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**Working Paper**

## Who is afraid of the asset quality review? Potential losses and capital shortfalls in the European banking system

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### **Potential Losses and Capital Shortfalls in the European Banking System**

Thomas Bonczek, Clemens Fuest,  
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# **Who is afraid of the Asset Quality Review?**

**Potential Losses and Capital Shortfalls  
in the European Banking System**

Thomas Bonczek, Clemens Fuest, Michael Schröder

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<sup>1</sup> Research contributions of Thomas Bonczek were conducted during his time at the ZEW.

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## 1 Introduction

The creation of a banking union is widely seen as a key element of institutional reforms towards more financial and economic stability in Europe. Its objective is to improve the effectiveness of banking regulation and supervision and to sever the link between the finances of national governments and the banks in the Eurozone, which was a destabilising force in the European debt crisis.

A key element of the banking union is the creation of a single supervisory mechanism. At the end of 2014, the European Central Bank will take over the responsibility for banking supervision in the Eurozone. It will directly supervise the largest and systemically most important banks in the Eurozone, a group of approximately 130 financial institutions. Before assuming its new task the ECB intends to investigate the financial solidity of these banks in the framework of a 'comprehensive assessment'. It is the objective of this assessment 'to enhance the transparency of the balance sheets of significant banks in the euro area, and in so doing, to trigger balance sheet repair where necessary, as well as to strengthen confidence.'<sup>2</sup>

The asset quality review (AQR), a review of the quality of different types of assets including underlying collateral will be the most important element of this assessment. The assessment will be combined with a stress test.

The AQR and the stress test linked to it raise a number of questions. How large will the capital shortfall be? Which banks and which member countries will be affected? How does the type and level of capital thresholds used in the stress test affect the results? How will the required capital be raised? Clearly, the answers to these questions depend on what the ECB and the national authorities participating in the exercise will find in the review. But the

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<sup>2</sup> European Central Bank (2014a), p.1

results will also depend on the structure of bank balance sheets with current valuations. It is therefore interesting to ask whether, on the basis of publicly available information, anything can be said about the magnitude of the existing capital shortfalls<sup>3</sup> that can be expected. In this paper we calculate hypothetical capital shortfalls by studying various stress test scenarios using publicly available bank balance sheet data.

A related, widely discussed issue is whether banks have already reacted and taken measures addressing capital shortfalls before the review begins. We investigate this by comparing bank balance sheets in 2012 and 2013.

We start with a status quo scenario and calculate the capital shortfall for the common tier 1 (CET1) capital thresholds of 5.5, 8 and 12 % of risk weighted assets as well as book equity to asset ratios of three and four per cent. As a second step, we consider a scenario where 50% of the currently non-performing loans have to be written off. Thirdly we assume that, in addition, 5% of the loans currently classified as performing are reclassified as non-performing. We then consider a market downturn scenario where specific assets that are held in banks' own portfolios (trading securities, assets held for sale, as well as held-to-maturity securities and investments in associates) lose 10% of their value.

For the analysis of these scenarios we use data from the Bankscope database. Our analysis includes the 128 banks that were originally selected to be covered by the ECBs comprehensive assessment.<sup>4</sup> For most of these banks

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<sup>3</sup> We define capital shortfalls as the amount of debt funding which would have to be converted to equity to meet capital requirements, keeping the size of the balance sheet stable. An alternative but less straightforward approach would be to calculate the deleveraging which is required to meet the capital thresholds.

<sup>4</sup> On September 26<sup>th</sup> the ECB reported that the number of banks subject to the AQR is 131, or 127 banking groups. The full list of the banks included in the AQR is listed in European Central Bank (2014b). See also the corresponding statement on the ECB's



almost complete balance sheet data are available for 2013. We also conduct the analysis for the year 2012. This allows us to estimate the changes of bank capital and capital shortfalls over the year 2013. As mentioned above, this is interesting because many observers argue that the upcoming AQR has already induced many banks to strengthen their capital base.

In addition, we address the issue of financial stability risks posed by the fact that banks are heavily invested in government bonds. We do so by considering the capital shortfalls that would arise in the case of a restructuring of government debt. Due to data limitations we can only do so for a sample of 49 large Eurozone banks for which the data on sovereign bond holdings is provided by the EBA. These banks still account for about 77% of the assets of the banks included in the AQR.

Our main findings are as follows. Under current valuations most banks in the Eurozone reach the 8% CET1 threshold. The Eurozone-wide capital shortfall would only be 660 mn Euros, a very significant reduction compared to the capital shortfall of 15 bn Euros that would exist on the basis of the balance sheet data for 2012. While the CET1 threshold thus leads to a negligible shortfall in 2013 data, things are different if we choose a book-equity-to-asset ratio of 3% as the relevant benchmark. For this case we find a capital shortfall of 19 bn Euros. But compared to 2012 things have improved here as well. The shortfall for 2012 was much higher (64 bn Euros). More ambitious capital ratios would, unsurprisingly, lead to higher shortfalls.

In the stress scenario, where half of the nonperforming loans are written off, the overall sum of write offs for the large banks in the Eurozone would be about 455 bn Euros, but most of this amount is covered by provisions. To achieve the 8% CET1 threshold banks would need to raise 12 bn Euros. Again,

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website: <https://www.ecb.europa.eu/ssm/assessment/html/index.de.html>.

In our calculations we stick to the 128 banks initially selected to be part of the AQR.

achieving a book equity to asset ratio of 3% would be more ambitious and requires 23 bn Euros. Adding 5% of the loan portfolio to the nonperforming loans that are written off would raise the 3% book equity shortfall to 56 bn, of which 13.1 bn would occur in Dutch banks, 13 bn in French and 12 bn in German banks.

Finally, the market downturn scenario (minus 10% on banks' own portfolios) would lead to a capital shortfall of 154 bn Euros for the 8% CET1 threshold and 167 bn Euros for the 3% book equity to asset ratio. This time the highest capital shortfall (regarding the book equity ratio) would be that of Germany with 67 bn Euros followed by France (54 bn). For a 4% book equity to asset ratio, the overall capital shortfall increases to 306 bn Euros.

Our analysis shows that, under the relatively benign scenarios considered here, the capital shortfalls that occur relative to the 8% CET1 threshold are certainly manageable. While write-offs of nonperforming loans are likely to occur, there are considerable provisions that can absorb losses, in particular in Spain and Italy, but also in France. In contrast, using the book equity to asset threshold leads to much higher results for the capital shortfall and these shortfalls would also affect Germany and France.

Regarding the impact of government debt restructurings our results show that many banks are heavily invested in domestic government bonds. But nevertheless, due to relatively high common tier 1 capital most banks would still meet the 8% benchmark after a haircut of, for example, sovereign debt in Portugal. Even a haircut in a large country would not change this result significantly. For instance, a 40% haircut on Italian government bonds would cause bank losses in the Eurozone of about 75 bn Euros, but of which 54 bn Euros would only hit Italian banks. The 8% CET1 benchmark would only lead to a shortfall in Italian banks of about 26 bn Euros.

In the literature, stress tests in the European banking system and the different aspects of banking union have been discussed intensively. The contribu-

tion most closely related to this paper is Acharya and Steffen (2014). They also use bank balance sheet data to assess bank capital shortfalls for different stress test scenarios. The main difference to this paper is that we consider different and additional scenarios and use more up-to-date data. In particular, Acharya and Steffen (2014) do not look at government bonds exposures. In this regard our paper is complementary to Acharya and Steffen (2014). Our paper uses the 2013 balance sheet data and, in combination with the data for 2012, we are able to show whether and by how much banks improved their capital base over the year 2013.

As the capital shortfall regarding the CET1 benchmarks and the book equity ratio decreased significantly over the year 2013, banks in the Eurozone must have improved their CET1 ratio as well as reduced their leverage ratio. The (unweighted) average CET1 ratio over all 128 banks increased to 15.4% in 2013, an increase of more than 2 percentage points over the year. The average book equity ratio also increased, from 6.1% at the end of 2012 to almost 6.9% one year later. Banks used different strategies to improve the equity ratios: Many banks chose to reduce risk-weighted and total assets, but there are also quite a few that increased equity.

The rest of this paper is set up as follows. In section 2 we provide a brief description of the ECB's comprehensive assessment of the European banking system. In section 3 we describe the data we are using and provide some descriptive statistics, particularly regarding the changes between the years 2012 and 2013. Section 4 includes the scenarios and the results of our analysis. In section 5 we discuss the findings and the policy conclusions emerging from the analysis.

## 2 The comprehensive assessment and the AQR

The AQR aims at assessing the systemic stability of the European banking system by evaluating the adequacy of the equity of the 131 most important European banks.<sup>5</sup> This evaluation is done in two steps. The first step is the assessment of the status quo. The second step consists of the application of a stress scenario to banks' assets. The results are to show whether banks are able to withstand various crisis scenarios. In both steps the EBA estimates the gap between certain benchmarks for the capital requirements and banks' equity. How banks will react to equity gaps is an open question. Most likely, they would react by a combination of deleveraging and increasing their equity.

Under the stress scenario the following risk categories will be affected: credit risk, market risk, sovereign risk, securitization, and cost of funding. The assets that will be stressed include both the trading book and the banking book. The results of the AQR will be published at the end of October 2014.

The benchmarks for the capital requirements are 8% common equity tier 1 (CET1) for the status quo scenario and 5.5% for the stress scenario. The 8% CET1-ratio consists of 4.5% core tier 1 equity, a surcharge of 1% for systemically important financial institutions, and 2.5% capital conservation buffer. For the stress scenarios it is assumed that banks are allowed to use the capital conservation buffer completely to compensate for losses. Therefore the minimum capital requirements are reduced to 5.5% in the crisis scenario.

Our analysis has two aims: first, our results can be interpreted as a prediction of the results of the comprehensive assessment as we conduct a similar investigation on aggregated bank data, albeit without reviewing current asset

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<sup>5</sup> See e.g. European Central Bank (2014a, b) and European Banking Association (2014).

valuation. Second, we intend to provide additional insights into the stability of the banking system by applying stress tests which will not be part of the AQR (e.g. haircut on the sovereign debt of Portugal, Spain, and Italy), as well as by using additional benchmarks for the capital requirements. And third, we investigate the change of bank risk over time by analyzing both the balance sheet data of 2012 and of 2013.

Obviously, the ECB and the EBA will have much more detailed information on the bank's risk exposure and the quality of the assets. As our study uses only balance sheet data it is based on the (publicly available) information set of informed capital market participants. Therefore our results should be similar to the expectations of these market participants.

### 3 Data

For our analysis we use balance sheet data for 128 banks which will be investigated in the AQR.<sup>6</sup> For most of these banks almost complete balance sheet data are available from the Bankscope database. For the evaluation of the effects of a haircut on sovereign bonds we restrict our analysis to 49 large European banks for which the EBA provides detailed data on the sovereign bond holdings. The total assets of these 49 banks amount to approximately 77% of the total assets of the 128 banks which are analyzed throughout the other parts of the study.

The data sample uses balance sheet data until the end of December 2013 for all simulations. For the analysis of the sovereign bond holdings and the consequences of a haircut on sovereign debt the data sample includes information on the breakdown of bond holdings (by bank and by country) until June 30, 2013, but we again use the balance sheet of 2013 to evaluate the effects of a haircut. We are additionally using the balance sheet data for 2012 to show how the situation regarding the stability of banks changed over the course of the year 2013.

Table 1A in the appendix shows the basic financial statistics for all banks included in the AQR for 2013. The table gives the information on the CET1 ratio (= CET1 relative to risk-weighted assets), the ratio of risk-weighted assets to total assets as well as the ratio of book equity relative to total assets.<sup>7</sup>

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<sup>6</sup> On September 26<sup>th</sup> the ECB reported that the number of banks subject to the AQR is 131, or 127 banking groups. The full list of the banks included in the AQR is listed in European Central Bank (2014b). See also the corresponding statement on the ECB's website: <https://www.ecb.europa.eu/ssm/assessment/html/index.de.html>. In our calculations we stick to the 128 banks initially selected to be part of the AQR.

<sup>7</sup> In Table 2A in the appendix the same data are given for the year 2012.

The median bank has the following characteristics in 2013 (see the following Table 1): total assets are equal to 61.3 bn Euro, the risk-weighted assets are 40.5% of the total assets, the CET1 ratio is 13.2 %, and the book equity amounts to 6.2% of the total assets.

The comparison between the two years 2013 and 2012 shows that the median bank reduced total assets by 1.9 bn Euro, increased the CET1 ratio by 1.7 and the book equity to assets-ratio by 0.8 percentage points. The ratio of risk-weighted to total assets declined by almost 4 percentage points which means a reduction in risk-weighted assets by about 3 bn Euros. Overall, the median bank reduced its assets and improved its equity base.

**Table 1: Basic Financial Statistics for the 128 Banks included in the AQR: Summary Statistics for 2013 and 2012**

Assets (= total assets) in million Euro; CET1 is the Common Equity Tier 1 ratio (in %); RWA = ratio of risk-weighted assets relative to total assets (in %); Equity = ratio of book equity to total assets (in %).

	Assets	RWA	CET1	Equity
<b>2013</b>				
Median	61260	40.5	13.2	6.2
Mean <sup>8</sup>	179275	42.9	15.4	6.9
Minimum	567	6.7	5.8	0.1
Maximum	1800139	110.0	112.2	32.9
<b>2012</b>				
Median	63200	44.4	11.5	5.4
Mean	199995	44.9	13.2	6.1
Minimum	485	1.4	-6.7	-4.3
Maximum	2012329	110.7	116.4	35.5

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<sup>8</sup> The mean is the unweighted average over all banks.

The comparison of the mean values shows similar changes over the year 2013 regarding the CET1 and the book equity ratios. As the mean value of total assets is significantly higher than the median the distribution of total assets is skewed to the right: Most of the banks exhibit relatively low values for total assets, but the sample also includes a small number of very large banks. Looking at the change of the mean values the reduction of total assets over the year 2013 was a remarkably high 20 bn Euros which was significantly driven by the largest banks in the sample.

Although the mean of the RWA ratio increased over 2013, the mean values of the risk-weighted assets actually decreased by about 4 bn Euros. The increase in the ratio is due to the fact that total assets had even been reduced by a much higher pace.

The minimum and maximum values exhibit a high variation amongst the banks in the sample. For the CET1-ratio and the book equity ratio this difference between the best and the worst banks shrank over the year 2013 and the minimum values increased significantly.

There are also significant differences in the adjustment strategies of the banks between the very large and the smaller banks in Europe. In the following we rank the 128 European banks under consideration by total assets and form two groups: The first group consists of the 10 largest banks and the second group contains the following 118 banks. Both groups represent about 50% of the total assets of all 128 banks.

As Table 2 reveals the 10 largest banks reduced not only total assets and risk-weighted assets over the year 2013. These banks reduced book equity and, to a smaller extent, CET1 as well. The reduction in total and risk-weighted assets is therefore the main adjustment mechanism regarding the improvement of their capital ratios.



The 118 smaller banks forming group no. 2 diminished total and risk-weighted assets as well, but these banks also increased both book equity and CET1 by a significant amount. The consequence is a higher CET1 ratio and a lower leverage.

**Table 2: Comparison of Balance-Sheet Adjustments Between 2012 and 2013 by Bank Size**

Assets = total assets; CET1 = common equity tier 1; RWA = risk-weighted assets; Equity = book equity.

	Assets	RWA	CET1	Equity
Difference between 2013 and 2012 in million Euro				
All 128 Banks	-2252101	-294831	+102075	+30648
10 Largest Banks	-1211016	-76656	-7343	-22506
118 “Smaller” Banks	-1041085	-218175	+109418	+53154
Change between 2013 and 2012 in per cent				
All 128 Banks	-8.9%	-3.7%	+10.4%	+2.6%
10 Largest Banks	-9.5%	-2.0%	-1.5%	-3.7%
118 “Smaller” Banks	-8.4%	-5.3%	+22.5%	+9.2%

Overall the comparison between 2012 and 2013 leads to the cautious assessment that the stability of the banks under consideration has improved. In section 4.1 an additional analysis of the most significant changes between 2013 and 2012 is conducted on the country level.

A *cautious* assessment is necessary for at least two reasons. First of all, our analysis is only based on balance sheet data. We do not have access to the more detailed information set on risk exposures and asset quality as is available to the bank supervisors. The second reason is that Bankscope and the

other data sources we are using do not deliver complete balance sheet information for all of the 128 banks of the AQR. As Table 1A reveals the dataset is partly incomplete for 21 out of these 128 banks.<sup>9</sup> As these 21 banks only represent about 5% of the total assets of all 128 banks we expect that our analysis is still meaningful and representative.

Table 3A (in the appendix) lists the 49 banks for which we investigate the effects of haircuts on sovereign bonds in Portugal, Spain, and Italy (see section 4.4 for the results of these scenarios). For these very large banks our dataset is almost complete. Only for two banks – one German and one Greek bank – is the dataset to some part incomplete. These 49 banks represent 77% of the total assets of all banks included in the AQR.

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<sup>9</sup> The 21 banks (out of 128 banks) for which the dataset is incomplete are from France (6), Luxembourg (4), Spain (3), Germany (3), Latvia (2), as well as Cyprus (1), Greece (1), and Slovenia (1).

## 4 Scenarios and results

The scenarios we simulate aim at investigating the financial stability of the banking system in the Eurozone under different conditions regarding the realization of specific financial risks. As a result of the simulations we calculate capital shortfalls which are likely to occur under the scenario conditions.

To evaluate the results of the simulations we are using several thresholds regarding the relation of book equity to (not-risk weighted) total assets as well as the common equity tier 1 ratio. For the book equity ratio we apply the usual 3% threshold and, in addition, a slightly more prudent 4% ratio.<sup>10</sup> For the CET1 ratio we use three different thresholds: The official value of 8% for the CET1 ratio for large banks (consisting of 4.5% core tier 1 plus 2.5% capital conservation buffer plus a 1% surcharge for systemically important financial institutions) that is used as the main threshold in the AQR, a threshold of 5.5% which is used in the AQR to estimate capital shortfalls in the stress scenarios (i.e. 8% minus the capital conservation buffer), as well as a more prudent ratio of 12% which is not used in the AQR.

### 4.1 Unstressed Situation

The first scenario evaluates the status quo and shows whether banks fulfil the capital requirements when no specific financial stress will realize. As can be seen from Table 2 most banks in the Eurozone will exhibit no or only a very small CET1 capital shortfall with respect to the 8% benchmark. The calculated shortfalls for the 12% benchmark show that particularly Italian and Portu-

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<sup>10</sup> According to Haldane (2012) a book-equity-to-asset ratio of 4 per cent would have been required for banks to avoid failure in the recent financial crisis, for large banks even 7 per cent.

guesse, but also German and Austrian banks seem to be more vulnerable than the banks in other countries of the Eurozone.

**Table 3: Results for the Status quo Scenario for the End of the Year 2013**

EQ3 and EQ4: Thresholds for the ratio of book equity to not-risk weighted total assets of either 3 or 4%. CET1-5.5, CET1-8, CET1-12: Thresholds for the CET1 ratio of 5.5% (for stress scenarios only), 8%, and 12%. In million Euro.

	EQ3	EQ4	CET1-5.5	CET1-8	CET1-12
AUSTRIA	0	0	0	0	2281
BELGIUM	3039	6572	0	0	0
CYPRUS	60	107	0	0	403
ESTONIA	0	0	0	0	0
FINLAND	0	2676	0	0	0
FRANCE	10526	16487	0	0	0
GERMANY	884	14429	0	0	3419
GREECE	0	0	0	0	1130
IRELAND	2876	5821	0	0	195
ITALY	0	1971	0	661	18776
LATVIA	0	0	0	0	0
LUXEMBOURG	0	0	0	0	0
MALTA	0	0	0	0	84
NETHER- LANDS	1440	5194	0	0	0
PORTUGAL	0	4	0	0	2106
SLOVAKIA	0	0	0	0	0
SLOVENIA	0	0	0	0	0
SPAIN	412	964	0	0	1333

Nevertheless, the situation improved significantly compared to the year 2012 (see Table 4) in which particularly banks in Cyprus, Greece, and Spain still exhibited large capital shortfalls.

**Table 4: Results for the Status quo Scenario for the End of the Year 2012**

EQ3 and EQ4: Thresholds for the ratio of book equity to not-risk weighted total assets of either 3 or 4%. CET1-5.5, CET1-8, CET1-12: Thresholds for the CET1 ratio of 5.5% (for stress scenarios only), 8%, and 12%. In million Euro.

	EQ3	EQ4	CET1-5.5	CET1-8	CET1-12
AUSTRIA	0	0	0	0	2242
BELGIUM	8789	15199	0	0	0
CYPRUS	595	905	1057	1597	2519
ESTONIA	0	0	0	0	0
FINLAND	979	4399	0	0	0
FRANCE	11738	22773	0	0	378
GERMANY	7577	41997	0	0	3650
GREECE	13319	16257	7872	9485	12689
IRELAND	4601	8319	0	0	272
ITALY	111	2428	0	263	15122
LATVIA	0	0	0	0	0
LUXEM-BOURG	0	0	0	0	0
MALTA	0	0	0	0	152
NETHERLANDS	4021	9470	0	62	885
PORTUGAL	0	0	0	0	1943
SLOVAKIA	0	0	0	0	0
SLOVENIA	0	0	0	0	523
SPAIN	12488	18396	402	4024	25918

When looking at the book equity ratios the situation is slightly worse: for 24 out of the 128 banks the book equity is less than 3% of the total assets. The highest shortfall is to be expected in France (10.5 bn), Belgium (3.0 bn) and Ireland (2.8 bn).

But again, compared to the situation at the end of 2012 the book equity ratios of most banks improved significantly. This is particularly true for Greece with a reduction of the book equity shortfall of -13.3 bn, Spain (-12.1 bn), Germany (-6.7 bn), and Belgium (-5.8 bn). Only in France, the country with the highest book equity shortfall, there was no significant change in bank risk over the year 2013.

The improvements in the CET1-ratio and book equity ratio that occurred during 2013 in most countries could be either due to an increase in capital or a reduction in assets or both. To shed more light on the details of the adjustments Table 5 gives the percent changes of these balance sheet positions over the year 2013.

The countries with the most significant reduction in the book equity shortfall over the year 2013 are Greece, Germany, and Spain. But also in Belgium, the Netherlands, Ireland and Cyprus the book equity ratio improved clearly. In almost all of these countries banks achieved this improvement by reducing total assets. The only exception is Greece where the banks increased total assets but over-compensated the distorting effect by a strong growth in book equity. With the exceptions of the Netherlands and Ireland all of the above mentioned countries also increased book equity. Thus, reducing total assets and increasing book equity was the strategy chosen by most banks.

Regarding the CET1-ratio the situation is more heterogeneous. Most of the banks in the abovementioned countries also improved the ratio of common equity tier 1 to risk-weighted assets to a certain amount and did so by a reduction in risk-weighted assets. But with regard to equity about half of the countries decreased and the other half increased common tier 1-capital.

**Table 5: Change in Assets and Capital over the Year 2013**

Change in total assets, risk-weighted assets, book equity, and common tier 1 capital over the year 2013. In percent of the values of 2012.

	<b>Total Assets</b>	<b>RW Assets</b>	<b>Book Equity</b>	<b>C Tier 1</b>
AUSTRIA	-6.0	-0.7	-8.2	-4.6
BELGIUM	-19.3	-24.2	1.9	-1.5
CYPRUS	-43.4	-37.7	113.9	223.0
ESTONIA	2.3	48.4	5.2	12.1
FINLAND	-8.7	12.2	4.4	4.3
FRANCE	-6.0	15.3	1.7	13.8
GERMANY	-14.2	-26.4	3.3	1.4
GREECE	18.4	39.6	Increase <sup>11</sup>	371.6
IRELAND	-14.8	-7.5	-16.4	-15.8
ITALY	-7.2	-5.3	-13.2	-7.8
LATVIA	5.0	-15.2	8.9	6.4
LUXEMBOURG	-2.9	64.6	6.3	68.2
MALTA	0.3	-0.7	8.5	10.0
NETHERLANDS	-8.6	15.0	-5.5	-3.1
PORTUGAL	-4.8	-7.1	-10.9	-6.6
SLOVAKIA	2.1	-4.3	2.6	2.9
SLOVENIA	-11.2	-28.9	25.2	21.5
SPAIN	-8.6	-4.6	10.2	-3.1

In those countries with an obvious failure of systemic stability or at least a high threat of instability in 2012 – Cyprus and Greece – CET1 increased impressively. Astonishingly, in Italy, Portugal, and Spain – also countries that were at the brink of systemic crisis – CET1 has been reduced over the year 2013.

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<sup>11</sup> The aggregated book equity for the Greek banks was 7258 in 2013 and -1126 in 2012. Due to the negative basis a percent change is not meaningful.

To sum up, in most countries of the Eurozone banks considerably reduced their risk of financial instability. In particular, the book equity to asset ratio has been improved by decreasing total assets as well as increasing book equity. Only in France, a country with a relatively high book equity shortfall in 2012, the situation did show only a minor change over the year 2013. Irrespective of these positive results, the capital buffers do not seem to be very high: The application of the more prudent 4% book equity benchmark would cause significant shortfalls particularly in France (16.5 bn) and Germany (14.4 bn).

## **4.2 Writing-off Non-Performing Loans**

The next scenario we are simulating is the write-off of non-performing loans. We are assuming that 50% of the non-performing loans are written off and consider existing loan provisions. This is a major difference compared to Acharya/Steffen (2014) who simulate a 100% write off and do not include the loan provisions into their calculations. As the loan provisions show large differentials amongst the banking sectors of the Eurozone countries, considering the loan provisions not only makes a significant difference in absolute terms but also changes the comparison across countries substantially.

Table 6 summarizes the main results. Focusing on gross-write-offs only, the banking sectors of Italy (111 bn), Spain (99 bn), and France (71 bn) would have to bear the largest burden amongst all Eurozone countries. But the results change significantly when the net-write-offs (= write-offs minus loan provisions) are investigated. The ranking of the largest net-write-offs is led by the Spanish banking sector (16.2 bn), followed by Greece (10.8 bn), Germany (8.1 bn) and then Italy (7.1 bn). Compared to 2012 gross-write-offs increased significantly in some countries. The strongest increases are in Italy (+17.8 bn), Greece (+ 15.8 bn), and Spain (+15.1 bn). However, it is only in Spain that net-write-offs grew remarkably, too (+13.9 bn). In the other two countries higher loan provisions neutralized most of the increase in write-offs.



**Table 6: Writing Off 50% of Non-Performing Loans (NPL): Additional Capital Shortfalls compared to the Unstressed Scenario**

Write-off: minus 50% of NPL, Net-Write-Off: Write-off minus loan provisions. EQ3 and EQ4: Thresholds for the ratio of book equity to not-risk weighted total assets of either 3 or 4%. CET1-5.5, CET1-8, CET1-12: Thresholds for the CET1 ratio of 5.5% (for stress scenarios only), 8%, and 12%. In million Euro for the year 2013.

	Write-Off	Net-Write-Off	EQ3	EQ4	CET1-5.5	CET1-8	CET1-12
AUSTRIA	13233	386	0	0	0	0	102
BELGIUM	8954	1190	22	23	0	0	0
CYPRUS	4876	0	0	0	0	0	-1
ESTONIA	85	10	0	0	0	0	0
FINLAND	1261	178	0	171	0	0	0
FRANCE	71274	139	135	134	0	0	0
GERMANY	36347	8111	3041	5874	597	1401	4081
GREECE	43149	10785	0	386	38	1806	5185
IRELAND	35909	0	0	0	0	0	0
ITALY	111431	7087	0	495	640	2968	5519
LATVIA	191	0	0	0	0	0	0
LUX.	311	31	0	0	0	0	0
MALTA	238	79	0	0	0	33	70
NET.	19479	4792	397	735	0	0	5
POR.	6574	0	0	0	0	0	0
SLOVAKIA	596	0	0	0	0	0	0
SLOVENIA	1911	0	0	0	0	0	0
SPAIN	99040	16169	478	909	1753	5210	12808

The other five columns of Table 6 show the additional capital shortfalls compared to the unstressed scenario which are due to the NPL write-off. These

additional shortfalls are relatively small and hit only four countries: The most severe mismatch relative to the 8% CET1 benchmark would realize in Spain (5.2 bn), Italy (3 bn), Greece (1.8 bn), and Germany (1.4 bn). However, the application of the 5.5 % benchmark which is used in the AQR for stress scenarios does not show any major capital shortfall, with the exception of Spain (1.8 bn).

Compared to the end of 2012 particularly the Greek banking sector significantly reduced the potential capital shortfall under this scenario. In Spain the situation deteriorated strongly with respect to CET1 but improved for book equity. For all other countries the changes over the year 2013 are relatively small.

Looking at the book equity to asset ratio only the German banking sector would show a larger shortfall of 3 bn Euros. But again this seems to be a manageable amount.

The AQR might lead to the result that additional loans have to be assessed as non-performing. To cover this aspect of the AQR we also simulate the effect on bank capital if 5% of the existing loans will be classified additionally as not performing. Table 7 shows the results for the book equity to asset ratio.

Compared to the unstressed scenario some countries would face an enormous additional capital requirement to meet the 3% benchmark. The highest book equity shortfall would occur in the Dutch banking sector (11.7 bn), closely followed by the German banking sector (10.9 bn) and the banks in Belgium (3.9 bn). But overall these capital shortfalls do not look as impressive as their counterparts for the year 2012. Particularly in Germany the situation improved clearly as in 2012 the shortfall would have been 15.9 bn Euros higher. Also in Greece and Spain banks now exhibit a much better capital base. Most of this improvement in Germany and Spain stems from a reduction in total assets whereas in Greece higher book equity contributed to the improved situation.

**Table 7: Write Off 50% of Non-Performing Loans (NPL) plus Classification of additional 5% of the Loans as Non-Performing: Additional Net-Write-Offs and additional Capital Shortfalls compared to the Unstressed Scenario**

Net-Write-Off: Write-off minus loan provisions. EQ3 and EQ4: Thresholds for the ratio of book equity to not-risk weighted total assets of either 3 or 4%. In million Euro for the year 2013.

	<b>Net-Write-Off</b>	<b>EQ3</b>	<b>EQ4</b>
AUSTRIA	3377	0	100
BELGIUM	9656	3933	5342
CYPRUS	157	85	84
ESTONIA	211	0	0
FINLAND	4727	2532	2873
FRANCE	49297	2447	3732
GERMANY	46215	10857	27012
GREECE	14985	602	1394
IRELAND	2219	97	96
ITALY	25532	2973	4844
LATVIA	65	0	0
LUXEMBOURG	742	0	0
MALTA	221	0	0
NETHERLANDS	38615	11681	22057
PORTUGAL	363	0	0
SLOVAKIA	230	0	0
SLOVENIA	69	0	0
SPAIN	47807	1305	5429

### 4.3 Effect of a Market Downturn

A main source of bank risk is a possible decrease in market prices. To approximate the potential losses of banks in the Eurozone caused by deteriorating asset values we simulate a 10% negative shock to the value of specific assets which the banks are invested in. We use the balance position “Other Earning Assets” and deduct the value of derivatives as well as loans and advances to other banks. The remaining position mainly consists of trading securities, assets held for sale, as well as held-to-maturity securities and investments in associates which are essential parts of the banks’ own portfolios.

A downturn of the values of these assets would significantly deteriorate both the CET1 ratios as well as the book equity ratios of banks in almost all countries of the Eurozone. Even when applying the relatively low benchmark of a CET1 ratio of 5.5% the banks in the Eurozone would have to face – compared to the unstressed scenario - an additional capital shortfall of about 58 bn Euro. Most of this capital shortfall would realize in France (33 bn), Germany (14.4 bn) and Spain (7.5 bn). Relative to the 8% CET1-ratio the capital shortfall would even increase to ca. 154 bn Euro across the banks of the Eurozone. Applying this higher threshold the French banking sector would face a shortfall of 75 bn, the German of 30 bn and in Italy and Spain the gap in CET1 would be 22bn and 15.8 bn.

When looking at the 3% book to equity benchmark the countries mentioned above would also rank highest with Germany (66 bn) showing the most significant mismatch followed by France (43.8 bn) and Spain (11.9 bn). The Netherlands (9.1 bn) and Belgium (7.5 bn) also exhibit a significant shortfall.

But again, compared to 2012 the capitalization of the banks involved in the AQR show a clear improvement. At the end of 2013 the CET1 shortfall (5.5% benchmark), although still substantial, was 14 bn Euros lower than one year earlier, regarding the 8% CET1 benchmark the reduction amounts also to 14

bn Euros. With regard to the 3% book equity ratio the shortfall decreased from 198 bn (end of 2012) to 147 bn Euros one year later. These results show that bank still have to substantially increase their capital to assets ratios. But the announced AQR may have already motivated banks to move in the right direction.

**Table 8: Results for the Market Downturn Scenario: Additional Capital Shortfalls compared to the Unstressed Scenario**

EQ3 and EQ4: Thresholds for the ratio of book equity to not-risk weighted total assets of either 3 or 4%. CET1-5.5, CET1-8, CET1-12: Thresholds for the CET1 ratio of 5.5% (for stress scenarios only), 8%, and 12%. In million Euro for 2013.

	EQ3	EQ4	CET1-5.5	CET1-8	CET1-12
AUSTRIA	0	69	2	1637	9084
BELGIUM	7513	11447	332	2343	8150
CYPRUS	32	32	0	0	436
ESTONIA	0	0	0	0	0
FINLAND	3978	4304	0	550	4105
FRANCE	43809	98283	32968	75497	157204
GERMANY	66006	92474	14384	30365	69502
GREECE	0	489	0	1609	4381
IRELAND	339	335	0	0	4525
ITALY	4669	5454	1831	22056	50158
LATVIA	57	89	0	0	0
LUXEMBOURG	1	382	610	1127	1954
MALTA	0	0	42	203	375
NETHERLANDS	9094	19498	0	895	12720
PORTUGAL	710	1926	0	1308	2407
SLOVAKIA	0	0	0	0	13
SLOVENIA	0	0	0	0	111
SPAIN	11865	17272	7492	15874	57845

#### 4.4 Effect of a Haircut on Sovereign Debt

In the last series of simulations we investigate the consequences of a 40% haircut on sovereign debt in Portugal, Italy, and Spain. In this analysis we include 49 banks out of the set of banks for which the AQR is conducted. For these 49 banks of the Eurozone the EBA provides disaggregated data on the sovereign bond holdings, differentiated by issuing countries and investing banks. The latest update of this data is for June 2013. For these simulations we are using this information provided by the EBA and combine it with the balance sheet data (end of 2013) from the Bankscope database.

A 40% haircut on the Portuguese sovereign bonds would cause an overall loss of about 8.5 bn across the 49 banks in the Eurozone that are included in our analysis. The capital shortfall with respect to the 3% book equity ratio would be relatively small (0.6 bn) and would only hit Portuguese banks. The same haircut on Italian and Spanish sovereign bonds would cause significantly higher capital shortfalls. With respect to the 8% CET1 benchmark the shortfalls would be 26 bn Euros in case of Italy and 12bn in case of a haircut on Spanish sovereign bonds. But again, this deterioration of the bank capital would have to be borne almost entirely by the domestic banking sector of these countries.<sup>12</sup>

Direct effects on other countries due to the haircuts are almost zero in all three simulations. This is mainly due to an improvement of the capitalization of Greek banks, but also in Germany and France over the year 2013.

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<sup>12</sup> Table 5A in the appendix shows the results for a haircut on Spanish sovereign bonds.

**Table 9: Effects of a 40% Haircut on Portuguese Sovereign Bonds: Additional Capital Requirements compared to the unstressed Scenario<sup>13</sup>**

EQ3 and EQ4: Thresholds for the ratio of book equity to not-risk weighted total assets of either 3 or 4%. CET1-5.5, CET1-8, CET1-12: Thresholds for the CET1 ratio of 5.5% (for stress scenarios only), 8%, and 12%. In million Euro for the year 2013.

	EQ3	EQ4	CET1-5.5	CET1-8	CET1-12
AUSTRIA	0	0	0	0	2
BELGIUM	0	0	0	0	0
CYPRUS	0	0	0	0	0
FINLAND	0	0	0	0	0
FRANCE	0	0	0	0	0
GERMANY	0	257	0	0	62
GREECE	0	0	0	0	0
IRELAND	0	0	0	0	0
ITALY	0	64	0	0	78
LUXEMBOURG	0	0	0	0	0
MALTA	0	0	0	0	1
NETHERLANDS	0	0	0	0	0
PORTUGAL	637	1827	0	0	8610
SLOVENIA	0	0	0	0	0
SPAIN	0	0	0	0	228

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<sup>13</sup> The results for the unstressed scenario for these 49 banks are shown in Table 3A in the Appendix.

**Table 10: Effects of a 40% Haircut on Italian Sovereign Bonds: Additional Capital Requirements compared to the unstressed Scenario<sup>14</sup>**

EQ3 and EQ4: Thresholds for the ratio of book equity to not-risk weighted total assets of either 3 or 4%. CET1-5.5, CET1-8, CET1-12: Thresholds for the CET1 ratio of 5.5% (for stress scenarios only), 8%, and 12%. In million Euro for the year 2013.

	EQ3	EQ4	CET1-5.5	CET1-8	CeT1-12
AUSTRIA	0	0	0	0	100
BELGIUM	0	0	0	0	0
CYPRUS	0	0	0	0	21
FINLAND	0	0	0	0	0
FRANCE	0	0	0	0	392
GERMANY	129	3174	0	0	1550
GREECE	0	0	0	0	45
IRELAND	0	0	0	0	0
ITALY	11610	13013	11226	26348	52233
LUXEMBOURG	0	0	0	0	0
MALTA	0	0	0	0	0
NETHERLANDS	0	266	0	0	0
PORTUGAL	0	19	0	0	4378
SLOVENIA	0	0	0	0	0
SPAIN	0	0	0	0	1153

<sup>14</sup> The results for the unstressed scenario for these 49 banks are shown in Table 3A in the Appendix.



## 5 Conclusions

Our results show that the large banks of the Eurozone that are included in the AQR are better capitalized at the end of 2013 than one year earlier. The capital shortfalls – both with regard to common equity tier 1 and to book equity – diminished significantly, particularly in Greece, Spain, Italy, and Germany. This is mainly due to a reduction in total assets and risk-weighted assets in many banks, but also to an improvement in the capital base.

Despite these improvements, capital shortfalls would still occur in our scenarios, even in the status quo scenario. The most significant shortfall would realize in our market downturn scenario. It is a striking feature of our results that capital shortfalls are much larger in the case of book-equity-to-total-asset-ratios. According to Haldane (2012) the simple book-equity-to-assets ratio is much better at predicting failures of banks, in particular large banks, than risk weighted measures like CET1.<sup>15</sup> Banks seem to be relatively successful in approaching and reaching the official benchmarks set by the supervisors, but additional reserves are not yet built up sufficiently.

Caution is also warranted because we consider stress scenarios in isolation. In a real world crisis situation it is likely that events like a haircut on government debt would probably coincide with a general market downturn, so that capital shortfalls may be much larger than suggested by the isolated scenarios considered here.

Nevertheless the process initiated by the CRD IV directive has been enforced by the announcement of the AQR and motivated banks to improve their capi-

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<sup>15</sup> The limitations of risk weighting are also emphasized by Admati and Hellwig (2013). Schleer et al. (2014) show in addition that a high leverage of banks leads to more significant restrictions concerning the credit flows to the private sector in crisis periods.

tal base. Although what has happened so far is not enough, at least the analysis of static balance sheet data performed here suggests that the capital base of the European banking system seems to be moving into the right direction.

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## Appendix

**Table 1A: Basic Financial Statistics for the Banks included in the AQR for the End of the Year 2013**

Assets (= total assets) in million Euro; CET1 is the Common Equity Tier 1 ratio (in %); RWA = ratio of risk-weighted assets relative to total assets (in %); Equity = ratio of book equity to total assets (in %). Datasource: Bankscope.

Bank	Country	Assets	CET1	RWA	Equity
BAWAG PSK Group	AUSTRIA	36402	15.3	43.9	7.7
Erste Group Bank AG	AUSTRIA	199876	11.8	49.0	7.4
Oesterreichische Volksbanken AG	AUSTRIA	20904	14.1	53.9	5.8
Raiffeisen Zentralbank Oesterreich AG	AUSTRIA	147324	10.4	60.6	8.0
Raiffeisenlandesbank Niederoesterreich-Wien AG	AUSTRIA	29070	11.6	43.7	8.1
Raiffeisenlandesbank Oberoesterreich AG	AUSTRIA	37432	9.8	73.5	9.5
AXA Bank Europe SA/NV	BELGIUM	36886	17.4	13.2	2.2
Argenta Spaarbank-ASPA	BELGIUM	32147	17.7	22.5	4.3
Bank of New York Mellon SA/NV	BELGIUM	53982	17.3	16.8	3.5
Belfius Banque SA/NV	BELGIUM	182777	15.4	23.3	3.6
Dexia	BELGIUM	222936	21.4	21.3	1.8
KBC Groep NV/ KBC Groupe SA	BELGIUM	241306	15.8	37.5	6.0
Bank of Cyprus Public Company Ltd	CYPRUS	30342	10.2	73.7	9.0
Co-operative Central Bank Limited	CYPRUS	3555			8.4

Hellenic Bank Public Company Limited	CYPRUS	6384	13.1	38.6	6.3
RCB Bank Ltd	CYPRUS	4787	26.2	6.7	1.8
DNB Pank AS	ESTONIA	567			17.3
SEB Pank	ESTONIA	4443	21.2	74.3	17.4
Swedbank As	ESTONIA	8932	32.5	63.7	21.2
Danske Bank Plc	FINLAND	26680	17.2	55.7	8.9
Nordea Bank Finland Plc	FINLAND	304761	15.0	18.4	3.1
OP-Pohjola Group	FINLAND	100981	14.3	40.9	7.6
BNP Paribas	FRANCE	1800139	12.8	31.2	5.1
BPCE Group	FRANCE	1123520	12.8	32.9	5.2
BPIFrance Financement	FRANCE	30756			9.0
Banque Centrale de Compensation	FRANCE	254091			0.1
Banque PSA Finance	FRANCE	25117			13.1
Caisse Francaise de Financement Local	FRANCE	80017			1.7
Caisse de Refinancement de l'Habitat	FRANCE	53134			0.6
Credit Agricole Group	FRANCE	1706326	13.1	30.7	4.8
Credit Mutuel (Combined - IFRS)	FRANCE	645216	14.5	30.0	6.0
HSBC France	FRANCE	208893	13.7	15.5	2.6
La Banque Postale	FRANCE	200232	13.2	22.6	4.3
RCI Banque	FRANCE	29505			9.9
Societe Generale	FRANCE	1235262	13.4	25.6	4.4
Aareal Bank AG	GERMANY	42981	18.5	30.6	5.7
Bayerische Landesbank	GERMANY	255601	15.8	34.2	5.8
Commerzbank AG	GERMANY	549661	13.5	34.6	4.9

DekaBank Deutsche Girozentrale	GERMANY	116073	15.6	19.3	3.2
Deutsche Apotheker- und Aerztebank eG	GERMANY	34692	17.0	31.4	6.3
Deutsche Bank AG	GERMANY	1611400	16.9	18.6	3.4
Deutsche Zentral-Genossenschaftsbank	GERMANY	386978	16.4	22.0	3.7
HASPA Finanzholding	GERMANY	41611	10.6	71.1	9.3
HSH Nordbank AG	GERMANY	109022	15.3	33.6	4.1
Hypo Real Estate Holding AG	GERMANY	122454	32.5	14.5	5.2
IKB Deutsche Industriebank AG	GERMANY	24045	13.1	58.0	6.5
KfW Iplex-Bank GmbH	GERMANY	23280			14.9
Landesbank Baden-Wuerttemberg	GERMANY	273523	18.5	29.1	4.9
Landesbank Berlin Holding AG	GERMANY	102437	11.9	24.9	2.3
Landesbank Hessen-Thüringen - HELABA	GERMANY	178083	12.8	30.9	4.0
Landeskreditbank Baden-Wuerttemberg	GERMANY	70141	15.7	25.5	4.3
Landwirtschaftliche Rentenbank	GERMANY	81932	23.9	16.5	3.9
Muenchener Hypothekenbank eG	GERMANY	34717	11.7	21.2	2.6
NRWBANK	GERMANY	143153	44.0	27.1	12.9
Norddeutsche Landesbank	GERMANY	200845	11.8	34.1	4.1
SEB AG	GERMANY	31754	13.6	37.2	6.5
Volkswagen Financial Services AG	GERMANY	90992	8.6	91.2	9.8
WGZ-Bank AG	GERMANY	90926			3.6

Wuestenrot und Wuerttembergische	GERMANY	75043			4.3
Alpha Bank AE	GREECE	73697			11.4
Eurobank Ergasias SA	GREECE	77586	11.5	47.7	5.8
National Bank of Greece SA	GREECE	110930	10.3	50.1	7.1
Piraeus Bank SA	GREECE	85778	15.2	61.3	9.6
Allied Irish Banks plc	IRELAND	117734	14.3	53.0	8.9
Bank of Ireland-Governor and Company	IRELAND	132137	12.4	42.7	6.0
Merrill Lynch International Bank Ltd	IRELAND	294444			2.0
Permanent TSB Plc	IRELAND	37604	13.6	43.4	6.3
Ulster Bank Ireland Limited	IRELAND	35375	11.5	110.0	13.1
Banca Carige SpA	ITALY	42156	5.8	51.4	3.9
Banca Monte dei Paschi di Siena SpA	ITALY	199106	10.6	42.4	3.1
Banca Popolare di Milano SCaRL	ITALY	49353	7.8	86.4	7.4
Banca Popolare di Sondrio	ITALY	32770	7.9	72.5	6.1
Banca Popolare di Vicenza	ITALY	45235	9.2	62.1	8.1
Banca popolare dell'Emilia Romagna	ITALY	61758	8.6	69.6	7.6
Banco Popolare - Societa Cooperativa	ITALY	126043	10.6	39.1	6.8
Credito Emiliano SpA-CREDEM	ITALY	31531	9.9	52.4	6.8
Credito Valtellinese Soc Coop	ITALY	27199	8.6	64.3	7.0

Iccrea Holding SpA	ITALY	40045	9.3	35.2	3.7
Intesa Sanpaolo	ITALY	626283	12.2	44.3	7.2
Mediobanca SpA	ITALY	72841	11.7	71.9	9.5
UniCredit SpA	ITALY	845838	10.1	50.1	5.9
Unione di Banche Italiane Scpa-UBI	ITALY	124242	13.2	49.1	9.0
Veneto Banca scpa	ITALY	37307	7.7	66.8	8.5
ABLV Bank AS	LATVIA	3281			5.7
SEB banka AS	LATVIA	4226			10.2
Swedbank AS	LATVIA	5000	28.0	62.5	20.2
Banque Internationale a Luxembourg SA	LUXEMBOURG	19699	14.9	22.1	5.9
Banque et Caisse d'Epargne de l'Etat Luxembourg	LUXEMBOURG	40714	16.6	30.6	9.1
Clearstream Banking SA	LUXEMBOURG	11247			6.0
KBL European Private Bankers SA	LUXEMBOURG	12469	13.5	31.0	7.7
RBC Investor Services Bank SA	LUXEMBOURG	12574			7.3
State Street Bank Luxembourg SA	LUXEMBOURG	8742			32.9
UBS (Luxembourg) SA	LUXEMBOURG	9302			6.5
Bank of Valletta Plc	MALTA	7258	11.7	49.4	7.9
HSBC Bank Malta Plc	MALTA	5722	9.4	49.3	7.4
ABN AMRO Group NV	NETHERLANDS	372022	15.3	29.3	3.6
Bank Nederlandse Gemeenten NV. BNG	NETHERLANDS	131183	24.0	8.9	2.6
ING Bank NV	NETHERLANDS	787644	13.5	35.9	4.3
Nederlandse Waterschapsbank NV	NETHERLANDS	73006			1.7



Rabobank Nederland-Rabobank Group	NETHERLANDS	674139	16.6	31.4	5.9
Royal Bank of Scotland NV	NETHERLANDS	39385			7.5
SNS Bank NV	NETHERLANDS	74537	16.6	19.5	3.5
Banco BPI SA	PORTUGAL	42700	16.2	51.0	5.4
Banco Comercial Portugues	PORTUGAL	82007	12.9	53.4	4.0
Caixa Geral de Depositos	PORTUGAL	112963	11.3	54.9	6.0
Espirito Santo Financial Group SA	PORTUGAL	84850	9.2	70.3	7.9
Slovenska sporitel'na as-Slovak Savings Bank	SLOVAKIA	11699	20.8	40.0	11.0
Tatra Banka as	SLOVAKIA	9469			10.7
Vseobecna Uverova Banka as	SLOVAKIA	11556	15.9	59.0	11.9
NLB dd-Nova Ljubljanska Banka dd	SLOVENIA	12490	14.9	64.5	10.2
Nova Kreditna Banka Maribor dd	SLOVENIA	4811	18.1	59.8	11.6
SID - Slovene Export and Development Bank	SLOVENIA	3940			9.5
Banco Bilbao Vizcaya Argentaria SA	SPAIN	582575	12.2	55.7	7.7
Banco Financiero y de Ahorros SA	SPAIN	269159	11.8	35.1	4.6
Banco Mare Nostrum SA-BMN	SPAIN	47519	10.3	39.3	4.4
Banco Popular Espanol SA	SPAIN	147852	12.0	54.5	7.9
Banco Santander SA	SPAIN	1115638	12.6	43.9	7.2
Banco de Sabadell SA	SPAIN	163442	12.0	44.4	6.4

Bankinter SA	SPAIN	55136	12.9	41.3	6.2
CAJAMAR Sociedad Cooperativa de Credito	SPAIN	42105			6.6
Caja Espana de Inversiones Salamanca	SPAIN	35527			1.8
Catalunya Banc SA	SPAIN	63062	14.3	28.7	4.0
Ibercaja Banco SAU	SPAIN	63118	10.3	38.1	4.1
Kutxabank SA	SPAIN	60762	12.0	60.1	8.1
LA CAIXA	SPAIN	351269	12.7	39.7	7.8
Liberbank SA	SPAIN	44547	10.4	38.4	3.6
NCG Banco SA	SPAIN	52687	11.3	44.1	5.2
Unicaja	SPAIN	41243			5.1

**Table 2A: Basic Financial Statistics for the Banks included in the AQR for the End of the Year 2012**

Assets (= total assets) in million Euro; CET1 is the Common Equity Tier 1 ratio (in %); RWA = ratio of risk-weighted assets relative to total assets (in %); Equity = ratio of book equity to total assets (in %). Datasource: Bankscope.

Bank	Country	Assets	CET1	RWA	Equity
BAWAG PSK Group	AUSTRIA	41265	11.7	50.0	6.9
Erste Group Bank AG	AUSTRIA	213824	11.6	49.3	8.2
Oesterreichische Volksbanken AG	AUSTRIA	27667	10.9	56.8	4.3
Raiffeisen Zentralbank Oesterreich AG	AUSTRIA	145955	13.9	49.5	8.3
Raiffeisenlandesbank Niederoesterreich-Wien AG	AUSTRIA	32310	10.3	44.0	7.5
Raiffeisenlandesbank Oberoesterreich AG	AUSTRIA	39823	9.3	71.2	8.7
AXA Bank Europe	BELGIUM	39217	16.5	12.5	2.1

SA/NV					
Argenta Spaarbank- ASPA	BELGIUM	34145			3.8
Bank of New York Mellon SA/NV	BELGIUM	53982	17.3	16.8	3.5
Belfius Banque SA/NV	BELGIUM	212947	13.3	23.6	2.5
Dexia	BELGIUM	357210	19.9	15.5	0.9
KBC Groep NV/ KBC Groupe SA	BELGIUM	256886	13.8	39.8	6.2
Bank of Cyprus Public Company Ltd	CYPRUS	31032	0.6	69.5	1.1
Co-operative Central Bank Limited	CYPRUS				
Hellenic Bank Public Company Limited	CYPRUS	8756	8.2	60.7	5.5
RCB Bank Ltd	CYPRUS				
DNB Pank AS	ESTONIA	485			19.4
SEB Pank	ESTONIA	4183	23.1	72.4	16.8
Swedbank As	ESTONIA	8961			20.4
Danske Bank Plc	FINLAND	31813	15.8	51.3	7.5
Nordea Bank Finland Plc	FINLAND	341947	18.0	13.4	2.7
OP-Pohjola Group	FINLAND	99769	14.0	38.2	7.2
BNP Paribas	FRANCE	1907290	13.6	28.9	5.0
BPCE Group	FRANCE	1147521	12.2	33.2	4.7
BPIFrance Financement	FRANCE	29941	10.5	83.1	16.2
Banque Centrale de Compensation	FRANCE	254091			0.1
Banque PSA Finance	FRANCE	27186			12.6
Caisse Francaise de Financement Local	FRANCE	92037			1.3
Caisse de Refinance-	FRANCE	55338			0.6

ment de l'Habitat					
Credit Agricole Group	FRANCE	2008152	13.3	23.9	3.8
Credit Mutuel (Combined - IFRS)	FRANCE	645216	14.5	30.0	6.0
HSBC France	FRANCE	225208	13.6	13.5	2.3
La Banque Postale	FRANCE	195787	12.1	20.0	3.6
RCI Banque	FRANCE	28767			9.3
Societe Generale	FRANCE	1250696	12.5	25.9	4.3
Aareal Bank AG	GERMANY	45734	16.7	31.7	5.1
Bayerische Landesbank	GERMANY	286823	12.9	35.0	5.3
Commerzbank AG	GERMANY	635878	13.1	32.7	4.3
DekaBank Deutsche Girozentrale	GERMANY	129744	14.0	18.2	2.8
Deutsche Apotheker- und Aerztebank eG	GERMANY	37886			5.2
Deutsche Bank AG	GERMANY	2012329	15.1	16.6	2.7
Deutsche Zentral-Genossenschaftsbank	GERMANY	407236	13.6	22.0	3.1
HASPA Finanzholding	GERMANY	41611			9.3
HSH Nordbank AG	GERMANY	130606	11.5	46.7	4.0
Hypo Real Estate Holding AG	GERMANY	168977	31.3	10.8	3.7
IKB Deutsche Industriebank AG	GERMANY	26923	9.8	58.5	4.2
KfW IpeX-Bank GmbH	GERMANY	23365			14.6
Landesbank Baden-Wuerttemberg	GERMANY	336326	15.3	28.5	3.1
Landesbank Berlin Holding AG	GERMANY	118298	12.2	24.2	2.3
Landesbank Hessen-Thüringen - HELABA	GERMANY	199301	11.4	30.5	3.4

Landeskreditbank Baden-Wuerttemberg	GERMANY	70096			4.1
Landwirtschaftliche Rentenbank	GERMANY	88398			2.9
Muenchener Hypothekenbank eG	GERMANY	36643			2.2
NRWBANK	GERMANY	146828		23.2	12.5
Norddeutsche Landesbank	GERMANY	225550	10.9	34.5	3.4
SEB AG	GERMANY	35634	12.2	35.6	5.8
Volkswagen Financial Services AG	GERMANY	87379	9.2	87.2	10.1
WGZ-Bank AG	GERMANY	96082			3.2
Wuestenrot und Wuerttembergische	GERMANY	77193			4.4
Alpha Bank AE	GREECE	58357			1.3
Eurobank Ergasias SA	GREECE	67653	116.4	5.6	-1.0
National Bank of Greece SA	GREECE	104799	-6.7	61.6	-1.8
Piraeus Bank SA	GREECE	63020	10.3	56.7	-4.3
Allied Irish Banks plc	IRELAND	122516	15.1	58.3	9.2
Bank of Ireland-Governor and Company	IRELAND	148146	14.5	38.1	5.8
Merrill Lynch International Bank Ltd	IRELAND	371741			1.8
Permanent TSB Plc	IRELAND	40919	18.4	36.3	6.9
Ulster Bank Ireland Limited	IRELAND	40912	11.4	110.7	20.2
Banca Carige SpA	ITALY	49326	7.4	49.4	7.5
Banca Monte dei Paschi di Siena SpA	ITALY	218882	9.6	42.4	2.9
Banca Popolare di Mi-	ITALY	52475	9.0	82.3	7.7

lano SCaRL					
Banca Popolare di Sondrio	ITALY	32349	7.6	75.0	6.0
Banca Popolare di Vicenza	ITALY	46709	8.2	61.8	7.2
Banca popolare dell'Emilia Romagna	ITALY	61638	8.3	72.6	7.7
Banco Popolare - Societa Cooperativa	ITALY	131921	11.2	41.8	6.8
Credito Emiliano SpA-CREDEM	ITALY	30749	9.4	54.3	6.5
Credito Valtellinese Soc Coop	ITALY	29896	8.1	66.5	6.6
Iccrea Holding SpA	ITALY	40045	9.3	35.2	3.7
Intesa Sanpaolo	ITALY	673472	12.1	44.3	7.5
Mediobanca SpA	ITALY	78679	11.5	70.1	8.4
UniCredit SpA	ITALY	926828	11.4	46.1	7.2
Unione di Banche Italiane Scpa-UBI	ITALY	132434	10.8	57.8	8.0
Veneto Banca scpa	ITALY	40165	7.9	63.3	7.7
ABLV Bank AS	LATVIA	3039			4.9
SEB banka AS	LATVIA	3955			11.0
Swedbank AS	LATVIA	4912	21.7	75.1	18.5
Banque Internationale a Luxembourg SA	LUXEMBOURG	21301	14.4	19.8	5.2
Banque et Caisse d'Epargne de l'Etat Luxembourg	LUXEMBOURG	40493			8.4
Clearstream Banking SA	LUXEMBOURG	14280			4.8
KBL European Private Bankers SA	LUXEMBOURG	12937	12.7	32.2	7.2
RBC Investor Services	LUXEMBOURG	12329			7.0

Bank SA					
State Street Bank Luxembourg SA	LUXEMBOURG	7541			35.5
UBS (Luxembourg) SA	LUXEMBOURG	9302			6.5
Bank of Valletta Plc	MALTA	7049	10.7	51.3	7.4
HSBC Bank Malta Plc	MALTA	5886	8.3	48.1	6.8
ABN AMRO Group NV	NETHERLANDS	394404	12.9	30.8	3.6
Bank Nederlandse Gemeenten NV. BNG	NETHERLANDS	142228	22.0	8.2	1.9
ING Bank NV	NETHERLANDS	836068	14.3	33.3	4.5
Nederlandse Waterschapsbank NV	NETHERLANDS	76084		1.4	1.6
Rabobank Nederland-Rabobank Group	NETHERLANDS	752410	17.2	29.6	5.9
Royal Bank of Scotland NV	NETHERLANDS	71401			2.5
SNS Bank NV	NETHERLANDS	81341	7.7	25.3	1.6
Banco BPI SA	PORTUGAL	44565	15.2	55.0	4.6
Banco Comercial Portugues	PORTUGAL	89744	12.4	59.4	4.5
Caixa Geral de Depositos	PORTUGAL	116857	11.2	58.5	6.2
Espirito Santo Financial Group SA	PORTUGAL	87574	10.1	74.3	9.3
Slovenska sporitel'na as-Slovak Savings Bank	SLOVAKIA	11777	16.2	45.8	10.2
Tatra Banka as	SLOVAKIA	9073	17.1	61.8	11.7
Vseobecna Uverova Banka as	SLOVAKIA	11216	15.1	62.5	11.8
NLB dd-Nova Ljubljanska Banka dd	SLOVENIA	14335	9.1	77.1	8.0
Nova Kreditna Banka	SLOVENIA	5322	8.1	81.2	4.8

Maribor dd					
SID - Slovene Export and Development Bank	SLOVENIA	4258.8			8.5
Banco Bilbao Vizcaya Argentaria SA	SPAIN	637785	10.8	51.6	6.9
Banco Financiero y de Ahorros SA	SPAIN	309187	5.2	36.2	1.0
Banco Mare Nostrum SA-BMN	SPAIN	63380		42.1	0.3
Banco Popular Espanol SA	SPAIN	157618	10.3	56.3	6.3
Banco Santander SA	SPAIN	1269628	11.2	43.9	6.6
Banco de Sabadell SA	SPAIN	161547	10.6	45.8	5.7
Bankinter SA	SPAIN	58166	10.8	43.7	5.6
CAJAMAR Sociedad Cooperativa de Credito	SPAIN	43097		57.1	5.8
Caja Espana de Inversiones Salamanca	SPAIN	37891			-2.8
Catalunya Banc SA	SPAIN	74104			0.8
Ibercaja Banco SAU	SPAIN	44664	10.4	43.4	4.8
Kutxabank SA	SPAIN	66707	10.1	63.6	7.2
LA CAIXA	SPAIN	359109	10.4	47.8	6.9
Liberbank SA	SPAIN	46255	5.2	44.8	2.4
NCG Banco SA	SPAIN	59983	6.9	47.8	2.2
Unicaja	SPAIN	40714	11.2	44.4	5.0



**Table 3A: The 49 Banks included in the Analysis of disaggregated Sovereign Bond Holdings (described in Section 4.4 of this Study)**

<b>BANK</b>	<b>COUNTRY</b>
Erste Group Bank AG	AUSTRIA
Raiffeisen Zentralbank Oesterreich AG	AUSTRIA
KBC Groep NV/ KBC Groupe SA	BELGIUM
Bank of Cyprus Public Company Ltd	CYPRUS
OP-Pohjola Group	FINLAND
BNP Paribas	FRANCE
BPCE Group	FRANCE
Credit Agricole Group	FRANCE
Societe Generale	FRANCE
Bayerische Landesbank	GERMANY
Commerzbank AG	GERMANY
DekaBank Deutsche Girozentrale	GERMANY
Deutsche Bank AG	GERMANY
Deutsche Zentral-Genossenschaftsbank	GERMANY
HSH Nordbank AG	GERMANY
Hypo Real Estate Holding AG	GERMANY
Landesbank Baden-Wuerttemberg	GERMANY
Landesbank Berlin Holding AG	GERMANY
Landesbank Hessen-Thuringen - HELABA	GERMANY
Norddeutsche Landesbank	GERMANY
WGZ-Bank AG	GERMANY
Alpha Bank AE	GREECE
Eurobank Ergasias SA	GREECE
National Bank of Greece SA	GREECE
Piraeus Bank SA	GREECE
Allied Irish Banks plc	IRELAND

Bank of Ireland-Governor and Company	IRELAND
Permanent TSB Plc	IRELAND
Banca Monte dei Paschi di Siena SpA	ITALY
Banco Popolare - Societa Cooperativa	ITALY
Intesa Sanpaolo	ITALY
UniCredit SpA	ITALY
Unione di Banche Italiane Scpa-UBI	ITALY
Banque et Caisse d'Epargne de l'Etat Luxembourg	LUXEMBOURG
Bank of Valletta Plc	MALTA
ABN AMRO Group NV	NETHERLANDS
ING Bank NV	NETHERLANDS
Rabobank Nederland-Rabobank Group	NETHERLANDS
SNS Bank NV	NETHERLANDS
Banco BPI SA	PORTUGAL
Banco Comercial Portugues	PORTUGAL
Caixa Geral de Depositos	PORTUGAL
Espirito Santo Financial Group SA	PORTUGAL
NLB dd-Nova Ljubljanska Banka dd	SLOVENIA
Nova Kreditna Banka Maribor dd	SLOVENIA
Banco Bilbao Vizcaya Argentaria SA	SPAIN
Banco Popular Espanol SA	SPAIN
Banco Santander SA	SPAIN
LA CAIXA	SPAIN

**Table 4A: Results for the Status quo Scenario for the largest 49 Banks in the Eurozone (see Section 4.4 of this Study)**

EQ3 and EQ4: Thresholds for the ratio of book equity to (not-risk weighted) total assets of either 3% or 4%. CET1-5.5, CET1-8, CET1-12: Thresholds for the common equity tier 1 ratio of 5.5% (for stress scenarios only), 8%, and 12%. In million Euro.

	EQ3	EQ4	CET1-5.5	CET1-8	CET1-12
AUSTRIA	0	0	0	0	1625
BELGIUM	0	0	0	0	0
CYPRUS	0	0	0	0	402
FINLAND	0	0	0	0	0
FRANCE	0	0	0	0	0
GERMANY	732	13847	0	0	143
GREECE	0	0	0	0	1130
IRELAND	0	0	0	0	0
ITALY	0	1800	0	0	9947
LUXEMBOURG	0	0	0	0	0
MALTA	0	0	0	0	11
NETHERLANDS	0	1712	0	0	0
PORTUGAL	0	4	0	0	1669
SLOVENIA	0	0	0	0	0
SPAIN	0	0	0	0	16

**Table 5A: Effects of a 40% Haircut on Spanish Sovereign Bonds: Additional Capital Requirements compared to the unstressed Scenario<sup>16</sup>**

EQ3 and EQ4: Thresholds for the ratio of book equity to not-risk weighted total assets of either 3 or 4%. CET1-5.5, CET1-8, CET1-12: Thresholds for the CET1 ratio of 5.5% (for stress scenarios only), 8%, and 12%. In million Euro.

	EQ3	EQ4	CET1-5.5	CET1-8	CeT1-12
AUSTRIA	0	0	0	0	9
BELGIUM	0	0	0	0	0
CYPRUS	0	0	0	0	0
FINLAND	0	0	0	0	0
FRANCE	0	0	0	0	0
GERMANY	81	2282	0	0	209
GREECE	0	0	0	0	3
IRELAND	0	0	0	0	0
ITALY	0	91	0	0	328
LUXEMBOURG	0	0	0	0	0
MALTA	0	0	0	0	0
NETHERLANDS	0	35	0	0	0
PORTUGAL	0	17	0	0	4539
SLOVENIA	0	0	0	0	0
SPAIN	0	0	2807	12101	53474

<sup>16</sup> The results for the unstressed scenario for these 49 banks are shown in Table 4A in the Appendix.