10	0.00	0.00
Malaysia	0.00	13.00	0.00	0.65
Mexico	-1.30	4.00	-0.06	0.20
Netherlands	-9.10	87.90	-0.45	4.39
New Zealand	-22.30	86.10	-1.11	4.30
Norway	16.70	72.20	0.83	3.61
Peru	-15.50	23.20	-0.77	1.16
Philippines	-81.37	78.02	-4.07	3.90
Poland	-1.00	101.00	-0.05	5.05
Portugal	47.40	752.30	2.37	37.60
Russia	39.00	106.50	1.95	5.32
Singapore	-33.00	68.00	-1.65	3.40
Slovakia	148.00	152.30	7.40	7.61
Slovenia	130.50	223.50	6.52	11.17
South Africa	0.00	80.50	0.00	4.02
Spain	34.00	149.20	1.70	7.46
Sweden	8.60	81.70	0.43	4.08
Switzerland	-4.80	65.10	-0.24	3.25
Taiwan	9.40	18.30	0.47	0.91
Thailand	-14.30	126.00	-0.71	6.30
Turkey	3.90	172.00	0.19	8.59
UK	-41.00	64.80	-2.05	3.24
Uruguay	-54.80	-23.20	-2.74	-1.16
US	-43.91	75.84	-2.19	3.79
Debt-weighted Averages				
Euro Area	14.87	162.05	0.74	8.10
All countries	-10.77	90.43	-0.54	4.52

Source: Bloomberg

Note: Not all dates available for all countries.

1/ Tentative haircuts use a durantion approximation formula and a 5-year duration assumption. Banks did the own calculations of haircuts bond by bond; therefore actual haircuts, while similar, might differ from the ones above.

APPENDIX III. RISK ASSESSMENT MATRIX[1]

Nature/ Source of Main Threats	Overall Level of Concern	
	Likelihood of Severe Realization of Threat in the Next 1–3 Years	**Expected Impact on Financial Stability if Threat is Realized**
	(high, medium or low)	*(high, medium or low)*
1. *Prolonged recession in advanced economies*	***Staff assessment**: **Medium***	***Staff assessment**: **High***
	• Signs of deceleration in global data and recent European political developments continue to fuel uncertainty. • Given real linkages with the United States, Germany, and large southern Euro Area countries, and financial linkages with the United Kingdom, France is exposed to both export and financial shocks. • A weaker global environment would weaken confidence and lower domestic consumption and investment.	• Bank asset quality (and, consequently, equity value) would be affected. • Bank earnings (and therefore ability to recapitalize using internal resources) would be affected due to lower interest margins and higher provisions on nonperforming loans (NPLs). • Increased financial distress and heightened risk aversion would dampen growth by widening spreads and possibly reducing credit supply, amplifying the recession.
2. *Strong intensification of the Euro Area crisis*	***Staff assessment**: **Medium***	***Staff assessment**: **High***
	• The European environment is highly volatile and uncertainties remain on Europe's ability to resolve its debt crisis. • Any widening of the crisis in Europe could result in very weak growth for the Euro Area. • Continuing uncertainty among high-yield Euro area countries could see sovereign spreads widen further.	• French SIFIs' exposure to high-yield Euro area countries (Italy in particular) is large and could translate into bank losses, via declines in loan quality and lower sovereign bond values. • Further deleveraging by French banks may lower returns if this involves disposing of profitable activities.

[1] The RAM shows events that could materially alter the baseline path – the scenario most likely to materialize in the view of the staff.

Nature/ Source of Main Threats	Overall Level of Concern	
	Likelihood of Severe Realization of Threat in the Next 1–3 Years	**Expected Impact on Financial Stability if Threat is Realized**
	(high, medium or low)	*(high, medium or low)*
3. *France's sovereign rating downgrade*	***Staff assessment: High***	***Staff assessment: Medium***
	• France's sovereign rating faces the risk of further reductions because of its relatively high public debt stock and budget deficit relative to other AAA-rated European countries. While the authorities are committed to meeting the fiscal targets of France's Stability Program, additional efforts may be required in 2013, if growth is lower than the current official forecast of 1.7 percent. • One rating agency downgraded France's AAA rating in January 2012 and another one in November 2012. A loss of the AAA rating may result in higher French sovereign spreads.	• As of end-2011, the exposure of the eight largest French banking groups to their sovereign was 2.5 percent of their consolidated assets. • Impact on funding costs of banks and corporates due to contagion could be material if not already factored in by markets. • Possible spillovers from sovereign rating downgrade to banks' ratings. • The downgrade in credit ratings could affect French banks' large derivative business and, through higher margin calls, may put pressure on their liquidity.
4. *Closure of wholesale funding to French banks*	***Staff assessment: Medium*** • Long-term funding improved significantly in the first months of 2012, following the ECB's three-year long-term refinancing operations (LTROs), but has recently become more difficult. Market conditions are still uncertain for the rest of the year. • French banks have significant refinancing needs in 2013–14, and market access may be challenging. • The business model of some French SIFIs has been called into question, since unavailability of low funding costs puts at risk their global investment banking operations.	***Staff assessment: High*** • French banks are reliant on significant amounts of wholesale funding. • The domestic interbank market remains partly frozen. French banks, like other European banks, have increased their access to the ECB window. Potential negative second round-effects relate to cross-border interbank exposures and derivatives positions. This could create conditions for a systemic liquidity shock.

Nature/ Source of Main Threats	Overall Level of Concern	
	Likelihood of Severe Realization of Threat in the Next 1–3 Years	**Expected Impact on Financial Stability if Threat is Realized**
	(high, medium or low)	*(high, medium or low)*
5. *Housing price correction*	***Staff assessment: Medium*** • Housing prices have been supported until recently by fundamental factors, asset allocation factors (the perception of real estate as a safe haven), and a low interest rate environment. • Downside risks remain due to high LTV ratios, a worsening of the economic outlook, and a possible unexpected increase in interest rates. • Staff estimates suggest that France's housing prices were 10–25 percent overvalued at end-2010.	***Staff assessment: Medium-Low*** • Risks to banks appear limited as French households have comparatively low levels of debt and lending standards are overall sound notwithstanding some relaxation during the boom years. • However, given the large share of real estate in total households' net wealth, there are potentially indirect effects via the impact of a real housing price correction on confidence and, thus, on GDP growth (as evidenced during the 2008–09 down cycle).

1/ The risk assessment matrix shows events that could materially alter the baseline path—the scenario most likely to materialize in the staff's view.

APPENDIX IV. LIQUIDITY STRESS TEST PARAMETERS

(In million euros)

Cash-Outflows	Up to 1 day	Greater than 1 day up to 1 week	Greater than 1 week up to 1 month	Greater than 1 month up to 2 months	Greater than 2 months up to 3 months	Greater than 3 months up to 6 months	Greater than 6 months up to 1 year	Greater than 1 year up to 2 years
Own issuances due								
thereof: short term (initial maturity less than 1 year)	60%	60%	40%	40%	40%	40%	40%	20%
thereof: long term (initial maturity more than 1 year)	80%	80%	80%	60%	60%	60%	60%	30%
Unsecured wholesale funding due								
thereof: from SMEs	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	3.0%
thereof: sight deposits	0%	3%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%
thereof: from non financial corporates	30%	30%	30%	30%	30%	30%	30%	15%
thereof: sight deposits	0%	15%	30%	30%	30%	30%	30%	30%
thereof: from financial institutions	75%	75%	75%	75%	75%	75%	75%	30%
thereof: sight deposits	0%	35%	75%	75%	75%	75%	75%	75%
thereof: from others	25%	25%	25%	25%	25%	25%	25%	12%
thereof: sight deposits	0%	13%	25%	25%	25%	25%	25%	25%
Secured wholesale funding due								
thereof: secured by sovereign (PSEs or government guaranteed) debt 0% r/w	0%	0%	0%	0%	0%	0%	0%	0%
thereof: secured by sovereign (PSEs or government guaranteed) debt 20% r/w, covered bonds up to AA-, non-financial corporates	0%	0%	0%	0%	0%	0%	0%	0%
thereof: secured by equity	20%	20%	20%	20%	20%	20%	10%	0%
thereof: secured by other instruments	40%	40%	40%	40%	40%	40%	20%	0%
Repos due with central banks	0%	0%	0%	0%	0%	0%	0%	0%
Retail funding due (SMEs excluded)	5%	5%	5%	5%	5%	5%	5%	2%
thereof: sight deposits	0%	2%	5%	5%	5%	5%	5%	5%
Outflows from derivatives	100%	100%	100%	100%	100%	100%	100%	100%
Undrawn volume of committed credit/liquidity lines to								
thereof: banks	10%	20%	50%	75%	100%	100%	100%	100%
thereof: conduits	40%	40%	40%	40%	40%	40%	40%	20%
thereof: other financial institutions	10%	15%	20%	25%	30%	30%	30%	30%
thereof: retail/sme/non-financial corporates	1%	2%	3%	4%	5%	5%	5%	5%
thereof: others	10%	20%	50%	75%	100%	100%	100%	100%
Additional outflows due to a two-notch rating downgrade	100%	100%	100%	100%	100%	100%	100%	100%
Others	0%	0%	0%	0%	0%	0%	0%	0%

Cash-Inflows	Up to 1 day	Greater than 1 day up to 1 week	Greater than 1 week up to 1 month	Greater than 1 month up to 2 months	Greater than 2 months up to 3 months	Greater than 3 months up to 6 months	Greater than 6 months up to 1 year	Greater than 1 year up to 2 years
New own issuances (already contracted)	100%	100%	100%	100%	100%	100%	100%	100%
Loans maturing								
thereof: loans to financial institutions	100%	100%	90%	70%	50%	50%	50%	25%
thereof: others	50%	50%	50%	30%	30%	10%	10%	10%
Inflows from derivatives	100%	100%	100%	100%	100%	100%	100%	100%
Paper in own portfolio maturing	100%	100%	100%	100%	100%	100%	100%	100%
Reverse repos								
thereof: secured by sovereign (PSEs or government guaranteed) debt 0% r/w	0%	0%	0%	0%	0%	0%	0%	0%
thereof: secured by sovereign (PSEs or government guaranteed) debt 20% r/w, covered bonds up to AA-, non-financial corporates	0%	0%	0%	0%	0%	0%	0%	0%
thereof: secured by equity	25%	25%	25%	25%	25%	25%	25%	13%
thereof: secured by other instruments	50%	50%	50%	50%	50%	50%	50%	25%
Volume of available credit/liquidity lines from								
thereof: banks	10%	20%	50%	75%	100%	100%	100%	100%
thereof: other financial institutions	10%	15%	20%	25%	30%	30%	30%	30%
Others	100%	100%	100%	100%	100%	100%	100%	100%

Counterbalancing Capacity	Haircut	Cumulated sales of assets on the market: Up to 1 day	Greater than 1 day up to 1 week	Greater than 1 week up to 1 month	Greater than 1 month up to 2 months	Greater than 2 months up to 3 months	Greater than 3 months up to 6 months	Greater than 6 months up to 1 year	Greater than 1 year up to 2 years
Cash and central bank reserves in excess of minimum reserve requirements	0%	100%	100%	100%	100%	100%	100%	100%	100%
Unencumbered CB eligible collateral (deposited in 3G)									
thereof: debt securities issued or guaranteed by sovereigns/PSEs/government/... 0% risk-weight under Basel II standardised approach	0%	30%	50%	100%	100%	100%	100%	100%	100%
thereof: debt securities issued or guaranteed by sovereigns/PSEs/government/... 20% risk-weight under Basel II standardised approach	5%	30%	50%	100%	100%	100%	100%	100%	100%
thereof: covered bonds (excl own issues, rating at least AA-)	5%	15%	25%	50%	100%	100%	100%	100%	100%
thereof: non-financial corporate bonds (rating at least BBB+)	7%	15%	25%	50%	100%	100%	100%	100%	100%
Unencumbered assets (CB eligible, but not deposited 3G)									
thereof: debt securities issued or guaranteed by sovereigns/PSEs/government/... 0% risk-weight under Basel II standardised approach	0%	30%	50%	100%	100%	100%	100%	100%	100%
thereof: debt securities issued or guaranteed by sovereigns/PSEs/government/... 20% risk-weight under Basel II standardised approach	5%	30%	50%	100%	100%	100%	100%	100%	100%
thereof: covered bonds (excl own issues, rating at least AA-)	5%	15%	25%	50%	100%	100%	100%	100%	100%
thereof: non-financial corporate bonds (rating at least BBB+)	7%	15%	25%	50%	100%	100%	100%	100%	100%
Equity securities	40%	30%	70%	90%	100%	100%	100%	100%	100%
Securitization									
thereof: CB eligible, deposited in 3G	10%	5%	12%	50%	100%	100%	100%	100%	100%
thereof: CB eligible, not deposited in 3G	10%	5%	12%	50%	100%	100%	100%	100%	100%
thereof: securitization at least rated AA-	10%	5%	12%	50%	100%	100%	100%	100%	100%
thereof: other	30%	5%	10%	40%	80%	90%	100%	100%	100%
Other CB eligible assets (according to the criteria of the 9th february 2012)									
thereof: deposited in 3G									
thereof: not deposited in 3G									

APPENDIX V. TOP-DOWN SATELLITE MODELS

The ACP's TD model focuses on credit risk for the corporate sector. ACP's TD model is based on (i) a single equation on the net ROA to derive the stressed capital level; and (ii) a transition matrix model to calculate the stressed RWA model for corporate claims. Therefore, credit and market risk is implicitly captured in the ROA equation. Stressed RWA for retail is not calculated due to the lack of data.

Regression output for the ROA model

Dependent variable	Net Return on Asset (ROA)
ROA (lag)	0.112***
	(0.013)
GDP (yoy)	0.090***
	(0.022)
IPCH (yoy)	0.017
	(0.042)
Slope (10 yrs-3 mths Govt)	-0.050
	(0.5411)
Stock Index Volatility (SBF 250-3months)	-0.007*
	(0.004)
Capital	0.016***
	(0.003)
Non-interest income	0.088***
	(0.005)
Constant	0.002
	(0.002)
R-squared	0.671

Notes: observation period: 1993-2011, 3,973 observations. Bank fixed effects are included in the regression. 546 banks. Standard error in parentheses.*** p<0.01, ** p<0.05, * p<0.1

ACP's TD model computes stressed RWAs using regulatory PDs and a transition matrix. The regulatory PDs for each class of risk of their corporate portfolios are reported to the ACP by banks in the quarterly prudential COREP templates. They are mapped into the Creditpro S&P transition matrix (*TM* here after) made of 80 percent of large European corporate exposures and 20 percent of large American corporate exposures. This matrix is computed over an observation period of 20 years (1990-2009). On-site inspections provided ACP with scales converting the internal rating system of each bank into the S&P rating. This *TM* has eight classes of risk.

In order to relate the TM to the business cycle, ACP makes use of the Asymptotic Single-Risk-Factor (ASRF) model of credit risk used in Basel II. Defining $\widetilde{Z}_t$ as the macroeconomic systemic risk factor, the PD of the asset class *i* would be:

$$PD_i / [\widetilde{Z}_t = \Phi^{-1}(\alpha)] = \Phi\left[\frac{\Phi^{-1}(\overline{p}_i) + \sqrt{\rho_i}\Phi^{-1}(1-\alpha)}{\sqrt{1-\rho_i}}\right]$$

$\overline{p}_i$ is the long term average PD of the class i.

This formula generalizes to every component of the eight by eight transition matrix as followed:

$$P_{ijt} = \Phi\left[\frac{\Phi^{-1}(\overline{P}_{i8} + ... + \overline{P}_{ij}) + \sqrt{\rho_i}\Phi^{-1}(\widetilde{Z}_t)}{\sqrt{1-\rho_i}}\right] - P_{i8t} - ... - P_{i,j+1,t}$$

The next step is to compute a "through the cycle" transition matrix TMTTC as the average of transition matrices observed over the period and a "crisis" transition matrix TM crisis as an average of the transition matrices observed in 1991, 2001,2002 and 2009. From the comparison of the observed and ASRF transition matrices, we uncover the value of the latent macroeconomic systemic factor corresponding respectively to "normal times" and "crisis":

$$\begin{cases} \hat{Z}_{0\%crise} = \arg\min_{Z_t} \left| TM_{TTC} - TM(Z_{0\%crisis}) \right| \\ \hat{Z}_{100\%crise} = \arg\min_{Z_t} \left| TM_{crisis} - TM(Z_{100\%crisis}) \right| \end{cases}$$

The final step is to compute the value of the macroeconomic systemic risk which comes as follows:

$$\widetilde{Z}_t = \Phi\left[\left(\Phi^{-1}(\widetilde{Z}_{100\%}) - \Phi^{-1}(\widetilde{Z}_{0\%})\right) \times \%crisis + \Phi^{-1}(\widetilde{Z}_{0\%})\right]$$

Where % crisis depend on the spread between the long term average default rate and the one forecasted over the stress horizon thanks to the bridge equation (#). The stressed transition matrix is then used to compute the RWA (under the large corporate parameters of the Basel II formula).

Regression explaining the default rate by macroeconomic variables

Dependent variable	Default rate
Default rate (-1)	0.578***
	(0.1672)
GDP (yoy)	-0.378***
	(0.0919)
Inflation (yoy)	-0.886***
	(0.236)
constant	2.565404***
	(0.5411)
R-squared	0.671

Notes: observation period: 1992-2009, 18 observations.
Source: Insee. S&P for the corporate default rate.

APPENDIX VI. GUIDELINES FOR STRESS TESTING FRENCH BANKS

I. INTRODUCTION

1. **This note summarizes the key points agreed between the French authorities and the IMF FSAP mission for the calibration and estimation of the TD and BU stress tests of French banks in the context of the 2012 France FSAP Update.** It covers stress tests of solvency, liquidity, and contagion risks.

2. **FSAP stress testing differs in important ways from the stress tests in which French banks have been involved recently.** Unlike the exercises conducted by the European Banking Authority (EBA), FSAP stress tests are not meant to provide precise numerical estimates of short-term capital needs. Rather, they are means to explore potential weaknesses and the channels through which *extreme but plausible shocks* may affect the financial system, and are an instrument for a useful dialogue on these issues. FSAP stress tests help identify priorities for policy actions (reducing exposures, building buffers) both in normal times, when vulnerabilities can be identified but are not under strain, and at times of stress, where the tests can be used to get a sense of the size and direction of risks. The FSAP stress testing process can also serve other purposes, such as helping the authorities identify information gaps, and testing their preparedness to deal with financial stress.

Timeline

3. **The exercise will be launched the March 7, 2012.**

4. **The banks will submit their results to ACP April 22, 2012**.

- FSAP team reports results to the authorities based on the FSAP team TD balance-sheet approach by May 4, 2012.

- The Authorities will report to the FSAP team final results of BU and TD stress tests of solvency liquidity and contagion by May 17, 2012. This includes the network approach, as well as the market-based spillover analysis if available at that time.

- Conference call to discuss all results before second mission: May 22 at 10:00 AM/4:00 PM (Washington DC Time/Paris time)

- Second FSAP mission, May 30–June 13: BU and TD—by both the authorities and the FSAP team—stress tests are discussed in a seminar and checked for consistency. Authorities and FSAP team discuss the main financial stability implications of the stress tests results.

5. **Endorsement of the aggregate results is expected by the IMF Executive Board in fall 2012**, in the same time as the Article IV for France. Publication of the IMF report with aggregated results can be expected during Fall 2012.

II. Coverage and Division of Labor

6. **The France FSAP stress tests part will assess the resilience of the French banking system to solvency, liquidity and contagion risks under extreme but plausible macroeconomic scenarios and single factor shocks.**

7. **Solvency stress tests will be undertaken by the participating French banks (BU, bottom-up tests), and by the authorities and the FSAP team (TD, top-down stress tests).** The FSAP team's TD approach will implement a balance sheet approach using the framework included in Schmieder et al. (2011) "Next Generation Balance Sheet Stress Testing"[1] using information publicly available if supervisory data is not available to the team and the necessary assumptions when information available is not sufficient.

8. **Liquidity stress tests will be undertaken by the banks (BU first round).** The authorities will prepare an aggregate summary of the counterbalancing measures taken by banks to confront withdrawals/roll-over difficulties (TD second round). This aggregation will be used by the authorities to refine the BU stress tests results in order to incorporate systemic factors, due to interconnectedness in asset markets, as described in the section devoted to liquidity stress. See Section III for more details on this approach.

9. **The contagion stress test will be conducted by the authorities:**

- The authorities are developing two network analysis of the interbank market (one includes only French banks, and the other one includes the banking groups that are part of Target2). They will share the results if and when they are available, and tentatively by May 17, 2012 (i.e., consistently with the reporting of the other stress tests, following the timeline above), so that the results can be used in the analysis and conclusions of the FSAP Update.

- In addition to the network analyses, the authorities will provide a market-based approach to spillovers. Apart from domestic banks, these analyses will also comprise other systemically important financial institutions, such as large insurers and banks overseas.

[1] The paper and the tool are available at http://www.imf.org/external/pubs/cat/longres.aspx?sk=24798.0.

Banks included in the stress tests

10. **BU stress tests will include the following eight banks/banking groups:** BNP Paribas, Groupe Crédit Agricole, Société Générale, Groupe Crédit Mutuel, BPCE, HSBC France, Caisse des Dépôts et Consignations, and La Banque Postale.

11. **TD stress tests bank-by-bank conducted by the authorities will cover the largest potential sample that could be stressed by the authorities' model, constrained by tool availability.** This sample includes BNP Paribas, Groupe Crédit Agricole, Société Générale, BPCE, and HSBC France. Stress tests will be based on banks' consolidated exposures, including overseas, and will cover only banking operations.

12. **The TD stress tests bank-by-bank conducted by the FSAP mission will cover the same eight banks included in the BU stress tests** (BNP Paribas, Groupe Crédit Agricole, Société Générale, Groupe Crédit Mutuel, BPCE, HSBC France, Caisse des Dépôts et Consignations, and La Banque Postale) and the rest of the banking system as an aggregate (the latter subject to public data availability).

13. **Tests of solvency, systemic liquidity and contagion will be based on bank' portfolios as of end-December 2011.** The risk-horizon for the solvency tests will be five years (2012–2016), except for market and sovereign risks and for the sensitivity stress tests that will assess the instantaneous impact of a shock on banks' solvency position as of December 2011.

14. **The scope of consolidation (for RWA and own funds, P&L and BS) is the perimeter of the banking group as defined by the CRD.**[2]

15. **The general principle applied in the conduct of this exercise is that future regulatory changes will only be captured if they actually come into force during the period of the assessment (2012 to 2016) taking into account the phase-in, and then only to reflect the reality of meeting regulatory solvency requirements at that time.** Therefore, all the new rules that will enter into force between 2012 and 2016 will be appropriately taken into consideration.

16. **TD and BU stress tests will use the macroeconomic scenario in this note.** Potential losses under the adverse scenario will be estimated using ACP and FSAP team models (TD) or bank models (BU).

[2] Bank employees' defined-benefit pension funds shall be taken into account. Material insurance holdings should be deducted for the calculation of the capital in accordance with the CRD rules and accounted for by using the equity method.

III. SOLVENCY STRESS TESTS[3]

17. **Market risk is in general limited but sovereign risks are sizable.** BU stress tests indicate that shocks to equity and real estate prices have a negligible impact on CET1 ratios. Exposures to sovereigns in the European periphery were cut substantially in the second half of 2011, and have reduced French banks' **vulnerability** to a sovereign shock.[4] Nevertheless, non-AAA sovereign debt holdings in AFS and trading accounts remain sizeable, in particular to Italy, and a worsening of the euro crisis would cause cumulated losses of capital of about 5 percent of the initial amount of CET1 capital. Prudential filters would allow capital charges to be phased in over the risk horizon (a cumulative 20 percent each year starting in 2014), thereby smoothing the impact. A more extreme shock affecting all sovereign holdings (including France) in all books would impact the initial aggregate CET1 capital by an additional 5 percent. This would be significant for a smaller bank with sizeable hold-to-maturity holdings of French bonds.

18. **The aggregate results presented in Figure 2 are based on BU stress tests (i.e. conducted by each individual bank on the basis of a common guidance agreed between staff and French authorities) and stress tests undertaken by the ACP at an individual bank level.** ACP results show a higher decline in CET1 for all banks due to more conservative (higher) and cyclical default probabilities (for claims other than retail) than those used by banks in general.

19. **Solvency stress tests will comprise an assessment of banks' resilience under baseline and one stress macroeconomic scenarios as well as supplementary sensitivity tests (described in section IV).**

A. Risk Factors for Scenario and Sensitivity Solvency Tests

20. **The following risk factors will be included in the BU solvency stress tests:** credit risk; sovereign risk; counterparty and market risks (including shocks to the exchange rate, interest rates, equity prices); funding cost; real estate prices and interest rate risk in the banking book.

B. Scenarios

21. **Scenario analysis will examine resilience under a baseline macroeconomic scenario and one adverse scenario based on two standard deviations of GDP growth projections from the central growth baseline forecast included in the most recent IMF's**

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[3] See details in Appendices IV, V, and VI.

[4] In the second half of 2011, cross border public sector exposures of French banks fell by 38 percent to Italy, 39 percent to Spain, 39 percent to Greece, 32 percent to Portugal, and 26 percent to Ireland.

World Economic Outlook (WEO) or WEO Update. The other key macroeconomic variables for the stress tests— unemployment and headline CPI inflation—will be determined using the authorities' Mascotte macro econometric model.

Baseline scenario

22. **The latest WEO update (February 2012) provides the following scenario:**

Appendix Table 1. France: Key Exogenous Macroeconomic Variables in the Baseline Scenario

Key Macroeconomic and Fiscal Assumptions	Actual	Projections					
	2010	2011	2012	2013	2014	2015	2016
Real GDP growth (in percent)	1.4	1.7	0.5	1.0	1.8	1.9	1.9
Average nominal interest rate on public debt (in percent) 1/	3.2	3.3	3.1	3.0	3.0	3.1	3.2
Average real interest rate (nominal rate minus change in GDP deflator, in percent)	2.3	1.7	0.4	1.5	1.2	1.2	1.2
Nominal appreciation (increase in US dollar value of local currency, in percent)	-9.5	4.9	-7.8	-0.1	-0.4	-0.5	-0.5
Inflation rate (GDP deflator, in percent)	0.8	1.6	2.8	1.5	1.8	2.0	2.0

1/ Derived as nominal interest expenditure divided by previous period debt tock.

Adverse macro scenario

23. **It will be assumed that the stress scenario is triggered by one-year external demand and funding shocks starting in Q1, 2012, which impacts mainly the first and second years, while the path for the remaining three years will depend on the dynamics of the authorities' macroeconomic model.** It is characterized by volatility in the sovereign market, leading to a consolidation of public finances in France, which enables a return to baseline. The shock leads to a maximum cumulated deviation from baseline of 2 standard deviation of GDP growth for 2012–13 due to the following triggers (see Table 2) :

- A reduction in external demand caused by a global recession starting in Q1, 2012, that impacts the euro area mainly in the first and second year, reducing output by about 4 percent on average for the euro area relative to the WEO forecast (see chart). The scenario also assumes a fiscal shock resulting from a temporary rise in sovereign spreads and a funding shock, as discussed below. Taking into consideration financial and trade spillovers, world output is lower than the WEO projections by about 2 percent. The other external assumptions include a nominal exchange rate depreciation of about 13 percent over 2012–13 (see Table 2).

- A worsening of the European debt crisis that pushes up sovereign spreads to short-term Euro area policy rates by about 160 bps in the Euro area in 2012 and motivates a fiscal adjustment.[5] The shocks to sovereign spreads are consistent with a decline in

[5] This shock is consistent with the sovereign shocks (for Euro countries, the weighted average shock is 160 bps). The countries' shocks are represented by the fiftieth (baseline) and ninetieth (adverse scenario)

(continued)

the value of sovereign bonds. The fiscal shock will be represented by the additional fiscal measures needed to achieve a reduction of the fiscal deficit to 3 percent of GDP by 2013, in line with France's Stability Program, despite lower growth and higher interest rates.

- A simultaneous worsening in banking funding costs that leads to a credit contraction (in addition to current deleveraging bank plans). In addition, higher corporate funding costs will aggravate the recession via lower investment. The impact on credit growth and funding conditions will have the following characteristics

- Domestic lending evolution reflects the impact of adverse funding conditions in 2012–13, estimated to amount to a 2.8 percent lower growth in domestic credit (relative to baseline, and additive to any credit demand effects from lower GDP growth, see paragraph 66 to 68). This estimated credit reduction, due to bank funding conditions and sovereign stress, is consistent with the WEO adverse scenario.

- The relation between changes in bank funding costs and stock prices will be based on recent historical data.

Appendix Table 2. France: Key Exogenous Macroeconomic Indicators in the Baseline and the Adverse Scenarios

	Baseline		Adverse	
Key Macroeconomic and External Assumptions	2012	2013	2012	2013
Euro area real GDP growth (in percent)	-0.5	0.8	-2.9	-0.5
World real GDP growth (in percent)	3.3	3.9	2.0	3.3
Euro area real effective exchange rate appreciation (in percent) 1/	-4.6	0.0	-3.9	-3.8
Nominal appreciation (increase in US dollar value of local currency, in percent)	-7.8	-0.1	-6.5	-6.3
Petroleum spot price (US dollar, percent change from previous year)	1.6	-3.1	-13.7	-1.0
Nonfuel commodity price (index, percent change from previous year)	-10.4	-1.7	-17.3	-2.9

Source: IMF World Economic Outlook Update, January 24, 2012.
1/ Index based on relative unit labor costs in manufacturing adjusted for exchange rate movements.

percentiles of the historical distribution of annual changes of daily sovereign yields (Bloomberg generic five-year government bonds). The overall shock was calculated by weighting the individual country shocks by outstanding bond amounts by country (see Appendix I)

Appendix Table 3. France: Baseline and Adverse Scenario: Key Macroeconomic Indicators

Baseline	2011	2012	2013	2014	2015	2016
Real GDP	**1,7**	**0,5**	**1,0**	**1,8**	**1,9**	**1,9**
Private consumption	0,3	0,2	1,0	1,9	2,1	2,1
Gross fixed capital formation	2,9	1,3	1,4	2,5	2,9	2,9
Exports (goods and services)	5,0	2,4	2,2	3,5	3,6	3,7
Imports (goods and services)	5,0	0,2	1,9	2,5	3,2	3,4
Contributions to real GDP growth (in GDP pts):						
Domestic demand (excl. changes in stocks)	1,0	0,5	0,9	1,6	1,9	1,9
Net exports	-0,1	0,6	0,0	0,2	0,1	0,1
Changes in inventories	0,9	-0,6	0,0	-0,1	0,0	0,0
Household saving ratio (% of RDI)	16,9	16,4	16,4	16,3	16,1	16,1
Total employment	0,7	0,1	0,1	0,3	0,6	0,6
Unemployment rate (% of labour force) (e)	9,7	9,9	10,1	10,0	9,7	9,3
Household's consumption deflator	2,0	2,0	1,3	1,3	1,5	1,7
GDP deflator	1,6	1,7	1,5	1,6	1,8	2,0
House prices	6,2	1,2	0,4	0,2	0,9	0,4
Public Balance (% of GDP)	-5,7	-4,9	-4,7			
Current Account (% of GDP)	-2,3	-1,9	-1,5			
Foreign demand	5,4	1,9	3,6	4,5	5,0	5,1
oil price (US$ / barrel)	111,5	105,7	102,4	98,0	94,8	92,7
U.S dollars per EUR	1,39	1,28	1,28	1,28	1,27	1,26
Long-term bond yield	3,3	3,4	3,4	3,5	3,6	3,7
Short-term deposit rate	1,4	0,9	0,9	1,3	1,9	2,5

Adverse Scenario	2011	2012	2013	2014	2015
Real GDP	**1,7**	**-1,9**	**0,0**	**2,4**	**2,6**
Private consumption	0,3	-1,0	-1,5	1,2	2,6
Gross fixed capital formation	2,9	-4,5	1,6	3,9	3,7
Exports (goods and services)	5,0	-0,4	1,9	5,5	5,7
Imports (goods and services)	5,0	-5,2	1,3	4,4	4,9
Contributions to real GDP growth (in GDP pts):					
Domestic demand (excl. changes in stocks)	0,9	-2,0	-0,4	1,8	2,3
Net exports	-0,1	1,4	0,1	0,2	0,2
Changes in inventories	0,9	-1,3	0,3	0,3	0,2
Household saving ratio (% of RDI)	16,9	13,9	14,0	15,9	16,3
Total employment	0,7	-0,2	-0,7	0,1	0,6
Unemployment rate (% of labour force) (e)	9,7	10,2	11,1	11,2	10,9
Household's consumption deflator	2,0	1,8	0,8	0,5	0,9
GDP deflator	1,4	1,3	0,2	0,3	0,9
House prices	6,2	0,0	-4,8	-2,7	1,7
Public Balance (% of GDP)	-5,7	-3,6	-3,1		
Current Account (% of GDP)	-2,4	-0,7	-0,8		
Foreign demand	5,4	-1,6	2,1	6,1	7,2
oil price (US$ / barrel)	111,5	89,8	88,8	93,5	93,9
U.S dollars per EUR	1,4	1,3	1,2	1,2	1,2
Long-term bond yield	3,3	4,4	4,1	3,5	3,7
Short-term deposit rate	1,4	0,9	0,9	1,3	1,9

Source : Banque de France, based on the Mascotte model.

24. **The worsening of funding conditions for the nonfinancial corporate sector under the stress scenario will be assumed to be represented by an increase in the corporate risk premium of 60 bps in 2012 and 300 bps in 2013 (non-additive to the sovereign risk premium).**

25. **Interest rates. It is assumed that short run policy interest rates remain at their baseline levels under the stress scenario.** Thus, the only shock to long-term rates under the stress scenario is from the sovereign risk premium shock.

26. **Inputs. The IMF team will provide to BdF the size of the external demand shock (proxied by the effects of the shock on the euro area, the US, Japan, and other regions) for the estimates of the real GDP growth path, and the credit reduction due to bank funding conditions.** It will also provide other external assumptions such as oil price, nonfuel commodity price index, euro area short term policy rate, and nominal U.S. dollar exchange rate (WEO's adverse scenario, based on the simulated estimates from the IMF's GEM model – see attached file for detailed assumptions).

C. Satellite Models

27. ***General Principles.*** The banks must translate key macro-economic variables of the macro-economic scenarios provided into income, expense, loan loss and capital requirements (disaggregated into Regulatory probability of default (PD) and Downturn LGD) forecasts. These forecasts will differ according to the bank's business model, loan portfolio and internal models.

28. ***Solvency stress test and satellite models.*** The banks have to add all the impact of the different satellite models (including sovereign risk; counterparty and market risk; funding cost) to assess the global impact on the solvency position.

Impairment parameters

29. **Impairment parameters (estimates of write-downs and write-ups) for corporate and household exposures will be based on estimates of:** defaults rates / default probabilities (pds point in time), loss given default (lgd point in time), and exposures at default (EAD) for domestic and foreign clients, by country. Risk-weighted assets will be based on regulatory parameters (through-the-cycle) and will be adjusted under the stress scenario to reflect higher risk.

30. **Equity investments allocated to both the AFS and those designated at fair value through profit and loss portfolios will be subject to the application of the same valuation as those used in the trading book on similar assets.**

31. **All the participations, in line with the IFRS principles, shall be subject to the test of impairment in the baseline and adverse scenario.**

Sovereign risk in the BU tests

32. **Sovereign risk will be measured in the baseline and in the adverse scenario through changes in sovereign yields leading to a repricing of all affected bonds.** The methodology is as follows:

- The term structure of sovereign risk will shift upward for all countries to which French banks are exposed in a parallel fashion in the baseline and in the adverse scenarios.

- For the baseline scenario, the shock will be derived from the fiftieth percentile of the historical distribution of annual changes of daily yields of Bloomberg generic five-year government bond yields over the period 2006–11 (see Appendix I, columns 1 and 2, for a sample of countries).

- For the adverse scenario, the shock will be derived from the ninetieth percentile of the historical distribution of annual changes of daily yields of Bloomberg generic five-year government bond yields over the period 2006–11 (see Appendix I, columns 1 and 2, for a sample of countries).

- When there is no available debt instrument to derive a valuation haircut, the relevant haircuts are interpolated.

- The change in the yields will be used in the BU approach to reprice all bonds using a cash-flow approach. The change in the yield in the adverse scenario is added to the change in the yield in the baseline.

33. **Holdings of government bonds in AFS, FVO, and trading accounts will be repriced.**[6] Haircuts will not be applied to AAA rated countries[7] in the BU stress tests since the scenario will include a flight to quality aspect.

34. **For AFS position, the regulatory filter will be taken into account, as well as transitional provisions required for additional filters and deductions in** CRR (notably articles 449 and 450) published by the Council of European Union on January 9, 2012. Thus, the table below for this phase-out in the stress-test horizon will be used.

2011	2012	2013	2014	2015	2016
Phase-in of Basel 3 regulation for AFS filter					
0%	*0%*	*0%*	*20%*	*40%*	*60%*
Impact on AFS reserve					
Reserve of AFS (negative or positive)	Reserve of 2011 + Losses on AFS portfolio due to haircut	Reserve of 2012	80% of Reserve of 2013	60% of reserve of 2014	40% of reserve of 2015
Impact on Capital					
None if no credit default event	None if no credit default event	None if no credit default event	20% of reserve of 2013	40% of reserve of 2014	60% of reserve of 2015

35. **For stress testing purposes, the exposures to be stressed should be all direct and indirect sovereign exposures.** The net direct exposure comprises gross exposures (long) net

[6] The sensitivity of the HTM portfolio to changes in market conditions is examined through sensitivity analysis. See section IV.

[7] AAA rated countries are determined as countries rated AAA on 31 December 2011 by at least two main rating agencies: Australia, Austria, Canada, Denmark, Finland, France, Germany, Luxembourg, Netherlands, Norway, Singapore, Sweden, Switzerland, United-Kingdom, the United-States,

of cash short position of sovereign debt (without derivative hedges such as CDS). This will be referred to as the "net direct position." The indirect sovereign exposures includes both on and off balance sheet exposures. The impact on the gross exposures will be documented.

36. **Direct derivatives positions should be subject to fair value adjustments, based on the relevant shock** (e.g., for an interest rate derivative, use the shock on interest rates) and the relevant CVA adjustments.

37. **Indirect exposures (those with counterparties other than the sovereign itself, i.e., CDS) should be treated in a similar way, subject to fair value adjustments of the relevant shock and the CVA adjustment.**

38. **Haircuts to AFS portfolios would be applied to adjusted (marked to market) balance sheet values.** It means that banks have recognized losses (or gain) before the haircut itself.

39. **Other portfolios, including loans and advances and HTM are excluded from the calculation of haircut.** Nevertheless, banks have to stress them using the credit risk approach, and assume regulatory PDs and LGDs consistent with the stressed scenario. They also have to assume increase of general provisions greater than or equal to the Expected Loss on these portfolios.

40. **It is assumed that sovereign risk is concentrated only during the first year of the adverse scenario, and consequently, haircuts will only be applied to the first year.** Moreover, during the first year, and given a general assumption of no change in the risk-free rate, the haircut defined above will be the only change made to the value of the sovereign portfolio.

Sovereign risk in TD tests

41. **The TD approach by the FSAP team will have two scenarios:**

- a flight-to-quality scenario in which haircuts only apply to non-AAA sovereigns; and
- a scenario without flight to quality, in which haircuts apply to all sovereigns (see appendix I).

Bank funding costs

42. **Funding costs.** The stress tests will incorporate an increase in funding costs under stress scenarios. The increase in funding costs for each year of the risk horizon will be included in the solvency stress tests as higher interest payments made on corporate deposits and on short- and long-term debt.

43. **The increase of funding costs will use banks' asset liability management (ALM) model to establish a relationship between funding costs and the macroeconomic scenario.** Recent data from the crisis shall be used to justify the assumptions so that they are sensitive to recent stresses, as well as longer term history. Given the absence of sovereign crisis in the distant past, and the fact that the stress scenario is triggered by a worsening of the European sovereign crisis, the model will give particular weight to recent observations. It is expected that the initial increase in funding costs under the stress scenario will follow closely the increase in sovereign costs, and will then be adjusted also following the results of the stress tests in each year for each bank.

44. **The evolution of the economy envisaged in the scenarios (baseline and adverse) is expected to cause an increase in the cost of funding of the banks, due to the following main drivers:**

- higher sovereign risk;
- the evolution of short term and long interest rates (wholesale);
- the rise in the banks' credit spreads;
- the drop in the value of the sovereign assets used as collateral in the funding transactions (central banks, wholesale funding); and
- deposits (retail), but one has to take into account that these are pretty insensitive.

54. **For each year of the risk horizon, all short-term debt is funded at the new funding rate.** Only the long-term debt due in each year is re-priced at the new rate; nevertheless, interest rates paid on existing floating rate debt shall reflect the expected increase in interest rates.

55. **The deposit rate (paid by the bank) will move taking into consideration that traditionally interest rate of sight deposit is low (almost inexistent for retail) and that interest rate of some savings products is regulated ("livrets réglementés") in France.**

56. **The change of funding costs paid by the bank will be weighted by the levels of long- and short-term debt.** In case an assumption is made to pass higher funding costs to customers, both cases—with and without pass-through—will be reported together with a justification of the former: it is assumed that due to competition, it is not possible to pass all the increase of funding cost to the customers. It is also assumed that the replacement rate of deposit (income for the bank) move only accordingly to the evolution of short term and long term interest rate (i.e., it is impossible to pass the rise in bank's credit spread).

57. **In the adverse scenario, the banks' credit spreads shall be subject to a negative evolution correlated to sovereign credit spreads for France for domestic activities and the sovereign spread of the relevant subsidiary for elements of the existing funding structure that are funded in other jurisdictions.**

58. **The banks increase in the banks' credit spreads shall be consistent with recent experience of sovereign stress: if the bank cannot show evidence of the contrary, it will be applied on a one for one basis (i.e., 100 percent).**

59. **The increase in interest rates and sovereign spreads will have an impact on the fair value of the sovereign assets (ECB haircuts) used as collateral in funding transactions (Central Banks and Wholesale).** The drop in the fair value of sovereign exposures will be computed by the application of the haircuts to the assets allocated in the trading and banking books.

60. **The reduction in the fair value of sovereign debt and the need to adjust the value of collateral supporting the central bank transactions will increase the portion of uncollateralized funding of banks, causing an increase in the funding cost, due to the difference between the interest rates paid for the same maturity on the collateralized and uncollateralized funding transactions.**

61. **In principle, balance sheets will grow with nominal GDP (with an exception for banks planning deleveraging).** The funding structure of the banks (wholesale, deposits, short and long term, official financing) and the hedging strategy should not change over the time horizon of the exercise. Maturing liabilities are assumed to be replaced by similar ones.

Market risks

62. **Market risks will be incorporated in the adverse scenario as an instantaneous shock that affects only the banks' first year results.** It will be applied following European directives or, if no European directive exists, Basel regulatory rules. Banks will assess market risk under the scenarios following their own models and current regulations. The main assumptions for the estimation of potential losses due to market risk are as follows in the stress scenario:

- Short- and long-term interest rates will not change during the first year, but credit spread (including bank and corporate debt) will evolve in line with sovereign risk (being cautious that sovereign risk won't be double counted)

- An equity shock of about 25 percent to the CAC index

- The U.S. dollar/euro exchange rate changes by +/-6.5 percent, consistent with the WEO adverse scenario's assumptions.

63. **For the computation of the impact from the market risk shocks, the assumption will be that instantaneous shocks (both baseline and adverse) are applied to trading book positions as of March 1, 2012.** The different portfolios and books will be stressed using the most appropriate parameters from the set provided.

64. **For the period 2012 to 2016, net trading income should evolve proportionally to GDP growth.**

65. **The results (losses or gains) of the shocks (sovereign + others trading book portfolio) will be used to adjust the net trading income forecasts of the banks in 2012.** No market shock is assumed the following years (2013 to 2016) and in baseline scenario.

66. **It should be noted that the parameters could be considered as directional, allowing for compensation between gains and losses on different portfolios.**

67. **For simplicity reasons, the RWA on market risk (standard and internal models), excluded securitization, should evolve correspondingly to the evolution of trading activities (taking into account the assumption of balance sheet growth see paragraphs 67–69).**

68. **Banks will have to derive their own RWA forecast for 2012 to 2016, this will be benchmarked with their Quantitative Impact Study (QIS) submission.**

Counterparty Risk

69. **In order to calculate expected CVA losses associated with counterparty credit risk in the trading book, the bank would model the PD and LGD of its counterparties (or model the CDS-spread) using the macro-scenario and market risk shocks, and subsequently calculate the CVA for the derivatives outstanding.**

Securitization

70. **All exposures (traditional and synthetic, re-securitizations, as well as liquidity lines on securitization transactions), for which there is a significant risk transfer (as in the meaning of the CRD, see part 2 subsection 4 and notably Annex IX part 2), are included in the scope of the exercise.**

71. **The exercise takes into account the CRD III.**

72. **The stress is applied to the securitization positions (Standard and Internal Ratings-Based (IRB) portfolios) in the different credit quality step at December 2011 of direct increased risk weighted in substitution of the original ones.** The increase in RWA should reflect the assumption included in macro-scenario (baseline and stress scenario) and stressed market parameters.

73. **All the positions should be stressed independently of the approach followed (external rating, Supervisory Formula, Internal Assessment Approach).**

74. **Exposure currently deducted from capital should be risk weighted at 1250 percent.**

75. **Losses: banks are required to estimate the amount of impairment at the end of each period, taking into account the macro-scenario.**

Profits projections

76. **Profits (interest income, interest expenses, net fee and commission income, and operating expenses) under stress will be based on a satellite model or expert judgment.** To the extent possible, each profit component will be estimated using separate models. For end-2011, net profits before tax will be adjusted for extraordinary income/losses in order to avoid misleading results. Profit projections will include the impact of higher interest payments due to higher funding costs during times of stress.

77. **In forecasting the P&L from 2012 to 2016, banks shall make use of the definitions of profit and losses contained in the "Consolidated income statement" of the FINREP reporting.**

78. **Trading income.** For the 2012-2016 period, net trading income is assumed to follow the evolution of the GDP with a specific shock in 2012 (see paragraph 50). In general, the assumption is that a decline in GDP results in lower trading income.

79. **Interest Income.** The estimation of the impact of the scenario on the remuneration of their assets and liabilities will be done by the banks using their internal procedures (e.g., ALM tools used on a regular basis) respecting the general assumptions contained in the methodological note. In particular:

80. **There are specific assumptions on the cost of funding in the adverse scenario (see bank funding costs section).**

81. **The roll-over of maturing assets shall not take into account increased credit spread:** e.g., the banks shall not benefit from the increase on sovereign or corporate bond yield, or shall not increase their margins on loans.

82. **For the purposes of the stress test, the banks shall not take into account possible debt valuation adjustments (DVA).** Hence, following a deterioration of own creditworthiness, the bank is not allowed to book a P&L profit on those over-the-counter (OTC) derivatives (or any other fair valued liability) that present a net liability to the bank.

D. Behavioral Adjustments

83. **Balance-sheet growth.** In principle, balance-sheets will grow with nominal GDP. Asset allocation will remain proportionally identical. Asset disposals and acquisitions over time will not be considered, except where agreed with legally binding commitments or included in deleveraging plans approved by the bank's Board of Directors. Maturing exposures are assumed to be replaced by similar ones, unless there is a good reason for this not to happen.

84. **If, under a scenario, a firm falls below any of the regulatory solvency ratios (Table 1 below), the firm should report what actions will be taken to respond to this capital shortfall and transmit additional results of the stress with those actions taken into account.**

85. **In order to take into account medium-run structural plan decided by institutions to cope with CRR, stress tests results should also be reported, including the impact of those plans.** Thus banks should compute different set of results:

- One set of results with a constant structure of balance sheet;
- Another set of results taking into account the structural plan for implementation of CRR

86. **Dividend payout ratio.** Dividends can only be paid in the stress scenarios by banks that remain adequately capitalized (i.e., meeting at least all solvency measures indicated below or above them), and after setting aside adequate provisions for impairment of assets and transfer of profits to staff benefits and statutory reserves.

87. **The hedging positions are expected to be rolled-over, i.e., no change in the hedging strategy of the banks is allowed.** The fair value of the hedging positions, subject to the application of the market risk parameters, must reflect the evolution of the fair-value of the assets on the balance sheets. An estimation of the increased cost for the roll-over of the hedging positions shall be reflected in the P&L.

E. Solvency Measures

88. **Solvency will be measured in each year of the risk horizon in line with the transitional provision of Title I of Part Ten of CRR.** When an option is proposed by CRR, the one in line with Basel III[8] should be taken into account. These measures will be used to

[8] Text published by the Basel Committee on Banking Supervision (BCBS) in December 2010 and revised in June 2011.

reflect relative strength among institutions, rather than capital shortfall with respect to a benchmark. Specifically:

- An institution's solvency under stress will be assessed in terms of all components of capital (CET1, Tier 1, and Total Capital, plus conservation buffer, and loss absorbency requirement for G-SIBs) for each year of the risk horizon; these ratios will be phased in line with Title I of Part Ten of CRR.

- The calculation of risk weights will reflect implementation of new regulatory rules in line with CCR, taking into account regulatory transition for floors (transition from Basel I to Basel II and CRR).

89. **Changes in risk weights should reflect, at a minimum, the results of the Comprehensive QIS (in addition to changes due to business volume).**[9] Banks will use their internal models for forecasting changes in risk weights, they may also use some form of expert judgment so as to reconcile increases (or decreases) due to business volumes with the new capital charges introduced by CRR.

Appendix Table 4. France: Solvency Measures Under Stress

(In percent)

Forecast Year	Y1 (2012)	Y2 (2013)	Y3 (2014)	Y4 (2015)	Y5 (2016)
Minimum Total Capital	8.0	8.0	8.0	8.0	8.0
Minimum Tier 1 Capital	4.0	4.5	5.5	6.0	6.0
Minimum Common Equity Tier 1	2.0	3.5	4.0	4.5	4.5
Conservation Buffer	0.0	0.0	0.0	0.0	0.625
Additional Loss Absorbency for G-SIBs	0.0	0.0	0.0	0.0	0.5 1/

1/ Assumption of 2.0 percent Common Equity Tier 1 requirements in 2019 for BNP Paribas, Groupe Crédit Agricole, Société Générale, and BPCE.

[9] BCBS, 2010, Publication No 186 (December). Ten French banks submitted data for the comprehensive QIS, 5 were part of Group 1 (large banks) and 5 were part of Group 2. Similar criteria were used in the stress tests undertaken in the recent Germany and UK FSAPs.

IV. LIQUIDITY STRESS TESTS[10]

90. **The liquidity test will combine BU and TD rounds.** It will be very similar, from a methodological point of view, to the 2011 EBA liquidity risk assessment, in the extent that it will be based on a maturity ladder analysis in order to capture:

(i) the bank's liquidity needs derived from outflows. During the stress-test, banks are facing a lack of funding on every usual source of market liquidity: the unsecured whole sale funding market is partly closed ,especially the funds provided by financial institutions, the secured funding is quite impacted by the stress as well. And besides, banks are facing extra cash-outflows, due to drawings of granted credit and liquidity lines and a run-off of retail deposits. In consequence, a run-off rate is to be applied to every source of funding;

(ii) the available standby liquidity from inflows, which mainly comes from loans maturing, reverse repos, and available credit lines. During stress, although banks face a lack of funding, they are not supposed to cut off funding to customers—both retail customers and corporate—they keep fulfilling their role of financing the economy; and

(iii) the available liquidity buffers to counterbalance liquidity gaps under two scenario: with and without banks' access to ECB facilities. In the first case, the stress test assumes haircuts on assets, due to massive and sudden sales on the market; in the second one, the stress test assumes that the ECB plays its role of lender of last resort and that current ECB's haircuts are applied.

91. **The liquidity stress testing exercise is linked to the macroeconomic scenario. It will simulate both idiosyncratic and systemic risk.**

92. **The maturity ladder will be based on definitions of regulatory ratios.** The run-off rates and haircuts on assets will be calibrated by type using banks' historical data during the different crisis they experienced over the past few years.[11]

93. **The TD second round.** The authorities will prepare an aggregate summary of the counterbalancing measures taken by banks to confront withdrawals/roll-over difficulties

[10] The FSAP team will also discuss with the authorities, outside of the stress testing framework, banks' ability to meet (i) French regulatory liquidity requirements; and (ii) Basel III Liquidity Coverage Ratio (LCR) and Net Stable Funding Ratio (NSFR).

[11] Following the authorities' comments, some specific run-off rates could be broken down by currency (EUR, U.S. dollar) in the Top-Down round, but not systematically.

(TD second round). This aggregation will be used to refine the BU stress tests results. For example, if the majority of banks report asset sales of particular asset classes in their counterbalancing capacity, the TD analysis might increase haircuts on those assets; if banks report that they would discontinue reverse repos, the TD analysis might incorporate a (further) reduction in repo roll-overs.

94. **The unit of measurement is the survival horizon of institutions (up to two years), which is assessed through the construction of the residual stressed funding gap after sales of liquid assets.** The liquidity stress test will be implemented under two assumptions: (i) without banks' access to ECB facilities; and (ii) with banks' access to ECB facilities, based on the bank's ability to provide adequate collateral.

95. **Assessment date and assumptions.** The assessment date will be end of December. Assumptions used by banks and by the authorities will be documented.

96. **The final and exact calibration of the model (such as the closure of wholesale secured and unsecured funding markets, assumptions on loan decisions, and asset haircuts) will be reported by the authorities to the FSAP team, together with the results of the stress tests.**

V. Sensitivity Stress Tests

97. **The scenario analysis described in the previous sections will be supplemented by sensitivity tests (to be performed BU by the banks) that will measure the instantaneous impact on banks' solvency position as of December 2011 of the following shocks:**

- Liquidation of non-AAA sovereign bonds[12] in the HTM portfolio, by country, assuming that bonds are sold at market values as of December 2011; and (ii) assuming that market values deteriorated as per Appendix I, columns 1 and 2.

- Failure of largest five corporate exposures by name, and the largest five corporate exposures for the five countries where the bank is most exposed. Exposures comprise lending to the private sector, and counterparty risk from derivatives

- An exchange rate shock (U.S. dollar/euro) of +/- 20 percent;

- An interest rate shock of 200 bps affecting positions in the banking book (in order to stress IRBB). This shock will assess the impact of changes in interest rate on solvency due to banks' duration mismatches (including income and valuation effects);

[12] Haircuts will not be applied to the AAA sovereign in the BU stress tests since the scenario includes a flight to quality aspect.

- A shock to real estate prices of negative 25 percent; and

- The maximum potential loss of wholesale funding by currency that each bank can suffer while still meeting contractual obligations, without access to ECB funding (reverse stress tests of liquidity concentration).

98. **The measures of solvency in Table 1 will also be used for the solvency sensitivity tests to reflect relative strength among banks.**

VI. OUTPUT

99. **As part of the reporting of results, the authorities will:**

- Document the models and the exact assumptions and calibration used in TD and BU stress tests and the results;

- Require from banks (and report to the FSAP team) details of the satellite models and expert judgment used to calibrate the tests, including on earnings capacity, market, credit, and counterparty losses, as well as the change in funding conditions under the stress scenario;

- Engage with firms on an ongoing basis to help ensure consistency of underpinning assumptions and suitability of models prior to submission of stress test results;

- Ensure the reliability of results by checking against historical experience, other stress testing work by the firms, and the results of TD stress tests; and

- During the second mission of IMF, and for the purpose of a more accurate analysis, the FSAP team may have access to additional details, while the confidential nature of the information will be preserved.

100. **Capital adequacy under stress will be reported to the FSAP team using the metrics described in the Solvency Measures section, for each year over the forecast horizon for the aggregate of the system, including measures of dispersion, like standard deviation and inter-quartile range (Q3-Q1).** Results will also document satellite models/expert judgment, as well as the estimation of important stress testing parameters. The reporting of stress results in the Financial System Stability Assessment (FSSA) and in the Stress Testing Technical Note will be discussed in detail at the time of the second FSAP mission with a view to ensuring the adequate protection of sensitive information.

101. **For liquidity stress tests, the reported outcome will be based on banks' abilities to confront the outcome of the stress test with and without access to ECB support;** in case of ECB support, the report will specify whether the bank qualified for ECB support, and the extent of the possible support (e.g., assessing the ability to provide adequate collateral). It

will be reported for the aggregate of the system, including measures of dispersion, like standard deviation and inter-quartile range (Q3-Q1).

Appendix Table 5. France: Sample of Shocks to Sovereign Yields[13]

	Change in Yield (bps)		Tentative Haircut (percent)	
	50th Pctile	90th Pctile	50th Pctile	90th Pctile
Austria	2.95	92.69	0.15	4.63
Belgium	26.50	107.68	1.32	5.38
Czech Rep.	-30.95	55.68	-1.55	2.78
Denmark	-4.60	89.44	-0.23	4.47
Finland	-72.00	52.50	-3.60	2.62
France	1.40	90.37	0.07	4.52
Germany	-9.95	86.57	-0.50	4.33
Greece	72.75	869.32	3.64	43.46
Hungary	39.50	249.73	1.97	12.48
Ireland	23.50	508.12	1.17	25.40
Italy	33.35	126.37	1.67	6.32
Japan	-21.60	3.00	-1.08	0.15
Netherlands	-9.55	87.80	-0.48	4.39
Norway	-14.80	35.46	-0.74	1.77
Poland	-19.55	101.71	-0.98	5.08
Portugal	47.70	723.56	2.38	36.17
Romania	0.00	56.64	0.00	2.83
Slovakia	147.80	151.13	7.39	7.55
Slovenia	130.50	223.50	6.52	11.17
Spain	34.00	146.85	1.70	7.34
Sweden	8.45	81.64	0.42	4.08
Switzerland	-45.15	15.31	-2.26	0.77
United Kingdom	-41.15	64.71	-2.06	3.23
United States	-44.05	75.80	-2.20	3.79
Simple Averages				
Euro Area	29.93	241.19	1.50	12.06
All Countries	10.63	170.65	0.53	8.53
Weighted Averages (by Gross Debt in U.S. dollar)				
Euro Countries	13.37	159.98	0.69	8.00
All Countries	-20.42	75.06	-1.02	3.75

Source: Bloomberg

Note: Not all dates available for all countries.

1/ Bloomberg generic government bonds.

[13] Using for the tentative haircut a duration approximation formula and a five-year duration assumption. Banks did their own haircuts calculations bond by bond, therefore haircuts which might differ from the ones above.

F. Solvency Stress Tests

Appendix Table 6. France: Output Tables

			BASELINE					ADVERSE				
		2011	2012	2013	2014	2015	2016	2012	2013	2014	2015	2016
Solvency measures in %	Total Capital	8	8	8	8	8	8	8	8	8	8	8
	Tier 1	4	4	4,5	5,5	6	6	4	4,5	5,5	6	6
	Common / Core Tier 1	2	2	3,5	4	4,5	4,5	2	3,5	4	4,5	4,5
	Conservation Buffer	0	0	0	0	0	0,625	0	0	0	0	0,625
	G-SIB	0	0	0	0	0	0,5	0	0	0	0	0,5
Risk Drivers (for scenario stress test)	Net profit (before losses)											
	Credit losses											
	Losses due to market related risk (excluding sovereign risk)											
	Losses from sovereign debt holding trading book & AFS											
	Risk weighted assets of the banking sector (Total capital)											
Risk Drivers (for scenario stress test), in % of RWAs	Net profit (before losses)											
	Credit losses											
	Losses due to market risk (excluding sovereign risk)											
	Losses from sovereign debt holding trading book & AFS											
	Change in risk-weighted asset (RWAs) *in percent*											
Background	Total Capital ratio , *in percent*											
	Tier 1 -ratio , *in percent*											
	Common Equity / Core Tier 1 ratio , *in percent*											
	Total Capital											
	Tier 1											
	Common Equity / Core Tier 1											
	Return on Total Capital											
	Dividend yield (dividend paid/[Paid up capital + Share premium])											
	Gross direct exposure on sovereign											
	Net direct exposure on sovereign											
	Trading book and FVO portfolio											
	AFS portfolio											
	HTM and L&R portfolio											
Stress test parameters (in percent)	Percentage of profits retained											
	Deductions from Common Equity / Core Tier 1											
	Credit risk											
	PD PiT (performing exposures)											
	LGD PiT (performing exposures)											
	EAD growth											
	RWA / EAD											
	Change of Credit Risk RWAs											
	thereof (if applicable) : securitization in banking book (SEC BB)											
	Change of market risk RWAs											
	thereof (if applicable) : stressed Value-at-Risk (sVaR)											
	thereof (if applicable) : equity standard measurement method (SMM)											
	thereof (if applicable) : incremental risk charge and securitization in trading book (IRC ans SEC)											
			WEO 22 February 2012 (except for inflation rate: BdF)					**BdF estimates 28/02/2012**				
Scenario (in percent)	Real GDP growth	1,7	0,5	1	1,8	1,9	1,9	-1,8	0,2	2,4	2,5	2,3
	Nominal GDP growth	3,3	3,3	2,5	3,6	3,9	3,9	-0,1	0,9	2,9	3,7	4,3
	Unemployment rate	9,7	9,9	10,1	9,8	9,4	9,1	10,2	11	11,1	10,8	10,5
	Nominal short term interest rate	1,4	0,9	0,9	1,3	1,9	2,5	0,9	0,9	1,3	1,9	2,5
	Nominal long term interest rate	3,3	3,4	3,4	3,5	3,6	3,7	4,4	4,1	3,5	3,7	4,1
	Inflation rate (household's consumption deflator)	2	2	1,3	1,3	1,5	1,7	1,9	1	0,6	1,1	1,7
	GDP deflator	1,6	2,8	1,5	1,8	2	2	1,7	0,7	0,5	1,2	2
	Nominal exchange rate (U.S. dollar in euros)	1,39	1,28	1,28	1,28	1,27	1,26	1,30	1,22	1,20	1,20	1,21

G. Liquidity Stress Test

Liquidity Stress Test

Loss of funding (in %)	Up to 1 day	Greater than 1 day up to 1 week	Greater than 1 week up to 1 month	Greater than 1 month up to 2 months	Greater than 2 months up to 3 months	Greater than 3 months up to 6 months	Greater than 6 months up to 1 year	Greater than 1 year up to 2 years
Aggregated cumulative withdrawal of retail deposits								
Aggregated cumulative loss of unsecured wholesale funding								
Aggregated cumulative loss of secured wholesale funding								

Liquidity gap	Up to 1 day	Greater than 1 day up to 1 week	Greater than 1 week up to 1 month	Greater than 1 month up to 2 months	Greater than 2 months up to 3 months	Greater than 3 months up to 6 months	Greater than 6 months up to 1 year	Greater than 1 year up to 2 years
Aggregated cumulated net funding gap								
Aggregated cum. net funding gap after count. capacity without CB support								
Aggregated cum. net funding gap after count. capacity with CB support								

Survival period	Up to 1 day	Greater than 1 day up to 1 week	Greater than 1 week up to 1 month	Greater than 1 month up to 2 months	Greater than 2 months up to 3 months	Greater than 3 months up to 6 months	Greater than 6 months up to 1 year	Greater than 1 year up to 2 years
Number of banks which still meet their contractual obligations without ECB support								
Number of banks which still meet their contractual obligations with ECB support								

Survival period	Mean	Interquartile range (Q3-Q1)	Standard deviation
Estimated survival period (in days) without ECB support			
Estimated survival period (in days) with ECB support			

Sensitivity Stress Test

Estimated maximum potential loss of wholesale funding, by currency, while still meeting contractual obligations during at least 1 month (in %)	Mean	Interquartile range (Q3-Q1)	Standard deviation
EUR			
U.S. dollar			
Other			

APPENDIX VII. CAPITAL DEFINITION

1. **Capital is expected to change for the impact, due to the capitalization of profit or loss after tax**, the phase-in deductions, the grandfathering of capital instruments non-eligible to Title II of Part Two of CRR, and/ or for the amortization of Tier 2 instruments in the last five years following the current regulatory regime.

2. **Other potential changes in the capital amount must be detailed by the banks in the "CRD3_details" and "CRD4_details" of the exercise templates.**

3. **In the time horizon, substitutions of capital instruments (step-up clause) by issuances that have the same quality (Core, Tier 1, Tier 2, Tier 3) and amount are allowed**, but the correct estimation of the cost of capital of the new instruments, reflecting the scenarios, must be reflected in the P&L.

4. **Any capital actions and issuances already launched and with funds transferred to institutions in the sample by April 30, 2012 are being considered in the exercise.** Capital actions and issuances between January 1 and April 30, 2012 will only be considered if they are publicly announced before December 2011 and fully committed by April 30, 2012. These items should also be reported in "memorandum items" in the "CAP" template.

Definition and components

5. **The exercise is based on regulatory regime at the date of the stress taking into account transitional provision (see Title I of Part Ten of CRR).**

Government support measures

6. **No government support measures are assumed.**

Tax effect and evolution of deferred tax assets

7. **The tax regimes will be treated like regulatory changes.** That is as they are at present moment (December 2011) with changes only, if agreed by law and definitely coming in. Deferred tax credits, where applicable, may be recognized.

APPENDIX VIII. DEFAULTED ASSETS FLOW (A-IRB PORTFOLIOS AND STANDARDIZED)

1. **The new defaulted assets** (flows) will be estimated by the banks multiplying the expected default rates at the end of the year (PD'pit) by the EAD at the beginning of each year (EADt), gross of funded credit risk mitigation factors (see Box 1 below).

Box 1. Estimation of Defaulted Assets Flows: Examples for 2012 and 2013

The estimation of defaulted assets flows should be based on the expected default rate at the end of the year = PD'pit.

At the end of year 2012 the defaulted assets flows in 2012, "Default Flows (2012)," should be equal to:

Exp (2011) * PD'pit (2011)

Where:

- Exp (2011) = EAD (2011), gross of funded CRM;
- PD pit (2011) = default rate expected at the end of 2011 for 2012 before the application of the scenario in 2012
- PD'pit (2011) = default rate expected at the end of 2011 for 2012 after the application of the scenario in 2012

At the end of 2013 the defaulted assets flows in 2013, "Default Flows (2013)," should be equal to:

Exp (2012) * PD'pit (2012)

Where:

- Exp (2012) = Exp (2011) – Default Flows (2012);
- PD'pit (2012) = default rate expected at the end of 2012 for 2013 after the application of the scenario in 2013.

Where:

- The expected default rate at the end of the year (PD'pit) should be equal to the individual/asset class probability of default after the application of the stress;
- The EAD at the beginning of each year of the stress exercise should be equal to the exposure value, as defined by the CRD, of the non-defaulted assets, gross of funded credit risk mitigation factors and after adjustment for the balance-sheet growth assumption (for assumptions regarding the evolution of EAD over the stress-test exercise, please refer to Appendix VI on "RWA / Credit risk without securitization positions").

2. **In the estimation of the expected default rates** (PD'pit) the banks are invited to explicitly take into consideration the possible impact caused by the envisaged decrease in the fair value of credit mitigants as well as the most recent events and trends observed by the banks on their loan portfolios before submitting the results to ACP (i.e., worsening of PiT

indicators used by the banks for intercepting at an early stage signals of deterioration in the quality of their portfolios or relevant default on large counterparties).

3. **For simplicity and consistency reasons, the stock of defaulted assets at the end of each forecast year "t" (i.e., years from 2012 to 2016) should be equal to the sum of:**

- the amount of defaulted assets at the end of the previous year (year "t-1"); and
- the expected defaulted flows in year "t." **(A)IRB portfolios**

4. **For the (A)IRB portfolios the default flows to the different rating asset classes should be computed at the end of each year, avoiding releasing only the worst asset classes.**

5. **For this purpose, in each portfolio the total flow of defaulted assets of each year, calculated following the above mentioned procedure, should be assigned to the different rating classes in proportion to the mean EAD-weighted PD'pit of the class.**

6. **For instance (see table below)**, if the PD'pit (t) after the application of the scenario is 10 percent, the Exp (t) is 100 and the portfolio has two rating asset classes, Class 1(CL1) with a PD' pit (t) of 7.5 percent and an Exp (t) of 80 and Class 2 (CL2) with a PD' pit (t) of 20 percent and an Exp (t) of 20.

- the flow of defaulted assets at the end of year t+1 will be equal to 10; and

- of the total defaulted assets, six will be assigned to CL1 and four to CL2.

As a result, the average PD'pit of the portfolio before application of the scenario in year t+2 will be 9.72 percent and the exposure will be 90.

	Year-end: t				Year-end: t+1	
	PD'pit (t)	EAD (t)	Flow of defaulted assets		PD'pit(t+1)	EAD(t+1)
CL1	7,50%	80	6		7,50%	74
CL2	20,00%	20	4		20,00%	16
Total portfolio	10,00%	100	10		9,72%	90

NB: EAD(t) after taking into account the growth in nominal GDP in year t (see Appendix VI for more details on the computation of EAD).

8. **Any deviation from this approach should be clearly justified.** In any case, after application of the scenario and the allocation of default flows, the distribution of the assets across the different rating classes should reflect the recent historical rating migrations observed on the (A)IRB portfolios.

Standardized portfolios

9. **For the purpose of estimating the evolution of the defaulted assets flow after the application of the scenarios,** banks may use internal models which have not been recognized for capital requirements computation, if their use is deemed appropriate and is accepted by the ACP.

10. **When there are no appropriate internal models in use for estimating the PDs'pit, it is expected that banks approximate PDpit** (before the application of the scenarios) using the last observation(s) of default rates at end December 2011 (or the average default rates observed in the last three years). For stress-testing purposes, regarding the 2012-1016 forecast period, banks have to estimate the evolution of those PDpit consistently with the stress-test macro-scenarios (baseline and adverse scenario) and with historical data.

11. **Where appropriate, for the stress testing exercise** the (A)IRB banks are encouraged to extend the application of the forecast regarding the evolution of the default rates after application of the scenario on the (A)IRB portfolios (see above) to SA and (F)IRB portfolios (country/sector).

APPENDIX IX. LOAN LOSSES

Stressed PDs (PIT) and stressed LGDs (PIT)

1. **The impairment flows will be estimated by the banks, both on defaulted and non-defaulted assets, by applying expected loss impairment rates (LGDpit) to exposures.**

2. **The new defaulted assets will be computed by applying the expected stressed default rates** (PDspit) on the initial EAD (gross of funded CRM) of the standardized and (A)IRB portfolios. For an overview on the computation of defaulted asset flow see Appendix VI.

3. **The LGDpit used for the estimation of impairments should usually be different from the LGD downturn parameter used for the calculation of the RWAs for the (A)IRB portfolios. For simplicity and consistency:**

- on defaulted (A)IRB assets the best estimate of LGD is assumed to be equal to the LGDpit; and

- write-off and positive assumptions regarding increasing recovery flows on defaulted assets are not allowed.

4. **The impairment flows on defaulted assets in "year t" should be equal to the sum of:**

- the impairments on new defaulted assets in "year t"; and
- the increase in the impairments of the existing defaulted assets in "year t-1."

5. **The stock of impairments on non-defaulted assets at the end of each year of the stress exercise should be recomputed, reflecting the potential increase in the expected losses and the need for additional impairments.**

Overview (application to Standardized and (A) IRB banks)

(A)IRB Portfolios

6. **For the computation of losses on the new defaulted assets, it is expected that the (A)IRB banks make impairments equal to the best estimate of LGD.** The best estimate of LGD will reflect the analytical evaluation of the single defaulted exposures (updated value of collaterals) and the more recent trends observed in the workout of defaulted assets during the recent crisis. The long term average downturn LGD will be, in any case, used as appropriate benchmark.

Box 2. Impairment Flows on New Defaulted Assets: Examples for 2012 and 2013

The estimation of impairment flows should be based on the expected loss impairment rate on defaulted assets at the end of the year = LGDpit

At the end of 2012 the impairment flows on defaulted assets flows (Specific prov (2012)) should be equal to:

Default Flows (2012) * LGD'pit (2011)

Where:

LGD'pit (2011) = loss impairment rate expected at the end of 2011 for 2012 after application of the scenario in 2012

Default Flows (2012) as defined in Box 1

At the end of 2013 the impairment flows on defaulted assets flows (Specific prov (2013)) should be equal to:

Default Flows (2013) * LGD'pit (2012)

Where:

LGD'pit (2012) = loss impairment rate expected at the end of 2012 for 2013 after application of the scenario in 2013

Impairment Flows on old defaulted assets

The estimation of impairment flows should be based on the expected loss impairment rate on defaulted assets at the end of the year = LGDpit

At the end of 2012 the impairment flows on defaulted assets stocks should be equal to:

[Def Stock (2011) * LGD'pit (2012)] – Stock Specific Prov (2011)

Where:

Def Stock (2011) is the stock of defaulted assets at the beginning of 2012 gross of impairments (Stock Specific Prov (2011))

Stock Specific Prov (2011) = Stock of Impairments on defaulted assets at the beginning of year 2011 = Def Stock (2011) * LGDpit (2011)

At the end of 2013 the impairment flows on defaulted assets stocks should be equal to:

[Def Stock (2012) * LGDpit (2013)] – Stock Specific Prov (2012)

Where:

Def Stock (2012) = Def Stock (2011) + Default Flow (2012)

Stock Specific Prov (2012)=Stock Specific Prov (2011)+Specific Prov (2012)

(F)IRB and standardized portfolios

7. **For the stress testing exercise, the (A)IRB banks, when appropriate, are encouraged to** extend the application of the forecast regarding the average evolution of loss rates (best estimate of LGDpit) after the application of the scenario on SA and (F)IRB portfolios (country/sector).

8. **If there are no appropriate internal models for the estimation of LGDpit**, it is expected that the banks approximate LGDpit (before the application of scenarios) via the last observation of loss rates (2011 yearly impairment flow on new defaulted assets/total new defaulted assets in 2011). For stress-testing purposes, regarding the 2012-1016 forecast period, banks have to estimate the evolution of those LGDpit consistently with the stress-test macro-scenarios (baseline and adverse scenario) and with historical data.

9. **The impact of the macro-economic scenarios should be reflected in the fair value of the credit risk mitigants ("CRM," i.e., financial collateral).**

APPENDIX X. RWA/CREDIT RISK WITHOUT SECURITIZATION POSITIONS

Standardized portfolios

1. **The RWA for the standardized portfolios should be calculated based on the scenarios assuming rating migration as appropriate.** However, for each forecast year "t" of the stress test exercise, the RWA at the end of the previous year (year-end "t-1") should be considered as a floor:[1] for example, the RWA as at end 2011 will be a floor for 2012, the RWA as at end 2012 will be a floor for 2013, etc.

2. **In any case, no rolling out in the application of the (A) IRB models is allowed in the time horizon.**

(A) IRB portfolios

3. **The RWA forecasts over the horizon of the stress-test exercise** (2012 to 2016) must reflect the estimated yearly defaulted/impairment flows and the application of the new regulatory parameters after stress (new PDs, new LGDs) as estimated by the application of the stress test models in use (CRD prescription for obtaining the authorization for the use of the internal models for capital requirements).

4. **As for the standardized approach (see above), RWA on the (A) IRB portfolio for a given year "t" are, in any case, subject to a minimum floor equal to the RWA at the end of the previous year ("t-1").**

Stressed PDs and LGDs

5. **The presence of adequate stress testing methodologies is a requirement for the authorization of the use of internal rating systems for supervisory capital purposes.**

6. **Stress tests comprise a series of methods of varying complexity and sophistication that enable the simulation of the sensitivity of a portfolio to extreme but plausible variations in one or more risk factors scenario analyses.** They involve: a) sensitivity analyses, which are used to assess capital adequacy with respect to a change in one risk factor; b) scenario analysis, which are used to simulate the impact on capital of an adverse shock leading to the simultaneous variation in a set of risk factors.

7. **Banks shall make use of their stress testing methodologies for simulating the impact caused on credit capital requirements (due to evolution of regulatory PDs and LGDs) by the application of the macro-economic scenario (baseline and adverse).** For consistency with the general assumptions of constrained balance sheet growth (i.e., balance-

[1] The assumption is applicable to the Standardized Banks and to the Standardized portfolios of IRB Banks.

sheets assumed to grow in line with nominal GDP) and identical asset allocation, it is assumed that performing EADs2 will also grow in line with nominal GDP, while keeping the same risk profile ; i.e.:

- should the nominal GDP increase in "year t," new originations at the beginning of year t should be assigned to the different rating classes in proportion of the allocation of performing EAD at the end of the previous year;

- should the nominal GDP decrease in "year t," the EAD assigned to each rating class will be reduced in the same proportion, so that the performing EAD at the beginning of "year t" reflect the structure of the performing portfolio at the end of the previous year ("year t-1").

8. **The maturing assets in each year of the exercise are assumed to be immediately replaced in the same year by assets with the same risk and maturity profile.**

9. **The estimation of the credit capital requirements evolution over the stress-test horizon** (2012 to 2016) shall reflect the potential transition of the exposures in the different rating asset classes by the remapping each year of the individual PDs after the application of the scenario to the appropriate rating asset class.

Treatment of IRB excess/shortfall and RWA on defaulted assets (LGD downturn – Best Estimate LGD)

10. **For simplicity and consistency the impairments on the new defaulted assets shall be equal to the best estimate of LGD.** The difference between the LGD downturn and the best estimate of LGD, when the former is bigger than the latter, will be computed as RWA.

11. **The excess/shortfall on old defaulted assets shall be changed according with the expected evolution in the impairment in the time horizon of the exercise (see Box 3).**

[2] EADs considered here at the "beginning of the year," i.e., before applying the stress on PDs and LGDs and before rating migrations subsequent to the stress-test.

Box 3. IRB Excess/Shortfall for Old Defaulted Assets: Examples for 2012 and 2013

At the end of 2012 the IRB excess or shortfall on old defaulted assets should be equal to:

Def stock (2011) * [Best estimate LGD (2011) – Best estimate LGD (2012)] = + excess or - shortfall

Where:

Def stock (2011) = stock of defaulted exposures at the beginning of 2011, according to CRD definition gross of impairments

Best estimate LGD (2011) = the best estimate of the LGD at the end of 2011 before the application of the scenario

Best estimate LGD (2012) = the best estimate of the LGD at the end of 2012 after the application of the scenario in 2012

At the end of 2013 the IRB excess or shortfall should be equal to

Def stock (2011) * [Best estimate LGD (2012) – Best estimate LGD (2013)] = + excess or - shortfall

Where:

Def stock (2011) = stock of defaulted exposures at the beginning of 2011, according to CRD definition gross of impairments

Best estimate LGD (2012) = the best estimate of the LGD at the end of 2012 after the application of the scenario in 2012

Best estimate LGD (2013) = the best estimate of the LGD at the end of 2013 after the application of the scenario in 2013