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IN-DEPTH ANALYSIS

Robustness, Validity and Significance of the ECB's Asset Quality Review and Stress Test Exercise

Author: Thomas Breuer
University of Applied Sciences Vorarlberg

Provided at the request of the
Economic and Monetary Affairs Committee

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Provided in advance of the Supervisory Hearing with
the Chair of the Supervisory Board of the Single Supervisory Mechanism
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Abstract

This Analysis presents in plain language the main features of the Asset Quality Review and the EU-wide stress test 2014 and discusses some key issues in the interpretation of the forthcoming 2014 stress test results. It comments on selected policy issues in the implementation of the asset quality review and the stress tests into supervisory processes.

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CONTENTS

List of abbreviations	4
List of tables	4
List of figures.....	4
Executive summary	5
1. Introduction	7
2. In a nutshell: the EU-wide stress test 2014.....	7
2.1 The macroeconomic stress scenario.....	8
2.2 The scenario in terms of risk parameters	9
Credit risk	10
Market risk.....	11
Securitisation risk	12
Cost of funding and interest income	12
Sovereign risk	12
Non-interest income and expenses	12
3. How plausible, severe, and informative is the scenario?.....	13
3.1 Comparison to Historical Scenarios.....	13
3.2 Comparison to Scenarios Employed Elsewhere	14
3.3 Issues Surfacing in the Academic Literature on Stress Tests.....	15
3.4 Questions and Answers on the Stress Test Method	16
4. Policy issues	18
References.....	20

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LIST OF ABBREVIATIONS

ABCP	Asset Backed Commercial Papers
ABS	Asset Backed Securities
AQR	Asset Quality review
BRRD	Bank Recovery and Resolution Directive
CDO	Credit Debt Obligations
CMBS	Commercial Mortgage Backed Securities
CVA	Credit Value Adjustments
EAD	Exposure at Default
EBA	European Banking Authority
ECB	European Central Bank
GDP	Gross Domestic Product
IRB	Internal Ratings Based approach
NCA	National Competent Authority
LGD	Loss Given Default
PD	Probability of Default
RMBS	Retail Mortgage Backed Securities
RWA	Risk Weighted Assets
SRM	Single Resolution Mechanism
SSM	Single Supervisory Mechanism
VaR	Value at Risk

LIST OF TABLES

Table 1: Comparison of macroeconomic variables in the historical period 2002-2013 and in the adverse scenario.	13
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LIST OF FIGURES

Figure 1: AQR and Stress Tests.....	8
Figure 2: The balance sheet impact of the macroeconomic scenario is calculated in two steps.	10

EXECUTIVE SUMMARY

The European Central Bank (ECB) is performing a comprehensive assessment of major EU banks prior to assuming full responsibility for supervision under the Single Supervisory Mechanism (SSM) in November 2014. The comprehensive assessment consists of (i) an Asset Quality Review (AQR) aimed to enhance the transparency of bank exposures by reviewing the quality of banks' assets, and (ii) a stress test to be performed in close cooperation with the European Banking Authority (EBA) which examines the resilience of banks' balance sheets to stress scenarios.

The EU-wide stress test specifies two scenarios, a *baseline* and an *adverse* scenario. Both scenarios specify a development of risk factors from 2014 to 2016. The baseline scenario is the best prediction with the information available in early 2014, when the stress tests were designed. The adverse scenario is designed to be an adverse development which still should be sufficiently plausible to warrant action upon alarming stress test results.

The AQR is conducted as the first part of the Comprehensive Assessment (Note on the Comprehensive Assessment, European Central Bank, 2014). The results of the AQR should specify the starting-point balance sheet of the bank, which are then submitted to the stress test. In fact, the AQR and the stress test are conducted in parallel. This may result in problematic ex-post modifications of the starting-point balance sheet. Together, the AQR and the stress tests result in a sequence of possible balance sheets of the bank for the years 2014 to 2016, conditional on the baseline resp. stress scenarios (see Fig. 1). If these projected balance sheets show the bank to dispose over sufficient capital even in the stress scenario, the bank is deemed to be safe. If the bank falls short of specified capital levels in the baseline or in the stress scenario, it is expected to submit capital plans to the ECB, which will be assessed by Joint Supervisory Teams (JSTs) of the ECB and national competent authorities (NCAs).

The shocks to the international environment and EU specific shocks combine to the following shocks in EU macroeconomic indicators: GDP falls by around 5 percentage points from its baseline level, for a period of three years, with deviations in various EU countries.

Inflation is around 1 percentage point below its baseline levels, for a period of three years, leading to 2016 prices lower by around 4%. Unemployment is higher than its baseline level by around 2 percentage points with variations in different EU countries, leading to EU unemployment rates of about 12%. Residential property prices fall over the next three years, leading by 2016 to prices around 21% lower than the baseline level (which sees a mild increase in house prices). Commercial property prices fall by 2016 to prices around 15% lower than the baseline level. The adverse scenario is as extreme as the extreme moves in the period 2002-2013, and therefore does indeed have some plausibility.

The macroeconomic scenarios do not determine balance sheets unambiguously. Many risk parameters determining the value of assets and liabilities do not occur among the macroeconomic indicators specified by the scenarios. Therefore the scenario values of the macroeconomic indicators have to be translated into risk parameter values, see Fig. 2. One key step in the quantification of credit risk is the translation of the macroeconomic scenario into point-in-time losses given default (LGDs) and probabilities of default (PDs). As a general principle banks should use their internal models for this step. Banks without appropriate point-in-time models can infer stressed point-in-time parameters from ECB benchmarks. These ECB benchmarks are not publicly available. Thus it is difficult to judge the severity of the resulting scenario in terms of risk parameters. Defaults of sovereigns – and subsequent credit risk losses on sovereign bonds – are assumed not to happen in the stress scenarios.

The stress tests performed on US banks by the Federal Reserve Board (see Board of Governors of the Federal Reserve Board, 2013) differ in an important point from the EU stress tests. Instead of making the static balance sheet assumption, US banks are required to submit with the stress tests a description of all capital actions assumed over the planning horizon. The EU static balance sheet assumption has the virtue that the actual balance sheets as of December 2013 (and not uncertain plans) are submitted to the stress

test, and this initial point is verified in the AQR. On the other hand, the static balance sheet assumption is obviously unrealistic even if the stress scenario becomes reality, since banks would react to the scenario, buying and selling positions, perhaps making capital provisions, or adapting their business model.

The strengths of the 2014 EU stress tests include: First, the 2014 EU stress tests make definite progress on the 2011 stress tests in that the adverse scenario considered in 2014 is more severe than the one in 2011. Second, the more active involvement of the ECB side by side with the NCAs fosters equal treatment of major banks across the EU (the “level playing field”). The stronger role for the ECB has the potential to bring the European banking system closer to the level playing field. It remains to be seen whether the ECB will be successful in this endeavour. Third, the more detailed EBA methodological notes giving stronger guidance to banks and NCAs about how to work out the balance sheet implications of the macroeconomic scenario. Fourth, complementing the stress test exercise with the AQR has the potential to provide undisputed and reliable initial balance sheets serving as starting points for the stress tests.

The weaknesses of the 2014 EU stress tests include: First, the restriction of attention to one adverse scenario might foster an illusion of safety. Banks faring well in this one scenario are not necessarily safe in other scenarios. Analysing at least a handful of scenarios would yield more information on the stability of banks under different circumstances. (For example neither the baseline nor the adverse scenario consider increased litigation costs, the failure of approved recapitalisation plans, or sovereign default risk in the banking book.) Second, the stress tests are designed from a microprudential point of view on individual financial institutions, thus choosing to neglect the macroprudential view on systemic risks. The static balance sheet assumption together with the specification of a fixed scenario independent of the reaction of banks amounts to neglecting second round effects. These second round effects include chain reactions triggered by defaults or value adjustments of interbank assets and liabilities, as well as market effects of fire sales. In the future this weakness might be alleviated if banks are required to specify their reaction to a given scenario. This information could help supervisors to gauge the market impact of banks’ reactions, which is an important but non-trivial task. Third, banks are allowed and encouraged to make heavy use of their internal models in working out the balance sheet implications of the macroeconomic scenarios. Although the internal models are to be checked by the supervisors, there remains substantial leeway in the choice of models. The reliance on internal models might be problematic because internal modellers could misrepresent risks inadvertently or on purpose – a danger, which cannot be not fully eliminated in the quality assurance process. Additionally, internal models may threaten the level playing field.

1. INTRODUCTION

The ECB is performing a comprehensive assessment of major EU banks prior to assuming full responsibility for supervision under the Single Supervisory Mechanism (SSM) in November 2014. The assessment is an important step in preparing the SSM and, more generally, towards bringing about greater transparency of the banks' balance sheets and consistency of supervisory practices in Europe.

The assessment started in November 2013 and will take 12 months to complete, ending in October 2014. It is being carried out in collaboration with the national competent authorities (NCAs) of the Member States participating in the SSM, and supported at all levels by consulting and accounting firms.

The comprehensive assessment is comprised of two main pillars, namely

- the AQR designed to enhance the transparency of bank exposures by reviewing the quality of banks' assets, including the adequacy of asset and collateral valuation and related provisions;
- a stress test to be performed in close cooperation between the ECB and the European Banking Authority (EBA) designed to examine the resilience of banks' balance sheets to stress scenarios.

The comprehensive assessment will conclude with an aggregate disclosure of the outcomes as well as bank level data, together with any recommendations for supervisory measures. This comprehensive outcome will be published prior to the ECB assuming its supervisory role in November 2014.

This analysis presents in plain language the main features of the 2014 EU-wide stress test and the AQR. Furthermore, it discusses the possible significance of the results of the stress tests and the AQR.

2. IN A NUTSHELL: THE EU-WIDE STRESS TEST 2014

This section describes in non-technical language the EU-wide 2014 comprehensive assessment. The description is based on the relevant publications of the ECB and EBA (ESRB European Systemic Risk Board, 2014; European Banking Authority, 2014).

The method of the "join-up" of stress tests and AQR (European Central Bank, Comprehensive Assessment Stress Test Manual, 2014) was published only on August 8, 2014 - at a time when European banks largely completed their input to the stress test exercise.

The EU-wide stress test specifies two scenarios, a *baseline* and an *adverse* scenario. Both scenarios specify a development of risk factors from 2014 to 2016. The baseline scenario is the best prediction with the information available in early 2014, when the stress tests were designed. The adverse scenario is designed to be an adverse development which still should be sufficiently plausible to warrant action upon alarming stress test results.

Scenarios are specified in two steps. First, from a narrative which is formulated so as to give the scenario some credibility, a *macroeconomic scenario* is derived which specifies changes of macroeconomic risk factors. Second, the macroeconomic risk factor changes are translated into changes of the *risk parameters* on which the balance sheets and the regulatory capital calculations of an individual bank depend (see Fig. 2). Then banks simulate the effect of the scenario on both sides of their balance sheets, including capital cushions, and regulatory capital requirements. These stress test results produced by the banks are reviewed in a quality assurance process by the ECB and National Competent Authorities (NCAs).

Additionally, the AQR is conducted as second part of the Comprehensive Assessment. The results of the AQR specify the starting-point balance sheet of the bank, which are then submitted to the stress test. Together, the AQR and the stress tests result in a sequence of possible balance sheets of the bank for the years 2014 to 2016, conditional on the baseline resp. stress scenarios (see Fig. 1). If these projected

balance sheets show the bank to dispose over sufficient capital even in the adverse scenario, the bank is deemed to be safe. If the bank falls short of specified capital levels in the baseline or in the stress scenario, it is expected to submit capital plans to the ECB, which will be assessed by Joint Supervisory Teams (JSTs) of the ECB and NCAs.

A key assumption of the 2014 EU stress tests is that balance sheets are static. Assets and liabilities which mature within the time horizon of the exercise are assumed to be replaced with similar financial instruments in terms of type, credit quality at date of maturity and original maturity as at the start of the exercise at the end of 2013. Obviously this assumption is not very realistic, but it prevents discussions about potential responses of banks over the time horizon of the exercise. Furthermore, this assumptions implies that banks receiving public capital contributions or ECB support will continue to do so until 2016, the time horizon of the stress test exercise.

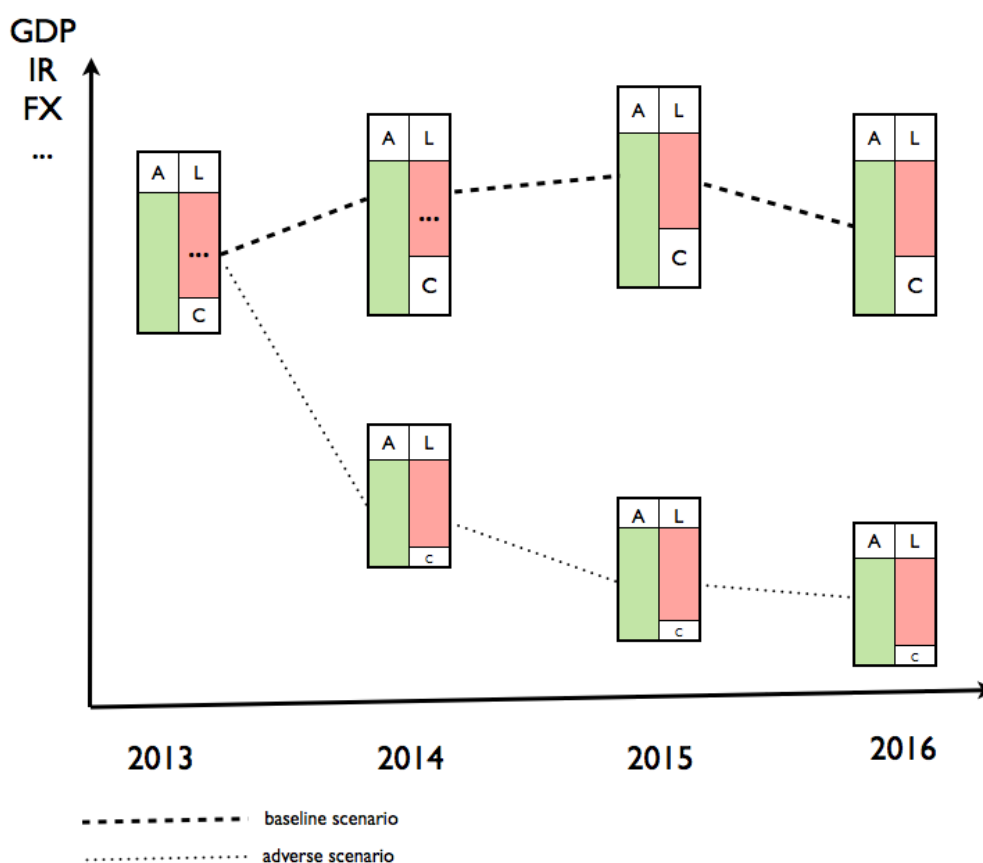


Figure 1: AQR and Stress Tests. The AQR determines the initial balance sheet as of end 2013. The stress tests analyse possible developments of the balance sheet under various scenarios.

2.1 The macroeconomic stress scenario

We briefly summarise the macroeconomic stress scenario. The details of the scenario are laid out in (ESRB European Systemic Risk Board). The macroeconomic stress scenario is an *adverse scenario*, deviating from the *baseline scenario* predicted by the Directorate General for Economic and Financial Affairs (DG ECFIN) European Economic Forecasts as the most probable scenario for the future development of macroeconomic indicators. Both the baseline and the adverse scenario cover the period 2014 – 2016.

- Government bond yields increase to around 100 basis points above their baseline levels, for a period of three years, with deviations in various EU countries.
- Equity prices fall by around 20% compared to their baseline levels, for a period of three years, with deviations in various EU countries.

- Foreign currencies in non-Euro EU countries depreciate by 15% resp. 25%.
- Long term Euro interest rates between defaultable market participants (swap rates) increase by around 100 basis points over the baseline scenario, for a period of three years.
- House prices fall by around 10% compared to their baseline levels, for a period of three years, with deviations in various EU countries. Typically, house price shocks in Northern EU countries are more severe.
- Due to increased funding costs, real GDP falls by around 0.13% compared to its baseline level, for a period of three years, with deviations in various EU countries. Typically, GDP shocks in Eastern EU countries are more severe.
- In the rest of the world, GDP falls by around 5%, and consumer prices fall by around 2% to 16%, with large variations across different regions of the world. This leads to a drop in foreign demand in the EU area of around 10%.

(Shocks to asset markets other than equity, bond, and real estate markets are not assumed.) The shocks to the international environment and the above EU specific shocks combine to the following shocks in EU macroeconomic indicators:

- GDP falls by around 5 percentage points from its baseline level, for a period of three years, with deviations in various EU countries.
- Inflation is around 1 percentage point below its baseline levels, for a period of three years, leading to 2016 prices lower by around 4%.
- Unemployment is higher than its baseline level by around 2 percentage points with variations in different EU countries, leading to EU unemployment rates of about 12%.
- Residential property prices fall over the next three years, leading by 2016 to prices around 21% lower than the baseline level (which sees a mild increase in house prices). Commercial property prices fall by 2016 to prices around 15% lower than the baseline level.

2.2 The scenario in terms of risk parameters

The macroeconomic scenarios do not fix balance sheets unambiguously. Many risk parameters determining the value of assets and liabilities do not occur among the macroeconomic indicators specified by the scenarios. Therefore the scenario values of the macroeconomic indicators have to be translated into risk parameter values.

This translation involves discretionary choices at two points. First, the choice of risk parameters is, to a certain degree, a matter of discretion. Second, macroeconomic indicator values do not determine unique values of the risk parameters but just a distribution of the risk parameters conditional on the stressed values of the macroeconomic indicators. Usually the expectation value of this conditional distribution is taken as a proxy for the risk parameter values. But the conditional distribution depends on a model for the joint distribution. Therefore the translation of macroeconomic indicators into risk parameter values is model dependent.

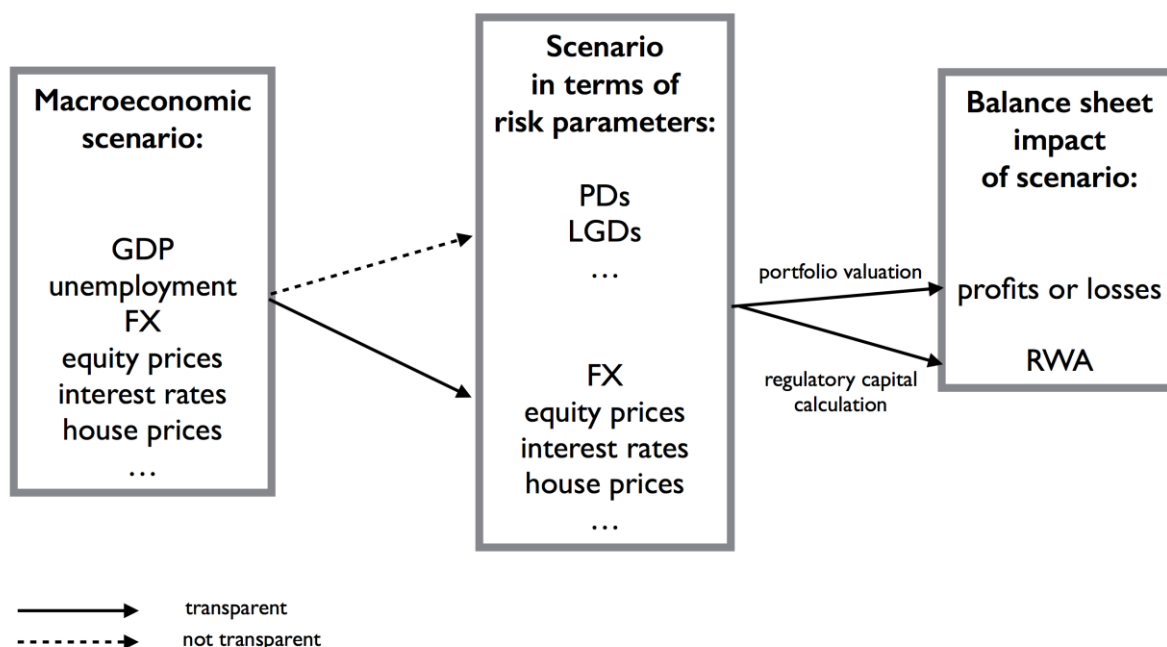


Figure 2: The balance sheet impact of the macroeconomic scenario is calculated in two steps. First, the change of the macroeconomic factors is translated into changes of the risk parameters; second the changes of the risk parameters determine profits or losses and regulatory capital. Due to the heavy reliance on internal models or unpublished ECB benchmarks, the first step is not fully transparent to the public. Thus it is difficult to judge the severity of the resulting scenario in terms of risk parameters.

Too much discretion of banks threatens to endanger the comparability of stress test results across banks and countries. This would jeopardise the goal of the stress tests to render more transparent the state of EU banks. In order to limit the amount of discretion involved in the stress tests the EBA and the ECB have published a methodological note guiding NCAs and banks in the translation of the macroeconomic scenarios into risk parameter scenarios, see (European Banking Authority, Methodological Notes, 2014). In the rest of this section we describe the directions given in that document. As another instrument to restrict the amount of discretion of banks in the stress test exercise, a quality assurance process has been established, in which the ECB together with the NCAs examines and challenges banks' stress test models and results.

Following that document we describe the calculation of the impact the macroeconomic scenario has on credit risk, market risk, securitisation risk, sovereign risk, cost of funding and interest income, and non-financial tangible assets and participations. The resulting numbers are then entered into the appropriate places in the balance sheets to produce the stressed balance sheets.

Credit risk

Credit risk is stressed for all assets in the banking book which are exposed to credit risk, excluding counterparty credit risk, on and off balance sheet positions. The Methodology applied is to use stressed point in time default probabilities (PDs) and point in time losses given default (LGD) for provisioning. (Exposure at Default and Credit Value Adjustments (CVA) are calculated as market risks, as outset below.) Potential rating migration and stressed regulatory parameters are used for the calculation of Risk Weighted Assets (RWA).

One key step in the quantification of credit risk is the translation of the macroeconomic scenario into point-in-time LGDs and PDs. As a general principle banks should use their internal models for this step. Banks without appropriate point-in-time models can infer stressed point-in-time parameters from ECB benchmarks. These ECB benchmarks are not publicly available.

The credit risk methodology strongly relies on the internal risk models of banks. Interactions between market risk and credit risk may lead to an impact of market risk factors on PDs and LGDs. Carry-trades and foreign currency loans are important examples, see Box 1. But most internal risk models used by banks do not account for the dependence of LGDs and PDs on market risk factors. Subsequently these interactions between market and credit risk are not accounted for in the stress tests.

Box 1: Mutual interaction of credit risk and market risk:

The example of foreign currency loans

Consider a foreign currency loan taken by a borrower whose income is in a currency different from the currency of his income (“the home currency”). Depreciation of the home currency is a move of a market risk factor. First, it increases the repayment obligation as expressed in the home currency. Increased difficulties of the borrower to meet the increased repayment obligation are reflected in an increased PD. Second, if the loan is secured by a collateral denoted in the home currency, a home currency depreciation results in a higher loss given default (LGD). Similarly, for a mortgage a drop in another market risk factor, namely real estate prices, will lead to an increased LGD. Third, depreciation of the home currency also results in a higher exposure at default (EAD). The EU stress test methodology in its market risk methodology reflects the third impact of exchange rate depreciations, namely on EADs. But the stress test methodology does not generally account for the first and second impact of exchange rate depreciations, namely the increased PDs and LGDs.

Credit-RWA (which then determines the regulatory capital required to cover credit risk) is to be calculated following the standard regulatory requirements¹, but taking into account the rating migrations and defaults triggered by the stress.

Market risk

The impact of market risk is considered for all positions assessed at fair value, including the trading book and securitisation positions. One factor of credit risk, namely exposure at default (EAD), is also regarded as depending on market risk. Banks with no significant trading activities can calculate the impact of the stress scenario simply as a fixed multiple of their average net trading income over the last three years. Banks with significant trading activities or a Value at Risk (VaR) model in place are required to follow a more complex calculation based on their internal models.

The overall impact of market risk in the stress is calculated as an average of the impact in the baseline resp. adverse scenario, and the impact in four historical scenarios. The ECB provides a set of market risk factor changes in the baseline and the stress scenario, including for example the following:

- Long term interest rates in developed countries increase by 100 to 200 basis points,
- exchange rates remain unchanged, but the volatilities of foreign currencies in the adverse scenario increase by a factor between 2 and 4,
- stock prices in the adverse scenario drop by 20% to 30% in the developed countries, and by almost 50% in the emerging markets,
- EEA countries’ sovereign credit spreads for indirect sovereign exposures increase by around 50% to 100% (with outliers in both directions).

When a material part of a bank’s net trading income is generated by risk factors outside the set specified by the ECB, banks have to include those additional risk factors and estimate appropriate stress changes for them.

¹ CRD IV (European Parliament and Council, 2013) and CRR (European Parliament and Council, 2013).

Securitisation risk

Securitisation positions include Asset Backed Commercial Papers (ABCP), Retail Mortgage Backed Securities (RMBS), Asset Backed Securities (ABS), Credit Debt Obligations (CDO), and Commercial Mortgage Backed Securities (CMBS).

For securitisation positions not held for trading the impact of the stress scenario is estimated in a way similar to credit risk impact, with an estimation of the impairments (all credit risk related adjustments, due to downgrades or defaults, and regardless if those take the form of provisions or not). For securitisation positions which are marked-to-market, the loss incurred in the scenarios is estimated according to the market risk methodology.

The RWA calculation for securitisations is calculated according to the applicable prudential framework, but with the original risk weights substituted by pre-defined increased weights specified explicitly by the ECB and EBA. Depending on the kind of securitisation the risk weights are typically three times higher than the normal risk weights.

Cost of funding and interest income

The impact of the changed interest rates in the macroeconomic scenario has an impact on funding costs and interest income. Banks are expected to develop their own models how the stressed interest rate environment affects their lending and funding rates, and the pass-through of the change in the cost of funding to the lending rates. Banks' approaches and projections are subject to the usual quality assurance process of the stress tests. Additionally, in order to ensure the consistency of banks' projections with the macroeconomic scenario, banks are required to at least reflect the changes in domestic sovereign bond spreads.

The static balance sheets assumption in this context is interpreted as implying that the size of the respective portfolios is constant and that maturing assets will be replaced by new positions of the same type. But the interest paid or received on the new positions will in general differ from the interest on the maturing positions. Callable debt liabilities and sight deposits are assumed to be exercised on the first possible date.

Sovereign risk

For sovereign positions in the banking book the impact of the stress scenario is estimated in a way similar to credit risk impact, with an estimation of the impairments. For sovereign positions in the trading book and fair value positions the loss in the stress scenarios is estimated according to the market risk methodology, with sovereign's credit spreads increasing by 50% to 100% and valuation haircuts for long term (10 yr) sovereign bonds of about 20%.

Defaults of sovereigns are assumed not to happen in the stress scenarios.

Non-interest income and expenses

Banks can either use their own method in projecting non-interest income and expenses under the stress scenarios, or take the average of the non-interest income in the two years with the smallest ratio of non-interest income to total assets and assume operating expenses remaining at the level of 2013.

3. HOW PLAUSIBLE, SEVERE, AND INFORMATIVE IS THE SCENARIO?

This section discusses the plausibility and the severity of the 2014 stress test scenarios, and the information content realistically expectable of the stress test results. This is done from three points of view:

- comparison to historical scenarios,
- comparison to stress scenarios employed earlier in Europe and the United States,
- discussion of issues surfacing in the academic literature on stress tests

Questions and answers on the stress test method serve as a summary of the section.

3.1 Comparison to Historical Scenarios

Table 1 compares the extremal yearly moves in the adverse scenario to the historical maximal resp. minimal changes of the macroeconomic variables in the period 2002–2013. We see that the GDP change assumed in the adverse scenario (-3.4% for 2015) is not quite as severe as the worst historical value in the period 2002 – 2013.² Inflation in the adverse scenario is lower than the historical minimum 2002-2013. The house price index in the adverse scenario falls considerably more than the historical minimum 2002-2013.³ The drop in equity prices is much milder in the adverse scenario than the worst historical drop 2002 – 2013. Summing up, it is probably fair to say that the adverse scenario is about as extreme as the extreme moves in the period 2002-2013. In this sense the adverse scenario does indeed have some plausibility.

Table 1: Comparison of macroeconomic variables in the historical period 2002-2013 and in the adverse scenario.

	Adverse scenario maximal yearly relative changes 2014-2016	Maximum resp. Minimum yearly changes 2002-2013 (source: Eurostat resp. Euro Stoxx)
GDP EU27 (annual real growth rate)	-3.4%	min [2002-2013]: - 4.5% max [2002-2013]: 3.4%
Inflation EU27 (HICP annual av. Rate of change)	min[2014-2016]: 0.0% max[2014-2016]: 1.1%	max [2002-2013]: 3.7% min [2002-2013]: 1.0%
Unemployment rate EU27	min[2014-2016]: 11.3% max[2014-2016]: 13.0%	max [2002-2013]: 10.8% min [2002-2013]: 10.2%
House price index EU27	-14%	min [2011Q4-2014Q1]: -1.9%

² Extending the historical period beyond 2002, World Bank data (<http://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?page=6>) show for example for France that the worst annual GDP change assumed in the adverse scenario (-2.8%) was surpassed historically in the period 1980 – 2013 only in one year, namely in 2009 with a value of -3.1%. For most other EU countries as well, the GDP reductions assumed in the adverse scenario were slightly surpassed only once historically since 1980, namely 2009.

³ Extending the historical period for house price index beyond 2011, German data (http://www.bulwiengesa.de/sites/default/files/immobilienindex_2014_0.pdf) suggests that the 12.5% house price reduction assumed for Germany in the adverse scenario is severe, compared to the historically most severe annual house price reduction in the period 1975 – 2013 of only 5.6%.

10y interest rates (yield on gvt bonds)	4.4%	min [2004-2013]: 2.95% max [2004-2013]: 4.56%
Euro Stoxx 50	-19.2%	max [2002-2014]: +59.5% min [2002-2014]: -51.9%

This judgement comes with three important caveats. First, Table 1 shows macroeconomic variables for the EU 27 but not for individual countries. Both in the historical data and in the adverse scenario variations across countries are large. Second, Table 1 considers only the macroeconomic variables. In order to evaluate the impact of the scenarios on bank balance sheets, the macroeconomic variables have to be translated into risk parameter moves, see Section 2.2 and Fig. 2. There is much discretion involved in this translation, and indeed for important risk types banks are encouraged or required to use their own internal models for this translation. Therefore it is difficult to say that the adverse scenario describes a situation which is potentially very harmful to the average bank. Internal models are developed by banks and then examined and approved by supervisors, possibly with modifications required. Still, different internal models for similar portfolios can produce significantly different results.

Third, plausibility should be judged in a multivariate framework, taking into account correlations, not just on the size of individual risk factor moves. Simultaneous moves of risk factors against their statistical correlations renders a scenario more implausible. However, correlations in times of crisis may differ markedly from correlations in quiet times (Hartmann, Straetmans & de Vries, 2004; Kalkbrener & Packham, 2013). From this point of view it is interesting to note that in the adverse scenario all important markets are in a downturn. This is not very plausible for negatively correlated markets, where in times of crisis one often observes “flight to quality”. When one market takes a severe downturn, investors withdraw their funds and invest them in other, hopefully safer markets. The safe haven market then typically goes upward. In the adverse scenario there is no important market going upward.

3.2 Comparison to Scenarios Employed Elsewhere

The EBA-ECB 2014 Stress Test is not the first stress test for European banks, and it is not the only stress test exercise this year.

The stress tests performed on US banks by the Federal Reserve Board (see Board of Governors of the Federal Reserve Board, 2013) differ in an important point from the EU stress tests. Instead of making the static balance sheet assumption, US banks are required to submit with the stress tests a description of all capital actions assumed over the planning horizon.

The static balance sheet assumption has the virtue that the actual balance sheets as of December 2013 (and not uncertain plans) are submitted to the stress test, and this initial point is verified in the AQR. On the other hand, the static balance sheet assumption is obviously unrealistic even if the stress scenario becomes reality, since banks would react to the scenario, buying and selling positions, perhaps making capital provisions, or adapting their business model. Thus, even in the stress scenario the actual balance sheet would be different from the stressed balance sheet produced by the stress test exercise.

Other differences between the 2014 US and EU stress tests are the use of an additional scenario in the US stress tests, dubbed the severely adverse scenario. Furthermore, the US stress tests are defined in terms of a different set of variables: for the Euro area, developing Asia, Japan, and the UK, the GDP growth, the inflation, and the exchange rates to the US dollar are specified. In contradistinction, in the EU stress tests exchange rate changes are assumed to have an impact only on market risk, but not on credit risk (PDs and LGDs) which for a typical bank requires considerably more regulatory capital. This assumption neglects the influence of exchange rates on PDs and LGDs, which is highly relevant for foreign currency loans (see Box 1) like the ones extended to Central European customers over the last two decades or to Thai companies before the 1997 crisis.

The EBA-ECB adverse scenario and the US Fed severely adverse scenario are of comparable magnitude. The GDP downturn in the US Fed severely adverse scenario is slightly more severe than the EBA-ECB adverse scenario for the US and European economies, slightly less severe for the UK economy. The EBA-ECB adverse scenario is more persistent, whereas the US Fed severely adverse scenario assumes a quicker recovery.

3.3 Issues Surfacing in the Academic Literature on Stress Tests

I briefly sketch four issues from the academic literature on stress tests, following Breuer, Jandacka, Rheinberger & Summer, 2009.

A first issue is the choice of stress scenarios. On the one hand a stress scenario should be sufficiently severe to deserve the name stress scenario. On the other hand scenarios should be sufficiently plausible. Even very alarming stress test results hardly warrant action if the underlying scenario is highly implausible. In this respect it seems the macroeconomic scenario of the 2014 EU stress tests strike a good balance between severeness and plausibility.

A second issue is the use of the same scenario for all banks.⁴ On the one hand this is motivated by the desire to understand the behaviour of the European banking system. Analysing different scenarios for different banks would not yield useful information about the situation of the banking system. On the other hand, analysing just one fixed scenario does not give reliable information about an individual bank. The fact that some bank fares well in one particular scenario does not imply it survives all scenarios. What is a harmful scenario for one bank might be a lucky strike for another. It would be premature to interpret a positive stress test result in one scenario as implying the bank is safe under all circumstances. It may happen, and did happen in the past, that some bank fares well in a regulatory stress scenario, but fails shortly afterwards in a different situation. (For example, increased litigation costs do not figure in the baseline or the adverse scenarios of the 2014 stress tests, but may still be material risk to some European banks.)

The force of this argument hinges on the heterogeneity of European banks. If banks are very similar to each other the adverse stress scenario might indeed be close to the worst case for most banks; in this case a bank faring well even in this almost worst case can indeed be deemed safe. But if banks are very different from each other, their worst case scenarios are very different from each other; passing well in one scenario does not imply much for other scenarios. We might be in for more surprises after the stress tests.

A third issue is the neglect of second round effects implicit in the static balance sheet assumption. The 2014 stress tests take the stress scenario as given and analyse how banks are affected by the given scenario. In reality the reaction of banks feeds back to the markets. Shocks are at least partially endogenous, made by the banks participating in the markets. Second round effects include chain reactions triggered by defaults or value adjustments of interbank assets and liabilities, as well as market effects of fire sales. Banks as market participants will react to developments on the market, and in turn their reaction will contribute to development of markets.

Finally, entering the stress test results for various risk types into the appropriate places of the balance sheet amounts to a summation of losses caused by the different risk types, a procedure which might underestimate losses if the interaction between risk-types is non-negligible (see Breuer, Jandacka, Rheinberger & Summer, 2010).

⁴ Only for market risk VaR banks have to analyse four historical scenarios in addition to the baseline and adverse scenarios.

3.4 Questions and Answers on the Stress Test Method

What are the specific strengths and weaknesses of the 2014 comprehensive assessment?

Strengths:

- The 2014 EU stress tests make definite progress on the 2011 stress tests in that the adverse scenario considered in 2014 is more severe than the one in 2011.
- Another strength of the 2014 stress tests is the more active involvement of the ECB side by side with the NCAs. The stronger role for the ECB has the potential to bring the European banking system closer to the level playing field. It remains to be seen whether the ECB will be successful in this endeavour.
- The third strength of the 2014 stress tests are the more detailed EBA methodological notes giving stronger guidance to banks and NCAs about how to work out the balance sheet implications of the macroeconomic scenario.
- Complementing the stress test exercise with the AQR has the potential to provide undisputed and reliable initial balance sheets serving as starting points for the stress tests.

Weaknesses:

- First, the restriction to one adverse scenario might foster an illusion of safety. Banks faring well in this one scenario are not necessarily safe in other scenarios. Analysing at least a handful of scenarios would yield more information on the stability of banks under different circumstances. (For example neither the baseline nor the adverse scenario consider increased litigation costs, the failure of approved recapitalisation plans, or sovereign default risk in the banking book.)
- Second, the stress tests take a microprudential point of view on individual financial institutions, thus choosing to neglect the macroprudential view on systemic risks. The static balance sheet assumption together with the specification of a fixed scenario independent of the reaction of banks amounts to neglecting second round effects. These second round effects include chain reactions triggered by defaults or value adjustments of interbank assets and liabilities, as well as market effects of fire sales. In the future this weakness might be alleviated if banks are required to specify their reaction to a given scenario. This information could help supervisors to gauge the market impact of banks' reactions, which is an important but non-trivial task.
- Third, banks are allowed and encouraged to make heavy use of their internal models in working out the balance sheet implications of the macroeconomic scenarios. Although the internal models are to be checked by the supervisors, there remains substantial leeway in the choice of models. There is not one true model. The use of different models threatens the level playing field.

Is the 2014 asset quality review and the stress test (combined also: comprehensive assessment) exercise apt to evidence whether the euro area banking sector sufficiently well capitalized to withstand even a severe worsening of economic conditions?

The AQR will probably bring more clarity about the current state of European banks, although there remains considerable discretionary leeway in the judgement of asset quality. It remains to be seen whether the involvement of the four big accounting firms in the AQR helps to improve consistency of write-off decisions across the EU. Supervisors gave a key role in the review of banks' financial statements to the same accounting firms who were heavily involved in the original audit. This might be practical given the restricted resources of the ECB and the NCAs, but could set counterproductive incentives.

The information content of the stress test exercise is probably restricted for the reason given above: The restriction to one adverse scenario might foster an illusion of safety. Banks faring well in this one

scenario are not necessarily safe in other scenarios. Additionally, the leeway given to banks in calculating the balance sheet implications of the adverse macroeconomic scenario makes it difficult to compare stress test results at different banks.

Can the input parameter of the 2014 stress test exercise be considered as sufficiently challenging to ensure its credibility, given that previous stress test exercises of EBA were often criticised as being too lenient? Does the methodology for the 2014 stress test exercise take sufficiently into account key criticisms levelled at previous stress tests?

Roughly speaking the 2014 adverse macroeconomic scenario is more severe than the 2011 scenarios. But the macroeconomic scenario by itself does not pin down the balance sheet impact (see Fig. 2). The methodological notes published by the EBA contribute to narrow down the leeway banks have determining the balance sheet impact, but there remains considerable leeway due to the use of different internal models. The ECB has the opportunity to further reduce the leeway by playing an active role in the quality assurance process of the stress tests.

The severity of the scenario in terms of risk parameters (see Section 2.2) is hard to judge on public information alone. Credit risk, which at typical banks accounts for the bulk of regulatory capital, is stressed on the basis of internal models or on ECB benchmarks of point in time LGDs and PDs, none of which is publicly available. The strong reliance in internal models harms the transparency of the stress tests and will make the interpretation of stress test results more difficult.

Is there any reason for concern that the 2014 stress test exercise is too much focused on the origins of past crises, rather than preparing for future risks, such as very low inflation?

The use of a small number of scenarios always increases the chances of missing out important sources of damage. By restricting themselves to just *one* adverse scenario ECB and EBA run a high risk to miss out dangerous potential developments. Compared to this criticism it is less relevant whether the scenario considered is inspired by historical experience or by supposed weaknesses of banks.

Not analysing a very low inflation scenario for two reasons probably does not harm additionally the significance of the stress tests: First, the inflation rate in the adverse scenario is already below the historically observed inflation rates. Second, a very low inflation would supposedly lead to a reduction in demand and subsequently in GDP. But a severe reduction of GDP is anyway part of the adverse scenario considered in the 2014 stress test.

4. POLICY ISSUES

This concluding section suggests possible policy recommendations, answering some questions formulated by the European Parliament, DG Internal Policies of the Union, Directorate A – Economic and Scientific Policies.

Is there any reason for concern that the discretion left to national authorities in the context of the coordinated 2014 stress test exercise can be used in a way that harms a level playing field in Europe?

The 2014 stress test exercise leaves considerably less leeway to banks than the 2011 stress test. The quality assurance process and the detailed methodological notes are two key tools in narrowing down the leeway. The joint involvement of the ECB along with NCAs in the quality assurance process has the potential to foster both, the European level playing field and the more detailed information available on the national level. The construction gives the ECB an important role in ensuring the comparability of stress test results of banks in different countries. Whether the ECB has sufficient resources available already in mid-2014 to fill this role remains to be seen.

But, as pointed out above, there still remains considerable discretionary leeway for banks and for NCAs. In particular, the heavy reliance on internal models is a serious obstacle to the comparability of stress test results of different banks. Additionally, there is much discretionary leeway in the AQR. Decisions about when and how much to write down involve a considerable amount of judgement and sometimes can be taken with hidden strategic considerations (see Advisory Scientific Committee of the ESRB, 2012).

Apart from that, the “escape clause” (of Art. 32 (4) point d (iii) of the BRRD) allows for an injection of public funds bypassing the resolution tools of the BRRD/SRM regime in case the AQR or the stress tests reveal a capital shortfall. Although the application of this escape clause is subject to approval of the Union State aid framework, it exemplifies the strong role of national authorities in the BRRD/SRM regime.

In the stress test exercise the ECB takes the main responsibility but has to rely on resources and information from the NCAs, there is asymmetric information, and the incentives might not be fully aligned. (This makes the AQR and the stress test exercise a principal-agent problem with the ECB playing the role of the principal.) It might be worthwhile to scrutinise the design of cooperation between the ECB and NCAs with a view to optimising the alignment of incentives.

What impact may the strengths and weaknesses have on the goals to enhance transparency on the condition of banks, to identify the need for corrective action, and to overall build confidence in the financial system?

The question makes the assumption that stress tests can simultaneously serve the three goals of (i) enhancing transparency, (ii) identifying the need for corrective action, and (iii) building confidence in the financial system. This underlying assumption is debatable. In particular, the goals (i) transparency and (iii) confidence building might exclude each other. In case a bank or a substantial part of the banking system is in bad shape, transparency might in fact reduce confidence in the system. It is hard to predict which part of the information released after the stress tests is digested by the markets in which way. As an example remember the publication of government bond holdings by individual banks in the 2011 stress tests. This information made it clear to investors that important EU banks would be hit very hard by the default of a EU government. This insight clearly informed the strategy of investors during the subsequent sovereign debt crisis.

Furthermore, the compulsory precautionary recapitalisation measures envisaged in cases of capital shortfalls revealed by stress tests may have negative systemic side effects. If recapitalisation is not

feasible on capital markets, either the taxpayer needs to provide fresh capital, or holders of junior debt, convertible bonds or equity take losses. Taxpayer involvement, if admissible at all under the “escape clause”, might be problematic for political reasons. Burden sharing by holders of junior debt, convertible bonds or equity, has systemic side effects if the holders of those positions are again part of the banking system. (It is striking that capital shortfalls in the stress scenarios may have systemic consequences similar to real losses, although the stress scenarios are fictitious.) A possible remedy is to reduce the interconnectedness of the financial system by limiting the amount to which financial institutions may hold debt and equity of other financial institutions.

Still, the AQR and the stress tests probably enhance the safety of the banking system by inducing banks to proactively clean up their balance sheets before hidden risks are made public after the stress tests. Additionally, the availability of mechanisms for recapitalising or unwinding banks should help to build confidence (see Advisory Scientific Committee, 2012).

Is there any reason for concern as regards the functioning of the agreed framework for home-host cooperation in carrying out the comprehensive assessment?

Since the majority of AQR and stress test results are reported in a consolidated way, the home-host cooperation between NCAs is a side issue. The EBA can be expected to play a key role in ensuring effective communication and coordination between home and host authorities in the framework of colleges of supervisors.⁵

Given that the ECB has not yet published details on how the AQR results and the stress test results will be merged, is there any reason for concern that losses which de-facto are very likely to incur in the short term are deferred to a future stress case scenario?

The ECB published details of the join-up (European Central Bank, Comprehensive Assessment Stress Test Manual, 2014) only on August 8, 2014 - at a time when banks have largely completed their input to the stress test exercise. From a methodological point of view, the AQR should first determine the initial balance sheets, which then in a second step are subjected to the stress tests, see Fig. 1. In fact this year the two parts of the exercise are performed in parallel. This procedure raises the question how to deal with cases where the AQR results in changes to the initial balance sheets. There will probably not be enough time to fully repeat the stress tests with the new initial balance sheets.

⁵ See <https://www.eba.europa.eu/documents/10180/669262/2014-04-29+FAQs+Stress+Test+-+April+2014.pdf>, page 2.

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