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Executive summary

While economic growth has continued in recent months, it has seemed less assured. Subdued economic growth in China combined with a marked slowdown in many emerging countries curbed activity in advanced economies. These developments left their mark on financial markets, where they triggered a number of asset price corrections and renewed volatility.

Price adjustments were particularly substantial in the case of banking institutions. In an environment still suffering from the aftermath of the crisis of almost a decade ago, this sectoral fragility inevitably recalled painful memories. Limiting to this one similarity would amount to disregard the considerable changes which the financial system has undergone in recent years. The tightening of prudential requirements restored the solvency and liquidity of credit institutions, which are now better equipped to cope with any renewed tension. Financial institutions restructured themselves, abandoning their riskiest activities to concentrate on more traditional forms of financial intermediation.

That does not imply that core activities are risk-free. A still open challenge for the financial system is the appropriate distribution of risks among shareholders, professional lenders and depositors. The uncertainty recently created by recovery programmes implemented for some Italian and Portuguese banks shows that the regulatory and institutional framework set up to improve the organisation of that risk-sharing is still not ideal. In that regard, one of the factors accounting for the recent fall in equity and bond prices seems linked to the uncertainty over the arrangements for implementing the recent Bank Recovery and Resolution Directive (BRRD) and the scope of the prudential mechanisms which, in order to protect financial intermediaries against a shortage of capital, would trigger the introduction of limits on dividend payments and on the interest paid on securities convertible into equity capital.

However, the main factor put forward by the markets to justify the fall in financial stocks is the combination of weakening of economic growth with interest rates which are slipping in negative territory for an increasing range of instruments. Such combination could be toxic for banks and insurers, eroding profitability from the angle of both volumes and margins. Fearing this decline in profitability, some market participants have expressed reservations about the current monetary policy stance.

In response, it must first be noted that the reduction in central bank interest rates has very greatly benefited credit institutions. It has helped to reduce the risks by improving the debtors’ position. It has boosted market liquidity and supported demand for bank loans. By affecting assets of ever longer maturities, it has spurred a rise in bond prices which has been highly advantageous for insurance companies as well as banks.

There is an undeniable time lag between the effects of the monetary policy easing on the real economy, where the positive impact of this policy has been offset by weakening growth in the emerging countries, and on the financial sector, which has already reaped most of the benefit of the improvement in refinancing conditions. As these favourable effects were linked mainly to falling interest rates, any future interruption of this trend (and stabilisation at almost zero or negative rates) would be likely to put stress on the profitability of credit institutions and insurance companies, and that stress could only become more acute if the environment of virtually zero interest rates were to persist.
This might suggest that the benefits of the low interest rate environment are not equally distributed between the real economy and the financial economy, and yet these benefits are closely linked. While the financial system is bound to benefit from a stronger, more sustained expansion of activity, economic growth needs the support of a sound and efficient financial sector. These synergies are also important in the pursuit of the two main objectives of central banks, namely price stability and financial stability.

Nevertheless, the current economic conditions are hampering the task of the central banks. The persistence of inflation close to zero is still lowering expectations regarding the prices of goods and services. If this decline in expectations is not countered by an accommodative monetary policy, it will result in a rise in real interest rates which will hamper the revival of activity, complicate the debt reduction process, or even block the escape from the deflation trap. At the same time, legal, economic and operational constraints limit the scope for cutting interest rates on bank deposits. This constraint on the liability side could encourage financial intermediaries to maintain their margins by exploiting opportunities on the asset side.

A first option would be to refrain – largely if not altogether – from passing on the easier monetary policy conditions to bank lending conditions. This would undermine one of the main levers that central banks try to activate via their expansive monetary policy. Up to now, the decline in ECB key interest rates has been very largely reflected in the interest rates on new bank loans, given the keen competition between financial intermediaries, particularly on the mortgage market. That competition is further heightened by the existence of excess capacity which, in many individual institutions, results in organisational structures which are too large or inappropriate, considering the downscaling of activities that took place in recent years. The need to rethink business models is a major challenge for financial intermediaries, since there lies the primary source of profitability problems and not in the level of interest rates, which tends to expose, rather than drive, the lack of profitability.

However, an in-depth review of the organisational aspects of financial intermediation activities will be necessary, given that the spread of IT innovations will likely result in the market entry of companies specialising in digital technologies. These new players will force traditional financial institutions to improve their product marketing by making use of large databases, to modify the transactions processing methods by means of decentralised trade verification protocols of the “block chain” type, or to better exploit the possibilities offered by IT for replacing silo structures with a greater integration of the various lines of business.

Competition conditions between current market players are also set to change. This evolution is sponsored by the European Commission (EC) which, with the launch of its action plan for the capital markets union, aims at fostering the development of financial channels complementing bank intermediation. Inter alia, the plan aims to relaunch a quality securitisation market, facilitate long-term investment in infrastructures by insurers and pension funds, and stimulate risk capital funds and issuance of covered bonds. Credit institutions should not interpret these developments solely as a threat, since they also entail the opportunity to exploit synergies by offering fee-generating services, such as asset management advice. The emergence of such parallel banking activities will curb the excessive dependence of economic agents on credit institutions. However, authorities must ensure that the reliance on these parallel entities is not primarily aimed at circumventing prudential supervision and market transparency requirements.

Financial intermediaries may be tempted to explore another way of preserving their profitability by taking on additional risks, in an attempt to secure higher returns. For the moment, the level of financial market valuations does not indicate any major speculative activity or any widespread excessive increase in asset prices, although there are some exceptions to this general finding.

It is a primary duty of prudential authorities to take action if pockets of vulnerability develop within the financial system. On one hand, such vulnerabilities may concern individual institutions, and, in the case of large euro area banks, supervisory responsibilities have been delegated to the ECB. On the other hand, the crisis which hit the sector showed that financial risks tend to spread rapidly throughout the system. The mandate of preventing the emergence of such systemic risks in Belgium was entrusted to the Bank, which performs those duties in coordination with the ECB. The purpose of this report is to describe how the Bank has performed that mission and to detail the macroprudential instruments that it has used for that purpose.

Macroprudential policy has two main objectives. The first is to limit the risks of contagion that could result from the concentration of financial transactions within a small number of individual institutions. With that in mind, at the beginning
of 2016 the Bank introduced a capital buffer for systemic institutions, thus conforming to the guidelines of the European Banking Authority (EBA). Implementing the EBA methodology, the Bank identified eight Belgian banks as being domestic systemically important institutions. Four of them – BNP Paribas Fortis, KBC Group, ING Belgium and Belfius Bank – are subject to a capital surcharge amounting to 1.5% of the risk-weighted assets, while the other four – AXA Bank Europe, Argenta, Euroclear and The Bank of New York Mellon – will have to build-up an additional 0.75% buffer. These percentages will be phased in over a period of three years.

Second, next to actions of such a structural nature, macroprudential policy can also be used for counter-cyclical purposes, to ensure that phases of excessive credit expansion do not translate in excessive debt levels and overvaluation of financial or real estate assets, which might face abrupt corrections in the event of a recession. None of the euro area economies has so far implemented macroprudential policy with such an objective, given the weakness of demand for business loans. Conversely, real estate market developments have led some countries – including Belgium – to introduce measures targeting that sector of the economy.

Unlike many European countries, Belgium has not suffered any sharp property price correction in recent years, as prices have continued to rise steadily throughout the past decade and, following a brief hiatus, growth seems to have revived in recent months. Rather than focusing on market overvaluation, which is hard to measure in view of the contradictory signals given by the various indicators, attention should centre on banks’ lending policies. The overall debt level of Belgian households, traditionally lower than elsewhere in the euro area, has risen steeply in recent years and is now aligned with the European average. Furthermore, several borrowers continue to contract substantial levels of debt in relation to the total value of the property to be financed or implying high debt service costs in relation to their income. The Bank therefore decided to extend by one year its macroprudential policy measure imposing a 5 percentage point add-on to the risk weights of Belgian mortgage loans for credit institutions using the internal model approach for the computation of capital requirements. If such pockets of vulnerability on the mortgage market do not weaken in the coming months, the Bank will consider additional measures.

The sources of systemic risks are not solely economic but may also be legal, operational or technological. Owing to their specific characteristics and their diversity, these risks are hard to anticipate. However, they may cause serious reputational problems for financial institutions. In these areas, an increasingly important question for the whole banking system and, more generally, for network activities such as financial infrastructures, is cyber security. Digitalisation and the growing use of service platforms available on the internet make these activities extremely vulnerable to external intrusion. In December, the Bank published a circular presenting the additional prudential expectations concerning the operational continuity and security of systemically important financial institutions, thus aligning with international initiatives in the implementation of measures targeting cyber risks. In addition, in the context of the law on the security and protection of critical infrastructures, which designated the Bank as the sectoral authority and as the entity responsible for inspecting the financial sector, the Bank has extended its activities to include the consequences of cyber risks.

The sphere of macroprudential policy also encompasses financial institutions other than credit providers. Systemic risks stemming from insurance companies could likewise weaken the entire financial system, due to the key functions these institutions perform in terms of risk hedging and as investors on financial markets. Insurance companies were barely affected by the 2008 crisis, but the decline in interest rates is now highlighting the discrepancy that has arisen between current market conditions and the returns that had been guaranteed on many life insurance contracts at a time when such returns seemed justified by the still high level of interest rates, which in turn reflected a more favourable macroeconomic environment. Financial management aimed at aligning the maturity of assets and liabilities largely closed this gap, but this implies that gains on long-term securities acquired in previous years are used primarily to fulfil the insurers’ contractual obligations and are not devoted to the paying out of dividends to shareholders or to profit sharing for policyholders.

For new contracts, it is crucial to align guaranteed interest rates with market conditions. The Bank proposed to reduce the maximum reference rate for individual life insurance contracts from 3.75% to 1.5%. The Minister for Economic Affairs, exerting his power of evocation, decided to set that rate at 2%, thus aligning it with the rules on supplementary pensions. Also, the Law of 13 March 2016 on the status and supervision of insurance and reinsurance companies incorporates a legal framework for a regular procedure for determining that maximum. The Bank further welcomes the agreement concluded between the social partners and enshrined in the law of 18 December 2015 which,
effective from 1 January 2016, adapts the system of setting minimum guaranteed interest rates for group insurance and supplementary pension contracts.

Macroeconomic policy does not only cover a broad spectrum of measures, it also involves several national and international authorities, including central banks and prudential, political and market authorities. The importance of good coordination between the various players is commensurate to the issues at stake and to the important role macroprudential policy will assume in the years ahead, when it will be necessary both to revitalise the economy by facilitating investment funding and to prevent a resurgence of systemic risks in a financial system still burdened by a high debt level.
Macroprudential report

1. Introduction

The law of 25 April 2014 (1) officially designated the Bank as the macroprudential authority. This new mandate includes the detection and monitoring of developments which could impair the stability of the financial system. If systemic risks arise, the mandate also authorises the Bank to implement macroprudential measures to reduce the sources of vulnerability. Those measures encompass not only instruments within the Bank’s sphere of competence but also the publication of recommendations to the authorities with power to implement certain special provisions.

To perform this task to the optimum, the Bank is equipped with a wide range of macroprudential instruments which can be applied to address systemic risks relating either to the business cycle or to more structural developments on financial markets. For instance, the Bank can deploy instruments originally designed for microprudential purposes, e.g. by imposing supplementary capital requirements – such as the leverage ratio – or liquidity requirements, either in general or targeting specific risk exposure categories. Furthermore, concentration limits can be set for specific types of counterparty or activity. Other instruments are exclusively macroprudential in character. They include measures limiting the level of mortgage debt as a percentage of the property value or the level of debt service costs in relation to income. While the Bank has no power to activate such instruments, it can make recommendations to the federal government which is responsible for setting such limits.

In view of the importance of the macroprudential authority mandate and the extent of the means of action granted to the Bank, the legislation introduced several provisions to ensure transparency in the performance of these new duties. Thus, the Bank is required to publish and motivate its decisions and recommendations. It is also required to publish and submit to the president of the Chamber of Representatives an annual report detailing its performance in accomplishing its mission of safeguarding the stability of the financial system. The present report fulfils that requirement.

2. Risk assessment

2.1 Framework for risk assessment and interaction with the SSM and the ESRB

Safeguarding financial stability implies a twofold objective of macroprudential policy actions. In the first, cyclical, perspective macroprudential policy attempts to contain the development of systemic vulnerabilities by creating buffers during expansionary periods – e.g. when credit is rapidly expanding – which can absorb the losses arising in the event of aggregate systemic shocks or can be used to support lending to the economy during an economic downturn. The second policy objective is to curb structural systemic risks resulting from vulnerabilities such as the mutual links between

(1) The Law of 25 April 2014 establishing mechanisms for a macroprudential policy and defining the specific tasks delegated to the National Bank of Belgium as part of its mission to contribute to the stability of the financial system.
financial intermediaries, the concentration of institutions’ risk exposures, and the crucial role that institutions play on significant markets, potentially making them too big to fail.

An effective macroprudential policy necessitates regular, comprehensive analyses of the potential risks to the financial system’s stability and the associated vulnerabilities in systemic financial institutions or in the sector as a whole. The macroprudential analyses conducted during the reporting period and discussed in the various committees of the Bank were based on a comprehensive risk assessment framework based on three pillars.

These three pillars can be described respectively as a top-down approach, a bottom-up approach and a model-based methodology for the identification of the potential threats to the financial stability of the Belgian financial sector.

– The top-down approach consists in an analysis of the general economic and financial developments on the basis of an assessment of the evolution of several indicators such as economic growth, macroeconomic imbalances, interest rates, the sustainability of public finances, lending developments, the financial position of households and businesses, developments in house prices, etc. This approach identifies potential vulnerabilities to the sustainability and viability of Belgian banks, insurers and market infrastructures, and the associated implications for financial stability. This also includes an analysis of the interplay between a range of economic variables and financial institutions’ profit and loss accounts, balance sheets and liquidity profile.

– The bottom-up approach reviews the main attention points emerging from the risk analyses performed by the Bank’s departments responsible for the microprudential supervision of Belgian banks, insurers and financial market infrastructures. Such attention points emerge, for example, from the analysis of institution-specific developments or sector-specific challenges, and may or may not be linked to changes in macrofinancial parameters. The bottom-up approach, furthermore, relies on relevant information acquired from market intelligence.

– The third pillar consists in a model-based approach intended to detect potential threats to the stability of the Belgian financial sector. First, threshold values are determined for a wide range of indicators concerning multiple sectors of the economy. Each threshold value determines the degree of intensity of the risk signal issued by each indicator over a particular prediction horizon. Various approaches, including a statistical methodology for the identification of early warning indicators for banking crises, are applied to determine these thresholds. Next, the information obtained

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**Chart 1**

**ANALYSIS OF MACROPRUDENTIAL RISKS AT THE BANK**

- **Top-down approach**
  - Macroeconomic and financial environment
  - Financial conditions index
  - Risk of a banking crisis

- **Bottom-up approach**
  - Early warning indicators

- **Activation of macroprudential instruments**

Source: NBB.
from signals issued by different indicators is combined in aggregate systemic risk criteria. These aggregate measures represent the predicted probability of a banking crisis occurring over a particular prediction horizon, on the basis of a logistic function linking the indicators to past banking crises and a financial conditions index (FCI), calculated on the basis of a series of indicators related to credit trends, to the banking sector, to the level of debt in the economy, to the property market and current financial market developments. Sub-indices are calculated for each sphere and then aggregated into a FCI, taking account of their relative importance and the possible endogeneity of the risks.

This macroprudential analysis framework lays the foundations for prioritising risks requiring further in-depth analysis and for underpinning decisions regarding the implementation of prudential policies, such as the activation of macroprudential instruments. For this purpose, a framework for the selection, calibration and assessment of macroprudential instruments was also established.

In the context of the shared responsibilities foreseen by Article 5 of the Regulation on the Single Supervisory Mechanism (SSM)(1), these risk analyses are regularly shared with the ECB. In order to ensure efficient coordination between the national authorities and the ECB, and to avoid the risks of inaction in that regard, various operational structures have been set up at the level of both the ECB and the Bank (see section 4 of the Macroprudential Report 2015).

The Bank has thus been actively involved in thematic working groups established by the ECB and focusing on issues such as the development of methodologies for analysing and detecting systemic risks, the property market and the calibration of the capital surcharge for systemically important institutions (SIs).

The Bank has also closely cooperated with the European Systemic Risk Board (ESRB), responsible for the coordination of macroprudential policy for the EU as a whole. Entrusted with a narrower sphere of powers compared to the ECB, mainly related to issuing warnings and recommendations, the ESRB’s scope is broader since it extends to all EU countries and encompasses the financial sector as a whole including, in addition to banks, insurance companies and the securities markets. The Bank has actively contributed to the work of the ESRB, not only by notifying macroprudential measures but also by participating in the ESRB’s permanent assessment team that scrutinises and monitors all notifications from EU countries. In addition, the Bank closely cooperates with the ESRB in the refinement of systemic risk analyses and in devising the arsenal of instruments. Furthermore, the Bank is represented in various task forces and expert groups focusing on a variety of analyses concerning, for example, the real estate market or the shadow banking sector, the issue of interconnectedness within the financial system, the development of “heat maps” for detecting potential systemic risks, cross-border effects and the recognition of macroprudential policy, etc.

In order to reduce the risk of duplication between the work of the ECB and that of the ESRB in the macroprudential sphere, regular exchanges of information and consultations are foreseen, in addition to joint meetings at the level of the various structures of these two institutions. While some of these procedures may seem cumbersome, this sharing of responsibilities has improved the quality of the analyses and the methodologies for detecting risks to financial stability. The exchange of information and constant dialogue between national and European authorities have likewise helped to reduce the risks of inaction.

2.2 Main risk factors

The persistently weak economic growth and the associated low interest rate environment – partly due to the necessarily accommodative monetary policy stance – are depressing the long-term profitability of financial institutions. These two main risk factors, which materialised during the reporting period, may in turn fuel a third one, namely the search for yield on financial markets, resulting in low risk premiums and high prices for a wide range of financial and real assets. Due to the increased risk of development of financial bubbles, this search for yield may directly affect the resilience of financial institutions via a potential increase in the proportion of riskier assets on their balance sheets. However, the search for yield may also produce indirect effects, by weakening the financial resilience of the banks’ customers (households or businesses) or by encouraging the development of new entities, known as shadow banks, subject to

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(1) The Law of 25 April 2014 establishing mechanisms for a macroprudential policy and defining the specific tasks delegated to the National Bank of Belgium as part of its mission to contribute to the stability of the financial system.
less – if any – regulation, which could reinforce financial risks in the absence of adequate supervision. Against this backdrop, the Bank is continuing to closely monitor developments on the Belgian residential property market. To address risks stemming from the real estate sector, mainly reflected in a steady rise in household indebtedness, the Bank adopted prudential measures, first at the end of 2013 and again in 2015. These measures aim at strengthening the resilience of the market and of credit institutions in the event of higher than expected losses on Belgian mortgage loans. If market vulnerabilities – such as the significant proportion of mortgage loans which combine a high loan-to-value ratio (LTV), a high debt-service-to-income (DSTI) ratio and long maturity – are not further reduced the Bank may consider additional measures to inhibit the production of these risky loans.

The 2015 Macropurudential Report had already highlighted four major risk factors: weak economic growth, low interest rates, search for yield, and vulnerabilities in the residential property sector. These risks are not peculiar to Belgium but are present, in varying degrees, in most euro area countries. In order to assess the resilience of the main SSM banking institutions and insurance companies, the prudential authorities of the euro area perform regular stress tests to assess the potential impact of an adverse scenario, detrimental to their main profitability parameters, on the solvency of those institutions. Box 1 presents an outline of the stress tests currently conducted by the ECB and by the European Insurance and Occupational Pensions Authority (EIOPA) in coordination with the national prudential authorities.

Box 1 – Testing the resilience of banks and insurers

To determine the resilience of financial institutions in the face of major macroeconomic and financial risks, supervisors make use of stress test techniques. In recent years, this prudential instrument has undergone constant improvement in order to provide a more accurate picture of the impact of shocks on the financial health of banks and insurance companies, and to detect at an early stage the vulnerabilities of individual institutions and of the financial system as a whole.

In contrast to previous exercises concerning the banks, no minimum requirement (threshold) was imposed. This is therefore not a “pass or fail” exercise, implying an obligation for the institutions concerned to arrange capital increases without delay. In the case of banks, the stress test results will nevertheless be taken into account to some extent in determining the additional prudential requirements under pillar 2. For insurers, the stress test results could give rise to recommendations to the national authorities.

In accordance with European rules, the European Banking Authority (EBA) and the EIOPA are in charge of coordinating the stress tests on credit institutions and insurance companies at European level. That coordination is reflected in the harmonisation of the scenarios and of the methodology to be applied by the institutions in conducting their individual stress tests (“bottom-up stress tests”). These European institutions receive the support of the competent authorities – namely the national microprudential authorities and, in the case of the banks, the ECB – in examining the quality of the data and results to ensure conformity with the methodologies defined by the EBA and the EIOPA.

The stress tests coordinated by the EBA in 2016 will cover 51 European banks, or around 70 % of the sector’s assets. However, the ECB – as the competent authority – decided to extend the exercise to 57 institutions on the basis of the slightly simplified EBA methodology. In Belgium, two credit institutions will take part in the EBA exercise – KBC Group and Belfius – while Argenta, AXA and Bank of New York Mellon (BNYM) will be included in the additional group of banks tested by the ECB using a simplified methodology. The subsidiaries of various foreign banking groups operating in Belgium, including BNP Paribas Fortis and ING Belgium, will be tested via their parent company.

As regards insurance companies, at least 75 % of the market should be represented for each national market. Owing to the strong focus on low interest rates, national supervisors are asked, when selecting the sample of institutions, to take account of those which are relevant from a low interest rate perspective. In that regard, it was also decided
to express market shares in terms of life insurance technical provisions (disregarding unit-linked business). The stress tests to be conducted at EIOPA level cover nine Belgian institutions, and the Bank intends to extend that list by adding some extra participants at national level in order to detect the vulnerabilities of the smaller institutions.

As in previous exercises, two main scenarios were considered for credit institutions over a three-year horizon. The economic forecasts produced by the EC in the autumn of 2015 are used for the baseline scenario. However, it should be noted that macroeconomic and financial conditions have deteriorated slightly since then, particularly in regard to the interest rate assumptions. The adverse scenario – prepared by the ESRB – simulates a deep recession which, over the three-year period from 2016 to 2018, involves a cumulative drop in GDP of 7.6% in Belgium, compared to 6.8% for the euro area, in relation to the baseline scenario. Given the scale of that recession, the impact on the labour market is significant. According to the adverse scenario, in 2018 unemployment rises by 4.2 basis points in Belgium and 2.3 basis points in the euro area. Taking account of this recession and the already tense situation on the property markets of many Member States, the ESRB predicts that property prices will fall, dropping by the end of 2018 to 20% below the level expected in the baseline scenario in both Belgium and the euro area.

Finally, to take account of the risk of a sudden surge in risk aversion, the adverse scenario is accompanied by a rise in both short- and long-term interest rates and a widening of the spreads over the exercise horizon. This scenario thus reflects the main systemic risks examined in this report.

### TABLE COMPARISON OF THE MACROECONOMIC SCENARIOS FOR BELGIUM AND FOR THE EU FOR THE BANKS

<table>
<thead>
<tr>
<th></th>
<th>Baseline scenario</th>
<th>Adverse scenario</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Belgium</td>
<td>EU</td>
</tr>
<tr>
<td>GDP</td>
<td>1.3</td>
<td>1.7</td>
</tr>
<tr>
<td></td>
<td>2.0</td>
<td>2.1</td>
</tr>
<tr>
<td></td>
<td>1.6</td>
<td>2.1</td>
</tr>
<tr>
<td>Unemployment rate</td>
<td>8.4</td>
<td>7.9</td>
</tr>
<tr>
<td></td>
<td>9.2</td>
<td>8.9</td>
</tr>
<tr>
<td>Short-term interest rate</td>
<td>−0.1</td>
<td>0.0</td>
</tr>
<tr>
<td>(swap rate 3M)</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Long-term interest rate</td>
<td>1.0</td>
<td>1.2</td>
</tr>
<tr>
<td></td>
<td>1.3</td>
<td>1.5</td>
</tr>
<tr>
<td>Residential property prices</td>
<td>0.6</td>
<td>1.7</td>
</tr>
<tr>
<td></td>
<td>1.7</td>
<td>4.5</td>
</tr>
<tr>
<td></td>
<td>−10.1</td>
<td>−4.8</td>
</tr>
<tr>
<td></td>
<td>−2.9</td>
<td>−0.6</td>
</tr>
</tbody>
</table>

Source: NBB.

In the case of insurance companies, the stress test was constructed around one baseline scenario and two stress scenarios to take account of the specific character of the sector. The first stress scenario simulates a situation of permanently low interest rates, while the second scenario combines a low interest rate with stress for various other asset categories: the so-called double-hit scenario, devised in collaboration with the ESRB. The quantitative scenarios are also supplemented by a short list of qualitative questions and relevant data surveys for each scenario.

Since the insurance stress test takes place in the middle of the first year of implementation of Solvency II, it will consider institutions at the individual level, in contrast to the banks stress tests, conducted at the consolidated level.

The stress test scenario reference date is the end of 2015 for banks and insurance companies. The testing began in the second quarter of 2016. For banks covered by the EBA, individual results will be published in the 3rd quarter. For the other banks tested by the ECB and for insurance companies, a general document with no individual results will be published by the ECB and the EIOPA respectively.
In view of the growing potential threats to the integrity of the IT infrastructure of financial institutions or market infrastructures – e.g. as a result of the use of externally developed software or targeted cyber attacks – the Bank considered it appropriate to include cyber risk among the key factors considered as potential threats to the stability of the financial system.

The following sections discuss the five main identified risks. In addition to a detailed description of the nature of those risks, their repercussions on the business environment of banks, insurers and financial market infrastructures will be discussed, together with the potentially related systemic risks, either because of the high probability that the identified risk will materialise and/or because of the potentially major impact on the financial system.

Of course, this list is not exhaustive. Although the Belgian financial sector has reduced its exposure to debtors in weaker euro area economies, the macroprudential analysis still monitors developments in some countries, owing to potential second-round effects arising from adverse scenarios and that could affect the working environment of Belgian financial institutions through financial markets contagion. Financial institutions also need to prepare themselves to withstand the shocks which could accompany the United Kingdom’s exit from the European Union (known as “Brexit”). Risks associated with the tense geopolitical situation in a number of regions neighbouring the European Union and the poor financial and economic outlook in a number of developing countries could also trigger renewed turbulence in the financial system – as happened in 2015 and early 2016 – and further exacerbate the aforementioned risks through second-round effects. In addition, at the level of individual institutions, operational, reputational and financial risks could result from abuses and misconduct, and spread very rapidly throughout the system via the many existing connections between markets and infrastructures. In view of their specific nature, these risks are less likely to be contained by targeted, timely instruments; instead, they require the implementation of structural guidelines, compliance requirements and governance rules.

2.2.1 Low inflation against the backdrop of a slow recovery

Risks

In the euro area, as in Belgium, activity has been growing at a modest pace for the past three years, with GDP growth reaching around 1.5% per annum. The fall in oil prices, the favourable financing conditions associated with the accommodative monetary policy, and the generally neutral fiscal policy stance are all factors which have bolstered activity.
The sustained recovery of activity in the euro area and in Belgium has gradually been accompanied by a deeper strengthening of the economy, borne out by a number of signs. The geographical basis of growth has been extended to almost all the Member States. The recovery has been based, to a great extent, on the strengthening of domestic demand, mainly private consumption, driven by the low oil prices but also by a significant improvement in the labour market. Net job creations have perpetuated the downward trend in the unemployment rate that began in mid-2013 in the euro area, and during 2015 in Belgium.

In this context, bank lending to non-financial corporations and households regained momentum after a long period of decline, owing to a revival of demand and the more widespread transmission of the accommodative monetary policy across the various euro area jurisdictions. In Belgium, too, bank lending to the non-financial private sector has picked up since 2014. After having bottomed out in April 2014, the growth rate of bank lending to non-financial corporations returned to positive territory at the beginning of 2015, reaching 4.1% in March 2016, while lending to households has remained at a relatively high level, in the region of 5% over the past 12 months.

However, the economic revival has remained modest, considering the scale of the stimuli, since a number of constraints continue to apply. In addition, risks continued to hamper the recovery, and some of them have gradually materialised. Despite its decline, the unemployment rate (both total and long-term), remains at a high level, on average, in the euro area. The strength of corporate investment has also fallen short of what was expected from the revival in domestic demand, the rise in profitability and the improvement in financing conditions. Moreover, despite sometimes substantial adjustments, some of the repercussions of the great recession of 2008-2009 and the euro area crisis of 2011-2012 continue to curb the vigour of the recovery, and particularly on the debt reduction process concerning households or non-financial corporations in certain countries.

Economic prospects have weakened somewhat since mid-2015, against the backdrop of a slowdown in emerging economies, leading to a marked fall in commodity prices and a loss of momentum in the expansion of world trade. At the same time, financial markets also exhibited heightened uncertainty and volatility — in a context of lower liquidity on certain bond markets and geopolitical tensions and conflicts. In these circumstances, the growth outlook for the euro area and for Belgium has been revised downwards by international institutions and private forecasters.
These factors, jointly with the effects of the persistently low level of commodity prices, attenuate the pressure on domestic costs, and particularly on wages, in the euro area. This had an impact on inflation expectations. Lower inflation expectations influence pricing and wage-setting, therefore affecting actual inflation. Moreover, a decline in inflation expectations not countered by an easing of monetary policy, leads to real interest rates rise and the debt burden increases.

**Impact on the financial sector and prudential measures**

To safeguard financial stability, financial institutions need to have business models that guarantee lasting profitability. The downward pressure on the long-term profitability of both banks and insurers exerted by the persistently weak economic growth in Belgium and the euro area will require these institutions to make additional efforts to continue adapting their business model and cost structure in line with a low nominal growth environment.

As a result of the global financial crisis, the main Belgian credit institutions undertook radical restructuring of their business models, mainly reverting to traditional banking activities in certain strategic markets. By drastically scaling down non-strategic – and particularly cross-border – activities, Belgian banks thus cut the size of their balance sheet from over €1,500 billion in 2007 to around €1,000 billion in 2014 and 2015, and shifted the focus back to the banks’ traditional role of intermediation between savers and borrowers, both in Belgium and in some strategic foreign markets. Via interest and fee income, these intermediation activities are now the principal income source for the Belgian banking sector, which would come under pressure if demand for loans or investments declines as a result of sluggish economic growth. Weak economic growth could also contribute to heavier than expected loan losses. To cope with these adverse effects on the profitability of their traditional activities, Belgian banks may therefore need to make further adjustments to their business model, in particular by better aligning cost structures with the (reduced) volume of business. At the same time, they will have to ensure that their credit standards are adjusted for the negative influence of weak economic growth on the borrower’s ability to repay.

So far, that pressure has yet to materialise, as Belgian credit institutions have posted good results, with profits of €6.1 billion in 2015, against €4.5 billion in 2014. Despite the refocusing on the Belgian market and the fiercer competition, foreign strategic markets remain an important source of income for the banks. Moreover, banks enjoyed an increase in their interest income in a context of not only higher interest margins but also higher premiums associated with

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**CHART 4**

**QUALITY OF BANKS’ ASSETS IN BELGIUM AND IN THE EUROPEAN UNION**

(impaired claims and coverage ratio, in %)

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Sources: NBB, ECB.
the refinancing of mortgage loans – though that will depress the banks’ profitability in the coming years. Banks have also continued to diversify their income sources related to commissions generated by significant sales of investment funds to households. As regards the quality of the loan portfolios, the revival in economic activity led to a slight improvement with a small decline in the default rate, from 3.9% in 2014 to 3.6% in 2015. This contrasts with the picture for impaired claims in some peripheral Member States, where default rates have continued to rise, in some cases exceeding 15%.

The good results posted by Belgian banks are reflected in their annualised return on equity, which stood at 10.1%, and in their relatively high annualised return on assets, of around 0.6%.

In the case of insurance companies, the main effect of the anaemic macroeconomic environment is weak demand for life insurance products. In 2015, life insurance premium income was down by 6% to €15.4 billion, the lowest figure since 2002. This downward trend in premium income is directly linked to the weak economic growth and low interest rate environment, which could persist for a while yet. It is therefore highly likely that insurers will need to make further adjustments to their operations and cost structure, on top of the measures already taken. Business models that guarantee lasting profitability for insurers, even in adverse economic circumstances, are crucial for maintaining the stability of the financial sector as a whole. It is possible that further cuts in operating expenses, perhaps via consolidation, will prove necessary to tailor the cost structures to the reduction in the business volume. In order to lastingly reinforce the profitability of certain institutions, the Bank has already implemented some microprudential measures on the basis of transversal analyses of insurance companies.

2.2.2 Low/negative interest rates

Risks

In light of the risks stemming from low inflation and weak growth, the ECB Governing Council adopted new measures to ease monetary policy in 2015 and in early 2016. More particularly, the ECB Governing Council cut the interest rate on the deposit facility to a negative figure. It expanded its asset purchase programme, extending its duration and widening the definition of eligible assets to include listed investment grade bonds denominated in euro, issued by non-banking corporations established in the euro area. In addition, a series of four new targeted longer-term supplementary
refinancing operations with a duration of four years will be launched from June 2016. The Governing Council has also stated that, taking account of the current outlook for price stability, it expects the ECB’s key interest rates to remain at their current levels or below for an extended period of time, and well beyond the horizon set for net asset purchases.

As a result, government bond yields declined, some actually becoming negative for relatively long maturities. As a result of arbitrage transactions, that tendency spread to other related assets. In the current context, this situation is set to persist.

In Belgium, 2015 brought a continuing decline in bank interest rates on both household loans and loans to non-financial corporations. This follows the reduction in the reference interest rates on the money and capital markets, indicating a partial repercussion of the accommodative monetary policy on borrowing rates and a stabilisation of bank margins. As a result, interest rates on loans to the non-financial sector have reached historically low levels: the average weighted interest rate on new loans to businesses was estimated at 1.80% in March 2016, while the interest rate on a mortgage loan for a period of more than 10 years was 2.27%.

Source: ECB, Thomson Reuters Datastream.

(1) Interest rate on new bank loans of € 1 million or less with an initial interest rate fixation period of more than 5 years.

(2) Interest rate on new mortgage loans with an initial interest rate fixation period of more than 10 years.

(3) Countries included: Austria, Belgium, Germany, Finland, France, Italy, the Netherlands and Spain.
Impact on the financial sector and prudential measures

Thanks to the low short- and long-term interest rates, the slowdown was generally limited and economic activity was supported. However, low – and sometimes negative – interest rates tend to be detrimental to the profitability of the financial sector, especially for the activities of life insurance companies. The Bank’s macroprudential analyses pay very close attention to this aspect.

A persistently low interest rate environment is likely to depress the net interest income of the Belgian banking sector. On the one hand, it reduces the advantage to credit institutions of very cheap resources, such as sight deposits, the remuneration of which is only partly linked to market interest rates. On the other hand, high-yield securities or loans have to be replaced, upon maturity, with lower yield ones. In that connection it should be noted that, during the period under review, in the very low interest rate environment, a large number of mortgage borrowers took the opportunity to refinance their loans at lower interest rates, upon payment to the credit institution of a reinvestment fee corresponding to three months’ interest on the outstanding capital on the refinanced mortgage loan, which dented the profitability of a key balance sheet item for many Belgian banks. So far, banks have been able to neutralise the adverse effects of the level of interest rates on their interest income with measures taken in order to offset – at least temporarily – the negative impact on their profitability and to anticipate that impact in the years ahead. On the one hand, banks reduced the remuneration paid on deposits, particularly savings deposits, thus cutting their financing costs, while they continued to benefit from favourable borrowing conditions on the wholesale market. On the other hand, Belgian banks were largely able to maintain their commercial margins on new loans despite the increasing competition on that market. The positive effect on the overall margin is commensurate with the share of recent loans (on which commercial margins are higher) in the total outstanding loans. Thus, in 2015, despite the adverse environment, Belgian banks saw their net interest income increase both in absolute terms and as a percentage of interest-bearing assets. However, such effects are mostly temporary. Since the maturity of banks’ liabilities are shorter than the maturity of assets, banks benefit from a situation in which interest rates are falling, because the cost of their liabilities adjusts to the new interest rate environment faster than the return on assets. However, financing costs can hardly be expected to fall much further since the interest rate on savings deposits has slumped to a very low level – in some cases to the absolute statutory minimum – whereas, conversely, the return on assets will gradually decline. Persistently low interest rates would gradually compress Belgian banks’ interest income, which constitutes the primary source of their net income. The return on equity, which averaged 10% in 2015, is therefore likely to come under pressure from here on. Belgian banks ease the pressure on their net interest income by increasing the fee from expansion of their asset management activities, enabling them to offer customers products generating higher returns. Changes in the granting of fixed-interest loans or in the management of the interest rate risks could also help to mitigate the pressure on net interest income, but such measures must be applied with great caution since they could expose banks to interest rate risks in a rising interest rate scenario.

A protracted period of low interest rates is also unfavourable for the insurance sector, especially for the life insurance sector, since life insurers’ liabilities generally have a longer average maturity than their assets, and they are also committed to high guaranteed returns from the past. Sectoral figures for the situation at the end of 2014 show an average duration for assets and liabilities of 8.3 and 10.1 years respectively, implying a 1.8 year duration mismatch. At the level of individual institutions, there are wide variations in the maturity gap between insurance companies. For companies with a relatively large maturity gap, the current low interest rate environment constitutes a significant reinvestment risk which could be accompanied by a steep decline in profitability. For that reason, the outstanding amount of life insurance contracts offering guaranteed returns and the level of those returns are very important risk parameters for insurers when the interest rate on risk-free investments drops to very low levels. Contracts offering a high guaranteed return which cannot be profitably refinanced owing to the prevailing low yields, therefore, constitute currently the most serious risk for the Belgian insurance sector.

The total inventory reserves for contracts with a guaranteed return increased from €165.8 to €168.4 billion between the end of 2013 and the end of 2014, the latest period for which data are available from the detailed annual reports. That increase in the outstanding reserves is attributable to group insurance, where the rise reached almost 5%. For individual policies, the amount of the reserves remained stable overall. The greatest risk for the Belgian insurance sector is the legacy of contracts offering a high guaranteed rate. In 2014, current contracts offering a guaranteed return of more than 4.5% represented €26.6 billion, which is 16% of the inventory reserves, compared to €27.6 billion in 2013.
The persistently low interest rates prompted insurers to offer contracts increasingly aligned with the market and to promote class 23 contracts which are linked to investment funds and do not offer a guaranteed return. In addition, some class 23 contracts specify that the guarantee is time-limited and that, once the set period has expired, the reserve is technically regarded as a new premium on which a guaranteed rate applies in accordance with the market conditions prevailing at that time. Hybrid products were also developed which reduce the risk for insurers. Those contracts consist of a life insurance policy offering a guaranteed return (class 21) and another life insurance policy offering a yield which depends on how the investment fund performs (class 23). They make it possible for the lower market returns on investments to be reflected in the rate offered to policyholders, but the scope for doing so is limited by keen competition between insurers and by competition from other savings products.

Moreover, notwithstanding the recent adjustments in new life insurance business, institutions with an inadequate match between the duration of assets and that of liabilities will still have to replace substantial amounts of securities maturing in the coming years with low-yielding investments, so that the actual return on the assets could conceivably become insufficient to cover the guaranteed rates on contracts concluded earlier. This average guaranteed rate on class 21 contracts is declining only very slowly, dropping from 3.04% in 2013 to 2.91% in 2014 or, more specifically, from 2.88% to 2.72% for individual insurance policies and from 3.41% to 3.27% for group policies. The future trend in the outstanding amount of life insurance contracts with guaranteed returns and the level of those returns are therefore crucial risk parameters for insurers if low interest rates persist.

The Bank has repeatedly expressed its concern about the impact that weak nominal growth combined with persistently low interest rates could have on insurance companies. It has taken various measures and issued recommendations to
boost the sector's resilience, and also advised the government on the maximum interest rate as described in box 2 of section 3. The aim of these measures is to strengthen the solvency position without creating new operational risks.

For institutions which act as financial market infrastructures, such as International Central Securities Depositories (ICSDs) and custodians, low/negative interest rates imply a specific challenge. In the aftermath of the crisis, their customers saw such institutions as safe havens owing to their specific risk profile (no proprietary trading, no corporate lending, no retail activities). Furthermore, the low/negative interest rate environment resulted in very low opportunity costs for holding such deposits. This led to a situation of significant growth of deposits with such FMs by professional market players, causing a steady increase in the balance sheet total since the crisis. These FMs, in turn, invest those deposits with other market players or central banks. Such increasing reinvestment between market players entails higher credit and liquidity risks; the Bank therefore urged financial market infrastructures to take measures to curb the growth of deposits by professional market players and to restore those deposits (normally used for ICSD settlements) to a normal level.

2.2.3 Search for yield

Risks

Although the depressed economic environment warrants an accommodative monetary policy, the very low level of nominal interest rates could trigger new excesses on financial markets and cause an ill-considered increase in risk-taking by economic agents in their investments. Such a heightened appetite for risk presents central banks with the challenge of how to stimulate economic risk-taking while discouraging excessive financial risk-taking. This led authorities to extend their range of action by activating macroprudential policy instruments, thereby allowing monetary policy to focus on its primary objective of maintaining price stability. While price stability entails positive effects on financial stability, macroprudential policy can dampen the secondary effects and the associated potential risks of an accommodative monetary policy stance.

Impact on the financial sector and prudential measures

The prospect of a long period of low or negative interest rates fuels increased risk-taking by investors in search for higher yields, which could become excessive if it leads to increasing imbalances. This could make investors more vulnerable to sudden changes in general risk aversion, particularly if liquidity on the secondary markets drops to a low level.

During the period under review, global financial markets have experienced a number of episodes of sharp price fluctuations on the equity markets and on the markets for high-yield bonds, attributable primarily to a deterioration in the underlying fundamentals, but also to substantial – albeit short-lived – changes in investors’ risk appetite and reduced market liquidity. Conversely, other markets, such as those for government bonds, were still mainly driven by avid search for yield, resulting in very low risk premiums.

While the search for yield was still evident on financial markets, it has not yet become generally apparent in the Belgian banking and insurance sector. Analyses of balance sheet developments in these sectors show no major changes in the asset mix or in the bond portfolio investment strategy. In the banking sector, the new acceleration in the growth of mortgage lending since the end of 2014 is a point for concern, since it may point towards the occurrence of a search for yield without sufficient regard for the associated risks (see section 2.2.4 below). In that context, however, it should be remembered that Belgian banks have undergone a period of significant restructuring in which many risky activities were dismantled and many claims on non-Belgian counterparties were either sold or left to run-off. In the case of Belgian insurers, the limited signs of a search for yield are particularly evident in some individual institutions, which seem to have revised their investment strategy in favour of riskier debtors or longer maturities in order to maintain the level of their returns. Owing to the low-yield bond investments, some insurers appear to be shifting their assets (to a limited degree) to long-term alternative investments such as the corporate credit markets or the mortgage market, but also into investment fund units. While these alternatives may offer higher yields, they also imply higher credit and liquidity risks. These changes in insurers’ investment strategy are partly motivated by the entry into force in January 2016 of the new prudential rules on solvency. Under those rules, class 23 products will be subject to more favourable capital requirements. Being less risky for insurers, these products have become very popular since 2012.
For institutions acting as financial market infrastructures – such as ICSDs and custodians – fees and other remuneration for settlement and custody services are more important sources of revenue than interest income, given the nature of their activities. The low/negative interest rates increased the incentive to further reduce these institutions’ dependence on interest income. In addition, the significant growth of deposits by professional counterparties prompted FMIs to apply negative interest rates on some of their customer deposits, too. This had a clear impact on the growth of deposits: after expanding for years, deposits placed with these FMIs by professional market players eventually stagnated or actually declined, benefiting their leverage ratio.

The search for yield is also reflected in a shift from portfolio investments to investment funds. In the case of Belgian funds, it is mainly mixed funds investing in bonds and equities that have become steadily more successful since 2011. Besides net purchases of fund units which still remained positive in 2015, price effects also played a role in the growth of the outstanding amounts. The combination of these two factors led Belgian investment funds to register a total of € 148 billion in outstanding assets at the end of 2015. In addition, Belgian residents invested € 169 billion in foreign funds. Those funds are based abroad but sold in Belgium and are often managed by Belgian banks.

The shift to alternative investment instruments is in line with the phenomenon triggered by profitability concerns and regulatory requirements, whereby the activities of traditional financial institutions are being transferred to entities subject to less stringent rules or less severe restrictions. It is important to monitor the development of these new structures, known as shadow banks. On the one hand, the growth of the non-bank financial sector – including the shadow banks – has led to a diversification of funding sources. The resulting more efficient allocation of capital is fostering the enlargement of the financial sector, which is one of the aims of the capital markets union. On the other hand, the development of the shadow banks also entails risks. The intermediation chain becomes more complex, and the less stringent regulation and absence of safety nets heighten the vulnerability of not only the shadow banks but also the financial sector as a whole, owing to the interconnections with other financial institutions. As for investment funds – the sector which has produced the strongest growth lately – the risks are twofold. First, in periods of financial stress and inadequate market liquidity, open funds which allow immediate exit of investors may be obliged, in the event of a shortage of liquid resources, to fire-sale assets or even to suspend redemptions. Of course, investment funds must respect the statutory consumer protection, but if in the event of a severe and contemporaneous materialisation of risks in periods of financial stress the impact on the real economy will
be unavoidable, with a potential indirect effect on the banking sector. Second, banks face contagion risk from the rest of the financial sector, which could originate from the interconnections between the funds and the regular banking sector. This risk could materialise, for example, if a bank linked to the fund manager provides support for reputational reasons, even without any contractual obligation to do so (the “step-in risk”), or if the manager reduces the liquidity provided to the bank. This risk is all the more acute because it is highly concentrated on few Belgian banks.

The Bank pays particular attention to the close monitoring of shadow banking activities in Belgium, in line with the framework proposed by the Financial Stability Board (FSB). It has also started to keep a close watch on the step-in risk concerning the biggest market players. These activities fit in a broader international macroprudential framework. In that context, the ESRB is examining the risk concerning leverage effects and the liquidity risk in investment funds. More particularly, it is examining whether the existing restrictions applicable to individual funds could be better harmonised between the Member States to permit consistent monitoring. Such monitoring could form the basis for devising macroprudential measures, such as stress tests, liquidity buffers or redemption restrictions, for a sub-group of institutions which are specifically exposed to these risks or which, owing to their size, present a risk to financial stability.

2.2.4 Residential property market

*Risks*

In Belgium, residential property prices have more than doubled in nominal terms since the year 2000, presenting only a very mild correction during the great recession in comparison to the experience of many euro area Member States, both in terms of scale and duration. However, the growth rate has slowed significantly since 2011. In 2015, despite the housing bonus reforms
which substantially reduced, particularly in the Flemish Region, the fiscal advantage related to the deductibility of mortgage debt service, prices seem to have regained momentum, recording around 4% growth over the first three quarters, thus ending the slowdown recorded in the preceding four years. In real terms, the trend in property prices has been similar.

The housing market had been particularly dynamic at the end of 2014, in anticipation of the entry into force of the aforementioned fiscal reform. In 2015, activity remained at a high level: the Belgian Royal Federation of Notaries recorded a 6.4% rise in the number of transactions over the year as a whole.

In that context, overvaluation of the Belgian residential property market resurfaced in 2015, notably owing to the absence of price corrections following the reduction in the tax advantage associated with mortgage borrowing. The exact degree of property market overvaluation is uncertain, however, as numerous factors could influence property prices in either direction, such as a change in the current accommodative monetary policy or an improvement in the employment market situation, which would stimulate demand for housing, etc.

As a result of the relatively strong expansion of mortgage lending, the gross debt ratio of households maintained its upward trend, reaching 59.5% in the fourth quarter of 2015. This further rise contrasts with the slight deleveraging since the beginning of 2010 in the euro area, where the debt ratio declined gradually from 64% to 59.1% of GDP in the fourth quarter of 2015. Despite the further rise in the gross debt ratio in Belgium, the financial position of households remains robust overall, as is evident from the ratio of debts to financial assets, which is still lower in Belgium than in the euro area. Since the crisis, the increase in debt has more or less matched the rise in financial assets. However, microeconomic data indicate that debt, income and assets are unevenly distributed among households, and identify potential vulnerabilities in the debt structure (pockets of risk). More particularly, some households have a limited repayment capability in view of their income or liquid assets. The relatively low and stable level of individuals’ arrears recorded by the central credit register (as a percentage of total credit) nevertheless shows that the current repayment burden is still under control for most households. This is attributable partly to the accommodative monetary policy which, lowering interest rates, has prevented a steep rise in the debt repayment burden in the past year.

**Impact on the financial sector and prudential measures**

In this highly uncertain context, and in view of the very adverse impact that a real estate shock could have on financial stability, close monitoring of this market is necessary also given the importance of real estate both for the asset position...
of households and for banks’ loan portfolios. On average, mortgage loans represent around 15% of the banking sector’s balance sheet, though for some institutions that figure may exceed 40%. Also, apart from the impact on the financial sector, real estate crises are generally accompanied by serious detrimental effects for the real economy, partly because of their consequences for households’ wealth, as is evident from recent experience of property market crises.

Mortgage lending by Belgian banks to Belgian households has risen steadily in past years. Since 2000, when the outstanding amount represented roughly €50 billion, claims have more than tripled, with a new acceleration since the second half of 2014, leading the yearly growth rate to around 5%. The low interest rate environment contributed directly to the further expansion of the mortgage loan portfolio in 2015, following a previous strong increase in the second half of 2014 as a result of anticipation of the measures to limit the “housing bonus” in Flanders. The total outstanding amount of mortgage loans to Belgian households increased from €169.4 billion at the end of 2014 to €177.4 billion at the end of 2015. In addition to low interest rates, other factors contributed to the recent expansion of the portfolio. In some cases of mortgage loan refinancing, borrowers took advantage of the cheap interest rates to borrow a larger sum by drawing on capital which had already been repaid without affecting their monthly instalments. The growth of the mortgage loans portfolio is also due to the anticipation effects of more stringent conditions (to be introduced in 2016) governing eligibility for a reduced VAT rate on renovations, and changes in the housing bonus system in Wallonia and Brussels.

Although the recent increase in mortgage loans was not accompanied by a substantial, general easing of credit standards that banks apply when granting loans, the proportion of the new production with a high value for one or more risk parameters is still relatively large.

In the total sector portfolio, the percentage of mortgage loans with a contractual maturity of over 25 years has declined steadily since 2012. In 2015, those loans accounted for only a small proportion (2%) of the total amount of new lending. Furthermore, as a result of the low interest rates the DSTI (debt service to income ratio) declined, albeit very slightly, for new loans in 2014 and 2015. Nevertheless, loans with a DSTI of more than 50% still represented a fifth of new business in 2015. Owing to the low interest rate, the average amount of newly granted mortgage loans has also increased in the past two years.
This put upward pressures on the average level of LTV (loan-to-value ratio, i.e. the ratio between the amount of the loan and the value of the property being financed) for new loans, without, however, exceeding the limits defined by the banks’ lending policy. The proportion of loans with an LTV ratio of more than 100% has therefore remained stable since 2013 at a relatively modest level. However, in 2015 loans with an LTV ratio of over 90% still represented almost 30% of new business.

Although, as already mentioned, some pockets of risk still exist, the quality of Belgian banks’ mortgage loan portfolios remained stable in 2015. The proportion of mortgage loans in arrears remained at around 1.2%. At the same time, the total amount of arrears – in other words, the total amount still unpaid when the loan is in default – increased from €1.3 to €1.35 billion. In addition to the regulatory capital, since the end of 2013 banks have to hold an extra buffer,
resulting from the imposition of a 5 percentage point increase in the risk weight on domestic mortgage loans for banks using internal models for computing capital requirements. In October 2015, in its capacity as the macroprudential authority for Belgium, the Bank decided to extend this measure in light of persistent vulnerabilities, such as the significant proportion of loans combining high LTV, high DSTI and long maturities. Should these vulnerabilities persist, the Bank will consider additional measures to curb the production of these risky loans.

Belgium is not the only EU economy where vulnerability risks have become more acute on the mortgage loan market. Many other Member States are seeing strong activity in this market, as the very low level of interest rates is increasing potential borrowers’ incentives to borrow, while encouraging investors to seek alternative investments in real assets. In view of these developments, recent analyses by the ESRB and the ECB, conducted in coordination with national macroprudential authorities, placed particular emphasis on the potential risks associated with residential property. In this context, the Bank submitted to the ESRB a self-assessment of the risks surrounding developments on the Belgian property market, which has been taken in due consideration for the overall assessment. On the basis of these coordinated analyses, the ESRB has the power to issue official warnings to individual member countries where developments on the domestic real estate market could threaten financial stability.

The Bank has also analysed the commercial property market in view of the continuous rise in banks’ exposures to that type of business. The analyses will continue in 2016 on the basis of more granular data.

2.2.5 Cyber risk

Risks

Cyber risk analyses revealed various cyber threats. Recent experience indicates that cyber risk management has not been adapted to the increasing use of standardised data system components, reliance on a small number of technologies, persistent, targeted attacks and social engineering.

The integrity of the data systems of a financial institution or market infrastructure can be impaired in several ways. The unintended or deliberate installation of malware can result in changes to data and system configurations. Data system components may also have back doors which make it possible to circumvent the component’s authentication processes.

Recent events have shown that commonly used basic technologies may have serious defects which undermine the effective security of the data systems, such as a cryptography leak (heartbleed). These defects, not always known to technology developers, are present in a large number of different applications. Lengthy, complicated processes for updating the technology create additional exposure.

The importance of the human factor in cyber risk must also not be underestimated. Cyber criminals who succeed in gaining the trust of an employee (social engineering) can try to convince that employee to carry out certain actions. These targeted employees are for example authorised to perform payments, modify system configurations or change access rights. Cyber security systems are often unable to prevent these apparently legitimate actions.

Impact on the financial sector and prudential measures

Digitalisation and the importance of the internet in the financial sector continue to grow, stimulated partly by innovative newcomers and the further optimisation of IT resources. Financial institutions and FMs are making ever-increasing use of specialised software/hardware components and service providers for the development and management of data systems (examples include the growing use of external clouds for data storage and processing).

Financial institutions and FMs manage the information systems for the storage of non-cash money, the processing of financial transactions and the management of (confidential) financial customer data. These systems must be adequately protected against various forms of cyber crime, cyber espionage and cyber terrorism. An in-depth assessment of cyber risk management is among the top priorities of the prudential supervision and oversight of financial institutions and market infrastructures.
In particular, the number of persistent, targeted cyber attacks is expected to rise. Since cyber criminals are able in some cases to hide the attack from the system managers, financial data can be extracted over a long period of time, and deliberately published, altered or destroyed.

In addition, the data systems of different financial institutions are increasingly interdependent. If one institution's data system is infected, that can therefore also have significant implications for the operations of other financial institutions with linked data systems.

Both the prudential supervision and the oversight of financial infrastructures have particularly focused on the security of financial institutions and infrastructures against cyber risks, and European and international cooperation is becoming ever more important in this context. For instance, in 2015 the SSM conducted a transversal study of cyber security at the 130 largest credit institutions and banking groups in Europe, that is, those considered important. Additional supervision measures are being planned and implemented on the basis of that survey. The SSM also set up an IT-expert group to improve the coordination of the supervision of the various IT and cyber risks throughout the sector, and to direct and monitor that supervision. In addition, a new working group has been set up by the EBA for IT supervision which will pay due attention to cyber risks as well as to the various IT risks. Another important platform for cooperation in combating cyber risks is the SecurePay Forum for the security of internet payments in Europe.

The National Bank of Belgium, which acts as the sectoral authority in the context of the law on critical players in the financial sector, law which endorses the Bank with the responsibility of performing inspections to assess the effectiveness of the control systems of critical financial infrastructures, likewise supports the sector in the assessment of protection against cyber risks.

The close cooperation with entities such as Febelfin and the Federal Computer Crime unit continued with the aim of limiting e-banking fraud. In this respect, it is worth noting that in 2015, as in 2014, instances of e-banking fraud remained stable at a low level in Belgium as a result of the efforts made by financial institutions and following some successful arrests by the Belgian police and the judiciary. The Bank is also keeping a close eye on the threats and the mobile banking security solutions used by financial institutions in Belgium.

As well as monitoring developments concerning cyber risk, the Bank also worked on guidelines for improving cyber resilience. It issued a circular for systemic institutions, defining the prudential expectations regarding operational business continuity and security, with particular attention to cyber resilience. The circular entered into force on 1 January 2016 and the subjects covered include raising awareness of security in software development, the physical and logical segmentation of internal IT systems, the use of strong authentication solutions for privileged administrator access to critical or sensitive IT systems, and the periodic organisation of large-scale security tests in which independent experts check the effectiveness and quality of the security on the basis of realistic attack scenarios carried out in an ethical manner.

At international level, the Bank took part in various working groups. The Bank is collaborating on the development of cyber resilience guidelines for FMIIs in a working group of the Committee on Payments and Market Infrastructures – International Organization of Securities Commissions (CPMI-IOSCO). In 2015 the working group published a consultation paper putting forward five categories of measures for the management of cyber risk and three general components. The five categories combine measures in the following spheres: cyber governance, identification of cyber risks, prevention of cyber attacks, detection of cyber incidents, mitigation of the impact of cyber incidents, and recovery after cyber incidents. The three general components are continuous testing of data systems, awareness of developments in the organisation’s environment, and continuous improvement of cyber security strategies on the basis of acquired insight. Investments in the various categories of measures are mutually complementary. For example, in the current context, an organisation cannot guarantee that the measures taken will ward off every cyber attack. Preventive measures therefore need to be combined with detection systems and recovery measures.

This guidance supplements the CPMI-IOSCO-principles for financial market infrastructures. It clarifies and supplements the governance requirements (principle 2), the framework for comprehensive risk management (principle 3), settlement finality (principle 8), operational risk management (principle 17), and the links between financial market infrastructures (principle 20).
3. Macroprudential measures taken by the Bank

In accordance with the powers conferred by the law of 25 April 2014, the Board of Directors has met on three occasions in its capacity of macroprudential authority since the Macroprudential Report was first published in June 2015. The meetings devoted to the risk assessment were held on 15 October 2015, 2 March 2016 and 9 June 2016. This quarterly frequency is in line with the meetings held at SSM level with a macroprudential focus. During these meetings, the Board examined the risk analyses described in the second chapter of this report and the measures necessary to mitigate the emergence of some of those risks.

In view of the vulnerabilities, the Bank decided to activate various macroprudential instruments, in addition to several recommendations – mainly to the attention of financial institutions – to ensure that the necessary measures are taken to mitigate vulnerabilities. In accordance with Article 5 of the SSM Regulation, the Bank likewise notified the ECB, under the non-objection procedure, of the macroprudential measures envisaged. The ECB did not object to any of those measures, and did not see any need to impose stricter requirements than the ones imposed by the Bank.

3.1 Legal measures

3.1.1 Residential real estate

At its meeting on 15 October 2015 the Bank decided to prolong the macroprudential measure introduced at the end of 2013 targeting the real estate market, imposing a fixed 5 percentage point increase in the risk weightings on domestic residential mortgage loans for banks using the internal ratings-based approach (IRB) to determine their minimum regulatory capital requirements. That measure came into force via the Bank regulation approved by the Royal Decree of 8 December 2013, and was subsequently implemented in 2014 by Article 458 of the CRR\(^{(1)}\) for a period of two years.

However, the extension of the measure entailed a relatively long and complicated procedure with the ECB, the ESRB and the EBA, in accordance with Article 458 of the CRR and Article 5 of the SSM Regulation. Taking account of the positive opinion issued by those authorities, the EC did not object to a one-year extension of the measure. This non-objection by the EC was notified on 15 March 2016 to the Bank, which issued a regulation\(^{(2)}\).

The decision to maintain the capital surcharge is based on the result of the Bank’s continuous analyses of the mortgage market and the risk profile and quality of the mortgage loan portfolios of credit institutions as described in the second part of this report. Those analyses showed that, although default rates on this type of claim are fairly stable and the mortgage market slowed down to some degree following the introduction of the measure, there are still some factors which could favour an increase in loan losses in the future.

First, the mortgage market slowdown seems to have been short-lived. Both the expansion of mortgage lending and the growth of residential property prices have begun to regain momentum in recent quarters. Second, household debt has maintained its upward trend and is approaching the euro area average. Third, despite some tightening of lending conditions, the Bank considers that the proportion of the riskiest segments in new business is still too high.

In view of these vulnerabilities, the Bank considers it appropriate to maintain the capital surcharge – estimated at € 617 million in capital for all the banks concerned. The average risk weighting of banks using the IRB approach thus increased from around 10% at the end of 2012 to almost 15% at the end of 2015, approaching the average for the SSM. The Bank will continue its close monitoring of mortgage market developments and will regularly examine the appropriateness of the current macroprudential measure, as regards both its level of calibration and its scope.


\(^{(2)}\) Regulation of 24 March 2016 of the National bank of Belgium concerning extra capital requirements for specific systemic risks.
3.1.2 Identification of Belgian D-SiBs and their additional capital requirements

The high economic and social costs of failure of systemic banks are the reason for increasing their resilience through additional capital requirements. Thus, with effect from 2016, global systemically important banks (G-SiBs) will be subject to a Core Equity Tier 1 capital buffer (CET-1) ranging from 1% to 3.5% of the total amount of the risk exposure, the size of the buffer increasing with the systemic importance of the institution. BNP Paribas Fortis and ING Belgium are Belgian subsidiaries of global systemically important banks, but no Belgian group has been classified as a G-SiB.

Banks which are not of global systemic importance may nevertheless be systemic at regional or national level. From 1 January 2016 the Bank must annually identify and publish the list of domestic systemically important banks (D-SiBs), referred to as other systemically important institutions (O-SiIs) in EU legislation. For that purpose, the Bank adapted its methodology for identifying D-SiBs in 2015 in line with the EBA guidelines on the designation of O-SiIs (1) and identified the Belgian D-SiBs in accordance with the new methodology. The Bank also decided to impose additional capital requirements on Belgian D-SiBs.

Identification and publication of Belgian D-SiBs

The EBA methodology for identifying O-SiIs comprises two steps. In the first step, institutions are automatically designated as O-SiIs on the basis of a quantitative score for systemic risk; in the second step, other institutions may be added at the discretion of the supervisory authority.

First, scores are calculated for banks on the basis of indicators relating to their size, the complexity of their activities, their interconnectedness and their substitutability. To determine the total score for an institution’s systemic importance, the EBA guidelines are based on a list of mandatory indicators associated to a weighting factor. In that respect, they correspond very closely to the criteria used in the methodology for identifying G-SiBs. Any bank which has a total systemic importance score above a pre-determined threshold is automatically designated as a D-SiB. Next, the authorities have the option, at their discretion, of using other indicators or applying other weighting factors to the EBA’s mandatory indicators in order to classify other institutions as D-SiBs in addition to those designated automatically.

| TABLE 1 | MANDATORY INDICATORS ACCORDING TO THE EBA METHODOLOGY |
| --- | --- | --- |
| **Criterion** | **Indicators** | **Weighting** |
| Size | Total assets | 25.00 |
| Importance (including substitutability/financial system infrastructure) | Value of domestic payment transactions | 8.33 |
| | Deposits from the EU private sector | 8.33 |
| | Loans to the EU private sector | 8.33 |
| Complexity/cross-border activity | Value of OTC derivatives (notional) | 8.33 |
| | Cross-border liabilities | 8.33 |
| | Cross-border claims | 8.33 |
| Interconnectedness | Liabilities towards financial institutions | 8.33 |
| | Claims on financial institutions | 8.33 |
| | Outstanding debt instruments | 8.33 |

Source: EBA guidelines on the criteria to determine the conditions of application of Article 131(3) of Directive 2013/36/EU (CRD IV) in relation to the assessment of O-SiIs.

(1) EBA guidelines on the criteria to determine the conditions of application of Article 131(3) of Directive 2013/36/EU (CRD IV) in relation to the assessment of other systemically important institutions (O-SiIs). See also the National Bank of Belgium regulation of 10 November 2015 on the method of designating domestic systemically important institutions and determining the amount of the tier-1 capital buffer.
On the basis of this methodology, eight Belgian banks were designated as D-SIBs: BNP Paribas Fortis, KBC Group, ING Belgium, Belfius Bank, AXA Bank Europe, Euroclear, The Bank of New York Mellon (BNYM) and Argenta(1). The first seven were identified automatically as D-SIBs in the first step of the methodology, while Argenta was identified in the second step. The supplementary indicators taken into account in the second step of the methodology are banks’ share of deposits and of loans in Belgium, and the share of the liabilities and assets to Belgian financial counterparties in the financial system. Particular attention focused on deposits. The reason for including these supplementary indicators is their national relevance. As such, they are considered as more appropriate for identifying domestic systemically important banks than indicators of European or global relevance. The list of institutions designated as Belgian D-SIBs was published on the Bank's website and will be revised annually, in accordance with the Law of 25 April 2014(2) and the EBA guidelines.

Capital surcharges for Belgian D-SIBs

Although the European legislation does not impose specific guidelines for determining the level of the capital surcharge for D-SIBs, the Basel framework identifies two general principles for that purpose. First, the level of the additional capital requirement must be proportional to the institution’s systemic importance. In practice, institutions are divided into categories (or “buckets”) according to their systemic importance, and the same capital surcharge is imposed on all institutions in the same category. A second principle foresees that, wherever possible and without prejudice to the need for a qualitative assessment, authorities are required to use quantitative methods to determine the level of the capital surcharge. In that context, after calculating the total systemic importance score in accordance with the EBA guidelines, the Bank conducted a number of quantitative analyses to determine the amount of the additional capital buffers stipulated for Belgian D-SIBs.

![Chart 13: CAPITAL SURCHARGES FOR D-SIBs](image)

The Bank decided to apply capital surcharges(3) to each of the eight Belgian D-SIBs, dividing them into two buckets according to their systemic importance. Institutions in the first bucket, namely AXA Bank Europe, Argenta, Euroclear and BNYM, are of lesser systemic importance and are required to maintain an additional tier-1 capital buffer (CET-1).

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(1) Since Dexia is subject to the specific requirements of an EU-approved restructuring plan, it was not included in calculating the systemic importance score.
(2) The Law of 25 April 2014 on the status and supervision of credit institutions.
(3) National Bank of Belgium regulation of 10 November 2015 on the method of identifying domestic systemic institutions and determining the amount of the tier-1 capital buffer (CET-1).
of 0.75% of the risk-weighted assets. Institutions in the second bucket, namely BNP Paribas Fortis, KBC Group, ING Belgium and Belfius Bank, which are of greater systemic importance, are subject to a CET-1 buffer of 1.5%. These capital surcharges will be phased in over a three-year period from 1 January 2016.

A comparison with the levels of capital surcharges already announced in other European countries shows that most of them range between 1% and 3%, though there are exceptions: lower levels are imposed in Spain, Hungary, Italy, Luxembourg, Portugal and Slovenia, and higher ones in Sweden. This comparison also shows that the capital surcharges imposed on Belgian D-SiBs correspond to the European average. More specifically, the Belgian D-SiB requirements are generally higher than those in the aforementioned countries, but lower than those in Denmark, Lithuania, the Netherlands, Sweden and Slovakia. The requirements imposed by Belgian authorities are most comparable to those in Finland, France, Greece, Ireland and Malta. These differences between European countries may be due both to the degree of the banks’ systemic importance and to divergent policy choices.

### 3.1.3 Countercyclical capital buffer

Starting from 1 January 2016, the Bank is also responsible for the quarterly setting of the CET-1 countercyclical capital buffer (CCB) applicable to credit exposures on counterparties established in Belgium. The CCB was introduced under the Basel III framework and aims to promote sustainable lending during the cycle by fostering credit institutions’ resilience. The countercyclical nature of the CCB implies that capital buffers are imposed if cyclical systemic risk increases (e.g. in the case of excessive credit expansion), and can be eased when the cycle turns around and the risks decline. If risks materialise, as in periods of financial stress, the buffer can be immediately decreased, in order to give banks extra breathing space and thus more scope for absorbing losses and maintaining their supply of credit. In principle, the buffer must range between 0% and 2.5% of the risk-weighted assets, but may be set at a higher level if justified by the underlying risks.

During 2015 the Bank developed a policy framework for the setting of the CCB, as described in the sections below. On the basis of the range of information available – a selection of key indicators for each decision is published in detail on the Bank’s website – the Bank proposes a countercyclical buffer rate and notifies the ECB accordingly. The ECB has the power to top-up the buffer rate but cannot reduce it. According to the information available in the first half of 2016, neither the credit situation nor the other indicators used suggest any increase in systemic risk. The CCB was therefore set for the first and second quarters of 2016 at 0% (1) for credit risk exposures on counterparties established in Belgium. That buffer rate will be reviewed every three months.

The policy framework for determining the CCB was developed in accordance with European and Belgian law. The law requires the Bank to set the countercyclical capital buffer rate on the basis of one or more reference indicators reflecting the credit cycle and the risks resulting from excessive credit expansion in Belgium, and taking account of the specific characteristics of the national economy. The main indicator is the ratio between the volume of credit granted in Belgium and GDP, and that ratio’s deviation from the long-term trend, known as the credit/GDP gap. As described in its communication on strategic choices (2) and in the article ‘Credit gaps in Belgium: identification, characteristics and lessons for macroprudential policy’ in the FSR 2016 (3), the Bank bases its calculation of the credit/GDP gap on the narrow credit concept, more specifically lending by resident banks to the resident non-financial private sector, including securitised loans.

Since the beginning of 2016, the credit/GDP gap has been calculated each quarter on the basis of the narrow credit concept definition. In accordance with the Banking Law, the Bank implements the statistical filter method recommended by the ESRB (4) to calculate the credit gap. This leads to identify, over the period 1980 Q1 – 2015 Q4, two periods of financial expansion corresponding to periods of strong credit growth. The first expansion (1986-1992) occurred against the backdrop of vigorous economic growth which also resulted in increased lending to both households and non-financial corporations (NFCs). The second credit expansion period (2005-2008) featured a boom

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(1) National Bank of Belgium Regulation of 24 November 2015 on the determination of the tier-1 countercyclical capital buffer percentage.
(2) “Strategic choices for determining the countercyclical buffer in Belgium” (www.nbb.be).
(3) B. De Backer, H. Dewachter, S. Ferrari, M. Petriano and Ch. Van Nieuwenhuyze (2016), “Credit gaps in Belgium: identification, characteristics and lessons for macroprudential policy” in the FSR 2016 (3), the Bank bases its calculation of the credit/GDP gap on the narrow credit concept, more specifically lending by resident banks to the resident non-financial private sector, including securitised loans.
(4) More specifically, a one-sided, recursive Hodrick-Prescott filter with a smoothing parameter of 400,000 is applied. This method is used by the great majority of macroprudential authorities in other EU countries.
in residential real estate prices and concerned mostly households rather than non-financial corporations. Despite the credit expansion, mainly driven by households, the credit/GDP gap has narrowed since the financial crisis and became negative from the fourth quarter of 2014. In the fourth quarter of 2015 the credit/GDP gap was slightly negative at –0.6% of GDP for both households (0.1% of GDP) and non-financial corporations (–0.5% of GDP). Thus, the estimated credit/GDP gap does not currently identify any excessive cyclical component in lending to the non-financial private sector.

CHART 14 CREDIT/GDP RATIO AND CREDIT GAP
(quarterly data, in % of GDP)

The estimates of the credit/GDP gap in the first half of 2016 justify a zero buffer rate. However, the buffer rate is not automatically determined by the value of the credit/GDP gap. In accordance with the ESRB recommendations, the Bank monitors a wide range of additional indicators considered relevant for signalling an increase in cyclical systemic risks. Those indicators reflect not only credit developments, such as credit growth in various sectors and the credit/GDP gap on the basis of broader credit concepts, but also developments in residential real estate prices and their possible overvaluation, as well as structural vulnerabilities such as the debt burden of the private sector and the leverage effect in the banking sector. The decision on the countercyclical buffer rate also forms part of the Bank’s broader macroprudential risk assessment framework, described in Part 2.1 of this report.

In addition to the Belgian buffer rate, Belgian banks also have to apply the buffer rates imposed by foreign authorities to their credit risk exposures in those countries. The financial cycle is currently such that most Member States have set their CCB at 0% for the first half of 2016. Only Norway and Sweden have imposed a 1% buffer rate applicable from the third quarter of 2015, which will rise to 1.5% from the third quarter of 2016. The Czech Republic and the UK will introduce a CCB of 0.5% from January and March 2017 respectively. The CCBs of third countries also have to be applied in the event of risk exposures there. For that purpose, the ESRB has promoted centralised monitoring of the potential risks in third countries which are also relevant for Belgium (1).

3.1.4 Mutual recognition of macroprudential measures

In February 2016 the new ESRB framework for voluntary reciprocity of macroprudential measures entered into force. The macroprudential measures adopted by a given country generally apply to the banks of that country and to the

(1) Brazil, Hong Kong, China, Turkey, Russia and the United States.
subsidiaries of foreign banks. They do not, however, apply to the branches of foreign banks, nor to direct lending by foreign banks. This implies that similar risk exposures in a given country may be subject to different (macro-)prudential requirements. In an integrated financial system, such as the internal market, national macroprudential policies may thus generate significant and undesired cross-border effects.

Reciprocity implies that the macroprudential measures applied in a given Member State also apply to branches of foreign banks and to direct lending by foreign banks in that Member State. The new ESRB framework has been formalised in an ESRB recommendation and establishes a coordinated mechanism of voluntary reciprocity of macroprudential measures for all Member States. It covers all macroprudential measures which are not subject to the mandatory reciprocity principle under the CRD IV / CRR. It therefore does not include countercyclical capital buffers (CCBs) for which recognition is mandatory if they do not exceed 2.5% and for which recognition is strongly recommended if they do exceed 2.5% and higher pillar 1 requirements for residential property, as laid down by Articles 124 and 164 of the CRR. It should be noted that the ESRB framework also covers measures which have not been harmonised by the CRD IV / CRR, and the entire financial sector. Member States may choose whether or not to apply the reciprocity principle but are subject to a “comply-or-explain” procedure.

The ultimate goal of the new framework is to impose the same set of macroprudential requirements for the same type of risk exposures, regardless of the legal status or the country of incorporation of the service provider, in order to guarantee a level playing field for the institutions. To this end, the measures have been divided into different categories, the application of the reciprocity principle being strongly recommended for measures focusing on domestic risk exposures. This applies in particular to the measures adopted pursuant to Article 458 of the CRR. Measures targeting risks pertaining to individual institutions (especially the O-SII or G-SII buffers), however, are exempted. Furthermore, there is a category of hybrid measures for which a careful examination of the motives and goals is required in order to assess whether reciprocity is desirable. This is typically the case for pillar 2 decisions and systemic risk buffers relating to risks associated with a group of institutions considered jointly. In order to apply the reciprocity principle, the same macroprudential measure must be applied as in the activating country. If this measure is not included in the regulatory framework, a measure with a similar effect may be applied, after consulting the ESRB.

The Bank endorses this ESRB framework and to that end has issued a horizontal regulation, establishing a flexible recognition procedure for three types of macroprudential measures. These are measures for which the CRR or the Banking Law provide a legal basis for recognition, pursuant to the CRD IV. They include: (1) national measures adopted on the basis of Article 458 of the CRR in order to address macroprudential risks or systemic risks; (2) countercyclical capital buffers above 2.5% (for which recognition is not mandatory by law) and (3) buffers for macroprudential or systemic risk. The Bank will devise ad hoc rules for all other types of macroprudential measures for which the ESRB recommends recognition. When this report was published, the ESRB had recommended recognition of one measure, namely the Belgian 5% surcharge for the risk-weightings on residential mortgage loans. The DNB already notified the Bank in 2013 of its decision to apply this measure directly to branches active in Belgium.

3.2 Recommendations

In addition to activating the macroprudential measures presented above, the Bank issued the following recommendations to financial institutions:

1. The Bank recommends banks to ensure that their solvency is sufficient not only to respect all future requirements but also to preserve an adequate margin in order to strengthen their long-term viability. This implies that, if necessary, dividends paid to shareholders must be restricted.

2. The Bank expects insurance companies to continue improving their solvency and consequently to limit the distribution of profits to policyholders and shareholders when necessary to preserve their long-term resilience.

(1) Recommendation of the European Systemic Risk Board of 15 December 2015 on the assessment of cross-border effects of and voluntary reciprocity for macroprudential measures (ESRB/2015/2).


(3) Regulation of 24 February 2016 of the National Bank of Belgium on the recognition of macroprudential measures.
3. The Bank also expects insurance companies to continue improving the alignment of the duration of assets and liabilities, and by that token, to realise capital gains with due consideration.

4. Following the observations made during the preparatory phase of Solvency II, the Bank also recommends insurance companies to significantly improve the quality of their data and their reporting procedures.

5. The Bank strongly recommends banks to maintain prudent lending standards, particularly in light of emerging signs of easing of the standards of credit to households in recent months. The Bank considers that the proportion of new loans with a high risk profile remains high.

6. As cyber attacks are expected to become more frequent, more sophisticated, more targeted and more persistent with serious implications for the stability of the financial markets, it is necessary to ensure that all parties involved keep a close watch on cyber risks.

The Bank monitors these recommendations.

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Box 2 – Measures to improve the resilience of insurance companies in the low interest rate environment

Weak economic growth combined with persistently low interest rates is unfavourable for the insurance sector, especially for life insurance, since the liabilities in that segment generally have a longer average duration than assets, and insurers are also committed to high guaranteed returns offered in the past.

In that context, the Bank has for several years required institutions to form a “supplementary” technical provision. The income on assets corresponding to that provision must be added to that generated by life insurance assets in order to guarantee the level of interest rates stated in the contracts.

The Bank has also repeatedly encouraged insurance companies to limit the distribution of profits to shareholders and policyholders. In view of developments in recent years, the Bank submitted a proposal for a Royal Decree to the Minister for Economic Affairs, aimed at setting limits on the payment of profit shares. In particular, the Bank – as the microprudential authority – would be able to prohibit the payment of profit shares to policyholders if an institution’s situation is insufficiently sound.

Insurers have also been compelled to continue their restructuring and their rationalisation programmes in order to strengthen their solvency position. In view of the scale of the capital gains made on the sale of financial assets in recent years – gains amounting to € 1.5 billion in 2015 – the Bank also emphasized the importance of giving careful consideration to the realisation of capital gains in order to avoid mortgaging their future results if interest rates were to remain at a very low level in the years ahead.

Finally, the Government – following the advice of the Bank – has taken significant steps to safeguard financial stability. In view of the low interest rates – which actually dropped to negative territory in some market segments – the Bank had proposed that the Government should review the mechanism for setting maximum interest rates on long-term life insurance contracts in order to ensure alignment with market conditions. The Bank proposed a maximum interest rate of 1.5 %, as opposed to the original 3.75 % set in the law of 9 July 1975. However, the Government set the rate at a higher level of 2 %. From 2017, the new interest rate setting mechanism will apply, based on the average of the 10-year OLO interest rates over the past 24 months, with a maximum of 3.75 % and a minimum of 0.75 %. If the difference in relation to the prevailing reference rate exceeds 25 basis points, the reference rate based on the OLO interest rates takes effect. The maximum reference interest rate is thus fixed once a year, and for the first time on 1 January 2017. However, under the new regime, the Minister for Economic Affairs is still able to approve, modify or reject the new maximum interest rate.
Financial Stability Overview

Financial stability can be defined as a condition in which the financial system – made up of financial intermediaries, markets and market infrastructures – can withstand shocks without major disruption to financial intermediation or the effective allocation of savings to productive investment. As in previous editions of the Financial Stability Report, this article reviews in detail recent developments in the Belgian banking and insurance sector, with data and analyses covering profitability, solvency and risk exposures. A section on financial market infrastructures supplements this analysis of the main intermediaries in the Belgian financial system.

Since the financial performance and resilience of these main categories of Belgian financial institutions is affected by developments in financial and real estate markets and overall economic conditions, the first section of this article briefly summarises a number of key developments – and potential future risks – in the operating environment of the financial sector. Several of these developments are also covered in detail in the ECB’s May Financial Stability Report.

1. Operating environment

1.1 Financial markets

Worldwide economic activity, which had had difficulty getting back on a satisfactory growth trajectory following the financial crisis and subsequent recession, once again faced increased uncertainty and economic headwinds in the period under review, with geopolitical tensions serving to heighten the sombre mood. Global growth prospects were affected by a slowdown of growth in China, which in turn depressed economic activity in other emerging countries and world trade. In the emerging economies, economic activity slowed for the fifth consecutive year in 2015, contributing to weak global demand and persistently low oil and commodity prices.

The US economy, in contrast, kept expanding and continued to serve as a key engine for global economic growth in 2015, opening the way for the US Federal Reserve to increase the corridor for the Fed funds rate by 25 basis points to [0.25 % ; 0.50 %] in December 2015. This first rate rise since December 2008 did not lead to any strong increase in long-term interest rates, however, as market participants had previously priced in the FOMC’s rate decision and, following the news, did not revise their expectations of an overall gradual exit from the very accommodative US monetary policy stance.

In other major currency areas, central bank decisions were focused on easing monetary policy further.

The Bank of Japan surprised financial markets in January by introducing negative interest rates charged on the excess over required reserves and the balances accumulated by financial institutions under its quantitative and qualitative easing programme and loan support programme. The BoJ thus joined the ECB and the Swiss National Bank in imposing negative rates on bank reserves.
The ECB also eased monetary policy further. While the economic recovery continued in 2015 and the first few months of 2016, the March 2016 ECB staff macroeconomic projections confirmed that the recovery will be moderate, with projected annual real GDP growth rates of 1.4% in 2016, 1.7% in 2017 and 1.8% in 2018. Given the downward revisions of inflation and growth forecasts in the ECB staff macroeconomic projections, the ECB's Governing Council adopted a comprehensive package of measures at its monetary policy meeting in March 2016 to further ease financing conditions, stimulate new lending and thereby reinforce the momentum of the euro area’s economic recovery and accelerate the return of inflation to levels below, but close to, 2%. The set of measures that was agreed included decisions to further cut the ECB's interest rates on the main refinancing operations and marginal lending facility (by 5 basis points each to 0.00% and 0.25% respectively) and deposit facility (by 10 basis points to –0.40%); an expansion of the monthly purchases under the Asset Purchase Programme from € 60 billion to € 80 billion, intended to run until the end of March 2017, or beyond, if necessary; an inclusion of investment-grade euro-denominated bonds issued by non-bank corporations established in the euro area in the list of assets that are eligible for regular purchases under a new corporate sector purchase programme; and a new series of four targeted longer-term refinancing operations (TLTRO II), starting in June 2016, each with a maturity of four years.

As shown in Chart 1, the above-mentioned developments in the world economy and related monetary policy decisions in the major currency areas contributed, on balance, to a persistence of very low government bond yields in the advanced economies, with sizeable segments of the public debt markets in the euro area, Japan and Switzerland being associated with negative market yields for investors. The very low yields also indicate that term premiums in sovereign bond markets remain very compressed, implying a weak remuneration for duration risk. For investors who have extended the maturities of the government bonds that they purchase in order to preserve positive returns, this search for yield could thus expose them to potential rapid and major market movements should this term premium return to normal. Many investors and analysts do not seem to expect a scenario of higher interest rates in the short term, however, as market prices indicate expectations for an extended period of very low interest rates in the major currency areas.

The demand for government bonds was also boosted by occasional – but relatively short-lived – periods of high volatility in other global financial markets. Tensions were mostly concentrated in equity markets and high-yield corporate bond markets, which proved to be vulnerable to investors’ reconsiderations of global growth prospects on the basis of concerns over China’s growth outlook. The turbulence spilled over to advanced economies, as flattening yield curves
and widening credit spreads were seen as possible precursors of recessionary scenarios. At the same time, lower commodity and energy prices strongly affected the securities prices of corporations active in the energy and mining sectors. Also underlying some of the turbulence was market participants’ growing concern over the dwindling options for policy support in the face of the weakening growth outlook. With fiscal margins tight and structural policies largely dormant, central bank measures were seen to be approaching their limits.

Equity markets started the year 2016 with strong price declines as a result of growing concerns over growth in China and vulnerabilities in emerging market economies more broadly. Between the end of December 2015 and mid-February, the S&P 500 and Euro Stoxx 50 equity indices declined by more than 10% and 15% respectively (Chart 2). During that

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**Chart 2**

**EQUITY AND HIGH-YIELD BOND MARKETS**

(daily data, in %, unless otherwise stated)

**STOCK MARKET INDICES**

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**IMPLIED VOLATILITY (1)**

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**PRICE-EARNINGS RATIOS (2)**

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**HIGH-YIELD BOND SPREADS (3)**

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Sources: JP Morgan Chase, Thomson Reuters Datastream.
(1) Based on the implied volatility derived from options on the S&P 500 and Euro Stoxx 50 indices.
(2) Stock market indices in local currency, calculated by Thomson Financial Datastream.
(3) Spreads relative to US Treasuries, in percentage points.
(4) Difference between the yield on corporate bonds denominated in US dollar with a rating below BBB/Baa3 and the interest rate on ten-year US Treasury bonds.
(5) JP Morgan Chase EMBI+ index; spread relative to interest rate on US Treasuries with a corresponding maturity.
time, measures of volatility implied in options on these stock market indices also surged, before reversing after mid-February when stock market prices started to recover, albeit to very different degrees between the US and the euro area.

Global credit markets were also strongly affected by the financial market turbulence in the first quarter of 2016 (lower panel of Chart 2). The widening of spreads was particularly sharp for US high-yield debt, which was weighed down by the under-performance of energy companies and fears of a rise in default rates. At its peak in the middle of February, the spread between US high-yield corporate bonds and US Treasuries reached its highest level since 2011. By comparison, the widening of corporate spreads was more moderate in Europe, with high-yield spreads halfway back to their 2011 peaks. The divergence between the corporate bond spreads across the two regions coincided with the onset of the oil price plunge in mid-2014, possibly reflecting concerns over contagion from the oil sector to other parts of the US economy. Sovereign credit spreads in emerging markets also widened somewhat during the initial weeks of 2016.

While the euro area financial system seems to have resisted well to the high volatility in global financial markets – with standard indicators of bank, fiscal and financial stress all remaining at low levels –, euro area banks’ equity and debt securities markets came under particularly strong pressure in the first few weeks of 2016 as investors grew increasingly concerned about banks’ ability to generate sustainable profits in a low interest environment. As a result of the sector specific concerns (coupled with the above-mentioned global factors), one index of euro area banks’ stock prices lost around 30% between the end of 2015 and 11 February. The sharp declines in banks’ equity prices also spilled over to their funding markets, particularly in the markets for contingent convertible capital instruments.

As part of the fall in euro area banks’ stock prices amounted to an overshooting – with bank valuations falling to levels below what could be justified by fundamentals –, bank shares and valuations have recovered some of these losses since mid-February. As for the ECB policy measures announced in March, markets seem to have perceived that the dampening impact of more negative deposit rates on banks’ net interest margins would be compensated in part by the improved funding conditions stemming from the TLTRO II programme. Overall, the systemic implications of the turmoil in banks’ stock prices in 2016 were contained. This reflects the fact that euro area financial institutions have strengthened their balance sheets significantly over the past few years and built up their resilience to adverse shocks. Euro area banks’ profitability nevertheless remains at low levels and banks’ return on equity continues to hover below their cost of equity, while the return on assets remains well below its pre-crisis levels. Banks may thus need to further adapt their business models to ensure long-term sustainability – via consolidations, cost-cutting or other efficiency measures. In some countries, like Italy, these profitability challenges are compounded by structural difficulties related to high unresolved stocks of non-performing loans which hinder financial intermediation and, through lower profitability and profit retention, reduce banks’ internal capital generation capacity.

1.2 Bank credit developments in Belgium

Also the Belgian banks are confronted with the challenge of maintaining a sufficiently high level of profitability and are looking for new sources of revenue, as will be discussed in more detail in the next section of this article. In this connection, the Belgian banks’ business plans seem to indicate a collective strategy to further grow their mortgage lending activities to boost revenues in a low growth plus low interest rate environment.

As highlighted in Chart 3 and discussed in more detail in the thematic article devoted to the Belgian mortgage market in this FSR, Belgian banks’ lending to households has continued to grow in recent years on the back of a dynamic growth of Belgian banks’ mortgage loan books, widening the gap between the total volume of loans granted to domestic households and to non-financial corporations in Belgian banks’ balance sheet.

Over the last fifteen years, the Belgian household sector’s mortgage debt has almost tripled, rising from €68.4 billion at the end of 2000 to €197.9 billion at the end of 2015 (left-hand panel of Chart 4). Being mainly attributable to mortgage loans, the household gross debt ratio has shown an almost uninterrupted upward trend over these years reaching 59.5% of GDP at the end of 2015. This trend differs from the (slight) deleveraging observed for the average euro area household debt ratio, which has brought it down gradually from 63.6% of GDP in 2010 to 59.1% of GDP in 2015. In some euro area countries, high household debt levels were part of the major imbalances that triggered financial crises in these countries and these are now being reduced. The gap between the ratios for Belgium and the euro area has thus
been narrowing steadily over the past few years and the Belgian household gross debt ratio has recently, for the very first time, even slightly exceeded the euro area ratio.

When debt levels are compared to the assets owned, Belgian households show an overall better financial position than their euro area peers as their debt is better covered by their total assets as well as their financial assets (right-hand panel of Chart 4). Moreover, the increase in wealth among Belgian households seems to have paralleled their rising debt level, which has resulted in a fairly stable debt-to-assets ratio of around 20% over the past few years. However, due to the declining debt levels in the euro area, gaps between Belgian and euro area households are becoming smaller as well.

The big increase in mortgage debt over the past 15 years occurred during a period of steadily rising house prices, with nominal property prices in Belgium more than doubling since the beginning of the century. While the tax reform in the Flemish Region was expected to keep a lid on price developments in 2015 – given the large reduction in the mortgage tax relief and the share of this Region in the number of transactions in the secondary market –, the available 2015 data point to a new pick-up in growth, with house prices increasing around 4% on average during the year.

As shown in the upper panel of Chart 5, banks continued to grant significant volumes of new mortgage loans with high LTV ratios. In part, this relates to the increase in house prices on the Belgian property market, which forced households with limited own funds to have recourse to high(er)-LTV loans to access the residential property market. Yet, the important share of high-LTV loans is also a reflection of banks’ lending policies, which could be tightened up to discourage the production of such loans. For the 2015 vintage, 30% of the volume of new mortgage loans was still made up of loans with an LTV ratio above 90%. There has been a gradual reduction in the share of new loans with the highest LTV ratios (> 100%) over the past 7 years, but it should be recalled that the large volume of refinanced loans in recent years has positively affected these LTV vintage figures, given that remortgages are often classified as new loans by banks with their LTV levels being updated. Partial data collected from banks where loans used for refinancing are excluded from
the vintage figures shown in Chart 5 thus tend to show even higher shares in new production of loans with an LTV of more than 90%. These data without refinanced loans also suggest no further improvement in LTV standards in the year under review as compared to 2014. This slowdown in the reduction of high-LTV loans in new production is a point of particular interest given the still sizeable market share of loans with an original LTV of more than 90% in new production.

The credit standards data highlighted in the lower panel of Chart 5 show that Belgian banks have also continued to produce a high volume of new mortgage loans where borrowers have to reserve 50% or more of their (disposable) income for paying interest and repaying capital (as assessed at the time of origination). In the 2014 and 2015 vintages, the share of these loans in new production still amounted to around 20%, and no further improvement was recorded in 2015 on the 2014 figures.

While aggregate indicators do not yet point to any worsening of Belgian households’ mortgage credit quality, maintaining this high asset quality will require a slowdown in the build-up of loan segments that are vulnerable in the case of a major downturn in the real estate market and/or an economic shock affecting the debt repayment capacity of mortgage debtors. For several years now, the Bank has been closely monitoring developments in the Belgian residential real estate and mortgage loan market. The assessment of the related risks pointed up the presence of certain sub-segments within the outstanding stock of Belgian banks' domestic mortgage loan portfolios that combine high levels of risk parameters, such as high loan-to-value ratios, long loan maturities and (or) high debt service ratios (Chart 6). Those loan segments could be the source of higher-than-expected credit losses for banks if conditions in the Belgian housing market were to become less buoyant than they have been over the past 15 years.

In this context, and in view of the relatively large share of domestic mortgage loans in Belgian credit institutions’ balance sheets, the Bank took a prudential measure at the end of 2013, aimed at strengthening the banks’ resilience and reducing the concentration risk: a flat-rate 5-percentage-point add-on to the risk weights calculated by the banks using an internal ratings based (IRB) model for the determination of their minimum capital requirement under Basel Pillar 1 for credit risk. By adding a fixed percentage to the risk weight calculated by the bank itself instead of imposing the same minimum fixed risk weight for all banks, banks’ incentives to maintain sound credit standards in loan origination are not
affected by this macroprudential measure. As a result of the introduction of the add-on, the average risk weight of the IRB banks for Belgian mortgage loans effectively went up from around 10% at the end of 2012 to about 15% at the end of 2013 and in the years thereafter. Including this add-on (equivalent to around €600 million of additional capital), the total buffer to cover potential losses on Belgian mortgage loans amounts to €2.8 billion. This buffer is a very large multiple of the current loss rate on Belgian mortgage loans, estimated at between €150 and €200 million per year.

In 2015, the Bank concluded that the macroprudential 5-percentage-point add-on for IRB banks risk weights for mortgage loans still provided an adequate and necessary capital buffer in view of the risks identified. In the final quarter of the year under review, it therefore initiated the necessary procedure for continuing the measure in 2016 and 2017.
That extension required the agreement of the competent European institutions in accordance with Article 458 of the Capital Requirements Regulation (CRR), which was obtained in the first quarter of 2016.

Going forward, the Bank will continue to assess how potential vulnerabilities – related to growth rates for house prices and mortgage loans, trends in household debt or banks’ mortgage credit standards – develop and, based on this assessment, regularly evaluate the appropriate level of the macroprudential add-on as well as the potential need for additional measures. As regards the banks’ credit standards, section 1 of the thematic article shows that banks have tightened up their credit policies since 2012 for the most risky sub-segments of the mortgage loan portfolio, but the data also highlight that they are still producing large volumes of mortgage loans with very high loan-to-value or debt-service ratios. The pockets of risk in the stock of Belgian mortgage loans thus continue to grow. Moreover, the available data on the credit standards applied by banks in new mortgage loan production in 2015 suggest that the tightening of credit standards for the most risky loans may have slowed down (or come to an end) in the course of the year under review if no account is taken of the loans used to refinance a previous loan. Against this background, the Bank stands ready to envisage additional measures to target these high-risk loans should the further reduction in these loans in new production not proceed as strongly and rapidly as might be desired in view of the vulnerabilities that have already accumulated in the existing stock and the earlier recommendations and policy measures announced by the Bank. The Bank’s policy stance on Belgian mortgage loans will also take into account the results of peer analyses being conducted at the level of the European Central Bank and the European Systemic Risk Board for countries with identified potential residential real estate vulnerabilities, including Belgium.

Source: NBB.
(1) The three indicators are calculated at the time of granting the loans.
(2) The relative size of the circles reflects the relative size of the portfolios, while the level of the outstanding amount of loans in relation to the value of the property (loan-to-value, LTV) and the ratio between the debt repayments and the borrower’s income at the time of granting the loan (debt service ratio, DSR) are broken down by specific intervals. In addition, each portfolio is broken down according to the initial maturity (M) of the loans expressed in years.

CHART 6  BREAKDOWN OF THE PORTFOLIO OF MORTGAGE LOANS OF IRB BANKS BY LTV, DSR AND MATURITY AT ORIGINATION(1)(2)
(non-consolidated data, end-2015)
1.3 Disintermediation and shadow banks

Potential risks for financial stability related to credit intermediation might also be building up outside the banking sector. Due to the very low risk-free rates, funding costs for many borrowers are at historically low levels, contributing to sustained high volumes of new debt issuance in these markets and a continuation of the gradual shift in global credit intermediation away from the banking sector and towards the debt securities markets. This development results in part from more subdued banking intermediation business, as credit institutions have focused on repairing balance sheets and cutting back non-core balance sheet exposures. But this disintermediation has also been fostered by investors’ increasingly frantic search for yield in a low-yield environment through direct investment on the capital markets or through other financial intermediaries or financial instruments, such as exchange-traded funds (ETFs).

This structural change in the credit markets could be shifting the locus of financial stability risks from the banking sector towards the non-banking (or “shadow banking”) sector and/or capital markets. In this connection, it should be noted that a greater role for non-banks in financial intermediation could have many benefits, as it provides economies with a “spare tyre” alternative to bank-based finance and potentially increased availability of risk-sharing capital. These benefits are among the principal motivations for the Capital Markets Union project in the European Union.

In terms of financial stability, a greater role for non-banks in financial intermediation could also be desirable, as banks are predominantly financed with short-term debt, exposing them to both solvency and liquidity risks, while investment funds, in contrast, mostly rely on the issuance of shares, shifting most of the investment risks to the end-investors. But because these non-banks rely to a much larger extent than banks on financial markets to manage their assets, a key issue for future financial stability is the resilience of financial market liquidity in periods of stress, and the ability of market participants relying on this market liquidity to cope with episodes of impaired liquidity.

On the market liquidity demand side are large segments of the rapidly growing shadow banking system, and in particular some sub-segments of the asset management industry. Over the past few years, assets managed by investment funds (other than money market funds) have expanded rapidly. By the end of 2015, investment funds domiciled in the euro area were providing € 1 200 billion in credit to euro area financials, € 950 billion to euro area governments, and € 330 billion to other euro area non-financials. The sector is thus highly interconnected with other parts of the financial system. If the investment funds hold relatively less liquid assets but give investors the right to redeem their holdings at short notice, there is a risk that, in periods of stress, investor redemptions could exhaust available liquidity in the asset management vehicle, causing the need to liquidate part of the less liquid holdings. Such pressure to liquidate assets can be magnified if leverage is used by investment funds, including through derivatives transactions.

In the current low rate environment, risk-taking by investment funds could be building up, which in turn harbours the risk of future unravelling. Possible triggers for sector-wide outflows in the medium term include strong repricing of low risk premia in many financial markets. Such market-wide stress could lead to high redemptions of investor holdings in investment funds or higher margin requirements, both resulting in forced selling into illiquid markets and amplifying the stress in these markets. The impact of selling pressure on market conditions could be aggravated by correlated investment and herding among fund investors and asset managers.

2. Banking sector

By the end of 2015, Belgian banks’ total balance sheet amounted to € 970 billion. While major deleveraging and de-risking have taken place since the onset of the financial crisis, the size of the sector’s balance sheet seems to have stabilised in recent years. Nevertheless, it appears that the accompanying refocusing on more traditional and domestic business activities is continuing, as evidenced for example by the growing share of domestic loans on the assets side and the growing reliance on deposits from retail counterparties on the liabilities side.

Furthermore, in 2015, the Belgian banking sector recorded a return on equity (ROE) of 10 %, a level not seen since 2007. This positive development, that took place despite the extensive de-risking and deleveraging of banking activities, was partly related to the favourable impact of temporary factors. First, the recent decline in interest rates has contributed positively to the sector’s net interest income as banks’ funding costs have come down faster than the repricing of interest-bearing assets.
However, there is now very little scope for a further fall in funding costs (especially on deposits). If euro area interest rates were to stay low for much longer, the reinvestment of assets at lower rates would thus start to bear more heavily on banks' interest margins. At the same time, the current interest rate environment has enticed numerous banks' customers into refinancing their mortgage loans. While the penalty payments linked to remortgaging have temporarily boosted banks' net interest income, the lower rate negotiated by these customers is often fixed for the remaining maturity of the loans and will thus impact banks' interest income in future. Among other non-structural factors that have contributed to bolster the profitability of the Belgian banking sector in 2015 are the important realised and unrealised gains on financial instruments. These unrealised gains, which are derived from changes in the fair value of diverse instruments, mainly reflected the decline in interest rates. They are thus not expected to be entirely repeated and could even be reversed in the future, depending on market developments. Finally, the sector's bottom line result of 2015 was positively influenced by the liquidation of KBC Financial Holding, as the fiscal recognition, in 2015, of this entity's past losses resulted in a significant tax income for KBC Bank.

Admittedly, banks have to a certain point already anticipated the challenges related to future profit generation by promoting other sources of income such as fee-generating business. It nonetheless remains to be seen to what extent the income derived from these activities could be further increased to offset the disappearance of the favourable incidence of the aforementioned non-recurring factors. Other changes in Belgian banks' operating and regulatory environment could moreover prove challenging for the sector. Competition from non-banks such as FinTech companies could potentially start to erode a number of banks' income sources, including fee-generating business. Furthermore, despite the relatively good and stable quality of Belgian banks' assets, the introduction of the new IFRS 9 accounting standard from 2018 should lead to higher and earlier provisioning levels. This, combined with the gradual implementation of the new additional capital buffers that entered into force in early 2016, could have an impact on the sector's profitability and solvency position.
2.1 Balance sheet total and composition

After the financial crisis, the Belgian banking sector underwent a vast deleveraging and de-risking process which translated into a global reduction of the sector’s balance sheet, from €1,714 billion at the end of June 2008 (a few weeks before the bankruptcy of Lehman Brothers) down to €970 billion at the end of 2015, and which led to a reorientation of Belgian banks’ business activities towards their core markets and more traditional business lines (Chart 7). The Financial Stability Overview in the 2015 FSR provided details of the major developments observed during the period 2007-2014.

Prior to the financial crisis, Belgian banks had expanded their foreign activities considerably (either cross-border or through local presence) as the mature banking market in Belgium was not offering enough scope for expansion. Compared to their European peers, Belgian banks started to deleverage earlier and more extensively, often as part of agreements with the European Commission following state aid received by some major Belgian institutions. By the end of 2015, many of Belgian banks’ foreign activities had been shed so that 77% of the banking sector’s assets were related to business activities conducted in Belgium. Hence, the scaling down of banks’ balance sheet observed since 2008 has been concentrated on foreign markets, with the notable exception of foreign home markets. Banks have retained a presence in selected foreign markets such as Eastern and South-Eastern Europe (KBC Bank, BNP Paribas Fortis), the Netherlands (Argenta), Ireland (KBC Bank), Switzerland (ING Belgium) and Luxembourg.

DELEVERAGING AND ASSET RESTRUCTURING TOWARDS BELGIUM AND OTHER HOME MARKETS

As part of the Belgian banks’ refocusing on the domestic market, exposures to Belgian counterparties have grown further, during the crisis years as well, from €352 billion at the end of 2007 to €446 billion at the end of 2015 (left-hand
panel of Chart 8), lifting their share in total loans and debt instruments from 27% to 55%. In sharp contrast, loans and debt securities of foreign counterparties fell by a cumulative €566 billion between 2007 and 2015. The right-hand panel of Chart 8 compares the Belgian banks’ exposures vis-à-vis counterparties located in specific countries between the end of 2007 and 2015, showing their levels at the end of 2014 as well. It illustrates some of the major changes seen over that period. The marked drop in exposures vis-à-vis Dutch counterparties mainly reflects the exit, in 2008, of Fortis Bank Nederland from the consolidation scope of Fortis Bank (now BNP Paribas Fortis) while the reduction of exposures vis-à-vis US, UK and German counterparties relates primarily to the sharp reduction in Belgian banks’ activities on the wholesale market (e.g. derivative contracts, reverse repos).

This deleveraging process seems to have come to an end in 2013. Since then, total assets have stabilised at just under €1 000 billion. Between the end of 2014 and the end of 2015, total assets contracted by €26 billion, partly on account of the decline in the market value of the sector’s derivatives portfolio. However, recent changes in the composition of the sector’s balance sheet indicate that banks are still in the process of reorienting their business models towards more traditional business activities. Over the course of 2015, loans to customers increased, partly on the back of strong growth in banks’ domestic mortgage loan portfolios, while debt securities and interbank claims were further reduced.

EXPOSURES TO OTHER CREDIT INSTITUTIONS

Changes in exposures to other credit institutions reflect the reduction in Belgian banks’ wholesale business. Those claims plummeted after 2007, when they had been as high as €321 billion, and fell again during the year under review, from €91 billion at the end of 2014 to €82 billion at the end of 2015. Belgian banks’ largest foreign interbank exposures are held vis-à-vis institutions located in France (€19 billion), the United States (€12 billion), the Netherlands (€12 billion), the United Kingdom (€11 billion) and Germany (€7 billion).

Those cross-border interbank exposures include both intragroup and non-intragroup claims, as some of the above-mentioned consolidated data capture intragroup interbank exposures, for example when Belgian consolidating credit institutions are part of a large financial group as in the case of BNP Paribas Fortis or ING Belgium or, in the past, in the case of Dexia Bank Belgium (now Belfius) within the Dexia group. Chart 9 looks more closely at the scale of this intragroup financing, using data compiled on a territorial basis, whereby intragroup flows between banking entities located in Belgium and those based abroad are

**chart 9**
**cROSS-BORDER INTERBANK INTRAGROUP AND NON-INTRAGROUP POSITIONS**
(data on a territorial basis, in € billion)

![chart showing intragroup and non-intragroup positions](image)

Source: NBB.
distinguished from non-intragroup interbank transactions. The data reveal that Belgian banking entities are, on aggregate, still large net providers of liquidity to other entities of the banking group to which they belong, as they provide significantly more intragroup financing than they receive, albeit on a much smaller scale than in 2007 and 2008. This important intragroup financing reflects both the funding of Belgian entities’ activities abroad through their foreign branches and subsidiaries, as well as the funding collected in Belgium by branches of foreign entities and transferred to the parent company. In addition, some Belgian entities, functioning as central custody or deposit-taking entity of their group, collect important amounts of (mainly foreign) funds and redistribute those funds to other entities within their group. The sharp decline in intragroup transactions in the first few years after the crisis began can in part be associated with the restructuring that took place at some of the large Belgian banks (Fortis Bank, Dexia SA). In addition, the entry into force at the end of 2012 of the NBB Regulation on own funds of credit institutions and investment funds contributed to reducing intragroup flows. This Regulation stipulates that unsecured exposures of Belgian subsidiaries in relation to their parent company or subsidiary of their parent company based abroad may not exceed their regulatory capital. Over the year 2015, intragroup financing declined by € 12 billion so net intragroup interbank cross-border financing was down from € 99 billion at the end of 2014 to € 87 billion at the end of 2015.

To a certain extent, developments in interbank loans are related to the changes in the market value of derivatives, mainly interest rate swaps. On the assets side of the balance sheet, the market value of derivatives declined from € 83 billion at the end of 2014 to € 63 billion a year later. Banks frequently agree new contracts with reverse features to neutralise their existing exposures – so-called back-to-back contracts – but not necessarily with the same counterparties. Hence when cash collateral is used within these contracts, it leads to important amounts of interbank transactions on both the asset and liability sides of the balance sheet.

EXPOSURES TO THE PUBLIC SECTOR

Belgian banks’ holdings of sovereign debt securities and, more generally, exposures to the public sector have remained relatively stable since 2007 (Chart 10). However, considerable changes in the composition of this portfolio have occurred

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**CHART 10**

**BELGIAN BANKS’ EXPOSURES TO THE PUBLIC SECTOR**

(consolidated end-of-period data)

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Source: NBB.

(1) Exposures to central government until June 2014 and exposures to public authorities in the form of debt securities since September 2014.

(2) Other exposures to the Belgian public sector include all direct or indirect exposures with the exception of the direct exposure to the central government resulting from the holding of bonds.
in the last eight years. In the period from end-2007 to end-2012, banks increased their exposure to the Belgian public sector and reduced their holdings of other countries’ sovereign debt, mainly in stressed countries, partly as a result of the turbulence in the euro area sovereign bond markets. But, from the end of 2012, Belgian banks started to reverse this trend and gradually increased their exposures to the so-called peripheral countries but also other euro area countries. At the end of 2015, exposures to peripheral countries’ public sectors amounted to €20 billion, €11 billion of which was vis-à-vis Italy and €7 billion vis-à-vis Spain. Exposures to the public sectors of a group of countries whose bonds are characterised by particularly low yields amounted to €49 billion at the end of 2015, including €19 billion vis-à-vis Germany, €15 billion vis-à-vis France and €11 billion vis-à-vis the Netherlands. Conversely, banks’ holdings of Belgian sovereign bonds declined further in 2015 by €5 billion to reach €55 billion at the end of the year. Combined with other exposures to the Belgian public sector, they still account for half of banks’ overall exposure to the public sector. Even though the concentration of public sector exposures on Belgium is shrinking, it is still high, implying strong sensitivity to any widening of the spread on Belgian government bonds.

The left-hand panel of Chart 11 shows the relative extent of exposures to general governments (which include all public authorities except central banks), households and non-financial corporations in the balance sheets (excluding derivatives) of Belgian banks and their European peers at the end of 2014. The chart illustrates that exposures to public sector authorities account for a larger share in Belgian banks’ total assets (20%) than, on average, in selected other European banking sectors’ assets.

EXPOSURES TO THE NON-FINANCIAL PRIVATE SECTOR

Belgian banks’ loans to the non-financial private sector came to €479 billion at the end of 2015, which is about 50% of their balance sheet excluding derivatives (Chart 11, left-hand panel). Slightly less than half of these exposures consist of claims on non-financial corporations (€213 billion) and the remainder are loans and advances to households (€265 billion).
In line with the refocusing of Belgian banks towards home markets and more traditional activities, loans to foreign corporates were down sharply from € 216 billion in 2007 to € 91 billion at the end of 2015. The right-hand panel of Chart 11 provides a sectoral breakdown of loans and advances to foreign non-financial corporations. The figure shows that the manufacturing and wholesale and retail trade sectors represent each 18% of the loans and advances to foreign non-financial companies while the oil and energy industry (as part of the energy, gas, steam and air conditioning supply and mining and quarrying sectors) account for less than 8% of these claims. By the end of 2015, the main exposures vis-à-vis foreign non-financial corporations were located in Turkey (€ 11 billion), the Netherlands (€ 10 billion), the United Kingdom (€ 8 billion) and France (€ 8 billion).

Compared to foreign non-financial companies, loans and advances to foreign households have been less affected by the deleveraging process, due to their concentration in Belgian banks’ foreign home markets. These loans rose by € 2 billion throughout 2015 and amounted to € 58 billion at the end of the year, of which € 15 billion in the Netherlands, € 11 billion in Ireland, 10 € in the Czech Republic and € 7 billion in both Turkey and Luxembourg.

One major consequence of the reorientation of Belgian banks’ business models is the greater exposure to the Belgian non-financial private sector since 2008. In 2015, these claims rose by an additional € 17 billion on a consolidated basis to reach € 330 billion at the end of the year. This increase occurred essentially on the back of loans to domestic households which rose by € 12 billion, while exposures to non-financial corporations grew by only € 5 billion to reach € 122 billion at the end of 2015.

The right-hand panel of Chart 12 displays a sectoral breakdown of Belgian banks’ portfolios of loans to domestic non-financial corporations, based on the consolidated financial reporting (FINREP). The figure illustrates that loans to domestic non-financial companies active in the real estate and construction sectors together account for 25% of banks’ domestic corporate loan portfolio, followed by loans to non-financial corporations in the wholesale and retail trade sector (15%) and the manufacturing sector (12%). The left-hand panel of Chart 12 shows the evolution of the maximum loan balance or credit limit authorised (“authorised exposure amount”) by the banking sector to domestic non-financial corporations reported on a non-consolidated basis in the Central Corporate Credit Register. These data further highlight that the authorised amounts for exposures to non-financial corporations in the construction and real estate sectors have grown

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**Chart 12** CLAIMS ON DOMESTIC COMPANIES

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Source: NBB.
dynamically over the last decade. By contrast, the share of authorised exposures to non-financial corporations in the wholesale and retail trade and manufacturing sector have both shrunk.

As stated earlier, the increase in banks’ exposures to the Belgian private sector was mainly driven by loans to domestic households which reached € 207 billion at the end of 2015. This rise reflects to a large extent the strong growth of the domestic mortgage portfolio that was already observed in 2014 and further accelerated in 2015.

In 2015, low interest rates served as a direct boost to the mortgage loan portfolio, which had already staged a robust rise in the second half of 2014 in anticipation of measures in Flanders curbing mortgage tax relief as from 1 January 2015. On a non-consolidated basis, total outstanding mortgage loans granted by Belgian banks to Belgian households grew from € 169 billion at the end of 2014 to € 177 billion at the end of 2015 (Chart 13, left-hand panel). Other factors than low interest rates contributed to the observed increase, although to a lower extent. Some borrowers took advantage of refinancing opportunities to borrow additional amounts in existing contracts. In addition, some households anticipated future stricter conditions related to low VAT rates on renovations and changes to the Walloon and Brussels housing bonus system, scheduled to come into force in 2016 and 2017. However, evidence suggests that the recent spurt of growth has, so far, not been accompanied by an across-the-board easing of credit standards (see related thematic article in this Financial Stability Report).

Furthermore, the prevailing low interest rate level has encouraged a considerable number of households to refinance their mortgage loans since the second half of 2014. Between the end of June 2014 and the end of 2015, an estimated € 50 billion or 30 % of the stock was renegotiated, either externally (€ 13 billion), when the client refinances at a different bank, or internally (€ 37 billion). This remortgaging has to a large extent driven new production volumes. New mortgage loans granted in 2015 reached € 61 billion, € 36 billion of which were refinancings (Chart 13, right-hand panel). New loans granted for those refinancings mostly took the form of a fixed-rate loan as customers sought to lock in the low interest rate for the whole duration of the loan.

**Belgian Banks’ Domestic Mortgage Loans**

<table>
<thead>
<tr>
<th>Year (€ billion)</th>
<th>Non-securitised loans</th>
<th>Securitised loans</th>
<th>Year-to-year growth rate (in %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
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<td>2001</td>
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<td>2015</td>
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<tr>
<td>2016</td>
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</tbody>
</table>

**NEW MORTGAGE LOANS**

<table>
<thead>
<tr>
<th>Year (12 months cumulative)</th>
<th>Mortgage loans, excluding refinancing</th>
<th>Mortgage loans, excluding internal refinancing</th>
<th>All mortgage loans</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td></td>
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<td>2008</td>
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<td>2014</td>
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<tr>
<td>2015</td>
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</tbody>
</table>

Source: NBB.

**Liabilities Reoriented Towards Retail Funding**

In line with the closer focus on non-financial customers on the asset side of the balance sheet, Belgian banks have also reoriented their funding structure towards more retail funding since the onset of the crisis. The share of deposits from
households and non-financial corporations in Belgian banks’ liabilities has thus increased (from 28% of the aggregate balance sheet at the end of 2008 to 50% by the end of 2015), while recourse to wholesale funding has been reduced significantly. On a more structural basis, Belgian banks tend to rely more on deposits and less on debt securities for their funding than their euro area counterparts. The particular features of their funding structure tend to have a favourable impact on the cost at which Belgian banks can finance their activities.

Although Belgian banks have in general always had a large household deposit base, the total balance sheet amount of this funding source has continuously increased since the end of 2008. Over the course of 2015, this increase continued and outstanding household deposits reached €340 billion by the end of the year, up from €334 billion at the end of 2014, thereby representing 35% of Belgian banks’ liabilities at the end of 2015.

Typically, Belgian banks’ household deposits consist for a large part of savings deposits, for which a first sizeable tranche of interest payments is exempted from the Belgian withholding tax (€1,880 of interest received in 2015). Although this category of deposits further expanded in 2015, its growth had been slowing during the year. As a consequence, the volume of Belgian banks’ customer savings deposits stabilised, in the second half of the year, at around €260 billion on a non-consolidated basis (Chart 14, left-hand panel), with net outflows even being observed during certain months. The main reason for this development is the low interest rate environment, since declining market rates led to further cuts in the interest rates banks pay on savings deposits. During 2015 and the first few months of 2016, those interest rates moved closer to or even reached the Belgian legal minimum rate of 11 basis points, which encouraged households to a larger extent than before – when interest rates were already declining – to redirect a part of their assets into investment funds or other investment assets (such as real estate), in search of higher returns.

As the difference between the rates offered on savings and sight deposits narrowed markedly over the course of 2015, retail customers were left with fewer incentives to put their money into savings accounts. Non-financial corporations also accumulated higher deposits. Together with a further decline in term deposits held by customers of Belgian banks, these developments explain the rise in the amount of sight deposits collected in 2015 from those customers, which alongside households and non-financial corporations also include non-bank financial institutions, hence reflecting more volatile developments in the wholesale market. The outstanding volume of customer sight deposits, that had already risen sharply in 2013 and 2014, rose by a further €18 billion in 2015.

**Chart 14**

**BREAKDOWN OF BELGIAN BANKS’ CUSTOMER DEPOSITS AND COMPARISON OF CUSTOMER LOAN-TO-DEPOSIT RATIOS WITH EUROPEAN PEERS**

<table>
<thead>
<tr>
<th>Year</th>
<th>Sight Deposits</th>
<th>Term Deposits</th>
<th>Savings Deposits</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>100</td>
<td>120</td>
<td>140</td>
<td>360</td>
</tr>
<tr>
<td>2007</td>
<td>110</td>
<td>130</td>
<td>150</td>
<td>390</td>
</tr>
<tr>
<td>2008</td>
<td>120</td>
<td>140</td>
<td>160</td>
<td>420</td>
</tr>
<tr>
<td>2009</td>
<td>130</td>
<td>150</td>
<td>170</td>
<td>450</td>
</tr>
<tr>
<td>2010</td>
<td>140</td>
<td>160</td>
<td>180</td>
<td>480</td>
</tr>
<tr>
<td>2011</td>
<td>150</td>
<td>170</td>
<td>190</td>
<td>510</td>
</tr>
<tr>
<td>2012</td>
<td>160</td>
<td>180</td>
<td>200</td>
<td>540</td>
</tr>
<tr>
<td>2013</td>
<td>170</td>
<td>190</td>
<td>210</td>
<td>560</td>
</tr>
<tr>
<td>2014</td>
<td>180</td>
<td>200</td>
<td>220</td>
<td>590</td>
</tr>
<tr>
<td>2015</td>
<td>190</td>
<td>210</td>
<td>230</td>
<td>600</td>
</tr>
</tbody>
</table>

Sources: ECB, NBB.

(1) The customer loan-to-deposit ratio is calculated by dividing total loans to all counterparties except credit institutions and central banks by total deposits from the same counterparties.
On a consolidated basis, it can be seen that the money collected by Belgian banks from non-bank customers in 2015 was more than sufficient to finance the outstanding loans to those counterparties, as evidenced by a customer loan-to-deposit ratio of 91%. This was also true for previous years, since the ratio has been stable around 90% now for many years. When comparing it to the ratios of banks within selected European peer countries such as the Netherlands and France, it can be seen that Belgian banks actually show the lowest customer loan-to-deposit ratio (Chart 14, right-hand panel).

In a way, the low loan-to-deposit ratio also reflects the relatively more stable character of Belgian banks’ funding. Looking at the funding structure of banks elsewhere in the euro area, it appears that they generally rely less on deposit funding than Belgian banks (Chart 15, left-hand panel). At the end of 2014, 56% of the aggregate consolidated balance sheet of Belgian banks (excluding derivatives) consisted of deposits from households and non-financial corporations, while the share ranged between 25% (Germany) and 50% (Spain) in peer countries. This relatively high weight in Belgium essentially comes from the large volume of household deposits, which can be related to the previously mentioned favourable tax treatment of their savings deposits as well as to the financial wealth of Belgian households being traditionally amongst the highest in Europe. Here, it should be noted that, because the figures represent consolidated data, the deposits held in Belgian banks also include deposits collected in their home markets outside the euro area (e.g. the Czech Republic, Turkey, Hungary) in order to fund their activities in those foreign markets.

**MARKET FUNDING**

Thanks to the availability of such a large customer deposit base, Belgian banks tend to rely relatively less on market funding than other European credit institutions. Moreover, in contrast to their wider recourse to deposits from – mostly
domestic — households and non-financial corporations, Belgian banks have globally reduced their reliance on market funding since 2008. The largest decline was recorded in funding collected through (cross-border) interbank transactions. In 2015, deposits from banks and also from other financial institutions decreased further by €10 billion and reached €175 billion at the end of the year. Simultaneously, the outstanding debt securities issued contracted over the year, from €104 billion at the end of 2014 to €99 billion at the end of 2015.

Compared to their euro area counterparts, debt securities issuance is of less importance for Belgian banks: while the share of debt securities issued within total funding (excluding derivatives) represents around 13% for Belgian banks, this source of funding accounts for more than 20% in most other countries. As shown in the right-hand panel of Chart 15, debt securities are a relatively costly source of funding compared to deposits. Here, it should be noted that developments in Belgian banks’ deposit rates largely reflect changes in the savings deposit rate. At the current juncture, having a larger share of deposit funding is beneficial to banks as variations in the interest paid on deposits impact the whole stock whereas only the new production of debt securities issued is gradually repriced following changes in the interest rate environment. At the end of 2015, the total funding cost of Belgian banks, which also takes into account interest flows related to subordinated debt and derivatives, amounted to an estimated 1.2% on average (on a non-consolidated basis). It should be remembered however, that the average yield on assets has fallen back simultaneously.

Although the volume of debt securities issued has fallen over the past few years, Belgian banks have had greater recourse to covered bonds (Table 1), since a legal framework for Belgian covered bonds was introduced in 2012. As covered bonds are so-called dual-recourse instruments for which investors have a claim on the pool of assets covering the bonds as well as on the issuer, such instruments provide a relatively cheap source of debt funding compared to deposits. At the end of 2015, the amount of covered bonds issued by Belgian banks stood at €21 billion on a consolidated basis, up from €17 billion at the end of 2014. Nevertheless, the framework includes some regulatory limits for the amount of covered bonds that a credit institution can issue in order to prevent excessively high asset encumbrance. The share of a bank’s total assets that can be pledged for the purpose of issuing covered bonds is limited to 8%. This led to the first securitisation offer by a Belgian bank since 2006, as Belfius Bank issued residential-mortgage-backed securities to the tune of €800 million (given the regulatory limit for its issuance of covered bonds had been reached). As a result, the amount of asset-backed securities (ABS), on a consolidated basis, also rose in the course of 2015.

### Table 1: Overview of Belgian Banks’ Funding Structure and Liquidity Ratios Over Time (1)

<table>
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</thead>
<tbody>
<tr>
<td>Total liabilities</td>
<td>1 190</td>
<td>1 151</td>
<td>1 147</td>
<td>1 049</td>
<td>961</td>
<td>996</td>
<td>970</td>
</tr>
<tr>
<td>Total funding (1)</td>
<td>913</td>
<td>849</td>
<td>816</td>
<td>784</td>
<td>759</td>
<td>783</td>
<td>786</td>
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<tr>
<td>of which:</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retail deposits</td>
<td>283</td>
<td>300</td>
<td>304</td>
<td>321</td>
<td>334</td>
<td>334</td>
<td>340</td>
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<td>Covered bonds (2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Asset-backed securities (2)</td>
<td>17</td>
<td>21</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Regulatory liquidity ratio (in %) (3)</td>
<td>102</td>
<td>78</td>
<td>83</td>
<td>69</td>
<td>73</td>
<td>80</td>
<td>–</td>
</tr>
<tr>
<td>Liquidity coverage ratio (in %) (4)</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>137</td>
</tr>
<tr>
<td>Customer loan-to-deposit ratio (in %)</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>92</td>
<td>92</td>
<td>93</td>
<td>91</td>
</tr>
</tbody>
</table>

Source: NBB.

(1) Defined as the sum of total deposits and total debt securities issued (including bonds).

(2) These data are available in the regulatory reporting since the third quarter of 2014.

(3) The Bank’s regulatory stress test ratio for the one month horizon, which has been replaced by the liquidity coverage ratio as from October 2015. It is a ratio between the net cash outflows in a liquidity stress test scenario — simulated inter alia by applying stressed run-off rates to various sources of funding — and the available unencumbered liquidity buffer. The ratio should be 100% or lower.

(4) Basel Liquidity coverage ratio, implemented in Belgium as from October 2015, is defined as the ratio between a bank’s stock of high-quality liquid assets (HQLA) and its net cash outflows in a 30-day stress scenario. The ratio should be 100% or higher.
The issuance of relatively more secured funding instruments brings with it an increasing encumbrance of the balance sheet. This is especially the case for covered bonds, as many frameworks – including the Belgian one – require over-collateralisation for this type of secured funding, which means the bonds must be covered at all time by assets with a value exceeding the covered bonds’ nominal outstanding amount. The other major reasons for encumbrance of Belgian banks’ balance sheet are derivatives and repo transactions. Together, those instruments led to an asset encumbrance level of around 12% of the total sector’s consolidated balance sheet at the end of 2015. This is significantly lower than the European banks’ average of around 18%, but represents the average of a rather large variation between Belgian banks. The share of encumbered assets within total assets is an important aspect of a bank’s liquidity position, as the higher the level, the lower the share of assets that remain available to cover unsecured bond-holders, which might also push up the cost of this funding source.

While a higher share of stable funding sources improves a bank’s liquidity position, a higher encumbrance level would limit the possibility of sales of assets in the event of liquidity pressures. To manage Belgian banks’ liquidity risks, the Bank until recently applied a liquidity stress test ratio which has, since October 2015, been replaced by the Basel liquidity coverage ratio (LCR). This ratio, together with the net stable funding ratio (NSFR), has been defined as a liquidity risk mitigating measure within the Basel III regulations. While the LCR was designed to attenuate short-term liquidity risks, by requiring banks to maintain an adequate level of liquid assets to withstand a stressed funding scenario lasting for one month, the NSFR, which is projected to enter into force in 2018, is intended to improve the banks’ structural liquidity position.

In methodological terms, the LCR is comparable to the NBB’s previous regulatory liquidity ratio though it is based on different parameters, definitions and assumptions for the simulated liquidity crisis scenario. More specifically, the LCR is defined as the ratio between the stock of high-quality liquid assets (HQLA) within a bank and its net cash outflows in a 30-day stress scenario. The HQLA represents a set of unencumbered assets that can be converted into cash on private markets in times of severe liquidity stress, such as central bank reserves and marketable securities issued or guaranteed by sovereigns. At the end of 2015, the Belgian banks’ total liquidity buffer amounted to €171 billion on a consolidated basis. The denominator of the ratio represents a bank’s net cash outflows, that is, the difference between its total out- and inflows, during the prescribed liquidity stress scenario. At the end of 2015, the estimated net liquidity outflow of Belgian banks in such a scenario amounted to €124 billion on a consolidated basis. The amount of those net outflows is calculated by applying ‘stressed’ weights to the various sources of outflows and inflows. For example, the run-off rate of deposits from non-financial corporations ranges from 20 to 40%, while outflows from retail deposits are mainly assigned a 5% run-off rate.

Since Belgium had used the option set out in the Capital Requirements Regulation (CRR) to impose stricter requirements until full implementation of the LCR in 2018, Belgian institutions had to meet the full requirement of a minimum LCR of 100% immediately from 1 October 2015 on a (sub)consolidated as well as solo level. Supervisory data so far confirm that the liquidity buffers already formed in the context of the Belgian regulatory liquidity ratio, largely enabled banks to meet this requirement. At the end of 2015, the sector’s LCR amounted to 137% on a consolidated basis. The previously applied liquidity ratio was calculated in an inverted way so that, to meet the requirements, this ratio had to be 100% or lower. In 2016, the Bank decided to align the LCR requirement with the SSM LCR regime by October 2016. Belgian banks will then be subject to a LCR minimum requirement of 70%, which will increase to 100% in 2018. Significant subsidiaries of significant institutions will however be subject to a minimum LCR requirement of 75% on a permanent basis, and there will be no LCR requirement for non-significant subsidiaries.

2.2 Profitability

Developments observed on both sides of the balance sheet impacted Belgian banks’ profit generation capacity. Even though the deleveraging of their balance sheets was accompanied by an overall de-risking of their activities, the sector’s return on equity (ROE) reached 10.1% in 2015, up from 7.7% in 2014, and its return on assets (ROA) was 0.6%. Net profit amounted to €6.1 billion, a level not seen since 2007, more than a third of which could be attributed to the Belgian banks’ foreign activities (Table 2). Figures for the first nine months of 2015, which are the last comparable data available, show that Belgian banks performed relatively better than their EU peers, as their ROE for this period (10%) was higher than the EU average (5%) and median (8%). However, these averages
hide significant differences between individual institutions as at least some Belgian banks face a major challenge in attaining higher and more sustainable profit levels in the current operating environment. Nevertheless, banks' operating income rose from € 20.7 billion in 2014 to € 22.0 billion in 2015 thanks to positive developments in many of its components.

### TABLE 2 MAIN COMPONENTS OF THE INCOME STATEMENT

<table>
<thead>
<tr>
<th>In € billion</th>
<th>In % of operating income (2015)</th>
<th>p.m. P&amp;L derived from foreign activities, in € billion (2015)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2008</strong></td>
<td><strong>2009</strong></td>
<td><strong>2010</strong></td>
</tr>
<tr>
<td>Net interest income</td>
<td>14.48</td>
<td>14.89</td>
</tr>
<tr>
<td>Interest income</td>
<td>233.02</td>
<td>143.13</td>
</tr>
<tr>
<td>Interest expenses</td>
<td>218.53</td>
<td>128.24</td>
</tr>
<tr>
<td>Non-interest income</td>
<td>4.18</td>
<td>3.29</td>
</tr>
<tr>
<td>Net fee and commission income (including commissions paid to bank agents)</td>
<td>6.14</td>
<td>5.02</td>
</tr>
<tr>
<td>(Un)realised gains or losses on financial instruments(1)</td>
<td>−3.83</td>
<td>−2.74</td>
</tr>
<tr>
<td>Other non-interest income</td>
<td>1.86</td>
<td>1.01</td>
</tr>
<tr>
<td>Total operating income (bank product)</td>
<td>18.66</td>
<td>18.18</td>
</tr>
<tr>
<td>Total operating expenses</td>
<td>(−) 15.97</td>
<td>13.98</td>
</tr>
<tr>
<td>Staff expenses (excluding commissions paid to bank agents)</td>
<td>8.58</td>
<td>7.30</td>
</tr>
<tr>
<td>General and administrative expenses (including depreciation)</td>
<td>7.39</td>
<td>6.67</td>
</tr>
<tr>
<td>Total impairment and provisions (−)</td>
<td>13.31</td>
<td>7.36</td>
</tr>
<tr>
<td>Impairments on loans and receivables</td>
<td>2.84</td>
<td>5.59</td>
</tr>
<tr>
<td>Impairments on other financial assets</td>
<td>7.46</td>
<td>0.29</td>
</tr>
<tr>
<td>Other impairments and provisions</td>
<td>3.01</td>
<td>2.06</td>
</tr>
<tr>
<td>Other components of net operating income(3)</td>
<td>−0.81</td>
<td>0.11</td>
</tr>
<tr>
<td>Net operating income</td>
<td>−11.43</td>
<td>−3.04</td>
</tr>
<tr>
<td>Total profit or loss on discontinued operations</td>
<td>−9.04</td>
<td>0.00</td>
</tr>
<tr>
<td>Net profit or loss including minority interest</td>
<td>−20.97</td>
<td>−1.27</td>
</tr>
<tr>
<td>p.m. Net profit or loss (bottom-line result)</td>
<td>−21.21</td>
<td>−1.22</td>
</tr>
</tbody>
</table>

Source: NBB.

(1) This item includes the net realised gains (losses) on financial assets and liabilities not measured at fair value through profit or loss, the net gains (losses) on financial assets and liabilities held for trading and designated at fair value through profit or loss, and the net gains (losses) from hedge accounting.

(2) This figure is the cost-to-income ratio of the Belgian banking sector.

(3) Other components of net operating income comprise the share in profit or loss of associates and joint ventures accounted through the equity method, and the profit or loss from non-current assets, disposal groups classified as held for sale, net qualifying as discontinued operations and the negative goodwill recognised immediately in profit or loss.
First, Belgian banks’ net interest income increased again in 2015 to reach €14.9 billion. While volume effects have been marginal, interest margins picked up as the average interest paid on liabilities fell more rapidly than the yields on assets. On a non-consolidated basis, interest rates paid on savings deposits, for instance, came down by 35 basis points between the end of 2014 and the end of 2015, while yields on mortgage loans, other term loans and securities slid by 14, 24 and 25 basis points respectively (Chart 16).

The low interest rates offered by banks on new mortgage loans have given many borrowers an incentive to refinance their loans, with customers then having to pay a penalty equal to three months’ interest payments on the amount still outstanding. Still, implicit yields on mortgage loans have remained above 3% on average, as banks have been able to partly offset the negative impact of loan refinancing by applying higher commercial margins on the new loans than on the original ones. In addition, rates were also supported by the one-off inclusion in interest income of the penalties related to the significant volumes of refinanced loans. Although implicit rates on bonds and other securities have already fallen significantly, further declines are expected, notably in light of the negative rates that were applied in 2015 on a large segment of the euro area government bonds.

In the meantime, with deposit rates and other funding costs already close to zero, the scope for additional cuts in funding costs seems limited (assuming that borrower rates do not turn negative), so that the further repricing of the assets in the low interest rate environment will start to dominate (assuming that banks do not fully compensate by raising commercial margins for new production). Hence the increase in net interest income observed in 2015 can be considered to have been largely a one-off effect.

In addition, the yield curve became much less steep, as shown by the narrowing of the spread between 10-year and 1-month rates (Chart 17). A flatter yield curve is less favourable to banks’ traditional maturity transformation activities between short-term liabilities and long-term assets. This will have an impact on the Belgian banks’ intermediation margin which, together with the commercial margin, form the net interest margin. This net interest margin is computed in Chart 17 as the ratio between the net interest income generated during a quarter and the average level of interest-bearing

**NET INTEREST INCOME**

**CHART 16 IMPLICIT YIELDS ON ASSETS AND DEPOSITS**

(Chart 16) Implicit yields are calculated as the ratios between the 12-month cumulative flows of interest actually received and paid and the average volume of corresponding assets or liabilities during the same period.

Source: NBB.
assets during that quarter. Looking ahead, the net interest margin is therefore expected to decline from the high level reached in 2015, as it will adapt at least partly to the new yield curve profile. But given the gradual adaptation of assets’ yields, this decline should be only gradual and, at first, quite manageable for Belgian banks. A prolonged period of low interest rates would however weigh heavily on Belgian banks’ revenues, if not profits. This would be particularly true for banks whose business models are oriented to a large extent towards retail customers. While such a business model tends to offer stable funding sources, it can weigh on an institution’s profitability as the low interest rate pass-through might be weaker than for universal banks.

While the persistence of the current low interest rate environment would be detrimental to banks’ net interest income generation, an abrupt rise in interest rates could also have a negative impact on profitability. If and when the exit from the current low interest rate environment occurs, interest rate rises could be quite disorderly and sustained. If a lot of assets were taken on at fixed rates during the low interest rate period, funding costs could outpace the repricing of assets and put pressure on net interest income. As regards mortgage loans, this phenomenon would be amplified by the caps applied to client interest rates. A (sudden) rise in interest rates would also lead to mark-to-market losses on fixed-income assets measured at fair value. To cover risks related to different scenarios, banks can have recourse to derivative contracts (e.g. interest rate swaps). The impact of the interest flows related to these swaps on net interest income will depend on the bank’s hedging policy and the structure of its balance sheet.

**OTHER INCOME AND COSTS**

To compensate for the expected decline in net interest income, which was again by far the largest source of income in 2015, and to circumvent the many issues related to the current low interest rate environment, banks have started to gradually shift income generation towards activities generating fees and commission, instead of interest flows. Those revenues rose again from € 5.3 billion in 2014 to € 5.9 billion in 2015, mainly on the back of commissions earned on the sale of investment funds to households, also contributing to the increase in operating income. The importance of fee and commission income, as a share of operating income, differs markedly among Belgian banks. The increase observed at sector level was not observed in the same way at every bank.

The activities generating gross fee and commission income are of a diverse nature. Asset management services and sales of third parties’ investment products, which accounted for around 30% of total gross fees in 2015, include...
commissions related to purchases by customers of shares of collective investment funds (Chart 18, left-hand panel). Those commissions increased markedly in 2015 as is reflected in the increasing volumes of customers’ assets channelled through such collective investment funds, whether managed by the customer’s bank or another institution (Chart 18, right-hand panel).

**CHART 18**  
**BELGIAN BANKS’ GROSS FEE AND COMMISSION INCOME**  
(consolidated data)

Gains on financial instruments were also up, to a large extent thanks to positive (realised or unrealised) changes in the market value of financial assets, mainly debt securities’ holdings, and to a smaller extent, financial liabilities. Total gains on financial instruments rose from close to zero in 2014 to € 1.2 billion in 2015 but were again unevenly spread among banks. Declines in other sources of operating income, mainly driven by income related to foreign exchange differences, nevertheless limited the global increase in non-interest income.

To cope with the negative impact of the current economic environment on their profitability, banks can also adjust their cost structure. However, the rise in income was accompanied by an increase in operating expenses, leading to a stable cost-to-income ratio at around 60% (Chart 19, left-hand panel). This increase is mainly due to a rise in general and administrative expenses which is in part explained by the new contribution to the European Single Resolution Fund which further added to the share of bank levies in banks’ expenses. Staff expenses remained broadly unchanged. Most of the largest banks have announced cost-cutting measures in the past and, recently, some of them revealed that they were extending their restructuring plans and are envisaging additional cost reduction measures in their branch office networks and workforces. Here again, developments in staff expenses differed between individual banks, depending on the extent to which these measures have already been implemented. Even though the cost-to-income ratio of the Belgian banking sector is slightly below the EU average for the first nine months of 2015, it still exceeds that in many other European countries.

Total impairments remained low with loan losses dropping again from € 1.3 billion in 2014 to € 1.1 billion in 2015, resulting in a further decrease in the sector’s loan loss ratio (Chart 19, right-hand panel). Less than a third of total impairments were...
booked in foreign portfolios, confirming the significant slowing of the deterioration in the quality of some of those portfolios, such as Irish portfolios. In this perspective, an important development is the introduction of the new IFRS 9 accounting standard for financial instruments, which will replace IAS 39 from 2018, and will have an impact on the impairments to be booked. The recognition and measurement of loan losses will be based on an expected loss model, covering the full lifetime of the asset, which should lead to earlier and higher provisioning levels than under the current incurred loss model.

The expected vulnerability of profitability in the years to come provides incentives for institutions to find new ways of boosting their net profit. Shifts in the composition of certain portfolios and the promotion of off-balance-sheet products are possible ways of increasing income. While there has been no sign of any major search for yield by Belgian banks so far, it is important to keep that search within reasonable bounds as it is often also accompanied by various specific risks. Excessive search-for-yield behaviour could increase banks’ interest rate sensitivity if portfolios are shifted towards longer maturities, in a move to capture higher yields. Adjustments to the hedging policy could have a similar effect. Investment policy might also be redirected towards less liquid higher-yielding assets (e.g. non-government bonds), and that would have a negative impact on the banks’ liquid asset buffer and possibly lead to substantial mark-to-market losses if prices were to fall strongly in these markets. Finally, increased credit risk could be the consequence of a shift towards investment that may be of lower quality but will generate higher yields. Even if the recent increase in the domestic mortgage loan portfolio growth was not accompanied by an overall easing of credit standards, regulatory funding plans reported by Belgian banks indicate that they will seek to further expand their domestic mortgage loan business. Those developments are closely monitored by the Bank. The increase observed in the Belgian banks’ commercial real estate loans also deserves some attention.

2.3 Asset quality

As already indicated by the recent development in the loan loss ratio, the quality of Belgian banks’ exposures in the form of loans improved in the course of 2015. As shown in Table 3, the ratio of impaired claims to total loans declined, from 3.9% at the end of 2014 to 3.6% at the end of 2015. While credit deterioration in foreign portfolios (and also in the
Corporate loan portfolio played an important role in the rise of this indicator over the period 2007-2013, it were also mainly those foreign portfolios that led to the improvement, observed over the past two years, in the credit quality of Belgian banks’ loan portfolios. The coverage ratio, expressing the extent to which banks have provisioned for loan losses, amounted to 44% by the end of 2015, close to the level observed at the end of 2014.

| TABLE 3 CREDIT QUALITY INDICATORS OF EXPOSURES IN THE FORM OF LOANS (consolidated end-of-period data) |
|-----------------------------------------------------|-----------------------------------------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Percentage of impaired claims(1)          | 2.0 | 2.9 | 2.8 | 3.3 | 3.8 | 4.3 | 3.9 | 3.6 |
| Coverage ratio(2)                           | 41.1 | 43.0 | 42.8 | 41.5 | 41.4 | 39.5 | 43.3 | 44.1 |

Source: NBB.
(1) Impaired claims (according to IAS 39 definition) as a percentage of total loans.
(2) Percentage of impaired claims covered by specific provisions.

Prudential reports based on the new and broader EBA concept of non-performing exposures (NPE) allow for a comparison of the relative credit quality between banks’ loan portfolios across different countries. For Belgium, data point to a non-performing loan ratio of 3.7% at the end of 2015, down from 4.1% at the end of 2014. As can be seen from the left-hand panel of Chart 20, several euro area peer countries have higher NPE ratios, such as Italy and Austria, while other countries show ratios broadly similar to or slightly below the Belgian figure. Banks also have to report their exposures with forbearance measures. These exposures can be defined as exposures for which the bank has made concessions (modifications of contract terms or debt refinancing) towards debtors facing or about to face difficulties in meeting their financial commitments. The extent to which still performing loans are being restructured can be an indicator of credit quality deterioration that could lead

| CHART 20 COMPARISON OF BELGIAN BANKS’ SHARE OF NON-PERFORMING LOANS AND PERFORMING FORBORNE LOANS WITH EUROPEAN PEERS (end-of-period consolidated data, in % of total loans and advances) |

Source: ECB.

(1) Impairment is defined according to International Financial Reporting Standards (IFRS). The concept of non-performing exposure (NPE), as defined by the European Banking Authority, builds on the definitions of impairment and default (according to the Capital Requirements Regulation), while being broader than these two concepts.
to a higher share of non-performing debt in the future. When assessing the extent of such performing forborne exposures within total loan exposures across banks in different EU countries, it can be concluded that first of all, the share is broadly related to the share of NPEs within that country, and second, the indicator is at a relatively low level for Belgian banks (Chart 20, right-hand panel).

The NPE reporting also allows for a breakdown of non-performing exposures between various types of counterparty and according to their country of residence. Therefore, the data can be used to determine whether or not the overall further credit quality improvement of Belgian banks’ loan portfolios in 2015 was related to specific portfolios, e.g. loans to particular counterparties or granted in certain countries. When looking at loans to the non-financial private sector which account for almost 75% of the total loan portfolio, it can be seen that loans to non-financial corporations are, in general, of a worse quality than loans to households (Table 4). Especially loans that are collateralised by commercial real estate (CRE) seem to be characterised by high NPE ratios.

When compared to last year’s figures, it appears that, so far, no deterioration in credit quality has been observed for the domestic residential real estate-related loan portfolios of Belgian banks. Their NPE ratio even slightly improved from 1.7% at the end of 2014 to 1.6% at the end of 2015 on the back of significant growth in this portfolio. As regards the much smaller domestic consumer credit portfolio, the NPE ratio seems to have increased marginally in the course of 2015. Overall, at the end of 2015, the NPE ratio for loans to domestic households (1.8%) was much lower than for loans granted to foreign households (10.7%). A large proportion of these foreign exposures are mortgage loans in countries such as Ireland, the Netherlands, Czech Republic, Luxembourg, Turkey, Slovakia or Hungary. Though down from 14.7% at the end of 2014, the share of non-performing foreign mortgage loans was still significant at the end of 2015 (12.3%) and in fact largely reflected past deteriorations in credit quality of Irish and Hungarian portfolios.

As mentioned before, the portfolio of loans to non-financial corporations usually shows higher percentages of non-performing exposures than the portfolio of loans to households. Hence, at the end of 2015, the NPE ratio was at 5.2% for loans to domestic NFCs (slightly down from 5.4% at end-2014) and 6.6% for foreign corporates. The higher ratio for claims on foreign counterparties reflects the lower average quality of loans granted to corporations in countries like Ireland, Spain, France and Hungary. But for most of these portfolios, the NPE ratio improved in comparison with 2014 and the NPE ratio for the whole foreign corporate loan portfolio came down from 8% at the end of 2014 to 6.6% at the end of 2015.

### Table 4

<table>
<thead>
<tr>
<th></th>
<th>Total portfolio</th>
<th>Domestic portfolio</th>
<th>Foreign portfolio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NPE (in %)</td>
<td>NPE (in %)</td>
<td>NPE (in %)</td>
</tr>
<tr>
<td>Outstanding exposure (in € billion)</td>
<td>659.1</td>
<td>3.7</td>
<td>168.4</td>
</tr>
<tr>
<td>Loans to non-financial corporations</td>
<td>220.3</td>
<td>5.8</td>
<td>125.2</td>
</tr>
<tr>
<td>Loans collateralised by CRE</td>
<td>22.0</td>
<td>9.4</td>
<td>14.7</td>
</tr>
<tr>
<td>Loans to households</td>
<td>269.2</td>
<td>3.9</td>
<td>208.3</td>
</tr>
<tr>
<td>Residential mortgage loans</td>
<td>215.9</td>
<td>4.0</td>
<td>168.4</td>
</tr>
<tr>
<td>Consumer credit</td>
<td>19.7</td>
<td>4.0</td>
<td>13.7</td>
</tr>
</tbody>
</table>

Source: NBB.
Against the background of a worsening credit risk outlook in commodity-exporting countries, worries may arise about banks’ exposures towards corporations within the commodities sector (especially oil- and energy-related). As regards Belgian banks, exposures to these counterparties are quite limited, as already discussed in a previous section. The non-performing rate of loans to non-financial corporates that are active in the commodities sector (as assessed on the basis of the broader category of the sectors of mining, quarrying, electricity, gas, steam and air conditioning supply) reached 3.3% at the end of 2015, a level still below the average NPE ratio for the total portfolio of loans to NFCs.

Part of the total amount of loans granted to foreign NFCs by Belgian banks is located in emerging countries. In 2015, slowing economic growth in those countries led to increasing worries about potential credit risks, which could ultimately result in rising loan losses for banks with material exposures to such economies. For Belgian banks, total exposures towards emerging markets, excluding Eastern Europe, amounted to €30 billion on a consolidated basis at the end of 2015 (left-hand panel of Chart 21). The bulk of that amount, that includes exposures to all kinds of counterparties, was concentrated in Turkey (€24 billion) and mainly reflects the local activities of BNP Paribas Fortis’ Turkish subsidiary. Almost half of this exposure (€11 billion) relates to loans that are granted vis-à-vis local NFCs. The NPE ratio for claims on Turkish NFCs and households remained globally stable in 2015 at 2.5%, although the ratio recently increased for SME loans (from 2.3% at the end of 2014 to 2.8% at the end of 2015).

The right-hand panel of Chart 21 draws attention to a rather important aspect of banks’ foreign exposures, which is the currency of local claims, given that loans granted in foreign currency can give rise to increased risks of default should the domestic currency depreciate. Counterparties to which those loans are granted are then faced with increasing difficulty in repaying their loans if their income is mainly earned in local currency. A significant share of loans to Turkish NFCs is granted in other currencies than the Turkish lira (e.g. US dollars), which may contribute to higher risks of default as the lira depreciated in 2015. So far, however, NPE ratios for FX loans granted to Turkish corporates have remained below the average portfolio ratio.
2.4 Solvency

The stability of Belgian banks’ asset quality discussed in the previous section has helped to hold down the increase in the sector’s risk-weighted assets (RWA), which grew by only € 6 billion since 2013 to reach € 345 billion at the end of 2015. Credit risk RWAs amounted to € 283 billion, or 82 % of total RWAs (Table 5).

The significant decrease in credit risk-weighted assets of Belgian banks since 2008 largely reflects the deleveraging process that followed the financial crisis. The top panel of Chart 22 covering the exposures of a selection of banks that use an internal ratings-based (IRB) approach in their assessment of credit risk confirms that the sector's balance sheet has been reoriented toward less capital-consuming counterparty types, as proxied by the average regulatory risk weight according to internal models. Exposure at default (EAD) to corporates, which is a measure of the extent to which a bank is exposed to such counterparties in the event of default, fell from € 325 billion at the end of 2008 to € 246 billion at the end of 2015, while in the meantime banks' retail exposures secured by real estate, mostly mortgage loans, rose from € 105 billion to € 222 billion. The overall average risk weight of the sector however remained fairly stable. This is because exposures to credit institutions, which carry a relatively low risk weight, were also reduced during this period. While the evolution in average risk weights depicted in Chart 22 reflects in part recalibrations of banks' internal models and composition effects, changes in the regulatory framework were also at play. Basel III introduced a reduction in the risk weight applied to SME exposures as well as more stringent rules for exposures to credit institutions. In addition, the NBB is phasing out by 2018 the waiver that allowed IRB banks to apply the standard approach when risk-weighting their sovereign exposures instead of the less favourable IRB approach. The bottom panel of Chart 22 depicts the contribution of several types of Pillar I risk categories to the RWA of Belgian banks and a selection of their European peers. The graph illustrates that the composition of the Belgian banking sector’s RWA is broadly in line with these EU peers. Besides credit risk RWA, other Belgian banks’ RWA concern market and operational risk (3 % and 10 % of total RWAs respectively), but also include the credit valuation adjustment (CVA) (2 %) which, under CRD IV, aims to improve the coverage of counterparty risk arising from derivatives transactions, and the regulatory 5 % add-on applied to the IRB portfolio of Belgian mortgage loans (2 %).
The Tier 1 capital of the Belgian banking sector is composed of common equity Tier 1 capital (CET 1 – € 53.3 billion at the end of 2015) and, to a smaller extent, of additional Tier 1 capital (AT 1 – € 1.8 billion). Chart 23 displays the Tier 1 capital ratio and composition of Tier 1 capital of Belgian banks and their European peers. It appears that the Tier 1 capital ratio of Belgian banks (16 %) is in line with their European peers but that recourse to issuance of AT 1 capital varies significantly across the selected European countries. In 2015, the Belgian banking sector’s CET 1 capital grew by € 1.8 billion, to € 53.3 billion. This increase, due to one large institution, was the principal contributor to the improvement in the sector’s CET 1 ratio to 15.4 % by the end of 2015. It should also be underlined that Belgian banks’ Tier 1 and CET 1 capital ratios are well above the Pillar I regulatory minima, set at 6 % and 4.5 % for respectively the Tier 1 and CET 1 ratio according to the phased-in implementation of CRD IV rules, but also when taking into account Pillar II capital requirements.

While there was ample room above the requested thresholds at the end of 2015, CRD IV prescribes the gradual implementation of a range of additional buffers from 2016 which will raise the capital requirements imposed to Belgian banks over the coming years. In addition to the minimum capital requirements, a capital conservation buffer, which aims to ensure that banks build up capital buffers outside periods of stress, was introduced on 1 January 2016, starting off at 0.625 % and rising to 2.5 % by 2019. A countercyclical buffer will need to be activated in the event of excessive lending growth in the economy or when other indications of cyclical imbalances are building up. Credit institutions active in several countries, like many Belgian institutions, ought to observe several countercyclical buffers, in relation to the size of their
activities in each country. In accordance with the Law of 25 April 2014 which appointed the Bank as macroprudential policy authority, the Bank has set the countercyclical buffer for the Belgian market at 0% from 1 January 2016, confirmed this level for the second quarter of the year and will review the appropriateness of the rate every quarter.

At the end of 2015, the NBB established a list of eight Belgian banks considered as domestic systemically important banks (D-SIBs) and decided upon capital surcharges for these banks. This additional capital requirement will ultimately amount to 1.5% for the four largest institutions and 0.75% for the smaller D-SIBs in January 2018, with buffers being gradually incremented by respectively 0.5% and 0.25% each year as of January 2016.

Despite the entry into force of the EU Bank Recovery and Resolution Directive (BRRD), designed to make sure that banks hold sufficient liabilities to which a bail-in could be applied, individual minimum requirements for eligible liabilities (MREL) ratios for Belgian banks had not been fixed by the Single Resolution Board or by the NBB for the banks under their respective remit. These will be decided in the course of 2016 during finalisation of resolution plans. In this context, Belgian banks’ Tier 2 capital increased by €1.5 billion in 2015. These instruments which are eligible in case of a bail-in would help banks, if needed, to meet their MREL requirements.

In addition, the European Commission is set to report on the final calibration of the leverage ratio to the European Parliament and Council at the end of 2016. This ratio, which is a non-risk-based “backstop” measure, determines the minimum amount of capital in relation to the total volume of assets and off-balance sheet items and aims to restrict the build-up of excessive leverage in the banking sector. It was introduced as an observation ratio as of January 2015 and is expected to become binding from 2018. At the end of 2015, all major institutions reported a phased-in leverage ratio above the 3% minimum requirement currently foreseen by the Basel Committee.

The final calibration of both the MREL and the leverage ratios will possibly influence the capital planning decisions of some credit institutions.
3. Insurance sector

3.1 Profitability

Weak economic conditions and the low interest rates once again weighed on Belgian insurance companies’ profitability (Chart 24). The sector’s net profit dropped from € 1.4 billion in 2014 to € 1.2 billion, hitting the lowest level since the loss recorded in the sovereign debt crisis year 2011. The sector’s return on equity was 8.2 % for the year under review, against the 8.8 % recorded in 2014. The weaker result in 2015 was entirely due to the further decline in the life insurance result – down from € 0.7 billion in 2014 to € 0.2 billion – in spite of a further increase in capital gains realisations (of € 1.4 billion) to support the net investment income in the life insurance account.

CHART 24
NET RESULTS, PREMIUM INCOME AND COMBINED RATIO(1)
(non-consolidated data, in € billion unless otherwise stated)

Source: NBB.
(1) The combined ratio is the ratio of the sum of the cost of claims plus operating expenses to net premium income.
The non-technical result of the Belgian insurance sector’s profit and loss statement improved last year, but the deficit of € 0.6 billion continued to adversely impact the profitability of the sector. This non-technical result includes the investment income that is not imputed to life or non-life insurance business, but also exceptional results and taxes, traditionally a quite volatile element in the Belgian insurance industry’s overall result.

Non-life insurance activities produced a record result last year, with a profit of € 1.6 billion. The 50% increase in this result since 2012 is mainly due to strong underlying performance. With premium growth of 3% and a combined ratio below 100%, non-life business in 2015 confirmed once again this strong performance. The net combined ratio, which compares the total cost of claims and operating expenses to net premium income, stood at 97.6%. This indicates that insurance companies are maintaining a sound balance between insurance costs and premium income through various measures such as changes in premium tariffs and cost control measures. It is worth noting, though, that these generally solid results for the combined ratio were not achieved in all sub-sectors of the non-life sector; in some, costs were higher than premium income.

In contrast to the further increase in non-life insurance premiums, total life insurance premiums (€ 15.4 billion) declined again in 2015 (by 6%) from the already low levels recorded since 2013. This seems to confirm a structural weakening of demand for life insurance products in recent years, mainly in the case of individual (rather than group) policies. While the big drop in 2013 premium income was related to the increase in the tax on premiums paid on life insurance products to 2% at the beginning of that year, the stabilisation of life premiums at a structurally lower level since then also reflects the decline in the yields offered by insurance companies on new individual life insurance contracts as a result of the low interest rate environment. In this perspective, the further decline in interest rates in 2015 and the first months of 2016 is likely to have further dampened Belgian households’ demand for life insurance investment products. A persistence of low interest rates is thus likely to continue to weigh on new volumes of life insurance products that Belgian insurance companies will be able to sell, and eventually on their profitability if cost structures are not adapted to the lower business volumes. In response to this, some insurance companies are increasingly trying to promote their unit-linked insurance business by introducing new unit-linked products or mixed products, combining features of both class 21 and class 23 contracts.

Table 6 provides more details about the two main elements making up the life insurance technical result, which traditionally features a negative result on pure insurance activities, counterbalanced by a positive result on investment activities. It shows that the decline in the overall life insurance technical result to € 0.2 billion in 2015 was due to a significant drop in net investment income (from € 10 billion in 2014 to € 8.5 billion). This deterioration is to some

### Table 6

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
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<th>2012</th>
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<th>2014</th>
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<tr>
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<td>-0.7</td>
<td>1.2</td>
<td>0.6</td>
<td>0.7</td>
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<td>Result of insurance activities</td>
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<td>-8.3</td>
<td>-8.2</td>
<td>-9.3</td>
<td>-8.3</td>
</tr>
<tr>
<td>Net investment income</td>
<td>7.8</td>
<td>4.1</td>
<td>9.5</td>
<td>8.9</td>
<td>10.0</td>
<td>8.5</td>
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<tr>
<td>Non-life insurance technical result</td>
<td>0.7</td>
<td>0.9</td>
<td>1.0</td>
<td>1.2</td>
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<tr>
<td>Result of insurance activities</td>
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<td>-0.1</td>
<td>-0.1</td>
<td>-0.2</td>
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</tr>
<tr>
<td>Net investment income</td>
<td>1.2</td>
<td>0.8</td>
<td>1.1</td>
<td>1.2</td>
<td>1.3</td>
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<td>Non-technical result (1)</td>
<td>-0.1</td>
<td>-1.1</td>
<td>0.1</td>
<td>-0.4</td>
<td>-0.9</td>
<td>-0.6</td>
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<tr>
<td>Net investment income</td>
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<td>-0.9</td>
<td>0.9</td>
<td>0.3</td>
<td>0.4</td>
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<tr>
<td>Other results</td>
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<td>-0.7</td>
<td>-1.2</td>
<td>-0.9</td>
</tr>
<tr>
<td>Net result for the financial year</td>
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<td>2.4</td>
<td>1.4</td>
<td>1.4</td>
<td>1.2</td>
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</tbody>
</table>

Source: NBB.
(1) Data from quarterly reporting.
(2) The non-technical result includes investment income not imputed to life and non-life insurance activities, and exceptional results and taxes.
extent due to value adjustments for class 23 contracts. Changes in the net asset value of these investments, which are comparable to mutual funds, are recorded in the income statement of insurance companies under both the result of insurance activities and net investment income. Excluding these class-23-related value adjustments, net investment income in 2015 remained in line with the average recorded for the period 2012-2015 (€ 7.8 billion). This is significantly higher than the average of € 5.4 billion recorded in the period 2006-2011, when impairments on financial assets (€ 1.3 billion on average per year) weighed heavily on life insurance net investment income, with particularly high losses in 2008 (the Lehman Brothers default and subsequent market turbulence) and 2011 (losses on Greek and other peripheral government bonds). The better average in 2012-2015 nevertheless also reflects a growing amount of net capital gains realisations, which increased from € –0.2 billion in 2012 to € 0.7 billion in 2013, € 1.2 billion in 2014 and € 1.4 billion in 2015. In comparison, net capital gains averaged € –0.25 billion during the crisis years 2008-2011. The large capital gains realised between 2014 and 2015 have thus masked a 4% decline (from € 6.8 billion to € 6.5 billion) in the underlying net income on financial investments, which is made up of dividend income and interest payments – with pro rata adjustments of differences between book and face value for fixed-income instruments – but excludes capital gains. As a result of the low interest rate environment and the gradual materialisation of repricing risk in the bond portfolios (see below for more details on this issue), the underlying net income on financial investments thus gradually declined each year from € 7.2 billion in 2012 to € 6.5 billion in 2015.

The high reliance on non-structural capital gains realisations to support the profitability of life insurance business draws attention to the sustainability of current life results in the context of an operating environment characterised by lacklustre economic growth, low inflation and low interest rates. For the stability of the sector as a whole, the development of business models guaranteeing lasting profitability for insurers – even in less favourable economic circumstances – is required. On top of all the measures they have already taken, insurers may thus be forced to adjust their operations and cost structures even further, possibly through consolidations, in order to align cost structures with the shrinkage in activity volumes.

These pressures on life insurance profitability are coinciding with the introduction of the Solvency II framework, which implies a completely different approach to assessing the solvency of insurance undertakings as compared to the Solvency I regime that was applicable up the end of 2015.

3.2 Solvency II, the new solvency framework as from 1 January 2016

The switch to the Solvency II framework on 1 January 2016 constitutes a fundamental reform of the solvency framework. Under this regime, total assets and liabilities have to be calculated at market or market-consistent values, with a company's own funds being defined as the difference between the assets and liabilities at market value. Hence, under Solvency II, for example, the estimated value of the technical reserves will rise when market interest rates are low, putting pressure on a company's equity if these extra liabilities are not fully matched by an equivalent increase in the value of assets. According to Solvency II rules, assets will be valued on the basis of quoted market prices wherever available, while the fair values of other assets are calculated on the basis of assumptions reflecting market conditions, interest rates, the probability of events etc. Insurance companies' liabilities are mainly technical reserves (for which market values as such are not available) and the value of these reserves is arrived at by calculating the present value of the incoming and outgoing cash flows on the basis of the discount rate. This discount rate is a risk-free rate set by the European Insurance and Occupational Pensions Authority (EIOPA) on the basis of market swap rates with maturities of up to 20 years, currently extrapolated to the ultimate forward rate of 4.2% for maturities beyond 20 years. In April 2016, EIOPA published a Consultation Paper on the methodology for deriving the UFR and its implementation, which may lead to a future reconsideration of the level of the UFR, probably with a phase-in period.

In order to smooth the transition towards the new regulatory framework, Solvency II has put in place transitional measures, some of which will apply until 2032, by which time the balance sheet position of insurance companies will be fully estimated at market value. These transitional measures also concern the calculation of the technical provisions and the discount rate to be used, allowing insurers – with the agreement of their supervisor for some of these exceptions – to gradually phase in, over a period of 16 years, some of the main Solvency II regulations. These transitional measures are supplemented by other adjustments in the case of long-term insurance contracts, such as life insurance or disability
insurance, for which interest rate levels and changes in interest rates could have a major impact on the economic value of the balance sheet, since the potential long-term liabilities generally have a maturity that is longer than the associated financial investments. The Solvency II Long-Term Guarantee (LTG) package thus partly corrects this mark-to-market principle by defining the way long-term products will be valued under certain circumstances – and subject to the approval of the supervisor –, allowing insurers to not recognise the full extent of short-term volatility in asset prices. These LTG adjustments include the matching adjustment (a mechanism, subject to supervisory approval, that prevents changes in the value of assets caused by spread movements) and the volatility adjustment (which covers insurance products that would not be eligible for the matching adjustment).

The preparation for these Solvency II rules was one of the key focal points for the Belgian insurance sector and the Bank during the year under review. In this context, the Bank examined – among many other things – the quality of the financial and accounting data that insurance companies have to submit in order to enable the prudential authorities to verify compliance with the new solvency requirements. In anticipation of the new regime, the Bank therefore requested from Belgian insurers and insurance groups a preparatory set of annual and quarterly reports for their financial positions at the end of 2014 and the third quarter of 2015. The final version of these Quantitative Reporting Templates (QRTs) will form the basis for the Bank’s periodic risk analyses and will provide deeper insight into the solvency position and the financial situation under Solvency II.

While the Bank found that there was significant room for improving the quality of the QRT reporting, analyses of the data submitted during the preparatory stage nonetheless showed that the sector was generally ready for the entry into force of Solvency II. Many insurers were deemed to have sufficient capital to meet the new SCR and MCR solvency requirements, although the degree of preparedness and the safety margins in relation to the minimum requirements varied greatly from one company to another.

For the sector as a whole, the SCR solvency ratio stood at 190 % on the basis of the QRT data pertaining to the end of 2014, as the available own funds to meet the SCR (€ 32.6 billion) were almost double the solvency capital requirement (€ 17.2 billion). The different risk modules making up the SCR are aggregated using correlation matrices; at sector level, the SCR “market risk” component is by far the largest element of the total SCR requirement.

While the sector overall thus seems well positioned for Solvency II capital requirements, the analysis of the solvency margins also revealed that some insurance companies, typically smaller ones, were undercapitalised. Examination of the solvency ratios reported during the preparatory stage for 2014 revealed a ratio below 100 % for eight companies. The solvency deficit for these eight insurance undertakings corresponds to 1.6 % of the solvency capital requirement for the market. Another eight reported a solvency ratio of between 100 % and 120 %. Following these findings, the Bank launched a dialogue with insurers reporting a solvency ratio below the statutory minimum (100 %) during the preparatory stage. It reviewed the measures that those undertakings could adopt to restore their solvency position before the actual entry into force of Solvency II. Various types of prudential measures were taken, such as the option of using – subject to the Bank’s approval – certain transitional provisions or certain parameters specific to the undertaking concerned, adjustment of the reinsurance structure, a reduction in the guaranteed interest rates, de-risking of the asset portfolio or capital increase. In view of the QRT reporting quality, that approach was also extended to all companies with a solvency ratio of less than 120 % or those confronted since the reporting by new events liable to jeopardise their solvency ratio. The approach mainly aimed to set up an action plan for these undertakings which, if successfully implemented, would enable them to achieve sufficient solvency by the time the new rules took effect. Despite this proactive approach, it is still possible that some undertakings may still not be solvent enough, e.g. because the planned measures have not yet been fully implemented or because a change in the macroeconomic circumstances has had a serious adverse effect on the solvency ratio.

3.3 Assets and reinvestment risk in a low interest rate environment

The valuation of insurance companies’ assets at market value under Solvency II should facilitate assessments of the financial risks facing insurers and enable them to better anticipate the impact of low interest rates on their solvency. Risks related to the assets held by insurance companies can stem from the riskiness of the individual assets themselves (reflecting related market, liquidity or default risks) or from their (in)ability to replicate or match the characteristics of
the liabilities that they are supposed to cover (mismatch risk of the so-called covering assets). As regards the last risk dimension, due to the sometimes very long-term nature of some of their liabilities, (life) insurance companies can be confronted with difficulties in finding enough corresponding assets with the same long maturities, even if the bulk of asset and liability cash-flow profiles are well matched. This is particularly relevant for life insurance activities, where some of the liabilities can be far in the future and where premiums are generally collected under long-term contracts, unlike most non-life insurance premiums which are collected under contracts renewed annually.

Data gathered by the Bank through an ad-hoc data collection for interest rate risk show in this connection that the assets and liabilities in the Belgian insurance sector are relatively well matched. At sector level, the data for end 2014 show an average duration of assets and liabilities of 8.3 years and 10.1 years respectively, implying a negative duration gap of 1.8 years. As expected, the duration of assets is shorter than that for liabilities because the cash flows of the assets are on average shorter. This cash-flow gap appears as from the 4-year horizon, when, on average, the assets start to mature somewhat faster than the liabilities.

The data collected by the Bank also show that the extent of asset/liability mismatches varies between insurance companies. The net economic value and profitability of insurance companies with a comparatively large duration gap is more sensitive to a low interest rate environment. This sensitivity comes from the fact that maturing assets will have to be rolled over in new financial investments to match the cash-flow profiles of all outstanding liabilities, exposing the insurance company to reinvestment risk. This reinvestment risk could materialise especially if the current low interest rate environment were to persist for a long period. In addition to making further improvements in the management of their assets and liabilities, insurance companies with a duration gap should thus treat the currently very large unrealised capital gains on their bond portfolios with utmost caution — even more so than the well-matched insurers. In particular, these capital gains should not be used to boost short-term payouts to policy-holders or shareholders in the short-term, which would be tantamount to bringing forward the associated reinvestment risks in a low yield environment. If capital gains need to be realised, insurance companies should take advantage of them to bolster preventive strategies and allocate most of these capital gains to cover their contractual obligations, before the payment of dividends or profit shares.

A complementary, but more partial, analysis of the mismatch between assets and liabilities links the maturity profile of the outstanding amounts of life insurance policies offering guaranteed rates of return with the corresponding maturity profile of the public and corporate sector bonds included in the covering assets of these life insurance liabilities. For the other assets included in the covering assets — such as bank deposits, loans, real estate assets or equity investments — detailed information on the maturity structure was not available, so these assets could not be integrated into the analysis. As public sector and corporate bonds account for a very large part of the covering assets in the life insurance classes with guaranteed rates of return, the scope of the analysis was nonetheless sufficiently wide to confirm that the life insurance assets and liabilities in the maturity segments between 1 year and 30 years are relatively well-matched. This maturity segment covers 80% of total life insurance liabilities. This partial analysis also confirmed that public and corporate bonds are less able to provide a good match for the shortest (up to one year) and the longest life maturities (over 30 years), which is not a surprising result given the traditional maturities of these bonds. Yet, alternative asset classes with no or very long fixed maturities — such as equity holdings or real estate investments, not covered in the analysis — could help to match these very long-term liabilities.

The covering assets shown in Chart 25 are the assets that insurance companies hold on their balance sheet in order to honour future liabilities towards life and non-life insurance policy-holders, as represented by the technical reserves on the liabilities’ side of insurance companies’ balance sheets. At the end of 2015, these covering assets totalled € 250 billion, or 87% of the Belgian insurance sector's total balance sheet (equal to € 286 billion). The majority of the covering assets are composed of investments in public sector and corporate bonds, but also include investments in other assets, such as real estate or mortgage loans.

The chart distinguishes between the covering assets of life insurance and non-life insurance activities, and, within the former, between two classes of life insurance (class 23 and other classes). The great majority of life insurance premiums — for both individual and group policies — are collected on contracts under which the insurer bears at least part of the risks relating to financial market developments. The other life insurance policies with variable capital, better known as class 23 products or unit-linked products, are comparable to mutual investment funds, since the policy-holders/investors bear all the investment risks. The financial assets covering these class 23 insurance policies represent
only around 12% of the total assets covering the life insurance liabilities and are mainly constituted of undertakings for collective investment (UCIs).

Most life insurance contracts – predominantly class 21 policies – thus entail a market risk for the insurance companies, as they offer policy-holders a guaranteed rate of return, even if this is just a guarantee on the capital invested (i.e. when the minimum guaranteed rate of return is 0%). To meet these guarantees, the life insurance companies must choose in their asset and liability management an asset mix that is the most appropriate for both the structure and the characteristics of the associated liabilities, while establishing a balance between the risks on the investment portfolio and the expected rates of return. According to the composition of the covering assets for life insurance activities excluding class 23 as at the end of 2015, they invest mainly in government and corporate bonds, accounting for respectively 49% and 27% of the total covering assets for the other classes of life insurance shown in Chart 25. In the last three years, investment in corporate bonds was cut back, bringing the total invested in this asset class down from €53.7 billion at the end of 2012 to €48.0 billion at the end of 2015. During the year under review, the portfolio of government bonds also declined slightly (by around €1 billion), but remained the largest asset class with an outstanding stock of €87.7 billion. Holdings of mortgage loans by life insurers stabilised at €8.5 billion, while other loans increased by around €1 billion, so that total loans in 2015 accounted for an increasing share of covering assets in life insurance (11.3%).

The covering assets relating to non-life insurance activities are a little less dominated by government bonds (35%) and corporate bonds (25%), in favour of a slightly larger proportion of equities and other types of assets, particularly short-term instruments and bank deposits. After a decade of steady growth which peaked in 2014, holdings of mortgage loans by non-life insurers dropped by 9% in 2015 to €1.3 billion.

The percentage of the investment portfolio of the various insurance activities composed of equities, including shares in associated or non-associated companies, declined from 8% of the total covering assets at the end of 2008 to 5% at the end of 2015.

PUBLIC SECTOR BONDS

The reason for the substantial presence of government bonds in the investment portfolios held by life and non-life insurance companies is that, in the past, these bonds were regarded as risk-free assets owing to the very low probability of default. In addition, government bonds are available in a wide range of maturity dates (from 1 year to 30 years and sometimes longer), increasing the scope for matching the typically long-term liabilities in the life insurance business.
Furthermore, as an exception, the prudential regulations regarding investment and concentration limits in covering assets do not apply to the government bond asset class. These bonds often also meet insurance companies’ preference for steady and regular sources of investment income.

At the end of 2015, investment in fixed-income instruments issued by public sector entities, which include central and local government authorities, as well as international public institutions, amounted to €113 billion, €103 billion of which was assigned as covering assets, including for class 23 contracts. The difference between the total government bond portfolio and the bonds considered as covering assets is due to the so-called free assets (€1 billion) and to specific lending/repurchase operations involving a temporary transfer of the ownership of the securities (€9.1 billion). These repo operations – 83% of which involve Belgian government bonds – cannot be considered as covering assets for the duration of the repo transaction.

Charts 26 and 27 and Table 7 below provide more detail on the composition and main features of insurance companies’ investment in fixed-income instruments issued by public sector entities. The analysis is based on detailed information on the individual financial securities included in the public sector bond portfolio, combined with data on the ratings of the individual bonds and their issuance date, maturity date, coupon rate, currency, etc., as available in the Bloomberg information system. By mapping the maturity profile and coupon rates of public sector bonds in the portfolio, it shows the amounts that insurance companies may have to reinvest in coming years at yields that may be lower than the maturing coupon rates if the current low interest rate environment were to persist.

The breakdown of the public sector bonds according to the issuing country (Chart 27) shows that the insurance sector maintained its high investment in Belgian government bonds in 2015, after the major reallocations that took place between 2010 and 2012 and that resulted in a significantly lower exposure to public sector bonds from peripheral euro area countries. At the end of the year under review, investment in government bonds of Italy, Spain, Ireland, Portugal and Greece – which had been reduced markedly after June 2009 by bond sales or write-downs of the book value of the securities – reached €6.5 billion. Investment in Spanish public sector bonds posted an increase from €2.2 billion at the end of 2013 to €3.5 billion in 2014 and stabilised at €3.9 billion in 2015. The exposures on Ireland and Portugal represented respectively €2.0 billion and €0.7 billion at the end of 2015, while the exposure on Greece remained negligible.

Belgian government bonds still represented 54% of the total public sector bonds in the covering assets at the end of last year (up from 34% in 2009). This concentration exposes the insurance sector to idiosyncratic shocks concerning the sovereign risk premium on Belgian government bonds. In 2011, investment in Belgian government bonds rose by around
€21 billion. This major reallocation of exposures towards Belgium echoed developments in other countries, as insurance companies in many euro area countries showed a greater home bias as a result of the intensification of the euro area debt crisis. This reallocation of government bond investments towards the home country occurred at a time of relatively high yields on Belgian government bonds (OLOs), due to the prevailing political uncertainties at that time. In 2011, the ten-year OLO yield reached an average of 4.2% (versus 3.4% in 2010), even peaking at levels above 5% in November.

As a result, at the end of 2015, the average coupon on Belgian government bonds – accounting for €56.0 billion in the insurers’ covering assets – was still 4.0%. A mechanical simulation shows that, all other things being equal, if these Belgian sovereign bonds were to be reinvested when they arrive at maturity at the current low OLO yields, in line with the original lifetime of the matured OLOs, it will be 2025 before the total weighted average coupon of the OLO portfolio would fall below 3%. But this would be followed, as from 2034, by a quite steep fall in the total weighted average coupon rate.

Chart 27 maps the credit rating composition, maturity profile and average coupon rates of the public sector bonds included in the covering assets of both life and non-life insurance activities. Between 2012 and 2015, the credit rating composition of the public sector bond portfolio in life insurance showed a downward trend with the share of AAA/AA-rated bonds falling by almost 6 percentage points in favour mainly of BBB bonds and “no rating information” (increasing both by more than 3 percentage points). In this connection, a very partial analysis of life insurance companies’ transactions in public sector bonds showed that around one quarter (27%) of government bonds bought in 2015 and issued this year or before had a BBB rating, which is a significantly higher share than the weight of these BBB bonds in the stock of these companies’ covering assets (12%). While this may be seen as a manifestation of companies’ search for yield in the current low interest rate environment, these developments are taking place at the margin, and still within the investment-grade universe of public sector bonds.

**Chart 27** BREAKDOWN OF PUBLIC SECTOR BONDS BY YEAR OF MATURITY AND AVERAGE FIXED COUPON RATE

(Non-consolidated data at the end of 2015, book values, excluding class 23 contracts)

These investment-grade ratings account for approximately 88% of the total book value of public sector bonds in life insurance. The other 12% is composed of either speculative-grade bonds (1.5%) or bonds without a rating (10.4%). Public sector bonds with an AAA rating amount to €12.3 billion or 14% of the total. This largely reflects holdings...
of public sector bonds issued by Austria, Germany, the Netherlands and the United States, with a residual category including various types of AAA-rated instruments, including issues by international financial institutions. Bonds with an AA rating are the largest category of total public sector bonds in covering assets, accounting for € 51.9 billion or 59 % of total book value. This exposure is mainly the counterpart of the € 41.9 billion invested in Belgian AA-rated public sector bonds for the assets covering life insurance, but it also includes € 8.0 billion of AA-rated bonds issued by French public sector entities. Within the remaining investment-grade ratings of A and BBB, the main issuers behind the BBB-rated public sector bonds are Italy (€ 4.8 billion) and Spain (€ 3.2 billion).

As regards the coupon rates and repricing risks, the left-hand panel of Chart 27 shows that, in the coming years, Belgian life insurance companies may have to reinvest significant amounts of maturing AAA- and AA-rated bonds at yields that may be lower than the maturing coupon rates if the current low interest rate environment were to persist and if reinvestment of these assets were required in order to cover the related liabilities (i.e. for companies with a duration gap). For companies with no current mismatch between the assets and liabilities, reinvestment of maturing assets would indeed not be required in principle. While the data available suggest that the Belgian insurance sector’s assets and liabilities are relatively well matched, the sector’s duration gap averages 1.8 years. Reinvestment risks are thus present in many portfolios, though to very different degrees between individual companies. In this perspective, the information in Chart 27 presents some scale of the reinvestment risks in a low interest rate environment – and in particular of the potential challenges related to the relatively high guaranteed rates of return on some life insurance contracts – even if these coupon rates are not necessarily a reliable indicator of the effective yield to maturity of these public sector bonds in Belgian insurance companies’ covering assets. This yield to maturity depends not only on the coupon rate but also on the price at which the bond was acquired. Moreover, it disregards all other aspects of insurance companies’ asset and liability management, including hedging policies, that need to be considered to arrive at well-informed conclusions about current investment yields and the associated reinvestment risks in a low interest rate environment.

For life insurance activities, the left-hand panel of Chart 27 shows that, within the next five years, around € 21 billion of public sector bonds will come to maturity, accounting for 24 % of public sector bonds in the covering assets. This € 21 billion includes € 17 billion of AAA- and AA-rated bonds, which are likely to be the most sensitive to downward repricing risks if the current low interest rate environment were to continue for a long time. For non-life insurance activities, the right-hand panel of Chart 27 shows that around € 5 billion of public sector bonds will come to maturity during the first five years, representing 36 % of public sector bonds in the covering assets. This € 5 billion includes € 3.6 billion of AAA- and AA-rated bonds. The credit rating composition of the public sector bond portfolio in non-life insurance activities changed somewhat between 2012 and 2015, as it did in the life business, but the change was even clearer: here, the share of BBB-rated bonds rose by more than 9 percentage points at the expense of investment in AAA/AA- rated bonds (minus 6 percentage points) and speculative-grade bonds (minus 4 percentage points).

While the predominance of public sector bonds with an AAA or AA rating has limited the spillovers of the euro area’s sovereign debt crisis to the Belgian insurance sector, continuation of such an asset allocation may expose insurance companies to significant profitability pressures if maturing AAA and AA public sector bonds need to be rolled over in similar investments at the current historically low primary or secondary market yields on these bonds. However, as was shown in Chart 27, the Belgian insurance companies’ public sector bond portfolio is well laddered in terms of maturities, in both life and non-life insurance activities. In life insurance, half the portfolio will not reach maturity until the end of 2026, suggesting that the entire public sector bond portfolio of the life business is repriced, on average, every 20 years. For non-life insurance activities, half of the portfolio will only come to maturity by the end of 2022, suggesting that the entire public sector bond portfolio of the non-life business is repriced, on average, every 12 years.

At the end of 2015, the average coupon on all the public sector bonds in life insurance covering assets was 4.3 %, about 10 basis points lower than at the end of 2012. As shown in Table 7, this average is the result of a wide distribution of coupon rates on individual public sector bonds, where the bulk of them still carry a fixed coupon of more than 3 % (up to 6 %). The average remaining time to maturity of these bonds is still quite high, ranging from almost 10 years for bonds with fixed coupons between 3 % and 4 % and almost 14 years for bonds with fixed coupons between 4 % and 6 %. In non-life, a 12 percentage point reallocation of the portfolio composition from bonds carrying a coupon higher than 3 % to bonds with a coupon up to 3 % led to a decline in the average coupon of all the public sector bonds in the covering assets from 4.1 % at the end of 2012 to 3.8 % at the end of 2015.
Belgian insurance companies also hold a large portfolio of corporate bonds. At the end of 2015, these bonds accounted for a total of respectively €48 billion and €9.7 billion in the life and non-life covering assets, excluding class 23. Chart 28 provides a breakdown by bond-issuing sector in the covering assets. With a share of 29%, corporate bonds issued by manufacturing companies now dominate the Belgian insurance sector’s corporate bond portfolio, followed by bonds issued by credit institutions (23%) and non-bank financial institutions (12%). In 2014, bonds issued by banks still accounted for 28% of the portfolio, pointing to major disinvestment in this asset class, possibly related to a reassessment

### TABLE 7 COUPON AND MATURITY BREAKDOWNS OF THE PUBLIC SECTOR BONDS IN COVERING ASSETS
(non-consolidated data at the end of 2015, book values, in € billion)

<table>
<thead>
<tr>
<th></th>
<th>Life</th>
<th>Non-life</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Amount outstanding</td>
<td>Average age</td>
</tr>
<tr>
<td>Zero-coupon bonds</td>
<td>7.0</td>
<td>14.5</td>
</tr>
<tr>
<td>Variable-rate bonds</td>
<td>0.8</td>
<td>6.1</td>
</tr>
<tr>
<td>Fixed coupon [0% – 3%]</td>
<td>9.3</td>
<td>2.5</td>
</tr>
<tr>
<td>Fixed coupon [3% – 4%]</td>
<td>23.7</td>
<td>6.5</td>
</tr>
<tr>
<td>Fixed coupon [4% – 5%]</td>
<td>31.0</td>
<td>7.9</td>
</tr>
<tr>
<td>Fixed coupon [5% – 6%]</td>
<td>13.0</td>
<td>15.2</td>
</tr>
<tr>
<td>Fixed coupon [6% – 11%]</td>
<td>2.2</td>
<td>17.6</td>
</tr>
<tr>
<td>No coupon info</td>
<td>0.7</td>
<td>1.3</td>
</tr>
<tr>
<td>Total</td>
<td>87.7</td>
<td>8.8</td>
</tr>
</tbody>
</table>

Sources: Bloomberg, NBB.

### CORPORATE BONDS

**Zero-coupon bonds**

**Variable-rate bonds**

**Fixed coupon [0% – 3%]**

**Fixed coupon [3% – 4%]**

**Fixed coupon [4% – 5%]**

**Fixed coupon [5% – 6%]**

**Fixed coupon [6% – 11%]**

**No coupon info**

**Total**

**CORPORATE BONDS**

Belgian insurance companies also hold a large portfolio of corporate bonds. At the end of 2015, these bonds accounted for a total of respectively €48 billion and €9.7 billion in the life and non-life covering assets, excluding class 23. Chart 28 provides a breakdown by bond-issuing sector in the covering assets. With a share of 29%, corporate bonds issued by manufacturing companies now dominate the Belgian insurance sector’s corporate bond portfolio, followed by bonds issued by credit institutions (23%) and non-bank financial institutions (12%). In 2014, bonds issued by banks still accounted for 28% of the portfolio, pointing to major disinvestment in this asset class, possibly related to a reassessment

### CHART 28 BREAKDOWN OF THE CORPORATE BONDS BY SECTOR OF ISSUER
(non-consolidated data at the end of 2015, book values in € billion, excluding class 23 contracts)

Sources: Bloomberg, NBB.
of risks in the context of the implementation of bail-in regulations for bonds issues by credit institutions. The remaining 36% are spread over residual sectors gathered in the “other sectors” category. The breakdown by credit rating shows that banking sector bonds have the highest proportion (58%) of high-rated bonds (AAA/AA), in contrast to the manufacturing sector where this proportion barely reaches 9%. A partial analysis of Belgian life insurance companies’ recent transactions in corporate bonds confirmed that very few speculative-grade bonds are bought, but that around one-third of new bonds acquired carried a BBB rating, a share significantly higher than the corresponding weight of BBB bonds (a quarter) in the outstanding stock of life insurance companies’ corporate bonds. The high-rated bonds issued by the non-bank financial sector or other sectors account for respectively 20% and 23% of the total book value. If the corporate bonds are consolidated according to the corporate group to which the individual bond issuer belongs, the data show that the corporate bonds held by the Belgian insurance sector are not concentrated on any specific individual groups.

At the end of 2015, the average coupon on these corporate bonds amounted to 3.8% in life and 3.4% in non-life, lower than the above-mentioned average coupon rates for the public sector bond portfolio.

### 3.4 Life insurance contracts with minimum guaranteed rates of return

Chart 29 compares the annual investment return on assets covering class 21 contracts with the average rate of return guaranteed to policy-holders on these contracts. Preliminary figures for the year 2015 show an investment return of 4.85%, comparable to that achieved in in 2014 (4.8%). The figure for 2015 includes the increased amount of capital gains realisations (see section 3.1 above). In the period 1999-2012, the average net investment return was 5.1%. This period included three years during which the annual return on investment was lower than the prevailing average guaranteed rate of return on outstanding contracts. This occurred during years of severe financial market downturns in 2002 (equity markets), 2008 (Lehman Brothers) and 2011 (euro area debt crisis).

<table>
<thead>
<tr>
<th>Year</th>
<th>Average guaranteed rate of return on existing contracts</th>
<th>Investment return on assets covering guaranteed rate contracts</th>
<th>Long-term interest rate (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>3.25%</td>
<td>4.78%</td>
<td>5.05%</td>
</tr>
<tr>
<td>2000</td>
<td>3.25%</td>
<td>4.75%</td>
<td>5.05%</td>
</tr>
<tr>
<td>2001</td>
<td>3.25%</td>
<td>4.75%</td>
<td>5.05%</td>
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<tr>
<td>2002</td>
<td>3.25%</td>
<td>4.75%</td>
<td>5.05%</td>
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<tr>
<td>2003</td>
<td>3.25%</td>
<td>4.75%</td>
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<td>2004</td>
<td>3.25%</td>
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<td>2005</td>
<td>3.25%</td>
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<td>2006</td>
<td>3.25%</td>
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<tr>
<td>2007</td>
<td>3.25%</td>
<td>4.75%</td>
<td>5.05%</td>
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<tr>
<td>2008</td>
<td>3.25%</td>
<td>4.75%</td>
<td>5.05%</td>
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<tr>
<td>2009</td>
<td>3.25%</td>
<td>4.75%</td>
<td>5.05%</td>
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<tr>
<td>2010</td>
<td>3.25%</td>
<td>4.75%</td>
<td>5.05%</td>
</tr>
<tr>
<td>2011</td>
<td>3.25%</td>
<td>4.75%</td>
<td>5.05%</td>
</tr>
<tr>
<td>2012</td>
<td>3.25%</td>
<td>4.75%</td>
<td>5.05%</td>
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<tr>
<td>2013</td>
<td>3.25%</td>
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<td>5.05%</td>
</tr>
<tr>
<td>2014</td>
<td>3.25%</td>
<td>4.75%</td>
<td>5.05%</td>
</tr>
<tr>
<td>2015</td>
<td>3.25%</td>
<td>4.75%</td>
<td>5.05%</td>
</tr>
</tbody>
</table>

Sources: Thomson Reuters Datastream, NBB.
(1) Yield on the secondary market in ten-year Belgian government loans (OLOs).

The stock of life insurance policies offering guaranteed rates of return and the level of these guaranteed rates of return are particularly important risk parameters for insurance companies when risk-free interest rates fall to very low levels, as has happened in the recent period. In the 1990s, insurance companies had tended to offer their customers a guaranteed rate of return of 4.75%, which was the statutory ceiling in force up to the end of June 1999. In July 1999, this ceiling was reduced to 3.75%. In the case of an exit from a supplementary pension plan, until end-January 2016 the current legislation required companies to guarantee a minimum return of 3.25% on employers’ contributions and 3.75% on personal contributions.
While the profitability of insurance contracts guaranteeing such returns was eroded when long-term interest rates began to drop below those levels, the sector has gradually modified that adverse structure by marketing contracts offering guaranteed rates of return which are more in line with risk-free interest rates, and containing clauses which provide for a revision on the basis of changing market conditions. Moreover, some contracts specify that the guarantee is limited in time, and that, at the end of that period, the contract reserve (i.e. the amount of savings built up) is technically regarded as a new premium with a new guaranteed interest rate in line with prevailing market conditions.

All these measures contributed to a reduction in the average guaranteed rate of return on class 21 contracts from 4.5% at the end of 1999 to 3.12% at the end of 2012, 3.04% at the end of 2013 and 2.91% at the end of 2014. Chart 30 provides some more information on the structure of the guaranteed rates of return on life insurance policies, giving the situation at the end of 2014. At that time, the Belgian insurance sector still had large numbers of contracts offering high guaranteed rates of return for policy-holders. These liabilities are to a significant extent the legacy of contracts concluded a long time ago, in most cases guaranteeing these rates of return on future premiums as well.

Analysis of the data broken down by contract in the right-hand panel of Chart 30 reveals that contracts concluded in the past and still offering a guaranteed return of more than 4.5%, amounted €26.6 billion, or around 16% of the inventory reserves. Most liabilities related to class 21 group insurance contracts are associated with a guaranteed rate of return of at least 3%, because insurance companies, spurred on by competition, tended to offer a guaranteed yield on this policies that was at least in line with the minimum rates that companies sponsoring group insurance policies have to guarantee on employer (3.25%) or employee (3.75%) contributions according to the 2003 Law on the supplementary pension.
system (second pillar). In the case of individual insurance, the inventory reserves relating to contracts with a guaranteed rate higher than 3% fell by 6% between end 2013 and 2014 in favour of contracts offering a lower rate of close to 2%.

The left-hand panel of Chart 30 analyses the same data, but broken down by company rather than by contract. It focuses on the average guaranteed rate of return offered by each individual insurance company, taking all class 21 life insurance contracts together. The chart confirms that, for some years now, insurance companies have adapted to the lower interest rate environment by offering contracts more in line with market conditions, resulting in a decline in the average guaranteed rates of return. At the end of 2014, around 93% of the class 21 inventory reserves were held by insurance companies offering an average guaranteed return of 3.25% or lower, whereas in 2005, hardly any companies had an average guaranteed rate of return lower than 3.5%.

Life insurance companies have thus succeeded in reducing their average guaranteed rate of return by lowering the guaranteed rates of return for new life insurance premiums, including for a large number of policies providing only a capital guarantee while offering a larger range of profit-sharing rates and mechanisms. However, the biggest reduction in the interest rate risk for insurance companies resulted from the introduction of greater flexibility in the determination of the guaranteed rate of return. Whereas, in the 1990s, the guaranteed rate of return prevailing at the time of conclusion of the contract generally also applied to all future premiums, most of the contracts concluded during the past decade have only guaranteed the rate of return prevailing at the time of collection of the premium, so that the guaranteed rate of return can be adjusted according to changing market conditions. Some of these contracts also offer policy-holders more flexibility, allowing them to terminate their policies more easily or to reduce them without incurring heavy penalties. That means that some insurance companies are exposed to a greater risk of surrender or cancellation, especially if interest rates rise strongly. In those circumstances, they would face a choice between raising the rate of return on their contracts or accepting a cut in their volume of business. In both cases, that would impair the profitability of class 21 life insurance policies.

In order to protect themselves against the effects of low interest rates on the profitability of guaranteed-rate-of-return contracts, insurance companies have to form an additional provision for contracts offering a guaranteed rate of return 10 basis points higher than the so-called flashing-light rate, defined as 80% of the average yield on ten-year Belgian government bonds on the secondary market over the past five years. Insurance companies can spread the amounts to be allocated to this provision over a maximum of ten years. The flashing-light rate for this additional provision, which is calculated once a year by the supervisory authority, was 1.96% at the end of 2015. By the end of 2014, the cumulative additional provisions that the Belgian insurance companies had constituted in this framework amounted to €5.4 billion, up from €3.9 billion and €3.1 billion at the end of 2014 and 2013 respectively. Income from the assets corresponding to that provision is added to revenue generated by the covering assets representing the life insurance provision so as to guarantee the return promised in the contract.

Insurance companies with large duration gaps could be exposed to major reinvestment risks in case the current very low interest rate environment were to persist. Accordingly, the Bank has recommended that insurance companies should treat carefully and cautiously any decisions that lead to the realisation of capital gains and should take advantage of them by adopting a preventive strategy and allocating most of their capital gains to covering their contractual obligations, preferably before the payment of dividends or profit shares. As shown in Chart 31, insurance companies distributed during the year 2014 €1.7 billion in the form of dividends (€1.2 billion) and profit-sharing (€0.5 billion). This amount was only slightly down compared to the two previous years, in spite of the further strong decline in interest rates, which could put pressure on future profitability, as explained before. The ratio between the total amount of profit-sharing and the stock of class 21 life insurance technical provisions was equal to 0.29% in 2014. That this ratio is higher for individual (0.33%) contracts than for group insurance (0.21%) has to do with the fact that group contracts offer, on average, a higher guaranteed rate of return than individual insurance contracts.

Having regard to the low interest rate environment, the Bank in 2015 submitted a proposal to the competent minister – in accordance with the insurance law – to adjust the mechanism of maximum interest rates on individual long-term life contracts in order to better reflect the current market conditions. In this view, it recommended reducing this maximum reference rate from 3.75% to 1.5%. In January 2016, Belgium’s Minister of the Economy exercised his right of evocation; he set the maximum reference rate at 2%, effective from February 2016. From 1 January 2017, the maximum reference interest rate will be fixed once a year through a calculating mechanism which should more accurately reflect
current market conditions and prevent distortions of competition that could be contrary to the consumer’s interests. Social partners also reached an agreement to adapt the system of guaranteed interest rates on group insurance and pension contracts under the Law of 28 April 2003 governing supplementary pensions. In the future, the previously fixed minimum rates (3.25% on employers’ contributions and 3.75% on personal contributions) will be replaced with a system allowing a regular adjustment in line with market conditions.

The formation of the additional life insurance reserve (the flashing-light reserve) will be maintained and new provisions on profit-sharing have been introduced, taking account of both the profitability and the solvency of the insurance company and giving the Bank the power to limit profit distribution in specific cases.

4. Financial market infrastructures – (I)CSD sector

There are currently three central securities depositories (CSDs) active in Belgium. Two of them provide custody and settlement services primarily for the Belgian securities market; i.e. NBB-SSS (fixed-income debt) and Euroclear Belgium (equities). The third one, Euroclear Bank, is an international CSD (ICSD) whose custody and settlement services cover international debt securities, such as eurobonds, and domestic securities issued in local markets around the globe\(^{(1)}\).

The year 2015 marked a new turning point for the (I)CSD sector in Europe. First of all, TARGET 2 Securities (T2S), the common securities settlement platform developed by the Eurosystem, was launched with a first wave of European CSDs migrating their systems in June and August 2015. From a regulatory point of view, ESMA and EBA submitted at the end of 2015 a set of draft regulatory technical standards (RTS) and implementing technical standards (ITS) established under the CSD Regulation (CSDR) to the Commission. This new set of rules, which aims to harmonise prudential supervision of (I)CSDs in Europe, is expected to be endorsed by the EU decision-making bodies during the course of 2016. While revenue sources will fall off due to the outsourcing of settlement activity to T2S, costs for (I)CSDs to reach compliance with CSDR, including capital requirements, will increase. For those (I)CSDs providing ancillary banking services, intraday credit and liquidity risks will also have to be covered by additional capital, on top of existing CRD/CRR capital requirements. When aimed to promote competition between (I)CSDs, regulatory challenges can open up opportunities for (I)CSDs that are able to take advantage of the new environment. CSDR provisions on the freedom to provide services, which allow issuers to select any (I)CSD of their choice to issue securities, have already been in force since 2014 but it may take some time to change current market practices.

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(2) The term (I)CSD is used to cover both CSDs and ICSDs.
Other legislation like the Securities Financing Transactions Regulation (SFTR) adopted end-November 2015 that aims to improve transparency of securities financing transactions, such as repos and securities lending, by obliging market counterparties to report transactions details to a trade repository, also conditions the re-use of collateral processed in (I)CSDs’ books.

Competition between (I)CSDs is expected to grow in response to other regulations, not specifically targeting (I)CSDs but other financial market infrastructures or market participants, such as the European Market Infrastructure Regulation (EMIR) clearing obligation or new Basel III requirements on liquidity. The expected boost in the financial sector’s demand for collateral management services is leading (I)CSDs to develop value-added services in this field, either on their own or by joining forces with other service providers. Regulation targeting the break-up of so-called vertical silos in the post-trade landscape, which limit participants from clearing or settling transactions via the market infrastructure of their choice, will also drive competition. The updated Markets in Financial Instruments Directive (MiFiD 2), effective as of 2018 and which aims to improve the functioning and transparency of financial markets by promoting trading on regulated trading venues rather than over-the-counter (OTC) trading, includes provisions for central counterparties (CCPs) to provide non-discriminatory access to market participants for cleared financial instruments regardless of the trading venue on which a transaction is executed. A similar level playing field is required in the CSDR which states that CSDs should be provided with transaction feeds from CCPS and trading venues upon request by the CSD. CCPS often have important interrelationships with (I)CSDs to settle cleared transactions or to manage margin collateral provided by CCPS’ clearing members.

The number of challenges the (I)CSDs face and the strategic options they need to consider in order to capitalise potential business opportunities are quite significant. Economies of scale might be a decisive factor for (I)CSDs in that respect. The ICSDs Euroclear Bank and Clearstream Luxembourg, as well as CSDs in large countries in terms of GDP, often with liquid and deep public debt securities markets, may have some advantages in that respect (1) (Chart 32). Because of their distinct business profiles, the (I)CSDs established in Belgium will each respond to these and future challenges from their own perspective.

(1) In terms of employment, (I)CSDs are relatively small within the financial sector. (I)CSDs in Europe employ about 7 800 people, of which 6 400 in CSDs established in the EU. The average CSD has about 100 employees. The ICSDs, Euroclear Bank and Clearstream Luxembourg, have respectively 2 850 and 1 080 employees (Source: ESDFA, CSD Factbook, 2014).

CHART 32 SIZE OF (I)CSD SECTOR IN EUROPE IN TERMS OF SECURITIES DEPOSITS COMPARED TO NATIONAL (TOP-15 CSDs) OR EU (ICSDs) GDP
(at the end of 2014, in € billion)

Sources: NBB, ECB Blue Book and Eurostat.
The NBB is currently responsible for the prudential supervision – including the issuance of authorisations – vis-à-vis settlement institutions (CSDs) in Belgium. It also acts as overseer of Belgian securities settlement systems operated by Belgian settlement institutions to ensure that systems operate properly and that they are efficient and sound. Settlement institutions that have credit institution status, such as Euroclear Bank, are also regulated and supervised as credit institutions. Following the Royal Decree of 11 June 2015, the NBB has been confirmed as sole competent authority for the (I)CSDs established in Belgium under the CSDR and is therefore responsible for their authorisation and supervision. As overseer of securities settlement systems, the NBB has also been recognised as relevant authority within the CSDR framework.

4.1 Activity of (I)CSDs in Belgium

The sub-section below provides an overview of the Belgian (I)CSDs’ activities in terms of securities deposits, new issue activity and settlement turnover.

**NBB-SSS**

NBB-SSS acts as the register (“issuer CSD”) for both Belgian public and private sector fixed-income debt. Public sector debt includes securities issued by the Belgian federal government and by regional or local governments. Private sector debt registered in NBB-SSS can be issued by corporates, credit institutions or other entities. End 2015, total outstanding securities deposits in value amounted to € 575 billion, a 3 % increase compared to 2014. Total public sector debt securities (OLOs, Treasury bills and others) represent about 65 % of total securities deposits, their lowest share so far (Chart 33). OLOs represent the largest category of securities in NBB-SSS; i.e. 53 % of total securities deposits or about 80 % of total public sector debt.

**CHART 33** VALUE OF SECURITIES DEPOSITS IN PRIVATE AND PUBLIC SECTOR DEBT IN NBB-SSS
(end of year or quarter)

Source: NBB.
In 2015, the value of new issues settled in NBB-SSS rose with 16% in value and 35% in number compared to 2014; a first increase since 2010 (Chart 34, top panel). New issue activity in public sector debt (53%) slightly outweighs the one in private sector debt (47%). The majority of private debt securities (in value) have been issued by credit institutions (55%) and corporates (33%). Public debt is mainly issued as Treasury Bills (58%) or OLOs (21%).

In terms of securities settlement turnover (Chart 34, bottom panel), the number of transactions settled in NBB-SSS in 2015 increased by 12% to more than 600,000 transactions; i.e. about 2,300 transactions on average each day. This increase
was mainly due to the number of transactions settled in private sector debt (+40 %). Settlement turnover in value reached almost € 9 trillion, up by 4 % compared to previous year. Such increase was mainly due to strong activity in Q1 2015, with settlement in OLOs rising nearly 20 % compared to Q1 2014. In March 2015, when the ECB launched its public sector purchase programme (PSPP), markets showed high volatility with euro area government bonds yields going up considerably. More than 70 % of settlement turnover is still in OLOs, ahead of Treasury bills (25 %). Settlement turnover in value in private debt, although increasing almost 35 % year-on-year, remains marginal compared to public debt.

EUROCLEAR BELGIUM

As 99 % of securities deposits held in Euroclear Belgium are in equities and valued at market prices, the value of securities deposits fluctuates with market volatility. At the end of 2015, total value of securities deposits held in Euroclear Belgium stood at € 269.4 billion (up +/- 20 %). Since about 80 % of total securities deposits in Euroclear Belgium are BEL-20 equities, the value of securities deposits closely follows trends in the BEL-20 index (Chart 35, top panel). New issue activity in Euroclear Belgium is limited(1) whereas, at the same time, two companies left the Brussels stock exchange in 2015(2). Turnover in Euroclear Belgium increased in 2015, both in number (up to +/- 2.5 million, +17 % compared to 2014) and in value (€ 0.9 trillion, +32 %) (Chart 35, bottom panel). Compared to the previous year, growth in turnover (in value) was mainly in Q1 and Q4 2015. The main part of the settlement

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(1) In the course of 2015, there were few IPOs on Euronext Brussels (excluding Alternext segment) including Xior Student Housing NV (Real Estate), Bone Therapeutics (Biotechnology), Mithra (Pharmaceuticals), TNC Comm. VA (Investment Services), Biocartis Group NV (Health Care Providers) (Source: Euronext).
(2) CMB (Maritime transport), Vision IT (Consulting).
value (75 %) comes from over-the-counter (OTC) trades. Stock exchange transactions are settled in Euroclear Belgium after netting; i.e. after the central clearing by the Paris-based CCP LCH.Clearnet SA. Since settled securities are nearly all equities, volatility in their market value is reflected in the value of settlement turnover as well.

EUROCLEAR BANK

The value of securities deposits held in the books of Euroclear Bank on behalf of its participants has increased by 5 % to nearly €12 trillion equivalent (Chart 36, left-hand panel). A narrow majority (55 %) of securities deposits are in international bonds, such as eurobonds. Euroclear Bank and Clearstream Luxembourg are the “issuer ICSD” for such securities for which issuers can choose the currency or country of issue, aiming to attract international investors; i.e. ICSDs’ main client base. Unlike for domestic securities where only one CSD generally acts as the primary place of deposit, a specific structure exists for eurobonds where the two ICSDs in the EU act as notary. More than 60 % of total issuance in eurobonds is held in Euroclear Bank. Securities held by participants in the books of Euroclear Bank can be denominated in more than 50 currencies. After EUR (50 %), USD is the main denomination currency (26 %). The appreciation of the USD FX rate (vis-à-vis EUR) has contributed to the rise in the outstanding value (in EUR equivalent) of securities deposits (Chart 36, right-hand panel).

Regarding aggregated new issue activity and securities settlement turnover (Chart 37, top panel), the number of transactions settled in Euroclear Bank amounted 83.3 million in 2015, up by more than 10 % compared to 75.2 million in 2014. In value terms, this represents €442.6 trillion for 2015 (+12 % from €394.6 trillion in 2014). The number and value of transactions settled in Euroclear Bank reached a historical peak in March 2015: on one single day, more than 370 000 transactions were settled with a value slightly above €2 trillion. Strongest growth in settlement activity was in Q1 2015 whereas growth

(1) Excluding funds.
(2) Source: ECB Blue Book.
rates slowed down towards the end of the year. New issue activity in Euroclear Bank is relatively small (€ 2.5 trillion, up almost 13 %) compared to settlement turnover. The relative share of the USD has grown throughout the years, at the expense of EUR activity (Chart 37, bottom-left). A similar trend, but far less pronounced, can be observed in the relevant share of denomination currencies in settlement turnover. In 2015, about 70 % of settlement turnover, free of payment and against payment transactions are in EUR, 16 % in USD and 7 % in GBP (Chart 37, bottom-middle). In terms of settlement turnover per security type, compared to securities deposits, international debt accounts for about 30 % of settlement turnover while the main part is composed of other security types such as domestic debt and, to a lesser extent, equities or exchange-traded funds (ETFs) (Chart 37, bottom-right). The role of Euroclear Bank and the relative importance of its funds business, both in ETFs and mutual funds, are described in box 1.
Box 1 – Fund settlement explained

The way funds are bought and sold depends on whether the funds are stock market listed or not. Mutual funds, a basket of stocks, bonds or other financial instruments in which a group of investors has invested, are not listed and are to be bought directly from the fund itself. Such funds are actively managed by fund managers with the aim of outperforming a selected benchmark; i.e. a stock or bond index. On the other hand, exchange-traded funds (ETFs) can be bought and sold by (retail) investors on the stock exchange, like common stock. ETFs usually track a stock, bond index, currencies or commodities.

MUTUAL FUNDS

As mutual funds are not listed and are to be bought from the fund itself, transactions in such products are processed differently than other types of securities and do not follow, as a consequence, the standard trading, clearing and settlement process. Unlike other securities, cross-border mutual funds are not registered in a (I)CSD. Instead, funds’ transfer agents are selected by the fund manager to maintain the shareholders’ register. Funds’ distributors (i.e. sellers of funds to final investors) used to contact each transfer agent for each fund separately. Due to the complexity of this (often manual) process, intermediary order routers have been developed to send funds orders automatically to the relevant transfer agents. Euroclear Bank’s FundSettle is an example of such order router (Chart below). FundSettle processes about 90,000 funds and connects with over 900 fund administrators (transfer agents) worldwide. At Euroclear Group level(1), the volume of fund orders routed in 2015 reached 12.7 million, up 13% compared to previous year. The value of funds processed at the end of 2015 increased with more than 13% from € 1.5 to 1.7 trillion. Different linkages for mutual funds exist between Euroclear Bank and other CSDs such as Euroclear Sweden and Euroclear UK & Ireland. It allows investment firms from the countries were these CSDs are located to access a larger number of foreign funds covered by Euroclear Bank or, alternatively, Euroclear Bank clients to access local fund markets. In September 2015, Euroclear Bank connected with the Hong Kong (HK) CSD to provide its participants’ access to HK and China domiciled funds(2).

ROLE OF EUROCLEAR BANK’S FUNDSETTLE IN MUTUAL FUNDS

![Diagram showing the role of Euroclear Bank’s FundSettle in mutual funds](chart)

Sources: Euroclear, NBB.

(1) The Euroclear Group includes the ICS Euroclear Bank and the CSDs Euroclear Belgium, Euroclear Finland, Euroclear France, Euroclear Netherlands, Euroclear Sweden and Euroclear UK & Ireland.

(2) Following the implementation of the Mainland China-HK Mutual Recognition of Funds initiative for allowing HK-domiciled funds to be sold to retail investors in China, while Chinese funds will be made available to HK investors.
EXCHANGE-TRADED FUNDS (ETFs)

As a rule, ETFs tracking an international or other index primarily attract an international investor audience. In Europe, ETFs are traditionally listed and traded on different stock exchanges. Due to the existing, still fragmented, post-trading landscape in Europe, they are cleared and settled in different central counterparties (CCPs) and CSDs. As a result, funds purchases and sales between investors from different countries need to be transferred between national CSDs (chart below, left-hand panel). Changes made by the ICSDs, including Euroclear Bank, now allow issuance of ETFs in an international structure, similar to eurobonds. Such international issued ETFs are held on the account of an ICSD instead of being spread among different national CSDs. Trades in ETFs can therefore be executed on different stock exchanges and settled in one settlement location (chart below, right-hand panel). This development is in line with the existing situation on the US funds market where there is one CSD (DTCC) to settle ETFs traded on different stock exchanges. Recently, ETFs have succeeded in attracting growing flows of investor funds. (I)CSDs open the possibility for both domestic and international investors to broaden their investment opportunities and choices, geographically and in different currencies. One example is the RMB-denominated ETF market, whose first launch in an international structure was supported by Euroclear Bank in 2015. From the NBB’s perspective, ETFs’ registration and settlement in ICSDs have to comply with the same principles as for other types of securities. The international structure of ETFs supported by the ICSDs is a positive evolution as it reduces the number of transfers between CSDs and thereby the potential operational risks.

4.2 Role of (I)CSDs in collateral management

Due to the commoditisation of settlement services with the launch of T2S and the resulting loss of revenues generated from settlement fees, CSDs will have to develop and expand other value-added activities and move up the value chain. Collateral management could be one such activity. The ICSDs, Euroclear Bank and Clearstream Luxembourg, have already been major providers of collateral management services for many years.
With the aim of promoting financial stability, new sets of regulations have been adopted targeting not only financial institutions, but also FMIs such as CCPs and (I)CSDs, and even corporates. A common denominator in most of these regulations is the required use of high-quality collateral to cover exposures or to preserve sufficient liquid asset buffers. In October 2015, the liquidity coverage ratio (LCR) has come into effect, which requires banks to have sufficient high-quality liquid assets to withstand a 30-day period stress scenario. Although other jurisdictions have arranged a phase-in period (to reach full compliance in 2018), the new rule became fully binding for Belgian financial institutions as of October last year (replacing the NBB liquidity ratio). Other regulation will be implemented during the course of 2016. Following the publication of the relevant technical standards in December 2015, the EMIR mandatory CCP clearing of OTC interest rate derivatives – the largest segment of all OTC derivatives – is to start as from June 2016. The clearing obligation will apply to a first set of certain classes of interest rate swaps\(^{(1)}\) and counterparties\(^{(2)}\). The next clearing obligations will cover other interest rate swaps as well as credit default swaps, for which ESMA submitted draft regulatory technical standards to the Commission in October and November 2015 respectively.

Within a longer time horizon, regulation will also target exposures derived from non-centrally-cleared derivatives and the related requirements on the bilateral exchange of collateral. Applicable draft technical standards were published in March 2016. A phase-in period is envisaged until 2020. Following current provisions, the possibility of re-using collateral will in some cases be constrained for risk mitigation purposes (i.e. the re-use of non-cash collateral put forward as initial margin will no longer be allowed). Specific rules on collateral re-use have also been covered in the Securities Financing Transactions Regulation (SFTR). As from July 2016, SFTR requires prior consent from the counterparty that initially provided the collateral before it can be re-used.

**DEVELOPMENTS IN COLLATERAL MANAGEMENT SERVICES**

Due to greater demand for (high-quality) collateral and the increased complexity of allocating the right collateral at the right time and place, collateral management services dominate several (large) (I)CSDs’ strategies. In particular, triparty collateral management services whereby collateral management tasks (including collateral selection, valuation and substitution) are taken over by the (I)CSDs from market counterparties.

(I)CSDs themselves have the option of building their own legacy collateral management systems or of relying on the expertise of an external party. The Euroclear Group CSDs (outside Euroclear Belgium which mainly holds equities) make use of the triparty collateral application of Euroclear Bank. Participants of Euroclear Group CSDs are able to transfer collateral assets between Euroclear Group entities, making use of the same technology. Eurobonds, for example, can be exchanged between ESES (i.e. the joint settlement platform of Euroclear Belgium, Euroclear France and Euroclear Netherlands) and Euroclear Bank to meet a participant’s financing needs in either central bank (in ESES) or commercial bank money (in Euroclear Bank). The joint venture with the Depository Trust & Clearing Corporation (DTCC) – DTCC-Euroclear GlobalCollateral Ltd – will ultimately also connect both DTCC and Euroclear Bank pools of collateral, making use of the latter’s triparty collateral application. The first phases of the project are expected to be delivered in the course of 2016.

By the end of 2015, the average daily value of triparty collateral managed by the Euroclear Group (I)CSDs (the so-called Euroclear Collateral Highway) had reached € 1 068 billion; a 20% increase on the € 887 billion in 2014 (Chart 38, left-hand panel). The share of triparty collateral managed by Euroclear Bank amounted € 508 billion, from € 450 billion in 2014. These figures can be put into perspective against those of the semi-annual ICMA repo survey\(^{(3)}\) covering more than 60 financial institutions in Europe. The estimated European repo market as a whole has stagnated at a level around € 5.6 trillion, which is still far (almost –10%) from the peaks since 2010 (€ 6.2 trillion in December 2010). According to ICMA, such stagnation is due to banks’ deleveraging their balance sheets as a result of new capital adequacy and

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\(^{(1)}\) Fixed-to-float interest rate swaps (plain vanilla), float-to-float swaps (basis swaps), forward rate agreements and overnight index swaps, denominated in EUR, GBP, JPY and USD.

\(^{(2)}\) CCPs’ clearing members are the first type of counterparties to comply with EMIR.

\(^{(3)}\) Semi-annual survey conducted by the European Repo Council (ERC) of the International Capital Markets Association (ICMA).
liquidity requirements (preventing them from lending out highly-liquid assets through repos), as well as the excess liquidity in the market as a result of central banks’ quantitative easing measures (Chart 38, right-hand panel).

The share of triparty repos of financial institutions taking part in the ICMA repo survey compared with overall repo activity remains constant at about 10%. The fact that collateral managed by triparty agents such as Euroclear Bank did increase relates partly to their international participant base outside Europe as well as to the arrival of new players on the collateral buy-side spectrum. Non-banking institutions such as corporates, which are not covered by the ICMA repo survey, have moved into the market for collateral management services in increasing numbers due to changes in their investment strategies. Cash-rich corporates tend to seek alternatives for short-term cash investments, such as bank term deposits or money market funds (see also section on interdependencies below).

There are potential indications that market participants are facing growing needs to source specific (high-quality) assets which tend to be in shorter supply on the market than before. In the framework of the expanded asset purchase programme (APP)\(^1\), Eurosystem central banks have been purchasing €60 billion of public and private sector assets each month since March 2015, and have decided to further extend this programme to €80 billion in 2016. By the end of March 2016, cumulative purchases of assets under the public sector purchase programme (PSP), the main part of APP, totalled about €650 billion with German and French securities covering more than 40% of this amount (Chart 39, top panel). The widening spread between the EONIA interbank interest rate for unsecured lending transactions and benchmark repo indices such as the GC repo rate\(^2\) may indicate higher demand for specific collateral assets (Chart 39, bottom-left). As illustrated by the movement in repo rates (which are below EONIA), collateral takers in the repo market tend to offer cheaper cash in exchange for assets they need in their collateral portfolio. To minimise

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\(^1\) APP consists of the public sector purchase programme (PSPP), the third covered bond purchase programme (CBPP3) and the asset-backed securities purchase programme (ABSP). \(^2\) General collateral (GC) represents a basket of (high quality) assets that is generally accepted by counterparties in the repo market. The individual collateral assets that comprise this basket can be substituted for each other.
potential adverse effects on market liquidity in bond and repo markets, purchased bonds under PSPP can be lent out by the Eurosystem via selected (I)CSDs’ securities lending and borrowing programmes, such as Euroclear Bank’s. Based on anecdotal information, reliance on the Eurosystem’s securities lending programmes seems to have increased for some types of assets.

Other developments in securities financing transactions can to some extent also be read from (I)CSDs’ books. In Euroclear Bank, for example, growth rates of triparty collateral management services in support of underlying repos and those in support of securities lending transactions have further diversified in the course of 2015 (Chart 39, bottom-right). Growth in outstanding triparty collateral managed on behalf of Euroclear Bank participants’ repo transactions is limited, and declines as from March 2015, due to ample liquidity available in the market as a result of the Eurosystem’s long-term refinancing operations as well as the start of the PSPP programme. On the other hand, growth in outstanding triparty collateral in support of underlying securities lending transactions, such as collateral swaps or collateral transformation trades (i.e. exchanging lower-quality assets for higher quality collateral), is much stronger.
Collateral Management for Eurosystem Funding

In general, a bank’s decision to get secured funding via the interbank money market or through central bank liquidity goes hand in hand with the allocation of different types of assets as collateral. This “collateral arbitrage” includes, from a cash borrower’s (or collateral provider) perspective, the analysis of possible opportunity costs in the selection of the type of assets as collateral, taking into account the eligibility of collateral in interbank markets and central bank operations, as well as the possibility of maximising returns in collateral management (e.g. availability of collateral re-use facilities). As of 2014, cash borrowers can also rely on triparty agents to make such arbitrage for Eurosystem monetary policy and credit operations.

Eligible marketable assets, use of collateral & outstanding credit

The list of asset types eligible as collateral by the Eurosystem allows euro area banks to make use of a wide range of collateral. By the end of 2015, total eligible marketable assets equalled €13.5 trillion (Chart 40, left-hand panel). While central government bonds represent 50% of total eligible marketable assets, they only account for about 20% of assets actually used, after non-marketable assets such as credit claims (Chart 40, right-hand panel). Still, the share of central government bonds was lower in the period 2008-2011, ranging between 10%-15%. The relative share of (un)covered bank bonds, asset-backed securities and non-marketable assets has, on the other hand, gone down. The amount of collateral the Eurosystem receives, as collateral taker, is primarily used to cover refinancing operations; the surplus can be allocated to counterparties’ intraday credit line. The actual average outstanding credit provided by the Eurosystem is about €530 billion (Q4 2015) which is close to pre-crisis levels and illustrates the scale of available liquidity in the market due to quantitative easing measures.
Role of Belgian (I)CSDs in the mobilisation of cross-border collateral

Eurosystem counterparties can only obtain credit from the central bank of the country in which they are established, i.e. their home central bank. Collateral lodged by Eurosystem counterparties can be qualified as either domestic or cross-border collateral: whether the collateral is issued and safekept in the domestic (I)CSDs of the Eurosystem counterparty (domestic collateral) or not (cross-border collateral). Domestic collateral is always mobilised via the domestic (I)CSD of the Eurosystem counterparties. Cross-border collateral, on the other hand, is mobilised through linkages between (I)CSDs and central banks. The Eurosystem aims to facilitate the mobilisation of cross-border collateral. In that perspective, Eurosystem counterparties have since 2014 been able to rely on (I)CSDs acting as triparty agent (on behalf of the Eurosystem and its counterparties) for the mobilisation of collateral. Euroclear Bank can adopt such a role both for domestic and cross-border collateral(1). The launch of T2S is also expected to further promote the use of cross-border collateral. Today, two of the Belgian (I)CSDs – NBB-SSS and Euroclear Bank – can be used in monetary policy and credit operations and play an important role in the mobilisation of cross-border collateral by Eurosystem counterparties.

In 2015, cross-border collateral represented on average about 30% of total collateral held in custody by the Eurosystem (Chart 41, left-hand panel). Based on the distribution per lending country (i.e. the country of the central bank in which the Eurosystem counterparty is located) German, French and Dutch counterparties rely most on cross-border collateral. Belgian counterparties make far less use of cross-border collateral (only 1.1%) as they prefer to use domestic as well as non-marketable assets (Chart 41, middle panel). On the other hand, non-Belgian counterparties do rely to a large extent on collateral issued in either NBB-SSS or Euroclear Bank. Collateral assets issued in a Belgian (I)CSD represents 12.5% of total cross-border collateral mobilised on behalf of the Eurosystem (Chart 41, right-hand panel).

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(1) As Euroclear Bank is Belgian resident, eurobonds are considered domestic collateral in the case of Belgian credit institutions. A full list of triparty agents can be found on https://www.ecb.europa.eu/paym/coll/coll/triparty/html/index.en.html.
Regulatory focus

In response to regulatory changes, such as the clearing obligation for OTC derivatives, collateral management services have become a critical function of (I)CSDs, similar to the registration or settlement of securities. They are vital, not only to financial institutions in meeting new regulatory requirements, but also for CCPs and central banks that primarily act as collateral takers. As year-on-year growth in such services is significant, due attention will further be paid by the NBB to monitor the related operational and strategic risks. Particular focus will be paid to future trends in collateral re-use and collateral transformation as well.

4.3 Risk environment

As market utilities, (I)CSDs can reduce risks (and costs) for their participants. However, if not well managed, operational, credit or liquidity risks in the systems they operate could create potential systemic risks with contagion effects through interdependencies with other market participants or financial market infrastructures, such as CCPs. Given their critical role in the functioning and stability of the financial system, preserving a low risk profile of (I)CSDs is key from a regulatory perspective. The share-out of regulatory authorities’ responsibilities in the framework of the CSD Regulation (CSDR) and – for some (I)CSDs with banking status – the single supervisory mechanism (SSM) is explained in box 2.

OPERATIONAL RISK

Operational reliability is a primary concern to all (I)CSDs’ operators. Deficiencies in information systems or internal controls can cause severe hiccups in the daily processing of financial markets transactions. Apart from day-to-day operational risk management, project management risk is also a potential source of major operational risk. Large projects, such as the migration to TARGET2-Securities (T2S) or CSDR compliance, may put strong constraints on (I)CSDs’ available IT or risk management resources. T2S was launched on 22 June 2015 with a first wave of CSDs migrating to the new platform including the Maltese, Greek, Romanian and Swiss CSDs (eurobusiness only), later joined by the Italian CSD (Monte Titoli) end of August 2015. For the period September-December 2015, after the migration of the Italian CSD, T2S settled, on average, 1.87 million transactions per month. The daily average value of transactions was slightly above € 200 billion.

The Belgian CSDs that decided to join the T2S platform (i.e. NBB-SSS and Euroclear Belgium as part of ESES) were scheduled for the second wave of migrations end of March 2016, together with the Portuguese CSD (Interbolsa). The NBB-SSS did successfully migrate as scheduled. To prepare its migration to T2S, NBB-SSS had already adopted a new settlement platform with many new T2S features in February 2015. As announced in October 2015, the migration of Euroclear Belgium, together with the other ESES CSDs (i.e. Euroclear France and Euroclear Netherlands) was postponed.

Another type of operational risk which is high on the financial sector’s agenda is cyber resilience. The digitalisation of many financial services has expanded the potential for cyber attacks, while at the same time the risk of such attacks occurring has increased as well. A CPMI survey among critical infrastructures – including (I)CSDs – revealed that more than 70% of them considered cyber security threats are increasing, while about 50% found it likely that a cyber attack would bring down their infrastructure (1).

CREDIT RISK

Credit risk is usually defined as the risk of loss from an FMI participant default. One typical example of credit risk in a CSD is settlement or principal risk; i.e. the risk of the loss of securities delivered or payments made to the defaulting participant prior to detection of the default. Such risks can be removed by using delivery versus payment (DVP) mechanisms, ensuring that the delivery of securities only occurs if payment is made too. DVP mechanisms exist in NBB-SSS and Euroclear Belgium (central bank money in €) and Euroclear Bank (commercial bank money in >50 currencies). See also the next section on the CPMI-IOSCO assessment of NBB-SSS for non-euro settlement.

(1) Benoît Coeuré, Member of the ECB Executive Board, Speech at the workshop on the CPMI-IOSCO Guidance on Cyber Resilience for FMs, 13 January 2016.
(I)CSDs having a banking status provide cash account facilities for their participants and potentially credit to support their settlement activity. Unlike financial institutions in general, these (I)CSDs do not engage in maturity transformation; i.e. credit exposures on participants are typically intraday. The existing prudential banking regulatory framework (CRD/CRR) does not adequately cover such intraday credit exposures. On the other hand, the 2012 CPMI-IOSCO Principles for FMIs (PFMIs) require (I)CSDs to fully cover credit exposures to each participant, including intraday, using collateral and other equivalent financial resources (such as part of available equity). The CSDR and the draft regulatory technical standards as published by the EBA further detail requirements for (I)CSDs to measure, monitor and manage (intraday) credit risks, including the type of collateral accepted to secure credit exposures and the conditions when using other equivalent financial resources. While (I)CSDs are required to cover (intraday) credit risk exposures in any case, points for the NBB’s attention include the reduction of the system’s aggregate participants’ credit use. This requires an adequate and regular analysis of a system’s credit usage drivers. Settlement patterns can have an impact on the potential for credit consumption, for example due to cross-border settlement (e.g. linked (I)CSDs do not necessarily operate in the same timeframe which may require pre-financing on behalf of participants that intend to settle transactions via a cross-border link) or system inefficiencies (e.g. time gaps between repo roll-overs whereby the (I)CSD finances the cash borrower between the closing and renewal of its repo transactions). Taking into account regulatory requirements on the availability of high-quality collateral (due to EMIR or Basel III rules), system participants share the same interest in minimising credit use as it will also lower their collateral needs, and consequently the related opportunity costs for holding collateral required to cover credit exposures.

Other sources of credit risk include exposures of (I)CSDs to their cash correspondents through which payment flows resulting from settlement and corporate action activity are processed. If participants decide to leave settlement or corporate action proceeds on their cash accounts in the system, these long cash balances create overnight credit risks for the (I)CSDs. To manage the related credit risks, (I)CSDs invest them on the interbank market either through reverse repos (secured investment), cash redeposits (unsecured), or place them on accounts with their local central banks. (I)CSDs do generally apply dissuasive interest rates (i.e. lower than market rates) on long cash balances maintained by their participants. With the current interest rate environment, and central banks’ negative deposit rates, (I)CSDs need to be vigilant that participants’ long cash balances do not accumulate in their books.

**LIQUIDITY RISK**

As a rule, CSDs provide settlement services mainly in a single currency – their home currency – with settlement in the books of the local central bank; i.e. the central bank of issue of that currency. (I)CSDs with a banking status provide cash accounts to their participants in order to allow multicurrency settlement. If (I)CSDs provide credit to their participants,

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**Box 2 – About overseers, supervisors, competent and relevant authorities**

The organisation of the regulatory landscape for (I)CSDs has been reshaped significantly, primarily due to the CSD Regulation (CSDR) and for some FMIs with banking status – including (I)CSDs – the single supervisory mechanism (SSM).

**COMPETENT AND RELEVANT AUTHORITIES FOR (I)CSDS UNDER CSDR**

The CSDR has set rules to identify authorities responsible for the authorisation and supervision of CSDs. A pivotal role is assigned to the “competent authority”, which is designated by national governments and responsible to carry out duties concerning the authorisation and supervision of CSDs. The list of competent authorities is published on the ESMA website. The CSDR provides for other authorities, “relevant authorities”, to also be involved in the authorisation and supervision of CSDs. Relevant authorities include overseers of the CSDs, the EU central banks issuing the most relevant currencies in which settlement takes place and, where relevant, the EU central bank in whose books the cash leg of a securities settlement system operated by the CSD is settled.

In Belgium, the NBB, which is the supervisory authority of the CSDs under the present Belgian legislation, has been confirmed as the competent authority under the CSDR for carrying out the duties, including the authorisation and supervision of CSDs established in Belgium. As overseer of securities settlement systems, the NBB is also recognised as a relevant authority within the CSDR framework.

As competent authority and overseer, the NBB will be involved in cooperation arrangements with other Member States’ competent and relevant authorities. This is particularly relevant for Euroclear Bank. Cooperation with other competent authorities is required when a CSD’s activities have become of substantial importance for the functioning of the securities markets and the protection of investors in another Member State. The full regulatory impact for Euroclear Bank still needs to be assessed when ESMA has drafted the specific guidelines in that respect.

REGULATORY FRAMEWORKS FOR FMIS WITH BANKING STATUS

In the euro area, six FMIs have the regulatory and legal status of a credit institution: two CCPs (Eurex AG, LCH. Clearnet SA) and four (I)CSDs (Clearstream Frankfurt, Clearstream Luxembourg, Euroclear Bank, OekB). These FMIs have a double regulatory status: as CSD or CCP, they are regulated respectively by the CSDR or by EMIR, while as credit institutions, they are subject to banking regulation. This poses the interesting question of regulatory focus and an adequate regulatory framework for supervising/overseeing such FMIs.

The SSM implemented since November 2014 organises the financial supervision in the euro area countries by the ECB and the national competent authorities (NCAs). It is noteworthy that under the SSM, these FMIs with banking status have been qualified as “less significant institutions” (LSI)\(^1\). This is because under the SSM criteria, which have been set up to identify systemic-relevant credit institutions within the euro area, these FMIs were not selected.

Also for FMIs with a banking status, their systemic relevance is due to their role as FMI rather than their banking activities as such. In this sense, the CSDR and EMIR rules are more binding as they cover these FMIs’ activities in their capacity as respectively a CSD or a CCP, irrespective of their banking or non-banking status. Under the CSDR for example, banking activities are qualified as ancillary services apart from core services such as notary or settlement services.

Typically, major risks in such FMIs are operational risks (operational availability, cyber resilience, settlement efficiency) and financial risks – often on an intraday basis (intraday liquidity and credit risks, settlement risks). As such risk profile of an FMI is fundamentally different from that of a universal deposit-taking bank, prudential requirements for banks do not always adequately cover these specific operational and financial risks of FMIs. International agreed regulatory standards for CCPs and (I)CSDs (CPMI–IOSCO Principles for FMIs (PFMIs)) have been developed to cover among others these specific risks. The PFMIs cover FMIs irrespective of their regulatory (bank/non-bank) status.

In the EU, the PFMIs were transposed into European legislation (EMIR and CSDR). For instance, in the CSDR, there is a specific set of requirements (backed up by a comprehensive set of technical regulatory standards issued by the EBA) for regulating the banking activities of a CSD. A few noteworthy requirements are:

- besides its licence as CSD, a CSD with banking status needs to obtain a supplementary licence in order to provide only banking-type ancillary services directly related to the core or ancillary services of the CSD (limited purpose bank);
- specific additional capital charges for intraday credit risks;
- requirements regarding the quality of the collateral a CSD can accept to fully cover its credit risk exposures to individual participants.

\(^1\) In the SSM framework, credit institutions are categorised as “significant” or “less significant”. The ECB directly supervises significant institutions, whereas the NCAs have primary responsibility for the supervision of the less significant ones. Credit institutions are considered significant subject to conditions set by the SSM.
they could face liquidity risks if the borrowing participant is not able to reimburse intraday its cash positions, in which case the (I)CSD needs to monetise the available collateral that covers the credit exposure. Current provisions in the draft CSDR regulatory technical standards for liquidity risk management go further than those of the PFMI. While the PFMI requires (I)CSDs to withstand the failure of the participant with the largest payment obligation, the CSDR requires sufficient liquidity sources to cope with the simultaneous failure of the participants with the two largest payment obligations (i.e. Cover 2 scenario). (I)CSDs with a banking status will need to demonstrate that they have sufficient liquidity sources to cope with such crisis scenarios. Collateral assets, pledged by (I)CSDs participants to cover credit risk exposures, can be regarded as qualifying liquidity sources as long as there are arrangements to monetise such collateral from defaulting participants on an intraday basis.

INTERDEPENDENCIES

Interdependencies refer to the interrelationships between systems, such as payment systems, CCPs and (I)CSDs, and between systems and their participants. Due to such interdependencies, the sound functioning of an individual system often depends on the sound functioning of other interconnected systems or participants.

New type of participants

New interdependencies emerge between non-financial institutions and (I)CSDs. For reasons already mentioned in section 2, corporates have joined the buy-side spectrum of the repo markets by accessing PFMI directly, instead of via financial intermediaries. These types of participants will also be obliged to post collateral for their OTC derivatives transactions under EMIR. The number of corporate treasuries accessing Euroclear Bank’s triparty platform has increased five-fold within five years to more than 50 in 2015. These new types of participants have a different risk profile than other participants and this needs to be translated into adequate admission criteria. In principle, the Settlement Finality Directive (SFD) which aimed to reduce systemic risks associated with participation in payment and securities settlement systems, and in particular the risk linked to the insolvency of a participant in such a system, stipulates that only legal entities (i.e. credit institutions, investment firms and public authorities) are covered by settlement finality provisions. However, national implementing laws may further stipulate the types of legal entities that can participate in a settlement system. The Belgian Law of 28 April 1999, implementing the SFD, was amended by a Royal Decree of 14 April 2013 based on the PFMI allowing other types of legal entities to participate in a settlement system, insofar as specific conditions are met.

CCPs

Major interdependencies exist between the post-trade clearing and settlement layer: i.e. between CCPs and (I)CSDs. CCPs participate in (I)CSDs to settle cleared securities transactions and/or to make use of their triparty collateral management services for the collateral received from their clearing members. Legislation such as EMIR makes the use of CCPs mandatory for certain derivatives segments (as mentioned in section 2), and will also drive CCPs’ demand for collateral management services. (I)CSDs have a strategic interest to provide settlement and collateral management services between CCPs and market participants. Given their large participant base (1) and their access to multiple securities (collateral) markets worldwide, Euroclear Bank and Clearstream Luxembourg have, as ICSDs, been able to attract a large number of CCPs on their books (Chart 42, left-hand panel). The value of settled transactions by CCPs

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(1) Euroclear Bank has more than 1,500 participants, whereas Clearstream Luxembourg has close to 1,400 participants (ECB Blue Book, 2014).
in the ICSDs and top-5 EU CSDs varies strongly. Chart 42 (right-hand panel) plots selected (I)CSDs in terms of yearly aggregate settlement turnover based on the value of transactions (X axis) and the number of transactions (Y axis). The size of the “bubble” represents the yearly total value of settlement transactions processed in the books of these (I)CSDs via a CCP. In some cases, a local CSD, though smaller in size than an ICSD, can settle an equivalent amount of transactions via a CCP.

**Regulatory focus**

The ESES CSDs’ migration to T2S, initially foreseen for April 2016, is now scheduled for September 2016. Regulators of the ESES CSDs, both overseers and securities commissions, are closely monitoring the T2S migration programme with ESES project management, as well as with Euroclear Risk Management and Internal Audit. Another priority in the NBB’s oversight and supervision of Belgian FMIs is cyber risk. The nature of cyber risks and their impact (e.g. data integrity) challenge existing applicable operational risk management frameworks. The NBB takes also part in related CPMI-IOSCO workstreams to develop principles-based international guidance for FMIs to enhance their cyber resilience. In the longer term, the (I)CSD sector might be challenged by FinTech and in particular blockchain technologies. But it could take many years before new technology takes over core parts of the system (1). For instance, many countries have legislation that requires data to be physically maintained in the country. The NBB interacts frequently with the industry to follow up further developments in this domain.

In Belgium, Euroclear Bank is the only CSD which has banking status and provides – typically intraday – credit to its participants. As part of its oversight and supervisory work, the NBB has developed a set of indicators to monitor the evolution in intraday credit and related liquidity risks, including the quality of the collateral pledged by Euroclear Bank’s participants. Liquidity stress-testing, including multi currency aspects, also continues to be a primary focus of the NBB. As those (I)CSDs providing intraday credit and their participants have a mutual interest in minimising as far as possible

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credit consumption – and thus the use of collateral – a close and structural dialogue between system operators and their participants, in particular at risk management level, is warranted. To mitigate other types of credit risk that result from participants’ long cash balances, (I)CSDs should define the appropriate level of participants’ working cash balances that ought to support settlement activity in the system.

The NBB also pays due attention to interrelationships between CCPs and (I)CSDs in its oversight and supervision of FMIs and how those interdependencies are managed by the FMIs themselves. As both CCPs and their clearing members are often participants in the same (I)CSDs, such interdependencies should be taken into account in (I)CSDs’ liquidity stress test scenarios. Potential impacts on the default of clearing members, or the CCP itself, is further elaborated in the article by Steven Vancauwenberge (“CCP resilience and recovery – impact for the CCP users”).

**CONSOLIDATION WITHIN THE TRADE AND POST-TRADE LANDSCAPE**

Taking into account the launch of T2S and the commoditisation of the settlement function, as well as the fiercer competitive environment among (I)CSDs in value-added services or due to CSDR rules, consolidation may provide (I)CSDs the economies of scale that are expected to be required in order to capitalise potential business opportunities. Consolidation

---

**CHART 43  TRADING, CLEARING AND SETTLEMENT INFRASTRUCTURE**

*(situation at the end of March 2016)*

Legend

Outside background colors indicate FMI belonging to the same group

- Deutsche Börse Group
- Euronext Group
- London Stock Exchange Group
- Euroclear Group

Arrows represent the flow of clearing instructions from exchanges to CCP, or the flow of settlement instructions from CCP to SSS. Links between CCP or links between SSS are not represented. A light-blue inside background color indicates the CSDs and NCBs that have or will join T2S. An asterix (*) indicates that the NBB participates in the CCP’s supervisory college.

Source: NBB.
among infrastructures at the trading and clearing layers can also have strategic consequences for (I)CSDs. As illustrated before, feeds from CCPs’ cleared trades, as well as the derived use of collateral management services, can be of strategic importance for (I)CSDs. Clearing activity is a central component in the potential merger between Deutsche Börse and London Stock Exchange which own the two largest CCPs in Europe: i.e. Eurex and LCH.Clearnet. Chart 43 provides a stylised overview of the European trade and post-trade landscape relevant in that context. The first layer represents the stock exchanges whereas clearing by CCPs is depicted by the second layer. On the day when the buyers and sellers have to settle their obligations, assets (securities or cash) are exchanged. Securities and cash settlement is shown in respectively the third and fourth layer. Chart 43 also shows the ownership of market infrastructures, whether the settlement layer is owned by the stock exchange (Clearstream, Interbolsa, Monte Titoli) or not (Euroclear).

4.4 Assessment of the NBB-SSS against the CPMI-IOSCO Principles for Financial Market Infrastructures

The NBB-SSS is the central securities depository (CSD) for dematerialised fixed-income securities in Belgium: i.e. government securities and corporate debt. The system is run by the NBB. NBB-SSS participants – more than 80 entities, both domestic and international – can settle transactions in EUR by book-entry on a delivery-versus-payment basis in central bank money. The NBB-SSS holds € 575 billion in assets and has a yearly turnover of € 8 919 billion (in 2015).

In February 2015, the NBB-SSS migrated to a new settlement platform (“RAMSES”) with a view to its migration to T2S in March 2016. The NBB-SSS has also discontinued the automatic securities lending and borrowing service.

<table>
<thead>
<tr>
<th>TABLE 8</th>
<th>SUMMARY OF THE RESULTS OF THE PRINCIPLE-BY-PRINCIPLE ASSESSMENT OF OBSERVANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment category</td>
<td>Principle</td>
</tr>
<tr>
<td>Observed ............</td>
<td>1, 2, 4, 5, 7, 8, 9, 11, 13, 15, 18, 20, 21, 22, 23</td>
</tr>
<tr>
<td>Broadly observed ...</td>
<td>3, 12, 17, 19</td>
</tr>
<tr>
<td>Partly observed ......</td>
<td>–</td>
</tr>
<tr>
<td>Not observed ......</td>
<td>–</td>
</tr>
<tr>
<td>Not applicable ......</td>
<td>6, 10, 14, 16, 24</td>
</tr>
</tbody>
</table>

Source: NBB.

This assessment has been carried out by the NBB’s Oversight team, which is fully independent from the operational departments of the NBB (such as the NBB-SSS).

Oversight has assessed the NBB-SSS against the applicable CPMI-IOSCO Principles for Financial Market Infrastructures (PFMIs(1)), taking into account the specifics of a central bank infrastructure, where relevant.

Table 8 gives an overview of the ratings of the 24 Principles. A detailed assessment of each Principle is set out below.

PRINCIPLE 1 LEGAL BASIS

The Terms & Conditions of the NBB-SSS have been amended to take into account the migration to T2S. After the finalisation of this new version, an external legal opinion confirming the validity and enforceability of the new Terms & Conditions

(1) An overview of these PFMs can be found in box 1 on p.129 of the FSR 2013.
under Belgian law should be provided. In addition, further assessment of the impact of recovery/resolution measures that can potentially affect participants is recommended considering recent regulatory developments in this domain.

**PRINCIPLE 2 GOVERNANCE**

The NBB has documented objectives, governance arrangements for the Board and management level and a documented risk management framework. In the last few years, progress has been made to enhance compliance with the Governance Principle via the publication of a Mission Statement, the establishment of a User Committee and of a Management Committee. The publication of its “conflicts of interest” policy has answered the remaining open Oversight recommendation regarding this Principle.

**PRINCIPLE 3 FRAMEWORK FOR THE COMPREHENSIVE MANAGEMENT OF RISKS**

The PFMI principles require PFMI authorities to analyse the risks borne from and posed to other entities. More specifically, an analysis has to be made of the settlement and funding flows in the FMI. The impact on the sound functioning of the market and the system from either the default or operational outage of the largest participant has to be analysed. The desktop analysis made by the NBB-SSS reveals a concentration of activity in the hands of a few participants. The analysis was made based on data from the NBB-SSS only while some NBB-SSS participants also participate in other CSDs. Analyses made by individual CSDs have a more limited value in the new T2S context. Therefore, the reliance on a T2S simulator addressing the impact of the outage or default of one or more T2S participants would allow the CSDs to observe the PFMI principles in a meaningful way.

**CREDIT AND LIQUIDITY RISK MANAGEMENT (PRINCIPLE 4 CREDIT RISK, PRINCIPLE 5 COLLATERAL, PRINCIPLE 6 MARGIN, PRINCIPLE 7 LIQUIDITY RISK)**

Participants can buy securities in the NBB-SSS with the cash (EUR) on their dedicated cash account in the books of the central bank. This account is funded by the NBB-SSS participants from their main T2 account with the NBB. As long as there is sufficient cash on this dedicated account, settlement will take place. The NBB-SSS does not provide credit to its participants neither in the settlement process, nor for any other purpose. Such credit could be provided, if needed, by the NBB. The credit provision by the NBB as central bank complies with the ESCB monetary policy framework which imposes full collateralisation of the positions, with the application of commonly agreed haircuts. Nor is the NBB exposed to any liquidity risk against the euro.

**SETTLEMENT (PRINCIPLE 8 FINALITY, PRINCIPLE 9 MONEY SETTLEMENTS, PRINCIPLE 10 PHYSICAL DELIVERIES)**

The NBB-SSS settles intraday with immediate finality. Money settlements take place in central bank money. The NBB-SSS does not offer physical settlement. All securities that are settled in the system are dematerialised or immobilised and settled in book-entry form.

**PRINCIPLE 11 CENTRAL SECURITIES DEPOSITORIES**

Through its accounting procedures, including the segregation of assets belonging to the NBB, the different participants and their underlying clients, the NBB-SSS protects investors from custody risk. The Terms & Conditions ensure the full protection of underlying clients’ assets against the default of the NBB-SSS participant that is their custodian.

**PRINCIPLE 12 EXCHANGE-OF-VALUE SETTLEMENT SYSTEMS**

The NBB-SSS system allows participants to eliminate principal risk for transactions in EUR by ensuring that the final settlement of the cash leg and securities leg occur only when the other leg settles. For transactions in other currencies (mainly USD, GBP, CHF, NOK), the NBB-SSS does not provide DVP settlement as the securities leg is FOP settled within the NBB-SSS while the cash leg is settled outside the system. This relates to 1.39% of the total value of transactions settled in 2015). The NBB-SSS has been asked to adapt its settlement processes in order to provide for a DVP arrangement (i.e. final settlement of one leg occurs if and only if the final settlement of the linked leg occurs – on a gross (trade-by-trade) or net basis) for primary and secondary market transactions in all applicable currencies.
DEFAULT MANAGEMENT (PRINCIPLE 13 PARTICIPANT-DEFAULT RULES AND PROCEDURES, PRINCIPLE 14 SEGREGATION AND PORTABILITY)

The NBB-SSS's new Terms & Conditions describe the procedure in the event of a participant default and define the moment of entry, moment of irrevocability and moment of settlement finality of transfer orders in line with the “Collective Agreement” which defines these moments in a harmonised way across all T2S CSDs.

PRINCIPLE 15 GENERAL BUSINESS RISK

The NBB checks whether the NBB-SSS’s costs and revenues are in balance and takes remedial action if necessary. With a slightly increasing securities depot and a custody fee basis system, the NBB-SSS relies on a stable stream of revenues.

PRINCIPLE 16 CUSTODY AND INVESTMENT RISKS

All securities processed by the NBB-SSS are safekept directly within the NBB-SSS. The NBB-SSS does not rely on custodians.

PRINCIPLE 17 OPERATIONAL RISK

The NBB-SSS maintains high levels of operational reliability, especially since the launch of the new RAMSES platform. Cyber resilience is a new specific point for the NBB-SSS’s attention in terms of operational risk. Considering the regulatory evolutions in that domain, the overseers have recommended that the NBB-SSS carries out a fully-fledged assessment of its cyber resilience against the principles of the CPMI guidelines on cyber resilience in financial market infrastructures, including an adequate holistic approach covering aspects like governance structure, business continuity and ad-hoc communication plans and legal aspects and to regularly update this assessment in line with the evolving guidelines and standards. The adequacy and the effectiveness of the NBB policies in that domain will be reviewed on a regular basis accordingly.

Considering their systemic importance for the well-functioning of financial markets, CSDs should analyse the impact of a long-term IT outage (extending over several days), notwithstanding the business continuity measures implemented in order to cope with the two-hour resumption time. Therefore, it is recommended that the NBB-SSS further assesses the potential consequences of a scenario of a long-term unavailability of its RAMSES platform and/or T2S and develops alternative (manual) procedures to ensure (partial) business continuity under such extreme scenarios.

PRINCIPLE 18 ACCESS AND PARTICIPATION REQUIREMENTS

The NBB-SSS’s access criteria are objective, risk-based, and publicly disclosed. They guarantee fair and open access.

PRINCIPLE 19 TIERED PARTICIPATION ARRANGEMENTS

There is no sub-participant status in the NBB-SSS. As a rule, assets of participants’ underlying clients are held in omnibus accounts. For that reason, the NBB-SSS does not have any specific, detailed and identifiable information on the activities of individual underlying clients. However, the NBB-SSS has – based on the PFMI methodology – identified the proportion of activity that each direct participant conducts on behalf of indirect participants in relation to the direct participants’ capacity. The questionnaire sent to the participants having the most underlying client depots has revealed the existence of six important underlying clients (based on securities depot). It is recommended that the analysis is expanded to turnover data (in order to make a distinction between “buy-and-hold” custodians and more active players in the market) and that conclusions are drawn about the risks to which NBB-SSS may be exposed as a result of tiered participation arrangements. This outcome should be regularly reviewed and reported to the responsible governance bodies and adequate measures taken when required.

PRINCIPLE 20 FMI LINKS

The NBB-SSS has no links as investor CSD with other CSDs. Other CSDs may become participant in the NBB-SSS and are treated as regular participant. The NBB-SSS does not bear/pose any credit or liquidity risk.
EFFICIENCY (PRINCIPLE 21 EFFICIENCY AND EFFECTIVENESS, PRINCIPLE 22 COMMUNICATION PROCEDURES AND STANDARDS)

The NBB-SSS monitors key performance indicators (KPIs) such as the settlement efficiency and the system’s up-time on a daily basis. It regularly benchmarks its tariff structure with peers and client surveys and the User Committee’s input contribute to the NBB-SSS meeting users’ expectations. The NBB-SSS uses internationally accepted communication procedures and standards.

TRANSPARENCY (PRINCIPLE 23 DISCLOSURE OF RULES, KEY PROCEDURES, AND MARKET DATA, PRINCIPLE 24 DISCLOSURE OF MARKET DATA BY TRADE REPOSITORIES)

The NBB-SSS is a domestic and low-risk system. It publicly discloses its Rule Book on its website. Training and support are provided to participants on request to further facilitate their understanding of the system. Fees and statistical data, as well as the Disclosure Framework, are also published.

The table below summarises all recommendations to the NBB-SSS:

<table>
<thead>
<tr>
<th>TABLE 9</th>
<th>LIST OF RECOMMENDATIONS FOR THE NBB-SSS</th>
</tr>
</thead>
<tbody>
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<td>Principles</td>
<td>Issues of concern</td>
</tr>
<tr>
<td>1</td>
<td>Legal basis</td>
</tr>
<tr>
<td>3</td>
<td>Analysis of risks borne from and posed to other entities</td>
</tr>
<tr>
<td>12</td>
<td>DVP for foreign currencies</td>
</tr>
<tr>
<td>17</td>
<td>Cyber resilience</td>
</tr>
<tr>
<td>17</td>
<td>Long-term IT outage</td>
</tr>
<tr>
<td>19</td>
<td>Tiered participation arrangements</td>
</tr>
</tbody>
</table>

Source: NBB.
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4 Main components of insurance companies’ assets 114
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6 Components of the income statement of insurance companies 116
7 Composition of insurance companies’ covering assets for all types of activities 117
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<th>TABLE 1</th>
<th>NUMBER OF CREDIT INSTITUTIONS</th>
</tr>
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<tbody>
<tr>
<td>Credit institutions governed by Belgian law with Belgian majority shareholding</td>
<td>23</td>
</tr>
<tr>
<td>Credit institutions governed by Belgian law with foreign majority shareholding</td>
<td>28</td>
</tr>
<tr>
<td>EU Member States</td>
<td>21</td>
</tr>
<tr>
<td>Other States</td>
<td>7</td>
</tr>
<tr>
<td>Belgian branches of foreign credit institutions</td>
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<td>EU Member States</td>
<td>47</td>
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<tr>
<td>Other States</td>
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<td>Total</td>
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Source: NBB.
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<th>2007(1)</th>
<th>2008(1)</th>
<th>2009(1)</th>
<th>2010(1)</th>
<th>2011(1)</th>
<th>2012(1)</th>
<th>2013(1)</th>
<th>2014(1)</th>
<th>2015(1)</th>
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<tr>
<td><strong>A. Large banking groups</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Balance sheet total (in € billion)</td>
<td>1 010.7</td>
<td>1 229.2</td>
<td>1 348.0</td>
<td>1 488.8</td>
<td>1 326.8</td>
<td>1 092.0</td>
<td>1 003.2</td>
<td>967.8</td>
<td>857.1</td>
<td>774.7</td>
<td>851.6</td>
<td>802.7</td>
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<tr>
<td>Customers’ holdings (in € billion)</td>
<td>482.1</td>
<td>532.0</td>
<td>667.4</td>
<td>700.9</td>
<td>612.8</td>
<td>622.5</td>
<td>559.8</td>
<td>518.4</td>
<td>518.2</td>
<td>516.5</td>
<td>544.0</td>
<td>559.2</td>
</tr>
<tr>
<td>Loans and advances to customers (in € billion)</td>
<td>433.2</td>
<td>535.1</td>
<td>553.8</td>
<td>619.0</td>
<td>505.0</td>
<td>481.7</td>
<td>450.7</td>
<td>441.4</td>
<td>432.8</td>
<td>444.7</td>
<td>463.1</td>
<td>476.1</td>
</tr>
<tr>
<td>Risk asset ratio (in %)</td>
<td>12.6</td>
<td>11.1</td>
<td>11.2</td>
<td>11.2</td>
<td>17.0</td>
<td>12.0</td>
<td>16.2</td>
<td>17.9</td>
<td>18.5</td>
<td>16.9</td>
<td>17.8</td>
<td></td>
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<tr>
<td>Net after tax results (in € billion)</td>
<td>4.6</td>
<td>5.7</td>
<td>9.2</td>
<td>6.2</td>
<td>–20.9</td>
<td>–1.5</td>
<td>5.0</td>
<td>–0.1</td>
<td>1.2</td>
<td>2.6</td>
<td>3.9</td>
<td>5.2</td>
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<td>Return on average assets (in %)</td>
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<td>0.5</td>
<td>0.7</td>
<td>0.4</td>
<td>–1.4</td>
<td>–0.1</td>
<td>0.5</td>
<td>–0.0</td>
<td>0.1</td>
<td>0.3</td>
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<td>Return on average equity (in %)</td>
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<td>23.1</td>
<td>13.7</td>
<td>–40.8</td>
<td>–3.8</td>
<td>11.1</td>
<td>–0.1</td>
<td>2.7</td>
<td>5.6</td>
<td>7.8</td>
<td>10.3</td>
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<tr>
<td>Cost-income ratio (in %)</td>
<td>70.6</td>
<td>72.3</td>
<td>54.1</td>
<td>59.8</td>
<td>87.1</td>
<td>77.1</td>
<td>64.2</td>
<td>65.2</td>
<td>71.5</td>
<td>60.0</td>
<td>60.9</td>
<td>58.3</td>
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<tr>
<td><strong>B. Total of Belgian credit institutions</strong></td>
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<td></td>
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<tr>
<td>Balance sheet total (in € billion)</td>
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<td>1 369.3</td>
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<td>1 147.3</td>
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<td>996.3</td>
<td>970.3</td>
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<tr>
<td>Customers’ holdings (in € billion)</td>
<td>570.1</td>
<td>622.1</td>
<td>715.7</td>
<td>761.6</td>
<td>681.8</td>
<td>691.9</td>
<td>636.7</td>
<td>615.2</td>
<td>620.4</td>
<td>622.1</td>
<td>659.1</td>
<td>676.0</td>
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<tr>
<td>Loans and advances to customers (in € billion)</td>
<td>482.9</td>
<td>591.3</td>
<td>591.0</td>
<td>666.2</td>
<td>556.5</td>
<td>536.5</td>
<td>506.6</td>
<td>509.4</td>
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<td>Risk asset ratio (in %)(2)</td>
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<td>11.9</td>
<td>11.2</td>
<td>17.3</td>
<td>19.3</td>
<td>18.5</td>
<td>18.2</td>
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<tr>
<td>Net after tax results (in € billion)</td>
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<td>6.6</td>
<td>9.7</td>
<td>6.7</td>
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<td>Return on average equity (in %)(2)</td>
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<tr>
<td>Cost-income ratio (in %)</td>
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<td>72.6</td>
<td>54.4</td>
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<td>85.6</td>
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<td>72.1</td>
<td>60.8</td>
<td>61.2</td>
<td>58.6</td>
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</tbody>
</table>

Source: NBB.

(1) Since 2006, the data are based on the new IAS/IFRS prudential reporting scheme. This has led to a methodological break in the time series shown in this table, affecting in particular the level of the cost-income ratio (due to a reclassification of commission expenses), the average yield on assets, the average cost of funding and the interest margin.

(2) Only for credit institutions governed by Belgian law.
### TABLE 3  NUMBER OF INSURANCE COMPANIES

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<tr>
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<tbody>
<tr>
<td><strong>A. By the location of their registered office</strong></td>
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<td>45</td>
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<td><strong>B. By specialisation (5)</strong></td>
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<td>71</td>
</tr>
<tr>
<td>Life and non-life insurance</td>
<td>22</td>
<td>24</td>
<td>25</td>
<td>26</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>24</td>
</tr>
<tr>
<td>Total</td>
<td>151</td>
<td>147</td>
<td>145</td>
<td>142</td>
<td>133</td>
<td>129</td>
<td>127</td>
<td>116</td>
</tr>
</tbody>
</table>

Source: NBB.

(1) Companies with their registered office in Belgium comprise the Belgian subsidiaries of foreign companies.
(2) Belgian branches of companies with their registered office in another E.E.A. country.
(3) Belgian branches of companies with their registered office outside the E.E.A.
(4) Provision of insurance services without an establishment in Belgium.
(5) Including the Belgian branches of foreign insurance companies.
<table>
<thead>
<tr>
<th>TABLE 4</th>
<th>MAIN COMPONENTS OF INSURANCE COMPANIES’ ASSETS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(data on a company basis, in € billion)</td>
</tr>
<tr>
<td>Investments</td>
<td>202.7</td>
</tr>
<tr>
<td>All activities with the exception of class 23</td>
<td>184.6</td>
</tr>
<tr>
<td>Shares (1)</td>
<td>13.4</td>
</tr>
<tr>
<td>Debt securities</td>
<td>136.6</td>
</tr>
<tr>
<td>Land and buildings</td>
<td>3.1</td>
</tr>
<tr>
<td>Mortgage loans</td>
<td>5.4</td>
</tr>
<tr>
<td>Investments in affiliated undertakings</td>
<td>15.7</td>
</tr>
<tr>
<td>Other</td>
<td>10.5</td>
</tr>
<tr>
<td>Class 23</td>
<td>18.1</td>
</tr>
<tr>
<td>Shares (1)</td>
<td>13.6</td>
</tr>
<tr>
<td>Debt securities</td>
<td>4.2</td>
</tr>
<tr>
<td>Other</td>
<td>0.3</td>
</tr>
<tr>
<td>Reinsured part of technical provisions</td>
<td>7.0</td>
</tr>
<tr>
<td>Claims and other assets</td>
<td>14.1</td>
</tr>
<tr>
<td>Total</td>
<td>223.8</td>
</tr>
</tbody>
</table>

Source: NBB.
(1) Including shares in UCITS.
<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Own funds</td>
<td>14.2</td>
<td>14.5</td>
<td>14.6</td>
<td>13.7</td>
<td>13.7</td>
<td>13.7</td>
<td>14.9</td>
<td>14.4</td>
</tr>
<tr>
<td>Technical provisions</td>
<td>188.0</td>
<td>198.5</td>
<td>211.0</td>
<td>218.3</td>
<td>226.6</td>
<td>231.6</td>
<td>240.1</td>
<td>242.6</td>
</tr>
<tr>
<td>Life insurance (with the exception of class 23)</td>
<td>139.4</td>
<td>149.2</td>
<td>160.4</td>
<td>167.7</td>
<td>170.9</td>
<td>172.6</td>
<td>175.4</td>
<td>175.3</td>
</tr>
<tr>
<td>Class 23</td>
<td>18.2</td>
<td>19.2</td>
<td>19.6</td>
<td>18.7</td>
<td>23.7</td>
<td>26.2</td>
<td>28.7</td>
<td>30.5</td>
</tr>
<tr>
<td>Non-life insurance</td>
<td>24.8</td>
<td>24.2</td>
<td>24.9</td>
<td>25.9</td>
<td>25.4</td>
<td>25.8</td>
<td>28.1</td>
<td>28.5</td>
</tr>
<tr>
<td>Others</td>
<td>5.5</td>
<td>5.9</td>
<td>6.1</td>
<td>6.0</td>
<td>6.6</td>
<td>7.0</td>
<td>7.9</td>
<td>8.3</td>
</tr>
<tr>
<td>Reinsurance companies' deposits</td>
<td>4.8</td>
<td>4.7</td>
<td>4.9</td>
<td>5.1</td>
<td>5.3</td>
<td>4.3</td>
<td>3.9</td>
<td>6.4</td>
</tr>
<tr>
<td>Creditors' claims</td>
<td>14.5</td>
<td>14.3</td>
<td>15.5</td>
<td>16.7</td>
<td>16.3</td>
<td>18.6</td>
<td>19.0</td>
<td>20.3</td>
</tr>
<tr>
<td>Other liabilities</td>
<td>2.3</td>
<td>2.5</td>
<td>2.6</td>
<td>2.8</td>
<td>2.7</td>
<td>2.5</td>
<td>2.9</td>
<td>2.6</td>
</tr>
<tr>
<td>Total</td>
<td>223.8</td>
<td>234.4</td>
<td>248.5</td>
<td>256.6</td>
<td>264.5</td>
<td>270.7</td>
<td>280.8</td>
<td>286.1</td>
</tr>
</tbody>
</table>

Source: NBB.
### TABLE 6  COMPONENTS OF THE INCOME STATEMENT OF INSURANCE COMPANIES
(data on a company basis, in € billion, unless otherwise stated)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Technical account in life insurance</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net premiums written</td>
<td>19.5</td>
<td>18.6</td>
<td>19.0</td>
<td>18.4</td>
<td>20.7</td>
<td>15.9</td>
<td>16.0</td>
<td>15.1</td>
</tr>
<tr>
<td>Claims paid (–)</td>
<td>15.3</td>
<td>13.5</td>
<td>12.7</td>
<td>15.5</td>
<td>18.4</td>
<td>18.3</td>
<td>–18.1</td>
<td>–19.7</td>
</tr>
<tr>
<td>Change in the provisions for claims (–)</td>
<td>2.9</td>
<td>11.5</td>
<td>11.7</td>
<td>6.1</td>
<td>9.0</td>
<td>4.2</td>
<td>–5.6</td>
<td>–2.0</td>
</tr>
<tr>
<td>Premiums after insurance costs</td>
<td>1.3</td>
<td>–6.5</td>
<td>–5.5</td>
<td>–3.2</td>
<td>–6.6</td>
<td>–6.6</td>
<td>–7.7</td>
<td>–6.6</td>
</tr>
<tr>
<td>Net operating expenses (–)</td>
<td>1.6</td>
<td>1.6</td>
<td>1.6</td>
<td>1.7</td>
<td>1.7</td>
<td>1.6</td>
<td>–1.6</td>
<td>–1.7</td>
</tr>
<tr>
<td>Result before investment income</td>
<td>–0.3</td>
<td>–8.0</td>
<td>–7.1</td>
<td>–4.8</td>
<td>–8.3</td>
<td>–8.2</td>
<td>–9.3</td>
<td>–8.3</td>
</tr>
<tr>
<td>Net investment income</td>
<td>–3.4</td>
<td>8.8</td>
<td>7.8</td>
<td>4.0</td>
<td>9.5</td>
<td>8.9</td>
<td>10.0</td>
<td>8.5</td>
</tr>
<tr>
<td>Technical result life insurance</td>
<td>–3.7</td>
<td>0.7</td>
<td>0.8</td>
<td>–0.7</td>
<td>1.2</td>
<td>0.6</td>
<td>0.7</td>
<td>0.2</td>
</tr>
<tr>
<td><strong>B. Technical account in non-life insurance</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net premiums written</td>
<td>9.7</td>
<td>9.2</td>
<td>9.5</td>
<td>10.4</td>
<td>10.8</td>
<td>11.1</td>
<td>12.3</td>
<td>12.7</td>
</tr>
<tr>
<td>Claims paid (–)</td>
<td>6.5</td>
<td>6.6</td>
<td>6.8</td>
<td>7.2</td>
<td>7.2</td>
<td>7.3</td>
<td>–8.1</td>
<td>–8.0</td>
</tr>
<tr>
<td>Change in the provisions for claims (–)</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
<td>0.1</td>
<td>0.6</td>
<td>0.7</td>
<td>–0.5</td>
<td>–0.7</td>
</tr>
<tr>
<td>Premiums after insurance costs</td>
<td>2.8</td>
<td>2.2</td>
<td>2.3</td>
<td>3.1</td>
<td>3.0</td>
<td>3.2</td>
<td>3.8</td>
<td>4.0</td>
</tr>
<tr>
<td>Net operating expenses (–)</td>
<td>2.8</td>
<td>2.6</td>
<td>2.7</td>
<td>3.0</td>
<td>3.1</td>
<td>3.2</td>
<td>–3.6</td>
<td>–3.7</td>
</tr>
<tr>
<td>Result before investment income</td>
<td>0.0</td>
<td>–0.4</td>
<td>–0.4</td>
<td>0.1</td>
<td>–0.1</td>
<td>–0.1</td>
<td>0.2</td>
<td>0.3</td>
</tr>
<tr>
<td>Net investment income</td>
<td>0.2</td>
<td>1.0</td>
<td>1.2</td>
<td>0.8</td>
<td>1.1</td>
<td>1.2</td>
<td>1.3</td>
<td>1.3</td>
</tr>
<tr>
<td>Technical result non-life insurance</td>
<td>0.2</td>
<td>0.7</td>
<td>0.7</td>
<td>0.9</td>
<td>1.0</td>
<td>1.2</td>
<td>1.5</td>
<td>1.6</td>
</tr>
<tr>
<td><strong>C. Non-technical account</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total technical result life and non-life insurance</td>
<td>–3.5</td>
<td>1.4</td>
<td>1.5</td>
<td>0.2</td>
<td>2.3</td>
<td>1.8</td>
<td>2.1</td>
<td>1.8</td>
</tr>
<tr>
<td>Residual net investment income</td>
<td>0.3</td>
<td>–0.7</td>
<td>0.2</td>
<td>–0.9</td>
<td>0.9</td>
<td>0.3</td>
<td>0.4</td>
<td>0.3</td>
</tr>
<tr>
<td>Other and exceptional results and taxes</td>
<td>–0.7</td>
<td>0.2</td>
<td>–0.3</td>
<td>–0.2</td>
<td>–0.7</td>
<td>–0.7</td>
<td>–1.2</td>
<td>–0.9</td>
</tr>
<tr>
<td>Net result</td>
<td>–3.9</td>
<td>0.9</td>
<td>1.4</td>
<td>–0.9</td>
<td>2.4</td>
<td>1.4</td>
<td>1.3</td>
<td>1.2</td>
</tr>
<tr>
<td>p.m. Return on equity (in %)</td>
<td>–27.3</td>
<td>6.3</td>
<td>9.7</td>
<td>–6.7</td>
<td>17.8</td>
<td>10.2</td>
<td>8.8</td>
<td>8.2</td>
</tr>
</tbody>
</table>

Source: NBB.
# TABLE 7  COMPOSITION OF INSURANCE COMPANIES' COVERING ASSETS FOR ALL TYPES OF ACTIVITIES
(data on a company basis, in % of total covering assets, unless otherwise stated)

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bonds</td>
<td>66.2</td>
<td>69.0</td>
<td>70.4</td>
<td>73.0</td>
<td>72.8</td>
<td>70.1</td>
<td>68.1</td>
<td>68.2</td>
</tr>
<tr>
<td>Equities</td>
<td>7.7</td>
<td>6.6</td>
<td>6.1</td>
<td>4.8</td>
<td>4.2</td>
<td>5.0</td>
<td>5.0</td>
<td>5.1</td>
</tr>
<tr>
<td>Real estate</td>
<td>1.6</td>
<td>1.7</td>
<td>1.7</td>
<td>1.7</td>
<td>1.7</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Loans</td>
<td>2.8</td>
<td>2.6</td>
<td>2.7</td>
<td>3.3</td>
<td>4.7</td>
<td>6.0</td>
<td>6.5</td>
<td>6.6</td>
</tr>
<tr>
<td>UCITS</td>
<td>12.5</td>
<td>12.1</td>
<td>11.3</td>
<td>9.9</td>
<td>9.6</td>
<td>10.4</td>
<td>11.5</td>
<td>11.5</td>
</tr>
<tr>
<td>Others</td>
<td>9.2</td>
<td>8.0</td>
<td>7.8</td>
<td>7.3</td>
<td>7.0</td>
<td>7.0</td>
<td>7.3</td>
<td>7.3</td>
</tr>
<tr>
<td>Total (in € billion)</td>
<td>196.5</td>
<td>210.8</td>
<td>221.3</td>
<td>225.5</td>
<td>236.8</td>
<td>240.5</td>
<td>250.2</td>
<td>249.9</td>
</tr>
</tbody>
</table>

Source: NBB.
Thematic Articles
Review and assessment of recent developments in the Belgian mortgage market

Introduction

This article reviews and assesses recent developments in the Belgian mortgage market, providing an update of similar analyses that appeared in the Financial Stability Reviews 2012 and 2014.

The first section describes the most recent developments in the household sector’s mortgage debt and in banks’ credit standards. The analysis is in part based on data from a quantitative survey of 14 Belgian banks’ domestic mortgage loan portfolios that was also used for the 2012 and 2014 analyses. In this semi-annual collection of information, banks have to report figures with end-June and end-December reference dates for various portfolio characteristics, in terms of both their outstanding stock of Belgian mortgage loans and their new business volumes. Moreover, banks have to report data on the corresponding minimum regulatory capital requirements once a year for their year-end position. This article includes the latest available information from this survey, which pertains to the situation as at the end of 2015.

The second section focuses on credit quality and on Belgian banks’ capital buffers for domestic mortgage loans and concludes with a summary of the Bank’s risk assessment and policy stance. In this connection, it can be reminded that the 2012 FSR article had already concluded that more vigilance was required from banks and authorities alike to ensure the continuous application of sufficiently conservative credit standards and adequate risk-pricing in all new mortgage loans. This was followed by the Bank’s decision, at the end of 2013, to implement three prudential measures. The objective of these measures was to strengthen banks’ resilience and to reduce the concentration risks associated with regulatory capital risk weights that could be too low for losses that may emerge in less favourable market circumstances from the materialisation of risks in certain sub-segments of banks’ Belgian mortgage loan portfolios. These three measures were presented in detail in the 2014 FSR article and are revisited in section 2 of this article.

1. Review of recent market developments and credit standards at origination

Over the last fifteen years, the Belgian household sector’s mortgage debt has almost tripled, rising from € 68.4 billion at the end of 2000 to € 197.9 billion at the end of 2015. Being mainly attributable to mortgage loans, the household gross debt ratio shows an almost uninterrupted upward trend over these years reaching 59.5 % of GDP at the end of 2015, as shown in the left-hand panel of Chart 1. This trend differs from the (slight) deleveraging observed for the average euro area household debt ratio, which has brought it down gradually from 63.6 % of GDP in 2010 to 59.1 % of GDP in 2015. In some euro area countries, high household debt levels were part of the major imbalances that triggered financial crises in these countries and these are now being reduced. The gap between the ratios for Belgium and the euro area
has thus been narrowing steadily over the past few years and the Belgian household gross debt ratio has recently, for the very first time, even slightly exceeded the euro area ratio.

When debt levels are compared to assets owned, Belgian households show an overall better financial position than their euro area peers as their debt is better covered by their total assets as well as their financial assets (right-hand panel of Chart 1). Moreover, the growth of wealth among Belgian households seems to have paralleled their rising debt level, which has resulted in a fairly stable debt-to-assets ratio of around 20% over the past few years. However, due to the rising debt levels in Belgium, gaps between Belgian and euro area households are becoming smaller here as well.

Based on 2010 data provided by the Eurosystem’s Household Finance and Consumption Survey (HFCS), it is possible to analyse the distribution of (mortgage) debt and assets between households in more detail (Chart 2). The chart provides information on two variables to measure the ability of households to service their mortgage debt. First, the debt-service-to-income ratio (DSti) is calculated to reflect the proportion of a household’s monthly income needed to meet the scheduled mortgage loan repayment for that month. In addition, the liquid-assets-to-debt-service ratio (LatDS) links this monthly mortgage debt servicing to households’ liquid financial assets, indicating how many months of its scheduled mortgage loan repayments a household could finance from those financial assets. Breaking down Belgian mortgage debt into different parts according to these two dimensions leads to the conclusion that mortgage debt and liquid financial assets are unequally distributed within the population. Of those households that can continue to meet their debt commitments for more than six months relying on their liquid financial assets only (for instance, having suddenly lost their income), a large majority has to reserve only a small fraction of their monthly income for mortgage repayment. On the contrary, households with high DSti ratios (> 40%) seem to have a less favourable wealth position, given that their LatDS ratio is more often less than six months. It would therefore appear that liquid assets in Belgium are mostly held by households without mortgages and by those indebted households that have relatively little trouble repaying their debt from their household income, while a significant proportion of mortgaged households spend a large part of their household income on repayments and have few liquid financial reserves to make up for any temporary loss of income.
The HFCS data also enable a comparison with corresponding data for the euro area countries taken together. Judged by income-related debt ratios, Belgium’s most vulnerable categories account for a larger share of the total mortgage debt stock, with 18.2% of debt being concentrated among households that spend over 40% of their income on debt repayments. The comparable figure for the euro area is 14.9%. This relatively weaker position of Belgian households could be due to some structural features of the Belgian housing market, where households typically take out their first mortgages at a relatively young age when their income still has growth potential, and mortgages tend to have shorter maturities as well as (full) capital amortisation instead of interest-only repayments. On the other hand, regarding the amount of liquid assets, Belgian households seem comparatively better placed than their euro area peers. In Chart 2, it can be seen that 30.8% of mortgage debt in Belgium is owed by households with liquid assets that are insufficient to finance six months of debt service, while this percentage is running at 53.8% in the euro area. Moreover, 14.9% of total Belgian outstanding mortgage debt is completely covered by liquid assets, whereas the figure is only 8.9% for the euro area. Though the latter indicates the overall sustainability of household debt in Belgium, the large mismatch between indebted households and those holding financial assets could entail financial vulnerabilities for specific groups of Belgian households, constituting so-called “pockets of risk”.

The past 15 years have been characterised by strong growth of the Belgian household sector’s mortgage debt (Chart 3). This has followed from a rise in the number of mortgage loans as well as from an increase in the average amount of new mortgage loans and from a decline in the rate of amortisation of the outstanding stock (due inter alia to rising average loan maturities).

The Central Credit Register – which has information on all outstanding household loans in Belgium back to the beginning of 2007 – shows that the number of mortgage loans in Belgium has risen from less than 2.2 million contracts in 2007...
to almost 2.9 million since the last quarter of 2015 (left-hand panel of Chart 3). This continuous increase in the number of mortgage loans is closely related to the rising number of housing sales in recent years, which reached historically high levels in 2014 and 2015. The sharp increase in the number of transactions in the last quarter of 2014 – owing to anticipation of the tax regime change in Flanders, curbing mortgage tax relief from 1 January 2015 – does appear to have spilled over to the following year due to the low interest rate environment that has continued to boost the number of property transactions. Borrowers anticipating stricter conditions for reduced VAT rates on house renovation (as from 2016) as well as impending changes to the tax treatment of mortgage loans in the Walloon (2016) and Brussels (2017) Regions may also have brought forward a number of planned real estate transactions to 2015 (and 2016). Notwithstanding an already high level in 2014, Belgian notaries thus recorded again very high levels of real estate transactions in 2015 and the first quarter of 2016.

The very dynamic housing market also contributed to a further increase in the stock of banks’ mortgage loans measured in billion euros (right-hand panel of Chart 3). Since the final quarter of 2014, the year-to-year growth rate of this portfolio has amounted to around 5%, up from less than 3% in the first half of 2014. The stock of mortgage loans granted by Belgian banks to Belgian households thus grew from €167.3 billion at the beginning of the last quarter of 2014 to €178.3 billion by the end of February 2016. During this period, a great number of Belgian households also decided to refinance their mortgage loans (see below for more details).

The strong expansion of mortgage debt over the past 15 years occurred during a period of sharp house price rises. In Belgium, nominal property prices have more than doubled since the beginning of the century, continuing an upward movement without any sharp correction that has characterised developments since 1970 (left-hand panel of Chart 4). In fact, compared to other euro area countries, nominal property prices in Belgium suffered smaller and less persistent declines during the financial crisis, even though their growth slowed down to a very moderate pace in 2014 (0.6%). While the tax reform in the Flemish Region was expected to keep a lid on price developments in 2015 – given the big cut in the tax abatement and the share of this Region in the number of transactions in the secondary market –, the available 2015 data point to a new pick-up in growth, with house prices rising by around 4% on average during the year. It is not clear to what extent this further increase in the average house price in secondary market transactions could be related to the growing attractiveness of real estate as an investment asset in the current very low interest rate environment. Heavy losses on financial assets during the financial crisis and tax regularisation measures that favoured reinvestment of...
repatriated capital in some types of assets (including Belgian real estate) had already enhanced the relative attraction of real estate as an investment asset for households a few years ago.

A wider shift of households’ financial savings to Belgian residential real estate assets is one explanation for the growing divergence between, on the one hand, the average size of new mortgages that are used to finance the purchase of an existing house or apartment and, on the other hand, the average composite housing price, calculated as the volume-weighted average of the sales prices of small and medium-sized houses, large houses and apartments (right-hand panel of Chart 4). Indeed, this shift of investment money tends to push up property prices while bringing down the average mortgage loan size as such properties are to a greater extent financed from own funds. In similar vein, the extra flexibility and lower tax rate for gifts and donations probably also stimulated additional inter-generational transfers of financial resources in the context of home purchases, lowering the average loan-to-value ratio, all other things being equal. Between 1996 and 2006, the average composite housing price and the average mortgage loan size followed a fairly similar pattern, resulting in a loan-to-value ratio (the ratio between the two) of around 80%. Since 2006, however, the two aggregates have increasingly diverged as the average mortgage increased by an additional 15% to €140 000 in 2014, while the composite house price has risen by 30% to €223 000. As a result, the associated loan-to-value ratio dropped to 65% (and even below that) in the years 2007-2014.

This average loan-to-value ratio nevertheless has to be interpreted with caution, as the data collected from the 14 participating credit institutions confirm that it is the result of a very wide distribution of loan-to-value ratios at origination. As shown in the right-hand panel of Chart 5, banks are actually still granting significant volumes of new mortgage loans with high LTV ratios. In part, this relates to the increase in house prices on the Belgian property market, which forced households with limited own funds to have recourse to high(er)-LTV loans to access the residential property market. More recently, it might also be due to households feeling encouraged to take out relatively larger loans in a low interest rate environment. Yet, the important share of high-LTV loans is also a reflection of banks’ lending policies, which could be tightened to discourage the production of such loans. For the 2015 vintage, 30% of the volume of new mortgage loans was still made up of loans with an LTV ratio above 90%.

There has been a gradual reduction in the share of new loans carrying the highest LTV ratios (> 100%) over the past 7 years, but it should be recalled that the large volume of refinanced loans in recent years has positively affected these
LTV vintage figures, given that remortgages are often classified as new loans by banks with their LTV levels being updated. The loan amount or the ratio numerator of such refinanced loans is typically lower than the original amount since most Belgian mortgage loans have capital repayments over the duration of the contract, while at the same time the collateral value or denominator of the ratio often turns out higher than at the time the loan was granted keeping in mind the persistent increase of property prices in Belgium. Partial data collected from banks where loans used for refinancing are excluded from the vintage figures shown in the right-hand panel of Chart 5 thus tend to show even higher shares in new production of loans with an LTV of more than 90%. These data without refinanced loans also suggest no further improvement in LTV standards during the year under review as compared to 2014. This slowdown in the reduction of high-LTV loans in new production is a point of particular interest given the still sizeable market share of loans with an original LTV of more than 90% in new production.

While refinancing transactions distort the statistics on LTV at origination, the indexed loan-to-value ratio – that takes into account loan amortisations and developments in collateral value for all loans – could offer a cleaner picture of the LTV-related riskiness of Belgian banks’ domestic mortgage loan portfolios. Loans with an indexed LTV higher than 90% accounted for 16.5% (or €28.8 billion) of the total outstanding stock at the end of 2015. At the end of 2014, the share of these loans came to 15.3%. Loans with an indexed LTV above 100% account for 4.4% of the total, meaning that almost 8 billion of mortgage debt is currently not entirely covered by the current (market) value of the collateral provided (left-hand panel of Chart 6). Assessing this, one should bear in mind that the amount of mortgage debt used to calculate indexed LTV captures the amount of capital that still needs to be repaid (thus not including the capital already repaid since origination). In Belgium, to a greater extent than in some other euro area countries, mortgage loans are characterised by both interest and capital repayments (typically in the form of annuities with monthly reimbursement of capital) over their maturity. At the end of 2015, such loans accounted for 97% of the total outstanding stock (right-hand panel of Chart 6). Loans that have no capital repayments before their final maturity (so-called “bullet” loans) account for a very small share of the stock (only €6 billion of Belgian mortgage debt, of which €2.3 billion are bridge loans).

Chart 7 provides a breakdown of the stock and vintages according to the original maturity of the mortgage loan. It can be seen from the figures that, since 2007, banks have continued to tighten customers’ access to mortgage loans with long maturities. The percentage of loans granted with a maturity of more than 25 years has plummeted from 23%
### Chart 6

**Breakdown of the Outstanding Mortgage Loan Stock According to Indexed Loan-to-Value Ratios and Amortisation Type**

(in % of total loan stock, at the end of 2015)

<table>
<thead>
<tr>
<th>Indexed LTV</th>
<th>Loans with regular capital repayments</th>
<th>Bridge loans</th>
<th>Other bullet loans</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 80 %</td>
<td>70.8 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>80 %; 90 %</td>
<td>12.2 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>90 %; 100 %</td>
<td>11.3 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 %; 110 %</td>
<td>1.8 %</td>
<td>1.4 %</td>
<td></td>
</tr>
<tr>
<td>&gt; 110 %</td>
<td>2.6 %</td>
<td>2.1 %</td>
<td></td>
</tr>
</tbody>
</table>

Not available

Source: NBB.

(1) Indexed LTV ratios are calculated as the ratio between the amount of the mortgage loan outstanding at reporting date (taking repayments of capital into account) and the assessed market value of the property.

### Chart 7

**Maturities at Origination**

(in % of total loans at the end of the year or total loans granted during a particular vintage)

Source: NBB.
in 2007 production volumes to only 2% in 2015. At the same time, the share of loans with a maturity between 20 and 25 years in mortgage loan vintages remained relatively stable while the share of loans with a maturity between 15 and 20 years clearly increased. These trends seem to have influenced the average maturity level of total outstanding stock as from 2013; by the end of 2015, 11% was associated with initial maturities above 25 years, down from 20% in 2012. Yet, here again, refinanced loans tend to positively bias results since their maturity is often updated at the time of refinancing and is therefore smaller than the maturity of the original loan. This is especially true for the 2014 and 2015 vintages, when there was a huge volume of loan refinancing.

As the average duration of mortgage contracts shortens, higher debt-service-to-income ratios might be expected since it can be argued that, on average, capital amounts will have to be reimbursed within a shorter time span. However, the available data do not suggest that the lower availability of longer mortgage loan maturities, especially from 2012 on, contributed to concurrent upward pressure on the debt-service-to-income ratios for borrowers at the time of the origination of their mortgages (Chart 8). This suggests that banks have become more selective in their credit origination policies since 2012. Yet, the most recent vintage figures have to be interpreted with caution in this regard, as the 2014 and 2015 data for new production volumes include large amounts of refinanced loans. All other things being equal, this inclusion of remortgages should generally improve the reported distribution for DSTI levels, as the loans replacing the refinanced loans should have lower monthly debt payments (because of the reduced interest rate) and possibly higher debtor incomes (which on average increase over time) as well. For the real new loans of the vintage, the further decline in mortgage loan rates in 2015 should also have had a positive impact on the recorded DSTI levels.

Notwithstanding these elements that could have influenced positively the mortgage loan DSTIs included in the 2014 and 2015 vintages, the reported data show that Belgian banks continued to produce a high amount of new loans where borrowers have to reserve 50% or more of their (disposable) income for paying interest and repaying capital on their mortgage loan (as assessed at the time of origination). In both vintages, the share of these loans in new production amounted to around 20%, and no further improvement was recorded in 2015.

Changes in debt service levels after origination can be the result of revisions of mortgage interest rates in those contracts for which the rate has not been fixed for the whole maturity of the contract. Indeed, borrowers who have chosen variable-rate contracts see their DSTI levels decline when interest rates fall and, conversely, are confronted with upward pressures on their monthly debt burden when interest rates rise. Yet, Belgian mortgage credit law imposes strict limits
on the maximum interest rate variability that lenders are allowed to pass on to mortgage borrowers: the rate charged to borrowers, reviewed on the basis of the monthly average yields on Belgian government bonds, may never exceed a level that is twice the initial client rate. Moreover, the law and the banks’ commercial policies have resulted in a standard practice for variable-rate mortgage loans to have a cumulative cap of 1, 2 and 3 % respectively on the upward or downward adjustment that can take place in the first, second and subsequent years of the loan.

The share of variable-rate contracts within the stock of Belgian mortgage debt has been falling for several years now, as a result of the low interest rate environment encouraging borrowers to opt for fixed-rate contracts in their desire to lock in the current low rates. By the end of 2015, 65 % of the total Belgian mortgage loan pool had an interest rate fixed for the whole maturity of the contract (left-hand panel of Chart 9), which was not only the result of a growing share of new loans carrying fixed interest rates, but also of refinanced loans in which customers given the current environment typically prefer a new fixed rate for the remaining maturity of their loan. This development affected large parts of the stock, especially from the second half of 2014. As a consequence, of the newly granted loans – which also include refinanced loans that are classified as new loans – respectively 76 % and 83 % of the 2014 and 2015 vintages consisted of fixed-rate contracts (right-hand panel of Chart 9).

Of the falling share of mortgage loans having some form of interest rate variability, slightly more than 14 % of the stock at the end of 2015 is scheduled to be repriced in the course of 2016 (left-hand panel of Chart 9). In this connection, it should be recalled that the Belgian mortgage loan regulations forbid mortgage loans for which the interest rate is fixed for less than 1 year.

Client rates for new mortgage loans reached historically low levels in 2015 and early 2016, with long- and short-term rates dropping from respectively 3.8 % and 3.1 % at the beginning of 2014 to 2.4 % and 2.2 % in February 2016 (left-hand panel of Chart 10). This chart also includes an indication of the volume of loan refinancing that has taken place in recent years, albeit only for the mortgage loans refinanced externally. Estimates including as well the amount of internally refinanced loans indicate that, overall, no less than one-third of the total stock of mortgage loans was refinanced between the second half of 2014 and the end of 2015. Belgian mortgage loan regulations stipulate that the maximum financial penalty for early redemption by borrowers is three months’ interest due on the remaining capital outstanding.
Therefore, borrowers often opt for early redemption for the purpose of refinancing their loans at lower interest rates when rates on new mortgages fall below the yield on historical contracts. Consequently monthly mortgage refinancing volumes are very sensitive to the level of interest rates on new mortgages, as attested again by the developments in 2014 and 2015. The low interest rates on new mortgage contracts also clearly affect the average interest rates on the outstanding stock of mortgage loans, which are shown in the right-hand panel of Chart 10. Falling below 3 % as from the end of 2014, the long- and short-term interest rates on Belgian banks’ domestic mortgage loans are at historically low levels. Data from the semi-annual survey on Belgian banks’ mortgage loan portfolios suggest that, within the outstanding stock, there has been a major shift towards loans within the interest rate bucket of between 2 % and 3 %, reducing the share of loans in the higher buckets.

**CHART 10**
MORTGAGE LOAN INTEREST RATES
(in %, unless otherwise stated)

Source: NBB.
(1) Initial rate fixed for at least 10 years.
(2) Only for loans refinanced externally.
(3) Rate fixed for more than five years.

2. Credit quality, Basel parameters and prudential measures

So far, aggregate indicators do not point to any worsening of Belgian households’ mortgage credit quality. In the left-hand panel of Chart 11, it can be seen that mortgage credit quality has in fact been generally improving since 2007, since the share of loans defaulting within a certain time period after origination is, in most cases, smaller for loans that are granted in later vintages. For example, the share of loans granted in 2007 which defaulted within 2 years (M+24) after origination, amounts to 2 %, while that default rate is only 1 % for loans originated in 2013. It could be concluded from this development that there has been no sign of any deterioration in households’ credit quality so far. However, it should be noted that defaulted loans seem to take more time to cure or are more difficult to cure for the most recent default vintages (right-hand panel of Chart 11). Whereas, as an example, around 42 % of defaulted loans in 2007 had regularised payments by the third month after default, this percentage was down to 37 % for loans from the 2010 and 2011 default vintages. As regards loans that defaulted in 2015, the cure rate of loans defaulted 3 months earlier was at 42 % again, indicating that cure rates might be starting to improve again.
In order to maintain the high asset quality of Belgian mortgage loans, it will be important to prevent the further build-up of loan segments that are vulnerable in the case of a major downturn in the real estate market and/or an economic shock affecting the debt repayment capacity of mortgage debtors. For a number of years, the Bank has therefore been closely monitoring the developments in the Belgian residential real estate and mortgage loan market. The assessment of the related risks pointed up the presence of certain sub-segments within the outstanding stock of Belgian banks’ domestic mortgage loan portfolios that combine high levels of risk parameters, such as high loan-to-value ratios, long loan maturities and/or high debt service ratios (Chart 12). Those loan segments could be the source of higher-than-expected credit losses for banks if conditions in the Belgian housing market were to become less buoyant than they have been over the past 15 years.

As part of the Bank’s monitoring framework for risks related to the residential real estate market, particular attention has therefore been devoted to the way in which potential risks associated with mortgage loans were taken into account in calculating the minimum capital requirements for credit risk under the Basel Pillar 1 rules. For this purpose, the data collection on Belgian banks’ mortgage portfolios includes information on the overall risk profile and quality of the residential mortgage portfolios together with the related Basel II risk parameters and risk weights, which is requested each year for the year-end positions. Two methods can be used for calculating minimum capital requirements for mortgage loans granted to retail clients. The first approach, called the standardised approach (SA), applies a risk weight of 35% to the outstanding amount of mortgage loans (that meet certain criteria) for the calculation of the risk-weighted assets (RWA) for credit risk. The second approach, the internal ratings-based (IRB) approach, relies on banks’ internal risk models to calculate the average risk weight to be applied to the mortgage exposures concerned in order to calculate RWA, and is based on important risk drivers such as the probability of default (PD) and loss given default (LGD, i.e. the estimated loss over the total exposure if the borrower defaults).

Since IRB models tend to be used by the larger institutions while smaller banks generally opt for the SA approach, the capital requirements for the bulk of the total outstanding Belgian mortgage debt (i.e. more than 90%) is calculated on the basis of the risk weights in banks’ own internal models. In order to compute these risk weights, Belgian banks calibrate their models on historical credit loss data. These data do not include a crisis period for the historic time span.
considered. Quite on the contrary, as evidenced by an almost continuous rise in prices and mortgage lending, the Belgian residential real estate market enjoyed rather buoyant market conditions during that time. Therefore, the risk weights calculated within those internal risk models are considerably lower than those determined by the SA approach (35%), with an average IRB risk weight of only 10%. As the EU average is 16%, the Belgian average rate is also lower than in most other countries. Nevertheless, institution-specific data show that those risk weights vary widely between the nine Belgian credit institutions using an IRB approach for credit risk. Detailed analysis of those differences prove they are largely attributable to variations in the banks’ risk profiles; the larger the banks’ relative importance of the riskier sub-segments in their domestic mortgage loan portfolio, the higher the amount of defaults in that portfolio, and the higher the risk weights that are calibrated via those banks’ internal models.

In this context, and in view of the relatively large share of domestic mortgage loans in Belgian credit institutions’ balance sheets, the Bank considered it justified to take a prudential measure aimed at strengthening the banks’ resilience and reducing the concentration risk. At the end of 2013, the Bank opted for a flat-rate 5-percentage-point add-on to the risk weights calculated by the banks using an IRB model for the determination of their minimum capital requirement under Pillar 1 for credit risk. This measure took effect with the Royal Decree of 8 December 2013, and, in practice, requires a bank calculating its minimum capital requirement on the basis of, say, a risk weight of 9%, to increase that weight to 14%. As such, by adding a fixed percentage to the risk weight calculated by the bank itself – instead of imposing the same minimum fixed risk weight floor for all banks –, banks’ incentives to maintain sound credit standards in loan origination are not affected by this macroprudential measure. As a result of the introduction of the add-on, the average risk weight of the IRB banks for Belgian mortgage loans effectively went up from around 10% at the end of 2012 to about 15% at the end of 2013 and in the years thereafter. Including this add-on (equivalent to around € 600 million
of additional capital), the total buffer to cover potential losses on Belgian mortgage loans amounts to €2.8 billion, composed of an unexpected loss buffer of €2.3 billion (for both IRB and STA banks) and an IRB expected loss buffer of €0.5 billion. This buffer is a very large multiple of the current loss rate on Belgian mortgage loans, estimated at between €150 and €200 million per year.

The other two measures adopted by the Bank at the end of 2013 were microprudential in nature. One involved launching a horizontal assessment of the IRB models on the basis of the results of the back-testing to be conducted by the institutions, followed by necessary adjustments to those approaches. The other microprudential measure involved requesting credit institutions to carry out a self-assessment of the degree to which each bank conforms to the EBA Opinion on Good Practices for Responsible Mortgage Lending and the EBA Opinion on Good Practices for the Treatment of Borrowers in Mortgage Payment Difficulties.

In 2015, the Bank concluded that the macroprudential 5-percentage-point add-on for IRB banks’ risk weights for mortgage loans still provided an adequate but necessary capital buffer in view of the risks identified. In the final quarter of the year under review, it therefore initiated the necessary procedure for continuing the measure in 2016 and 2017. That extension required the agreement of the competent European institutions in accordance with Article 458 of the Capital Requirements Regulation (CRR), which was obtained in the first quarter of 2016.

Going forward, the Bank will continue to assess how potential vulnerabilities – related to growth rates for house prices and mortgage loans, trends in household debt or banks’ mortgage credit standards – develop and, based on this assessment, regularly evaluate the appropriate level of the macroprudential add-on as well as the potential need for additional measures. As regards the banks’ credit standards, section 1 of this article has shown that banks have tightened up their credit policies since 2012 for the most risky sub-segments of the mortgage loan portfolio, but the data also highlight that they are still producing large volumes of mortgage loans with very high loan-to-value or debt-service ratios. The pockets of risk in the stock of Belgian mortgage loans thus continue to grow. Moreover, the available data on the credit standards applied by banks in new mortgage loan production in 2015 suggest that the tightening of credit standards for the most risky loans may have slowed down (or come to an end) in the course of the year under review if no account is taken of the loans used to refinance a previous loan. Against this background, the Bank stands ready to envisage additional measures to target these high-risk loans should the further reduction in these loans in new production not proceed as strongly and rapidly as might be desired in view of the vulnerabilities that have already accumulated in the existing stock and the earlier recommendations and policy measures announced by the Bank. The Bank’s policy stance on Belgian mortgage loans will also take into account the results of peer analyses being conducted at the level of the European Central Bank and the European Systemic Risk Board for countries with identified potential residential real estate vulnerabilities, including Belgium.
Credit gaps in Belgium: identification, characteristics and lessons for macroprudential policy

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Introduction

The 2007-2008 financial crisis revealed the importance of financial cycles, and more specifically credit cycles, for financial stability and developments in the real economy. Even though several (mostly country-specific) banking or financial crises had already shown the relevance of such credit cycles in the build-up of financial imbalances, it was the recent financial crisis that triggered renewed interest in the impact of credit and financial cycles on economic and financial stability. Since then, a growing literature has confirmed that systemic banking crises are often preceded by credit booms (e.g. Reinhart and Rogoff, 2009; Drehmann et al., 2011; Gourinchas and Obstfeld, 2012; Behn et al., 2013; Laeven and Valencia, 2013; Detken et al., 2014 and Aikman et al., 2015) and that the subsequent credit crunch during the bust phase of the credit cycle tends to cause more severe recessions than those that do not coincide with a financial crisis (e.g. Hutchinson and Noy, 2005; Reinhart and Rogoff, 2009; Drehmann et al., 2012; Jorda et al., 2013).

The renewed interest in financial and credit cycles is not only observed in academia but also among policy bodies and authorities responsible for (macro)prudential policy. In the aftermath of the financial crisis, monitoring credit cycles and addressing the pro-cyclicality of the financial sector moved to the forefront of macroprudential policy. In fact, with the introduction of the Basel III countercyclical capital buffer (CCB), macroprudential policy-makers are endeavouring to strengthen banks’ resilience to cyclical systemic risk. Within the European macroprudential framework, responsibility for activating macroprudential instruments like the CCB lies with the national designated authorities, although the ECB can decide to adopt a more stringent stance and the ESRB can issue warnings and recommendations, subject to a “comply or explain” mechanism (ESRB, 2013). In its capacity as macroprudential authority for Belgium since April 2014, the National Bank of Belgium (NBB) is the responsible authority for monitoring cyclical and systemic risks and, since the beginning of 2016, for setting the CCB rate. The appropriateness of this rate is reviewed each quarter. In January 2016, the NBB introduced a CCB rate of 0% on credit exposures in Belgium, which was confirmed and maintained in the second quarter of 2016 (NBB, 2015 and 2016).

The first experiences with the CCB in Europe show substantial cross-country heterogeneity, both in terms of reported positions in the respective credit cycles (credit gaps) and in operationalising the CCB framework. In this article, we review these experiences, particularly as regards measurement of the credit cycle. In line with the ESRB Recommendation (2014), the credit cycle is among others measured through a credit gap concept, defined as the deviation of the credit-to-GDP...
ratio from its long-term trend. Although this methodology is largely harmonised and the ESRB puts forward a standardised credit gap as a benchmark, countries still have some discretion, in particular on the definition of credit, and are allowed to base their policy decisions on a national preferred credit gap\(^{(1)}\). Credit concepts can be based either on a broad credit definition (standardised concept), covering the funding of the non-financial private sector through both loans and debt securities, or on some narrower concept, covering only bank loans for instance. Initial experience shows that many European countries chose to specify, besides the credit gap based on the standardised approach, an additional credit gap that better accounts for national specificities. Most countries reporting such an additional credit gap use a narrow credit concept closely related to domestic bank lending to the non-financial private sector.

Unlike the business cycle, the analysis of financial and credit cycles is relatively new and a more profound understanding of their characteristics is important for the design of macroprudential policy. Therefore, this article provides an in-depth analysis of the cyclical and early warning properties of alternative credit gaps, focusing on the Belgian experience within the broader European context. First, we present the properties of credit gaps in Belgium, compare them to those of other European countries, and assess the synchronicity of European credit gaps. Similar to the idea that synchronised business cycles are a prerequisite for a common monetary policy (as argued for instance in Angeloni and Dedola, 1999, and Mink et al., 2007), the co-movements of credit cycles (credit gaps) may determine the optimal macroprudential policy design, i.e. the extent to which macroprudential policy is used to target country- and/or sector-specific developments (e.g. households versus non-financial corporations). Second, we analyse the properties of domestic and foreign credit gaps for providing early warning of banking crises. While there is a wealth of literature illustrating the early warning properties of the credit gap (e.g. Borio and Lowe, 2002; Drehmann et al., 2011; Behn et al., 2013 and Detken et al., 2014), a smaller set of research investigates the (lack of) synchronicity of credit cycles in Europe (e.g. Aikman et al., 2015; Meller and Metiu, 2015; and Samarina et al., 2015). We contribute to this empirical literature by illustrating the cyclical and early warning properties of both the standardised and narrow credit gaps currently used for calibrating the CCB rate and by drawing some lessons for macroprudential policy-makers in monitoring risks stemming from the credit cycle.

The remainder of this article is organised as follows. Section 1 reviews the initial experience with the implementation of the CCB in Belgium and Europe. More specifically, we present the broad and narrow credit gaps for Belgium and compare the current positions of different countries in their respective credit cycles. Section 2 focuses on the cyclical characteristics of credit gaps, i.e. their ability to capture the credit cycle, their lead/lag behaviour with respect to real GDP and their co-movement across countries. In line with the above-mentioned literature, we find little evidence of strong synchronicity (in particular for Belgium) which confirms the national implementation of macroprudential policy in Europe. However, as shown in Section 3, the lack of synchronicity does not warrant a macroprudential policy focusing solely on national developments as foreign credit gaps (not necessarily synchronised with domestic ones) have strong signalling power for banking crises (given the extensive interconnectedness of the financial sector). We conclude with some potential implications for macroprudential policy, and in particular for the operationalisation of the CCB in Europe.

1. Credit gaps in practice: measurement and first experiences in Europe

Measuring credit cycles is no easy task since they are not directly observable. Macroprudential policies in practice thus need to rely on proxies to assess cyclical systemic risk implying some model choices and uncertainty.

As part of the CCB setting, credit cycles are mainly proxied by credit gaps, calculated as the deviation of the credit-to-GDP ratio from its trend following the BCBS guidance (2010) and the ESRB Recommendation (2014). For the trend/cycle decomposition, the ESRB relies on a statistical tool: a one-sided Hodrick-Prescott (HP) filter. While the procedure for estimating the credit gap is largely harmonised, individual countries have some discretion over the credit concept used. Besides a broad (standardised) credit concept put forward by the ESRB, countries are allowed to use a narrower credit concept to account for national specificities. In the case of Belgium, in line with the ESRB recommendation, a standardised credit gap is notified to the ESRB, while an additional (preferred) credit gap, including only bank loans, is used as benchmark in the context of the CCB decision framework which also includes a wide variety of additional variables.

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\(^{(1)}\) While the credit gap serves as a guide for setting the CCB rate, the authorities also have the discretion to include in their decision any other variable that is deemed relevant for their risk assessment and judgement. A list of key indicators used by the NBB is included in each quarterly communication on the CCB.
In this section, we illustrate the ESRB methodology for evaluating credit cycles through the computation of credit gaps and present the two credit concepts used in Belgium. We show that the extracted credit gap dynamics are influenced by the properties of the statistical filter as well as by the credit definitions. We review the practices in other European countries and compare the current positions of the different countries in their respective credit cycle on the basis of their credit gaps reported to the ESRB.

1.1 Credit gaps as proxies for credit cycles: the ESRB methodology

Although there is no generally accepted formal definition, the credit cycle can be seen as a broad-based (cyclical) dynamic in lending to the non-financial private sector. In this sense, the credit cycle differs from both the financial cycle and the business cycle. The credit cycle is a more precise concept than the financial cycle, which focuses mainly on the cyclical (endogenous) interactions between prices and volumes of credit on the one hand and financial and real assets (in particular real estate) on the other. The credit cycle also differs from the business cycle as the latter focuses more on the co-movement of real economic variables.

The term “credit cycle” itself is a misnomer in the sense that there is no unique periodicity (length of the cycle) at which the credit cycle operates. Instead, as is the case for business cycles, credit cycles could be interpreted as a combination of a multitude of cycles of different periodicities driving credit dynamics (representing different types of factors ranging from economic factors to financial innovation and (de)regulation). The specific weight of the respective cycles in the overall credit cycle can differ across countries and potentially also across time.

Despite the substantial heterogeneity in the credit cycles across countries, several characteristics of the credit cycle have been identified in the literature. Drawing on a large dataset spanning more than 100 years for 12 countries, Haldane (2010) and Aikman et al. (2015), for instance, conclude that the credit cycle is a “well-defined” empirical regularity observed in all countries and is clearly distinct from the business cycle. They show that credit cycles are not only substantially longer than the typical business cycle – with a low correlation between these two types of cycles as well – but also that the credit cycles display much larger time variation (amplitude).

The measurement and identification of credit cycles is nevertheless still at a very early stage. Given the absence of a generally accepted structural model (definition) for credit cycles, it remains difficult to identify and estimate credit cycles accurately in real time. Various methods co-exist and may give conflicting results. The BCBS guidance (2010) and the ESRB Recommendation (2014) have advanced the one-sided credit gap as a benchmark (statistical) measure of the credit cycle. By integrating this measure into the macroprudential (CCB) policy frameworks, the one-sided credit gap has become a key indicator for credit cycle analysis for most countries. For instance, at the EU level, the Capital Requirements Directive (CRD) IV requires each Member State to report on a quarterly basis the credit gap and the CCB rate.

Following the ESRB Recommendation, the one-sided credit gap is calculated as the difference between the (appropriate) credit-to-GDP ratio and its long-term trend (extracted using a one-sided HP filter with smoothing parameter $\lambda$ of 400 000). Despite being a purely statistical filter lacking structural identification, the ESRB approach has some appealing features. First, by imposing a sufficiently high smoothing parameter $\lambda$, the credit gap will incorporate (in addition to high-frequency changes) the cycles with periodicities that are typically associated with the credit cycle. Chart 1 displays the gain function of the high-pass filter associated with the ESRB procedure and shows that, for a value of the smoothing parameter $\lambda$ of 400 000, the credit gap fully reflects (with weight 1) cycles up to a periodicity of approximately 22 years. More standard values for the smoothing parameter $\lambda$ typically used for business cycle analysis (i.e. $\lambda$ of 1 600) would hardly assign any weight to these longer cycles. Moreover, the linearity of the HP filter enables the credit gap to be disaggregated according to the type of credit or to the sector receiving the credit (e.g. loans to households or non-financial corporations). The breakdown of the credit gap can be relevant when trying to identify the source(s) of the observed credit gap dynamics. Finally, the ESRB approach is well-suited to deal effectively with structural breaks as these will be relatively quickly reflected in the (one-sided) HP trend as more weight is given to recent observations (see Basset et al., 2015).

Despite the prominent role assigned to the one-sided credit gap in the macroprudential (CCB) framework, several caveats should be noted. First, as discussed in the following section, estimated credit gaps – and hence the assessment of the credit cycle position – can differ significantly depending on the type of credit used (e.g. broad or narrow credit
concepts). As a consequence, the assessment of the credit cycle hinges on the appropriateness of the credit concept used. Second, credit gaps calculated as recommended by the ESRB overlook very persistent credit dynamics, as these are by construction eliminated from the credit ratio or significantly underweighted in the credit gap. As a consequence, these very persistent dynamics are not considered as part of the cyclical movements but rather as part of the trend dynamics of credit and hence fall outside the scope of the (credit gap) analysis. Therefore, on top of the analysis of the estimated credit gap, it is crucial to carry out a supplementary assessment of the sustainability of the filtered trend dynamics using a wide array of additional relevant risk metrics.

1.2 Credit concepts: standardised versus preferred

While the procedure applied to extract the long-term trend of the credit-to-GDP ratios is largely harmonised, practices can differ as regards the credit concepts deemed most relevant. The ESRB (2014) recommends the use of a “broad” (standardised) credit concept (in line with the BCBS guidance, 2010) but also allows countries to compute their own additional concept if this is justified by “national specificities”. As a result, the assessment of the credit cycle depends on the type of credit concept used in the computation of the credit gaps. In this context, the NBB and several other European macroprudential authorities have opted to put forward an additional credit gap on top of the standardised one. The NBB’s preferred credit gap is narrower than the standardised one as it is restricted to lending by resident banks to the non-financial private sector (including securitised loans). By contrast, the standardised gap computed by the NBB is based on a non-consolidated credit concept that comprises all types of (domestic and foreign) loans granted to the non-financial private sector, including those issued by non-financial corporations (NFCs), as well as debt securities(1).

CREDIT GAPS IN BELGIUM: COMPARISON OF CREDIT CONCEPTS

Among the two alternative concepts, the NBB’s preference for the narrow (bank) credit concept is mainly based on three types of considerations. First, the standardised credit gap in Belgium is more volatile than the bank credit gap primarily because

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(1) The Belgian standardised credit concept excludes trade credit and pension scheme liabilities of NFCs (in Belgium pension reserves are generally built up via autonomous pension funds and are thus registered on their accounts instead of on the NFCs’ balance sheets).
of the contributions of NFCs and, in particular, domestic and foreign inter-company loans. In the context of an assessment of prudential risks related to credit developments, it is not necessarily desirable to include these inter-company loans in the credit concept. They indeed mainly refer to intra-group transactions and seem more related to the distribution of liquidity within the group, without necessarily increasing the group’s net external liabilities. Moreover, the standardised credit gap can be computed only about 104 calendar days after the reference period, whereas the bank credit gap is already available with a publication lag of about 28 calendar days. This allows the bank credit concept to cover one more quarter than the standardised concept at the moment of the decision-making regarding the level of the CCB rate. Finally, bank credit data – used since 1980 – cover a larger time span than national financial accounts data, which are available back to 1995.

Movements in the bank credit gap in Belgium (chart 2, bottom left-hand side panel) reveal that the past thirty years have seen two periods of strong increase in the gap. The first rise coincided with the period of robust economic growth at the end of the 1980s and was caused by significantly more bank lending to both households and NFCs. The second increase

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(1) Bank credit data are obtained from banks’ balance sheet items (Scheme A), whereas standardised credit data need to be compiled from the quarterly financial accounts due to the inclusion of the various non-bank loans and debt instruments.

(2) Therefore, in order to compare credit gaps over the same time span and apply the HP filter on the same amount of information, standardised credit data have been retropolated on the basis of bank credit data using the BIS methodology (see Dembiermont et al., 2013), which is commonly used in other euro area Member States.
(2005-2008), which preceded the financial crisis, was marked by an acceleration of house prices and was driven more by household credit than by NFC credit. Household contributions to the bank credit gap turned positive at the end of 2004, while those of NFCs did not result in positive credit gaps until mid-2007. Despite the continued credit expansion, the bank credit gap has narrowed since the financial crisis and even turned negative in the fourth quarter of 2014. At the end of 2015, the bank credit gap was slightly negative at –0.6%, both for households (–0.1%) and for NFCs (–0.5%), meaning that credit-to-GDP ratios were approximately in line with their trend-wise growth.

Significant differences in levels and dynamics can be observed between the Belgian bank and standardised credit gaps. Regarding differences in levels, the latest data for instance show a standardised credit gap of –5.1% in 2015Q3 (against –0.6% for the bank credit gap in 2015Q4). But despite the discrepancy between the two alternatives, both gaps are currently negative and hence do not call for the activation of the CCB. More striking was the difference in level between the two gaps in 2009Q3, when the standardised credit gap culminated at 22.7% – as a result of a surge in foreign non-bank loans – while the bank credit gap reached only 6.3%. The dynamics of the standardised gap in Belgium also tend to be dominated by NFC (inter-company) loans. Over the period 1998-2006 for instance, the standardised credit gap widened dramatically to peak at more than 15% before returning to zero – which mainly reflected trends in domestic inter-company loans –, whereas the bank credit gap remained constantly negative over that period. As shown below, level differences between standardised and additional gaps can also be observed for other European countries by looking at the gaps communicated to the ESRB.

COMPARISON BETWEEN BELGIUM AND OTHER EUROPEAN COUNTRIES

Many European countries have opted for computing an additional (typically narrow) credit gap supplementing the (broad) standardised credit gap. Looking at the credit gaps notified to the ESRB, one can observe that additional gaps are reported for 16 European countries, including Belgium. One potential explanation for having so many double notifications is that the standardised credit concept might be considered too broad by many countries and so may not adequately reflect their specific national features, such as differences in the structure of their financial system and in the quality and/or availability of credit data. Despite the lack of any formal common definition, standardised credit concepts used by European countries rely on a broad credit definition similar to Belgium (all types of loans to the non-financial private sector, including debt securities). Instead, the vast majority of additional gaps are based on a narrow bank credit concept and mostly rely on bank credit (as in Belgium).1

Although a time series analysis is not (yet) possible based on the credit gaps submitted to the ESRB given the too few quarterly notifications, comparing the last reported gaps makes it clear that the standardised and additional gaps can differ considerably from one another not only in Belgium but also in other countries (at least at this point in time – see Croatia, Luxembourg and Slovenia on chart 3 for instance). Moreover, while both gaps are negative for many countries reporting the two statistics, the sign of the gaps can also differ in some cases (Czech Republic, France, Norway, and Slovakia). These differences between the standardised and additional gaps highlight the importance of the credit concept for estimating the credit cycle.

Despite the conceptual difference and substantial heterogeneity in sizes of the alternative credit gaps among European countries, both standardised and additional credit concepts currently point to negative gaps in Europe in general. Some countries seem to have experienced such a pronounced reduction in lending or slowdown in credit growth relative to GDP growth that they report credit gaps close to –60%. By contrast, other countries report slightly positive gaps. The gaps reported by the rest of the countries surveyed are relatively uniformly distributed between these extremes, which makes it hard to identify groups of countries with comparable positions in the credit cycle. Belgium in particular is currently situated in the upper part of the spectrum with relatively small and negative credit gaps. Most countries where a positive CCB rate is currently applied or where the designated authority has announced that a positive CCB rate will be applied in the near future (1% in Norway, 1% in Sweden, and 0.5% in the Czech Republic starting in 2017) are among the European nations with positive credit gaps according to at least one of the two credit concepts. By contrast, the Financial Policy Committee in the UK announced the application of a CCB rate of 0.5% for UK exposures while the reported standardised credit gap is largely negative (about –25%). The latter example from the UK shows that the decision on the appropriate CCB level is not a mechanical exercise solely based on the credit gap, but can also include the information of a large set of indicators that help assess the position of an economy in the credit cycle.

\(1\) Note that some countries base their additional gap on the standardised credit concept but change the methodology to extract long-term trends from credit-to-GDP ratios (modified use of the HP filter).
2. Credit gaps characteristics

Unlike the business cycle, analysis of and experience with monitoring the credit cycle is relatively new and a more profound knowledge of their characteristics is necessary for the design and effectiveness of macroprudential policy instruments such as the CCB. Currently, the CCB framework is anchored to the credit gap and is implemented at the national level. In this section, we find some evidence in favour of this framework based on the characteristics of the credit gaps.

The section starts with a frequency analysis showing that credit gaps are dominated by cycles with a frequency typically associated with the credit cycle. It further compares these cycles with business cycles. Second, the co-movement of credit cycles in various European countries is assessed by means of a principal component analysis and various synchronisation measures. This enables an assessment of the importance of international developments for national macroprudential policies and helps reflect on the appropriate level of application of macroprudential policy (supranational, national or sector-specific level).

Although the analysis presented in this section focuses on Belgium, it is based on time series of estimated credit gaps for 16 European countries. The approach used to estimate Belgian bank and standardised credit gaps is (approximately) reproduced for the other countries. As a result, other countries’ estimated credit gaps do not necessarily match the gaps reported in official publications or notified to the ESRB (1). More specifically, standardised credit data regarding the non-financial private sector are obtained from the BiS (total credit series adjusted for breaks) as the data match the Belgian standardised concept as well as the concepts used in several other countries, which facilitates international comparisons.

The bank credit data are also based on the BiS series, which we adjust for securitisation using ECB data starting in 2009 (2). These series are then adapted for the statistical break introduced by the adjustment by applying the BiS backcasting method. Only European countries with data available for both standardised and bank credit for the non-financial private sector going back to 1980 are considered. This ensures that the HP filter can be applied over the same sample period as in Belgium and that credit gaps can therefore be compared between countries. GDP series obtained from the ECB, in most cases available back to 1995, are retropolated using historical OECD data.

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(1) Differences could be observed mainly because different credit concepts are used or because the HP filter is applied to a different sample period. In addition to this, different definitions of GDP could be used in the denominator of the credit-to-GDP ratios. Note also that some European countries do not compute bank credit gaps.

(2) The adjustment for securitisation is based on ECB series of bank loans for euro area counterparts. No securitisation data are available from the ECB for non-euro area Member States.
2.1 Frequency analysis of credit gaps

A frequency analysis of the credit gap makes it possible to break down the overall credit gap variable into cycles of different length and hence assess the relative importance of these respective cycles in the overall credit gap dynamics\(^{(1)}\). Table 1 presents some descriptive statistics on the cyclical properties of the credit gaps for Belgium and compares them with those of other European countries. The analysis suggests that credit gaps in Belgium do primarily reflect the credit cycle dynamics/frequencies. Regardless of the credit concept used (bank or standardised), medium-term frequencies, typically associated with the credit cycle, appear to dominate the credit gaps dynamics; more than half of the total variation in credit gaps can be attributed to the medium-term frequencies, while business cycle frequencies, especially for bank credit, remain much less important. For Belgium, the bank credit gap seems the most direct representation of the credit cycle: 63% of all variation in the bank credit gap is explained by medium-term frequencies. In general, credit gaps computed following the ESRB Recommendation (2014) mainly reflect credit cycle developments.

Table 1 also highlights similarities and differences between the Belgian credit gaps and those observed in other European countries. In the majority of countries, credit cycles (i.e. medium-term frequencies) are the dominant drivers of the overall credit gap signal. However, some heterogeneity is observed in the amplitude and in the length of the cycle both across countries and across credit gap concepts. Compared to the sample of European countries in the analysis, the Belgian credit cycle seems relatively small and hence well-contained. While the length of the bank credit cycle (gap) seems similar to that of other countries, we observe significantly shorter cycles for the standardised credit concept with a higher

<table>
<thead>
<tr>
<th>Characteristics of Credit Cycles Based on Credit Gap Estimates(^{(1)})</th>
<th>Bank credit gaps</th>
<th>Standardised credit gaps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variation explained by</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium-term frequencies (in %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belgium</td>
<td>63</td>
<td>56</td>
</tr>
<tr>
<td>European countries</td>
<td>[38 – 68]</td>
<td>[44 – 64]</td>
</tr>
<tr>
<td>Business cycle frequencies (in %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belgium</td>
<td>10</td>
<td>37</td>
</tr>
<tr>
<td>European countries</td>
<td>[4 – 27]</td>
<td>[6 – 37]</td>
</tr>
<tr>
<td>Max amplitude (in % of GDP)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belgium</td>
<td>7.2</td>
<td>11.3</td>
</tr>
<tr>
<td>European countries</td>
<td>[4.8 – 40.8]</td>
<td>[4.3 – 40.2]</td>
</tr>
<tr>
<td>Periodicity of dominant cycle (in years)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belgium</td>
<td>23</td>
<td>9.7</td>
</tr>
<tr>
<td>European countries</td>
<td>[17 – 34]</td>
<td>[9.7 – 34]</td>
</tr>
</tbody>
</table>

Sources: BIS, ECB, NBB.

\(^{(1)}\) The statistics in this table were generated on the basis of the spectral decomposition using the Tukey-Hanning smoothing window and window lag of 60. Results may be dependent on the actual choice of window type and lags included. Medium-term frequencies are defined as cycles with length of a complete cycle between 8 and 35 years. Business cycle frequencies refer to cycles with length between 1.5 and 8 years. Numbers in brackets represent the observed minimum and maximum for the European countries included in the sample. The maximum amplitude is computed as the square root of the maximal power spectrum while the periodicity of the dominant cycle is the periodicity of the cycle with maximal power spectrum.

\(^{(1)}\) Note that given the relatively small sample size spanning about 35 years, considerable statistical uncertainty surrounds the frequency analysis. Results should therefore be considered as indicative only and should be interpreted accordingly.
amplitude than the bank credit gap, which might be explained by the dominance of inter-company loans (included in the standardised credit gap concept) that display considerable variations at higher (i.e. business cycle) frequencies.

Chart 4 depicts the decomposition of the credit gap dynamics into credit cycle and business cycle components(1). In line with the results in table 1, it can be seen that credit gaps reflect mainly medium-term cycles and that business cycles are far less relevant in the overall credit dynamics. These results corroborate the general finding that financial cycles in general and credit cycles in particular operate at different frequencies and remain to a large extent dissociated from the business cycle frequencies.

The relationship between the credit gap and the business cycle can be further analysed by means of the cross-correlation between the respective credit gaps and year-on-year real GDP growth, taking into account a possible lead/lag relationship of four quarters. Such correlations indicate that the credit gap is in general only weakly correlated with GDP growth (average correlation of 0.16 and 0.05 for the bank and standardised credit gaps respectively) and tends to lag behind GDP growth in a vast majority of countries, including Belgium (see chart 5).

These results corroborate the empirical literature. Albeit dependent on the sample period, studies that rely on international comparisons generally tend to find that the credit gap is weakly correlated with GDP growth and tends to lag behind it (Zhu, 2011; Drehmann and Tsatsaronis, 2014). As such, the credit gap seems less useful as an early warning indicator for recessions than for banking crises (see section 3). Drehmann and Tsatsaronis (2014) also note that the merits of the CCB – anchored to the credit gap – should be assessed against the buffer’s objectives, which is not to manage the business cycle, but to address the risks stemming from the credit cycle.

The low correlation does not come as a surprise, given the dominance of credit cycle frequencies in the credit gap, which are largely unrelated to business cycle fluctuations. A decomposition of the correlation with real GDP growth, measured for the credit and business cycle components separately, shows that the correlation largely stems from the business cycle component of the credit gap, although the correlation remains on average low (see chart 5, right panel).

But correlations are time-dependent. Based on the frequency decomposition, correlations can be expected to be higher when the business cycle and the credit cycle are in the same phase, e.g. in recessions associated with financial crises.
However, Repullo and Saurina (2011) argue that the credit gap moves countercyclically with GDP growth. In our sample, some countries indeed do present a negative correlation. In such a context, macroprudential policy-makers should be aware that applying the CCB could lead to raising capital buffers due to a slowdown in GDP rather than a credit expansion.

### 2.2 Co-movements between European credit gaps

Analysing the co-movement of credit cycles is important for various reasons. First, whether a common macroprudential policy can be applied across countries or sectors depends to a large extent on the degree of synchronisation of credit cycles (gaps) across them. Perfect synchronisation between countries and sectors would suggest that a single macroprudential policy stance would fit each country and each sector. Furthermore, if there is evidence that macroprudential policies are to be used to mainly target vulnerabilities at the national level as in the current European framework, looking at international credit developments might still be informative regarding future domestic credit developments, or regarding the potential occurrence of foreign banking/financial crises (or recessions) that could turn into global crises (through e.g. banks’ foreign exposures – see Drehmann et al., 2011).

According to the (recent) empirical literature, credit cycles in Europe can be thought of as mainly desynchronised, both across countries and across sectors. Meller and Metiu (2015), for instance, find evidence against the existence of a common credit cycle in Europe, although they point to the possible presence of clusters of countries that tend to co-move. Similarly, Aikman et al. (2015) find that credit growth correlations across countries are low and suggest that there are significant cross-country asymmetries. Without going against the results of the first two studies, Anguren Martin (2011) finds some episodes of credit growth synchronisation which typically tend to coincide with crisis periods. Finally, focusing on credit gaps of households and NFCs, Samarina et al. (2015) show that sector-specific cycles are not well synchronised, which supports the idea of targeted macroprudential policy measures and analysis that would be better suited to address sector-specific developments.

In this sub-section, we analyse the co-movement and synchronisation of credit gaps with particular focus on Belgium. By means of principal component analysis, we show that, despite some evidence of co-movement across European

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**CHART 5**

**CROSS-CORRELATION BETWEEN CREDIT-TO-GDP GAP AND REAL GDP GROWTH**(1)

<table>
<thead>
<tr>
<th>Country</th>
<th>Bank credit gap</th>
<th>Standardised credit gap</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT</td>
<td>-0.05</td>
<td>0.00</td>
</tr>
<tr>
<td>BE*</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>DE</td>
<td>0.05</td>
<td>0.10</td>
</tr>
<tr>
<td>EL</td>
<td>0.10</td>
<td>0.15</td>
</tr>
<tr>
<td>ES</td>
<td>0.15</td>
<td>0.20</td>
</tr>
</tbody>
</table>

**MAXIMUM CROSS-CORRELATION BY COUNTRY**

Sources: BIS, ECB, NBB.

(1) Correlation between the credit gap and year-on-year real GDP growth. The cross-correlations measure the correlation at different leads and lags (4 quarters at the most). The left-hand chart shows the maximum cross-correlation over the different leads/lags. Countries in which the credit gaps lead real GDP growth are indicated with an asterisk. The right-hand chart shows the maximum cross-correlation (average across countries) between the different frequency components of the credit gap and real GDP growth.
countries, country-specific factors remain important drivers of the credit gap in some countries, including Belgium. Subsequently, we apply various statistical measures to analyse the synchronisation of credit gaps in greater detail.

**PRINCIPAL COMPONENT ANALYSIS**

The results of a principal component analysis show that overall credit cycle developments in Europe can be summarised by only two principal components. These two components together explain about 90% (81%) of the overall variation in the credit cycle frequencies of bank (standardised) credit gaps in the 16 European countries considered. Despite the finding of the existence of co-movements, the results show that, in line with the literature, there is no evidence in favour of a unique credit cycle in Europe based on the principal component loadings: as can be seen from chart 6 – depicting the loadings of the countries on the first two principal components –, countries have quite varying degrees of sensitivity to the two common components. Nonetheless, the vast majority of countries receive a positive weight on the first principal component which explains about 77% (71%) of the overall variation in bank (standardised) credit gaps. This principal component captures credit gaps dynamics fairly well around the latest global financial crisis, incorporating the credit boom/bust phenomenon observed in several countries.

The Belgian loadings in particular show that the sensitivity of Belgium to the two principal components is comparable to that of some other countries (that belong to the same quadrant on chart 6). Nonetheless, in line with the relatively low amplitude of Belgian credit gaps reported in table 1, the loadings for Belgium are relatively small, which illustrate that the Belgian credit gaps are not extremely sensitive to movements of the first two principal components. The loading on the first component is for instance rather small in the case of bank credit, suggesting that over the period 1980-2015, if the first factor collapsed (as a result of a credit crunch for instance), the deepening of the bank credit gap in Belgium was generally more contained than in other countries. Besides, credit gaps in Belgium and some other countries do not appear to be explained well by the first two principal components. Regressing Belgian credit gaps on the two components yields a low $R^2$ of about 50% (see chart 7). As a result, despite some similarities with other countries captured by the first two principal components, idiosyncrasies in credit cycles (gaps) remain important in Belgium.

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**CHART 6**  
**COUNTRY LOADINGS ON FIRST TWO PRINCIPAL COMPONENTS OF CREDIT GAPS**

Sources: BIS, ECB, NBB.
(1) The analysis is performed on the credit cycle frequencies of credit gaps.

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(1) This result is robust to changes in the sample period (for instance to the exclusion of the period referring to the latest global financial crisis).
Correlations and synchronisation measures

The results on imperfect co-movements and the relevance of country-specific factors are also reflected in imperfect correlations/synchronicities of credit gaps\(^1\). An overall view of international credit gap developments is provided in chart 8 that presents a “heat map” of the bank credit gaps since the beginning of the 1980s in the 16 European countries considered. Clearly, the map indicates a lack of strong synchronicity in credit gaps and shows that important idiosyncrasies remain, although some similarities can be noticed. One example of such similarity is when the majority of countries exhibited high credit gaps around the middle/end of the 2000s (in red on the chart), before lending slowed down considerably after the global financial crisis (shift to orange and then green for most countries). Belgium is no exception, apart from the relatively less deepening of the credit gap after the crisis.

Gap synchronisation measures – defined as equal to 1 when gaps in two countries have the same sign in a given quarter and \(-1\) otherwise (see Mink et al., 2012) – corroborate the importance of idiosyncrasies in the case of Belgium in particular. The average gap synchronisation over time between Belgium and other countries is around 0.3 but can vary (and be negative) depending on the country\(^2\). The gap synchronisations with the three main neighbouring countries are \(-0.4\), 0.2, and \(-0.2\) vis-à-vis respectively Germany, France and the Netherlands. These statistics can easily be restated into the probability of two countries being in the same phase of the cycle (positive or negative gaps). The implied probabilities are respectively 30\%, 60\% and 40\% of the time. Swing synchronisation measures between Belgium and other countries – defined as equal to 1 (\(-1\)) when the change in the gaps in Belgium and another country have the same (opposite) sign (see Meller and Metiu, 2015) – point to more synchronisation in the movements of credit gaps but remain low in general. With respect to the corresponding gaps for the three main neighbouring countries, the Belgian bank credit gap has moved in the same direction as in Germany, France and the Netherlands 55\%, 70\% and 55\% of the time.

Correlation measures further corroborate the imperfect similarity in credit cycles between countries. Table 2 shows the correlations between the bank credit gaps in each of the countries and their respective foreign factor, defined as the GDP-weighted average of credit gaps in other countries\(^3\). The foreign factor – so defined – is a simple measure summarising developments in foreign credit gaps in a single series. Although correlation coefficients are generally

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\(1\) The analysis focuses on bank credit gaps for brevity and since the latter better represent the credit cycle in Belgium.

\(2\) Specific results of the analysis on gap synchronisation are available upon request.

\(3\) The results are qualitatively similar for alternative definitions of the foreign factor (e.g. the unweighted average, median or the 75th percentile).
positive (and significant) and relatively close to one for some countries, some other countries show small or even negative correlations with their respective foreign factor (including Belgium, Germany and Switzerland). The sectoral decomposition of credit gaps between households and NFCs also points to weak international coherence of sectoral credit developments, with sectors in some countries well correlated with their (sector-specific) foreign factor and some others hardly showing any co-movement. Sector-specific gap and swing synchronisation measures confirm the lack of similarity between sector-specific credit cycles across countries.

Moreover, correlations (as well as gap and swing synchronisation measures) are not only weak between countries, but they also appear to be weak within countries. As shown in the last column of table 2, sector-specific credit gaps for households and NFCs within a same country are in general far from perfectly correlated. In particular, the Belgian correlation coefficient between the credit gaps of the two sectors is 0.54. So, idiosyncratic factors not only operate at the country level, generating imperfect correlation across countries, but also at the sectoral level (within countries), implying sector-specific credit gap developments.

3. Early warning properties of credit gaps

Being anchored to the credit gap, the operationalisation of the CCB is embodied in a framework targeting risks that are mainly related to the domestic credit cycle. However, the application of the CCB should also account for indicators other than the credit gap that capture cyclical systemic risks. These could in principle include domestic as well as foreign developments. A great body of literature has been produced aiming at identifying useful early warning indicators for

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Note: A sectoral decomposition of bank credit gaps is possible using bank credit data from the ECB available since 2003. ECB data on bank loans to households are retropolated as far back as possible (but never further than 1980) based on BIS sectoral data on total credit to households and the BIS backcasting method. Historical bank credit to NFCs are obtained by taking the difference between bank credit to the non-financial private sector (BIS data adjusted for securitisation as presented at the beginning of section 2) and the obtained historical bank credit data to households.
In recent years, special attention has been devoted to early warning models as starting point for the operationalisation of macroprudential policies, such as the CCB (e.g. Drehmann et al., 2011 and Detken et al., 2014) and instruments targeting residential real estate (e.g. Ferrari et al., 2015).

In this section, additional empirical evidence is provided on the early warning properties of both standardised and bank credit gaps. We investigate the signalling power of domestic as well as foreign credit gaps for banking crises. Cross-border interconnections of the financial system imply that, despite the absence of high synchronisation of European credit gaps, foreign credit cycle developments may contain relevant information on the build-up of potential cyclical systemic risks. Finally, the potential role of credit gaps as useful early warning indicators of future recessions is briefly discussed.

Chart 9 shows the incidence of banking crises and recessions in our sample of 16 European countries over the time period covered. The dating of banking crises is based on a combination of several recent sources, including Laeven and Valencia (2008, 2013), Behn et al. (2013), Babecký et al. (2014), Detken et al. (2014) and Anundsen et al. (2016). The sample includes 22 banking crises, which tend to be clustered around two episodes: the period from the late 1980s to the mid-1990s (including the Nordic banking crisis) (1), and the 2007-2008 financial crisis (2). These events involve banking crises caused by domestic boom/bust phenomena as well as banking crises that were triggered by exposures to boom/bust cycles in other jurisdictions and/or non-domestic credit related events (e.g. the 2007-2008 crisis in Belgium).

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**Table 2: Correlations of Bank Credit-to-GDP Gaps Between and Within Countries**

<table>
<thead>
<tr>
<th>Between countries (foreign credit gap)</th>
<th>Within countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>NFPs</td>
<td>HHs</td>
</tr>
<tr>
<td>AT</td>
<td>0.56*</td>
</tr>
<tr>
<td>BE</td>
<td>0.03</td>
</tr>
<tr>
<td>DE</td>
<td>-0.35*</td>
</tr>
<tr>
<td>EL</td>
<td>0.73*</td>
</tr>
<tr>
<td>ES</td>
<td>0.85*</td>
</tr>
<tr>
<td>FI</td>
<td>0.46*</td>
</tr>
<tr>
<td>FR</td>
<td>0.25*</td>
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<td>IE</td>
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<td>0.65*</td>
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<tr>
<td>NL</td>
<td>0.33*</td>
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<tr>
<td>PT</td>
<td>0.63*</td>
</tr>
<tr>
<td>CH</td>
<td>-0.25*</td>
</tr>
<tr>
<td>DK</td>
<td>0.84*</td>
</tr>
<tr>
<td>NO</td>
<td>0.59*</td>
</tr>
<tr>
<td>SE</td>
<td>0.21*</td>
</tr>
<tr>
<td>UK</td>
<td>0.82*</td>
</tr>
</tbody>
</table>

Sources: BIS, ECB, NBB.

(1) The foreign credit gap is computed, for a given country, as the GDP-weighted average credit gap of the other countries in the sample. No data are available for households and NFCs separately from the ECB for non-euro area Member States. NFPs stands for non-financial private sector. * indicates significance at the 5% level (two-sided test).
Recessions are identified as periods of at least two consecutive quarters with negative quarter-on-quarter growth of real GDP\(^{(1)}\). While a substantial number of recessions are related to banking crises (for example, following the Nordic crisis and the 2007-2008 financial crisis), they occur more frequently over the sample period, reflecting the finding in the previous section that business cycle frequencies are higher than credit cycle frequencies. Recessions that were not related to banking crises include the early 1980s and the collapse of the dotcom bubble.

Chart 10 depicts the average evolution of domestic credit gaps around the onset of a banking crisis in countries that experienced such crises. Both the standardised and the bank credit gap show an upward tendency in the years preceding banking crises, signalling the build-up of vulnerabilities. It should be noted that both the standardised and the bank credit gaps, on average, exceed the two-percentage-point threshold advocated by the BCBS and the ESRB for a potential activation of the CCB well before the onset of banking crises. Several studies, including Behn \textit{et al.} (2013), Detken \textit{et al.} (2014) and Drehmann and Juselius (2014) found that the credit-to-GDP gap is among the best early warning indicators for signalling the build-up of vulnerabilities that may lead to a banking crisis.

After the onset of crises, credit gaps tend to drop to levels below pre-crisis levels. On average, bank credit gaps seem to peak about a year before the start of banking crises, whereas standardised gaps tend to widen further up to the first year of the crisis. As for both indicators it takes a few quarters before the credit gap starts declining after the onset of a crisis (especially in the midst of a recession), the ESRB has proposed indicators other than credit gaps for the release of the CCB.

However, the interquartile ranges around the average credit gaps show that the credit gaps do not breach the BCBS/ESRB threshold of two percentage points before the onset of a banking crisis in the case of all crisis countries in the sample. In Belgium, for example, the domestic bank credit gap signals the build-up of vulnerabilities only three quarters before the onset of the 2008 crisis\(^{(2)}\). While the standardised credit gap in Belgium issues a signal from the 5th quarter before the onset of the crisis, it also warns against the potential occurrence of a crisis much earlier (from 20 to 13 quarters before the crisis onset) before falling below the Basel/ESRB threshold during most of the relevant pre-crisis horizon. As such, it tends to display a larger volatility than the bank credit gap, showing substantial fluctuations around the Basel/ESRB threshold.

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\(^{(1)}\) Real GDP has been adjusted for seasonal and calendar effects. Furthermore, if the period between two recessions is shorter than one year, this period is considered as a pause and not as a recovery, and therefore also classified as a recession.

\(^{(2)}\) It should be noted that the two-percentage-point threshold was calibrated on the basis of a standardised rather than narrow credit concept.
threshold both before and after the onset of the 2007-2008 crisis. Consequently, the Belgian bank credit gap shows a much higher correlation than the Belgian standardised credit gap with the average pre- and post-crisis developments in crisis countries, especially in the period during which vulnerabilities are building up.

**Table 3** provides statistical evidence on the average relationship between credit gaps and banking crises. In particular, the logit estimates in specifications (1) and (4) in table 3 confirm the early warning signalling abilities of both the domestic standardised and the domestic bank credit gaps: the larger the credit gap, the higher the probability of being in a vulnerable state, which is defined as a period that is followed by a banking crisis within one to three years. Credit gaps based on the bank credit concept perform slightly (but not significantly) better than credit gaps based on the standardised credit concept, corroborating the widespread use of credit gaps based on a narrow credit concept in addition to the standardised credit gaps for activation of the CCB.

However, low pseudo $R^2$ values (only 5% and 7%, respectively) show that many sources of vulnerability remain unexplained. AUROC levels, which measure the early warning performance of indicators\(1\), confirm that, while having reasonable early warning signalling abilities (AUROCs of 66% and 68%, respectively, being significantly larger than 50%), credit gaps are far from perfect indicators of vulnerable states. From a policy perspective, these results imply the need for macroprudential policy-makers to monitor additional indicators, as also indicated in the CRD IV and the ESRB Recommendation (2014) on the CCB.

The literature on early warning indicators has furthermore shown that, in addition to domestic indicators, foreign developments also contain relevant information for macroprudential policy-makers. For instance, Alessi and Detken (2011) find that the global private credit gap – defined as the PPP-GDP weighted average of the 18 countries in their sample – is among the best performing indicators for detecting growing financial imbalances. Similarly, Behn et al. (2013) find that global credit variables are strong predictors of macrofinancial vulnerabilities, exhibiting consistent and significant effects in multivariate logit models. Anundsen et al. (2016) underline that global imbalances in house prices increase the fragility of the domestic financial system. Notwithstanding the low correlation in European credit cycles highlighted in

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\(1\) The 95% confidence interval of the AUROC for the standardised credit gaps amounts to [0.6157, 0.7073] and for the bank credit gaps to [0.6338, 0.7246].

\(2\) The ROC (Receiver Operating Characteristic) curve plots an indicator or model's true positive rate (i.e. the share of correctly predicted vulnerable periods) against the false positive rate (i.e. the share of falsely predicted ones) for every possible value of the threshold. The area under the ROC curve or AUROC ranges from zero to one: a value larger than 0.5 (corresponding to a ROC curve above the 45-degree line) indicates that an indicator issues informative signals, whereas the AUROC is equal to one for a fully informative indicator.
earlier sections of this article, the strong interconnectedness of European financial sectors and their common exposures to foreign factors might imply that the latter have early warning properties for banking crises.

Defining foreign credit gaps for a given country as the GDP-weighted average credit gaps of the other countries in the sample\(^{(1)}\), specifications (2) and (5) in table 3 confirm the signalling ability of the foreign credit gaps: rising gaps indicate a rising risk of being in a vulnerable state. When comparing these findings to the results for the domestic credit gaps, we find that widening foreign credit gaps in fact signal stronger increases in risk than widening domestic credit gaps. In addition, foreign credit gaps seem to explain a larger share of the vulnerabilities leading to banking crises (higher pseudo \(R^2\) values: 11% and 22%, respectively) and present a significantly better signalling performance than the domestic credit gaps (AUROC values of 75% compared to 66% for standardised credit gaps and 80% compared to 68% for bank

Table 3
EARLY WARNING PROPERTIES OF CREDIT GAPS: LOGIT ESTIMATION RESULTS\(^{(1)}\)

<table>
<thead>
<tr>
<th></th>
<th>Standardised credit-to-GDP gap</th>
<th>Bank credit-to-GDP gap</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Domestic credit gap</td>
<td>0.0538 ***</td>
<td>0.0340 ***</td>
</tr>
<tr>
<td>Foreign credit gap</td>
<td>0.2616 ***</td>
<td>0.2318 ***</td>
</tr>
<tr>
<td>Constant</td>
<td>-2.3783 ***</td>
<td>-2.8550 ***</td>
</tr>
<tr>
<td>Pseudo R²</td>
<td>0.0510</td>
<td>0.1094</td>
</tr>
<tr>
<td>AUROC</td>
<td>0.6615</td>
<td>0.7498</td>
</tr>
<tr>
<td>Number of crises</td>
<td>22</td>
<td>22</td>
</tr>
<tr>
<td>Number of observations</td>
<td>1 642</td>
<td>1 642</td>
</tr>
</tbody>
</table>

Sources: BIS, ECB, NBB.

(1) The estimation (using data from 1981Q3 to 2015Q3) is performed regressing a dummy variable representing vulnerable periods (i.e. equal to one in the 5th to 12th quarter prior to the onset of a crisis and to zero otherwise) on credit gaps, by means of pooled regression. Observations from 4 quarters before to 12 quarters after the onset of a banking crisis have been dropped, as well as the last 12 quarters of the sample. Foreign credit gaps are computed, for a given country, as the GDP-weighted average credit gap of the other countries in the sample.

Table 4
EARLY WARNING PROPERTIES OF BANK CREDIT GAPS: EARLIER BANKING CRISIS VERSUS THE 2007-2008 CRISIS\(^{(1)}\)

<table>
<thead>
<tr>
<th></th>
<th>Earlier banking crises (pre-2004Q1 data)</th>
<th>2007-2008 crisis (post-1992Q4 data)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Domestic bank credit gap</td>
<td>0.0555 ***</td>
<td>0.0499 ***</td>
</tr>
<tr>
<td>Foreign bank credit gap</td>
<td>0.1492 **</td>
<td>0.1070</td>
</tr>
<tr>
<td>Constant</td>
<td>-3.0930 ***</td>
<td>-3.0500 ***</td>
</tr>
<tr>
<td>Pseudo R²</td>
<td>0.0221</td>
<td>0.0095</td>
</tr>
<tr>
<td>AUROC</td>
<td>0.7289</td>
<td>0.5644</td>
</tr>
<tr>
<td>Number of crises</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Number of observations</td>
<td>1 304</td>
<td>1 304</td>
</tr>
</tbody>
</table>

Sources: BIS, ECB, NBB.

(1) The logit estimation (using data from 1981Q3 to 2015Q3) is performed regressing a dummy variable representing vulnerable periods (i.e. equal to one in the 5th to 12th quarter prior to the onset of a crisis and to zero otherwise) on bank credit gaps, by means of pooled regression. Observations from 4 quarters before to 12 quarters after the onset of a banking crisis have been dropped, as well as the last 12 quarters of the sample. Foreign credit gaps are computed, for a given country, as the GDP-weighted average credit gap of the other countries in the sample.

(1) The results are qualitatively similar for alternative definitions of foreign credit gaps (e.g. the unweighted average, median or the 75th percentile).
Combining both the domestic and foreign credit gaps in the model further enhances signalling performance to AUROC levels of 78% and 82%, respectively.

While the tendency of foreign credit gaps to display a better signalling performance than domestic credit gaps is in line with earlier findings in the literature, their importance for detecting the build-up of vulnerabilities may have changed over time. Behn et al. (2013) note that the good predictive abilities of the global variables are subject to a caveat related to the evaluation period that includes the global financial crisis, where there is a strong clustering of crisis episodes across countries. Similarly, Anundsen et al. (2016) find that global developments in house prices were of great importance in the build-up to the recent global financial crisis, while they had less influence prior to earlier crisis episodes.

Table 4 indeed confirms that foreign credit gaps were mainly important in explaining vulnerabilities in the run-up to the 2007-2008 crisis. In contrast, while explaining fewer of the vulnerabilities leading to the earlier banking crises in our sample, the effect of domestic credit gaps is significant and of similar magnitude in both sub-samples.

To further compare the signalling properties of domestic and foreign credit gaps, table 5 shows how signals obtained from domestic and foreign credit gaps, based on the two-percentage-point threshold advocated by the BCBS and the ESRB, relate to the occurrence of future banking crises. The upper left-hand panel of table 5 shows that the domestic and foreign standardised credit gaps combined fail to indentify only 3% of the pre-crisis quarters, i.e. one to three years before a banking crisis (Type I error). A signal is issued simultaneously by both the domestic and foreign credit gaps in 48% of the pre-crisis quarters. In 24% of the pre-crisis quarters, only domestic credit gaps identify a vulnerable state: the cases where the foreign credit gaps fail to issue a signal all relate to crises in the earlier part of the sample. Conversely, in 24% of the pre-crisis quarters, which all relate to the 2007-2008 financial crisis (e.g. in Belgium), only foreign credit gaps issue a signal. This confirms our earlier finding that foreign credit gaps mainly add signalling value for the global financial crisis. Over the entire sample, both indicators seem to have an equal contribution to signalling vulnerable states: when considered in isolation, both the domestic and foreign standardised credit gaps issue a correct signal in 72% of the pre-crisis quarters. These numbers clearly show the benefit of combining signals obtained from the two indicators, as the latter results in issuing a correct signal 97% of the time.

Table 5

<table>
<thead>
<tr>
<th></th>
<th>Pre-crisis periods</th>
<th>Normal periods</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No foreign signal</td>
<td>Foreign signal</td>
</tr>
<tr>
<td>Standardised credit gaps</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No domestic signal</td>
<td>3</td>
<td>24</td>
</tr>
<tr>
<td>Domestic signal</td>
<td>24</td>
<td>48</td>
</tr>
<tr>
<td>Bank credit gaps</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No domestic signal</td>
<td>7</td>
<td>26</td>
</tr>
<tr>
<td>Domestic signal</td>
<td>28</td>
<td>39</td>
</tr>
</tbody>
</table>

(1) The table reports the fraction of quarters in which the credit gaps exceed the two-percentage-point threshold advocated by the BCBS and the ESRB. Pre-crisis periods represent vulnerable periods (i.e. the 5th to 12th quarter prior to the onset of a crisis). Normal periods represent all other periods in the sample, except observations from 4 quarters before to 12 quarters after the onset of a banking crisis as well as the last 12 quarters of the sample (which have been dropped).

(2) Note again that this two-percentage-point threshold was calibrated for the standardised credit concept for a different sample of countries over a different time period. This threshold may result in sub-optimal signalling performance in our sample, especially when the narrow credit concept is used.
The lower left-hand panel of table 5 presents the same information for the bank credit concept. Compared to the standardised credit gaps, the Type I error is slightly larger (almost 7% compared to 3%). Furthermore, the fraction of pre-crisis quarters in which both the domestic and the foreign bank credit gaps issue a signal is lower (39% compared to 48%). Domestic bank credit gaps issue a signal in 28% of the pre-crisis quarters for which no signal is issued by the foreign counterpart (again mainly related to earlier crises). The opposite case, which again almost exclusively relates to the 2007-2008 crisis, results in only a slightly lower number (26%). We can therefore confirm that both indicators seem to have an equal contribution in signalling vulnerable states: when considered in isolation, they correctly signal vulnerable states in 67% and 65% of the pre-crisis quarters, respectively. The difference between these numbers and the fraction of pre-crisis quarters correctly signalled when both indicators are considered (93%), again show the benefit of combining information of domestic and foreign credit gaps.

The picture looks rather different when looking at the right-hand panels of table 5. Of the 57% false alarms rate for the standardised credit gaps, the largest contribution comes from the domestic credit gaps: the domestic standardised credit gaps issue a signal in normal times in 44% of the quarters, compared to only 37% of the normal times quarters for the foreign standardised credit gaps. As bank credit gaps are generally less volatile than standardised credit gaps, they display a lower rate of false alarms (49%). Like the standardised gaps, the largest contribution to this Type II error comes from the domestic bank credit gaps, which exhibits a 37% Type II error when considered in isolation. As the foreign bank credit gaps tend to be smoother on average than the domestic ones, the false alarms rate amounts to only 23%.

These results suggest that, while domestic credit gaps seem able to signal vulnerable states just as well as foreign credit gaps, they tend to result in a higher false alarms rate. Therefore, foreign credit gaps exhibit better signalling performance than domestic credit gaps in our sample. Given that domestic and foreign credit gaps do not always issue signals for the same crises, combining information from domestic and foreign credit gaps significantly raises the ability of correctly identifying vulnerable states, implying that macroprudential policy-makers may benefit from monitoring both domestic and foreign credit gaps.

Finally, the properties of credit gaps as indicators signalling the build-up of vulnerabilities in the run-up to recession periods are explored, extending the analysis in the previous section on the relationship between the credit gap and the business cycle. The conclusion of credit and business cycles having very different frequencies and credit gaps mainly representing credit cycle frequencies should imply that credit gaps contain lower signalling power for recession episodes. We repeat the signalling exercise above using a dependent variable indicating vulnerable states preceding economic recessions unrelated to banking crises (1) and find that while credit gaps display some predictive power for recessions (AUROCs of 58% and 57% for the standardised and bank credit gaps, respectively), the overall signalling power for recessions is indeed lower than for banking crises. Furthermore, foreign credit gaps do not seem to significantly improve the ability of signalling vulnerabilities that lead to the occurrence of future recessions.

Conclusion

More than any other global crisis, the recent financial crisis revealed the potential for excessive credit developments to generate cyclical systemic risks that can threaten financial stability and the real economy. As a consequence, it became imperative to closely monitor credit cycles in order to detect in real time the build-up of imbalances and to develop macroprudential tools, such as the CCB, to make banks more resilient to cyclical systemic risk. In the context of the CCB, international bodies, such as the BCBS and the ESRB, recommend the use of a benchmark credit-to-GDP gap (along with other indicators) to assess the position of an economy in the credit cycle. Consequently, much of the cyclical macroprudential framework is anchored to the credit gap.

The experience with macroprudential policy in general and the CCB policy framework in particular is for many European countries still at an early stage. Moreover, knowledge on credit cycles is far less advanced than on business cycles. So, we centered our analysis on the characteristics and early warning properties of credit gaps, focusing in particular on Belgium. This analysis is relevant for the design and effectiveness of macroprudential policies with regard to credit developments.

(1) The vulnerability indicator equals one in the 5th to 12th quarter prior to the start of a recession and zero otherwise. As banking crises are often followed by a recession, pre-recession periods and recessions that coincide with pre-crisis periods and banking crisis periods, respectively, are excluded from the sample.
The characteristics of credit cycles presented in this article broadly endorse the design of the European macroprudential framework, organised under the auspices of the ECB and ESRB, according to which each national designated authority is responsible for the activation of the CCB in its jurisdiction and reciprocity extends these decisions to all foreign banks with exposures on that region. Furthermore, the credit gap properties suggest that greater granularity in the application of countercyclical instruments might be warranted in order to tackle cyclical systemic risks stemming from specific sectors of the national economy. Correlations and synchronisation measures indeed highlight the lack of similarity between credit cycles (gaps) in Europe (despite the level of financial integration) and show that – within countries – substantial idiosyncrasies remain at the sectoral level (households and NFCs). In Belgium in particular, the dynamics of the credit gaps seem to be relatively detached from those observed in other European countries, and over the past 35 years, credit developments among households and NFCs have not always displayed a high degree of synchronisation.

The lack of synchronicity between credit developments to households and NFCs calls for capital-based macroprudential policy instruments (in Pillar 1) that can be applied at the sectoral level. Under current legislation, this option is only possible, subject to strict procedural limits, for risks stemming from developments in the real estate sector and for intra-financial sector exposures.

In practice, the implementation and effectiveness of the CCB also depends on the credit concept used to estimate credit gaps and whether these credit gaps actually capture the credit cycle. For Belgium, the bank credit concept seems more suited than a broad (standardised) concept since it better captures national specificities (by excluding large and volatile flows of – mainly accounting driven – inter-company loans). Furthermore, bank credit represents more accurately the credit cycle in Belgium and has a shorter publication lag. Finally, on the basis of the results of the early warning analysis, bank credit concepts are generally found to contain somewhat more predictive power for banking crises than standardised concepts.

Starting in 2016, the CCB rate was set at 0% in Belgium since the current position in the domestic bank credit cycle is rather neutral (neither a boom nor a bust in credit to households or NFCs), especially when compared to the large negative credit gaps reported in many EU countries.

Some limitations are however associated with the use of domestic credit gaps both with respect to the monitoring of cyclical risks and as indicators of the macroprudential policy stance. First, banking/financial crises remain extremely hard to predict in real time and credit gaps (and other early warning indicators) issue far from perfect signals. Notwithstanding the low synchronicity of credit cycles, the early warning exercise illustrates that foreign credit gaps could also be considered in the risk assessment in a given country. Second, it should be noted that credit gaps are used to monitor cyclical systemic risks and are not informative with respect to structural systemic risk since they discard all information on structural credit developments. Structural systemic risks might be related to, among others, the systemic importance of specific banks or trend-wise increases in credit-to-GDP ratios. Specifically, imbalances could build up from these developments, while credit gaps would not flag any risk related to the position in the credit cycle. An extended and complementary set of macroprudential instruments and indicators is being used to monitor these more structural risks. In fact, up to now prudential action in Belgium and in other European countries mostly consisted of measures addressing structural risks. Given the weak or neutral position in the credit cycle in most countries, the need for measures addressing cyclical risk has been low. However, insofar credit dynamics strengthen and countries move further in their credit cycle, the activation of instruments such as the CCB might broaden across Europe.
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ESRB (2014), Recommendation of the ESRB of 18 June 2014 on guidance for setting the countercyclical buffer rate.


Introduction

The recent financial crisis has led to a deep debate on whether the accounting standards provide investors with an accurate view of the value of a bank’s assets and liabilities, and of its profitability. A key component under discussion has been the adequacy and the timeliness of loan loss reserves. Much like minimum capital requirements, loan loss reserves aim at absorbing future losses that a bank may face, although loan loss reserves are meant to absorb expected losses, while the minimum regulatory capital requirements aim to ensure that banks can absorb losses that go beyond the expected amounts.

A key concern relating to loan loss reserves is whether banks set aside sufficient amounts. Many critics have argued that the current international accounting standards (or, the so-called “IAS-39” rules) lead to outcomes whereby banks’ loan loss reserves are not adequately built up in good times and, therefore, loans tend to be under-provisioned (1) in the early stages of down-turns when loan non-repayments start to become an issue, (Laeven & Majnoni, 2003; Bouvatier & Lepetit, 2008; 2012). There is further concern that this inherent pro-cyclicality may amplify the self-perpetuating relationship between lax bank lending standards, loan growth, and economic activity in good times, resulting in excessive economic volatility, (Berger & Udell, 2004; Dell’Arriacia & Marquez, 2006; Foos et al., 2010). In this context, inadequate loan loss reserves may also make it more costly for banks to remove distressed loans from their balance sheets, especially during later stages of down-turns, since the losses they will have to declare will be greater as a result of the insufficient reserves (2).

These challenges with respect to provisioning also come at a time when the international standards relating to the treatment of loan loss reserves are being overhauled, precisely in order to allow banks to increase loan loss reserves at an earlier stage. New international accounting rules under the International Financial Reporting Standards (or, the so-called IFRS 9 rules) that are expected to enter into force in 2018 will change fundamentally how banks should estimate future losses in impairing their assets.

The primary aim of this paper is to discuss the interactions between loan loss reserves and other problem loan categories, such as non-performing loans and written-off loans. In a second part, it also provides a look into the

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(1) The terms loan loss reserves and provisioning are often used interchangeably, which could be confusing. However, the former term is a stock concept, referring to the total amounts set aside to absorb future losses. Provisioning, on the other hand, is a flow concept, often used to refer to the actions of banks to add to or remove from those reserves over time.

(2) The obstacles and disincentives that banks face in writing-off bad loans have been identified as a potential driver of low credit growth in some of the Southern and Eastern European countries, (Aiyar et al., 2015).
evolution of loan loss reserves in Belgium, in particular the extent to which they have been built to absorb eventual losses as loans are written-off.

1. Problem loan concepts

There are three distinct categories that are typically used to characterize problem loans. First, banks may distinguish a loan as being non-performing once it becomes likely that the borrower will not be able to meet all its contractual repayment obligations. Second, banks typically “impair” the value of certain loans by setting aside reserves to absorb the expected future losses on those loans. Third, banks write-off loans, effectively removing the exposures from their balance sheets, either by selling them to third parties, or by liquidating the underlying collateral or guarantees.

These distinct concepts are at times used interchangeably, which may lead to confusion. This section provides a concise summary of the three categories and how they relate to one another. Recent accounting and regulatory reforms relating to these concepts are also discussed. Lastly, the section highlights some of the well-known shortcomings of the current and upcoming rules.

1.1 Non-performing loans

Until very recently, no harmonized definition of non-performing loans existed across EU member states. While many national authorities required banks to classify loans as non-performing when the interest and/or principal payments corresponding to the loan were past-due for more than 90 days, other member states such as in Belgium, Denmark, Germany, or the Netherlands, either did not apply the “90 days past-due” criterion or did so only implicitly (1).

Many European competent authorities also instructed their banks to categorize loans as non-performing when other criteria were satisfied. For example, loans for which a “default” event had taken place or those for which reserves against expected losses had been booked had to be automatically categorized as non-performing. Other criteria, such as significant financial difficulties faced by the borrower in meeting its obligations or a bankruptcy of the borrower were also allowed by most member states, although these criteria were often secondary to the non-payment of the interest or principal. Some authorities also required that if any of the outstanding loans to a borrower was declared as non-performing, all loans to that borrower would be automatically deemed as non-performing. In certain member states, restructuring arrangements (i.e. which often involve concessions to a borrower in difficulty) were alone considered as a sufficient condition for classifying a loan as non-performing. In turn, other member states allowed banks to upgrade a loan to performing status after the bank had engaged in “forbearance”, defined as the granting of concessions, or modification of the terms and conditions of the contract or its refinancing, to a counterparty that is facing financial difficulties. Lastly, a small number of authorities allowed a loan to be continued to be categorized as performing if it was backed by collateral of sufficient quality, or if other risk mitigants were present.

An explicit definition of non-performing loans has only recently been developed in Belgium. However, the concept was implicitly defined by the national accounting treatment for impairments and prudential treatment for defaulted assets. Under the Belgian Generally Accepted Accounting Principles (B-GAAP), which is still in place for individual (i.e. solo) supervisory reporting purposes (see Section 3), banks have to set aside reserves for expected losses associated with “non-recoverable” or “uncertain” loans. Non-recoverable loans are those for which the bank expects less than full payment of the outstanding principal and interest, which, in many cases, covers loans for which payments are significantly past-due. However, due to the principles-based approach of B-GAAP, banks could also consider loans that are past-due for more than 90 days as uncertain loans. In addition, under the prudential framework the definition of defaulted loans also incorporated the concept of non-performing loans, including not

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(1) The comparative data on supervisory practices are obtained from the 2012 update of the World Bank’s Bank Regulation and Supervision database, available from http://go.worldbank.org/WFIEF83AP.

(2) Under the Capital Requirements Regulation (CRR), a default can be declared if either (i) the borrower is unlikely to pay its credit obligations in full without recourse to the underlying collateral; or (ii) the borrower is past due (i.e. has not fulfilled the required regular minimum payments) for over 90-days. The CRR defines a number of elements that can be taken as an indication that the borrower will not be able to pay its obligations, including – but not limited to – the choice to impair the value of the relevant assets or to sell the assets with a discount.
only loans that are more than 90 days past-due but also loans that are either restructured or those that are likely to default in the near future.

The marked heterogeneity in the definition of non-performing loans within the EU has been recently addressed by an implementing regulation developed by the European Banking Authority (EBA) and approved by the European Commission. The new regulation, which entered into force in January 2015, aims to align the definition of non-performing loans for supervisory reporting purposes. Box 1 provides a more detailed discussion of the rules, which are applicable across the EU.

Notwithstanding how non-performing loans are defined, declaring a loan as non-performing has several implications for a bank. First, to the extent that the definition of non-performing loans overlaps with the definition of default for the purposes of prudential policy, the risk-weighting of the loan is increased, effectively raising the bank’s capital requirement, or equivalently, lowering the bank’s regulatory capital ratio. Second, non-performing loans typically earn lower interest income than performing loans since the borrowers cannot meet their regular interest payment obligations in full. Third, accounting rules often require banks to set aside reserves for loans that are deemed to be past-due, which generates costly loan impairments.

The discussion above suggests that the lack of a standardized definition of non-performing loans has in effect granted banks discretion in the identification of non-performing loans. This discretion could undermine the incentives for adequate monitoring of credit risk, potentially contributing to the unchecked growth of poor quality credit in some (but not all) of the periphery member states. To that extent, EBA’s efforts in harmonizing the definition of non-performing loans should certainly help to improve the conditions in the future. However, in the short run, the changing definitions are leading to a further worsening of the reported non-performing loan figures in some member states, especially those whose banks have already been hit hard. This may suggest the need for speeding up the development of a framework for alternative solutions, such as the prioritized development of distressed loan markets within the EU, enabling banks to off-load a relatively sizeable proportion of their troubled assets (Aiyar et al., 2015a; Jassaud & Kang, 2015).

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**Box 1 – Standardizing definitions of non-performing loans and forbearance**

The definition of non-performing loans is far from uniform globally. The definitions used in the financial soundness indicators of the IMF, for example, recommend that authorities identify loans as non-performing (i) when the payments of principle and interest are past due by more than 90 days; (ii) when the interest payments of more than 90 days are delayed; and/or (iii) when national rules deem them as non-performing. Despite these suggestions, which are in line with the Basel Committee’s core principles and the Basel II/III criteria for defaulted assets, there are substantial differences in the way in which banks categorize loans as non-performing.

In 2015, the EU adopted uniform definitions of both forbearance and non-performing exposures for the purpose of supervisory reporting. With the new rules, non-performing exposures are now defined as those being (i) material exposures more than 90 days past-due and/or (ii) unlikely to be repaid in full without realization of collateral. Defaulted exposures under CRR or those impaired are to be automatically categorized as non-performing. The value or the quality of collateral should not be taken into account in the categorization. Forbearance actions cannot be used to upgrade an exposure, at least until the criteria for non-performing exposures are no longer satisfied.

These changes are already leading an adjustment in non-performing loans in several EU members. Indeed, the asset quality review portion of the ECB’s Comprehensive Assessment of 2014, where the EBA’s reporting standards were applicable, has led to an upward adjustment of the stock of non-performing exposures of over € 136 billion, especially hitting some of the member states that faced with the highest proportion of non-performing loans, (Bank of Italy, 2014; Aiyar et al., 2015a; ECB, 2015).
1.2 Impaired loans

Unlike the concept of non-performing loans, international and national accounting standards are in place to guide banks on how they should set aside reserves for expected losses from loans. Depending on the particular accounting standards in place, the so-called loan loss reserves (often called the “impairment allowances” or, in short, “impairments”) may appear as a liability or as “contra-assets” in an institution's financial reports. In either case, the reserves set aside effectively reduce the value of the corresponding loans – hence the term “impaired” loans – and the newly provisioned amounts appear as an expense item in the profit and loss account.

While national accounting rules may differ, under the current international accounting (or the so-called “IAS-39”) rules, provisions can only be set aside when banks have objective evidence for potential future losses, such as an “incurred loss”. Thus, a bank can build reserves to absorb losses from non-performing loans, but cannot do so for its performing loans – even if it estimates it will face losses due to realization of future events, such as an economic slow-down. Essentially, this implies that losses can only be considered when the probability of default is already very high.

There are pros and cons associated with this simple approach to provisioning under the IAS-39. On the one hand, the exclusive reliance on incurred losses makes the estimation of the future losses relatively straightforward. Indeed, banks are simply instructed to calculate the losses arising due to lower future cash flows that are entirely due to the incurred loss event and nothing more. However, relying solely on incurred loss events may bias the estimation of future losses. Indeed, there is concern that this approach has led to procyclicality, implying that loan loss reserves are not adequately built in good times to absorb losses in bad times.

Aside from accounting rules, regulatory rules also have an impact on the provisioning choices of banks. Under the 1988 Basel Capital Accord (Basel I), banks were allowed to include loan loss reserves that are linked to specific losses, i.e. “specific reserves”, to be a part of Tier-1 capital. Additionally, reserves created against the possibility of losses not yet identified, i.e. “general reserves” can be included in Tier-2 capital. With the implementation of the revised Basel Capital Accord (Basel II) rules across the EU by the Capital Requirements Directive (so-called “CRD II”) in 2006, these rules continued to be applicable for banks using the standardized approach for the calculation of regulatory capital requirements for credit risk. For general reserves, an upper limit was introduced, allowing recognition of those reserves up to a maximum of 1.25% of risk-weighted assets. For banks that opt for the internal ratings based method (IRB) for the calculation of capital requirements, the recognition of reserves in regulatory capital depends on the extent that the former covers for the model-based estimates for expected losses (EL). Shortfalls are deducted from Tier-1 and Tier-2 capital on an equal-basis (50%-50%). Excesses may be recognized in Tier-2 capital only up to a maximum of 0.6% of risk-weighted assets. These provisions were left unchanged under Basel III and its implementation in the EU through the Capital Requirements Regulation (“CRR”) in 2013.

In many ways, impairing a loan today determines how much additional loss the bank may have to take going forward, for example if it decides to write-off that loan. If the reserves set aside are not sufficient, then these losses may be large, which can then jeopardize the bank's capital position going forward. Such a situation may, in turn, give the bank an incentive to delay writing-off the loan for as long as possible. In this regard, the new IFRS 9 rules represent a step in the right direction. However, the upcoming rules also give banks more discretion than the existing IAS 39 rules in estimating expected losses, which could potentially undermine its very purpose.

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(1) As an example, under the Belgian Generally Accepted Accounting Principles (B-GAAP) rules, certain types of reserves (i.e. “uncertain loans”) appear as liabilities, effectively offsetting the amounts lent. In turn, under the IAS-39 rules the reserves for other types of impaired assets (i.e. “non-recoverable loans”) may be directly incorporated into the carrying amount of those assets without the use of an allowance account on the liabilities.

(2) More specifically, the IAS-39 rules dictate that, “losses that are expected as a result of future events, no matter how likely, are not recognized,” (IAS-39 59). The text further defines certain trigger events that can be recognized as objective evidence for future losses, including: “significant financial difficulty of the issuer…; a breach of contract…; borrower [entering] bankruptcy…; disappearance of an active market for that financial asset…; observable data indicating … a measurable decrease in estimated future cash flows…”

(3) The IAS-39 rules state that “the amount of the loss is measured as the difference between the asset's carrying amount and the present value of estimated future cash flows (excluding future credit losses that have not been incurred) discounted at the financial asset's original effective interest rate (i.e. the effective interest rate computed at initial recognition).” (IAS 39 63).
1.3 Written-off loans

As discussed above, written-off (or “charged-off”) loans are those loans that are effectively removed from a bank’s balance sheet. Adjustments are made on the asset-side by removing the written-off loans for which no reserves are built from the original amounts lent. This also leads to a reduction in non-performing loans, since written-off loans are often – and in many cases have to be – declared as non-performing at an earlier stage. The total stock of loan loss reserves is also reduced by removing those that are set aside for the written-off loans.

The removal of written-off loans from the balance sheet effectively lowers the value the firm’s equity and thereby its regulatory capital position. Losses associated with write-offs (e.g. the non-recoverable portion of the original value of the loans) are carried over to the institution’s profit and loss accounts after netting out the reserves booked previously to absorb those losses.

Although write-offs and loan loss provisions have a number of commonalities, i.e. lowering the value of the related assets and appearing as an expense item on the profit and loss account, there are some key distinctions between the two.
First, and foremost, while a bank may be able to reverse its reserves built for certain loans as conditions improve, the same cannot hold for write-offs. Indeed, write-offs are final and the amounts recovered are determined by the ability of the creditor to claim and recover its assets, either by liquidating them or by selling them off. This is indeed a key distinction and implies that banks may delay write-offs despite a relatively sizeable loan loss reserve account if there is chance that the conditions will improve.

Second, the losses associated with write-offs are beyond the direct control of the bank, since factors such as market conditions and the structure of the legal system become important determinants of the incentive structure. Banks may have less incentive to write-off their problem loans if the insolvency regime does not provide adequate measures for creditors to obtain their residual claims in an effective and speedy manner. Many EU countries have reformed their insolvency regimes in recent years, in many cases simplifying and improving the turn-around for insolvency procedures (Aiyar et al., 2015b). Reforms in this direction are clearly of key importance in removing the obstacles that banks may face in recovering their assets.

Third, in some countries there are differences in the tax treatment of write-offs and loan loss provisioning. For example, Belgium, France, and the UK allow loan loss provisions associated with specifically identified loans or loan pools to be tax deductible. Italy provides tax deductions for all loan loss provisions with a cap but no deductions are foreseen generally for write-offs, although the provisions have been amended in recent years, (Jassaud & Kang, 2015). Germany requires that the general provision for tax purposes cannot exceed 60% of average loan losses over the past five years. More generally, the ability of banks to carry-forward their losses, in the form of deferred tax assets (DTAs), from provisioning or write-offs could also change a bank’s incentives. In particular, when prudential and fiscal rules do not allow DTAs, banks may have an incentive to provision at an earlier phase of the crisis when their net profits are high and delay write-offs until after a severe downturn.

2. An illustration of problem loan transformations

This section provides a simple illustration of how a bank would transform its performing loans to different problem loan categories. The example is not aimed at capturing all of the potential transformations that are possible. In particular, asset quality is continuously downgraded in the illustrated case, with performing loans becoming categorized as non-performing and unimpaired loans becoming impaired. The section provides how these transformations may impact the bank’s balance sheet and its profit and loss account. Based on the illustrated case, it also discusses some of the more general issues that may arise as a result of problem loan transformations.

Chart 1 panel (a) starts with an example where gross loans are categorized into performing, non-performing (NPL) and impaired loans at the end of the reporting period. All impaired loans are recognized as non-performing, which is typically a regulatory requirement. However, the opposite does not hold: Banks may hold no reserves for certain non-performing loans. The diagram also draws attention to the distinction between the gross and net values of impaired loans. The gross value of impaired loans refers to the value of the loan without taking the impairments into account, or without reducing the loan’s original value. In turn, the net value of impaired loans refers to the residual value net of impairments. In this context, the terms “total impairments” and “loan loss reserves (LLR)” are often used interchangeably, but should not be confused with the concept of “impaired loans”.

Panel (b) shows the manner in which a bank may engage in write-offs and issue new loans within the next period. The diagram distinguishes between three types of written-off loans. This distinction has been made to highlight that the carrying amount of the loans will only drop by the shaded parts (items A and C), netting out the losses that the bank has already accounted for by setting aside reserves (item B). The latter term, or reserves that correspond to the written-off loans, will be removed from the reserve account. The write-off losses, i.e. given by the non-recoverable share \((1 – ρ)\) of the written-off loans, are carried over to the profit and loss (P&L) account after netting out the reserves corresponding to the written-off loans. Lastly, in the illustrated example, the bank issues new loans, partially offsetting the impact of the write-offs on the size of the bank’s loan book.

(1) Banks may adjust over time their losses due to write-offs if the estimated recoveries (i.e. due to sale of asset or liquidation of underlying collateral) are different than the actual recoveries; however, these adjustments are usually quite limited.
Panel (c) depicts how the bank may engage in further transformations in its asset quality within the same period as panel (b). According to the illustrated case, there are net flows into the impaired loans category (items D, E, G, and H). In addition, a part of performing loans becomes non-performing for which no reserves are set aside (item F). The bank also decides to provision more for some of its loans that were previously impaired (item I), possibly due to increased expectations of losses on readily impaired loans. The new flow of impairments into the loan loss reserves (items E, H, and I), or the so-called “loan loss provisions” in this period, lower the total asset value of the bank’s loan book and appear as a net loss in the P&L account.

Finally, panel (d) provides a view of how the bank’s loan book would look like at the end of the period $t + 1$, after netting out all of the transformations that occurred within that period as detailed in panels (b) and (c).

The impacts of these transformations on the bank’s loan book and its P&L expenses(1) can then be summarized by the following tables.

Several observations can be regarding the example and how the points made here can be generalized.

First, panel (b) depicts an example where all written-off loans have been earmarked as impaired at an earlier period. There is, however, no reason that this should be the case. Indeed, as will be argued below, the manner in which banks

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(1) This analysis does not detail the impact of asset quality transformation on regulatory capital through their impact on the risk-weighted assets (RW A).
may write-off their loans is not regulated and is not subject to any accounting standards. Thus, banks may write-off loans that have been unimpairred.

Second, although panel (c) depicts a flow of loans from lower to higher problem loan categories, the opposite may also hold. Indeed, the accounting rules typically allow banks to engage in “reversals”, effectively reducing their loan loss reserves. The ability for banks to exercise reversals is indeed a key difference between provisions and write-offs. Although both have a similar impact on a bank’s balance sheets and P&L accounts, write-offs cannot be reversed (1).

Third, write-offs may reduce the stock of loans in different problem loan categories if the net flows into those categories are relatively small. This has been the case for loan loss reserves in the illustrated case since the reserves that have been accumulated for the written-off loans (item B) are greater than the sum of new provisions (E + H + I). More generally, write-offs may reduce the amount of impaired or non-performing loans when the values of the written-off loans are greater than the new flows into those categories.

Lastly, write-offs need not lead to any P&L expenses if the reserves that have been built for those losses (item B in the illustrated example) is equal to or greater than the actual losses, (given by \((1 - \rho) \times (A + B + C)\)). Thus, banks whose loan loss reserves are not adequately built are likely to delay write-offs.

3. Problem loans in Belgium (2)

This section provides a brief overview of the evolution of problem loans in Belgium, especially in response to the implementation of the IAS 39 rules and the more recent financial crisis. Since the concept of non-performing loans has not been explicitly defined in Belgium until very recently (3), the focus is on the concepts of impaired loans and write-offs. A key question that is investigated is the extent to which reserves may be built to absorb eventually losses from write-offs.

(1) Banks may, however, adjust their write-off losses from one period to another if the estimated recoveries (i.e. due to sale of asset or liquidation of underlying collateral) at the point of write-off are different than the actual recoveries.
(2) See the Section 3 of Arbak (forthcoming) for a complete version of this section.
(3) Depending on the context of the reporting framework, the non-performing loan concept in Belgium either overlaps with the impaired loans or with defaulted loans derived from prudential treatment. As noted in Section 2, the Belgian framework until very recently did not have an explicit requirement to categorize loans that are more 90 days past-due as non-performing.
The analysis relies on annual individual (i.e. solo) supervisory data (the so-called “Schema-A reports”), which is based on the Belgian Generally Accepted Accounting Principles (BGAAP). As noted above, the dataset only covers two problem loan categories: Loan loss reserves (LLR) and losses on written-off loans gross of provisioning. As is standard in the literature, all variables are represented as a percentage of lagged gross loans.

While data on loan loss reserves exist, the losses on written-off loans have to be derived by taking advantage of the parallel reporting on impaired assets. More specifically, using the Schema A reporting framework, one can get figures for:

1. Net flows into the stock of loan loss reserves ($\Delta LLR$), which is by definition equivalent to net provisioning minus reserves that were built for written-off loans; and,
2. P&L expenses due to new provisioning and write-offs (Expense impact), which are equivalent to net provisioning plus losses on written-off loans net of reserves readily built.

The written-off losses are then calculated by subtracting the net flows into the stock of loan loss reserves, from the provisioning and write-off expenses. The derived write-off losses are therefore gross of reserves already built for those loans.

CHART 3
EVOlUTION OF STOCK OF LOAN LOSS RESERVES OF BELGIAN BANKS (% of gross loans, end-year figures)

A quick look to Chart 2 makes it clear that the Belgian banks differ substantially in the manner in which they built their loan loss reserves over the last two decades. The four major banks have in generally reduced their loan loss reserves gradually between early 2000s and 2007, down from around 3% in 2000 to 1% in 2007. The reserve stocks of the smaller banks also declined in the same period as a whole however the banks declined substantially after 2004. Interestingly, the loan loss reserve ratios of major banks were in general lower than those for other banks prior to 2007, at least on an aggregate level.

Things changed substantially after 2007. While the smaller banks’ loan loss reserve ratios did not change much until 2014, the major banks started to put aside substantially more in reserves to reach a maximum of over 7% in 2013.

(1) Although the Schema-A data is available on available on a monthly basis for balance sheet items and on a quarterly basis for P&L items, an analysis of the data revealed that the accounting identities regarding loan loss reserves and their P&L impacts only hold at an annual basis for some banks.

(2) The reported loan loss reserves cover provisions on interbank and customer loans, although the reserves corresponding to the former are thought to be quite small, if not inexistent.

(3) The use of lagged loans is due to the fact that write-offs have a direct impact on the current amount of loans. Thus, the use of current shares may hide some of the dynamics.

(4) Net provisioning is defined new amounts added to reserves to absorb future losses net of reversals, i.e. reserves that are removed due to improvement in asset quality.

(5) More specifically, the change in loan loss reserves as it impacts the balance sheet is defined as: $\Delta LLR = \text{Provisions} - \text{LLR(write-offs)}$ while the impact of provisioning and write-offs on P&L expenses is defined as: Expense impact = $\text{Provisions + LOSS(gross)} - \text{LLR(write-offs)}$. Thus, subtracting the latter from the former will give the gross losses on write-offs, Expense impact = $\Delta LLR + \text{LOSS(gross)}$. 

Source: NBB Schema A, individual (solo) reporting

(1) The major banks are BNP-Paribas Fortis, Belfius, ING Belgium, and KBC Bank.
Although the ratio of loan loss reserves to loans declined in recent years to around 6%, the loan loss reserves of four major banks are still quite high historically.

Chart 3 provides more insight into how loan loss reserves of Belgian banks have built over the last two decades. The charts show both the expense impact and the change in loan loss reserves as well as the difference between the two lines (i.e., the shaded area), which is equivalent to the write-off losses gross of reserves.

For major banks, it is clear that the rise in the ratio of loan loss reserves in 2008 was due to a remarkable level of provisioning set aside in that year. However, the continued increases in the reserves in the years that follow were mostly due to the deleveraging of the loan portfolios, which in turn are due to the write-offs. The figures therefore highlight that the build-up in loan loss reserves in 2008 was in many ways in preparation for losses on future write-offs. A similar picture also emerges for the more subdued jump in provisioning in 2000, which has been followed by substantial write-off losses in 2002 and onwards.

In contrast to major banks, the relationship between current provisioning and future write-off losses appears to be weaker for smaller banks, at least on the aggregate level. In particular, apart from 1995, the first year for which the figures could be produced, an increased level of provisioning does not seem to be followed by a corresponding increase in write-off losses in subsequent years. More generally, the changes in loan loss reserves for smaller banks appear to be mostly due to deleveraging, which may once again be due to write-offs. The results for 2014 and 2015 highlight heavy losses, which are largely due to losses on wound-down entities.

These results invite the possibility that there may be differences in the way that banks build their loan loss reserves, at times almost as a precautionary measure to absorb future losses. For some banks, the link may consistently strong or weak, depending on their internal credit risk management policies. The possibility that certain Belgian banks may be using provisioning to absorb future losses suggests that those banks are using B-GAAP provisioning rules to produce results that should be more common under the upcoming IFRS 9 rules. Nevertheless, a major caveat of the analysis above is that the aggregate figures presented may be misleading since they may be exaggerating or concealing individual variations in the variables of interest.

(1) A formal empirical analysis by Arbak (forthcoming) using the Schema A supervisory reporting reveals that forward-looking losses are indeed a key driver of current provisioning decisions, although the link appears to have weakened after the financial crisis and has not been impacted much by the implementation of IAS 39 rules for consolidated supervisory reporting.
Conclusion

This paper provides a summary of how loan loss provisioning interacts with other problem loan categories. It also distinguished between two additional categories of problem loans: non-performing loans and written-off loans. The aim has been to provide clarity on some of the concepts that are often used interchangeably in the literature, in financial reports, and even in regulatory and accounting rules, in many cases leading to confusion even among experts.

One issue that has been highlighted is that until very recently no pan-EU definition for non-performing loans existed. The text also highlighted that some of the recent and upcoming reforms may also have some down-sides. In particular, while the standardized definitions of non-performing loans will clearly improve monitoring efforts, comparison across banks, and market discipline in the long-run, the reforms alone may not be sufficient to help banks that are already burdened by a persistent stock of non-performing loans. In a similar manner, while the expected loss provisioning approach that is being introduced under the IFRS 9 rules may lead to loan loss reserves to be built in anticipation of future events, the new approach will give banks more discretion in the estimation of expected losses.

This paper also provides a brief analysis of loan provisioning practices by Belgian banks. The aggregate figures suggest that certain Belgian banks may be using provisioning to prepare themselves for future losses. In particular, figures for the major four Belgian banks reveal that they appear to have increased their provisions with view of heavy write-offs in at least two crisis periods. Although the relationship does not appear to be present for the smaller institutions, more detailed empirical analysis reveals that the aggregate figures may be misleading. Put together, these results imply that the impact of the introduction of the IFRS 9 rules may be varied for the Belgian banking industry.
References


Cyber risk response strategies for financial market infrastructures: towards active cyber defence

Filip Caron

Introduction

Technology is fundamentally transforming the financial industry and its underlying financial market infrastructures (FMI). Innovation is being embraced by FMI to streamline their processes for clearing, settling and recording financial transactions between market players. While technological advances enable FMI to develop competitive advantages in an increasingly complex world, these advances also expose them to a variety of new types of threat, such as cyber threats. Indeed, it appears that a variety of actors might in fact be interested in unlawfully gaining access to transactional information or in compromising the confidentiality, integrity and/or availability of an FMI’s information systems.

Recent cyber incidents in diverse industries have indicated that it can be notoriously hard to adequately protect and defend an information system. The complexity of information systems and interaction between them makes it nearly impossible to identify all entry points to an information system. Moreover, developing a control environment that effectively protects all entry points would most probably not be (economically) feasible.

The main premise in cyber security increasingly becomes: a security breach will be inevitable. In this context it is important to complement the protective security measures with capabilities to rapidly detect, analyse and mitigate malicious activities in the information systems. Cyber security strategies developed according to the principles of active cyber defence aim at (near) real-time detection, analysis and mitigation of cyber threats, preferably before damage occurs.

This article will discuss the components of a comprehensive cyber defence strategy permitting this real-time detection, analysis and mitigation. The next section starts by positioning active cyber defence in a layered cyber security strategy. Active cyber defence requires the effective implementation of supporting techniques, and these will be described in sections 3 and 4. Section 5 elaborates on the actual active cyber defence techniques and section 6 concludes the article. The techniques described in this article are applicable for all financial services organisations.

1. Towards active cyber defence

Cyber risk mitigation strategies have been continuously evolving. FMIs have constructed highly sophisticated defensive perimeters around their critical information systems, but the new security-breach-inevitability assumption has generated a strong momentum for the development of resilient\(^1\) and active cyber defence strategies (Dewar, 2014).

While active defence strategies are often associated with retaliatory action, these strategies cover a broader set of interdependent activities, and might even explicitly exclude retaliation. *Active cyber defence aims at the fast identification, detection, analysis and mitigation of immanent cyber threats.*

Implementing active cyber defence strategies requires robust processes and practices, which could be organised in a layered architecture as depicted in Chart 1. Developing effective cyber defence practices attributed to a specific layer requires the presence of robust practices appertaining to lower layers. For example, retaliatory actions require strong attribution of a cyber attack, which in turn requires that the information systems continuously capture relevant information on their status.

Planning forms the basis of an effective active cyber defence strategy. It should enable the FMI to determine how it will defend its critical assets against looming threats. The focus should be on determining both the risk appetite and the threats in the organisation’s environment. Exercises which define risk appetite also need to take into account the additional business and legal risks that could be created by particular active defence practices.

Based on the findings of the planning layer, the organisation should adapt its infrastructure in order to limit the possible attack paths. After establishing an initial foothold, the attackers typically focus their efforts on lateral movements through the information systems in order to identify the assets of value. Typically, the practices in the second layer are oriented towards restricting entry points, reducing the direct interdependence between information systems and shielding critical information assets.

The third layer focusses on the implementation and positioning of detection mechanisms in the adapted infrastructure, as well as on external collaboration. Decisions on information capturing within the information systems will have an impact on the available analysis options. For example, data flows can only be analysed when network devices register the packages that pass by them. Proactive, anomaly and forensic analysis capabilities are located in the fourth layer.

Practices in the top layer deal with *responding in real time* to a cyber attack. This layer includes activities to contain the infection, to trace the cyber attacker who has gained unauthorised access to the infrastructure, and retaliatory hacking.

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\(^1\) Resilient cyber defence strategies emphasise the continuity of service provision under extreme circumstances, e.g. cyber attacks or natural disasters. Guidance papers such as (CPMI-IOSCO, 2015), encourage FMIs to develop disaster recovery functions, to elaborate cyber business continuity plans, and to adopt technological diversity.

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CHART 1 \hspace{1cm} ACTIVE CYBER SECURITY STRATEGY

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<tr>
<th>Supporting actions</th>
<th>Active cyber defence strategy layers</th>
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<td>(FSR 2015)</td>
<td>Real-time react</td>
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All cyber defence processes and practices are to some degree associated with one or more of the following cyber security objectives: intelligence gathering, annoyance, containment, attribution and attack. The intelligence gathering, attribution and attack objectives are straightforward to interpret. Annoyance involves deceiving the attacker, e.g. by establishing decoy environments, which could significantly increase the amount of resources needed by the attacker to obtain control over the critical information assets. Containment refers to techniques that isolate the infected information system components in order to protect the other components from contamination.

The next four sections will highlight some of the major techniques in the different layers.

2. Enabling active cyber defence

Each active cyber defence strategy comes with its own prerequisites. The information systems’ architecture needs to comprise some basic defence components, e.g. for containing system infections. These defence components might not be present in the current portfolio of information system resources, which tends to include multiple legacy systems. This section will discuss the planning activities and some of the most effective measures for improving the cyber defence readiness of the existing portfolio. Other relevant practices are adequate patching and a continuous vulnerability assessment.

2.1 Active defence planning

Planning is the logical first step in the development of an active defence strategy and will enable the FMI to concisely define how it will defend its critical information assets against relevant threats. Table 1 provides an overview of common practices in active defence planning.

Cyber defenders must acquire a clear understanding of the mission-critical business processes and the information assets most coveted by potential attackers. Regular meetings with the business operations could foster a better understanding of the business risks and concerns. These basic business insights will become valuable when a defence decision needs to be made. A recent survey suggested that only 23% of organisations with a dedicated active defence team explicitly invest in developing these business insights (Ernst & Young, 2015). These are organisations that are commonly considered to have obtained a high level of cyber security maturity.

**Table 1**

**ACTIVE DEFENSE PLANNING**

| Organization                          | • Facilitate direct interaction between cyber defenders and business experts;  
|                                      | • Document the business assets and resources that need to be protected, e.g. financial, intellectual property and customer data. Classify these assets and resources in terms of sensitivity and priority;  
|                                      | • Document and update how the information systems are designed (including the sources of security operations data such as alert logs) and what is considered to be normal behavior in the information system. Identify critical information that is lacking;  
|                                      | • Determine the defense capabilities you will establish in house and what you require from external experts. Establish working relationships with external cyber incident response teams.  
| Environment                         | • Identify and describe the relevant threat actors. Threat actor classification schemes can support this analysis, e.g. (Casey, 2007);  
|                                      | • Detect strong dependencies on third party service providers and technologies. Research the vulnerabilities related to these services and technologies.  
| Risk appetite, assessment and mitigation planning | • Define the residual risk tolerance levels, taking into account regulatory and contractual requirements;  
|                                      | • Identify the potential legal and business risks of different active defense strategies;  
|                                      | • Select the active cyber defense practices that will be implemented and develop an implementation roadmap.  

Acquiring advanced technical expertise in defending every aspect of the information systems might not be (economically) feasible. FMs are encouraged to determine which cyber defence activities will be outsourced. Developing working relationships with capable and trustworthy experts forms an integral part of the planning layer. Guidance on selecting these experts can be found in (Creasey, 2013).

The assessment of the organisational environment and the risks posed by this environment were discussed in last year’s article (Caron, 2015). Planning an active defence strategy requires the selection of practices in higher layers. Certain active defence strategies will introduce additional risks. These risks will be considered during the discussion of the related active cyber defence strategies.

2.2 Adapt to defend

Network segmentation and data flow restrictions are considered as important first lines of defence against a cyber security breach.

Segmentation could constrain lateral movements between the information system components, as well as enabling faster isolation of compromised segments. The cyber attack against Target, where card details were stolen after the security of the heating-ventilation-and-air-conditioning system was breached, is an often-cited example of a lack of network segmentation.

Furthermore, segmented networks enable FMs to differentiate the levels of cyber security in the various segments. For example, the segments containing the infrastructure to host the official webpage might be considered less critical than the segments containing services of systemic importance for our financial system.

Restricting inbound data flows will reduce the risk of receiving malicious code. Controlling outbound data flows helps prevent data leaks and could stop malware connecting back to the intruder’s servers. Table 2 discusses the implementation of these defence components.

<table>
<thead>
<tr>
<th>TABLE 2 ADAPT TO DEFEND</th>
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<tbody>
<tr>
<td><strong>Network segmentation</strong></td>
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<tr>
<td>• Segment the network in logical enclaves of information resources, e.g. based on the user (anyone, customers, employees, developers, etc.) or product lines;</td>
</tr>
<tr>
<td>• Consider implementing demilitarized zones (DMZs) between systems with strongly different security requirements;</td>
</tr>
<tr>
<td>• Limit the exposure of legacy systems by encapsulating them in well-managed segments;</td>
</tr>
<tr>
<td>• Develop and impose access policies for the different network segments taking into account the principles of least privilege and need-to-know;</td>
</tr>
<tr>
<td>• Enforce data encryption in highly confidential segments.</td>
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<tr>
<td><strong>Restrict data flows</strong></td>
</tr>
<tr>
<td>• Impose stringent policies on the data that can be transferred between network segments;</td>
</tr>
<tr>
<td>• Limit data flows into network segments (i.e. ingress filtering);</td>
</tr>
<tr>
<td>• Restrict the outbound data flows of network segments (e.g. egress filtering and sinkholing);</td>
</tr>
<tr>
<td>• Consider the use of proxy servers for data flows.</td>
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</table>

Several standards are actively promoting network segmentation to segregate critical services and sensitive data (e.g. customer data or source code) from less secure network components, e.g. (CPMI-IOSCO, 2015). Similarly, the National Bank of Belgium stressed the importance of network segmentation in its guidance on the expectations for business continuity and information security for systemically important financial institutions (National Bank of Belgium, 2015). Furthermore, the scope of mandated security assessments might be significantly reduced if organisations can demonstrate effective network segregation for their critical services (PCI, 2015).
While physically disconnecting network segments would prevent lateral movement, it would also disable intersegment data flows. This might obstruct legitimate business behaviour, e.g. a customer trying to connect over the internet to a critical service. A multitude of other approaches have been suggested. For example, VLAN technologies enable the logical grouping of information system components regardless of the underlying physical connections. Cyber criminals with access rights to a specific VLAN could attack an underlying component in an attempt to gain privileges to other VLANs supported by that component (i.e. VLAN hopping) (Altunbasak, et al., 2005).

Recently, software-defined networking (SDN) has been suggested as a set of technologies to manage networks, enabling the implementation of granular and flexible policy management for network segments. In a software-defined network, the controller orchestrating the network and its flows could become the weakest link (ONF, 2013).

In addition to segmentation, the FMI should consider restricting the data flows to the different segments. Where possible the FMI should consider whitelisting for ingress and egress filtering (e.g. identified customers or trusted self-managed servers), instead of using a blacklist. Furthermore, FMIs could opt for indirect flows between segments with significantly different levels of trust, e.g. between customers on the Internet and the internal network. This could be achieved by directing the flows to proxy servers located in between the firewalls of a demilitarised zone (DMZ). Data flow analysis tools could be added to the DMZ in order to detect attempts at data exfiltration and malicious code delivery. However, legitimate encryption tunnels – for example to the hijacked computers of a customer – could still be used for data exfiltration.

3. Identification and detection techniques

FMIs that have adapted their infrastructure, network and information systems to improve their cyber defence readiness need to ensure that effective mechanisms for the identification of threats and detection of cyber attacks are put in place. A comprehensive overview of detection systems can be found in (Scarfone & Mell, 2007).

Cyber threat intelligence sharing & collaboration and honeypots are two detection mechanisms that are often mentioned in the context of active defence. These techniques will be further developed in this section. An overview of the related considerations can be found in Table 3.

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<th>TABLE 3</th>
<th>THREAT IDENTIFICATION AND DETECTION</th>
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</table>
| **Cyber threat intelligence sharing and collaboration** | • Develop a sharing framework that describes the objectives and scope of the sharing initiative, as well as its conditions under which sharing would be permitted;  
• Define data storage, sharing and protection standards for threat intelligence, consider encryption and sanitization of sensitive information;  
• Establish formal and informal sharing relationships. Consider appointing a liaison officer (fostering long term trust relationships) and signing memoranda of understanding (for formal multilateral sharing initiatives);  
• Participate in the sharing relationship: distribute the results of your cyber threat analyzes and incident investigations;  
• Contribute to knowledge maturation, i.e. bringing together seemingly unrelated observations to distil robust sets of indicators of compromise;  
• Improve the internal control system of the FMI based on the intelligence received through the sharing initiatives. |
| **Honeypots** | • Determine the type (low versus high interaction) and location of the honeypots;  
• Implement adequate protective measures that isolate the honeypot form the legitimate systems in the network;  
• Consider restricting outbound flows to protect legitimate systems of innocent third parties (for high interaction honeypots);  
• Ensure that the honeypot provides a “realistic” decoy environment, i.e. that it contains technologies and data elements that are expected to be found in the real information systems;  
• Reserve sufficient resources to analyze honeypot activity, to communicate the findings and to formulate actionable recommendations for improving the internal control system. |
Two important general considerations should be mentioned. Firstly, detection mechanisms do not provide any value without the skilled experts to evaluate the situation. These systems may generate a multitude of false positive alerts, e.g. for exceptional but legitimate network flows. Further analysis may be required (analysis layer) and mitigating actions might need to be taken (active defence layer). Secondly, failure to detect anything does not necessarily mean that a cyber attack is not imminent or even taking place. If there are no effective detection mechanisms, it might be almost impossible to identify, analyse and stop subtle attacks (e.g. espionage-driven attacks).

3.1 Cyber threat intelligence sharing and collaboration

Significant commoditisation of successful cyber attacks has been observed (Sood & Enbody, 2013). Cyber intrusion tactics that appear to be successful in breaching the security of an organisation are often quickly directed against (similar) organisations. For example, investigations revealed that the Carbenak attack vectors have been directed at up to a hundred banks, e-payment systems and other financial institutions (Kaspersky Lab, 2015).

FMIs are encouraged to set up cyber threat intelligence-sharing relationships with their peers, commercial threat intelligence services and law enforcement agencies. Individual organisations that limit their threat analyses to their own information systems and networks may be left blissfully unaware of targeted attacks against their industry sector, acquired technology or business processes.

Various information-sharing and analysis centres (ISACs) and computer emergency response teams (CERTs) have been established. FS-ISAC is a global non-profit organisation that focuses on providing a platform for cyber and physical threat intelligence analysis and sharing. For Belgium, Febelfin has signed a Memorandum of Understanding on intelligence sharing with FS-ISAC. Additionally, the federal cyber emergency team CERT.be and the cross-sector Cyber Security Coalition provide platforms for cyber intelligence exchange.

FMIs could further enrich the cyber threat intelligence obtained from their peers with information acquired from open source fora, commercial cyber threat intelligence services, or law enforcement agencies. Commercial threat intelligence services gather information from a variety of sources, which is filtered and further analysed. They provide their clients with detailed cyber threat reports customised for their industry or even their organisation. Figure 2 provides an overview of the different cyber threat intelligence sources.
Standardisation in the structuring of actionable threat intelligence promises to further foster sharing initiatives. The Organization for the Advancement of Structured Information Standards focuses on the continued development of three open cyber threat sharing standards: STIX, TAXII and CyBOX (OAIS, 2015). These standards respectively focus on the structuring of threat information, the definition of a message exchange protocol, and the specification of observable events in information systems and networks.

There are currently two major obstructions to fruitful threat intelligence sharing: privacy concerns and the lack of an adequate sharing framework. Firstly, precise descriptions of threats could contain data elements that are considered to be personally identifiable information (PII), e.g. the IP addresses that were used to launch the attack (Gorzelak, et al., 2011). Secondly, the lack of an adequate sharing framework hampers active participation in sharing initiatives. A recent survey indicated that only 24% of the organisations were ‘very likely’ to share information with the community, and more than half of the respondents stated that this was due to inadequate policies (Dinkar, et al., 2016).

A potential pitfall of successful cyber threat intelligence sharing is that the security analysts could become overwhelmed by notifications. External triage might be a useful service in that context. Due to economies of scale, cloud providers trying to protect their customers' virtual resources might develop an advantage under such circumstances.

3.2 Honeypots

During cyber attacks there are often extended periods in which the victim organisation is unaware of the ongoing attack. By remaining under the radar, the intruder can identify and locate the most valuable pieces of information. Decoy cyber resources or honeypots could be deployed to detect malicious behaviour and characterise adversaries.

Honeypots are commonly divided into two types: low interaction and high-interaction (Grudziecki, Jacewicz, Juszczyk, Kijewski, & Pawlinski, 2012). Low-interaction honeypots provide the cyber attacker with emulations of some potentially vulnerable services which are expected to be found in the FMI's information systems. They do not provide all the functionality that is commonly found in an operational information system, but will be able to respond to (basic) malicious activities such as port scanning. In contrast, high-interaction honeypots offer a more complex environment with full operating system and application functionality. They may therefore provide far richer insights into the attacker's behaviour.

Honeypots give an FMI the facility to rapidly collect a limited amount of highly valuable information, i.e. all recorded connection to and behaviour in a decoy environment must be considered suspicious. This potential can only be achieved if the FMI allocates sufficient resources and places the honeypots in strategic positions. Firstly, the FMI will have to devote significant resources both to develop realistic decoy environments, in order not to tip off the intruders, and to analyse all suspicious behaviour. Secondly, the location of the honeypots will affect the security and the potential findings. By implementing a honeypot in a well-managed DMZ environment, the FMI protects its legitimate systems from lateral movement originating from the honeypot. Alternatively, honeypots could be placed in the internal operations environment to act as sensors for infected systems. Network segmentation will limit the scope of the sensor capabilities to the segment in which the honeypot is located.

Moreover, attackers are increasingly able to spot (commercial low-interaction) honeypots. As a result, the attacker who is able to identify a honeypot may decide to either avoid it or perform irrelevant actions on it. Both will significantly impair the value of the honeypots as detection mechanisms.

However, downstream liability is probably the most important risk related to the implementation of a high-interaction honeypot (Grant, 2004). Research has indicated that under certain circumstances the extensive functionality of these honeypots could be exploited to launch an attack on other systems (McGrew & Vaughn, 2006). In order to limit the downstream liability risk, the honeypot operator might consider prohibiting or limiting outbound connections to third parties.
Other legal risks which could be broadly categorised as negligence liabilities have been cited. If you identify important weaknesses through your honeypot, you should remedy them promptly and effectively. Honeypot analyses could indicate that the organisation has been aware of an important weakness but neglected to correct it (promptly) (Harrington, 2014).

Honeypots are not the only deception mechanisms available to an FMI. Detection mechanisms can be configured to intercept the transmission of honeytokens, i.e. decoy data such as fake user credentials and program code. Careful selection is crucial to the use of honeytokens.

4. Analysis techniques

Security events are significant occurrences, i.e. something that happens at a certain point in time and is triggered by someone or by a system component. For example, a router passes a packet between two other network components, or a cyber attacker changes the content of a certain file. Typically, information systems and applications tend to record a wide variety of events occurring within their perimeter. Other sources of these security events include detection systems, data/intrusion prevention systems and mitigation techniques (e.g. antiviruses). Together, these events contain a wealth of information on what happens in the FMI’s information systems and infrastructure. Security incident and event management tools provide a means to collectively analyse the relevant events.

While these security events are a valuable input for the analysis of an incident’s impact, these analyses tend to require the investigation of additional data. Incident analyses may also examine malware samples or verify whether critical files have been corrupted. An overview of the analysis-related activities can be found in Table 4.

<table>
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<tr>
<th>TABLE 4</th>
<th>ANALYSIS TECHNIQUES</th>
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| **Security incident and event management** | • Identify the relevant sources of security events (hardware/software logging, detection and prevention controls …) and establish centralization of these events;  
• Define, refine and update the rule-set based on both expected and abnormal behavior;  
• Adapt the rule-set whenever new threat intelligence is obtained;  
• Establish processes to respond to events and alerts generated by the SIEM. |
| **Incident analysis** | • Set up multi-disciplinary incident handling teams that consist of forensic, legal, business and communication experts with a deep insight in the information systems and business operations;  
• Define data extraction, collection, reduction and custody policies;  
• Consider the development of a software reference library for in-house developed and customised applications;  
• Decide on the priority between forensic analysis and incident containment for different lines of business. Take relevant directives and business risks into account;  
• Develop a scientifically accepted methodology and build relationships with firms specialised in cyber forensics. |

4.1 Security incident and event management

Security incident and event management (SIEM) tools enable the collection and correlation of security relevant data from a wide variety of information system components. Complex attack vectors might not be intercepted by individual detection mechanisms, but automated rule-based analyses on integrated data could flag these vectors. Some tools will take historical information and risk correlations into account. An example of a correlation rule might be triggering an alert when an unusually large number of emails are bounced in combination with antivirus notifications, as this might be the result of a poorly designed phishing attack.
The integration of security data and the analysis possibilities that this integration creates are considered to be the major advantage of SIEM tools. These tools do not replace other detection measures, such as network intrusion detection systems, firewalls or malware detection systems.

Implementing an SIEM tool is not considered straightforward due to the increasing complexity and the excessive requirement for professional services (Schultz, 2009). Three considerations will have a significant impact on the effectiveness of the SIEM implementation: the quality of the correlation and detection rules, the coverage of security events, and the response processes.

Developing the correlation and detection rule-set is an iterative process, which starts with modelling expected and/or abnormal behaviour. Results from organisational and environmental analysis in the planning layer will support the definition of expected behaviour. Threat analyses and intelligence could provide actionable inputs for abnormal behaviour. Depending on the flexibility and predictability of the business processes, providing alerts for all deviating behaviour might not be desirable as it could overwhelm the incident response team with false positives.

The rules in the SIEM rule-set will need to be continuously refined. Penetration tests could provide valuable insights into the detection capabilities of the developed rule-set and highlight blind spots. Additional detection mechanisms and log-generating components will be introduced over time, which may require their incorporation in existing rules and/or demand new rules. Similarly, new threats will continue to appear and influence the rule-set.

Optimising the coverage of the SIEM tool will be crucial in order to reduce the risk of non detection and inaccurate reporting of incidents. Consequently, the FMI will need to ensure that sufficient detection and event registration mechanisms are precisely positioned in its infrastructure. Moreover, all critical detection and registration mechanisms must be connected to the SIEM in order to avoid critical gaps in the collected information.

Well-designed SIEM tools will not provide additional value for cyber security programs unless they are combined with effective processes to respond to the generated alerts. As previously mentioned these processes require highly skilled experts. The active defence section will discuss this in more detail.

4.2 Incident analysis

FMIs operate diverse interlinked information system components which generate huge amounts of data. As intruders often move laterally between these components, data relevant to a cyber attack is likely to be scattered over multiple files and storage devices.

The objective of incident analysis is to identify, collect, preserve and analyse data in order to reveal the details of a cyber attack and its impact, without damaging the integrity of the evidence. A wide variety of incident analysis techniques can be applied, including memory analysis, data recovery techniques, data analytics and malware reengineering. While it remains difficult to predict exactly which techniques will be needed to investigate a specific attack, having some incident policies in place can ensure that evidence cannot get lost or corrupted.

FMIs are encouraged to proactively analyse the context in which incident analyses would take place. This involves identifying experts with both technical and business knowledge who could direct and conduct the analyses, setting up priorities for collecting (volatile) evidence, analysing related regulatory requirements, selecting incident analysis toolkits, and contacting specialised external experts. SIEM tools which provide centralisation of security event logs could assist in the rapid reconstruction of the intruder's activity sequence. By maintaining a software reference library, which contains digital signatures of the in-house or customised applications, the FMI rapidly eliminates known-to-be-good files during an incident analysis. The National Software Reference Library (NSRL) holds an extensive collection of digital signatures of known software applications (NIST, 2016). A similar approach can be taken for other data files.

The rapid adoption of cloud technologies has sparked discussion on the validity and reliability of forensic sciences in this new context. Investigators have less insight into and control over the information system resources in the cloud. There are considerable differences between the cloud models. Infrastructure-as-a-service (IaaS) clouds offer a set of virtualized computer resources and the greatest scope for evidence collection, as it enables the user to configure the systems and
install advanced detection and monitoring software. In contrast, software-as-a-service (SaaS) cloud solutions provide on-demand software without insight in or access to the underlying components, which results in the narrowest scope for evidence collection. The 65 principal challenges are enumerated in (Dykstra, et al., 2014).

There may be other impediments to incident analysis. Firstly, it is almost impossible to analyse files that have been encrypted by the cyber attacker. Similarly, steganography that relies on embedding data within other data can be notoriously hard to trace, e.g. digital watermarks or hiding information in images. Secondly, incident analysts must take into account the incident containment strategies of the FMI. While incident analysts would opt for isolation of the information systems affected in order to preserve the evidence, the FMI may prioritise the rapid restoration of (part of) its services.

5. Active defence techniques

The techniques of the previous layers provide the base capabilities required to adequately react in case of a cyber incident. Table 5 lists three important technique sets that deal with containing the infection, with tracing back the cyber attacker who gained unauthorized access to the infrastructure and with retaliatory hacking.

<table>
<thead>
<tr>
<th>TABLE 5</th>
<th>ACTIVE DEFENSE TECHNIQUES</th>
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| Cyber incident response team | - Develop a cyber incident response plan that focuses on incident detection; notification & escalation; communication; and coordination with forensics and vendors teams.  
- Define an incident categorization scheme.  
- Acquire containment and remediation capabilities.  
- Establish contingency plans.  
- Outline processes for post-incident evaluations and follow-up on recommendations. |
| Trace back | *FMI* could consider the deployment of trace back techniques under specific circumstances:  
- Apply trace back techniques in internal networks, while respecting all privacy and other legal restrictions.  
- Inform and collaborate with law enforcement agencies and internet service providers before starting the trace back exercise outside their own network. |
| Retaliation | *FMI* are strongly advised not to engage in retaliatory actions. |

5.1 Cyber incident response team

As a cyber security breach may become inevitable, FMI should consider the establishment of a cyber incident response team or blue team. The cyber incident response team could be proactive by conducting incident prevention campaigns and developing incident response plans and capabilities. However, the focus should be on the detection, containment and remediation of the incident. The team should play an important role in the recovery of the operations.

Cyber incident response teams should be able to review the FMI’s cyber security programme and challenge the security designs for applications and changes to the existing infrastructure. Through recommendations on these designs, a cyber incident response team will aim at ensuring that adequate defence mechanisms are available to limit the impact of a cyber attack. It should be noted that optimal defence mechanisms in real-world business settings might deviate from technologically optimal defence mechanisms. For example, two internet-facing servers with the same security policies but supporting different business services could be placed in the same DMZ zone from a technological cost-effective perspective. However, the business might opt for separate segments to protect the business services from cyber incidents impacting on the other service.

The second proactive activity deals with specifying operation and incident response procedures. It is important to consider the staffing roles. While the cyber incident response team should contain highly skilled ICT experts familiar with the
information systems and the infrastructure, it could greatly benefit from the input of legal, public relations, business and human resources experts. Legal experts will have to ensure that the actions remain compliant with regulations (including privacy laws), assess third party exposure and protect the admissibility of the collected evidence. Public communications might play a critical role when the incident affects service delivery or a third party, e.g. customers who are not able to perform financial transactions. Business experts could assist in prioritising the services that need to be protected. Human resources experts could advise the team when the organisation faces a malicious insider.

Previous sections have provided an overview of incident detection mechanisms. Established and effectively configured SIEM tools will provide the cyber incident response team with valuable initial assessments. These assessments will enable the team to categorise the incident and notify the right level of decision makers.

Containment strategies focus on isolating the affected components. By restricting the network connectivity to those components, the cyber incident response team prevents the malware from receiving further commands from the attacker and from moving laterally between components of the organisation’s information system.

After isolating the affected components, the cyber incident response team will focus on removing the threat and restoring the business services. Recent proposals for cyber security guidance have suggested that an FMI should design and test its systems and processes to enable the safe resumption of critical operations within two hours of a disruption, and to enable complete settlement by the end of the day of the disruption, even in the case of extreme but plausible scenarios (CPMI-IOSCO, 2015).

5.2 Trace back

Organisations confronted with a cyber attack often aim at tracing the origin of the attack, i.e. determining who launched and assisted in the attack. Obtaining this information would be useful in legal action and for some immediate threat mitigation activities, e.g. blocking malicious traffic and hacking back. Moreover, cyber security experts indicate that a strong attribution might be a critical component in cyber attack deterrence (Geers, 2010).

There are two main types of technique: tracing back the origin of a message flow and forced self-identification of the attacker.

Firstly, message flows can be reconstructed by means of marking, logging and input debugging techniques. Marking requires the routers to add flow information to the individual IP packets. Deterministic marking is often used for critical applications that require advanced security services such as non-repudiation. As this requires the marking of all packages, it entails a significant processing overhead. Alternatively, probabilistic marking reduces the processing overhead but complicates the reconstruction of the message flow. Logging requires network devices that are configured to log unique identifiers of packets (e.g. hashes) which they have handled. These logs could be queried afterwards. In contrast to marking and logging, input debugging is based on a continuous message flow in the future. Input debugging is based on the iterative processes of requiring adjacent network devices to report the occurrence of a behavioural pattern.

Resourceful cyber attackers can make attribution extremely difficult. Techniques include – but are certainly not limited to – spoofing, laundering hosts, and varying the timeframes in which events take place.

Secondly, forced self-identification or beaconing is based on enhancing files containing sensitive information with code that phones home, i.e. sends a message back to the servers of the legitimate owner. Depending on the circumstances, the message that is sent back may contain valuable information for identifying the intruder. Web bugs in a file are considered a benign version of beaconing. These bugs are basically links to a surreptitious object, which will be retrieved from a server at the site of the legitimate owner. Web bugs are commonly used in email messages to link to externally stored images. Upon opening the email, the email management software sends a message including the user’s IP address and other information in order to obtain the image.
5.3 Retaliation

The ability to initiate legal action, holding cyber attackers accountable for the damage caused by them, can be considered a significant deterrent. Yet effective legal action seems difficult to achieve in the current context. This is partly due to the cross-border nature of contemporary cyber attacks, i.e. the attacks are often launched from jurisdictions with less developed criminal justice systems (Messerschmidt, 2013). Cross-border cyber crime could create thorny jurisdictional issues, but a lack of legislation adapted to the current cyber space is also a commonly cited weakness (Kuchler, 2015).

Additionally, legal action against cyber attackers may result in public disclosure of the cyber security weaknesses. Such public disclosures could pose significant business risks, e.g. by having a major negative impact on the reputation of the organisation under cyber attack.

Hence, victims of a cyber attack may be tempted to respond in kind, i.e. by means of hacking back or retaliatory hacking. In general, cyber attack victims can deploy the same tools and techniques as the cyber attackers. Retaliatory attacks generally focus on achieving at least one of the following objectives: destroy, disrupt, degrade, deny and exploit.

Destruction involves responses that cause complete and permanent damage to the attacker's computer systems, i.e. the systems can no longer perform any function and need to be entirely rebuilt. Exploitation is a related objective in which the victim organisation conducts vengeful activities that involve accessing the attacker's computer systems in order to collect and/or modify data in its systems.

Disruption aims at interrupting the flow of information to the attacker's computer systems. For example, last year the FBI, Europol and several security vendors succeeded in poisoning the botnet of the Dridex banking Trojan's and redirecting infected systems to a sinkhole (Leyden, 2015). Hence, the infected computers in the botnet were no longer sending information back to the cyber attackers.

Degradation is meant to reduce the effectiveness and/or efficiency of the attacker's computer systems. The activation of a fork bomb could be considered as a degradation-based retaliatory action. These bombs are often disguised as important-looking information, and organisations can place them in strategic positions; once the bomb leaves its original position or is copied, it starts continually replicating itself. At a certain point the system's resources will be depleted, resulting in a system crash (Nong, 2008).

Denial-based strategies focus on preventing the attacker from accessing and using critical information and/or services. The use of ransomware-like software on your own data which is triggered when the data is accessed by an unauthorised party could block access to the data without rendering other systems unusable (Laperruque, 2015).

As organisations involved in retaliatory hacking are using techniques similar to those of the cyber attackers, they are exposed to the same legal risks as cyber attackers. Through retaliatory hacking, an organisation is at the very least knowingly (or even intentionally) accessing an information system without authorisation. This is in itself a criminal offence (Wong Yang & Hoffstadt, 2006). But the organisation also faces non-legal risks.

Retaliatory hacking raises the risk of collateral damage to innocent parties (Lewis, 2013). By routing their communication and commands through the information systems of innocent parties, trace back analyses may result in misattribution. Retaliatory hacking on the systems of innocent bystanders will result in financial losses and have an impact on the brand and goodwill of the organisation.

Playing cat and mouse with serious cyber attackers may result in them raising their game, e.g. launching even more sophisticated and destructive attacks. Retaliatory hacking may have two outcomes: the attacker either decides to move on to an easier target, or perceives the attack as an invitation to return fire. Security analysts have warned that organisations are not ready to compete with large criminal organisations or nation states (Fisher, 2013). Furthermore, in (Harrington, 2014), the author indicates that customers might wonder whether their data has been placed at risk because of escalation.
Finally, an organisation’s code of corporate ethics and business conduct should reflect its corporate values, including uncompromising integrity, responsibility and good citizenship. Organisations that empower or direct security experts to conduct retaliatory hacking may violate their own code of corporate ethics and compromise their ethical standing in the community.

Conclusion

In a world where FMIIs increasingly assume that they will inevitably face a security breach, the development of an operative real-time incident response capability becomes crucial. The effectiveness of these active defence capabilities is very dependent on the existence and quality of the supporting techniques and access to internal and external experts.

Active cyber defence requires a carefully designed multi-layer cyber security strategy. Careful planning and an infrastructure that comprises a basic defence mechanism are fundamental. Detection and analysis techniques should provide the necessary information to conduct effective cyber incident responses.

Effective cyber incident response programmes complement advanced technologies with professionals from diverse backgrounds to mitigate the various risks related to an incident. Additionally, these experts should carefully evaluate the legal, reputational and business risks related to the mitigating actions.
Bibliography


CCP resilience and recovery – Impact for the CCP users

Queenie Swerts
Steven Van Cauwenberge

Introduction

Back in 2009, in a bid to improve the management of potential counterparty and liquidity risks in the derivatives markets, the 20 countries agreed on mandating the use of a central counterparty (CCP) for clearing standardised over-the-counter (OTC) derivatives trades. Mandatory CCP clearing reduces the overall risk, provided the CCP itself is safe. Hence, mandatory CCP clearing for selected derivatives was combined with even stricter standards for CCP resilience and CCP recovery.

In the European Union (EU), mandatory clearing for OTC interest rate products will be implemented from June 2016 onwards. Regulation (EU) No 648/2012 of 4 July 2012 on OTC derivatives, central counterparties and trade repositories (the so-called “EMIR” Regulation) sets out CCP resilience requirements. The EU Commission is currently reviewing selected aspects of this “EMIR” Regulation and also intends to propose requirements for CCP recovery and resolution as ultimate risk tools. EMIR itself is based on the international CPMI-IOSCO Principles for Financial Market Infrastructures (PFMI), published in April 2012. In mid-2015, CPMI and IOSCO started to check whether further additional guidance on CCP resilience or recovery standards is appropriate, and a market consultation is expected to be launched in the summer of 2016.

In this article we consider what risks a clearing member or its clients incur when clearing their trades via a central counterparty. Clearing members may share part of the loss when another clearing member defaults in extreme but plausible markets (part 1 of this article). If things get even worse, and the CCP itself becomes at risk, this will lead the CCP to use pre-arranged recovery measures (part 2 of this article).

Box 1 – Main EU CCPs and their relevance for Belgium

There is currently no central counterparty established in Belgium. However, CCPs are relevant for Belgian markets, clearing members and central securities depositories (CSDs). A malfunctioning of a European or third country CCP will have an impact beyond the CCP’s domestic borders. This is why the EMIR Regulation stipulates a CCP supervisory college for each EU CCP.

The most relevant CCPs for both the European Union and Belgium are Eurex Clearing AG in Frankfurt, LCH. Clearnet Ltd in London and LCH.Clearnet SA in Paris, given their share in clearing activity for listed derivatives,
OTC derivatives and repos. They clear Belgian markets, have Belgian clearing members and clients, and use Belgian CSDs to settle or to hold collateral.

These three CCPs might also become part of the same group, together with the Italian CCP CC&G. Indeed, a merger was announced between the Deutsche Börse Group and the London Stock Exchange Group. This proposed consolidation could to a large extent be driven by the CCP activities of the groups. The precise way in which the CCP activities might be restructured is difficult to predict but could include a merger of future group CCPs, a re-arranging of clearing activities between CCPs, or a cross-CCP clearing or margining. Each of these arrangements would allow CCP customers to clear more trades and hold bigger positions while providing a smaller amount of collateral. This would also further concentrate or interconnect the risks to be managed by the (combined) CCP(s). Consequently, this could attract the scrutiny of the financial stability authorities, as well as the competition authorities, since a single CCP would further concentrate the risk and operate with less collateral overall, and have even more systemic impact if a problem arises.

In general, a new single CCP could be created by merging existing CCPs. A single CCP could improve market liquidity, as the market in a given instrument would no longer be split between the sub-set of participants that clear solely via one particular CCP. Also, the merged CCP would benefit from economies of scale. Furthermore, from the point of view of the participants, netting effects would occur across more products that are now cleared in the same CCP, thus reducing the collateral needed. Clearing several product classes in a single CCP provides collateral reduction benefits for clients, although regulations – such as EMIR – rightly limit the extent of netting allowed across the products or product classes in a portfolio. The prospective merger could offer further possibilities in this respect, e.g. if (selected) CCP clearing services are offered via one CCP of the new group. Indeed, Eurex Clearing AG has substantial activities in interest rate futures that might be nettable with the LCH.Clearnet Ltd interest rate products. An alternative to the creation of a single merged CCP is the establishment of links between the separate CCPs. A CCP link is an arrangement whereby two or more CCPs become mutual counterparties. That allows a market participant clearing contracts via one CCP to clear a contract with a market participant that uses another CCP. Also with CCP links, there are more netting options for exposures held by market participants, and their related collateral needs diminish. Linked CCPs have counterparty risk on each other that also has to be managed. A comparable arrangement is the establishment of cross margining across CCPs, thereby offsetting the cleared positions held with two CCPs

### Table 1: Main EU CCPs Relevant for Belgium

<table>
<thead>
<tr>
<th>Central counterparty</th>
<th>Main markets cleared</th>
<th>Belgian clearing members</th>
<th>Belgian Central Securities Depositories</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCH Clearnet SA</td>
<td>Euronext markets, including Euronext Brussels</td>
<td>9</td>
<td>Euroclear Bank, Euroclear Belgium, NBB SSS</td>
</tr>
<tr>
<td>LCH Clearnet Ltd</td>
<td>Interest Rate Swaps, Repos, including OLO repos</td>
<td>3</td>
<td>Euroclear Bank, NBB SSS</td>
</tr>
<tr>
<td>EurexClearing AG</td>
<td>Major euro CCP / interest rate derivatives / repos</td>
<td>2</td>
<td>Euroclear Bank</td>
</tr>
</tbody>
</table>

Source: NBB.
and thus diminishing the required margins. This again implies that the CCPs now have a risk on each other, and that needs to be managed.

A good rough indication of how big a CCP is, or how much risk it manages, consists in looking at the overall initial margin amounts it receives and at its default fund resources. Although the products cleared and the specific risk management methods used by the CCPs do differ, the overall structure and requirements for initial margin and default fund calculations are prescribed by the EMIR regulation. The data in Table 2 are thus to a certain extent comparable across CCPs. In case of a clearing member default the initial margin of the defaulter and the whole default fund covering the clearing service can be used to cover the CCP losses.

### Table 2: Prefunded Coverage Resources Available to the Main EU CCPs

<table>
<thead>
<tr>
<th>Central counterparty</th>
<th>Initial margins collected</th>
<th>Default fund resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCH Clearnet SA</td>
<td>23,238</td>
<td>3,266</td>
</tr>
<tr>
<td>LCH Clearnet Ltd</td>
<td>77,340</td>
<td>5,434</td>
</tr>
<tr>
<td>EurexClearing AG</td>
<td>47,022</td>
<td>3,637</td>
</tr>
</tbody>
</table>

Source: CPMI-IOSCO quantitative disclosure framework data, third quarter 2015, as disclosed by the CCP. Initial margins are summed over all clearing members. Where a CCP has more than one default fund, the sum of the sizes of all default funds is taken.

1. Protection of central counterparty clearing in the event of a clearing member default

CCP clearing comprises the substitution of counterparts to a trade, whereby the CCP interposes itself and becomes the seller to the buyer and the buyer to the seller. Consequently, the clearing member – i.e. the direct participant in the CCP – assumes its obligation vis-à-vis the CCP eventually on behalf of the buyer and/or the seller – i.e. the indirect participant in the CCP.

In the absence of a clearing member default, the overall position of the CCP, summed over all clearing members, is zero: the CCP has a matched book. The CCP must therefore have the necessary resources to cope with a clearing member default.

The chart below represents the resources available to the CCP to cover its obligations if a clearing member defaults, as required by EMIR. It is called the CCP default waterfall, because the layers of coverage are used successively as the preceding cover is exhausted. All waterfall resources are prefunded, as opposed to the resources available to the CCP for recovery purposes (see below, point 2).

In principle, variation margin is exchanged at the end of the day between each clearing member and the CCP, to set off their mutual exposure. While no CCP calls variation margin continuously, nor can it do so, clearing member positions and their values also change during the day. To protect the CCP, its potential future exposure vis-à-vis a clearing member is covered by initial margins and the default fund.

The CCP’s exposure to a clearing member is first covered by the initial margin layer provided to the CCP that covers the clearing members’ own house positions and its clients’ positions, respectively. In the event of margin erosion, intraday margin calls can be made. Subsequently, the default fund contribution of the defaulting clearing member is used.
In the European Union, before using the default fund contributions of surviving members, the CCP has to contribute a quarter of its own minimum equity resources. This so-called “skin in the game” mechanism discourages the CCP from relying too readily on the default fund contributions of surviving clearing members, but instead encourages it to set sufficient initial margin requirements.

After that, the default fund contributions of the surviving clearing members are used. According to standard practice, to cover the risk that the CCP incurs, all clearing members mutualise any losses in excess of the margins that the defaulter posted to the CCP and – at least in the EU – after the “skin-in-the-game” tranche of the “waterfall” has been used.

In the unlikely event that the default fund does not provide sufficient cover, the CCP’s remaining capital is at stake. Before a CCP uses all its capital, recovery measures can be implemented: in that case however, the financial resources available to the CCP are not prefunded but only contractually specified in the CCP rulebook.

Below we consider selected aspects of the risks confronting a clearing member or its client when clearing via a CCP, and the risks that a CCP has to take into account in designing its own resilience. A clearing member may face liquidity stresses due to CCP margin calls (point 1.1), a clearing member’s client may find that the chosen margin model affects the portability of its positions if its clearing member defaults (point 1.2), and the clearing member may lose its default fund contribution if another member defaults (point 1.3). The consequences of CCP recovery measures for clearing members or their clients are considered under point 2 of this article.

1.1 Margin calls and the mitigation of avoidable liquidity stress for clearing members

In a way, variation or initial margin – when called – will always be potentially pro-cyclical. The EMIR regulatory technical standards require a CCP to manage the avoidable pro-cyclicality when it calls margin. To that end, margin calculation...
needs to be sufficiently conservative, and sudden calls or cliff effects are to be avoided. This approach can avoid liquidity stresses for clearing members and the overall market.

The various approaches for initial margin calculation allowed under EMIR\(^{(1)}\) reduce the pro-cyclicality effects but have diverging impacts as regards the degree to which they result in under-margining – that is clearly not acceptable – or in over-margining – that represents the cost of mitigating pro-cyclicality.

The EU Commission is currently assessing the effectiveness of the EMIR margining requirements, paying specific attention to their pro-cyclicality. A July 2015 report of the European Systemic Risk Board (ESRB)\(^{(2)}\) provides input to the Commission in this respect and sets out some recommendations. Firstly, CCPs calling margin should use metrics to measure both the cover obtained and its pro-cyclicality. Further, the CCPs discretion to set and call initial margin “add-ons” is also considered. These add-ons are called to take into account the market liquidity of a contract, for instance, or the concentration of a clearing member’s position\(^{(3)}\). Specific add-ons are also applied in the case of collateral called from clearing members that is subsequently re-used for counterparty credit mitigation between interoperable CCPs\(^{(4)}\). These constitute good risk management practices. CCPs usually also call “additional margins” if the prefunded default fund resources occasionally breach the minimum cover requirement. While this is acceptable practice, this type of additional margin call ought not to occur too frequently, or replace the default fund contributions.

1.2 Protection of a clearing member’s clients – Relevance of the segregation model for the porting of clearing members’ client positions

In the current “normal” markets, the initial margin that the CCP collects from the clearing member is intended to cover the potential future exposure on the (portfolio of) contracts that the clearing member clears over the margin period of risk (MPOR)\(^{(5)}\). For that purpose, the clearing member provides initial margin collateral to the CCP, the collateral being pledged separately for its own positions and for the segregated positions of its clients.

The clients of a clearing member want to maximise the chance of their positions and related collateral being ported to a surviving clearing member, should their clearing member default. Various segregation models exist, and the model chosen, together with the MPOR, affects portability.

The positions of all clients of a clearing member are usually grouped in a single account with the CCP. There are two forms of this client omnibus account. In the “net client omnibus” account model, the individual client positions net each other out and the CCP registers the net clients omnibus position and receives the related margin collateral on a “net basis”. Normally, a minimum MPOR of two, or – for OTC derivatives – five days is required to calculate the margin. Clients do provide more margin but not to the CCP: they provide it to their clearing member where their (gross) position and the related margin is held.

Alternatively, in the “gross client omnibus” accounts model, the position and margin of each separate client is held with the CCP on behalf of that client, on a “gross basis” per client. Nevertheless, the CCP can use the margins of all clients of a single clearing member to cover these clients’ positions if the clearing member defaults. In the US, a one day MPOR is applied as standard for this “gross client” initial margin if calculated over “on-exchange” trades\(^{(6)}\).

\(^{(1)}\) See EMIR CCP RTS Art. 28 on margin pro-cyclicality. EMIR provides as possible options: create a 25 pct. margin buffer, include a stressed period in the margin calculation, or set a floor on margin. For the diverging impacts of pro-cyclicality mitigation and margin risk sensitiveness, see Murphy, David; Vassos, Michalis and Vaeul, Nick (2014), “An investigation into the pro-cyclicality of risk-based initial margin models”, Bank of England Financial Stability Paper no 29.

\(^{(2)}\) ESRB report on the efficiency of margin requirements in limiting pro-cyclicality of 28 July 2015. It should be noted that this ESRB report also proposes affording policy makers scope for intervention in this area. Margin add-ons could be used to mitigate systemic risk via a macro-prudential use of margin (and haircut requirements), for both CCP clearing and bilateral clearing margining, whereby an authority would set margins above the minimum EMIR requirements.

\(^{(3)}\) To restrict the concentration of margin positions, CCPs may also use concentration limits. For margin calculation purposes, EMIR or its Regulatory Technical Standards (RTS) also requires position concentration to be considered relative to the market and its impact on the required liquidation period (Art. 24 ff. EMIR CCP RTS). Position concentration is also to be taken into account for stress testing purposes (RTS Art. 52).

\(^{(4)}\) I.e., in a CCP interoperability arrangement. On the re-use of initial margin collateral for CCP interoperability mitigation purposes, see Art. 52 and 53 EMIR. For a further analysis, see the ESMA Final report on “Possible systemic risk and cost implications of interoperability arrangements” of 1 March 2016.

\(^{(5)}\) Also called the liquidation period, i.e. the period needed to hedge or close that contract or portfolio. EMIR also specifies to what extent netting is allowed in a portfolio, based on estimated co-movements across products.

\(^{(6)}\) CCPs offer clearing services according to different models in the EU and in the US. In the US, CCP clearing services are offered under a “Legally Separated but Operationally Co-mingled” (LSOC) client accounts model. The clearing member acts as an agent for its client. In the EU, the client-clearing member and clearing member-CCP relationships are both “principal to principal” relationships. EMIR requires that the length of the MPOR is set in accordance with the contract type, and imposes a minimum standard length of two and five days respectively for on-exchange and OTC contracts. Recently, ESMA consulted on a proposal (ESMA (2015), Review of Article 26 RTS 15//2013 on a one day MPOR with respect to client accounts) to also allow the use of a one day MPOR for margining client positions in exchange traded products, including derivatives, provided that the margin is held on a per client gross basis with the CCP, and frequent intraday margining is available. ESMA expects that a one day MPOR does not necessarily imply more risk for the CCP. With the proposal, ESMA seeks to obtain EU – US equivalence of CCP risk management practices in this respect. It should also be noted that under both the US and the EU regime, clients mutualise the other clients’ losses if their common clearing member defaults. Finally, a simultaneous default of a clearing member and a big client will augment the stress incurred.
It is not straightforward to determine in advance which of the two systems ("gross client omnibus" with a one day MPOR versus "net client omnibus" with a two day MPOR) is the safer. Overall, more collateral is held on a two day margining basis, but this takes into account the collateral held both by the CCP and by the clearing member\(^\text{(1)}\). The one day gross margining collateral is available at the level of the CCP, but of course, so are the positions to be covered. As individual client positions and margins are known and available at the level of the CCP, it becomes more likely that clients’ positions will be ported if a clearing member defaults. Under a net omnibus client model, porting will be more difficult, as clients of a defaulting clearing member will usually have to be ported to several clearing members\(^\text{(2)}\).

Finally, an individual client can also request to hold its own positions and collateral with the CCP, under a so-called individual client segregation model. In the European Union, CCPs are obliged to offer this model. In this case, the segregated margin will be used exclusively to cover the segregated positions of this particular individual client of the clearing member, and porting will normally occur if the client’s clearing member defaults.

### 1.3 Coverage of a clearing member default in “extreme but plausible” markets

It would not be prudent to expect that defaults will occur in “normal markets” only. Under EMIR, the current market fluctuations are to be covered by the defaulter’s collateral with a minimum 99 pct confidence interval\(^\text{(3)}\). To cover the CCP’s exposure to a clearing member default beyond this level, occurring in so-called “extreme but plausible” markets, clearing members contribute to the CCP’s prefunded default fund. This constitutes a “survivor pays” mechanism whereby clearing members mutualise losses so as to cover the CCP’s exposure to the defaulter.

We shall first consider the relevant elements that determine the size of the overall available default fund resources and coverage (point 1.3.1). Next, we look at the factors that determine an individual clearing member’s contribution to the default fund (point 1.3.2).

#### 1.3.1 Elements of default fund sizing

The size of the default fund will be decisive for the coverage it achieves. This in turn depends partly on the scenarios used to determine “extreme but plausible” markets, and partly on how the stress loss risk for the CCP is distributed among the clearing members.

##### 1.3.1.1 Scenarios of “extreme but plausible” market stress

Under EMIR, CCPs have to cover “extreme but plausible” price fluctuations or volatility\(^\text{(4)}\). Clearly, the scenarios used to design “extreme but plausible” stressed markets will influence the outcome of any coverage requirement. The choice of scenario influences the safety of using the CCP clearing services.

Under EMIR, both historical extreme markets and hypothetical scenarios of “extreme but plausible” markets have to be taken into account. The notion “extreme but plausible markets” is not very precise. Depending on the criterion used for a stressed market (e.g. 10YR OLO for fixed income, EURO/USD for exchange rates, EURO STOXX50 for equities), different time periods will be determined as exhibiting the greatest stress.

What counts as a “stressed period” also depends on the portfolio in question. In regard to large directional market movements, there is a difference in overall market stress (e.g. an event comparable to the Lehman default) and stress in a specific market (e.g. a Swiss franc “de-peg” event). It makes a difference whether stress risk is assumed to occur across all asset classes simultaneously, whereby the outcomes per asset class are subsequently summed. While this is

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\(^{\text{(1)}}\) Assuming that the CM sets margins for its clients as does the CCP for the clearing member, the increase of overall collateral held is roughly estimated to be 40 pct. higher under a two day margining regime.

\(^{\text{(2)}}\) To enhance portability, some CCPs – such as Eurex Clearing AG – provide for overall client positions to be held temporarily – up to two days – directly with the CCP as a counterparty.

\(^{\text{(3)}}\) Or, for OTC derivatives, with a minimum “99.5 pct.” confidence interval. Coverage is also determined by the MPOR, the lookback period and the probability distribution chosen to calculate this confidence interval.

\(^{\text{(4)}}\) EMIR does not set a confidence interval here, as it does for initial margin coverage. For example, a 99.9 pct. confidence interval might not be “extreme but plausible”.

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Box 2 – Use of multiple default funds by a CCP

The default fund model that the CCP uses is also relevant for sizing the default fund. A multi-product CCP that covers its stress exposure with a single default fund might be able to clear with less collateral overall. In practice, multi-product CCPs frequently do have multiple default funds per service provided (as does for instance LCH Clearnet Ltd for its SwapClear and RepoClear services), as clearing members that only clear a specific class of products are not inclined to mutualise other services. Intermediary models also exist. Eurex Clearing AG, for instance, has separate default funds for the product classes it clears up to a specific threshold, up to which only clearing members clearing that product class mutualise the CCP’s risk on the defaulting clearing member. Above that threshold, all clearing members contribute, via a (virtual) single default fund.

1.3.1.2 Default fund sizing and “cover2” measure

To size the default fund, the “cover2” principle\(^{(1)}\) applies. This means that the fund resources should be sufficient to cover, in “extreme but plausible” markets, the stress loss risk that the CCP faces, i.e. the losses of the two biggest clearing member positions that are not covered by initial margins\(^{(2)}\).

How robust is a CCP in the face of extreme but plausible market stresses under “cover2”? The prudence of the cover2 requirement can be assessed according to the distribution of the potential stress losses that the CCP faces vis-à-vis its clearing members\(^{(3)}\). The size of the default fund produced by a cover2 requirement is highly dependent on how the risk for the CCP is distributed among its clearing members. For “stylised” distributions of stress risk exposure over a set number of clearing members, a “cover2” default fund would cover the summed stress exposure over all of its clearing members as follows: around ten pct. for uniformly distributed stress exposures, one third for an exponentially distributed exposure, and up to half for a concentrated, so-called “whale” distribution. For a more uniform distribution of stress exposure among clearing members, the cover2 has a lower value, implying a higher risk that the CCP may face losses beyond its default fund resources. According to a portfolio approach, an evenly distributed exposure risk would be considered safer, but the cover2 standard is by definition a weaker safety net in such a set-up. In practice, this is not a problem as the stress exposure that a CCP faces in reality is usually exponentially distributed over its clearing members, so that a few clearing members clear the bulk of the market. The cover2 measure functions very well in this context.

A related question is how to take into account the risk that clearing members default simultaneously. For example, for a given CCP, it could be more probable that its second to fourth clearing members default, while their summed stress risk is higher than the stress calculated via the cover2 approach. Also, the more clearing members a CCP has, the greater the likelihood that two members default simultaneously\(^{(4)}\). Again, this might have a big impact under a uniform stress loss distribution among the clearing members, but there may be little or no impact in the case of an exponentially distributed stress loss.

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\(^{(1)}\) At least in the European Union, this principle applies for a CCP established in the EU and for a third country CCP that provides services in the EU. Other comparable and pre-funded resources available to the CCP can also be taken into account for the “cover2”.

\(^{(2)}\) The CCP’s own contribution, its “skin in the game”, that is to be used prior to the default fund contributions of the surviving clearing members is disregarded here.

\(^{(3)}\) This view is discussed more extensively in the paper by Murphy, D. and Nahai-Williamson, P. , “Dear Prudence, won’t you come out to play?”, Bank of England Financial Stability Paper no 30 of October 2014.

\(^{(4)}\) The CMH/KOSCO PFMI and EMIR provide only partial guidance in this respect, requiring clearing member group affiliates to be considered. Normally, a clearing member’s risk to the CCP is to be considered on a stand-alone basis. Where clearing member group affiliates have off-setting positions, the requirement for the CCP to take the group level exposure into account for stress testing purposes clearly must not lead to a lower combined overall stress coverage than the sum of the stress coverages.
Cover2 is quite valuable as a rule of thumb. While further guidance on the distributional aspects of stress loss may not be necessary, the cover2 requirement cannot as such be compared across CCPs. It thus seems prudent that a CCP takes into account the distribution aspects of its potential stress loss risks on clearing members.

### 1.3.2 Clearing member contributions to the default fund

The clearing member may lose all or part of its prefunded default fund contribution in the event of the default of another clearing member. How much is at stake depends on how that contribution is determined for a given default fund size. The specific default fund replenishment modalities are also relevant.

#### 1.3.2.1 Determination of a clearing member’s contribution to the default fund

Usually, each clearing member contributes to the default fund in proportion to its outstanding positions. A clearing member thus contributes more the greater the risk that it brings to the CCP. According to this approach, each clearing member’s default fund contribution will usually be smaller than the initial margin it provides to the CCP. Across all products cleared, 10 to 25 pct. of the initial margin amount provided is a good, very rough indication. Conversely, the total default fund size will usually be higher than the own initial margin contributions of even the “biggest” clearing member. Chart 2 shows a stylised representation.

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**Chart 2**

**INITIAL MARGIN AND DEFAULT FUND CONTRIBUTIONS OF AN INDIVIDUAL CLEARING MEMBER AND OVERALL CCP RESOURCES FOR STRESS LOSS COVERAGE (STYLED REPRESENTATION)**

<table>
<thead>
<tr>
<th></th>
<th>Initial margin portions</th>
<th>Default fund portions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual clearing member contributions</td>
<td>20%</td>
<td>80%</td>
</tr>
<tr>
<td>CCP “cover2” default waterfall resources</td>
<td>25%</td>
<td>75%</td>
</tr>
</tbody>
</table>

Sources: Estimates, derived from the CPMI-IDSCC quantitative disclosure framework data for CCP.

Some CCPs do not set the contribution of each clearing member in proportion to its positions. Instead, they set a fixed amount as default fund contribution that is equal for each clearing member and is unrelated to the fluctuating exposure the clearing member brings to the CCP. While this does not necessarily affect the overall default fund size, the initial margin/default fund contribution ratio may differ greatly among clearing members. This approach could hinder access to the CCP for small clearing members. On the other hand, if the default fund contribution is set high enough, there could be less need to make sudden calls for initial margin “add-ons” under stressed conditions, thus avoiding pro-cyclical effects and ensuring continuous coverage of the CCP’s stress loss risk.
1.3.2.2 Default fund replenishment modalities

If the default fund contributions of the surviving clearing members are used, the default fund must be replenished at once – normally, on the next business day – to ensure the future continuous operation of the CCP. In that case, the clearing member also has the option of withdrawing as a clearing member. During the contractual cooling-off period that precedes this withdrawal, further loss sharing or replenishment requirements nonetheless still apply to both continuing and withdrawing clearing members. A precise understanding of these arrangements set out in the CCP’s rulebook is relevant, as it also affects the adequacy and results of a CCP recovery process.

Box 3 – Re-use by the CCP of clearing member default fund contributions and initial margins

A CCP has to manage not only the credit risks it incurs but also its overall liquidity risks, especially in the event of a clearing member default. Here too, EMIR imposes a cover2 measure for liquidity stress. However, a clearing member facing a resilient CCP will not be directly affected by the CCP’s liquidity management(1). A CCP has the right to use default fund contributions and initial margins where the purpose is to manage the default of a clearing member, so long as its rules make provision for that and it follows the EMIR requirements. Default fund contributions can, by definition, be used by the CCP to cover a clearing member default, while initial margins only cover the positions of the clearing member providing the margin, or of its clients. However, the use by the CCP of initial margins posted by a non-defaulting clearing member, via repo, is compatible with EMIR, insofar as it does not represent the final application of these margins to cover the loss due to the clearing member’s default(2). Hence, both initial margins and default fund contributions can be used for CCP liquidity management or settlement purposes. In this case too, the re-use by the CCP may have an impact on the adequacy and results of a CCP recovery process.

(1) For the impact of the CCP tool to obtain liquidity under recovery, see hereafter, point 2.2.2.
(2) See in this respect, CCP RTS Art. 44 and the ESMA FAQ on EMIR, CCP question 18 on Art. 45 (4) EMIR.

2. CCP recovery – Potential impact on clearing members

2.1 Introduction

In October 2014, the Committee on Payments and Market Infrastructures (CPMI) and the International Organisation of Securities Commissions (IOSCO) published a report on the recovery of FMIs(1). The aim of the report is to provide guidance supplementing the PFMs on how to draft comprehensive and effective recovery plans.

CPMs should prepare for potential threats to their viability and financial strength in order to maintain the continuity of their critical services in extreme financial conditions without requiring the intervention of the resolution authority. A recovery plan should identify the CCP’s critical services and contain a list of triggers that will activate the implementation of the recovery tools, the objective being to recover from a set of extreme scenarios that could not be managed by relying only on the CCP prefunded financial resources. The recovery tools therefore supplement the “default waterfall” of the CCP when needed.

CPMI-IOSCO considers five categories of recovery tools: tools to allocate uncovered losses caused by a clearing member’s default (cash calls and haircutting of claims); tools to address uncovered liquidity shortfalls (obtaining liquidity from clearing members or third parties); tools to replenish financial resources (cash calls and recapitalisation); tools to

(1) CPMI-IOSCO guidance of October 2014 on “Recovery of financial market infrastructures”.
re-establish a matched book (forced allocation of contracts and contract termination); and tools to allocate losses not related to clearing member default (capital, recapitalisation, insurance and indemnity agreements).

2.2 CCP recovery tools

The following section provides an overview of CCP recovery tools with an impact on the clearing members of the CCP, along with a discussion of the tools’ characteristics.

In very extreme circumstances, the default of a clearing member could give rise to losses exceeding the prefunded financial resources of a CCP, including the default fund. A viable recovery tool is to ask clearing members to provide additional contributions to the CCP, to share in the CCP’s losses. This could be done via so-called cash calls or assessment powers (point 2.2.1), variation margin haircutting (point 2.2.2), or initial margin haircutting (point 2.2.3). A CCP might also obtain liquidity from clearing members under recovery (point 2.2.4), or allocate or tier-up contracts (points 2.2.5 and 2.2.6).

2.2.1 Cash calls or assessment powers

Usually, the CCP has the right to apply cash calls to direct clearing members, to the extent that the contributions are capped at a certain pre-agreed level. If contractually permitted ex ante, the CCP can ask for additional contributions that have no upper limit. Uncapped cash calls have the advantage for the CCP of comprehensively addressing the financial shortfall, but clearing members may not be able to measure the contribution in advance, creating a risk beyond their control. Clearing members may lose confidence in the CCP and decide to delay the cash payments, creating liquidity risk for the CCP. To enhance the reliability of the tool, CCPs could use participant’s proprietary assets held at the CCP as collateral for the cash calls if that is legally permitted.

If the CCP has the contractual obligation to cap cash calls, it may be required to implement additional loss allocation tools to cover the remaining losses, creating an additional burden on clearing members.

To enable clearing members to control their potential exposure to the CCP, the CCP could link the size of cash calls to the default fund contributions. This would enable clearing members to control their potential exposure to the CCP by adjusting their behaviour. Clearing members would have an incentive to limit the risk that they bring to the CCP and could reserve sufficient capital on their books to cover this potential exposure.

2.2.2 Variation margin haircutting (VMHC)

As a CCP collects variation margin gains on a daily basis, VMHC may be a viable recovery tool. VMHC implies that the CCP applies pro rata haircuts to the gains made by clearing members with in-the-money positions, while continuing to receive in full the payments made by clearing members with out-of-the-money positions.

VMHC has the advantage of being a measurable recovery tool for clearing members, because the clearing member’s loss is limited by the size of the variation margin gain. Clearing members can thus anticipate and model their exposure to some extent, provided that the terms and conditions of the tool are clearly stated ex ante in the FMI’s rules.

VMHC is an effective recovery tool for the CCP. In principle, it is reliable and timely provided that the CCP collects all pay-ins on a daily basis before distributing the pay-outs. Nevertheless, there is a risk that clearing members expecting haircuts on potential future variation margin gains may not be willing to pay variation margins to the CCP on out-of-the-money positions, or may decide to leave the CCP.

It is important to note that VMHC has the same impact on clearing members as an insolvency proceeding but has the advantage of being quicker and less costly. The “No-Creditors-Worse-Off” (NCWO) principle derived from the banking recovery framework is thus respected.

In order to limit the impact on its clearing members, the CCP can decide to cap the haircut to an amount lower than the total amount of pay-outs owed by the CCP. However, this might require the CCP to supplement the tool with other loss allocation
tools, such as contract tear-up or additional cash calls, possibly creating disruption due to the highly stressed market conditions. The advantage of capping VMHC is that it to some extent contains the negative liquidity impact for clearing members. Regardless of whether VMHC is capped, the tool provides the right incentives for clearing members to control the amount of risk they bring to the CCP, because the size of the loss is related to the risks of the clearing members’ positions. Nevertheless, VMHC does not specifically allocate the losses to the clearing members that are the best fit for that. In-the-money positions are not a perfect indication of a clearing member's ability to absorb losses. Moreover, VMHC could create pro-cyclical effects in times of financial distress and have an impact on the hedging arrangements of clearing members with other positions outside the CCP. Depending on the contract between the direct clearing members and their clients, VMHC could also have an impact on indirect clearing members which are less equipped to anticipate their potential exposures towards the CCP and to absorb the related losses.

2.2.3 Initial margin haircutting (IMHC)

Clearing members of a CCP are required to post initial margin covering their own obligations vis-à-vis the CCP in order to become members. If a clearing member defaults, the CCP can use the collateral posted by the defaulting clearing member to cover the exposure resulting from the default.

IMHC consists in writing down the initial margin provided by non-defaulting clearing members in order to cover the exposure caused by the default of another clearing member. The non-defaulting clearing members are then required to provide additional initial margin to restore the appropriate level of collateral and/or to reduce their exposure at the CCP. This tool is controversial because initial margin was originally meant to cover the exposure created by the clearing member itself, not that of other clearing members. This is stated in Article 45(4) of EMIR: ‘A CCP shall not use the margins posted by non-defaulting members to cover the losses resulting from the default of another clearing member.’

Moreover, exposing clearing members to contamination risks in times of financial distress would create pro-cyclical effects. This may create disincentives for the clearing members to provide additional initial margin to the CCP, which would be left under-protected. Clearing members may even have to pass the impact of the tool on to their clients, creating a risk that is harder to anticipate and control.

An argument in favour of IMHC is that it constitutes an additional pool of prefunded financial assets for the CCP when the default waterfall proves to be insufficient. Some stakeholders argue that IMHC is fairer for the clearing members than VMHC because it would apply to all clearing members, as opposed to VMHC which is based on profit and is therefore less predictable.

If the tool is allowed under the forthcoming EU legislation, it should be rules-based and capped, in order to enable clearing members to calculate the necessary capital reserves in advance. As clearing members in CCPs, banks receive preferential treatment for capital charges covering direct exposures to CCPs. If IMHC is accepted as a recovery tool, this preferential treatment may need to be modified.

Some stakeholders argue that IMHC should be limited to cash collateral, which is not bankruptcy-remote in some jurisdictions. However, this could result in a situation where clearing members start posting initial margin exclusively in securities, creating a liquidity risk for the CCP.

2.2.4 Obtaining liquidity from clearing members

The CCP could ask all its clearing members to provide liquidity in times of distress, or limit the call for funds to those who are owed funds by the CCP. This recovery tool would enable clearing members to control the related risk and give them an incentive to monitor the CCP's liquidity risk management. Requesting liquidity from all clearing members would require pay-ins and would expose clearing members to obligations that they might not be able to control.

The tool could be implemented via collateralised or uncollateralised lending. Collateralised lending would be preferable from a clearing member’s perspective.
2.2.5 Forced allocation of contracts

In order to cover its open position created by the defaulting clearing member, the CCP has to return to a matched book. This can be done by offsetting transactions or by auctioning off the unmatched positions. If the CCP fails to return to a matched book via voluntary means and the clearing service is considered critical for the functioning of the financial market, the CCP could force the allocation of unmatched positions to non-defaulting clearing members, naming its own price.

Forcing the allocation of contracts to non-defaulting clearing members implies a risk that clearing members may be saddled with unmanageable positions. This unpredictable forced allocation would create greater risks at a time of extreme stress and could oblige direct clearing members to pass the financial impact on to their clients. Some clearing members consider forced contract allocation to be a more disruptive tool than complete contract termination, available as a tool of last resort.

A less reliable but better way of re-establishing a matched book is via voluntary contract allocation.

2.2.6 Contract termination: tear-up

Contract termination involves permanently closing all the open contracts of a clearing service, or a subset of contracts at a certain price (e.g. based on the price for calculating the last variation margin), before the actual settlement date. In this way, the CCP can limit its losses and compensate those with claims based on its remaining financial resources. If the CCP has insufficient resources to pay the settlement price in full, the amounts due are written down pro rata among the clearing members concerned. Some regulators argue that complete termination is a winding-down tool rather than a recovery tool, since all the positions (both matched and unmatched) covered by the clearing service would be terminated. Complete termination is contrary to the recovery objective of critical service continuity.

The threat of contract termination as the recovery tool of last resort would provide the right incentives for all clearing members to participate voluntarily in an auction in order to avoid the implementation of the tool. Nevertheless, a full tear-up would result in significant market distortions. Direct and indirect clearing members hedging particular risks would see their hedged positions becoming unhedged. It could be difficult and costly for clearing members (in particular direct clearing members) to recreate their positions at other CCPs or via bilateral clearing. Moreover, settling the torn up contracts could create liquidity risks for the CCP clearing members.

A partial tear-up has the advantage of being relatively more measurable and controllable than a full contract termination, provided that the terms and conditions are well documented ex ante in the CCP’s rules. A partial termination of contracts consists in closing out a subset of open contracts, enabling the CCP to limit the termination of contracts to the problematic ones that have a position opposite to that of the defaulting clearing member.

Nevertheless, a partial tear-up also alters the hedging arrangements of the direct and indirect clearing members. Clearing members subject to the termination are made worse off than the ones that are spared, which is not in line with the NCWO principle. In order to avoid this, the CCP could apply higher variation margin haircuts to the clearing members not exposed to the termination.

A viable method of avoiding the disruption caused by mandatory full or partial tear-up is to offer the clearing members the opportunity to voluntarily designate the contracts for tear-up. The clearing members would be able to stop a particular contract that may have become unattractive.

2.2.7 Non default-related losses – remaining capital and recapitalisation

CCPs are also exposed to general business, operational, custody and investment risks. In order to protect themselves against losses, CCPs are required to dedicate a portion of their capital to cover these risks. Nevertheless, the dedicated portion of the CCP’s capital could still prove insufficient to protect the CCP, and the CCP, after having borne the first loss, may allocate the remaining losses to its clearing members.

Clearing members could thus be exposed to non default-related losses even if those losses are mainly due to poor risk management methods at the CCP. For instance, UK CCPs use loss allocation tools for losses caused by an investment
counterparty default. A first tranche is allocated to the CCP itself and the rest is distributed among the clearing members in proportion to their margins.

Allocating a subset of non default-related losses to clearing members distributes the burden between the CCP and its clearing members. It provides the right incentives to clearing members to monitor the risk management activities of the CCP. Nevertheless, clearing members are exposed to uncapped losses that they are unable to control.

3. Recovery tools of the three major CCPs for the Belgian market

Table 3 provides an overview of the recovery tools of LCH.Clearnet Ltd, LCH.Clearnet SA and Eurex Clearing AG, and indicates the potential impact on Belgian clearing members if the respective CCPs go into recovery.

<table>
<thead>
<tr>
<th>Recovery Tools</th>
<th>LCH.Clearnet SA</th>
<th>LCH.Clearnet Ltd</th>
<th>Eurex Clearing AG</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCP default waterfall(1)</td>
<td>CDSClear</td>
<td>Cash &amp; Derivatives, Fixed Income and EGCPlus</td>
<td>ForexClear and SwapClear</td>
</tr>
<tr>
<td>Capped assessments</td>
<td>100% of default fund contribution(2)</td>
<td>100% of default fund contribution(3)</td>
<td>100% of default fund contribution(4)</td>
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<tr>
<td>VMHC</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>Loss distribution(6)</td>
<td>NO</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>IMHC</td>
<td>NO</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Voluntary contributions(7)</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Obtaining liquidity from clearing members</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Forced allocations of contracts</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Contract termination: tear-up</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Remaining capital and recapitalisation</td>
<td>Shareholders</td>
<td>Clearing members</td>
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</tr>
<tr>
<td></td>
<td>NO(8)</td>
<td>YES(9)</td>
<td></td>
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<tr>
<td></td>
<td>NO</td>
<td>YES(10)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NO</td>
<td>YES(10)</td>
<td></td>
</tr>
</tbody>
</table>

Source: CCP website and rulebook.
(1) As described in the coloured part of Chart 1
(2) Max. 100% of the default fund contribution over a period of 25 days independently of the number of default events.
(3) Max. 100% of the default fund contribution per default event, capped at max. 300% of the default fund contribution within a specified period of six months in case of multiple defaults.
(4) Max. 100% of the default fund contribution per default event, capped at max. 300% of the default fund contribution within a specified period of six months in case of multiple defaults.
(5) Max. 200% of the default fund contribution within a capped period of 20 business days, extendable to 3 months independently of the number of default events.
(6) Loss distribution is an additional contribution from the non-defaulting clearing members capped at an amount of max. 100% of the default fund contribution.
(7) LCH.Clearnet SA and LCH.Clearnet Ltd can ask for voluntary contributions from their clearing members as the penultimate recovery tool, to re-establish a matched book before tearing-up contracts.
(8) It is at the discretion of the shareholders to recapitalise the CCP. If there is no recapitalisation, the remaining capital of the CCP will be depleted.
(9) Eurex Clearing AG’s last two lines of defence are a parental guarantee from Deutsche Börse and the CCP’s remaining capital. Clearing members will not be affected by these capital tools. This is based on public information available on the Eurex Clearing AG official website http://www.eurexclearing.com/clearing-en/risk-management/lines-of-defense.
(10) LCH.Clearnet Ltd’s rules allow it to allocate solvency-threatening losses caused by investment losses to its clearing members, after having born an initial portion of the loss first.
For clearing members of LCH.Clearnet Ltd, LCH.Clearnet SA and Eurex Clearing AG, the initial margin is unaffected by recovery and there is no risk of being exposed to a forced allocation of contracts. Clearing members could be asked to make additional capped payments if the default fund proves to be insufficient.

Clearing members of LCH.Clearnet Ltd and LCH.Clearnet SA could be exposed to VMHC depending on the service they use and to contract tear-up. In order to avoid a contract tear-up, clearing members of both CCPs have a strong incentive to provide enough voluntary contributions to the CCP in recovery.

Clearing members of LCH.Clearnet Ltd are exposed to investment losses if the maximum amount of losses allocated to the CCP itself is exceeded.

Finally, clearing members of Eurex Clearing AG will be affected by cash calls up to twice their default fund contribution and by contract tear-up. Thereafter, Deutsche Börse will provide a guarantee and the CCP's remaining capital will be exhausted.

**Conclusion**

Participation in a CCP involves some risks, both in the face of a resilient CCP and when the CCP recovery regime becomes active.

A clearing member facing a resilient CCP may be confronted with sudden margin calls that have a pro-cyclical effect overall and that make its liquidity provisioning harder. Moreover, as contributors to the CCP default fund, they may share part of the loss if a clearing member defaults, and their prefunded resources may be lost. Clients of a clearing member risk non-portability of their positions if their clearing member defaults.

If the default fund is insufficient to cover the losses to which the CCP is exposed in the event of a clearing member default, the CCP will have to implement its recovery tools and require the clearing members to provide additional contributions by way of cash calls, variation margins or loss distributions. In addition, if the CCP is unable to re-establish a matched book via an auction, it could decide to terminate all contracts, or a subset of the open contracts covered by a clearing service, at a certain price before the actual settlement date. This will have an impact on clearing members of a CCP in recovery.

Finally, it is relevant to note that while there is little variation in the default waterfall structure of the three major EU CCPs, there are significant differences in the recovery tools with respect to the maximum amount of the assessment powers, the application of VMHC, the possibility of requests for additional (voluntary) contributions and the allocation of non-default-related losses to clearing members.
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