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THE ECONOMIC BEHAVIOUR OF HOUSEHOLDS IN GREECE: RECENT DEVELOPMENTS AND PROSPECTS*

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I INTRODUCTION

Economic theory suggests that it is important to study and analyse the consumption and saving behaviour of households.1 Consumption, the largest component of aggregate demand, has an impact on total demand; thus, changes in consumption cause fluctuations in economic activity. Moreover, the saving rate determines the economy's capital stock, which in turn influences the transition to a steady state and the future growth potential of an economy. Household saving rates differ across European Union (EU) countries, and various studies point out the heterogeneity observed in the saving behaviour among EU households (see Rocher and Stierle 2015 and ECB 2016). Greece is among the countries with a negative saving rate.

Households' consumption and saving behaviour has been studied according to several economic theories, such as the permanent income hypothesis, the life cycle hypothesis, the sociodemographic hypotheses, uncertainty, etc. Research uses macroeconomic and microeconomic data to study and analyse households' saving/consumption behaviour and employs econometric models to estimate the economic relationships among the variables.

Economists examine the underlying factors of household consumption, such as disposable income, pointing out that its increase leads to an increase in consumption and vice-versa. Moreover in the economic literature, wealth is identified as another factor that affects households' consumption behaviour. Households possess financial assets (currency in circulation, deposits, shares, etc.) and non-financial assets (such as houses, equipment, etc.), which together make up their total wealth. When the value of these assets increases, households perceive themselves as wealthier and tend to consume more. Therefore, disposable income and wealth are the key determinants of household consumption.

Empirical findings regarding wealth effects on consumption vary across countries and across periods. However, it is recognised that an investigation of such effects needs to distinguish between financial and non-financial wealth (see Cussen and Phelan 2010). Empirical evidence implies that financial wealth has an impact on consumption in the euro area, while non-financial assets may not play a significant role (see Skudelny 2009). Other papers show that non-financial (real) wealth affects household consumption in the United States and the United Kingdom, probably reflecting deeper housing markets. A recent study on euro area countries has shown that both financial and real wealth have a positive effect on consumption, but the impact of financial assets is stronger than that of real assets (see De Bonis and Silvestrini 2012).

Recent contributions to international literature underline the role of deleveraging in household saving and consumption. Specifically, it is argued that the increased household

Throughout this article, reference is made to households only, although the household sector also includes non-profit institutions serving households (NPISHs).



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deleveraging observed in the recent period has been associated with higher saving and lower consumption (see McCarthy and McQuinn 2014, Glick and Lansing 2010). However, more recent empirical research suggests that the deleveraging effects on household consumption and saving are strongly heterogeneous across countries and are closely linked with the financial conditions prevailing in each country (see Bouis 2015).

While disposable income and wealth and their relationship with consumption and saving have been extensively analysed in international literature, studies focusing on the case of Greece are scarce, and a comprehensive analysis of household financial wealth is not available as yet. The econometric investigation of the above relationship is beyond the scope of this article, which analyses household financial wealth and examines its evolution over time, with particular emphasis on the recent period. In addition, an in-depth analysis of the components of net financial wealth, i.e. assets and liabilities, as well as their composition, is performed. In the context of this analysis, the changes in the size of household financial assets and liabilities are decomposed into those stemming from: (a) transactions (e.g. change in investment choices in the case of assets or debt increase/decrease in the case of liabilities); (b) changes in the valuation of assets/liabilities (valuation gains/losses); or (c) a combination of the above.

The sections below analyse Greek households' saving behaviour, initially through the interaction between investment and debt and subsequently through the interaction between consumption and disposable income. To this end, saving is measured by two different methods, each based on a different statistical source. The first method is based on financial accounts, whereby the financial definition of saving is derived. The second method uses data from non-financial (national) accounts, on the basis of which the non-financial (traditional) definition of saving is derived. Finally, a brief review of the evolution of disposable income and its components, as well as of the evolution of household real final consumption expenditure by functional purpose is performed, focusing mainly on the recent period.

The data used in this article are drawn from the Statistical Data Warehouse of the European Central Bank (ECB), specifically the quarterly accounts of the euro area (Euro Area Accounts, EAA), which provide detailed information on income, expenditure, financing and investment for the institutional sectors of each country (households, non-financial corporations, general government, financial corporations and the external sector). These EAA are produced by integrating the quarterly nonfinancial (national) accounts with the quarterly financial accounts (central bank data) by institutional sector and for all EU countries, while their reliability, consistency and comparability are ensured by the European System of National and Regional Accounts (ESA 2010).² It is the first time that these data are used in Greece for a study and analysis of household financial wealth and saving behaviour through the interaction of investment and debt.

The remainder of the article is structured as follows: Section 2 presents the evolution over time of Greek households' net financial wealth and how it has been affected by the recent crisis. Section 3 looks at the composition of the household asset portfolio and examines the relative contributions of transactions and asset valuations to changes in household assets. Section 4 analyses the components of household liabilities and examines the relative contributions of transactions and valuations to changes in household liabilities. Section 5 provides the financial and non-financial definition of saving. Section 6 examines disposable income and its compo-

² Non-financial accounts describe the value of goods and services resulting from the production activity, the income flows generated by this process and their uses within the economy. On the other hand, financial accounts describe the stocks of financial assets and liabilities. The two sets of accounts are linked with one another, as the deficit (or surplus) created by income and expenditure in non-financial accounts appears on the financial side as a decrease (increase) in financial assets and/or an increase (decrease) in liabilities (https://www.ecb.europa.eu/stats/prices/acc/html/index.en.html).



Chart I Household net financial wealth*

nents and Section 7 provides an overview of the evolution of households' real consumption expenditure by functional purpose. Finally, Section 8 summarises and concludes.

2 EVOLUTION OF HOUSEHOLD NET FINANCIAL WEALTH

Chart 1 shows the evolution of Greek households' net financial wealth, which is defined, according to ESA 2010, as the difference between total assets and liabilities, during the period from the first quarter of 2002 to the first quarter of 2016.

The period under review can be divided into three subperiods:

(a) The first subperiod is between the first quarter of 2002 and the fourth quarter of 2007, when Greek households' net financial wealth rose by 30.4% (average annual rate of change for that period: 2.6%). This rise occurred as

the combined result of increases in total household assets (up by 69.0%, or 7.3% in average annual terms) and of total liabilities (up by 254.1%,³ or 24.8% in average annual terms). Thus, in the fourth quarter of 2007, net financial wealth came to €217.5 billion.

(b) The second subperiod is between the first quarter of 2008 and the second quarter of 2012, when household total liabilities continued to increase (up by 21.7%, or 5.9% in average annual terms), while at the same time their total assets decreased (-33.8%, or -7.6% on average annually), as the upward trend in the prices of their financial assets had been reversed in the context of the financial crisis that evolved into a debt crisis. As a result, by the second quarter of 2012 net financial wealth had declined by 65.3% (18.4% on average annually) compared with the first quarter of 2008, to stand at €75.6 billion.

³ The substantial increase in liabilities is partly due to a strong base effect from the low stock of liabilities in the first quarter of 2002.



(c) The third subperiod lasts from the third quarter of 2012 to the first quarter of 2016, when household total liabilities decreased (-20.9%, or -5.2% in average annual terms), while their total assets increased (+12.9%, or 3.4% on average annually). The combined outcome of these divergent developments was a positive impact on household net wealth, which increased by 79.8% (16.4% in average annual terms) relative to the third quarter of 2012 and came to €135.9 billion in the first quarter of 2008 and the first quarter of 2016, household net financial wealth declined by 37.5%.

Sections 3 and 4 below discuss in more detail the components of net financial wealth, i.e. assets and liabilities.

3 ANALYSIS OF HOUSEHOLD ASSETS

Economic theory argues that the value of the household portfolio, whether it refers to real assets (houses) or financial assets (shares, bonds, deposits, etc.), is influenced by a number of factors, including the macroeconomic environment, changes in real estate prices, the international economic environment, etc. In particular, declines in real estate prices, the financial crisis, an uncertain political environment, as well as the recessionary phase of the business cycle are expected to have an adverse effect on the value of the household portfolio. This section analyses household financial wealth.⁴

According to international literature, the interaction of the aforementioned factors motivates households to restructure their portfolios in an effort to preserve the value of their assets and limit, to the extent possible, impairments (see Arrondel et al. 2014, Cussen and Phelan 2010, Cussen et al. 2012 and Cooper 2013). This restructuring occurs either directly as a result of transactions, i.e. acquisition of new assets or sale of assets already possessed by households (shares, bonds, deposits, etc.) or a targeted shift from high-risk financial assets

to less risky ones, or indirectly through changes in the value of financial assets, i.e. asset and exchange rate revaluations/devaluations, reclassifications, etc.

The analysis of the changing composition of household portfolios over time is important, as it reflects what part of these changes is due to transactions (investment choices) and what part is due to valuation adjustments. In the former case, information is derived on the household investment pattern, namely the risk, yield and liquidity preferences of households, and its changes. In the latter case, the focus is on the impact of the macroeconomic environment and stock exchange fluctuations on changes in the value of the household portfolio, hence in its composition.

A recent study by Cussen et al. (2012) examines, among other things, the behaviour of households from 24 EU countries during the recent financial crisis. The authors find that in 2008 almost all households in the sample⁵ shifted towards safer assets, such as currency and deposits, away from shares and other equity, thus showing a clear preference for less risky/lower-yield and more liquid assets.

3A COMPOSITION AND RESTRUCTURING OF THE HOUSEHOLD ASSET PORTFOLIO

Charts 2 and 3 illustrate the impact of macroeconomic conditions and the recent financial crisis on the restructuring of Greek households' asset portfolio.

As shown in Chart 2, prior to the financial crisis (average of the period from the first quarter 2002 to the fourth quarter 2007), the composition of the household financial asset portfolio was as follows: shares and other equity: 21.5%; debt securities: 12.3%; investment fund shares: 8.8%; and deposits: 48.5%, demonstrating Greek households' preference for conservative investment options. The role of the remaining

- 4 Data on the housing wealth of Greek households are not available,
- preventing an assessment of their total wealth. 5 Excluding Estonia, Lithuania and Luxembourg.







Sources: ECB, Bank of Greece and authors' calculations.

categories, such as currency, insurance technical reserves and other accounts receivable/ payable, was insignificant (see Zarco 2009).

After the onset of the financial crisis, risk aversion and a restructuring of the household portfolio can be observed, with a strong shift to safer and more liquid financial assets, such as deposits, and a marked decline in shares and other equity, debt securities and mutual fund shares/units as a percentage of the stock of household financial assets. Furthermore, in periods of heightened uncertainty in Greece, even deposits lost their attractiveness and currency holdings tended to increase.

In more detail, Chart 3 depicts the composition of the household asset portfolio at four distinct points in time.

(a) Before the financial crisis (specifically in the fourth quarter of 2007), shares and other equity, debt securities and investment fund shares together accounted for 40.2% of total assets. Deposits represented a percentage of 49.0%, which is particularly high considering the favourable macroeconomic environment at the time, indicating risk aversion on the part of Greek households, which favoured safer and more liquid asset holdings. Currency accounted for a negligible percentage (3.2%).

(b) At the peak of the financial crisis in the second quarter of 2012, economic uncertainty increased households' propensity to hoard, resulting in a substantial increase in the relative weight of currency, from 3.2% of total assets before the crisis to 17.6%. The relative weight of deposits rose from 49.0% to 59.7%, mainly at the expense of shares and other equity, which fell to 3.9% from 26.9%, and debt securities, which fell to 6.3% from 8.3% of total assets.

(c) In the first quarter of 2014, while shares and other equity and deposits remained





Chart 3 Portfolio composition of household financial assets at different points in time

Sources: ECB, Bank of Greece and authors' calculations.

broadly unchanged as a percentage of total assets relative to the pre-crisis period (at 26.7% and 49.3%, respectively), the percentage of currency increased to 10.3% from 3.2%) and that of debt securities fell to 1.4% from 8.3%.

(d) The recent picture of the household portfolio (first quarter of 2016) reflects a new increase in the percentage of currency holdings, to 17.1% from 10.3% in the first quarter of 2014, and a decline in the percentage of shares and other equity to 18.1% from 26.7%. Deposits remained almost unchanged as a percentage of total assets compared with the first quarter of 2014.

3B ANALYSIS OF HOUSEHOLDS' INVESTMENT CHOICES (TRANSACTIONS)

As mentioned above, the analysis of transactions focuses on the factors that can influence households' investment decisions and overall behaviour under the prevailing economic circumstances, especially in crisis periods. In particular, the financial crisis motivates households to invest in more liquid and less risky assets, in an effort to reduce their exposure to future stock exchange fluctuations and mitigate any further financial wealth losses. Moreover, households' reduced risk tolerance is reflected in their shift to safer assets, which can also be used to hedge risky assets in their portfolio. The changes in the value of assets due to transactions are shown in Charts 4 and 5.

Specifically, Chart 4⁶ shows household investment in fixed assets (mainly houses),⁷ representing a major share of total investment

6 The four-quarter moving average is used in the analysis and the charts, in order to smooth out the seasonality of the series.

7 Houses account for the bulk of household gross capital formation, which also includes purchases of equipment by sole proprietors, as well as cultivated assets (ESA 2010).





Chart 4 Households' transactions in housing and financial assets*

before the crisis, as well as in financial assets, between the first quarter of 2006 and the first quarter of 2016.

Households seem to have reduced their residential investment starting from the first quarter of 2008, i.e. half a year before real estate prices began to decline. Subsequently, in line with the continued downward trend of real estate prices, residential investment fell dramatically, to ≤ 1.2 billion in the first quarter of 2016 from ≤ 8.1 billion in the first quarter of 2008, in terms of four-quarter moving sums.⁸ Besides, the decline in household financial investment started from the third quarter of 2007 and intensified as from the first quarter of 2009, on the backdrop of rising unemployment and shrinking household disposable income.

Furthermore, Chart 5 shows the composition of household investment flows (transactions in assets), in four-quarter moving average terms.⁹

In the period before 2009, deposits were the preferred investment instrument for households, suggesting their caution towards risky assets. Similar findings are reported in a Eurostat study on the financial assets and liabilities of households in the EU, according to which, in 2007, Greece had the second highest share, after Slovakia, of currency and deposits in the total financial portfolio of households (see Zarco 2009).

Next in households' preferences, and reflecting a search of higher yield associated with higher corresponding risk, came investment in shares and other equity, followed by debt securities. Insurance technical reserves were very low, as were also households' currency holdings. It is worth noting that, even the period of strong economic growth in Greece (2004-2007)

⁹ It should be noted that investment in deposits, debt securities, shares and investment fund shares also includes those held abroad.



⁸ As mentioned in the Monetary Policy 2015-2016 report of the Bank of Greece (June 2016), the cumulative decline in the average level of house prices between the onset of the economic crisis in 2008 and the first quarter of 2016 was close to 41.3% in nominal terms.



Chart 5 Households' transactions in financial assets*

saw household portfolio shifts away from investment fund shares, whose yields were seen as less attractive.

This picture changed markedly following the onset of the economic crisis, when house-holds, more manifestly as from early 2010, tended to withdraw deposits and increase their currency holdings amid an adverse eco-nomic environment and heightened economic uncertainty. At the same time, they drastically reduced their net investment in shares and debt securities¹⁰ and virtually eliminated their net investment in insurance products. House-holds' strong shift to safer assets may also reflect, apart from their increased risk aversion under conditions of high uncertainty, the need to hedge risky assets already held in their portfolio.

In the first half of 2015, amid mounting economic uncertainty as a result of protracted negotiations with Greece's creditors, households proceeded to mass deposit withdrawals, while at the same time increasing their currency holdings (hoarding) and investment in foreign investment fund shares (mainly euro money market funds). The imposition of capital controls on 28 June 2015 reined in hoarding and deposit withdrawals by households.

3C ANALYSIS OF VALUATION ADJUSTMENTS OF HOUSEHOLD ASSETS

The changes in household total financial assets as a result of valuation changes or statistical reclassifications are shown in Chart 6.

The conclusions of the analysis are the following:

10 Transactions in debt securities in 2011-2012 were related to the exchange of Greek government bonds under the private sector involvement (PSI) programme.



Chart 6 Valuation changes in household financial assets*



* Four-quarter moving averages

(a) The most part of household asset devaluation took place in the early phase of the crisis (2008-2009) and continued at a weaker pace in the next three years (2010-2012). By contrast, in the period from the fourth quarter of 2012 to the third quarter of 2014, the value of the household financial portfolio rebounded, in line with the improving overall economic environment. This was followed by a new devaluation in the first half of 2015, in the context of heightened uncertainty.

(b) Revaluations of household total assets were driven primarily by shares and, secondarily, debt securities. The role of investment fund shares, insurance, pension schemes and other accounts receivable was negligible.

(c) In the period from the first quarter of 2008 to the second quarter of 2012, shares and other equity held in the household portfolio were subject to massive valuation losses, which were -to a large extent - recouped by the first quarter of 2014, before recording new losses until the first half of 2016.

3D THE RELATIVE CONTRIBUTIONS OF TRANSACTIONS AND VALUATION ADJUSTMENTS TO THE CHANGE IN HOUSEHOLD **TOTAL ASSETS**

The relative contributions of transactions and valuation effects to the annual percentage changes in household total assets are shown in Chart 7.

Prior to 2008, the change (increase) in the value of household total assets was almost exclusively due to transactions, with the exception of the period from the fourth quarter of 2004 to the fourth quarter of 2005, when valuation effects also had a positive contribution. A different picture can be seen later on, particularly in the first phase of the financial cri-





Chart 7 Changes in household total assets*

sis (2008-2009), when the impairments of household assets could not be offset by the positive flows (transactions) that were also taking place at the time.¹¹ As a result, the value of household total assets shrank.

In 2010-2012, household assets continued to show sharp declines, this time attributable also to negative transactions (disinvestment), besides adverse valuation effects. By contrast, in the period 2013-2014, household assets rebounded strongly, as a result of valuation gains that more than offset the comparatively low negative transactions. From 2015 onwards, extensive devaluations and, less importantly, disinvestment drove household assets down.

4 ANALYSIS OF HOUSEHOLD LIABILITIES

4A HOUSEHOLD LIABILITIES

The years that preceded the financial crisis, especially the 2004-2007 period of strong eco-

nomic growth in Greece, saw a continuous and sharp increase in households' debt liabilities,¹² mainly associated with the financing of residential investment, as shown in Chart 8.

Similar findings for various industrial countries are reported by Bê Duc and Le Breton (2009) and Glick and Lansing (2010). Glick and Lansing (2010) analyse the relationship between household leverage, house prices and consumption for various industrial countries, including the United States, focusing on the decade preceding the 2007 financial crisis. They argue that the larger the expansion in the use of borrowed money (leverage), the more rapid the rises in house prices in the countries



¹¹ Cussen and Phelan (2010), using data on Irish households, show that, in the years preceding the financial crisis (2003-2007), changes in the value of household assets were almost equally driven by transactions and valuation effects. Subsequently, during the crisis of 2007-2009, the pattern of the decline in total assets of Irish households is similar to that observed for Greek households, with the contribution of valuation changes exceeding that of transactions.

¹² As mentioned in footnote 3, household liabilities did increase, but from a low level in comparison with the other euro area countries.



Chart 8 Household total liabilities* and investment in housing assets**

examined. Also, when economic conditions deteriorated and house prices started falling, the negative impact on consumption was larger for countries with high household leverage.

Greek households' total liabilities increased steadily from the first quarter of 2002 to the third quarter of 2010,¹³ when they peaked, having increased by 347% during that period. It is worth noting that the increases, albeit weaker, continued beyond the first quarter of 2008 that marks the start of the decline in households' real property values. However, during the deterioration of the crisis and with the implementation of economic adjustment programmes for Greece from 2010 onwards, households gradually began to reduce their net debt incurrence.

In more detail, some of the factors that contributed in this direction were the adoption by banks of tighter credit standards, as suggested by the results of Bank Lending Surveys, along with interest rate increases for the main loan categories. At the same time, as pointed out in the Annual Report 2010 of the Bank of Greece (April 2011), the deterioration in macroeconomic conditions (rising unemployment, falling disposable income) also played a major role, as it affected the financial condition of households by reducing their capacity as well as their willingness to take on new debt. Overall, between the fourth quarter of 2010 and the first quarter of 2016, households reduced their total debt liabilities by 23.8% relative to the peak observed in the third quarter of 2010.

4B THE COMPOSITION OF HOUSEHOLD LIABILITIES

The main categories that make up household liabilities are loans and other accounts payable, as shown in Chart 9. Total household liabilities

¹³ The sharp increase in household total liabilities observed since June 2010 largely reflects statistical reclassifications. Specifically, from that month onwards, loans to sole proprietors, farmers and unincorporated enterprises were reclassified from corporate loans to household loans, and loans to religious institutions are included in loans to private non-profit institutions.











were 21.7% lower in the first quarter of 2016 relative to the peak of the third quarter of 2010.

Within household debt liabilities, the main subcategories are housing loans, consumer loans, loans to sole proprietors (as from June 2010) and other loans.¹⁴ As shown in Chart 10, household liabilities almost quadrupled, both for housing and consumer loans, from 2002 to June 2010.¹⁵ Thereafter, the stock of these loans started to decline, also in the context of intensified loan restructuring by banks. Sole proprietors, farmers and unincorporated enterprises began to reduce their debt liabilities as from January 2011.

Between January 2002 and March 2016, the composition of household loans remained remarkably stable, with housing loans accounting for 70% of total loans and consumer loans for 30%.

Other accounts payable comprise various liabilities that have not fallen due, mainly tax and social security liabilities, liabilities vis-à-vis non-financial corporations such as the Public Power Corporation (DEH), and other liabilities arising from trade transactions. Overall, other accounts payable peaked in the second quarter of 2012, falling by 51.1% thereafter until the first quarter of 2016.

4C LEVERAGE RATIOS

The expansion in the use of borrowed money by households between the first quarter of 2006 and the first quarter of 2016 can be measured by two ratios, as illustrated in Chart 11:

The first is debt-to-income ratio, i.e. debt as a percentage of disposable income, and is defined as follows:

 $Debt-to-income\ ratio = \frac{Total\ liabilities}{Disposable\ income}$

Thus, while in the fourth quarter of 2006 households' debt represented 68.5% of their disposable income, in the first quarter of 2010

it amounted to 81%. This development was the combined result of countervailing effects, i.e. an increase in both household disposable income and net borrowing (change in the nominal debt stock). As the increase in net borrowing more than offset the increase in disposable income, the ratio showed this strong rise. Subsequently, the ratio kept increasing,16 mainly due to a reversal of the upward trend of disposable income, and peaked at about 109.8% in the second quarter of 2014. Since then, the ratio gradually declined (first quarter of 2016: 101.8%), as households reduced, although at a slow pace, their net borrowing and the decrease in disposable income was weaker. Still, the ratio remains high compared with its pre-crisis levels, as for every €100 of disposable income, households have higher liabilities (€101.8).

The second leverage ratio is the debt-to-assets ratio, measuring the extent to which household assets have been financed with debt, and is defined as follows:

Debt-to-assets ratio =

Total liabilities Total assets

Between the first quarter of 2006 and the second quarter of 2012, this ratio rose substantially, more than doubling from about 30.6% to 66.5%, thus indicating the high leverage of households. This development reflected, apart from the increase in household debt, a parallel decrease in the value of their assets as a result of the debt crisis.¹⁷ Subsequently, the ratio improved noticeably, falling to 45.3% by the second quarter of 2014, due to a recovery in the value of household assets and a decline in net

¹⁷ As calculated over the same period, the debt-to-assets ratio for the euro area also showed an increase (from 31.0% in the first quarter of 2006 to 36.0% in the second quarter of 2012), which was far smaller than in the corresponding Greek ratio. In the first quarter of 2016, the debt-to-assets ratio for the euro area stood at 31.7%.



¹⁴ Total household loans also include some other categories, such as loans from other financial institutions (OFIs), insurance corporations and occupational pension funds. As these involve small amounts, they are not reported separately.

¹⁵ Brissimis et al. (2012) examine the factors that determined the evolution of consumer credit in Greece in the recent past. Papapetrou and Lolos (2011) investigate the interdependence between housing credit and the labour market.

¹⁶ In addition to declining disposable income, this also partly reflects statistical reclassifications affecting total household liabilities.



Chart II Household leverage ratios

borrowing. In the first quarter of 2016, total household liabilities corresponded to 46.6% of their total assets. The small increase in leverage observed more recently is mainly due to valuation losses on household assets, which were not offset by the decrease in their debt.

International literature points out that these ratios should be interpreted with some caution, as it is important to examine, among other things, how debt is allocated among households and how it is linked with the expected path of household income. Furthermore, it is argued that the debt-to-assets ratio does not fully reflect households' debt servicing capacity, given that certain financial assets are, by their nature, illiquid and thus cannot be used for immediate debt reduction, particularly in times of adverse economic conditions.

4D THE RELATIVE CONTRIBUTIONS OF TRANSACTIONS AND VALUATION ADJUSTMENTS TO CHANGES IN HOUSEHOLD LIABILITIES

Deleveraging, i.e. household debt reduction, can be achieved through repayment or

through changes in the outstanding amount of debt due to write-offs/write-downs.¹⁸ Chart 12 shows the relative contributions of these two factors (referred to as transactions and adjustments, respectively) to the annual percentage change in household total liabilities.¹⁹ As seen from the chart, households increased their liabilities at high rates until the first quarter of 2006, followed by a reversal of this trend, more manifestly as from the third quarter of 2007 with the onset of the financial crisis. The first signs of deleveraging are visible as from the fourth quarter of 2010, with the reduction in total liabilities being almost exclusively driven by transactions (i.e. net debt repayment) until the beginning of 2012 and, later on, particularly in the period from the second



¹⁸ The credit institution may decide to write off the entire debt, if all extrajudicial and judicial actions have been exhausted and no further recovery can be expected, or to write down part of the debt so that the remaining part is reduced to a level likely to be serviced without problems.

¹⁹ Adjustments include any statistical reclassifications and/or changes in the outstanding amount of loans due to exchange rate variations. The latter applies e.g. to many households that have borrowed in foreign currency, notably the Swiss franc: when this currency appreciated, it had an upward effect on the debt liabilities of the households concerned.





quarter of 2012 to the third quarter of 2014, by adjustments as well.²⁰

5 HOUSEHOLD SAVING: FINANCIAL AND NON-FINANCIAL DEFINITION

Households' saving behaviour can be analysed either through the interaction between their investment and debt (*financial definition of* saving) or through the interaction between consumption and disposable income (*traditional or non-financial definition of saving*).

5A HOUSEHOLD SAVING: FINANCIAL DEFINITION

Households may choose to channel a part of their income, which they do not spend on consumption, into investment in financial assets (shares, deposits, bonds, etc.) or non-financial assets²¹ (houses, equipment, etc.). They also have the option to borrow, if their income is not sufficient to finance such investments. The financial definition of saving, according to Berry et al. (2009), Cussen and Phelan (2010) and Cussen et al. (2012), can be derived as follows:

Funds raised \equiv Funds invested (1)

Relationship (1) can be rewritten as follows:

Saving+Net borrowing= Net investment in financial assets+ Net investment in non-financial assets² (2)

Rearranging relationship (2), saving can be expressed as follows:

- 21 Non-financial investment includes, in addition to gross fixed capital formation (houses, equipment, etc.), also acquisitions less disposals of non-produced assets (patents, intellectual property rights, leases of land or buildings, etc.).
- 22 In the case of net lending/borrowing, "net" refers to the incurrence of new debt minus repayment of existing debt. Similarly, in the case of investment, "net" refers to the acquisition of new assets minus disposal of existing assets.



²⁰ To a large extent, the size and the relative contribution of the "adjustments" component reflect the impact of bank resolutions and loan write-offs/write-downs during that period.



Chart 13 Household net lending/borrowing*

Saving= Net investment in financial assets – Net borrowing+ Net investment in non-financial assets (3)

Therefore, from (3) it is deduced that:

Saving = Net lending/borrowing+ Net investment in non-financial assets (4)

Thus, an increase in saving results from a net increase in some type of investment, a net decrease in debt or a combination of both.

Chart 13 shows the prevailing trends in household net lending/borrowing,²³ as derived from their transactions on the asset side minus transactions on the liability side. A positive sign suggests that households are net lenders, i.e. acquisition of financial assets exceeds net incurrence of debt, or net repayment of debt exceeds net disinvestment. Specifically, in the period up to the first quarter of 2010, households were net lenders, as their net financial investment more than offset net incurrence of new debt. Two distinct subperiods can be identified:

(a) The first subperiod is between the first quarter of 2002 and the third quarter of 2007, when households invested in financial assets, while at the same time constantly and considerably increasing their net borrowing. As their rising investment more than offset their rising liabilities, households ended up as net lenders.

(b) In the second subperiod, from the fourth quarter of 2007 to the first quarter of 2010, households started to gradually reduce both



²³ A net lending position of households in non-financial accounts implies that households have a surplus of funds can thus finance the other institutional sectors of the economy (non-financial corporations, financial corporations, general government and the external sector). Conversely, a net borrowing position implies that households are net borrowers, i.e. they face a deficit of funds and need to obtain financing from the other sectors.



Chart 14 Trends in household saving*

their net lending and their net financial investment, thus remaining net lenders in this subperiod too.

Thereafter, households became net borrowers, as their net debt reduction, which started from the fourth quarter of 2010, fell short of their net disinvestment. Exceptions were the period from the fourth quarter of 2011 to the second quarter of 2012 and the more recent period from the second quarter of 2015 to the first quarter of 2016, when households were again net lenders.

Between the third quarter of 2013 and the first quarter of 2015, although households proceeded to increased net debt reduction, their net disinvestment was even larger, making them net borrowers. From the second quarter of 2015 onwards, net debt reduction retained its momentum, but was accompanied by weaker net disinvestment, which made households net lenders. From relationship (4) and under its financial definition, saving is the sum of net investment in non-financial assets (mostly houses) and in financial assets, minus net transactions in liabilities. Therefore, by introducing also non-financial investment (houses, etc.) in the analysis, we can obtain saving according to its financial definition (see Chart 14).

As shown in Chart 14, household saving remained at high levels until the fourth quarter of 2008, supported by strong investment in real estate, other non-financial assets and financial assets, which outweighed net incurrence of new debt. The subsequent downward trend in saving is explained by the fact that the decline in total household net investment outpaced the decline in their liabilities. Actually, saving turned negative in the first quarter of 2011, although households had started, already from the fourth quarter of 2010, the net repayment of their existing debt. This negative outcome reflected both reduced invest-



ment mainly in houses and strong net disinvestment of financial assets. Since then, saving has alternated from positive to marginally negative values, depending on which component dominates each time.

From an analysis of data for the recent period, a number of significant conclusions can be drawn:

(a) As from the second quarter of 2013, households intensified their net reduction of liabilities, and this trend continued into the next quarters. It is important to note that households proceeded to a net reduction of their liabilities for the first time in late 2010.

(b) As from the second quarter of 2014, saving followed an upward trend, which was supported mainly by deleveraging rather than nonfinancial investment, which had been drastically curtailed by then. Whenever these two explanatory factors together exceeded net disinvestment of financial assets, saving was in positive territory, a fact that is more manifest in more recent quarters.

(c) Saving is exceptionally low compared with its pre-crisis levels, because of a contraction of investment in houses/equipment and large disinvestment of financial assets.

5B HOUSEHOLD SAVING: NON-FINANCIAL DEFINITION

Economic theory posits that household disposable income is channelled either into consumption or into saving. Consequently, household saving, according to the analysis of non-financial accounts, is defined as household disposable income, minus consumption, that is:

Saving = Disposable income - Consumption (5)

As shown in Chart 15, the household saving rate,²⁴ in terms of four-quarter moving sums, followed a downward path as from the second quarter of 2009, falling from 7.4% in that quar-

ter to -5.6% in the first quarter of 2016. We can identify two subperiods: the first subperiod is up to the first quarter of 2012, when the household saving rate was positive, and the second subperiod, when it was negative. In general, when the rate of increase (decrease) in disposable income falls short of the rate of increase (decrease) in consumption, the saving rate decreases (increases). It is pointed out that the decline in household saving -particularly from end-2009 onwards - is linked with the fall in disposable income. Specifically, the continuous downward trend in the household saving rate from the second quarter of 2012 to the second quarter of 2014, i.e. when the ratio was in negative territory, was due to the fact that the decrease in disposable income outpaced the decrease in consumption. As from the second quarter of 2014, the household saving rate stabilised at low levels, standing at -5.6% in the first quarter of 2016 (compared with -5.3% one year earlier), as the rate of decrease in disposable income (-1.7%) exceeded the rate of decrease in consumption (-1.4%).

It should be noted that the two methods of measuring saving, according to its financial and non-financial definition, should yield the same result (see Lequiller and Blades 2014 and Cussen et al. 2012). In practice, however, this is not the case, due to the statistical discrepancy²⁵ arising from the different statistical sources used under the two approaches. This means that, adding this statistical discrepancy to the financial definition of saving, the non-financial (traditional) definition of saving can be derived as follows:

Saving: Non-financial accounts ≡ Saving: Financial accounts+ statistical discrepancy (6)



²⁴ The saving rate is defined as the ratio of saving to disposable income, in terms of four-quarter moving sums.

²⁵ Where statistical discrepancy is equal to net lending/borrowing in non-financial accounts minus net lending/borrowing in financial accounts. It should be noted that in the case of Greece the statistical discrepancy for the household sector is significant for the years before 2010, while it has been declining in more recent years. Also, statistical discrepancies are acknowledged to exist in ECB statistics.



Chart 15 Nominal disposable income and consumption (annual percentage changes) and saving rate*

Sources: ECB, ELSTAT and authors' calculations. * Four-quarter moving sums.





Equation (6) is illustrated in Chart 16, which decomposes the evolution of household saving into contributing factors, in terms of four-quarter moving sums. Until early 2010, saving was supported by household financial and nonfinancial investment and a gradual decline in incurrence of new liabilities. Thereafter, the almost continuous downward path of saving was driven by falling investment in houses/equipment, but also by strong net disinvestment from financial assets. Debt reduction, which started from the fourth quarter of 2010 and intensified from the second quarter of 2013, had a positive contribution to saving.

Sections 6 and 7 take a closer look at the factors of equation (5), namely household disposable income and consumption. Specifically, Section 6 provides a brief overview of developments in household disposable income and its components, and Section 7 discusses the evolution of real final consumption expenditure of households by purpose in the recent period.

6 HOUSEHOLD DISPOSABLE INCOME AND ITS COMPONENTS

Chart 17 shows the evolution of household gross disposable income and its components.

On the income side, the main components of disposable income are compensation of employees (wages and salaries and employers' social contributions), operating surplus and mixed income (in the case of sole proprietors, this refers to the mixed income of the proprietor, whereas in the case of households it refers to the own-account production of housing services by owner-occupiers), social transfers other than in kind (pensions and various social benefits, such as unemployment/maternity/ family benefits, etc.), income from property receivable (interest, dividends, rents received for land) and other current transfers receivable. On the expenditure side, the main components are social security contributions, income and wealth taxes, property income payable and other current transfers payable²⁶ (see Chart 17).

According to economic theory, compensation of employees, operating surplus and mixed income, and property income exhibit a procyclical behaviour, i.e. they tend to deteriorate in economic downturns, as wages fall, jobs are lost, sole proprietors' business activity slumps and dividends and land rents decline.

A breakdown of household disposable income into components shows that the largest percentage contributions come from compensation of employees, and operating surplus (see Chart 17), followed by social benefits (mainly pensions) and net property income. An increase (decrease) in these components has a positive (negative) effect on disposable income. By contrast, an increase in social contributions and taxes has a negative impact on disposable income and vice-versa. Between the first quarter of 2010 and the first quarter of 2016, households' nominal disposable income shrank by 32.8% (from €173.5 billion to €116.5 billion, in terms of four-quarter moving sums), largely due to sharp falls of 31.5% in compensation of employees, (from €86.8 billion to €59.4 billion), 29.1% in operating surplus (from €76.2 billion to €54.0 billion), 17.2% in social benefits (mainly pensions, from €43.5 billion to €36.1 billion) and 45.6% in net property income (from €9.5 billion to €3.5 billion). During the same period, real disposable income declined by 32.5%.²⁷

Consumption theories, such as the permanent income hypothesis and the life cycle hypothesis, associated the evolution of household income with household consumption expenditure, identifying a positive relationship between the two variables (see Friedman 1957). On the back of falling disposable income, households' consumption expenditure declined, as shown in Chart 15. Between the first quarter of 2010 and the first quarter of 2016, this decline was in real terms 24.7%, i.e. from €169.4 billion to €127.5 billion.



²⁶ These include non-life insurance premiums, contributions to nonprofit institutions, etc.

²⁷ Calculated as nominal disposable income divided by the deflator of private consumption.



It should, however, be pointed out that the increase in compensation of employees (in terms of four-quarter moving sums) observed as from the third quarter of 2014 is associated with a rise in dependent employment, as confirmed by data from the ERGANI information system, and in total employment (ELSTAT, Labour Force Surveys). The maintenance of the rise in employment and the decline in unemployment, as a consequence of the gradual restoration of confidence and the return of the economy to positive growth rates, could signal an increase in household permanent income, *ceteris paribus*, and thus lead to an increase in their consumer spending.

The following section briefly reviews the evolution of households' consumption expenditure in the recent period. In order to provide a deeper insight into households' consumption behaviour, the discussion focuses on real domestic consumption expenditure by functional purpose.²⁸ It is noted that this analysis includes household consumption expenditure by residents and non-residents (tourists) incurred in

²⁸ According to ELSTAT, the main source of data on household final consumption is the Household Budget Survey, while complementary sources and methods are used where necessary. The data used to calculate household final consumption expenditure refer to the average monthly expenditure per household based on the resident/non-resident distinction (including expenditure by resident households incurred abroad and excluding expenditure by non-residents (tourists) incurred in the Greek territory) and are available broken down by manner of acquisition of the goods and services concerned (purchased, produced and consumed by the same household, received in kind from employers, organisations or other households). Furthermore, the Household Budget Survey provides data on the average number of members per household. These data, along with Greece's estimated population figures, are used to compile the national aggregate of final consumption expenditure from annualised data. Complementary data sources most notably include the Survey of Private Legal Building Activity of ELSTAT, receipts and payments for travel services from the Balance of Payments of the Bank of Greece, as well as administrative data sources. Finally, in certain cases, data on household consumption expenditure is derived as a balancing item of the supply and use tables compiled by the National Accounts Directorate of ELSTAT. The analysis, which is carried out on an annual basis, includes households only, excluding non-profit institutions serving households.



Chart 18 Composition of domestic consumption expenditure over time*



the economic territory of Greece, excluding residents' expenditure incurred abroad, and uses annual data for the period up to the end of 2015.

7 HOUSEHOLD FINAL CONSUMPTION EXPENDITURE BY PURPOSE

In the period 2009-2015, household final consumption expenditure declined in real terms by 19.3%, from €163.7 billion in 2009 to €132.0 billion in 2015. As shown in Chart 18, this decline was broadly based across all the twelve categories of goods and services²⁹ and was significant for all categories with the exception of hotels and restaurants, for which it was only marginal, due to the strong growth in tourism (in terms of both arrivals and receipts) from 2013 onwards. The period 2009-2015 saw a marked fall in the consumption of durable goods, demand for which is more elastic and, as argued in international literature, moves in line with households' perceptions of economic conditions. Specifically, it is argued that factors such as high unemployment, falling household disposable income and wealth, high indebtedness and economic uncertainty have a negative effect on the consumption behaviour of households, making them unwilling to make purchases of big-ticket items (see ECB 2015). It is worth noting that consumer spending in the



²⁹ The twelve categories are the following: (1) food and non-alcoholic beverages; (2) alcoholic beverages and tobacco; (3) clothing and footwear; (4) housing, water, electricity and gas; (5) furnishings, household equipment and routine household maintenance; (6) health; (7) transport; (8) communication; (9) recreation and culture; (10) education; (11) hotels and restaurants; and (12) miscellaneous goods and services.

Chart 19 Evolution of domestic consumption expenditure



Source: ELSTAT and authors' calculations.

categories of "furnishing, household equipment, etc."³⁰ and "clothing and footwear" declined by 54.5% and 46.8%, respectively, far more strongly than total consumer expenditure (19.3%) in the same period.

Chart 19 shows the percentage allocation of household annual expenditure to the twelve main categories of goods and services, enabling to identify the evolution of household consumption patterns between 1996 and 2015. Comparing the allocation for 2009 and 2015, the ranking of categories in decreasing order of their relative shares in total consumption expenditure remained unchanged for the categories with the largest shares, i.e. "housing", "water supply, electricity and gas", "food and non-alcoholic beverages", "transport", "hotels and restaurants", as well as for "education", which continued to rank last with the smallest share. On the other hand, the categories of "furnishing, house equipment and routine household maintenance" and "clothing and footwear" fell to lower places in the ranking, while "recreation and culture" and "alcoholic beverages, tobacco" moved to higher places.

Furthermore, it can be observed that the share of expenditure on basic needs (food, housing and network services) in total consumption increased at the expense of non-basic expenditure (furnishing etc., clothing and footwear). These changes provide indications on the evolution of consumption patterns.

Specifically, between 2009 and 2015, the categories with the most significant increases in

³⁰ The decline in this category of expenditure is associated with the downturn in residential construction, as mentioned in previous sections.



their shares in total expenditure were "hotels and restaurants" (from 11.8% to 14.4%), due to the positive impact of tourism, and "housing, water supply, electricity and gas" (from 19.4% to 21.2%), followed by "transport" (from 13.2% to 14.4%). Only marginal increases were recorded in the shares of "alcoholic beverages and tobacco" (from 4.5% to 4.9%) and "food and non-alcoholic beverages" (from 15.7% to 15.9%). Interestingly, "transport" not only increased its share in total expenditure but also showed compositional changes within this category: the share of "purchase of vehicles" decreased (-49.5%) and that of "transport services" (i.e. use of tram, buses, trains, etc.) increased (+41.2%), probably also reflecting the pick-up in tourism.

In the same period, the share of expenditure on "health services" declined from 4.6% to 4.2%, accompanied by a reallocation within this category, as expenditure on outpatient services fell (-58.1%) and that on medical products, appliances and equipment more than doubled (117%).

"Miscellaneous goods and services" also recorded a decline in their share in total expenditure, from 8.4% to 7.5%, along with a reallocation within this category: expenditure on social protection (elderly care at home, nursing homes, recovery and rehabilitation centres providing long-term support, schools for children with special needs, etc.) fell by 66.1% and personal care (grooming and beauty services) by 33.4%, while expenditure on insurance services increased by 45.3%, with an emphasis on health and saving insurance products. This trend reflects a precautionary motive, on the part of households, to guard against potential uncertainties, including uncertainty about their future income and access to healthcare services.

Finally, of particular note is the category of "education", given its importance for human capital formation, hence the future productive capacity of the economy. Although education accounts for a very small share in households' total expenditure (2.1% in 2015), an important

reallocation within this category can be observed, with a shift of expenditure away from "pre-primary and primary education" towards "secondary education".

8 CONCLUDING REMARKS

Economic theory highlights household consumption and saving as important factors behind the fluctuations of economic activity and economic growth. The importance of household disposable income and wealth, both financial (currency, deposits, shares, etc.) and non-financial (houses, etc.), as determinants of households' consumption and saving behaviour is recognised in international literature.

The aim of this study was, first, to examine households' (mainly financial) net wealth and its evolution over time, with a focus on the most recent period, by analysing its components, i.e. assets and liabilities, and their composition. Next, the Greek households' saving behaviour was analysed, by exploring the interactions between investment and debt and between consumption and disposable income. To this end, two approaches were adopted, based on the financial and the non-financial (traditional) definition of saving, respectively. Finally, in the context of the non-financial definition of saving, the study briefly reviewed the evolution of disposable income and its components and the evolution of households' real consumption expenditure by purpose, focusing on the recent period.

Some key conclusions drawn from the analysis are the following:

The financial crisis affected significantly Greek households' net financial wealth. Between early 2008 and the first half of 2012, households' net financial wealth was reduced by 65.3% (average annual rate of change during that period: 18.4%), reflecting both a decrease in assets and an increase in liabilities. From the third quarter of 2012 to the first quarter of 2016, net financial wealth increased by 79.8%

(average annual rate of change during that period: 16.4%), as households' total liabilities declined, while the value of their total assets increased. Overall, between early 2008 and early 2016, net financial wealth fell by 37.5%.

During the deterioration of the crisis, risk aversion prevailed and household portfolio shifts occurred, away from shares and other equity, debt securities and investment fund shares towards more liquid financial assets, such as deposits. At times of heightened uncertainty in Greece, even deposits lost their attractiveness, and cash holdings (currency) increased considerably.

Before 2008, the increase in household total assets stemmed almost exclusively from transactions. This pattern changed thereafter, particularly in the early phase of the crisis (2008-2009), as household assets sustained large valuation losses that could not be offset by the positive flows (transactions) occurring in that period. By contrast, in 2013-2014, household total assets showed a marked increase, largely reflecting upward revaluations that exceeded the comparatively low negative transactions. From 2015 onwards, sharp devaluations coupled with disinvestment contributed negatively to the change in the value of household assets.

In the period that preceded the financial crisis, in particular during the Greek economy's boom years from 2004 to 2007, a continuous and considerable increase in households' debt liabilities was observed, mostly associated with residential investment. Starting from early 2008, residential investment shrank considerably. Moreover, households almost quadrupled their liabilities, both for housing and consumer loans, from 2002 to June 2010. The composition of household loans remained remarkably unchanged, with housing loans accounting for about 70% of total loans and consumer loans for 30%. A net reduction in household liabilities occurred for the first time in late 2010 and, intensified as from the second quarter of 2013, continued into the next quarters. In spite of a decline in household net borrowing, total liabilities as reflected in leverage ratios remained high.

According to the financial definition of saving (interaction between household investment and debt), up to the end of 2008 household saving remained robust, supported by households' high investment in real estate, other non-financial assets and financial assets, which outweighed net new debt incurrence. Thereafter, savings followed a downward trend, as the decline in total household net investment outpaced the reduction in net liabilities. Although households had started already from the fourth quarter of 2010 a net repayment of their existing debt, saving became negative in the first quarter of 2011, reflecting both a decline in (mainly residential) investment and strong net disinvestment of financial assets. Since then, saving has alternated from positive to marginally negative, depending on which component dominates each time. Household saving is exceptionally low compared with its pre-crisis levels, because of a contraction of investment in houses/equipment and large disinvestment of financial assets.

According to the non-financial accounts of the household sector, the household saving rate, in terms of four-quarter moving sums, followed a downward path as from the second quarter of 2009, falling from 7.4% to -5.6% by the first quarter of 2016. Two subperiods can be identified in this regard: one until the first quarter of 2012, when the household saving rate was in positive territory, and a second when it became negative. It is pointed out that the decrease in household saving - in particular from end-2009 onwards – is linked with the decline in disposable income. Specifically, the continuous downward trend in the household saving rate from the second quarter of 2012 through the second quarter of 2014, when this ratio was in negative territory, is attributable to the fact that the rate of decrease in disposable income exceeded the rate of decrease in consumption. Since the second quarter of 2014, the household saving rate appears to have stabilised at very low levels.



A decomposition of household disposable income indicates that the largest percentage contribution comes from compensation of employees, followed by operating surplus, social benefits and, finally, net property income. In the period from the first quarter of 2010 to the first quarter of 2016, all these four components fell sharply. In the same period, household disposable income shrank by 32.8% in nominal terms and by 32.5% in real terms; as a result, household consumption expenditure declined, by 24.7% in real terms, from €169.4 billion in the first quarter of 2010 to €127.5 billion in the first quarter of 2016. Finally, from 2009 onwards, household final consumption expenditure by purpose declined in real terms across all individual categories of expenditure. Expenditure on consumer durables fell sharply, on the back of rising unemployment and shrinking disposable income. In the same period, the share of expenditure on basic needs (food, housing and network services) in total consumption increased, and the share of expenditure on non-basic needs (furnishing etc., clothing and footwear) decreased accordingly. The above changes provide indications on the evolution of household consumption pattern.



REFERENCES

- Arrondel, L., L. Bartiloro, P. Fessler, P. Lindner, T.Y. Mathä, C. Rampazzi, F. Savignac, T. Schmidt, M. Schürz and P. Vermeulen (2014), "How do households allocate their assets? Stylised facts from the Eurosystem Household Finance and Consumption Survey", European Central Bank (ECB), Working Paper Series, No. 1722.
- Bank of Greece (2011), Annual Report 2010.
- Bank of Greece (2015), Annual Report 2014.
- Bank of Greece (2016), Monetary Policy Interim Report 2016.
- Bê Duc, L. and G. Le Breton (2009), "Flow-of-funds analysis at the ECB framework and applications", European Central Bank (ECB), *Occasional Paper Series*, No. 105.
- Berry, S., R. Williams and M. Waldron (2009), "Household saving", Bank of England, *Quarterly Bulletin Articles*, 49(3).
- Bouis, R. (2015), "Household Deleveraging and Saving Rates: A Cross-Country Analysis", mimeo, February.
- Brissimis, S.N., E.N. Garganas and S.G. Hall (2014), "Consumer credit in an era of financial liberalisation: an overreaction to repressed demand?", *Applied Economics*, 46(2), 139-152.
- Cooper, D. (2013), "Changes in US household balance sheet behavior after the housing bust and Great Recession: Evidence from panel data", Federal Reserve Bank of Boston, *Public Policy Discussion Papers*, 13(6).
- Cussen, M., B. O'Leary and D. Smith (2012), "The impact of the financial turmoil on households: a cross country comparison", Central Bank of Ireland, *Quarterly Bulletin Articles*, 2(12), 78-98.
- Cussen, M. and G. Phelan (2010), "Irish households: assessing the impact of the economic crisis", Central Bank of Ireland, *Quarterly Bulletin Articles*, 4, 62-76.
- De Bonis, R. and A. Silvestrini (2012), "The effects of financial and real wealth on consumption: New evidence from OECD countries", *Applied Financial Economics*, 22(5), 409-425. European Central Bank (ECB)(2015), *Economic Bulletin*, No. 3, April.
- European Central Bank (ECB)(2016), Household Sector Report 2016 Q1, Quarterly report of financial and non-financial accounts for the household sector in the euro area.
- Friedman, M. (1957), A theory of the consumption function, NBER, Princeton University Press, 20-37.
- Glick, R. and K. Lansing (2010), "Global Household Leverage, House Prices, and Consumption", Federal Reserve Bank of San Francisco, *Economic Letters*, 1(11).
- Lequiller, F. and D. Blades (2014), Understanding national accounts, OECD Publishing, Second edition.
- Lolos, S.E. and E. Papapetrou (2011), "Housing credit and female labour supply: assessing the evidence from Greece", Bank of Greece, *Working Papers*, No. 141.
- McCarthy, Y. and K. McQuinn (2014), "Deleveraging in a highly indebted property market: who does it and are there implications for household consumption?", Central Bank of Ireland, *Research Technical Papers*, No. 5.
- Rocher, S. and M. Stierle (2015), "Household saving rates in the EU: Why do they differ so much?", European Commission, *Discussion Papers*, 005.
- Skudelny, F. (2009), "Euro area private consumption: is there a role for housing wealth effects?", European Central Bank (ECB), *Working Paper Series*, No. 1507, May.
- Zarco, I.A. (2009), "Financial assets and liabilities of households in the European Union", Eurostat, *Statistics in Focus*, 32.





EUROPE AS AN OPTIMUM CURRENCY AREA: THE EXPERIENCE OF THE BALTIC COUNTRIES*

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I INTRODUCTORY REMARKS

The theory of Optimum Currency Areas (OCAs) is central to international macroeconomic analysis and to the broad debate on monetary integration and has grown to be of particular interest to the European currency area in recent decades.

The key conclusions of the OCA theory are based on the premise that, for a currency area to be successful and labelled as optimum, the benefits of joining should outweigh the costs that the loss of monetary policy tools entails for prospective members (Van Overtveldt 2011). The literature on this topic lists a number of criteria that need to be met for a monetary union to qualify as an OCA. These criteria form the basis of the OCA theory and serve a twofold purpose: on the one hand, they seek to reduce the incidence of asymmetric shocks by requiring that participating economies share similar structural characteristics (e.g. labour market institutions, inflation rates and levels of economic development); on the other hand, they aim to establish adequate adjustment mechanisms (e.g. labour mobility and fiscal integration), to lessen the impact of asymmetric shocks, should they occur.1

The endogeneity of the OCA criteria, a notion developed in the context of discussions on the OCA theory, assumes that monetary integration leads to a significant deepening of reciprocal trade. This has led to the idea that countries may satisfy the OCA criteria ex post, even if they do not ex ante (Frankel and Rose 1998).

By arguing that non-qualifying currency areas could, over time, turn into OCAs, the endogeneity hypothesis provided the theoretical underpinning for refuelling the debate on Economic and Monetary Union (EMU). Thus, the OCA criteria could be fulfilled ex post, as a result of the expected higher trade integration and income correlation (Mongelli 2008). On the other hand, endogeneity would mean that the fulfilment of the criteria is the result of a dynamic process, potentially involving factors that hamper, rather than facilitate, the development of an OCA. Thus, even economies that meet the OCA criteria before entering a monetary union may stop doing so after they have joined (see, inter alia, Giannakopoulos and Demopoulos 2011).

In the case of the euro area, although it was generally accepted that the participating countries did not initially satisfy the conditions for an OCA, the monetary union seemed to work well from its inception in 1999 to the outbreak of the financial crisis in 2008. Thereafter, however, developments across the euro area countries brought to light the flaws of this union, as economic convergence among the participating countries proved to have been inadequate, and appropriate mechanisms to absorb asymmetric shocks were not in place. This article aims to empirically test the validity of this narrative. To this end, it will attempt to empiri-

1 See Gibson, Palivos and Tavlas (2014).



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cally confirm the validity of the hypotheses that: (a) the monetary union functioned smoothly, with the participating economies following a path of convergence, thereby supporting the case for endogeneity; and (b) this changed in the period after the outbreak of the crisis. If confirmed, this would certainly support the argument that the initial perception of a smooth path towards a European OCA was overly optimistic.

The analysis focuses on the case of the three Baltic economies, i.e. Estonia, Lithuania and Latvia. These countries seceded from the former Soviet Union in the early 1990s and simultaneously embarked on a transition to market economy. Having joined the European Union (EU) in 2004, they all adopted the single currency within a period of five years (2011-2015).² Although their euro area entry is relatively recent, their economic integration into the EU began immediately after their independence from the Soviet Union, as all three countries had set EU and euro area membership as a long-term national goal. Attesting to this is the fact that it took them only a short time to achieve a very high degree of economic integration with the rest of the EU. Indeed, as shown in Chart 1, by the start of the past decade, these economies had already had quite high trade openness and, as seen from Chart 2, a high degree of trade integration with the EU countries.

Furthermore, all three countries adopted fixed exchange rates of their currencies vis-àvis the euro, which meant that their monetary policies had to be closely coordinated with that of the European Central Bank (ECB). Due to the structural similarities of their economies, the three countries can be examined together as a bloc for the purposes of this investigation.

The analysis that follows will address the question of whether the abovementioned narrative holds true in the case of the Baltic economies. That is, it will check the validity of the argument that the pre-crisis conver-



Latvia

0

Lithuania

Chart I Baltic countries: Trade openness



Estonia

0

gence of the Baltics with the EU countries was conjunctural, which would mean that the conditions for an OCA were not satisfied over time, and that this was largely revealed by the adverse impact of the 2008 financial crisis. In fact, the divergence of these countries from the euro area after the outbreak of the crisis is reflected in the strong recovery from the sharp real GDP contraction they had experienced in 2009, as opposed to the anaemic rebound of euro area economies. More specifically, as seen in Chart 3, although the 2008 crisis caused real GDP in 2009 to fall more sharply in the Baltic countries (-14.5%) than it did in the euro area (-4.5%), the former recovered very strongly and soon. On the other hand, the euro area economies took a quite different path, with a lacklustre initial recovery followed by a relapse to recession. Therefore, the divergence between the two blocs also seems to be linked with the better performance of the Baltic economies, compared with the euro area. For this reason, the periods before and after the onset of the crisis will be examined separately in the analysis below.

2 Estonia in 2011, Latvia in 2014 and Lithuania in 2015.




Chart 2 Baltic countries: trade with the EU



Our methodology is based on the theory of Purchasing Power Parity (PPP),³ in particular, on the simple assumption that, in an economically well-integrated monetary union, the real exchange rates of its member countries are expected to converge. In other words, if the economies meet the criteria for joining a monetary union, any shocks will be symmetric and their macroeconomic variables will co-move.

Specifically, according to the theory of Generalised PPP (G-PPP), if the fundamental economic variables determining the real exchange rates of a group of economies are non-stationary, then the real exchange rates of these economies are also non-stationary. Nevertheless, if these variables tend to share common trends in the long run, they can still form a cointegrating relationship (Enders and Hurn 1994). In this case, the relevant economies are likely to constitute an OCA, if they face similar real disturbances (Mundell 1961).

Finally, it should be noted that the econometric model used, apart from examining whether a G-PPP relationship exists between the real exchange rates of the three Baltic countries against the euro, is also used to determine whether a similar relationship exists between their real exchange rates against the US dollar. The purpose of this latter empirical investigation is to cross-check the findings of the analysis, given that the Baltic countries used the US dollar as an anchor currency in an early stage of their transition process and before the emergence of the euro, although their trade relations with the United States are limited, particularly in comparison with their trade with the EU.

This article is structured as follows: The next section reviews the theoretical framework. Section 3 presents the data and the econometric methodology. Section 4 reports the empirical results. Finally, Section 5 concludes.

2 THE THEORY OF GENERALISED PURCHASING POWER PARITY

In the OCA literature, the theory of Generalised Purchasing Power Parity (G-PPP) is the

³ The choice of method was largely determined by the availability of the monthly price and exchange rate data needed to ensure a sufficiently large number of observations, and was also based on reliability considerations related to the increased transparency of exchange rate and price level data.



most commonly used theory for testing whether a group of countries form a currency area.

The G-PPP theory was introduced by Enders and Hurn (1994) and is based on the following idea: It could be that the fundamental economic variables determining the real exchange rates of a group of countries are non-stationary, and consequently the real exchange rates of the countries are non-stationary; nevertheless, if the fundamentals are sufficiently integrated, the real exchange rates will share common trends and therefore will converge towards a long-run equilibrium relationship (i.e. they will form a cointegrating relationship). If this holds true, the economies will constitute an optimal currency area in the sense of Mundell (1961), who argues that two or more economies constitute a currency area if they face similar real disturbances. The theory also suggests that, when economic interdependence in a group of economies is high, an economy's bilateral real exchange rate is influenced by the exchange rates of the other economies in the group and the fundamentals of the other economies.4

Testing for G-PPP initially entails univariate stationarity analysis of the individual real exchange rate series. The real exchange rate (R) is calculated as:

$$\mathbf{R} = \mathbf{S} \left(\mathbf{P} / \mathbf{P}^* \right) \tag{1}$$

where S is the nominal exchange rate (the value of the domestic currency expressed in terms of the foreign currency), P^* is the general level of prices in the foreign country and P is the general level of domestic prices. An increase (decrease) in the real exchange rate means depreciation (appreciation) of the domestic currency.

A stationary real exchange rate implies that PPP holds between a given pair of countries (i.e. changes in the ratio of their national price levels are mirrored by changes in the nominal exchange rate between the relevant currencies), which, in turn, indicates that these countries are connected by strong trade and finance links and that their economies are converging towards each other. By contrast, a non-stationary real exchange rate would prima facie suggest an absence of strong finance links between the two countries. Nevertheless, nonstationary real exchange rates can still share common trends in the long run, which is evidence of economic convergence/integration between the economies and the existence of a currency area.

Specifically, following the notation of Enders and Hurn (1994), G-PPP can be described as follows: given a n-country world, a m ($m \le n$) country currency union exists when G-PPP holds, such that a long-run equilibrium relationship exists between the m-1 bilateral exchange rates, of the form:

$$r_{2jt} = a + b_{3jt}r_{3jt} + b_{4jt}r_{4jt} + b_{5jt}r_{5jt} + \dots + b_{mjt}r_{mjt} + e_t \quad (2)$$

where r_{ijt} is the log of the bilateral real exchange rate in period t between Country j and Country i; a is the intercept term; b_{ijs} are the parameters of the cointegrating vector, which represent the degree of comovement of the real exchange rates; and e_t is a stationary stochastic disturbance term. The b_{ij} parameters reflect the economic interdependencies within the group of economies. Enders and Hurn (1994) show that the estimated b_{ijs} are closely linked to the aggregate demand functions of a goods market-clearing relationship. They also indicate that the more similar the aggregate demand functions in each country of the group, the lower the b_{ijs} in magnitude.

Numerous empirical studies have used the G-PPP theory to test whether a group of countries with common characteristics form an OCA (see e.g. Sarno (1997), who focuses on EMS countries; Antonucci and Girardi (2006) on EMU countries; Kawasaki and Ogawa (2006), Wilson and Choy (2007) and Nusair (2012) on Eastern Asian countries; Neves et al.



⁴ The idea that third-country effects should be taken into account when testing for bilateral PPP within a system of countries is further developed by e.g. Sideris (2006b).

(2007) on Mercosur countries; and Sideris (2011) on Central European countries in relation to the euro area).

3 DATA AND ECONOMETRIC METHODOLOGY

In this empirical investigation, we use monthly observations for the nominal exchange rates of the domestic currency of each Baltic country vis-à-vis the euro and the US dollar, respectively. For the calculation of real exchange rates, we use the consumer price indices (CPIs). The choice of CPIs is explained by the fact that these measures are published for all countries, ensuring a large sample of data compiled by a broadly similar methodology.⁵

The sample period is determined by CPI data availability. In particular, monthly CPI data are available for the period from February 1995 to November 2014 (258 monthly observations). The sources of data are the IMF International Financial Statistics (IFS) online database and Eurostat.

The price indices (P) refer to monthly data with 2005 as base year (2005=100). The nominal exchange rates (S) of the three Baltic countries are end-month.⁶ The real exchange rate (R) of each Baltic country is derived from its nominal exchange rate adjusted for prices. The logs of the real exchange rate series are denoted by r_{ij} , where the subscript i takes the values la, li and es for Latvia, Lithuania and Estonia, respectively, and the subscript j takes the values $\notin x\alpha i$ for the euro and the US dollar, respectively. The nominal exchange rate series are taken from the monthly database of the Vienna Institute for International Economic Studies (WIIW).

To explore the potential relevance of the 2008 crisis, the analysis is carried out (i) for the precrisis or pre-onset period, from February 1995 to September 2008 (164 observations), and (ii) for the post-onset period, from October 2008 to November 2014 (74 observations).⁷ We first test for stationarity of the euro (and the dollar) real exchange rate series of Latvia, Lithuania and Estonia, applying unit root tests. If non-stationarity is established, we test whether a G-PPP relationship exists between the Baltics and the euro area (the US economy), using the Johansen (1995) cointegration technique.

4 EMPIRICAL RESULTS

4.I UNIT ROOT TESTS

In order to test for stationarity of the individual data series, we apply the Elliott-Rothenberg-Stock (ERS) test (see, inter alia, Neves et al. 2007). In the regressions of the series, we include a constant and a trend based on tests for their statistical significance. The lag length (known to have an impact on the results of the unit root tests) is selected based on the Schwarz Information Criterion (SIC). The regressions are estimated using spectral ordinary least squares (OLS). The test results, which are shown in Table 1, provide evidence that all series are I(1).⁸

According to the results for the euro real exchange rate series of Lithuania (r_{lie}), Latvia (r_{lae}) and Estonia (r_{ese}), as shown in Table 1A, the ERS test statistics (P-stats) take the values: $P_{lie}=110.06$ (Lithuania), $P_{lae}=78.90$ (Latvia) and $P_{ese}=282.60$ (Estonia), which are higher in absolute terms than the critical value of the test (5.65) at the 5% level of significance. Hence, the null hypothesis (H_0) cannot be rejected, and we conclude that the variables r_{lie} , r_{lae} and r_{ese} are non-stationary in levels. Non-stationarity implies that a series has at least one unit root,

⁸ The results are consistent with the findings of Sideris (2006a) and Hsing (2008).



⁵ The Harmonised Index of Consumer Prices (HICP) would have been even more relevant, but is available for a smaller sample of observations.

⁶ For the period up to end-December 1998, the exchange rates of the currencies of the Baltic countries are expressed in relation to the European currency unit (ECU). The nominal effective exchange rates of the Estonian kroon and the Latvian lats against the US dollar as from December 2010 and December 2013, respectively, are expressed by reference to the euro/dollar parity.

⁷ The financial crisis began in September 2008 with the collapse of Lehman Brothers.

Table | ERS unit root tests (February 1995-November 2014)

		Testing for unit root in:			
		Levels		First differences	
Variable	Intercept terms	P-statistic	Critical value (5%)	P-statistic	Critical value (5%)
$r_{li\epsilon}$	c, t	110.06	5.65	0.91	5.65
$r_{la \epsilon}$	c, t	78.90	5.65	0.99	5.65
r _{es€}	c, t	282.60	5.65	1.40	5.65
B. Real exchange rates vis-à-vis the US dollar					
		Testing for unit root in:			
		Levels		First differences	
Variable	Intercept terms	P-statistic	Critical value (5%)	P-statistic	Critical value (5%)
r _{li\$}	c, t	19.17	5.65	0.79	5.65
r _{la\$}	c, t	14.05	5.65	1.08	5.65
r _{es\$}	c, t	11.40	5.65	0.97	5.65

A. Real exchange rates vis-à-vis the euro

i.e. it is at least integrated of order one (I(1)), without precluding a higher order of integration. To determine the order of integration of r_{lie} , r_{lae} and r_{ese} , the test is repeated using the first differences of each variable, which we denote by Δr_{lie} , Δr_{lae} and Δr_{ese} . The ERS test statistics now take the values P_{lie} =0.91 (Lithuania), P_{lae} =0.99 (Latvia) and P_{ese} =1.40 (Estonia), which are far lower in absolute terms than the critical value (5.65) at the 5% level of significance. Hence, the null hypothesis (H₀) is rejected, and we conclude that the variables Δr_{lie} , Δr_{lae} and Δr_{ese} are stationary. It ensues that r_{lie} , r_{lae} and r_{ese} are integrated of order one (I(1)).

Table 1B reports the results of the unit root tests for the real exchange rate series of Lithuania (r_{lis}) , Latvia (r_{las}) and Estonia (r_{ess}) vis-à-vis the US dollar. All three series are found to be integrated of order one (I(1)).

4.2 TESTING FOR G-PPP USING COINTEGRATION ANALYSIS

Cointegration ranks

In this section, we investigate whether a longrun equilibrium G-PPP relationship of the type described in equation (2) exists between the real exchange rates. The analysis tests for cointegration using the Johansen VAR methodology (Johansen 1995). The number of lags included in the VAR systems is determined by the Akaike Information Criterion (AIC). Under this approach, the number of cointegrating relationships is identified using the Johansen's trace and maximum eigenvalue (Max-Eigen) tests. For each set of real exchange rates (i.e. vis-à-vis the euro and the US dollar, respectively), cointegration analysis is performed for two different periods, i.e. before and after the onset of the crisis.

The results on the existence of a G-PPP relationship between the real euro exchange rates are reported in Table 2. Both tests indicate the presence of one cointegrating vector in the system for the pre-onset period, i.e. February 1995-September 2008 (see Table 2A).⁹ The results provide support to the existence of an equilibrium relationship for the period before the onset



⁹ The estimated trace statistics (34.82) is greater than the critical value at the 0.05% confidence level (29.80), thus leading to the rejection of the null hypothesis of no cointegration (H₀). Likewise, the maximum eigenvalue (23.17) exceeds the critical value at the 0.05% confidence level (21.13).

Table 2 Cointegration analysis: real exchange rates vis-à-vis the euro

A. February 1995-September 1998					
Rank	Maximum eigenvalue	Critical value (95%)	Trace	Critical value (95%)	
0	23.17*	21.13	34.82*	29.80	
1	8.66	14.26	11.66	15.49	
2	3.0	3.84	3.0	3.84	
B. October 2008-November 2014					
Rank	Maximum eigenvalue	Critical value (95%)	Trace	Critical value (95%)	
0	14.60	21.13	21.46	29.80	
1	6.20	14.26	7.01	15.49	
2	0.38	3.84	0.38	3.84	
* Denotes rejection of the hypothesis at 0.05 significance level.					

of the crisis. In other words, the cointegration analysis shows that the Baltic countries meet the conditions for an OCA with the euro area during the pre-onset period: the real exchange rates appear to be closely integrated and form a G-PPP relationship during this period.

By contrast, the results for the post-onset period (October 2008-November 2014), as reported in Table 2B, do not suggest an equilibrium relationship: neither the trace test nor the maximum eigenvalue test provide evidence of cointegration¹⁰ or long-run interaction among the exchange rates.

Overall, the test findings suggest that the Baltics did form an OCA with the euro area before the crisis, but not afterwards. As far as the pre-crisis period is concerned, this would mean that the negative impact of the fact that these economies were at the time undergoing transition to market economy was fully offset by the positive impact of: (a) their high degree of economic integration with the countries of the euro area; (b) the stability of their nominal exchange rates vis-à-vis the euro under their respective national exchange rate policies; (c) the considerable flexibility of their institutional framework, in particular regarding the labour market; and (d) a favourable economic conjuncture characterised by the absence of major symmetric shocks, especially after 2000 and until the outbreak of the Great Crisis. However, according to the empirical results, this situation changed with the outbreak of the 2008 crisis, after which economic activity developments diverged between the Baltic States and the euro area, as a result of asymmetric shocks.

The cointegration test results for the real exchange rates vis-à-vis the US dollar, as reported in Table 3, do not point to a long-run relationship between the exchange rates, and in this sense, they are in line with expectations. As can be seen, there is no cointegration among the exchange rates in either the pre-onset or post-onset period.¹¹ The real exchange rates do not share common trends or converge towards one another.

The long-run relationship: Long-run elasticities

Table 4 shows the estimated cointegrating vector, which describes the G-PPP relationship

¹¹ For the pre-onset period, the trace statistic (14.55) is lower than the critical value at the 0.05% confidence level (29.80). Likewise, the maximum eigenvalue statistic (8.74) is lower than the critical value (21.13).



¹⁰ The estimated trace statistic (21.46) is lower than the critical value at the 0.05% confidence level (29.80). Likewise, the maximum eigenvalue statistic (14.46) falls short of the critical value (21.13). Thus, based on both tests, we accept the null hypothesis of no cointegration (H_0).

Table 3 Johansen tests for cointegration rank: real exchange rates vis-à-vis the US dollar

A. February 1995-September 1998					
Rank	Maximum eigenvalue	Critical value (95%)	Trace	Critical value (95%)	
0	8.74	21.13	14.55	29.80	
1	4.03	14.26	5.80	15.49	
2	1.77	3.84	1.77	3.84	
B. October 2008-November 2014					
Rank	Maximum eigenvalue	Critical value (95%)	Trace	Critical value (95%)	
0	9.78	21.13	16.89	29.80	
1	6.54	14.26	7.11	15.49	
2	0.57	3.84	0.57	3.84	

Table 4 Estimated cointegrating relationship

Real exchange rates vis-à-vis the euro (February 1995-September 2008)				
	r _{es€}	$r_{ia\epsilon}$	$\mathbf{r}_{\mathrm{li}\varepsilon}$	
Coefficient	1	-0.09	0.19	
t-stats		-3.70	2.64	
Standard deviation		0.024	0.073	
Probability		0.0003	0.009	

between the three real euro exchange rates for the period February 1995-September 2008. This relationship can be normalised on the Estonian kroon/euro real exchange rate, in order to reflect a simplified form of the interrelationship among these rates.¹² The estimated coefficients can be interpreted as longrun elasticities. All coefficients are statistically significant at the 5% level.

The estimated coefficients are less than unity. In the long-run relationship, a 1% increase (decrease) in the Estonian kroon/euro real exchange rate is associated with a 0.09% decrease (increase) in the Latvian lats/euro real exchange rate and a 0.19% increase (decrease) in the Lithuanian litas/euro real exchange rate. The low values of the coefficients can be interpreted as evidence of significant homogeneity of the relevant economies. According to Enders and Hurn (1994), the low values of parameters mean that the common path of the exchange rates is the result of significant homogeneity of the relevant economies rather than of mutual interactions between the exchange rates. Assuming that the exchange rates are only influenced by real output processes of the various nations, the normalised vector coefficients will be smaller the more similar are a country's aggregate demand parameters. The results therefore indicate that the Baltic economies share a common structure of aggregate demand.

The adjustment coefficients

Johansen's maximum likelihood technique (Johansen 1995) also estimates the adjustment



¹² Normalisation to any of these rates would be possible, by changing accordingly the parameters of the long-run relationship.

Table 5 Estimated adjustment coefficients

Exchange rates vis-à-vis the euro (February 1995-September 2008)			
	Adjustment coefficient	Standard deviation	t-stats
Δr_{li}	0.169	0.04	4.39
Δr_{la}	0.088	0.03	2.60
Δr_{es}	-0.02	0.014	-1.59

coefficients of each variable in the long-run relationship. The adjustment coefficients indicate the speed at which the variables (in this case, real exchange rates) adjust towards their long-run equilibrium. If a certain variable adjustment coefficient is insignificantly different from zero, then the variable is known to be weakly exogenous, as the dynamics of this variable is not influenced by the long-run equilibrium relationship.

Table 5 presents the estimated speed-ofadjustment coefficients for the G-PPP relationship with respect to the euro for the period February 1995-September 2008. Adjustment coefficients are found to be statistically significant for the Lithuanian litas and the Latvian lats. The highest coefficient is found in the case of the real exchange rate of the Lithuanian litas vis-à-vis the euro. At 0.169, this coefficient implies that the litas/euro real exchange rate adjusts by 16.9% per month towards the long-run equilibrium.

The adjustment coefficient of the Estonian kroon is not found to be statistically significant, indicating the G-PPP relationship does not influence its short-run dynamics of r_{ese} , i.e. the latter is weakly exogenous to the cointegration system. Yet, this weak exogeneity of r_{ese} may be due to the frequent interventions in foreign exchange markets undertaken by the Estonian monetary authorities in order to keep the real exchange rate of the national currency at a predetermined level. Moreover, weak exogeneity may also reflect the impact of the institutional and regulatory framework governing prices in Estonia.¹³

5 CONCLUSIONS

The results of the econometric analysis for the three Baltic economies lead to conclusions that are consistent with the common narrative of how the monetary union has performed. Specifically, we find that the Baltic countries did form an OCA with the euro area before the Great crisis of 2008, but not afterwards, when the occurrence of significant asymmetric shocks mostly triggered by the global crisis led to an economic divergence between the two blocs.

In the empirical work, cointegration analysis is employed to investigate the convergence between the three real exchange rates vis-à-vis the euro against the OCA criteria. Cointegration between the Baltics and the euro area is examined for two periods, the pre-crisis or preonset period, from February 1995 to September 2008, and the post-onset period, from October 2008 to November 2014.

The empirical findings provide evidence in favour of G-PPP (and therefore an OCA) with the euro area only for the pre-onset period. More specifically, they indicate that, during that period, the Baltic economies were in a process of convergence with the euro area, as reflected in the gradual convergence of their bilateral real exchange rates vis-à-vis the euro. Relative exchange-rate stability was supported by increased trade integration, a favourable global economic environment and the con-

¹³ These results are indicative of the dynamics, but fail to identify the whole cointegrating system.



straints that the fixed exchange rate regime operated by the Baltic countries imposed on monetary policy. As a result, the Baltic economies followed a path of real convergence with the euro area.

However, with the outbreak of the Great crisis in 2008, it became clear not only that their convergence with the euro area had been overestimated, but also that the risks from the emergence of severe imbalances in these economies had been underestimated. The crisis gave rise to significant asymmetric shocks, which revealed the inadequate degree of convergence of the economies, and this was also reflected in the path of the real exchange rates. More generally, the experience of the crisis showed that the pre-crisis convergence of these economies, which was largely responsible for the build-up of significant, mostly external imbalances, was unsustainable (IMF 2014).14 Against this backdrop, the crisis plunged the Baltic countries into a deep recession, from which, however, they managed to recover quite soon, thanks to prompt policy responses, including adjustment measures.¹⁵ The euro area economies, on the other hand, followed a different path, as mentioned in the introduction. The results of our research support this narrative, as the methodology applied shows that, in the post-onset period, convergence with the euro area economies was insufficient.

The results indicate that the process of convergence towards the euro area has been weakened in recent years by the impact of the Great crisis of 2008. More specifically, prior to 2008, convergence was promoted by a favourable economic conjuncture, the absence of asymmetric shocks and accelerated economic integration with the EU, largely as a result of the role of the euro in European markets. However, with the outbreak of the financial crisis in 2008, it became clear that the degree of economic integration was lower than pre-crisis convergence would suggest (IMF 2014), with the Baltic economies recovering faster than the euro area.

A similar analysis has also been carried out with respect to the US economy. The results show no alignment between the Baltics and the US economy for either the pre-onset or the post-onset period. This confirms our initial hypothesis that the G-PPP theory does not hold for the United States. The results for the United States largely reflect the weakening of the US dollar in European markets, but also the limited economic integration of the Baltic countries with the United States.

In general, the 2008 crisis demonstrated that the previously achieved convergence between the Baltics and the euro area, though significant, was not sufficient to keep the flaws of the monetary union from coming to light. In our view, the results for the Baltic countries are quite representative of the general situation that prevailed in the euro area for some time after the crisis.

15 One important policy response involved internal devaluation, which led to the speedy recovery in the very sizeable export sectors of these economies.



¹⁴ According to several analysts, the Balassa-Samuelson effect explained much of the convergence path of transition economies and was used as an alibi for the large imbalances built up before the crisis. The methodology used in this article does not enable to disentangle the significance of this particular effect.

REFERENCES

- Aggarwal, R. and M. Mougoue (1993), "Cointegration among Southeast Asian and Japanese currencies", *Economic Letters*, 41(2), 161-166.
- Antonucci, D. and A. Girardi (2006), "Structural changes and deviations from the Purchasing Power Parity within the euro area", *Applied Financial Economics*, 16, 185-198.
- Enders, W. and S. Hurn (1994), "Theory and tests of generalized purchasing-power parity: common trends and real exchange rates in the Pacific Rim", *Review of International Economics*, 2(2), 179-190.
- Frankel, J. and A. Rose (1998), "The endogeneity of the optimum currency area criteria", *Economic Journal*, 108(449), 1009-1025.
- Giannakopoulos, N. and G. Demopoulos (2001), "Theory of monetary unions", in: Demopoulos, G., N. Baltas and J. Hassid (eds), *Introduction to European Studies Vol. 2: Economic Integration and Policies*, Athens: I. Sideris, 329-369. [In Greek]
- Gibson, H.D., Th. Palivos and G.S. Tavlas (2014), "The crisis in the euro area: an analytic overview", *Journal of Macroeconomics*, 39, 233-239.
- Hsing, Y. (2008), "On the functional form of PPP: the case of nine new EU countries", *Applied Financial Economics Letters*, 4(6), 389-393.
- IMF (2014), 25 Years of Transition: Post-Communist Europe and the IMF. Regional Economic Issues, Special Report. Eds: J. Roaf, R. Atoyan, B. Joshi, K. Krogulski and an IMF Staff Team. Washington: International Monetary Fund Publication Services.
- Johansen, S. (1995), *Likelihood-Based Inference in Cointegrated Vector Autoregressive Models*, Oxford: Oxford University Press.
- Kawasaki, K. and E. Ogawa (2006), "What should the weights of the three major currencies be in a common currency basket in East Asia?", *Asian Economic Journal*, 20(1), 75-94.
- Mongelli, F.P. (2008), "European economic and monetary integration and the optimum currency area theory", *European Economy, Economic Papers*, 302, Brussels: European Commission.
- Mundell, R.A. (1961), "A theory of optimum currency areas", *The American Economic Review*, 12(4), 657-665.
- Neves, J.A., L. Stocco and S. Da Silva (2007), "Is Mercosur an optimum currency area?", *Munich Personal RePEc Archive*, MPRA Paper No. 2758.
- Nusair, S. (2012), "Is East Asia an optimum currency area? A test of generalized purchasing power parity in the presence of structural breaks", *Journal of the Asia Pacific Economy*, 17(3), 399-425.
- Sarno, L. (1997), "Policy convergence, the exchange rate mechanism and the misalignment of exchange rates. Some tests of purchasing power parity and generalized purchasing power parity", *Applied Economics*, 29(5), 591-605.
- Sideris, D. (2006a), "Purchasing Power Parity in economies in transition: evidence from Central and East European countries", *Applied Financial Economics*, 16(1-2), 135-143.
- Sideris, D. (2006b), "Testing for long-run PPP in a system context: evidence for the US, Germany and Japan", *Journal of International Financial Markets, Institutions and Money*, 16(2), 143-154.
- Sideris, D. (2011), "Optimum currency areas, structural changes and the endogeneity of the OCA criteria: evidence from six new EU member states", *Applied Financial Economics*, 21(4), 195-206.
- Van Overtfeldt, J. (2011), The End of the Euro: The Uneasy Future of the European Union, Chicago: Agate.
- Wilson, P. and K.M. Choy (2007), "Prospects for enhanced exchange rate cooperation in East Asia: some preliminary findings from generalized PPP theory", *Applied Economics*, 39(8), 981-995.





THE EVOLUTION OF FINANCIAL TECHNOLOGY (FINTECH)

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I INTRODUCTION

The term "financial technology" (or FinTech) refers to the application of technology for the provision of financial services. As a sector, Fin-Tech refers to technology startups that are emerging to compete with traditional banking and financial market players, offering a number of services, from mobile payment solutions (see Section 2.1) and crowdfunding platforms (see Section 2.2) to online portfolio management and international money transfers. FinTech companies are attracting the interest of both financial services users and investment firms, which see them as the future of the financial sector.

The term FinTech can be traced back to the early 1990s and more specifically to a project initiated by Citigroup.¹ However, it was only in 2014 that the sector started to attract the increased attention of regulators, industry and consumers. Although FinTech is seen as a recent close cooperation of financial services and information technology, the linkage of these two sectors has a long history. In fact, financial and technological developments have been interconnected and mutually reinforcing over time.

The global financial crisis of 2008 was a turning point and one of the reasons that made Fin-Tech a new norm. This change has brought about challenges both for regulators and market participants, mainly in terms of striking a balance between the potential benefits and risks of innovation. Increased activity raises questions like: What will the financial landscape be like after digitisation? What will be the role of traditional banks? Will FinTech companies expand in tandem with the banking sector or not? What are the new risks posed by these new synergies to financial services users?

Regulators are faced by a difficult task in finding the right balance that will at the same time allow incumbent firms to survive and newcomers to innovate, as hindering the entry of new firms would distort the market in favour of established firms. Thus, given the abovementioned challenges, regulators should follow some general principles in order to strike a balance.² First, they should keep a neutral stance towards technological developments. Rules should promote healthy competition among market players, irrespective of whether they offer traditional approaches or new technological solutions. Second, a harmonised, nondiscriminatory set of rules should apply establishing a level playing field for all participants, with a view to averting market fragmentation and low competition. Finally, regulators should above all ensure the protection of users, as well of the financial system itself.

This article is structured as follows: Section 2 examines the drivers of the evolution of the FinTech sector. These include supply-side factors, related to the digital revolution, and demand-side factors, related to the emergence of new consumer patterns. A more detailed analysis is provided regarding the development of FinTech in payment services, lending and funding. Section 3 focuses on the role of banks with respect to FinTech, i.e. how big traditional players react and what alternative strategies they could adopt. Next, Section 4 explores the ensuing challenges for regulators, discusses different approaches to the protection of financial services users and outlines the existing regulatory framework of the European Union



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¹ FinTech is the initial name for the Financial Services Technology Consortium, a project initiated by Citicorp, former Citigroup. The Financial Services Technology Consortium (FSTC) started in 1993 to facilitate technological cooperation efforts in the sector of financial services.

² See Darolles (2016).

Chart I Global investment in FinTech (2010-2014)



(EU). In the last section, a brief overview of the landscape in Greece is provided.

2 THE EMERGENCE OF FINTECH

Once the global economy exited the crisis, it became clear that many customers, especially the younger generation, had lost their trust in banks. Apart from an increased mistrust of banks, young people have developed different consumer patterns from those of their elders. They have grown up being used to having access to personalised, tailor-made solutions, in stark contrast with the past "mass" approach of banks and other traditional financial institutions. Against this backdrop, if traditional players wish to attract profitable clients, they need to evolve and offer interactive solutions of the same level as those of their FinTech competitors.

This trend has been fuelled by a steady growth in global investment in the FinTech sector (see Chart 1), mainly by venture capital and private equity. Between 2013 and 2014, in only one year, FinTech investment almost tripled in the United States. London, San Francisco/Silicon Valley and New York have already emerged as major financial innovation hubs, while new hubs have followed suit around the world, namely Amsterdam, Paris, Berlin and Dublin, which are the main centres of the European FinTech ecosystem (see Chart 2).

These new opportunities have the strongest impact on emerging market economies, especially those with a rapidly increasing middleincome population. More specifically, there is now growing demand for financial services by people who previously had no access to the banking sector, as mobile device-based technology enables access to financial solutions without the need of physical banking infrastructure.

In developing countries, FinTech includes among other things the following features: (1) a young population with digital literacy and equipped with mobile devices; (2) a fast-growing middle class, with 60% of the world's middle class being identified in Asia by 2030; (3) inefficient financial markets, which allow for

Chart 2 FinTech hubs*



informal alternative solutions; (4) lack of physical banking infrastructure (1.2 billion people have no bank account); and (7) underregulated frameworks for data protection and competition. The above features are further fuelled by the interplay between a dynamic private sector that seeks to expand to the provision of financial services and a public sector that aspires after market reform in order to achieve economic growth.

In Asia and Africa, the recent growth of Fin-Tech is primarily driven by economic development. Hong Kong and Singapore saw in less than a year the creation of three FinTech accelerators,3 thus featuring the greatest concentration of FinTech accelerators worldwide. The emergence of FinTech in Asia is not unprecedented in the wake of the crisis, but it is rather the combination of a number of business and regulatory factors. More specifically, IT spending by traditional banks in Asia and Africa is lower than in Europe and the United States. This can be explained by a slightly less competitive market, which is still largely controlled and subject to distortions by state-owned banks. Public mistrust of the state-owned banking system (because of corruption and inefficiency) means that users are willing to adopt alternative solutions offered by non-banks. As a result, mobile financial services and mobile phone products are comparably more attractive.

Although Africa shares many common features with Asia-Pacific in terms of financial innovation development, the nature and the direction of the determinants of this sector are quite different in Africa. According to G20, almost 2.5 billion adults in the African continent (almost half of the working age population) have no access to the formal financial sector (see Table 1). In this context, telecommunication companies, instead of banks, have taken the lead in the development of FinTech in the region. Mobile money, which means basic payment and saving services whereby money is transferred electronically using a mobile device, although initiated in the Philippines, achieved its greatest success in Kenya and more recently in Tanzania.

2.1 PAYMENT SERVICES

The past five years have witnessed a number of novelties, which, by making a wide use of

³ Business development programmes for innovative firms that act as innovation "incubators", providing space, support (tailored training programmes, mentorship, networking, etc.) and every possible assistance to new researchers, entrepreneurs and startups, in order to develop new ideas and technology-driven solutions in the area of financial services.



Table I Commercial bank branches (per 100,000 adults)

Area	2004	2014	
Euro area	33.6	28.0	
East Asia and Pacific	13.9	10.8	
Least developed countries	1.2	3.3	
Sub-Saharan Africa	1.4	3.9	
South Asia	7.2	8.9	
Latin America and Caribbean	12.5	15.7	
Middle East and North Africa	11.0	15.2	
Source: The World Bank, http://data.worldbank.org/indicator/FB.CBK.BRCH.P5.			

mobile devices and the internet, resulted in simpler payment solutions. Innovation comes in different forms, depending on the payments sector and the market. Such novelties include, for instance, digital wallets, mobile payments, contactless payments⁴ and real-time payments.

At the same time, over the past five years an increasing number of FinTech startups and non-bank payment providers have entered the payments industry (see Chart 3), taking advantage of an array of new technology conditions prevailing in the market and using alternative business models that could both disrupt and complement conventional payment practices. This new paradigm of non-bank payment provider has led to the emergence of FinTech startups (which seek to apply technological advances in payment services) as well as of incumbent firms in other non-payment industries (like Facebook and Apple).

A tangible proof of the potential market power of technology-driven financial service providers is PayPal. Today, the company has more than 100 million active accounts and processes a daily average of USD 315 million in payments. The use of prepaid cards also follows an upward trend. A report released in 2012 by Master-Card⁵ projected that the market for the socalled e-money (cards pre-loaded with cash) would be worth around USD 822 billion by 2017. Furthermore, it should be noted that almost every bank account holder in the EU has a debit card and 40% of them also have a credit card. 34% of EU citizens already shop online and more than 50% have a smartphone, which allows them to access mobile payment. Some economy sectors —like the travel industry perform most of their sales online. Finally, small and medium-sized enterprises (SMEs) are among the main beneficiaries of FinTech startups. They are willing to experiment with new tools that will have a material impact on their business activities. In fact, SMEs are the backbone of many economies (accounting for 80% of global economic activity).

First, what are the benefits of mobile payments? Due to the fact that mobile phones are all the more powerful and connected, the integration of payments into a mobile phone offers many potential advantages. The customer, using the computing and communication power of a mobile phone, may perform several other activities simultaneously. For instance, a consumer can compare retail prices, store the payment record using a financial management software, download a warranty or instructional video on how to use a product, etc.

- 4 Contactless payment allows consumers to pay for small purchases by simply tapping their card (or their mobile device) near the pointof-sale terminal, while the intervention of third parties or signature or PIN verification are typically not required.
- 5 2012 Global Prepaid Sizing Study, commissioned by MasterCard: A look at the potential for global prepaid growth by 2017.





Chart 3 Shares (per product and per customer segment) of FinTech in global banking revenue*

The main common characteristics of payments innovations are: (1) simplicity (they allow customers to make payments in a single tap); (2) interoperability of IT systems (they are not restricted to a single payment method, as the digital wallet is linked to credit/debit cards or a bank account); and (3) supply of value-added services (customers, merchants and financial institutions interact more closely, which enables them to offer additional services such as offers, rebates and reward points).

These innovations have led to a shift away from cash towards electronic payments, as consumers now benefit from the use of payment cards even in small value transactions. Given that innovative solutions make use of the existing infrastructure, which has very low variable costs, the cost of electronic transactions is expected to fall as the volume of electronic payments increases. On the other hand, as a result of this shift towards electronic payments and hence the accumulation of more personal data, financial institutions, service providers and merchants will be better informed about their customers.

Furthermore, as transactions become all the more virtual and automated, an increasing number of payment processes will become invisible to end users, changing in this way both their needs and their consuming behaviour. In more detail, the successful deployment of digital wallets will free consumers from any limitations on the number of payment cards they can hold and use for their transactions. Conversely, customers may add multiple payment cards to digital wallets and choose a different card each time with a few additional clicks or in just one click. On their part, to ensure faster, simpler and more efficient payments, a growing number of merchants and payment solution providers will offer an automated or one-click check-out in electronic payments, in which consumers will have set a default card for all transactions unless a different payment method is selected. As a result of the above, card issuers will have to differentiate in order







to compete for the default card, by providing e.g. rebates or loyalty points. Moreover, leveraging data in specific customer segments will become a key component of financial institutions' strategies to gain a dominant share in digital wallets.

With banks increasingly aware of the fact that FinTech and developments in payments strongly affect the future path of payment services, the payments industry is rapidly evolving, as traditional players and FinTech startups have established collaborative partnerships to make the best of both parties and to provide customers with optimal solutions. New technologies compromise the traditional role of banks in the payments landscape. Conventional payment solutions, such as credit and debit cards, have been the main interest income source for many banks. Such fee revenue is threatened by innovation, and banks may see their share in the payment services market decline, since the adoption of a digital wallet is as simple as the installation of an application in a smartphone. New, innovative banking products and services are only available digitally (e.g. digital wallets for mobile devices), user-friendly, tailor-made and readily available to users. Financial institutions' ability to partner with merchants will constitute a critical component of their strategies, either by offering merchants with special terms and conditions of use or by becoming the default card for e-commerce platforms.

2.2 LENDING AND FUNDING

In the post-crisis period, lower risk appetite among retail banks has significantly limited access to traditional bank lending. This mutual loss of trust created a lending gap, which means that a considerable part of borrowing needs is not adequately met by financial institutions. Furthermore, customer preferences in financial services are rapidly changing, which calls for increased transparency, effectiveness and control over savings and loans.

Over the same period, alternative peer-to-peer (P2P) lending platforms have emerged to fill gaps in the traditional lending model. Such platforms use alternative methods for assessing customers' creditworthiness (for example, files of sales history from eBay, social media data, etc.) and automated processes to offer loans to a broader base of customers, as well as a new class



of investment opportunities. P2P lending platforms are a new form of lending, without necessitating financial intermediation. Acting mainly as online stock markets, lenders offer an amount, which is usually shared among borrowers to achieve risk diversification, while borrowers pick the lowest interest rate, i.e. the lowest return among those offered by lenders.

Emerging alternative lending models pose competitive threats and create opportunities for financial institutions, which highlights the importance of close partnerships and synergies with a view to mutually sharing capabilities and learning from each other's lessons. In particular, P2P lending processes are flexible and automated, while P2P online platforms can process requests from investors and borrowers faster and more efficiently due to state-of-the-art infrastructure and absence of regulatory obligations. As a result, online platforms entail lower operating costs than traditional financial institutions. In view of rising customer demand for flexible, smart and tailored services, conventional financial institutions are upgrading their financial products, focusing on sophisticated or highly personalised products.

Typically, capital raising activities have been facilitated by specialised financial institutions, which on the back of their expertise are able to identify and support investment opportunities. In view of growing interest in startups and digitisation, a number of alternative funding (crowdfunding) platforms have been launched, thereby increasing access to capital raising activities and providing funding to a greater number of companies and projects, where potential funders meet project developers via an online platform.

Alternative funding platforms⁶ provide an opportunity for businesses to interact directly with individual investors to widen their raising capital options. Crowdfunding serves as an alternative model to funding for projects and businesses that lack access to capital investment. It rests upon the active participation of internet users, who are invited to financially back a new project or business often in exchange for some sort of "reward" (e.g. rebates and small gifts), without the need of a financial intermediary. In recent years, "equity crowdfunding" has also emerged, under which backers receive equity shares of the company or buy part of the debt/lend money in return for a future premium.

Although these alternative funding platforms are not likely to replace the traditional funding ecosystem in the short or medium term, their growth could change the role of incumbent institutions. Against this backdrop, the public, investors and regulators have largely focused their attention on alternative financing mechanisms. However, FinTech goes beyond this narrow scope to include financing of technology itself (e.g. via venture capital, private equity, public offerings, etc.). In addition to the continued development of alternative financing mechanisms, FinTech is increasingly involved in areas such as robo-advisory services.⁷ Robo-advisors are just one example of the way incumbent firms are innovating in order to recast their customer relationships and offer new banking approaches.

2.3 DIGITISATION

Digitisation is nothing new in the banking and financial sector. High-frequency trading and related arbitrage strategies are good examples of the impact that new technologies already have. The increased use of mobile phone devices and smartphones (in 2014, active mobile devices outnumbered humans on the planet) has placed digital services in the hands of consumers who previously could not be reached. Boasting access to cloudbased technology, smartphones enable digital services to be accessed by almost anyone, anywhere and anytime.

7 "Robo-advisors are a class of financial adviser that provide financial advice or investment management online with moderate to minimal human intervention", Wikipedia.



⁶ The most popular platforms globally are kickstarter.com and indiegogo.com, while groopio.com is the first Greek crowdfunding platform.

Besides, new technology has considerably improved storage of, access to and interpretation of data, resulting in significant benefits, yet also the need for greater data protection. For the banking industry, perhaps the biggest potential comes from "big data".8 In recent years, thanks to the development of new technologies and applications - such as the widespread use of social media and smartphones – the volume and the format of data have changed drastically, and data analytical and management capabilities are impressive. Technology advancements have made it possible to effectively analyse and interpret vast, complex sets of data. This "smarter" data management allows banks to create more effective, client centric solutions that are more in line with customer needs.

For the largest part of the 20th century, payments meant the exchange of banknotes or checks. Even credit card transactions required the submission of receipts and supporting documents between banks. Nonetheless, digitisation in payment services has taken place very early, making it hard to imagine the digitisation of other industries without a previous digitisation of the payments industry (PayPal for instance). However, all these digital payment systems use a centralised network that requires users' trust in a central counterparty. In 2009, a whitepaper proposed the creation of a distributed ledger that facilitates transactions between parties without the need of an intermediary via a cryptographic process. Such a distributed payment peer-to-peer protocol is the Bitcoin network, with bitcoins as the digital currency of the ledger. Digital currencies belong to the class of cryptocurrencies, using cryptography to control the creation of additional units and to secure transactions. As transactions are made, changes in the ownership of cryptocurrencies are recorded in a public ledger which is known as the "blockchain".9 Since 2009 a range of networks have been developed, built on the same underlying principles and concepts but employing different encryption technology or targetting on different usage.¹⁰

The outlook for digital currencies as a means of payment is unclear. Some consider that the key role of digital currencies will be cross-border capital transfers, which are priced quite highly by banks. Virtual currencies have attracted great attention from the media and policymakers, while central banks are closely monitoring this issue. Indeed, blockchain technology poses a number of challenges that have yet to be resolved. In particular, there is still considerable uncertainty in many markets surrounding the future regulatory framework for bitcoins, with regulatory authorities puzzling over whether digital currencies should be treated as a fiat currency (and thus as a foreign currency), as a commodity (and therefore as a good), as a form of money substitute (and therefore not officially recognised by governments) or as something completely new.

3 THE ROLE OF BANKS

The financial crisis of 2008 led to a series of major upheavals in the banking and more broadly the financial sector. First, it became evident that the activities of large financial institutions generate systemic risk. This in turn led to the compilation of different metrics designed to quantify systemic risk. Bank financial regulation tightened (Basel III) and many financial institutions had to respond by, among other things, adjusting their IT development methods to the new regulatory framework. At the same time, banks had to confront not only an increasing number of competitors, but also



⁸ A 2012 definition by Gartner research company states that: "Big data is high-volume, high-velocity and/or high-variety information assets that demand cost-effective and innovative forms of information processing". The three "Vs", i.e. Volume, Velocity and Variety, are usually referred to in the literature as the key features of big data. Thus, the concept of big data is not merely about the size, the type or the source of data but rather reflects a number of processes that require enhanced insight.

⁹ In particular, when users spend digital currencies, the respective network records the transaction in a list called block. Every block is linked to the previous and the next one and thus a chain is created, i.e. the blockchain. In this way, the blockchain is essentially a public distributed ledger, since everyone on the network has a copy, allowing for security and transparency.

¹⁰ There are more than 500 different alternative digital currencies (altcoins). Most of them build up on the same framework provided by Bitcoin and die out shortly. Apart from Bitcoin, most popular distributed ledgers are Litecoin, Ripple and Namecoin.

a new type of competitor, which is largely seen as better placed to respond to changing market regulations and customer needs. This is about FinTech startups that can develop innovative products at a faster rate, showing a clear competitive advantage relative to the more traditional methods employed by banks.¹¹

2015 was the year when it became clear that the Digital Revolution had finally hit the banking sector. Global investment in FinTech tripled to USD 12 billion between 2013 and 2014,¹² and the British Bankers' Association announced that mobile banking has become the preferred payment method for customers. The banking sector has a high IT spending-to-revenue ratio. However, between 2014 and 2015, total global investment increased by only 4.6%, with the bulk referring to system maintenance.

Historically, banks have been responsible for most financial innovations. The launch of credit cards in the 1950s and of ATMs in the 1970s revolutionised the way we access and pay for goods and services. The financial sector has continued to witness many remarkable innovations and technological advances, such as contactless technology, digital wallets and cryptocurrencies. However, nowadays innovation rarely comes from banks, but from small FinTechs. Despite their differences, both FinTechs and banks have a lot to gain from working together. FinTechs can benefit from the long history of banking operations and banks' institutional framework. On their part, banks can gain value added, either through synergies and partnerships with Fin-Techs or through the acquisition of their advanced technology offerings.

The European Banking Authority (EBA), the European Securities and Markets Authority (ESMA) and the European Insurance and Occupational Pensions Authority (EIOPA), in their joint report on risk and vulnerabilities in the EU financial system that was published in March 2016,¹³ acknowledge that increasing proliferation of financial technology and of FinTechs, digitisation and rapid innovation

characterise a changing financial sector, noting that technology advances may increasingly affect traditional providers of financial services and their revenues. The report states that FinTech's development can also provide opportunities, including wider access to financial services for customers at lower costs, increasing competition and efficiency, reduced systemic risk, as well as access to better and more customer-friendly products. On the other hand though, concerns are expressed as to the impacts on the banking sector. In more detail, it is argued that FinTech could affect banks' future profit generation capacity, promote the risk-taking behaviour of traditional financial institutions and increase operating risk as a result of outsourcing to FinTech in an effort to reduce operating costs. At the same time, the report expresses concerns that FinTech may give rise to additional risks, such as money laundering and reputational and integrity risks, as in the long run FinTech and digitisation could pose risks to financial stability and the orderly functioning of markets. Finally, the Board of Directors of the Euro Banking Association decided to create an open forum for banks, FinTechs and other stakeholders to exchange views and experience on the various issues related to the implementation of the New Payment Services Directive (PSD2) and the creation of an Open Banking environment.

Banks maintain their reputation for reliable and secure transactions and invest in high regulatory standards, but they also recognise the importance of being at the forefront of innovation and seek to exploit the enormous potential offered by FinTech. This has led a large portion of banks to explore different approaches to leverage FinTech innovation (see Chart 5), including venture capital investments, accelerator/incubator programmes and

¹³ Joint Committee Report on Risks and Vulnerabilities in the EU Financial System, https://esas-joint-committee.europe.eu.



¹¹ In the financial sector, FinTech firms have a comparative advantage, due to the technical debt that was accumulated by traditional players, notably banks. See Darolles (2016).

¹² http://www.fintechinnovationlondon.net/media/730274/Accenture-The-Future-of-Fintech-and-Banking-digitallydisrupted-or-reima-.pdf.



Chart 5 Dealing with technology and innovation*

close collaboration with the FinTech community. There are also several other initiatives such as the "hackathon-type" innovation programmes, with a limited impact on the internal performance of the sponsoring organisations.

According to a survey conducted by PricewaterhouseCoopers (PwC 2016a) on 176 CEOs from the Banking and Capital Markets sector in 62 countries, interviewed CEOs see customer relationship management systems (80% of respondents), data analytics (75%)and social media communication and engagement (56%) as the top three technologies that would generate the greatest returns in terms of customer engagement. The ability to analyse a larger volume of data with higher speed and more accurate predictions can ensure a faster, targeted and forward-looking response to customer demands and capital market developments. Chart 6 also shows that CEOs acknowledge the impact that customers have on their business strategy (for almost 90% of respondents, meeting customers' expectations is a top priority).

As the rate of change is accelerating, banks engage with the FinTech community in order to better understand future challenges and opportunities. Against this background, banks should continue (a) developing and publishing an internal "road map" outlining how to identify and respond to market threats and opportunities; (b) conducting ongoing research to keep abreast of FinTech-driven changes; (c) ensuring that key staff are educated on developments, threats and opportunities; (d) developing an innovation programme; and (e) optimising already available information and data.¹⁴

Experience from several European FinTechs has shown that FinTechs and banks can work together at different levels. Notwithstanding the level at which they engage in a partnership, both sides have potential valuable gains. Fin-Techs are technology-intensive companies that seek to test new technologies and explore what is technically feasible without being bound by rigorous legal frameworks. By implementing

14 See BNY Mellon (2015).





Chart 6 Determinants of corporate strategy*

innovative approaches, they promote a large number of new ideas in a very flexible way. On the other hand, banks can add regulatory, legal and risk management expertise and can give FinTechs access to global payment systems as well as to their customer databases. Together, FinTechs and banks create an ecosystem that allows them to better respond to customer needs and bridge the gap between the services offered by traditional banks and those actually demanded by customers.

4 THE ROLE OF REGULATORS

In recent years, retail payments have seen significant technical innovations with a rapid growth in the number of electronic and mobile payments, as well as with the emergence of new types of payment services, which has challenged the framework under the Payment Services Directive (PSD).¹⁵ Many innovative products or services fall entirely or in large part outside the scope of the PSD. At the same time, the EU market for card, internet and mobile payments remains fragmented along national borders and faces serious challenges that hinder its further development and halt the EU's growth momentum (different cost of payments for consumers and merchants, different technical infrastructures, lack of a common set of technical requirements among payment service providers, high interchange fees that translate into higher consumer prices).

In this context and in order to adapt the European payments market to the opportunities of the single market and to support the growth of the EU economy, the European Commission adopted a package of measures. The revised Payment Services Directive (PSD2)¹⁶ introduces some new elements and significant improvements in the EU payments market. In particular, it aims to facilitate and render more secure the use of internet payment services by including within its scope the new payment initiation services. Such services operate between the merchant's and the consumer's bank, allowing for low-cost and efficient electronic payments without the use of a credit card. These service providers will now be sub-

¹⁶ These measures become effective on 31 January 2018. Directive 2015/2366/EU.



¹⁵ Directive 2007/64/EC.

ject to the same high regulatory and supervisory standards as the other payment institutions. At the same time, banks and other payment service providers should enhance online security by requesting strong customer authentication.

Secure payment services are a prerequisite for the smooth functioning of the payment service market. Users should therefore be adequately protected against potential risks.17 All online payment services should be secured by adopting technologies able to guarantee safe user authentication and to mitigate the risk of fraud. In order to allow for user-friendly and easy to access means of payment for low-risk payments, such as low value contactless payments at the point of sale, mobile or not, security requirement exemptions should be specified in regulatory technical standards. In this respect, the user should be able to rely on measures that protect the confidentiality and integrity of personalised security credentials (for example, by SMS or email).

Moreover, in recent years technological advances have given rise to the emergence of a range of complementary services, such as account information services where the user is able to have an overall view of its financial situation immediately and at any given moment.

The PSD2 also includes the above mentioned services in order to provide consumers with adequate protection for their payment and account data. Finally, payment initiation services enable the payment initiation service provider to provide comfort to a payee that the payment has been initiated in order to provide an incentive to the payee to release the goods or to deliver the service without undue delay. Since payment initiation services were not included in the PSD, this raised a number of legal issues, such as consumer protection, security and data protection. The new rules under the PSD2 therefore address these issues.

From a regulatory point of view, a change of attitude was warranted as to how FinTech prod-

ucts and services should be regulated. The digitisation of processes and services of financial institutions is a completely understandable market trend with regulatory implications and obligations related to the use of technology. On the other hand, tech startups enter the financial industry with little or no past regulatory experience. These companies tend to lack a culture of compliance regarding their obligations for customer protection in the provision of financial services. This is precisely where the current debate around FinTech regulation lies.

The objective of the new rules set by the PSD2 is to close the regulatory gaps, as well as to provide more legal clarity and ensure consistent application of the legislative framework across the EU. In particular, a level playing field is guaranteed for both incumbents and new market participants, enabling new means of payment to reach a broader market and ensuring a high level of consumer protection in the use of these payment services across the EU. This will improve the efficiency of the payment system as a whole and lead to more choice and more transparency of payment services, while strengthening the trust of consumers in a harmonised payments market.¹⁸ Moreover, the Directive states that the definition of payment services should be "technologically neutral" and should allow for the development of new types of payment services, while ensuring equivalent operating conditions for both existing and new payment service providers.

The European Supervisory Authorities (comprising the ESMA, the EBA and the EIOPA) are monitoring the growing number of institutions offering automated services as well as the use of Distributed Ledger Technology (DLT). The EBA also encourages regulators to



¹⁷ Directive 2015/2366/EU: "Consumers should be protected against unfair and misleading practices...".

¹⁸ It should also be noted that low value payment instruments are an inexpensive and easy-to-use alternative for goods and services of low price and should thus not be overburdened. In order to enhance consumer confidence in a harmonised payments market, it is important that the payment services user is aware of the actual costs and charges.

closely monitor FinTech with a view to assessing potential risks to investor protection, e.g. information technology risk.

The banking and financial sector has undergone profound changes and regulators need to avoid two pitfalls. The first is overprotecting incumbents by erecting barriers to entry for newcomers. This would discourage financial innovation and hinder competition in the sector. Conversely, the second potential pitfall is choosing to act in favour of newcomers, by imposing on them less strict regulating rules than on incumbents. Thus, they should provide a level playing field to all participants, while at the same time fostering an innovative, secure and competitive financial market. In addition to the rules per se, authorities look in general at the incentives offered to market players and how these could make them change their behaviour. In this vein, FinTech needs a framework that will be both harmonised and dynamic and from which market players (e.g. institutional or newcomers) and regulators alike benefit. Regulators' objectives include: (a) financial stability, (b) prudential regulation, (c) fairness and (d) competition and market development.¹⁹

5 THE GREEK FINTECH LANDSCAPE

In Greece, since the imposition of capital controls and the subsequent shock, an increasing number of individuals and businesses, following the global trend, have resorted to electronic means of payment and banking. Restrictions on cash withdrawals, corporate transactions and capital transfers abroad have pushed many consumers and firms towards a broader use of electronic payment methods. On 26 September 2016, the European Central Bank (ECB) published the 2015 statistics on non-cash payments in the EU. On the basis of these statistics, in Greece the total number of non-cash payments, comprising cheques, card payments (excluding e-money payment transactions), credit transfers and direct debits, surged to 423 million in 2015.

In Greece, the most popular FinTech instrument is the e-wallet, which allows users to make payments and transfer amounts to third parties or to bank accounts. Apart from walletto-wallet transfers (without transaction fees), the e-wallet also enables the payment of utility and other bills, the transfer of amounts to a mobile contact or a business VAT identification number, as well as payments at a physical store without a POS terminal.

In the Greek market, banks as well offer electronic banking services through different communication channels, such as e-banking and mobile banking. Furthermore, banks have shown a keen interest in the provision of upto-date electronic services and are active supporters of FinTech. A number of banks have launched the electronic wallet linked to a bank account or a debit/credit/prepaid card, which supports among other things contactless payments, transactions history, transfers of amounts to mobile or social media contacts without the need to know the bank account number of the recipient, one-click buying on electronic stores, payments of utility and other bills, rebates and reward points.

The competent authorities for the authorisation and prudential supervision of credit institutions, payment institutions and electronic money institutions²⁰ are the Bank of Greece and the ECB. In particular, the authorisation requirements and the supervision rules governing the operation of electronic money institutions are laid down in Law 3862/2010, Law 4021/2011,²¹ and Bank of Greece Executive Committee Acts 33/19.12.2013 and 22/12.7.2013. Under Article 12(1) of Law

²¹ Law 4021/2011 (Articles 9-30) transposes into Greek law the provisions of Directive 2009/110/EC of the European Parliament and of the Council of 16 September 2009 (OJ L267/10.10.2009) on the taking up, pursuit and prudential supervision of the business of electronic money institutions amending Directives 2005/60/EC and 2006/48/EC and repealing Directive 2000/46/EC.



¹⁹ See Arner et al. (2015).

²⁰ Under Article 10 (1) of Law 4021/2011, "electronic money" means "electronically, including magnetically, stored monetary value as represented by a claim on the issuer which is issued on receipt of funds for the purpose of making payment transactions and which is accepted by a natural or legal person other than the electronic money issuer".

4021/2011, the Bank of Greece is responsible for the authorisation and prudential supervision of Electronic Money Institutions. In this capacity, the Bank of Greece issued Executive Committee Act 33/19.12.2013. In order to be granted authorisation, prospective electronic money institutions are required to hold initial capital of not less than EUR 350,000 (three hundred and fifty thousand). The above Law also sets out the capital requirements and the method of calculation of own funds requirements for electronic money institutions, and specifies the safeguarding requirements for funds received, the optional exemptions and the activities in which electronic money institutions are entitled to engage in addition to issuing electronic money, either in Greece or on a cross-border basis. In accordance with Article 25(1) of Law 4021/2011, issues concerning the provision of information, by electronic money institutions, to electronic money holders on their rights, as well as the review of complaints from electronic money holders do not fall under the competence of the Bank of Greece, but under that of the Secretariat General of Consumer Affairs.

In the context of providing information to interested parties, the Bank of Greece publishes online lists (register tables) of all credit or financial institutions authorised to provide banking services. According to the register tables, only one electronic money institution and nine payment institutions are operating in 2016. The tables also include those payment and electronic money institutions that have notified of their intention to provide services in Greece without establishment.²²

6 CONCLUSIONS

As already mentioned in the introduction, financial sector and technology have long been intertwined concepts and these two sectors are mutually reinforcing. Although it is difficult to determine how and where this shift in financial services began, the global financial crisis of 2008 was undeniably a turning



FinTech covers digital innovations and technology-enabled business innovation models in the financial sector. Such innovations may disrupt existing structures in the industry, revolutionise the way existing businesses generate and distribute their products and services, and open new avenues for entrepreneurship. Examples of innovations that are central to FinTech today include mobile payment systems, new digital advisory and trading systems, peer-to-peer lending, equity crowdfunding, cryptocurrencies and blockchain.

Recent innovations might pose several challenges for incumbent providers of financial services. But they may also represent opportunities for the financial sector, including wider access for consumers to financial advice and services at a lower cost and increased competition and efficiency. The growing diversity of market participants and financial services offered can also reduce systemic risk and lead to better and more customer-friendly products. The financial sector has benefited more compared to other industries from the improvements in the information technology sector.

In the banking sector, FinTech could impact banks' future revenue-generating capacity, with a negative impact on capital adequacy due to loss of deposits. Financial institutions rely more heavily on non-interest income. FinTech companies are often able to offer more efficient services, while market entry barriers may be lower than for traditional financial service providers, as digitisation further facilitates their entry into the market.

Supervising authorities are closely monitoring the evolution of financial technology in order to fully understand developments in FinTech and innovation and be ready to respond effectively to a rapidly changing financial sector.



²² http://www.bankofgreece.gr/Pages/en/Supervision/SupervisedInstitutions/default.aspx.

This includes assessing potential risks to investor protection. Digitisation offers huge growth potential for the financial sector. However, it is important that the necessary regulatory changes do not stifle innovation and at the same time ensure the stability that this sector needs in order to meet customer expectations. The aim of the regulatory framework is to promote financial stability and access to services, while regulators aim to continue exploring policies that promote innovation and the entry of newcomers.



REFERENCES

- Accenture (2016), "FinTech and the Evolving Landscape: Landing Points for the Industry", https://www.accenture.com/t20160427T053810_w_/us-en/_acnmedia/PDF-15/Accenture-Fintech-Evolving-Landscape.pdf#zoom=50.
- Arner, D.W., J. Barberis and R.P. Buckley (2015), "The Evolution of FinTech: A New Post-Crisis Paradigm?", University of Hong Kong Faculty of Law Research Paper No. 2015/047; UNSW Law Research Paper No. 2016-62, http://ssrn.com/abstract=267655.
- Bareisis, Z. and G. Lodge (2016), Banks, Retailers, and Fintech: Reimagining Payments Relationships, Part One: The Bank Perspective, Celent Report, Oliver Wyman Group, January.
- BNY Mellon (2015), "Innovation in Payments: The Future is Fintech", https://www.bnymellon.com/ global-assets/pdf/our-thinking/innovation-in-payments-the-future-is-fintech.pdf.
- Chishti, S. and J. Barberis (2016), *The FINTECH Book: The Financial Technology Handbook for Investors, Entrepreneurs and Visionaries*, Wiley.
- Darolles, S. (2016), "The rise of fintechs and their regulation", Banque de France, *Financial Stability Review*, 20, 85-92.
- EY (2015), "Who will Disrupt the Disruptors?", *The Journal of Financial Perspectives: FinTech*, Winter 2015.
- EY (2016), EY FinTech Adoption Index.

Kim, Y., J. Choi, Y.-J. Park and J. Yeon (2016), "The adoption of mobile payment services for 'Fintech'", *International Journal of Applied Engineering Research*, Vol. 11, No. 2, 1058-1061. McKinsey & Company (2016), "Cutting through the noise around financial technology".

- Micu, I. and A. Micu (2016), "Financial technology (Fintech) and its implementation on the Romanian non-banking capital market", *SEA-Practical Application in Finance*, Vol. 4, No. 2(11).
- Philippon, T. (2016), "The FinTech opportunity", *NBER Working Paper Series*, No. 22476: http://www.nber.org/papers/w22476.
- PwC (2016a), 19th Annual Global CEO Survey Key findings in the banking and capital markets sector: Creating a platform for competitive regeneration, PricewaterhouseCoopers LLP, February.
- PwC (2016b), Blurred lines: How FinTech is Shaping Financial Services, Global FinTech Report, PricewaterhouseCoopers LLP, March.
- Rysman, M. and S. Schuh (2016), "New innovation in payments", *NBER Working Paper Series*, No 22358: http://www.nber.org/papers/w22358.
- Santander InnoVentures, Oliver Wyman and Anthemis Group (2015), "The Fintech 2.0 Paper: rebooting financial services", http://santanderinnoventures.com/wp-content/uploads/2015/06/ The-Fintech-2-0-Paper.pdf.
- Walker, A. (2014), "Banking without banks: exploring the disruptive effects of converging technologies that will shape the future of banking", *Journal of Securities Operations and Custody*, Vol. 7, No. 1(12), 69-80.



INTRODUCTION TO SOLVENCY II FOR (RE)INSURANCE UNDERTAKINGS

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A INTRODUCTION

If we wish to draw a general picture of what insurance and reinsurance undertakings do for business, we could say that their main objective is to provide (re)insurance products and coverages. In providing their services, (re)insurers pool funds by assuming insurance and financial risks, while at the same time they channel those funds to the financial system, which makes them major investors in the economy.

Insurance and reinsurance undertakings which are active in the European Union (EU) must meet specific solvency requirements. Those requirements (called Solvency I¹ until 31 December 2015) had been applicable for over 30 years. Their main drawbacks were regarded as being: lack of sensitivity to risks, which failed to provide (re)insurers with the appropriate incentives for adequate risk management; lack of transparency vis-à-vis customers, who tend to be quite sensitive to issues of trust; and reduced protection of policyholders. The new solvency requirements (now called Solvency II) became fully effective from 1 January 2016 and cover a wide range of issues pertaining to almost all aspects of the prudential supervision of insurance and reinsurance undertakings operating in the EU, thus shaping a so-called "solvency framework".

Section A gives an introduction to the structure and the main concepts of Solvency II. Section B presents the legal framework of Solvency II, placing emphasis on its European dimension. As the changes that were introduced impacted not only the requirements (for supervision, compliance, etc.) but most importantly the rationale, relative to the previous framework, Section C outlines the main differences in the Solvency II approach, compared with Solvency I. Next, Section D describes the components of Solvency II and its pillars, and discusses several issues of relevance. This section aspires to address the issue without using legal, actuarial or other technical terms, but is rather targeted at anyone interested. Lastly, Section E attempts to sum up the key points of the paper and concludes.

B THE LEGAL FRAMEWORK AND THE EUROPEAN DIMENSION OF SOLVENCY II

B.I THE EUROPEAN SYSTEM OF FINANCIAL SUPERVISION

The crisis of 2007-08 has brought to the fore serious weaknesses in the supervision of the financial system. Most importantly, it showed that the EU supervisory system had almost reached its limits in its ability to effectively address EU-wide issues. As a result, the EU could no longer afford to sustain a situation in which:

(a) there was no mechanism ensuring that national supervisory authorities make the best possible supervisory decisions on cross-border financial institutions;

(b) there was no adequate cooperation and exchange of information among national supervisors;

(c) the joint action of national authorities called for complex rules based on fragmented regulatory and supervisory requirements;

(d) national solutions were quite often the only feasible option to deal with EU-wide problems; and, last but not least,

(e) the interpretation of the same legislative texts varied across the EU.

¹ The provisions of Solvency I were transposed into Greek law with Decree Law 400/1970, as amended.



In November 2008 the European Commission assigned a high-level group headed by Jacques de Larosière to find and suggest ways of strengthening European supervisory mechanisms, with the ultimate goal of increasing the protection of consumers in financial services and rebuilding trust in the European financial system.

In response to the aforementioned challenges and on the basis of the recommendations of the de Larosière report, the **European System of Financial Supervision (ESFS)** was established with a view to overcoming those weaknesses and ensuring that the ESFS remains committed to the objective of a stable and single European financial market, bringing national supervisory authorities together in a strong, integrated EU network.

The ESFS rests upon two building blocks:

a) macroprudential supervision, consisting of the European Systemic Risk Board (ESRB). This building block is responsible for the macroprudential oversight of the EU financial system as a whole and is aimed at contributing to the prevention or reduction of systemic risks that threaten financial stability in the EU, with a view to averting, to the extent possible, largescale financial market turbulence, and

b) microprudential supervision, consisting of three European Supervisory Authorities, i.e. the European Banking Authority (EBA) for the banking sector, the European Securities and Markets Authority (ESMA) for the capital market and the European Insurance and Occupational Pensions Authority (EIOPA) for the insurance and occupational pensions sector. The second building block also includes all national competent authorities (NCAs). Its objective is to increase the quality and consistency of national supervision, strengthen the oversight of cross-border groups and contribute to the drafting of a singe European rulebook per sector (insurance, banking, securities).

The key players under Solvency II are the EIOPA alongside the NCAs for insurance and

reinsurance undertakings (i.e. the Bank of Greece and the respective supervisory authorities of other Member States). The role of the ESRB under Solvency II, albeit minimum, is pivotal, as it deals with cases which are critical for the recovery of insurance and reinsurance undertakings.²

B.2 THE EUROPEAN INSURANCE AND OCCUPATIONAL PENSIONS AUTHORITY (EIOPA)

The European Insurance and Occupational Pensions Authority (EIOPA) was established in accordance with Regulation (EU) 1094/2010 of the European Parliament and the Council of 24 November 2010 and, as discussed above, is part of the European System of Financial Supervision.

EIOPA's mission is to work towards the better functioning of the EU internal market, especially by ensuring a high level of regulation and supervision, taking account of the varying interests of all Member States and the different nature of financial institutions. In its capacity, EIOPA supports financial stability, transparency of markets and financial products, as well as the protection of policyholders, pension scheme members and beneficiaries.

Its tasks also include the promotion of supervisory harmonisation and the provision of advice to EU institutions in the areas of regulation and supervision of insurance and reinsurance undertakings and occupational pensions. EIOPA replaced CEIOPS³ and is accountable to the European Parliament and the Council of the European Union.⁴

- 2 The ESRB is involved in those cases in which the recovery period for (re)insurance undertakings needs to be extended (under Article 138 of Directive 2009/138/EC).
- 3 CEIOPS (Committee of European Insurance and Occupational Pensions Supervisors) ceased to operate on 31 December 2010.
- 4 The Council of the European Union is, along with the European Parliament, the main decision-making body of the EU. It has legislative and fiscal powers, in conjunction with the European Parliament, and coordinates or develops Member States' policies. Depending on the affairs under examination, the composition of the Council varies. Nine different configurations (or nine different councils) have been established with the participation of all competent ministers in their respective areas. The Economic and Financial Affairs Council configuration (ECOFIN), which is made up of the economics and finance ministers from all Member States, is responsible for the area of private insurance.



EIOPA takes active part and assists in the effective, efficient and consistent operation of the colleges of supervisors, which have been set up by supervisory authorities for each insurance group in the EU with cross-border activities.⁵ Its assistance is for the time being limited to the monitoring of the agenda items and annual work programmes, while in the near future it is expected to further increase.

Another main task of EIOPA is to monitor developments in the financial markets and test the resilience of (re)insurers as well as of the European financial system as a whole to potential adverse shocks. Monitoring comprises the conduct of studies and the publication of biannual reports, which present the development of risks to national markets. Testing the resilience of (re)insurers to adverse shocks is achieved by conducting periodic stress tests, with the participation of all EU Member States.

B.3 THE EUROPEAN DIMENSION OF SOLVENCY II

Solvency II is a framework developed by the EU in line with the "Lamfalussy regulatory process"⁶ and broadly transferred in December 2009 in the Treaty on the Functioning of the European Union (TFEU).

The Lamfalussy process involves four "levels", each of which focuses on a specific stage of the legislative process:

Level 1: The first level is based on a European Commission proposal for a directive or a regulation⁷ following open consultation with all stakeholders. Level 1 measures are of a general framework nature, set out the basic principles of legislative acts and lay a clear foundation for Level 2 implementing measures. The adoption of Level 1 framework principles requires codecision of the Council and the European Parliament, and the final legislative text is called a legislative act. Directive 2009/138/EC on the solvency of insurance and reinsurance undertakings (Solvency II) constitutes a legislative act (in the form of a Directive) and forms part of Level 1 measures in the Lamfalussy process. **Level 2:** A legislative act (i.e. a Level 1 legislative text) may delegate to the European Commission the power to adopt non-legislative acts (hence "delegated acts")⁸ of general application to complement or amend certain nonessential elements of a legislative act. The aforementioned delegation of power to the European Commission may occur either under Article 10 of Regulation (EU) 1094/2010 or under Article 290 TFEU.

Delegated acts (DAs) under Article 10 of Regulation (EU) 1094/2010 specifically indicate that they have been adopted as Regulatory Technical Standards (RTS), supplement or amend certain non-essential elements of the legislative act (i.e. the Level 1 legislative text), are rather technical and do not imply strategic decisions or policy choices. These standards are endorsed by the European Commission, following submission of a draft by EIOPA.

Delegated acts under Article 290 TFEU (which are also DAs without any other indication), although they are likewise limited to non-essential elements of the legislative act, may imply strategic decisions or policy choices and thus have a broader scope and grant greater flexibility to the European Commission. Their endorsement by the European Commission does not require EIOPA's involvement.⁹

- **5** In 2015 EIOPA participated in more than 100 colleges of supervisors.
- 6 This process was first introduced in March 2001, named after Baron Alexandre Lamfalussy, chairman of the Committee of Wise Men on the regulation of European securities markets, which was entrusted with the task of assessing EU legislative practices in the area of financial services and the submission of proposals for improving the system.
- 7 A regulation has general application, is binding in its entirety on all parties and is directly applicable in all Member States. A directive is binding, as to the result to be achieved, upon each member state to which it is addressed, but leaves to the national authorities the choice of form and methods (under Article 288 TFEU).
- 8 Delegated acts, although they are called non-legislative acts, are actually EU legislative texts. Their differentiation from the so-called legislative acts is the decision procedure: while legislative acts require the full involvement and, subsequently the co-decision, of the Council and the European Parliament, this is not the case for non-legislative acts, which are adopted by the European Commission and enter into force only if no objection has been expressed by the European Parliament or the Council within a period set by the legislative act.
- 9 Perhaps only in an advisory capacity.



In addition to delegated acts supplementing or amending non-essential elements of the Level 1 legislative act, a uniform implementation of the legislative act may be needed. This need is met through Implementing Technical Standards (ITS), which are adopted by means of implementing acts.¹⁰

Implementing Technical Standards aim to determine uniform conditions for implementing legislative and non-legislative acts. These standards are purely technical and do not imply any strategic decisions or policy choices. EIOPA submits its draft standards to the European Commission for endorsement.

Delegated acts (both DAs under Article 290 TFEU and RTS) as well as Implementing Technical Standards are legally binding and take the form of a regulation, directive or decision¹¹ (although their most common form is that of a regulation, which has general application and is directly applicable in all Member States).

According to a strand of literature, only delegated acts under Article 290 TFEU are considered to be Level 2 measures, whereas Regulatory Technical Standards and Implementing Technical Standards are characterised as 2.5 Level measures.

Level 3: The third level of the Lamfalussy process comprises those measures that have the form of non-binding guidelines (GLs) or recommendations, aimed at ensuring the common, uniform and consistent application of EU law. Such measures are issued by EIOPA and are addressed to competent supervisory authorities and/or supervised insurance and reinsurance undertakings. Although these measures are not binding, each national competent authority¹² must notify whether it intends to comply with that guideline or recommendation or not. If a national competent authority does not comply or does not intend to comply, it must inform EIOPA, stating its reasons.¹³ Furthermore, even though they are non-binding on supervisory authorities, if transposed into national law and depending on the method of transposition, they become binding in their capacity as national law.

Level 4: The fourth level refers to the process undertaken by EIOPA, with a view to checking the application of EU rules by national competent authorities.

B.4 SOLVENCY II LEGISLATIVE TEXTS

Since, as already mentioned, Solvency II is the natural outcome of the Lamfalussy process, in order to gain insight into the specific provisions of this framework, one must consult more than one legal texts, which cover all levels of that process. What further complicates things is that, apart from EU law, national (in our case, Greek) law should not be overlooked. All legislative (or non-legislative) acts by means of a directive must be transposed into national legislation (in Greece, by law or presidential decree) to have legal effect in a Member State. Furthermore, a similar transposition into a Member State's national law is required for all (Level 3) guidelines issued by EIOPA. Due to the fact that those guidelines are not legally binding texts, each competent authority (the Bank of Greece for Greece) should choose which guidelines it will transpose into national law, and how, and which not.¹⁴

The basic EU act under Solvency II is Directive 2009/138/EC of the European Parliament and of the Council of 25 November 2009 on the taking-up and pursuit of the business of Insurance and Reinsurance (Solvency II). This directive was subject to two major recasts.

10 Under Article 291 TFEU.

- 11 A decision is binding in its entirety, while if specifying those to whom it is addressed, it is binding only on them (Article 288 TFEU).
- **12** Turning to Greece, the national competent authority for the supervision of (re)insurance undertakings is the Bank of Greece under Article 3(10) of Law 4364/2016.
- 13 This process is also known as the "comply or explain process".
 14 Of course, for those guidelines that it will choose not to transpose into national law, a national supervisory authority must explain its decision to EIOPA, stating the reasons. For instance, a sufficient (and indeed quite typical) explanation is that a guideline provides for matters concerning legal persons which do not exist in that country.



The first recast took place in 2011 with Directive 2011/89/EU of the European Parliament and of the Council of 16 November 2011 amending directives as regards the supplementary supervision of financial entities in a financial conglomerate (Financial Conglomerates Directive – FICOD). The aforementioned directive amended specific articles of the Solvency II Directive with a view to ensuring the appropriate supplementary supervision of insurance groups.

The second recast of the Solvency II Directive took place in 2014 with Directive 2014/51/EU of the European Parliament and of the Council of 16 April 2014 amending directives and regulations in respect of the powers of the European Insurance and Occupational Pensions Authority and the European Securities and Markets Authority (this directive is more commonly known as Omnibus II Directive -OMD II). This second recast, apart from being very time-consuming (as it took more than three years to reach an agreement), was also quite extensive. Most important still, not only did it amend essential elements of the initial Solvency II Directive, but at some points it also amended even its original character.

Those three directives, recorded in a single (codified) legislative text, constitute Level 1 of the Lamfalussy process under the legal framework of Solvency II. All three directives have been transposed into Greek legislation by Law 4364/2016.

With regard to Level 2 of the Lamfalussy process under Solvency II, the European Commission has so far issued a delegated regulation and four delegated decisions, under Article 290 TFEU. The regulation supplements Directive 2009/138/EC and contains all the modalities of its implementation,¹⁵ while the decisions concern the equivalence of the solvency regimes in Switzerland, Australia, Bermuda, Brazil, Canada, Mexico, the United States and Japan.

With respect to Level 2.5 of the Lamfalussy process, the European Commission is not

expected to adopt any delegated act by means of Regulatory Technical Standards, at least in the near future. Yet, things are quite the opposite with Implementing Technical Standards, as the European Commission has already issued 21 ITS so far.

Finally, turning to Level 3 of the Lamfalussy process under Solvency II, EIOPA has issued a series of guidelines, which have been transposed into Greek law by relevant Bank of Greece decisions.¹⁶

C INSURANCE FROM THE NEW PERSPECTIVE OF SOLVENCY II

To fully grasp the new arrangements introduced by Solvency II, one must first understand the rationale behind them. Solvency II rests upon a different approach to the function of insurance undertakings and insurance contracts. In the following sub-sections, this new approach is presented and its cornerstones are analysed.

C.I THE (RE)INSURANCE UNDERTAKING AS A FINANCIAL INSTITUTION

As mentioned in the introduction, (re)insurance undertakings raise funds by assuming insurance and financial risks and channel those funds to the financial system.

The bulk of an insurance undertaking's obligations consists of obligations vis-à-vis policyholders and beneficiaries, which under Solvency II are called technical provisions.¹⁷ The type of technical provisions, as well as the underlying need for provisioning (or reserving, as most commonly used), varies between life insurance and non-life insurance. In life insurance, an insurance undertaking assumes a –usually long-term– commitment vis-à-vis

¹⁷ In Greece, under Solvency I, these were called "technical reserves".



¹⁵ Regulation (EU) 2015/35, as amended by Regulation (EU) 2016/467.

¹⁶ A full list of all relevant legislative texts is available on the Bank of Greece website: http://www.bankofgreece.gr/Pages/en/deia/ solvencyII.aspx.

policyholders to provide a predetermined amount – face amount – at an unknown point in time. Even though this point in time is not given, it is associated with an ex ante determined event, e.g. death, disability, retirement, etc. An insurance policy is offered for a fee, which is paid for in the form of, either periodical or one-off, insurance premiums. In this context, technical provisions are the (mathematically calculated – hence "mathematical reserve" under Solvency I) necessary amount of assets that an insurance undertaking must hold to be able to settle its contractual obligations vis-à-vis policyholders.

In non-life insurance, the insurance undertaking assumes risk for a short period of time - usually one year or less. In this context, technical provisions are mainly specified as the required amount of assets that an insurance undertaking must hold to be in a position to compensate policyholders and claimants in the future for a loss which is associated with an insurance event that has already occurred.¹⁸ The fact that in non-life insurance both the amount to be paid and the time of payment are not known at the time of the conclusion of the contract makes risk assessment very challenging. For a further clarification of the phrase "future compensation for a loss", it should be pointed out that, although the insurance coverage spans a short period of time, the coverage of a loss and therefore the obligation to pay out the claim may extend to a time considerably later than the date of the event, sometimes even ten or twenty years after its occurrence, depending on the size of the loss as well as due to legal complications.¹⁹

In the light of the above, it becomes clear that the concept of technical provisions has three dimensions: the policyholder's point of view, the insurer's point of view and the supervisor's point of view. Policyholders see technical provisions as their own money, accumulated from the insurance premiums they have paid; therefore, technical provisions are equal to the amount of their claims on the insurer. Insurers see technical provisions as the level of funds available for investing and, lastly, supervisors view technical provisions as the necessary level of assets that insurers must hold in order to fulfil, to the extent that it is reasonably predictable, their obligations vis-à-vis policyholders.

Certainly, insurers hold, apart from technical provisions, additional capital in the form of own funds,²⁰ but the focus from this point of view, i.e. under Solvency I, is clearly on technical provisions.

The above perspective is the most common, but not the only one. Another perspective, that of Solvency II, which could help us shed light on certain other aspects of the insurance business, views (re)insurers as financial institutions. According to this perspective, shareholders-investors are at the centre, as these initially make available their funds in search for suitable investment opportunities, e.g. bonds, equity and other investment opportunities in the form of investment funds, loans to SMEs, construction mortgages, investment in infrastructure, etc., with a view to investing them to yield the highest possible profit. However, as the larger the investment the higher the profit, initial investors (shareholders) seek at the same time for additional funds coming from new investors to manage along with their own funds and channel them to the identified investment opportunities. Making available those additional funds to the initial investors may materialise in various ways and take several forms: e.g. in the form of equity capital (i.e. by becoming shareholders) or in the form of loans. Such a loan may be a typical loan as we know it or a sui generis loan. For example, a sui generis loan could imply that the new investor contributes to the undertaking a



¹⁸ The type of technical provisions that best fits this definition is the (outstanding) claims provision. Non-life insurers must also establish other types of technical provisions (such as premium provision), the amount of which however is usually lower relative to the aforementioned claims provision.

¹⁹ R.L. Brown and L.R. Gottlieb, "Introduction to Ratemaking and Loss Reserving for Property and Casualty Insurance", 2nd ed., Actex Publications Inc., 2001.

²⁰ Under Solvency I, the additional capital, in excess of technical provisions, held by an insurer was called "available solvency margin".

determined amount of money in return for another determined amount (which includes his profit as creditor to the undertaking), which is payable only in the event of an accidental event, which is described in the contract of this sui generis loan, e.g. the occurrence of material damages on a property due to an earthquake). In this case, sui generis lending is called "earthquake insurance", the new backer is called "policyholder" (and that is how they are referred to hereinafter), the contribution to the undertaking is called "insurance premium", while the amount receivable if that accidental event occurs is called "indemnity".

From this perspective, the insurance undertaking initially makes available shareholdersinvestors' funds. Subsequently, it collects policyholders' money and invests all of this (initial capital and insurance premiums) in different opportunities identified. If, for some reason, it is not possible to identify any appropriate investment opportunities, then shareholders-investors, in search for yield, abandon this business. They no longer want the funds that they have obtained from the other investors (mainly the insurance portfolio, as well as the investment that corresponds to the money paid by policyholders) and transfer (sell) them to other shareholders-investors (buyers) who are more effective in identifying suitable investment opportunities.

On the basis of this perspective, investors' funds entail the risk of not yielding the anticipated profit to their holders or even of losing their value. Such risks mainly arise from the fact that the hypothetical buyer of the portfolio might ask for more money to assume it, if needed, and as a result, this gap should be closed in their own expense (i.e. in the expense of initial investors). From this point of view, insurers must maintain technical provisions which are tantamount to the sum of money that the new investor (buyer) would ask for in order to take over the insurance portfolio. Besides, it becomes clear that the concept of technical provision adequacy is void and the focus is on insurers' own funds to finance such portfolio transfers, where necessary.

C.2 INSURANCE CONTRACTS AS FINANCIAL INSTRUMENTS

The new perspective, which was described in the previous sub-section, is the most appropriate stance that an insurer should in general maintain to achieve an effective management under Solvency II. In addition, it is also the actuaries who should change the way they see insurance policies. The traditional approach views each insurance contract as a series of future benefits, which can be perceived as the insurer's cash outflows to be paid out to the beneficiary upon occurrence of a predetermined possible event (e.g. death, retirement, accident, etc.) According to the traditional approach, for policyholders to receive a benefit, they must either renounce other benefits provided for in the insurance policy (e.g. guaranteed future cost of death charges or guaranteed insurance premiums or guaranteed renewals) or leave part of the insurance policy's value to the insurer (e.g. the surrender fee in the event of an early termination of the contract or part of their accumulated insurance premiums in the form of technical provisions, etc.) or have sustained a loss (e.g. occurrence of the insured event, such as death, retirement, disability, earthquake, etc.).

On the other hand, insurance contracts may be considered as a pool of options which have been either offered, in return for a fee, by the insurer to the policyholder²¹ (i.e. the insurer has short position) or are held by the insurer in the policyholder's knowledge (i.e. the insurer has long position). With regard to the options that the insurer has offered the policyholder, it should be noted that, as the exercise of such options does not always depend on the policyholder's will (e.g. earthquake, disasters, death, etc.), a distinction should be drawn between the options, the exercise of which is

²¹ L.M. Tilman, "Asset/Liability Management of Financial Institutions", *Euromoney Institutional Investor*, Ch. 16 "Understanding options embedded in insurers' balance sheets".



left at the policyholder's discretion, usually determined on a financial basis , and those options, the exercise of which is not conditional on the policyholder's choice, but which remain embedded in insurance contracts, with insurers having nevertheless short position.

Of course, it is known that upon occurrence of the insured event beneficiaries do not take into account the economic context to exercise their rights (for example, in investment-linked insurance policies beneficiaries do not examine stock market indices and the insurer's return guarantees, in order to receive the death benefit, but the policyholder's death is a sufficient condition).

The most common options envisaged in an insurance contract are the surrender option, the renewal privilege, the policy loan option, the settlement option and the over-depositing option. Nevertheless, on top of the above options which explicitly stand out in insurance contracts, there exist other options which are not so explicit (or do not appear as such) but are still options of the insurer, such as insurers' right to hold on their account the technical provisions when policyholders discontinue the payment of insurance premiums, the right to levy mortality, expense and/or surrender charges which are proportional to the level of the assets managed by the insurer, etc.

The above perspective has direct consequences for an undertaking's risk valuation and risk management methodologies. Risk valuation (in the form of either technical provisions or capital requirements) under Solvency II must employ market-based economic theories (market consistent valuations), breaking with more traditional, actuarial practices and methods. The role of risk management in general and of the risk manager in particular has now become pivotal.

Finally, one could not help but wonder why the need to view insurance contracts as a pool of options has arisen now rather than earlier. What has changed today? To answer these

questions, we should start from the assumption that, in the past, insurance undertakings mainly focused on insurance risk and that the investment risk assumed was not complex at all, while policyholders valued the long-term gains and protection that they would enjoy from an insurance coverage rather than the short-term profits that would ensue from the (shortsighted) exerice of any rights or options offered. In recent years, competition in the insurance market has increased globally, mainly because of policyholders' search for yield. In response to increased competition, insurers reduce their profit margins and offer policyholders a wider array of more complex rights and options, which are increasingly linked to market returns (e.g. guaranteed interest rates, guaranteed returns, etc.). In tandem with this trend in insurance products, capital markets have become more efficient (in the sense that information is diffused very rapidly and is available when investors plan their investment choices) and uncertainty (which is observed in markets as volatility) has heightened, thereby considerably increasing the value of rights and options that are embedded in insurance contracts for policyholders.

Thus, it is clear that those insurers which will fail to recognise the rights and options offered to policyholders and manage them in a way that is consistent with capital markets jeopardise their financial soundness and ultimately their viability, to the extent that market behaviour as well as policyholders' reactions are largely included in the assumptions used by actuaries both in the pricing and reserving of insurance products. However, this is not allowed under Solvency II, as valuation methodologies that are not market-based ignore the ever-changing reality. Against this backdrop, risk management and risk managers are a sine qua non for Solvency II.

C.3 RISK MANAGEMENT UNDER SOLVENCY II

If one discusses with insurance executives about corporate risk management practices in an effort to explain the new perspective that is



warranted under Solvency II, one will undoubtedly be confronted by their prompt and justifiable answer: "But insurers are by default firms that have been dealing with risk for centuries and, if they had not had effective risk management, the insurance market would not have survived as a business industry".

Undeniably, insurers do not expect a manual to highlight the necessity of risk management or some innovative regulatory framework (like Solvency II) to introduce such a requirement. They are already well aware of that necessity and have been managing risks for years. So, what's all that fuss about a purportedly groundbreaking risk management practice introduced by Solvency II?

Let us then explain the true reasons for which risk management, as described in the international literature over recent years and envisaged in Solvency II, is a novelty. Its originality has nothing to do with risk management actions per se (e.g. that fact that reinsurance should be used as a tool for the management of mortality risk is by no means seminal); it rather concerns the systemisation, the consistency and the effectiveness of the methodology.

Regarding the systemisation of risk management, within an insurance firm it is acknowledged that, while in most cases all risks are dealt with, this is done in a non-systematic way by several operational units or staff members of the firm, with often overlapping or even conflicting tasks, or that risks are managed in such a way that the firm ignores the total level of risk assumed. In other words, management fails to address all risks individually and on aggregate, explore their possible interlinkages investigate their impact on the firm's capital and assign to specific operational units or employees clear responsibilities and powers in order to take concrete action for the management of individual or aggregate risks. Such an endeavour must be supported by the necessary culture, as well as by a risk-oriented organisation at the firm level or, as commonly known, by appropriate risk governance. This is the only way to reveal any inconsistencies as to how the same risk is managed by different functions in a firm.

Turning to the effectiveness of risk management, it should be noted that, over time, crisis management has been the only viable alternative to risk management – although it is much costlier, time-consuming and, in most cases, embarrassing.

In all business decisions there is an inherent risk element. For instance, there are inherent risks in business decisions regarding the market on which a firm chooses to target, the products offered, their pricing, their reserving method, the management of investments made with the money received by policyholders, the choice of the distribution channel for insurance products (e.g. online or via agents or brokers) etc.

As time passes, all individual business decisions and their ensuing risks make up the firm's total risk portfolio. This portfolio has its own unique risk profile. The firm-specific risk profile determines the level as well the degree of stability or variability of the profits depending on the business and/or the economic cycle. From this perspective, it is acknowledged that business decisions are not disconnected from one another and that a firm encompasses all the decisions that it has made over time and which continue to have an impact. Some decisions have been made with a view to introducing new risks into the firm (e.g. the decision to develop a new insurance product or use a new distribution channel for those products, such as the Internet), others were aimed at reducing risks (e.g. the decision to purchase reinsurance or hedging, i.e. the introduction of a market risk hedging system) and others at increasing the risk that ensued from previous decisions (e.g. the decision to further expand a business line). For a firm to effectively manage its total risks, it is necessary to address and manage underlying risks not only on an individual basis, but also their interdependencies.

The drawback of risk management is that it has a different meaning to different people. Under



Solvency II, the concept of risk management takes the broadest possible concept, at the enterprise level. In this vein, risk management is all about acquiring a perspective which views the firm as a single risk portfolio, with individual risks in constant interaction. From this point of view, management involves the full spectrum of risks to which an insurer is exposed and subsequently calls for a single approach to addressing them. This perspective has the advantage of not overlooking the usefulness of an appropriate risk-oriented attitude, while it should be noted that it does not refer to the mitigation of risks but rather to the improvement of profitability opportunities and prospects, with the ultimate goal of maximising the value of a firm's capital.

Without this approach to risks as a single portfolio, the Board of an insurer perceives risks as separate pieces of a puzzle rather than getting the whole picture. In many firms, the risk management function generates literally hundreds of pages in risk assessment reports on a monthly basis. Yet, even after all those reports, the Board is not adequately briefed to be able to make informed decisions and, in many cases, to paint a full picture of its firm:

- What are the ten main risks assumed by the firm?

- Is there a concise report that is delivered on a regular basis to the firm's Board, showing the level of insurance risk, operational risk, counterparty risk and market risk, both currently and over time?

- What is the degree of the firm's compliance with internal procedures and existing legislation?

- Were past actual losses or past actual adverse events inflicted on the firm associated with already identified risks?

- Is the firm managed with a view to maximising risk-adjusted profits? If a firm cannot answer any of the above questions with certainty, then it is highly likely that it will benefit from an integrated approach to addressing all risk components, like the approach introduced by Solvency II.

C.4 THE CORNERSTONES OF SOLVENCY II

The above analysis clearly demonstrates that Solvency II calls for a different perspective on the nature of an insurer as a financial institution and on insurance contracts as financial instruments. Against this background, it is easily understandable that, as a result of the above, the cornerstone of Solvency II should be the systematic, effective and consistent management of current or future risks facing insurance and reinsurance undertakings.

Further lessons contributing to the formulation of Solvency II have been learnt from past insolvency cases in Europe.

This is explained by the fact that private insurance is among the few business activities in which the consumer-policyholder pays in advance to purchase the product (in the form of insurance premiums) in exchange for a promise of a future benefit. Besides, this promise involves the payment of a much higher amount of money at an unknown yet critical time, as this is exactly when the consumer is most financially vulnerable and in need of the insurance payout. In this context, an eventual insolvency of the insurer is crucial for the policyholder.

Looking at insolvency cases in the broader financial sector and despite any differences as to the manifestation of each case, a number of common conclusions and lessons were drawn. Namely, the Board's responsibility for the functioning of the firm, the implementation of an effective governance system, the need of firms' self-limitation in terms of risk taking and finally the important role of cash.

One of the core elements, and – according to many– cornerstones, of Solvency II is the


Board's responsibility for the smooth functioning of an insurance firm. If this appears to be self-evident, it should be recalled that under Solvency I the Board of a firm bore no direct responsibility, at least vis-à-vis the supervisory authority, for its management, and accountability was sought ex post facto, after the firm had become insolvent. It was believed ex ante that each Board had transferred the two key responsibilities to others: on the one hand, the management responsibility to the "administration and management officer" and on the other hand, the responsibility for forming technical provisions (that is, the responsibility for checking almost all balance sheet liabilities) to the appointed actuary, who was personally accountable to the supervisory authority. Solvency II, besides attributing to the Board full responsibility for administration and management, takes one step further, bringing to the heart of each effort the fact that all staff must be fully aware of their risk-roles and tasks, starting from the Board members and ending to each and every one of the employees, working even at the most remote branch. This knowledge must be accompanied by a deep understanding of how their individual tasks can affect risks at the enterprise level, as well as how their operations and responsibilities interact with the respective operations and responsibilities of the other functions of the firm.

A prerequisite for the effective risk management of an insurer is the existence of an effective governance system, which shall ensure all necessary safeguards to preventing anyone, either an individual or a group of people within the firm, from acquiring excessive power and taking risks on behalf of the firm. This may refer, for instance, to a specific underwriter authorised to assume excessive risks, or an employee who may determine and amend at will reinsurance contracts, or even a CEO whose (mostly oral) orders are executed without any objections, even if they infringe upon policies already established by the Board. It is important to point out that an effective governance system, coupled with clearly distinct

responsibilities, is the only safeguard that a firm has against human errors and flaws in procedures and systems. Solvency II, acknowledging this need, introduces the concept of key functions, which are the actuarial function, the risk management function, the internal audit function and the compliance function. In addition, it introduces requirements for specific procedures and processes which are implemented by independent experts, such as the independent overview of assets and liabilities valuations and the independent validation of risk measurement models. Lastly, it establishes the requirement that each firm recognises and addresses all conflicts of interest that have arisen or may arise in the future.

The Solvency II framework can be characterised as quite liberal. There no longer exist any restrictions which had been established under Solvency I on the type and the level of investments and insurance risks that a firm was allowed to assume.²² From now on, each firm is free to determine its investments by itself, without any restrictions, and may also assume insurance risks unconditionally. Considering that, each firm should exhibit self-discipline, setting specific restrictions (tolerance limits) on the nature of risks it proposes to cover. Furthermore, for each individual type of risk falling within its tolerance limits, the firm must set specific risk limits. Similar to the strategic and business plans that determine where the firm plans to move to, restrictions and limits determine when a firm must stop. Finally, on the basis of studies that have been conducted from time to time worldwide, it is clear that all kinds of fraud, abuse, theft and infringement in general within firms are almost identical in one respect: they invariably track the firm's cash flows. Besides, all kinds of errors or failures have multiple adverse effects on an organisation if they affect cash. Under Solvency II, a firm's cash outflows and

²² Solvency I specified which investments an insurer was allowed to undertake within clear-cut limits. By way of illustration, an insurer could not invest its assets backing the technical reserves in financial derivatives. Moreover, there were currency matching requirements, in the event that investments and obligations were denominated in different currencies.



inflows are placed at the centre of attention. The actuarial function takes on a key role in safeguarding the flow of cash, as all valuations that it carries out and all procedures that it follows for the validation of the models are based on cash flows.

D THE COMPONENTS OF SOLVENCY II

D.I THE PARTS OF THE LEGISLATIVE FRAMEWORK OF SOLVENCY II

Solvency II has been designed in such a way as to ensure a modern, innovative and liberal regime of prudential supervision. Its main objective is to strengthen the protection of policyholders, whilst contributing to financial stability, the creation of fair and stable markets and the integration of the European insurance market. Solvency II rests upon three pillars, consisting of (i) quantitative requirements, (ii) qualitative requirements that are mainly associated with governance and supervision requirements, and (iii) supervisory reporting and public disclosure.

These three pillars, albeit core elements of Solvency II, are not expressly stated in legislative texts, at least not explicitly. The provisions regarding each pillar are scattered throughout legislative texts²³ and the only way to pinpoint them is by making a reference to their content: anything associated with quantitative requirements (calculations, methodologies, valuations) is part of Pillar I; anything relating to organisational or supervisory requirements is included in Pillar II; and any arrangements regarding public disclosure or reporting for supervisory purposes belong to Pillar III.

The legislative framework of Solvency II is structured in 6 parts. Those parts, as well as their titles, can be easily identified in Law 4364/2016.

- Part 1 is "General rules on the taking-up and pursuit of direct insurance and reinsurance activities".

- Part 2 is "Specific provisions for insurance and reinsurance".

- Part 3 is "Supervision of insurance and reinsurance undertakings in a group".

- Part 4 is "Reorganisation and winding-up of insurance undertakings".

Part 5 includes "Other provisions".

- Finally, Part 6 comprises "Transitional and final provisions".

Where in this section a reference is made to an article without specifying the law or regulation or decision thereof, it is assumed that the article refers to Law 4364/2016.

D.2 PART I: "GENERAL RULES ON THE TAKING-UP AND PURSUIT OF DIRECT INSURANCE AND REINSURANCE ACTIVITIES"

The first part of Solvency II includes all main provisions regarding the functioning of insurance and reinsurance undertakings on a solo basis (as opposed to groups, as laid down in Part 3). Part 1 comprises ten chapters, numbered in Greek characters from A to J.

The pursuit of insurance and reinsurance in Greece, as is also the case in the rest of the EU, is a regulated activity, subject to the supervision of the Bank of Greece, and is undertaken by firms that meet specific requirements and which have obtained an authorisation by the aforementioned supervisory authority. The first three chapters A, B and C provide for such matters. In greater detail:

- Chapter A includes Articles 1-9. This chapter determines the scope of the law (i.e. to which undertakings and activities Solvency II applies and which undertakings are excluded from its provisions). Furthermore, this chapter includes a classification of insurance opera-



²³ In some cases, it is not uncommon to find provisions regarding all three pillars under the same article or even under the same paragraph of an article.

tions according to classes of insurance (9 classes for life insurance and 18 classes for non-life insurance).

- Chapter B includes Articles 10-18 and covers the taking-up and pursuit of direct insurance or reinsurance. This chapter specifies that the pursuit of insurance and reinsurance operations is a supervised activity and is subject to prior authorisation granted by the supervisory authority. In addition, it lays down the conditions for authorisation with regard to both the undertakings seeking authorisation and their shareholders.

- Chapter C (Articles 19-28) comprises the general rules of supervision and determines its general principles and its main objective, as well as general supervisory powers. While Chapters A and B are, as a rule, a copy of existing provisions from the previous supervisory framework (e.g. the authorisation of insurance undertakings is not a novelty introduced by Solvency II), Chapter C is an utterly new chapter, which, as it regards supervision, is largely part of Pillar II, although there are also provisions regarding reporting for supervisory purposes (Article 24), which are part of Pillar III.

Chapters D, F and G constitute the core of Solvency II. These chapters comprise the bulk of arrangements that belong to all three Pillars, as they determine quantitative requirements, governance requirements and public disclosure requirements. In more detail:

- Chapter D (Articles 29-47) comprises governance requirements, with its largest part belonging to Pillar II, while Articles 38-42 belong to Pillar III since they involve the public disclosure of information.

- Chapter F (Articles 50-106) contains quantitative requirements, technical provisions and own funds.

- Finally, Chapter G (Articles 107-114) relates to cases of insurance and reinsurance

undertakings which are non-compliant with capital requirements, or are in difficulty or in an irregular situation.

Chapter E, which was not mentioned above, consists of only two Articles (48 and 49) regarding composite insurance undertakings that pursue life and non-life insurance activities simultaneously and the distinct separation of life and non-life insurance management.

Lastly, the last three chapters of Part A, namely H, I and J (Articles 115-144), relate to the freedom of undertakings established in another EU Member State to pursue crossborder activities, through a branch or remotely through the freedom to provide services, in Greece and vice versa, as well as the conditions for the taking-up of business by undertakings of third (non-EU) countries through branch establishment.

D.2.1 Authorisation of insurance and reinsurance undertakings

Insurance and reinsurance are regulated activities. Therefore, their pursuit is subject to prior authorisation by the supervisory authority (Article 10). Nevertheless, this does not imply that insurance undertakings established in Greece are not allowed to seek for and purchase reinsurance from reinsurance undertakings elsewhere in the world.

The operations which an insurance or reinsurance undertaking is allowed to carry out are clearly defined and distinctly separated into two large categories: life and non-life insurance. For reinsurance undertakings, this separation is sufficient. The authorisation granted by the supervisory authority (Article 11 para. 4) may concern life reinsurance activity, nonlife reinsurance activity, or all kinds of reinsurance activity (both life and non-life).

For insurance undertakings, the authorisation involves specific risks, classes and groups of classes of direct insurance and/or all activities, either in life or in non-life insurance. What



insurance undertakings are not authorised is to pursue life and non-life insurance activities simultaneously (in contrast with reinsurance undertakings which, as already mentioned, are allowed to do so). At this point, there is a particularity in terms of insurance undertakings that pursued simultaneously both life and nonlife insurance activities before Greece joined the then European Economic Community (EEC) on 1 January 1981. Composite insurance undertakings which had received such an authorisation in Greece before 1 January 1981 may continue to pursue those activities simultaneously (under Article 48 para. 5).

Insurance undertakings may pursue reinsurance activities only for the classes already authorised. Conversely, the pursuit of the direct insurance business by reinsurance undertakings is not authorised. The main reason for the above prohibition lies in the fact that the framework for the reorganisation and winding-up of insurance undertakings with special privileges to policyholders and beneficiaries is not applicable to reinsurers, but exclusively to insurers.

There are two types of authorisations granted by the supervisory authority to an insurance or reinsurance undertaking. Pursuant to the first and most common type, the authorisation is valid for the entire EU. In this way, all authorised insurance or reinsurance undertakings are granted a "European passport" enabling them to pursue business in any other EU Member State, either through branches (right of establishment) or remotely (freedom to provide services). The second type is a different version of the above authorisation and is granted to a particular category of insurance undertakings (the so-called "excluded insurance undertakings") which are excluded from the scope of the three Pillars of Solvency II. This special authorisation is valid only in Greek territory (Article 12).

Lastly, the aforementioned classification of life and non-life insurance in classes or groups of classes relates solely to the authorisation of an insurance or reinsurance undertaking as well as to the kind of activities it may pursue. For all necessary calculations and reporting to the supervisory authority, in contrast with the provisions of the previous framework, the above classification is no longer used, but a different one is employed, which is based on homogeneous risk groups and as a minimum by lines of business or other case-by-case approaches.²⁴

D.2.2 Excluded insurance undertakings

Solvency II places emphasis on the protection of all policyholders of all insurance undertakings. On that account, exclusion from the scope of Solvency II [due to size] is quite limited, as small and medium-sized insurance undertakings are subject to the principle of proportionality. However, in the event that the provisions of the framework, even after the application of the proportionality principle, are too burdensome for such undertakings, then these are excluded from the scope of Solvency II.

Exclusion of an undertaking from the scope of Solvency II is made in such a way so as not to lead to distortions of competition by creating dual-track insurance undertakings, or to avert any unreasonable or undue results, e.g. a situation in which an undertaking falls within the scope of Solvency II at the stage of growth, but is excluded from it when it has accumulated large obligations which are on a run-off situation, or whether it uses reinsurance as an exclusion mechanism or not.

Before analysing what it means for an undertaking to be excluded from the scope of Solvency II, it is important to describe what it does not entail:

- When an undertaking is excluded from Solvency II, this does not mean that it is also

24 By way of illustration, portfolios consisting of obligations and corresponding assets, in cases of transfer or when using specific adjustments (e.g. matching adjustment), or portfolios of obligations for which an undertaking may change the insurance premiums and/or the benefits under similar circumstances and with similar effects, when calculating the contract boundaries.



excluded from the requirement to obtain authorisation by the competent supervisory authority; otherwise, we may end up with unauthorised undertakings pursuing insurance activities in Greece.

- The fact that a concrete, uniform, EU-wide framework for the functioning of excluded undertakings is not envisaged does not imply that each Member State is not obliged to determine its own framework. Member States are free to determine on their own the framework for the functioning of such undertakings. Of course, it is not uncommon that national laws in some countries regarding such undertakings are consistent with the provisions of Solvency II – in other words, in some countries there may be no excluded undertakings.

- The right of establishment and freedom to provide services, as specified in the Treaty on the European Union, is valid, irrespective of the "passport" system that is provided for in the framework. Yet, the "passport" contributes to an automated access, thereby limiting the supervisory responsibilities and powers of the host State. Against this background, excluded undertakings are not prohibited to pursue insurance or reinsurance activities in other EU Member States, but to do so, they need an approval (authorisation) by the host Member State.

Undertakings which may be excluded from the scope of Solvency II must fulfil one of the following conditions: they must either take the form of a mutual undertaking and at the same time fully transfer their risk²⁵ or be very small.²⁶

In the first case, a full transfer of risks can take two alternative forms: either the conclusion of an agreement which provides for the full reinsurance of the insurance policies issued or the conclusion of an agreement under which the accepting undertaking is to meet the liabilities arising under such policies in the place of the ceding undertaking. A prerequisite for reinsurance or accepting undertaking is that the counterparty of the mutual undertaking is another mutual undertaking.²⁷ If all of the conditions are met, then the mutual undertaking is automatically excluded from the scope of Solvency II without necessitating prior approval by the supervisory authority.

In the second case (i.e. exclusion due to size), exclusion is subject to approval by the supervisory authority, while insurance undertakings must fulfil two general conditions: (a) they must not have established a branch in another EU Member State, or must not pursue insurance activities in another EU Member State in accordance with the provisions regarding the freedom to provide services; and (b) their business must not include insurance or reinsurance activities covering liability, credit and suretyship insurance risks.

In addition to the aforementioned general conditions, undertakings which may be excluded from the scope of Solvency II due to size must meet the following thresholds:

- their annual gross written premium income does not exceed EUR 5 million;

the total of technical provisions does not exceed EUR 25 million;

- the business of the undertaking does not include reinsurance operations or, if it does, it is very small relative to its direct insurance operations;²⁸

– either they do not belong to an insurance group or where the undertaking belongs to a group, the technical provisions of the group do not exceed EUR 25 million.

²⁸ In this context, reinsurance operations should be not more than 10% of gross written premium income or not more than 10% of the total of technical provisions – for the underlying insurance and reinsurance obligations. For reinsurance operations to be characterised as small, on top of the above conditions, they should not exceed EUR 0.5 million of gross written premium income or EUR 2.5 million of total reinsurance obligations.



²⁵ Article 7(1) of Law 4364/2016.

²⁶ Article 7(2) 2 of Law 4364/2016.

²⁷ The rationale behind the counterparty being a mutual undertaking is associated with the relatively stronger links that are developed in those cases, as for a mutual undertaking to provide reinsurance to another mutual undertaking, the latter is required to become member of the first.

The exclusion of an undertaking from Solvency II requirements due to size is a dynamic process which is verified both during the initial authorisation of the undertaking and for each year of operation. At the time of initial authorisation, in order to be excluded from the scope of Solvency II, the undertaking must establish in its scheme of operations that its activities are not expected to exceed any of the thresholds within the following five years.

Undertakings may be excluded due to size not only upon first authorisation but also throughout their operation. If an undertaking, although in the beginning it did not fall under the scope of Solvency II, has followed a business downsizing practice with a view to meeting the conditions for exclusion for three consecutive years and is expected to continue to meet those conditions in the following five years, it may request to be excluded due to size.

If an undertaking has been excluded due to size either upon first authorisation or later, on account of reduced business, it must each year confirm that it has met all quantitative conditions for exclusion over the past three consecutive years. If this fails to be verified, the undertaking ceases to be entitled to exclusion and falls within the scope of Solvency II from that year onwards.

Finally, it is important to note that the aforementioned amounts are adjusted for inflation (based on the Harmonised Index of Consumer Prices of the EU). As those amounts must reflect the actual size of each undertaking and should not easily be affected by the management practices of each undertaking, technical provisions are gross of reinsurance, i.e. technical provisions are not calculated net of the amounts recoverable from reinsurance contracts.

D.2.3 Head offices and legal form of the insurance and reinsurance undertaking

While under the previous supervisory framework the head office of an insurance or reinsurance undertaking should be located only in specific Greek cities, such restriction is now removed by Solvency II. . Regarding the legal form of insurance undertakings, there are three options: société anonyme, European company, or mutual association. In all three cases, the shares should not be anonymised. Mutual undertakings have an additional restriction: they may only be non-life insurers. All of the above, as well as the operations laid down in their statute, any amendment thereto regarding the type of their activities and any increase or decrease in their share capital, are subject to prior approval by the supervisory authority.

D.2.4 Pillar I: Quantitative requirements

"Pillar I" of Solvency II concerns the quantitative requirements on (re)insurance undertakings and comprises the following elements:

- 1. Valuation of assets and liabilities
- 2. Technical provisions
- 3. Own funds
- 4. Solvency capital requirement
- 5. Minimum capital requirement
- 6. Investments.

(Re)insurance undertakings value assets and liabilities as follows, unless stated otherwise: (a) assets are valued at the amount for which they could be exchanged between knowledgeable willing parties in an arm's length transaction; and (b) liabilities are valued at the amount for which they could be transferred, or settled, between knowledgeable willing parties in an arm's length transaction.

When valuing liabilities, no adjustment is made to take account of the own credit standing of the insurance or reinsurance undertaking.

Insurance and reinsurance undertakings establish technical provisions for all of their insurance and reinsurance obligations towards policyholders and beneficiaries of insurance or reinsurance contracts. The value of technical provisions corresponds to the current amount



that insurance and reinsurance undertakings would have to pay if they were to transfer their insurance and reinsurance obligations immediately to another insurance or reinsurance undertaking.

Apart from technical provisions and other obligations, undertakings hold an additional amount of assets or third-party commitments that can be called in specific circumstances. This additional amount takes the form of own funds, i.e. funds that can be called up to absorb any unexpected losses, if and when they occur, and is in principle calculated as the excess of assets over liabilities, the so-called "economic capital". In this context, own funds are used as an extra level of security (protection of policyholders). The amount of own funds is equal to the sum of on-balance sheet items and any off-balance sheet items. On-balance sheet items are called basic own funds and are equal to the sum of economic capital and subordinated loans. Those loans, although they cannot be treated as own funds in the narrow accounting sense, since they are not "own" funds of the undertaking, exhibit some characteristics that could place them under own funds.29 Off-balance sheet items are called ancillary own funds, usually comprise the unpaid share capital or initial fund, letters of credit and guarantees, or any other commitments, such as any future supplementary contributions by members of a mutual association, and are subject to prior supervisory approval. Own funds are classified into three tiers (Tier 1, 2 and 3) depending on their loss-absorbency and to the extent that they meet five main criteria:

- Permanent availability
- Subordination
- Absence of incentives to redeem
- Absence of mandatory servicing costs
- Absence of encumbrances.

Basic own funds can be classified in one of the three tiers (Tier 1, 2 or 3), whereas ancillary own funds can only be classified in Tier 2 or 3.³⁰ Eligible own funds must be higher than the solvency capital requirement.

The solvency capital requirement corresponds to the economic capital that a (re)insurance undertaking must hold to limit the annual probability of default to 0.5%, that is the probability of default should be 1 over 200 years, and to reflect the actual risk profile of the undertaking, taking account of all quantifiable risks.

The solvency capital requirement is calculated in two alternative ways. The first involves the use of a standard formula (standardised method), which aims to strike the right balance between sensitivity to risk and practicability. The standard formula enables the use of parameters specific to each undertaking, depending on the case, as well as of standardised simplifications for small and mediumsized undertakings. The risk measure is the Value-at-Risk of basic own funds with a 99,5% confidence level over a one-year period, covering at least the following risk modules: nonlife underwriting risk, life underwriting risk, health underwriting risk, market risk, counterparty default risk, and operational risk. The second method involves the use of internal models that have been developed by the (re)insurance undertakings themselves on the basis of specific principles.

The minimum capital requirement represents an amount of capital below which policyholders' interests are exposed to an unacceptable level of risk, were insurance and reinsurance undertakings allowed to continue their operations. As a result, if the undertaking fails to comply with the minimum capital requirement, the supervisory authority is allowed to activate a measure of last resort, i.e. a withdrawal of authorisation.

All investments by undertakings are managed and monitored in accordance with the prudent person principle, which requires from

³⁰ They cannot be classified in Tier 1 as they are not readily available.



²⁹ The key characteristic of subordinated loans is the fact that the lender has agreed to not receive interest or principal, which will instead be allocated in favour of policyholders in the event of financial difficulties facing the undertaking or, otherwise, to receive it only when financial difficulties are remedied.

(re)insurance undertakings to give due consideration to the risks to which they are exposed. In this context, the legislation does not envisage any particular categories of investments, and no prior supervisory approval is required. Nevertheless, insurance and reinsurance undertakings should only invest in assets and instruments whose risks they can properly manage, monitor and control.

Last but not least, a key chapter of Pillar I is the long-term guarantee measures (LTG) which (re)insurance undertakings provide to their policyholders. Those measures are aimed at addressing artificial volatility in the balance sheets of undertakings under Solvency II.³¹ Such measures are the symmetric adjustment in the equity risk module (SA), the volatility adjustment (VA), the matching adjustment (MA), transitional measures on risk-free rates (TMRFR), transitional measures on technical provisions (TMTP) and the extension of the recovery period (ERP).

D.2.5 Pillar II: Quantitative requirements – Supervision and Governance

The quantitative requirements and the supervisory rules for (re)insurance undertakings (Pillar II of the Solvency II framework) are laid down in two sections, of which one comprises the Supervisory Authorities and General Rules and applies to supervisory authorities, and the other comprises the Governance System and applies to (re)insurance undertakings.

The main objective of supervision

The main objective of supervision according to Solvency II is the protection of policyholders and beneficiaries. The term beneficiary is intended to cover any natural or legal person who is entitled to a right under an insurance contract. Financial stability and fair and stable markets are other objectives of supervision.

Striking a balance between the main and other objectives of supervision calls for an ongoing effort, as, although on a first reading they appear to be consistent with one another, under special circumstances the same objectives may dictate different decisions or actions on the part of a supervisory authority. On the one hand, the other objectives of supervision must be taken into account without undermining the main objective, i.e. the protection of policyholders and beneficiaries, as a solvency framework should give precedence to the protection of those persons — otherwise, what's the point in undertakings being solvent? — while, on the other hand, supervisors must duly consider the potential impact of their decisions on the stability of the financial systems concerned in the EU, in particular in emergency situations.

Solvency II is not limited to those objectives, but sets an additional mandate to the supervisory authorities, in the form of a limitation, requiring that, in times of exceptional movements in the financial markets, supervisory authorities should take into account the potential pro-cyclical (recessionary) effects of their actions.

Supervisory principles and general rules

Under Solvency II, supervision rests upon a risk-oriented, forward-looking approach, which is allowed for by the existence of a system that captures the actual risk profile of undertakings, on the basis of economic principles, taking full advantage of the information provided by the financial markets. In addition, special care is given towards ensuring that the Solvency II framework is not too burdensome for small and medium-sized undertakings. Therefore, the proportionality principle is promoted, which applies to all Solvency II requirements.

The principle of proportionality

The principle of proportionality is a new concept in private insurance law, based on an escalation of supervisory requirements on each undertaking depending on the nature, scale and complexity of the risks inherent in its business activities. Although the proportionality



³¹ The term "artificial volatility" refers to the volatility of own funds, as a result of a drop in interest rates with a concurrent increase in credit spreads.

principle governs the entire framework, it is not clearly defined therein. Thus it is left to be defined on a case-by-case basis and in a manner akin to the level and the type of risks of each undertaking (rather than the size of its business, unless expressly stated so by the law). It is clear that, on the basis of this principle, two seemingly identical undertakings but with divergent risk management practices are subject to different requirements.

Ladder of supervisory intervention

Under the provisions regarding supervisory authorities, Solvency II grants to the supervisory authorities of all Member States the same, increased, powers, but is not limited to an exhaustive list. Thus, supervisory authorities possess an escalating ladder of intervention in the undertakings depending on the degree of any non-compliance.

First of all, supervision follows a principlesbased approach without involving the imposition of concrete measures and the intervention of the supervisory authority in the undertaking's operation. In the event of significant noncompliance with the solvency capital requirement, the undertaking submits a realistic recovery plan for approval by the supervisory authority. In this case, supervision makes a first-level intervention, requiring the undertaking to take concrete measures either to mitigate the risk assumed or to raise additional capital with a view to remedying non-compliance within six months. In the event that the condition of the undertaking deteriorates and, as a result of this deterioration, non-compliance with the minimum capital requirement is observed, the undertaking submits a realistic short-term finance scheme for approval by the supervisory authority. In that case, supervision makes a second-level intervention in the undertaking, following a rules-based approach this time for the remedy of non-compliance within three months. Finally, if the undertaking fails to comply with the rules for technical provisions, supervision shall not expect the submission of a recovery plan or finance scheme; instead, it intervenes promptly and may prohibit the free disposal of its assets or even resort to more drastic measures. In any event, the measures adopted are proportionate, thus reflecting the level and duration of the deterioration of the solvency position of the undertaking concerned.

Stress testing

A new power in the hands of the supervisory authorities is the possibility to require undertakings to assess their solvency standing under adverse scenarios (stress test). The supervisory authority may require that stress tests are conducted either by each undertaking on a solo basis, noting the risks specific to the undertaking concerned depending on its risk profile, or by the entire market.

Supervisory review process

In order for the supervisory authorities to identify those undertakings with financial, organisational or other characteristics that generate a high risk profile, the concept of the Supervisory Review Process (SRP) is introduced. This process is developed by the supervisory authorities and comprises the review and assessment of (a) each undertaking's compliance with the Solvency II framework, (b) the system of governance, (c) the risks which the undertaking concerned faces or may face, and (d) its ability to address any possible events or future changes in economic conditions that could have adverse effects on its overall financial standing.

Capital add-on under Pillar II

Supervisory authorities may, only in exceptional circumstances, impose a capital add-on on insurance or reinsurance undertakings as a measure of last resort, in cases in which either their risk profile deviates significantly from the assumptions underlying the Solvency Capital Requirement or the system of governance deviates significantly from the standards laid down in the Solvency II framework.

Nevertheless, even in the aforementioned cases of deviations, the imposition of a capital addon by the supervisory authority is exceptional,



suggesting that there is a course of actions to be followed by each supervisor in order to remedy those deficiencies, with the imposition of a capital add-on being the very last step. On the basis of the proportionality principle, the supervisory authority is free to consider imposing a capital add-on and has the power to impose it, but is by no means obliged to do so.³²

Outsourced activities

Another power that the supervisory authorities possess refers to the supervision of functions that have been outsourced by (re)insurance undertakings, in particular given the possibility of outsourcing key functions.

In this context and in order to ensure effective supervision of outsourced activities or functions, it is essential that the supervisory authorities have access to all relevant data held by the outsourcing service providers, as well as the right to conduct on-site inspections at the business premises of the outsourcing service provider, regardless of whether the latter is a regulated or unregulated entity.

Governance requirements

The governance requirements on (re)insurance undertakings which are laid down by Solvency II are aimed at achieving harmonisation with the respective requirements on the banking and securities sectors. Under Solvency II, rigorous governance requirements are a prerequisite for the existence of an effective solvency regime, as certain risks can only be addressed through such requirements rather than with the establishment of quantitative requirements.

Against this background, undertakings have the following four key functions:³³ the actuarial function, the risk-management function, the internal audit function and the compliance function. The system of governance also includes compliance with fit and proper requirements for persons who effectively run the undertaking or have other key functions.

To ensure the sound operation of the system of governance, undertakings are required to

have written policies in relation to risk management, internal control, internal audit and, where relevant, outsourcing.

Lastly, the Own Risk and Solvency Assessment (ORSA) is introduced, through a process of internal assessment conducted by the undertaking itself as part of its strategic decisions, which also serves as a supervisory tool.

D.2.6 Pillar III: Supervisory reporting and public disclosure

Supervisory reporting and public disclosure make up Pillar III of the Solvency II framework and refer to the information to be provided for supervisory purposes, as well as public disclosure.

Information to be disclosed³⁴ is contained in a single document entitled "Solvency and Financial Condition Report". In this report, which is released on annual basis, each under-taking includes information using specific structure and, in some cases, according to a specific format.³⁵ The report comprises data regarding the business and the performance of the undertaking in the previous year, a description of the system of governance, and information on its risk profile. Furthermore, it includes information on the methods used for the valuation of assets, technical provisions and other liabilities as well as a description of its capital management.

Information provided for supervisory purposes³⁶ can be found under the general heading "regular supervisory reporting" and com-

- 33 A function is defined as an internal capacity to undertake practical tasks of administration, management, representation or control over specific operations of an undertaking, within a system of governance (Article 3(29) of Law 4364/2016.
- 34 Articles 290-299 of the Regulation (EU) 2015/35.
- 35 The procedures, formats and templates of the report on solvency and financial condition are specified in Implementing Regulation (EU) 2015/2452.
- 36 Article 304 of Regulation (EU) 2015/35.



³² If not (when capital add-ons are imposed in not so exceptional circumstances), there is a risk of indirectly admitting that the Solvency II framework fails to establish a new risks-based solvency regime. Needless to say, the phrase "in exceptional circumstances" should in no way be interpreted as drawing the line in the number of cases in which a supervisory authority may impose such capital add-ons.

prises: (a) the (published) solvency and financial condition report; (b) the regular supervisory report, which contains information specifying and further elaborating on the published report;³⁷ (c) annual and quarterly quantitative templates specifying in greater detail and supplementing the information presented in the above reports.

D.3 PART 2: "SPECIFIC PROVISIONS FOR INSURANCE AND REINSURANCE"

The second part of Solvency II (Articles 145-169) comprises specific provisions to life insurance, non-life insurance, health insurance and legal expenses insurance. These provisions are actually recasts of older provisions regarding, by way of illustration, the law applicable to insurance contracts, issues specific to compulsory insurance, general information for policyholders before the conclusion of insurance contracts, cancellation periods, finite reinsurance and special purpose vehicles, while a set of provisions facilitating EU-wide co-insurance operations is contained at the end.

D.4 PART 3: "SUPERVISION OF INSURANCE AND REINSURANCE UNDERTAKINGS IN A GROUP"

The third part of Solvency II provides for the supervision of groups, in particular insurance groups. For this kind of supervision, the definition provided by the Solvency II framework is of great relevance. Insurance and reinsurance undertakings which are linked with one another in one of the following two ways are considered a group:³⁸

 a group of undertakings that consists of a participating undertaking, its subsidiaries and the entities in which the participating undertaking or its subsidiaries hold a participation, or

- a group of undertakings that is based on the establishment, contractually or otherwise, of strong and sustainable financial relationships among those undertakings, under certain conditions.

As for the understanding of Solvency II requirements on groups it is important to have previously acquired a full grasp of the relationships which two or more undertakings can establish, all relevant definitions are presented in the Annex of the present study.

D.4.1 Cases of application of group supervision

Supervision at the group level applies to the following three cases reflecting three different types of group relationships. In the first case, the group relationship refers to either insurance and reinsurance undertakings, which are a participating undertaking in at least one insurance or reinsurance undertaking, or insurance and reinsurance undertakings, the parent undertaking of which is an insurance holding company or a mixed financial holding company which has its head office in the EU. In this case, the scope of supervision extends to the entire spectrum of the group's solvency and financial condition.

In the second case, the group relationship involves insurance and reinsurance undertakings, the parent undertaking of which is an insurance or reinsurance undertaking or an insurance holding company or a mixed financial holding company that has its head office outside the EU. In this case, supervision rests upon an assessment of the equivalence of third-country supervisory regimes and varies accordingly.

In the third case, the group relationship refers to insurance and reinsurance undertakings, the parent undertaking of which is a mixed-activity insurance holding company. In this case, the scope of supervision focuses rather on the supervision of intra-group transactions than on the group's solvency.

In the above analysis, it has been taken for granted that the head of each group is clearly



³⁷ For this reason, both reports (the report on solvency and financial condition and the regular supervisory report) have exactly the same structure, with identical contents.

³⁸ Article 170 of Law 4364/2016.

identifiable. However, in most cases things are not so clear-cut. A group may operate in more than one countries, either within or outside the EU. For this reason, Solvency II (Article173) states that the **ultimate parent undertaking at the EU level** is deemed head of the group.. If a group forms a subgroup which is active only in one country, the supervisory authority of that country may, without prejudice to national law,³⁹ deem the subgroup as a national subgroup which is subject to group supervision, irrespective of the remainder of the group.

D.4.2 European insurance group supervision

The supervision of EU insurance groups (i.e. the first case of group supervision) applies:

(a) to insurance or reinsurance undertakings, which are a participating undertaking in at least one EU insurance undertaking, EU reinsurance undertaking, third-country insurance undertaking or third-country reinsurance undertaking; and

(b) to insurance or reinsurance undertakings, the parent undertaking of which is an insurance holding company or mixed financial holding company which has its head office in the EU.

It should be noted that, in cases where the group also pursues activities other than insurance, Solvency II is interested in that part of the group which concerns insurance and reinsurance operations, addressing the remaining part either in a simple (yet clear) manner or by way of reference to other legislative texts, for instance Law 3455/2006 regarding credit institutions, investment firms and financial institutions.

EU group supervision focuses on two aspects: (a) the financial position of the group and (b) the cooperation of supervisory authorities.

The assessment of a group's financial position includes group solvency, the supervision of risk concentration and of intra-group transactions,

and the supervision of the system of governance. For the cooperation of the supervisory authorities that are associated with a group, the role of the colleges of supervisors is pivotal. For each group with cross-border operations a college of supervisors is set up, headed by one of the above supervisory authorities, namely the group supervisor, and having as members the supervisory authorities of the other countries in which the group is active, namely the supervisory authorities concerned to group supervision. The college of supervisors means a permanent but flexible structure for cooperation and coordination among the supervisory authorities concerned to group supervision, as well as for facilitation of the decisionmaking process.

D.4.3 European group solvency

The solvency of an EU group is calculated by two different ways which are called Method 1 and 2, respectively. Method 1 is the default method and is carried out on the basis of the consolidated accounts. Under the accounting consolidation-based method, data from all (re)insurance undertakings of the group are consolidated, and the group's own funds and Solvency Capital Requirement are calculated as if the group were a single undertaking. In this case, the resulting capital requirement is the consolidated group Solvency Capital **Requirement**. The consolidated group Solvency Capital Requirement can be calculated either using the standardised method, which also applies to an undertaking on a solo basis, or on the basis of an **internal model for a group**⁴⁰ upon request of permission. The permission is granted by the group supervisor, after consulting with the supervisors of all Member States in which the related undertakings falling under the scope of the internal model for the calculation of the consolidated group Solvency Capital Requirement have their head offices,



³⁹ This leeway is provided by Solvency II Directive (Directive 2009/138/EC) and is a national choice, left at the discretion of the national legislator. In Greece, the national legislator chose to grant this leeway to the Bank of Greece.

⁴⁰ Article 188(2) of Law 4364/2016.

i.e. the **supervisory authorities involved**. In the event that this internal model is used for the calculation of the consolidated group Solvency Capital Requirement and of the Minimum Capital Requirement of at least one insurance or reinsurance undertaking of the group (on a solo basis), the model is called **group internal model**,⁴¹ the supervisory authorities of the Member States, in which the head office of the participating as well as of any related insurance and reinsurance undertaking using the group internal model is located, are called **supervisory authorities concerned**, and all parties concerned must jointly decide whether or not to grant the permission sought.

Method 2 is called deduction and aggregation method, is an alternative method to Method 1 and can be used only following permission by the group supervisor. This method is used to calculate the capital requirement of the group, the **aggregated group Solvency capital Requirement**, employing the relevant successive aggregations and deductions of individual capital requirements and own funds of the related insurance and reinsurance undertakings, as calculated for each undertaking on a solo basis.

D.4.4 Group solvency supervision for groups with centralised risk management

A problem facing groups with insurance or reinsurance subsidiaries in several EU Member States is that each subsidiary is subject to the supervision of the national competent authority. As a result, if such a group aspires to manage the risks assumed by all of its subsidiaries in a common (centralised) manner, it is faced by as many possible hindrances as the number of the national competent authorities supervising its subsidiaries.

Solvency II gives to such groups, provided that they have a proven centralised risk management, the option, with regard to specific issues of their subsidiaries (e.g. the possible imposition of a capital add-on), to be subject to the supervision of a single supervisor, namely the group supervisor, instead of the other supervisory authorities concerned or, with respect to other issues, to reduce any flexibility that the national supervisory authorities possess in enforcing measures on the supervised subsidiary (e.g. in the event of non-compliance with the Solvency Capital Requirement). This option is given to a group following prior supervisory approval.

D.4.5 Solvency of groups with parent undertakings outside the EU

The supervision of groups, the parent undertaking of which is an insurance or reinsurance undertaking, an insurance holding company or a mixed financial holding company which has its head office in a third, non-EU country (i.e. the second case of group supervision), is subject to verification of equivalence of the supervisory regime of that third country. In the event that the third-country supervisory regime has been deemed (by the European Commission or the group supervisor) equivalent to the Solvency II regime, a college of supervisors is set up, with participation of the third-country supervisory authority, with a view to ensuring a proper exchange of information, and the calculation of the group solvency is carried out in accordance with the regulation of the third country.

The assessment of the equivalence of thirdcountry supervisory regimes is conducted by EIOPA, and the European Commission decides whether there is equivalence or not. The Commission's equivalence decision may be full or provisional. Their difference lies in that a full recognition of equivalence has no time limit, unless of course changes are in the meantime made in the supervisory system of the third country, and in this case a re-assessment is warranted, whereas the provisional recognition of equivalence is valid over a predetermined time horizon and specific conditions are determined which the third country should meet in order to achieve full recogni-



⁴¹ Article 189 of Law 4364/2016.

tion. Furthermore, in the event of provisional equivalence, for the favourable provisions of equivalence to be enforceable,⁴² the parent undertaking of which the head office is located in a third country must have a total balance sheet exceeding the balance sheet of each one of its EU subsidiaries. Finally, in the event of lacking decisions (positive or negative) by the European Commission, a verification of equivalence may be carried out and a full equivalence decision may be adopted by the **acting group supervisor**,⁴³ in cooperation with EIOPA.

If there is no equivalent supervision or if equivalence is provisional, but there is at least one subsidiary of the group in the EU, the balance sheet of which exceeds that of the parent undertaking, then the calculation of group solvency is carried out in accordance with what is provided for in Solvency II (and not according to the third-country methodology).

D.4.6 Mixed-activity insurance holding companies

Where the parent undertaking of one or more insurance or reinsurance undertakings is a mixed-activity insurance holding company (i.e. the third case of group supervision), supervision is general and exercised over transactions between those insurance or reinsurance undertakings and the mixed-activity holding company and its related undertakings. In this case, the group solvency is not calculated.

D.5 PART 4 "REORGANISATION AND WINDING-UP OF INSURANCE UNDERTAKINGS"

The fourth part of Solvency II (Articles 220-248) provides for matters relating to the reorganisation and winding-up of insurance⁴⁴ undertakings with a head office in Greece, including their branches in other Member States, as well as of branches of third-country insurance undertakings situated in the territory of Greece. This Part also applies to branches of Greek insurance undertakings which are active in third countries, unless stated otherwise in the third-country law.

Before resorting to the withdrawal of authorisation of an insurance undertaking, and under specific circumstances, the supervisory authority may take a series of measures, aimed at safeguarding or restoring the financial condition of the insurance undertaking, the so-called reorganisation measures. Such measures differ from administrative measures against the undertaking or shareholders that the supervisory authority may adopt in its capacity as supervisor, as reorganisation measures may affect pre-existing rights of claimants, policyholders and beneficiaries, as well as of other contracting parties and creditors. Such measures refer to mandatory share capital increase, mandatory transfer of portfolio, suspension of payments and reduction of claims.45 For the implementation of reorganisation measures, the supervisory authority may appoint an insurance administrator, either cooperating with the Board of the insurance undertaking or acting as a replacement thereof.

The supervisory measure of last resort for the protection of policyholders is the withdrawal of authorisation of an insurance undertaking and the opening of winding-up proceedings.⁴⁶ In this case, the competent authority appoints a liquidator who is responsible for administering winding-up proceedings. The windingup of an insurance undertaking involves the realisation of its assets and the distribution of the proceeds (indemnification) to policyholders and beneficiaries. Winding-up proceedings end either when the insurance portfolio has been disposed of (i.e. the rights of all insured parties have been satisfied) or when the assets of the undertaking concerned have been exhausted. In the first case, the phase of a typical liquidation follows.

42 In other words, the calculation of group solvency is carried out in accordance with the supervisory provisions of the third country.

43 As quasi group supervisor is defined that supervisory authority which would hypothetically be the group supervisor if the group were European.

44 In contrast with reinsurance undertakings, to which special provisions on reorganisation and winding-up are not applicable, but to which only common provisions for their reorganisation apply, as is generally the case for all societes anonymes.

45 Articles 277-230 of Law 4364/2016.

46 As opposed to a typical liquidation.



D.6 PART 5: "OTHER PROVISIONS"

The fifth part of Solvency II includes Articles 249-268. This Part provides for a number of issues, which are not directly connected with other Parts. By way of illustration, these provisions regard the right to apply to the courts, the exchange rates of the euro and the revision of amounts expressed in euro, claims representatives, loss adjusters and legal representatives. Moreover, provisions are included regarding the operation of certain sectors or businesses, such as capital redemption, profit sharing mechanisms and surplus funds. Part 5 concludes with administrative and criminal sanctions on breaches of private insurance legislation.

D.7 PART 6: "TRANSITIONAL AND FINAL PROVISONS"

The sixth and last part of Solvency II comprises transitional and final provisions. This Part is structured in three large sections: the first section refers to the authorisations of existing undertakings and the rights acquired by existing branches and reinsurance undertakings, the second section refers to a series of transitional provisions for the smooth transition from Solvency I to Solvency II, and the third section involves phase-in provisions. Phase-in provisions had initially been designed with a view to enabling the supervisory authority to grant and, subsequently the undertakings to obtain, any necessary permissions or approvals regarding their operation on the first day of application of the framework (1 January 2016) at a time prior to the first application, i.e. from 1 April 2016 onwards. As the transposition of the Solvency II Directive in Greek law took place later than the first day of its application (on 5 February 2016) with retroactive effect from 1 January 2016, those phase-in provisions were never implemented.

Special reference is made to the insurance subclass IV.2 "Accident and sickness in non-life insurance", which was applicable under Solvency I. As by Law 4367/2017 this class no longer exists, all insurance undertakings which comprised that sub-class received automatically an authorisation for both Solvency II classes 1 "Accident" and 2 "Sickness". Thus, all life insurance undertakings which included this sub-class were converted into special composite insurance undertakings, in the sense that, although they are not treated as composites, they are not entitled to further expand their authorisation into other classes of non-life insurance.

As already mentioned, Solvency II has introduced a series of transitional provisions with a view to ensuring the smoothest possible transition from the former supervisory framework.

E CONCLUSIONS

As mentioned above, Solvency II provides a single (and common) framework at the European level (and not merely at the national level). This has multiple and direct consequences:

a) The legal framework of Solvency II shall not vary across countries or per national legislator. As a result, any country-specific circumstances, which under the previous framework could only be addressed with special legislative measures specific to the country concerned,⁴⁷ can now be dealt with only within the range of possibilities provided by the common EU-wide legal framework.

b) The solvency of (re)insurance undertakings in all EU Member States is comparable, as it is determined on the basis of uniform criteria, in contrast with the former Solvency I regime which was only seemingly common.⁴⁸

⁴⁸ As the previous directives that introduced Solvency I had minimum harmonisation, after more than 30 years of application, crosscountry differences were so large that, arguably, there were 28 different frameworks.



⁴⁷ An illustrative example is the solutions provided by Greek legislation in the past: mass losses from the drop in share prices in 2000, which were likely to significantly impair the solvency of insurance undertakings, were capitalised by way of derogation and were amortised in three years. Similarly, PSI-related losses were not recognised immediately but gradually through a derogation for Greek government bonds.

c) The operation of European groups has become considerably simpler, as they are not faced by divergent supervisory requirements in each country in which they are active, but deal with a single EU-wide regime, which has direct positive effects on their operating costs as they now can benefit from economies of scale across countries.

d) The supervisory authorities throughout Europe no longer act on their own, at least to the same degree as under the previous regime, or without any coordination between them, but they make a concerted effort, developing common supervisory practices or even common supervisory actions, both through the institution of the college of supervisors with regard to groups with cross-border presence and through EIOPA, which now enjoys enhanced powers relative to the past.

In Section C of this paper, the new perspective dictated by Solvency II was presented. This perspective calls for a different treatment of insurance undertakings and insurance contracts: it invites us to view the insurance undertaking as a financial institution that seeks, through the maximisation of its shareholders' profits, to protect policyholders and insurance contracts as financial instruments. This new point of view is key to the risk valuation and management of a (re)insurance undertaking. This inevitably leads to the adoption of market consistent risk valuations, an integrated approach to risks and an enterprise risk management perspective. The practice of an integrated, rather than a solobased approach to risks is corroborated by the fact that the main criterion for the solvency of an undertaking is the level of aggregate risks assumed, either using the Solvency Capital Requirement standard formula or on the basis of an internal model.49

As already noted, Solvency II rests upon three pillars (quantitative requirements -governance requirements- public disclosure of information and supervisory reporting). Although the rationale behind Solvency II pillars is considerably different from the respective arrangements of the previous regime, traces of all building blocks of the three pillars could also be found in the former supervisory framework, save one. Quantitative or governance requirements as well as reporting for supervisory purposes have always been present, albeit simpler and undeniably different. Nevertheless, there existed some. What was altogether lacking under the previous regime, given that it had not been envisaged at all, was the public disclosure by undertakings themselves of detailed information on their solvency and financial condition. This enhances transparency vis-à-vis policyholders and markets, i.e. any eventual future investors wishing to assume the insurance portfolio.

Of course, at the end of the day, the policyholder cannot help but wonder (and this is what he is ultimately interested in) whether the application of a new supervisory framework, namely Solvency II, makes the provision of benefits from the insurance undertaking more certain. Even though time is the ultimate judge, it is a fact that (re)insurance undertakings as well as supervisory authorities boast a wider array of reliable tools to better calculate and monitor the solvency of (re)insurance undertakings, which in turn leads to timely decision-making, while on their part policyholders are much better informed about their insurer of choice, thanks to public disclosure.



⁴⁹ As opposed to the former regime, under which solvency was calculated as a fixed percentage of the technical provisions and/or insurance premiums.

ANNEX UNDERTAKINGS IN A GROUP

Relationships between two or more undertakings

Two undertakings -(re) insurance or notmay be linked to each other in the following ways:

a) Participating-related relationship:

This relationship can be described in two levels, depending on the degree of control or influence of the participating undertaking over the related undertaking:

- At the minimum level of control, the first undertaking (i.e. the participating undertaking) has a **qualifying holding** in the second undertaking (the related undertaking), whereby a qualifying holding is defined as a direct or indirect holding of 10% or more of the shares or voting rights of the second undertaking, or any other means of providing significant influence over the management of that undertaking.

- The next level of control is called **participation** and means the direct or indirect, through a subsidiary undertaking, holding of at least 20% of the shares or voting rights of the second undertaking.

(b) Parent-subsidiary relationship:

In this relationship, which is the highest level of control, as parent undertaking is defined that undertaking which meets one of the following conditions:

- it is a parent undertaking within the meaning of Article 32(2) of Law 4308/2014, or

- it is a parent undertaking within the meaning of Article 1 of Directive 83/349/EEC, provided that it has its head office in another EU Member State,

while a subsidiary undertaking is defined as an undertaking that fulfils one of the above conditions in the opposite sense, i.e. as a subsidiary. The aforementioned conditions can be summed up to the fact that the first undertaking (the parent undertaking) holds the majority of the voting rights of the shareholders of the second undertaking (its subsidiary) or exercises a dominant influence over the latter, having for instance the right to appoint or remove the majority of its management board members.

Any subsidiary undertaking of a subsidiary undertaking is also considered as a subsidiary of the parent undertaking which is at the head of those undertakings.

It goes without saying that, if two undertakings are linked to each other by a parent-subsidiary relationship, then they are also related with one another by a participating-related relationship.

Undertakings in a group

There are three kinds of groups which are of interest for Solvency II:

a) groups with undertakings which are active in areas of the financial sector other than insurance;

b) insurance groups; and

c) groups which are active in different business sectors, but at the same time pursue insurance activities.

For understanding the first kind of groups, the concept of the **financial conglomerate is of rel-evance**. This concept is defined in Law 3455/2006 and refers to any group of under-takings, in which at least one of the entities is within the insurance sector and at least one is within the banking or investment services sector. The undertaking which is at the head of the group may be either a regulated entity (i.e. is within the insurance or banking or investment services sectors) or an unregulated entity. If the undertaking at the head of the group is an unregulated entity, it is called a **mixed financial holding company**. If the undertaking at the



head of the group is a regulated entity, it is named after the business area in which it is active, i.e. bank, insurance or reinsurance undertaking or investment firm or asset management company or alternative investment fund manager.

Insurance groups are groups of undertakings which are mainly active in insurance and/or reinsurance. The undertaking at the head of an insurance group may be either an insurance or reinsurance undertaking itself or an undertaking, the main business of which is to acquire and hold participations in subsidiary insurance or reinsurance undertakings, being neither an insurance or a reinsurance undertaking itself nor a mixed financial holding company. In the last case, the undertaking at the head of the group is called an **insurance holding company**.

Finally, there are groups which are active in different business sectors other than the financial sector, including at least one insurance or reinsurance undertaking among their subsidiary undertakings. The undertaking at the head of such groups, which is obviously neither a mixed financial holding company nor an insurance holding company, is called a **mixed**activity insurance holding company.

In the light of the above, it becomes clear that one of the following undertakings can be at the head of a group:

a) an insurance or reinsurance undertaking which has its head office within the EU;

b) an insurance or reinsurance undertaking which has its head office in a third (non-EU) country;

c) a mixed financial holding company;

d) an insurance holding company; or

e) a mixed-activity insurance holding company.

For each of the above cases, the form of group supervision exercised varies.



WORKING PAPERS (JULY – DECEMBER 2016)

This section contains the abstracts of Working Papers authored by Bank of Greece staff and/or external authors and published by the Bank of Greece. The unabridged version of these texts is available on the Bank of Greece's website (www.bankofgreece.gr).

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On the optimality of bank competition policy

Working Paper No. 209 Ioannis G. Samantas

This study examines whether the effect of market structure on financial stability is persistent, subject to current regulation and supervision policies. Extreme Bounds Analysis (EBA) is employed over a sample of 2,450 banks operating within the EU-27 during the period 2003-2010. The results show an inverse Ushaped association between market power and soundness, as well as a stabilising tendency in markets of less concentration, where policies lean towards limited restrictions on non-interest income, official intervention in bank management and book transparency. Regulation significantly contributes as a stability channel through which bank competition policy is optimally designed.

The re-pricing of sovereign risks following the Global Financial Crisis

Working Paper No. 210 Dimitris Malliaropulos and Petros M. Migiakis

How strong has been the effect of the Global Financial Crisis (GFC) on systemic risk in sovereign bond markets? Was the increase in credit spreads relative to triple-A benchmarks which followed the GFC the result of higher sovereign credit risk or the result of a re-pricing that reflected changes in broader market conditions and risk aversion? This paper examines these issues by specifying a sovereign credit yield curve which relates sovereign yield spreads to credit ratings and global variables. The model allows for time-variation in both the price of credit risk and the average spread across all rating categories, which proxies the effect of global risk factors on yield spreads. Daily data of ten-year bond yields and ratings

from a large database of 64 countries are used, covering both emerging markets and developed economies, for the period from 1.1.2000 to 1.1.2015. Estimates suggest that sovereign risk premia increased significantly after the GFC, with most of the increase due to a re-pricing of broader market risks rather than an increase in the quantity or price of sovereign risk per se. This increase in global risk could be the result of a flight-to-quality from lower-rated sovereign bonds to AAA benchmark bonds. Interestingly, it is found that global risk in the sovereign bond market is driven by global variables that relate to investor confidence, volatility risk, central bank liquidity and the slope of the yield curve in the United States.

Moral hazard and strategic default: evidence from Greek corporate loans

Working Paper No. 211 Ioannis Asimakopoulos, Panagiotis K. Avramidis, Dimitris Malliaropulos and Nickolaos G. Travlos

Using a unique dataset of corporate loans of 13,070 Greek firms for the period 2008-2015 and an identification strategy based on the internal credit ratings of banks, it is shown that one out of six firms with non-performing loans

are strategic defaulters. Furthermore, potential determinants of firms' behaviour were investigated by relating the probability of strategic default to a number of firm characteristics such as size, age, liquidity, profitability and collateral



value. The results provide evidence of a positive relationship of strategic default with outstanding debt and economic uncertainty and a negative relationship with the value of collateral. Also, profitability and collateral can be used to distinguish the strategic defaulters from the financially distressed defaulters. Finally, it is found that the relationship of strategic default risk with firm size and age has an inverse U-shape, i.e. strategic default is more likely among medium-sized firms compared to small and large firms and it is also more likely among middle-aged firms compared to newfounded and established firms.

New perspectives on the Great Depression: a review essay

Working Paper No. 212 George S. Tavlas

The Great Depression of 1929 was the most devastating and destructive economic event to afflict the global economy since the beginning of the twentieth century. What, then, were the origins of the Great Depression and what have we learned about the appropriate policy responses to economic depressions from that episode? This essay reviews two recently published books on the Great Depression. Eric Rauchway's *The Money Makers: How Roosevelt and Keynes Ended the Depression, Defeated Fascism, and Secured a Prosperous Peace* (Basic Books, 2015) tells the story of the ways Franklin D. Roosevelt drew on the ideas of John Maynard Keynes to place monetary policy front-andcenter to underpin the recovery from the Great Depression and to underwrite the blueprint of the Bretton Woods System. Barry Eichengreen's Hall of Mirrors: The Great Depression, the Great Recession, and the Uses – and Misuses – of History (Oxford University Press, 2015) shows the way the lessons learned from analysis of the Great Depression helped shape policy makers' response to the 2007-08 financial crisis, thus helping to avoid many of the mistakes made by policy makers in the 1930s.

Inter-industry wage differentials in Greece: rent-sharing and unobserved heterogeneity hypotheses

Working Paper No. 213

Evangelia Papapetrou and Pinelopi Tsalaporta

This paper examines the structure and determinants of inter-industry wage differentials in Greece, along with the role of the rent-sharing and unobserved heterogeneity hypotheses, employing restricted least squares and quantile regression techniques with cluster robust standard errors at the firm level. To this end, a unique dataset, the European Union Structure of Earnings Survey (SES), is utilised. Data refer to 2010 when the first elements of the economic adjustment programme to deal with the chronic deficiencies of the Greek economy, restore sustainable public finances and competitiveness, and set the foundation for long-term growth were beginning to be implemented. Results point to high wage dispersion across industries at the mean of the conditional wage distribution, even after controlling for personal and workplace characteristics. However, evidence for the unobserved heterogeneity hypothesis is rather scant. Therefore, there is room for efficiency wage or rent-sharing theories in accounting for a large part of inter-industry wage differentials, tentatively implying that firm heterogeneity in the ability-to-pay matters more than employee unobservable attributes in the wage determination process.



Self-fulfilling dynamics: the interactions of sovereign spreads, sovereign ratings and bank ratings during the euro financial crisis

Working Paper No. 214 Heather D. Gibson, Stephen G. Hall and George S. Tavlas

During the euro area financial crisis, interactions among sovereign spreads, sovereign credit ratings, and bank credit ratings appeared to have been characterised by selfgenerating feedback loops. To investigate the existence of feedback loops, we consider a panel of five euro area stressed countries within a three-equation simultaneous system in which sovereign spreads, sovereign ratings and bank ratings are endogenous. We estimate the system using two approaches. First, we apply GMM estimation, which allows us to calculate persistence and multiplier effects. Second, we apply a new, system time-varyingparameter technique that provides bias-free estimates. Our results show that sovereign ratings, sovereign spreads, and bank ratings strongly interacted with each other during the euro crisis, confirming strong doom-loop effects.

The slowdown in US productivity growth - what explains it and will it persist?

Working Paper No. 215 Ursel Baumann and Melina Vasardani

US productivity growth has been surprisingly weak after the Great Recession, raising concerns among economists and policy makers. Shedding light on this weakness is crucial, given the importance of productivity in the long-term growth prospects of the economy.

The literature relates the recent subdued pace of productivity growth to a number of factors, namely: (a) the fading effects of the information and communication technology (ICT) revolution, with the productivity slowdown merely suggesting a return to more "normal" rates following the exceptional ICT boom in the mid-1990s; (b) capital mismeasurement, as the gains from IT innovation for consumers' prosperity are largely intangible; (c) a decline in business dynamism and labour market fluidity, which hinders the optimal allocation of resources as well as technological diffusion or spillovers between firms and sectors; (d) a misallocation of resources due to the credit boom that preceded the Great Recession, with a possible lasting drag on productivity growth even after the downturn; and (e) tighter credit standards during the crisis and in the first years of the recovery, which restricted firms' access to credit, thereby discouraging investment in innovation and the entry of new businesses into the market.

This paper contributes to the debate by empirically revising the main determinants of labour productivity growth over the period 1999-2013 for a panel of US states and explores how changes in these determinants have affected the dynamics of labour productivity in recent years. The results show that US productivity growth is determined by changes in capital deepening, the availability of credit and the extent to which credit growth is excessive, as well as by the dynamism of the economy as measured by labour market churn and the firm entry rate. Besides, given the sectoral composition of growth, it is important to control for the impact of high-productivity sectors such as IT-producing and mining sectors.

The key findings of this paper suggest that more than half of the slowdown in US productivity growth in the period 2011-2013 relative to its sample average is due to a decline in the rate of capital deepening. The other major factor



explaining the recent weakness in productivity growth – more closely related to TFP – is the slowdown in business dynamism experienced by the US economy. By contrast, while financial factors had weighed on productivity growth during the Great Recession (i.e. during the 2008-2010 period), they now appear to have become supportive. Overall, part of the productivity slowdown appears to be cyclical, particularly in relation to capital investment, but some other aspects related to business dynamism, could prove more persistent. Understanding the drivers and the evolution of business dynamism is thus crucial and a priority for future research.

The results of the study lead to a number of policy implications. The authors suggest that

policies that support productivity growth should focus primarily on measures facilitating the diffusion of technology and enhancing the effectiveness of resource allocation. Such policies could include the promotion of capital investment in physical and human capital, targeted fiscal measures and further trade integration, aimed at accelerating the development and wide adoption of commercial uses of new technologies. Moreover, measures that mitigate uncertainty, address regulatory and competitive hurdles, and ensure the uninterrupted provision of credit to small young firms/startups especially during downturns are estimated to re-invigorate business dynamism, ultimately yielding significant gains in TFP growth.

Alternative Bayesian compression in Vector Autoregressions and related models

Working Paper No. 216 Mike G. Tsionas

In this paper we reconsider large Bayesian Vector Autoregressions (BVAR) from the point of view of Bayesian Compressed Regression (BCR). First, we show that there are substantial gains in terms of out-of-sample forecasting by treating the problem as an error-in-variables formulation and estimating the compression matrix instead of using random draws. As computations can be efficiently organised around a standard Gibbs sampler, timings and computational complexity are not affected severely. Second, we extend the Multivariate Autoregressive Index model to the BCR context and show that we have, again, gains in terms of out-of-sample forecasting. The new techniques are used in US data featuring medium-sized, large and huge BVARs.

Alternatives to large VAR, VARMA and multivariate stochastic volatility models

Working Paper No. 217 Mike G. Tsionas

In this paper, our proposal is to combine univariate ARMA models to produce a variant of the VARMA model that is much more easily implementable and does not involve certain complications. The original model is reduced to a series of univariate problems, and a copula-like term (mixture-of-normals densities) is introduced to handle dependence. Since the univariate problems are easy to handle by MCMC or other techniques, computations can be parallelised easily, and only univariate distribution functions are needed, which are quite often available in closed form. The results from parallel MCMC or other posterior simulators can then be taken together and use simple sampling-resampling to obtain a draw from the exact posterior which includes the copula-like term. We avoid optimisation of the parameters



entering the copula mixture form, as its parameters are optimised only once before MCMC begins. We apply the new techniques in three types of challenging problems: large time-varying parameter vector autoregressions (TVP-VAR) with nearly 100 macroeconomic variables, multivariate ARMA models with 25 macroeconomic variables and multivariate stochastic volatility models with 100 stock returns. Finally, we perform impulse response analysis in the data of Giannone, Lenza, and Primiceri (2015) and compare, as they proposed with results from a dynamic stochastic general equilibrium model.

Insights on the Greek economy from the 3D macro model

Working Paper No. 218 Hiona Balfoussia and Dimitris Papageorgiou

This paper examines the macroeconomic and welfare implications of banking capital requirement policies and their interactions with real and financial shocks for the Greek economy. The model employed is that of Clerc et al. (2015), a DSGE model featuring a detailed financial sector, banking capital regulations and bank default in equilibrium. The key model implication is that capital requirements reduce bank leverage and the default risk of banks but their relationship with social welfare is hump-shaped, reflecting a trade-off. The model is calibrated to data on the Greek economy and the dynamic responses to a number of financial and real shocks which may have played a material role in the unfolding of the Greek crisis are explored. The results indicate inter alia that an increase in depositors' cost of bank default leads to a substantial increase in the deposit rate, a decline in deposits and bank equity and an increase in bank fragility, while on the real side of the economy the decline in total credit prompts a deterioration of key macro variables. Additionally, the results imply that while recapitalisations increase bank net worth and credit supply and boost economic activity, this potential benefit is severely compromised in a high financial distress scenario, as the positive real and financial implications of a recapitalisation become both smaller and more short-lived.

Non-performing loans in the euro area: are core-periphery banking markets fragmented?

Working Paper No. 219

Dimitrios Anastasiou, Helen Louri and Mike G. Tsionas

The objective of this study is to examine the causes of non-performing loans (NPLs) in the banking system of the euro area for the period 2003-2013 and distinguish between core and periphery country determinants. The increase in NPLs post crisis has put into question the robustness of many European banks and the stability of the whole sector. It still remains a serious challenge, especially in peripheral countries which are hardest hit by the financial crisis. By employing both Fully Modified OLS and Panel Cointegrated VAR, we esti-

mate that NPLs are affected by the same macroeconomic and bank-specific conditions but the responses are stronger in the periphery. Following the FMOLS estimations, NPLs in the euro area have performed an upward (much higher in the periphery) shift after 2008 and are mostly related to worsening macroeconomic conditions especially with respect to unemployment, growth and taxes. Fiscal consolidation and interest rate margins are significant for the periphery, while credit to GDP is significant only for the core. Qual-



ity of management and loans to deposits play an important role, while size is negatively significant only in the periphery. Most of these findings were confirmed by the panel Cointegrated VAR results. A chi-square test comparing the estimated coefficients for the core and periphery NPLs rejects the hypothesis of equality, revealing another aspect of banking fragmentation in the euro area. Such findings can be helpful when designing macro-prudential as well as NPL resolution policies, which should be adjusted appropriately to the different responses between core and periphery banks.





ARTICLES PUBLISHED IN PREVIOUS ISSUES OF THE ECONOMIC BULLETIN

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