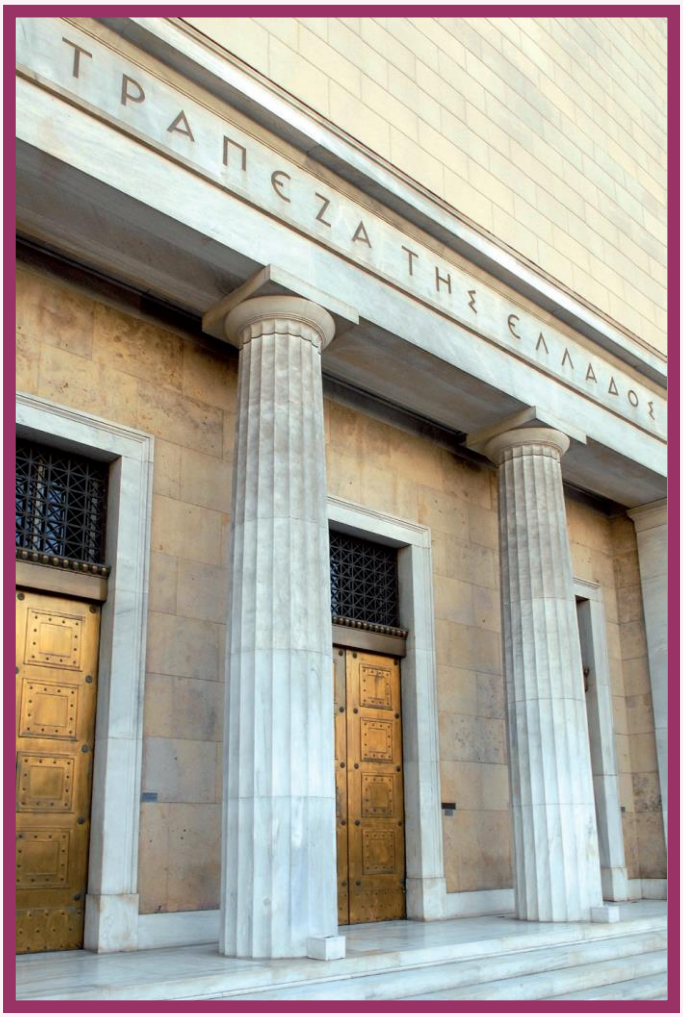
FINANCIAL STABILITY REVIEW



DECEMBER
2019

BANK OF GREECE
EUROSYSTEM

FINANCIAL STABILITY REVIEW

DECEMBER
2019

BANK OF GREECE
EUROSYSTEM

BANK OF GREECE

21, E. Venizelos Avenue

GR- 102 50 Athens

www.bankofgreece.gr

Financial Stability Department

Tel. +30 210 320 5103

Fax +30 210 320 5419

ISSN 1792-1988 (online)

FOREWORD

The Bank of Greece's *Financial Stability Review* is published twice a year, providing an analysis of financial stability developments in Greece, looking into the risks to and resilience of the (a) banking, insurance and other sectors of the financial system; and (b) financial infrastructures.

Several members of the Bank's staff have contributed to this Review, but special mention should be made to: Christos Antonopoulos, Theodoros Axelos, Dimitrios Chalamandaris, Georgios Efstathiou, Dimosthenis Gallis, Eleftheria Georgoulea, Alexandros Kalliontzoglou, Konstantinos Kanellopoulos, Georgios Kaoudis, Evaggelia Kardara, Katerina Kotsoni, Katerina Lagaria, Eleni Loukidou, Daniela Marcelli, Vassiliki Nidrioti, Ioannis Papadogeorgis, Savas Papadopoulos, Dimitrios Paxinos, Sofia Savvidou, Nikolaos Stavrianou, Stavros Stavritis, Georgios Tsiatouras, Elias Veloudos, Maria Vergeti and Konstantinos Zavandis.

Special credit is also due to the Bank of Greece's governing bodies, the Economic Analysis and Research Department, the Banking Supervision Department, the Financial Operations Department and the Resolution Department for their useful comments and corrections on drafts and texts.

Finally, we would like to thank for their excellent cooperation the Communication Section of the Human Resources and Organisation Department, and the Publications and Translations Section of the Economic Analysis and Research Department, without which this Review would not have been possible. The Financial Stability Department retains sole responsibility for any errors or omissions herein.

TABLE OF CONTENTS

I. EXECUTIVE SUMMARY

The macroeconomic fundamentals and prospects of the Greek economy have been improving throughout 2019, positively affecting the economic climate. This has been reflected in the operating environment of the banking sector, thus helping to enhance financial stability. As a result, the last remaining capital controls, in force since June 2015, i.e. those restricting fund transfers abroad by households and corporations, were lifted in September. This should act as a catalyst for attracting investment and bolstering economic activity.

Against the background of the lifting of capital controls and an improving fiscal position, Standard and Poor's (S&P) upgraded Greece's sovereign credit rating once again in October 2019, to BB- from B+, with a positive outlook, signalling a further upgrade in the immediate future. However, Greece still has a non-investment grade rating.[1]

The aforementioned developments have contributed to the improvement of banking sector financing conditions and liquidity, enhancing the potential to perform its intermediating function. The environment of very low or even negative interest rates in the euro area exerts a downward pressure on banks' funding costs. Yet, access to money markets is still restricted for Greek banks, which can secure long-term financing only by providing collateral.

At the same time, the Greek banking sector is faced with important challenges relating to operating profitability, as well as the quality of assets and of prudential own funds. In order to address these interrelated challenges effectively, either individually or collectively, account must be taken of the interplay of the results of each individual approach.

Within this framework, banks' operating profitability is inextricably linked with the structure of their assets. The particularly large stock of non-performing loans (NPLs) is a determinant of profitability, resulting in a persistently high cost of credit risk (June 2019: 1.8%). This cost consequently squeezes the net profit margin of banks.

Efforts to effectively tackle the large NPL stock have indeed borne fruit. NPL balances have further declined by 7.9% or €6.4 billion, to €75.4 billion in June 2019, from €81.8 billion in December 2018 (on-balance-sheet figures). It should be pointed out that the cumulative reduction of NPLs from their peak in March 2016 has amounted to 30% or €31.8 billion, testifying to the successful efforts of all stakeholders. Still, Greece has the highest NPL ratio (43.6%) among EU Member States, far exceeding the weighted EU average of 3%.[2]

The negative correlation between asset quality and high NPL levels, coupled with the current credit contraction,[3] impacts profitability by leaving little room for its improvement. If the status quo remains unchanged, banks' profitability will not be easily altered given the limited room for reducing other operating costs. Special Feature 1 of this *Financial Sta-*

[1] On the rating scales of Standard & Poor's, Fitch and DBRS, Greek sovereign debt falls short of the investment grade rating by three notches, whereas on Moody's rating scale, it falls short by four notches.

[2] European Banking Authority, *Risk Dashboard* – Q2 2019.

[3] According to Bank of Greece data, the annual rate of change of total credit to the private sector in June 2019 was -0.2%, having remained unchanged from the previous month. The monthly net flow of total credit to the private sector was positive, at €936 million, compared with a negative net flow of -€324 million in the previous month.

bility Review looks into the negative correlation between banks' profitability and asset quality and, more specifically, the large legacy NPL stock on their balance sheets.

The capital adequacy of credit institutions remained satisfactory, with the Common Equity Tier 1 (CET1) ratio at 15.6% as of June 2019. However, the quality of prudential own funds calls for caution, given that deferred tax credits (DTCs)[4] at sector level exceeded 60% of CET1 capital in June 2019.[5] It should be pointed out that the high DTC share in the prudential own funds of banks restricts their ability to accelerate the reduction of the NPL stock, as they are unwilling to use this portion of prudential own funds to absorb losses.[6] In this context, any additional regulatory capital requirements resulting from the phasing in of IFRS 9, the 2020 stress test, and the introduction of the prudential backstop will act as further aggravating factors.

As a result, proactive measures to improve the conditions in the above areas are a key priority to bolster financial stability. Credit risk at sector level has been reduced compared with previous years, but further rapid reduction of the existing NPL stock is now of utmost importance. Adopting a holistic approach is an imperative in order for banks to proceed with the necessary transformation of their business models, increase their efficiency and thus ensure the necessary conditions for internal capital generation.

[4] Without factoring in deferred tax assets (DTAs).

[5] DTCs account for 54% of the total capital base in the reference period.

[6] Under Law 4172/2013, this stock shall, in the case of profits, be offset against the amounts of income tax payable by credit institutions and, in the case of losses, determine the amount of banks' capital increases in favour of the Greek state, resulting in equity dilution.

This *Financial Stability Review* covers the entire financial system, albeit placing an emphasis on the analysis of banking developments, given that the banking sector is of particular relevance. The Report is complemented by special features highlighting topical issues of broader interest.

***

The resilience of Greek banking groups was strengthened in the first half of 2019 as a result of improvements in capital adequacy and most profitability indicators. Key drivers behind this are the elevated prudential own funds and a €390 million profit after tax and discontinued operations, compared with losses in the corresponding period of 2018.

In more detail, operating income fell marginally on an annual basis, as a decline in net interest income was largely offset by an increase in non-interest income. As regards the former, the decline in interest income was larger in absolute terms than the corresponding decline in interest expense. Operating expenses were further reduced, mainly as a result of banks' ongoing restructuring, i.e. staff and branch network reduction. Against this background, Greek banks' operating profits picked up in the first half of 2019 and their cost-to-income ratio improved.

The return to profitability was positively affected by profits from discontinued operations, mainly related to profits from the sale of subsidiaries and affiliated companies of Greek banks.

Banking groups recorded profits after tax and discontinued operations, compared with losses in the corresponding periods of previous years. Therefore, the return on assets (RoA) and return on equity (RoE) indicators of banking groups moved into positive territory (0.3 and 2.7, respectively). However, they fall

significantly short of the corresponding indicators for medium-sized banks in the EU (0.5 and 6.6, respectively).[7]

The capital adequacy of Greek banking groups improved in the first half of 2019 on the back of higher prudential own funds. The Capital adequacy Ratio (CaR) on a consolidated basis rose to 16.5% in June 2019, from 16% in December 2018, and the CET1 ratio rose to 15.6%, from 15.3%. Greek banks' leveraging also improved vis-à-vis 2018.

Liquidity conditions for credit institutions have been continuously improving on the back of an expanding deposit base and broadening funding sources, such as subordinated debt, covered bonds, interbank and repo transactions on more favourable terms, as well as securitisations in the domestic and international markets. At the same time, bank deposits – a solid source of funding – continued to rise. It is worth pointing out that the upward trend in total deposits was sustained despite persistently low deposit rates. Furthermore, corporations used part of their time deposits to purchase capital goods.[8] This reflects confidence that the country has entered a virtuous circle of economic growth, in which corporations are in a position to take calculated business risks.

***

In Greece, the "other" sectors of the financial system account for only a small fraction thereof, having a commensurately limited impact on financial stability. However, their connection with the banking sector calls for a continuous monitoring of their activities, given their impact on economic developments.

Insurance undertakings continued to readjust their investment portfolios in the course of 2019 in order to limit any inconsistencies with their insurance obligations, on the back of declining interest rates. The low interest rate environment restricts the ability of insurance undertakings to cover the returns guaranteed to their policyholders, whereas it concurrently strengthens the trend towards the provision of insurance policies the investment risks of which are borne by policyholders.

The stability of the domestic financial system was also positively affected by the smooth operation of payment, clearance and settlement systems, i.e. market infrastructures, which contributed to the successful completion of transactions. As regards electronic payment instruments, their use is still elevated in terms of both the volume and the value of transactions, despite a decline in transactions conducted with the use of payment cards in the first half of 2019, compared with the second half of 2018.

***

The Greek economy grew by 1.5% in the first half of 2019, while, for the whole year, based on the available macroeconomic indicators and the economic policy pursued, real GDP growth is expected to remain broadly at last year's levels. Nevertheless, it is important to point out that there are still risks emanating mainly from the external environment, which affect the Greek banking sector and financial stability.

Achieving sustainable rates of economic growth and improving macroeconomic aggre-

[7] Source: European Central Bank, Statistical Data Warehouse.

[8] According to Bank of Greece data, time deposits held by corporations fell from €4 billion in September 2018 to €3.8 billion in December 2018 and to €3.6 billion in September 2019. As recorded by the Hellenic Statistical Authority (ELSTAT), imports of capital goods from the EU increased cumulatively in the period from January 2019 to September 2019. By way of indication, the value of imports of machinery and transport equipment rose to €5.2 billion during this period, from €4.9 billion in the period from January 2018 to September 2018.

gates calls for an active role by the banking sector, which, however, given its existing weaknesses, cannot make a decisive contribution.

The large legacy NPL stock, which impacts profitability, coupled with the low quality of prudential own funds, burdens the operating environment of banks. NPL reduction has accelerated, but this pace is not enough to ensure a rapid de-escalation so that the Greek banking sector approaches the EU average.

The recent initiative of establishing a Hellenic Asset Protection Scheme (HAPS) is a welcome development, contributing towards improving banks' asset quality. Although it is an important step in the right direction, it should be complemented by other actions aimed at, on the one hand, effectively tackling the large NPL stock, and, on the other hand, improving the quality of banks' prudential own funds. In this vein, the Bank of Greece has set up a dedicated working group to develop alternative strategies and proposals on its initial plan[9] regarding the avenues for simultaneously reducing NPLs and DTCs, the latter as a share of banks' prudential own funds. This would give a longer-term boost to bank profitability and liquidity.

The need for a definitive solution to the NPL stock, apart from its particular significance from a financial stability perspective, is also premised on the need to bolster financing of the real economy, given the existing credit gap.[10]

Successfully tackling NPL levels will not only help reduce credit risk for banks, but also lay the groundwork for limiting financial risk for households and corporations, as the economy recovers, resulting in higher valuations of existing assets as a result of higher yields on capital and real estate. This will enable credit institutions to channel credit to the more dynamic and export-oriented businesses. They will thus be able to contribute to the overall restructuring of the economy, having a beneficial impact on the sectors of goods and services, thereby resulting in higher rates of total productivity and potential GDP growth.

In addition, an improved quality of banks' prudential own funds will favourably affect efforts to attract new investors. A strong capital base will create a new environment for banks to do business in, by improving the prospects of the banking sector as a whole.

Finally, banks must intensify their efforts aimed at a faster restructuring of viable businesses, a unified approach to debtors with multiple creditors, identifying "strategic defaulters" and implementing a definitive solution for non-viable businesses.

The path towards a new era for the banking sector hinges on the active participation of all stakeholders, given that it the restoration of the banking sector's intermediating function is an imperative need and an overarching objective, in the interest of safeguarding financial stability.

[9] This plan was presented in detail in November 2018 in the Special Feature entitled "A systemic proposal for the management of non-performing exposures" of the Bank of Greece's *Overview of the Greek Financial System*, available on the Bank of Greece's website, at: https://www.bankofgreece.gr/Publications/OVERVIEW%20OF%20THE%20GREEK%20FINANCIAL%20SYSTEM_NOV%202018.pdf.

[10] The credit gap has been estimated at €59 billion in the first half of 2019. This estimate is based on a static approach in the context of the methodology used for setting the Countercyclical Capital Buffer rate (CCyB rate).

II. MACROECONOMIC AND FISCAL DEVELOPMENTS

1. ECONOMIC ACTIVITY: DEVELOPMENTS AND PROSPECTS

Economic growth in Greece has remained on an upward path over the last two years, albeit weaker in the first quarter of 2019 due to the deteriorating international environment. GDP (seasonally adjusted data, at constant prices) increased by 1.5% in the first half of 2019 (Table II.1), driven by higher public consumption and exports of goods and services. Private consumption and imports made a negative contribution, while investment made a marginally positive contribution.

On the supply side, the construction sector accounted for the largest contribution, followed by the wholesale and retail trade sectors. By contrast, the primary sector and the public administration and defence sectors made a negative contribution in the first quarter of the year, reversing the positive image of 2018. The labour market retained its momentum, with the unemployment rate dropping to its lowest level in eight years. Inflation remained low, while the current account balance improved.

The growth rate of the Greek economy is expected to remain unchanged in 2019 compared with 2018, while in 2020 it is expected to pick up significantly, despite the adverse global economic environment. This is reflected in the evolution of the economic climate indicators, as both the Economic Sentiment Indicator (ESI) and the Purchasing Managers' Index (PMI) have reached high levels.

Private consumption declined in the first

Table II.1 GDP and its components (2017 – Q2 2019)

Percentage changes (at constant market prices of 2010)

	2017	2018	Q4 2017	Q1 2018	Q2 2018	Q3 2018	Q4 2018	Q1 2019	Q2 2019
Private consumption	0.9	1.0	-0.1	0.5	1.4	1.1	1.0	0.5	-0.7
Public consumption	-0.5	-2.5	1.7	-0.3	-3.9	-4.5	-1.4	-1.4	5.3
Gross fixed capital formation	9.4	-12.0	12.6	-8.9	19.0	-22.9	-26.5	8.3	-5.8
Dwellings	-5.5	17.4	-8.5	11.6	5.2	21.3	32.3	6.7	19.5
Other constructions	9.5	-22.1	-11.8	-4.9	54.3	-55.8	-23.6	-2.5	-45.5
Equipment	24.6	-11.0	56.5	-25.2	-11.5	56.3	-35.7	9.4	24.4
Domestic demand	**1.6**	**-1.4**	**1.9**	**-0.8**	**2.2**	**-3.3**	**-3.4**	**1.0**	**-0.1**
Exports of goods and services	6.9	8.7	5.5	8.7	9.1	6.9	10.2	4.3	5.4
Exports of goods	5.6	8.4	8.1	11.1	6.8	7.6	8.1	-0.4	4.0
Exports of services	8.3	9.3	2.5	5.4	11.9	7.1	12.7	9.1	6.9
Imports of goods and services	7.4	3.0	3.2	-7.5	2.8	15.6	2.2	9.8	3.7
Imports of goods	7.0	0.7	2.2	-11.3	0.0	15.5	0.3	10.1	3.9
Imports of services	9.0	14.4	7.8	11.8	16.0	16.7	13.1	6.3	2.8
Real GDP at market prices	**1.4**	**1.9**	**2.1**	**2.7**	**1.5**	**2.0**	**1.5**	**1.1**	**1.9**

Sources: Hellenic Statistical Authority and Bank of Greece.

quarter of 2019 despite a considerable rise in real disposable income (by 4.2%), against the backdrop of the elections. By contrast, public consumption increased by 1.9%.

Gross fixed capital formation rose marginally by 0.7%, as investment in dwellings, transport equipment and weapon systems increased substantially, while investment in other buildings and structures declined. However, due to the relatively small volume of investment, the large changes in transport equipment and weapon systems and other buildings and structures are due to base effects. Investment in dwellings maintained its 2018 momentum following 10 consecutive years of decline, on the back of growing short-term leases in tourist areas. In the medium term, investment is expected to increase considerably, supported by consolidated confidence in the prospects of the Greek economy; significantly lower Greek government bond yields, which also dragged down corporate bond yields; the systemic approach to addressing the issue of non-performing loans through the Hellenic Asset Protection Scheme (HAPS); the acceleration and facilitation of large investment projects such as the "Elliniko" real estate development; and the adoption and implementation of Law 4635/2019 on creating an investment-friendly environment and suspending VAT for three years on all building permits issued from 1 January 2006.

Despite the adverse international macroeconomic environment and the economic slowdown in the euro area, Greek exports of goods and services are on the rise, confirming that the Greek economy is becoming more export-oriented. More specifically, total exports increased by 4.8% in the first half of 2019, while exports of services increased by 8.0%, driven by a significant rise in tourism and shipping receipts. At the same time, imports of goods and services increased by 6.7%.

The current account balance improved considerably year-on-year in the first nine months of 2019 and was almost balanced, mainly due to a stronger services balance and improved primary and secondary income accounts.

The labour market continued to improve in the first half of 2019. According to the Labour Force Survey of the Hellenic Statistical Authority (ELSTAT), the employment rate increased by 2.5% year-on-year, while the unemployment rate dropped by 18.1% (20.1% in the first half of 2018). Salaried employment increased significantly by 4.8%. Private sector salaried employment flows also recorded an increase (on the ERGANI I.T. system), as 161.869 new jobs were created in the first 10 months of 2019. During the first half of 2019, salaried employees' income was higher by 4.6% year-on-year, on the back of rises in the number of employees and compensation per employee. However, despite the improved labour market, there are persisting problems, i.e. the high unemployment rate among women and young people and the large share of the long-term unemployed, while new jobs are mainly low-skilled and low-paid and hence unsuitable to attract employees who were forced to seek work overseas in previous years.

Inflation is expected to drop in 2019 compared with 2018 due to reduced indirect taxation on certain categories of products, as well as lower global oil prices, especially in the second half of 2019. Core inflation is expected to remain at the same level as in 2018.

The risks to the Bank of Greece's baseline scenario projections have remained broadly unchanged. External downside risks mainly relate to the adverse international macroeco-

nomic environment and the slowdown in growth mainly in the euro area, the uncertainty over a no-deal Brexit, and a possible rise in trade protectionism. On the other hand, domestic downside risks include the possibility of considerably stronger refugee flows.

2. FISCAL DEVELOPMENTS

In 2018, fiscal policy was slightly expansionary, as measured by the change in the cyclically adjusted primary balance of the general government (excluding the cost of supporting financial institutions) as a percentage of potential GDP. Therefore, as in 2017, fiscal policy did not give the necessary stimulus to economic activity to the extent possible, as it allowed a significant overshooting of the general government primary surplus target in the context of enhanced surveillance.

According to ELSTAT's second notification of fiscal figures as part of the Excessive Deficit Procedure (EDP) in October 2019, the general government recorded a surplus for the third consecutive year in 2018, of 1.0% of GDP, compared with 0.7% in 2017. The general government primary balance recorded a surplus of 4.3% of GDP in 2018, compared with 3.8% in 2017.

The 2018 general government primary balance, as calculated based on the enhanced surveillance methodology,[11] stood at 4.2% of GDP, well above the surplus target of 3.5% of GDP. The under-execution of intermediate consumption and public investment expenditure contributed to overshooting this target.

Despite helping to contain public debt, this overshooting impacted the real economy negatively, since the larger than required fiscal adjustment, which was achieved mainly through tax increases and under-execution of the Public Investment Programme, resulted in depriving the production process of valuable resources, while at the same time squeezing citizens' tax payment capacity.

In the second half of 2019, after the European Parliament elections, the Greek government's borrowing costs were significantly reduced, as reflected in a sharp decline in Greek government bond yields.

Their downward trend began in the first four months of the year, enabling Greece to raise €2.5 billion in February through the issuance of a 5-year bond yielding 3.6%, as well as an additional €2.5 billion in March through a 10-year bond issuance yielding 3.9%. However, the downward trend was temporarily halted in May as a result of the adoption of a package of expansionary fiscal measures, which created uncertainty as to whether the fiscal targets in 2019 and subsequent years would be met, coupled with adverse developments in the international investment environment.

The downward trend resumed in the second half of 2019, as indicated by the decline in the 10-year Greek government bond yield from around 3.5% in mid-May to 1.28% at the end of October. At the same time, in the auction of 13-week Greek Treasury bills on 9.10.2019, the yield was negative for the first time (-0.02%), and in the auction of six-month Greek Treasury bills on 30.10.2019 the yield was zero.

Likewise, the spread of the 10-year Greek government bond vis-à-vis the German Bund and corresponding government bonds of other euro area countries narrowed markedly. How-

[11] According to the enhanced surveillance methodology, the 2018 primary budget does not include certain privatisation revenues, the impact of the immediate settlement of tax refund applications, ANFA and SMP transfers from the Bank of Greece, and costs relating to migration flows.

ever, the downward trend in yields was halted in November, indicating that Greek government bonds remain vulnerable to international developments.

Inter alia, the brief election campaign, the new government's commitment to comply with the enhanced surveillance framework and the adoption of a growth-friendly fiscal policy mix contributed to these positive domestic developments in the second half of 2019.

Taking advantage of the favourable conjuncture, the Greek government tapped the markets again in July, raising €2.5 billion through a 7-year bond issue, yielding 1.9%. It also raised €1.5 billion in October through the reissuance of March's 10-year bond at a yield of 1.5%. At the same time, Standard & Poor's upgraded Greece's long-term credit rating by one notch.

The early repayment of €2.7 billion of the IMF loan financed by the latest Greek government bond issues was completed in November, thereby reducing interest payments and sending out a positive signal to the markets on public debt sustainability.

The expansionary fiscal package adopted in May 2019 led to an adjustment of general government primary expenditure, mostly by cutting investment expenditure, as also noted in the Introductory Report to the 2020 Budget, with a view to achieving the 2019 fiscal target of 2019. As a result, on the back of more positive than expected developments in VAT revenue, the budgetary target of 2019 is expected to be met with a safe margin. In line with this estimate are the national accounts data for the first half of 2019 and available general government data, on a cash basis, for the January-September 2019 period, adjusted for income and expenditure items without an impact on fiscal balances under the terms of enhanced supervision. In 2019, fiscal policy is expected to be expansionary and boost economic activity.

The State Budget for 2020, submitted in November, projects an overshooting of the fiscal target in 2019 and its achievement in 2020, through a growth-friendly and fiscally neutral policy mix. Growth-friendly measures with an estimated fiscal cost of €1.2 billion are expected in 2020, along with measures to improve the fiscal balance with a corresponding estimated fiscal gain.

Key growth-friendly measures presented in the draft Budget include lower tax rates on natural and legal persons, reduced social security contributions for full-time workers and a €2,000 "baby bonus". In the same vein, key measures to improve the fiscal balance include an increase in the required share of expenditure through electronic means of payment to avoid additional income taxation, streamlining the system for real estate property valuation and reviewing general government expenditures and revenues.

The European Commission assessed Greece's State Budget for 2020 as compliant in the context of the European Semester process, while, under the enhanced surveillance framework, it published the fourth Surveillance Report on 20 November.[12]

According to the Report, the primary surplus is expected to overshoot the fiscal target in 2019, reaching 3.8% of GDP, and to meet the target of 3.5% of GDP in 2020. The fiscal mix is expected to impact economic growth positively and improve the quality of public

[12] *Enhanced Surveillance Report - Greece*, November 2019.

finances. Major fiscal risks include the potential costs of court judgments on the 2016 insurance reform, as well as higher wage costs in the public sector due to an increased number of temporary workers.

The focus of fiscal policy on reforms aimed at boosting the Greek economy's growth potential should be strengthened. To this end, it is necessary to create a stable, pro-growth taxation framework. The observable realignment of the fiscal mix towards lowering tax rates, promoting electronic transactions and streamlining public spending by means of an expenditure review in the Introductory Report to the 2020 Budget is considered to be in the right direction.

Reorganising the state apparatus to make it more effective can also help save resources and reduce the tax burden. In this context, the digitalisation of Greek public administration is expected to help improve the fiscal outcome on both the revenue and the expenditure side.[13] The main benefits are expected from the broader tax base and the more effective monitoring of the amount and execution of public expenditure. The introduction of electronic invoicing and bookkeeping, as well as the electronic asset database will help in this regard. If these actions are combined with intensified tax audits and more efficient tax collection, benefits will be augmented.

Fostering productive investment is crucial for the much-needed stimulus to restore positive and high growth rates for the Greek economy. Shifting public expenditure towards infrastructure investment, capitalising on EU resources and expanding public-private partnerships (PPPs), particularly in sectors such as education, health and social security, are important productivity-enhancing tools for the Greek economy. Adopting policies that encourage research and innovation,[14] facilitate the diffusion of technology and promote entrepreneurship could act in the same direction.

In addition, efficient utilisation of public property and an immediate solution to the problems leading to the accumulation of general government arrears are a priority for enhancing private investment, which will trigger a virtuous circle of economic growth.

Finally, efforts to obtain the creditors' consent on lower primary surplus targets should be sustained. A lower primary surplus target, coupled with the implementation of the necessary structural reforms aimed at stimulating economic activity and the privatisation program, would not jeopardise the reduction of the debt-to-GDP ratio. This assumption is corroborated by improved debt sustainability, resulting from the fact that Greece's borrowing costs are markedly lower than the assumptions of the baseline scenario of the Sustainability Report accompanying the latest ESM Assessment Report, as well as from the early repayment of part of the IMF loan, completed in November.

[13] Albani, M., Anyfantaki, S. and S. Lazaretou (2019), "How do digital technologies drive Greece's economic growth? Opportunities and challenges", Bank of Greece, *Economic Bulletin No 49*, pp. 73-92.

[14] Albani, M. and S. Anyfantaki (2018), "Research and Innovation in Greece", Bank of Greece, *Economic Bulletin No 46*.

III. THE BANKING SECTOR: RISKS AND RESILIENCE

1. EVOLUTION OF KEY BALANCE SHEET AGGREGATES

In the first half of 2019, Greek banking groups' assets, after several years of contraction, grew moderately to €256.7 billion, up by 1.6% (or €3.9 billion) compared with end-2018 (see Table III.1).

More specifically, changes in asset amounts and structures are mainly attributed to:

(i) a €4.6 billion increase in bond and derivative holdings, mostly due to valuation gains on banks' bond portfolios and purchases of derivatives. As a result, the share of bonds and derivatives in total assets rose (June 2019: 15.1%, December 2018: 13.5% – see Table III.1 and Chart III.1);

(ii) a €1.8 billion increase in claims on credit institutions on the back of some credit institutions' improved liquidity;

(iii) a €1.7 billion increase in equity participations, tangible and intangible assets, largely due to the merger of Grivalia Properties Real Estate Investment Company with Eurobank-Ergasias S.A.;

(iv) the reduced stock of loans after provisions (down by €2.5 billion), mainly as a result of the repayment of a seasonal loan to the Payment and Control Agency for Guidance and Guarantee of Community Aids (OPEKEPE) (€1.6 billion) and also write-offs and sales of NPLs. As a result, the share of loans in total assets decreased (June 2019: 57.8%, December 2018: 59.6% – see Table III.1 and Chart III.1); and

Table III.1 Structure of assets and liabilities of Greek commercial banking groups

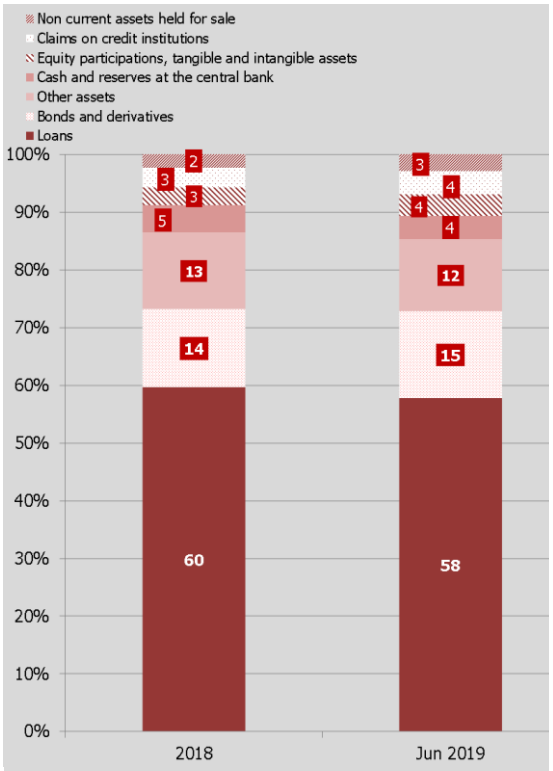
(amounts in million euro)

	2018		June 2019		Change
Assets		%		%	
Cash and reserves at the central bank	11,992	4.7	10,257	4.0	-1,735
Claims on credit institutions	8,692	3.4	10,507	4.1	1,815
Loans	150,647	59.6	148,134	57.8	-2,513
Bonds and derivatives	34,193	13.5	38,788	15.1	4,595
Equity participations, tangible and intangible assets	7,659	3.0	9,380	3.7	1,721
Non-current assets held for sale	5,823	2.3	7,432	2.9	1,609
Other assets	33,559	13.3	31,976	12.5	-1,583
Total	**252,565**	**100%**	**256,474**	**100%**	**3,909**
	2018		**June 2019**		**Change**
Liabilities		%		%	
Customer deposits	170,162	67.4	173,306	67.6	3,144
Liabilities to credit institutions	32,975	13.1	28,928	11.3	-4,047
Bank bonds	5,389	2.1	5,742	2.2	353
Liabilities associated with non-current assets held for sale	4,094	1.6	4,331	1.7	237
Other liabilties	12,715	5.0	15,203	5.9	2,488
Own funds	27,230	10.8	28,964	11.3	1,734
Total	**252,565**	**100%**	**252,474**	**100%**	**3,909**

Source: Bank of Greece.

Chart III.1 Structure of assets of Greek banking groups in 2018 and June 2019

(in percentages)



Source: Bank of Greece.

(v) a €1.7 billion reduction in cash and reserves at the central bank.

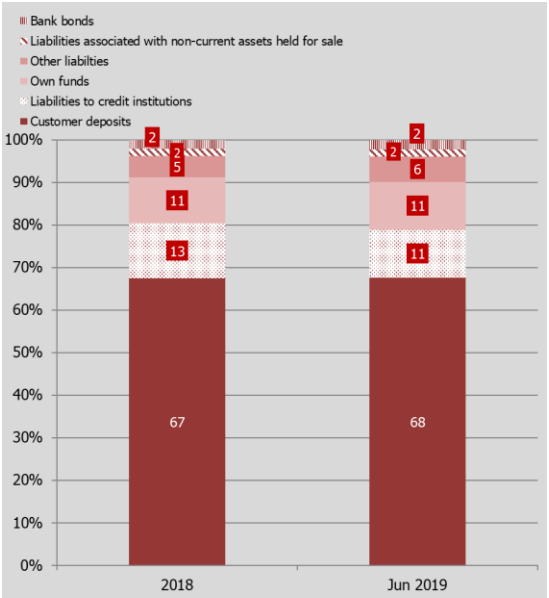
On the liabilities side, the most significant development was a reduction of liabilities to credit institutions, both in absolute terms (by €4.0 billion) and also as a percentage of total liabilities (June 2019: 11.3%, December 2018: 13.1% – see Chart III.2 and Table III.1), mainly mirroring a decrease in banks' financing by the Eurosystem and the interbank money market.

By contrast, customer deposits increased by €3.1 billion, also rising as a percentage of total liabilities to 67.6% in June 2019, compared with 67.4% in December 2018 (see Chart III.2 and Table III.1), reflecting improved confidence in the banking sector and the Greek economy in general.

In addition, other liabilities increased by €2.5 billion, mainly as a result of an increase in

Chart III.2 Structure of liabilities of Greek banking groups in 2018 and June 2019

(in percentages)



Source: Bank of Greece.

derivative liabilities that was almost equal in amount to the increase in derivative receivables.

Finally, banking groups' own funds increased by €1.8 billion as a result of:

- the merger of Grivalia Properties Real Estate Investment Company with Eurobank-Ergasias S.A.;
- the issuance of Tier 2 subordinated bonds; and
- after-tax profitability.

2. BANK RISKS

2.1 CREDIT RISK

Structure and evolution of non-performing loans (NPLs)

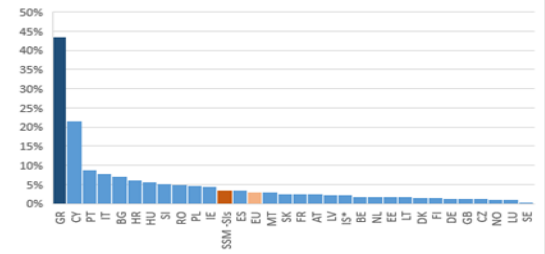
In the first half of 2019, the credit portfolio quality of credit institutions improved. Non-performing loans (NPLs) continued their downward trend, as the total stock of NPLs, including on-balance-sheet items only, stood at €75.4 billion at end-June 2019, having dropped by 7.9% or €6.4 billion from end-2018 (€81.8 billion). It is noteworthy that the

cumulative decline in NPLs from their March-2016 peak was 30% or €31.8 billion.

The ratio of NPLs to total loans (NPL ratio) at end-June 2019 stood at 43.6%, compared with 45.4% at end-2018, the highest among EU countries (see Chart III.3).

Chart III.3 NPL ratio for the EU, EU Member States and SSM systemic institutions in the first half of 2019

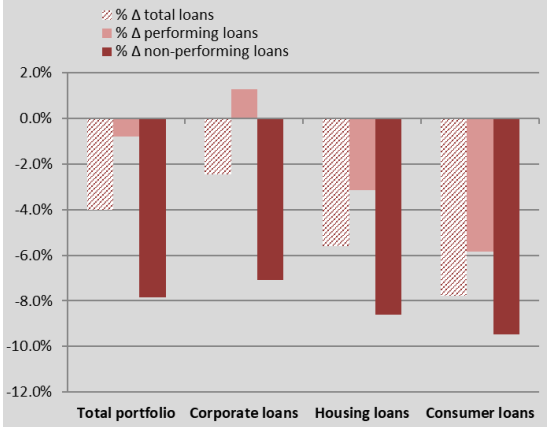
(in percentages)



Sources: Bank of Greece, EBA risk dashboard and ECB supervisory statistics.

The decline in this ratio is mainly due to a reduction of the NPL stock (by 7.9%), which exceeded the decrease in total bank loans during the year (4.0%) (see Chart III.4).

Chart III.4 Percentage change in total loans, performing and non-performing loans of Greek banks in the first half of 2019



Source: Bank of Greece.

However, the gradual decline in NPLs was mainly driven by write-offs (€2.1 billion) and loan sales (€3.6 billion) in the first half of 2019, while the net inflow of new NPLs continued mainly due to defaults on forborne exposures (Table III.2).

Table III.2 Evolution of NPLs in the first half of 2019

(in billion euro)

Total portfolio	
NPL stock (31.12.2018)	**81.8**
New NPLs	3.4
Cured NPLs	-3.3
Disbursements/Capitalisations of interest	0.9
Collections	-0.9
Foreclosures	-0.7
Loan sales	-3.6
Write-offs	-2.1
Other	0.0
NPLs at end-June 2019	**75.4**

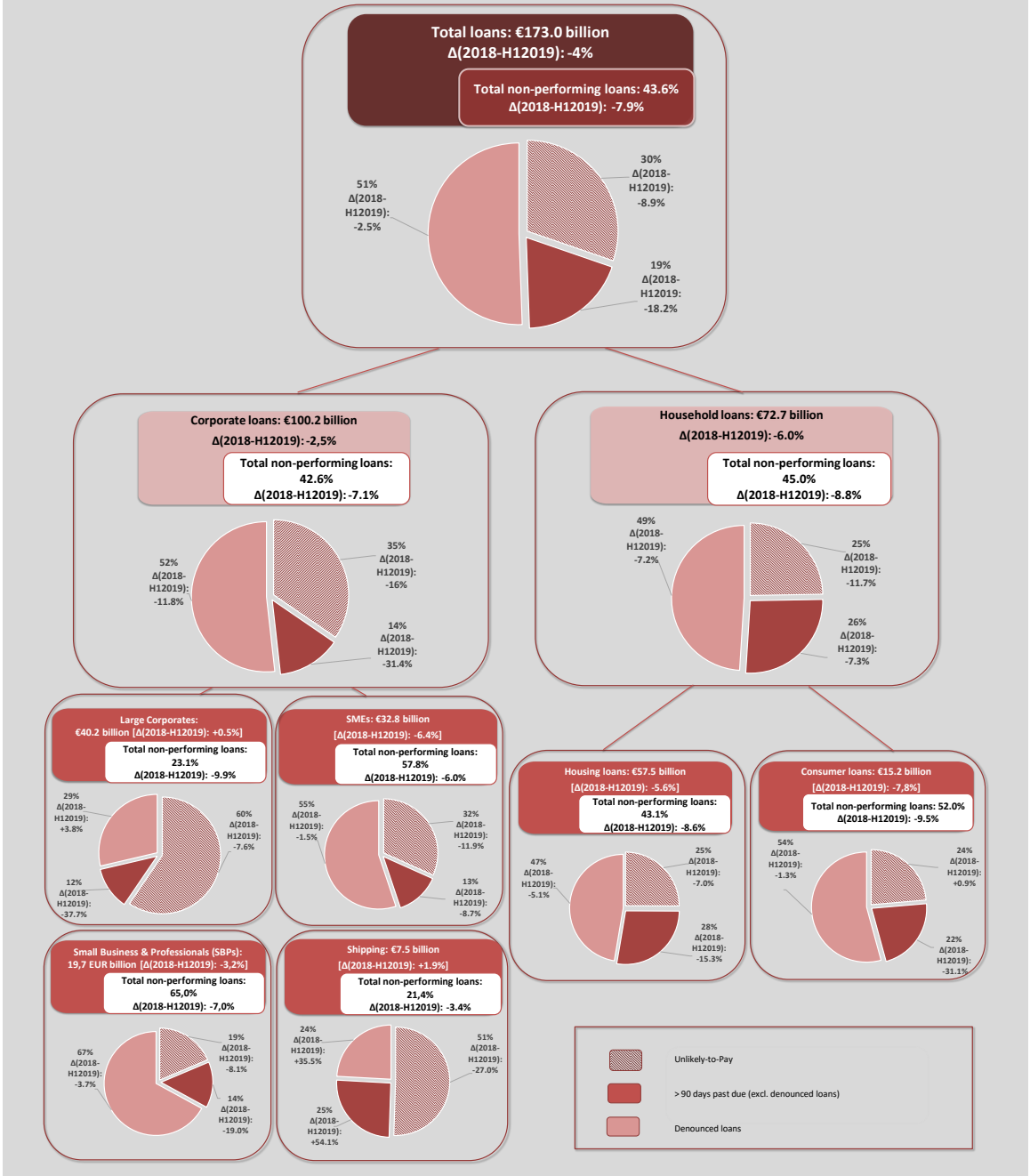
Note: The lines "foreclosures" and "loan sales" include any partly written-off amounts that are linked to these two categories. The line "write-offs" only includes loan write-offs.

Source: Bank of Greece.

Greek banks' new operational targets already submitted to the Single Supervisory Mechanism (SSM) at end-March 2019 aim to reduce the NPL ratio to below 20% in 2021.

Chart III.5 provides a detailed breakdown of the structure and evolution of NPLs by loan portfolio category in the first half of 2019.

Chart III.5 Structure and evolution of Greek commercial banks' total loans and NPLs by loan portfolio category in the first half of 2019



Source: Bank of Greece.

The amounts of unlikely-to-pay (UtP) loans and loans in early arrears, i.e. total performing loans that are 1-90 days past due, are strong signals of the future course of credit risk. Unlikely-to-pay loans amounted to €22.8 billion (30% of NPLs) at end-June 2019, down by 8.9% from end-2018 (€25.1 billion). However, the ratio of loans in early arrears to total performing loans has worsened, having risen to 13.7% at end-June 2019, from 13.4% at end-2018 (see Chart III.6).

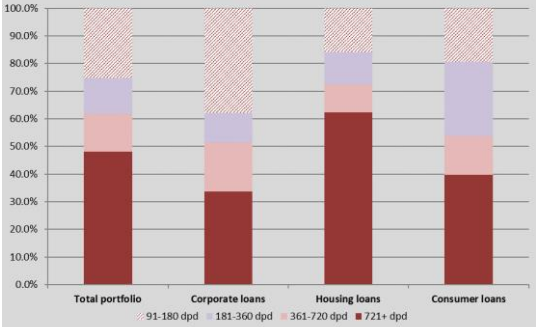
Loans over 90 days past due (excluding denounced loans) continued their downward trend during the first half of 2019 and amounted to €14.4 billion (19% of NPLs), down by 18.2% from end-2018 (€17.6 bil-

lion). It should be pointed out that 61.7% of NPLs falling into this category are more than one year past due.

The share of such NPLs in mortgage loans and corporate loans is 72.5% and 51.4% respectively, while consumer loans more than six months past due account for 80.6% of total loans, compared to 70.1% at end-2018.

Outstanding balances of NPLs more than 90 days past due are presented by loan portfolio category in Chart III.7.

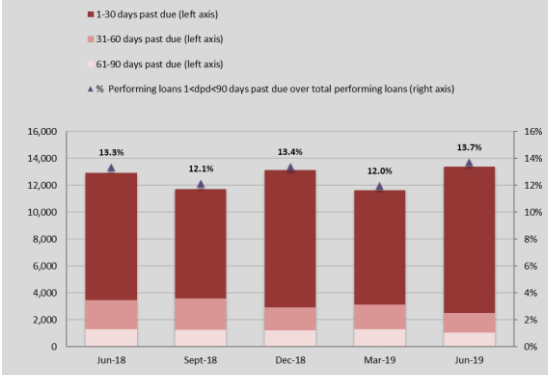
Chart III.7 NPLs more than 90 days past due (excluding denounced loans) by loan portfolio category



Source: Bank of Greece.

Denounced loans accounted for 51% of NPLs and amounted to €38.1 billion at end-June 2019, down by 2.5% from end-2018 (€39.1 billion), mainly due to write-offs of denounced loans of €1.1 billion.

Chart III.6 Loans in early arrears and ratio of loans in early arrears to total performing loans



Source: Bank of Greece.

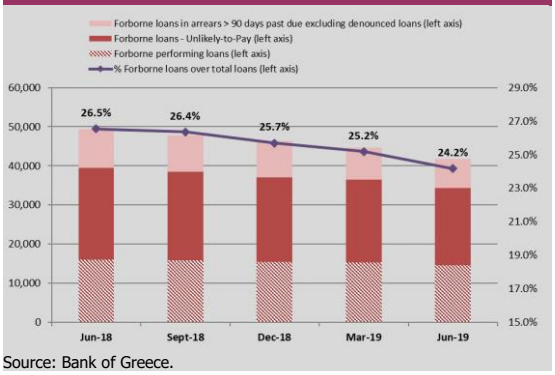
Table III.3 provides an overview of the key figures of all bank loans.

Monitoring and evaluation indicators for NPLs

With regard to the monitoring and evaluation indicators for the management of NPLs, the following should be pointed out:

• The NPL provisioning coverage ratio at end-June 2019 was reduced to 46%, from 47.4% in 2018. In particular, banks' accumulated provisions for impairment of NPLs were reduced to €34.7 billion at end-June 2019, from €38.7 billion at end-2018, mainly on the back of significant write-offs in the first half of the year.

Chart III.8 Forborne loans by delinquency bucket and ratio of forborne loans to total exposures



Source: Bank of Greece.

Table III.3 Total portfolio – key figures

(in million euro, on-balance sheet items)	Dec. 2018	June 2019
Breakdown of Non-Performing Loans (NPLs)		
Total loans	**180,181**	**172,971**
Performing loans	**98,383**	**97,592**
NPLs	**81,798**	**75,379**
Unlikely-to-pay	25,054	22,828
Past due > 90 days (excluding denounced loans)	17,644	14,429
91-180 days	3,214	3,635
181-360 days	2,580	1,897
> 1 year	11,849	8,897
Denounced loans	39,100	38,121
Breakdown of forborne loans		
Forborne loans	**46,317**	**41,811**
Performing forborne loans	15,506	14,615
Non-performing forborne loans	30,810	27,196
Breakdown of impairment losses and write-offs		
Accumulated impairment on NPLs	**38,732**	**34,683**
Write-offs	**5,898**	**2,116**
of which write-offs of denounced loans	3,548	1,146
Breakdown of collateral		
Total collateral	**102,559**	**98,852**
Collateral on performing loans	**58,890**	**57,750**
Collateral on NPLs	**43,669**	**41,102**
Unlikely-to-pay	14,198	13,725
Past due > 90 days (excluding denounced loans)	10,243	8,419
Denounced loans	19,228	18,958
Collateral on non-performing forborne loans	**17,758**	**16,643**
Breakdown of flows		
Flows of performing loans	**-982**	**-120**
Flows from NPLs	6,757	3,254
Flows to NPLs	-7,739	-3,373

Source: Bank of Greece.

Overall, it is noted that the level of the NPL coverage ratio falls short of the EU average for medium-sized banks, according to the latest available data for the first quarter of 2019 (see Chart III.9).

• The collateral coverage ratio for NPLs was 54.5% at end-June 2019, up from 53.4% at the end of 2018. However, the collateral coverage ratio for forborne loans is higher, i.e. 61.2%, compared with 57.6% at end-2018.

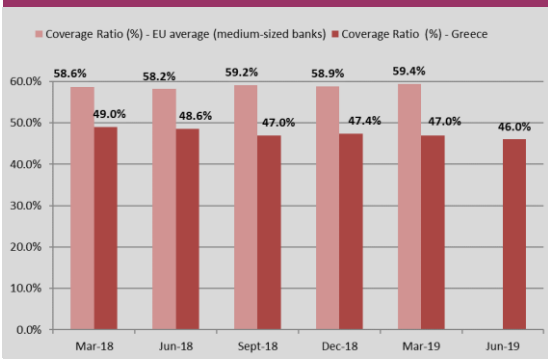
• Total forborne loans[15] came to €41.8 billion at the end of the first half of 2019, accounting for 24.2% of total loans, compared with 25.7% at end-2018 (€46.3 billion) (see Chart III.8). However, 17.9% of forborne loans are more than 90 days past due, compared with 19.9% at end-2018.

• At end-June 2019, 48.2% of NPLs over 90 days past due were not forborne, compared with 47.8% at end-2018,[16] while the corresponding rates in the mortgage, consumer and corporate portfolios were 44.0%, 47.5% and 53.4% respectively.

[15] Executive Committee Act 47/9.2.2015 provides an indicative list of possible forbearance solutions for performing and non-performing loans.

[16] Partly due to the fact that a large part includes borrowers under legal protection.

Chart III.9 Provisioning coverage ratio of NPLs



Sources: Bank of Greece and European Central Bank.

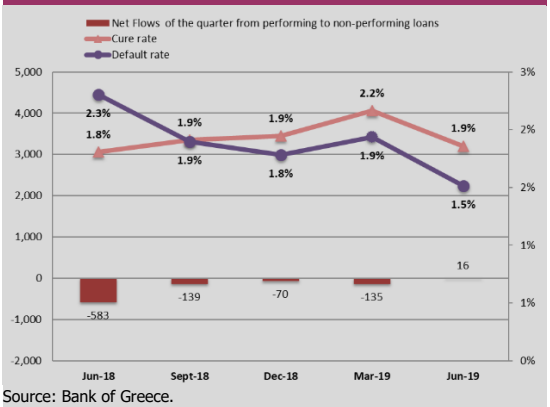
• It is noted that €11.1 billion, i.e. 14.8% of on-balance-sheet NPLs, concern legally protected loans pending a final court decision, of which €6.4 billion are denounced loans. Loans in this category concern either natural persons (e.g. Law 3869/2010[17]) or legal entities (e.g. Law 4307/2014, Bankruptcy Code). With regard to individual categories, about 31% of non-performing mortgages are under legal protection, while the corresponding rate for consumer loans is 19.9%.

• Loan write-offs in the first half of 2019 amounted to €2.1 billion, of which €1.1 billion relate to denounced – mainly corporate – loans.

• In the first half of 2019, total flows within banks' balance sheets from performing loans to non-performing loans (default rate) were marginally higher than the flows from non-performing to performing loans (cure rate), while total net flows over the same period amounted to €-0.12 billion.

• At end-June 2019, the quarterly cure rate was 1.9% and the default rate was 1.5%, confirming the positive trend of previous quarters (see Chart III.10). Looking into individual loan portfolio categories, the highest cure rate (2.6%) is recorded in mortgage loans and the lowest (1.4%) in corporate loans.

Chart III.10 Evolution of net quarterly flows from performing to non-performing loans, default rate and cure rate



Source: Bank of Greece.

• Credit institutions continue to opt for long-term forbearance measures, focusing on extending maturities, as reflected in the rising trend of loan term extensions over recent years. This trend continued into the first half of 2019, with the largest increase recorded in the mortgage portfolio (Chart III.11).

Table III.4 provides an overview of the key indicators for the total portfolio of loans.

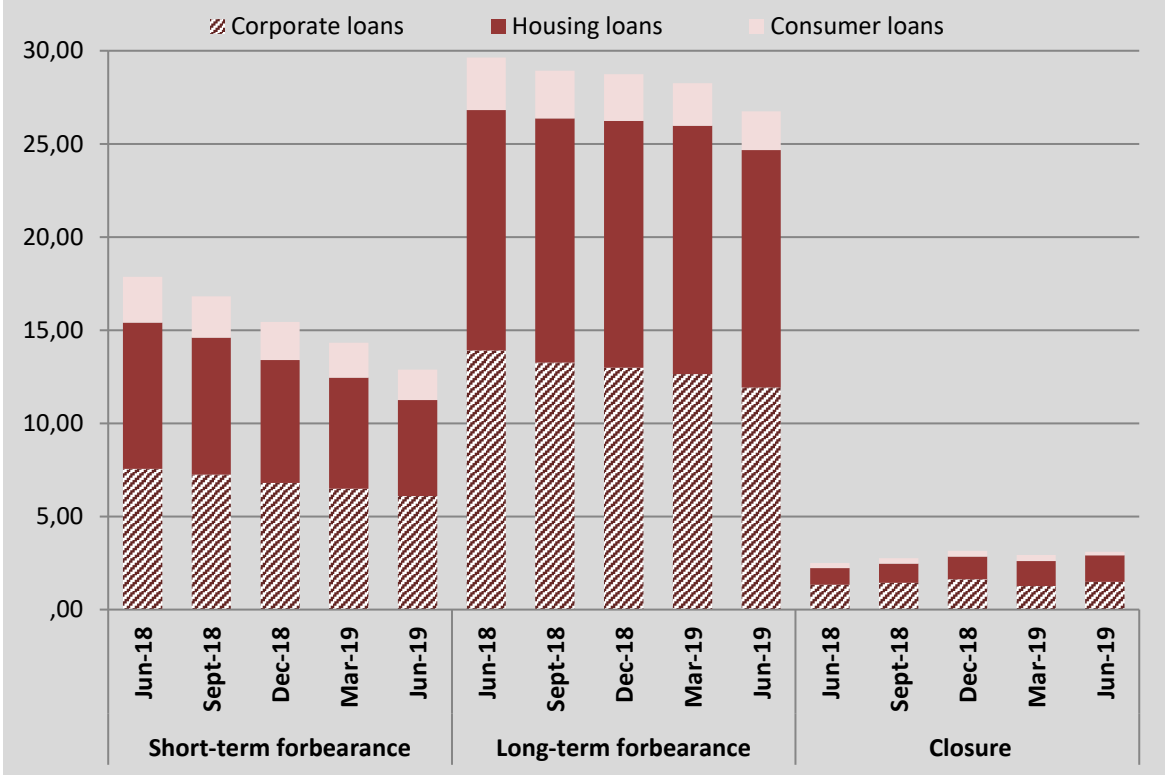
[17] The law, last amended in September 2018, provides that banking secrecy will be lifted with respect to borrowers benefiting from its provisions, who will cease to qualify for protection if they raise any objection. At the same time, borrowers will declare that they authorise any credit institution to disclose to their creditors the data of any bank accounts and products, permitting them to process and exchange the data they hold or receive from credit institutions.

Table III.4 Total portfolio – key indicators

(in percentages, on-balance-sheet items)	Dec. 2018	June 2019
Credit quality		
NPL ratio	**45.4**	**43.6**
> 90 days past due	31.5	30.4
NPL structure		
Unlikely-to-pay	**30.6**	**30.3**
Past due > 90 days (excluding denounced loans)	**21.6**	**19.1**
91-180 days	3.9	4.8
181-360 days	3.2	2.5
>1 year	14.5	11.8
Denounced loans	**47.8**	**50.6**
Forborne to total loans		
Forborne loans	**25.7**	**24.2**
Performing forborne loans	8.6	8.4
Non-performing forborne loans	17.1	15.7
Coverage ratios and write-offs		
Provisioning coverage ratio of NPLs	**47.4**	**46.0**
Total write-offs to total loans	**3.3**	**1.2**
Total write-offs to NPLs	**4.3**	**1.5**
NPL collateral coverage ratio	**53.4**	**54.5**
Collateral coverage on non-performing forborne loans	57.6	61.2
Total NPL coverage (provisions + collaterals)	100.7	100.5
Default and cure rates		
Default rate	1.8	1.5
Cure rate	1.9	1.9
Credit risk cost		
Loan-loss impairment to net loans	2.1	1.8
Loan-loss impairment to total assets	1.3	1.1

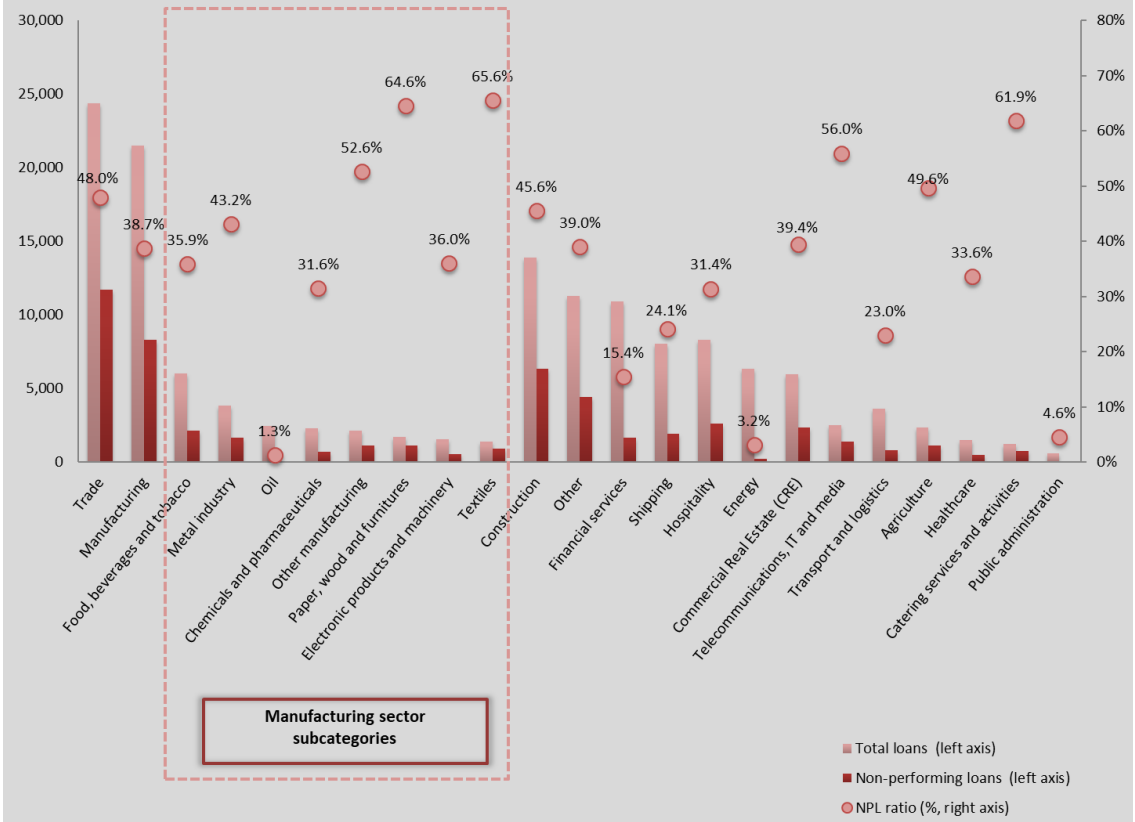
Source: Bank of Greece.

Chart III.11 Forborne exposures by type of forbearance measures and loan portfolio category



Source: Bank of Greece.

Chart III.12 Sectoral breakdown of corporate loans and NPEs in the first half of 2019



Source: Bank of Greece.

Credit risk per sector[18]

Exposures to non-financial corporations amounted to €122.5 billion at end-June 2019, accounting for about 61% of total financing of the economy by Greek banks. Non-Performing Exposures (NPEs) in the corporate portfolio (36.1%) are still mainly affected by the high share of SMEs (50%) and micro firms (59.3%).

As regards the sectoral breakdown of financing to the Greek economy, the largest share concerns firms operating in the trade sector (20% of total corporate financing), while the NPE ratio for this sector is higher than the corresponding average ratio for corporate loans (48% versus 36.1%).

As illustrated in Chart III.12, very high NPE ratios are recorded in the sectors of catering (61.9%), telecommunications, IT and communication services (56%), agriculture (49.6%), construction (45.6%) and manufacturing (38.7%), while the lowest ratios are indicatively in the energy sector (3.2%) and financial services (15.4%).

The tourism industry still has a high NPE ratio (31.4%), despite being export-oriented, growing and making an increasing contribution to GDP.

2.2 LIQUIDITY RISK

The Greek economy's better prospects improved the economic climate and propped up bank deposits, which are a stabilising factor for funding sources. Liquidity continues to rise on the back of the expansion of the deposit base, covered bond issuance, and interbank and repo transactions. As of September

[18] Concerning on- and off-balance-sheet items.

2019, the remaining capital controls, related to international payments and the transfer of funds abroad by corporations and households, have been lifted. This is expected to contribute decisively to attracting investment and boosting economic activity.

The lifting of capital controls, coupled with reduced fiscal risks, led Standard & Poor's (S&P) to upgrade Greece's debt to 'BB-' from 'B+' (positive outlook) on 25 October 2019. The positive outlook suggests that S&P could further upgrade Greece within the next 12 months, if the government continues to implement structural reforms that enhance the economy's growth potential and the sustainability of public finances.

It is worth mentioning that the decline in 10-year Greek government bond yields to historically low levels is not in itself a trigger for further upgrades of the country's credit rating, given the very low – or even negative – interest rates prevailing in other euro area countries for a long time. But since lower interest rates signal a greater potential for efficient public debt management, debt sustainability coupled with the momentum of reforms could lead to further upgrades of Greece's credit rating within 2020. As a result, the upgrade to investment grade category, expected after 2020, may take place sooner than expected.

In any case, international credit rating agencies view the European Commission's approval of the Hellenic Asset Protection Scheme (HAPS) as credit positive for the domestic banking sector. The approved HAPS will help banks speed up the reduction of large NPL stocks, which weigh on their capital and impair their lending capacity. An improvement in Greek banks' lending capacity will ultimately boost profitability, although international credit rating agencies expect the implementation of the HAPS to impact negatively on their capital adequacy in the 2020-2021 period.

As regards deposits, their upward trend continued despite persistently low deposit rates. Total deposits rose in the second and third quarter of 2019, while corporate and household deposits amounted to €139.2 billion in September 2019 (June 2019: €136.9 billion, March 2019: €133.3 billion, December 2018: €134.5 billion). Households' time deposits, which are a satisfactory investment choice in certain respects, remained relatively unchanged in the first nine months of 2019. On the one hand, hoarded banknotes increasingly returned to the banking sector, and, on the other hand, there has been an inflow of banknotes by foreign visitors. However, this increase in deposits was offset by part of the deposits being used for the purchase of consumer goods and services, in the belief that the negative impact of austerity on household disposable income has been exhausted.

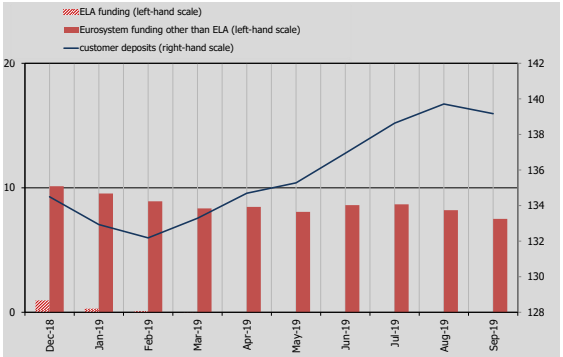
Non-financial corporations' total deposits increased from January to September 2019, whereas their time deposits declined over the same period. This reflects confidence that the country has now entered a virtuous circle of economic growth and corporations can therefore use part of their available funds to purchase capital goods, which will bring improved returns on assets (RoA), even higher than the attractive interest rates on deposits.

Eurosystem financing (excluding Emergency Liquidity Assistance (ELA), of which banks have already been weaned, first rose in the second quarter and then declined in the third quarter of 2019, to reach €7.5 billion in September 2019 (June 2019: €8.6 billion, March 2019: €8.3 billion, December 2018: €10.1 billion). Chart III.13 presents the evolution of

bank deposits and financing through Eurosystem monetary policy operations and ELA provision by the Bank of Greece.

Chart III.13 Bank deposits of non-monetary financial institutions and households, ELA funding and Eurosystem financing other than ELA

(in billion euro)



Source: Bank of Greece.

Banks' covered bonds have already largely substituted for ELA, while mortgages of different ratings are often used as collateral. Some issues of covered bonds are accepted as collateral by the Eurosystem once they reach investment grade status, otherwise they are used as collateral for liquidity transactions on the interbank market. All Greek banks have already issued covered bonds, as their access to capital markets has been improving. All systemic banks have achieved investment grade status,[19] while two of them have issued Tier 2 subordinated bonds.

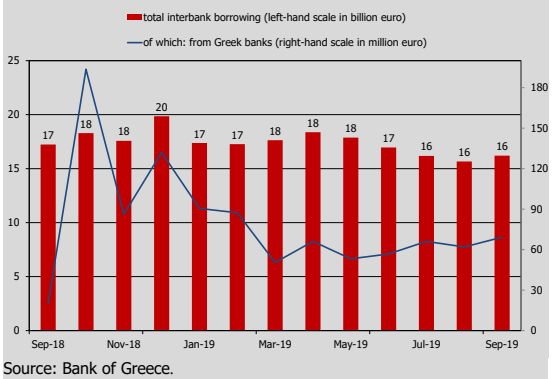
It should be noted that Greek banks' corporate loan portfolio, eligible for use as collateral in Eurosystem credit operations, is expected to expand gradually by 2020, on the back of improved credit ratings.

However, despite funding being needed for new credit in the medium term, Eurosystem financing is expected to decline overall after 2020, due to stronger demand for additional highly rated collateral, in line with the ECB's expanded Public Sector Purchase Programme (PSPP) requirements.

This decline can be partly offset by broadening and increasing funding sources. In more detail, deposits are expected to continue their upward trend, while banks can issue new Euro Medium Term Notes (EMTNs), gradually use the liquidity reserves of subsidiaries, provide credit insurance to borrowers (PPI)[20] and benefit from cash inflows from the provision of collateral in derivatives transactions (CSAs),[21] from sales of loan portfolios, as well as from the liquidation of loan portfolio collateral.

The volume of interbank market transactions suggested a stabilising trend in the second and third quarters of 2019, standing at €16.2 billion in September 2019 (June 2019: €17 billion, March 2019: €17.6 billion and December 2018: €19.9 billion). The evolution of interbank market lending for domestic banks on a solo basis is illustrated in Chart III.14.

Chart III.14 Evolution of financing of domestic credit institutions on the interbank market



Source: Bank of Greece.

[19] Credit ratings for the National Bank of Greece and Eurobank are BBB- by S&P, Baa3 for Alpha Bank by Moody's and BBB (low) for Piraeus Bank by DBRS.

[20] Payment Protection Insurance (PPI), also known as credit insurance, is an insurance product that allows borrowers to secure loan repayment in the case of events that may impair debt servicing capacity.

[21] The CSA (Credit Support Annex) sets out the conditions for collateral provision by the parties to derivatives transactions. It is one of the four parts of the "standard contract" developed by the International Swaps and Derivatives Association (ISDA).

Interbank repos are still an alternative to Eurosystem financing for banks, which have regained access to international money and capital markets. In the case of interbank repo transactions, the collateral used comprises securitisations and Greek and other euro area sovereign bond portfolios. Haircuts applied to these transactions vary depending on the type of collateral used. It is important to note that the terms (interest rate, haircuts) of banks' repo transactions are continuously improving.

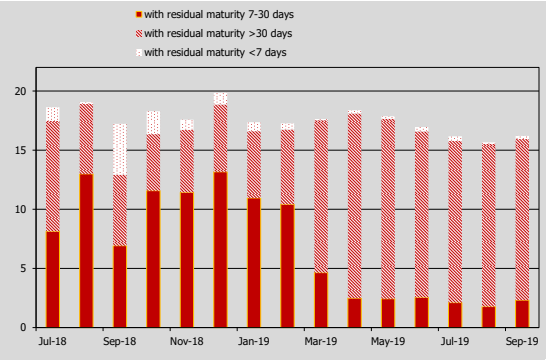
Banks may also draw further liquidity from debt securities that have not yet been used as eligible collateral, thanks to improved access to money markets, with increased trading volumes and more favourable pricing and interest rates. In particular, banks can draw liquidity from the unused stock of security portfolios, or even use government guarantees that have not yet been granted, if necessary.

By 2020, interbank repo agreements should gradually shrink as a result of the need to increase collateral in line with the ECB's eligibility criteria. Greek government bonds are likely to achieve investment grade status after 2020 and thus be eligible for purchase under the ECB's asset purchase programme. As a result, additional highly rated collateral required under certain repo transactions might become increasingly scarce, as Eurosystem purchases of sovereign bonds expand, thereby limiting the scope for further transactions on the interbank market. At euro area level, repos have declined over recent quarters, given that the ECB's securities lending transactions have been conducted more smoothly and with greater participation, also offering the possibility to accept cash as collateral.

Chart III.15 shows the evolution of interbank lending with very short-term maturity (<7 days), short-term maturity (7-30 days) and long-term maturity (>30 days). Repo lending on the long-term interbank market continued its upward trend in the second and third quarters, to reach 84.1% of total interbank lending in September 2019 (June 2019: 82.8%; March 2019: 73.1%, December 2018: 28.7%). As expected, repo lending on the short-term interbank market dropped significantly.

Chart III.15 Interbank market lending broken down by maturity

(in billion euro)



Source: Bank of Greece.

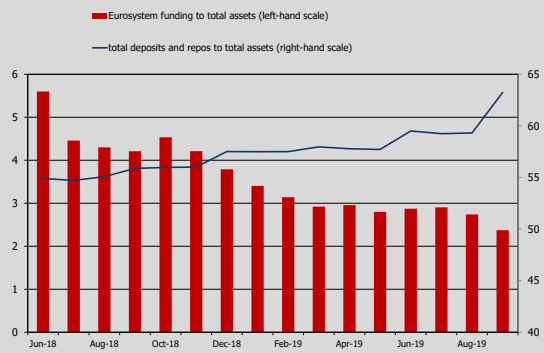
At the same time, Greek banks continue to further expand their positions, improving the composition of their portfolios with Level 1 securities and unencumbered debt. The aim is to continuously improve the liquidity coverage ratio (LCR), which reached 99% at the banking sector level in the second quarter of 2019. Banks therefore hold sufficient liquid assets allowing them to cover short-term liabilities and cope with any short-term financial market turbulence. At the same time, banks maximise their returns and comply with risk limits.

The ratio of Eurosystem financing to total assets remained unchanged in the second quarter, before declining in the third quarter of 2019 (September 2019: 2.4%, June 2019: 2.9%, March 2019: 2.9%, December 2018: 3.8%). By contrast, the ratio of total deposits and repos to total assets increased in the second and third quarters of 2019 (September 2019: 63.2%, June 2019: 59.5%, March 2019:

58%, December 2018: 57.5%). Chart III.16 shows the evolution of the two ratios.

Chart III.16 Deposits of non-MFIs and households and Eurosystem financing to total assets

(in percentages)

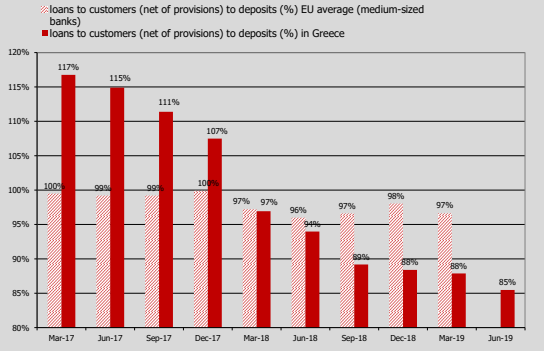


Source: Bank of Greece.

The gradual deleveraging of Greek banks' loan portfolios, coupled with increasing deposits, has led to an ongoing decline in the loan-to-deposit ratio, as illustrated in Chart III.17. This ratio has been falling sharply, standing below the EU average since the first quarter of 2018. In September 2017, the Greek ratio was 12.2 percentage points higher than the corresponding EU average ratio, whereas in March 2019 the Greek ratio was well below the EU average ratio, by 8.7 percentage points.

Chart III.17 Loans (after provisions) to deposits of commercial banks (on a consolidated basis)

(in percentages)

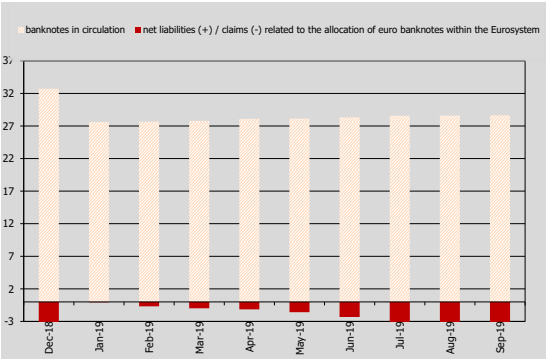


Source: Bank of Greece.

Finally, the amount of banknotes in circulation remained unchanged throughout 2019,[22] as depicted in Chart III.18.

Chart III.18 Banknotes in circulation and allocation of euro banknotes in circulation within the Eurosystem

(in billion euro)



Source: Bank of Greece.

2.3 MARKET RISK

General evaluation

Money and capital markets had a positive performance in the first nine months of 2019. Most stock markets have been on an upward path since the beginning of the year, recording double-digit gains in certain cases. Greek government bond yields have declined substantially, positively affected by the Greek economy's improved performance, a sharp decline in euro area government bond yields and the consolidation of negative yields in euro-denominated bonds, as well as investor expectations about major central banks' monetary policies and the lack of inflationary pressures. However, the currently high valuations of securities are vulnerable to geopolitical instability, potentially lower-than-expected economic growth in major euro area economies, the risk of adverse political de-

[22] The large decline in banknotes in circulation from December 2018 to January 2019 is attributed to a methodological change, namely an adjustment to the distribution key, which is based on the key for subscription to the ECB's capital assigned to each National Central Bank.

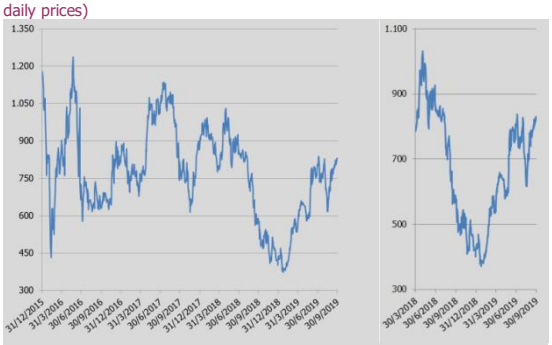
velopments (e.g. Brexit) and fluctuations in euro exchange rates and commodity prices. So far, contagion risk seems to be limited, as most current developments are assessed positively, while a first step has been made towards a US-China trade agreement. This comes against the background of investors reaching for yield in an environment of persistently low interest rates.

Exposure of the banking sector to equity holdings

The upward trend of the Greek stock market between January 2019 and September 2019 was solid, albeit with some fluctuations, having peaked at the end of July. Early elections and the single-party majority government that was formed as a result impacted the stock market positively. Overall, in the first nine months of 2019, the General Index of the Athens Stock Exchange rose by 41.6%. Stronger financial results of Greek non-financial corporations, higher dividend payments, significant recovery in banks' performance in 2019, upgraded credit ratings for Greek sovereign bonds and the four systemic banks by Standard and Poor's and improved macroeconomic and financial indicators for the Greek economy contributed to a surge in equity prices. Individual shares performed well, as banks' share prices considerably outperformed those of large-cap firms in the period under review. The rebound in bank stock valuations (see Chart III.19) is based on banks' improved financial performance, lower non-performing loan ratio, higher real estate prices, the elimination of Emergency Liquidity Assistance (ELA) and a generally favourable macroeconomic environment. The rise in stock prices on the Athens Stock Exchange could continue if the growth momentum is maintained, fiscal stability is safeguarded and more decisive measures for managing non-performing loans (the Hellenic Asset Protection Scheme (HAPS) for reducing non-performing loans) are implemented. Maintaining geopolitical stability in South-East Europe, potentially reduced debt servicing costs (on the back of early repayment of part of the IMF loans amounting to €2.7 billion), private sector investment initiatives and use of the European Strategic Investment Fund (EFSI) may also have positive effects.

Chart III.19 Banks' equity index

(left panel: 31.12.2015-30.9.2019, right panel: 30.3.2018-30.9.2019, in daily prices)

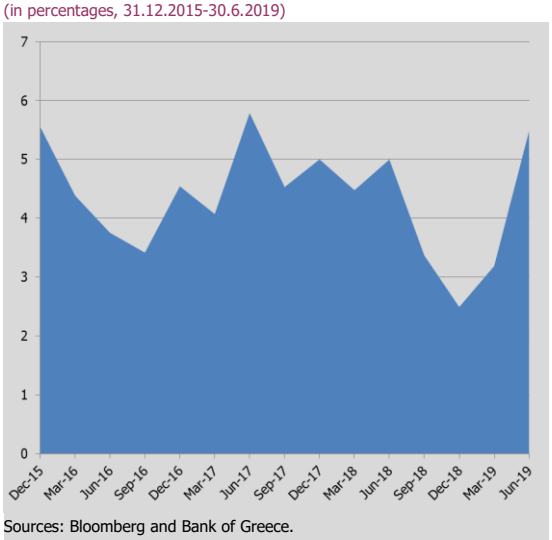


Source: Bloomberg.

Despite the fluctuations in the Greek equities market, the risk of Greek banks' exposure to equities remains low, due to the small size of their equity portfolio.

Chart III.20 Banks' capitalisation to equity assets

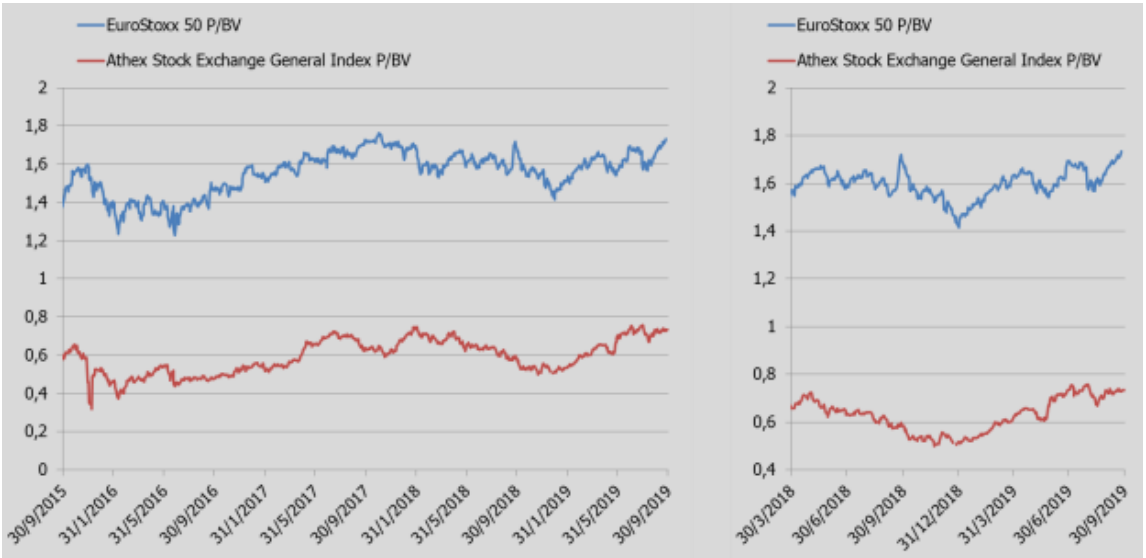
(in percentages, 31.12.2015-30.6.2019)



Sources: Bloomberg and Bank of Greece.

Chart III.21 Equity indices

(left panel: 30.9.2015-30.9.2019, right panel: 30.3.2018-30.9.2019, in daily prices)



Source: Bloomberg.

In particular, the banking sector held shares and mutual fund units (in portfolios valued at current value) worth in total €811.8 million as at 30.6.2019, compared with €675.6 million at 31.12.2018 (see Table III.5). It is noted that the valuations of Greek shares and in particular of Greek banks' shares (Chart III.20) were considerably higher in 2019, but generally remain below the EU average (see Chart III.21).

The Greek banking sector's holdings of Greek government bonds

The value of the Greek government bond portfolio, including Treasury bills, held by the banking sector (in portfolios valued at current value) was €10.68 billion as at 30.6.2019, compared with €9.95 billion as at 31.12.2018 (see Table III.5).

The exposure to Greek government bonds is not considered significant, as this portfolio represents only 4.2% of the total assets of the banking sector, compared with 3.9% as at 31.12.2018. It is noted that the portfolios that are valued at current value refer to those classified as fair value through other comprehensive income (FVTOCI) portfolio of financial instruments, fair value through profit and loss (FVTPL) and held for trading (HFT) (Table III.5 and Chart III.22).

The performance of Greek 10-year government bonds has declined significantly in the period from January 2019 to September 2019. Specifically, while the yield was 4.4% on 1.1.2019, it then fell sharply, recording a historic low of 1.33% in September . The improvement of macroeconomic indicators, the stability in the political environment following the call of early elections and the decline in euro area bond yields, sometimes to negative levels, were the catalysts for the decline in Greek government bond yields. A milestone in the significant drop in Greek government bond yields was the issuance of three-month Treasury bills with negative interest rates. However, Greek government bonds have not yet reached investment grade status and their yields remain vulnerable, especially to any turbulence in international financial markets and uncertainty about Greece's commitment to economic reforms. The zero interest rate on the European Central Bank's main refinancing operations since March 2016 plays an important role towards lowering Greek government bond yields.

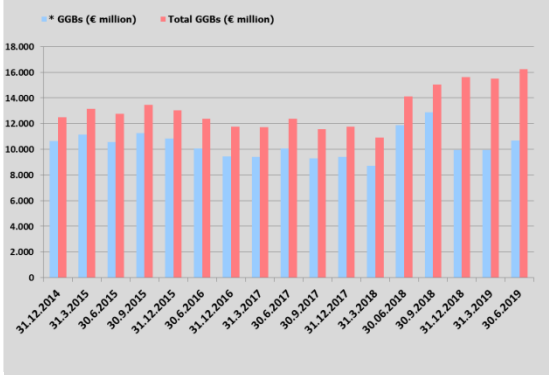
Table III.5 Securities portfolios of Greek banking groups

(balance sheet value, in million euro)

	31.3.2018	30.6.2018	30.9.2018	31.12.2018	31.3.2019	30.6.2019
All portfolios						
Greek Government Bonds (including Treasury Bills)	10,921.6	14,095.4	15,032.5	15,616.3	15,484.7	16,244.3
Total corporate bonds	730.1	780.3	826.3	949.5	908.8	830.3
Total shares	559	580.5	616.5	539.4	626.3	689.4
Total mutual fund units	140	138.6	137.7	134.8	119.2	122.4
Total holdings	556.4	472.5	451.9	403.0	446.0	518.7
Portfolios valued at current value						
Greek Government Bonds (including Treasury Bills)	8.720.1	11.886.8	12.876.2	9.951.2	9.940.3	10.682.8
Corporate bonds	701.3	751.4	797.4	643.6	888.5	810.0
Shares	559.0	580.5	616.2	554.4	626.3	689.4
Mutual fund units	139.9	138.6	137.7	121.2	119.2	122.4

Source: Bank of Greece.

Chart III.22 The Greek banking sector's holdings of GGBs

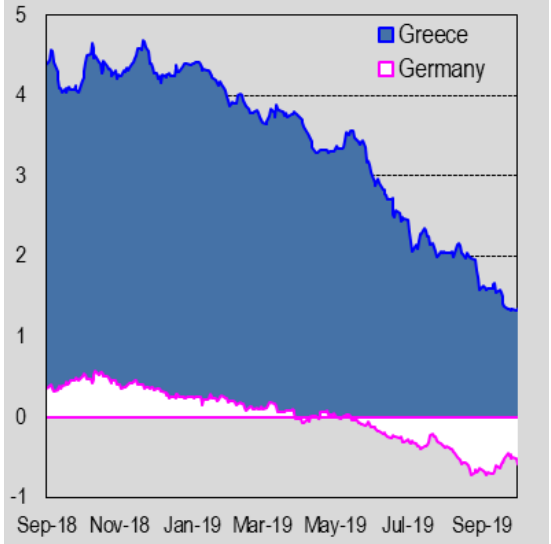


* Note: Greek Government Bonds (GGBs) available for sale, at fair value & held for trading. As of 1.1.2018 and the introduction of IFRS 9, fair value through other comprehensive income & held for trading purposes.

Source: Bank of Greece.

In the same vein, the spread of 10-year Greek government bond yields over the German Bund declined to 1.92% on 30.9.2019, with the latter yielding -0.57% (Chart III.23). The spread between 10-year Greek and German government bonds was halved (down by 51%) between 1.1.2019 and 30.9.2019. Nevertheless, this spread, although reduced, remains by far the largest among euro area countries.

Chart III.23 10-year Greek and German government bond yields



Source: Bloomberg.

The Greek banking sector's holdings of corporate bonds

The value of corporate bonds held by the banking sector remained very low, amounting to €810 million as at 30.6.2019, from €643.6 million as at 31.12.2018 (in portfolios valued at current value). As a result, the interest rate risk of corporate bonds for the banking sector remains very low.

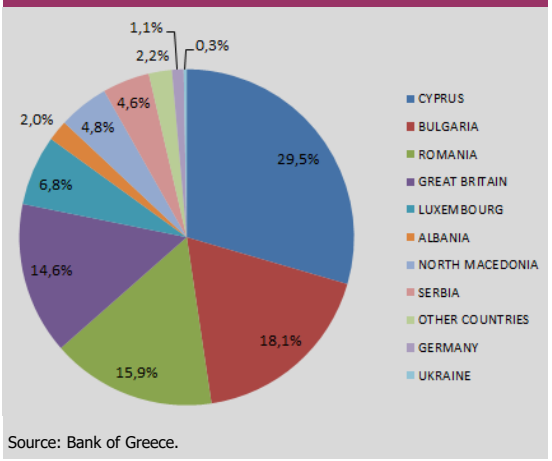
2.4 INTERNATIONAL ACTIVITY

Greek banking groups showed signs of stabilisation in the first half of 2019. In the context of commitments included in its restructuring plans, as approved by the European Commission, Piraeus Bank withdrew from Albania and completed the transfer of its subsidiary in Bulgaria to Eurobank Bulgaria AD.

Greek banks' assets abroad stood at €32.3 billion in June 2019, up by 1.2% from December 2018, while international activities now account for 12.6% of the banking sector's total assets on a consolidated basis. Broken down by region, South-East Europe (SE Europe)[23] accounts for 75.2% of total international activity business assets, mostly located in Cyprus, Bulgaria and Romania (see Chart III.24). Financial centres, namely the United Kingdom, Luxembourg and Germany, represent 22.5% thereof, led by the United Kingdom. The share of SE Europe in Greek banks' external position in deposits and loans is even larger (86.8% and 84.8%, respectively, see Table III.6). The region also accounts for the highest numbers of business units and staff.

[23] The activity of Greek banks in SE Europe is conducted through subsidiaries and branches in Albania, Bulgaria, Cyprus, North Macedonia, Romania, Serbia and Ukraine.

Chart III.24 Greek banking groups' assets - June 2019



Source: Bank of Greece.

international activity remained profitable in the first half of 2019, making a positive contribution of €77 million to pre-tax profits (compared with €60 million in the corresponding period of 2018). Activities in the United Kingdom, Serbia, and Egypt were loss-making.

Loans in arrears[24] declined by 6.3% from December 2018 to €3.7 billion or 19.3% of the loan book in June 2019. As a percentage of total loans, the ratio of loans in arrears was 15% for corporate loans, 31% for housing loans and 13% for consumer loans. Corporate and mortgage loans in arrears declined in June 2019 compared with December 2018 (-12% and -1%, respectively, on a comparable basis), while consumer loans in arrears increased by 2% (on a comparable basis). The coverage ratio stood at 65% (December 2018: 69%).

As regards liquidity, the loan-to-deposit ratio improved (June 2019: 89.7%, December 2018: 92.2%). Deposits picked up by 2.3% from December 2018 and lending declined marginally by 0.6% on a comparable basis.

The outlook for the profitability, liquidity and portfolio quality of Greek banks' international activity is positive, on the back of an improved economic sentiment in SE Europe and gradual focusing of Greek banks on niche markets.

3. RESILIENCE

The resilience of Greek banking groups was strengthened in the first half of 2019 on the back of improvements in capital adequacy and most profitability indicators. Key drivers behind this are profits after taxes and discontinued operations, as well as elevated prudential own funds.

3.1 PROFITABILITY

In the first half of 2019 Greek banks posted profits after taxes and discontinued operations amounting to €390 million, compared with losses in the corresponding period of 2018 (see Table III.7).

[24] Defined as l oans more than 90 days past due.

In more detail, operating income fell marginally on an annual basis, as the decline in net interest income was largely offset by an increase in non-interest income. As regards the former, interest income declined more than interest expense in absolute terms, negatively affected by banks' continued deleveraging (shedding of assets) and gradually declining lending rates. The drop in interest expenses was driven by the elimination of banks' exposure to Emergency Liquidity Assistance (ELA) and reduced cost of deposits. As a result, the net interest margin of Greek banks fell by 20 basis points year-on-year, to 2.2% in the first half of 2019 (see Table III.8), but remaining well above that of medium-sized banking groups in the EU.

Net non-interest income rose by 11.6% on an annual basis. Important drivers behind this were a pick-up in income from financial operations on the back of Greek government bond portfolio profitability, albeit non-recurring. In addition, other income more than doubled. By contrast, fee income fell marginally, reflecting conjunctural factors (e.g. lower turnover from letters of guarantee).

Operating costs were further reduced, mainly as a result of banks' ongoing restructuring, i.e. staff and branch network reduction. The introduction of International Financial Reporting Standard 16 (IFRS 16) on 1 January 2019 did not significantly impact operating costs, as higher depreciation costs were largely offset by reduced administrative costs.

Against this background, Greek banks' operating profits increased in the first half of 2019 and their cost-to-income ratio further improved, albeit remaining below that of medium-sized banking groups in the EU.

Table III.7 Financial results of the Greek banking sector

(amounts in million euro)

	H1 2018	H1 2019	Change (%)
Operating income	**3.923**	**3.912**	**-0.3**
Net interest income	2.961	2.839	-4.1
- Interest income	*4.011*	*3.836*	*-4.4*
- Interest expenses	*-1.050*	*-997*	*-5.0*
Net non-interest income	962	1.073	*11.6*
- Net fee income	*566*	*562*	*-0.8*
- Income from financial operations	*362*	*424*	*17.2*
- Other income	*34*	*87*	*>100*
Operating costs	**-2.157**	**-1.974**	**-8.5**
Staff costs	-1.200	-1.039	-13.4
Administrative costs	-783	-683	-12.7
Depreciation	-174	-252	44.4
Net income (operating income less costs)	**1.766**	**1.938**	**9.7**
Provisions for credit risk (impairment charges)	-1.462	-1.367	-6.5
Other impairment losses	-70	-17	-75.1
Non-recurring profits/losses	-84	-205	>100
Pre-tax profits (+)/losses (-)	**150**	**349**	**>100**
Taxes	-137	-65	-52.2
Profits(+)/losses(-) from discontinued operations	-327	106	-
After tax profits (+)/losses (-)	**-314**	**390**	**-**

Source: Financial statements for Greece's four significant banks (SIs) and supervisory data for the less significant banks (LSIs).

The cost of credit risk[25] decreased in the first half of 2019, mirroring a 6.5% year-on-year drop in provisions for credit risk. This reflects gradual progress towards tackling the high NPL stock and the improved macroeconomic environment. By contrast, non-recurring losses, mainly due to restructuring costs, increased.

Underlying the return to profitability were profits from discontinued operations, mainly related to the sale of subsidiaries and affiliated companies of Greek banks.

Banking groups recorded profits after tax and discontinued operations, compared with losses in the corresponding periods of previous years. Therefore, the return on assets (RoA) and return on equity (RoE) indicators of banking groups moved into positive territory (0.3 and 2.7, respectively). However, they fall significantly short of the corresponding indicators for medium-sized banks in the EU (0.5 and 6.6, respectively) (see Table III.8).

The medium-term outlook for profitability crucially hinges on the Greek economy achieving higher growth rates and NPLs being drastically reduced. Banks' efforts to achieve the newly agreed targets for reducing NPLs and their readiness to make use of systemic solutions will help in this direction.

Moreover, banks should review their business models, taking account of the environment of very low or even negative interest rates. In this context, emphasis should be placed on banks resuming their intermediation role and developing new, innovative products, so as to diversify their income sources.

3.2 CAPITAL ADEQUACY

Greek banks' capital adequacy improved in the first half of 2019 thanks to an increase in their prudential own funds.

In June 2019, the Capital Adequacy Ratio (CAR) rose to 16.5% on a consolidated basis, from 16% in December 2018 (see Chart III.25), and the CET1 ratio stood at 15.6%, up from 15.3%.

This is due to a 5.9% increase in the pruden-

Table III.8 Banking groups' profitability indicators in Greece and in the European Union

(in percentages)

	Greece[1,2]		EU 28[2,3]
	H1 2018	H1 2019	Q1 2019
Net interest margin	2.4	2.2	1.5
Operating costs/Total assets	1.8	1.5	1.6
Cost-to-income ratio	55.0	50.5	66.1
Provisions for credit risk/Net loans (Cost of credit risk)	1.9	1.8	
Provisions for credit risk/Operating income	37.3	34.9	
Return on Assets (RoA)	-0.26	0.30	0.5
Return on Equity (RoE)	-2.3	2.7	6.6

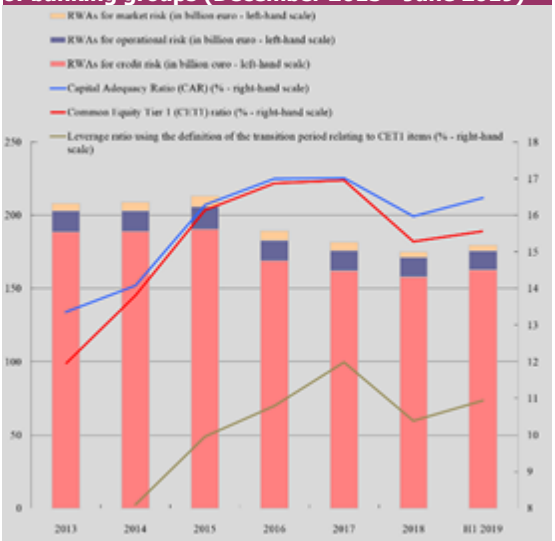
Sources: Financial Statements of Greece's four significant banks (SIs) and supervisory data for the less significant banks (LSIs) and ECB Statistical Data Warehouse (SDW).

[1] Indicators are calculated using total assets at the end of the corresponding period.

[2] RoA and RoE indicators are calculated using profits/losses after taxes and discontinued operations.

[3] Data refer to medium-sized (by assets) banking groups in the EU-28.

Chart III.25 Breakdown of RWAs by type of risk, evolution of capital adequacy and leverage ratio of banking groups (December 2013 - June 2019)



Source: Bank of Greece.

tial own funds of Greek banking groups in the first half of 2019 as a result of:

• the merger of Grivalia Properties Real Estate Investment Company with Eurobank Ergasias S.A.;

• the issuance of Tier 2 capital instruments; and

• after-tax profitability.

The issuance of subordinated bonds by two systemic banks signals their return to international capital markets and creates positive prospects for further bond issuance.

Higher prudential own funds were partly offset by an increase, albeit at a slower pace, in risk-weighted assets (by 2.7% in the first half of 2019).

In May 2019, a bank's request to switch from the internal ratings-based approach (IRB) to the standardised approach (STD) for measuring credit risk was approved by the Single Supervisory Mechanism (SSM), increasing the bank's risk-weighted assets.

Greek banks' leverage also improved in the first half of 2019 compared with 2018 (see Chart III.25), on the back of Tier 1 capital growing faster than the total exposures taken into account for calculation of the leverage ratio.

As regards the medium-term outlook for capital adequacy, Greek banks are facing a stricter capital requirements framework, in particular taking into account the gradual impact of IFRS9 implementation, the expected O-SII buffer increase and the entry into force of the prudential provisioning backstop.

3.3 LEVERAGE

Greek banks' leverage ratio[26] (Tier 1 capital/exposures) increased further in the first half of 2019 to reach 9% (from 8.2% at end-2018), well above the corresponding ratio for the banks directly supervised by the ECB (5.24% in the first half of 2019). This increase was mainly due to the merger of Grivalia Properties Real Estate Investment Company with Eurobank Ergasias S.A., banks' marginal profitability, the sale of troubled assets to Credit Servicing Firms (CSFs), as well as profits related to the investment portfolio repricing, which had a positive effect of €1.7 billion (or 8.%) on the leverage ratio. The denominator (total leverage ratio exposure using a fully phased-in definition of CET1 capital) decreased by €2.8 billion or 1.1%.

The deposits-to-GDP ratio remained unchanged in the first half of 2019 (at 86.2%). At the same time, the asset-to-GDP ratio increased marginally (to 160.8%, from 158.1%), mainly as a result of further purchases and repricing of bonds held in the investment portfolio, despite loan portfolio deleveraging.

[26] Defined as Tier 1 capital (fully phased-in definition) to Total Leverage Ratio exposure (using a fully phased-in definition of Tier 1 capital).

IV. OTHER SECTORS OF THE FINANCIAL SYSTEM

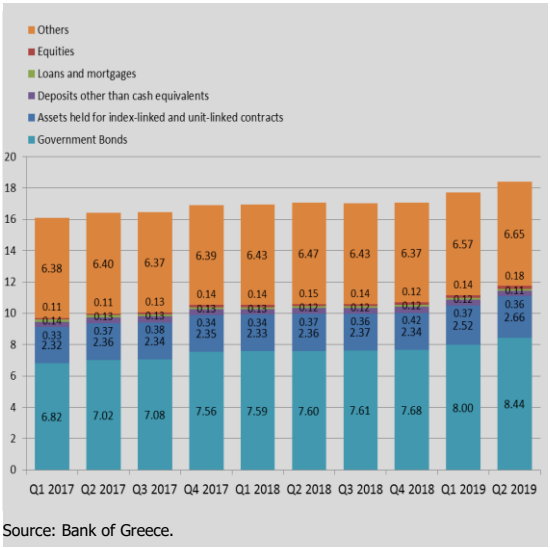
1. INSURANCE UNDERTAKINGS

1.1 EVOLUTION OF KEY BALANCE SHEET AGGREGATES

According to Bank of Greece data, in June 2019, the assets of insurance undertakings increased to €18.4 billion, compared with €17.1 billion in June 2018, continuing the upward trend recorded in recent years (see Chart IV.1).

Chart IV.1 Asset structure of insurance undertaking

(in billion euro)



Source: Bank of Greece.

In terms of asset structure, government bonds have long been the main category of investment by insurance undertakings. Thus, in the first half of 2019, government bond holdings accounted for 45.9% of total assets, reaching €8.4 billion, compared with 44.5% and €7.6 billon in the corresponding period of 2018 (see Chart IV.1).

The second most important asset category are index-linked and unit-linked contracts (contracts whose returns are linked to investments or indices). In June 2019, this category of assets amounted to €2.7 billion, compared with €2.4 billion in June 2018, accounting for 14.4% of total assets (June 2018: 13.8%).

Gross written premiums across the industry in the first half of 2019 stood at €2.1 billion, up by 8% year-on-year. Likewise, gross compensation increased by 7% in the first half of 2019, reaching €1.1 billion, compared with €1.0 billion in the first half of 2018.

At the end of June 2019, the total Solvency Capital Requirement (SCR) of the insurance industry stood at €1.9 billion, while total eligible equity amounted to €3.2 billion. At the same time, the Minimum Capital Requirement (MCR) for the industry was estimated at €0.7 billion, while the corresponding total eligible equity amounted to €3.1 billion.

2. OTHER FINANCIAL INSTITUTIONS

2.1 LEASING COMPANIES – FACTORING COMPANIES – CONSUMER CREDIT COMPANIES

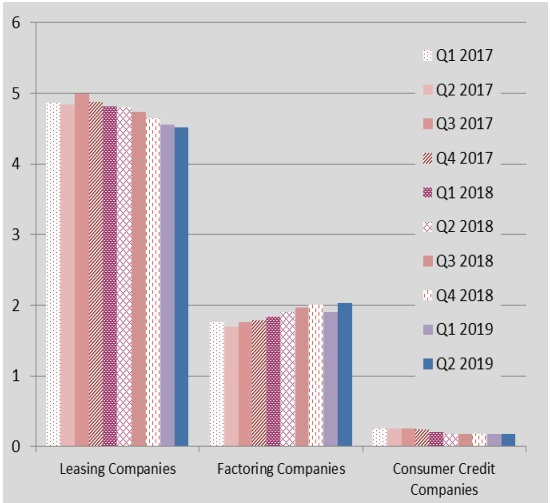
According to Bank of Greece data, leasing companies' assets followed a downward path in the first half of 2019, continuing the trend recorded in recent years, reaching €4.5 billion in June 2019, compared with €4.8 billion in June 2018 (see Chart IV.2).

On the contrary, factoring companies' assets have been rising in recent years, amounting to €2.0 billion in June 2019, up by 6.3% from June 2018 (€1.9 billion).

At the same time, consumer credit companies' assets remained at approximately the same level as in recent years, reaching €176.9 million, compared with €179.5 million in the second quarter of 2018.

Chart IV.2 Evolution of assets of other financial institutions

(in billion euro)



Source: Bank of Greece.

Regarding the interconnection of other financial institutions with credit institutions, their liabilities to credit institutions increased slightly in the first half of 2019, reaching 14.2% of total liabilities at end-June 2019, compared with 13.4% in the same period of the previous year. At the same time, claims on credit institutions also increased slightly, reaching 3.2% of their total assets in the first half of the current year, compared with 3% in the same period last year.

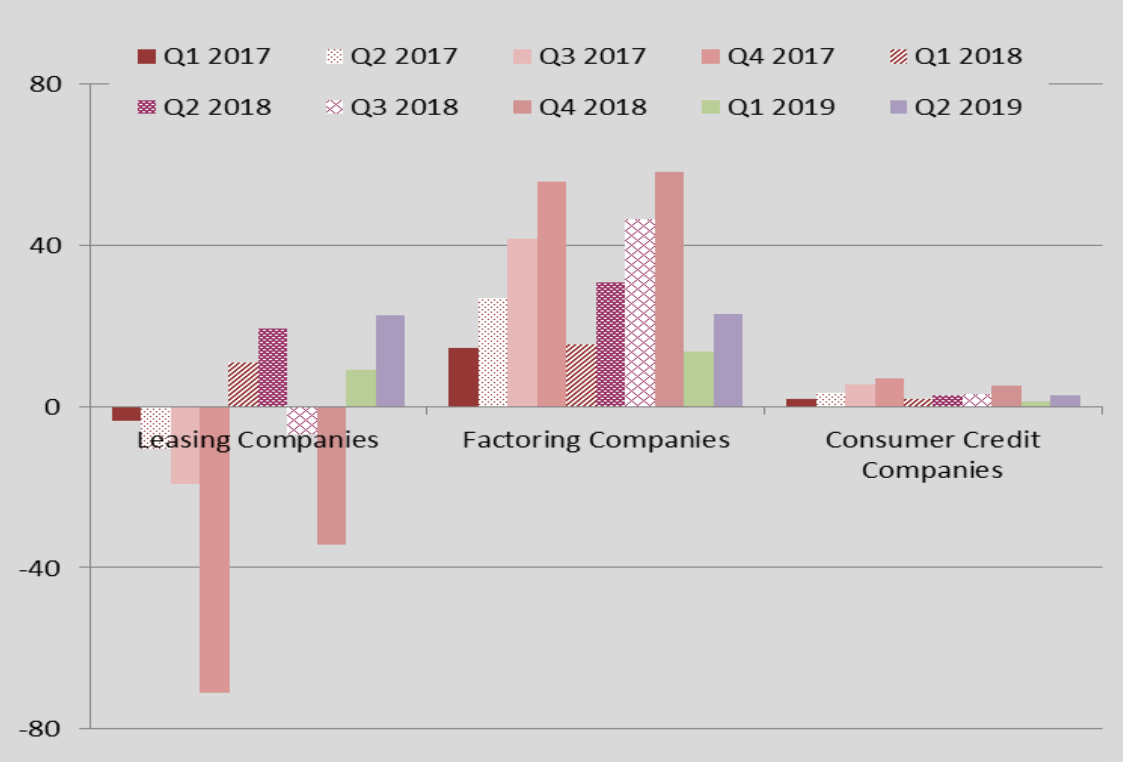
As regards income statements, leasing companies recorded profits of €9.1 million and €22.6 million respectively for the first and second quarter of 2019 (first quarter of 2018: €11.2 million, second quarter of 2018: €19.4 million).

At the same time, both factoring and consumer credit companies continued to post profits. These profits were lower for factoring companies, amounting to €22.8 million in the second quarter of 2019 (compared with €31 million in the second quarter of 2018). For consumer credit companies, profitability remained at approximately the same level (€2.9 million in the second quarter of 2019, compared with €2.8 million in the same quarter last year) (see Chart IV.3).

Finally, non-performing exposures (on- and off-balance-sheet) for the three sectors (leasing, factoring and consumer credit companies) totalled €2.78 billion in June 2019, down by 13.3% compared with the first half of the previous year (€3.2 billion). Likewise, the percentage of non-performing exposures to total exposures (NPE ratio) decreased to 35.7% in the second quarter of 2019, compared with 39.8% in the same period of 2018 (see Chart IV.4).

Chart IV.3 Evolution of Income Statements of other Financial Institutions

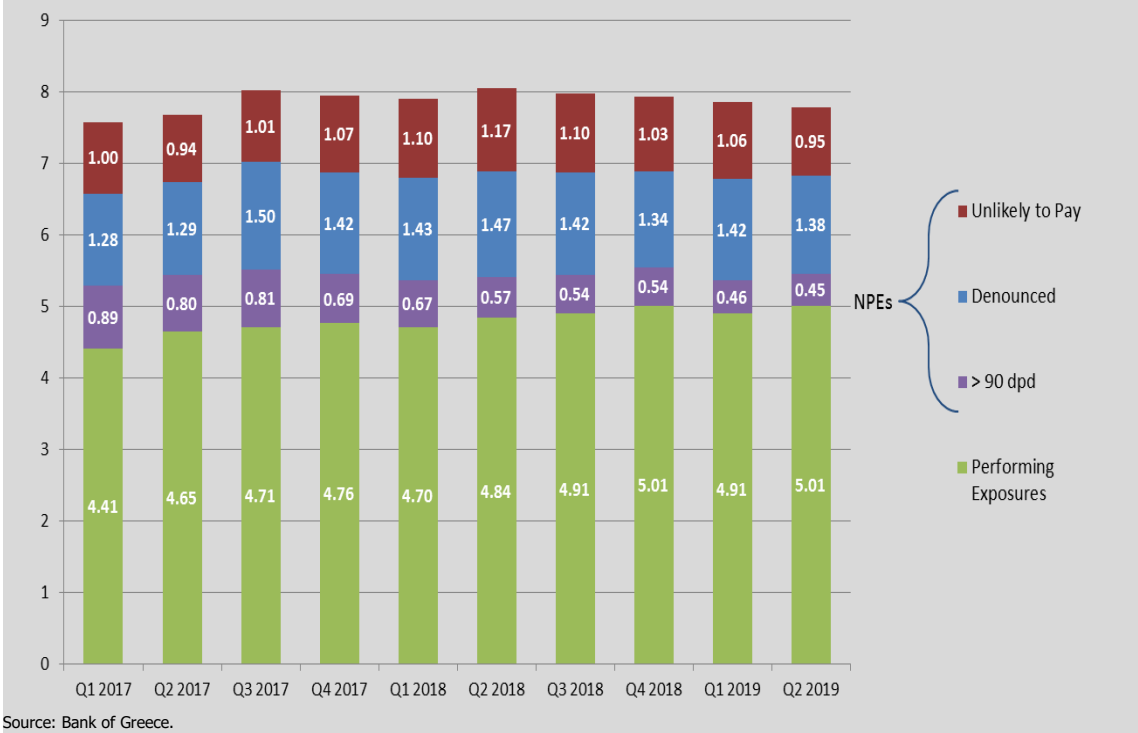
(in billion euro)



Source: Bank of Greece.

Chart IV.4 Performing and non-performing exposures

(in billion euro)



Source: Bank of Greece.

V. FINANCIAL MARKET INFRASTRUCTURES

1. ELECTRONIC PAYMENT INSTRUMENTS

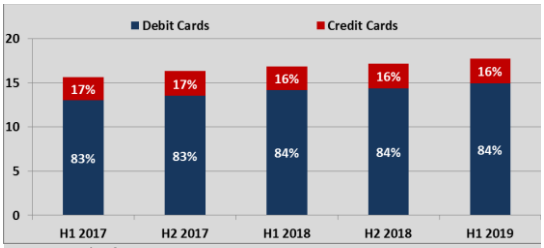
1.1 PAYMENT CARDS

Number of payment cards

In the first half of 2019, the total number of payment cards[27] in circulation rose further by 539,000 (+4%) from the second half of 2018, to 17.7 million cards. The rise is attributed to the issuance of 540,000 new debit cards (+4%) and a commensurate decrease in the number of credit cards, relative to the second half of 2018. Regarding the types of cards, at the end of the first half of 2019 the shares of debit cards (84%) and credit cards (16%) in total payment cards remained unchanged from their end-2018 levels (see Chart V.1).

Chart V.1 Number of cards per card type

(in million euro)



Source: Bank of Greece.

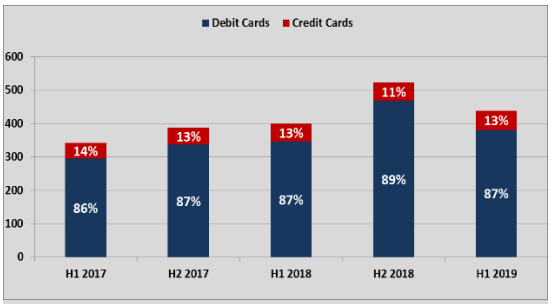
Transactions with payment cards

Despite the rising number of payment cards, both the total number and the total value of card transactions declined, compared with the second half of 2018.

More specifically, the total number of card transactions fell by 16% to 438.3 million (see Chart V.2).

Chart V.2 Number of card transactions

(in million euro)

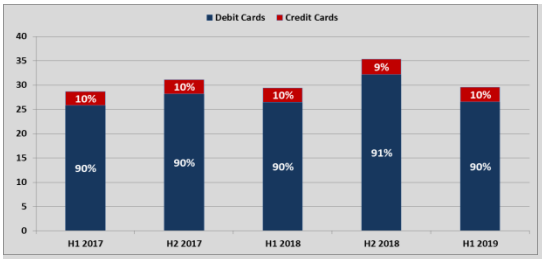


Source: Bank of Greece.

The corresponding total value of card transactions also dropped by 16% to €29.6 billion (see Chart V.3).

Chart V.3 Value of card transactions

(in billion euro)



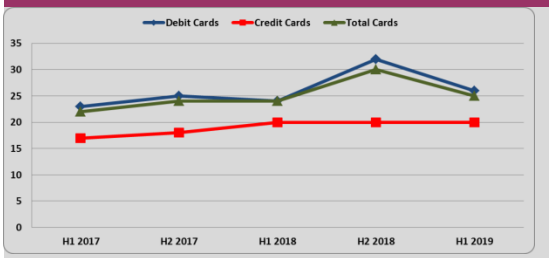
Source: Bank of Greece.

Focusing on transactions per card, the average number of transactions per card fell to 25, from 30 in the second half of 2018.

Debit cards continued to be the leading substitute for cash in the first half of 2019, although the average number of transactions per debit card dropped to 26, from 32 in the second half of 2018. The average number of transactions per credit card remained unchanged at 20 transactions for the second consecutive half (see Chart V.4).

[27] For the purposes of this Review, debit cards comprise prepaid cards and cards that can be used for cash withdrawals but not for purchases. Credit cards comprise virtual cards and delayed debit cards.

Chart V.4 Average number of transactions per card type

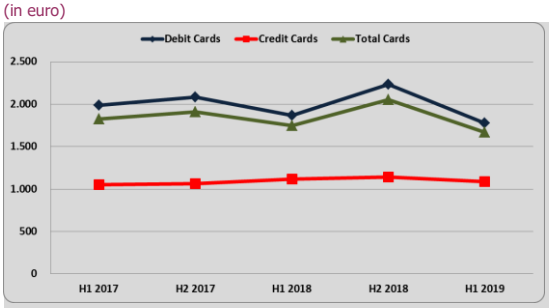


Source: Bank of Greece.

Compared with the second half of 2018, the average value of transactions per card declined by 19% to €1,668. This decrease is mainly due to a drop in the average value of transactions per debit card by 20% to €1,777. Likewise, the average value of transactions per credit card fell by 4.5% to €1,089 (see Chart V.5).

Chart V.5 Average value of transactions per card type

(in euro)

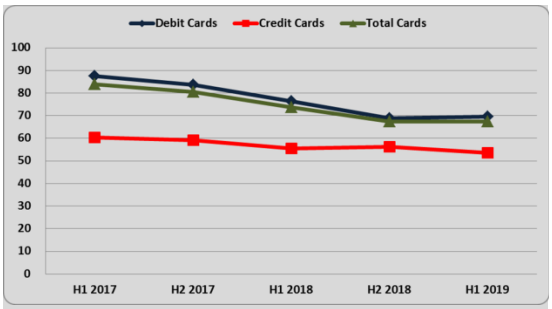


Source: Bank of Greece.

The average value per card transaction, for all types of cards, remained unchanged at €67, while the average transaction value for debit cards increased by 1% to €70 and the average transaction value for debit cards fell by 4.7% to €54, compared with the second half of 2018 (see Chart V.6).

Chart V.6 Average value per card transaction

(in euro)



Source: Bank of Greece.

Payment card transactions fraud

Monitoring of fraud in payment card transactions contributes to maintaining public confidence in the use of electronic payment instruments.

Key indicators of the intensity of card fraud are the number and value of fraudulent transactions as a percentage of the total number and value of card transactions, respectively.

In the first half of 2019, in volume terms, the fraud-to-transaction ratio stood at 0.03% and accounted for one fraudulent transaction per 4,000 card transactions (see Table V.1).

Table V.1 Fraud-to-transaction ratio - Volume

Period	Number of transactions	Number of fraudulent transactions	Fraud to transaction ratio
H1 2019	438,272,567	125,288	0.03%
H2 2018	524,130,575	78,394	0.01%
H1 2018	399,595,423	68,923	0.02%
H2 2017	387,083,435	52,656	0.01%
H1 2017	341,718,924	44,549	0.01%

Source: Bank of Greece.

In terms of fraud value, the corresponding ratio stood at 0.02% and accounted for €1 of fraud per €5,300 of card transactions (see Table V.2).

Table V.2 Fraud-to-transaction ratio - Value

(in euro)

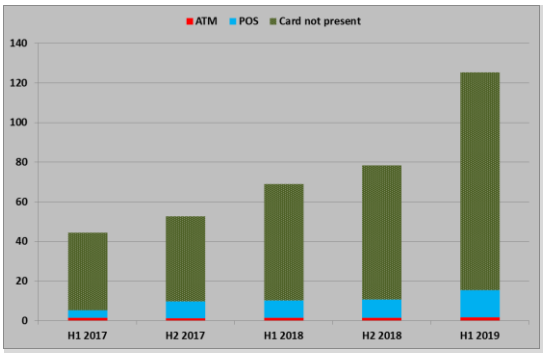
Period	Value of transactions	Value of fraudulent transactions	Fraud to transaction ratio
H1 2019	29,588,111,093	5,537,203	0.02%
H2 2018	35,362,782,570	3,903,583	0.01%
H1 2018	29,432,685,152	3,774,148	0.01%
H2 2017	31,149,471,319	3,349,095	0.01%
H1 2017	28,644,468,194	3,046,983	0.01%

Source: Bank of Greece.

A breakdown of fraud per card transaction type, i.e. (a) ATM transactions, (b) POS payments and (c) card not present (CNP) transactions, shows that fraud is most prevalent in remote transactions via the internet, telephone orders and mail orders (see Charts V.7 and V.8).

Chart V.7 Number of fraudulent transactions per transaction type

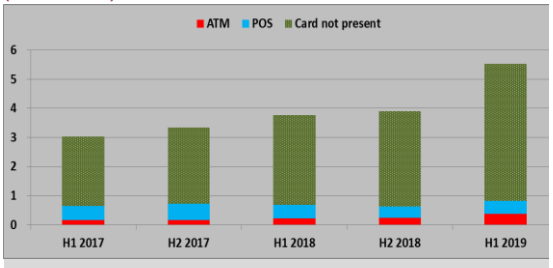
(in million transactions)



Source: Bank of Greece.

Chart V.8 Value of fraudulent transactions per transaction type

(in million euro)



Source: Bank of Greece.

In the first half of 2019, the number of fraud incidents recorded per card transaction type reached 1,700 ATM transactions, 13,500 POS payments and 110,000 CNP payments.

The corresponding fraud value came to €379,700 in ATM transactions, €437,500 in POS payments and €4.7 million in CNP payments.

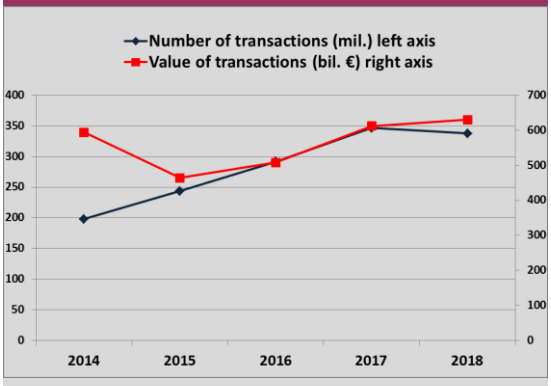
The in-depth analysis of CNP fraud suggests that the vast majority of incidents are related to cross-border online transactions. In contrast to the Greek payments market, where payment service providers make extensive use of the international protocol for secure transactions "3DSecure", thereby maintaining fraud in domestic internet transactions at a low level, the limited use of this technology by foreign payment service providers leads to higher fraud rates in cross-border internet transactions.

1.2 CREDIT TRANSFERS

Credit transfer transactions

On the basis of data collected by the Bank of Greece, in 2018 a total of 337 million customer transactions using credit transfers were effected, worth a total of €630 billion. Compared with 2017, the number of credit transfer transactions dropped by 3%, but their value rose by 3% (see Chart V.9).

Chart V.9 Credit transfers - Number and value of transactions



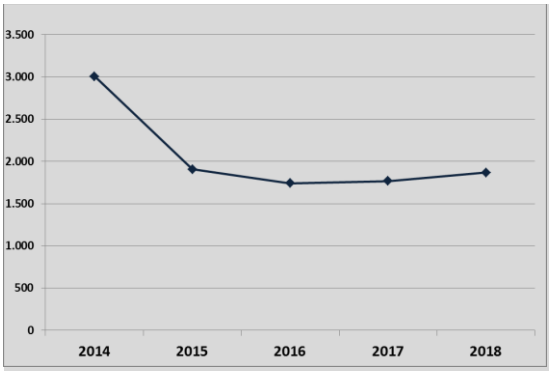
Source: Bank of Greece.

This can be attributed to the gradual lowering of the daily and monthly ceilings on the values transferred, imposed on natural and legal

persons in the context of the capital controls that were introduced to the Greek financial system in the second half of 2015. As a consequence, the average value per transaction increased by 6% to €1,866, from €1,767 in 2017 (see Chart V.10).

Chart V.10 Credit transfers - average value per transaction

(in euro)



Source: Bank of Greece.

Credit transfer transactions fraud

Based on 2018 data collected from a representative sample of payment service providers,[28] fraud rose by 45% year-on-year in terms of the number of credit transfer transactions and by 34% year-on-year in terms of their value. In more detail, there were 61 fraud incidents amounting to €212,600 in 2018, compared with 42 fraud incidents amounting to €158,500 in 2017.

The ratios of the number and value of fraudulent credit transfers to the total number and value of credit transfer transactions remained at the very low levels of 0.00002% and 0.00004%, respectively, accounting for one fraudulent transaction per 5 million credit transfers effected and €1 of fraud per €2.3 million transferred.

With regard to fraud techniques, the vast majority focuses on the extraction of users' personal credentials through phishing.

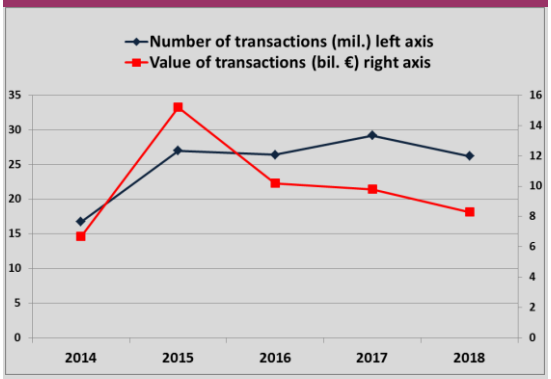
In order to raise security awareness among credit transfer users, payment service providers continue to engage in large-scale campaigns in order to inform both consumers and enterprises appropriately. The objective of information campaigns is to urge users to adopt transaction practices that are safe against third-party malicious actions.

1.3 DIRECT DEBITS

Direct debit transactions

On an annual basis, customer transactions using direct debits in 2018 decreased by 10% from 2017, to 26.2 million. Their corresponding value also dropped by 15% to €8.3 billion (see Chart V.11).

Chart V.11 Direct debits - Number and value of transactions



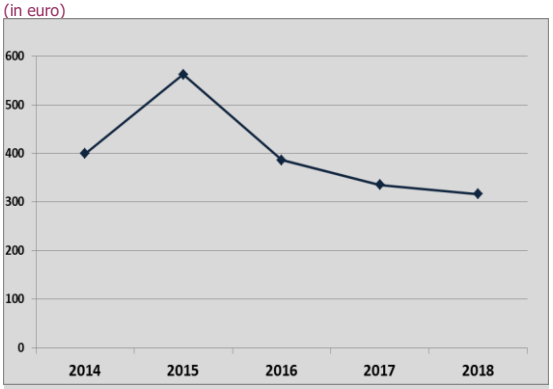
Source: Bank of Greece.

The reduced number and lower value of transactions are reflected in the average value per direct debit transaction, which decreased to €317, from €336 in 2017 (see Chart V.12).

[28] The sample accounts for 90% of the total volume and 80% of the total value of customer credit transfers.

Chart V.12 Direct debits - Average value per transaction

(in euro)



Source: Bank of Greece.

Direct debit transactions fraud

Direct debits continue to be regarded as the safest payment instrument given that no fraud incidents were reported by payment service providers also in 2018.

2. CENTRAL SECURITIES DEPOSITORIES

Central Securities Depositories (CSDs) are financial market infrastructures that keep records of ownership of securities issued in their home market, maintain accounts of various entities, usually financial institutions, for the registration of such securities and facilitate the transfer of ownership of these securities between individuals or entities in a secure manner through the settlement process.

The settlement of a security transaction between a buyer and a seller, executed either on a regulated market or over-the-counter, involves the transfer of cash and/or financial instruments between the parties on the books of a central securities depository, with a view to the fulfilment of the obligations of the parties to the transaction.

The two CSDs operating in Greece are described in the following two paragraphs.

2.1 THE BANK OF GREECE SECURITIES SETTLEMENT SYSTEM (BOGS)

The Bank of Greece Securities Settlement System (System for Monitoring Transactions in Book-Entry Securities – BOGS) is the central depository and securities settlement system where Greek government and other agencies' securities in book-entry form are issued, registered and monitored and the clearing and settlement of transactions in those securities are carried out.

In the first half of 2019, the system operated smoothly in an environment of relatively higher trading activity compared with the corresponding period of the previous year, owing to improved international financial conditions, which had a positive impact on the Greek securities market.

In more detail, the daily average value of transactions settled in BOGS in the first half of 2019 (buy/sell transactions, repo transactions, domestic transfers, etc.) amounted to around €1.5 billion, compared with €1.1 billion in the same period of 2018 (see Table V.3 and Chart V.13). Out of this total, the average daily value of buy/sell securities transactions settled in the system in the first half of 2019 increased significantly to €549 million, from €320 million in the corresponding period of the previous year.

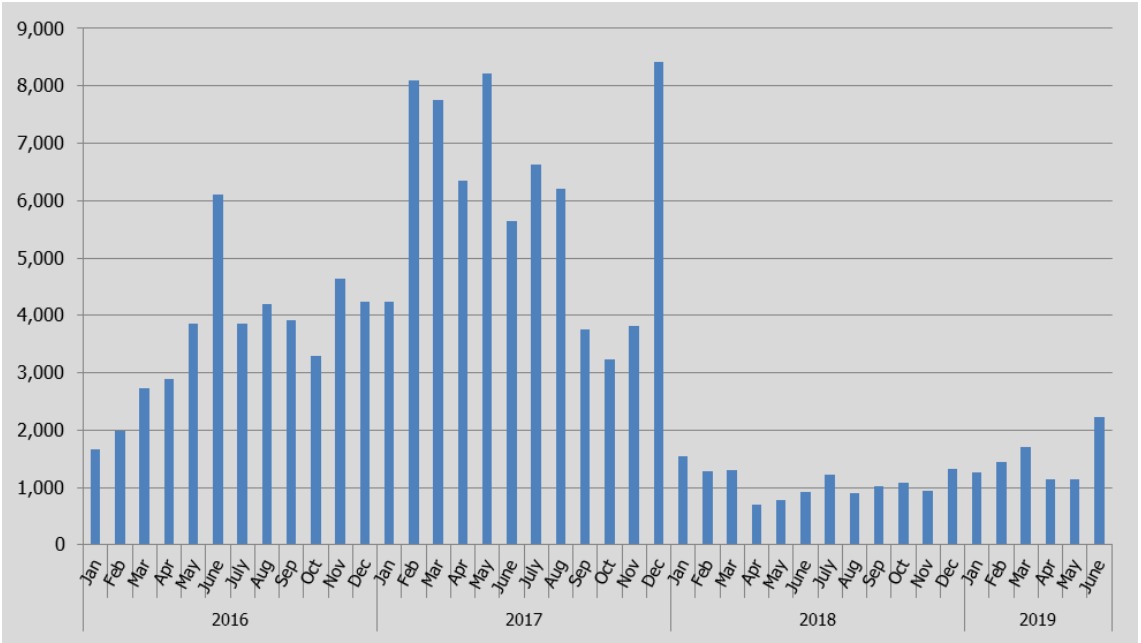
Table V.3 Daily average value and volume of transactions settled in BOGS

	Daily average value (in million euro)							Daily average transaction volume		
	2013	2014	2015	2016	2017	2018	2019	2017	2018	2019
January	3,043.14	7,154.57	7,875.16	1,655.73	4,235.79	1,548.34	1,260.33	243.23	319.41	237.45
February	5,309.67	7,230.32	9,732.19	1,984.11	8,092.08	1,277.22	1,438.64	317.45	313.90	336.65
March	6,430.53	7,416.68	6,573.52	2,727.62	7,755.32	1,294.59	1,703.39	311.30	288.76	360.10
April	5,867.68	8,633.30	6,258.86	2,899.13	6,342.42	697.84	1,146.08	268.67	236.50	307.60
May	7,410.18	7,132.08	5,386.06	3,853.81	8,219.23	772.86	1,139.99	417.00	273.45	260.17
June	7,810.40	7,258.80	7,278.41	6,096.57	5,652.42	919.38	2,236.98	313.86	298.38	359.00
July	6,796.00	5,970.67	762.52	3,853.60	6,632.58	1,219.55		324.14	306.45	
August	5,320.37	4,372.33	947.13	4,204.61	6,210.87	909.41		240.78	177.39	
September	7,087.89	5,129.95	773.63	3,911.92	3,759.71	1,017.99		323.62	204.50	
October	8,706.07	6,397.47	1,397.40	3,284.88	3,425.98	1,087.59		316.32	215.13	
November	8,274.94	4,814.90	1,499.89	4,639.48	3,808.32	943.20		702.82	189.73	
December	9,141.36	5,262.31	2,590.70	4,235.34	8,411.44	1,317.13		466.47	200.16	

Source: Bank of Greece.

Chart V.13 Daily average value of transactions settled in BOGS (2016 –June 2019)

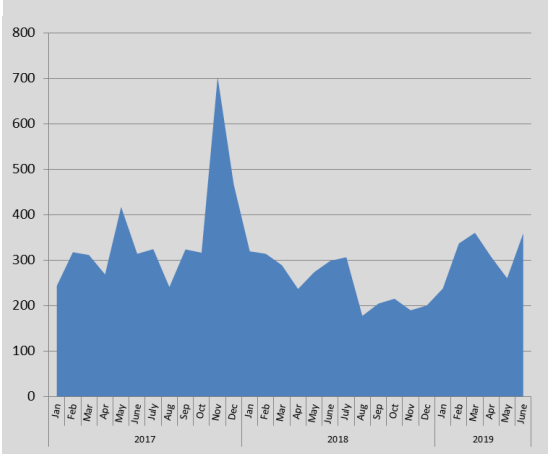
(in million euro)



Source: Bank of Greece.

Similarly, during the first six months of 2019, the daily average volume of transactions (buy/sell transactions, repo transactions, domestic transfers, etc.) settled in BOGS increased by 7.5% year-on-year and amounted to 359 transactions in June 2019, compared with 298.4 transactions in the corresponding month of 2018 (see Table V.3 and Chart V.14).

Chart V.14 Daily average volume of transactions settled in BOGS (January 2017 –June 2019)



Source: Bank of Greece.

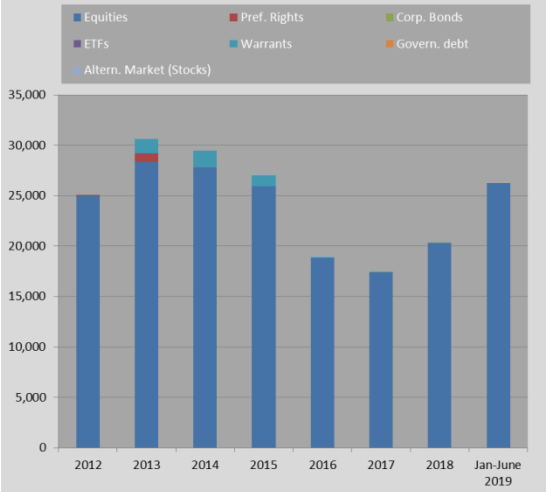
2.2 THE HELLENIC CENTRAL SECURITIES DEPOSITORY (ATHEXCSD) OF THE HELLENIC EXCHANGES GROUP

The Hellenic Central Securities Depository (ATHEXCSD) of the Hellenic Exchanges Group is the central securities depository that provides registry and settlement services for transactions in securities and other financial instruments at the level of the end-investor.

All dematerialised securities listed or admitted to trading on the Athens Exchange, securities that have not been admitted to trading on a regulated market, as well as securities that have been registered with foreign CSDs are registered and monitored in the Dematerialised Securities System (DSS) managed by ATHEXCSD.

Settlement activity in ATHEXCSD showed a significant increase during the first half of 2019 year-on-year, as presented in Table V.4 and Charts V.15 and V.16.

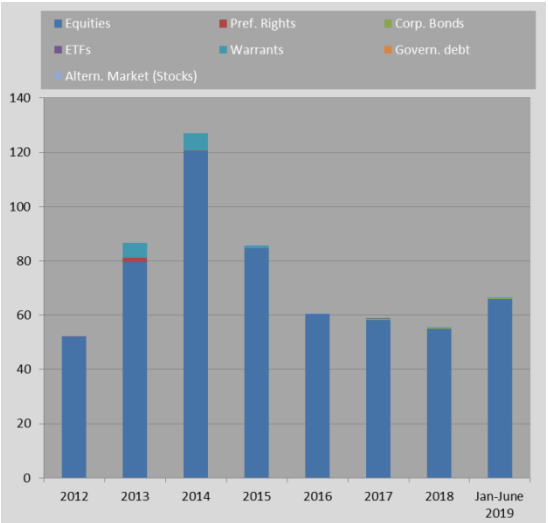
Chart V.15 Daily average volume of Athens Exchange transactions settled in ATHEXCSD



Source: ATHEXGROUP, Monthly Statistics Bulletin, AxiaNumbers.

Chart V.16 Daily average cash value of Athens Exchange transactions settled in ATHEXCSD

(in million euro)



Source: ATHEXGROUP, Monthly Statistics Bulletin, AxiaNumbers.

In particular, the average daily number of stock exchange transactions settled in the system in the first six months of the year increased significantly to 26,292, compared with 22,849 in the same period of 2018, but

Table V.4 Daily average volume and value of Athens Exchange transactions[1] settled in ATHEXCSD

	Equities	Pref. Rights	Corporate Bonds	ETFs	Warrants[2]	Government Debt	Alternative Market (Stocks)	Total
Daily average volume of transactions settled in ATHEXCSD								
2012	24,965	42	6	7	-	0	-	25,020
2013	28,379	793	1	8	1,462	0	-	30,643
2014	27,728	30	0	7	1,689	0	-	29,454
2015	25,890	1	0	5	1,096	0	1	26,993
2016	18,810	0	2	3	54	0	1	18,870
2017	17,436	10	28	2	22	0	4	17,501
2018	20,324	7	41	2	-	0	11	20,385
Jan-June 2019	26,210	7	49	2	-	1	23	26,292
Daily average cash value of transactions settled in ATHEXCSD (in thousand euro)								
2012	51,812.5	12.7	31.2	51.6	-	0.0	-	51,908.0
2013	79,718.3	1,276.8	2.1	42.3	5,584.9	0.0	-	86,624.4
2014	120,284.3	109.2	1.1	61.9	6,601.1	0.0	-	127,057.7
2015	84,547.5	0.0	0.1	35.6	1,127.1	0.1	2.3	85,710.4
2016	60,408.5	0.0	26.8	9.5	10.1	0.0	7.7	60,462.7
2017	58,211.5	1.9	551.4	37.7	3.7	0.0	5.4	58,811.7
2018	54,962.4	0.7	657.4	47.5	-	0.0	6.9	55,674.9
Jan-June 2019	65,774.1	4.6	815.0	22.4	-	55.3	12.0	66,683.5

Source: ATHEXGROUP, Monthly Statistics Bulletin, AxiaNumbers.

[1]Athens Exchange transactions settled in ATHEXCSD are calculated with the single count method (BUYS only).

[2] Warrants are the financial products listed for trading on the Athens Stock Exchange in the context of the recapitalisation of Greek banks (Cabinet Act 38 of 9.11.2012). They were available for up to fifty-four (54) months from the date of issue and expired in December 2017 and January 2018.

their average daily value decreased to €66.68 million, from €68.12 million.

Finally, there was a renewed increase in trading in corporate bonds this year, as new issues of corporate bonds were listed on the Athens Stock Exchange. In particular, the average daily number of settled corporate bond transactions amounted to 49 in the first half of 2019, compared with 46 in the same period in 2018, and their average daily value increased to €815,000, from €733,500 in the first half of 2018.

3. CENTRAL COUNTERPARTIES

Central Counterparties are financial market infrastructures that function as intermediaries between the buyers and sellers of financial contracts, acting as the buyer to every seller and the seller to every buyer. In this way they ensure that the obligations stemming from those contracts are fulfilled.

3.1 ATHENS EXCHANGE CLEARING HOUSE (ATHEXCLEAR)

The Athens Exchange Clearing House (ATHEXClear) offers clearing services and acts as central counterparty for the clearing of financial products in the securities and derivatives markets, as well as the Securities Lending Facility of the Athens Stock Exchange.

Table V.5 Daily Average Traded Volume in the Derivatives Market by commodity type and in the Securities Lending Mechanism of the Athens Stock Exchange

	Index Futures	Index Options	Stock Futures	Stock Options	Lending (Multilateral/Bilateral)	Total
2015	9,574	425	55,651	60	2,891	68,600
2016	3,596	269	58,218	48	1,318	63,449
2017	2,508	379	74,494	98	1,226	78,705
2018	2,573	326	53,063	47	670	56,679
Jan-June 2019	2,054	283	44,589	82	1,008	48,015

Source: Monthly Statistical Bulletin Derivatives - Lending, Hellenic Exchanges – Athens Stock Exchange S.A.

ATHEXClear clearing activity in the derivatives market declined markedly in the first half of 2019 year-on-year, as shown in Tables V.5 and V.6 and Charts V.17 and V.18.

Table V.6 Daily average traded value in the derivatives market by commodity type

(in million euro)

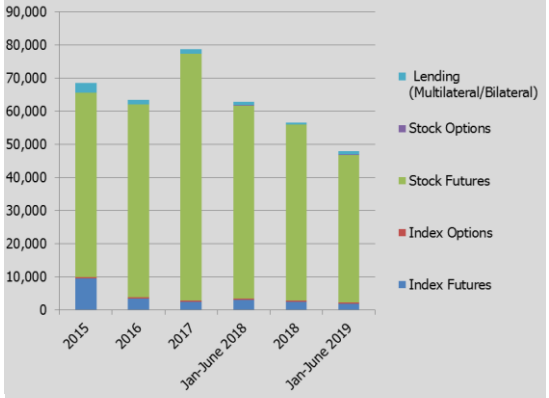
	Index futures	Index options	Stock futures	Stock options	Total
2015	11.20	0.49	5.19	0.02	16.90
2016	5.84	0.50	4.54	0.02	10.90
2017	9.73	1.49	6.66	0.04	17.93
2018	13.47	1.75	8.38	0.02	23.63
Jan-June 2019	10.23	1.30	6.48	0.01	18.03

Source: Monthly Statistical Bulletin Derivatives -Lending, Hellenic Exchanges – Athens Stock Exchange S.A.

In more detail, in the first half of 2019, the average daily volume of transactions cleared in the derivatives market and the securities lending facility amounted to 48,015 transactions, down by 24% year-on-year.

At the same time, the average daily value of transactions cleared was €17.2 million in the first half of 2019, down by 27% year-on-year.

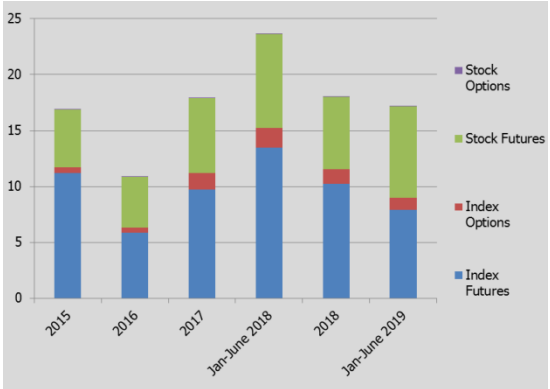
Chart V.17 Daily average traded volume in the derivatives market by commodity type and in the Athex Securities Lending Mechanism



Source: Monthly Statistical Bulletin Derivatives - Lending, Hellenic Exchanges – Athens Stock Exchange S.A.

Chart V.18 Daily average traded value in the derivatives market by commodity type

(in million euro)



Source: Monthly Statistical Bulletin Derivatives - Lending, Hellenic Exchanges – Athens Stock Exchange S.A.

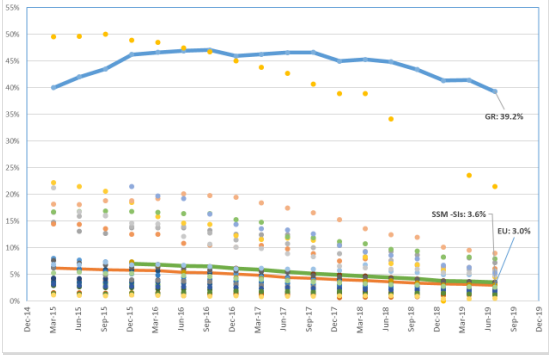
SPECIAL FEATURE I
EFFICIENT MANAGEMENT OF NON-PERFORMING LOANS (NPLs) AS A DRIVER OF GREEK BANKS' PROFITABILITY

Dimitrios E. Chalamandaris and Elias Veloudos[29]

Introduction

The efficient management of non-performing loans (NPLs) currently remains the key challenge for Greek banks. However, despite recent intensified efforts to reduce the large legacy NPL stock, Greece's NPL ratio (39.2% in the first half of 2019)[30] stood well above the corresponding average ratios of the EU (3%)[31] and of the systemically Significant Institutions (SIs) directly supervised by the ECB in the context of the Single Supervisory Mechanism (SSM-SIs, 3.6%).[32]

Chart 1 Greek, EU and SSM-SIs' NPL ratios (December 2014-December 2019)

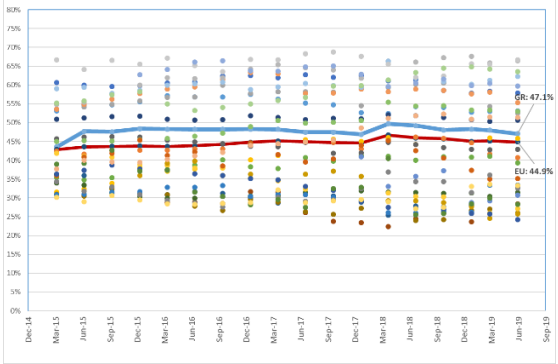


Sources: EBA Risk Dashboard and ECB supervisory statistics.

The NPL coverage ratio in Greece (47.1%) remained higher than the EU average ratio (44.9%)[33], but still lags behind other Member States with low NPL ratios (e.g. Italy, France, Portugal, Slovenia, and Slovakia).

The exceptionally high stock of NPLs on Greek banks' balance sheets weighs on the banking sector's credibility and sustainability, as well as its smooth operation. In addition, the high NPL stock is a source of systemic risk and an obstacle to sustainable economic growth.

Chart 2 Coverage ratio in Greece and the EU (December 2014-September 2019)



Sources: EBA Risk Dashboard and ECB supervisory statistics.

The impact of the high NPL stock is reflected in various aspects of bank activity as credit institutions are eventually affected by: (a) higher credit risk provisions; (b) increased administrative costs; (c) higher funding costs due to heightened credit risk; (d) elevated capital requirements; and (e) reduced interest income. Thus, bank profitability – as a key indicator of bank viability, given that it en-

[29] The authors would like to particularly thank A. Donatou, K. Kanellopoulos, G. Kaoudis, V. Nidrioti, S. Papadopoulos, V. Siakoulis, N. Stavrianou, and K. Zavandis for their valuable comments.

[30] A detailed analysis of Greek banks' profitability and NPL/NPE ratio is provided in the second chapter of this Review. Any discrepancy between the figures provided in the second chapter and this Special Feature is due to the use of different sources and definitions, as well as a different perimeter covered.

[31] European Banking Authority (EBA) data.

[32] ECB data.

[33] In the first half of 2019, the EU NPL coverage ratio was the same as that of the significant institutions directly supervised by the ECB in the context of the SSM (SSM-SIs).

sures loss-absorbing capacity – is negatively affected.

A particularly large legacy NPL stock, as in the case of Greece, holds up the smooth flow of credit to the real economy, thus rendering it imperative to step up efforts towards further NPL reduction. Such a reduction would help mitigate credit risk for banks, gradually boosting credit supply and concurrently lowering lending rates to non-financial corporations (NFCs) and households.[34] Financial risk for NFCs and households is also expected to decline on the back of the economic recovery, resulting in a higher valuation of existing assets, reflecting higher returns on capital and real estate.

In this manner, banks will be able to perform their primary function efficiently – notably financing production units, making a significant contribution to the overall restructuring of the economy and growth.

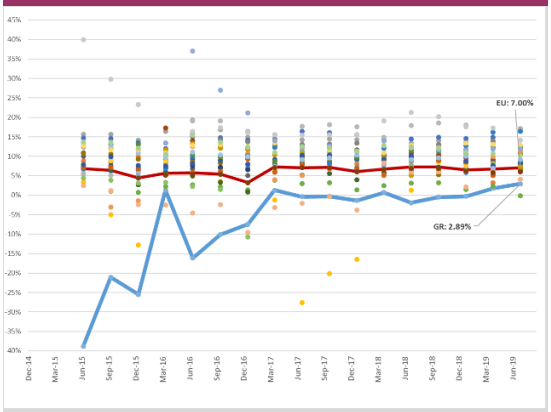
Failing or delaying to tackle the NPL problem would create significant negative feedback loops, weighing considerably on economic activity. In particular, any delay in tackling the problem would further increase the cost of NPL resolution and make it more difficult to manage NPLs effectively, as banks' balance sheets remain weak and the dynamics of economic growth remain limited and vulnerable. The (operational, institutional and business) improvement has already laid the groundwork for a holistic approach to the problem and the Bank of Greece has provided a detailed position through relevant analyses.

This Special Feature looks into the interplay between efficient NPL management and Greek banks' profitability. In this respect, based on international literature, we examine (a) the correlation between profitability and NPLs by means of a statistical approach; and (b) the impact of a percentage reduction of NPLs on Greek systemic banks' operating profitability, by applying a sensitivity analysis on banks' net interest income.

State of play

Greek banks' profitability over the last five years, as recorded in the Return on Equity (RoE) index (H1 2019: 2.89%), is well below the EU average (7%). It is worth pointing out that Greek banks' RoE index, as shown in most quarterly data since 2015, has been negative (or near zero).

Chart 3 RoE index in Greece and the EU

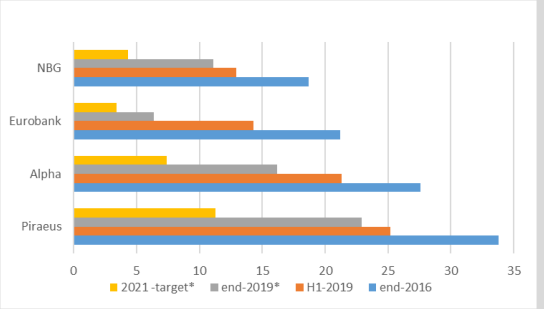


Sources: EBA Risk Dashboard and ECB supervisory statistics.

In order to improve asset quality, Greek banks have set, in cooperation with the SSM, certain binding operational targets towards reducing their NPL legacy stock. In this context, strengthening banks' operating profitability is inextricably linked to Greek banks' compliance with these targets.

[34] In any event, the final pricing of the loan disbursed is also determined by the client's creditworthiness (risk-adjusted pricing).

Chart 4 NPE reduction targets and evolution of NPEs of the four Greek Significant Institutions (SIs) (end-2016 - end-2019)



Source: Bank financial statements and presentations to investors.

Concurrently, the recent initiative for establishing a Hellenic Asset Protection Scheme (HAPS) is a positive step towards improving banks' asset quality. Although it is an important step in the right direction, it should be complemented by further actions to effectively tackle the large NPL legacy stock.

There is an imperative need for a holistic approach towards a definitive solution to the NPL legacy stock, on top of its significance from a financial stability perspective, taking into consideration the need to bolster financing to the real economy, given the existing credit gap.[35]

Methodology and findings

For the most part, international literature on NPLs mainly refers to their determinants.[36] Research interest has soared and studies have multiplied over the last two decades, as several banks recorded high NPL stocks, while statistical data have been systematically collected and reliable data have become available to analysts. Most of these studies look into profitability by means of RoE or RoA indexes among the determinants creating NPLs, confirming the negative correlation between NPLs and bank profitability.[37]

In our analysis, two approaches are applied to investigate the importance of efficient NPL management for the profitability of Greek banks, as well as of the resources that can be released for productive use:

i. A statistical analysis, applying a regression model; and

ii. A sensitivity analysis, employing simulation of changes in key figures in Greek banks' financial statements.

A. Statistical approach

The approach examines (a) the causality between profitability and NPLs; and (b) the importance of NPLs as a determinant of the analysis of banks' profitability.

In particular, panel data on EU Member States (drawn from the EBA Risk Dashboard) for all banks directly supervised by the ECB are used in order to explore the causality

[35] The estimated credit gap stood at €59 billion in the first half of 2019. This assessment is based on a static approach in the context of the methodology used for setting the countercyclical capital buffer (CCyB) rate.

[36] See an interesting compilation of the literature in Manz, F. (2019). "Determinants of non-performing loans: What do we know? A systematic review and avenues for future research", *Management Review Quarterly*, 69(4), pp. 351-389; and Nikolopoulos K.I. and Tsalas A.I. (2017). "Non-performing loans: A review of the literature and the international experience", in: Monokroussos P. and Gortsos C.V. (eds) *Non-Performing Loans and Resolving Private Sector Insolvency: Experiences from the EU Periphery and the Case of Greece*. Cham, Switzerland, Springer International Publishing, pp. 47-68.

[37] See also (i) Athanasoglou, P., Brissimis, S. and Delis, M. (2005). "Bank-specific, industry-specific and macroeconomic determinants of bank profitability", Bank of Greece, *Working Paper 25*, (ii) Beck, R., Jakubik, P. and Piloui, A. (2013). "Non-performing Loans What Matters in Addition to the Economic Cycle?", European Central Bank *Working Paper Series* 1515, (iii) Ghosh, A. (2015). "Banking industry specific and regional economic determinants of non-performing loans: Evidence from US states", *Journal of Financial Stability*, vol. 20, issue C, pp. 93-104, (iv) Louzis, D. P., Vouldis, A.T., and Metaxas, V.L. (2012). "Macroeconomic and bank-specific determinants of non-performing loans in Greece: A comparative study of mortgage, business, and consumer loan portfolios", *Journal of Banking and Finance*, 36(4), pp. 1012-1027, and (v) Makri, V., Tsagkanos, A., and Bellas, A. (2014). "Determinants of non-performing loans: The case of Eurozone", *Panoeconomicus*, 61(2), pp. 193–206.

(Dumitrescu-Hurlin hypothesis)[38] between historical data for RoE and NPL ratios.

The results of the Dumitrescu-Hurlin hypothesis testing of panel data confirm that there is a one-way causality effect between RoE and NPL ratios, showing that NPLs Granger cause the profitability of banks, not vice versa.

Following up on this finding, we estimate the profitability of the Greek banking sector, having the NPL ratio among the explanatory variables. In particular, we estimate the following model:

$$ROA = \alpha + \beta_1 NPL + \beta_2 CAR + \beta_3 CreditGDPgap + e$$

Where,

- *ROA= Return on Assets*
- *NPL= NPL ratio*
- *CAR= Capital Adequacy Ratio*
- *Credit GDP gap= the difference between the long-term trend of the Credit-to-GDP ratio and the Credit-to-GDP ratio in the context of the methodology applied for setting the countercyclical capital buffer (CCyB) rate.*

The sample covers supervisory quarterly figures on the Greek banking sector for the period December 2008-June 2019. Analysing this particular sample implies that all structural changes in the Greek banking sector over the past decade (e.g. bank mergers, acquisitions, resolutions and liquidations, etc.) are taken into account.

The investigation of the correlation between profitability of the Greek banking sector with capital adequacy, the NPL ratio and the credit-to-GDP gap is performed by estimating a Robust Least Square model. The Augmented Dickey-Fuller test (ADF test) is used to check for stationarity of the variables. The dependent variable "RoA" is stationary I (0), while for the explanatory variables of the model, stationarity was achieved by taking the first order differences. In addition, cointegration between variables was confirmed as the regression residuals have a unit root, thus stationary at level I (0). The model developed is shown below, while Table 1 displays in detail the estimated results.

$$ROA_t = -0.24 - 35.2\ \Delta NPL_{t-1} + 42.9\ \Delta CAR_t - 0.12\ \Delta\ Credit\ GDP\ gap_{\ t-2}$$

The degree of the time lags in the regression is based on the Akaike Information Criterion (AIC). As for the NPL ratio, its deterioration (improvement) at time t-1 seems to explain the evolution of profitability over period t.

Table 1 Statistical analysis outcome

Dependent variable: Return on Assets (RoA)

Variable	Time lag	Coefficient	Standard error	z-Statistic	Probability
C		-0.236	0.107	-2.210	0.027
NPL ratio (ΔNPL)	t-1	-35.190	6.795	-5.179	0.000
Capital Adequacy Ratio (ΔCAR)	t	42.984	3.093	13.896	0.000
Credit GDP gap (ΔCreditGDP gap)	t-2	-0.122	0.059	-2.068	0.039

Source: Bank of Greece calculations.

According to the results, the explanatory variables of the model are statistically significant at the 1% level, while the model has satisfactory explanatory ability (adjusted Rw-squared: 0.71).[39]

Finally, the results suggest that, over the last decade, the high NPL legacy stock was among the factors that had a significant negative impact on Greek banks' profitability.

[38] Dumitrescu, E.-I. and Hurlin, C. (2012). "Testing for Granger non-causality in heterogeneous panels", *Economic Modelling*, 29(4), pp. 1450-1460.

[39] Adjusted Rw-squared is the most appropriate criterion for checking the explanatory power of the estimated model, taking into account the outliers of the reference period (e.g. PSI, deleveraging, sale of network abroad, etc.).

B. Sensitivity analysis

The analysis aims to estimate the change in Greek banks' profits, assuming an NPL reduction, through their sale at net book value and at the same time an equivalent increase in granting new loans. It is worth noting that efficient NPL management can be achieved through both on- and off-balance-sheet strategies,[40] but for the sake of simplicity, the option of a sale of NPLs is adopted in the analysis.

The analysis uses a sample of H1 2019 data for the four Greek significant institutions (SIs), setting the following assumptions:

i. Banks reduce NPL stocks by selling NPLs and, at the same time, increasing their outstanding loans by the same amount. As a result, the balance of loans in banks' balance sheets remains unchanged.

ii. NPLs are sold at their net book value, thus these particular actions are capital neutral for banks.

iii. The part of the NPLs portfolio sold has exactly the same structure as that of the total NPL portfolio, in terms of loan category and provisioning policy. In other words, the portfolio of the NPLs sold, including consumer, mortgage and corporate NPLs, is similar in composition to the portfolio of NPLs as a whole, and thus follows the average loan-loss provisioning policy applicable to such loan portfolios.

iv. The remaining parameters of profitability (e.g. administrative costs, loan-loss provisions) remain unchanged (*ceteris paribus*).

v. Interest income on NPLs held by banks is calculated and taken into account.

vi. The current interest rate spread for each systemic bank is calculated as the difference between the interest income due to performing and non-performing loans, as of H1 2019.

$$Spread = \left(\frac{interest\ income\ due\ to\ performing\ loans}{performing\ loans}\right) - \left(\frac{interest\ income\ due\ to\ NPLs}{NPLs}\right)$$

vii. RWAs for new loans equals 100%.

In general, the impact of a reduction of the NPL stock on banks' profitability is not linear. Downsizing a high legacy stock of NPLs creates economies of scale characterised by specific idiosyncratic elements and the business model of each bank, thus having a variable impact on each bank's operating profitability. However, it is worth noting that the estimates of the analysis should be considered as rather conservative, as no further positive effects of NPL reduction are taken into account (e.g. decrease in loan-loss provisions, improvement of the overall economic climate with increased liquidity and decreased funding costs).

In particular, a reduction of Greek banks' NPLs, assuming an increase in new loans by an equal amount, would lead to an increase in net interest income. The increase in interest income related to outstanding NPLs[41] in a bank's balance sheet would be estimated based on the following equation:

$$Interest\ income = [(\%\ \text{NPL reduction}) \times (\text{NPLs}) \times Spread] + Initial\ interest\ income$$

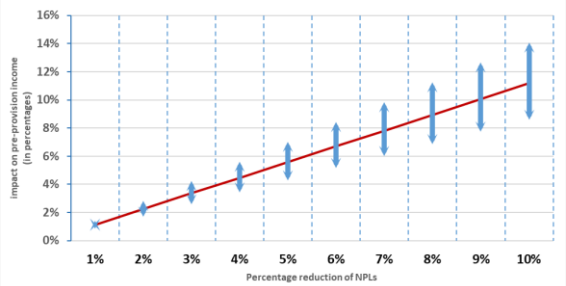
A sensitivity analysis is conducted by applying different percentages of NPL reduction to

[40] On-balance-sheet NPL strategies include, *inter alia*, internal workout, loan restructuring or even write-off. Off-balance-sheet strategies include the sale/securitisation of NPLs either through direct investment (possibly in the context of a secondary market) or through the establishment of an Asset Protection Scheme (APS) or an Asset Management Company (AMC).

[41] Source: FINREP regulatory data for the first half of 2019.

the four Greek SIs. Therefore, a static approach (point-in-time) is used to estimate the contribution of a reduction in NPLs to each bank's profitability (pre-provision income, as a percentage of net earnings before provisions and taxes or expressed as basis points on the Return on Average Assets – RoAA, see Charts 5 and 6).

Chart 5 Impact of percentage reduction of NPLs on pre-provision income (in percentages)



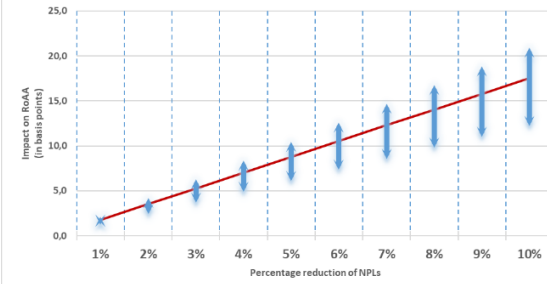
Source: Bank of Greece.

Note: The red line depicts the impact on pre-provision income (in percentages) of a reduction in NPLs (from 1% to 10%) for Greek systemic institutions (SIs) as a whole. Vertical lines depict the range of the impact on pre-provision income (in percentages) of a reduction in NPLs (from 1% to 10%) across all Greek SIs.

In detail, it was found that a reduction in the outstanding amount of the NPLs stock from 1% to 10%, under the assumptions made, would improve the pre-provision income of the four systemic banks cumulatively from 1.1% to 11.2%. In other words, we see an almost equivalent effect on profitability from the percentage reduction in NPLs. In a similar vein, RoAA improvement would range from 1.8 to 17.5 basis points. In addition, the improvement in profitability across individual banks (in terms of pre-provision income and RoAA) ranges from 0.9% to 14.1% and from 1.2 to 20.9 basis points, respectively (see vertical lines in Charts 5 and 6).

The wide range of the impact on individual banks' profitability is attributed mainly to the significant differences between the business models across all four systemic banks.

Chart 6 Impact of a percentage reduction of NPLs on Return on Average Assets (RoAA) (in basis points)



Source: Bank of Greece.

Note: The red line depicts the impact of a reduction in NPLs (from 1% to 10%) on Return on Average Assets – ROAA (in basis points) for Greek systemic institutions (SIs) as a whole. Vertical lines depict the range of the impact of a percentage reduction of NPLs (from 1 to 10%) on RoAA (in basis points) across all Greek SIs.

According to our analysis estimates, selling 1% to 10% of NPLs would release capital through the reduction of RWAs, ranging from €0.51 billion to €5.2 billion. The above-mentioned estimates are the outcome of simulations using H1 2019 data for all four Greek SIs, assuming that the Common Equity Tier 1 (CET1) ratio remains unchanged.[42] Moreover, the assumption that a percentage reduction in NPLs is followed by an increase in new loans of an equal amount can be read as an increase in loans granted from €0.78 billion to €7.8 billion, i.e. an increase of 0.4% to 4% respectively.

Conclusion

A particularly high legacy stock of NPLs on a bank's balance sheet has a severe impact on the efficiency of a bank's business model. This Special Feature found a significant adverse effect of NPLs on pre-provision income, limiting the ability of banks to generate internal capital and absorb losses.

Furthermore, it is evident that a reduction of the NPL stock, ranging from 1% to 10%, with a simultaneous increase in new loans of an

[42] As at the reference date, the Common Equity Tier 1 (CET1) ratio stands at 15.6%.

equal amount, would improve banks' profitability by up to 11.2%, while the NPL ratio would improve by 43 basis points for each percentage point of NPL reduction.

It is thus imperative to take steps towards the immediate reduction of the existing high NPL legacy stock. The initiatives taken so far by all stakeholders are in the right direction, but further efforts are required at a rapid pace.

A successful tackling of the NPL legacy stock will not only help lower credit risk for banks, but also lay the groundwork for limiting financial risk for households and corporations, on the back of the economic recovery and a higher valuation of existing assets reflecting higher yields on capital and real estate. This will enable financial institutions to channel credit to more dynamic and export-oriented businesses. Therefore, financial institutions will be able to contribute to the overall restructuring of the economy, having a beneficial impact on the sectors of goods and services, in turn resulting in higher rates of total productivity and potential GDP growth, thereby enhancing financial stability.

SPECIAL FEATURE II
THE REVISED PAYMENT SERVICES DIRECTIVE AS THE FOUNDATION FOR THE DEPLOYMENT OF OPEN BANKING IN THE GREEK FINANCIAL SYSTEM

Dimosthenis Gallis
Alexandros Kaliontzoglou
Dimitrios Paxinos
Georgios Tsiatouras[43]

What is open banking?

Open banking means *"a system in which financial institutions' data can be shared for users and third-party developers through application programming interfaces (APIs)"*.[44] In such an open banking system, access to customer financial information should be secured, always subject to the customer's explicit consent.

The use of the term *"banking"* is attributed to the fact that banks have been the financial institutions that traditionally service customer accounts. However, with the advent of the revised Payment Services Directive (PSD2) in recent years, both credit institutions and other institutions may service payment accounts.

Relevant regulatory framework

PSD2, transposed into Greek legislation by Law 4537/2018, lays the foundations for the deployment of open banking in the European financial services market by ensuring a basic level of open access to payment accounts.

The relevant regulatory framework encompasses, on top of PSD2 and its transposition law, other secondary legislation in the form of EU delegated and implementing regulations, as well as acts of "soft law", i.e. European Banking Authority (EBA) guidelines. The most significant among them are Commission Delegated Regulation (EU) 2018/389[45] (hereinafter "the Regulation") and EBA Guideline EBA/GL/2018/07,[46] which has been adopted by the Bank of Greece by means of Executive Committee Act 158/5/10.5.2019.

The scope of the regulatory framework includes payment service providers that service payment accounts accessible online, defined in Law 4537/2018 as *Account Servicing Payment Service Providers (ASPSPs)*, as well as third-party providers that need access to the payment account data for their own business purposes and are defined as *Payment Initiation Service Providers (PISPs)* and *Account Information Service Providers (AISPs)*.[47] In effect, PISPs and AISPs offer the two new payment services introduced by PSD2 to existing account holders that are clients of ASPSPs, by placing their applications on top

[43] The authors are grateful to colleagues Stavroula Kampouridou, Katerina Lagaria and Nikolaos Stavrianou for their valuable comments and suggestions.

[44] Financial Stability Board (2019), *FinTech and market structure in financial services: Market developments and potential financial stability implications*.

[45] Commission Delegated Regulation (EU) 2018/389 of 27 November 2017 supplementing Directive (EU) 2015/2366 of the European Parliament and of the Council with regard to regulatory technical standards for strong customer authentication and common and secure open standards of communication.

[46] Guidelines on the conditions to be met in order to benefit from an exemption from contingency measures under Article 33(6) of Regulation (EU) 2018/389 (RTS on SCA & CSC).

[47] ASPSPs, PISPs and AISPs in general are licensed credit institutions, payment institutions or electronic money institutions. Nevertheless, especially for the provision of payment initiation or account information services, the Law imposes less strict regulatory requirements than on most of standard payment services.

of the already available payment accounts serviced by the ASPSPs.

The Regulation sets out the basic information security requirements applicable to communication and data exchange between institutions that have to be implemented with Application Programming Interfaces – APIs,[48] including identification requirements mandating the use of digital certificates, as well as requirements for the implementation of a contingency mechanism ensuring the business continuity of third-party providers. Likewise, Executive Committee Act 158/5/10.5.2019 sets out requirements that ASPSPs need to meet in order to become exempt from the obligation of implementing the contingency mechanism under Article 33 of the Regulation.

Open banking API implementation models supported by PSD2

According to the Regulation, ASPSPs should allow third-party payment service providers to access payment accounts through interfaces that offer an equivalent level of information security, reliability and performance as the digital channels available to payment service users, such as electronic and mobile banking and e-wallets.

The Regulation defines two basic methods of interfacing between ASPSPs and third party providers offering one of the new PSD2 payment services:

(a) Interfacing via the standard digital channels available to the end users, i.e. the *"customer interface"*, provided that third parties present their identification credentials to the ASPSPs as an additional requirement under the Regulation compared to access practices prior to the Regulation's entry into force. The credentials are in the form of digital certificates compliant with the specifications of the eIDAS Regulation.[49]

(b) Interfacing via a *"dedicated interface"* that, alongside the general Regulation requirements, has to be deployed on an infrastructure offering a service level at least equivalent to the infrastructure supporting the standard customer interface and including a contingency mechanism. This mechanism will allow third-party providers to gain secure access to the customer interface in case the dedicated interface is unavailable, ensuring thus the business continuity of the third-party provider's service.

As a special case of the latter type of interfacing, the Regulation exempts ASPSPs from the obligation to implement and operate the contingency mechanism, provided that the dedicated interface fulfills specific quantifiable requirements ensuring an adequate level of availability, capacity and data quality compared with the corresponding customer interface. The Supervised Institutions Inspection Department of the Bank of Greece is responsible for the assessment of the aforementioned requirements for ASPSPs established in Greece, in accordance with Executive Committee Act 158/5/10.5.2019.

It should be noted that certain types of unsupervised payment initiation and account information service providers were active in the European market several years before PSD2, in certain cases with a widely established client base. The Regulation aimed at setting a

[48] The *UK Open Banking* standardisation initiative defines an API, in line with the Regulation, as *"a set of routines, protocols, and tools for building software applications. An API specifies how software components should interact"*. For more details see https://www.openbanking.org.uk/about-us/glossary/.

[49] Regulation (EU) No 910/2014 of the European Parliament and of the Council of 23 July 2014 on electronic identification and trust services for electronic transactions in the internal market and repealing Directive 1999/93/EC.

legal framework for the communication between ASPSPs and third-party providers, as the latter in most cases retrieved the required information from the customer interface using the end-user's own credentials,[50] not allowing ASPSPs to know whether the end user was directly accessing their account or the third party was accessing the account on the user's behalf based on their consent.

The position and strategy of the Bank of Greece towards the deployment of open banking in Greece

The Bank of Greece, within its supervisory remit, approached the implementation of open banking within the PSD2 framework with a view to ensuring, on the one hand, the sufficient and timely regulatory compliance of the market and, on the other hand, the creation of a homogeneous and secure Greek "open ecosystem" that would facilitate the activity of domestic and foreign third-party payment service providers, catering for easy and secure access to payment accounts and the development of low-cost innovative services.

For the above reasons, the Bank of Greece recommended to supervised institutions (a) choosing the most technologically advanced and secure solutions for open banking, adhering to specifications that would enable them to benefit from an exemption from the obligation to develop a contingency mechanism; and (b) implementing interfaces according to one of the two widely adopted European technical standards: the *NextGenPSD2* standard of the Berlin Group initiative supported by the NextGenPSD2 Implementation Support Program (NISP) and the *UK Open Banking* standard of the Open Banking Implementation Entity (OBIE). The absence in Greece of licensed third parties capable of testing the dedicated interface environments of Greek ASPSPs, upon Bank of Greece recommendations, ultimately led, to cross-institution tests in the Greek market.

The current status of open banking in Greece

Upon the entry into force of Regulation 389/2018 on 14 September 2019, almost all of Greece's supervised ASPSPs under PSD2 provide open banking service exclusively via dedicated interfaces – mostly based on the NEXTGenPSD2 standard. A key factor behind the readiness of the domestic market, apart from the supervisory and audit practices of the Bank of Greece, was that most of the supervised institutions had previous experience in the deployment of technical interfaces for interconnectivity with third-party systems due to pre-PSD2 business needs. Within the framework of requirements for obtaining the aforementioned exemptions, the supervised institutions' IT staff successfully tackled significant challenges such as the tight deadlines set by the Regulation for the testing and use of interfaces, and long-standing technical questions. To this end, EBA, in close cooperation with the national competent authorities, created channels for the continuous flow of clarifications on any technical issues raised by the market. However, open banking still faces the great challenge of attracting European third-party payment service providers to offer innovative services in Greece, which may well be addressed by the domestic institutions themselves if they adapt their business model to the new requirements, thereby assuming a third-party role as well.

[50] These methods are commonly referred to as *"screen scraping"* and *"reverse engineering"*.

Benefits, expectations and risks associated with the deployment of open banking in the Greek financial system

Credit institutions globally have invested in extensive business model digitalisation initiatives, in order to boost their profitability and upgrade their service level, against the backdrop of a rapidly evolving financial ecosystem with intense competition from new types of financial service providers. The increasing take-up of advanced and innovative technologies by financial institutions and the proliferation of FinTech companies have significantly helped to step up such competition, while institutions' inaction bias may risk loss of income.[51,52]

The take-up of open banking systems by financial institutions has been so far been a natural reaction to business needs as well as the changes in regulatory requirements, which have taken full effect. It should also be noted that open banking models that are based on the current regulatory framework can essentially be perceived as minimum requirements in the context of PSD2. Nevertheless, the aforementioned open banking approach in Greece is premised on international standards and therefore enables account servicing financial institutions (a) to expand their business to new value-added services, thereby gaining new revenue (e.g. from commissions); and (b) to capitalise on wider network connections to increase their visibility to new customers, potentially in a cross-border context.

Examples of such new services comprise: all-inclusive account aggregation (apart from payment accounts), identification and authentication services (such as digital identification services to trust service providers), product cross-selling (banking or non-banking), multi-account management and enhanced risk scoring.[53]

Some of these services can be based on a combination of PSD2 roles, while others may require the deployment of additional interfaces within existing infrastructures. Thanks to new open banking services, financial institutions can more effectively cover retail and corporate needs across a broad range of activity: lending, savings, account management, cash management, payments and productivity gains.[54]

Apart from catering for business needs, financial institutions will also need to take adequate organisational and technical measures that will address risks inherent in open banking systems. Such risks are principally operational in nature, especially in the context of information security and data privacy due to the extensive interconnectivity with third parties. The current regulatory framework lays down minimum information security requirements that have to be met by organisations. Furthermore, value-added services offered by third parties on the basis of open data undermine the direct relations that account servicing institutions have with their customers, something that institutions may have to assess as part of their business strategy risk management systems.[55,56]

[51] Basel Committee on Banking Supervision (2018), *Sound practices – Implications of FinTech developments for banks and bank supervisors*.
[52] EBA (2018), *EBA report on the impact of FinTech on incumbent credit institutions' business models*.
[53] McKinsey & Company (2018), *PSD2: Taking advantage of open-banking disruption*.
[54] Open Banking UK (2019), *Consumer priorities for open banking*.
[55] Financial Stability Board, *op. cit.*

The Bank of Greece will continue to monitor developments in the field of open banking, both through its regular contact with the Greek financial market for the provision of clarifications and recommendations on the correct implementation of the regulatory framework, as well as through its participation in relevant innovation initiatives. The Bank of Greece FinTech Hub[57] has been operational since March 2019 with a view to reinforcing and facilitating such activities.

[56] Basel Committee on Banking Supervision, *op. cit.*

[57] For more details, see the Bank of Greece's website, at https://www.bankofgreece.gr/en/main-tasks/supervision/fintech-innovation-hub

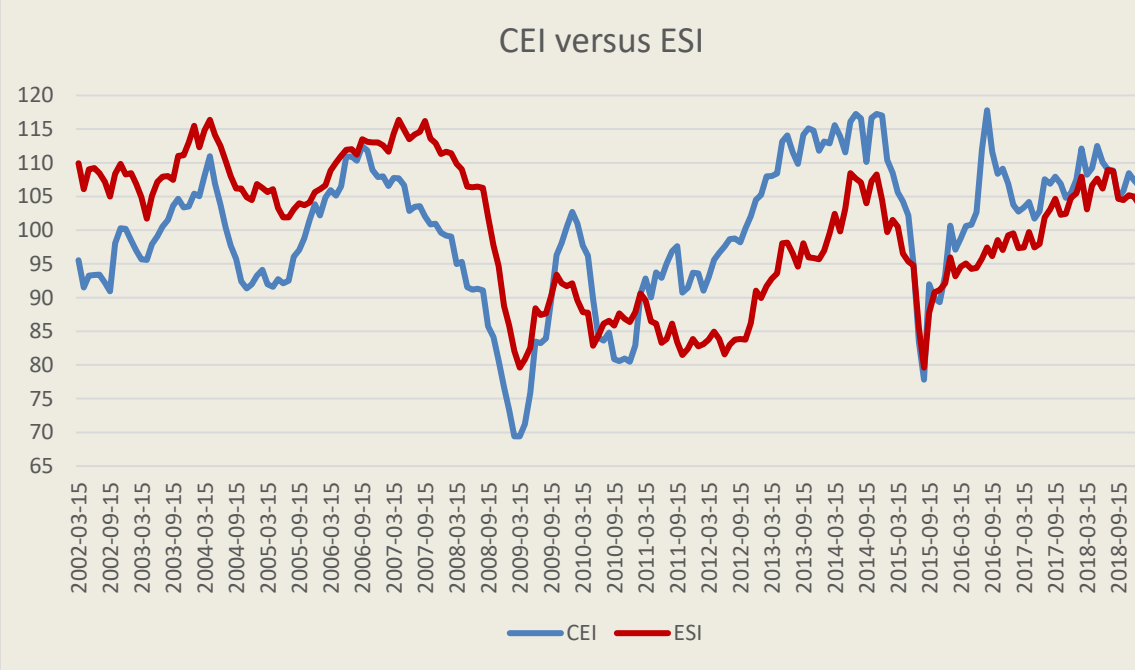
SPECIAL FEATURE III
MONTHLY COMPOSITE ECONOMIC INDICATOR FOR GREECE

Savas Papadopoulos[58]

Economic indicators, among other applications, are used to predict economic growth or recession. For this reason, a composite indicator is constructed by enriching the components of the Economic Sentiment Indicator (ESI) with crucial economic variables to obtain earlier economic change warnings. For index construction, we utilise variable clustering and principal component analysis. The index contains economic variables such as inflation, unemployment, imports, exports, indicators for retail trade and manufacturing, building permits, and new private passenger car registrations, as well as the ESI confidence indicators for manufacturing, services, consumer, construction, and retail trade (see Table 1). The Composite Economic Indicator (CEI) is depicted in Figure 1, where it is compared to the ESI.

Figure 1 shows that before the global financial crisis of 2008, the CEI reached its local peak in September 2006, while the ESI peaked one year later, in September 2007. After 2011, on the two long recovery paths, CEI is significantly ahead of ESI. The first upward path for CEI starts in December 2010, while ESI started to rebound in June 2012 (18 months later). At the end of the 25-month period (07/2017-07/2019), both indicators were above the 100-point average. Note that the CEI exceeded the average in April 2016 (15 months earlier than the ESI) and stood above the 110-point average on three occasions, i.e. the average of the index plus a standard deviation (s = 10). In the last

Figure 1 Composite Economic Indicator (CEI) versus Economic Sentiment Indicator (ESI)



[58] The author is grateful to G. Hondroyiannis, K. Lagaria, N. Stavrianou, and K. Zavantis for their valuable comments and suggestions.

month (07/2019), the CEI and ESI were very close to 108.2 and 109.3,[59] respectively. Recent findings indicate economic stability over the past period, which may support future economic growth. These conclusions might benefit regulators, the government, investors, shareholders, and others.

The CEI is recommended[60] to analysts as it gives earlier warning of economic changes than the ESI. The reason behind this is that the weights are calculated empirically from Greek data and are not fixed for all European countries, as is the case with ESI. Besides, the CEI includes eight more economic variables than ESI. Additional variables are selected based on their economic importance in the Greek system and their performance in the specific methodology compared with various other monthly variables that are publicly available.

Data, methodology and results

We analyse data covering 109 months (T = 109), from March 2002[61] to July 2019. The final index consists of 13 variables,[62] selected among many other candidate variables and listed in Table 1. From each variable, we subtract the value of the corresponding month of the previous year with logarithms in variables (E10-E13) that show total amounts. The monthly differences of order 12 not only achieve a stationary time series to avoid spurious relationships, but also eliminate monthly seasonality. We smooth the time series (E8–E13), due to the randomness that they present, by taking moving averages of size 3.

We present the calculations of the Composite Economic Indicator (CEI) in the Appendix in 5 steps. Initially, the input scale changes (see Step 1), and then variable clustering is applied, which divides the input variables of a composite economic indicator into different clusters (see Step 2). The first cluster contains four of the five components of the ESI index (E3-E6). The second cluster contains the variables (E10-E13), which include percentage changes in aggregate amounts. The third cluster contains unemployment, retail, and industrial indicators (E7-E9), and the fourth cluster pairs the Consumer Price Index, E1, with the Consumer Confidence Index, E2, one of the components of the ESI.

The clustering of the variables creates four linear combinations, one from each cluster, denoted as C1, C2, C3 and C4 (see Step 2 in the Appendix). Principal component analysis (PCA) converts the four correlated C1-C4 into four new linear combinations, P1, P2, P3 and P4, which are not linearly correlated (see Step 3 in the Appendix). The use of the PCA method was adopted by Manning and Shamloo (2015).[63] The application of the method of variable clustering for the construction of a financial index is innovative and has a positive contribution, as shown here. The first principal component, P1, sums C1-C4, P2 contrasts C1 and C4 with C2 and C3, P3 contrasts C1 and C2 with C3 and C4, and P4 contrasts C1 and C3 with C2 and C4, as a result of the opposite signs. In Step 4, a linear combination of the four main components

[59] The ESI has been rescaled by the current data so that $\bar{x} = 100$ and s=10.

[60] The CEI is a synthesis proposed by the author and does not reflect a broader proposal of the Bank of Greece.

[61] The data start in January 2001, but 14 original observations are lost, given that 14 lags are used for seasonality and smoothing.

[62] We extracted the data from the database Thomson Reuters Eikon - Datastream.

[63] Manning, M. J. F. and Shamloo, M. (2015). *A Financial Conditions Index for Greece* (No. 15-220), International Monetary Fund.

gives a score for the index transformed in Step 5, giving the final values of the composite index.

The combination of the equations in Steps 2-4 of the Appendix gives the final weights in the composite index. We list the weights in the second column of Table 1. The highest weighted variables, with a weighting factor of 14.3%, are the harmonised CPI, E1, and the Consumer Confidence Indicator, E2, one of the components of the ESI, which is 28.6% cumulative. The overall weighting of the second group, including the other four components of the ESI (E3-E6), is 51.9%. Thus, the harmonised CPI and the five ESI components account for 80.5% of the total weight in the final index. Note that the five indicators of the ESI account for 66.2% of the total weighting of the new indicator. The ESI weights for the variables (E2-E6) are 20%, 40%, 5%, 30% and 5%, respectively, while the new corresponding weightings are 22%, 21%, 20%, 20% and 17%. Finally, the total weightings of groups 3 (E10-E13) and 4 (E7-E9) are 8.5% and 11.0%, respectively, with a cumulative sum of 19.5%. Therefore, the new indicator strongly supports Eurostat's ESI indicator, but with different weighting factors, and enriches it with other main economic variables, thereby making it more comprehensive and useful.

Quantitative analysts, economists, etc. can easily compile the CEI by applying the 13 weights of Table 1 to the corresponding variables that are publicly available. Analysts do not need to grasp and apply the statistical methods of Steps 2-4 that require the use of statistical software, but merely to change the variable scale of Steps 1 and 5.

APPENDIX

Calculation of the Composite Economic Indicator (CEI)

We compute the CEI based on the following five steps:

Step 1: Change the scale to the differences of the 13 variables in Table 1, with mean 100 and standard deviation 10.[64]

Step 2: The variable clustering calculates the following four linear combinations:

$$C_1 = 0.054 \cdot \mathrm{E}_3 + 0.052 \cdot \mathrm{E}_4 + 0.051 \cdot \mathrm{E}_5 + 0.042 \cdot \mathrm{E}_6$$

$$C_2 = 0.061 \cdot \mathrm{E}_{10} + 0.055 \cdot \mathrm{E}_{11} + 0.045 \cdot \mathrm{E}_{12} + 0.034 \cdot \mathrm{E}_{13}$$

$$C_3 = -0.060 \cdot \mathrm{E}_7 + 0.058 \cdot \mathrm{E}_8 + 0.056 \cdot \mathrm{E}_9$$

$$C_4 = -0.071 \cdot \mathrm{E}_1 + 0.071 \cdot \mathrm{E}_2$$

Step 3: The principal component analysis produces the following four linear combinations of the four linear combinations from Step 2:

$$P_1 = 0.35 \cdot \mathrm{C}_1 + 0.35 \cdot \mathrm{C}_2 + 0.38 \cdot \mathrm{C}_3 + 0.22 \cdot \mathrm{C}_4$$

$$P_2 = 0.14 \cdot \mathrm{C}_1 - 0.34 \cdot \mathrm{C}_2 - 0.12 \cdot \mathrm{C}_3 + 0.65 \cdot \mathrm{C}_4$$

$$P_3 = 0.32 \cdot \mathrm{C}_1 + 0.20 \cdot \mathrm{C}_2 - 0.54 \cdot \mathrm{C}_3 - 0.11 \cdot \mathrm{C}_4$$

$$P_4 = 0.33 \cdot \mathrm{C}_1 - 0.40 \cdot \mathrm{C}_2 + 0.17 \cdot \mathrm{C}_3 - 0.40 \cdot \mathrm{C}_4$$

Step 4: Weighting P1-P4, by the percentages explaining the overall variance in the principal component analysis, calculates the CEI.

$$I = 0.45 \cdot P_1 + 0.28 \cdot \mathrm{P}_2 + 0.16 \cdot P_3 + 0.11 \cdot \mathrm{P}_4$$

Step 5: Change the scale of the index in Step 4 with mean 100 and standard deviation 10.

[64] This step can be omitted from the calculation as it does not affect the final results, but makes the estimated coefficients comparable.

Table 1 Components of the Composite Economic Indicator (CEI): Weights, abbreviations, correlation signs and transformations

Symbol	Weight	Variable
E_1	14.3%	Harmonised Index of Consumer Prices (HICP, –[65]) $\Delta E_{1,t} = E_{1,t} - E_{1,t-12}$
E_2	14.3%	Consumer Confidence Indicator (CCI, +) $\Delta E_{2,t} = E_{2,t} - E_{2,t-12}$
E_3	14.1%	Industrial Confidence Indicator (ICI, +) $\Delta E_{3,t} = E_{3,t} - E_{3,t-12}$
E_4	13.5%	Retail Trade Confidence Indicator (RCI, +) $\Delta E_{4,t} = E_{4,t} - E_{4,t-12}$
E_5	13.3%	Services Confidence Indicator (SCI, +) $\Delta E_{5,t} = E_{5,t} - E_{5,t-12}$
E_6	10.9%	Construction Confidence Indicator (BCI, +) $\Delta E_{6,t} = E_{6,t} - E_{6,t-12}$
E_7	3.8%	Unemployment rate (UNE, –) $\Delta E_{7,t} = E_{7,t} - E_{7,t-12}$
E_8	3.7%	Turnover Index in Retail Trade (RTI, +) $\Delta E_{8,t} = E_{8,t} - E_{8,t-12}$
E_9	3.6%	Industrial Production Index (IPI, +) $\Delta E_{9,t} = E_{9,t} - E_{9,t-12}$
E_{10}	2.8%	Imports of Goods (MPI, +) $\Delta \ln(E_{10,t}) = \ln(E_{10,t}) - \ln(E_{10,t-12})$
E_{11}	2.0%	Exports of Goods (XPI, +) $\Delta \ln(E_{11,t}) = \ln(E_{11,t}) - \ln(E_{11,t-12})$
E_{12}	2.1%	Total Construction Activity, Number of Permits Issued (CNS, +) $\Delta \ln(E_{12,t}) = \ln(E_{12,t}) - \ln(E_{12,t-12})$
E_{13}	1.6%	New Private Passenger Car Registrations (CRS, +) $\Delta \ln(E_{13,t}) = \ln(E_{13,t}) - \ln(E_{13,t-12})$

Source: Bank of Greece.

[65] The signs indicate the direction of the correlation between the variable and the composite index.

ISSN: 1792-1988 (online)