Macroeconomic determinants of non-performing loans

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Introduction

Belgium is typically considered to face only moderate credit risk associated with the non-financial private sector's financial health, given that the private debt ratio is not problematic and net financial wealth of households is high (EC, 2015 ; Bruggeman and Van Nieuwenhuyze, 2013). Indicators measuring realised (*ex-post*) credit risk, such as non-performing loans (NPLs) recorded on bank balance sheets and payment arrears of households (booked in the Central Individual Credit Register, CICR), tend to confirm the relatively high quality of bank assets in Belgium. That said, these figures have been on the rise since the financial crisis, coinciding with further increases in the private debt ratio.

It is against this backdrop that this article aims to assess the current level of and developments in banks' *ex-post* credit risk using their NPLs and, more specifically, households' payment arrears. Furthermore, this credit risk is explained by means of both macroeconomic factors and structural credit market variables such as loan-to-value (LTV) and debt-service-to-income (DSTI) ratios. If these variables prove significant for credit risk, macroprudential policies might prove useful.

One of the challenges of this analysis is the paucity of available data and the absence of a uniform international definition of NPLs. To an extent, the volume of NPLs reflects national accounting definitions, making it difficult to compare them across the world. However, the European Banking Authority (EBA) recently introduced a harmonised definition (EU, 2014) and data in line with this new definition are available for Belgium from the third quarter of 2014 onwards, with the drawback that these data do not support a time series analysis. NPL data according to national definitions are available for a longer period (since 1993Q2), but do not enable any breakdown of data by type of credit. Trends in realised credit risk per sector or type of loan can only be analysed for households based on CICR data, and then only from 2006.

This article has four sections. The first compares NPL levels and developments in Belgium with those in the other euro area countries. The second provides an overview of the available data resources for realised credit risk in Belgium, while the third investigates to what extent payment arrears in the mortgage loan market may be explained by macroeconomic conditions and by structural loan market factors (LTV, DSTI, bank business models). The final section discusses the implications of NPLs (feedback effects on macroeconomic conditions), and provides an outlook using an analysis of recent developments in debtors' creditworthiness.

1. Non-performing loans: An international comparison

The years following the financial crisis have seen the quality of assets in the euro area deteriorate sharply. Consolidated bank data released by the ECB[1] show NPLs to have increased most in the peripheral euro area countries and NPL ratios (NPLs/total loans) to have reached exceptionally high levels in Cyprus (53 %), Greece (27 %) and Ireland (22 %) by mid-2014 (latest available data), compared with the euro area average of 5.8 %. Credit quality is typically better in the core countries, Belgium being one of them (5.6 %). What is more, NPLs in the countries with higher NPL ratios have continued to rise, while some countries with lower ratios are already reporting minor falls.

The comprehensive assessment (CA) of the euro area's biggest banks – the outcomes of which the ECB published in October 2014 – suggest that these data underestimate credit risk. The asset quality review (AQR), which used a uniform NPL definition reflecting the more rigorous EBA definition, arrived at total NPL volumes for the banks reviewed of € 879 billion, € 136 billion more than previous estimations (ECB, 2014).

We also note that these data reflect credit risks at the level of banking groups, i.e. consolidated data including the operations of foreign subsidiaries and branches, and thus do not necessarily reflect credit risks in these groups' domestic markets. For Belgium, based on non-consolidated data – i.e. excluding the activities of foreign subsidiaries but including branches – credit risk turns out to be a lot smaller in the national market, with the NPL ratio averaging 2.9 %. The significant difference between the two sets of figures is down to the exposure of some Belgian banks to high credit risk in foreign markets, e.g. KBC through its subsidiary KBC Ireland (NBB, 2014). Since the aim of this article is to model credit risk in the Belgian market, it will primarily draw on non-consolidated data, except for international comparisons.

The financial crisis demonstrated that credit risk in the euro area is not a separate issue but ties in with macro-economic conditions. In fact, the highest NPL ratios were recorded by the peripheral countries buffeted by the deepest recessions and reporting the most fragile private sector balance sheet positions. This is corroborated by a cross-sectional analysis comparing the NPL ratios of the various countries with the consolidated gross debt of the non-financial private sector.

For the euro area countries, a clear link emerges between the size of the non-financial private sector's debt ratio
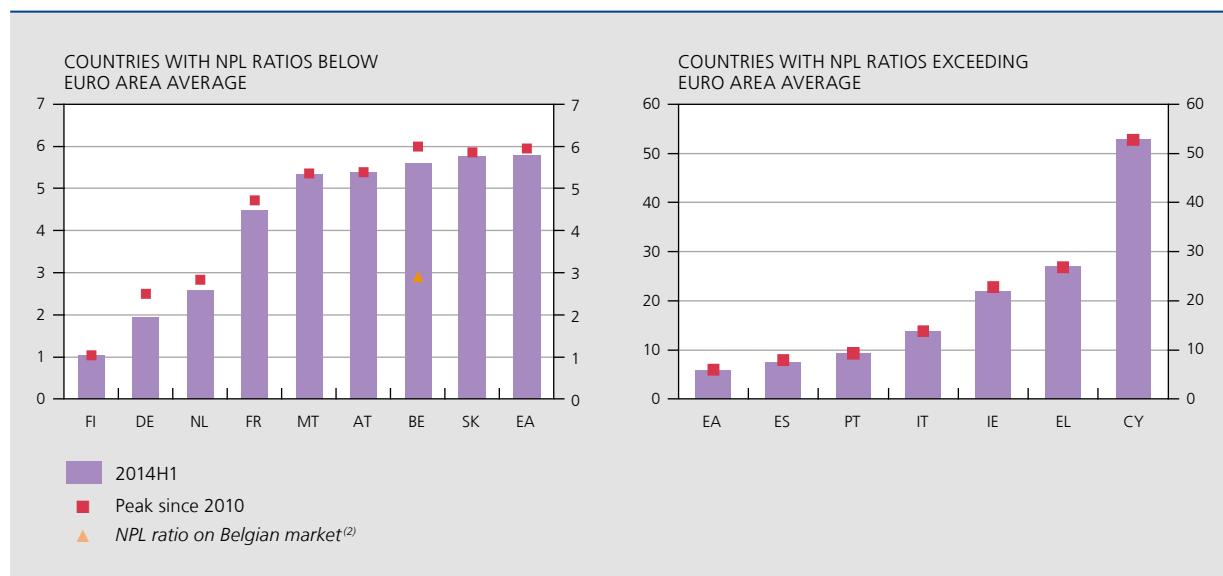
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(1) This article draws on the ECB's international data up to and including June 2014 which are not yet based on the EBA definition, enabling a comparison over time. The ECB is aiming to publish quarterly figures in accordance with the EBA definition at the end of 2015 (data from 2014Q4 onwards).

CHART 1   NPL RATIOS: INTERNATIONAL COMPARISON[1]

(NPLs as a % of total loans)

COUNTRIES WITH NPL RATIOS BELOW EURO AREA AVERAGE

COUNTRIES WITH NPL RATIOS EXCEEDING EURO AREA AVERAGE

- (purple) 2014H1
- (red square) Peak since 2010
- (orange triangle) NPL ratio on Belgian market[2]

Source: ECB.
(1) Consolidated data (domestic banking groups, i.e. including foreign subsidiaries and branches) for the euro area countries for which these data are available.
(2) Non-consolidated data (Belgian banks, excluding foreign subsidiaries), June 2014.

CHART 2

CHART 2   NON-FINANCIAL PRIVATE SECTOR DEBT LEVELS
AND NPL RATIOS
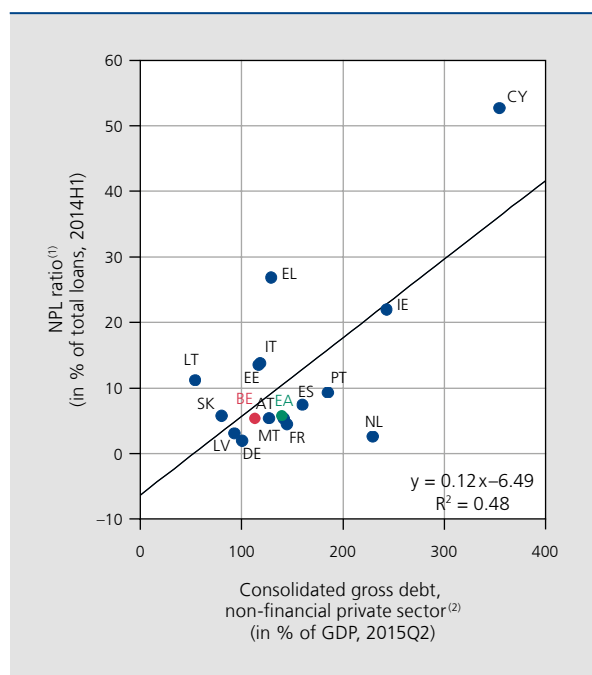
Sources: ECB, NBB.
(1) Consolidated data. No data for Luxembourg, Finland and Slovenia.
(2) For Belgium, consolidated gross debt excluding loans granted by the non-bank
foreign sector, 'captive financial institutions and non-institutional money lenders',
as these typically represent intra-group funding. The available data do not allow
for a similar adjustment for the other countries, but the extent of these intra-
group loans tends to be limited in most.

and NPL ratio levels[1]. Drawing on the latest available
data for both variables – i.e. the first half of 2014 for the
NPL ratio and the second quarter of 2015 for the debt
ratio – an increase of 10 percentage points of GDP in the
non-financial private sector's debt ratio sees the NPL ratio
go up by 1.2 percentage points. The profile for Belgium
does not stand out in any way, meaning that its NPL ratio
comes in at the level that would be expected based on the
debt ratio of the non-financial private sector[2].

Section 3 will discuss in greater detail the structural and
cyclical determinants of credit risk in Belgium, but the
next section will first provide an overview of available data
about (*ex-post*) credit risk in Belgium.

(1) Countries with high NPL ratios are major contributors, but even if outliers such as
Cyprus (with an NPL ratio of over 50 %) are factored out, the positive correlation
remains, albeit less tightly so.
(2) An unreported analysis also showed up a significant cross-sectional correlation
between changes in the NPL ratio and real GDP growth. Section 3 of this article
also confirms the strong link between NPL ratios and the economic cycle in
Belgium.
(3) In the footsteps of the Central Individual Credit Register, the Central Corporate
Credit Register has been keeping track of payment arrears since April 2012. These
series offer too short a history to be of use to our analysis.

2. Default data sources and definitions in Belgium

To measure (*ex-post*) credit risk, there are two types of
publicly available data in Belgium:

– accounting data from banks: non-performing loans
(NPLs), i.e. loans that are no longer producing any
returns or that are expected not to produce the return
agreed at contract date, are recognised in bank balance
sheets as NPLs;
– Central Individual Credit Register (CICR): this regis-
ter keeps track of all consumer and mortgage loans
for private individuals (positive register), as well as
payment arrears on such loans (negative register);
banks and other lenders report this information to
the CICR[3].

Both sources and definitions used – and in particu-
lar the criteria for registering a non-performing loan
and/or payment arrears – are explained in greater
detail below.

2.1 Non-performing loans

The definition of a non-performing loan depends on
whether banks report consolidated data – i.e. including
foreign subsidiaries and branches – or non-consolidated
figures, that is, excluding foreign subsidiaries but includ-
ing branches. Consolidated data are in line with interna-
tional financial reporting standards (IFRS), whereas the
non-consolidated numbers follow Belgium's generally
accepted accounting principles (BE GAAP).

Although consolidated data tend to be more comparable
across the world than non-consolidated data, there are
still significant differences in the way banks interpret ac-
counting principles for recognising NPLs. Under-reporting
is also an issue, as the ECB's comprehensive assessment
(CA) illustrated. As a result, in January 2015, the EU intro-
duced a uniform and broader definition of NPL consistent
with EBA guidelines.

The EBA defines a non-performing loan as:

(i) a loan that is in arrears for more than 90 days (principal
and/or interest);
(ii) a loan that is unlikely to be repaid without collateral
being realised.

The recent changes in methodology for the consolidated
series give rise to a major drawback: no lengthy time
series of data is available (from 2014Q3 onwards in

Belgium). Even more important for our analysis is that the data include the operations of foreign subsidiaries and branches and thus do not reflect credit risk in the domestic market, which is much better captured by non-consolidated data – i.e. excluding operations of foreign subsidiaries. In addition, these figures reach back much longer, to 1993Q2 on a quarterly basis.

BE GAAP (Scheme A) defines a non-performing loan as:

– irrecoverable or doubtful, i.e. 'problem risks on counterparties whose inability to honour their commitments has been established or is virtually certain, and also risks which are the subject of a lawsuit for which it is certain, or virtually certain, that its outcome will result in non-recovery of the disputed claims or in the impossibility of exercising the disputed legal remedies'; or:
– a loan with uncertain outcome, i.e. 'problem risks on counterparties that are established or foreseen as having trouble honouring their commitments, but whose inability has not been established or is not virtually certain, as well as the risks which are the subject of a lawsuit whose outcome is uncertain'.

In addition to the aggregate data, this article also draws on non-consolidated data per credit institution [1], grouped and not identified separately for reasons of confidentiality.

The BE GAAP definition of a non-performing loan is less broad than the EBA definition and does not, for instance, impose a 90-day criterion. Another drawback is that BE GAAP data do not provide any breakdown by type of debtor or loan, and any relationship with macroeconomic conditions will be less accurately identifiable than sector or individual borrower levels would allow.

2.2 (Negative) Central Individual Credit Register

CICR data do provide the required sector breakdown of payment arrears in the domestic market, albeit only for private individuals and from 2006 (from 2007 on a monthly basis). In addition to payment arrears in euros, the register also keeps track of the numbers of contracts and the number of people in arrears.

Payment arrears are supposed to be reported to the register by banks and other lenders, and the register imposes criteria by type of loan, the 90 days past due criterion being the most important. Mortgage arrears are expected to be reported to the register:

– when the amount due is not or not fully paid within three months of it becoming due;
– when the amount due is not or not fully paid within one month of a formal notice being served by registered letter.

The 90 days past due criterion also applies to other types of loan such as revolving credit and instalment sales and loans.

2.3 Probability of default

Using these data sources, the probability of default (PD) can be approximated, which is a central concept in the loan loss calculations of banks. In line with Basel II, the expected loss (EL) is a function of the probability of default (PD), the loss given default (LGD) and the exposure at default (EAD):

$$EL = PD * LGD * EAD$$

Particularly relevant is the degree to which the PD is determined by macroeconomic conditions. Stress tests (see Ferrari *et al.*, 2011) and more particularly credit risk models typically link the PD to a range of macro-economic scenarios. Usually, it is assumed that LGD depends on accounting practices, while EAD is kept constant.
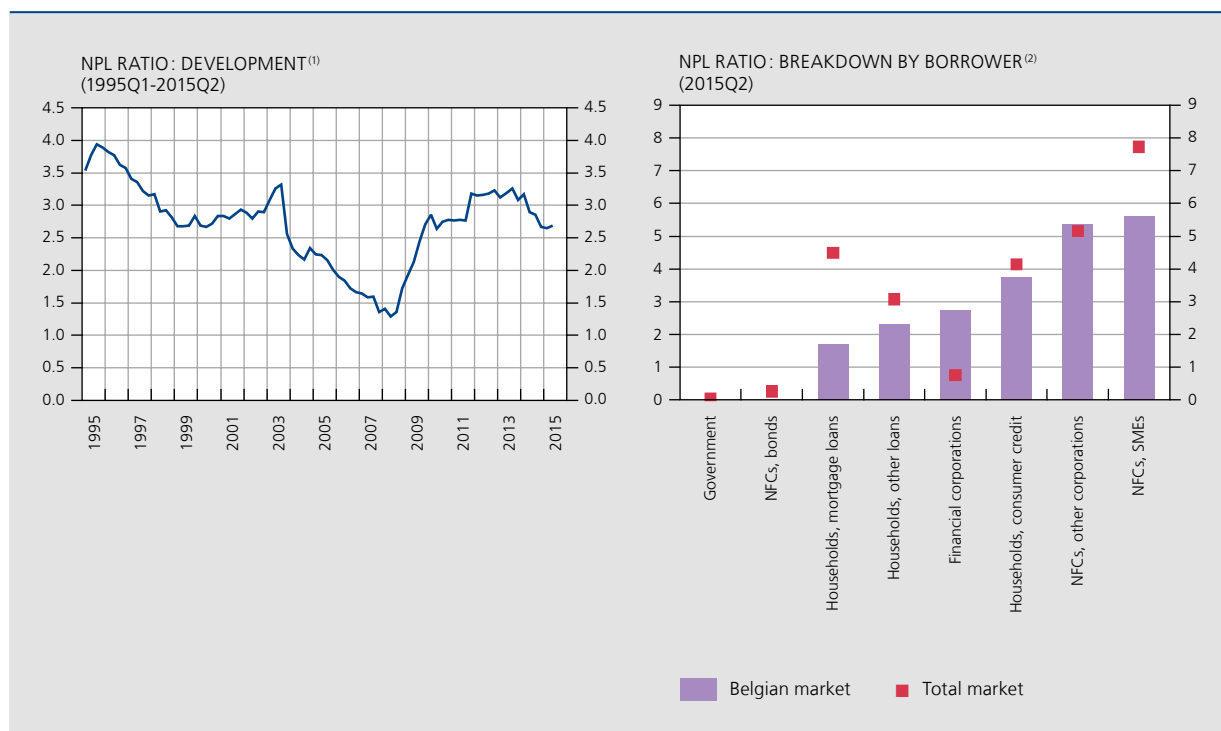
In the case of banks' accounting data, we derive our (simple) PD measure by taking the ratio of NPLs over total outstanding loans (both expressed in euros), i.e. the NPL ratio; for the CICR, we take the number of loans in arrears as a percentage of the total number of loans. When referring to credit risk, this article refers to PDs so calculated.

The NPL ratio (i.e. the PD) based on non-consolidated data reflects credit risk developments in the Belgian market since the mid-1990s, and shows that credit quality improved in the run-up to EMU and in the pre-crisis years. The ratio gradually came down from a maximum of around 4 % in 1995 to a historic low of 1.3 % in June 2008, partly explained by favourable macroeconomic conditions – relatively high economic growth coupled with falling interest rates and unemployment [2]. This trend was shared with the United States and the United Kingdom, which also saw their NPL ratios fall (ECB, 2005).

(1) In mid-2014, 39 Belgian credit institutions were drawing up their balance sheets on a non-consolidated basis.

(2) As noted, this figure should be assessed with caution as NPL interpretations not only differ between countries and between banks, but also from period to period. The observation that credit risk is hitting a low just before the crisis might reflect too upbeat a take by banks – for instance on loans 'with uncertain outcome' – and might not reflect the actual credit risk in the market. Different write-down percentages might also contribute, as these cause NPLs to go off-balance. For Belgium, no information about write-down percentages is available.

(NPLs as a % of total loans)

NPL RATIO : DEVELOPMENT[1]
(1995Q1-2015Q2)

NPL RATIO : BREAKDOWN BY BORROWER[2]
(2015Q2)

Belgian market   ■ Total market

Source : NBB.
(1) Non-consolidated data.
(2) Consolidated data.

The financial crisis reversed all this, and the NPL ratio went up relatively quickly from 1.3 % in 2008Q2 to 3.3 % in 2013Q3 – still better than the figures recorded in the mid-1990s. Some slight improvement has been noted since the end of 2013, and the NPL ratio stood at 2.7 % by the end of June 2015.

The breakdown of the consolidated data reveals that the NPL ratio depends heavily on the institutional sector – households, non-financial corporations (NFCs), etc. – and the market that debtors belong to, i.e. domestic or foreign market.

On the Belgian market, 2015Q2 NPL ratios varied from close to 0 % for government and NFC bonds[1] to 5.6 % for loans to SMEs. This relatively high credit risk on loans to SMEs matches the situation in foreign markets and is not surprising, given the typically higher risk profiles and the greater vulnerability to crises of the most fragile SMEs[2]. As it turns out,
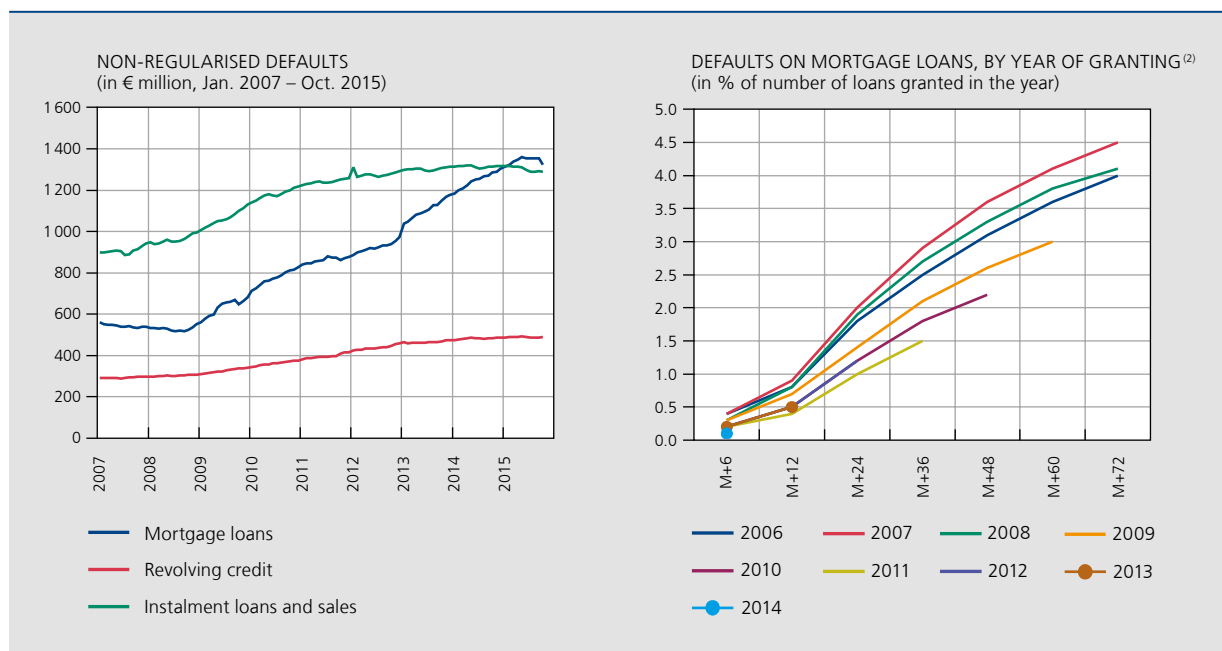
credit risk is also greater for loans with weaker collateral – mortgage loans have a relatively low NPL ratio of 1.7 %, well below the 3.8 % recorded for consumer credit.

In nearly all sectors, foreign market credit risk was higher than in the Belgian market in 2015Q2, with the one exception of financial corporations. If we break this down further, we find that this is not down to credit institutions so much as to the non-banking financial sector (including non-financial holding companies and corporations in the sector usually described as shadow banking). The biggest difference between domestic and foreign markets is the credit risk on mortgage loans, reflecting the diverging macroeconomic trends in Europe, particularly in the housing market. Countries such as Ireland and the Netherlands – both of which faced very challenging trends in their housing markets – typically weigh heavily in the foreign portfolios of Belgian banks (NBB, 2015).

CICR data can be used to illustrate developments in household credit risk in Belgium, but only from 2006 (and on a month-by-month basis from 2007). These

(1) Note that the EBA definition is not limited to loans but also includes debt securities such as bonds. Non-performing loans and debt securities taken together are also referred to as non-performing exposures (NPEs).
(2) See the article by Piette and Zachary (2015) in this Economic Review.

CHART 4   CENTRAL INDIVIDUAL CREDIT REGISTER: DEFAULTS [1]

NON-REGULARISED DEFAULTS
(in € million, Jan. 2007 – Oct. 2015)

DEFAULTS ON MORTGAGE LOANS, BY YEAR OF GRANTING [2]
(in % of number of loans granted in the year)

— Mortgage loans
— Revolving credit
— Instalment loans and sales

— 2006   — 2007   — 2008   — 2009
— 2010   — 2011   — 2012   — 2013
— 2014

Source : NBB (Central Individual Credit Register).
(1) A mortgage loan is registered to be in default when a due sum has not been paid either in part or in full (i) within three months following its due date or (ii) within one month after formal notice has been served by recorded delivery letter. Instalment sales and loans are considered to be in default when three instalments have not been paid either in full or in part by their due date, when a due instalment has not been paid either in full or in part for three months, or when the instalments become payable immediately. Lastly, revolving credit is considered to be in default when a capital sum and/or total expenses become due in accordance with the credit agreement conditions and are not repaid in full within three months or when the capital becomes repayable in full and the amount owing has not been repaid in full, or when the total amount repayable has not been repaid within one month of the deadline for restoring a zero balance.
(2) Loans are grouped by the year they were granted, with the curves showing the number of defaulting loans as a percentage of the original total number of loans, after a certain number of months following the granting of the loans. No account is taken of any regularisation of the loans.

data also allow for breakdowns by type of loans, e.g. mortgage loans on the one hand and consumer credit, such as instalment sales and loans and revolving credit, on the other. Total nominal amounts show that arrears on mortgage loans have recently become the most important category (€ 1.32 billion in October 2015), compared with those on instalment sales and loans (€ 1.29 billion) and those on revolving credit (€ 0.49 billion).

Note that the total amount of arrears does not just reflect increased credit risk or the PD, but also the upturn in the number of mortgages and trends in the average mortgage amount per loan.

The right-hand chart illustrates the PD based on CICR data, showing the percentage of loans agreed in a specific period that fall into arrears within a specific timeframe. The PD is cumulative and unadjusted, meaning that it does not factor in any regularisation of loans that were in arrears in the previous period. The chart reveals that credit

(1) A final figure for the number of loans issued in 2014 and in arrears after twelve months will not be available until the end of 2015.

risk was highest for loans issued in 2007, and that credit quality has improved slightly since then. The PD for mortgage loans issued in 2007 was 0.9 % after twelve months as against 0.5 % for loans agreed in 2013 [1]. This trend applies to all terms in which the first default was recorded.

This detailed PD information on mortgage loans allows for an accurate analysis of the correlations with macroeconomic and structural determinants, the subject of section 3.

3. Evaluation and determinants of mortgage defaults in Belgium

This section aims to explain the PDs calculated in the previous sections by linking them to both macroeconomic factors and a number of structural variables of the credit market. Structural factors include loan features – macroprudential risk measures/instruments such as LTV and DSTI – as well as bank characteristics, for instance bank size. Macroeconomic variables include cyclical variables such as unemployment, economic growth, interest rates, etc. This section will investigate whether higher LTVs, DSTIs and more fragile

macroeconomic conditions effectively constitute greater credit risk and thus whether macroprudential policies based on these variables might prove useful.

To arrive at as accurate a measurement as possible of the correlation between the PDs and structural/macroeconomic factors, we will focus on the mortgage loans market for which PD data are available (CICR data) and for which we can consult other sources on the structural aspects of the credit market, such as the Household Finance and Consumption Survey (HFCS) and the PHL (Prêts Hypothécaires – Hypothecaire leningen) survey on mortgage loans.

3.1 Structural and macroeconomic determinants

The HFCS[1] provides insight into a range of structural features, such as the risk profile of outstanding mortgage debt, calculating a number of risk measures at household level[2]. Households have trouble repaying their mortgages when their income is not sufficient to meet their scheduled debt repayments and when they do not have sufficient (liquid)

financial assets to meet these payments or repay (a proportion of) the outstanding debt if their sources of income suddenly dry up. What is more, if the property put up as collateral is not worth significantly more than the loan, banks run the risk of suffering losses. To assess the risk profiles of households' mortgage burdens, three macroprudential risk measures relate mortgage debt to income, to financial assets and to the value of the property respectively:

– the debt-service-to-income ratio (DSTI) divides the monthly mortgage payments by a household's gross income at the time of the survey. This ratio reflects the proportion of its income a household needs to meet its scheduled debt payments;
– the liquid-assets-to-debt ratio (LATD) divides the value of a household's liquid assets (deposits, bonds, listed shares and mutual funds) by its outstanding mortgage debt at the time of the survey. This ratio reflects what proportion of the outstanding mortgage debt a household could repay immediately from its financial assets, in the event of a sudden loss of income;
– the loan-to-value ratio (LTV) divides a household's outstanding mortgage debt by the – self-assessed – value of the property at the time of the survey.

If debt ratios linked to income or liquid assets exceed specific critical values, the risk increases that households will be unable to meet their debt commitments (Du Caju et al., 2014). To assess credit risk, this article focuses on mortgaged households[3] that are looking at excessive debt ratios, and more specifically on their share of the total outstanding mortgage debt. Excessive debt ratios

(1) The ESCB's Household Finance and Consumption Survey (HFCS) investigates the financial behaviour of households in the euro area : for an in-depth review, see Du Caju (2013). The first wave of surveys was conducted in 2010 in most countries, including Belgium, with over 62 000 euro area households surveyed in total, 2 364 of them in Belgium. Fundamental features of the assets and liabilities breakdown typically remain fairly stable over time, and an analysis of 2010 data therefore has relevance today. The survey was conducted in Belgium, Germany, Greece, Spain, France, Italy, Cyprus, Luxembourg, Malta, the Netherlands, Austria, Portugal, Slovenia, Slovakia and Finland. The 'euro area as a whole' signifies these fifteen countries.
(2) The survey assesses all risk measures at the time of the survey and not at the time a loan was agreed or a property transaction made.
(3) Note : according to HFCS data for 2010, 69.7 % of Belgian householders are owner-occupiers compared with 60.1 % in the euro area ; 30.5 % of Belgian households have mortgage loans compared with 23.1 % in the euro area.

TABLE 1   **PROPORTION OF OUTSTANDING MORTGAGE DEBT (2010)**
(measured by DSTI[1], LATD[2] and LTV[3] ratios)

Risky categories	Belgium	Euro area	Less risky categories	Belgium	Euro area
DSTI > 40 %	18.2	14.9	DSTI < 30 %	75.1	76.1
DSTI > 50 %	12.7	10.0	DSTI < 20 %	51.1	55.1
LATD < 10 %	46.0	57.0	LATD > 25 %	34.2	24.3
LATD < 5 %	35.1	41.4	LATD > 50 %	21.4	13.3
LTV > 80 %	20.2	26.5	LTV < 70 %	71.6	66.0
LTV > 90 %	10.0	18.2	LTV < 60 %	63.2	55.8

Source : NBB (HFCS 2010).
(1) The debt-service-to-income ratio divides the monthly mortgage payments by a household's gross income at the time of the survey.
(2) The liquid-assets-to-debt ratio divides the value of a household's liquid assets (deposits, bonds, listed shares and mutual funds) by its outstanding mortgage debt at the time of the survey.
(3) The loan-to-value ratio divides a household's outstanding mortgage debt by the – self-assessed – value of the property at the time of the survey.

are defined as DSTI > 40 %, LATD < 10 % and LTV > 80 % respectively.

On the ability to repay the mortgage from current income flows (DSTI), the table shows that, in Belgium, 18.2 % (12.7 %) of mortgage debt is concentrated with households that spent over 40 % (50 %) of their income on debt repayments at the time of the survey, compared with 14.9 % (10.0 %) for the euro area. Judged by income-related debt ratios, then, Belgium's risky category is bigger than that for the euro area, a finding that corroborates the sensitivity of the repayment capacity of Belgian households to loss of income, more specifically due to unemployment (Du Caju *et al.*, 2014).

However, when measured by asset-related debt ratios (low LATD and high LTV), the proportion of risky mortgage debt in Belgium dips below the figures for the euro area. If we look at mortgage debt as covered by liquid financial assets, at the time of the survey 46.0 % (35.1 %) of mortgage debts in Belgium were less than 10 % (5 %) covered by households' liquid assets, compared with 57.0 % (41.4 %) for the euro area. What is more, 20.2 % (10.0 %) of outstanding mortgage debt in Belgium comprises loans with LTVs over 80 % (90 %) at the time of the survey, as against 26.5 % (18.2 %) for the euro area. By the same token, these ratios suggest that the less risky categories with high LATDs and low LTVs are bigger in Belgium than in the euro area.

Drilling deeper into households' outstanding mortgage debt by way of their liquid financial assets (LATD) and the value of their properties (LTV), we find a significant proportion of the debt to be covered: HFCS figures show that 35.1 % of Belgian mortgage debt in 2010 was less than 5 % covered by liquid assets, while 9.9 percentage points boasted LTVs of over 80 %. By comparison, 41.4 % of euro area mortgage debt was less than 5 % covered by liquid assets, of which 15.5 percentage points had LTVs higher than 80 %. At the other end of the spectrum, Belgium sees 14.9 % of total outstanding mortgage debt concentrated with households with sufficient liquid assets to pay off their debt immediately (LATD > 100 %). These households hold on to these assets to finance other expected or unexpected expenses or simply because of their returns, which may well be higher than the cost of the loan, partly because of its tax treatment. In the euro area, only 8.9 % of total outstanding mortgage debt is completely covered by liquid assets.

CHART 5   SIZE AND ASSET QUALITY OF CREDIT INSTITUTIONS[1]

(in %)
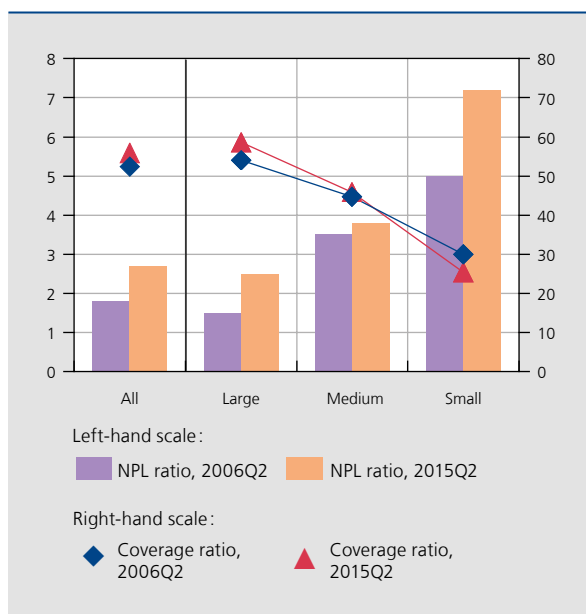
Source: NBB.
(1) NPL ratio for the total loan portfolio. Non-consolidated data.

In summary, HFCS findings highlight the importance of distribution aspects when estimating credit risk, proving that a very large number of mortgaged households spend the bulk of their income on repaying debt and have few financial reserves to offset any loss of income. These households account for a significant proportion of total mortgage debt and are vulnerable to unemployment shocks. This observation holds for Belgium as much as for the euro area, albeit that Belgium has a larger proportion of outstanding mortgage debt fully covered by liquid financial assets and a smaller proportion of outstanding debt that is barely covered at all.

Features specific to banks and their business models, such as their size or the sectors and markets they target, may also be suggestive of credit risk. An analysis of the NPL ratio per individual credit institution (non-consolidated data) reveals that, on average, the NPL ratio has a reverse correlation with the size of the bank. Based on aggregate data for banks in the various groups (large/medium-sized/small)[1], the 2015Q2 NPL ratio varied from 2.5 % for the majors, to 3.8 % for medium-sized and 7.2 % for small banks. Overall, credit risk has risen most sharply for small banks since 2006.

The relatively high NPL ratio for a number of small banks may suggest that they operate in niche markets with greater credit risk exposure, focusing more on corporate

and consumer loans, or seeking out the riskier segments of the mortgage market. As well as facing higher credit risks, these banks tend to provide less for their risks, as evidenced by their coverage ratios expressing provisions as a percentage of NPLs. Coverage ratios barely touch 25 % for small banks, compared with 46 % and 59 % for medium-sized and large banks respectively. In fact, small banks have seen their coverage ratios edge down even further since 2006. This may reflect a less than solid capital position and make these banks reluctant to take losses on loans. Some authors (Salas and Saurina, 2002) point to the importance of the capital position for both size and cover of NPLs, while also flagging the possibility of a 'gambling for resurrection' strategy that sees banks increase their portfolios' credit risks even more when their NPLs rise (Keeton and Morris, 1987).

It should be noted that small banks account for a negligible share of the market: the banking majors held around 80 % of the loan market at the end of June 2015, as against barely 1 % for all small banks together. Although the risks to overall credit quality in the Belgian market are limited, an asset quality review may be as useful to small banks as it is for the majors.

(1) DSTI and LTV data are taken from the PHL survey and are measured at the time loans are issued, implying that they may differ from the HFCS, which measured them in 2010 for the Belgian market. This does not necessarily coincide with the date the loans were issued.
(2) Note that the LTV ratio may well determine ultimate losses taken via the loss given default (when collateral is realised).

From a macroprudential perspective, it is worthwhile investigating the extent to which the difference in NPL ratios or PDs is down to the features of the loan portfolio (e.g. DSTIs, LTVs).

Drawing on CICR data for PDs and the PHL survey for DSTIs and LTVs[1], we have ranked Belgium's banks in different percentiles according to their PD on mortgage loans (lowest PD for the first percentile, highest PD for the last). The next step is to highlight the percentage of loans with high DSTIs (> 40 %) and LTVs (> 80 %) for these percentiles: p25, p50, p75, in the 2006-2013 period. The suspected link with DSTIs is indeed corroborated; that is to say, banks with low (high) PDs have a relatively low (high) percentage of loans with high DSTIs in their mortgage portfolios. The link between PDs and LTVs is less clear-cut.

The importance of these links should not be underestimated. The positive correlation between DSTIs and PDs shows that credit risk (PD) may be curbed by reining in DSTIs and so improve the financial stability and resilience of banks. The link between LTV and PD is less clear, which suggests that DSTI might be a more efficient macroprudential instrument than LTV to reduce credit losses by way of lower PDs[2]. This might be explained by diverging property valuation methods and DSTI being a direct measure of the debt burden, which is not so much the case for LTVs that do not contain information about income.
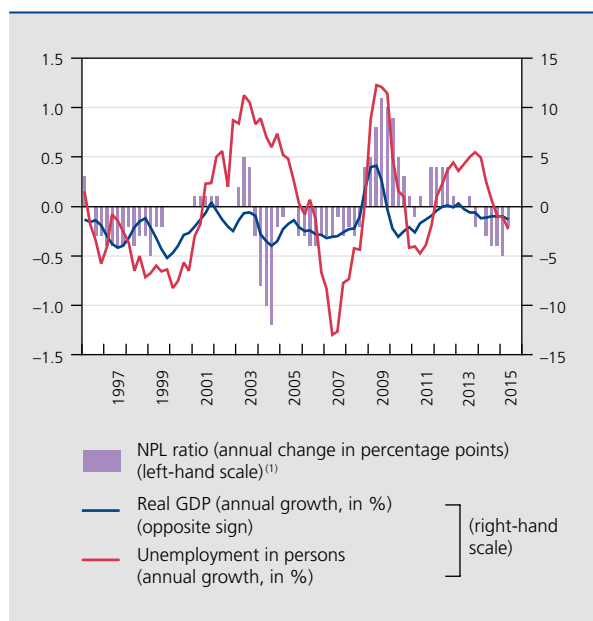
CHART 6   RELATIONSHIP BETWEEN DSTI, LTV AND ASSET QUALITY

(in %)
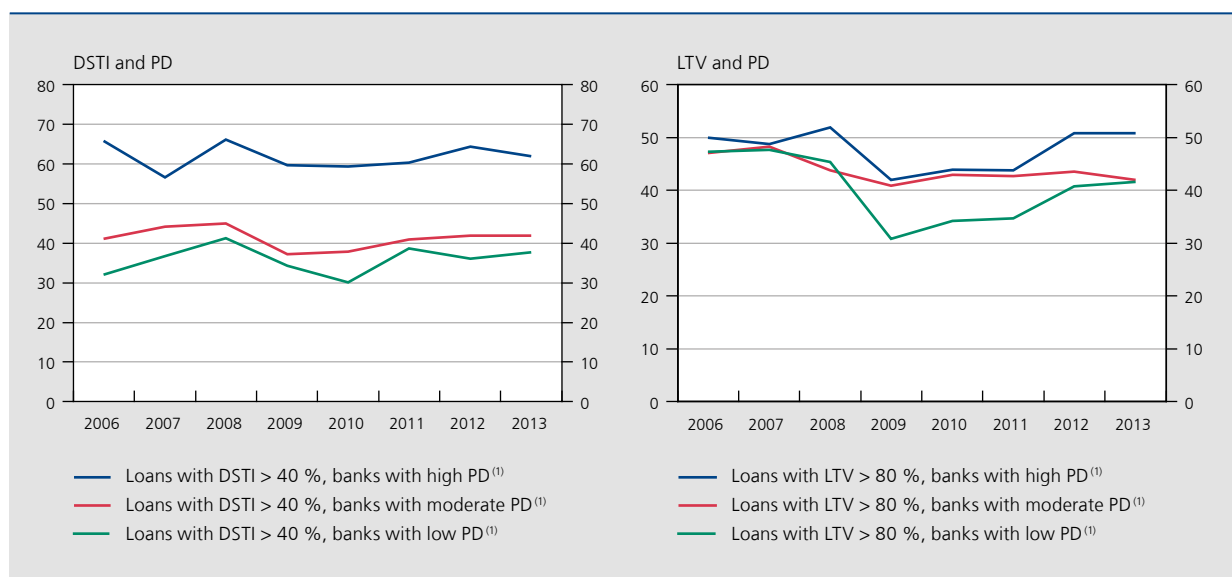
Source: NBB.
(1) On the mortgage portfolio (CICR data). A low/moderate/high PD coincides with percentiles 25/50/75. Excluding banks for which DSTI/LTV data are missing in the PHL survey for one or more years.

CHART 7

Source : NBB.
(1) Non-consolidated data.

correlated with macroeconomic indicators such as real GDP growth (–0.57) and unemployment (0.38). NPL ratios are counter-cyclical, coming down when business cycles improve and going up when they deteriorate (see Marcucci and Quagliariello, 2008).

Although aggregated NPL data do not allow for a very accurate measurement of the relationship with macroeconomic conditions (we may safely assume that NPL for households will be sensitive to macroeconomic conditions in a different way from corporations), these data do have the advantage – as we have noted – of spanning a lengthier period and therefore multiple economic cycles. The next sub-section discusses the contribution of macroeconomic and structural variables, albeit only for the PDs of mortgage loans – which are available from 2006 and therefore the correlation with the macroeconomic environment is mainly determined on the basis of the most recent economic cycle.

3.2 Econometric analysis of the probability of default on mortgage loans

To gain a more general picture of the determinants of realised *ex-post* credit risk, this sub-section will econometrically investigate the significance of macroeconomic variables on the one hand and structural factors on the other – i.e. loan features such as DSTI and LTV; and bank characteristics such as size. It will focus on the Belgian mortgage lending market, for which both PD data and information on structural factors are available.

Of course, NPL ratios (PDs) do not just reflect structural variables – e.g. loan features, bank characteristics – but also mirror macroeconomic conditions, as noted in section 1. In Belgium, NPL ratio developments are closely

TABLE 2   DEFAULT RATE OF MORTGAGE LENDING TO PRIVATE INDIVIDUALS

New contracts		… for which a first default was recorded …		
Year	New mortgage loan agreements for private individuals	… within nine months		
		Proportion	1st quartile	3rd quartile
		(in %)		
2006	317 438	0.54	0.08	0.70
2007	263 250	0.76	0.18	0.59
2008	258 902	0.67	0.14	0.71
2009	290 421	0.49	0.14	0.48
2010	350 397	0.38	0.09	0.39
2011	402 271	0.28	0.04	0.34
2012	321 261	0.46	0.05	0.63
2013	294 785	0.46	0.04	0.33

Source : NBB (Central Individual Credit Register).

Readers will recall that the percentage of mortgage lending agreements in arrears reached record levels in 2007, with 0.76 % of the year's 263 250 loans having run into arrears within nine months. Credit quality improved in subsequent years, leading to lower default rates.

As it turns out, default rates on mortgage lending to private individuals also vary from one bank to the next and these differences even exceed year-on-year variability. In 2013, for instance, default rates averaged 0.46 %, but a quarter of banks showed relatively high default rates (over 0.33 %) and another quarter showed relatively lower variablity (less than 0.04 %).

Note that this observation – of a large default rate variability between banks coupled with a lower variability from one year to the next – applies equally to mortgage agreements that go into arrears after more than nine months.

Can changes in macroeconomic conditions explain the observed variation in default rates ? Or is this variation explained by changes in the risk profiles of banks' mortgage loan portfolios ? We will try to answer these questions using an econometric model that explains the variations in monthly default rates[1] between banks and over time on the basis of two types of determinants : macroeconomic conditions on the one hand, and structural / macroprudential features on the other.

More specifically, we use the following Tobit model[2] :

$$PD_{kt}^i = c + \alpha_t + \gamma_k + \sum_{j=1}^{J_{Macro}} \beta_j * X_{kt}(j) + \sum_{j=1}^{J_{Prud}} \beta_j * X_k^i(j)$$

with PD_{kt}^i representing the monthly default rate for all loans originated by bank i in year k that are in arrears t months later. $X_{kt}(j)$ equals the jth macroeconomic variable ($j = 1,\dots, J_{Macro}$), $X_k^i(j)$ corresponds to the jth macroprudential variable ($j = 1,\dots, J_{Prud}$), α_t represents a fixed effect related to the loan age at default and γ_k is a fixed effect related to the year in which the loan was originated. Coefficients β_j measure the default rate's sensitivity to a 1 % change in an explanatory variable, assuming that the other variables remain unchanged at their mean.

More specifically, the analysis considers the following macro-economic conditions at the time the loan was in arrears[3] :

– key policy interest rate : a higher policy rate will affect the interest rate on variable-rate mortgages. Borrowers on variable-rate mortgages will face higher debt payments, increasing the probability of default. This implies an expected positive relationship between the policy rate and default rates ;
– unemployment rate : a higher unemployment rate increases the probability of borrowers losing their jobs and having trouble repaying their loans. This relationship – between unemployment and the default rate – is expected to be positive ;
– property price : a rise in residential property prices increases the probability of borrowers being able to refinance their mortgage at better conditions and thus reduce the default risk. The relationship between residential property prices and default rates is therefore expected to be negative.

The macroprudential variables measure specific features of banks' mortgage loan portfolios at origination. The data cover the period 2006-2013 and derive from the PHL survey.

The following variables were calculated as macroprudential determinants of the default rate :

– the proportion of the mortgage portfolio with a debt-service-to-income ratio (DSTI) higher than 40 % ;
– the proportion of the mortgage portfolio with a loan-to-value ratio (LTV) higher than 80 %[4] ;
– the proportion of the mortgage portfolio with maturity of over 20 years ;
– the proportion of the mortgage portfolio with variable interest rates.

These variables are often considered in the context of macroprudential policy measures related to the real estate sector. The underlying assumption is that they capture a bank's mortgage portfolio risk profile at the time the loans were originated. A higher risk portfolio would imply a higher default rate.

In addition, three other bank-specific variables come into play :

– a bank's share of the mortgage loans market : the relationship between market shares and default rates can be positive or negative. A negative correlation would mean that a bank with a smaller share of the mortgage loan has higher default rates, possibly because it focuses on riskier segments of the property market ;

(1) The default rate of the econometric model equals the monthly default rate defined as the proportion of loan agreements that defaulted at X months after origination among those that had not defaulted after (X-1) months.
(2) The Tobit model describes a relationship between a dependent variable called 'censored' as it is restricted in some way or another – monthly default rates can only be between 0 % and 100 % – and independent variables, i.e. the set of macroeconomic and structural variables.
(3) We also looked at other variables measuring macroeconomic circumstances, in particular GDP at the time of the payment arrears. For technical reasons – multicolinearity between variables – a Tobit model can handle only a limited set of variables simultaneously.
(4) Other models were run with macroprudential variables pegging different thresholds, e.g. LTV > 90 % or DSTI > 50 %. The results are still valid.

	Coefficient βj (standard deviation)	Standard deviation of the determinants (in %)	Impact on default rate (in percentage points)
Macroeconomic determinants at the time of default:			
Key policy interest rate	0.006943 *** (0.002317)	0.9	0.006
House prices, growth rate	−0.003176 ** (0.001477)	3.0	−0.010
Unemployment rate	0.002994 (0.003068)	0.5	0.002
Bank determinants in the year the loan was issued:			
Average interest rate	0.075311 *** (0.009698)	0.5	0.041
Proportion of portfolio with maturity > 20 years	0.003037 *** (0.000247)	10.4	0.032
Proportion of portfolio with DSTI > 40%	0.000453 *** (0.000103)	19.2	0.025
Market share for mortgage loans	−0.001458 *** (0.000188)	7.8	−0.011
Proportion of portfolio with LTV > 80%	0.000381 *** (0.000153)	9.3	0.009
Proportion of portfolio with variable interest rates	0.000770 *** (0.000067)	32.1	0.004
Growth rate of the mortgage portfolio compared to banking sector average	0.000074 * (0.000043)	32.3	0.002
Dependent variable:			
Monthly default rate (average, in %)	0.0628		
Log-likelihood	11 364		
Number of observations	2 100		

Source: NBB.
(1) The parameters of the Tobit model were estimated with maximum likelihood between 2006 and 2013 for a sample of 15 banks and a period of 72 months (age of the loan at the time of default). (***), (**) and (*) flag the significance of the coefficients at threshold values of 1%, 5% and 10% respectively. The final column equals the product of the coefficients (βj) and the corresponding standard deviations.

– the growth of the mortgage portfolio compared with the average growth of mortgage portfolios in the banking industry at large: the effect on default rates is positive if a larger market share encourages a bank to lend more to riskier borrowers;
– average interest rate on the mortgage portfolio: this interest rate is a weighted average of the rates applicable to various mortgage agreement[1], with weights reflecting their share in the loan portfolio and specific to individual banks. This average will depend on both the structure of the bank's portfolio and the term structure of interest rates. The effect on default rates will be positive if this variable reflects a risk premium.

(1) Interest rate data were taken from the MIR survey and reflect weighted averages that Belgian credit institutions apply to their new mortgage loans: agreements with initial fixed-rate terms of (1) less than one year, (2) over one year and less than five years, (3) over five years and less than ten years, and (4) over ten years.

We can draw three conclusions from the estimated model. The estimation results are presented in table 3.

First, variations in default rates between banks and over time are explained by the macroeconomic conditions at the time of default as well as by the specific features of a bank's mortgage portfolio at origination.

To assess the economic significance of these variables, the final column in the table presents the estimated coefficient multiplied by a standard change for the variable (the standard deviation). The key policy interest rate and residential property prices turn out to be the most important macroeconomic factors. A one-standard-deviation slowdown in annualised property prices equalling 3% exerts the biggest relative impact, i.e. an increase in the model-projected default rate of 0.01 percentage points.

An increase in the key policy interest rate by a standard deviation equalling 0.9 % pushes up the monthly default rate by 0.006 percentage points.

Among bank-specific determinants, the average interest rate would appear to be the variable that best explains default rates. Out of any two banks with the same risk profile in all other respects, a bank having more loans at higher interest rates in its portfolio is likely to also face higher default rates.

Two other bank factors with a relatively large impact on default rates are the proportion of the mortgage portfolio with maturity of over 20 years and the proportion of the portfolio with a debt-service-to-income ratio of over 40 %. Note that the elasticity of default rates to the proportion of the mortgage portfolio with a loan-to-value ratio higher than 80 % is lower than the elasticity of default rates to the proportion of the portfolio with a debt-service-to-income ratio higher than 40 %, confirming the relationships identified in chart 6 (sub-section 3.1).

In keeping with the observations in sub-section 3.1, a bank's share of the market has a negative effect on default rates, meaning that the smaller the bank in the market for mortgage loans, the higher its default rates are likely to be. Coefficients related to the other two characteristics – i.e. the proportion of the portfolio with variable interest rate mortgages and growth of the mortgage portfolio as compared to the bank sector average – are significant, but less important.
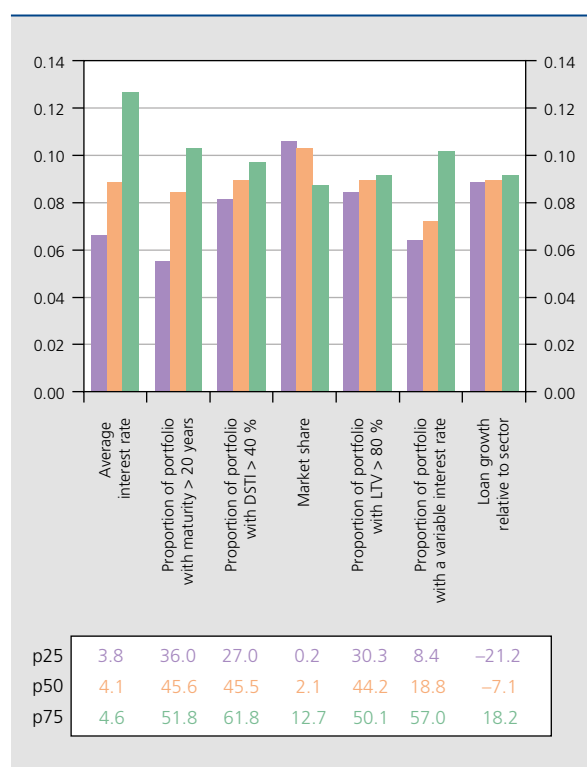
The second conclusion to draw from our analysis relates to differences in default rates between banks. To find out which features of banks' portfolios help explain the differences in default rates between banks, we need to review two factors: the sensitivity of the default rate for the relevant variables (see table above) and the variables' heterogeneity between banks (table in chart 8). This heterogeneity can be measured by the difference between the third quartile (line 'p75') and the first (line 'p25') of the distribution of each of these variables.

A first glance suggests that average interest rates best explain the variations in default rates between banks. This is mainly due to the sensitivity of default rates for this particular variable, as average interest rates are not all that different from one bank to the next: the spread between the third and first quartiles for average interest rates amounts to 0.8 percentage point.

Two prudential characteristics underpinning the heterogeneity of default rates between banks are the proportion of

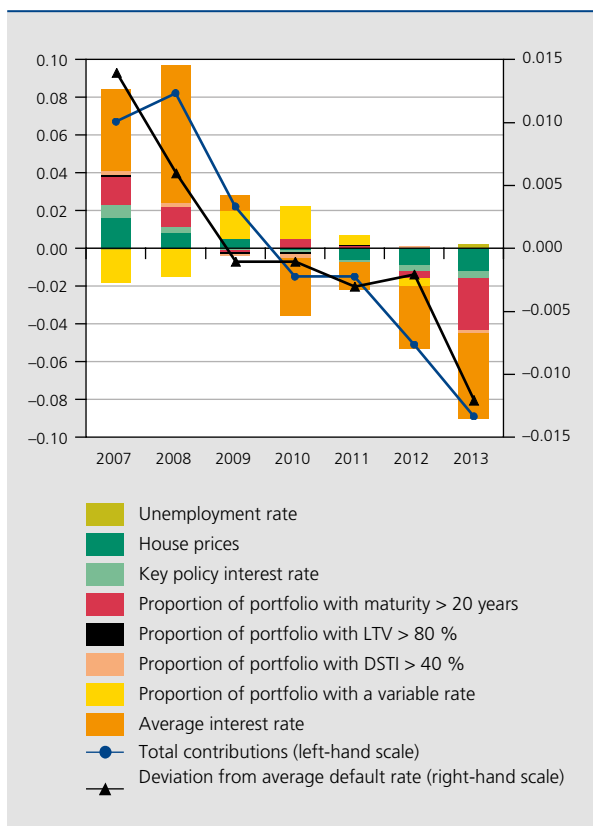|	Average interest rate	Proportion of portfolio with maturity > 20 years	Proportion of portfolio with DSTI > 40 %	Market share	Proportion of portfolio with LTV > 80 %	Proportion of portfolio with a variable interest rate	Loan growth relative to sector
p25	3.8	36.0	27.0	0.2	30.3	8.4	−21.2
p50	4.1	45.6	45.5	2.1	44.2	18.8	−7.1
p75	4.6	51.8	61.8	12.7	50.1	57.0	18.2

Source: NBB.
(1) Monthly default rates were calculated for 2013 and relate to loans originated in 2010. Bank characteristics are assumed to have the same values for all banks, with the exception of the characteristic being observed. Macroeconomic variables equal their average in the 2006-2013 period.

the loan portfolio with maturity of over 20 years and the proportion of the bank's portfolio with a variable interest rate. Although default rates are less sensitive to the proportion of adjustable-rate loans in the bank portfolio, this variable is very heterogeneous across banks: for one-quarter of Belgian banks, the adjustable interest rate proportion of the portfolio is below 8.4 %, while the other end of the distribution shows a quarter of banks at over 57 %. The differences between banks are a lot smaller when it comes to the proportion of the loan portfolio with maturity of over 20 years.

The actual size of a bank's market share turns out to be a better predictor of default rate variability than any changes in the variable. As for the remaining two macro-prudential determinants, the proportion of the mortgage portfolio with a debt-service-to-income ratio higher than 40 % relates to a greater variability between banks than the proportion of the portfolio with a loan-to-value ratio higher than 80 %. In addition, heterogeneity for the debt-service-to-income ratio is greater than for the loan-to-value ratio.

CHART 9   DEVIATION OF THE DEFAULT RATE FROM ITS AVERAGE IN 2006-2013 PERIOD: CONTRIBUTIONS BY MACROECONOMIC AND BANK VARIABLES

(in percentage points)

Unemployment rate
House prices
Key policy interest rate
Proportion of portfolio with maturity > 20 years
Proportion of portfolio with LTV > 80 %
Proportion of portfolio with DSTI > 40 %
Proportion of portfolio with a variable rate
Average interest rate
Total contributions (left-hand scale)
Deviation from average default rate (right-hand scale)

Source: NBB

Note: The difference between the sum of the contributions and the deviation of the actual default rate from its average is explained by the sum of the model's constant, the average of the fixed effects related to the age of the loan at default and the fixed effect related to the origination year. Contributions of variables not included in the chart are close to zero.

The third conclusion to be drawn relates to factors explaining the variation of default rates from year to year. To capture the relative roles that macroeconomic and macroprudential conditions play in default rate trends, the chart below shows how the determinants contribute to the deviation in default rates relative to their averages in the 2006-2013 period. These contributions are defined as the product of the estimated sensitivity coefficients and the spread of any variable over its average throughout the period.

Over this period, changes in the average default rate are largely attributable to variations in both the key policy rate and the average mortgage interest rate. In 2007 and 2008, in particular, default rates recorded a surge on the back of a major contribution by interest rates. Once the financial crisis had taken hold and interest rates began to drop below their averages, their contributions turned negative.

Two characteristics of bank portfolios turn out to be key contributing factors for default rate developments. First, the proportion of the mortgage portfolio with a variable interest rate was smaller than average during the 2007-2008 period of (relatively) high interest rates, making for a downward effect on default rates (as deviation from the average). As soon as interest rates come down, the proportion of the loan portfolio with a variable interest rate starts to rise to above-average and adds to the default rate. Secondly, the proportion of the mortgage portfolio with maturity of over 20 years has been falling since 2012 and has been a negative contributor to the default rate since then, particularly in 2013. Note also that the virtually unbroken rise in residential property prices in the 2010-2013 period helps to push the model-predicted default rate to below its average. Lastly, we note the limited contribution of the other macroprudential features, in particular the proportion of the portfolio with a loan-to-value ratio of more than 80 % and a debt-service-to-income ratio higher than 40 %. This lack of influence is mainly down to the variables barely changing year-on-year.

4. Implications and outlook

This final section reviews the implications of NPLs (feedback effects on macroeconomic conditions), and provides an outlook based on an analysis of debtors' creditworthiness.

The interaction between NPLs and macroeconomic conditions can be illustrated in a figure. The green arrows show the NPL determinants, i.e. both macroeconomic

CHART 10   INTERACTIONS BETWEEN MACROECONOMIC ACTIVITY AND ASSET QUALITY
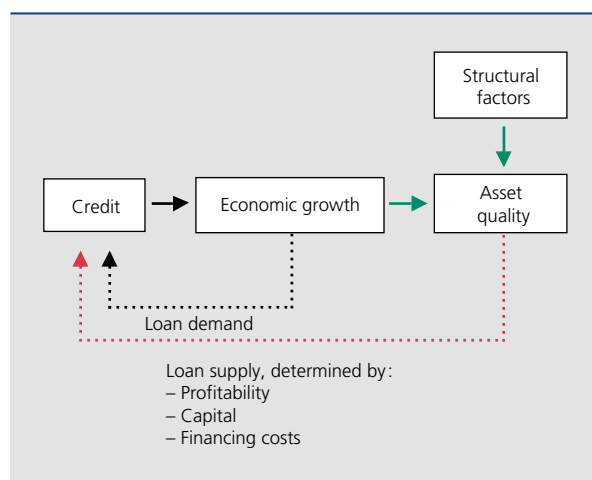
Source: NBB.

conditions and structural factors as the previous section demonstrated. Conversely, NPLs may influence macroeconomic conditions via the loan supply (red dotted line).

NPLs can change the loan supply through three closely related mechanisms:

– profitability: bank profitability is adversely affected by large numbers of NPLs: these loans fail to generate expected returns and compel banks to make more provisions to cover any losses;
– capital: NPLs typically push up risk-weighted assets, for instance by way of an adjustment of internal ratings-based (IRB) risk weights, and, as a result, the regulatory capital required;
– financing costs: NPLs heighten uncertainty over banks' profits and capitalisation, causing markets to demand higher risk premiums for their external borrowing requirements (Kashyap *et al.*, 1994).

(1) For Belgium, a VAR-based causality test shows a unidirectional causal link between NPLs and the economic cycle. Statistical tests demonstrate that the two economic indicators observed – year-on-year growth of real GDP and unemployment in persons – influence twelve-month changes in the NPL ratio, but that NPL ratio changes do not have any impact on the economic cycle – a highly plausible outcome in view of Belgium's relatively low NPL ratio.

Together, these three mechanisms can cause greater numbers of NPLs to spark tighter loan supply, i.e. higher bank lending rates and/or lower lending volumes.

Comparing NPL ratios (consolidated data) in the euro area countries with the interest margins of banks on new loans granted to non-financial corporations and households, we find that higher NPL ratios typically go hand in hand with higher interest rate charges or margins. This is particularly true for interest charged to non-financial corporations, while the relationship is much less significant for interest charged to households. Possibly, the credit risk as defined here – i.e. the NPL ratio – plays a less important part in the pricing of household loans, as these types of loans are more highly collateralised and other determinants might play a role too in determining margins (e.g. competition).

Looking at corporations, NPLs could be suggested to be part of the cause of the post-crisis financial fragmentation in the euro area. Belgium is among the countries with a relatively low NPL ratio and relatively low interest margins. NPLs are a particular challenge in the peripheral euro area countries, not just because of their level but also because they appear to coincide with tighter loan supply depressing economic activity[1].

CHART 11   IMPACT OF NPLs ON FINANCING CONDITIONS IMPOSED ON PRIVATE SECTOR IN THE EURO AREA[1]
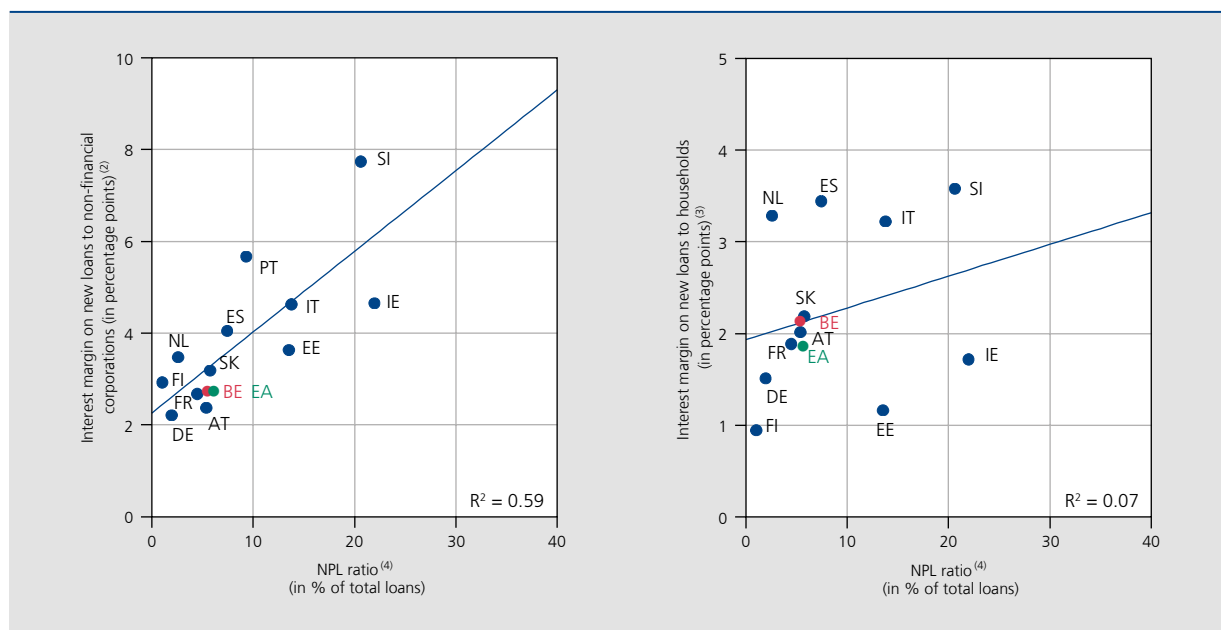
Sources: ECB, NBB.
(1) Situation in June 2014, no data for Cyprus, Greece, Latvia, Lithuania, Luxembourg and Malta. For households, also Portugal is excluded (series too volatile).
(2) Interest rate charged on new loans of € 1 million or less at an initial fixed-rate term of less than five years. Margin vis-à-vis five-year swap.
(3) Interest rate charged on new loans at an initial fixed-rate term of over ten years. Margin vis-à-vis ten-year swap.
(4) Consolidated data.

These countries would do well to resolve the issue of challenging NPL levels, as there are parallels with Japan's lost decade when banks waited too long to take losses on bad debts (see Boeckx et al., 2015 and Inaba et al., 2003). With their capital tied up in this way, they were no longer able to fund the economy independently, and became known as 'zombie banks'.

Better resolution of NPLs depends on a range of factors (see IMF, 2015), such as the prudential framework (e.g. NPL definitions and forward-looking provisions) as well as the legal framework (e.g. insolvency laws), a market for bad credit, information (e.g. credit scores for SMEs) and the tax regime (e.g. favourable tax treatment of provisions). An IMF survey of 18 European countries with sizeable NPLs found there was room for improvement on all these counts[2].

Another focus could be to reduce debt, as NPL challenges imply too great a debt burden. In that respect, conditions in the euro area are a little less worrying than shortly after the crisis, as debt ratios have declined in a number of countries

(deleveraging) and as monetary easing has taken some of the sting out of the debt pile through lower interest charges.

The euro area at large has seen a deleveraging trend since early 2010 and the consolidated gross debt of the non-financial private sector has fallen from 146 % of GDP in 2010 to around 140 % of GDP mid-2015. Deleveraging may be quite modest when compared with the rapid build-up of debt that preceded it, but it does reflect a trend reversal from the previous decade, which recorded a constant rise in debt ratios. The improved balance sheet of the euro area's private sector is also clear from its lower debts as a ratio of financial assets.

In Belgium, by contrast, consolidated gross debt has continued to increase in the non-financial private sector and is gradually closing the gap with the euro area, particularly for households (58.8 % of GDP in Belgium compared with 60.6 % in the euro area in 2015Q2). Belgium has merely seen the debt-to-financial assets ratio stabilise in the past few quarters, but this particular ratio is still at a significantly lower level than in the euro area.

(1) The market for bad debt is relatively underdeveloped in Europe : the IMF (2015) puts it at € 64 billion at the end of 2013, compared with $ 469 billion in the United States.

CHART 12   DEBT RATIO SINCE 2010: ACTIVE VERSUS PASSIVE (DE)LEVERAGING[1]
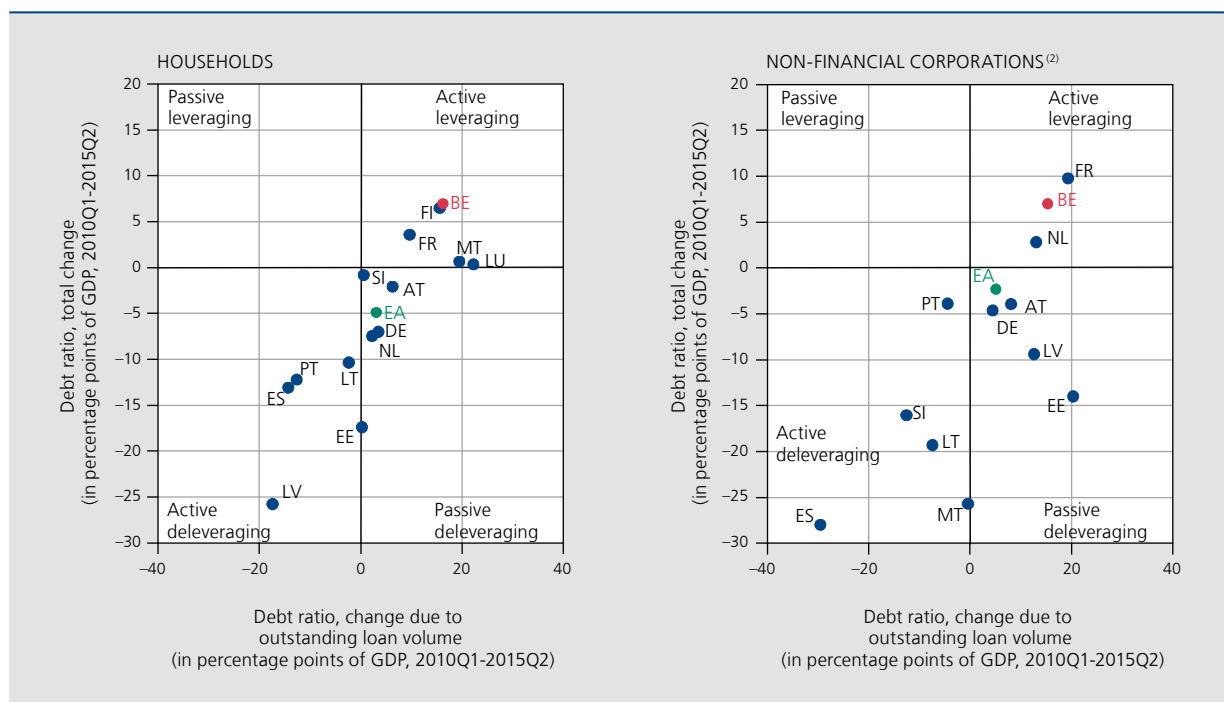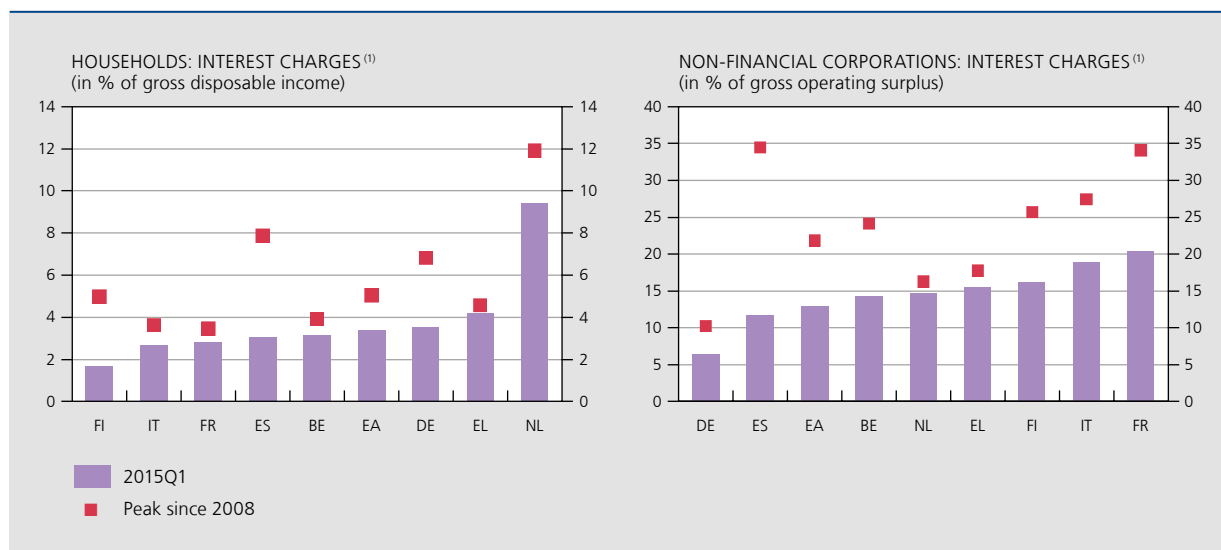

Sources : ECB, NBB.

(1) No data for Cyprus, Greece, Ireland, Italy, Slovakia. Non-financial corporations also exclude Finland and Luxembourg.

(2) For Belgium, consolidated gross debt excluding loans granted by the non-bank foreign sector, 'captive financial institutions and non-institutional money lenders', as these typically represent intra-group funding. The available data do not allow for a similar adjustment for the other countries, but the extent of these intra-group loans tends to be limited in most.

HOUSEHOLDS: INTEREST CHARGES [1]
(in % of gross disposable income)

NON-FINANCIAL CORPORATIONS: INTEREST CHARGES [1]
(in % of gross operating surplus)

■ 2015Q1

■ Peak since 2008

Sources: ECB, NBB.

(1) Calculated on the basis of the national accounts of the countries for which these data are available. Interest charges include fees for financial intermediation services indirectly measured (FISIM), that is to say interest actually paid, which in addition to the reference interest rate also includes an interest margin (FISIM).

Although the deleveraging trend is not broadly shared across the euro area, it seems that deleveraging occurs in the countries facing the highest credit risk. If we break down the debt ratio changes into credit flows and changes in nominal GDP, we find that about half of these countries are actively deleveraging, implying that loans have been cut back in nominal terms; the other half is deleveraging passively, i.e. reducing debt ratios thanks to nominal GDP growth. Belgium is part of a group of countries where debt ratios have risen relatively sharply and actively since 2010 due to new loan (primarily mortgages) flows. Nonetheless, this development is seen as sustainable as NPLs have not risen significantly.

In addition to the decline in debt ratios in the non-financial private sector in some countries, monetary easing has also reduced the debt burden in the euro area, as shown by the interest charges of households and non-financial corporations (i.e. interest payments as a percentage of gross disposable income for house-holds and as a percentage of gross operating surplus for non-financial corporations) [1]. Interest payments

reached an all-time high at the end of 2008, but have been consistently falling in the wake of successive inter-est rate cuts since October 2008.

That said, the impact of monetary stimulus varies, which can be related to underlying debt develop-ments and interest rate variability of outstanding loans. Countries that have deleveraged the hardest and where loans typically have floating rates – e.g. Spain – have seen their interest burden shrink the fastest. In Belgium, by contrast, the effect of monetary policy on household interest charges has been rather muted, reflecting the ongoing increase in the debt ratio and the relatively large proportion of fixed-rate loans [2].

Monetary policy has helped to improve the sustainabil-ity of debt positions by reducing interest charges, and has probably prevented NPL ratios in some countries from rising even higher. These countries should make the most of such conducive circumstances by resolving the heavy legacy of the past – i.e. NPLs – so that it does not constantly threaten to dampen the growth outlook.

Conclusion

This article assesses realised (*ex-post*) credit risk in Belgium, as measured by both NPLs and payment arrears of house-holds. It also examines the extent to which that risk can be explained by the macroeconomic environment and by

(1) Calculated on the basis of the national accounts. These interest charges include fees for financial intermediation services indirectly measured (FISIM), that is to say interest actually paid, which in addition to the reference interest rate used in the national accounts also includes an interest margin (FISIM). Interest charges as published in the national accounts do not include this margin (recorded as consumption by the sectors using these services). Only a few countries (those included in chart 13) release actual interest charges.

(2) Interest charges on fixed-rate loans can also be reduced by refinancing, although usually after a time lag.

structural variables, such as credit characteristics (e.g. LTV, DSTI) and features of the banks (e.g. their size). Such an analysis is relevant to macroprudential policies that might seek to curb credit risk via one or more of these variables.

Poor data availability on both credit risk and structural features has compelled us to focus our analysis on mortgage credit risk.

Outstanding mortgage debt in Belgium has a mixed risk profile. Overall, Belgian households' net financial wealth is high, but their debt ratio continues to rise. Distribution aspects are important. There are pockets of risk, as many Belgian households with mortgages spend a large proportion of their income on debt repayment (which tallies with a high DSTI). The analysis shows that these structural features of credit are informative for the credit risk incurred by banks on their loan portfolios. Banks with a relatively high NPL ratio also tend to have a relatively high proportion of loans with a high DSTI in their portfolio. Apart from the loan risk profile, banks' size also appears to be indicative of credit risk. An analysis of the NPL ratio per individual credit institution shows that, on average, a higher NPL ratio is observed for the group of small banks.

An econometric analysis confirms the explanatory power of a number of these structural factors for credit risk in Belgium, and also indicates that this depends, albeit to a lesser extent, on the macroeconomic environment. Moreover, in some countries where very high NPL ratios are recorded, non-performing loans also appear to be having an impact on economic activity through a tightening of credit supply, especially via higher interest margins on new loans to businesses.

In these countries, it would be advisable to look for a solution to the problematic NPL level. On the one hand, efforts can be devoted to a better resolution of bad loans; on the other, preventive steps can be taken giving consideration to the relationships put forward in this article. In that respect, one positive factor is that a number of these countries are now recording a drop in their private debt ratio. Furthermore, accommodative monetary policy is also playing a supporting role via a considerable decline in interest charges. These countries need to make the most of these circumstances and get rid of the heavy legacy of the past (NPLs) so that it does not constantly threaten to dampen the growth outlook.

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