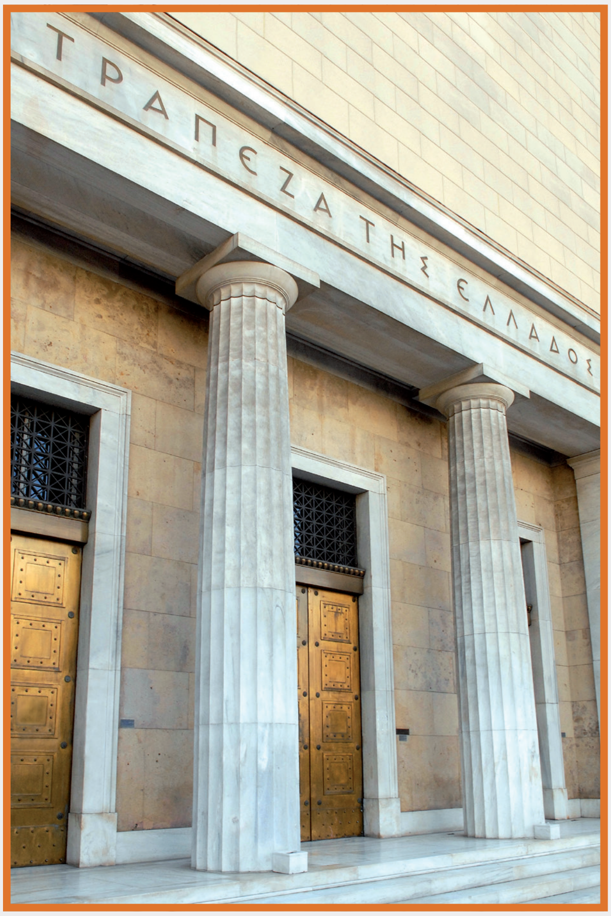
REPORT ON THE RECAPITALISATION AND RESTRUCTURING OF THE GREEK BANKING SECTOR



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BANK OF GREECE
21, E. Venizelos Avenue
GR- 102 50 Athens

Financial Stability Department – Secretariat
Tel. +30 210 320 5103
Fax +30 210 320 5419

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I. OVERVIEW

1. CONTEXT AND OBJECTIVES

Over the last couple of years, the Greek banking sector has been severely hit by the combined effects of:

- the cut-off from international markets and deposit outflows;
- adverse economic conditions, which resulted in deteriorating asset quality;
- the restructuring of the Greek sovereign debt through the Private Sector Involvement (PSI).

These factors put pressure on the liquidity and the capital base of Greek banks, thus threatening the stability of the banking sector and long-term sustainability of several banks.

In light of these conditions, the Bank of Greece and the Greek Government, implemented a series of measures to safeguard financial stability and protect depositors' interests. Such actions comprised inter alia:

- meeting banks' short-term liquidity needs by allowing access of eligible banks to emergency liquidity assistance (ELA);
- securing sufficient public resources (Financial Envelope) to cover the recapitalisation needs and restructuring costs of the Greek banking sector for the period 2012-2014, which were estimated at €50 billion[1];
- resolving distressed banks, within an enhanced legal framework;
- requesting all banks to increase their capital to a conservative level.

Within this process the European Commission, the European Central Bank and the International Monetary Fund provided guidance and ensured consistency with the programme's objectives. An international consulting firm provided analytical and technical support to the Bank of Greece in a range of activities.

This report presents the methodology used in the estimation of the **Financial Envelope** and confirms that the €50 billion earmarked under the Economic Adjustment Programme is appropriate as of December 2012 – taking into account two main elements:

- the estimate of the **capital needs** of all banks on a consolidated basis – based on the detailed assessment performed during the early part of 2012 (see Chapters II to V);
- **an updated estimate of the components of the Financial Envelope –** taking also into account events that materialised later in 2012, potential costs of future restructuring, and an appropriate buffer (see Chapter VI).

The Bank of Greece also conducted in March 2012 a strategic assessment of the banking sector. This analysis assessed the viability of banks on the basis of a much broader set of criteria (comprising regulatory and business criteria) and utilising both financial and pru-

[1] The March 2012 Memorandum of Understanding on Specific Economic Policy Conditionality envisaged an expansion of the capacity of the Hellenic Financial Stability Fund (HFSF) to a total of €50 billion. See also Law 3864/2010, as amended with Legal Act of 19 April 2012 (Government Gazette 94). In this report, by the term Memorandum we refer both to the Memorandum of Understanding on Specific Economic Policy Conditionality and the Memorandum of Economic and Financial Policies.

dential information[2]. The strategic assessment identified four "core banks", namely National Bank of Greece, Eurobank, Alpha Bank and Piraeus Bank, which were deemed suitable candidates for recapitalisation using programme funds.

"Non-core banks", as noted in the December 2012 Memorandum, will need to be recapitalised by the private sector by end-April 2013. Otherwise, they will be resolved by the end of June 2013.

2. CAPITAL NEEDS ASSESSMENT

The capital needs assessment was conducted in the first months of 2012 by the Bank of Greece. The objective of this exercise was to conservatively estimate the capital needs of all banks[3], so as to ensure minimum Core Tier 1 capital levels over the period 2012-2014 (see Chapters II to V).

Banks' capital needs were estimated on the basis of **two macroeconomic scenarios**[4], each reflecting plausible outcomes for key indicators (e.g. real GDP growth, unemployment rate, inflation, residential and commercial real estate prices) over 2012-2014:

- a Baseline Scenario, according to the assumptions of the Memorandum, with a Core Tier 1 ratio target of 9% for 2012 and 10% for 2013 and 2014[5];
- an Adverse Scenario, according to assumptions developed by the Bank of Greece, with a Core Tier 1 ratio target of 7% for the 2012-2014 period.

As a starting point, the exercise used the reference Core Tier 1 capital in December 2011, as submitted by banks[6], and then estimated the evolution of Core Tier 1 over the respective period, taking into account the following elements:

- loss incurred from the **PSI on Greek Government Bonds and selected state-related loans**, net of existing PSI provisions;
- **Credit Loss Projections** (CLPs) on banks' loan portfolios, carrying (i) Greek risk, based on the estimates by BlackRock Solutions, an international consulting firm commissioned by the Bank of Greece[7] to carry out a diagnostic study on the domestic loan portfolios of Greek banks; (ii) foreign-risk, based on an extension by the Bank of Greece of the European Banking Authority (EBA) methodology used in the June 2011 EU-wide stress testing and (iii) state-related risk, based on the estimates by BlackRock or the Bank of Greece[8], net of existing loan loss reserves;

[2] According to the March 2012 Memorandum the strategic assessment (viability study) of the banking sector would be carried out *"using a set of quantitative and qualitative criteria. The criteria will include in non-exhaustive terms: shareholders' soundness and willingness to inject new capital; quality of management and risk management systems; capital, liquidity and profitability metrics (both forward and backward looking); the Bank of Greece's assigned ratings to bank risks; and a sustainable business model."*

[3] At the time of the launch of the capital needs assessment exercise in January 2012, there were 17 commercial banks established in Greece.

[4] For a detailed description of the Scenarios see Chapter III and BlackRock Solution's report on "Diagnostic Assessment of Greek Banks".

[5] The December 2012 Memorandum envisages a minimum Core Tier 1 ratio of 9% for the whole 2012-2014 period. The impact of this change on capital needs is very limited because the Adverse Scenario is the binding one for almost all banks.

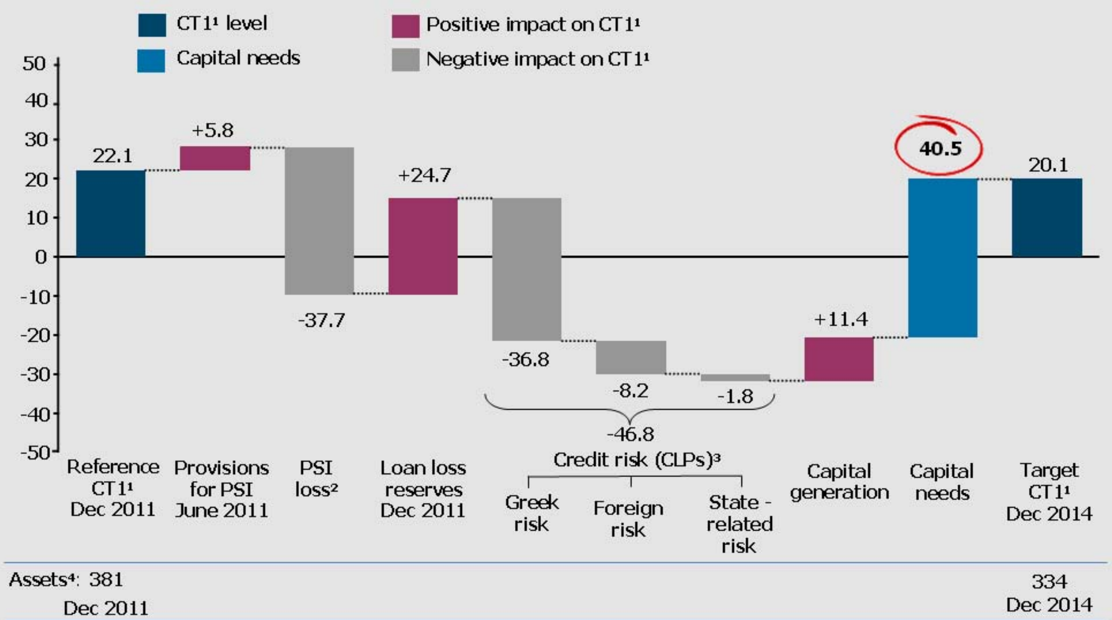
[6] Submitted in January 2012 in banks' three-year Business Plans; calculated without taking into account the impact of the modified PSI.

[7] In doing so, the Bank of Greece fulfilled a requirement under the June 2011 Memorandum.

[8] Depending on the category of state-related loans (see Chapter IV).

Chart I.1 Process for calculating capital needs (December 2011 – December 2014; consolidated basis)

(billion euro, estimated in May 2012)



Source: Bank of Greece.
1 CT1 : Core Tier 1.
2 Loss incurred by the Private Sector Involvement on Greek Government Bonds and selected state-related loans.
3 CLPs: Credit loss projections.
4 Total assets as per banks' Business Plans.

- **banks' internal capital generation** over the 2012 – 2014 period based on a conservative downward adjustment of key drivers of pre-provision profitability (i.e. income and expense elements[9]) from banks' three-year Business Plans and including only those capital actions that had already materialised at the time of the exercise.

Finally, the Bank of Greece estimated the **target level of Core Tier 1 capital** at the end of each year until 2014 based on the **target Core Tier 1 ratio** set for each scenario and the projected Risk Weighted Assets (RWAs). More specifically, to ensure that banks do not underestimate their risk exposure, RWAs were adjusted on the basis of a conservative Bank of Greece methodology.

The capital needs for each bank were then calculated as the difference between a) the target level of Core Tier 1 capital and b) the estimated level of Core Tier 1 capital at the end of each year until 2014.

This assessment was performed both for the Baseline and the Adverse Scenario; for each bank, the scenario that resulted in the highest capital needs was considered binding.

To ensure objectivity and robustness of the capital assessment exercise, the results were cross-checked against a top-down approach. Specifically, full year 2011 financial results of each bank were taken as a starting point, with forward projections based on a quantitative model taking into account macroeconomic forecasts, independently of the submitted Business Plans (see Chapter V).

[9] See analysis of component C in Section 3 of Chapter V.

Table I.1 Process for calculating capital needs (December 2011 – December 2014; consolidated basis)

(million euro; estimated in May 2012)

Banks[1]	Reference Core Tier 1[2] (1)	Total gross PSI loss (Dec 2011) (2)	Provisions related to PSI (June 2011) (3)	Gross CLPs for Credit Risk [3] (4)	Loan loss reserves (Dec 2011)[4] (5)	Internal Capital Generation[5] (6)	Target CT1 Dec 2014 (7)	Capital needs (8)=(7)-[(1)+(2)+(3)+(4)+(5)+(6)]
NBG	7,287	-11,735	1,646	-8,366	5,390	4,681	8,657	9,756
Eurobank	3,515	-5,781	830	-8,226	3,514	2,904	2,595	5,839
Alpha	4,526	-4,786	673	-8,493	3,115	2,428	2,033	4,571
Piraeus	2,615	-5,911	1,005	-6,281	2,565	1,080	2,408	7,335
Emporiki	1,462	-590	71	-6,351	3,969	114	1,151	2,475
ATEbank[6]	378	-4,329	836	-3,383	2,344	468	1,234	4,920
Postbank	557	-3,444	566	-1,482	1,284	-315	903	3,737
Millennium	473	-137	0	-638	213	-79	230	399
Geniki	374	-292	70	-1,552	1,309	-40	150	281
Attica	366	-142	53	-714	274	15	248	396
Probank	281	-295	59	-462	168	147	180	282
New Proton	57	-216	48	-482	368	34	115	305
FBB	145	-49	0	-285	167	-29	116	168
Panellinia	82	-26	3	-118	48	-26	42	78
Total	**22,119**	**-37,733**	**5,861**	**-46,834**	**24,727**	**11,381**	**20,062**	**40,542**
"Core banks"[7] Subtotal	**17,944**	**-28,214**	**4,154**	**-31,367**	**14,583**	**11,093**	**15,693**	**27,501**

Source: Bank of Greece.
1 The exercise concluded that for ABB, Credicom and IBG no additional capital was needed.
2 Core Tier 1 in December 2011 as submitted by banks without taking into account the impact of the Private Sector Involvement (PSI) and the bridge recapitalisation by the Hellenic Financial Stability Fund (HFSF).
3 Gross Credit Loss Projections (CLPs) over the June 2011 – December 2014 period for Greek loan portfolios, foreign and state-related loan portfolios. CLPs for Greek loan portfolios take into account three elements: (a) three-year CLPs estimated by BlackRock, (b) a fourth year of CLPs and (c) the credit risk cost for the new production (see Chapter V).
4 Accumulated provisions (as at December 2011) already recorded by banks for the loan portfolios referred to in column 4.
5 Internal capital generation based on banks' Business Plans for the period 2012 – 2014, as conservatively stressed according to the Bank of Greece methodology, taking also into account the capital actions that had already materialised at the time of the exercise (see Chapter V).
6 ATEbank was resolved in July 2012.
7 NBG, Eurobank, Alpha Bank and Piraeus Bank.

The resulting capital needs for all Greek commercial banks were estimated in May 2012 at €40.5 billion, of which the €27.5 billion corresponded to the four "core banks" (see Chart I.1 and Table I.1).

In October 2012, the Bank of Greece **reviewed the capital needs assessment** estimated earlier this year in light of the first half 2012 preliminary financial results and confirmed that the conservatively estimated capital needs were adequate.

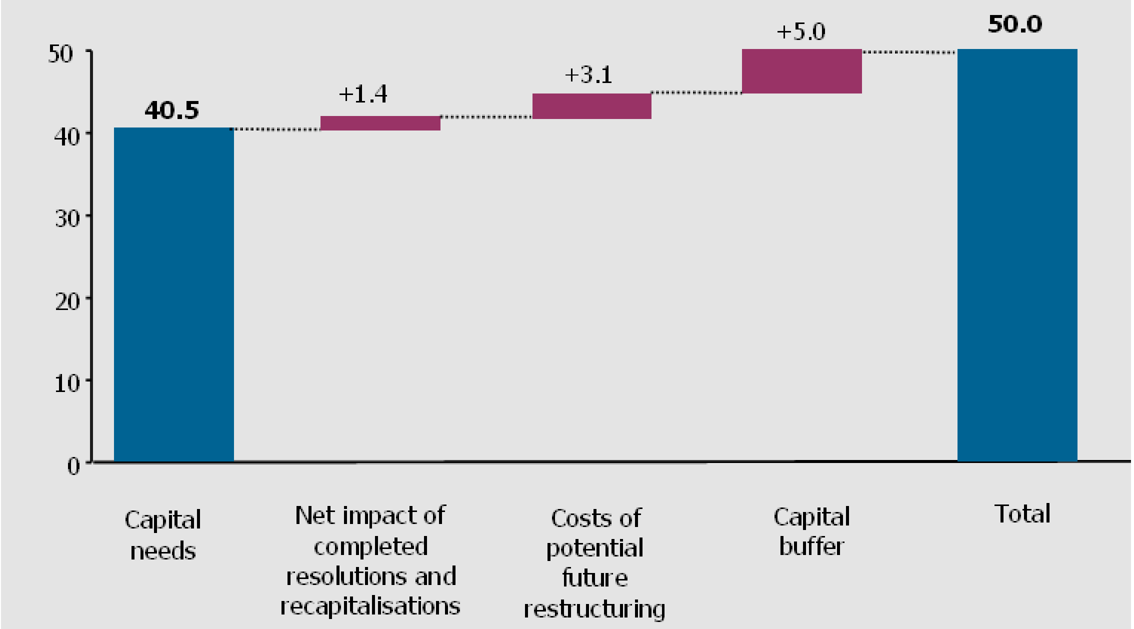
3. FINANCIAL ENVELOPE ESTIMATION

In December 2012, the Bank of Greece reviewed the adequacy of the Financial Envelope, i.e. of the level of public resources required as a backstop facility for the Greek banking sector's recapitalisation needs and restructuring costs over the 2012-2014 period (see Chapter VI).

The starting point of this **conservative estimate** is the outcome of the capital needs as-

Chart I.2 Financial Envelope estimation

(billion euro, estimated in December 2012)



Source: Bank of Greece.

sessment for all commercial banks (i.e. €40.5 billion - see Chart I.2); **irrespective of whether they are deemed suitable for recapitalisation with programme funds**.

The Bank of Greece **incorporated** in the Financial Envelope estimation:

- **the net impact (€1.4 billion) of completed resolutions**[10] **and recapitalisations** – in particular, a) the cost from the activation of resolution procedures for three commercial banks (ATEbank, Proton Bank, T-Bank) and three cooperative banks (Achaiki, Lamias and Lesvou-Limnou) over and above their capital needs, and b) the reduction in estimated capital needs due to the recapitalisation of two foreign subsidiaries operating in Greece, namely, Emporiki Bank and Geniki Bank, by their parent companies, Crédit Agricole and Société Générale respectively;
- **costs of potential future restructuring (€3.1 billion)** over and above the respective capital needs for "non-core banks" and cooperative banks, if needed;
- **a capital buffer (€5 billion)**, deemed appropriate, taking into account potential developments that could increase or decrease the needed funds. **Developments that could potentially increase the needed funds** include the impact on banks from further deterioration of macroeconomic conditions and from the recent sovereign debt buy-back. **Developments that could decrease the needed funds** include the private participation in

[10] The term *"resolution"* refers to the restructuring of an institution in order to ensure the continuity of its essential functions, preserve financial stability and restore the viability of all or part of that institution (see draft EU Directive Establishing a framework for the recovery and resolution of credit institutions and investment firms).

the recapitalisation process, the recognition of deferred tax, the planned liability management exercises and the realisation of synergies from mergers and acquisitions.

The Bank of Greece considers that, under reasonable levels of economic uncertainty, the amount of €50 billion earmarked in the Economic Adjustment Programme is appropriate to cover the Greek banking sector's recapitalisation and restructuring costs**.**

4. RECAPITALISATION TIMELINE

The overall framework for the recapitalisation of Greek banks was outlined initially in the March 2012 Memorandum and was subsequently updated in the December 2012 revised Memorandum.

The steps already implemented are the following:

- in April 2012, €25 billion were provided to the Hellenic Financial Stability Fund (HFSF), in the form of European Financial Stability Facility (EFSF) Notes;
- in May 2012, the HFSF extended €18 billion to the "core banks" in the form of an advance towards their capital increase, thus restoring their Capital Adequacy Ratio to the minimum requirement of 8%;
- in November 2012, following the issuance of the Cabinet Act 38 of 2012 on Recapitalisation Tools and Terms by the HFSF, the Bank of Greece officially informed banks of their individual capital needs requesting them to finalise their capital raising process by end-April 2013.

The recapitalisation process for the **"core banks"** comprises three steps:

- **bridge recapitalisation** by the HFSF. This refers to a capital advance in view of the capital increases scheduled to take place by end-April 2013. This capital advance has been completed in December 2012;
- **issuance of contingent convertible bonds** (by end-January 2013). The amount will be determined by the "core banks", in accordance with the recapitalisation framework. These instruments will be fully subscribed by the HFSF;
- **completion of share capital increases** (by end-April 2013), which will be fully underwritten by the HFSF.

Under this framework and according to the Cabinet Act 38 of 9 November 2012, private shareholders will retain control of the "core banks", provided they have subscribed no less than 10% of the newly issued common shares.

"Non-core banks", as stated in the December 2012 Memorandum, must be recapitalised from private sources by end-April 2013. They may also merge with other banks if they can demonstrate a credible Business Plan and meet recapitalisation needs by April 2013. If private shareholders are unable to support these banks, the Bank of Greece will proceed with the required steps for an orderly resolution by no later than June 2013, thus safeguarding financial stability and depositors' interests.

5. CONCLUDING REMARKS

The recapitalisation of Greek banks and the restructuring of the banking sector are expected to gradually restore depositors' and market confidence. The improvement in the capital and liquidity position of Greek banks will enable them to continue supporting the real economy and, thus, contribute to the improvement of the business environment. These elements will be instrumental in restoring sustainable growth to the Greek economy.

II. THE RESTRUCTURING OF THE GREEK SOVEREIGN DEBT

The Greek banks participated in the Private Sector Involvement (PSI) in the context of the restructuring of the Greek sovereign debt. The process involved the exchange of Greek Government Bonds (GGBs) with a series of new bonds, at a significant price discount.

The direct impact of this exchange on the capital base of banks was severe and constituted a major factor in determining the recapitalisation needs.

1. DESCRIPTION OF PSI

At two consecutive Euro Summits held on 11 and 25 March 2011, and subsequently, following an ad hoc decision taken at the Euro Summit of 21 July 2011, a new financial Support Programme was adopted for Greece to cover the country's financing needs until mid-2014, including the participation of the private sector.

Under the initial design of the Private Sector Involvement (PSI), private sector holders of Greek Government Bonds (GGBs) were invited to voluntarily exchange their holdings of existing GGBs for new bonds with longer maturities and lower coupons. This would incur a loss of about 21% on average, in Net Present Value (NPV) terms, for private bondholders. In view of its implementation, Greek banks recorded related provisions in their June 2011 financial statements.

The Euro Summit statement of 26 October 2011, however, acknowledged that a deeper PSI would play a vital role in establishing the sustainability of Greek sovereign debt. Thus a modified PSI was adopted – envisaging a significant reduction in face amount terms of Greek sovereign debt – together with an ambitious programme of structural reforms for the Greek economy, aimed at bringing down the Greek debt-to-GDP ratio to 120% by 2020. In particular, this GGBs exchange programme[11], which was completed on 25 April 2012, involved a discount of 53.5% on the face amount of Greek debt held by private investors. Specifically, the participation rate in the swap reached 96.9% of the total outstanding amount of eligible bonds. This rate is equivalent to €199 billion worth of bonds out of the total €205.5 billion in eligible paper, which was exchanged for:

(i) New Bonds issued by the Hellenic Republic having an aggregate face amount of €62.4 billion (31.5% of the principal amount of the bonds tendered for exchange);

(ii) PSI Payment Notes issued by the European Financial Stability Facility (EFSF) in two series maturing on 12 March 2013 and 12 March 2014, respectively, having an aggregate face amount of €29.7 billion (15% of the principal amount of the bonds exchanged), and

(iii) Detachable GDP-linked securities of the Hellenic Republic having a notional amount equal to the principal amount of the New Bonds issued.

In addition, private investors received short term EFSF bills, having an aggregate face amount of €4.9 billion, for the accrued interest of the exchanged GGBs at the settlement date of the exchange.

[11] Ministry of Finance, Press Release 25 April 2012.

The scope of the PSI programme also included certain loans to the broader public sector, which were also exchanged for new Hellenic Republic bonds and EFSF Payment Notes under the same terms as for GGBs. These were mostly loans to large state-owned enterprises, such as the Athens Urban Transport Organisation (OASA), TRAM S.A., the Hellenic Railways Organisation (OSE) and Hellenic Defence Systems (EAS), totalling €4.9 billion.

2. METHODOLOGY

Based on International Accounting Standards (IAS), the accounting treatment for the impairment of financial instruments varies according to the category in which the assets (GGBs) are classified.

The vast majority of GGBs held by Greek banks were classified under the "Held To Maturity" and "Loans and Receivables" categories. For these categories, the respective amount of loss was calculated as the difference between the carrying value and the present value of estimated future cash flows, after being discounted at the original effective interest rate of the GGBs.

Regarding the small share of GGBs classified in the "Available for Sale" (AFS) Portfolio, Greek banks transferred the AFS loss reserve resulting from marking the GGBs to market prices as of 31.12.2011 to their profit and loss statements hence accounting for the PSI losses.

Finally, the accounting treatment of loans to the broader public sector, within the scope of the PSI programme, was the same as for GGBs in the "Loans and Receivables" Portfolios.

For the capital needs assessment, as a first approximation, an impairment of 75% was estimated, comprising both the nominal haircut of 53.5% on the face value of the exchanged GGBs and the mark-to-market effect. After the publication of the full year 2011 financial statements, the actual impairment recorded by each bank was used. For those banks that did not publish full year 2011 financial statements, the relevant information was obtained from supervisory data.

3. IMPACT ON GREEK BANKS

In the context of the PSI, Greek banks exchanged GGBs and state-related loans of a total face amount of €48.6 billion, for New Bonds issued by the Hellenic Republic and PSI Payment Notes issued by the EFSF.

Banks' NPV loss from the debt exchange was estimated on average at 78% of the face amount of the old GGBs. For the Greek banking sector, these losses amounted to €37.7 billion (see Table II.1), out of which €5.8 billion had already been recorded on the June 2011 financial statements. This loss constituted a major factor for determining the capital needs of banks, as further presented in Chapter V.

Table II.1 Impairment losses on Greek government bonds (GGBs) and state-related loans under the PSI

(million euro)

Banks	Face amount of GGBs (1)	Face amount of state - related loans (2)	Total face amount (3)=(1)+(2)	PSI loss of GGBs (4)	PSI loss of state - related loans (5)	Total gross PSI loss (6)=(4)+(5)	Total gross PSI loss / Core Tier 1 (Dec 2011) (%) (7)	Total gross PSI loss / Total Assets (Dec 2011) (%) (8)
NBG	13,748	1,001	14,749	10,985	751	11,735	161.0	11.0
Eurobank	7,001	335	7,336	5,517	264	5,781	164.5	7.5
Alpha	3,898	2,145	6,043	3,087	1,699	4,786	105.7	8.1
Piraeus	7,063	280	7,343	5,686	225	5,911	226.0	12.0
Emporiki	351	415	766	270	320	590	40.3	2.7
ATEbank	5,164	608	5,772	3,873	456	4,329	1,144.2	17.1
Postbank	4,197	175	4,372	3,306	138	3,444	618.3	24.8
Millennium	185	0	185	137	0	137	29.0	2.2
Geniki	384	7	391	287	5	292	78.1	8.9
Attica	199	0	199	142	0	142	38.8	3.4
Probank	415	0	415	295	0	295	105.1	8.7
New Proton[1]	934	0	934	216	0	216	378.8	12.6
FBB	70	0	70	49	0	49	33.8	3.1
Panellinia	34	0	34	26	0	26	31.7	3.5
Total	**43,643**	**4,966**	**48,609**	**33,876**	**3,857**	**37,733**	**170.6**	**10.1**

Source: Bank of Greece.

[1] For New Proton Bank, part of the impact has been funded through the resolution of Proton Bank.

III. DIAGNOSTIC STUDY ON GREEK BANKS' LOAN PORTFOLIO

The Bank of Greece commissioned an international firm, BlackRock Solutions, to assess the quality of banks' recession-hit domestic lending portfolios[12]. In this context, BlackRock conducted an independent assessment and estimated Credit Loss Projections (CLPs) on the domestic loan portfolios of Greek commercial banks over a three-year and a loan-lifetime horizon.

BlackRock's methodology was based on proprietary econometric models tailored for Greece and applied on loan-level data. Qualitative analysis complemented the assessment. In order to ensure that its findings would be sufficiently conservative, BlackRock adopted a prudent approach in designing its methodology and estimating the key inputs for the calculation of capital needs of the Greek banking sector.

1. CONTEXT AND SCOPE

In August 2011, the Bank of Greece commissioned the internationally reputed consulting firm BlackRock to carry out a diagnostic study on the domestic loan portfolios of Greek banks, on the basis of data as of 30 June 2011. In doing so, the Bank of Greece fulfilled a requirement under the June 2011 Memorandum.

The estimation of the CLPs by an independent firm of international repute ensures transparency regarding the quality of loan portfolios and makes it possible to assess the adequacy of loan loss reserves for credit risk and to estimate the capital required for banks to remain robust in conditions of a severe recession. In carrying out its task, BlackRock was supported by international audit firms, asset valuation experts and other firms.

BlackRock was called upon to make an independent assessment of CLPs on banks' loan portfolios both over a three-year and a loan-lifetime horizon on the basis of two Scenarios: a Baseline and an Adverse one (see BlackRock report). In the context of the study, BlackRock had one-to-one meetings with bank officials, analysed raw data from banks and developed its own econometric models in order to assess CLPs. The Bank of Greece did not interfere in the conduct of the exercise and its participation was limited to the formulation of macroeconomic assumptions and the close monitoring of the exercise. BlackRock adopted a very prudent approach in the design of its methodology and the conduct of its study to ensure that its findings would be sufficiently conservative.

The diagnostic study covered the loan portfolios of all commercial banks established in Greece. These banks were divided into two groups based on their size. Group A included the seven largest banks (National Bank of Greece, Eurobank, Alpha Bank, Piraeus Bank, Emporiki Bank, Agricultural Bank of Greece, and Hellenic Postbank). Group B included the remaining 11 banks (Millennium Bank, Geniki Bank, Attica Bank, Probank, Proton Bank[13], T-Bank[14], First Business Bank,

[12] For a complete and detailed analysis of the diagnostic study methodology, see BlackRock Solutions' Report "Diagnostic Assessment of Greek Banks".

[13] BlackRock's role was focused on the assessment of loans transferred to "New Proton Bank".

Credicom Consumer Finance, Panellinia Bank, Investment Bank of Greece and Aegean Baltic Bank).

The diagnostic study covered loans carrying Greek risk, as the quality of such portfolios was closely related to developments in domestic macroeconomic aggregates. To this end, BlackRock collected data on all loans and other credit exposures of banks on a solo basis, as well as on loans granted by their domestic leasing, factoring and credit finance subsidiaries. Subsequently, BlackRock excluded exposures outside the scope of the diagnostic study, such as loans by foreign branches of Greek banks deemed as not carrying Greek risk, inter-company exposures, etc. The total amount of exposures included in the diagnostic study was €223.4 billion, of which approximately 90% was accounted for by Group A Banks (see Table III.1).

Table III.1 Categories of exposures included in the diagnostic study

Outstanding amounts (million euro; June 2011)

Balance sheet exposures on a solo basis	**248,300**
Domestic branches	230,200
Foreign branches	18,100
Loans carrying Greek risk	*2,100*
Loans not carrying Greek risk	*16,000*
Leasing, factoring and credit finance subsidiaries	**6,703**
Excluded exposures	**-31,555**
Loans by foreign branches not carrying Greek risk	-16,000
Inter-company exposures	-3,553
Miscellaneous (e.g. IFRS adjustments, outside the scope of the diagnostic study)	-12,002
Total exposures	**223,449**

Source: BlackRock Solutions.

2. WORKSTREAMS OF THE DIAGNOSTIC STUDY

The diagnostic study included four main workstreams:

(i) *The Data Integrity and Verification workstream* aimed at verifying the completeness and accuracy of bank data by comparing, for a specific loan sample, data stored in electronic records against contractual documents kept in loan files. Data checking focused on the characteristics of loans included as variables in the econometric models used in the diagnostic study[15].

Moreover, data were checked to verify the consistency of outstanding amounts, as submitted by banks in view of the diagnostic study, with data recorded in banks' financial statements. A representative sample of loans from each portfolio was selected to conduct the aforementioned checks. This work was carried out by auditors under the guidance of BlackRock.

(ii) *The Asset Quality Review workstream* aimed at examining the adequacy and appropriateness of banks' lending procedures and the quality of the loan portfolio. This assessment was based on interviews with bank officials, as well as on a thorough analysis of samples of loans from each portfolio.

The purpose of meetings with bank officials was to obtain an understanding of individual banks' business strategies, loan portfolio structures and risk-taking policies. Interviews covered the entire spectrum of lending procedures, i.e. from the early stages of loan ap-

[14] T-Bank was absorbed in December 2011 by the Hellenic Postbank, after the Bank of Greece's decision to take resolution measures under Law 3601/2007, as amended by Law 4021/2011. For this reason, the figures of T-Bank have been incorporated into those of the Hellenic Postbank.

[15] This workstream was not conducted for Group B Banks.

proval to the management of non-performing loans (NPLs).

The review of the loan files within each loan sample was conducted for two purposes: a) to assess whether loans were originated in accordance with the bank's lending policy and procedures and b) to assess whether the loan, beyond its adherence to the bank's criteria, would have been considered acceptable by a so-called "prudent lender". The loan samples were not designed to be representative of the respective loan portfolio, but intentionally contained a large number of high-risk loans. Moreover, for Mortgage and Consumer loan portfolios, additional loan samples were analysed in order to assess banks' loan restructuring policies.

In particular, for a sample of large corporate borrowers BlackRock conducted a full re-underwriting of the loans. That is, BlackRock reassessed the financial condition, the business prospects and the indebtedness of each borrower in the sample. As a result, it assigned a credit rating to each of these borrowers based on their creditworthiness and estimated a bespoke CLP, both for the Baseline and the Adverse Scenario.

(iii) *The CLPs workstream* aimed at estimating CLPs on banks' loan portfolios both over a three-year horizon and over the lifetime of the loans. BlackRock developed tailor-made econometric models for each loan portfolio, which were used for the estimation of CLPs at the individual loan level, based on raw data provided by the banks. The findings of the two preceding workstreams were also taken into account.

(iv) *The Loan Loss Reserves Review workstream's* objective was to compare, at a loan portfolio level, loan loss reserves (i.e. the accumulated loan loss provisions), as reflected in the banks' financial statements of June 2011, against BlackRock's assessment of CLPs.

3. METHODOLOGY FOR THE ESTIMATION OF CREDIT LOSS PROJECTIONS

BlackRock estimated CLPs for the loan portfolios on the basis of amounts outstanding on 30 June 2011. CLP is defined as the non-discounted loss of principal due to the (total or partial) non-repayment of loans, taking into account any amounts recovered from the sale of any relevant collateral. CLPs were calculated for a three-year and a lifetime horizon under both the Baseline and the Adverse Scenario. The CLPs do not take into account banks' loan loss reserves.

The Bank of Greece provided BlackRock with assumptions regarding the evolution of key macroeconomic variables used in the analysis, namely the real gross domestic product (GDP) growth rate, the unemployment rate, inflation, residential and commercial real estate prices, the three-month Euribor and the CHF/EUR exchange rate. For each of these variables two scenarios were provided, a Baseline and an Adverse Scenario.

In the Baseline Scenario, Greek macroeconomic developments were assumed to be in line with the projections included in the October 2011 Review of the Economic Adjustment Programme for Greece[16], while for the remaining years the Bank of Greece, assumed a plausible real GDP path, interlinking the other economic variables to its evolution.

[16] European Commission, *Fifth Review of the Economics Adjustment Programme for Greece*, October 2011.

In the Adverse Scenario, more conservative macroeconomic assumptions were developed by the Bank of Greece. It should be noted that these assumptions were formulated in early October 2011, on the basis of the then available information. A more detailed description is provided in BlackRock's report.

Following an in-depth analysis of loan portfolios and consultations with bank officials, BlackRock identified the following individual portfolios:

- Mortgages;
- Consumer;
- Corporate and Small & Medium Enterprises (SME);
- Small Business and Professionals (SBP);
- Commercial Real Estate (CRE);
- Shipping;
- State-related exposures[17].

For each portfolio, BlackRock developed a methodology tailored to its features. These methodologies, described in detail below for Group A Banks, incorporate assumptions supported by the results of the Asset Quality Review workstream. It is noted that the Data Integrity and Verification workstream confirmed the accuracy of data reported by Greek banks and, therefore, it was not necessary to adjust any data for the purposes of the study.

The Mortgages Portfolio

The Mortgages Portfolio stood at €70.1 billion, of which €2.2 billion were government-guaranteed and therefore state-related (see Chapter IV).

BlackRock's methodology was based on econometric models incorporating the behavioural features of borrowers and the impact of macroeconomic variables (such as the evolution of GDP, unemployment, interest rates and residential real estate prices). The models were designed to project future cash flows and expected loss of principal, taking into account estimates on the pace of loan repayment, NPL levels and the value of collateral. The most important explanatory factor of the econometric model turned out to be the Loan-To-Value ratio (LTV ratio).[18]

In order to ensure that property valuation was sufficiently conservative, BlackRock used input from experts, who appraised the current market value of a sample of residential properties following on-site visits (so-called "drive-bys"). BlackRock then compared this appraised value with the value of the property as reported by banks. The comparison resulted in a downward adjustment of property prices reducing the value of real estate collateral available to cover losses from defaulted loans.

In the context of its conservative approach and for both scenarios (see Table III.2), BlackRock classified as NPLs all loans that have been restructured, regardless of their performance status at the time of the exercise. This led to an adjustment of the average NPL ratio from 14.6% to 21.8% for Group A Banks, on the basis of June 2011 data.

To determine losses on NPLs, the following approach was adopted:

- the value of the real estate used as collateral at the time of liquidation was calcu-

[17] The methodology applied to State-related exposures is described in Chapter IV.

[18] A higher LTV ratio leads to a higher level of NPLs. The LTV is defined as the ratio of the value of the loan divided by the value of the mortgage collateral.

lated using the assumptions regarding the evolution of the Property Price Index;

- a substantial discount of 39% was applied to the value of the property under both scenarios, taking into account the unfavourable conditions prevailing upon collateral liquidation, i.e. forced sale;
- the costs related to the process of collateral sale (e.g. legal costs, maintenance costs) were set at 17% of the property value.

On the basis of discussions with banks and their historical experience, BlackRock estimated that an average period of two years would elapse from the termination of a loan contract until the liquidation of its collateral (i.e. auctioning of the property). For this reason, the Bank of Greece asked BlackRock to adjust CLPs for the first three years accordingly, in order to include in their results losses on mortgage loans that would become non-performing within the three-year period but the liquidation of their collateral would occur after that period.

The Consumer Portfolio

The Consumer Portfolio amounted to €29 billion and was divided into three sub-portfolios, those of Other Consumer Loans (€19.6 billion), Credit Cards (€6.9 billion) and Auto Loans (€2.5 billion).

BlackRock based its methodology on econometric models (for the sub-portfolios) which factored in the behavioural patterns of borrowers and the impact of macroeconomic variables, such as GDP growth and unemployment rate. The aim of these models was to forecast future cash flows and the expected loss of principal on the basis of estimates of the future level of NPLs and the recovery rate of overdue debts.

As in the case of mortgages, BlackRock included all restructured loans in NPLs. This adjustment mainly concerned the Other Consumer Loans and raised the average NPL ratio in that sub-portfolio for Group A Banks from 27.7% to 41.2%. It should be noted that the impact for the other two sub-portfolios was limited. In particular the average NPL ratio for Group A Banks was increased from 29.6% to 30.4% for the Credit Cards sub-portfolio and from 11.6% to 12.2% for the Auto Loans sub-portfolio.

In order to calculate recovery rates, BlackRock analysed historical data for Greek banks. In the Baseline Scenario, recovery rates stood at 20% for the sub-portfolios of Credit Cards and Other Consumer Loans, and at 35% for the sub-portfolio of Auto Loans, while in the Adverse Scenario the recovery rate was assumed to be 10 percentage points lower for all sub-portfolios.

The Corporate and SME Portfolio

The Corporate and SME Portfolio stood at €75.2 billion and was divided into four sub-portfolios: Corporate (€36.4 billion), SMEs (€32.8 billion), Leasing (€4 billion) and Factoring (€2 billion).[19] Indicatively, NPLs for Group A Banks averaged 10.9% for the Corporate Portfolio and 20.7% for the SMEs Portfolio.

[19] These balances include State-related exposures, which are analysed in Chapter IV.

Table III.2 Key conservative assumptions in calculating the Credit Loss Projections	
Household loans	
Restructured loans	• All restructured mortgage and consumer loans were classified as non-performing loans (NPLs) thereby adjusting the starting NPL ratio upwards, as at June 2011.
Residential property valuation	• The value of mortgage collateral was adjusted downwards based on appraisals for a sample of residential properties following on-site visits. As a result, the average Loan-To-Value ratio was increased by 13 percentage points.
Forced sale discount	• A discount of 39% was imposed on the mortgage collateral value upon liquidation to account for the unfavourable conditions of a forced sale.
Liquidation cost	• An additional average cost of 17% of the mortgage collateral value was assumed for legal costs and maintenance.
Business loans	
Restructured loans	• In the Small Business and Professionals Portfolio for all restructured loans a 90% Probability of Default was assumed.
Cure rate	• A zero cure rate (i.e. a zero percentage of NPLs that are repaid or becoming current over their lifetime) was assumed for the calculation of the Probability of Default in the Corporate and SME Portfolio.
Loss Given Default (LGD) for unsecured loans	• The LGD assumptions for unsecured loans were more conservative than the ones under the Foundation Internal Ratings-Based Approach of Basel II.
Collateral valuation	• Real estate collateral values were rebased to current market levels in order to account for value declines since the last valuation was performed (with discount up to 35%) and were also subjected to forward valuation discounts to account for anticipated market declines (e.g. discount 17% for commercial properties). • A discount of 20%-30% was imposed on real estate collateral to account for liquidation and enforcement cost, and for the payment of preferred claims (e.g. to employees, social security funds etc.) prior to the bank.
Corporate and personal guarantees	• Corporate and personal guarantees were not taken into account for the SBP Portfolio, while for the Corporate and SME Portfolio they raised the recovery ratio by a mere 10% and 5% respectively under the Baseline Scenario.

Source: Bank of Greece.

For the purposes of the diagnostic study, "Corporate" refers to enterprises with an annual turnover of more than €25 million, while "SMEs" are enterprises with a turnover of between €2 and €25 million. Moreover, a further distinction was made. The term "large corporate borrowers" was used for companies or groups of companies with a total exposure of over €25 million.

The estimation of CLPs was based on:

- A comprehensive re-underwriting for a sample of large corporate borrowers conducted as part of the Asset Quality Review workstream;
- econometric modelling for all the rest Corporate and SME borrowers, using a common methodology.

In particular, BlackRock conducted a comprehensive re-underwriting for a sample of large corporate borrowers as part of the Asset Quality Review workstream. The sample of large corporate borrowers to be re-underwritten was selected so that around 25% of the total large corporate borrowers' balances would be reviewed covering a number of industry sectors.

For each of the re-underwritten exposures BlackRock estimated bespoke CLPs both under the Baseline and Adverse Scenarios, taking into account the relevant collateral. For the rest of the large corporate borrowers, the aforementioned econometric modelling was used to estimate CLPs.

Regarding the econometric modelling, the statistical estimation of CLPs at loan level in the Corporate and SME Portfolio was based on the following formula:

Expected Loss (EL) =EAD x PD x LGD

Exposure at Default (EAD) was calculated as the sum of the on-balance sheet exposure and a percentage of the off-balance sheet exposures (e.g. Letters of Guarantee, undrawn credit limits). In order to determine this percentage, BlackRock relied on the analysis of historical data provided by banks, interviews with bank officials and findings from the sample of large corporate borrowers analysed as part of the Asset Quality Review workstream.

The estimation of Probability of Default (PD) was based on banks' internal rating systems and on historical default data from each bank. On the basis of the above, BlackRock calculated the default rate per rating category. At the same time, BlackRock developed an econometric model linking real GDP growth to corporate loan defaults using historical data nationwide over the past ten years. This model was used to adjust default rates per rating category for the years ahead under the assumptions for future GDP growth.

Loss Given Default (LGD) was calculated using a number of assumptions. For unsecured loans, the recovery rate was set by taking into account international practices for distressed portfolios adhering to the conservatism principle (see Table III.2). In particular, for the Corporate Portfolio, the recovery rate was set at 40% for the Baseline Scenario and at 30% for the Adverse Scenario, while for the SMEs Portfolio it was set at 25% and 15%, respectively. These recovery rates were substantially lower than those under the Foundation Internal Ratings-Based Approach in the context of Basel II.

For secured loans, collateral was mostly in the form of commercial property, financial assets (e.g. cash, bonds, shares, etc.), bank guarantees, post-dated cheques, residential property and Greek government guarantees.

BlackRock adjusted the value of collateral, taking into account the following:

- the timing of the latest valuation of the collateral;
- the projected evolution of the value of the collateral;
- the sale discount depending on the type of collateral; and
- collateral realisation costs (e.g. legal costs).

In the Adverse Scenario a further 10% valuation discount is assumed across all types of collateral.

The Small Business and Professionals Portfolio

The Small Business and Professionals Portfolio amounted to €24.5 billion. For the purpose of the diagnostic study, this Portfolio was defined to include enterprises with an annual turnover of less than €2 million.

The methodology for estimating CLPs on this Portfolio was similar to the econometric methodology applied to the Corporate and SMEs Portfolio, except that PD was estimated by econometric models that factor in borrower behaviour patterns, type of activity and location, as well as assumptions about future GDP growth. Indicatively, the average NPL ratio for Group A Banks came to 38%.

LGD was calculated using a similar methodology to the Corporate and SMEs Portfolio. For unsecured loans, under the Baseline Scenario the recovery rate was set at 5% -10% depending on the banks' historical recovery rates. Under the Adverse Scenario, a zero recovery rate was assumed. For secured loans, BlackRock adjusted the value of the collateral, as described above for the Corporate and SMEs Portfolio.

The Commercial Real Estate Portfolio

The Commercial Real Estate (CRE) Portfolio amounted to €4.4 billion. The commercial real estate leasing was also included in this Portfolio.

The methodology for estimating CLPs was similar to the one applied to the Corporate and SMEs Portfolio.

The Shipping Portfolio

The Shipping Portfolio amounted to €8.6 billion. The methodology for estimating CLPs on this Portfolio was similar to the one used for the Corporate and SMEs Portfolios, except that the PD was estimated by mapping the banks' internal credit ratings assigned to each borrower, to Moody's rating scale.

LGD was calculated on the basis of:

- the appraisal of the current value of a representative sample of ships by a specialised international vessel valuator;
- realisation costs; and
- assumptions about the future vessel valuation based on international historical data per type of ship, annual depreciation rates and trends in the international shipping market.

The above analysis was conducted for each type of vessel, taking the age of the ship into account.

CLP methodology for Group B Banks

The Credit Losses Projections for Group B Banks were estimated on the basis of the analysis carried out for the respective Portfolios of Group A Banks.

The CLPs in the Mortgage and Consumer Portfolios were estimated by the econometric models developed on the basis of Group A Bank data. Specifically, banks with portfolios entailing a total exposure of over €0.5 billion were required to submit detailed loan-level data to BlackRock, which then estimated the value of NPLs, using the same methodology as the one applied for Group A Banks. Banks with portfolios entailing an exposure under €0.5 billion were only required to submit aggregate data with average values for each portfolio, and the above econometric models were applied to these values.

LGD was estimated using the same methodology as the one described for Group A Banks.

With regard to the Business Loans Portfolio, all Group B Banks were required to submit loan-level data. BlackRock then grouped these loans by Portfolio (Corporate and SMEs, Small Business and Professionals and Commercial Real Estate) into the following four subcategories:

- performing and secured;

- performing and unsecured;
- past-due and secured;
- past-due and unsecured.

In order to calculate the CLPs for each sub-category, the weighted average loss rate recorded in the respective Portfolios of the Group A Banks was used. Exposure at Default was calculated in a similar way as for Group A Banks.

4. RESULTS

BlackRock estimated CLPs on the whole domestic loan book of Greek banks and submitted its final report to the Bank of Greece in the beginning of 2012.

The results shown in this section do not include state-related exposures and related CLPs due to the specific treatment of this Portfolio (e.g. perimeter of PSI), which is detailed in Chapter IV. In addition, exposures in the Business Portfolios include the part of the unfunded balance for which CLPs were calculated. Moreover, following the principle of conservatism, the three-year CLPs on the Mortgages Portfolio have been adjusted upwards to include the losses associated with those mortgages that become non-performing in the first three years, but their collateral had not yet been liquidated.

The CLPs per loan Portfolio are depicted in Table III.3.

Regarding Business loans, the Small Business and Professionals sub-portfolio exhibits the highest loss rate due to its retail nature and its increased vulnerability to the deepening domestic recession (see Chart III.1). It should be noted that loss rates in this sub-portfolio vary between banks due to different levels of collateralisation and concentration in specific industries. On the contrary, shipping loans exhibit the lowest loss rate thanks to the international nature of their business and the availability of collateral. As far as Commercial Real Estate loans are concerned, they constitute a very small part of the Business Portfolio and they exhibit relatively low loss rates compared with other jurisdictions.

Regarding Household loans, CLPs for Consumer loans are higher than CLPs for Mortgage loans, despite that the former represent only 30% of total household lending.

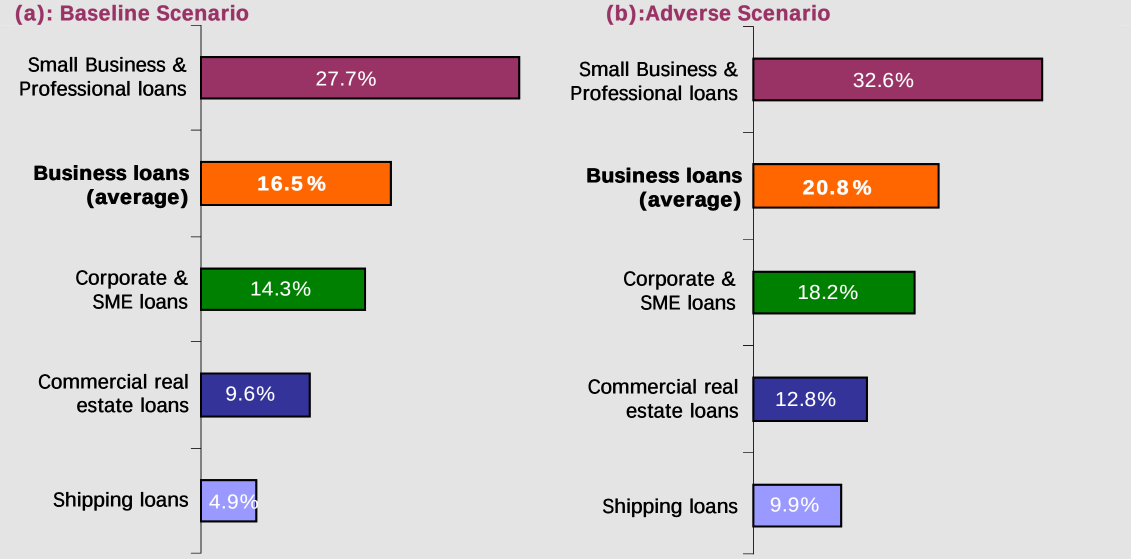
Table III.3 Credit Loss Projections per loan Portfolio[1]

(million euro)

		Baseline Scenario				Adverse Scenario			
Portfolios	Loan balances	3-year CLPs	3-year CLPs as a percentage of loan balances (%)	Lifetime CLPs	Lifetime CLPs as a percentage of loan balances (%)	3-year CLPs	3-year CLPs as a percentage of loan balances (%)	Lifetime CLPs	Lifetime CLPs as a percentage of loan balances (%)
Mortgage	67,928	4,040	5.9	5,866	8.6	6,289	9.3	9,736	14.3
Consumer	28,863	5,040	17.5	7,483	25.9	6,419	22.2	9,477	32.8
Business	106,318	17,505	16.5	19,144	18.0	22,096	20.8	24,255	22.8
Total	**203,108**	**26,585**	**13.1**	**32,492**	**16.0**	**34,803**	**17.1**	**43,468**	**21.4**

Source: BlackRock Solutions.
1 Credit loss projections do not take into account any loan loss reserves.

Chart III.1 Business loans - loss rates[1] per sub-portfolio



Source: BlackRock Solutions.
[1] Loss rates do not take into account loan loss reserves.

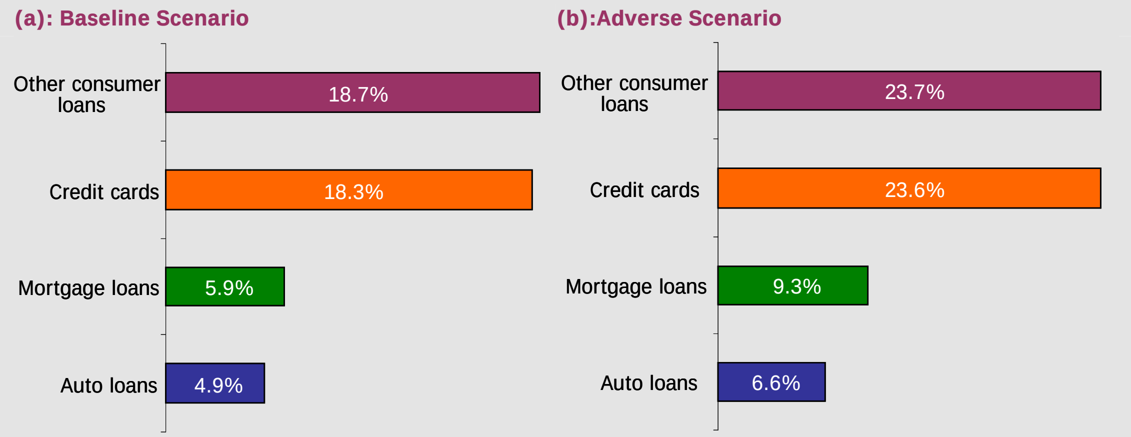
This is due to the fact that the Mortgages Portfolio, because of its significant collateral backing, has, as anticipated, the lower loss rate, whereas the loss rate of the Consumer Portfolio is the highest (see also Chart III.2).

Specifically, within the Consumer Portfolio, auto loans exhibit a considerably lower loss rate than both credit cards and other consumer loans. Again in this case the availability of collateral is the key driver for the lower loss rate.

The CLPs per bank and per Portfolio are outlined in detail in Table III.4.

The three-year CLPs derived by BlackRock have been a significant input towards the capital needs assessment for each individual bank according to methodology described in Chapter V.

Chart III.2 Household loans - loss rates[1] per sub-portfolio



Source: BlackRock Solutions.
[1] Loss rates do not take into account loan loss reserves

Table III.4 Credit Loss Projections on the loan Portfolio per bank[1]

(million euro)

Banks	Loan balances	Baseline Scenario: 3-year CLPs	Baseline Scenario: 3-year CLPs as a percentage of loan balances (%)	Baseline Scenario: Lifetime CLPs	Baseline Scenario: Lifetime CLPs as a percentage of loan balances (%)	Adverse Scenario: 3-year CLPs	Adverse Scenario: 3-year CLPs as a percentage of loan balances (%)	Adverse Scenario: Lifetime CLPs	Adverse Scenario: Lifetime CLPs as a percentage of loan balances (%)
NBG	41,019	4,421	10.8	5,623	13.7	5,812	14.2	7,581	18.5
Eurobank	37,116	4,486	12.1	5,842	15.7	6,026	16.2	8,032	21.6
Alpha	34,298	5,177	15.1	6,290	18.3	6,733	19.6	8,389	24.5
Piraeus	25,909	2,969	11.5	3,506	13.5	3,977	15.3	4,768	18.4
Emporiki	19,881	4,637	23.3	5,352	26.9	5,631	28.3	6,562	33.0
ATEbank[2]	14,639	1,825	12.5	2,146	14.7	2,482	17.0	3,030	20.7
Postbank	9,335	510	5.5	655	7.0	752	8.1	983	10.5
Millennium	4,997	407	8.1	557	11.2	587	11.8	822	16.4
Geniki	4,174	787	18.9	909	21.8	989	23.7	1,153	27.6
Attica	4,048	499	12.3	602	14.9	654	16.1	795	19.6
Probank	2,633	298	11.3	350	13.3	393	14.9	462	17.5
New Proton[3]	1,609	206	12.8	239	14.9	271	16.9	313	19.4
FBB	1,510	193	12.8	222	14.7	271	17.9	316	20.9
Credicom	774	38	4.9	43	5.6	51	6.6	57	7.4
Panellinia	589	85	14.5	102	17.3	109	18.6	133	22.6
Investment	343	38	11.1	44	12.8	49	14.2	55	16.0
ABB	236	8	3.4	9	3.7	16	7.0	18	7.5
Total	**203,108**	**26,585**	**13.1**	**32,492**	**16.0**	**34,803**	**17.1**	**43,468**	**21.4**

Source: BlackRock Solutions.

[1] Credit loss projections do not take into account loan loss reserves.

[2] ATEbank was resolved in July 2012.

[3] Proton was resolved in October 2011.

IV. TREATMENT OF FOREIGN AND GREEK STATE - RELATED LOAN PORTFOLIOS

Credit loss projections (CLPs) for foreign loan portfolios were estimated by the Bank of Greece in accordance with the Expected Loss (EL) methodology developed by the European Banking Authority (EBA) in the context of the June 2011 EU-wide stress testing exercise.

For Greek state-related loan portfolios that remained outside the perimeter of the Private Sector Involvement (PSI), the CLPs for some categories were estimated by BlackRock and for the rest by the Bank of Greece, through the application of an EL methodology.

1. CONTEXT AND SCOPE

The Bank of Greece developed a methodology for the estimation of CLPs for two categories of loan portfolios:

(i) those carrying foreign risk;

(ii) those loans carrying Greek state-related risk that remained outside the perimeter of the PSI.

For the above categories, the Bank of Greece estimated CLPs in order to ensure that the recapitalisation exercise would encompass the entire loan book of Greek banking groups (i.e. on a consolidated basis), so that the resulting capital needs would be sufficient to cover the full set of exposures.

CLPs were estimated over a three-year horizon under both a Baseline and an Adverse Scenario, using the methodologies outlined below. In line with the loan portfolios considered in BlackRock's diagnostic study, the reference date used was 30 June 2011.

2. METHODOLOGY AND RESULTS FOR FOREIGN RISK

As of end-June 2011, the loans carrying foreign risk amounted to €77.2 billion[20]. The underlying portfolios consisted of loans granted by Greek banks' foreign subsidiaries and loans granted by foreign branches of Greek banks that did not carry Greek risk. They also included exposures of €11.1 billion to foreign central governments, as well as part of the off-balance sheet items of branches and subsidiaries operating abroad.

Methodology

The analysis was conducted by country and by loan portfolio (i.e. Corporate, Small and Medium Enterprises, Consumer, Mortgage, and Sovereign). In an effort to simplify the exercise without compromising accuracy, the methodology incorporated a materiality threshold for country exposures at 1% of each group's total exposures. As a consequence, exposures below the materiality threshold were classified under "rest of the world" exposures.

The methodology used was similar to that of the EU-wide stress testing exercise conducted by the EBA in June 2011. It was based on an EL approach, where Probability of Default (PD) and Loss Given Default (LGD) were applied to banks' exposures (Exposure-At-Default - EAD) over a three-year horizon as follows:

[20] The following six banking groups with foreign branches and subsidiaries were considered: NBG, Eurobank, Alpha Bank, Piraeus Bank, Emporiki Bank and ATEbank.

$$EL = EAD \times PD \times LGD$$

For the PD and the LGD factors, banks submitted their internal estimates by country and by portfolio, using end of June 2011 as reference date. These estimates were then compared both with the averages of Greek banks with presence in those countries and with data obtained from EBA's latest EU-wide stress testing exercise on the PD and LGD country averages taken from a large sample of European banks. By adopting a conservative stance, the highest of the above mentioned PD and LGD estimates were selected for use in the analysis. The estimates obtained through this process and calculated for each bank and country constituted the starting loss parameters of the exercise. The estimates of PD and LGD used for the "rest of the world" exposures were the average PD and LGD of the countries under review.

For loans already classified as non-performing in June 2011, the EL was calculated as the product of the LGD and the loan balance, since the level of the PD parameter was equal to unity.

For the loans that were performing as of June 2011, the EL for the first year was calculated using the aforementioned loss rates. For the second and the third year, the ECB provided the Bank of Greece with relevant estimates of the loss rates for the period 2012-2014 by country, under both a Baseline and an Adverse Scenario. For the Baseline Scenario the loss rates were calculated on the basis of the macroeconomic forecasts provided by the International Monetary Fund (IMF, *World Economic Outlook*, September 2011), while for the Adverse Scenario the macroeconomic forecasts were developed by the ECB. Then the EAD for each year was calculated after subtracting the amount of the preceding year's non-performing loans (NPLs) from the outstanding exposures. The EL was calculated as the product of the above loss rates for each year and the respective EAD.

Finally, for sovereign exposures, no loss was calculated under the Baseline Scenario in line with the EBA 2011 EU-wide stress testing assumption, whereas for the Adverse Scenario an ECB estimate of impairment on foreign sovereign debt was applied.

Results

The CLPs for the 3-year period, as shown in Table IV.1, amounted to €6.5 and €8.3 billion, under the Baseline and the Adverse Scenario, representing 8.5% and 10.7% of total

Table IV.1 Credit Loss Projections of foreign loans per Portfolio[1]

(million euro)

		Baseline Scenario		Adverse Scenario	
Portfolios	Foreign loan balances	3-year CLPs	3-year CLPs as a percentage of loan balances (%)	3-year CLPs	3-year CLPs as a percentage of loan balances (%)
Corporate	31,297	1,882	6.0	2,524	8.1
SMEs	7,571	1,096	14.5	1,375	18.2
Consumer	12,865	3,148	24.5	3,311	25.7
Mortgage	14,291	406	2.8	584	4.1
Sovereign	11,140	0	0.0	487	4.4
Total	**77,164**	**6,532**	**8.5**	**8,280**	**10.7**

Source: Bank of Greece.
[1] Credit loss projections do not take into account loan loss reserves.

Table IV.2 Credit Loss Projections and loss rates of foreign loans per bank[1]

(million euro)

Banks	Foreign loan balances	Baseline Scenario		Adverse Scenario	
		3-year CLPs	Loss rate (%)	3-year CLPs	Loss rate (%)
NBG	29,289	2,802	9.6	3,523	12.0
Eurobank	22,516	1,228	5.5	1,622	7.2
Alpha	13,107	921	7.0	1,201	9.2
Piraeus	10,106	1,314	13.0	1,624	16.1
Emporiki	1,513	183	12.1	206	13.6
ATEBank	632	85	13.4	103	16.3
Total[2]	**77,164**	**6,532**	**8.5**	**8,280**	**10.7**

Source: Bank of Greece.
[1] Credit loss projections do not take into account loan loss reserves.
[2] The other Greek commercial banks did not have any foreign loan balances.

exposures, respectively. The Consumer Portfolio had the highest loss rate (Baseline Scenario: 24.5%; Adverse Scenario: 25.7%), contributing to the overall CLPs with the highest weights. The SMEs Portfolio had the second highest loss rate, while corporate loans ranked third in terms of loss rates but accounted for a larger share of losses, as their outstanding balances were significantly higher compared with those of the other two loan categories.

The results for foreign risk per bank are shown in Table IV.2.

3. METHODOLOGY AND RESULTS FOR GREEK STATE-RELATED RISK

State-related loans portfolio amounted to €22.4 billion as of June 2011 and comprised state-related business loans and Government-guaranteed mortgages.

Methodology

The state-related business loans amounted to €20.2 billion. In line with BlackRock's methodology, they were classified into the following categories:

1. Greek government-guaranteed loans, broken down into:

(a) loans to large enterprises controlled by the government;

(b) loans to SMEs and Micro Enterprises (MEs), either granted under business Support Programmes (e.g. the Guarantee Fund for SMEs and MEs – "TEMPME") or carrying a direct guarantee from the government.

2. Loans to borrowers in which the State has an ownership interest, i.e. companies controlled and fully or partly owned by the Greek government or government-linked companies or companies established for a public purpose.

3. Loans backed by Greek government-related collateral (e.g. loans secured by Greek government bonds, subsidies or other receivables of the government and government agencies).

The methodology applied for each category was the following:

- *For category 1(a) loans* that were in the perimeter of the PSI the loss was determined by the terms of the PSI, as described in Chapter II.
- *For categories 1(b) and 3*, BlackRock calculated CLPs on the portion of the exposure either not guaranteed by the Greek

Table IV.3 Credit Loss Projections[1] for state-related Business loans of Group A Banks

(million euro)

Banks	Total exposure as at 30.06.2011	Baseline Scenario 3-year CLPs 1b[2]	2[3]	3[4]	Total	Adverse Scenario 3-year CLPs 1b[2]	2[3]	3[4]	Total
NBG	3,138	128	67	79	274	133	67	95	295
Eurobank	2,181	6	47	90	143	8	47	118	173
Alpha	1,100	54	18	1	73	58	18	1	77
Piraeus	2,375	42	153	69	264	46	153	89	288
Emporiki	1,416	17	67	158	242	18	67	197	282
ATEbank[5]	2,180	193	289	-	482	233	289	-	522
Postbank	343	-	78	-	78	-	78	-	78
Total	**12,731**	**440**	**719**	**397**	**1,556**	**496**	**719**	**500**	**1,715**

Source: Bank of Greece, BlackRock Solutions.

[1] Credit loss projections do not take into account any loan loss reserves.
[2] CLPs category 1b: loans to SMEs and Micro Enterprises (MEs), either granted under business Support Programmes (e.g. the Guarantee Fund for SMEs and MEs – "TEMPME"), or carrying a direct guarantee from the government. [3] CLPs category 2: Loans to borrowers in which the State has an ownership interest, i.e. companies controlled and fully or partly owned by the Greek government, or government-linked companies or companies established for a public purpose.
[4] CLPs category 3: Loans backed by Greek government-related collateral (e.g. loans secured by Greek government bonds, subsidies or other receivables of the government and government agencies).
[5] In particular for ATEbank some of its state-related business loans were converted into Greek Government Bonds prior to the Private Sector Involvement, and hence its state-related exposure in this table is lower than what it was prior to the conversion.

government or not backed by Greek government-related collateral[21].

- *For category 2*, the Bank of Greece, estimated CLPs for the period 2012-2014 using an EL approach:

$$EL = EAD \times PD \times LGD$$

Specifically, the PD was set at 60% and the LGD at 45%, resulting in a loss rate of 27%. This loss rate was applied on €2.7 billion loan balances, excluding loans to the Public Power Corporation (DEH), where a zero loss rate was assumed[22].

For Group B Banks, BlackRock assumed that half of their state-related business loans fell under the categories 1a and 2 and the other half under category 1b. Then BlackRock applied the Group A Banks average loss rate for category 1b to the Group B Banks exposures.

Regarding mortgage loans backed by Greek Government Guarantee amounting to €2.2 billion, an assumption of zero CLPs was used because the Government Guarantee is on top of the mortgage collateral (double collateralisation).

Results

Overall, the CLPs on state-related loans of Group A Banks were estimated at €1.6 billion under the Baseline Scenario and at €1.7 billion under the Adverse Scenario. The results by Group A Bank and by category of loans are presented in Table IV.3.

Group B Banks state-related business loans amounted to €1.2 billion, for which BlackRock calculated €36 million and €43 million

[21] For Group B Banks the classification and loss rates of Group A Banks were used.
[22] BlackRock assessed the Public Power Corporation's (DEH) business model and financial statements in the context of the "large loans sample re-underwriting" and concluded that a zero loss rate for exposures toward DEH was appropriate.

of CLPs in the Baseline and Adverse Scenario, respectively, and the Bank of Greece calculated €15 million of CLPs in both Scenarios.

The estimated CLPs for the foreign risk, as well as for the state-related risk presented in this Chapter, constitute one of the inputs for the calculation of banks' capital needs, as analysed in Chapter V.

V. CAPITAL NEEDS ASSESSMENT

In January 2012, the Bank of Greece, with the technical support of an international consulting firm, initiated an assessment of the capital needs of the Greek banking sector, in light of the deepening sovereign crisis and the commitments envisaged in the Memorandum.

By design, this exercise included the banking activities of Greek commercial banks on a consolidated basis, while the assessment of capital needs was carried out under both a Baseline and an Adverse Scenario.

The assessment concluded that for the period 2012-2014, the Greek banking sector would require approximately €40.5 billion for strengthening its capital base.

1. CONTEXT AND SCOPE

The objective of this exercise was to conservatively estimate the capital needs of all Greek commercial banks and to ensure minimum Core Tier 1 (CT1) capital levels over the period 2012-2014, to be covered either by private or public funds.

The capital needs assessment was conducted, as envisaged in the Memorandum, under the following key assumptions:

- two macroeconomic scenarios (Baseline and Adverse Scenario), in line with the assumptions of the BlackRock diagnostic study (see BlackRock report);
- Core Tier 1 ratio targets: 9% in 2012 and 10% over 2013-2014 in the Baseline Scenario and 7% throughout the 2012-2014 period in the Adverse Scenario;
- the scenario under which the estimated capital needs were the highest would be considered binding.

The capital needs assessment covered all commercial banks established in Greece, as at January 2012[23]. By design, the exercise included the banking activities of banks on a consolidated basis (i.e. including their subsidiaries abroad) over the 2012-2014 period, as well as Solvency II capital needs for their insurance activities.

The Bank of Greece developed a proprietary bottom-up approach (see next section) based on the Business Plans submitted by banks for the period 2012-2014, in accordance with the methodology detailed in this Chapter.

2. GUIDING PRINCIPLES AND APPROACHES

Guiding principles

The capital needs assessment exercise was guided by two principles, which were equally applied across banks, as explained below:

(i) Fairness and proportionality: A common methodology was defined and applied consistently across all banks falling under the scope of the exercise, so as to ensure a level playing field. At the same time, the methodology had to consider and account for the historically demonstrated idiosyncratic characteristics of each bank.

(ii) Conservatism: The assessment was implemented under conservative assumptions, so as to ensure capital adequacy under adverse conditions, for the entire period.

[23] In January 2012 there were 17 commercial banks established in Greece. As mentioned in Chapter III, T-Bank was absorbed by the Hellenic Postbank in December 2011.

Bottom-up and top-down approach

The Bank of Greece developed a proprietary bottom-up approach to estimate capital needs. This bottom-up approach was based inter alia on the Business Plans submitted by banks for the period 2012-2014 and is detailed in the methodology section that follows.

In parallel, a top-down approach was developed with the objective of providing estimates to compare with the findings of the bottom-up approach. The same set of assumptions was used in both approaches. In the top-down approach the full year 2011 financial results of each bank were taken as a starting point, with forward projections based on a quantitative model taking into account macroeconomic forecasts, independently of the submitted Business Plans.

Specifically, the top-down approach modelled each bank on the basis of:

- Bank-specific inputs, such as: (a) the BlackRock credit loss projections for Greek risk; (b) Bank of Greece loss rate estimates for foreign subsidiaries; (c) reported starting points for balance sheet and profit and loss items; (d) interest rates; and (e) maturity profiles.
- A common set of assumptions for: (a) future dynamics of pricing and volumes (rollover rates for each asset class and loan type, consistent with the macroeconomic assumptions); (b) fee and commission income; (c) trading income; and (d) staff and other operating costs.

The inputs were checked for outliers and excessively aggressive pricing or volume growth was adjusted. After the estimates of the top-down approach were obtained, they were compared to the results of the bottom-up approach and any discrepancies identified were further investigated. The process, in some cases, triggered adjustments in the bottom-up estimates. Overall, the top-down approach confirmed the relevance and robustness of capital needs estimates from the bottom-up approach.

3. METHODOLOGY

Overview

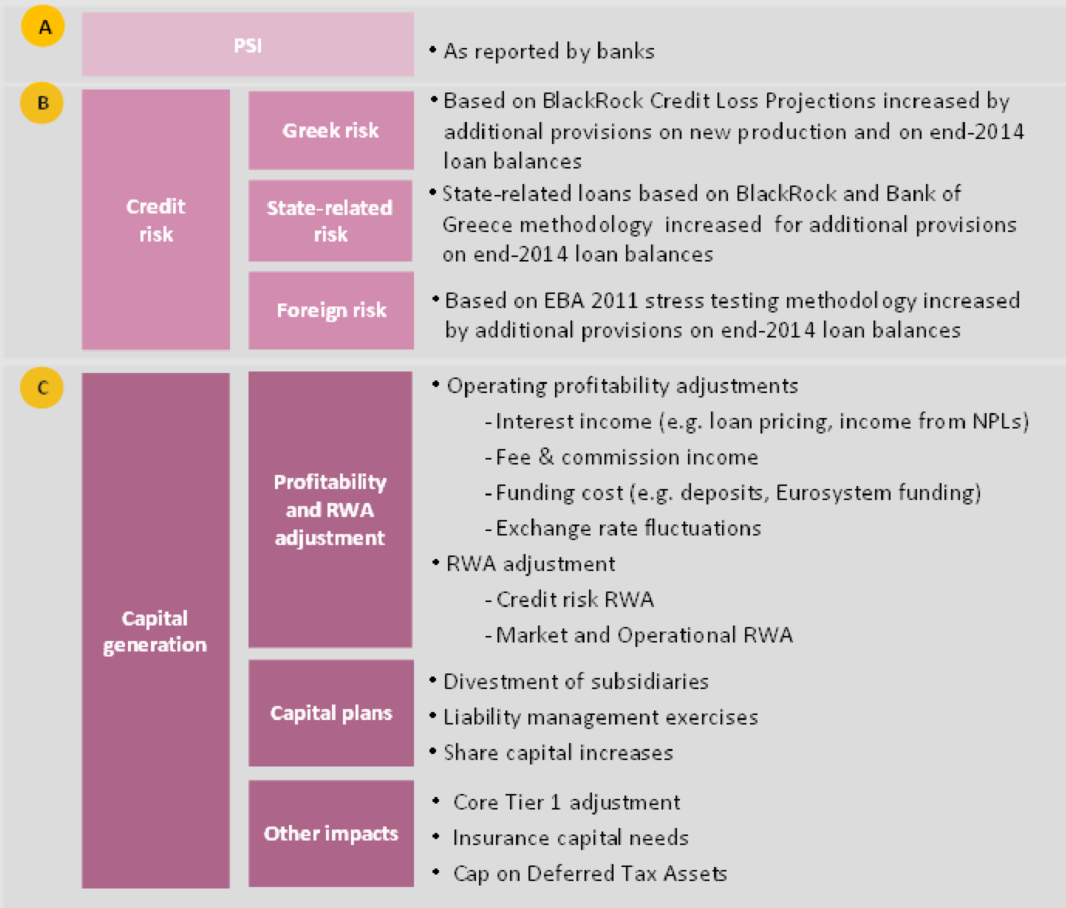
In mid-January 2012, the Bank of Greece requested all commercial banks to submit by the end of February 2012 their 2012-2014 Business Plans based on the two aforementioned macroeconomic scenarios.

As a starting point, the exercise used the reference Core Tier 1 capital at December 2011,[24] as submitted by the banks. Then, the Bank of Greece adjusted appropriately the information obtained by the banks' Business Plans to form the three key components of the capital needs assessment, (as presented in Chart V.1):

- Component (A) includes the loss incurred by the Private Sector Involvement (PSI) on Greek Government Bonds and selected state-related loans, net of existing PSI provisions;
- Component (B) includes the Credit Loss Projections (CLPs) on banks' loan portfolios carrying: (i) Greek risk; (ii) foreign risk and (iii) state-related risk, net of existing loan loss reserves and
- Component (C) refers to banks' internal capital generation, based on adjusted Business Plans over the relevant period.

[24] As submitted in banks' Business Plans without taking into account the impact neither of the modified PSI nor of the bridge recapitalisation by the HFSF.

Chart V.1 Key components of capital needs



Source: Bank of Greece.

The general principle of conservatism was applied by appropriate downward adjustments in key indicators within each of the following sub-components: (i) Pre-provision Profitability and Evolution of Risk-Weighted Assets (RWAs), (ii) Capital Plans and (iii) Other Impacts.

The Bank of Greece used as the starting point the reference Core Tier 1 capital on December 2011, as submitted in the banks three-year Business Plans,[25] and then estimated the evolution of Core Tier 1 over the respective period taking into account the aforementioned elements. The assessment was based on a "dynamic balance sheet" approach with capital needs calculated for each year over the 2012-2014 period.

The Bank of Greece also estimated the target level of CT1 capital at the end of each year until 2014 based on the target CT1 ratio set for each Scenario and the projected Risk Weighted Assets (RWAs).

The capital needs for each bank were then calculated as the difference between a) the target level of CT1 capital and b) the estimated level of CT1 capital at the end of each year until 2014. This assessment was per-

[25] Calculated without taking into account the impact of the modified PSI and the bridge recapitalisation through the Hellenic Financial Stability Fund (HFSF)._

formed for both the Baseline and the Adverse Scenario; for each bank, the scenario that resulted in the highest capital needs was considered binding.

The preliminary capital needs assessment was presented to the banks in early April 2012 (see Chart V.1). As a follow-up of the individual presentations, some banks asked the Bank of Greece for methodological fine tuning. These requests were assessed and reviewed by the Bank of Greece. Any amendment[26] to the methodology was applied equally to all banks, so as to remain fully aligned with the "fairness" principle.

The capital needs were reviewed for all banks on the basis of updated data following the finalisation of full year 2011 financial statements.

Moreover, the results of the bottom-up approach were compared to those obtained through an independent top-down approach. The top-down approach confirmed the robustness of capital needs estimates from the bottom-up approach.

The following three sections describe in detail the key components of the capital needs assessment.

Component A: Impact of the Private Sector Involvement (PSI)

The Bank of Greece took into account the gross losses incurred by banks as a result of their participation in the exchange of Greek government bonds and certain state-related loans under the PSI programme (see Chapter II).

The gross losses from the PSI programme were recorded in banks' full year 2011 financial statements.[27] However, banks had already recorded certain loss provisions for the PSI in the first half of 2011, which had already impacted on their end-2011 capital base. Therefore, these PSI-related provisions were added to the starting capital level in the capital needs calculations.

Component B: Credit loss projections on banks' loan Portfolios

The objective of this component was to estimate conservatively the credit risk cost for banks over a three-year period as an input to their capital needs. It includes the CLPs on banks' loan portfolios carrying: (i) Greek risk; (ii) foreign risk and (iii) state-related risk, net of existing loan loss reserves.

In their Business Plans, banks estimated on a consolidated basis loan loss provisions until 2014 to cover:

- existing exposures to residents (Greek risk);
- existing exposures to non-residents (foreign risk);
- new lending business over the period.

However, the Bank of Greece, adopting a more conservative stance, reinforced these loan loss provisions at group level to fully cover the following elements (see Table V.2):

- the CLPs from loans carrying Greek risk, as estimated by BlackRock for the three-year period June 2011 - June 2014 (see Chapter III);

[26] For instance, the use of a smoother path for deposit level and loan pricing evolution within the three year period.

[27] Full year 2011 financial statements were published in April 2012 and included the full impact from the PSI.

Table V.1 Calculation of Gross CLPs under the Binding Scenario (June 2011 – December 2014)

(million euro; estimated in May 2012)

Banks[1]	CLPs for Greek risk (1)	CLPs for foreign risk (2)	CLPs for state – related risk (3)	Bank of Greece increment[2] (4)	Gross CLPs for credit risk (5)=(1)+(2)+(3)+(4)
NBG	4,421	2,802	274	869	8,366
Eurobank	6,026	1,622	173	405	8,226
Alpha	6,733	1,201	77	482	8,493
Piraeus	3,977	1,624	288	392	6,281
Emporiki	5,631	206	282	232	6,351
ATEbank[3]	2,482	103	522	276	3,383
Postbank	510	-	78	894	1,482
Millennium	587	-	4	47	638
Geniki	989	-	4	559	1,552
Attica	654	-	13	47	714
Probank	393	-	15	54	462
New Proton	271	-	0	211	482
FBB	271	-	1	13	285
Panellinia	109	-	2	7	118
Total	**33,055**	**7,558**	**1,733**	**4,487**	**46,834**
"Core banks"[4] Subtotal	**21,157**	**7,249**	**812**	**2,148**	**31,367**

Source: Bank of Greece.
[1] The exercise concluded that for ABB, Credicom and IBG there was no need for additional capital.
[2] Including the fourth year of CLPs and the cumulative Expected Loss from the new loan production in Greece.
[3] ATEbank was resolved in July 2012.
[4] NBG, Eurobank, Alpha Bank and Piraeus Bank.

- the three-year CLPs from loans carrying foreign risk, as estimated by the Bank of Greece (see Chapter IV);
- the three-year CLPs from state-related loans, as estimated by BlackRock and the Bank of Greece (see Chapter IV);
- the cumulative Expected Loss from the new loan production in Greece over the 2012-2014 period, assumed at 1.2% of new loan production – taking into account the expected increase in banks' risk aversion, in the context of the financial crisis and the associated liquidity constraints;
- the additional provisions to be set aside in 2014 to cover the fourth year of CLPs amounting to 1% of end-2014 outstanding balances (excluding new loan production), so as to ensure a satisfactory loan loss reserves level.

The aforementioned CLPs were calculated both under the Baseline and the Adverse Scenario. Depending on which Scenario was binding for each bank, the relevant CLPs were used in the capital needs calculations, net of the loan loss reserves of banks on a consolidated basis as of December 2011.

Component C: Bank's internal capital generation

The Bank of Greece estimated the internal capital generation capacity of banks over the 2012-2014 period following a conservative downward adjustment of pre-provision profitability and excluding forecast capital plan actions that had not materialised at the time of the exercise. Three different sources of capital generation were identified as the most relevant, each one leading to an adjustment, mainly applied to banking activities in Greece (the "Solo perimeter"), as presented below:

(i) Pre-provision profitability and RWA evolution

The Bank of Greece applied a number of adjustments on banks' Business Plans maintaining a level playing field. In line with the principle of conservatism, whenever a bank's profitability forecast was more conservative compared with other banks, its forecast was not adjusted towards the industry average.

The adjustments covered many income and expense drivers, as well as the evolution of RWAs. In more detail:

Loan pricing: The purpose of the analysis was to ensure that a bank's loan pricing is coherent with market conditions and its own pricing power, as demonstrated by its historical ability to price above market, according to its Business Plan.

Based on the submitted Business Plans, the Bank of Greece defined a cap for the annual evolution of lending interest rates, based on market median evolution and starting with each bank's 2011 level.

As a consequence of the applied methodological constraints, interest income of banks that had forecast loan pricing above the predefined cap was adjusted downwards.

Interest income from non-performing loans (NPLs): The intention of the Bank of Greece for this source of income was to ensure that banks took into account the increasing level of NPLs in their revenue forecasts.

For each bank and year under review, the Bank of Greece defined minimum NPL levels, deriving the relevant information from BlackRock's analysis. Whenever a bank's NPL ratio was observed to be lower than the

Table V.2 Key conservative assumptions in assessing capital needs

Assumptions	Description
Credit risk	• Additional provisions of 100 basis points on December 2014 loan balances (excluding new loan production) for Greek, foreign and state-related risk on top of three-year Credit Loss Projections. • Credit Loss Projections of 120 basis points on new loan production for Greek risk.
Interest income	• Interest rate evolution of the loan book capped at market median based on banks' Business Plans. • Downward adjustment of interest income due to non-performing loans. As a result, interest income from NPLs range from 0% to below 10% of total interest income.
Interest expense	• Deposits evolution capped at market lowest quartile in the Adverse and at market median in the Baseline Scenario based on banks' Business Plans. • Adjustment of the cost of interbank and central bank funding.
Capital plans	• Capital plan actions (e.g. divestments, liquidity management exercises) not considered as capital generation unless already materialised.

Source: Bank of Greece.

minimum level, an upward adjustment was made to reach the level estimated by the Bank of Greece.

At a second stage, the Bank of Greece assumed that the implied interest rate from a non-performing loan could not exceed 50% of the implied interest rate of a performing loan of the same type.

As a consequence, a downward adjustment of interest income was imposed on any bank forecasting higher interest income for NPLs and/or lower NPL levels than the defined thresholds.

Net fee and commission income (F&C): In treating F&C, the aim was to ensure that the assumed evolution of this revenue driver was consistent with its underlying business.

The Bank of Greece considered two different types of F&C income:

- F&C linked to assets, which were capped at 2011 levels as a specific percentage of loans;
- F&C not linked to assets, which were capped at 2011 level in terms of an absolute amount.

As a consequence of this treatment, the F&C income of any bank that had forecast levels higher than the predefined cap was adjusted downwards.

Income from financial operations: Care was taken to ensure that banks' profitability did not rely on financial operations but on core banking activities.

Following this conservative approach, the Bank of Greece did not allow any projection to incorporate income from financial operations and as a result, any forecasted revenues stemming from this source were suppressed to nil.

Customer deposits: The objective was to ensure that banks neither assumed a lower cost of deposits nor overestimated deposits growth.

The Bank of Greece defined a market-wide minimum cost per type of deposit (e.g. savings, current, time deposits) and year, based on submitted Business Plans. Whenever an interest rate on deposits was assumed by the bank to be lower than the aforementioned minimum level, the methodology involved an alignment to the market-wide minimum.

Regarding deposits evolution, based on the submitted Business Plans, the Bank of Greece defined a cap for the evolution of outstanding deposits over time, as determined by market parameters (lowest quartile in the Adverse Scenario and market median in the Baseline Scenario), with the 2011 levels being the starting point for each bank. Then, the Bank of Greece imposed a higher funding cost for the part of the deposits in excess of the defined cap. In particular, the Bank of Greece assumed that these deposits were funded at the cost of central bank funding plus a mark-up.

As a result, interest expenses for any bank forecasting deposit evolution and/or deposit cost out of the predefined cap/floor ranges were appropriately adjusted.

Cost and evolution of other funding sources: The objective was to ensure that banks' funding cost from other sources is realistic, given the economic environment, prevailing market conditions and the bank-specific situation.

Regarding central bank funding, the Bank of Greece assumed that it would remain stable throughout the period, regardless of the type of central bank facility accessed.

Regarding interbank funding, the Bank of Greece, based on submitted Business Plans, determined a cap for its annual evolution, starting with each bank's 2011 level. Excess interbank funding needs were then replaced with funding at a fixed cost, to reflect:

- the increased risk premium due to the banks high reliance on interbank funding (Baseline Scenario);
- the possible unavailability of excess interbank funding forcing the banks to replace it with central bank funding at a mark-up (Adverse Scenario).

Then, the funding cost of each bank was appropriately adjusted.

Exchange rate fluctuations: In order to preserve methodological consistency across banks, care was taken to ensure that banks took into account identical exchange rate assumptions regarding foreign currency denominated loans.

The Bank of Greece used estimates by professional forecasters concerning future developments in the exchange rates of the euro vis-à-vis three specific foreign currencies, namely the Swiss Franc, the Turkish Lira and the US Dollar, each having an impact depending on a bank's relative business activity.

Thus, regardless of an individual bank's foreign exchange rate forecast, interest income on foreign currency - denominated loans was adjusted either upwards or downwards, depending on the initial path assumed by each bank, compared to the common methodological assumption of the Bank of Greece.

Financing of subsidiaries: The objective was to reduce the reliance of subsidiaries abroad on parent company funding. To this end a higher degree of self - funding was assumed.

Preference shares: By convention, the Bank of Greece did not consider any repayment of existing preference shares.

RWA adjustment: As the intention was to ensure that banks do not underestimate their risk exposure, the Bank of Greece considered two different types of RWAs:

- credit RWAs, expressed as a percentage of net outstanding loans, which was not allowed to drop below each bank's December 2011 level;
- other RWAs (i.e. operational and market risk), which was considered to be stable throughout the period and set at the maximum level observed over the period, as per the submitted Business Plans.

As a result, RWAs were adjusted for any bank that had forecast RWAs below the predefined path.

(ii) Capital plans

Among other inputs, banks also submitted to the Bank of Greece their plans for strengthening their capital base. Divestments, deleveraging, share capital increase and effective management of balance sheet items (e.g. liquidity management exercises) were alternative capital sources identified by each bank, in different compositions.

In calculating capital needs, the Bank of Greece took into consideration only these capital actions which had effectively materialised at the time of the capital needs assessment.

(iii) Other impacts

Core Tier 1 threshold adjustment: The Bank of Greece considered the necessary CT1 adjustment in order to ensure that the CT1 ratio of each bank would remain above the target CT1 for each year throughout the relevant period.

Insurance capital needs: Capital needs related to insurance activities of Greek banks have been taken into account including the requirements of the Solvency II framework.

Dividends: No dividend payments were taken into account.

Deferred Tax Assets (DTA): Adopting a conservative stance, the Bank of Greece imposed a prudential filter on the accounting level of DTA. In this context, the net accounting DTA (i.e. after subtracting deferred tax liability) as at December 2011 for each bank was capped at 10% of 9% of RWAs and any DTA level of a particular bank exceeding the aforementioned ceiling was not taken into account in capital calculations.

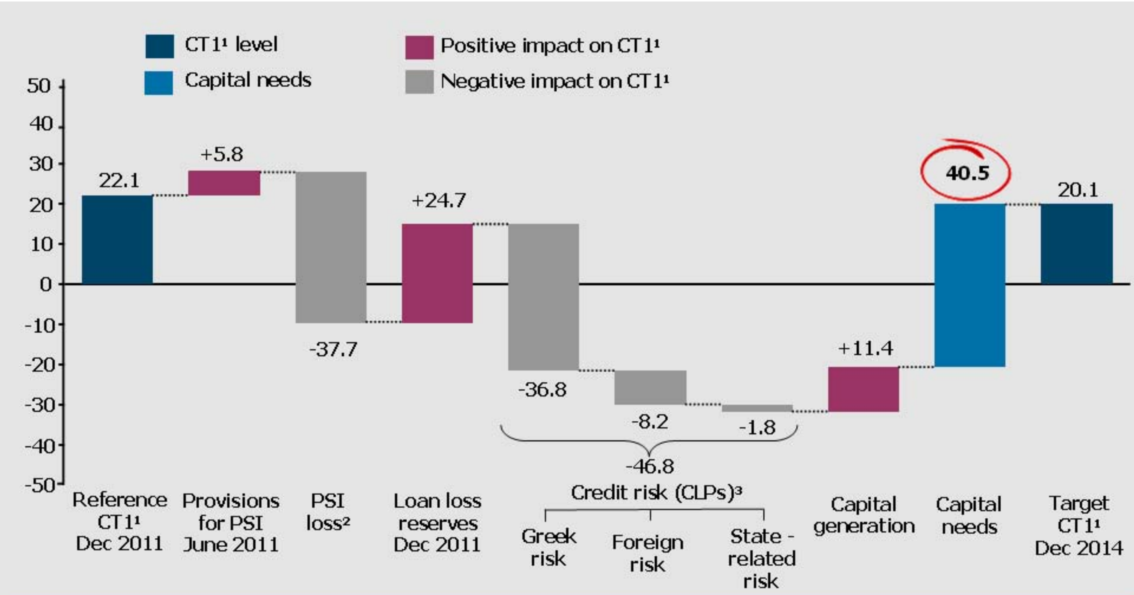
4. RESULTS OF THE CAPITAL NEEDS ASSESSMENT

The assessment ends with the conclusion that for the period 2012-2014, the Greek banking sector would require €40.5 billion to be adequately capitalised. The relevant components of this amount are depicted in Chart V.2 and described as follows:

- Starting point: Reference Core Tier 1 in December 2011: €22.1 billion;
- Provisions for PSI (as reported in the submitted Business Plans): €5.8 billion;
- PSI impact: €37.7 billion;
- CLPs: €46.8 billion, of which €36.8 billion for Greek risk, €8.2 billion for foreign risk and €1.8 billion for state-related risk, net of loan loss reserves of €24.7 billion, as of December 2011;
- Banks' internal capital generation (con-

Chart V.2 Process for calculating capital needs (December 2011 – December 2014; consolidated basis)

(billion euro, estimated in May 2012)



Assets[4]: 381 Dec 2011 | 334 Dec 2014

Source: Bank of Greece.
[1] CT1 : Core Tier 1.
[2] Loss incurred by the Private Sector Involvement on Greek Government Bonds and selected state-related loans.
[3] CLPs: Credit loss projections.
[4] Total assets as per banks' Business Plans.

servatively adjusted pre-provision profitability and materialised capital actions): €11.4 billion.

The Bank of Greece estimated the target CT1 capital level at December 2014 at €20.1 billion, based on the CT1 ratio threshold for the binding scenario for each bank and a projection of RWAs.

The capital needs for each Greek commercial bank were then calculated as the difference between a) the target level of CT1 capital and b) the estimated level of CT1 capital at the end of each year until 2014.. This assessment was performed for both the Baseline and the Adverse Scenario; for each bank, the scenario that resulted in the highest capital needs was considered binding.

The resulting capital needs for all banks amounted to €40.5 billion.

In October 2012, the Bank of Greece reviewed the capital needs assessment in light of preliminary financial results for the first half 2012 and confirmed that the initially estimated capital needs were still valid.

Consequently, in early November 2012, the Bank of Greece communicated to all banks their respective capital needs (see Table V.3), requesting them to proceed with the appropriate capital raising steps by April 2013.

Table V.3 Process for calculating capital needs (December 2011 – December 2014; consolidated basis)

(million euro; estimated in May 2012)

Banks[1]	Reference Core Tier 1[2] (1)	Total gross PSI loss (Dec 2011) (2)	Provisions related to PSI (June 2011) (3)	Gross CLPs for Credit Risk[3] (4)	Loan loss reserves (Dec 2011)[4] (5)	Internal Capital Genera-tion[5] (6)	Target CT1 Dec 2014 (7)	Capital needs (8)=(7)-[(1)+(2)+(3)+(4)+(5)+(6)]
NBG	7,287	-11,735	1,646	-8,366	5,390	4,681	8,657	9,756
Eurobank	3,515	-5,781	830	-8,226	3,514	2,904	2,595	5,839
Alpha	4,526	-4,786	673	-8,493	3,115	2,428	2,033	4,571
Piraeus	2,615	-5,911	1,005	-6,281	2,565	1,080	2,408	7,335
Emporiki	1,462	-590	71	-6,351	3,969	114	1,151	2,475
ATEbank[6]	378	-4,329	836	-3,383	2,344	468	1,234	4,920
Postbank	557	-3,444	566	-1,482	1,284	-315	903	3,737
Millennium	473	-137	0	-638	213	-79	230	399
Geniki	374	-292	70	-1,552	1,309	-40	150	281
Attica	366	-142	53	-714	274	15	248	396
Probank	281	-295	59	-462	168	147	180	282
New Proton	57	-216	48	-482	368	34	115	305
FBB	145	-49	0	-285	167	-29	116	168
Panellinia	82	-26	3	-118	48	-26	42	78
Total	**22,119**	**-37,733**	**5,861**	**-46,834**	**24,727**	**11,381**	**20,062**	**40,542**
"Core banks"[7] Subtotal	**17,944**	**-28,214**	**4,154**	**-31,367**	**14,583**	**11,093**	**15,693**	**27,501**

Source: Bank of Greece.

1 The exercise concluded that for ABB, Credicom and IBG no additional capital was needed.

2 Core Tier 1 in December 2011 as submitted by banks without taking into account the impact of the Private Sector Involvement (PSI) and the bridge recapitalisation by the Hellenic Financial Stability Fund (HFSF).

3 Gross Credit Loss Projections (CLPs) over the June 2011 – December 2014 period for Greek loan portfolios, foreign and state-related loan portfolios. CLPs for Greek loan portfolios take into account three elements: (a) three-year CLPs estimated by BlackRock, (b) a fourth year of CLPs and (c) the credit risk cost for the new production.

4 Accumulated provisions (as at December 2011) already recorded by banks for the loan portfolios referred to in column 4.

5 Internal capital generation based on banks' Business Plans for the period 2012 – 2014, as conservatively stressed according to the Bank of Greece methodology, taking also into account the capital actions that had already materialised at the time of the exercise.

6 ATEbank was resolved in July 2012.

7 NBG, Eurobank, Alpha Bank and Piraeus Bank.

VI. FINANCIAL ENVELOPE

In December 2012 the Bank of Greece conducted an updated estimate of the adequacy of the Financial Envelope, i.e. of the level of public resources required for the coverage of the Greek banking sector's recapitalisation needs and restructuring costs over the 2012-2014 period.

The Bank of Greece considers that the €50 billion earmarked in the Economic Adjustment Programme *is appropriate for covering both recapitalisation needs and restructuring costs of Greek banks.*

1. SCOPE

The initial timeline and framework for the recapitalisation of Greek banks was outlined in the March 2012 Memorandum and the relevant implementing Law 4046/2012. In November 2012 a new calendar for the whole recapitalisation process was agreed with the EC/ECB/IMF, as outlined in the last section of Chapter I.

In this context, the Bank of Greece conducted an updated estimate of the Financial Envelope to incorporate:

- the net impact of completed bank resolutions and recapitalisations;
- costs of future restructuring over and above capital needs (if needed);
- an appropriate capital buffer.

2. METHODOLOGY

The starting point of the Financial Envelope estimation is the outcome of the capital needs assessment, which concluded that for the period 2012-2014 the Greek banking sector would require approximately €40.5 billion for the strengthening of its capital base.

Net impact of completed bank resolutions and recapitalisations

The Bank of Greece updated the capital needs based on banking developments that changed the structure of the domestic banking sector. These developments refer to the activation of resolution[28] procedures and the recapitalisation of foreign subsidiaries. More specifically:

- Two commercial banks (ATEbank and Proton Bank) were resolved and therefore their resolution cost was incorporated in the Financial Envelope estimation, replacing their recapitalisation needs. Moreover, T-bank and three cooperative banks (Achaiki, Lamias and Lesvou-Limnou) were also resolved and, therefore their resolution cost was incorporated in the Financial Envelope estimation.
- Emporiki Bank and Geniki Bank were fully recapitalised by their parent banks Crédit Agricole and Société Générale, respectively, hence their capital needs were removed from the Financial Envelope.

The combined impact of the aforementioned events was a €1.4 billion increase in the resources needed.

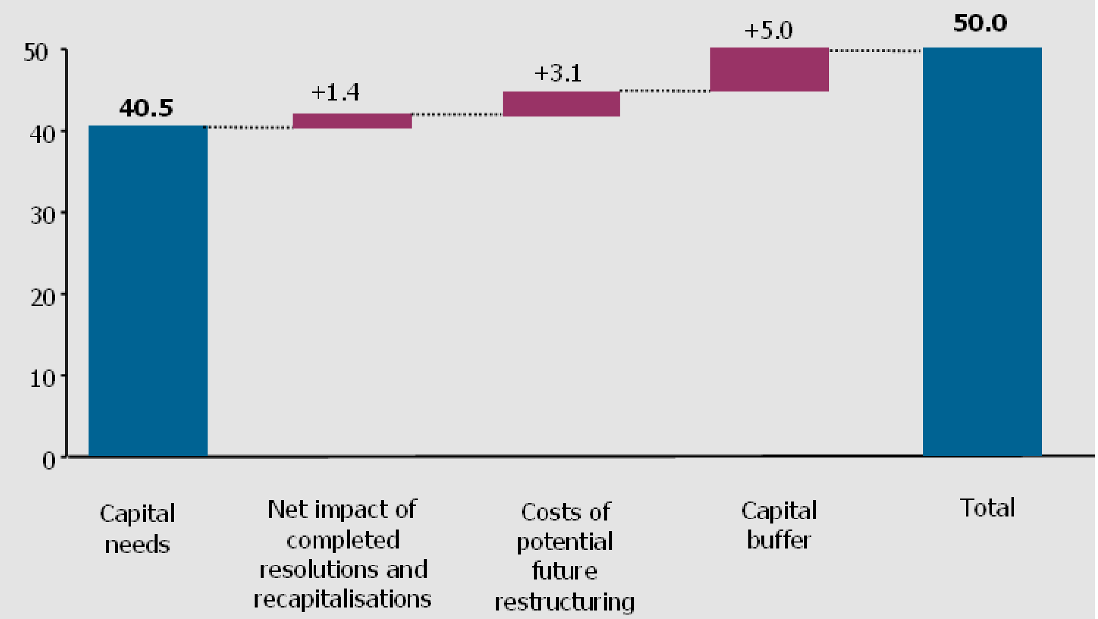
Costs of potential future restructuring

The Bank of Greece also took into account the cost of potential future restructuring for

[28] The term *"resolution"* refers to the restructuring of an institution in order to ensure the continuity of its essential functions, preserve financial stability and restore the viability of all or part of that institution (see draft EU Directive Establishing a framework for the recovery and resolution of credit institutions and investment firms).

Chart VI.1 Financial Envelope estimation

(billion euro, estimated in December 2012)



Source: Bank of Greece.

"non-core banks" over and above their capital needs, as well as possible needs for the restructuring of cooperative banks. This resulted in an increase of the resources needed by €3.1 billion.

Capital buffer

Finally, the Bank of Greece considered the impact of potential future developments on the resources needed.

Specifically, a further deterioration of macroeconomic conditions would increase NPLs resulting in higher Greek credit risk and lower interest revenue for "core banks", as well as higher restructuring costs for "non-core banks". Moreover, the capital needs of Greek banks will be impacted by their participation in the voluntary debt buy-back offer for the new Hellenic Republic bonds[29].

On the other hand, the Bank of Greece also considered the impact of potential developments that would lower the capital needs, such as the private sector participation in the recapitalisation process, the recognition of deferred tax, the planned liability management exercises and the realisation of synergies from the announced mergers & acquisitions.

The Bank of Greece, based on the above, deemed that a €5 billion capital buffer would be appropriate.

3. CONCLUSION

Based on the information available on December 2012, the Bank of Greece considers that the €50 billion earmarked amount in the Economic Adjustment Programme is appropriate to cover the recapitalisation and restructuring costs of the Greek banking sec-

[29] The Hellenic Republic completed on 11 December 2012 a voluntary debt buy-back offer for the new Hellenic Republic bonds that had been issued in the context of the PSI transaction

tor. As such, it is expected to remain adequate under reasonable levels of economic uncertainty.

The recapitalisation of Greek banks and the restructuring of the banking sector are expected to gradually restore depositors and market confidence. The improvement in the capital and liquidity position of Greek banks will enable them to continue supporting the real economy and, thus, contribute to the improvement of the business environment. These elements will be instrumental in restoring sustainable growth to the Greek economy.

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