EUROPEAN CENTRAL BANK

BANKING SUPERVISION

AGGREGATE REPORT ON THE GREEK COMPREHENSIVE ASSESSMENT 2015

The document at hand constitutes an analysis of the disclosure data published on 31 October 2015 conducted by the ECB. In case of discrepancies, the disclosure data supersedes this report.

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1   EXECUTIVE SUMMARY

One of the main objectives of the Memorandum of Understanding (MoU) signed by the European Stability Mechanism, the Hellenic Republic and the Bank of Greece on 19 August 2015 is to implement all necessary policy actions to preserve financial stability and strengthen the viability of the banking system in Greece. In particular, solvency and liquidity of the banking sector is to be preserved. Against this backdrop, "a buffer of up to €25billion has been envisaged under the Programme to address potential bank recapitalisation needs of viable banks and resolution costs of non-viable banks, in full compliance with EU competition and state aid rules". A forward-looking evaluation of each of the four core banks' capital needs has thus been requested of the ECB in its supervisory function. As a result, a Comprehensive Assessment (CA) has been conducted by the ECB, based on end of June 2015 data and comprising both an asset quality review (AQR) and a stress test with baseline and adverse scenarios.

The exercise is based on updated macroeconomic data and scenarios that reflect the changed market environment in Greece and has resulted in aggregate AQR-adjustments of €9.2 billion to participating banks' asset carrying value. Overall, the assessment has identified capital needs totalling, post AQR, €4.4 billion in the base scenario and €14.4 billion in the adverse scenario.

Covering the shortfalls by raising capital would then result in the creation of prudential buffers in the four Greek banks, which will facilitate their capacity to address potential adverse macroeconomic shocks in the short and medium term and their capacity to improve the resilience of their balance sheet, keeping an adequate level of solvency.

Banks have to propose remedial actions (capital plans) in order to cover the entire shortfall (€14.4 billion), out of which a minimum of € 4.4 billion (corresponding to the AQR plus baseline shortfall) is expected to be covered by private means.

The recapitalisation process under the Programme will follow this exercise. The forthcoming capital planning and recapitalisation process are not covered in this report.

1.1   GREEK COMPREHENSIVE ASSESSMENT 2015

Following the 19 August 2015 agreement between the European Stability Mechanism, the Hellenic Republic and the Bank of Greece, the ECB was requested to provide a forward-looking view of the capital needs of the four Greek systemic banks (Alpha Bank, Eurobank, National Bank of Greece and Piraeus Bank). The key objective was to review the status of the banks under a given set of macroeconomic scenarios. This report provides an overview of the approach taken and presents the results of the exercise.

The comprehensive assessment of the Greek banks was broad in scope: the participating banks have total group assets of €296 billion which account for approximately 90% of the assets of credit institutions in Greece. Substantially, the comprehensive assessment followed the methodology of the 2014 exercise of the 130 banks. However, further specifications to the methodology were required given the specificities of the Greek banking system and the current macroeconomic situation. These specifications are explained in detail in Chapters 4 and 5.

The comprehensive assessment of the Greek banks consisted of two components.

1.   **The asset quality review was a point-in-time assessment of the accuracy of the carrying value of banks' assets as of 30 June 2015 and provided a starting point for the stress test.** The AQR was undertaken centrally by the ECB, and was based on a uniform methodology and harmonised definitions. Under the AQR, banks were required to have a minimum Common Equity Tier 1 (CET1) ratio of 9.5%.

2.   **The stress test provided a forward-looking examination of the resilience of banks' solvency to two hypothetical scenarios, also reflecting new information arising from the AQR.** In contrast to the 2014 exercise, this stress test was undertaken centrally by the ECB based on data templates and loan tapes provided by the four banks. Under the baseline scenario, banks are required to maintain a minimum CET1 ratio of 9.5%; under the adverse scenario, they are required to maintain a minimum CET1 ratio of 8%.

The AQR respected current accounting and prudential regulation, including the Capital Requirements Regulation (CRR) / Capital Requirements Directive IV (CRD IV) rules. The Greek comprehensive assessment 2015 was in line with the AQR methodology applied in the comprehensive assessment 2014 as outlined in the AQR Phase 2 manual[1]. In some areas, the ECB's methodology involved additional prudential prescription to accounting concepts; the results are thus of a prudential nature. Consequently, AQR-adjustments were made in cases where banks were not breaching accounting rules. However, it is expected that many banks will reflect many of these adjustments in their accounts in agreement with their statutory auditors. Examples of areas in which additional prescription was provided include impairment triggers, the calculation of individual specific provisions, and collateral valuations.

Given the constrained timeline of the exercise, prioritisation of portfolios based on their size and materiality was required, while applying appropriate rigour to the wider process. Within the

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[1]   https://www.bankingsupervision.europa.eu/ecb/pub/pdf/assetqualityreviewphase2manual201403en.pdf

AQR, a detailed asset-level review was performed for over 26 specific portfolios making up 92% of the banks' risk-weighted assets in Greece.

The stress test is not a forecast of future events, but a prudential exercise to assess banks' ability to withstand weaker economic conditions. In the Greek comprehensive assessment 2015, the stress test was undertaken centrally based on data templates and loan tapes provided by the banks. The projections were produced by the ECB following a centrally agreed methodology. Throughout the exercise, there has been an appropriate level of interaction with the banks' technical teams in order for the ECB to understand the banks' submissions.

In order to maintain consistency and equal treatment across both the AQR and stress test, Single Supervisory Mechanism (SSM) teams independently performed quality assurance on the data provided by the banks and work of external auditors. On the AQR side, the ECB was in close contact with the external auditors, responding to over 150 methodology and process questions. The ECB reviewed and challenged outcomes from an SSM-wide perspective using comparative benchmarking, as well as engaging SSM on-site teams to investigate specific issues that arose. Over 300 experts (including external auditors, appraisers, consultants, and SSM staff) were involved in the AQR. On the stress test side, the ECB has followed a pre-approved quality assurance process including benchmarking of the results and comparing all projections with banks' own projections, with the material differences having been understood in detail. For the avoidance of doubt, the ECB's centrally calculated projections were always applied, however the banks' projections were used extensively in order to identify material differences and justify the rationale for those.

1.2   OUTCOMES

Significant AQR findings have been found in this exercise, despite the already material AQR findings from 2014 being captured in banks accounts. This has primarily been driven by the deterioration in the macro-economic environment in Greece which has led to higher NPE volumes as well as lower collateral values and cashflow valuations which has led to material reductions in carrying values. Additionally, further standardization of the definition of key metrics across the EU has led to further NPE and impairment recognition in the AQR. As an example the full implementation of the EBA ITS on NPE has meant that forborne cases could be better identified and tested for impairment. Finally, the fact that tax offsets were not allowed from the AQR has amplified the findings of the AQR vis a vis 2014.

The AQR resulted in direct aggregate adjustments of €9.2 billion to participating banks' asset carrying values as of 30 June 2015[2]. Including indirect impacts on CET1%, post AQR, the average CET1% for the system was 7.9%. The direct adjustments originated primarily from accrual accounted assets, particularly adjustments to specific provisions on non-retail exposures and retail mortgages. Additionally, non-performing exposure (NPE) stocks were increased by €7 billion across the in-scope institutions, as NPE definitions were moved onto a harmonised and comparable basis, including the examination of forbearance as a trigger of NPE status.

In the base scenario of the stress test, this capital impact leads to a decrease of the CET1 ratio for the system of 0.3 percentage points from 7.9% (post AQR) to 7.6% in 2017. In the adverse scenario, the impact is a decrease of the CET1 ratio for the system of 7.8 percentage points from 7.9% (post AQR) to 0.1%.

Overall, the comprehensive assessment identified a capital shortfall of €4.4 billion and €14.4 billion in the baseline and adverse scenario, respectively, across the four participating banks after comparing these projected solvency ratios against the thresholds defined for the exercise.

The results of the exercise, including the reduction in the CET1 ratio projected as of December 2017 for each bank in both the base and adverse scenarios are shown in Table 1[3].

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[2] The direct impact of AQR on provisions and CVA is equal to €9.2 billion. The indirect impact of AQR on CET1 (e.g. DTA deductions) and RWA is equal to €401 million and €8.8 billion, respectively.

[3] The shortfall shown in the table reflects the lowest capital level over the 2.5 year period. In the baseline scenario this is not necessarily December 2017, for which the projected CET 1 ratio is indicated.

Table 1	CET1 % and capital shortfall following AQR and stress test					
Bank Name	CET1 ratio starting point pre AQR	CET1 ratio starting point post AQR	CET1 ratio baseline scenario	CET1 ratio adverse scenario	Capital shortfall baseline scenario (€billion)	Capital shortfall adverse scenario (€billion)
Alpha Bank, S.A.	12.7%	9.6%	9.6%	2.1%	0.26	2.74
Eurobank Ergasias, S.A.	13.7%	8.6%	8.7%	1.3%	0.34	2.12
National Bank of Greece, S.A.	11.6%	8.1%	7.3%	-0.2%	1.58	4.60
Piraeus Bank, S.A.	10.8%	5.5%	5.2%	-2.3%	2.21	4.93
System wide	12.1%	7.9%	7.6%	0.1%	4.39	14.40

The remainder of this report is structured as follows:

- Nature and methodology of the exercise: Objectives and guiding principles, a high-level view of its approach and the execution of the project

- Aggregate outcomes of the comprehensive assessment

- Outcomes of the AQR and further analysis: review of the detailed drivers of the AQR results and details on the methodology applied

- Outcomes of the stress test and further analysis: review of the detailed drivers of the stress test results and details on the methodology applied

2 NATURE AND METHODOLOGY OF THE GREEK COMPREHENSIVE ASSESSMENT 2015

This chapter explains the rationale for the Greek comprehensive assessment, its components, provides a high-level overview of the methodology and describes how it was executed. Finally this chapter introduces some key features of the exercise that the reader should be aware of when interpreting the results.

2.1 RATIONALE

Following the agreement from 19 August 2015 between the European Stability Mechanism, the Hellenic Republic and the Bank of Greece, the ECB was requested to provide a forward looking view of the capital needs of the four Greek systemic banks (Alpha Bank, Eurobank, National Bank of Greece and Piraeus Bank). The key objective was to review the status of the banks, under given new macroeconomic scenarios and measure the capital needs for a subsequent recapitalisation exercise.

2.2 SCOPE

The ECB has undertaken a comprehensive assessment of the four Greek significant institutions with total group assets of €296 billion at the end of June 2015, accounting for approximately 90% of total banking assets in Greece. These banks were identified based on significance criteria referred to in Article 6(4) of the SSM Regulation. The four banks in scope were the following:

- Alpha Bank, S.A.

- Eurobank Ergasias, S.A.

- National Bank of Greece, S.A.

- Piraeus Bank, S.A.

2.3 OVERVIEW OF THE METHODOLOGY

The exercise comprised two pillars, namely the AQR and the stress test.

The AQR aimed to review the carrying value of assets on the participating banks' balance sheets as of 30 June 2015. The result was an indication of the need for additional provisions for losses on exposures on banks' balance sheets, leading to prudently calculated AQR-adjusted capital

ratios, which allowed for the meaningful comparison of all participating banks on a like-for-like basis.

Based on the AQR-adjusted balance sheet, the stress test examined the resilience of banks against two separate scenarios – a baseline and adverse scenario – starting in H2 2015 and running to the end of 2017. Under both scenarios, the solvency ratio of each bank was analysed over that period to understand bank sensitivities given prescribed stressed economic conditions. The baseline scenario was provided by the European Commission and reflected then-prevailing official macroeconomic forecasts while the adverse scenario represented a severe economic downturn triggered by a materialisation of the main economic risks as provided by the ECB.

Over the period following the 2014 comprehensive assessment to 30 June 2015, Greece experienced a deteriorating economic environment. In these 18 months from 2013 year-end to H1 2015, there was a contraction of the economy with a cumulative GDP decline of -0.4%. In addition, capital controls were announced on 28 June 2015. To reflect the recent macroeconomic developments of the Greek economy over the period following the 2014 CA to H1 2015, amendments and specifications to the AQR and stress test methodology were made. These are explained in more detail in the following section as well as Chapter 4 and 5.

Figure 1	Macroeconomic environment in Greece: Real GDP growth
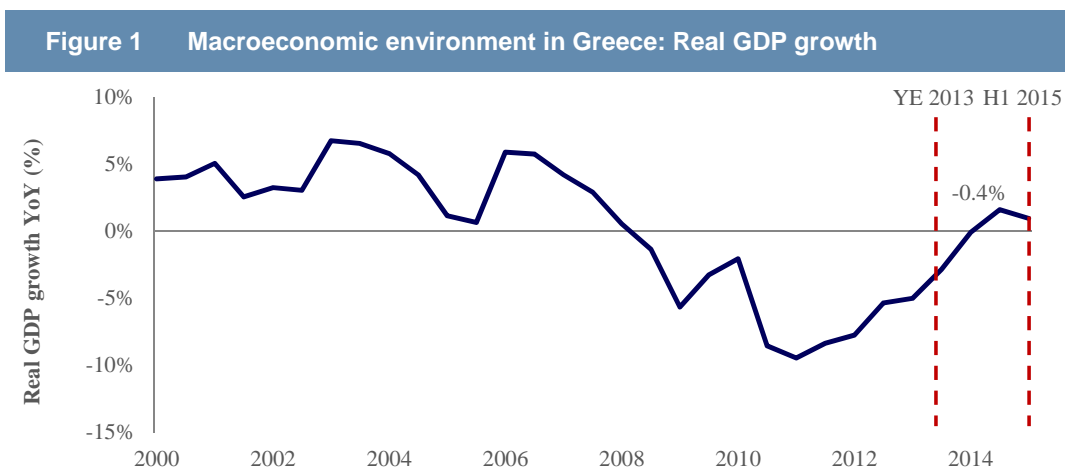
Source: Eurostat

The stock of Deferred Tax Assets (DTAs) on the Greek bank balance sheets in the COREP submission as at H1 2015 counted towards capital in line with the CRR rules over the course of the stress test. The majority of the DTA stock (82%) was not dependent on future profitability as a result of the tax regime in Greece. Of the remaining DTAs, for the purposes of the exercise, the phase in of deductions was applied consistently across the Greek banks. Specifically, a 5 year phase in was applied for DTAs that rely on future profitability and do not arise from

temporary differences (12% of stock), whilst DTAs that rely on future profitability and arise from temporary differences had either a 10 year or a 5 year phase in, depending on whether they existed prior to year-end 2013 or not (4% of stock take a 10 year phase in, whilst 2% takes a 5 year phase in). No further DTA accumulation was allowed for the purposes of the exercise from either the AQR or the stress test.

2.3.1   AQR METHODOLOGY

The Greek comprehensive assessment 2015 followed the same methodology applied in the comprehensive assessment 2014 as outlined in the AQR Phase 2 manual. Given the constrained timeline of the exercise, prioritisation of portfolios based on their size and materiality was required, while applying appropriate rigour to the wider process.

For the purpose of this exercise, the portfolio selection from the 2014 AQR was taken as the starting point, though the focus was put solely on exposures booked in Greek legal entities. In total 92% of Greek legal entity credit Risk-Weighted Assets (cRWA) were reviewed as part of the AQR.

Figure 2   Coverage of Greek legal entity cRWA in the AQR[4]
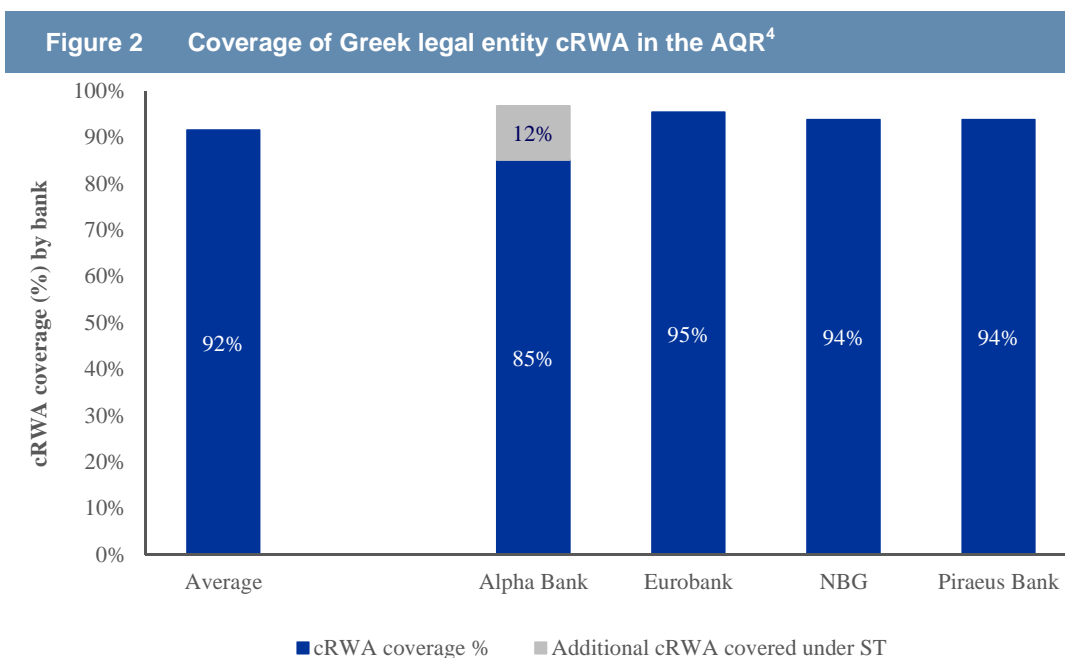
Note: cRWA coverage by bank refers to total Greek legal entity cRWA covered within the AQR exercise per bank

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[4] For Alpha Bank, additional coverage with granular data (i.e. loan tapes) was achieved for adequate treatment in the stress test.

The portfolio selection covered all major AQR asset segments, where the most significant in terms of RWA are Residential Real Estate, Large Corporates and Large SME.

Figure 3	Selected exposures by asset segments in the AQR (Greek legal entities)
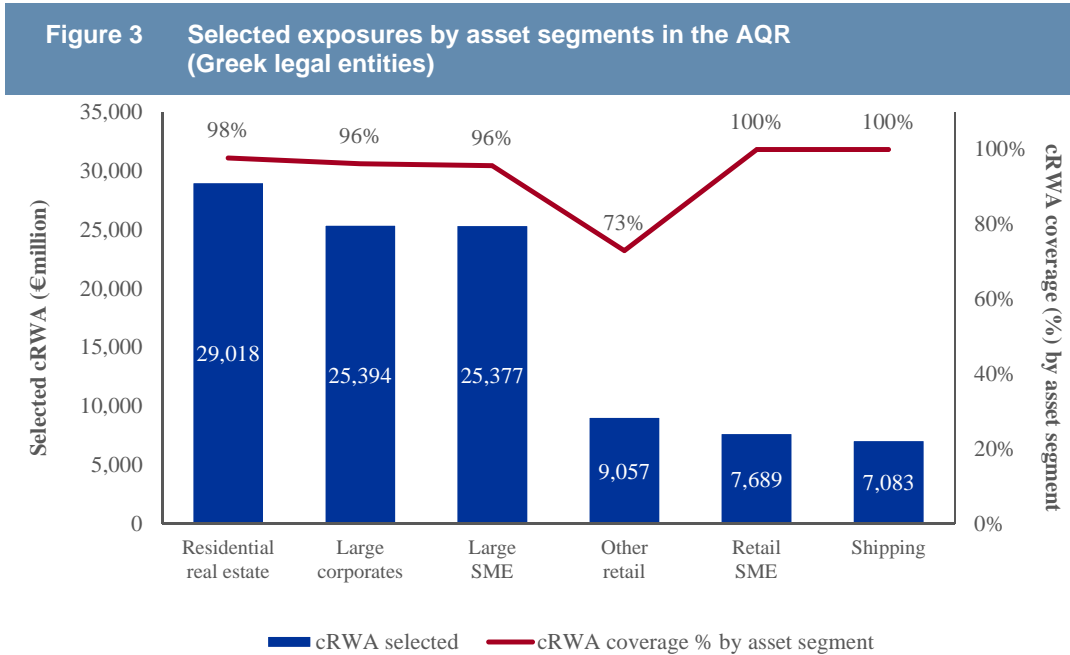
Note 1: cRWA coverage by asset class refers to total Greek legal entity cRWA covered within the AQR exercise by each asset segment
Note 2: Alpha 'Other retail' not included as covered under ST exercise

The AQR has nine interlinking workblocks with the final output of an AQR-adjusted CET1 ratio (workblock 9) to be compared to the threshold of 9.5%.

	Figure 4	Schematic of AQR workblocks

Phase 1	Phase 2					
Portfolio selection	**1** Processes, policies and accounting review (PP&A) *[Note: not relevant for this exercise apart from CVA workblock]* CVA challenger model adjust- ments	**2** Loan tape creation and data integrity validation (DIV)	**3** Sampling	**4** Credit file review (CFR)	**6** Projection of findings of credit file review **7** Collective provisioning **5** Collateral and real estate valuation	**9** Determination of AQR- adjusted CET1 for use in ECB stress test and definition of remediation activities for banks following the CA

8 Level 3 fair value exposures review *[Note: not relevant for this exercise]*		
i. Level 3 revaluation of non-derivative assets	**ii.** Core processes review	**iii.** Derivative pricing model review

Each workblock is described in more detail below:

1. **Processes, Policies and Accounting review (PP&A) / Credit Valuation Adjustment (CVA)**: A challenger model was used to assess the banks' CVA calculation in detail. The challenger model was based on the bank internal exposure projections (or Basel Exposure at Default (EAD) for derivatives where these did not exist). The challenger model was segmented and calibrated to reflect current market conditions.

2. **Loan tape creation and data integrity validation (DIV):** The credit analysis (sample selection and collective provisioning challenger model creation) was based on a "loan tape" provided by the bank. This loan tape included basic account information such as segment classification, missed payments status and identifiers of the loan / entity. The data was required to be of sufficient quality to perform the required analysis, which necessitated automated checks of the data set and a review of consistency across internal IT systems.

3. **Sampling:** Given the volume of analysis involved it was neither possible nor appropriate to review all exposures in every portfolio within the scope of the credit file

review. Therefore, risk-based sampling was conducted in a manner that meant the sample chosen was both large enough, and representative enough, to allow for robust analysis and later projection back to cover the entire portfolio. The size of the sample depended on: the homogeneity of the portfolio, the risk of the portfolio, the total number of debtors and the level of debtor concentration. Portfolios were stratified based on the riskiness and exposure size of debtors. The approach to sampling was consistent with best practice as defined by adherence to ISA 530.

To achieve a timely completion of this exercise, the sample for the 2014 CA has been taken as the starting point. In addition, "fresh" files were selected amounting to at least 10% for each portfolio.

4. **Credit file review (CFR):** The credit file review involved external auditors working on an exposure by exposure basis to verify that each credit exposure had been correctly classified in the bank's systems (e.g. correct regulatory segment, NPE status, impairment status) and that, if a specific provision was required, it had been set at an appropriate level. The CFR covered all loans, advances, financial leases and other off balance sheet items in the selected portfolios.

    To account for the current market environment, a number of additional elements were included: in particular external auditors needed to make sure that information on companies and collateral reflected the current market conditions. Quality assurance findings from the 2014 CA were taken into account from the start. The credit file review was also extended in order to capture any effects from the capital controls as an input to the stress test. In addition minimum haircuts were applied across all major asset classes.

5. **Collateral and real estate valuation:** A key input to determine appropriate carrying amounts is the valuation of collateral. The results of these valuations were used as inputs to credit file review and collective provisioning.

    For the exercise to be feasible in the tight timeline available, the valuation of collateral was limited to the areas deemed most important: All shipping collaterals were reviewed; for residential mortgages, collateral values were updated from 2014 using an index with a sample of 20% of properties being reappraised to verify the results of indexing; for real estate related debtors, revaluation criteria as per the Manual were followed; for other non-retail exposures reappraisals were conducted where deemed required by the bank team.

6. **Projection of findings of credit file review:** Findings of the credit file review were then projected to the unsampled part of the portfolio. Specifically, projected metrics

were mainly provisions and NPE reclassifications. Projection of findings was applied to homogeneous pools of exposure within each portfolio called "strata" (in line with audit guidelines, see Sampling). In order to prevent overstating the projection of single credit file review findings, a number of safeguards were implemented in the projection methodology (e.g. flagging of anomalies, common risk stratum based projection – using results from the whole risk bucket rather than just from the stratum, and overrides – in rare cases where results from the sample were felt to be unrepresentative which had to be approved centrally by the ECB).

7. **Collective provisioning analysis:** Smaller, homogeneous, impaired exposures are typically provisioned using a collective provisioning approach – that is, a point-in-time statistical model of incurred loss. Similarly, incurred but not reported (IBNR[5]) and other general provisions are usually set using collective models. Therefore, in order to verify that provisioning levels were appropriate, it was important that collective provisioning models were fully aligned with the letter and spirit of accounting rules (IAS[6] 39). This was performed using a comparison of banks' practices to provisioning levels suggested by a unified, simplified challenger model. In this exercise, the challenger model calibration was tailored to the current environment by calculating parameters for three time windows (2013, 2014, H1 2015) and subsequently selecting the most appropriate.

9. **Determination of AQR-adjusted CET1 ratio for use in ECB stress test:** In order to correctly account for all AQR adjustments, an "AQR-adjusted CET1 ratio" was calculated for each bank. This AQR-adjusted CET1 ratio was calculated according to the Single Rulebook, reflecting the implementation of the CRR / CRD IV rules (taking into account transitional arrangements) as of year-end 2015 – the main difference being that no formation of new DTAs will be allowed, associated to the AQR adjustments beyond those already booked by June 2015.

2.3.2 STRESS TEST METHODOLOGY

The stress test model projected CET1 ratios for each bank according to a baseline and adverse scenario. The output projection of CET1 ratios was compared to the CET1 ratio thresholds designed for the exercise and a shortfall calculated as the maximum CET1 shortfall in absolute terms at June 2015 and December 2015, 2016 and 2017.

The high level modelling approach for the projection was as per the diagram below.

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[5]   Provisions set aside for future expected losses on currently performing debtors.

[6]   International Accounting Standards.

Figure 5   Illustrative high level modelling approach for stress test

P&L and balance sheet projection

	H1 2015	H2 2015	2016	2017
CET1 %	XX	XX	XX	XX
RWA	XX	XX	XX	XX
Balance Sheet				
Assets	XX	XX	XX	XX
Liabilities	XX	XX	XX	XX
Equity	XX	XX	XX	XX
P&L				
Income	XX	XX	XX	XX
Expenses	XX	XX	XX	XX
Retained earnings	XX	XX	XX	XX

- **RWA projection module**
- **Credit loss module**
- **Net interest income and volumes module**
- **Other income and expenses module**
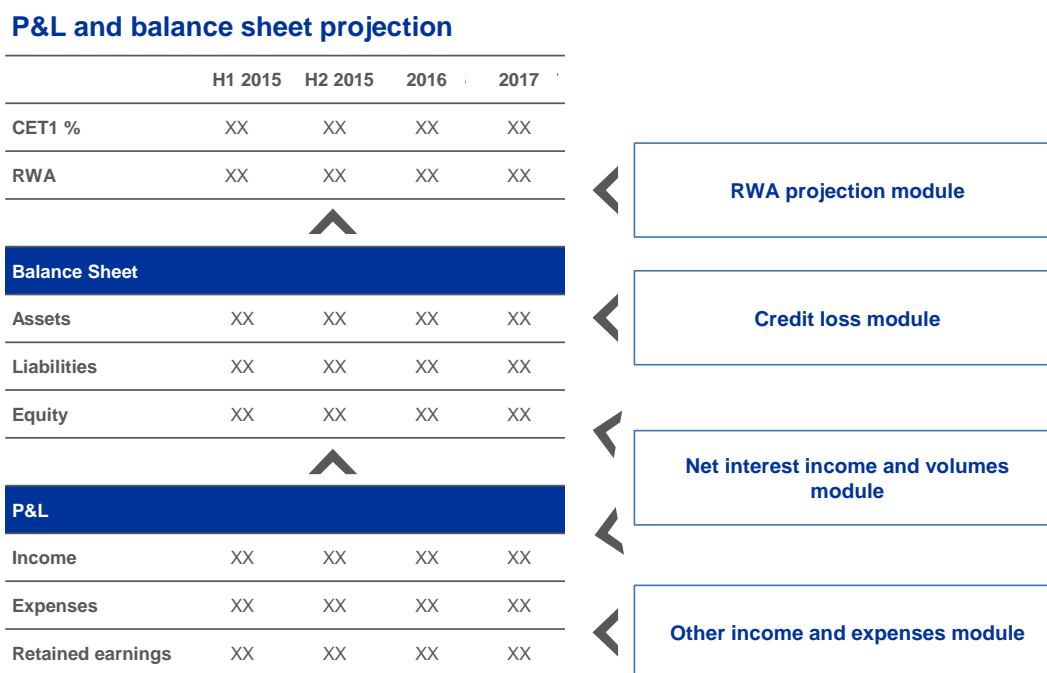
A projection of the P&L and balance sheet was produced based on the underlying performance of each bank. The CET1 ratio projection then considered the roll forward of capital in a mechanical manner, fully reflecting CRD IV phase in and other assumptions defined by the relevant stakeholders. Detailed "drill down" analysis was performed on Net Interest Income (NII), Other Operating Income and Expenses, RWA and provisions. The drill down analysis fed the P&L and balance sheet projection. More details on the stress test methodology applied are provided in Chapter 5.

2.4   EXECUTION

A number of parties were involved in the execution of the Greek comprehensive assessment:

- The Steering Committee of the comprehensive assessment was the main decision and steering body at the ECB / SSM level

- The Operational Project Management Meeting performed project management on an operational level, was responsible for progress control and coordination and prepared decision making for the Steering Committee

- At the ECB, the comprehensive assessment was conducted and coordinated under the lead of a Central Programme Management Office

- The ECB SSM Technical and Quality Assurance (QA) team performed central and on-site quality assurance on data provided by the banks and external auditors, prepared the models and templates used and developed the methodology applied in the exercise

- The Bank of Greece as the national supervisor has been closely involved in the process (including the QA mentioned above), contributing with its local expertise about the banks under review

- External auditors, property appraisers and valuation advisers were involved in the completion of the bank's AQR, acted as a first line of defence in the quality assurance and reported to the ECB. Note – the auditor for each bank was not the statutory auditor of the bank. Overall, more than 200 audit and valuation experts where involved in the exercise, reviewing about 4,000 credit files and 12,000 collateral items

- Participating banks were responsible for fulfilling their obligations to the ECB, providing data for the AQR and the stress test

Figure 6   Project governance
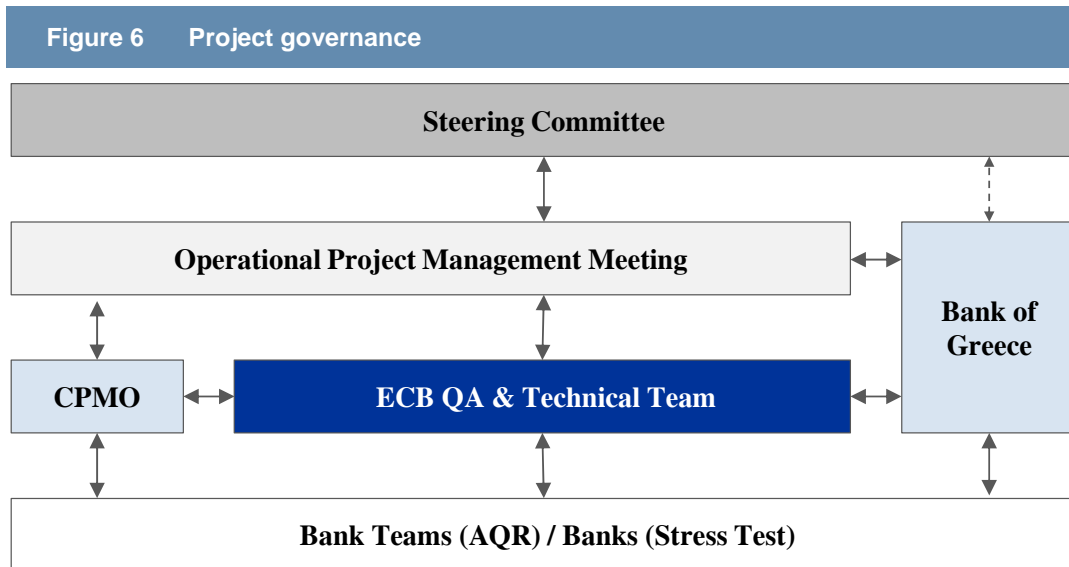
The two components of the comprehensive assessment, AQR and stress test, were executed by these bodies in different ways, reflecting the nature of each exercise:

- The AQR was executed by the external auditors, following a methodology designed and published by the ECB. Central quality assurance was performed and requests were made by the ECB and the external auditors to investigate certain results – further details of this process can be found in Chapter 2.6. Both the ECB and external auditors were

supported by external advisors (including consultants and appraisers) who brought expertise and independence to the review

- In this year's comprehensive assessment, the stress test was a centrally led top-down ECB exercise, following a methodology designed and published by the ECB. Banks provided the ECB with data on their baseline projections, while the adverse scenario projections were centrally performed by the ECB

- Following completion and finalisation of the comprehensive assessment result, a "supervisory dialogue" process was conducted between the participating banks and their Joint Supervisory Teams (JSTs). During the supervisory dialogue meetings, partial and preliminary results of the comprehensive assessment were shared and discussed. The banks were given 24 hours following the meeting to provide comments and questions to the ECB which assessed their materiality and incorporated where deemed appropriate

2.5   CHARACTERISTICS OF THE COMPREHENSIVE ASSESSMENT

A number of characteristics of the comprehensive assessment should be borne in mind when considering the results.

The comprehensive assessment was a prudential rather than accounting exercise. Although the exercise was conducted with regard to current accounting standards (IFRS), the prudential rules were considered as binding and were observed strictly and used to support the appropriate interpretation of the IFRS rules. The outcomes of the comprehensive assessment will consequently not necessarily be reflected directly in banks' accounts following the exercise, as alternative accounting interpretations may be possible, but not prudential.

The comprehensive assessment sought to maintain a level playing field across the four Greek banks by providing guidance on a range of important inputs such as impairment triggers, provisioning approaches for going concern NPE, collateral valuation and collateral haircuts for gone concern NPE, point-in-time collective provisioning, and credit valuation adjustment calculation where possible.

External auditors were aided by the published methodology[7] prepared for the comprehensive assessment 2014, which was complemented by additional guidance on the specifics of the Greek exercise. Furthermore, external auditors were supported by a central frequently asked

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[7]   AQR Phase 2 Manual, published on
https://www.bankingsupervision.europa.eu/ecb/pub/pdf/assetqualityreviewphase2manual201403en.pdf

questions (FAQ) and helpdesk process, as well as the thorough review of any outliers or anomalies during the central quality assurance process.

The comprehensive assessment involved central oversight in both methodology definition and quality assurance for consistency and transparency. This included the preparation of the methodological manual and providing additional clarifying support.

The teams were aided in their work as both the external auditors and the Central Project Management Office (CPMO) had experience of the QA process in 2014 and thus had the tools and techniques to identify and achieve compliance with the manual.

The AQR was conducted using a general principle that an approach would be adopted only where objective data was available to justify it. Whenever such data was not available a conservative fall-back assumption was used and applied consistently across the Greek system. An example of this is the use of loss emergence periods in the collective provisioning workblock. Loss emergence periods have a direct impact in provisions required for performing loans. A rebuttable assumption of 12 months was employed, which could only be lowered where granular, objective data was analysed by the bank team and approved by the ECB to show that a shorter period was appropriate.

The stress test is a forward-looking exercise that provides insight into the ability of a bank to withstand pre-defined adverse economic conditions. It should be noted that the stress test is not a forecast of future events, but rather a prudential gauge of participating banks' resilience under severe but plausible macroeconomic conditions. For example, a number of restrictive rules were imposed by the stress test methodology that constrict the responses of the participating banks to stress. These rules enhance the prudential nature of the exercise.

2.6   QUALITY ASSURANCE

This sub-section outlines the process of quality assurance conducted on the AQR and stress test, including an overview of the types of checks conducted.

To ensure an accurate and timely delivery of the AQR and stress test results, a thorough QA process has been put in place, involving ad hoc central and onsite ECB / SSM teams composed of experts from different business areas of ECB and SSM. Those teams were regularly reporting to the Operational Project Management Meeting and to the Steering Committee. In addition, the banks themselves made significant efforts to supply data and other requested information to the necessary standard on time.

- The ECB Central QA team was mainly responsible for methodological oversight, cross-bank benchmarking as well as performing automated QA checks on the data provided by the external auditors (AQR) or the banks (stress test).

- The SSM on-site QA team (especially devoted to the AQR) contributed heavily to the QA by performing a file by file review in parallel to external auditors to challenge their work by performing spot checks and liaising with the auditors on-site.

- JST's contributed with their supervisory experience and engaged with the central and on-site QA teams in the investigation of specific issues

In particular, regarding the AQR:

The quality of results was improved by providing detailed feedback on unexpected data items, unfilled fields and outlier submissions, as well as reviewing issues escalated by external auditors.

Granular analysis allowed the ECB to scrutinise the results of each workblock on a bank, asset class and system level. Areas where expert judgement was provided by external auditors or where there could be potential errors in the implementation of the methodology were challenged on a line-by-line basis by the ECB. Areas in which calculated parameters were outside of expected ranges (e.g. probability of impairment and loss given impairment within collective provisioning) were identified for future analysis.

Where more contentious issues arose, the ECB presented recommendations based on its understanding of the situation, and could open a bilateral discussion in the event of a disagreement. Additional analysis could then be presented by external auditors to justify the results. In cases of continued disagreement, the ECB decided upon implementation. The following diagram outlines the process by which the more contentious issues were resolved, always with the aim of reaching consensus between the ECB and external auditors.

Figure 7   Quality assurance correction process

1 **Identification of QA issue** — • ECB QA team identifies a number of anomalies and outliers and form a recommended course of action for anomalous datapoints on the basis of evidence available to them

2 **Desired action communicated to bank team** — • The recommendation is provided to bank teams for action

3 **Further bank team analysis and ECB consideration** — • **In case of disagreement on the issue from the bank team, the ECB is willing to consider further evidence and the process would "loop" back to step 2**

The combined work of the off-site and on-site team gave the ECB a reasonably complete picture of the work of the external auditors, and the ECB was thus able to be effective in QA despite the short time-frame.

There were 4 critical elements to the Quality Assurance of the stress test analysis: (1) Basic data quality checks on all of the input data (2) Comparison of ECB centrally led projections with bank projections (3) Sense checks on projections based on benchmarking analysis and (4) ECB expert review. The four elements are discussed more fully below:

1. Basic data quality checks were performed on all the input data templates. This involved basic tests e.g. check for segment volumes that don't add up to total; totals on different templates that should match, do match; no missing data etc. Issues that were identified were resolved or other prudent adjustments made in ECB projections.

2. Once the input data set from the banks was verified, the ECB produced its own stress test projections. To ensure that there were no issues around interpretation of input data in the calculations the projections were compared to the banks projections. Where there were divergences between bank and ECB projections that had a material impact on the CET1%, investigations were carried out with the relevant bank.

3. A peer benchmarking was carried of the four banks across a wide range of factors. Unintuitive findings from a relative or absolute perspective were verified. If issues were confirmed, inputs were revised or other prudent adjustments were made in ECB projections.

4. Finally, the stress test projection models were reviewed by a range of different experts from the ECB not directly involved in the calculations. These ECB staff identified any issues or concerns and highlighted them to the team managing the models. Any issues were discussed and errors were fixed. Any alternative propositions on assumptions were forwarded to the steering committee for decision.

3 AGGREGATE OUTCOMES OF THE GREEK COMPREHENSIVE ASSESSMENT 2015

This chapter first shows the aggregate change in available and required capital that was projected by the comprehensive assessment under the base and adverse scenario, covering both the AQR and stress test impact. Subsequently, it details the capital shortfall that arises after comparing the capital impacts against the relevant thresholds.

3.1 PROJECTED CAPITAL CHANGE

The comprehensive assessment capital impact across the four Greek significant institutions is €10.6 billion in the base case and €25.6 billion in the adverse scenario. €9.6 billion represents that AQR impact (€9.2 billion relate to adjustments in the carrying value of assets and €0.4 billion to the additional indirect impact on capital deductions), while the capital impact from the stress test was €1.0 billion in the base case and €16.0 billion in the adverse, as can be seen in Figure 8 below.

| Figure 8 | Comprehensive assessment CET1 % impact |

Baseline scenario

Adverse scenario

Significant AQR findings have been found in this exercise, despite the already material AQR findings from 2014 being captured in banks accounts. This has primarily been driven by the deterioration in the macro-economic environment in Greece which has led to higher NPE volumes as well as lower collateral values and cashflow valuations which has led to material reductions in carrying values. Additionally, further standardization of the definition of key

metrics across the EU has led to further NPE and impairment recognition in the AQR. As an example the full implementation of the EBA ITS on NPE has meant that forborne cases could be better identified and tested for impairment. Finally, the fact that tax offsets were not allowed from the AQR has amplified the findings of the AQR vis a vis 2014.

The AQR part of the comprehensive assessment required changes to asset carrying values of €9.2 billion. This led to an adjustment of the aggregate June 2015 CET1 ratio from 12.1% pre AQR to 7.8% post AQR (before adjustments to RWA, DTAs and Internal Ratings Based (IRB) provisioning shortfall). Additionally, RWA was decreased by €8.8 billion, due to the additional provisions and other appropriate adjustments were made to DTA and other deductions as well as the IRB provisioning shortfall for banks that are IRB. Post the necessary adjustments mentioned, the final post AQR CET1 ratio, which also represents the stress test starting point, has been adjusted to 7.9%. The main drivers of the AQR impact can be seen in Figure 9 below and are discussed in detail in Chapter 4.
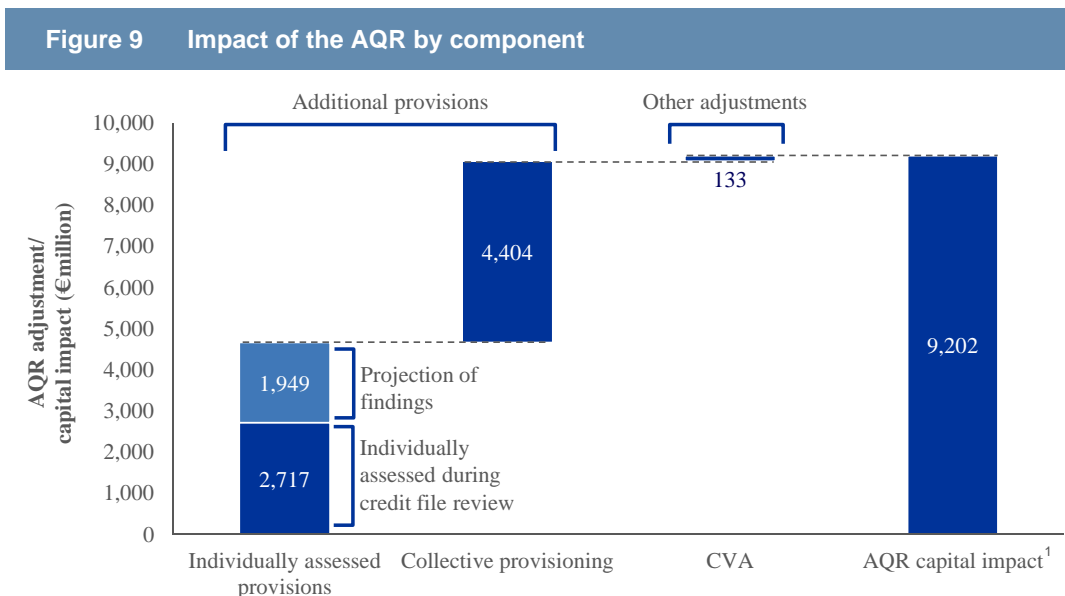
Figure 9   Impact of the AQR by component

1. Additional DTAs (tax offsetting impact) as a result of additional AQR provisions have not been recognised. As a result, additional provisions identified through the AQR exercise have a direct impact on AQR-adjusted CET1 ratio

The stress test base scenario capital impact across the four Greek significant institutions is 0.3 percentage points. This includes projected capital depletion of €1.0 billion, representing 6.3% of total post AQR CET1 capital held by the banks at 30 June 2015, and a decrease in RWA of €5.3 billion. The stress test adverse scenario capital impact across the four Greek significant institutions is 7.8 percentage points. This includes projected capital depletion of €16.0 billion,

representing 99.1% of total post AQR CET1 capital held by the banks at 30 June 2015, and a decrease in RWA of €23.1 billion.

The main drivers of the stress test results can be seen in Figures 10 and 11 below and are discussed in more detail in Chapter 5.
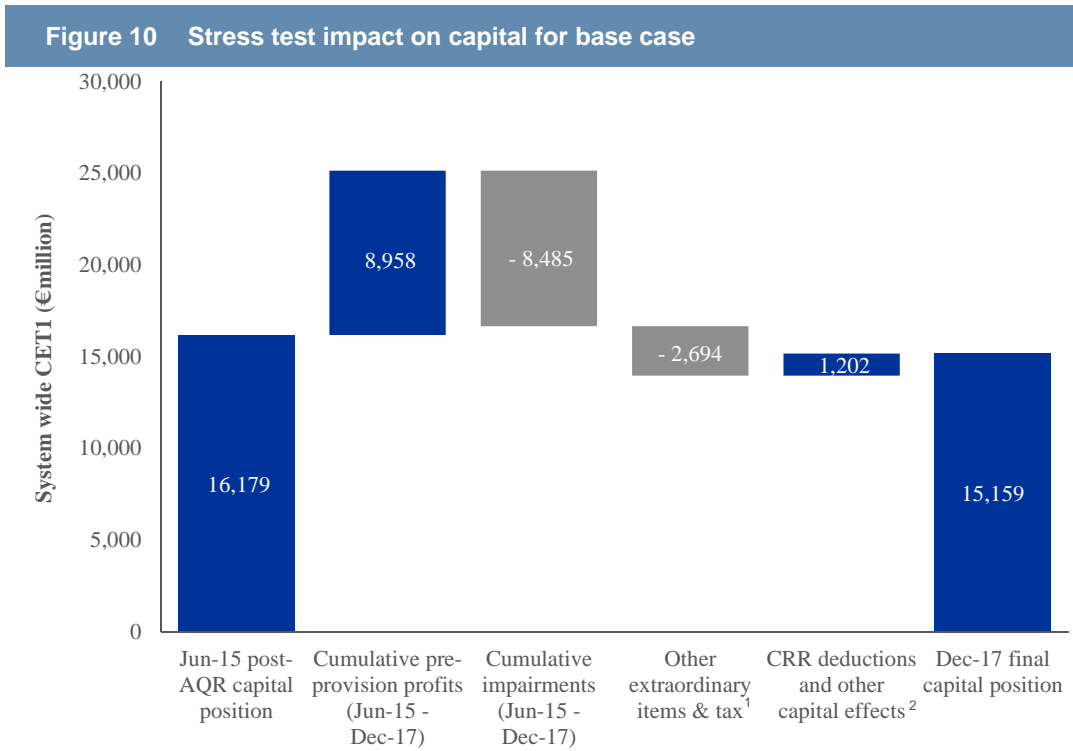
Figure 10   Stress test impact on capital for base case

1. Other extraordinary items & tax is defined as adjustments of REO carrying values, impairments on goodwill, profits of participations & methodological adjustments of participations carrying values, and tax
2. CRR deductions and other capital effects is defined as the values which must be deducted from the bank's tangible equity in order to arrive at CET1

Figure 11   Stress test impact on capital for adverse case
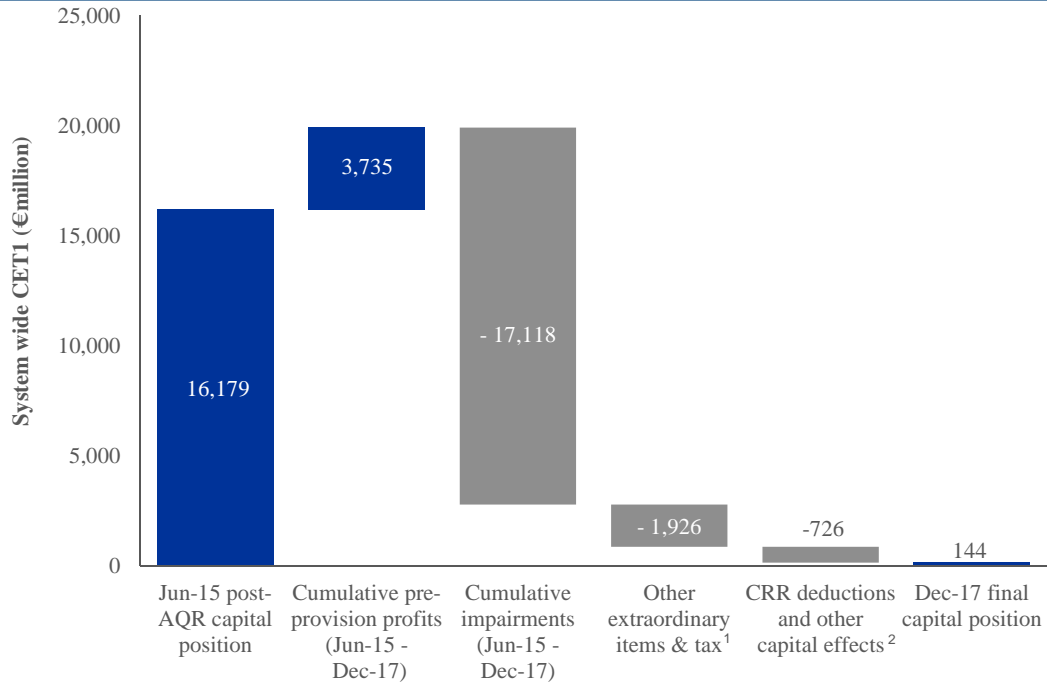
1. Other extraordinary items & tax is defined as adjustments of REO carrying values, impairments on goodwill, profits of participations & methodological adjustments of participations carrying values, and tax
2. CRR deductions and other capital effects is defined as the values which must be deducted from the bank's tangible equity in order to arrive at CET1

The detailed RWA impact decomposed into the impact from the AQR and the stress test is shown in Figure 12 below.

Figure 12   RWA impact from AQR and stress test
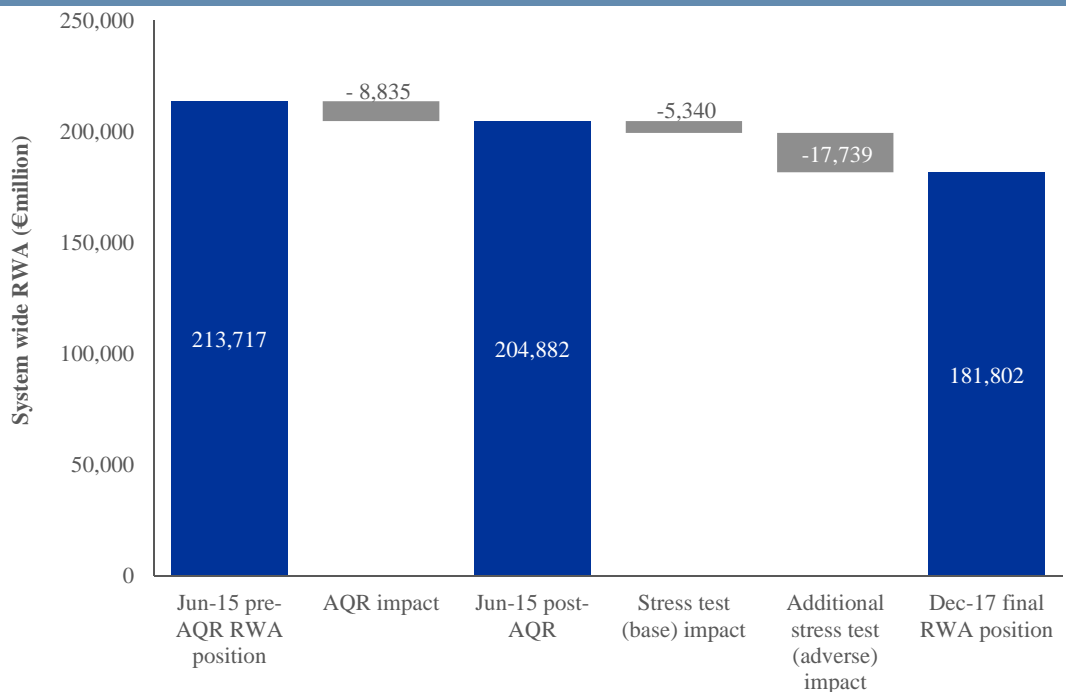
The figures illustrated above are consolidated Group figures, including international subsidiaries. In the figures below, a set of aggregate projections of key metrics is provided for the Group and Greece, both for the baseline and adverse scenario. Note – only Greek legal entities were included in the AQR. Also, NPE levels are stated in terms of Basel EAD classified as non-performing applying a simplified European Banking Authority (EBA) definition, divided by total EAD (i.e. total loans and receivables and Hold-to-Maturity instruments, including Sovereign exposures).

Table 2	Overview of key metrics Group vs. Greece for baseline scenario			
Group baseline	**H1 2015**	**H2 2015**	**FY 2016**	**FY 2017**
NIM (average over period, annualised)	3.3%	3.1%	3.1%	3.3%
CIR	55.2%	70.2%	58.6%	54.1%
Loan to deposit ratio (end of period)	158.3%	155.6%	134.4%	129.8%

Greece baseline	**H1 2015**	**H2 2015**	**FY 2016**	**FY 2017**
NIM (average over period, annualised)	2.8%	2.6%	2.5%	2.8%
CIR	56.3%	76.9%	62.9%	57.1%
EL performing assets (annualised)	3.1%	2.4%	1.6%	1.1%
NPE % (end of period)	38.4%	39.3%	40.8%	40.2%
Specific provisions / Defaulted loans (end of period)	51.1%	52.1%	52.7%	54.0%
Loan to deposit ratio (end of period)	168.3%	164.1%	136.2%	129.6%

Table 3	Overview of key metrics Group vs. Greece for adverse scenario			
Group adverse	**H1 2015**	**H2 2015**	**FY 2016**	**FY 2017**
NIM (average over period, annualised)	3.3%	2.5%	2.5%	2.5%
CIR	55.2%	98.9%	73.4%	71.9%
Loan to deposit ratio (end of period)	158.3%	152.5%	134.9%	124.8%

Greece adverse	**H1 2015**	**H2 2015**	**FY 2016**	**FY 2017**
NIM (average over period, annualised)	2.8%	1.9%	1.7%	1.8%
CIR	56.3%	137.2%	88.5%	86.4%
EL performing assets (annualised)	3.1%	3.4%	2.7%	2.1%
NPE % (end of period)	38.4%	40.0%	44.1%	46.1%
Specific provisions / Defaulted loans (end of period)	51.1%	54.1%	53.9%	54.4%
Loan to deposit ratio (end of period)	168.3%	160.7%	138.0%	124.5%

3.2 SHORTFALL IDENTIFIED

Each bank in the comprehensive assessment was required to maintain a 9.5 % CET1 ratio after accounting for the effect of AQR results on their mid-year 2015 balance sheet. Each bank was also required to maintain a 9.5% CET1 ratio at each year-end during the baseline stress test scenario, and an 8% CET1 ratio at each year-end during the adverse stress test scenario.

As discussed in the previous chapter, the total projected change in CET1 from the comprehensive assessment in the adverse scenario is €25.6 billion (including AQR adjustments). Moreover, the RWA decreased by €31.9 billion in the adverse scenario to 2017 (as a result of deleveraging and provisioning, including also AQR adjustments), decreasing the capital requirements. Offsetting this impact is the excess capital held by the participating banks.

Figure 13   Comprehensive assessment shortfall by main components
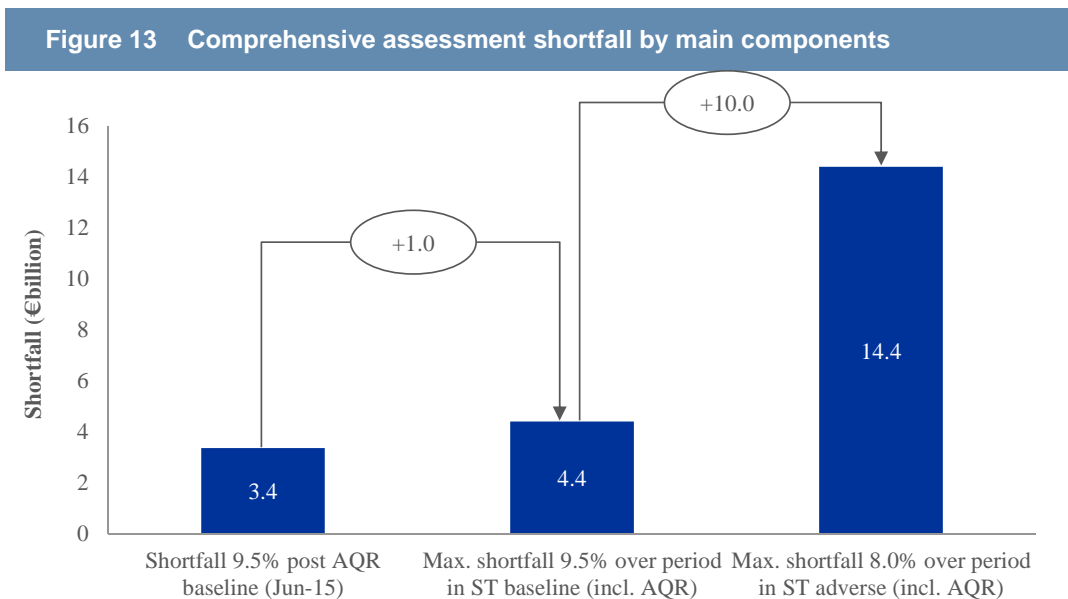
As shown above the total shortfall can be disaggregated into the main components of the comprehensive assessment by identifying:

- **Shortfall from the AQR**– this is the aggregate shortfall due to the AQR adjustments applied to the June 2015 capital positions of the banks

- **Shortfall from the stress test** – this is the aggregate shortfall (under the baseline and adverse scenarios, measured against their respective thresholds) using the stress test results, applied to the post AQR capital positions of the banks

4   AQR OUTCOMES

This chapter provides detail on the key results of the AQR and the AQR total impact for each individual workblock and across the four Greek significant banks.

The AQR component of the comprehensive assessment involved performing a detailed asset-level review of the in-scope portfolios, in line with current accounting and prudential regulation set out in CRR / CRD IV capital rules. In some areas the ECB's methodology involved additional prudential prescription to accounting concepts in order to achieve consistency and adequate conservatism. AQR adjustments should therefore not be interpreted as breaches to accounting rules.

As described in Chapter 1 and 2 in this report, the comprehensive assessment of the Greek banking system in 2015 was primarily a response to the market environment in Greece upon the 3rd MoU between Greece and the Institutions. The results are of a prudential nature, in order to assess the banks' ability to withstand the weak economic environment.

Additionally, it should be noted that, while the banks reflected an important part of the AQR adjustments from the comprehensive assessment 2014 in their accounts, the worsening of the market conditions meant that additional AQR findings were not unexpected, particularly given the prudential nature of the exercise.

The detailed outcomes of the 2015 AQR on the Greek significant banks is presented in the following sub-chapter.

4.1   TOTAL ADJUSTMENT AND CAPITAL IMPACT

The total adjustment to the carrying amount of loan portfolios and fair values of derivatives (CVA) was €9,202 million. This is shown by participating bank in the chart below:

Figure 14   Gross AQR adjustment by bank
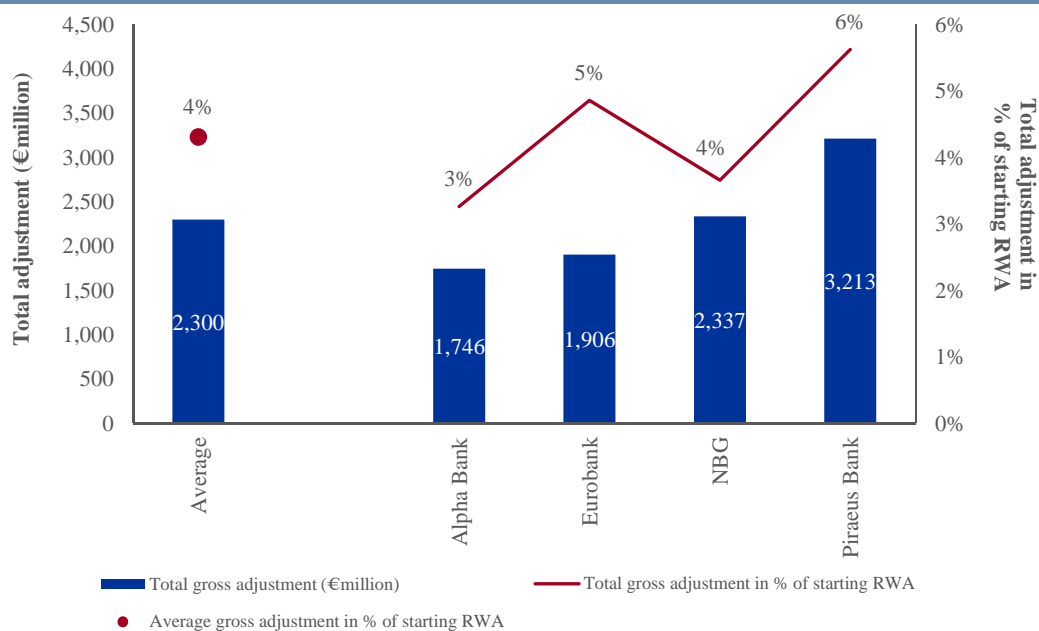
Note: Gross adjustment excludes any offsetting tax and risk protection effects. Adjustments include both additional provisions and CVA adjustment

Table 4   Breakdown of impact by AQR components

Bank name	Pre-AQR CET1 *in €MM*	Credit File Review *in €MM*	Projection of Findings *in €MM*	Collective Provisioning *in €MM*	CVA adjustments *in €MM*	Total AQR CET1 adjustments *in €MM*	Tax/Risk Protection adjustments[1] *in €MM*	Post AQR CET1 before adjustments to RWA, DTAs and IRB provisioning shortfall (Jun-15) *in €MM*
Alpha Bank	6,792	-531	-290	-904	-22	-1,746	0	**5,045**
Eurobank	5,389	-403	-286	-1,187	-30	-1,906	0	**3,483**
NBG	7,412	-692	-334	-1,311	0	-2,337	0	**5,075**
Piraeus Bank	6,189	-1,091	-1,039	-1,002	-81	-3,213	0	**2,976**
Totals	**25,781**	**-2,717**	**-1,949**	**-4,404**	**-133**	**-9,202**	**0**	**16,579**

1. Offsetting impact is zero given no DTAs from AQR were allowed to be recognised

The following chapters provide further information on the drivers of AQR adjustments, disaggregating the result into its three major components:

1.   Additional provisions resulting from the non-performing non-retail debtors from the risk-based sample that were individually assessed and then projected to the rest of the portfolio.

2.   Additional provisions identified through the collective provisioning assessment of all performing exposures and non-performing retail exposures.

3.   Additional adjustments of CET1 capital through the CVA challenger model impact.
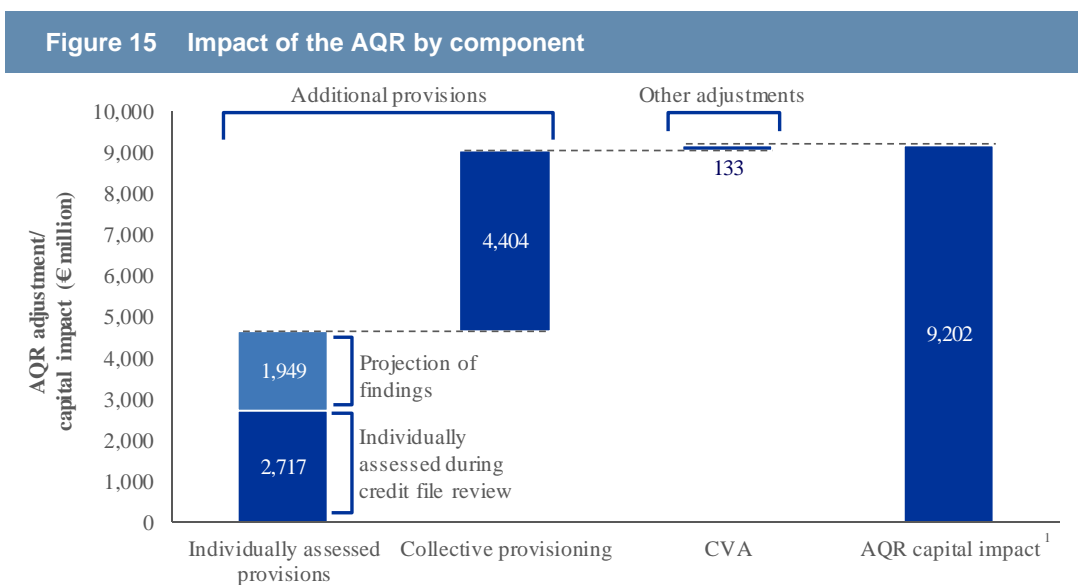
Figure 15   Impact of the AQR by component

1. Additional DTAs (tax offsetting impact) as a result of additional AQR provisions have not been recognised. As a result, additional provisions identified through the AQR exercise have a direct impact on AQR-adjusted CET1 ratio

Each component of the AQR had several drivers which are discussed in more detail in the following chapters – first the individual specific provisioning assessment (credit file review, collateral valuation and projection of findings) is discussed in Chapter 4.2, followed by the collective provisioning assessment in Chapter 4.3 and the CVA challenger model adjustments in Chapter 4.4.

As part of the credit file review the adjustment to provisions for non-performing debtors can be assessed under two approaches: Gone concern which relies on a final sale value of collateral exposures and going concern where operating cash flows are used to assess a prudent net present value (NPV) of future cash flows. In the majority of cases the gone concern approach is implemented given it is a more robust and prudent perspective. It is important to note that the rationale for implementing these approaches is based on a means to measure a prudent provisioning adjustment only and not a recommendation for bank strategy. Specifically, gone

concern represents a view that the prudent provision is based on the realisable collateral values, but it may be that the bank shareholders continue to believe that better returns are available through restructuring and subsequent sale of the business or curing of the loan. The percentage of gone concern debtors should not be seen therefore as an estimate of the percentage of companies or individuals to be liquidated – but the percentage of companies or individuals who should be provisioned down to a level based on the available collateral.

Table 5	Summary of AQR adjustment by component		
AQR component		**Adjustment**	**Section**
Individually assessed provisions		**€4,665 million**	**4.2**
Credit File Review		€2,717 million	**4.2.1**
CFR - reclassified NPE (going concern)		€232 million	
CFR - reclassified NPE (gone concern)		€770 million	
CFR - existing NPE treated under gone concern		€1,585 million	
CFR - existing NPE treated under going concern		€130 million	
Projection of Findings		€1,949 million	**4.2.2**
Collectively assessed provisions		**€4,404 million**	**4.3**
Collective Provisioning - specific provisions		€3,516 million	
Collective Provisioning - IBNR		€888 million	
CVA		**€133 million**	**4.4**
CVA Challenger model		€133 million	
Total AQR adjustment		**€9,202 million**	

Note: Numbers may not fully reconcile due to rounding

4.2 INDIVIDUALLY ASSESSED PROVISIONS

This chapter provides a detailed view on additional provisions identified for individually assessed non-retail debtors from the credit file review, collateral valuation and projection of findings workblocks. The credit file review assessed the chosen samples of non-retail debtors mainly in terms of (a) performing classification status and (b) need for additional provisions (Chapter 4.2.1 below), with findings being projected to the remaining unsampled debtors per portfolio according to pre-defined criteria (Chapter 4.2.3). Residential Real Estate facilities were assessed for their performing status only as an input to collective provisioning (Chapter 4.3).

4.2.1   CREDIT FILE REVIEW

Following the review of all 2,528 sampled non-retail debtors across the Greek significant institutions, the overall impact of the credit file review was an increase in provisions in the sample of €2,717 million from €7,513 million to €10,229 million. Given that provisions relate to NPE (existing or reclassified), all provisioning adjustments under the credit file review were specific.

This increase in provisions by asset class is shown below.

Figure 16   Summary of impact of provisions by asset class

Legend:
- Pre-AQR provisions
- Post-AQR provisions
- Total provisions adjustments in % starting cRWA
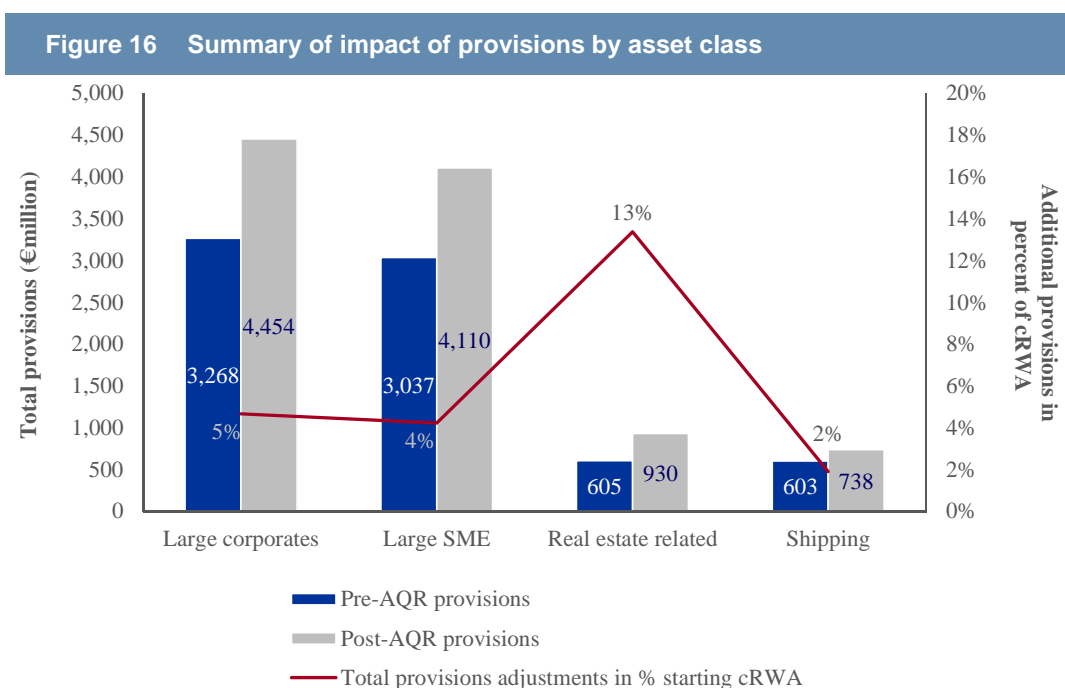
Reclassified NPE

€1,003 million of additional provisions in the credit file review was due to the reclassification of 240 debtors in the sample representing 16% of total non-retail debtors that were originally classified as performing. As shown in Figure 17, across the Greek system, the participating banks average proportion of non-retail reclassified debtors ranged from 8% to 22% (in the sample). For residential real estate (RRE), the proportion of reclassified debtors ranged between 2% and 43% (in the sample). Please note that the sample has been selected on a risk-based approach, i.e. simple averages across the sample are shown for illustrative purposes only but do not necessarily reflect projection effects. See the relevant sections in this chapter for details.

Figure 17   Number of reclassified NPE by bank in the sample
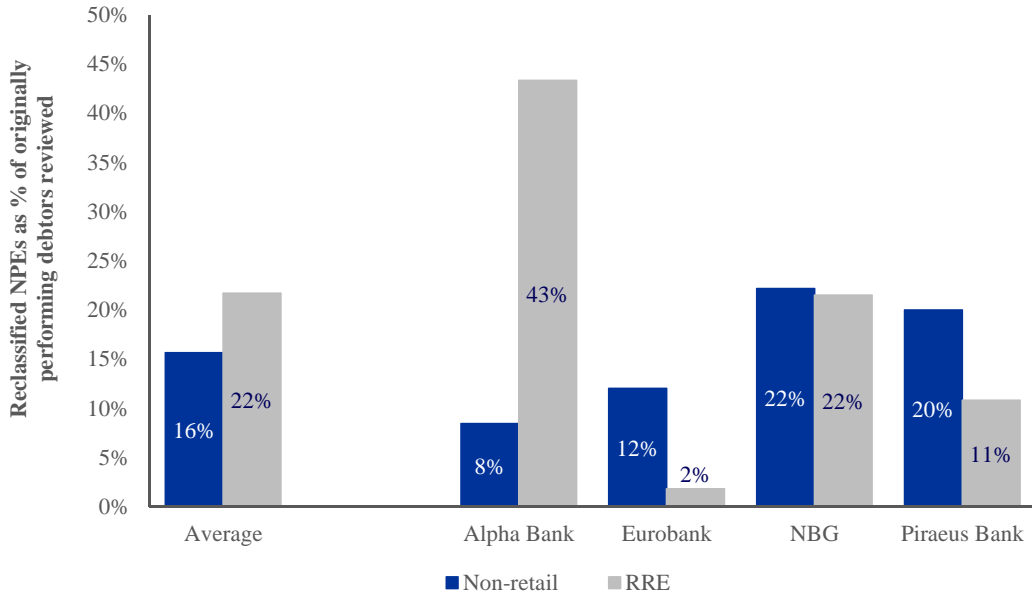
The performing / nonperforming classification status of a debtor is assessed through a comparison of objective performance criteria as defined in the AQR manual. These criteria define whether a debtor is impaired and its subsequent performing / non-performing classification. A review of the impairment triggers hit for reclassified NPE shows that for non-retail the most common triggers were debt service coverage ratio (70%) and forborne NPE (55%). The importance of these two triggers reflects the Greek macroeconomic environment: Deterioration in operating cash flows of debtors and subsequent need for forbearance measures.

Table 6	Distribution of impairment triggers for non-retail reclassified NPE	
Trigger	**Times hit**	**% of reclassified debtors**
Debt Service Coverage Ratio	169	70.4%
Forborne NPE	132	55.0%
Change in EBITDA	59	24.6%
Connected Client impaired	38	15.8%
Change in equity	30	12.5%
Loan-to-Value	16	6.7%
Emergency funding	15	6.3%
Probability of Default	7	2.9%

Note: In a number of cases debtors will hit more than one trigger. The assessment whether a reclassification to NPE is required is based on a holistic view of all triggers that impact a debtor simultaneously

Within the non-retail reclassified debtors, 63% of the debtors were treated under the gone concern approach and 37% were assessed as going concern. Additionally, for the RRE portfolio further reclassifications were primarily due to forbearance triggers.

The total change in provisions that were found for reclassified debtors is shown below by AQR asset segment:

Figure 18 Change in provisions by asset class for non-retail reclassified NPE (in the sample)
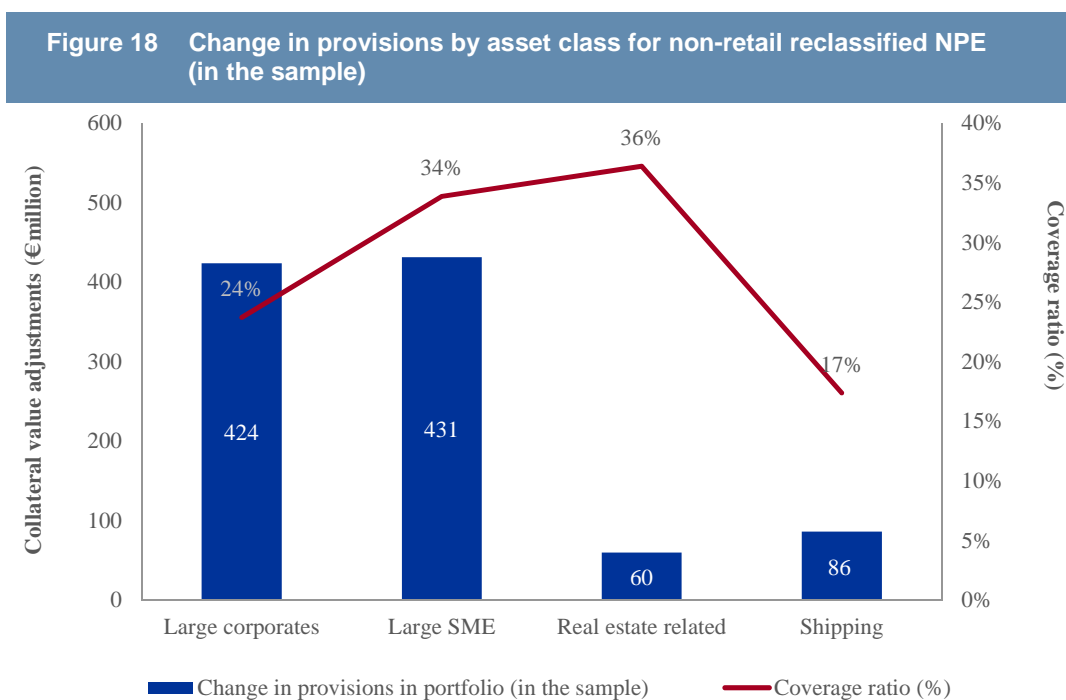
Existing NPE

For the 973 of debtors that remained NPE, the provisioning approach assessment determined that 78% of debtors were to be treated under the gone concern approach and 22% under going concern approach. The total adjustment amounted to €1,713 million.

Figure 19   Change in provisions by asset class for non-retail existing NPE (in the sample)
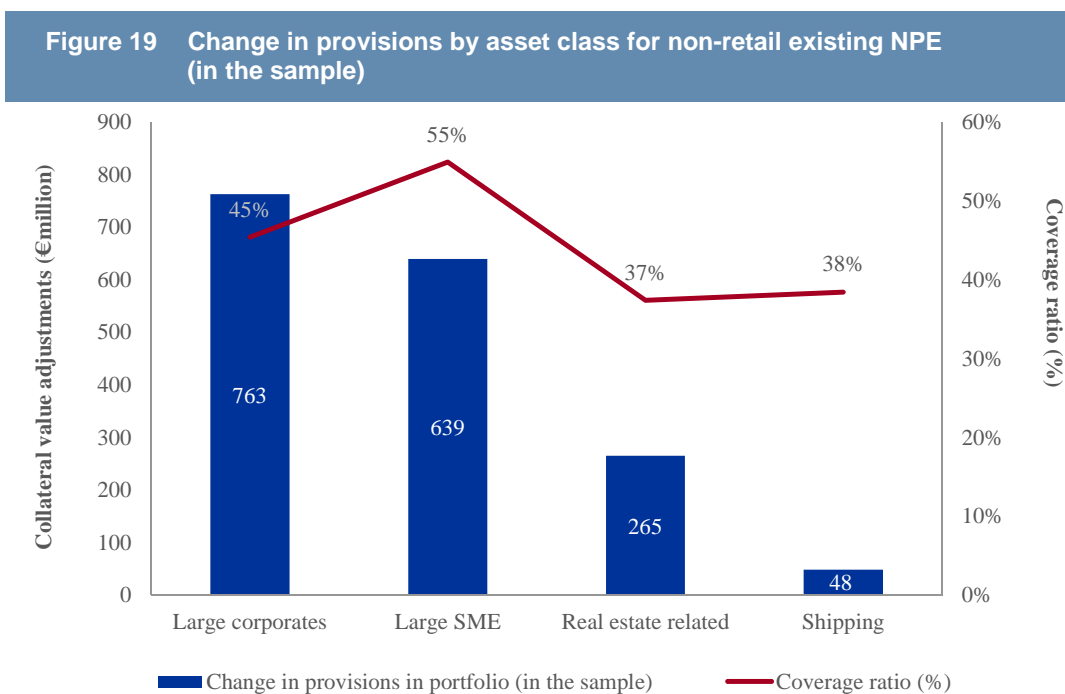
Note: Negative numbers imply a reduction provisions for given debtor(s) due to the AQR.

4.2.2   COLLATERAL AND REAL ESTATE VALUATION

The collateral and real estate valuation workblock was run during the credit file review process and was relevant for NPE gone concern debtors for which collateral liquidation was the more likely workout strategy i.e. collateral valuation reductions led to increased provisions. In addition, the workblock provided updated real estate property values and appraisal haircuts to be used in the loss given loss (LGL) calculation for residential real estate portfolios in the collective provisioning workblock.

Throughout the review, approximately 11,826 collateral items with a total value of €21,444 million were investigated. For 16% of retail collaterals and all collaterals in the shipping portfolios, a full revaluation was carried out as part of the AQR.

Across the Greek banking system, collateral values were adjusted downwards by €2,567 million representing an approximate 12% decrease compared to previous bank internal valuations. This decrease was driven by a change in price indices as well as by changes due to AQR

revaluations. Figure 20 illustrates the impact of both effects on the aggregated collateral value. For collateral items that required a reappraisal, the total adjustment can be split into a change in property value due to indexation and an incremental change as a result of the revaluation.

Figure 20   Collateral valuation adjustments throughout the AQR
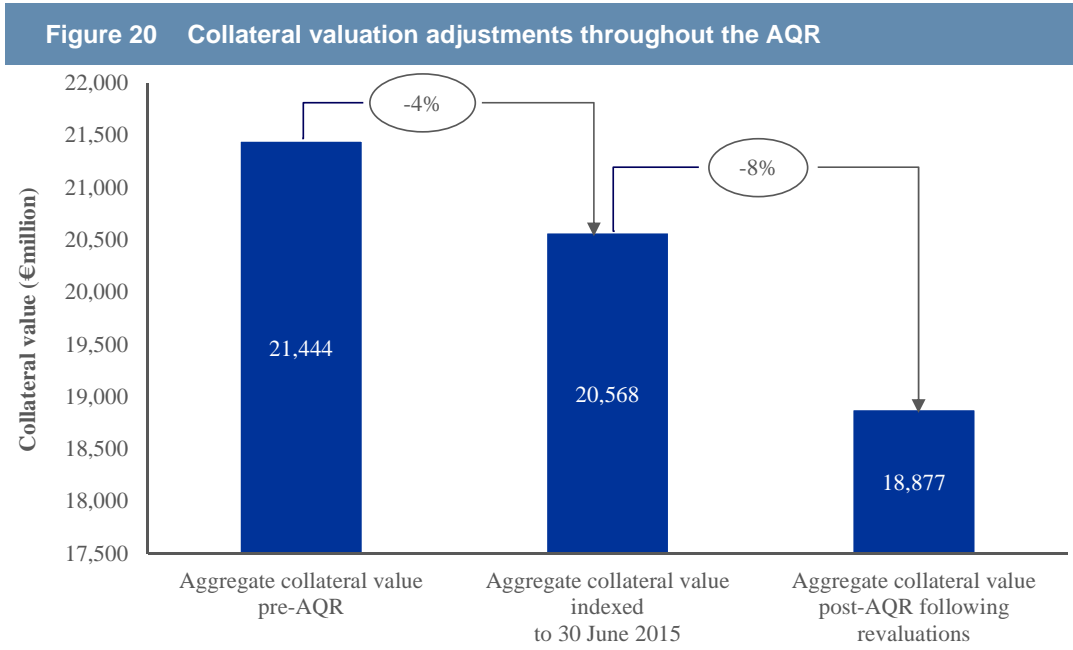
The collateral value reduction most severely affected commercial real estate (CRE) in absolute terms while land and residential real estate in relative terms.

Figure 21   Collateral value reduction for selected collateral types
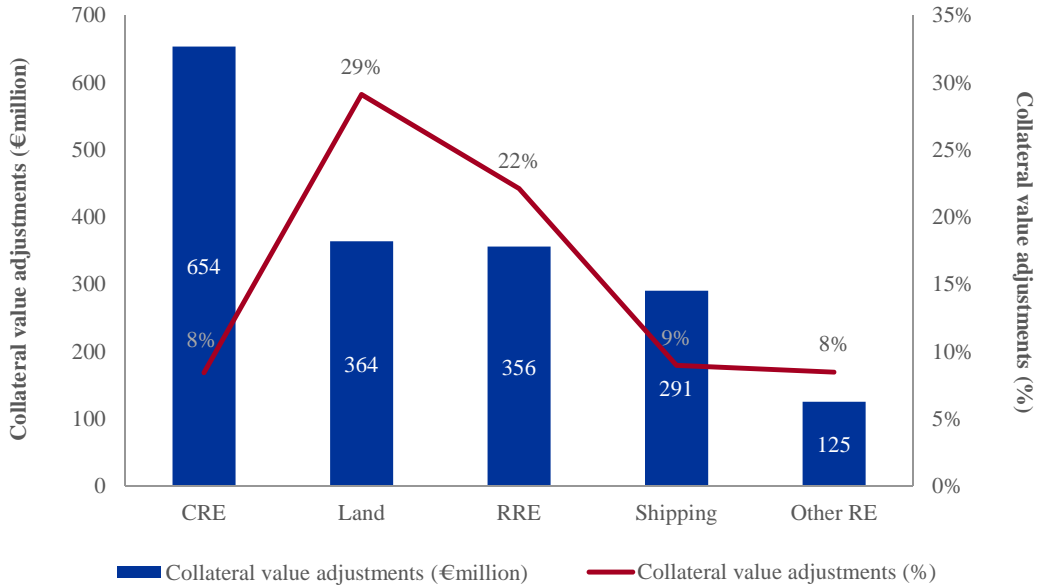
Note: Positive numbers imply a collateral value reduction. Numbers in this chart do not include 'other collateral' outside of 'other RE'

4.2.3   PROJECTION OF FINDINGS

The findings of the sample from the credit file review were extrapolated to the unsampled population of each portfolio, which led to additional €1,949 million of provisions. Findings were extrapolated both on NPE classification and required provisions. The effect of projection to the provisioning adjustments made during the credit file review can be seen below.

Figure 22   Impact of projection of findings on non-retail provisioning
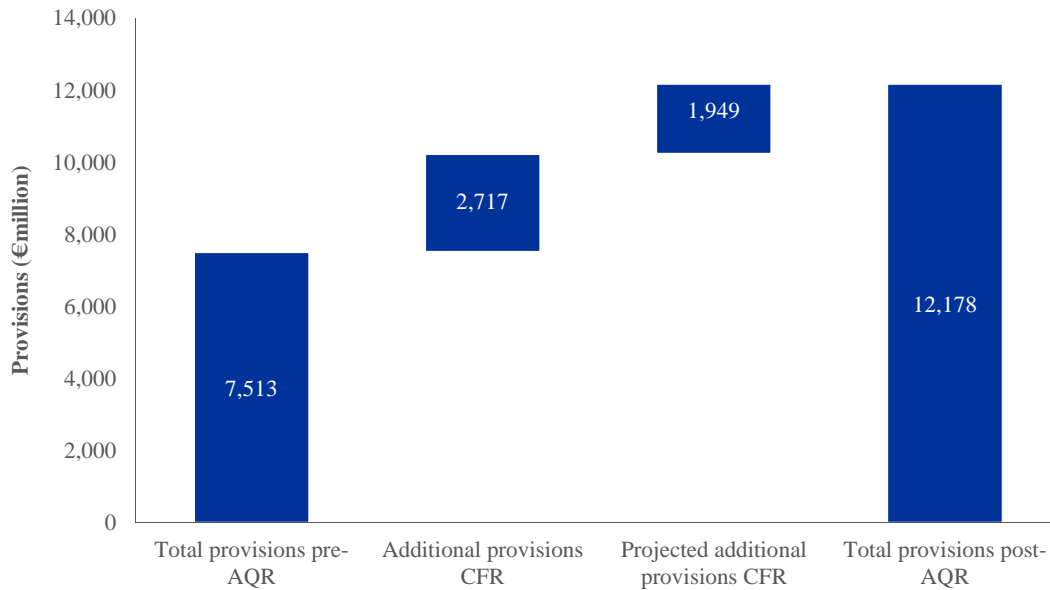
The amount of additional provisions from the credit file review of the sample compared to the projection of the sample varied widely by portfolio for two main reasons:

- **Sample coverage variation** – portfolios with a large number of debtors naturally had a lower coverage rate (e.g. Large SME portfolios), and hence a proportionally larger exposure on which to project

- **Different levels of prudence in existing provisions** – certain portfolio types were found in general to be less prudently provisioned against than others (see credit file review for details on the fundamental drivers)

The relative increase of additional provisions due to projection of findings vs. credit file review (sample) was relatively stable when compared with the 2014 CA (€2.1 billion on the sample and €1.8 billion projected over the remaining portfolio in the 2014 CA vs. €2.7 billion and €1.95 billion respectively as per Figure 22 above).

The following shows the absolute contribution from the sample and projection by type:

Table 7	Illustration of provisioning impact of the projection of findings split by portfolio type			
Asset segment	Sampling exposure coverage rate (%)	Additional provisions CFR (€million)	Projected additional provisions CFR (€million)	Total additional provisions (€million)
Large SME	20-40%	1,072	1,472	2,544
Real estate related	70-90%	326	122	448
Large corporates	70-90%	1,186	340	1,526
Shipping	70-100%	132	15	148
Total		2,717	1,949	4,665

Note: Sampling exposure coverage rate is applied to the total exposure of all four banks

NPE classification adjustments

The incidences of change in performance status found during the credit file review were also projected for both non-retail and RRE portfolios.

Overall, projection of findings identified an extra €3,146 million of NPE non-retail exposure compared to that originally reported by the banks. On top of €3,823 million from the credit file review, this totals €6,969 million. This was factored into the collective provisioning calculations as explained in further detail in the next chapter.

Ratios of NPE EAD increases following CFR increased consistently across portfolios (ranging from 3-7%), as shown in the following figure. Largest increases came from Shipping (7%) and Large Corporates (6%).
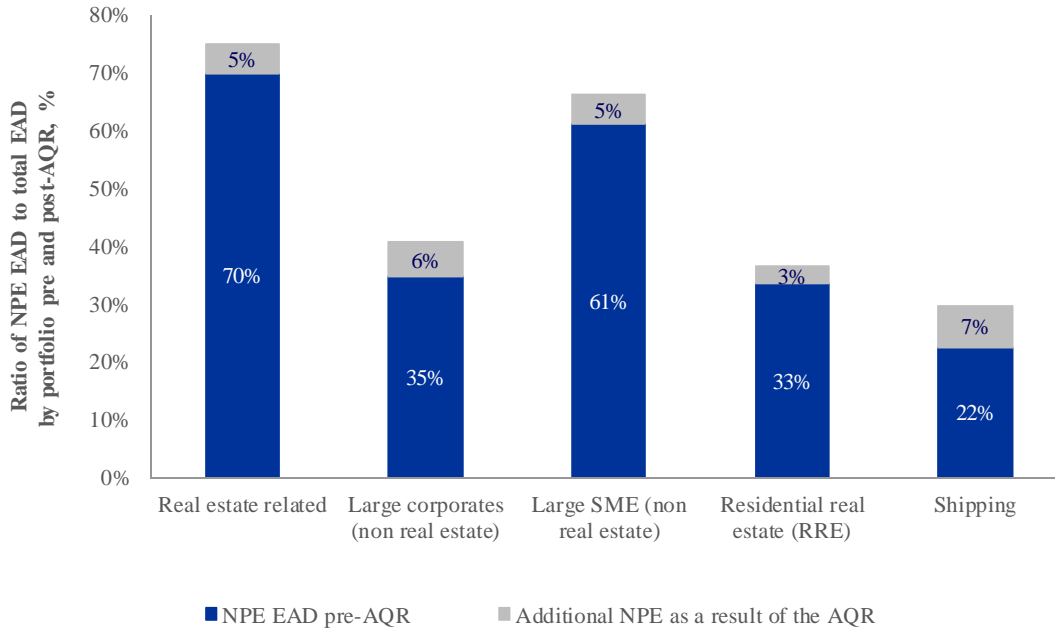
4.3   COLLECTIVELY ASSESSED PROVISIONS

The collective provisioning workblock involved a review of participating banks' collective provisioning models, both qualitatively and quantitatively. This review applied to non-performing retail exposures (for which specific provisions are calculated) as well as to all performing exposures (for which incurred but not reported losses, IBNR, is calculated). In total, 26 portfolios across most AQR asset classes were in-scope for this workblock.

As part of the qualitative review, external auditors assessed the compliance of collective provisioning models employed by participating banks with relevant accounting standards.

For the purpose of the quantitative review, external auditors developed a "challenger model" which was applied to all portfolios in-scope for this workblock. For each portfolio, the outcome of the challenger model was compared to the provisions recognised by the bank. For 27% of the in-scope portfolios, the challenger model resulted in provisions below participating banks' provisions, whereas for 73% of the portfolios, the challenger model outcome exceeded the significant banks' provisions. Where the challenger model outcome significantly exceeded[8] the bank's provisions, further investigation was required and in many cases this resulted in additional collective provisions to be recognised for the purpose of the AQR.

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[8]   If the bank team's estimate was 5-10% higher than the bank's estimate, the bank team investigated reasons across data or methodology to explain the differences and applied discretion in selecting challenger model estimate vs. bank's estimate

Across all participating banks and portfolios, the collective provisioning workblock identified the need for additional collective provisions of €4,404 million, €3,516 million of which represent additional specific provisions for retail debtors and €888 million of which represent additional IBNR. In relative terms, across the participating banks, this translates into an increase in IBNR of roughly 47% and an increase in specific provisions of about 18%. The main drivers of the increases due to cases of significant deviation are explained later in this chapter.

Figure 24   Additional collectively assessed provisions by type of provision
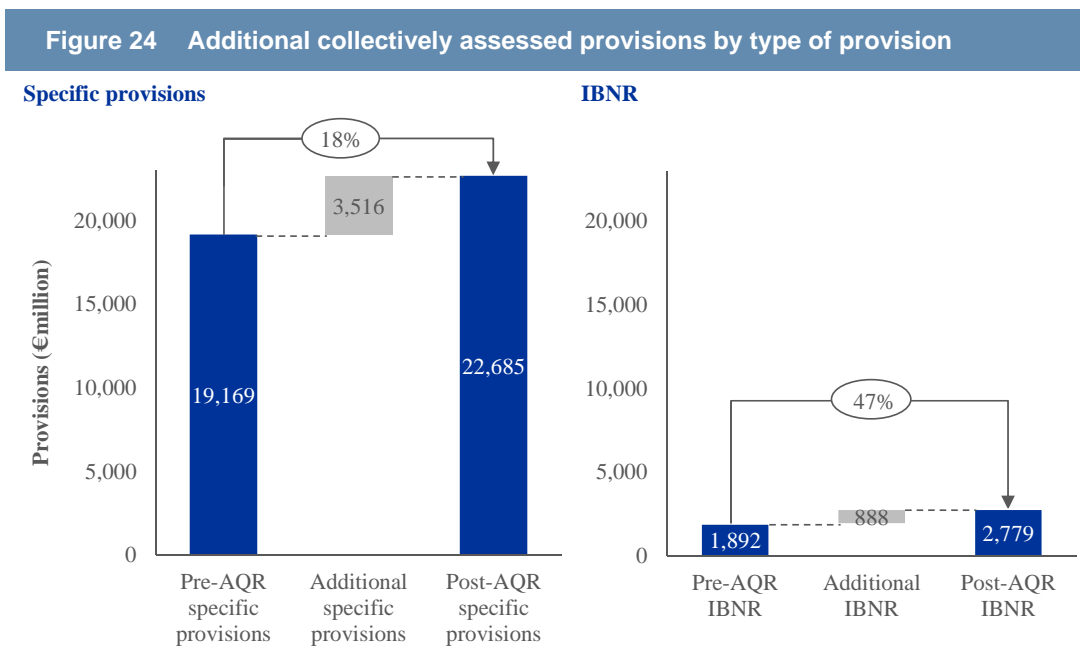
Retail NPE: Additional specific provisions resulting from collective assessment

Specific provisions account for a significant part of participating banks' collectively assessed provisions. Across the Greek system, six retail portfolios held by the four participating banks were found to have insufficient levels of specific provisions. In total this led to an increase in specific provisions of €3,516 million. A significant majority of these additional provisions stemmed from residential real estate portfolios (88%) followed by retail SME (7%) and other retail (5%). This pattern still largely holds when taking into account the relative size of the asset classes (as measured by credit RWA) – the most significant relative adjustment was made to residential real estate portfolios with an adjustment of about 10.6% of credit RWA. Figure 25 illustrates aggregated additional specific provisions, both in absolute terms and relative to credit RWA for retail asset classes.

Figure 25   Additional specific retail provisions by asset class
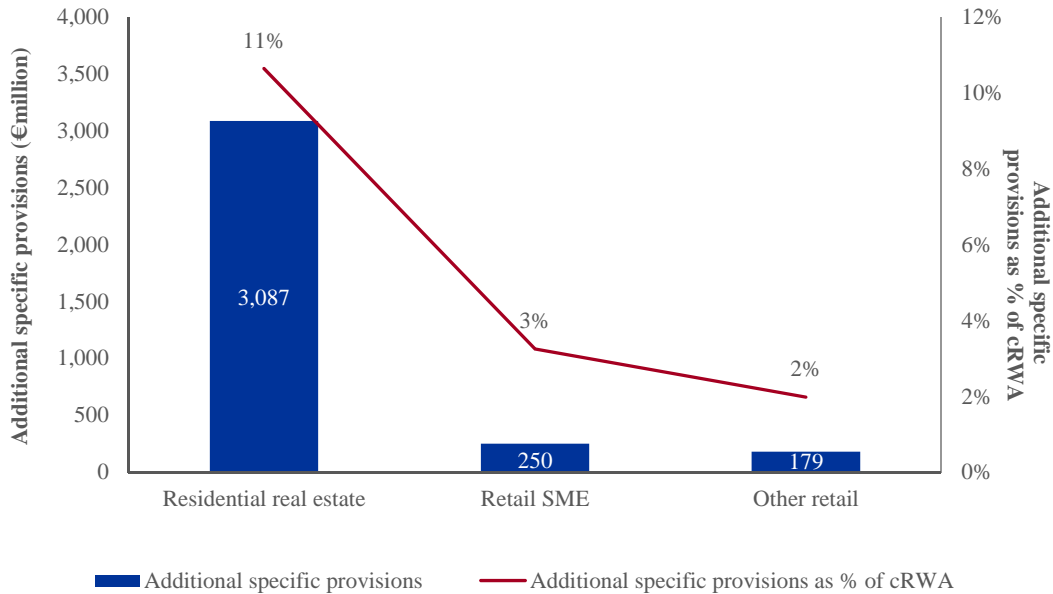
The challenger model provisions on non-performing exposures and, hence, additional specific provisions revealed by this workblock are significantly impacted by a number of key drivers.

- **NPE identification:** As outlined in Chapter 4.2.1, the stock of NPE was significantly increased by the AQR, through the credit file review. Also, cure rates were adjusted based on CFR findings. As a result, the basis for the calculation of specific provisions on residential real estate increased, ultimately leading to an increase in specific challenger model provisions and, in many cases, to additional specific provisions to be recognised for the purpose of the AQR. As a result, the cure rate on the defaulted population was adjusted down due to NPE reclassification.

- **Adjustment of RRE collateral:** For residential real estate portfolios, property values are an essential part of the loss given loss calculation, as the expected loss is calculated using projected proceeds from a foreclosure of the underlying property. As part of the collateral valuation workblock, properties were reappraised and indexed forward in order to adjust the collective provisioning LGL directly. For properties that were not reappraised, the average appraisal discount of the portfolio was applied. In addition, expected proceeds from collateral were calculated based on assumptions representative of the current conditions. Two key parameters used in the LGL calculation, sales ratio and time to sale were harmonised across the banks in order to reflect current conditions and to prudently account for obsolete / biased data. Specifically, these required the use of the fall back value for the sales ratio of 75% - implying a haircut on collateral values of 25%

- **Parameters that are not point-in-time:** In a number of cases, the banks' models were smoothing the impact of recent events, for example, through the use of long term parameters. Due to its point-in-time nature, the challenger model reflects the current conditions.

All performing exposures: Additional IBNR resulting from collective provisioning

This chapter provides more detail on the €888 million of additional IBNR identified as a result of the AQR as well as the most significant factors driving this result.

Across the Greek system, for 19 portfolios held by the four participating banks the challenger model revealed insufficient levels of IBNR, which led to an aggregated increase in IBNR of €888 million[9]. The majority of the additional IBNR stems from large SME (42%) and large corporate (26%) portfolios. Taking into account the size of each asset class (determined by credit RWA), however, the most significant adjustment was made to large SME (144 basis points), large corporates (91 basis points) and shipping (80 basis points) portfolios. Figure 26 illustrates the aggregated additional IBNR, both in absolute terms and relative to credit RWA for AQR asset classes.

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[9] The IBNR increase is attributable to 16 of these 19 portfolios. For the remaining 3 portfolios, the insufficient levels of IBNR were absorbed by a surplus identified in specific provisions for these portfolios

Figure 26   Additional IBNR by AQR asset class
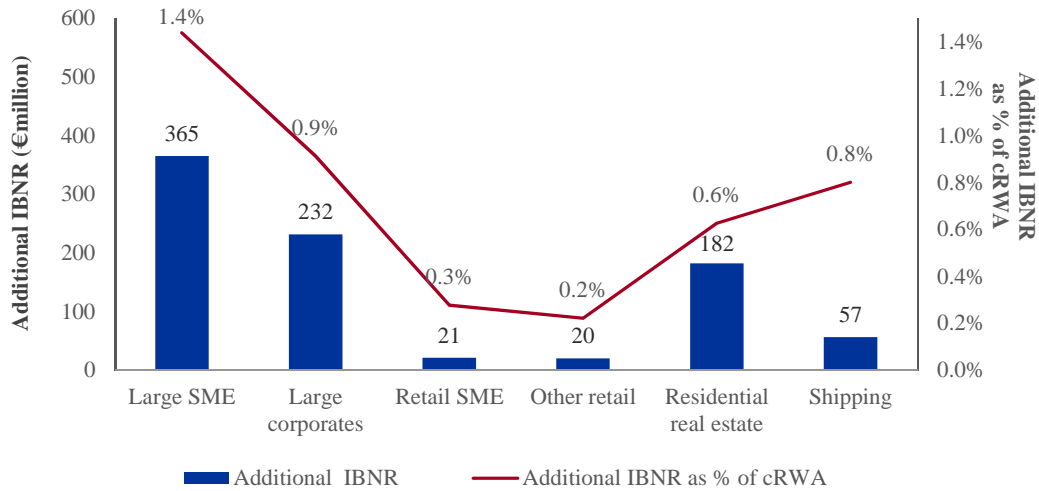
The challenger model provisions on performing exposures and, hence, additional IBNR revealed by this workblock is significantly impacted by a number of key drivers.

- **Credit file review:** For all sampled debtors / facilities a classification review was conducted during the credit file review. This review had an impact on the parameters for both retail and non-retail portfolios.

  - Where debtors / facilities were stated to be performing in the bank's loan tape were found to have defaulted in the credit file review, this increased the probability of impairment applied in the challenger model and additional NPE were projected; also cure rates were adjusted for retail portfolios.

  - An increase in the loss given impairment (LGI) was applied to reflect increased provisioning levels for debtors that had LGI is calculated as the coverage ratio of the defaulted asset applied in the challenger model

  Both of these effects led to an increase in the IBNR determined by this workblock.

- **Probabilities of impairment (PI) that are not point-in-time:** As for retail cure rates, in a number of cases the banks' models use long term parameters whereas the challenger model is fully point-in-time. Where banks exhibited a large number of defaults in the period examined, this led to higher probabilities of impairment and, ultimately, in an increase in IBNR.

- **Loss emergence period (LEP):** In the majority of cases the LEP employed in the challenger model exceeds the one applied by participating banks. This is partly driven

by the prudential nature of the exercise and partly by the fact that in many cases an analysis of the bank's LEP revealed a high volatility of observed LEPs as well as loss events, i.e. the beginning of the LEP, not being identified correctly. As raising the LEP has a one-to-one impact on IBNR, this was an important driver of the additional IBNR resulting from this workblock.

- **Adjustment of RRE collateral values:** The reduction in residential real estate property values due to forward indexing, sales ratio and time to sale raised LGL and led to an increase in IBNR.

- **Provisioning of non-zero provisioning of selected subportfolios:** In some cases, banks had excluded certain exposures that they considered of high-quality from the calculation of IBNR by setting the corresponding LGL to zero. Inclusion of such exposures in the challenger model with appropriate non-zero LGLs led to challenger model provisions in excess of banks' provisions and, hence, to additional IBNR.

4.4   CVA CHALLENGER MODEL ADJUSTMENTS

The four participating banks in the AQR were included in the CVA challenger model review (one model per bank was reviewed), given the size of their derivative exposures (fair value: €2.725 million), 65% of which relates to sovereign counterparties. The process included a template, which identified potential issues in the calculation methodology, parameters and portfolio coverage.

The AQR impact from the CVA challenger model was €133 million, corresponding to a 32% increase of an initial CVA amount of €412 million. A majority of this adjustment related to the use of inappropriate PD and LGD parameters specifically for the Greek Sovereign, where banks used lower LGD assumption and PDs that were not market implied. Additional adjustments occurred due to exposures excluded by the banks from their CVA calculation.

The distribution of CVA adjustments across entity groups is shown in Figure 27.

Figure 27 AQR impact of the CVA review grouped by RWA of participating banks
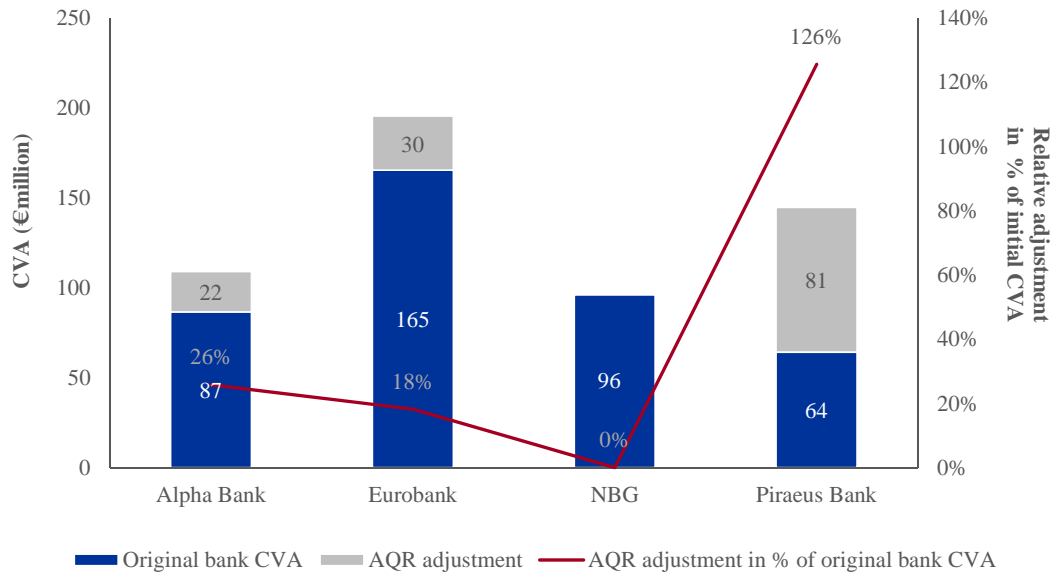
Note: No CVA adjustment impact for NBG

5 STRESS TEST

This chapter discusses the methodology, underlying scenarios and outcomes of the stress test. The stress test results are analysed in detail, mainly structured around the key drivers that impacted the outcome.

5.1 METHODOLOGY OF THE STRESS TEST

This chapter captures the methodology for the 2015 stress test of Greek banks. The chapter lays out the high level structure of the modelling approach and then drills down into all of the key components. The drill downs cover the detailed approach; the key assumptions and their source.

5.1.1 CONTEXT

The 2015 stress test of Greek banks follows a centrally led top-down approach based on banks' data and considers baseline and adverse scenarios spanning from 30 June 2015 to 31 December 2017 for a total of 2.5 years. The stress test methodology combined system-level and bank-level parameters to project balance sheet, profit and loss, and solvency position in annual increments (6 months for 2015). The stress test involved a constrained dynamic balance sheet approach – that is to say the balance sheet evolves allowing for new lending, deposit evolution, asset sales included in the DG Competition restructuring plans etc. Constraints were set by the ECB, consistent with the assumptions underlying the wider Greek programme. The constraints were differentiated between the baseline and adverse scenario.

The projections used to set the capital need were produced in a way that is consistent with the prevailing accounting and prudential rules. This means that provisions were projected in a way consistent with IAS 39; RWA projections reflected the standardised or IRB approach – whichever was used by the bank; capital projections were consistent with CRD IV, including phase in rules; and other financial projections were consistent with prevailing accounting rules.

5.1.2 KEY HIGH LEVEL ASSUMPTIONS

The key high level assumptions for the exercise were defined as follows:

- Macroeconomic series for Greece and other relevant countries were set by the ECB and are included in Chapter 5.2

- The CRD IV CET1 capital definition has been used with phase-in rules. The minimum capital hurdles for the baseline and adverse scenarios are 9.5% and 8%, respectively

- Loan volume projections were defined at a system level by the ECB down to a bank-level using fixed market shares as per June 2015

- Bank level deposits were projected based on system level projections set by the ECB and allocated to banks based on fixed market shares as per June 2015

- The eligibility of relevant collateral for Monetary Policy Operations (MPO) was assumed to be restored from 31 December, 2015. Use of MPO was limited to the amount of available collateral

- Sovereign debt holdings were assumed to remain flat over the stress test horizon; T-Bill holdings assumed to roll over at current levels

- The valuation of participations was adjusted in line with the Greek market index (excluding Greek banks)

- Foreign subsidiaries were assumed to be disposed of in line with the existing restructuring plans at a valuation consistent with current market multiples. If a foreign subsidiary was held throughout the period of the projection, its net income was stressed accordingly

- DTAs: No new DTA formation was allowed in either stress test scenario

5.1.3   HIGH LEVEL MODELLING APPROACH

The high level modelling approach was as per the diagram below

Figure 28   Illustrative modelling approach – P&L and Balance Sheet projections

P&L and balance sheet projection

	H1 2015	H2 2015	2016	2017
CET1 %	XX	XX	XX	XX
RWA	XX	XX	XX	XX

RWA projection module

Balance Sheet				
Assets	XX	XX	XX	XX
Liabilities	XX	XX	XX	XX
Equity	XX	XX	XX	XX

Credit loss module

Net interest income and volumes module

P&L				
Income	XX	XX	XX	XX
Expenses	XX	XX	XX	XX
Retained earnings	XX	XX	XX	XX

Other income and expenses module
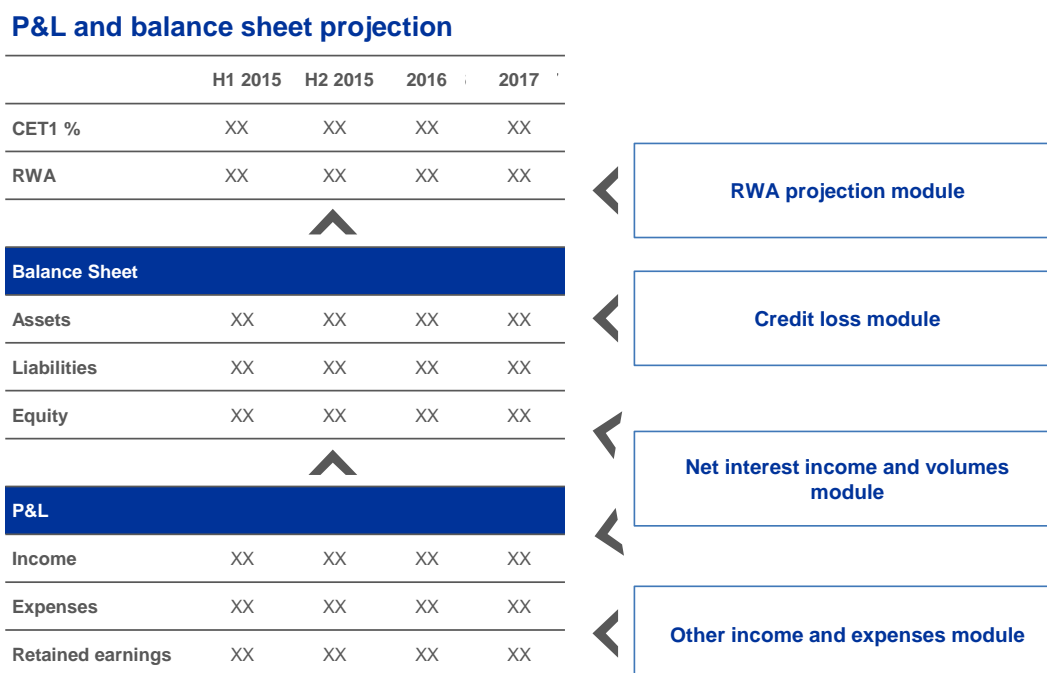
A projection of the P&L and balance sheet was produced based on the domestic business of the Greek banks. The projection is consistent with the assumptions described above. A projection of the marginal impact on the capital position of the foreign subsidiaries was also included, reflecting current agreed restructuring plan commitments. The CET1 ratio projection considered the roll forward of capital at the Group level in a mechanical manner, fully reflecting CRD IV phase in and other assumptions defined by the ECB. Detailed "drill down" analysis was performed on Net Interest Income, Other Operating Income and Expenses, RWA and provisions. The drill down analysis fed the P&L and balance sheet projection.

In the following sub-chapters, detail is provided on the approach to projecting NII, volumes, credit losses and RWA for the Greek portfolios.

5.1.4   NET INTEREST INCOME AND ASSET AND LIABILITY VOLUME PROJECTIONS[10]

The high level approach to projecting Net interest income involved the following steps:

1.   Project loans and deposits based on system level loan and deposit assumptions (as described previously).

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[10] This approach only applies to the Greek-legal entities

2.   Split lending into front book and back book and performing and non-performing projections (NPE rates coming from the credit loss module).

3.   Project the composition of the remainder of the liability side (wholesale and Eurosystem funding).

4.   Project Net Interest Income by multiplying rates by volumes.

5.   Calculate an adjustment for movements in income due to the structural interest rate risk-position.

5.1.4.1 Project the total loans and deposits

The first step was to project total loans and deposits by segment for each bank. Total loans for the system were projected by the ECB in consultation with the Institutions, having taken bank plans as an input. The projections were differentiated by segment as appropriate. Each relevant sub-segment of the bank's portfolio was then projected by assuming market share and sub-segment mix to remain constant as per June 2015.

5.1.4.2 Split the lending book into front and back book and performing and non-performing

Next, the migration rates to NPE from the credit loss module (described in Sub-chapter 5.1.5) were used to project the percentage of the portfolio that was back book and NPE. The total exposure was also reduced in line with recent observed amortisation and prepayment.

The gap between the projected total exposure and the projected back book net of amortisation and prepayment was filled with new lending. New lending was assumed to be "Normal Risk" according to the AQR definition (as stated in the AQR Manual). NPE migration and amortisation and prepayment for new lending were projected in line with what was observed for Normal Risk customers on the back book.

A percentage of NPE was moved to write-off, so that in the baseline, income from non-performing exposures was not overestimated.

This is illustrated in the chart below:

Figure 29   Front vs. Back Book & PE vs. NPE
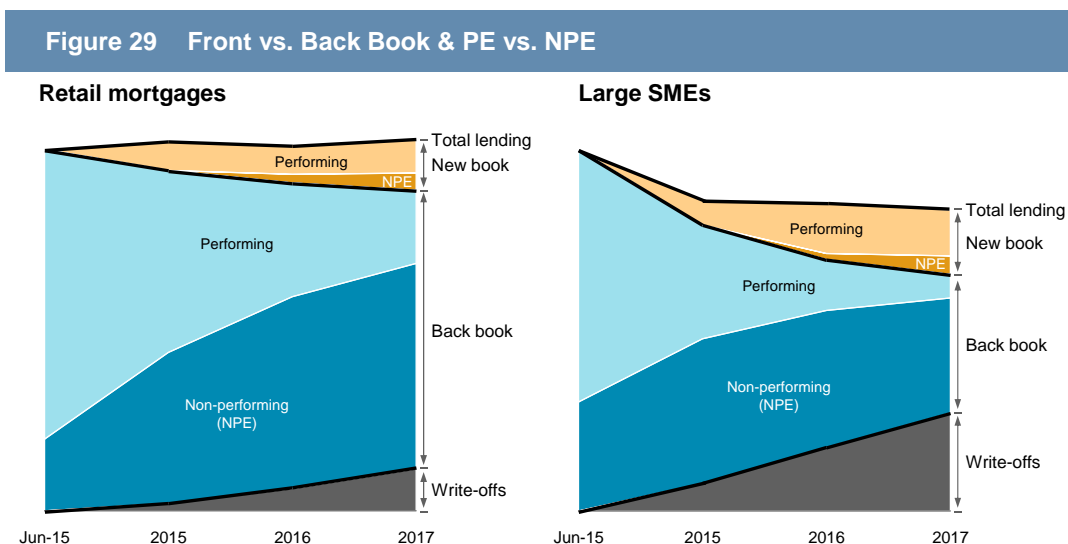
5.1.4.3 Project the composition of the remainder of the liability side

The balance sheet was closed by assuming the gap between total assets and total deposits and equity was filled with a mixture of Eurosystem and wholesale funding. Eurosystem funding was split into MPO and emergency liquidity assistance (ELA) with associated differences in pricing. Note that in the baseline scenario, there is no use of ELA in 2017.

5.1.4.4 Project average spreads on the performing and non-performing assets and the liabilities

Spreads were set for each type of asset as follows:

Type of asset	Spread assumption
Performing Credit exposure	Back book: Spreads remain unchanged from current contractual rates. Front book: The lower of bank plans and the observed recent front book spreads
NPE	Baseline: Interest income only assumed on portion of exposure that is unprovisioned Adverse: Interest income only assumed on portion of exposure that is unprovisioned for exposures with limited arrears (0-6 months). Exception to this is for retail

Table 8   Spreads for performing and non-performing assets and liabilities

Type of asset	Spread assumption
	mortgages (where moderate discount unwind is included on exposures with greater than 6 months in arrears)
Deposits	Back book: Spreads remain unchanged Front book: The lower of bank plans and the recent observed front book spreads
Wholesale	Back book: Unchanged. Front book: Spread set by the ECB for each type of wholesale funding.
MPO	In line with ECB policy.

5.1.4.5 Calculate an adjustment for movements in income due to the structural interest rate risk position

A shift to the yield curve was defined in the scenario. Therefore it was necessary to include the impact of the shift in the yield curve on the interest income of each bank.

The banks were asked to provide projections of the behavioural and contractual interest rate maturity profile for their balance sheet. The net interest income was then adjusted in each period of the baseline and adverse scenario for the impact of the shift in the yield curve on assets and liabilities that repriced during the scenario horizon. Foreign exchange (FX) balance sheet mismatches were also considered and an adjustment made accordingly.

The shift in the yield curve is assumed to be instantaneous and permanent over the horizon of the exercise. Therefore, there is no impact on structural interest rate risk from new lending.

5.1.5 APPROACH TO PROJECTING FEES AND COMMISSIONS, OTHER INCOME AND EXPENSES FOR GREEK LEGAL ENTITIES

Fees and commissions, other income and administrative expenses were projected using recent historic experience as the starting point. The starting point was projected forward, adjusting levels based on relevant drivers that have a direct influence on the level of fees and commissions, other income and expenses. For instance, expenses are clearly driven by full-time equivalent (FTE) staffing numbers. Drivers were defined in the restructuring plan (e.g. branches) or were calculated directly in the model elsewhere (e.g. new lending volumes). The sensitivity of fees and commissions, other income and expenses to the drivers was set based on expert judgment informed by historical experience of the banks and the banks' plans.

5.1.6 APPROACH TO PROJECTING NPE VOLUMES AND PROVISIONS FLOWS FOR GREEK SUBSIDIARIES (CREDIT LOSS MODULE)

The approach to projecting NPE volumes and impairment for most portfolios followed a 7 step process:

1. Observe recent historic NPE migration behavior and create migration matrices by segment

2. Observe relationship between NPE flows and macroeconomic factors

3. Condition observed migration matrices to reflect differences in forward looking expectations of macroeconomic factors

4. Further adjust migration matrices for the impact of capital controls and set the level of this adjustment

5. Project impairment rates for new NPE, conditioning for macroeconomic factors, capital controls and other factors. Apply impairment rates to volume of new non-performing loans to measure impairment flows

6. Assess impairment flows from NPE, considering macroeconomic factors, capital controls and other factors

7. Project IBNR stock and use to assess IBNR flow

The key steps are described in further detail in the sections that follow.

There were two major exceptions to the approach described above:

- For some concentrated portfolios (e.g. shipping and CRE), stable migration matrices could not be applied. For these portfolios, a structural approach was used which involved projecting the key risk drivers of the underlying debtors (e.g. loan to value (LTV) and debt-service coverage ratio (DSCR)) and applying a default "test" to assess whether the specific debtor would default in the scenario.
- For sovereign portfolios in the loans and receivables and hold to maturity portfolios, in the base case, no losses were assumed. In the adverse case, a reduction to the carrying value was assumed in a manner that was consistent with the 2014 EBA exercise.

Observe recent historic NPE migration behaviour

NPE volumes were projected using the banks' observed experience between December 2012 and June 2015 as a starting point. This means that NPE flows and credit migration were observed from the credit loan tapes provided by the banks and used as a starting point to

calibrate the projection. The analysis involved measuring the migration behaviour of each exposure and using it to assess the probability of an exposure migrating in the future. The analysis was differentiated by segment – i.e. migration rates were analysed separately for retail mortgages, corporate SME etc. Where appropriate, further segmentation was applied (e.g. differentiating retail mortgages by LTV).

The output was a set of migration matrices that aligned with the risk classifications for the AQR. This allowed for a pragmatic analysis (i.e. the granularity was not excessive). An illustration of the output is shown below.

Figure 30   Illustrative NPE migration matrix

December 2013

December 2012	1	2	3	4	5	6	7	8	9
1 Very low risk (excluded from AQR)	90%	8%		1%		1%			
2 Normal risk		90%		7%		2%	1%		
3 Normal risk (previously cured)			70%		19%	10%	1%		
4 High risk		10%		60%		25%	5%		
5 High risk (previously cured)			5%		50%	40%	5%		
6 NPE (less than 6 months arrears				5%		45%	40%	10%	
7 NPE (6-12 months arrears)			2%	3%	4%	6%	15%	60%	10%
8 NPE (12-24 months arrears				3%	2%	4%	6%	15%	70%
9 NPE (24+ months arrears)					5%		10%	15%	70%

December 2014

December 2013	1	2	3	4	5	6	7	8	9
1 Very low risk (excluded from AQR)									
2 Normal risk									
3 Normal risk (previously cured)									
4 High risk									
5 High risk (previously cured)									
6 NPE (less than 6 months arrears									
7 NPE (6-12 months arrears)									
8 NPE (12-24 months arrears									
9 NPE (24+ months arrears)									

December 2015

December 2014	1	2	3	4	5	6	7	8	9
1 Very low risk (excluded from AQR)									
2 Normal risk									
3 Normal risk (previously cured)									
4 High risk									
5 High risk (previously cured)									
6 NPE (less than 6 months arrears									
7 NPE (6-12 months arrears)									
8 NPE (12-24 months arrears									
9 NPE (24+ months arrears)									

Observe relationship between NPE flows and macroeconomic factors

A regression of macroeconomic data against long term historical default metrics was performed to assess the sensitivity of NPE flows to macroeconomic factors. The resulting macroeconomic model was used to adjust the migration matrices described above in line with the macroeconomic scenario defined by the ECB.

The regression approach involved 5 steps:

1. Transforming the default rate metric into a "credit quality indicator" by taking the normal inverse of the default rate

2. Performing a linear regression of macroeconomic factors against the credit quality indicator

3. Comparing the models that are most predictive and exclude those which have unintuitive relationships between the relevant macroeconomic factors and default rates

4. Comparing the resulting set of models based on expert knowledge and existing benchmarks

5. Testing that the macroeconomic model results were consistent with the default rates observed in the granular loan tape data between December 2012 and June 2015 and adjust accordingly.
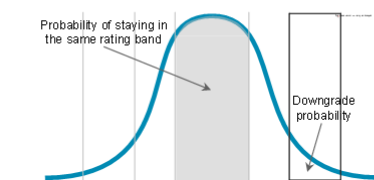
Condition observed migration behaviour to reflect differences in forward looking expectations of macroeconomic factors

The observed migration matrices between December 2012 and June 2015 were adjusted to reflect the macroeconomic outlook with the objective to consider both portfolio improvement effects and credit migration effects in a consistent manner.

Adjustments were done based on the Merton model as illustrated in the diagram below:
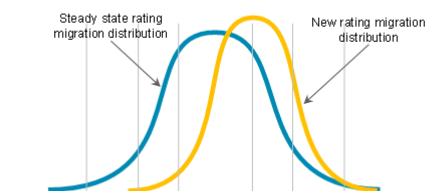

Figure 31   Illustrative Merton model approach

Compare conditioned migration behaviour to latest information on impact of Capital controls to assess the need for a further adjustment to migration and set the overlay

A further overlay was applied to the migration matrices to reflect the one-off impact of administrative measures (i.e. capital controls). This was calibrated based on four sources of information: (1) credit related Management Information for July and August 2015 provided by the banks; (2) the results of the credit file review conducted by bank teams as part of the AQR; (3) the views of bank management on the impact and (4) the views of ECB experts.

Define impairment rates and apply to new NPE flows

Specific impairment flows were projected by multiplying the new NPE flows by the impairment rate that would be expected following loss occurrence. This was based on AQR-adjusted impairment rates (i.e. Loss Given Impairment (LGI's) referred to in the AQR Manual), adjusted for the macroeconomic scenario.

This is illustrated in the diagram below. Performing exposure by rating was multiplied by the migration matrix and the resulting amount of exposure that transitions to default was multiplied by the LGI to arrive at an impairment flow for the period.

Figure 32   Illustrative impairment flow calculation
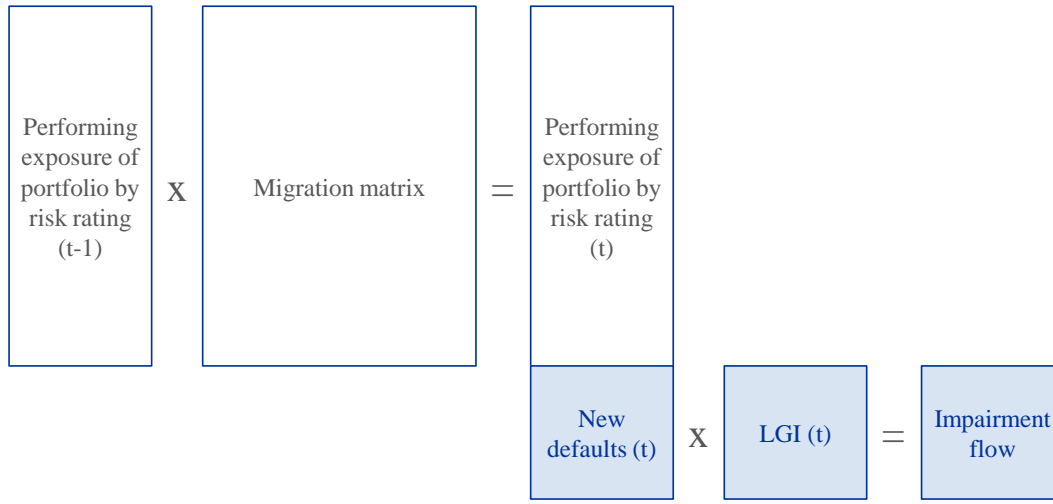
Assess impairment flows from existing NPE

The adjustments to LGI described in the previous chapter apply equally to NPE. As such in the adverse case, LGIs on NPE were adjusted to reflect the macroeconomic outlook and impact of administrative measures (i.e. capital controls). The impairment flow was then be defined as the change in LGI multiplied by the gross exposure:

Impairment flow = $(LGI_{scenario} - LGI_0)$ x gross NPE

Include impact of IBNR

IBNR stock was projected as $PD_{PIT,t}$ x PE_t x LGI_t. Any changes to the impairment stock influenced the P&L and capital position accordingly. The calculation is illustrated in the table below:

Table 9	IBNR stock calculation parameters			
	Jun-15	**Dec-15**	**Dec-16**	**Dec-17**
PE	100	90	80	75
NPE	10	15	17	20
PD PIT	2%	4%	3%	2%
LGI PIT	45%	50%	45%	40%

IBNR stock	0.9	1.8	1.08	0.6
IBNR flow		0.9	-0.72	-0.48

Adjust NPE stock for write-offs (in order to feed the interest income from NPE calculation)

As described above, income from NPE was calculated based on the NPE stock. Clearly, the NPE stock reduced over time with write-offs. Therefore, it was important that the NPE stock was reduced appropriately so that the income from non-performing exposures was reduced appropriately.

5.1.7   APPROACH TO PROJECTING RWA FOR GREEK LEGAL ENTITIES (RWA MODULE)

Credit RWA was projected for all portfolios included in the AQR for the exercise reflecting key dynamics:

- RWA density (RWA / assets) was assumed to be constant as a percentage of net exposure for PE and NPE for both IRB and standardised methodologies

- EL parameters were updated and the IRB provisioning shortfall adjusted in line with movements in provisions as described in the previous chapter

- RWA for operational risk was projected so that it is proportional with the average of gross income over the last 3 years

- RWA for market risk was held constant

5.2   SCENARIOS

The following chapters provide details on the baseline and adverse scenarios underlying the stress test in the Greek comprehensive assessment 2015, which were defined and / or agreed under the third Financial Assistance Programme for Greece. Key macrofinancial variables for the Greek economy as well as financial market shocks in Greece under the adverse scenario for the years 2015 to 2017 that were used in the exercise are displayed in the tables below.

Table 10	Key macrofinancial variables for the Greek economy		
	Baseline scenario	**Adverse scenario**	**Level deviation**

	2015	2016	2017	2015	2016	2017	
Real GDP annual growth	-2.3	-1.3	2.7	-3.3	-3.9	0.3	-5.9
HICP inflation – annual rate (%)	-0.4	1.5	0.9	-0.7	0.6	-1.0	-3.0
Unemployment rate (end-of-year, %)	26.9	27.1	25.7	27.3	28.1	27.5	1.8
House price growth (annual average, %)	-7.5	-5.0	-1.0	-7.8	-8.8	-7.8	-10.9
Prime commercial property price growth (%)	-3.4	-1.2	1.1	-3.6	-3.4	-2.1	-5.5

Note: Level deviation from baseline (2017) for unemployment rate (end-of-year,%) is given in percentage points, otherwise level deviation from baseline (2017) is given in percent relative to baseline.

Table 11 Financial market shocks in Greece under the adverse scenario			
Average annual deviation from baseline level	**2015**	**2016**	**2017**
Short-term interest rate (3-month Euribor)	40	80	80
10-year Greek government bond yield	204	390	170
Greek stock prices (ASE Composite Index)	-10.5	-20.1	-8.8

Note: Interest rate differentials are in basis points, stock prices are in percent

5.2.1 BASELINE SCENARIO

The baseline scenario is consistent with the assumptions of the third economic adjustment programme for Greece. As such it is assumed to capture the expected impact of the recent developments in Greece, in particular of the June-July 2015 bank holiday, the introduction of the capital controls, and the fiscal measures introduced under the agreed programme.

5.2.2 ADVERSE SCENARIO

The adverse scenario is based on the premise that downside risks materialise in the external environment of the Greek economy, as well as recent political and economic developments in Greece triggering a shock to consumer and business confidence.

Specifically within the Greek economy, consumer and business confidence would sharply drop in response to the imposition of deposit withdrawal and cross-border payment restrictions (beyond expected impact already included in the baseline scenario), turbulent conclusion of the

financial assistance programme, as well as to the increased political uncertainty. This would manifest itself through a reduction in private consumption and fixed investment. It is however assumed that, due to timely programme implementation, domestic aggregate demand would stabilise, at the lower level, in the final year of the scenario horizon. Impaired confidence would propagate to the property market, leading to a reduction in demand for residential and commercial property, which would drive the property prices lower with respect to the baseline scenario.

As for the external factors, the scenarios are based on assumptions such as an exogenous global shock originated in the US, leading to deteriorating economic conditions in the rest of the world through credit spread increases (on sovereigns, financial and non-financial firms), and a stock price shock in developed economies, and capital outflows in emerging markets. EU countries other than Greece are affected via trade and financial market spill overs.

The resulting impact on the Greek economy would be sizeable. By 2017, GDP would be lower by 5.9% compared to the baseline projection and unemployment rate would stand at 1.8 percentage points above the baseline level.

5.3 AGGREGATE IMPACT BY RISK DRIVERS UNDER THE BASELINE AND ADVERSE SCENARIOS

The aggregate impact of the stress test in terms of percentage point changes between June 2015 (post AQR) and year-end 2017 in the average CET1 ratio of participating banks is a decrease of 0.3 percentage points under the baseline and a decrease of 7.8 percentage points under the adverse scenario.

Overall, the impact on CET1 capital over the two and a half years stress test horizon amounts to a decrease of €1 billion under the baseline and of €16 billion under the adverse scenario.

The aggregate impact of the stress test by risk driver under the baseline scenario is shown in Figure 33. In the baseline, the four Greek banks' average CET1 ratio is projected to decrease from 7.9% in the second quarter of 2015 (post AQR), to 7.6% by the end of 2017. The solvency position under the baseline decreases mainly due to the projected loan losses (the 4.8 percentage point total impairments effect shown in the chart below) and other operating expenses (6.6 percentage point contribution to the change in the CET1 ratio). The average development of participating banks' solvency positions, however, masks variations across individual institutions.

Figure 33   Cumulative stress test impact on the CET1 % by risk driver under the baseline scenario

Bank-by-bank cumulative H2 2015-2017 impact on CET1% (%) by driver
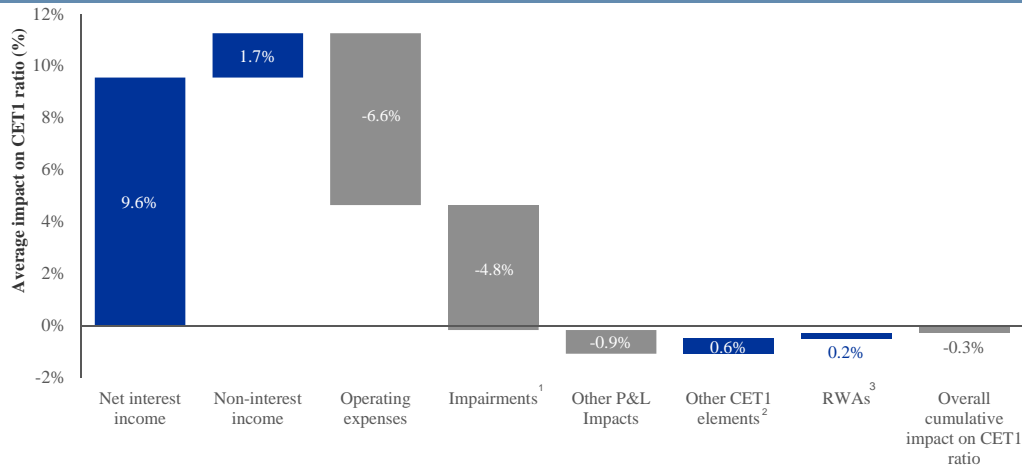
	Net interest income	Non-interest income	Operating expenses	Impairments[1]	Other P&L Impacts	Other CET1 elements[2]	RWAs[3]	Overall cumulative impact on CET1 ratio
Alpha Bank	7.7%	2.1%	-5.4%	-4.1%	-0.4%	-0.4%	0.4%	-0.1%
NBG	12.4%	1.3%	-8.3%	-6.9%	-1.7%	2.5%	-0.1%	-0.8%
Eurobank	9.4%	2.1%	-6.4%	-4.3%	-1.1%	0.2%	0.3%	0.2%
Piraeus	8.3%	1.5%	-6.1%	-3.6%	-0.4%	-0.4%	0.3%	-0.3%

1. Impairments include financial as well as non-financial impairments
2. Other CET1 elements include the impact of capital actions as per existing commitments (restructuring plans)
3. RWA impact is negligible because CET1 ratios are close to zero or even negative
Note: This chart shows cumulative results as of the end of the projection period

Under the adverse scenario, participating banks' average CET1 ratio is projected to decrease from 7.9% in the second quarter of 2015 (post AQR), to 0.1% by the end of 2017. This corresponds to a decline of the average CET1 ratio between H1 2015 (post AQR) and year-end 2017 of 7.8 percentage points (see Figure 34).

The key driver of the CET1 ratio impact is the increase in loan losses (8.4 percentage point contribution). Furthermore pre-provision profits are also lower compared to the baseline, primarily driven by NII (contribution to CET1 ratio is reduced from 9.6 percentage points under base to 7.1 percentage points under adverse). The 'Net Trading Income' and 'Administrative and other expenses' risk driver also impacts the overall results; however, they remain largely unchanged between the baseline and adverse scenario. The mark to market of Sovereign exposures in the available-for-sale (AFS) and fair value option (FVO) portfolios contributes to the capital depletion, albeit the impact is less material than the impairment of held-to-maturity Greek Sovereign exposures. Note – in the adverse case, an adjustment to carry values of Greek sovereign loans and receivables and hold to maturity exposures is included consistent with a writedown of 14% over 2.5 years.

Bank-by-bank cumulative H2 2015-2017 impact on CET1% (%) by driver							
Alpha Bank	5.1%	2.0%	-5.3%	-8.3%	0.2%	-1.4%	0.2%	-7.5%
NBG	10.9%	1.0%	-8.2%	-12.1%	-0.9%	1.0%	0.0%	-8.4%
Eurobank	6.8%	1.8%	-6.4%	-8.5%	-0.5%	-0.7%	0.2%	-7.3%
Piraeus	5.0%	1.2%	-6.1%	-7.0%	0.0%	-0.6%	-0.3%	-7.8%

1. Impairments include financial as well as non-financial impairments
2. Other CET1 elements include the impact of capital actions as per existing commitments (restructuring plans)
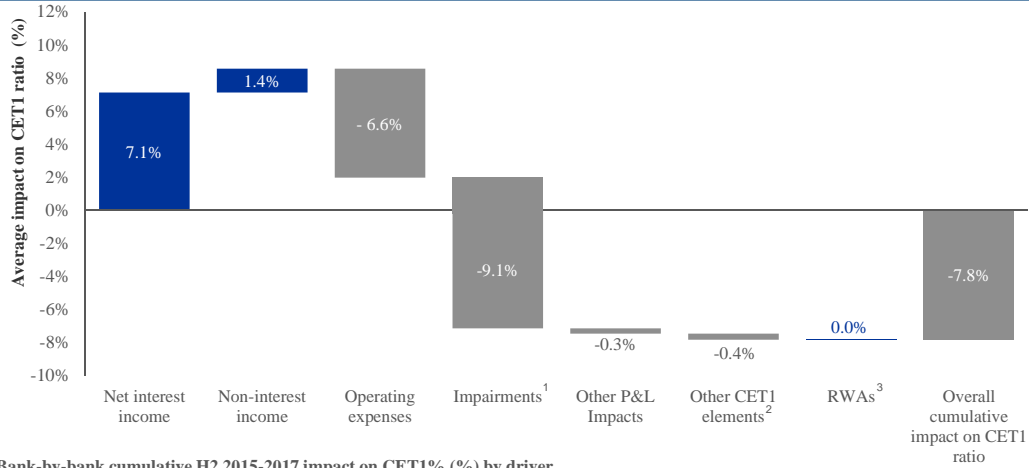3. RWA impact is negligible because CET1 ratios are close to zero or even negative
Note: This chart shows cumulative results as of the end of the projection period

6   APPENDICES

6.1   DETAILED RESULTS

Table 12	CET1 % for participating banks							
Name	Bank reported H1 2015	AQR adj. H1 2015	Post CA 2015 Baseline	Post CA 2016 Baseline	Post CA 2017 Baseline	Post CA 2015 Adverse	Post CA 2016 Adverse	Post CA 2017 Adverse
Alpha Bank	12.7%	9.6%	9.0%	9.3%	9.6%	5.1%	3.8%	2.1%
Eurobank	13.7%	8.6%	8.8%	9.1%	8.7%	5.7%	4.1%	1.3%
NBG	11.6%	8.1%	6.8%	7.6%	7.3%	2.6%	1.3%	-0.2%
Piraeus Bank	10.8%	5.5%	5.6%	5.3%	5.2%	2.3%	-0.1%	-2.3%
System wide	**12.1%**	**7.9%**	**7.4%**	**7.7%**	**7.6%**	**3.8%**	**2.1%**	**0.1%**

Table 13	Buffer (+) / shortfalls (-) for participating banks (€million)							
Name	Bank reported H1 2015	AQR adj. H1 2015	Post CA 2015 Baseline	Post CA 2016 Baseline	Post CA 2017 Baseline	Post CA 2015 Adverse	Post CA 2016 Adverse	Post CA 2017 Adverse
Alpha Bank	1,708	73	-263	-113	31	-1,408	-1,980	-2,743
Eurobank	1,663	-339	-253	-158	-270	-796	-1,279	-2,122
NBG	1,344	-831	-1,576	-1,069	-1,344	-2,932	-3,449	-4,602
Piraeus Bank	763	-2,188	-2,034	-2,133	-2,213	-2,853	-3,937	-4,933

Note: Columns highlighted in grey are worst case year

Table 14	AQR adjustment by bank and asset class (€ million)					
Name	**Retail SME**	**Residential real estate**	**Other retail**	**Corporates**	**CVA**	**Total AQR adjustment**
Alpha Bank	0	816	n/a[1]	908	22	1,746
Eurobank	271	700	200	705	30	1,906
NBG	0	966	0	1371	0	2,337
Piraeus Bank	0	787	0	2346	81	3,213
Total	271	3269	200	5330	133	9202

1: Alpha Bank's other retail was not in scope

6.2   LIST OF ACRONYMS AND ABBREVIATIONS

Other acronyms and abbreviations used in this document:

Term	Description
A	
AQR	Asset quality review
AFS	Available-for-sale
B	
bps	Basis points
C	
CA	Comprehensive assessment
CET1	Common Equity Tier 1
CFR	Credit file review
CIR	Cost income ratio
CPMO	Central Project Management Office
CRD	Capital requirements directive
CRE	Corporate real estate
CRR	Capital requirements regulation
cRWA	Credit Risk-Weighted Assets
CSA	Credit support annex
CVA	Credit valuation adjustment
D	
DIV	Data integrity validation
DSCR	Debt-service coverage ratio

Term	Description
DTA	Deferred tax asset
E	
EAD	Exposure at default
EBA	European Banking Authority
ECB	European Central Bank
EL	Expected loss
ELA	Emergency liquidity assistance
ESM	European Stability Mechanism
ESRB	European Systemic Risk Board
F	
FAQ	Frequently asked question
FTE	Full-time equivalent
FVO	Fair value option
FX	Foreign exchange
G	
GDP	Gross domestic product
H	
HICP	Harmonised Index of Consumer Prices
I	
IAS	International Accounting Standards
IBNR	Incurred but not reported
IFRS	International Financial Reporting Standards
IRB	Internal Ratings Based
ISA	International Standards on Auditing
J	
JST	Joint Supervisory Team
L	
LGD	Loss given default
LGI	Loss given impairment
LGI PIT	Loss given impairment point in time
LGL	Loss given loss
LTD	Loan-to-deposit ratio
LTV	Loan to value

Term	Description
M	
MoU	Memorandum of Understanding
MPO	Monetary Policy Operations
N	
NCA	National competent authority
NII	Net Interest Income
NIM	Net Interest Margin
NPE	Non-performing exposure
NPV	Net present value
P	
P&L	Profit and loss statement
PD	Probability of default – may refer to either the point-in-time or regulatory parameter
PD PIT	Probability of default point in time
PE	Performing
PI	Probability of impairment
PP&A	Processes, policies and accounting review
Q	
QA	Quality assurance
R	
RRE	Residential real estate
RWA	Risk-weighted assets
S	
SME	Small and medium enterprise
SSM	Single Supervisory Mechanism
ST	Stress test

6.3   BIBLIOGRAPHY

Source	Reference
AQR Phase 2 Manual	http://www.ecb.europa.eu/pub/pdf/other/assetqualityreviewphase2manual201403en.pdf
ECB stress test manual	http://www.ecb.europa.eu/pub/pdf/other/castmanual201408en.pdf
CRR / CRD IV	http://ec.europa.eu/internal_market/bank/regcapital/legislation-in-force/index_en.htm

6.4 DEFINITIONS AND EXPLANATIONS

Name	Definition
Administrative expenses	Personnel (e.g. salaries and benefits), physical property, sales & marketing, integration & restructuring, and other general administrative expenses
Common Equity Tier 1 capital	CET1 capital according to CRD IV / CRR definition including transitional arrangements
Common Equity Tier 1 ratio	CET1 ratio according to CRD IV / CRR definition including transitional arrangements
Cost-income ratio (end of period)	Cost-income ratio is equal to the sum of administrative expenses and depreciation divided by the sum of net interest income, dividend income, net fee and commission income, net trading income and other operating income
Credit Risk Weighted Assets	Credit RWA including off-balance sheet items (in accordance with CRD IV / CRR)
Credit Valuation Adjustment	An adjustment to the valuation of the portfolio of transactions with a counterparty to reflect the market value of the credit risk of the counterparty
Debt Service Coverage Ratio	EBITDA / (Debt principal repayments + Net Interest expense)
Debtor	Debtor is defined as an obligor within the meaning of CRR
Deferred tax assets adjustments to Common Equity Tier 1	The change to CET1 capital due to changing the amount of DTAs deducted from CET1 through a) changing DTA volumes and b) changing the threshold for exclusion from deduction
Dividend income	Dividend income is equal to the total income earned through dividends paid by participations
Expected loss	The loss that is expected to be incurred in the next 12 months as a result of lending to a debtor that may default.
Forbearance	Concessions towards a debtor facing or about to face difficulties in meeting its financial commitments consistent with Implementing Regulation (EU) No 680 / 2014

Loans and receivables	Balance of loans and receivables at the end of the period. Refers to balances net of provisions and on balance sheet
Loss emergence period	The length of time between the specific "event of loss" for an exposure (eg, a retail client losing their job, a corporate losing a large customer) and the bank's observation of loss.
Loss given impairment	The level of impairment that can be expected at the point of impairment. Term used for non-retail exposures in the context of the AQR collective provisioning challenger model. See Chapter 7.8 of the AQR Phase 2 Manual for details
Loss given loss	The level of loss (after discounted recoveries) that can be expected if the facility does not cure. Term used for retail exposures in the context of the AQR collective provisioning challenger model. See Chapter 7.7 of the AQR Phase 2 Manual for details
Net fees & commissions	Credit related, transaction & insurance related, and investment related fees, for retail, SME and commercial, minus brokerage and insurance deductions
Net interest income	Net interest income is equal to total interest income minus total interest expense
Net interest margin (average over period, annualised)	Net interest income (annualised if for half year) divided by the average volume of Loans and Receivables over the time period
Net trading income	Net trading income is equal to the total gains or losses made through trading activities
Pre-provision profits	Pre-tax income from the bank's activities, measured before impairments are taken
Probability of impairment	Point in time probability of exposure being impaired within a 12 month emergence period. Term used in the context of the AQR collective provisioning challenger model. See Chapter 7.5 of the AQR Phase 2 Manual for details
Return on equity (based on RWA * 9.5%) (average over period, annualised)	Return on equity is equal to net income attributable to owners of the parent net of estimated dividends excluding impairments on financial assets and other income and expenses (annualised if for half year) divided by 9.5% of the average volume of Risk-Weighted Assets over the time

	period
Shortfall	A shortfall occurs if the bank's CET1% falls below the CET1% hurdle rate at any point in the scenario. The capital shortfall is equal to the difference between the bank's CET1 capital and the amount of CET1 capital required (CET1% hurdle rate * Risk-Weighted Assets). The year where the maximum shortfall appears is used
Specific provisions / Defaulted loans (end of period)	The ratio of specific provisions over the non performing exposure (EAD), figures include write-offs