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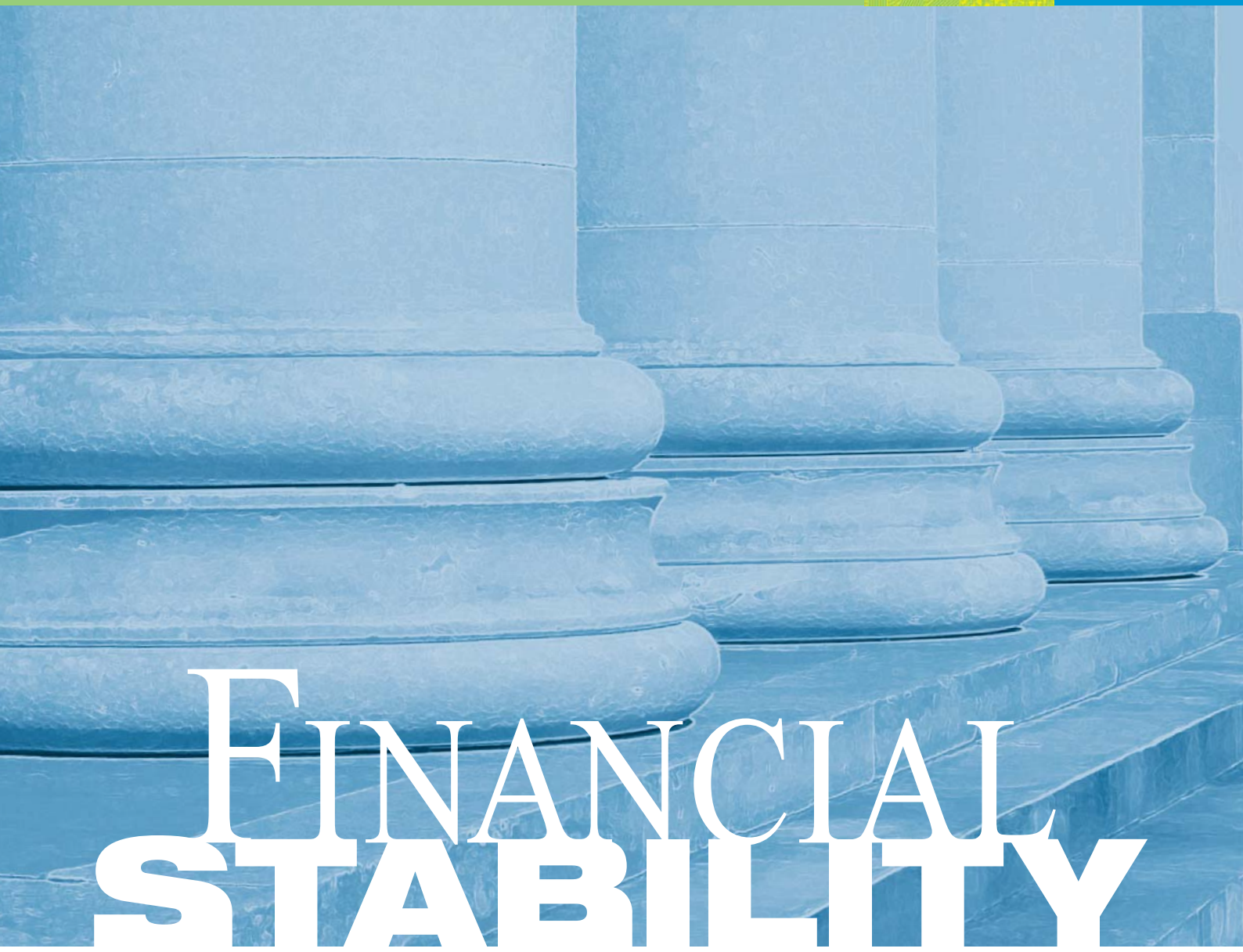

FINANCIAL STABILITY

CROATIAN NATIONAL BANK

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Financial Stability

No. 14, Zagreb, February 2015

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Croatian National Bank
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www.hnb.hr

ISSN 1847-0017 (online)

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Introductory remarks

Finance plays a key role in the allocation of resources, i.e. the process of transforming savings into investments, and therefore into economic growth and an increase in the overall level of social welfare. At the same time, because financial stability is based on the confidence of financial market participants, it largely depends in turn on their perceptions and behaviour, which are subject to cyclical swings. As financial crises create considerable economic and social costs, the maintenance of financial stability has the character of a public good and is thus an important economic policy objective.

Financial stability is characterised by the smooth functioning of all financial system segments (institutions, markets, and infrastructure) in the resource allocation process, in risk assessment and management, payments execution, as well as in the resilience of the system to sudden shocks. This is why the Act on the Croatian National Bank, in addition to the main objective of the central bank – maintenance of price stability and monetary and foreign exchange stability – also lists among the principal central bank tasks the regulation and supervision of banks with a view to maintaining the stability of the banking system, which dominates the financial system, as well as ensuring the stable functioning of the payment system. Monetary and financial stability are closely related, for monetary stability, which the CNB attains by the operational implementation of monetary policy, performing the role of the bank of all banks and ensuring the smooth functioning of the payment system, lowers risks to financial stability. At the same time, financial stability contributes to the maintenance of monetary and macroeconomic stability by facilitating efficient monetary policy implementation.

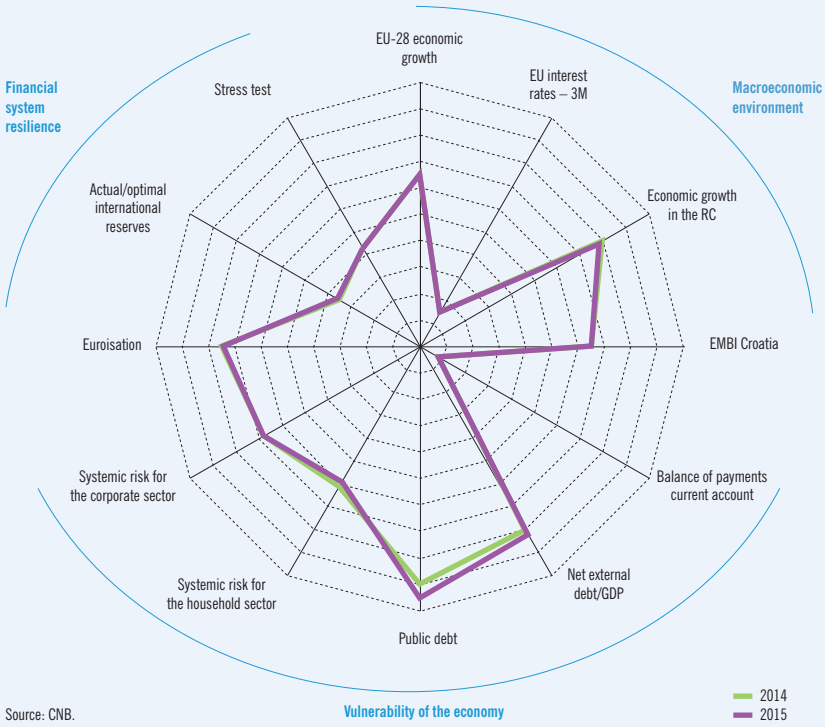
The CNB shares the responsibility for overall financial system stability with the Ministry of Finance and the Croatian Financial Services Supervisory Agency (HANFA), which are responsible for the regulation and supervision of non-banking financial institutions. Furthermore, owing to the high degree to which the banking system is internationalised, as reflected in the foreign ownership of the largest banks, the CNB also cooperates with the home regulatory authorities and central banks of parent financial institutions.

The publication Financial Stability analyses the main risks to banking system stability stemming from the macroeconomic environment of credit institutions and the situation in the main borrowing sectors, as well as credit institutions' ability to absorb potential losses should these risks materialise. Also discussed are CNB measures to preserve financial system stability. The analysis focuses on the banking sector, due to its predominant role in financing the economy.

The purpose of this publication is systematically to inform financial market participants, other institutions and the general public about the vulnerabilities and risks threatening financial system stability in order to facilitate their identification and understanding as well as to prompt all participants to undertake activities providing appropriate protection from the consequences should these risks actually occur. It also aims at enhancing the transparency of CNB actions to address the main vulnerabilities and risks and strengthen the financial system's resilience to potential shocks that could have significant negative impacts on the economy. This publication should encourage and facilitate a broader professional discussion on financial stability issues. All this together should help maintain confidence in the financial system and thus its stability.

Overall assessment of the main risks and challenges to financial stability policy

Figure 1 Financial stability map



Source: CNB.

Risks to financial stability remained unchanged in general, however, despite historically very low level of yields on borrowing of the Republic of Croatia in the international markets, the risks to the financial stability which stem from the domestic economy are still considerable, primarily due to the absence of economic growth. Similarly, increased volatility of risk premiums towards the end of the last year and early this year points to great sensitivity of the financial markets to shocks. The stress testing exercise shows that credit institutions as a sector are still capable of withstanding relatively large and highly unlikely but plausible shocks.

The main indicators of financial stability in Croatia are summarised in Figure 1. The financial stability map shows changes in key indicators of the possibility of the occurrence of risks related to the domestic and international macroeconomic environment and the vulnerability of the domestic economy, as well as changes in indicators of financial system resilience that can eliminate or reduce costs should such risks materialise. The map shows the most recent market developments or forecasts of selected indicators and their values in the reference period, i.e. the previous year. Increased distance from the centre of the map for each variable indicates a rise in risk or the vulnerability of the system, that is, of a diminution of its resilience, and accordingly a greater threat to stability. Any increase in the area of the map, then, indicates that the risks for the financial stability of the system are increasing, while a diminution of the area suggests they are decreasing.

Overall assessment of the main risks to financial stability has not changed much from the previous issue of this publication. The risks to financial stability relating to the international environment remain low. The continued expansive monetary policy of the ECB and the expected introduction of new instruments have kept risk premiums at extremely low levels, regardless of the gradual reduction in the Fed balance sheet and the announcement by the Fed Chair and market expectations of monetary policy tightening in the USA in the second half of 2015. However, increased volatility of risk premiums towards the end of the last year and early this year points to large sensitivity of the financial markets to shocks associated with recent events in Russia and Greece with the result that the international environment remains a significant potential source of risks for domestic financial stability.

Despite a historically very low level of yields on borrowing of the Republic of Croatia in the international markets, which is influenced by the relatively small risk aversion of the financial markets, the risks to financial stability which stem from the domestic economy are still considerable, primarily due to the absence of economic growth. The absence of GDP growth in the previous years, i.e. its expected stagnation in 2015 (the expected real GDP growth is 0.2%) and the associated relatively large budget deficit and growing public debt keep the risk premium for the Republic of Croatia at a much higher level than those for other EU Member States from Central and Eastern Europe and increase the risks to financial stability.

The low growth rate of the economy is manifested in relatively poorer corporate business performance so in the absence of any significant increase in capitalisation and deleveraging, the standard indicators of risk continue to point to increased level of risk to financial stability in that sector. By contrast, under the influence of unfavourable trends in the labour market and in the environment of subdued consumer optimism, the household sector continued to deleverage, thus diminishing the risks to financial stability stemming from this sector. In both these sectors, the reduction in short-term and long-term interest rates on loans contributed to a reduced burden of loan repayment and thus helped reduce the risks to financial stability, and the household sector also saw a small reduction in currency risk caused by an increase in the share of kuna loans, even though the consequences of a possible materialisation of this risk also depend on the intensity of the shock, as shown by the recent case of the appreciation of the Swiss franc, which took place after analytical preparations for this publication were made[1].

In accordance with developments in the risks of key business clients, banking sector risk exposure remained stable, despite growing differences among the banks. In the observation of this sector's risk, account should be taken of the increased exposure to the government sector, driven by not only increased need for government financing but also by a decline in the demand of the corporate and household sectors for new loans (see Box 1 Determinants of credit supply and demand of households and corporates). Banking sector profitability, which serves as the first buffer for maintaining stability, continues to be influenced by expenses for value adjustments for non-performing loans. However, it should be noted that a gradual increase in the coverage of such loans is greatly improving this sector's resilience.

In general, the biggest risk to financial stability arises from a relatively high sensitivity to changes in financing terms in the international financial markets which, coupled with high vulnerability associated with the expected low growth rates and high public and external debt level, may have considerable unfavourable effects on the economy of the Republic of Croatia. Any increase in risk premium driven by growth in risk aversion in the international financial markets, which might be prompted by some exogenous event, risk materialisation such as an unexpected fall in GDP or a significant increase in the budget deficit in the Republic of Croatia, would promptly spill over to the conditions for financing of the Republic of Croatia and put pressures on the exchange rate. This mechanism, further described in the chapter Stress testing of credit institutions, would affect the cost of financing of all sectors and increase their vulnerability due to exchange rate and interest rate risk exposure. The economic policy makers should thus work continuously on reducing these risks. The reduction in the risk premium, mainly influenced by GDP and public debt growth dynamics, the maintenance of the optimum level of foreign exchange reserves as well as high capitalisation and liquidity of the banking sector are the main factors that can reduce the effect of the increase in risk aversion in the international financial markets on financial stability in the Republic of Croatia.

In conclusion, the conducted stress testing which has been greatly improved (see the chapter Stress testing of credit institutions and Box 5 New methodological approach to stress testing) and now includes a much bigger number of channels through which developments in the environment can act on the banking sector as well as integrated liquidity shock stress testing, shows that the banking sector is still capable of withstanding relatively large and highly unlikely, but nevertheless possible, shocks.

1 See "A brief commentary on the recent appreciation of the Swiss franc" at the end of this publication.

Macroeconomic environment

ECB measures, combined with the results of the banking system analysis, created the preconditions for maintaining favourable financing conditions in the international market in 2015. Despite diminished external risks associated with the refinancing of maturing foreign liabilities of domestic sectors, continued poor economic activity, coupled with fast public debt growth and the absence of structural reforms capable of raising the competitiveness of the domestic economy, resulted in a much higher risk premium for Croatia relative to peer countries, making it highly vulnerable to possible changes in financing conditions.

The second half of 2014 was marked by stable conditions in the international financial markets and continued expansive monetary policy of the ECB. Although EU Member States mostly reported positive rates of change in GDP, with the countries of Central and Eastern Europe growing the fastest on average, economic activity in the EU was uneven while growth mostly lower than previously expected was particularly seen in Croatia's major foreign trading partners (Table 1). Although fiscal consolidation in peripheral euro area countries continued into 2014, persistently high levels of private and public debt again made them very vulnerable to a possible change in market sentiment and slower economic growth and low inflation (Table 3).

In the past period, the ECB took a number of measures aimed at improving financial conditions to boost economic growth and inflation expectations in the euro area. The repo rate was cut by 10 b.p. to 0.05%, and the deposit facility interest rate was also cut by 10 b.p. and stood at –0.20%. In addition, in

Table 1 Economic growth, exports and industrial production in selected developed and emerging market countries

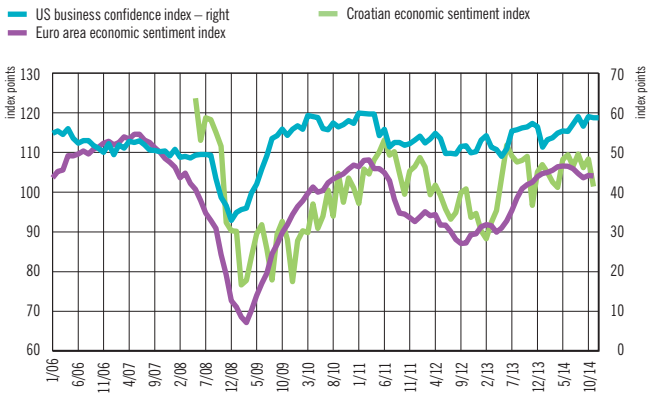
	Annual GDP growth rate			Quarterly GDP growth rate, $\Delta Q_t/Q_{t-1}$		Annual rate of change in exports		Annual rate of change in industrial production (seasonally adjusted)	
	2013	2014[a]	2015[b]	Q2/2014	Q3/2014	Q2/2014	Q3/2014	Q2/2014	Q3/2014
USA	2.2	2.2	3.1	0.8	0.9	3.5	4.0	4.2	4.6
EU	0	1.3	1.5	0.4	0.4	0.5	3.1	0.0	–0.3
Germany	0.1	1.3	1.1	0.3	0.4	1.5	5.4	–0.6	–0.3
Italy	–1.9	–0.4	0.6	0.3	0.3	0.7	2.2	–0.6	–1.1
Slovenia	–1	2.4	1.7	–0.1	0.1	3.9	7.6	1.6	1.0
Slovak R.	1.4	2.4	2.5	0.7	0.8	–0.5	–2.0	1.1	0.8
Czech R.	–0.7	2.5	2.7	0.3	0.5	6.7	5.7	0.5	–0.3
Poland	1.7	3.0	2.8	1.1	1.1	6.8	3.9	–0.3	0.4
Hungary	1.5	3.2	2.5	0.4	0.4	6.5	4.5	3.2	–0.7
Estonia	1.6	1.9	2.0	0.8	1.0	–3.1	3.4	3.4	1.2
Latvia	4.2	2.6	2.9	1.0	1.1	3.5	2.6	2.6	1.0
Lithuania	3.3	2.7	3.1	0.8	0.9	1.2	2.5	4.1	–1.6
Bulgaria	1.1	1.2	0.6	0.4	0.3	–0.7		–1.9	–1.3
Romania	3.5	2.0	2.4	0.3	–0.3	0.3	–5.8	1.0	–1.2
Croatia[c]	–0.9	–0.5	0.2	–0.2	0.0	13.6	3.1	–0.4	0.4

[a] Estimate. [b] Forecast. [c] The seasonal adjustment methodology of Croatia's GDP has been presented in the manuscript titled Description of the X-12 seasonal adjustment methodology that is available at request.
Sources: Eurostat, CBS, Bloomberg, OECD and CNB (for Croatia).

mid-October 2014, the ECB launched an asset-backed securities purchase programme, accepting as collateral receivables from non-financial corporations within the euro area. Concurrently with this programme, the ECB and other central banks of the euro area Member States have been purchasing since end-2014, in the framework of the covered bond purchase programme, bonds collateralised by euro-denominated assets issued by financial institutions. The aim of the ECB is to increase the balance sheet by approximately EUR 1.0bn and the scheduled duration of both programmes is a minimum of two years.

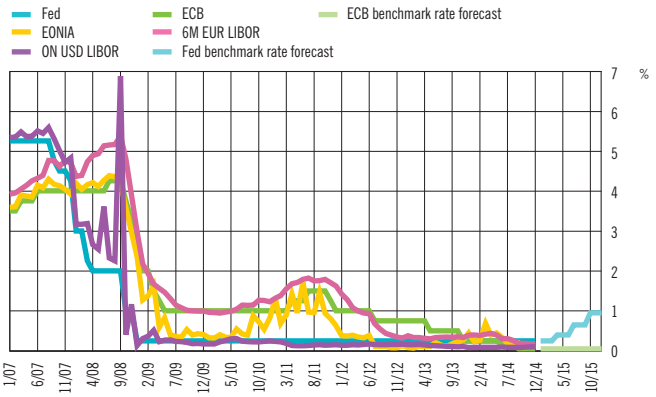
The new programmes, combined with targeted longer-term refinancing operations (TLTRO), are expected to improve the functioning of monetary policy transmission mechanisms,

Figure 2 Economic sentiment and business confidence indicies



Sources: Bloomberg and CNB.

Figure 3 Key interest rates of the main central banks and leading market interest rates



Sources: Fed, ECB and Bloomberg.

Table 2 Fiscal balance and current account balance in selected developed and emerging market countries

	Fiscal balance, as % of GDP			Current account balance, as % of GDP		
	2013	2014[a]	2015[b]	2013	2014[a]	2015[b]
USA	–5.6	–4.9	–4.3	–2.5	–2.6	–2.7
EU	–3.2	–3.0	–2.7	1.4	1.4	1.5
Germany	0.1	0.2	0.0	6.9	7.1	7.1
Italy	–2.8	–3.0	–2.7	1.0	1.5	1.5
Portugal	–4.9	–4.9	–3.0	–0.3	–0.2	0.1
Ireland	–5.7	–3.7	–2.9	3.8	5.5	5.5
Greece	–12.2	–1.6	–0.1	–2.7	–2.8	–2.5
Spain	–6.8	–5.6	–4.6	1.5	0.5	0.7
Slovenia	–14.6	–4.4	–2.9	4.8	6.2	6.1
Slovak R.	–2.6	–3.0	–2.6	0.8	0.5	0.2
Czech R.	–1.3	–1.4	–2.1	–2.2	–1.3	–0.9
Poland	–4.0	–3.4	–2.9	–1.4	–2.0	–2.4
Hungary	–2.4	–2.9	–2.8	4.2	4.3	4.3
Estonia	–0.5	–0.4	–0.6	–0.9	–2.8	–3.1
Latvia	–0.9	–1.1	–1.2	–2.2	–2.2	–2.3
Lithuania	–2.6	–1.2	–1.4	1.6	0.8	–0.4
Bulgaria	–1.2	–3.6	–3.7	2.2	2.1	2.3
Romania	–2.2	–2.1	–2.8	–1.4	–1.2	–1.4
Croatia	–5.2	–5.9	–5.7	0.9	0.8	0.8

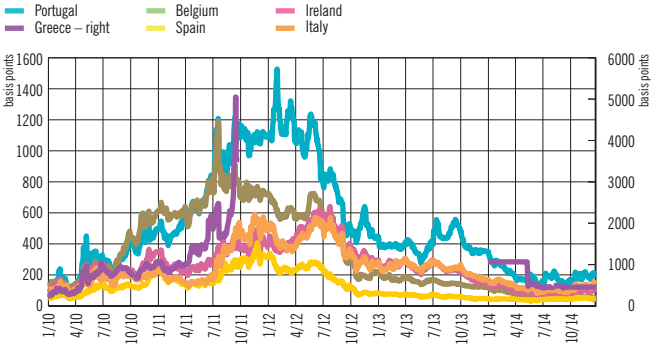
[a] Estimate. [b] Forecast.
Sources: European Commission, *European Economic Forecast*, fall 2014 and CNB (for Croatia).

facilitate the access of the real sector to loans and boost growth of long-term inflation expectations and inflation to the target level of slightly below 2%. It should be noted that, should the level of inflation in the euro area remain at an extremely low level for a protracted period of time, the ECB will be ready to take additional extraordinary monetary policy measures.

The financing conditions in the euro area were also influenced by a detailed analysis of EU banks conducted by the ECB in cooperation with EBA, ESRB and national supervisors in the process of setting up a banking union and taking over the supervisory role in relation to credit institutions. The markets responded relatively positively to the results of stress testing and the bank asset quality review process, which stabilised the confidence in the banking system and reduced the risks associated with banks' financing and risk premiums for their bonds (Figure 5).

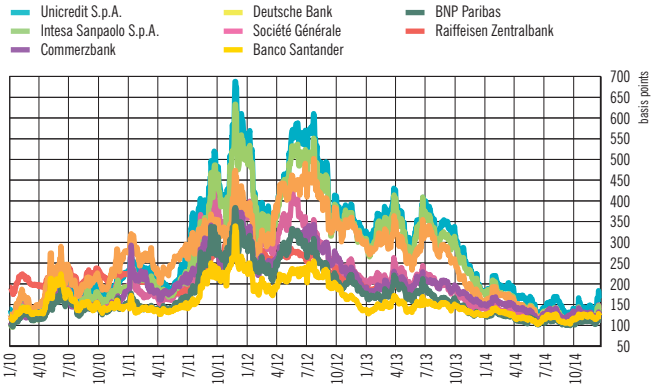
This created the preconditions for stronger bank support to economic recovery through credit activity and for a reduction in market disintegration, i.e. conditions for more balanced financing conditions in the euro area. The interest rates in the euro area stand at extremely low levels, and risk premiums for

Figure 4 CDS[a] spreads for 5-year bonds of selected euro area countries



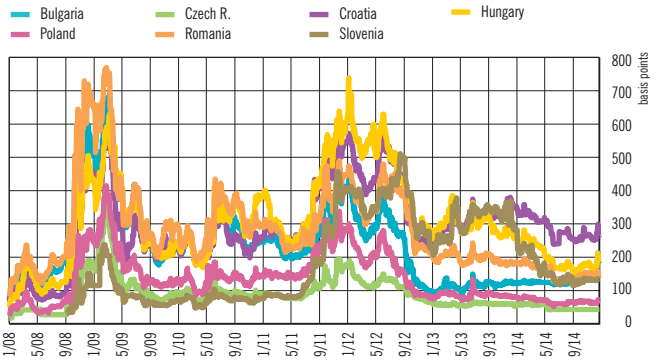
[a] Credit default swaps (CDS) spread is an annual premium that a CDS buyer pays for protection against credit risk associated with an issuer of an instrument.
Source: Bloomberg.

Figure 5 CDS spreads for 5-year bonds of selected banks



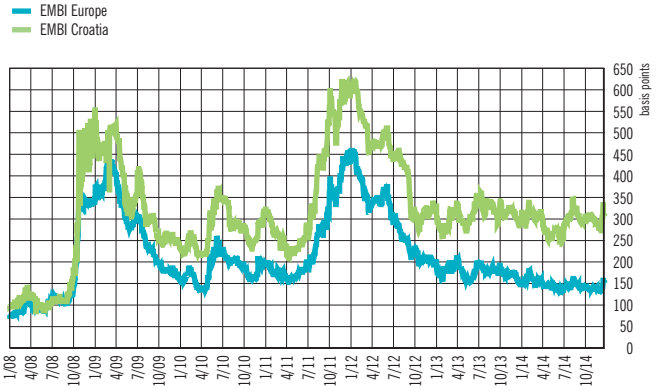
Source: Bloomberg.

Figure 6 CDS spreads for 5-year bonds of selected emerging market countries



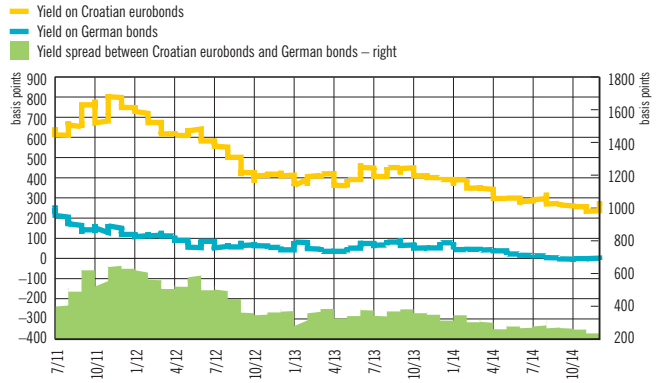
Source: Bloomberg.

Figure 7 EMBI spreads



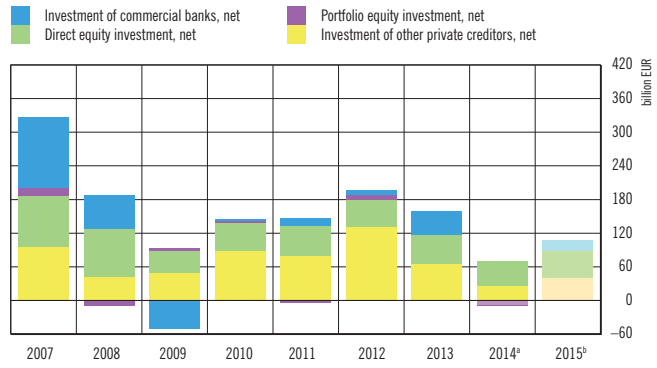
Source: J. P. Morgan.

Figure 8 Yields on Croatian and benchmark German bonds maturing in 2018 and their spread



Source: Bloomberg.

Figure 9 Capital inflows to European emerging market countries



[a] Estimate. [b] Forecast.
Source: International Institute of Finance, *Capital Flows to Emerging Market Economies*, October 2014.

Table 3 Public and external debt in selected European emerging market countries

as % of GDP

	Public debt			External debt		
	2013	2014[a]	2015[b]	2012	2013	6/2014
Italy	127.9	132.2	133.8	121.9	122.4	123.9
Portugal	128.0	127.7	125.1	232.3	234.4	....
Ireland	123.3	110.5	109.4	1004.9	938.1	....
Greece	174.9	175.5	168.8	226.6	229.6	229.2
Spain	92.1	98.1	101.2	168.2	157.2	161.9
Slovenia	70.4	82.2	82.9	147.1	114.2	....
Slovak R.	54.6	54.1	54.9	57.5	83.0	....
Czech R.	45.7	44.4	44.7	50.9	66.2	69.6
Poland	55.7	49.1	50.2	72.8	71.2	71.0
Hungary	77.3	76.9	76.4	159.3	148.7	147.2
Estonia	10.1	9.9	9.6	95.6	94.4	98.8
Latvia	38.2	40.3	36.3	135.9	130.8	....
Lithuania	39.0	41.3	41.6	75.8	70.5	69.6
Bulgaria	18.3	25.3	26.8	96.2	95.4	93.7
Romania	37.9	39.4	40.4	76.7	69.1	65.7
Croatia	75.7	80.5	83.3	102.1	105.3	105.5

[a] Estimate. [b] Forecast.
Sources: European Commission, *European Economic Forecast*, fall 2014, World Bank, *Quarterly External Debt Statistics* and CNB (for Croatia).

most European countries and banks are also low (Figures 3, 4, 5, 6, 7 and 8). However, despite fewer restrictions on the loan supply side and favourable financing conditions, the high level of private sector debt and the risks associated with poor macroeconomic developments in some EU countries continue to encourage household and corporate deleveraging. Such circumstances have an unfavourable effect on the asset quality and profitability of banks.

Stable developments in the international financial markets were also the result of a diminished uncertainty regarding Fed moves, which cancelled the bond buyback programme in October 2014 and in 2015 is expected to start with gradual monetary policy tightening and benchmark interest rate raising, developments already built into market expectations (Figure 2).

Under such circumstances, no significant changes in investor risk appetite can be expected over the short-term in the future while capital inflows in emerging market economies, including those in Europe, are expected to rise slightly in 2015 from the previous year (Figure 9). At the same time, a prolonged period of extremely lenient conditions in the financial markets increased the danger of excessive risk taking, as reflected in rising prices of financial assets and concurrent decline in risk premiums. Increased risks are also caused by uncertainty regarding market response to the expected divergence of monetary policies of the Fed and the ECB and other leading central banks such

as those of Japan and China in 2015, which will also be largely affected by falling oil prices. In addition, stable conditions in the financial markets are again threatened by risks associated with the geopolitical situation in the Middle East, Ukraine and Russia, in which increased instability in the financial market was witnessed towards the end of the year. Very important for maintaining financial stability on EU level are the pending elections in Greece, as confirmed by the temporary turbulence in the European sovereign debt market reported towards the end of 2014.

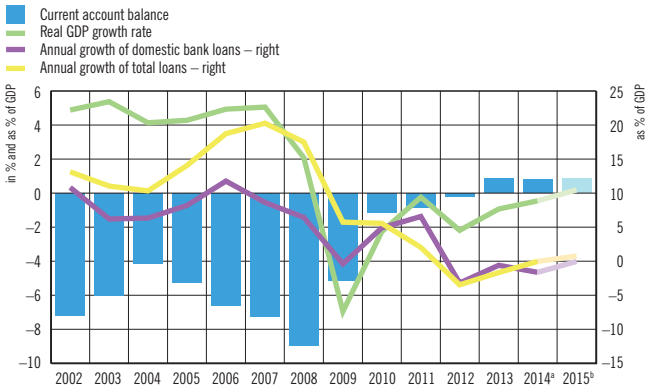
Under circumstances characterised by relatively favourable developments in the international financial markets, the risks to the financial stability of Croatia are diminishing. Despite the high level of external debt which stood at 105% of GDP towards the end of 2014, the lower level of this debt that falls due for payment in 2015 than in the previous year and the expected current account surplus improved domestic indicators of external vulnerability (Figures 10, 15 and 16). The analysis of the external debt structure shows that a substantial part of the debt can be attributed to parent banks of domestic banks and affiliated enterprises, which additionally reduces the risks associated with its refinancing (Figures 14 and 17). Such developments, together with favourable financial conditions in the international market lessen the possible risks associated with the refinancing of maturing liabilities of the domestic sectors in 2015 (Figures 13, 14 and 15). Finally, the model estimate shows that international reserves range around the optimum level. Coupled with the conditions of relatively favourable conditions in the international capital market, all this reduces the risk of domestic currency exchange rate destabilisation and thus the risk of destabilisation of the total financial system.

Major risks to financial stability in Croatia in 2015 are associated with a high level of public debt and its further growth due to real stagnation, i.e. a very low nominal GDP growth (Tables 1, 2 and 3). Domestic economic activity will fall by approximately 0.5% in real terms in 2014 and in 2015 increase by a small 0.2%, at an annual inflation of 0.2%, while by end-2015 public debt might exceed 83% of GDP. The result of such developments is a relatively high level of risk premium for Croatia relative to the peer countries (Figures 6 and 7), which increases the cost of the sources financing not only for the government but for other domestic sectors too.

Private sector deleveraging continues, and the expectation of slow economic recovery and further growth in unemployment additionally discourage investment and consumption and consequently the demand for loans (Figure 10). As a result, the expectations for the next year include slow credit activity and further deleveraging of credit institutions abroad (Figure 13).

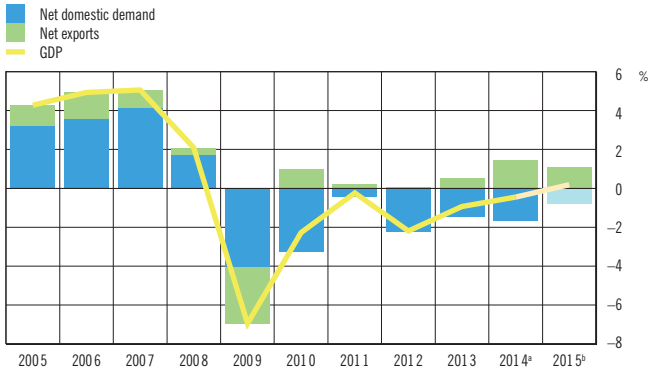
In addition to internal restrictions, recovery dynamics also depends on developments in the euro area where negative risks have increased due to persistently slow and uneven economic activity in EU member states, deflationary pressures and possible worsening of trade relations between Russia and EU member states, which could have an unfavourable effect on foreign demand for Croatian products and services.

Figure 10 Foreign capital inflows and GDP growth in Croatia



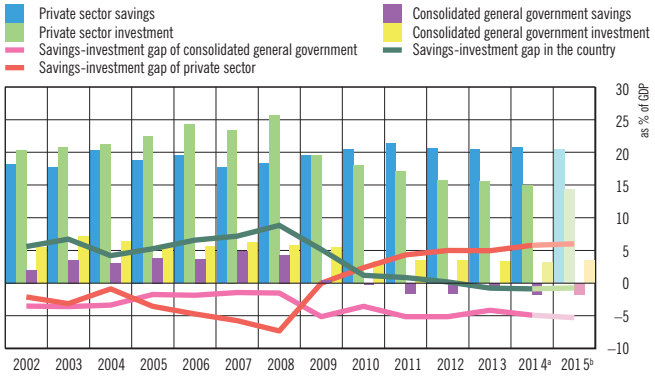
a Estimate. b Forecast.
Sources: CBS and CNB.

Figure 11 GDP growth pattern (contribution to growth)



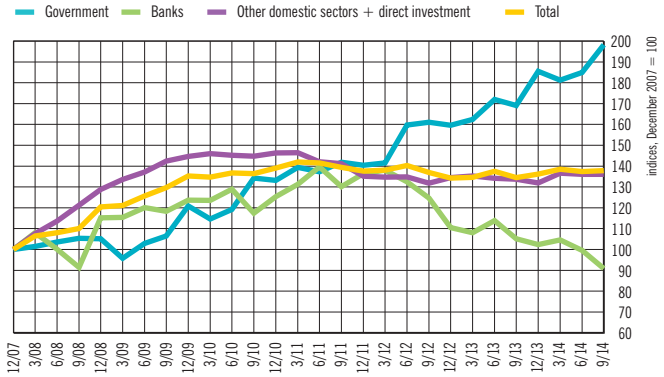
a Estimate. b Forecast.
Source: CBS.

Figure 12 Savings and investment – total and by sector



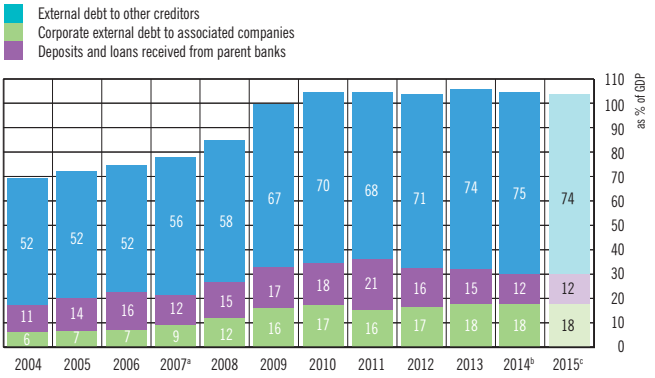
a Estimate. b Forecast.
Sources: MoF and CNB (estimate).

Figure 13 External debt by domestic institutional sector



Source: CNB.

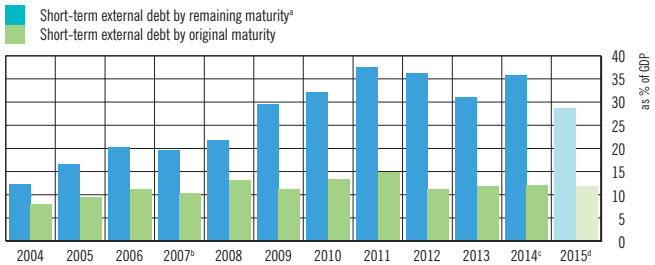
Figure 14 Total external debt by creditor



[a] Since end-2007, external debt has been calculated according to the new methodology. [b] Estimate. [c] Forecast.

Source: CNB.

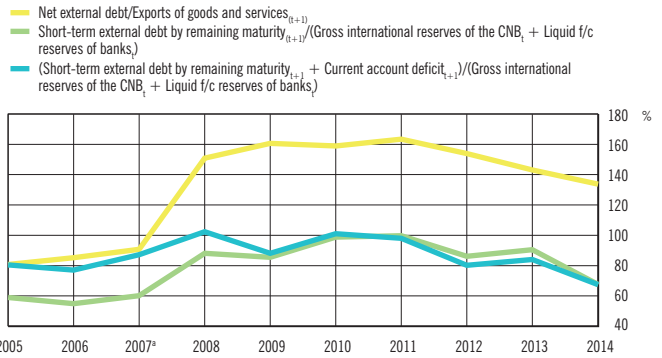
Figure 15 Short-term external debt



[a] Short-term external debt by remaining maturity is the amount of debt maturing in the reference year, representing thesum of the balance of short-term debt at the end of the previous year and long-term debt maturing in the reference year. [b] Since end-2007, external debt has been calculated according to the new methodology. [c] Estimate. [d] Forecast.
Note: From 2008 on, short-term debt by remaining maturity includes round-tripping transactions which represent an accounting item that has a neutral effect. This item excluded, debt maturing in 2011 decreases by about 2 percentage points of GDP. For more details on round tripping, see CNB Bulletin, No. 154, Box 4 Round tripping and its impact on Croatian statistical data.

Source: CNB.

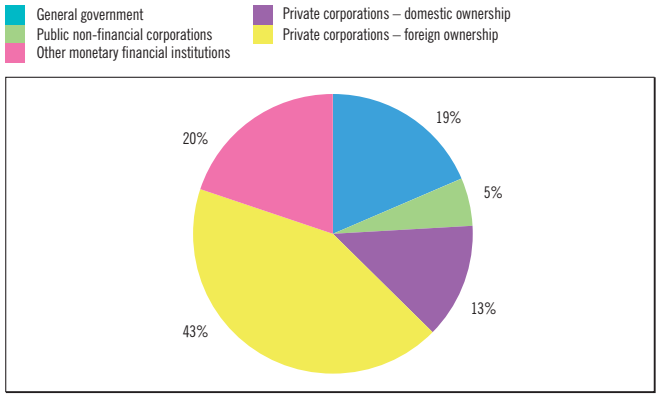
Figure 16 Selected indicators of external vulnerability



[a] Since end-2007, external debt has been calculated according to the new methodology.
Note: Net external debt is calculated as a difference between gross external debt and gross international reserves and bank foreign assets.

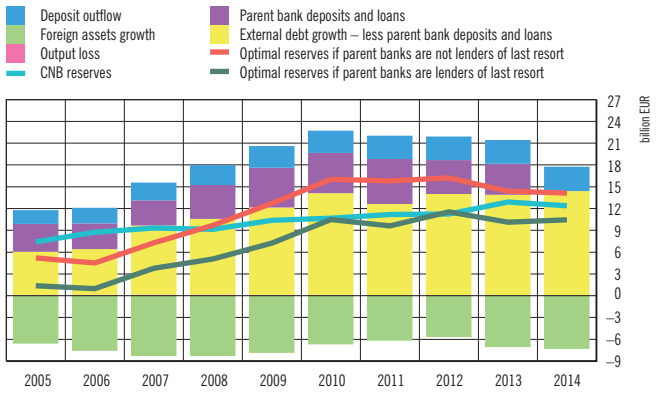
Source: CNB.

Figure 17 Projection of external debt principal payments in 2015 by sectors



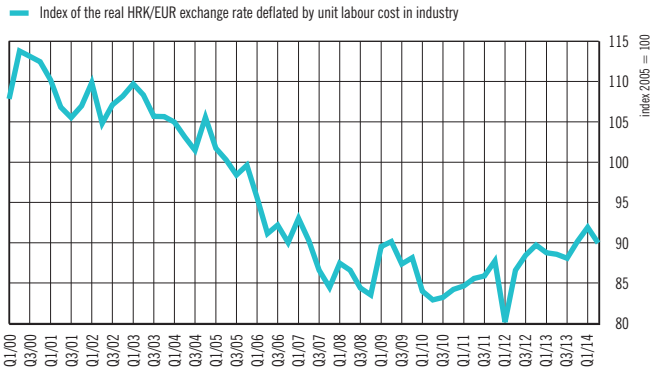
Source: CNB.

Figure 18 Optimal international reserves – contribution of individual components



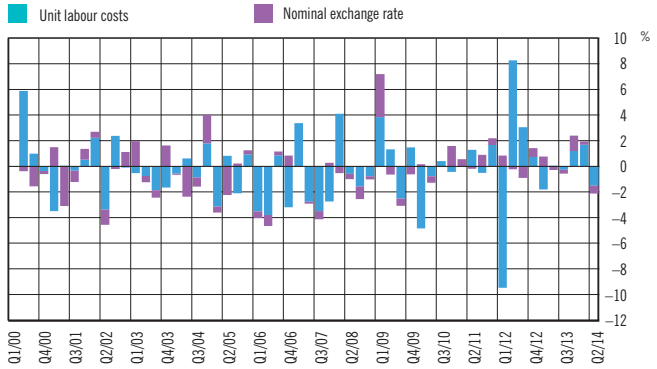
Source: CNB.

Figure 19 Real kuna/euro exchange rate



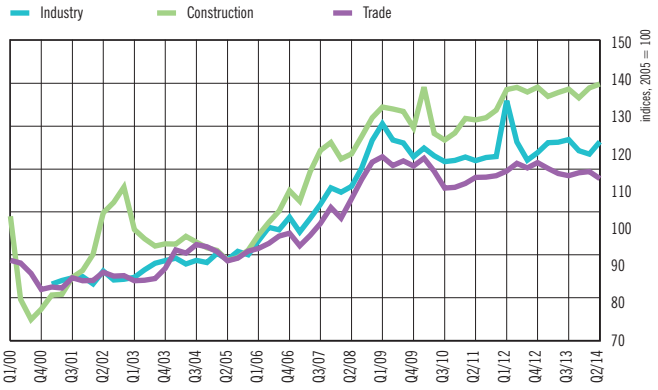
Note: A fall in the index indicates a real appreciation of the kuna against the euro.
Sources: CBS, CNB and CNB calculations.

Figure 20 Decomposition of real kuna/euro exchange rate – quarterly change



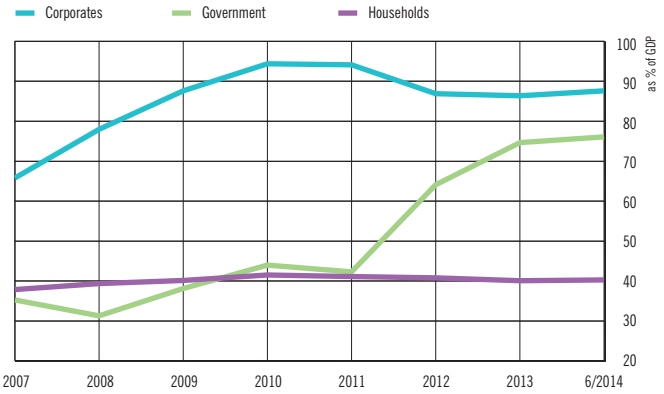
Sources: CBS, CNB and CNB calculations.

Figure 21 Unit labour cost



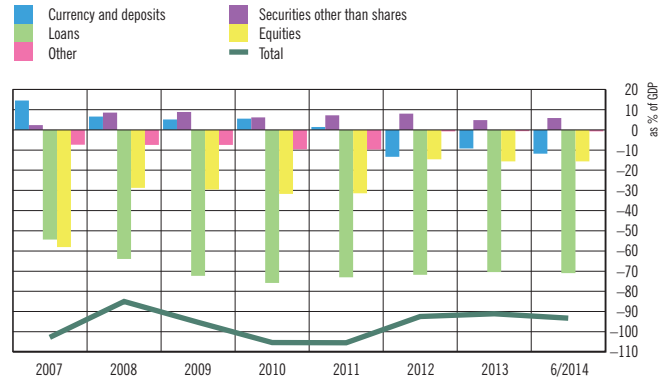
Sources: CBS and CNB calculations.

Figure 22 Total debt by sector



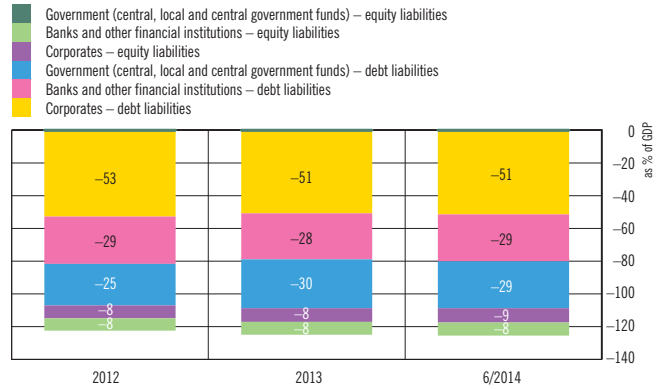
Source: CNB – financial accounts.

Figure 23 Net position of domestic sectors with respect to the rest of the world by instrument



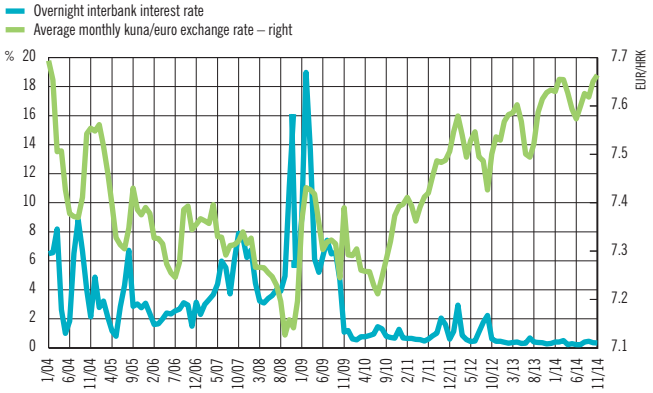
Source: CNB – financial accounts.

Figure 24 Net financial position of selected domestic sectors with respect to the rest of the world by equity and debt instrument



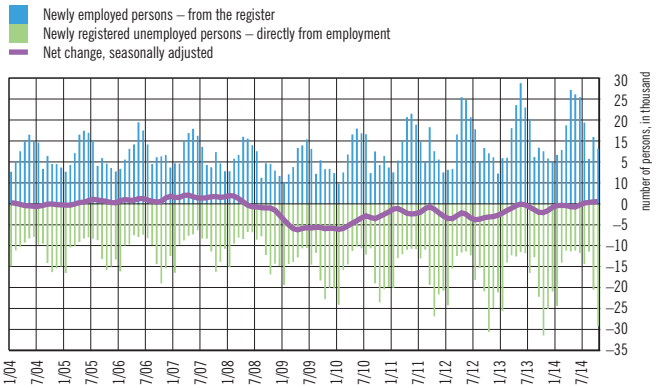
Source: CNB – financial accounts.

Figure 25 Kuna/euro exchange rate and overnight interest rates



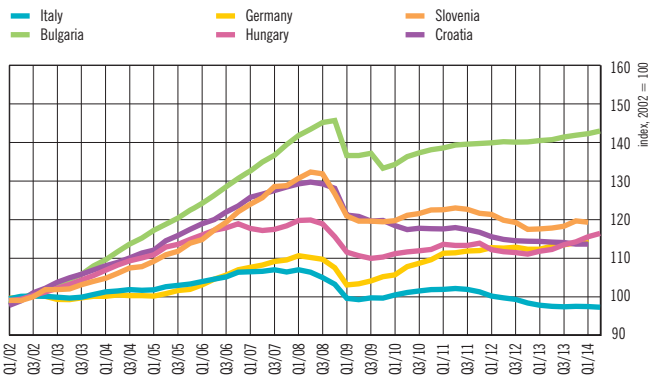
Source: CNB.

Figure 26 Changes in employment registered with the Croatian Employment Service (CES)



Sources: CES and CNB calculations.

Figure 27 Gross domestic product, seasonally adjusted data in constant prices



Sources: Eurostat, CBS and CNB.

Box 1 Determinants of credit supply and demand of households and corporates

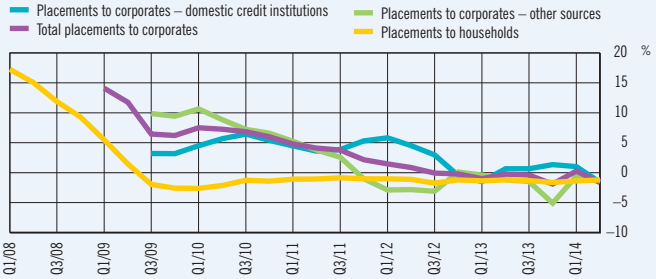
Bank loans are the main source of private sector financing in Croatia. In the wake of the escalation of the global financial crisis, credit activity slowed down considerably compared to the pre-crisis period. As a result, household loans have recorded negative annual rates of change since mid-2009 and corporate loans slowed down sharply (Figure 1). Despite the fact that the existing literature does not provide unequivocal proof of the nature of the effect of credit activity on economic growth and pace of recovery, the identification of determinants of credit supply and demand is important for understanding the capacity and scope of monetary policy to influence loan dynamics. The fact that credit activity slowed down in Croatia despite the expansive monetary policy of the central bank and high banking system liquidity raises the question as to whether the reasons for such developments lie on the supply side, because, for instance, the banks are less inclined to offer loans and to more stringent lending standards, or on the demand side, as a result of negative current real developments and pessimistic expectations regarding future economic growth. The main purpose of this research is thus to identify the determinants of credit supply and demand of households and corporates, using a switching regression framework.

The household and corporate loan market disequilibrium models were rated using the maximum likelihood method.[1] Using a system of simultaneous equations, the main determinants of real credit supply and demand of corporates and households were established and the periods of surplus supply and demand for each of these two sectors were identified. The dependent variable both in the function of loan supply and loan demand are bank loans to the corporate and household sectors. Surplus supply and demand were calculated as the difference between the estimated demand for loans and loan supply, with the loans actually utilised equalling at each given moment the lower of the values between supply and demand. Data used in the analysis are quarterly data for the period from the first quarter of 2000 to the second quarter of 2014.

The estimated model for corporates shows that faster economic activity results in higher demand for corporate loans, while faster than potential GDP growth acts in the opposite direction due to an increase in own sources of financing (Table 1). Higher corporate profitability, coupled with increased business confidence, is associated with heightened investment activity, while an increase in lending interest rate reduces demand for loans. An increase in the EMBI yield spread for Croatia boosts demand since it makes the substitution of domestic loans by foreign borrowing more difficult. Not surprisingly, credit supply was positively influenced by heightened economic activity, increased loan potential and greater profitability of deposit and lending operations. A larger amount of partly and fully irrecoverable placements increases loan supply, which can be explained by increased efforts of banks to dilute the share of bad placements in total placements by inflows of new, recoverable loans. At the same time, the increase in charges for value adjustments reduces earnings and bank capital, thus restricting their ability to supply loans. Higher country risk premium reduces loan supply, in the same way as higher risk premium of parent banks raises the price of capital and affects its allocation within the group.

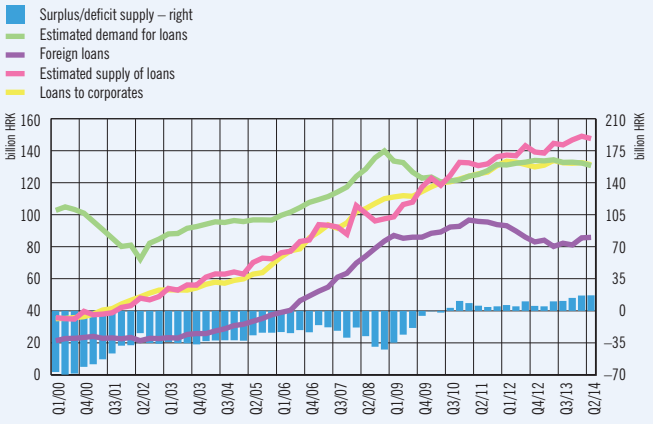
The pre-crisis period was characterised by surplus demand for corporate loans relative to the supply of such loans (Figure 2), which can be ascribed not only to a relatively poor availability of such loans and fast economic growth, but also to central bank measures aimed at slowing down credit activity with the aim of containing external imbalances and overheating of the domestic economy. The supply of loans was primarily determined by a high level of capital inflows into the banking sector, strong economic activity and reduced credit risk as reflected in the fall in the share of non-performing household and corporate loans and lower expenses on provisions for non-performing placements to corporates. A

Figure 1 Adjusted annual rates of change in loans to households and corporates



Note: The corrected changes have been calculated on the basis of data that exclude the effects of the following factors: the transactions of one bank that, in an effort to reduce partly recoverable and irrecoverable placements, transferred a portion of its claims to a company in the direct ownership of the parent bank; the bankruptcy of Centar banka; the methodological changes in accounting for fees and the effect of exchange rate changes. Other sources include corporate borrowing from domestic leasing companies and direct borrowing from the CBRD, foreign banks and affiliated enterprises.
Sources: HANFA, CNB and CNB calculations.

Figure 2 Estimated supply and demand for corporate loans



Source: CNB calculations.

1 This analysis builds on the research entitled Credit market disequilibrium, presented in Box 2 of *Financial Stability*, No. 5, July 2010. For details surrounding the analytical framework used in this research, see Čeh, A., M. Dumičić, and I. Krznar (2011): *A Credit Market Disequilibrium Model and Periods of Credit Crunch*, Croatian National Bank, Working Paper, W-28, January 2011.

Table 1 Results of the disequilibrium model on the market of corporate loans

Demand	
Independent variable	
Constant	3.58**
Lending interest rate	–0.03*
GDP	1.29***
GDP gap	–0.41*
Profitability of corporate assets	0.76***
EMBI spread	0.04*
Business confidence	0.35***
Standard deviation	0.10
Supply	
Independent variable	
Constant	–3.63
Lending and deposit interest rate spread	0.01*
GDP	2.35***
Credit potential	0.21**
Non-performing corporate loans	0.47***
Value adjustment charges for non-performing corporate loans	–0.19***
EMBI spread for RC	–0.01**
Parent bank CDS	–0.10***
Standard deviation	0.04

Note: * significant at 1%, ** significant at 5%,*** significant at 10%. Loans granted, GDP and credit potential were deflated by the consumer price index and observed in logs. GDP was seasonally adjusted and GDP gap is the difference between the original GDP series and its trend obtained by means of the Hodrick-Prescott filter. The business confidence index covering the entire observed period was obtained by constructing a new series comprised of the business confidence index of *Privredni vjesnik* and business expectation index. During most of the observed period, the credit potential of banks was primarily determined by capital inflows into the banking sector; however, after the Austrian regulators introduced new rules in March 2012 imposing on the banks in Austrian ownership the obligation to keep a certain ratio of loans to stable local sources of financing, domestic sources of financing grew in importance. The credit potential was therefore approximated by increasing foreign liabilities by savings and time deposits.
Source: CNB calculations.

Table 2 Results of the disequilibrium model on the market of household loans

Demand	
Independent variable	
Constant	–7.92**
Lending interest rate	–0.07***
GDP	1.47***
Consumer confidence	0.01***
Gross wage bill	1.32***
HREPI	–0.03
Standard deviation	0.06
Supply	
Independent variable	
Constant	–4.00***
Lending and deposit interest rate spread	0.02***
GDP	2.97***
Credit potential	0.34***
Non-performing household loans	0.31**
Value adjustment charges for non-performing household loans	– 0.21**
HREPI	– 0.05
Mother banks CDS	–0.5**
Standard deviation	0.04

Note: * significant at 1%, ** significant at 5%, *** significant at 10%. Loans granted, GDP, wage bill and credit potential were deflated by the consumer price index and observed in logs. The GDP and the wage bill were seasonally adjusted.
Source: CNB calculations.

significant portion of surplus demand for loans on the domestic market during that period was met by direct borrowing of corporates abroad.

The escalation of the global financial crisis in the third quarter of 2008 was followed by a considerable increase in risk premiums and slowdown in capital inflows which affected the credit potential of banks and their readiness to grant loans and led to a decrease in corporate loan supply. The freezing of the international financial markets led to increased demand of corporates for domestic loans despite a small increase in interest rates. Loan supply stabilised quickly owing to monetary policy relaxation which ensured financial stability in the country and the inflow of parent banks' capital into the domestic banks. A tendency to balance out demand and supply emerged in the credit market in the remainder of 2009 and early 2010, largely due to the fall in demand for loans caused by low economic activity and partly to the increased availability of foreign loans.

The recent period was marked by surplus supply of corporate loans over demand, under the prevailing standards for granting loans, which resulted in a continuous process of deleveraging of domestic banks abroad and a drop in their credit potential. The results of the bank lending survey also show that lending terms mostly tightened from the third quarter of 2012, thus negatively affecting the demand for loans.[2] In view of the restrictions caused by the long-term recession and the high debt levels

2 The usual models used to assess the supply and demand for loans often include data obtained by regular surveys of bank lending terms. As a rule, such surveys are conducted by central banks and their results provide an important source of information on non-price related lending terms which may greatly affect the dynamics of credit activities. This includes internal rules and written and unwritten criteria which reflect an individual bank's credit policy. As the CNB started conducting bank lending surveys in October 2012, the time series available is not sufficiently long to provide data capable of being used in the model. Therefore, the results of the estimated models may be interpreted in combination with the data obtained from the existing surveys on lending terms of domestic banks for periods in which this is possible.

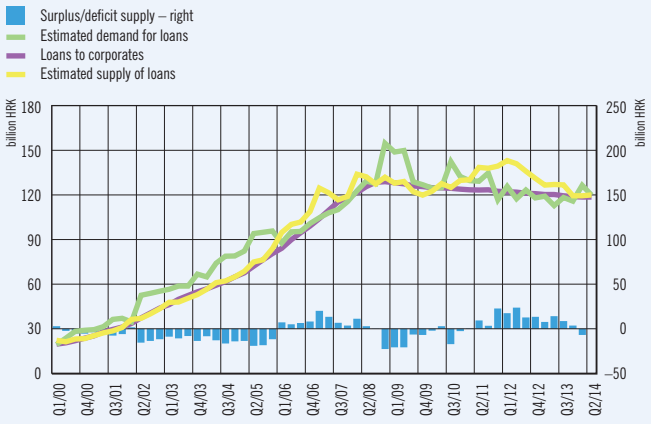
and poor capitalisation of corporates, corporate demand for domestic loans in the forthcoming period will mostly depend on their expectation of future demand, i.e. developments in economic activity. On account of risks addressed in other parts of this publication and continued expansive monetary policy, the expectations for 2015 are that there will be a surplus of corporate loan supply in relation to demand.

As regards the model for identifying the determinants of supply and demand on the household loan market, statistically significant on the demand side were the interest rate on household loans, personal consumption, consumer confidence index, real estate prices and the real net wage bill, while the function of loan supply is best determined by the credit potential of banks, the difference between lending and deposit rates, real GDP, credit risk indicators of banks, real estate prices and risk premiums for parent banks of domestic banks. As the mechanism of the effect of some variables on demand, i.e. supply of loans, is similar to that applicable to corporates[3], the effect of variables characteristic for households is described below.

The growth in the wage bill which depends not only on wages but also on the number of employees is, not surprisingly, pushing the demand for loans upwards. While an increase in real estate prices on the one hand decreases the demand for home loans, it may on the other hand also increase household borrowing capacity and the inclination of banks to grant loans due to higher collateral value. However, in both cases this coefficient is negative and did not prove significant.

A major part of the pre-crisis period was marked by surplus household demand for loans in relation to the supply (Figure 3). This demand was mainly driven by heightening economic activity, low starting level of debt of this sector, positive developments in the labour market and increased consumer confidence and gradual reduction in interest rates on household loans from the relatively high levels that marked the early 2000s. The reason for lower credit supply compared to demand should also be sought in CNB measures restricting credit activities of banks, with households, unlike corporates, having had no access to foreign sources of financing. The period of surplus supply lasted from early 2006 to mid-2007 when the CNB, in an effort to slow down growth in loan placements based on external debt growth, introduced the maximum permitted non-penalising loan placement rate of 12%. The beginning of the crisis in the third quarter of 2008 was followed by a brief period of increased household demand for loans that exceeded the supply, which had begun to fade, but the trend reversed and since

Figure 3 Estimated supply and demand for household loans



Source: CNB calculations.

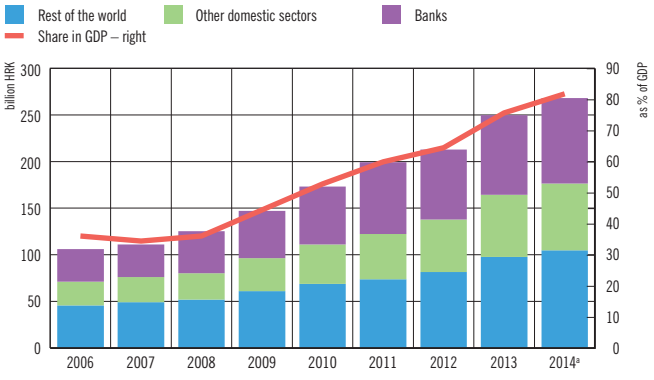
early 2011 the supply of loans has generally exceeded the demand. The demand for loans was also negatively influenced by raised awareness of households regarding currency risk, associated with the negative experiences of loans in Swiss francs. This is in line with the available results of the bank lending survey, which point to diminishing demand during that period and persistent tightening of standards for granting household loans. On account of the expected economic stagnation and further negative developments in the labour market, household demand for loans is not expected to increase so the year 2015 will probably witness a small surplus of household loans.

The main determinants of corporate and household demand for loans are linked to the domestic macroeconomic environment, i.e. the absence of economic activity, negative developments in the labour market and unfavourable consumer and business expectations due to the absence of reforms that would create the preconditions for boosting economic activity. Eased uncertainty, i.e. reversal of negative economic developments, might have a positive effect on the inclination of credit institutions to offer loans, which could, in addition to the already low interest rates, result in favourable non-price related financing conditions. Until such changes take place, despite the stability and high liquidity of the domestic banking sector supported by an expansive monetary policy, the conclusion may be drawn that the scope for monetary policy to encourage credit growth is limited.

3 On the demand side they include the lending interest rate, GDP, consumer confidence and on the supply side they include the interest rate spread, GDP, credit potential, non-performing household placements and expenses on provisions for non-performing placements as well as parent banks CDS yield spreads.

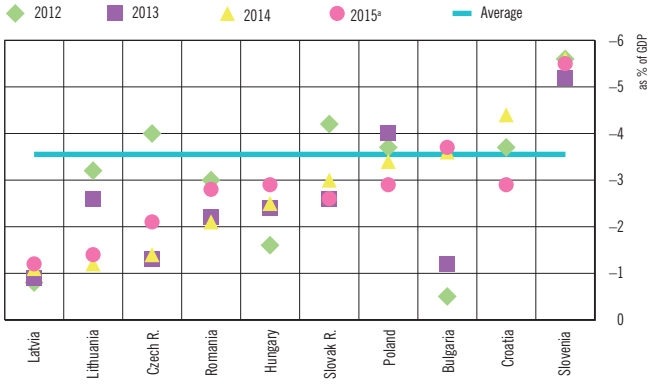
Government sector

Figure 28 General government debt



a EC projections.
Sources: EC, MoF and CNB.

Figure 29 General government deficit

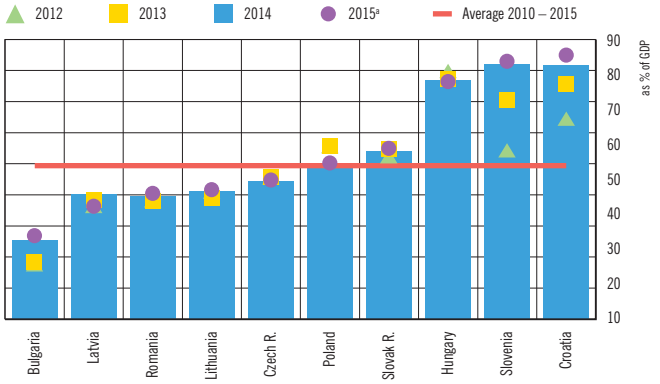


a EC projections.
Source: Eurostat.

Public debt grew more than expected in 2014, and is estimated to reach around 80% of GDP. The budget plan for 2015 did not bring fiscal consolidation; any possible fiscal consolidation might result from government measures, i.e. a detailed analysis of a part of budget expenditures, which should provide proposals for budgetary savings in order for the aims of the excessive deficit procedure to be realised. The level of debt and budget deficit in Croatia is the highest among comparable European economies; accompanied by a very weak economic recovery, such developments will continue into 2015. But high liquidity and a relatively low cost of borrowing on the domestic and international capital market should enable the realisation of the financing plan of the public sector without difficulties in 2015.

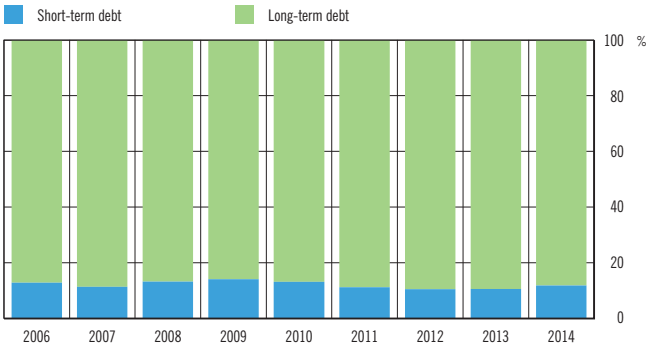
General government deficit is still one of the highest among comparable countries and it is estimated to stand around 5.6% of GDP in 2014 according to the European Commission's projections. Following a negligible decline in 2013, the general government budget deficit is expected to rise again in 2014, due to a faster growth in total expenditures (2.1%) than in income (0.7%) and a nominal fall in gross domestic product. Compared with similar countries, Croatia has had the highest deficit four years by now (Figure 29) and there are no changes in the level of deficit. The level of structural deficit in Croatia has been fixed at around 5% since 2010, due to severe structural problems both on the income and expenditure side of the budget, so its decrease requires structural reforms.

Figure 30 Public debt



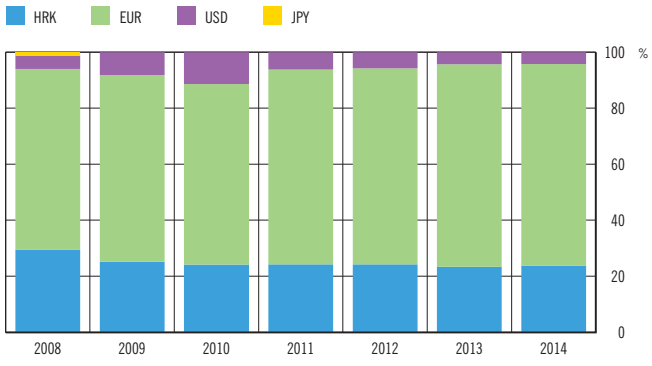
a EC projections.
Sources: EC, Eurostat and CNB.

Figure 31 Maturity breakdown of public debt



Source: CNB.

Figure 32 Currency breakdown of public debt



Source: CNB.

Table 4 Thresholds of the fiscal sustainability risk indicator in 2015a

Indicator	Direction to be safe	Threshold	Observation for Croatia	Change
r – gb (2015)	<	1,1%	4,7%	↓
General government public debt (as % of GDP) (2014)	<	42,8%	81,8%	↑
Cyclically adjusted primary balance (as % of potential GDP) (2014)	>	-0,5%	-0,2%	↓
Gross financing needs (as % of GDP) (2015)	<	20,6%	12,2%	↓
Share of short-term debt as a ratio of total debt (2014)	<	44,0%	11,8%	↑
Debt denominated in foreign currencies (2014)	<	40,3%	76,3%	↓
Weighted average maturity of public debt (years) (2014)	>	2,3	4,8	↓
Short-term external public debt (as % of international reserves) (2015)	<	61,8%	12,5%	↑

a Baldacci, E., I. Petrova, N. Belhocine, G. Dobrescu, and S. Mazraani: *Assessing Fiscal Stress*, IMF Working Paper, WP/11/100.
b Imputed interest rate on general government debt, deflated by the GDP deflator (5-year average), minus real GDP growth rate (5-year average).
Sources: IMF WP/11/100 and CNB.

However, there are no significant structural reforms on the expenditure side in the budget for 2015, so the structural budget deficit will still stand at around 5% of GDP.

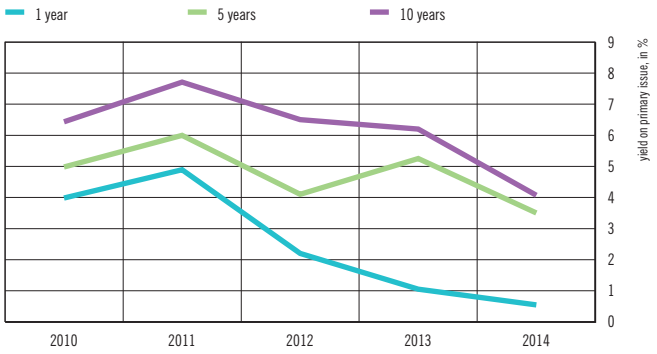
The exclusion of the CIHI from the State Treasury was also conducted, with the explanation that this will enable structural reforms in the health sector and a decrease in the deficit. However, the system still generates unpaid due liabilities and there is no guarantee that such a trend will not continue in the future.

Fiscal consolidation could stem from a detailed analysis of expenditures, which is in progress and which should propose budgetary savings, but it is unlikely that they will be implemented in the election year.

The planned general government deficit for 2015 is higher than 3% of GDP, which still puts Croatia among countries with the excessive deficit. European institutions expect that the effects of the implementation of measures will result in a decrease in the deficit to the level below 3% of GDP in 2016. It is thus assumed that the measures proposed by the Government in the second quarter of 2015 will affect the budget sufficiently for consolidation measures to be effectuated in 2016. Additional measures of budget consolidation in 2015 will clearly have a positive impact on the financial stability and the establishment of fiscal balance.

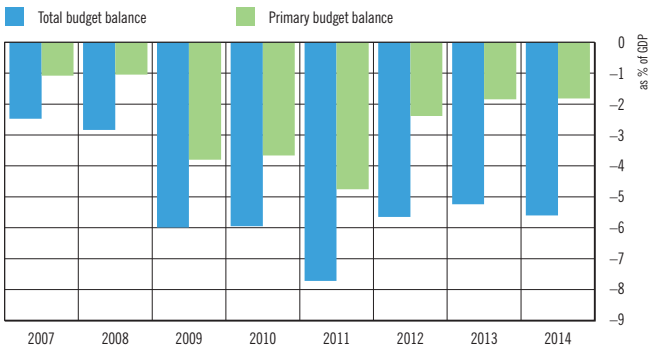
The fiscal sustainability risk is still significant due to a continued growth in public debt on the back of the absence of

Figure 33 Yield on primary issue of euro and euro-indexed securities



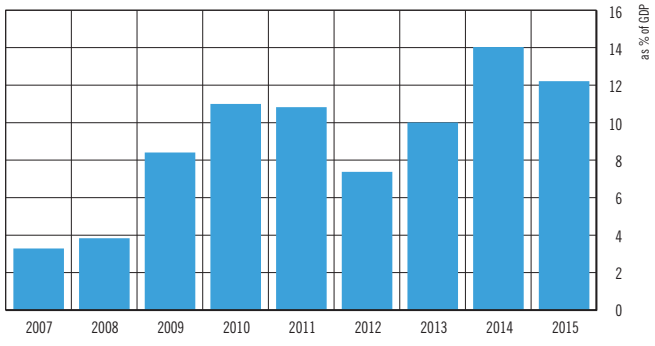
Source: Bloomberg.

Figure 34 General government deficit



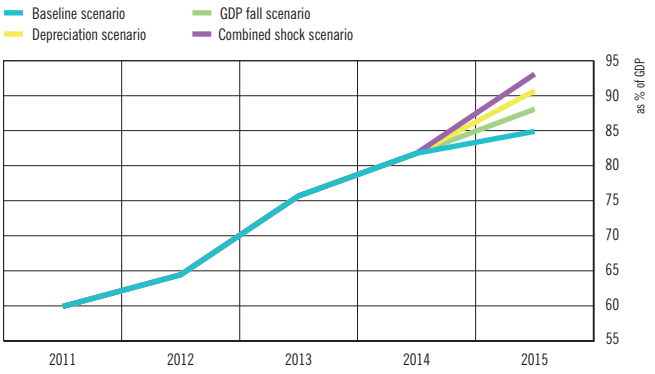
Sources: EC projections and CNB.

Figure 35 Financing needs



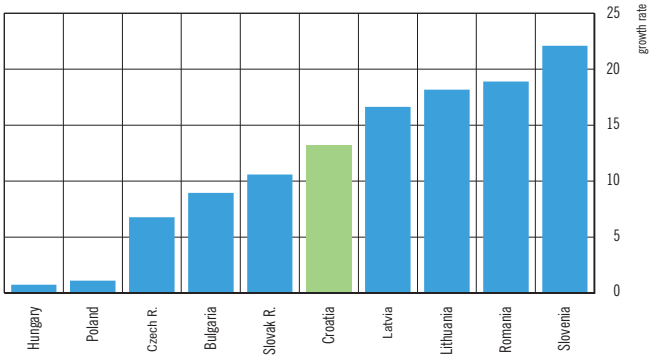
Sources: MoF and CNB.

Figure 36 Projection of public debt under various scenarios



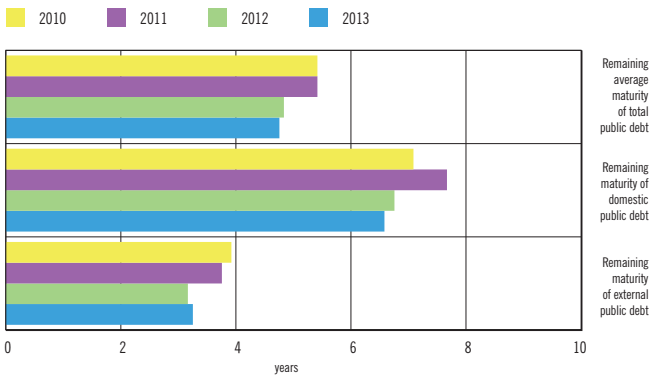
Source: CNB.

Figure 37 Public debt growth rate (2009 – 2015)



Sources: Eurostat and CNB.

Figure 38 Average remanining maturity of general government debt



Source: CNB.

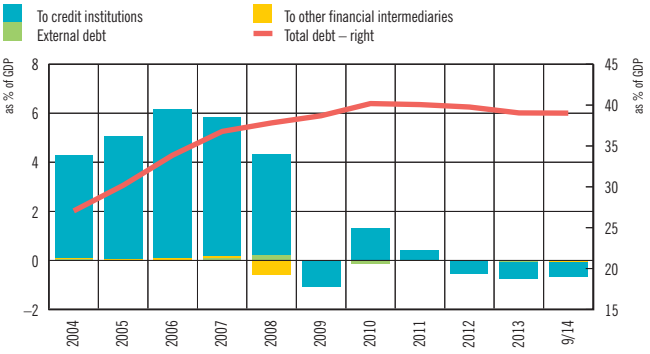
economic growth (Figure 28). According to the ESA 2010 statistical methodology, public debt rose above 80% of the share in GDP in 2014. The general government debt continues to grow at the same pace as in the previous years, due to the mentioned lack of any economic recovery and a slow progress in solving the structural deficit in the Croatian economy. The average annual growth in public debt in the crisis period stands at around 13%, which increases interest expenses and significantly hampers the implementation of fiscal consolidation. Concurrently, yields continue to decline and they have already been on historically low levels for two years; this was the result of the monetary easing measures in the EU, which enabled the decrease in yields on Croatian borrowings as well. The ECB policy aimed at stimulating growth and preventing deflation creates room for more favourable borrowing for EU countries. This also affects Croatia, which is recording the lowest yields on government debt in its history (Figure 33). The level of public debt will increase in 2015 as well, since the budget foresees the needs for financing of 12.2% of GDP, which is slightly less than in 2014.

The maturity structure of public debt and average public debt maturity in years are within the safe area, but there is no room for optimism due to the currency structure. The share of short-term debt in public debt stands at 11.8% and was on a slight upward trend in the last two years, due to historically low interest rates on T-bills, which are lower than 1% year-on-year. The debt currency structure is still unfavourable, due to the share of debt in domestic currency of 23.7%, so the exchange rate effect could lead to an increase in public debt of 7.7 percentage points in the event of a 10% depreciation of the kuna against the euro. In this sense, Croatia does not differ from other emerging market countries, which always have difficulties related to the rapid debt growth when the American dollar strengthens against the national currency. However, since dollar-denominated liabilities of the Republic of Croatia are largely protected from developments in the exchange rate of the dollar, i.e. converted into euro denominated liabilities, such risk for the RC is related to the euro. The currency structure of public debt is the most sensitive item of the effect of fiscal policy on financial stability, as is the case in other sectors of the Croatian economy. The share of domestic currency in the public debt has decreased by 5.6 percentage points since 2008. The average remaining maturity of total public debt of 4.8 years is a positive indicator, which has remained above the level of 4 years ever since 2008.

Under the combined shock-scenario, public debt could reach 93% of GDP. The aim of the shock scenario is to estimate the effect of an unlikely, but possible event on the debt level. In the event of a depreciation of around 10% and a fall in GDP of 2.1% in 2015, public debt could thus increase to 93% of GDP, under the dominant effect of the exchange rate changes, because 76.3% of public debt is denominated in a foreign currency.

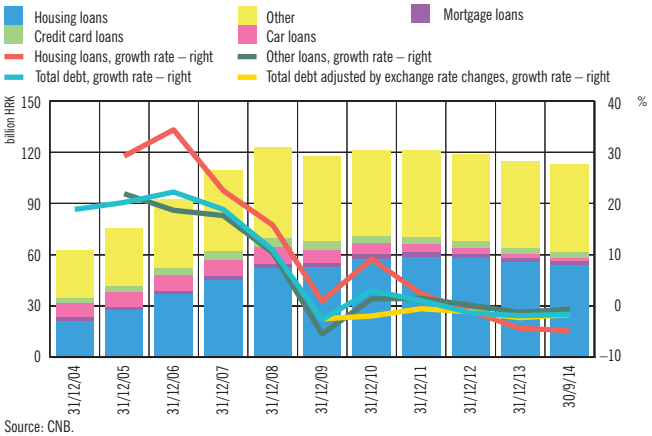
Household sector

Figure 39 Change in and stock of household debt



Note: Data on total household debt exclude debt to leasing companies in order to avoid a break in the data series caused by the change in the methodology for reporting the value of leasing contracts from 1 January 2011 onwards.
Sources: HANFA and CNB.

Figure 40 Household loans by purpose



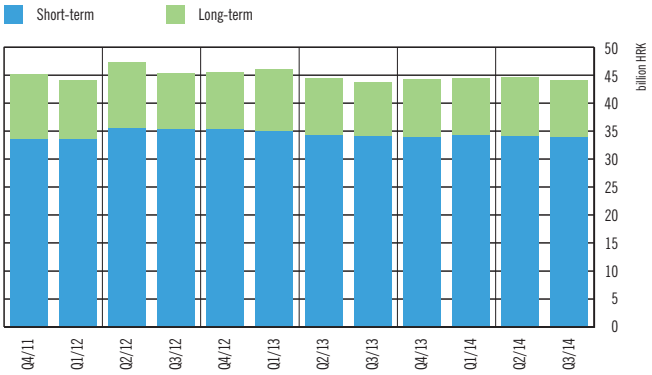
Source: CNB.

The deleveraging process in the household sector continued into 2014. Despite the reduced vulnerability of this sector and the expected halting of the contraction in economic activity, no stronger demand for new loans is likely in the following period either, due to high risks related to developments in the labour market, so the deleveraging process is expected to continue in the beginning of the following year.

The long-term deleveraging process in households continued into 2014. As a result, this sector's total debt remained below the level of 40% of GDP (Figure 39). Households slightly reduced their exposure to credit institutions in this period (by –0.6% of GDP at the end of September), while external debt and debt to other financial intermediaries, which accounts for less than 2% of this sector's total financing, remained almost unchanged. By the end of September, the debt was reduced by a total of 1.7% on the annual level (Figure 40).

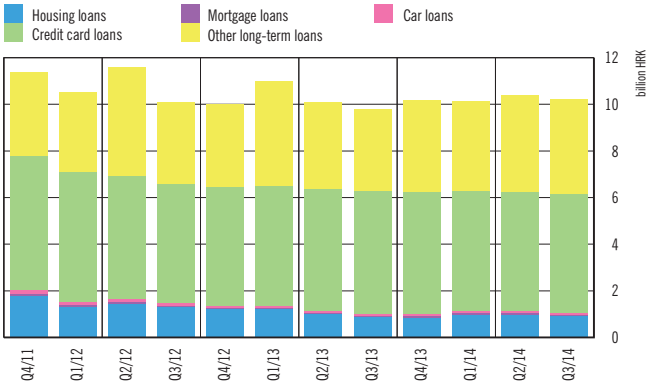
The standards of banks for granting total loans, almost unchanged in the last two quarters, and a considerable easing of standards for consumer and other loans (Figure 43) did not stimulate a significant household demand for new loans, due to the combined effect of negative trends in the labour market (Figure 44) and a low level of consumer optimism (Figure 2). Under such conditions, households continued to adapt their personal consumption and demand for loans. The annual rate of change in total newly-granted loans thus stood at only 0.6% at end-September, the growth being the result of the increase in other long-term loans (e.g. cash and general-purpose loans, Figure 42), whose average annual growth rate stood at 6.2% at end-September 2014, in line with the eased lending standards. The trend of stagnation in total newly-granted loans observed in

Figure 41 Maturity breakdown of newly-granted household loans, adjusted by seasonal fluctuations



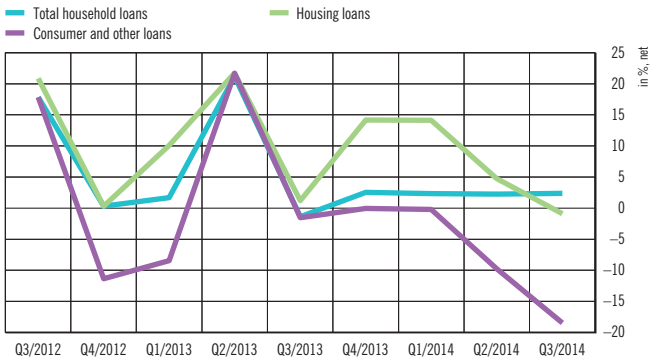
Source: CNB.

Figure 42 Newly-granted long-term household loans by purpose, adjusted by seasonal fluctuations



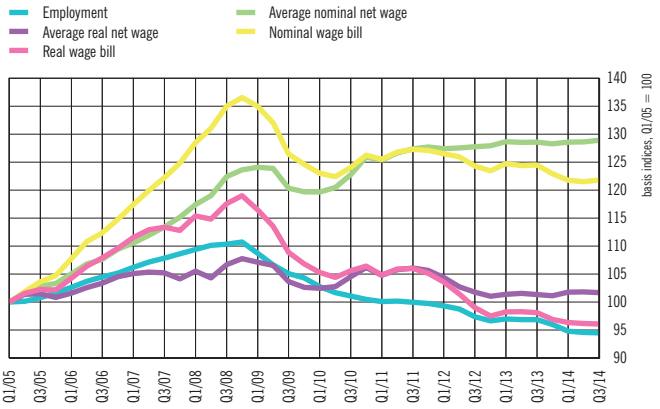
Source: CNB.

Figure 43 Change in household lending criteria in the last three months



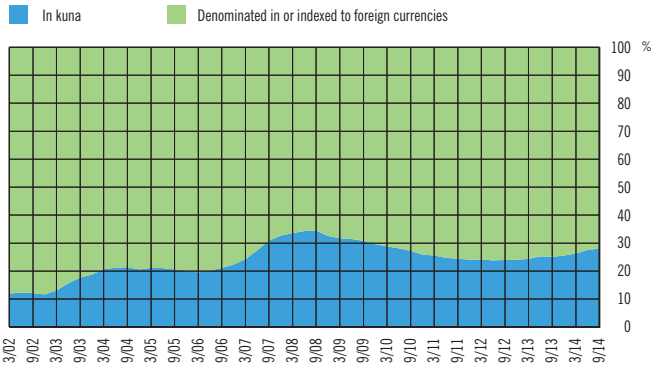
Note: Positive and negative values denote the strengthening and weakening of credit standards, respectively.
Source: CNB.

Figure 44 Employment and wages (seasonally adjusted)



Source: CBS.

Figure 45 Currency breakdown of household loans

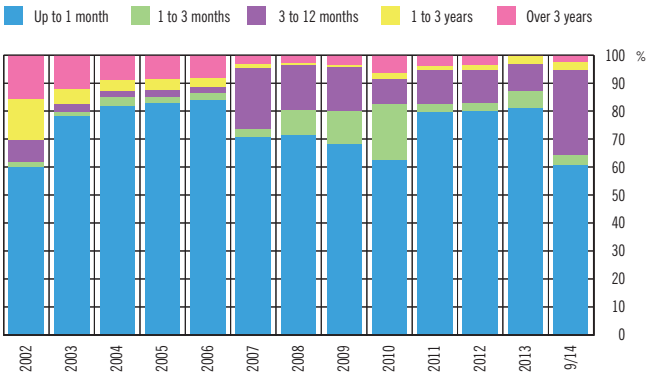


Source: CNB.

the last four years thus continued (Figure 41). Such dynamics in new lending affected the total amount of loans, so households continued to decrease their debt in terms of all types of bank loans (Figure 40), irrespective of their purpose. The strongest decrease was observed in the amount of car purchase loans at end-September (of 33.5% on the annual level), while housing loans decreased in the same period by the average annual rate of 4.3% or 4.9% if the exchange rate effect is excluded.

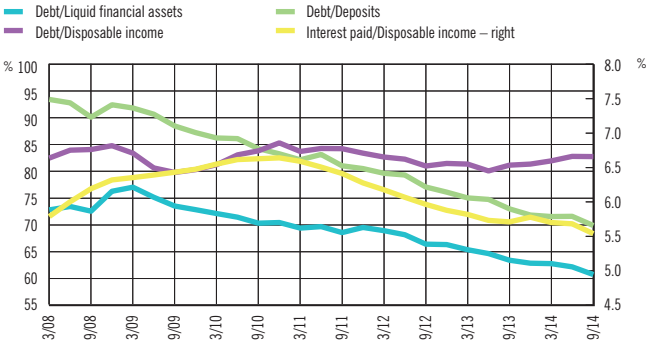
The absence of economic growth largely contributed to the continuation of negative trends in the labour market, observed primarily in a further fall in employment (2.4% on the annual level) and a stagnation in income. In addition to unfavourable conditions in the labour market, household exposure to exchange- and interest-rate risk also remained high in 2014, although a slight downward trend is noticeable. Due to the absence of any significant demand for new loans in the past three years, a gradual repayment of current claims and a simultaneous small increase in newly-granted other long-term kuna

Figure 46 Household loans by interest rate variability



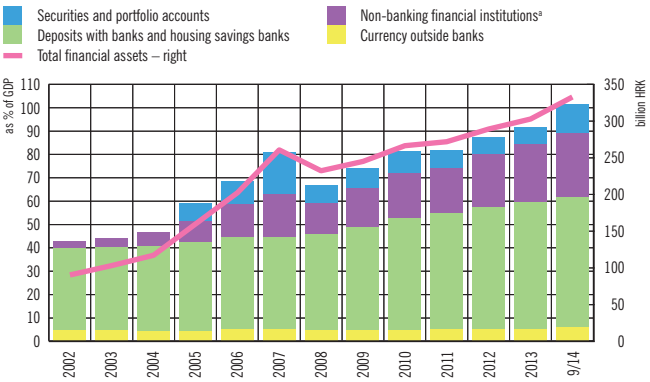
Source: CNB.

Figure 47 Household debt and debt burden



Note: Data on total household debt exclude debt to leasing companies in order to avoid a break in the data series caused by the change in the methodology for reporting the value of leasing contracts from 1 January 2011 onwards.
Sources: HANFA, CDCC and CNB.

Figure 48 Household financial assets



[a] Data on household claims against open-end and closed-end investment funds and data on claims against insurance companies are based on estimates.
Sources: HANFA, CDCC and CNB.

loans, the share of loans indexed to a foreign currency thus decreased slightly at the end of the third quarter, returning to the level from 2010 (72%, Figure 45). Concurrently, 98% of loans were granted with a possibility of interest rate change within one year. As a result, households were still highly exposed to the risk of the increased debt burden due to interest rate changes, although an increase in the share of loans with a possibility of interest rate change in the period from 3 to 12 months slightly improved the structure in the mentioned category (Figure 46).

Indicators of debt and debt servicing burden mostly continued to improve in 2014 (Figure 47). In addition to the growth in household deposits with credit institutions (of 2.8% at end-September), the increase in liquid financial assets of households[2] was also due to the increase in currency outside banks, which, accompanied by the decrease in debt, led to a further improvement in the ratio of debt and the mentioned forms of savings, which fell to their historic lows at the end of September 2014. Concurrently, the indicator of debt servicing burden of households improved despite the fall in nominal disposable income[3], thanks to a noticeable fall in interest paid burden (the average annual rate of change stood at –4.8% at end-September), whereas debt-to-income ratio remained almost unchanged. In addition to the mentioned increase in liquid forms of financial assets, households also increased their investments in other forms of assets in the observed period (Figure 48), particularly in assets with non-banking financial institutions, whereas the growth in securities generated in the third quarter resulted from the transfer of stocks from a foreign legal person to a domestic natural person, initiated by the bankruptcy of a foreign corporation[4].

Following a short-term deterioration in the mid-year, the vulnerability of the household sector[5] continued to decrease again at the end of the third quarter (Figure 49), thus continuing the trend that started in mid-2010, which was largely due to the several-year deleveraging process, a simultaneous continuous growth in household financial assets and a decrease in interest

2 Household financial assets do not include foreign cash and deposits with foreign banks because their level cannot be precisely estimated.

3 The estimated disposable income does not include certain forms of income generated in the official economy (e.g. royalties, temporary service contracts and income from capital) or income from the unofficial (or grey) economy.

4 This relates to OKTS-R-A security of the issuer Osijek koteks d.d.

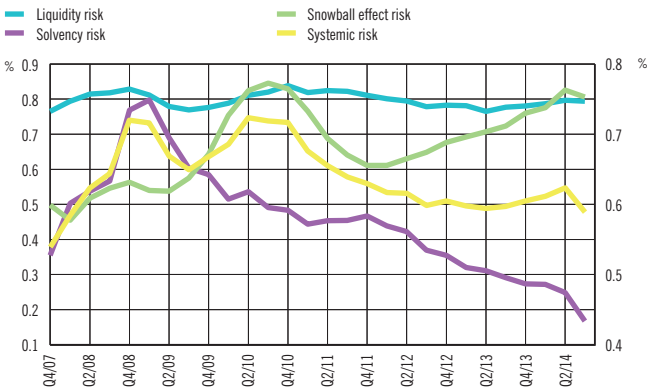
5 Household sector vulnerability is measured by the household systemic risk, i.e. by the average of liquidity risk (LR), solvency risk (SR) and "snowball effect" risk (SNR) which are defined as follows:

$$LR_t = 0.5 \cdot \frac{Debt_t}{Disposable\ income_t} + 0.5 \cdot \frac{Interest\ payments_t}{Disposable\ income_t}$$

$$SR_t = \frac{Debt_t}{Net\ financial\ assets_t}$$

$$SNR_t = \frac{Interest\ payments_t}{\frac{Debt_t + Debt_{t-1} + Debt_{t-2} + Debt_{t-3}}{4}} - \left(\frac{Disposable\ income_t}{Disposable\ income_{t-4}} - 1\right)$$

Figure 49 Indicators of vulnerability in the household sector

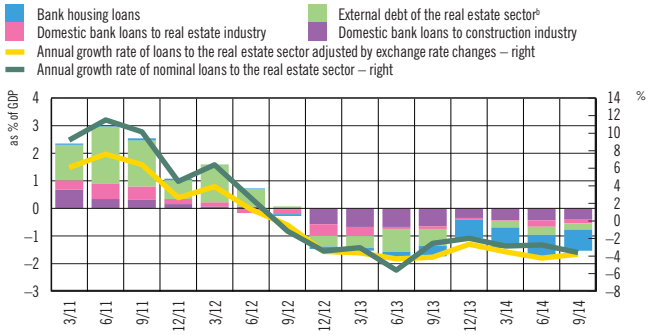


Sources: HANFA, CDCC and CNB.

payments. However, despite the falling aggregate systemic risk indicator, the exposure of the household sector to the "snowball effect" risk has been on an upward trend in the past three years, primarily due to a decrease in disposable income, which suggests a continuation of the deleveraging process. Nevertheless, the expected halting of the fall in disposable income in the following period will probably lead to a deceleration in the growth in the "snowball effect" risk indicator, so the aggregate systemic vulnerability of households could continue to decline. At the same time, despite the expected mild recovery of economic activity and the announced measures of debt write-off for socially vulnerable households, households will continue to be highly exposed to the mentioned macroeconomic risks related to the labour market in the following period, primarily to the risk of unemployment, which will continue to limit this sector's demand for new, especially long-term loans. Therefore, the household deleveraging process is likely to be extended into 2015.

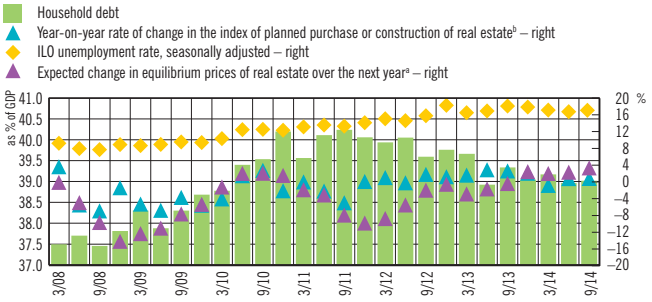
Real estate[6]

Figure 50 Annual change[a] of the real estate sector debt



[a] Changes in debt adjusted by exchange rate changes.
[b] External debt includes the debt of real estate and construction industries.
Note: Due to the application of the new sectorisation, Croatian Motorways and Rijeka-Zagreb Motorway were excluded from the construction industry.
Source: CNB calculations.

Figure 51 Household debt, unemployment rate, consumer optimism and real estate market expectations



[a] Refers to the expected annual change in the same period of the next year (+12 months) and is estimated based on the equilibrium price model, taking into account CNB projections for the main determinants of demand for residential real estate.
[b] Index of planning the purchase or construction of real estate was calculated based on consumers' answers to the question on plans regarding the purchase or construction of real estate in the next 12 months from the CNB's consumer confidence survey.
Source: CNB.

Despite the favourable financial availability of residential real estate, growth in demand and a recovery of the real estate market will still primarily depend on economic developments and signals from the labour market.

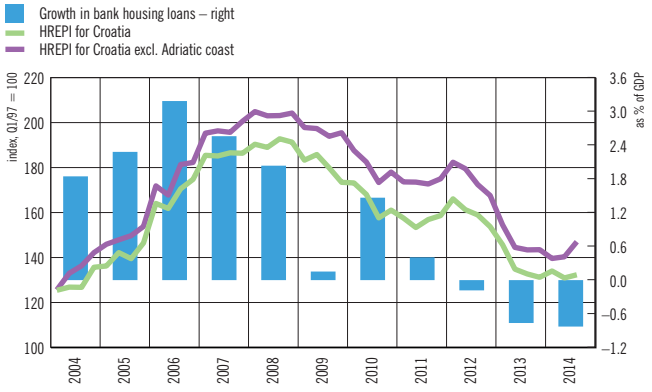
The deleveraging process of the household and corporate sector segments active on the real estate market, which began at the end of 2012, continued into 2014 (Figure 50). Housing loans decreased the most in the observed period (by an annual average of –0.7% of GDP), despite the mild growth in newly-granted housing loans in the third quarter (Figure 42). In addition to domestic liabilities of corporations in construction[7] and real estate activities (at end-September 2014, the average annual debt growth stood at –0.4% of GDP and –0.1% of GDP respectively), these corporations' liabilities to foreign creditors also continued to decline concurrently (by –0.2% of GDP). The total debt thus decreased by an average of 2.8% in the one-year period to the end of September, or 3.5% if the exchange rate effect is excluded.

Unfavourable labour market conditions, a low level of consumer optimism (Figure 51) and a further fall in disposable income limited the most the increase in demand for residential real estate in the observed period. Due to the mentioned uncertainty and a relatively high interest rate on housing loans as compared to the euro area (Figure 53), households are still reluctant to undertake long-term borrowing for the purpose of purchasing

6 In this chapter developments in the real estate market are analysed and operations of non-financial corporations in the construction and real estate activities are monitored.

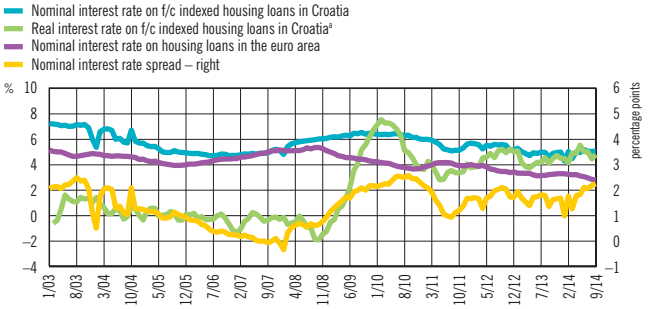
7 Due to the implementation of the new ESA 2010 standard, Croatian Motorways and Rijeka-Zagreb Motorway no longer belong to the public non-financial corporations sector, but to the central government subsector.

Figure 52 Housing loans and HREPI[a] on a quarterly basis



[a] The hedonic real estate price index takes into account qualitative characteristics of the real estate.
Source: CNB calculations.

Figure 53 Comparison of interest rates on newly-granted housing loans in Croatia and the euro area



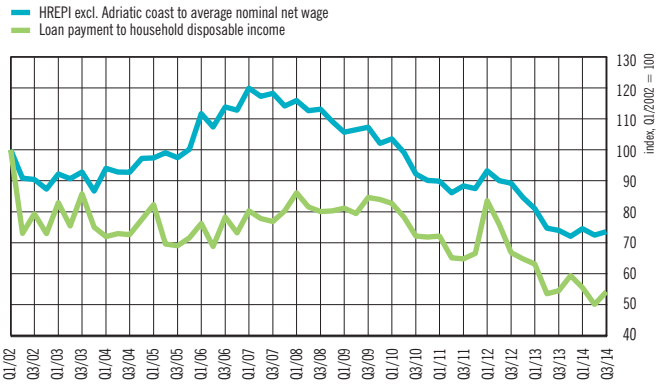
[a] The real interest rate on f/c indexed housing loans was deflated by the change in the average nominal net wage, excluding the effect of the crisis tax, and it is presented as the moving average of three successive time periods.
Note: Since December 2011, interest rates have been calculated according to the new methodology (for more details on the new interest rate statistics, see *CNB Bulletin*, No. 204, June 2014).
Sources: ECB and CNB.

or constructing real properties. Nevertheless, a growth in real estate prices in Croatia measured by the hedonistic real estate price index (HREPI) was recorded at the end of the third quarter of 2014 (of 2.5% on the annual level). This was the result of the increase in real estate prices on the Adriatic coast (of 8.7% on the annual level), whereas prices in the rest of Croatia slightly decreased on the annual level (Figure 52). However, despite the slight recovery of the real estate market, the consequences of the drop in prices in the last six years were observed, among other things, in the increased growth in the share of non-performing loans (see Box 2 Macroeconomic credit risk models for the corporate and household sector).

Indicators of financial availability in 2014 slightly fluctuated around their historically low levels, thus indicating the continuation of the period of relatively favourable investment opportunities in this market (Figure 54). These dynamics were mostly due to a decline in real estate prices, accompanied by a fall in estimated loan repayments on the annual level. Under such conditions, residential real estate in Croatia could become a more attractive investment, due also to the relatively low interest rates on household deposits and reduced yields in the capital market.

Although the mentioned trends suggest the beginning of real estate market stabilisation, no full recovery will be possible without an increase in demand for residential units, which is determined by macroeconomic conditions. The expected slight

Figure 54 Financial availability of residential property

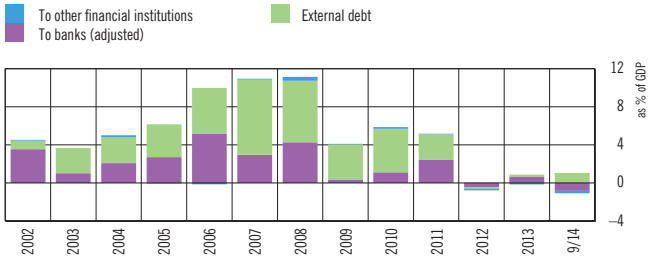


Sources: CBS and CNB calculations.

growth in disposable income and wages in this year probably will not improve the long-term undermined consumer optimism, due partly to high uncertainty related to developments in the labour market, in other words, the high unemployment rate and the risk of unemployment, to which households will still be exposed. It is thus likely that there will be no significant revival of the real estate market in 2015.

Non-financial corporate sector

Figure 55 Change in and stock of non-financial corporate debt[a]

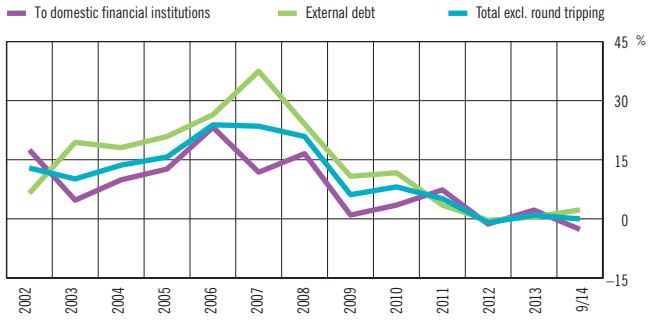


[a] The figure is based on revised data and includes changes in the classification of sectors (ESA 2010). Data on total corporate debt exclude debt to leasing companies in order to avoid a break in the data series caused by the change in the methodology for reporting the value of leasing contracts from 1 January 2011 onwards. Data on external debt exclude round-tripping transaction.

Note: Changes in non-financial institutions' debt exclude effects of the sale of a portion of claims of a major bank to a company in the direct ownership of the parent bank in December 2012 and 2013, the assumption of a portion of shipyard debt by the government in June 2012 and the conversion of debt into equity. The changes exclude debt to leasing companies and CBRD and round-tripping transactions.

Sources: HANFA and CNB.

Figure 56 Annual growth rate of non-financial corporate debt



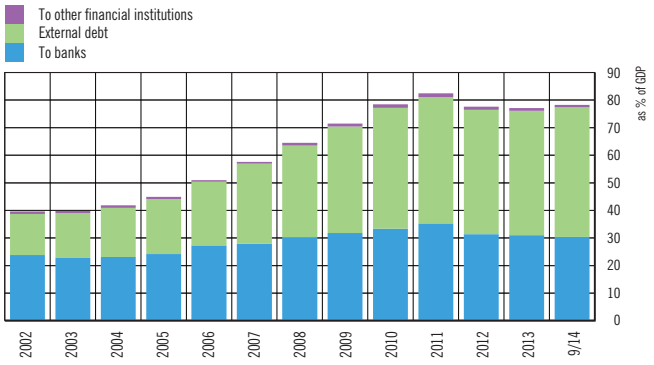
Note: Annual growth rates of non-financial institutions' debt exclude effects of the sale of a portion of claims of a major bank to a company in the direct ownership of the parent bank in December 2012 and 2013, the assumption of a portion of shipyard debt by the government in June 2012 and the conversion of debt into equity. The growth rates exclude debt to leasing companies and CBRD and round-tripping transactions.

Sources: HANFA and CNB.

Although the non-financial corporate sector deleveraged to domestic sources of financing in the first three quarters of 2014, the growth in external debt and the fall in GDP in the same period offset the effect of deleveraging, which resulted in a mild growth in the sectoral indebtedness burden. Interest rate risk of non-financial corporations decreased due to a slight increase in the share of loans with interest rates variable more than one year in total loans. The total exposure to currency risk held steady, as well as the exposure to liquidity and solvency risk, which resulted in a still relatively high vulnerability of the non-financial corporate sector.

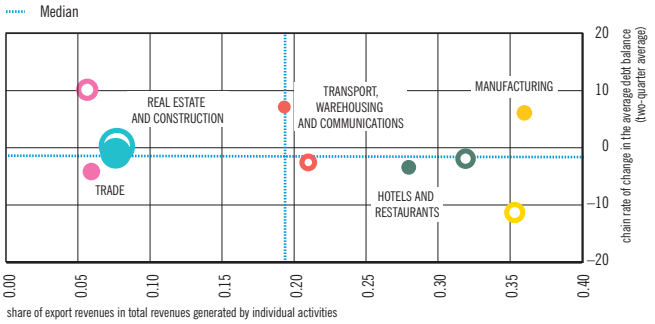
The total debt of the non-financial corporate sector slightly increased in the first three quarters of 2014, to the level of around 78% of GDP, from around 77% of GDP in December 2013 (note that because the sector classification according to the ESA 2010 standard was applied, some of the largest public enterprises were classified under the government sector, which resulted in a general decrease in the level of debt of the non-financial corporate sector in the presented period). Given that the annual growth rate of the total non-financial corporate debt was 0% (or –0.24%, adjusted by exchange rate changes), the debt growth was the result of the increase in the exchange rate and the fall in GDP in the previous year. In the period from September 2013 to September 2014, debt to domestic banks decreased the most, by around 0.8% of GDP (an annual rate of change of –2.7%), whereas debt to other financial institutions fell by around 0.3% of GDP (annual rate of change of –23%). However, the sector's external debt went up by around 1% of GDP (annual rate of change of 2.3%), the corporate debt

Figure 57 Indebtedness of the non-financial corporate sector



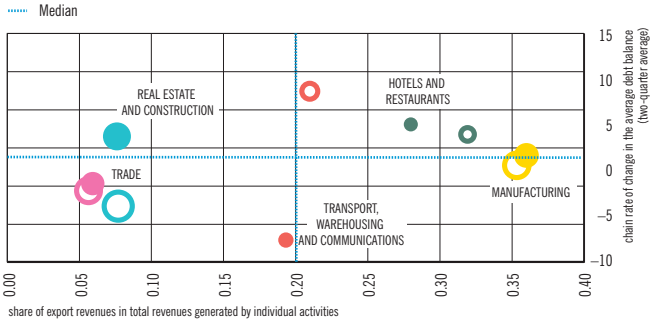
Note: The debt stock is shown without the corrections mentioned in the note from the previous figure (excluding the conversion of debt into equity). Stocks exclude debt to leasing companies and CBRD and round-tripping transactions.
Sources: HANFA and CNB.

Figure 58 External debt allocation by sectors from March to September 2014



Note: A full circle denotes the debt dynamics in the last two quarters observed. An empty circle denotes the same change in the debt balance in the previous period. The size of the circle denotes the significance of a particular activity's share in total external debt of non-financial corporations. Activities accounting for a relatively minor share in total debt are not presented. Data according to the ESA 2010 standard.
Sources: FINA (export and total revenues) and CNB (external debt).

Figure 59 Allocation of domestic bank loans by sectors from March to September 2014



Note: A full circle denotes the debt dynamics in the last two quarters observed. An empty circle denotes the same change in the debt balance in the previous period. The size of the circle denotes the significance of a particular activity's share in total external debt of non-financial corporations. Activities accounting for a relatively minor share in total debt are not presented. Data according to the ESA 2010 standard.
Sources: FINA (export and total revenues) and CNB (loans by activity).

classified as direct investments rising by around 0.2% of GDP and other external debt instruments by around 0.6% of GDP (Figure 55, 56 and 57).

In the period from March to September 2014, external debt increased in the transportation, storage and communications activities and the manufacturing industry the most, whereas the current growth rate of external debt declined in trade, construction and accommodation and food service activities (Figure 58). The growth in external debt in manufacturing industry was the strongest in the food, pharmaceutical, metal processing and electrical industries, while in transportation, storage and communications activities, the greatest growth in external debt was observed in telecommunications and air transport activities and services related to water transport, mostly in public enterprises. The biggest decline in external debt in the observed period in the trading activity was recorded in refined petroleum products trade and consumer goods trade, whereas the biggest decline in the construction activity was recorded in the segment of real estate management.

The current growth rate of domestic banks' loans in the period from March to September 2014 was negative in the transportation, storage and communications activity, its change of sign from positive to negative suggesting the deleveraging of this activity to domestic banks. Manufacturing industry and trade activities continued to deleverage in the observed period, but at a slower pace than in the previous period, from September 2013 to March 2014, while the construction and real estate activity and the hotels and restaurants activity continued to deleverage moderately (Figure 59). Domestic debt refinancing by external debt was more pronounced in the food industry.

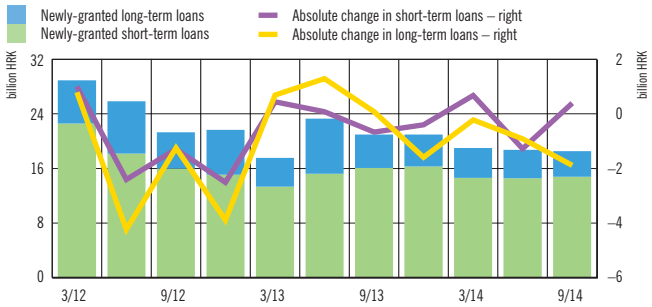
Results of the bank lending survey point to a drop in demand for loans in 2014. This trend was particularly present in the segment of small and medium enterprises, the major factors being the reduced need for fixed capital formation and internal corporate financing. However, such developments in demand were offset by the activities of debt refinancing and the financing of inventories and working capital in the second and third quarter. Also, in the conditions of favourable bank liquidity and weakened demand for loans, the easing of standards for granting loans was recorded for the first time in the third quarter of 2014. An improvement of supply characteristics was recorded in all types of corporate loans, except in long-term loans (Figure 60).

A trend towards stagnation in newly-granted loans of domestic banks was observed from the beginning of 2014, with a negligible decline in the share of long-term financing. This is in line with the aforementioned results of the bank lending survey, which indicate a slight decline in short-term debt refinancing and a simultaneous fall in demand for long-term investment loans. Parallel with this, the increase in non-financial corporate deleveraging in 2014 resulted in a stronger fall in the absolute stock of long-term loans in the second and third quarter. Following a mild fall in the second quarter, the third quarter of

Figure 60 Change in credit standards and demand for loans to corporates

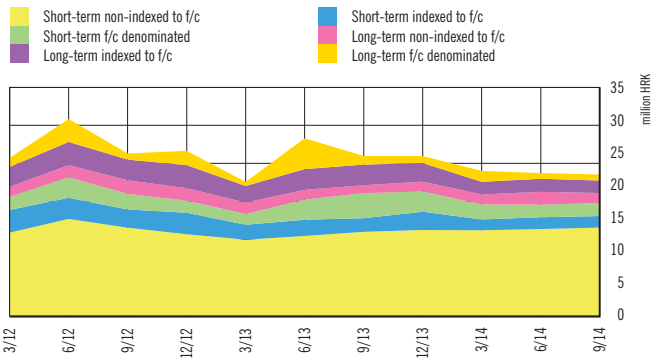
Note: Positive values show the increase in demand, i.e. the tightening of credit standards, whereas negative values show the decrease in demand, i.e. the easing of standards.
Source: CNB.

Figure 61 Newly-granted bank loans and absolute change in the stock of gross loans



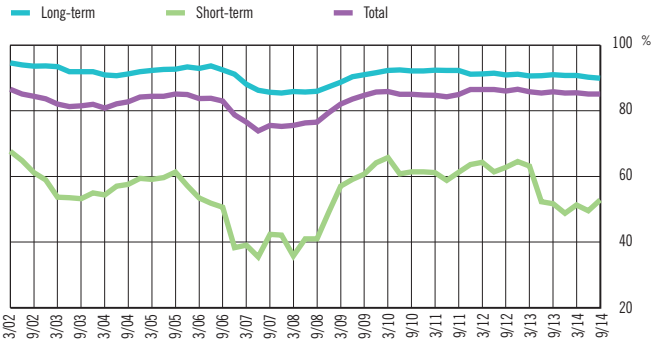
Note: Due to a change in the methodology of monitoring of stock and maturity of loans which are the consequence of change in the classification of sectors, the data from 31 December 2011 onwards are revised in line with the new methodology. The decrease in the stock of loans in December 2012 and 2013 is the result of the sale of a portion of claims of a major bank to a company in the direct ownership of the parent bank, with the decrease in June 2012 being the result of the assumption of a portion of shipyard debt by the government.
Source: CNB.

Figure 62 Breakdown of newly-granted loans to non-financial corporations by maturity and currency



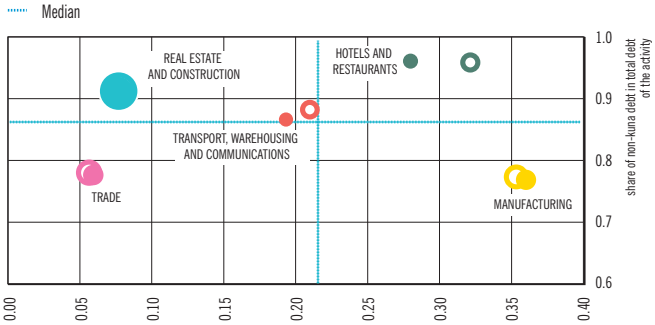
Source: CNB.

Figure 63 Share of corporate non-kuna debt[a] in total loans



[a] It is assumed that total external debt is denominated in foreign currencies. Debt indexed to foreign currencies (a foreign currency clause) is also included.
Source: CNB.

Figure 64 Currency exposure in September 2014



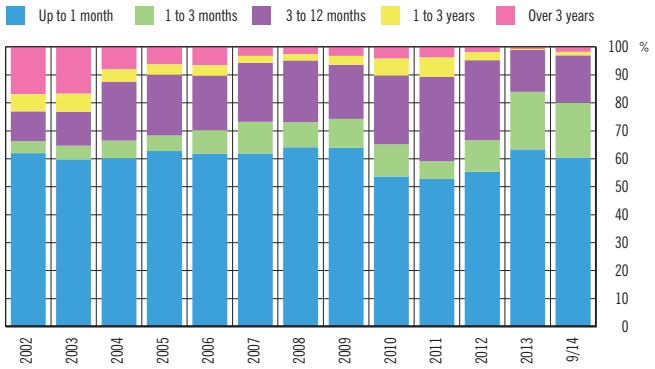
Note: A full circle denotes the debt dynamics in the last two quarters observed. An empty circle denotes the same change in the debt balance in the previous period. The size of the circle denotes the significance of a particular activity's share in total external debt of non-financial corporations. Activities accounting for a relatively minor share in total debt are not presented.
Sources: FINA and CNB.

2014 was marked by stagnation in the absolute stock of short-term loans (Figure 61).

A slight growth in short-term kuna financing, which started in the beginning of 2013, continued into 2014. Concurrently, a slight decrease in long-term financing of the same type and a stagnation of newly-granted loans in a foreign currency only slightly affected the change in the currency structure of newly-granted corporate loans (Figure 62).

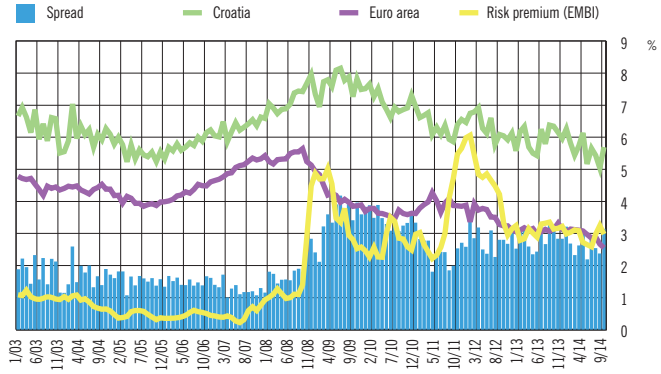
A mild decline in the currency exposure of non-financial corporations was most pronounced in the transportation, storage and communications activities and the manufacturing industry and somewhat less pronounced in the trade and construction activities. The hotels and restaurants activity slightly increased its currency exposure, and due to a concurrent fall in the share of export revenues, observed also in the transportation, storage and communications activities, this resulted in a mild increase in the currency risk (Figure 64). However, these changes in the

Figure 65 Breakdown of bank loans to non-financial corporations by interest rate variability



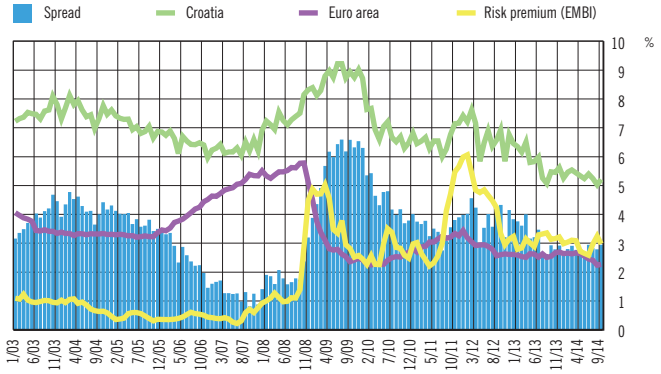
Source: CNB.

Figure 66 Interest rates on long-term loans to non-financial corporations in Croatia and the euro area



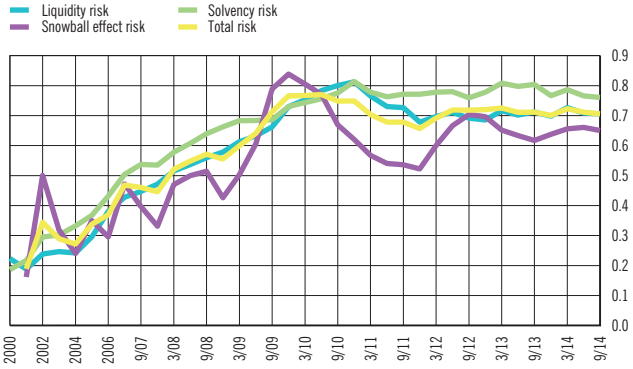
Sources: ECB, FINA and CNB.

Figure 67 Interest rates on short-term loans to non-financial corporations in Croatia and the euro area



Sources: ECB, FINA and CNB.

Figure 68 Indicators of vulnerability in the corporate sector



Note: The vulnerability in the corporate sector was estimated by three indicators. The liquidity risk indicator was calculated as the ratio of the sum of the total debt amount and interest payments of the sector to gross operating profit:

$$LR_t = 0.5 \cdot \frac{Debt_t}{Gross\ operating\ profit_t} + 0.5 \cdot \frac{Interest\ payments_t}{Gross\ operating\ profit_t}$$

The solvency indicator was calculated as the debt-to-equity ratio:

$$SR_t = \frac{Debt_t}{Equity_t}$$

The snowball effect risk was calculated as the ratio of interest payments to the average debt adjusted by the growth in gross operating profit:

$$SNR_t = \frac{Interest\ payments_t}{\frac{Debt_t + Debt_{t-1} + Debt_{t-2} + Debt_{t-3}}{4}} - \left(\frac{Gross\ operating\ profit_t}{Gross\ operating\ profit_{t-4}} - 1\right)$$

These indicators were normalised to the value range 0 – 1 and the total risk was calculated as the average of the three mentioned normalised indicators:

$$TR_t = \frac{LR'_t + SR'_t + SNR'_t}{3}$$

Sources: CNB and FINA.

last two quarters only slightly affected the currency structure of total loans granted to non-financial corporations (Figure 63).

The structure of loans by interest rate variability shows a minor increase in the share of loans with a variable interest rate in the period longer than one year, and the total share of loans with the interest rate variable within 12 months thus decreased from 99% to a still high 97% (Figure 65).

Weaker corporate demand for loans and a favourable access to domestic and foreign financing sources support the downward trend in domestic banks' interest rates on corporate loans. Interest rates in Croatia, irrespective of their maturity, thus continued to record their historical lows in terms of their average level in the second and third quarter of 2014, with the price of short-term financing coming close to the price of long-term financing. This was probably due to long-term weakened demand for financing of investments and a fall in yields to maturity on long-term government bonds of Croatia that was relatively sharper than in the euro area. It both intensified the reduction of interest rates on long-term loans in relation to interest rates on short-term loans. Such conclusions were suggested by the results of the bank lending survey. Parallel with

these movements in interest rates in Croatia, their somewhat more dynamic decline has also been recorded in the euro area since the beginning of 2014. Under such conditions, the spread between interest rates on corporate loans in Croatia and the euro area increased slightly, which reflects a still relatively high risk premium for the country (Figure 66 and 67).

The total riskiness of the non-financial corporate sector was marked by a stagnation in the last two years (with minor oscillations), but it still remained on a relatively high level as compared to the level of indicators from the pre-crisis period, until 2008, although the risk level decreased after the peak of the crisis in 2010. The liquidity risk follows the developments in the total risk of the sector, while a high and stagnating level of the solvency risk has been present since the mentioned peak of the crisis. Having culminated at the end of 2009, the snowball effect briefly declined in 2011, as a result of the growth in gross operating profit in 2011. Due to a renewed fall in disposable income, the mentioned risk indicator went up in 2012 and remained at levels that exceed the levels of indicators from the pre-crisis period (Figure 68).

Overall, due to the high level of non-financial corporate debt, which is slowly declining, the absence of growth in gross operating profit and the decrease in capital driven by operating losses, the vulnerability of the sector is still at a relatively high level, despite the fall in interest rates and a consequent decline in the interest paid burden. From the structure of vulnerability components, it can be concluded that a decrease in the sector's riskiness can only be realised by an increase in the capital, i.e. by the growth in gross operating profit. Without further borrowing, this can only be achieved by the increase in total profitability and cost-effectiveness of the non-financial corporate sector and by the inflow of new equity.

Box 2 Macroeconomic credit risk models for the corporate and household sector

The basic motive for the improvement of macroeconomic credit risk models for the corporate and household sectors is the upgrading of the analytical framework within the stress testing of credit institutions. The models used so far were based on loan quality data based on a different definition of a non-performing placement (A90 placements were not treated as irrecoverable). Also, in the segment of the corporate sector credit risk, the models used so far (due to a higher aggregation) could not determine the credit risk for specific economic activities. Finally, as four years have passed since the last estimate of these models' parameters and as previous models covered a smaller number of credit institutions (only commercial banks), a reassessment of these sectors' credit risk provides a more precise assessment of the relationship between the macro environment and credit risk.

1 Portfolio credit risk models for the corporate sector

The previous approach to credit risk modelling for the non-financial corporate sector was based on data collected on an aggregate basis. In order to take into account the specific features in the structure of the corporate portfolio in stress testing, the group of models was extended. In addition to enabling a more precise detection of the specific features of a certain corporate segment and in turn a more precise risk measurement on an aggregate basis, the sectorally adjusted measurement of credit risk also enables flexibility in the application of the new framework for stress testing through a greater number of significant macroeconomic variables in the models, which is particularly reflected in a more comprehensive impact of shocks.

In line with that, on a sample from the first quarter of 2004 to the fourth quarter of 2013, individual models for four segments were developed, including the construction sector, other – large enterprises[1] (all large private enterprises not dealing in construction), other – small enterprises (all small and medium-sized non-construction private enterprises) and state-owned enterprises (SOEs). This kind of segmentation resulted from noticeably different movements in the share of non-performing placements and potential liabilities among segments (Figure 1) and from the share of their exposure[2] in total exposure of the non-financial corporate sector.

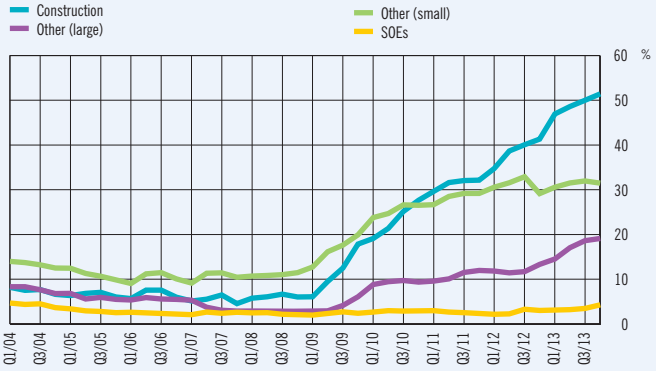
The modelling was carried out using a linear regression, and annual changes in the dependent variable (changes in the share of non-performing placements and potential liabilities) and independent variables[3] were applied in the estimations as follows:

$$y_t = \alpha + \beta * x_t + \gamma * x_t(-1) + \delta * x_t^2 + \epsilon_t \,,$$

where y is the change in the share of non-performing loans in a loan portfolio, x is the independent variable vector and ϵ_t the error term.

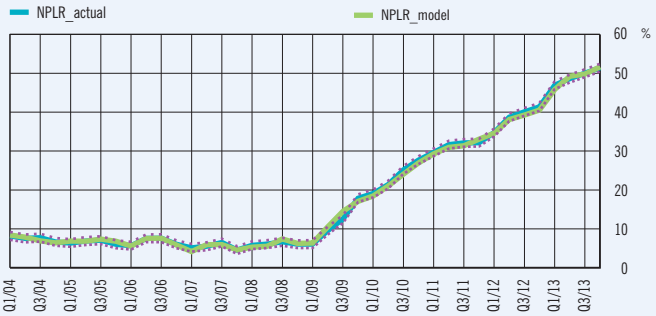
Since in the modelling of each segment a number of model specifications were tried out, the measure of the error between actual and model values was the average error (RMSE)[4]. Finally, such estimated values of non-performing placements and potential liabilities were aggregated on the level of the entire corporate sector based on the share of exposure of segments in the total exposure of sectors (Figure 2).

Figure 1 Non-performing placements and potential liabilities by segments



Source: CNB.

Figure 2 Actual and model estimates of non-performing placements and potential liabilities for the corporate sector



Notes: 1 Atypical growth in placements and potential liabilities in the second quarter of 2006 is related to the change in ID form, whereas the growth in the second quarter of 2007 and the fall in the fourth quarter of 2012 are related to the worsening, i.e. the "cleaning up" of the loan portfolio of a large bank. 2 Broken lines represent the deviation from the actual value of ±1 percentage point.
Source: CNB.

1 The classification of enterprises by size (small, medium and large) was done according to FINA's definition, the basic criteria being the amount of assets, total income and the number of employees.

2 Since for periods before the fourth quarter of 2009 in the ID-FINA base it is not possible to classify by groups the quality of loans of a certain enterprise, only its exposure, due to the size of the sample on which modelling is carried out, exposures are modelled. Shares of segments were 17%, 44%, 18% and 21% respectively at the end of December 2013.

3 Variables such as real GDP, exchange rate and inflation were tested in the form of annual rates of change (in %), whereas interest rates and unemployment rate were tested as annual changes.

4 In formal terms, it is the root mean square error, defined in the following manner:

$$RMSE = \sqrt{\frac{\sum_{t=1}^{n} \left(\text{NPLR-actual}_t - \text{NPLR-model}_t\right)^2}{n}}$$

Explanatory macroeconomic variables that have proved statistically significant in the models (Table 1) differ considerably among segments, which justifies the sectoral approach to credit risk modelling. Also, all coefficients in the models developed show the expected signs. Favourable macroeconomic developments (measured by economic growth) or the growth in price categories (inflation and real estate prices), through the increase in corporate income, cause a decrease in the share of non-performing placements and potential liabilities. Unlike the general growth in prices significant in the segments of other (non-construction, private) small and large enterprises, the growth in prices on the real estate market (measured by HREPI) is logically significant in the construction sector. In addition to the higher income, it also contributes to the increase in collateral value, which alleviates debt repayment for the debtor. In contrast to this, the growth in financing costs (interest rates) and the depreciation of the kuna against the euro increase the burden of the repayment of loans and lead to the growth in the share of non-performing placements and potential liabilities. From this point of view, the rise in the exchange rate in the construction sector mostly affects the household sector, where the increase in the loan repayment burden demotivates future potential buyers from borrowing, and reduces demand for residential properties, which has a direct impact on the decline in corporate income in this sector. The growth in the share of non-performing placements and potential liabilities is also due to the growth in the unemployment rate, which reflects unfavourable developments in the labour market and the general economic slowdown.

2 Credit risk models for the household sector

Unlike the corporate sector, where data on placements and potential liabilities were modelled, data on loans were used for the household sector.[5] As these data are collected on a summary basis (at the level of a credit institution), it is not possible to develop models of the probability of default, such as the model for corporate clients. Also, data on the quality of household loans are available for a longer time period only for housing and other loans. Whereas housing loans are a relatively homogeneous group, other (non-housing) loans represent an extremely heterogeneous group of instruments, which is much harder to model due to various factors that affect their quality (mortgage, car purchase and credit card loans, overdrafts and other loans). Consequently, credit risk modelling was approached, as before, through two models: a) the credit risk model in the segment of housing loans, and b) the credit risk model in the segment of consumer (other, non-housing) loans.

As in the corporate sector, modelling was carried out by using a linear regression, and annual changes in the dependent variable (change in the share of non-performing loans) and independent variables[6] were applied in the estimations. Independent variables with a time lag and non-linear transformation and dummy variables were additionally included, which increased the model's explanatory power.

A number of model specifications were tested in the modelling. Certain independent variables with a one-quarter time lag were used, which accompanied by the inclusion of the square value of certain independent variables in the models contributes to stability of estimated values.

All coefficients in the presented models (Table 2) show the expected signs. The depreciation of the kuna against the weighted exchange rate

Table 1 Regression analysis results by segments

	Construction	Other small	Other large	SOE
Dummy {Q2/2006}	2.793 (–1.516)	3.734 (1.376)*		
Dummy {Q2/2007}		0.458 (–1.475)		
Dummy {crisis}	3.365 (0.755)**	3.369 (0.819)**	1.919 (0.690)**	
Real GDP (–1)		–0.378 (0.097)**		–0.083 (0.029)**
Real GDP (–1) ^ 2				–0.010 (–0.006)
Inflation (–1)		–1.607 (0.205)**		
Inflation			–1.570 (0.661)*	
Inflation ^ 2			0.150 (–0.092)	
EUR/HRK exchange rate (–1)	0.340 (–0.182)			0.095 (–0.086)
EUR/HRK exchange rate		–0.455 (0.194)*		
(EUR/HRK exchange rate) ^ 2		0.251 (–0.126)		
HREPI (–1)	–0.047 (–0.044)			
Long-term interest rate on corporate loans indexed to f/c	0.733 (–0.522)	2.816 (0.479)**		0.513 (0.219)*
Unemployment rate (–1)	2.296 (0.204)**		0.686 (0.223)**	
C	1.837	4.127 (0.608)**	2.608 (1.159)*	0.118 (–0.145)

Note: Standard errors of the estimated parameters are shown in brackets.
Source: CNB calculations.

5 In the household sector, bank exposure mostly relates to loans.

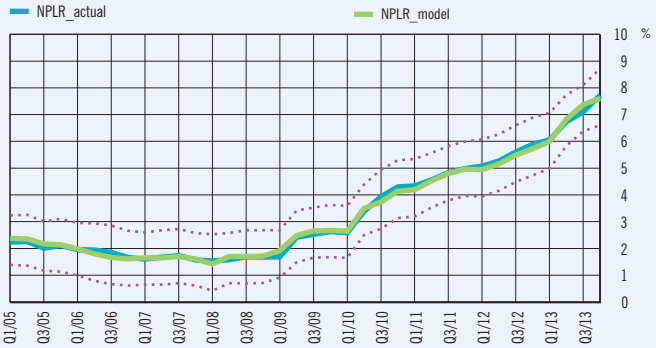
6 Variables such as real GDP and weighted exchange rate were tested in the form of annual rates of change (in %), whereas interest rates and unemployment rate were tested as annual changes. Additional steps were taken in order to make the estimated parameters as reliable as possible. All dependent and independent variables with observed outliers were winsorised to 1%. Unit root tests were made for all dependent variables and the correlation of independent variables was checked.

Table 2 Regression analysis results

	Housing loans	Consumer loans
Real GDP		–0.110 (0.056)*
EUR/HRK and CHF/HRK weighted exchange rate (–1)	0.032 (0.013)**	
EUR/HRK and CHF/HRK weighted exchange rate		0.037 (0.027)
Interest rates on housing loans (–1)	0.046 (0.068)**	
EURIBOR (–1)		0.453 (0.209)**
EURIBOR (–1)^2		0.141 (0.047)***
HREPI (–1)	–0.045 (0.008)***	
HREPI (–1)^2	0.001 (0.001)**	
Unemployment rate (–1)	0.092 (0.035)**	0.474 (0.082)***
C	0.424	0.537 (0.092)***

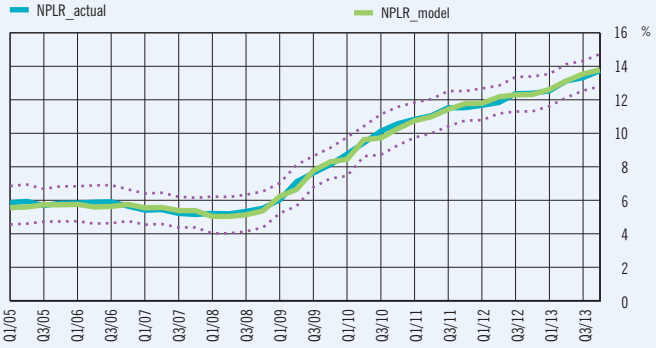
Notes: 1 Standard errors of the estimated parameters are shown in brackets.
2 Weights in the weighted exchange rate between EUR/HRK and CHF/HRK represent the share of euro and Swiss franc loans, respectively, in total household loans.
Source: CNB calculations.

Figure 3 Actual and model estimates of the share of non-performing housing loans



Note: Dotted lines represent the deviation from the actual value of ±1 percentage point.
Source: CNB.

Figure 4 Actual and model estimates of the share of non-performing other loans



Note: Dotted lines represent the deviation from the actual value of ±1 percentage point.
Source: CNB.

and the growth in interest rates on housing loans lead to an increase in the share of non-performing housing loans, since they increase the effective monthly liabilities of clients. The same effect on the share of non-performing housing loans will be realised in the event of deterioration in the labour market or a general economic slowdown (measured by the unemployment rate). In contrast to this, a higher level of real estate prices (measured by HREPI) is associated with a lower level of non-performing loans, since a higher real estate value will increase the opportunity cost of the termination of loan repayment.

In addition to the worsening of economic activity (measured by the growth rate of real GDP) or the depreciation of the kuna against the weighted exchange rate, a deterioration in the labour market will also contribute to the increase in the share of non-performing consumer loans to households. The growth in EURIBOR, a benchmark interest rate to which a significant share of consumer loans are indexed, leads to the growth in the share of non-performing other (non-housing) household loans, because it increases the effective monthly liabilities of citizens.

The estimated values of the share of non-performing housing loans (Figure 3) are very close to the actual ones (RMSE = 0.12)[7]. This is primarily due to the homogeneity of housing loans as instruments in the entire credit institutions sector. In contrast to this, the estimated values of the share of non-performing other household loans (Figure 4), as expected, show a slightly bigger deviation from actual values (RMSE = 0.21), due to the heterogeneity of this group of loans. However, if we compare the adjustment of model values to actual values according to the previous approach to the modelling of these segments, the models presented in this box contribute to the quality of the analytical framework of stress testing. RMSE for housing and consumer portfolio stood at 0.42 and 0.66 respectively.

The results of the quantitative analysis of scenario elasticities[8] (Table 3) obtained on the basis of estimated models are as expected. In the con-

7 A lower value of mean error logically suggests a better adjustment of model to actual data.

8 Scenario elasticity reflects the change in the share of non-performing loans (for housing and consumer loans portfolios) and non-performing placements and potential liabilities (for the corporate portfolio), depending on the scenario in the fourth quarter of 2015 relative to the fourth quarter of 2014.

ditions of slightly improved macroeconomic developments expected in 2015 (assumptions under the baseline scenario) and a significant deterioration in macroeconomic conditions in this year (assumptions under the adverse scenario), a growth in the share of non-performing loans, i.e. placements and potential liabilities, is expected under both the scenarios, irrespective of the segment. In the household sector, a growth of only 0.35 percentage points in the segment of housing and 0.48 percentage points in the segment of consumer lending is estimated under the baseline scenario, whereas a growth in the share of non-performing placements and potential liabilities in the segment of corporate lending is somewhat stronger and estimated to 4.64 percentage points. Bearing in mind the increase in the previous year, it is noticeable that a stagnation of this process in all portfolios is expected in 2015. Furthermore, under the shock scenario, a somewhat stronger sensitivity to shocks is observed in the corporate sector than in the household sector. For instance, a considerable fall in economic activity in 2015 will result in a growth in the share of non-performing placements and potential liabilities of corporates, of 0.3 percentage points, whereas in the segment of consumer loans, it will result in an increase in the share of non-performing loans of 0.23 percentage points. It is also evident that the greatest contribution to the total growth in the share of non-performing placements, as well as the greatest sensitivity to shocks, irrespective of the segment, comes from the changes in the exchange rate of the kuna against the euro or the weighted exchange rate.

A prolonged period of recession and significant differences in developments in the share of non-performing placements across sub-segments increase the importance of the reassessment of credit risk model parameters. The portfolio models presented in this box include a broader group of independent variables and thus enable flexibility in the application of the new framework for stress testing and consequently contribute to its analytical quality. Apart from the technical aspect, which involves a further improvement of the model's predictive properties and takes into account the specific features of sub-segments through sectorally adjusted risk measurement, the developed model enables a more precise assessment of a relationship between the macro environment and credit risk. It can be concluded that credit risk models will continue to be improved, primarily by the additional inclusion of variables specific for banks, which would additionally improve the transfer of macroeconomic shocks into bank balance sheets.

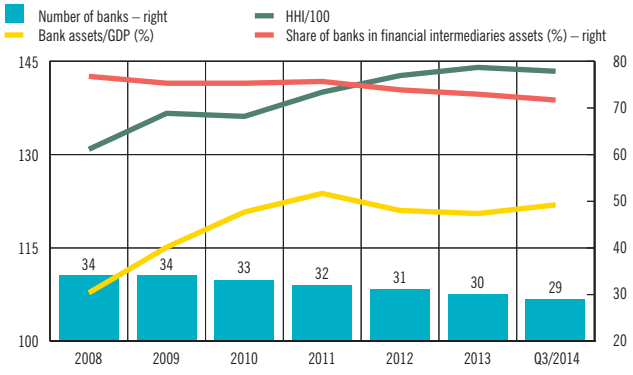
Table 3 Scenario elasticities

	Corporations		Housing loans		Consumer loans		Private sector	
	Baseline scenario	Adverse scenario	Baseline scenario	Adverse scenario	Baseline scenario	Adverse scenario	Baseline scenario	Adverse scenario
Real GDP	–0.052	0.313			–0.020	0.230	–0.030	0.212
Inflation	–0.330	–2.652					–0.152	–1.222
EUR/HRK exchange rate	0.005	9.468					0.002	4.362
HREPI	–0.009	0.023	–0.048	0.140			–0.016	0.045
Long-term interest rate on corporate loans indexed to f/c	0.022	1.057					0.010	0.487
Interest rates on housing loans			0.000	0.014			0.000	0.003
Unemployment rate	–0.022	0.227	–0.004	0.040	–0.020	0.208	–0.017	0.175
EUR/HRK and CHF/HRK weighted exchange rate			–0.020	0.415	–0.026	0.480	–0.012	0.243
EURIBOR					–0.010	0.437	–0.003	0.128
Total (including the constant component and dummy variables)	4.638	13.460	0.353	1.033	0.462	1.892	2.359	7.009

Source: CNB calculations.

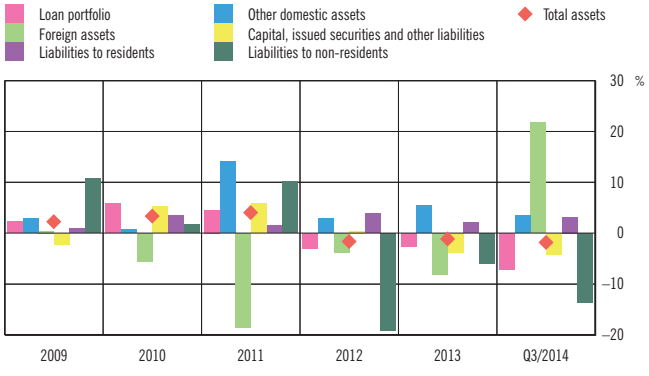
Banking sector

Figure 69 Selected developments in the banking sector



Source: CNB.

Figure 70 Year-on-year growth in major banking sector balance sheet items



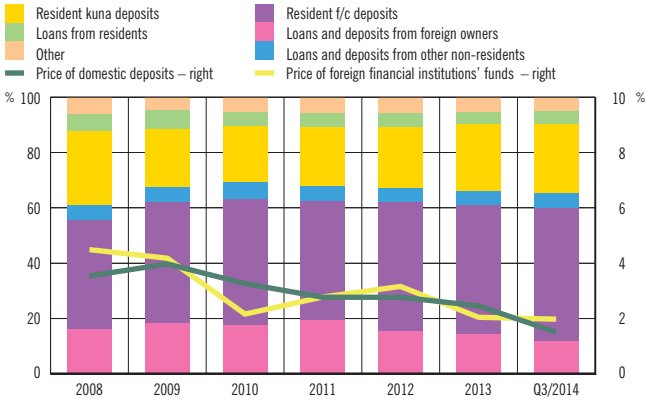
Source: CNB.

Further unfavourable macroeconomic developments, coupled with a poor demand for loans and a further fall in asset quality, make it more difficult to find business strategies that would halt a further fall in the assets and earnings of banks. In the environment of continued materialisation of credit risk and slow resolution of the issue of the existing non-performing loans, the banking sector has become more concentrated and the share of banks in the financial markets has continued to decline (Figure 69). The poor demand on the domestic market resulted in banks' investments in liquid assets and their further deleveraging in relation to foreign owners thus reducing net exposure to them to pre-crisis levels.

Balance sheet vulnerabilities

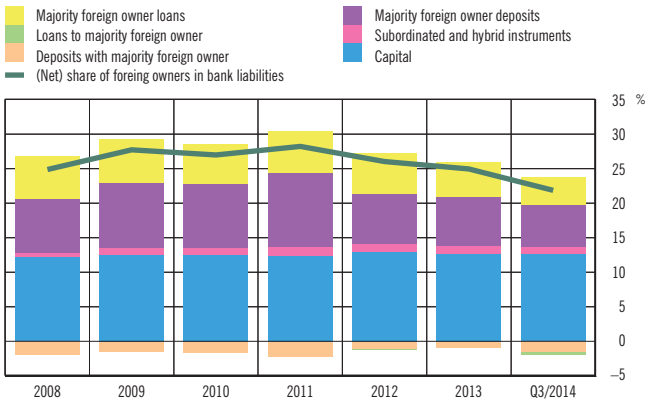
The banks channelled almost the entire inflow of funds from domestic sources of financing, which in the first nine months exceeded the trends usual for the season, to foreign assets, and further deleveraged with respect to foreign owners (Figures 70 and 71). The growth in household deposits, the most stable source of financing of banks since the beginning of the crisis, slowed down over the past year to the level of deposit interest rate which suggests the actual absence of any new inflows. By contrast, the increase in corporate deposits, whose share in total deposits fell steadily during the crisis, was primarily the result of borrowing by public enterprises and temporary deposits in the transaction accounts with the banks during the observed period.

Figure 71 Structure and price of banking sector liabilities



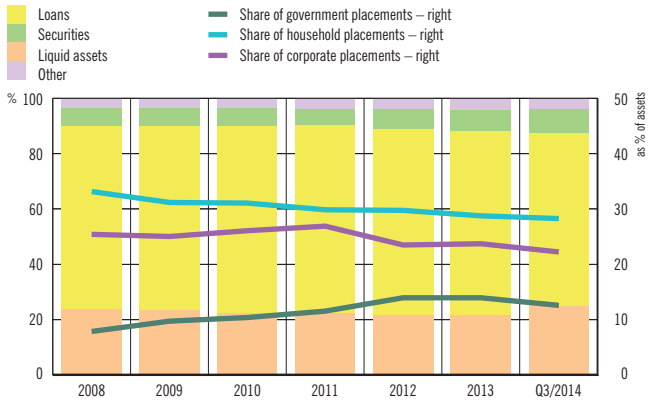
Source: CNB.

Figure 72 Net financial position of banks with respect to foreign owners



Source: CNB.

Figure 73 Banking sector assets



Source: CNB.

The temporary character of the newly received deposits of the private sector encourages banks to invest predominantly in liquid forms of foreign assets. By doing so, the banks avoid exposures to refinancing and liquidity risks. However, the reasons behind the absence of maturity transformation from short-term to long-term assets of banks also lie in poor demand of the private sector reflecting the standards for granting loans applicable in the period of prolonged recession (Figure 70). As a result, the total assets of banks fell by 1.9% on an annual level in September 2014.

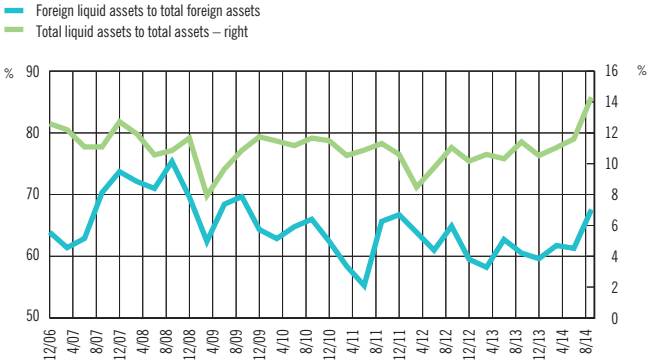
The return of some deposits and loans to foreign owners continued the downward trend of the share of these owners in the liabilities of banks with the result that at the end of September their (net) share in the balance sheets of banks fell to 20.7%, or to the pre-crisis level. The banks used some of the currently cheap and available domestic sources to reduce their liabilities towards the foreign owners, thus contributing to capital management and reduction of capital costs on the level of financial groups within which they operate. Loans granted to majority foreign owners also rose during the observed period, a development which in economic terms represents a form of bank deleveraging and not credit activity. The banks partly compensated for the reduction in the share of owners in the liabilities of banks by increasing the share of deposits from other non-residents (Figure 72).

As a result, the indicators of bank liquidity rose sharply (Figure 74). However, the increase in bank liquidity, normally favourable from the standpoint of financial stability, mainly also derives from the inability of banks to perform maturity transformation and channel the funds to the private sector. Therefore, technically, the impediment to credit growth does not lie in the present structure of the balance sheets of banks but in the expectations of banks and clients regarding future developments and their risk aversion[8]. The absence of maturity transformation also reduced maturity mismatches between assets and liabilities of banks (Figure 75). Although smaller mismatch may seem to pose a lower risk for the banks, it is the maturity transformation that is the key to banks' operations so the fall in mismatches is only a reflection of their risk aversion and the poor demand of the private sector. The inability of banks to "open" the difference between assets and liabilities mirrors their inability to formulate a long-term strategy under the existing conditions, which causes stagnation of their closed as well as their low income-generating balance sheets and growing risk of inertia, which is only slightly offset by deleveraging abroad.

On the asset side, the behaviour of banks continues to be based on the crisis pattern of behaviour, as manifested by the growing share of the government in bank assets. The fall in loans to the government in the third quarter was temporary and was compensated for by new borrowing in October. At the same time, debt securities, mostly issued by the domestic government, were the only form of assets that grew steadily throughout the

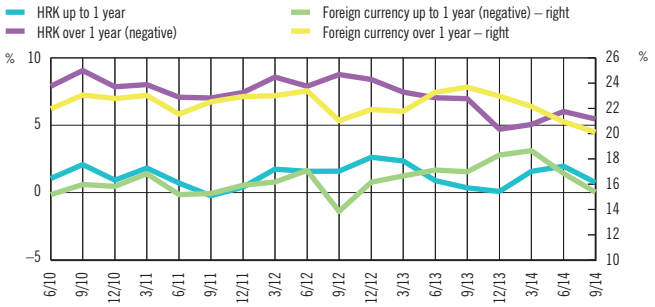
8 For more details on this topic, see Box 1 Determinants of credit supply and demand of households and corporates.

Figure 74 Liquidity indicators



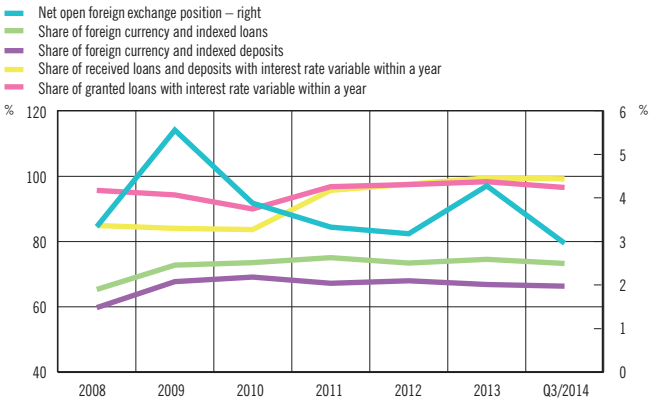
Source: CNB.

Figure 75 Cumulative mismatch of assets and liabilities, by currency and maturity, absolute values, as % of assets



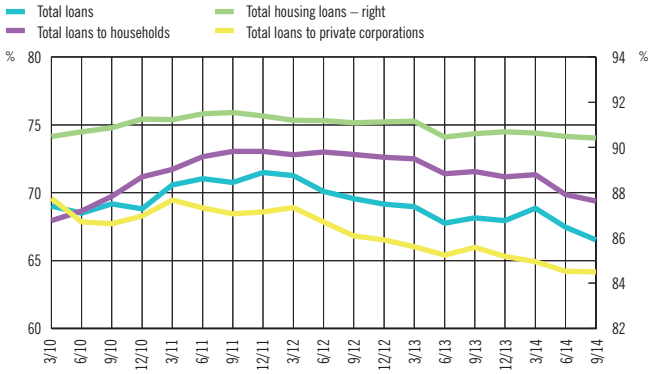
Note: Cumulative mismatch of assets and liabilities is the absolute difference between total assets and total liabilities with maturity of up to 1 year or over 1 year. Due to graphic presentation, it is shown in absolute values.
Source: CNB.

Figure 76 Bank exposure to direct risks



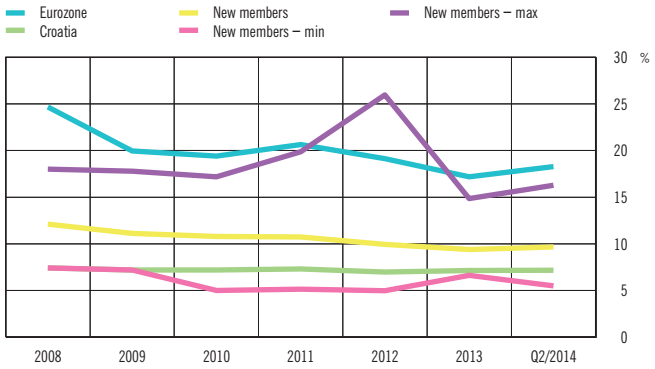
Source: CNB.

Figure 77 Share of unhedged loans in total loans exposed to CICR



Source: CNB.

Figure 78 International comparison of the use of financial leverage



Note: New members are countries that accessed the EU during and after 2004.
Source: ECB.

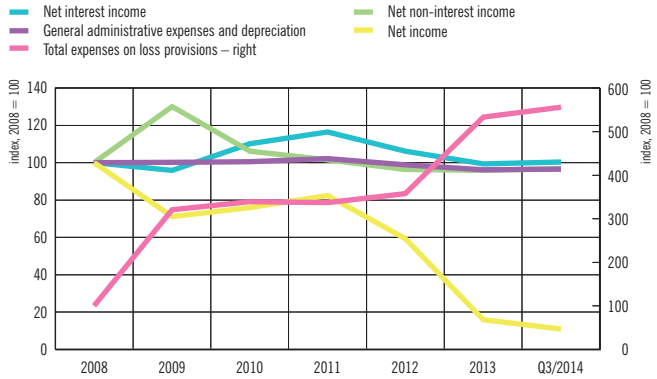
crisis. At the same time, private sector deleveraging, coupled with deterioration in the quality of placements to this sector led to a fall in their share in the assets of banks (Figure 73).[9]

Continued deleveraging of the private sector, coupled with a concomitant temporary fall in loans to the government, led to a fall in the credit portfolio of banks. The fall in loans, though only temporary, nevertheless points to the large influence the government sector has on the credit portfolio of banks and banks' balance sheets in general. The next period might see a change in the relationship between the banks and the government due to restrictions associated with the excessive deficit procedure.

In the period of loan stagnation and a small growth in deposits, banks' exposure to direct currency and interest rate risk re-

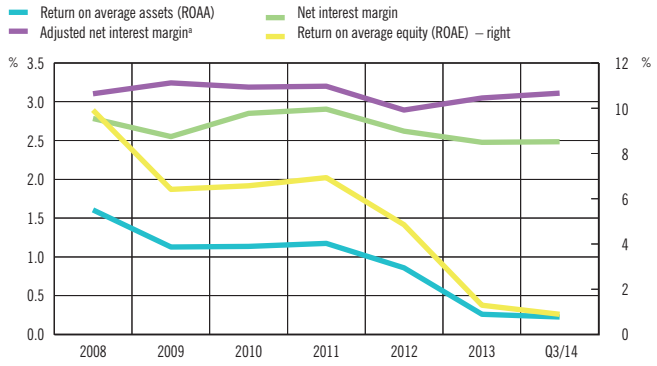
9 For more details on this topic, see the chapters Household sector and Non-financial corporate sector.

Figure 79 Change in selected business performance indicators



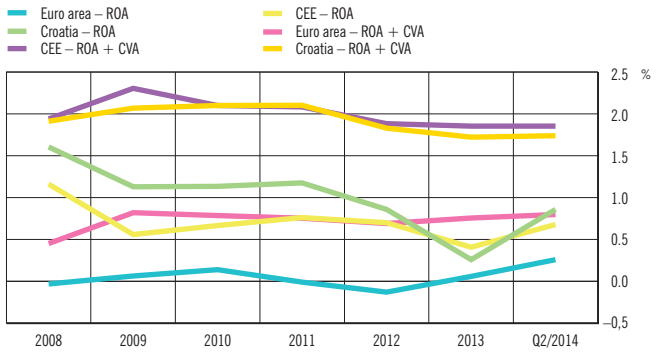
Source: CNB.

Figure 80 Indicators of returns



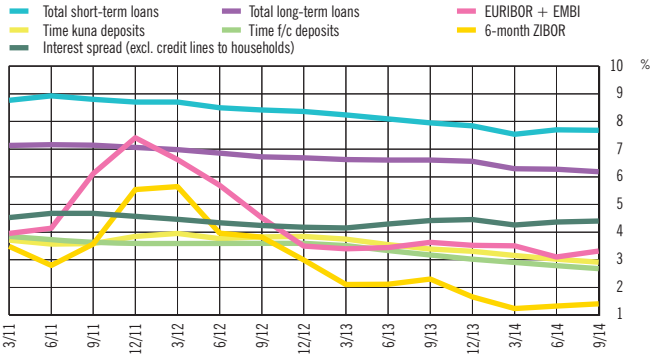
[a] Net interest income of banks is adjusted by income from trading activity and calculated exchange rate gains and losses.
Source: CNB.

Figure 81 International comparison of raw and modified data on return on assets (ROA)



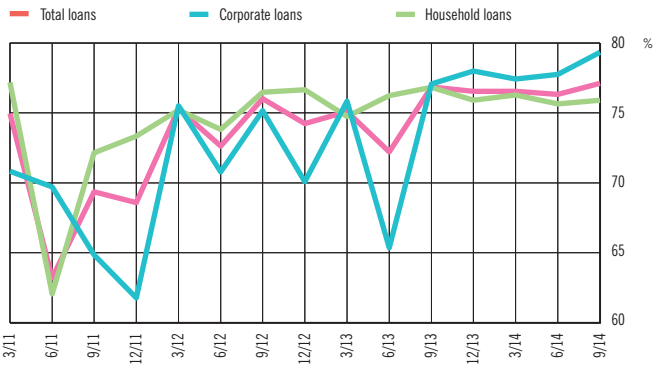
Note: ROA is modified by adding charges for value adjustments in order to estimate the operational efficiency of banks. For a group of countries, indicators are calculated as simple averages.
Source: ECB.

Figure 82 Selected interest rates (quarterly average of monthly interest rates)



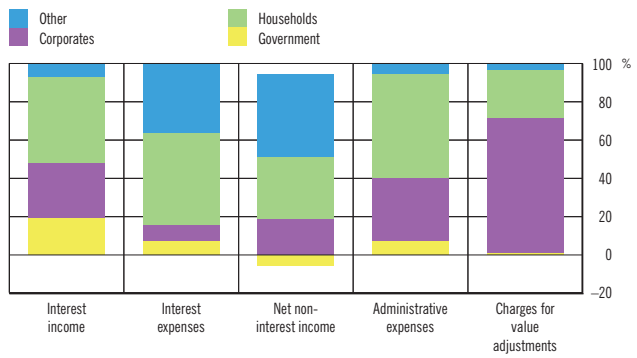
Note: Methodological break in bank interest rates series after January 2011.
Source: CNB.

Figure 83 Share of short-term loans in total newly-granted loans (quarterly average)



Source: CNB.

Figure 84 Structure of banks' net operating income by sectors, in the first nine months of 2014



Note: Administrative expenses by sectors are estimated.
Source: CNB.

mained stable and low (Figure 76). However, their exposure to CICR remained large despite a small fall over the observed period (Figure 77). A small fall in the exposure to CICR was the result of an increase in short-term kuna loans to the private sector and not to any increase in its protection against the currency risk.

When compared internationally, Croatia continues to belong to a group of countries in which the banking sector uses the financial leverage to a relatively small degree (Figure 78). However, the macroeconomic performances in Croatia (chapter: Macroeconomic environment) are significatelly weaker than in other EU countries, which might result in leverage growth in Croatia due to capital erosion as a result of asset deterioration. However, the pressure on the capital of banks will continue over the next period, both on account of credit risk and the pressure coming from the owners. Namely, the high country risk premium raises the cost of bank principal while the prospects for generating earnings on the existing balance sheets are weak. As a result, and in contrast with the countries of origin of owners of the banks in Croatia where leverage was reduced by recapitalisation, the share of owners in the liabilities of banks in Croatia is falling. Even though this fall still relates primarily to liabilities, in the first nine months of 2014, the banks paid out to the owners HRK 1.8bn in dividends, the amount which equals 250% of last year's earnings.

Strategic risks[10]

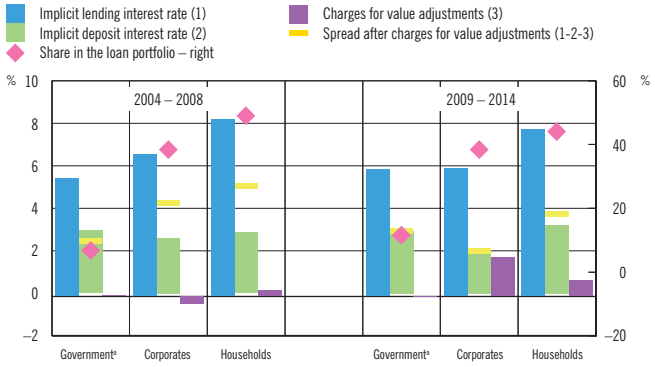
The careful management of the balance sheet structure and operating expenses already mentioned resulted in banks still having a solid net operating income; accordingly, their earnings were determined by developments in charges for value adjustments (Figure 79). After rising sharply in 2013, these charges held steady at a high level, influenced by inflows of new non-performing loans, but mainly as a result of growth in coverage of the existing non-performing loans (see Box 4 A new approach to the decomposition of return on bank assets).

The net interest margin of banks held steady at levels similar to those in the crisis period, while the indicators of return on average assets (0.2% at end-September 2014) and average equity (0.9% at end-September 2014) held steady at 2013 levels when they had fallen sharply as a result of high charges for value adjustments (Figure 80). A large contribution to keeping the net interest margin stable was also largely made by the currently low deposit interest rates whose downward trend continued into 2014. Given a somewhat faster fall in deposit than lending interest rates, the interest rate spread of banks rose slightly (Figure 82).

The difference between bank profitability before and after charges for value adjustments suggests that the operating profitability of banks in Croatia is equal to its average level in the countries of Central and Eastern Europe. However, the banks in these countries made value adjustments for a major share of non-performing loans sooner. This underlines the importance of prompter resolution of non-performing loans and also suggests that the resolution of this issue will take a little longer in Croatia since economic recovery clearly contributed to profitability of banks in the countries of Central and Eastern Europe (Figure 81).

10 Income statement items until September 2014 were annualised to make them comparable with the preceding whole year periods. This was done by summing up banks' business results in the last quarter of 2013 and the first three quarters of 2014.

Figure 85 Change in bank profitability in various segments of financing in the period of crisis



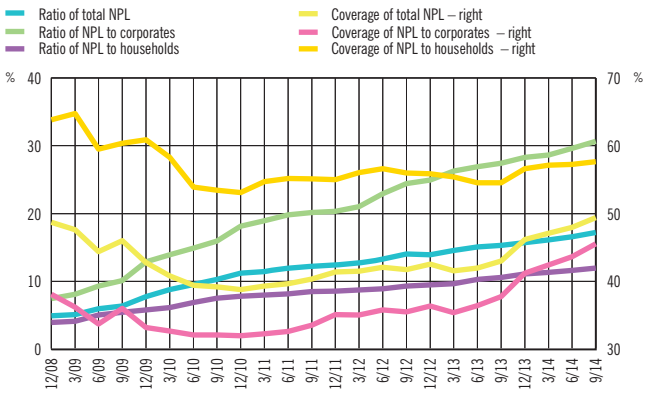
[a] Includes loans and debt securities for the central government, local government and social security funds.
Source: CNB.

The differences in the profitability of banks in Croatia arise to a great extent from credit portfolio diversification. Households are again the key sector for the banks, which is the result of cheaper sources of funds and relatively high implicit rates achieved after charges for value adjustments. However, as the importance of households also lies in related sales, this sector is also important for generating non-interest income. However, the household sector requires a distribution network and possession of physical assets to which the economy of scale is applied. The government, as the next most profitable sector and the only sector that is not deleveraging currently, also requires balance sheet strength since government borrowing generally takes the form of a smaller number of larger loans (Figures 84 and 85).

Under the circumstances of poor demand for long-term placements, it is difficult for the banks to formulate a strategy that would enable long-term profitability. Namely, since the beginning of the crisis, the banks' efforts were focused on optimisation on the liabilities side, with growing risk aversion on the asset side.

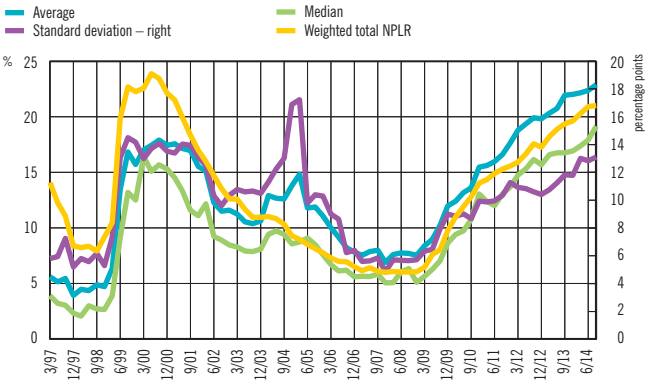
The fall in lending interest rates over the past several years reduced the burden of private sector debt repayment; however, the risks still present with bank clients pose potential credit risk for the banks (Figure 82). The disposable income of the household sector declined in the past three years, so the fall in this sector's debt repayment burden resulted exclusively from its deleveraging. By contrast, the risk of the corporate sector has held steady for several years and the ever increasing share of financing of current corporate needs bespeaks its reduced investment activity that would enable easier debt repayment in the future (Figure 83 and the chapters Household sector and Non-financial corporate sector).

Figure 86 Ratio of non-performing loans to total loans by sectors



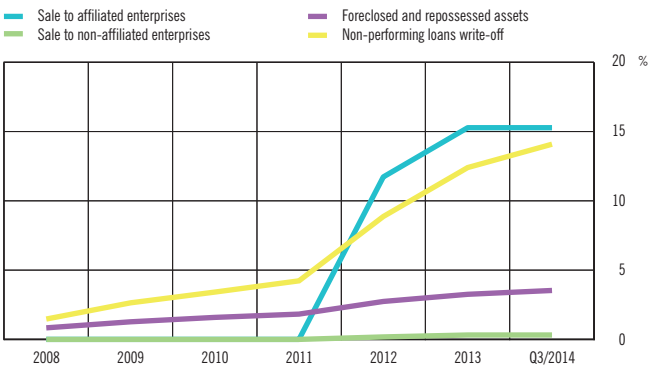
Source: CNB.

Figure 87 Distribution of the ratio of non-performing loans



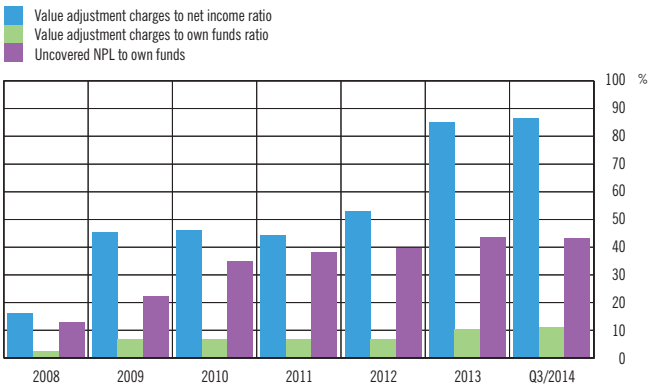
Source: CNB.

Figure 88 Resolution of the issue of non-performing loans in banks, cumulative as % of non-performing loans at end-September 2014



Source: CNB.

Figure 89 Burden of value adjustment charges on bank income and capital



Source: CNB.

Credit risk and capital adequacy

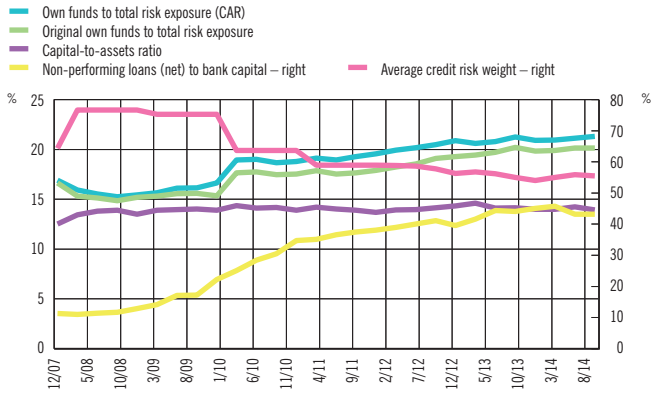
Over a prolonged period of recession, the share of non-performing loans grew steadily in accordance with expectations, reaching 17.2% at the end of September 2014 (Figure 86). Also, as a result of significant differences in the quality of individual segments of credit portfolios[11] and the possibilities of their diversification, the differences in the quality of loans between the banks continued to grow (Figure 87). So, despite a somewhat larger contribution of the household sector (the share of non-performing loans at the end of September 2014 was 12.0%) in the past year, the corporate sector (the share of non-performing loans was 30.6% at the end of September 2014) again had a dominant effect on aggregate indicators of credit portfolio quality. Given that no significant improvements in macroeconomic developments are expected in the forthcoming period, the share of non-performing loans will probably continue to grow which will require increased efforts towards the resolution of the issue of non-performing loans.

The coverage of non-performing loans rose to 49.5%, which is the result of developments in all the categories, but primarily those in the corporate sector. After the end of 2013 when the coverage rose as a result of amendments to the Decision on the classification of placements and banks' preparations for asset quality review of European banks (AQR), the coverage of non-performing loans continued to grow as was announced in previous issues of this publication, as a result of ageing of existing non-performing loans, which have become the most important determinant of the developments in bank earnings (Figure 86 and Box 4 A new approach to the decomposition of return on bank assets).

The results of non-performing loans resolution policies have been modest so far. In the corporate segment, pre-bankrupt-

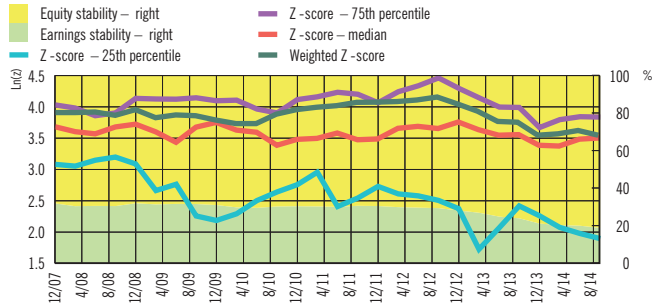
11 For more details on this topic, see Box 2 Macroeconomic credit risk models for the corporate and household sector.

Figure 90 Capital adequacy ratios



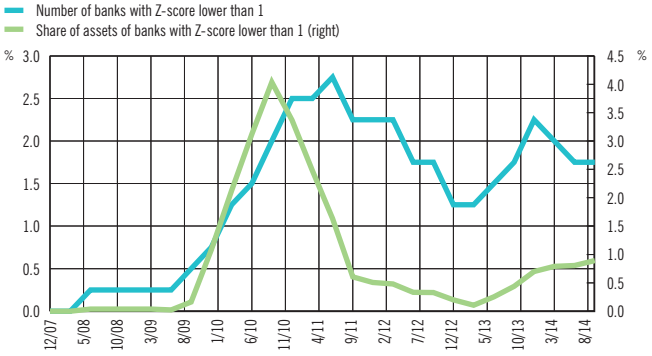
Source: CNB.

Figure 91 Structure and distribution of Z-score



The Z-score is a widely accepted indicator of the individual stability of banks and is calculated as: $Z=(k+\mu)/\sigma$ in which k is the equity and assets ratio, μ is the average indicator of ROA (in the last two years) and σ is the volatility of earnings (standard deviation of profitability of assets for the last two years). A higher score denotes a higher stability of the bank, i.e. a lower risk of bank failure. Also, the score can be divided into two components: earnings stability index and equity stability index.
Source: CNB.

Figure 92 Average number and share of assets of banks with a weakened solvency in the last year



Note: The value of Z-score of 1 was set as the threshold of a weakened solvency of banks. At this value, the level of earnings volatility is 100% of the sum of equity and bank's earnings which should provide hedge against this volatility.
Source: CNB.

cy agreements have so far not resulted in any significant improvement in corporate sector performances and the position of banks and other creditors with secured claims may be improved only after improvement in the operational results of the restructured corporates.

The resolution of the issue of non-performing loans can be achieved by improvement in the macroeconomic situation and the ensuing credit growth which would lead to dilution in the share of non-performing loans but the banks themselves can also make some contribution in this regard. In addition to loan rescheduling activities, since the beginning of the crisis the banks have cumulatively sold, written-off or taken over collateral for some 33% of non-performing loans from end-2014. Had there been no such activities, the share of non-performing loans would today stand at approximately 20% (Figure 88).

The coverage of non-performing loans kept the charges for value adjustments at slightly lower levels than those reported in the previous year (Figure 89). In current earnings, these expenses accounted for approximately 80% of net income. The increase in the coverage of non-performing loans protected the capital of banks against the potential shock of uncovered non-performing loans (Figure 90). As a result, current earnings, though largely exhausted by a fall in the scope of operations and poorer interest collection, are still capable of providing capital protection.

The importance of capital protection becomes clearer if we take into account a small fall in the capital to assets ratio to below 14% for the first time since the crisis. The pressure on the capital of banks comes not only from credit risk but also from dividend payouts to owners as well as a fall in loans and deposits. Account should be taken of the fact that the increase in capital adequacy in the past six years is almost entirely due to methodological changes and the fall in the average credit risk weight and only slightly to the inflow of new capital (Figure 90).

The described developments in the banking sector are also reflected in medial bank stability which, measured by insolvency risk, held steady at end-2013 level, while the gaps between the banks continued to widen (Figure 91). The fall in Z-score in the past two years was mostly due to a fall in the stability of bank earnings, in contrast with the stability of the equity, the component that traditionally had the biggest positive effect on total stability, which remained high. However, at the same time the number and the share of banks with a Z-score below the defined threshold of weakened solvency was slightly higher than in 2013 (Figure 92).

Box 3 Introduction of a countercyclical capital buffer

At the beginning of this year the CNB started formally monitoring systemic risks of a cyclical nature in Croatia that might possibly have a negative effect on the financial stability of the system[1]. It will, in the process, in accordance with its macroprudential policy and the recommendations of the ESRB[2], regularly monitor the evolution of possible imbalances in private sector funding needs and publish on a quarterly basis the buffer guides (CCB_{ref}), i.e. the legally prescribed countercyclical capital buffer rates (CCB). Given the fact that the Croatian economy is still in the contraction phase of the economic cycle, there is currently no need for this capital requirement so on 1 January 2015, the zero CCB rate was introduced with the initial period of application of 12 months[3]. Presented below is a short overview of the analytical basis for such a decision.

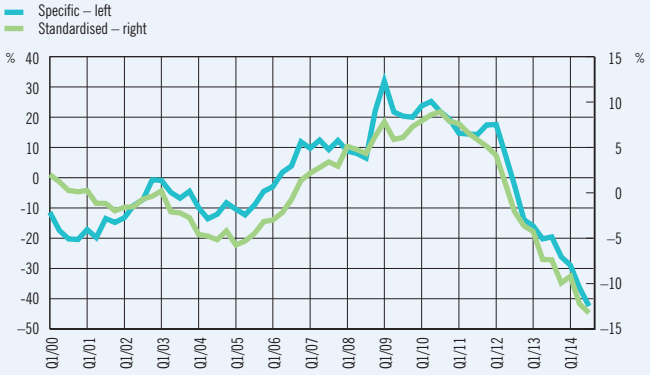
The process of private sector deleveraging in the Republic of Croatia continued into the second quarter of 2014, particularly in the household sector, driven by unfavourable developments in the labour market and uncertainties. In such a situation, the long-term consumption that might generate new borrowing is deferred. The trend of further deleveraging can also be seen in the corporate sector, despite a slight relaxation of the lending standards of banks. As a result, the standardised credit-to-GDP ratio held steady at the pre-crisis levels. The gap in the relative indebtedness, i.e. the departure of the loan to GDP ratio from a long-term trend, calculated on the basis of this ratio is negative and exceeds the level of –10%, which clearly points to the current absence of any risks of excessive lending that would have systemic consequences on the functioning of the financial markets with potential negative consequences to real economic developments. The CCB_{ref} thus stands at 0%. This is also confirmed by specific indicators of relative indebtedness (based on a narrower definition of loans that excludes direct cross-border financing (Figures 1 and 2), which historically signalled more precisely such disturbances (for more details, see Box 4 Financial cycles and countercyclical capital buffer calibration, *Financial Stability*, No. 13, July 2014).

Nevertheless, one should be aware of some specific features associated with the use of this instrument, which are reflected primarily in two dimensions: (i) it is a variable capital requirement, the amount of which reflects excessive growth of loans to the private sector and, (ii) its individual use is not linear as each credit institution calculates the specific rate of the countercyclical capital (CCB_{spec}) it uses, which depends on the distribution of their relevant exposure[4] in individual countries (E_i) and the legally prescribed rates in those countries[5]:

$$CCB_{spec} = \sum_{i=1}^{n} CCB_i * (E_i / \sum_{i=1}^{n} E_i)$$

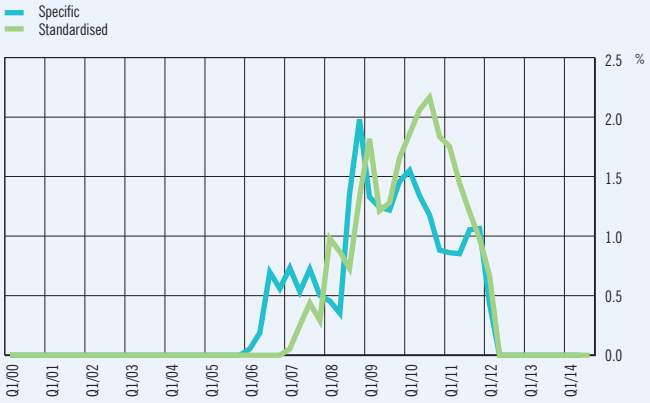
In other words, future volatility in the domestic and foreign markets may induce different variations in countercyclical capital buffers of individual institutions, due to the differences in exposures to these risks, i.e. due to potential imbalances in international cycles and changes in the geographical distribution of exposures of each of them. However, if a relatively large geographical concentration of exposures of domestic

Figure 1 Relative deviation of the credit-to-GDP ratio from its long-term trend (gap)



Source: CNB.

Figure 2 Buffer guide (CC*Bref*)



Source: CNB.

1 The Credit Institutions Act (Official Gazette 159/2013) and the Decision on the countercyclical buffer rate (Official Gazette 9/2015).

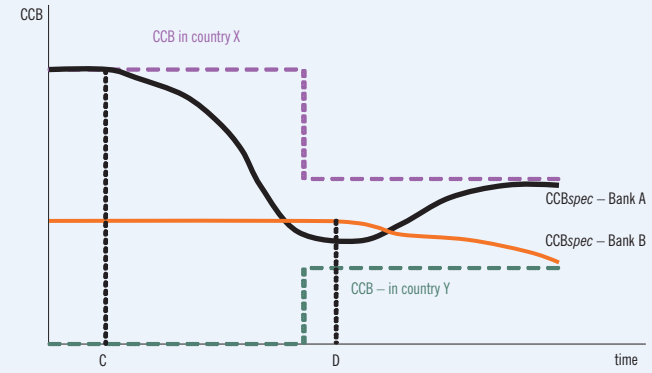
2 This relates in particular to the Recommendation of the European Systemic Risk Board of 18 June 2014 on guidance for setting countercyclical buffer rates (ESRB/2014/1), Recommendation of the European Systemic Risk Board of 4 April 2013 on intermediate objectives and instruments of macro-prudential policy (ESRB/2013/1) and Recommendation of the European Systemic Risk Board of 21 September 2011 on lending in foreign currencies (ESRB/2011/1).

3 The CNB is obligated to monitor regularly the evolution of risks and revise on a quarterly basis the buffer guides (CCB_{ref}), depending on the developments in the credit market and, unless prompt application of a rate is justified, the period for its application is twelve months from the date of its publication.

4 Relevant exposures comprise all exposures except those towards the government sector, international organisations, credit institutions and financial institutions.

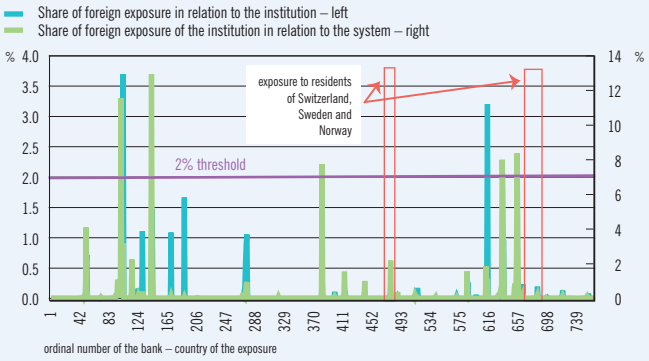
5 Decision on capital buffers and capital conservation measures (Official Gazette 8/2014).

Figure 3 Hypothetical effects of changes in the geographical distribution of relevant exposures on individual credit institutions



Source: CNB.

Figure 4 Estimate of the geographical distribution of relevant exposures of domestic credit institutions in terms of the materiality threshold (as at 30 November 2014)



Source: CNB.

credit institutions to residents is taken into account, no significant differences in the applied rates will be expected. Still, differences in the rates might have a significant impact on capital requirements of large parent international banks, some of which are also operating in Croatia. Using the illustration shown in Figure 3, one can picture a situation in which bank A operating in country X has exposures concentrated in the domestic market up to moment C and that is why there is no difference in the percentage of allocation of capital for these risks compared to the legally prescribed rate. However, were it to reduce lending to entities in country X during a period from C to D by reallocation of the funds towards demand in country Y with more stable operating conditions during the observed period (implicitly measured by the ratio of the rates of capital buffers in these two countries), there would be a gradual reduction in the regulatory cost in the form of the capital buffer. By contrast, bank B, also operating in country X, the business models and risk profiles of which are associated with a balanced geographical structure of clients over that entire period (until point D), would allocate a percentage of capital which corresponds to the average rate prescribed in these two countries.

Given the obvious manoeuvring space for arbitrage, particularly in the transitional period (until 2018) during which the national regulators are at liberty to recognise the rates of other national regulators, regardless of their size[6], the recommendation of the ESRB is to respect the principle of reciprocity, i.e. to recognise and apply all the rates prescribed by the national regulators.

However, the described specificities do not have any effect on variable capital requirements for credit institutions in Croatia. The first reason for this lies in the fact that credit growth is very slow in other European countries too, so that Great Britain, the Czech Republic and Slovakia have also introduced zero CCB rates. The second reason for this lies in the fact that the CNB did not recognise the countercyclical capital buffer rates prescribed in Switzerland (2%), Sweden (1%) and Norway (1%) since they would only lead to administrative costs given the special treatment of exposures not exceeding the materiality threshold of 2% under regulatory standards of the European Banking Authority[7], i.e. in light of the right given to credit institutions to apply the domestically prescribed rate to small exposures.

The Croatian banking system is generally oriented towards the financing of domestic institutional sectors, mostly through standard credit instruments. The estimate of the geographical distribution of exposures of all credit institutions shows that there are almost no materially significant relevant foreign exposures and that the nature of the two isolated cases where they could be identified (Bosnia and Herzegovina and Slovakia) is such that there is no effective rate that would be recognised and that these exposures do not account for a significant part of total foreign exposures, i.e. that they do not represent a potential channel for the transmission of cyclical shocks even in terms of individual institutions, let alone the system as a whole (Figure 4).

In conclusion, it should be noted that such a system of cyclical risks monitoring will require from the CNB in the future not only estimates of cross-border effects as regards the rates applied in individual countries but also estimates of unbalances and potential cyclical shocks in third countries, should there be an increase in non-resident lending, particularly in the region. Based on these analyses, the CNB would then prescribe on its own the countercyclical capital buffer rates that would apply to such exposures.

6 For more details on the procedures for the recognition of the legally prescribed rates in EU Member States and third countries, see Box 5 Schematic representation of procedures in the implementation of capital buffers, *Financial Stability*, No. 13, July 2014.

7 Commission Delegated Regulation (EU) No 1152/2014 of 4 June 2014 supplementing Directive 2013/36/EU of the European Parliament and of the Council with regard to regulatory technical standards on the identification of the geographical location of the relevant credit exposures for calculating institution-specific countercyclical capital buffer rates (http://eur-lex.europa.eu/legal-content/HR/TXT/PDF/?uri=CELEX-:32014R1152&from=HR).

Box 4 A new approach to the decomposition of return on bank assets

The importance of the analysis of bank earnings stems from the fact that earnings (past and current) are a component part of capital and thus of bank stability.[1] However, as standard decomposition of bank earnings, which comes down to the key elements of profit and loss account (net interest income, net non-interest income, administrative expenses and charges for value adjustments), is not suitable for a detailed analysis of bank profitability, since it does not provide a direct insight into the causal and consequential links between macroeconomic and regulatory framework, business strategy and bank results, a new analytical framework has been developed which makes this possible.

The decomposition[2] of changes in bank profitability enables decomposition of net interest income of banks to the effect of the level of implicit lending interest rate, the effect of the scope of interest rate-bearing assets, the effect of asset quality on interest income on the asset side and the effect of the level of implicit deposit interest rate and the scope of interest rate-bearing liabilities on the liabilities side. Also, the charges for value adjustment have been decomposed to the effect of inflows of new non-performing placements and the effect of growth in the coverage of the existing non-performing placements, while, for the sake of simplicity, net non-interest income and administrative expenses were not decomposed (Figure 1).

Method of decomposing the changes in bank earnings

In the decomposition of interest income (i.e. expenses), the effect of scope was quantified by multiplying the changes in the scope of interest rate-bearing assets (liabilities) by the average implicit lending (deposit) interest rate in the observed period, while the effect of interest rate was quantified by multiplying the changes in the implicit lending (deposit) interest rate by the average scope in interest rate-bearing assets (liabilities). In the decomposition of interest income, account should be taken of the effect of asset quality on interest rate income since a larger share of non-performing loans always leads to a lower interest income. This loss in interest income was quantified as an opportunity cost of an unearned implicit interest rate generated on the performing part of the portfolio.

The change in charges for value adjustments was decomposed at the expense of new non-performing loans and expenses on the existing non-performing loans. The expenses on new non-performing loans were approximated using the data from the portfolio of corporate loans, the data for which are available on an individual level, by calculating the average coverage for loans that in a certain year became partly or fully irrecoverable, while the remaining portion of charges for value adjustments was assigned to existing non-performing loans. The use of the calculation for the corporate sector on an aggregate represents an approximation; however, it should be borne in mind that the corporate sector accounts for almost 70% of all non-performing loans, which partly justifies this approach.[3]

The limitations of the analysis lie in the approximations used. Thus, the imputation behind the calculation of the interest income foregone due to credit risk is essentially that the burden of repayment of non-performing loans equals the burden of repayment of performing loans, while in reality it was exactly the heavier burden that could lead to non-repayment. In addition, constant migration of loans across risk categories and loan rescheduling and renewal activities generally make the decomposition of charges for value adjustments more difficult. That is why the decomposition used actually divided these expenses into the effect of net changes in non-performing loans and the effect of a net increase in the coverage of the existing non-performing loans.

Analysis of changes in bank asset yields in the wake of the outbreak of the crisis

The result and the benefit of the new analytical framework can best be illustrated by interpreting developments in the components of bank earnings after the outbreak of the recent crisis. The key element of bank earnings, net interest income, remained stable after the outbreak of the crisis despite initial increase in interest expenses. This is due to a partial spillover of the growth in nominal deposit interest rates to nominal lending interest rates as well as an increase in the share of interest-bearing assets in the total assets of banks, largely driven by expansive monetary policy of the central bank, which in turn made it easier for the banks to manage assets by enabling them to reduce liquidity reserves thus releasing the funds necessary for private sector financing. At the same time, the increase in non-performing loans during the crisis was accompanied by their negative impact on interest income. In 2010, the implicit lending interest rate started to fall,

1 For more details on decomposition of bank stability, see, for instance Box 3 Market power and stability of banks in the countries of Central and Eastern Europe, *Financial Stability*, No. 11, July 2013.

2 A similar approach was used in the Spanish Financial Stability Report where the change in net interest rate spread was decomposed to the effect of interest rates, the effect of balance sheet structure and the effect of scope (*Financial Stability Report*, Banco de Espana, May 2014). Also, in earlier internal analyses of the CNB, approaches were developed which decompose charges for value adjustments to those relating to new non-performing loans and those relating to the existing non-performing loans.

3 In general, the decomposition of changes in total earnings of banks can be illustrated as follows:

$$= \left[\Delta IA \cdot \frac{ILIR + ILIR(-1)}{2} + \frac{IA + IA(-1)}{2}\right] \cdot \Delta ILIR - E\_CR\_II -$$

$$-\left[\Delta IL \cdot \frac{IDIR + IDIR(-1)}{2} + \frac{IL + IL(-1)}{2} \cdot \Delta IDIR\right] + \Delta NNII - \Delta AE -$$

$$-\left[\left(NPL - NPL(-1)\right) \cdot NNPLC + CVA\_ENPL\right]$$

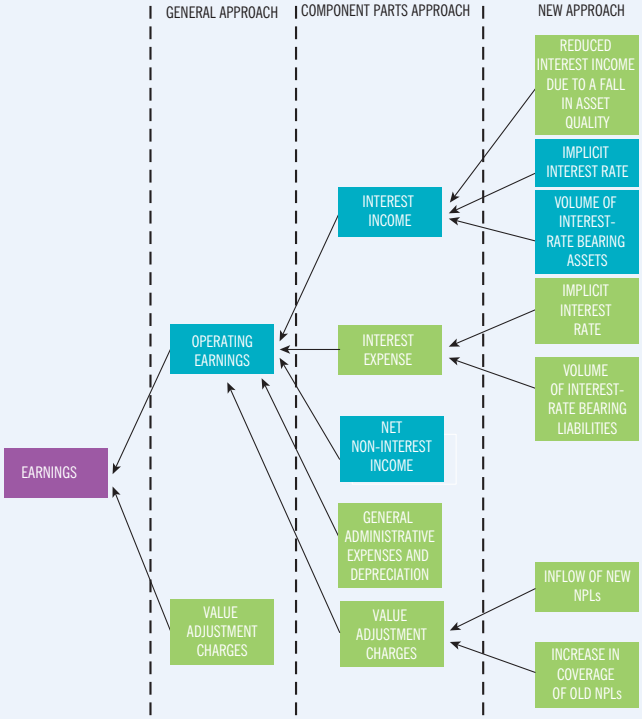
Legend:
IA = interest rate-bearing assets, ILIR = implicit lending interest rate on performing placements, II = interest income, E_CR_II = effect of credit risk on interest income, IL = interest rate-bearing liabilities, IDIR = implicit deposit interest rate, NNII = net non-interest income, AE = administrative expenses, NPL = non-performing loans, NNPLC = new, non-performing loans coverage, CVA_ENPL = charges for value adjustments of the existing non-performing loans.

influenced by a fall in nominal interest rates due to a global fall in risk premiums, which was manifested in a fall in benchmark interest rates and the earlier mentioned activities of the CNB. In addition to a fall in nominal interest rates, the growth in the share of the government in the portfolio (which borrowed at lower rates than the private sector) also contributed to the fall in the realised (implicit) lending interest rates. In the period that followed, none of the components of interest income had a positive contribution to bank earnings, while loan quality worsening put a pressure on interest income. Still, the fall in implicit deposit rates in 2010 and 2011 contributed to a further stability in net interest income with falling deposit interest rates (except in the period before the crisis and in 2012 when they rose in accordance with developments in the global risk premiums in the financial markets) and falling interest-bearing liabilities compensating for the fall in interest income, thus enabling a stable interest income since the banks were not able to increase the share of interest-bearing assets.[4]

In the period of favourable developments in deposit interest rates, which eased the pressures on interest income and savings on all administrative expenses, thus relaxing the pressures on net non-interest income, changes in bank earnings were mostly due to developments in the quality of their assets. In 2008, the share of non-performing loans started to rise, turning into significant charges for value adjustments in 2009.[5] However, in the period that followed, most of the increase in charges for value adjustments was the result of an increase in the coverage of the existing non-performing loans and not new non-performing loans. The increase in charges on the coverage of the existing non-performing loans was particularly noticeable in 2013 when the increase in the coverage of non-performing loans was driven by several factors (amended rules on the classification of placements, the preparation of banks and their owners for the implementation of the asset quality review of European banks – AQR, etc.) (Figure 2).

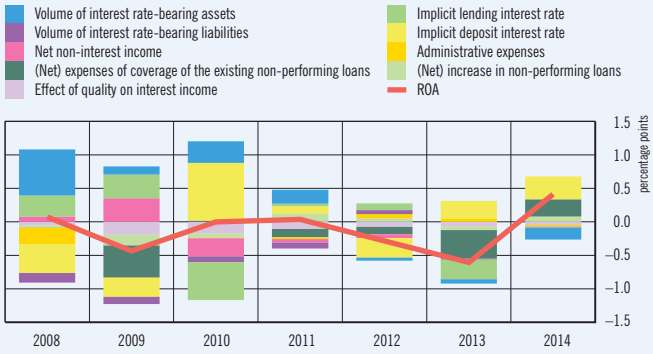
Therefore, the operating profitability of banks is only supported by prudent management of administrative expenses and stabilisation of net non-interest income. However, the net interest income of banks was maintained owing to a combination of a decline in the scope of foreign liabilities, deposit interest rate fall and an increase in the share of interest rate-bearing assets as a result of the expansive monetary policy of the central bank. In other words, the stability of bank earnings was maintained owing to a combination of exogenous factors and a somewhat more active bank policy aimed at reducing the costs of financing. In the context of charges for value adjustments, the developments in the profitability of banks after the outbreak of the crisis were primarily affected by expenses associated with the increase in the coverage of the existing non-performing loans which will, judging by the continued growth in the share of non-performing loans in 2014, continue to put pressure on the balance sheets of banks for some time in the future.

Figure 1 Illustration of an approach to decomposition of bank profitability



Sources: HANFA, CNB and CNB calculations.

Figure 2 Decomposed annual change in earnings of banks, as % of assets



Note: Positive numbers suggest an increase in bank earnings. For instance, the positive contribution of implicit deposit interest rates is the result of their reduction and in case of lending interest rates it is their increase.
Source: CNB calculations.

4 The implicit deposit interest rate is actually a weighted average nominal rate at which the banks borrow since the issue of quality is not of relevance in the case of liabilities of banks.

5 Namely, the coverage of a loan in the year when it enters the category of partly or fully irrecoverable loans is approximately 10%, which does not lead to a considerable increase in charges for value adjustments. In the period that follows, the coverage of these loans rises (to 100%), which leads to a significant growth in these charges.

Even though the circumstances in which the banks currently generate solid operating profit (as confirmed also by international comparisons, Figure 13, chapter Banking sector) are favourable in terms of the relatively low deposit interest rates on sufficiently ample domestic sources and a still a stable government demand for loans, there are no guarantees that they will necessarily continue. The expected fall in the deficit of the government, as the major bank client after the crisis and stabilisation or reduction in public debt might lead to a reduction in the need for bank financing. In addition, as shown by analyses of developments in household and corporate sector indebtedness, the banks might be faced with a further fall in these sectors' demand for loans[6] (which was reflected in 2014 in a fall in household and corporate loans) if a slowdown in economic activity persists. Also, any significant disturbances in the financial markets might drive the burden of debt repayment to the banks upwards. Bearing in mind all the above-mentioned factors, the banks' prospects for generating earnings (and thus providing support to stability) are weakened since they would not be able to offset the increase in risks on the liabilities side of the balance sheet by activities on the assets side in the same time frame. Under such circumstances, the banks would have to take a more active role and make bigger changes in their operations, neither of which they were inclined to do before the crisis, and the current circumstances in the domestic market do not make it possible.

6 For more details on this topic, see chapters Household sector and Non-financial corporate sector.

Stress testing of credit institutions

Table 5 Macroeconomic scenarios

Macro scenario	Baseline scenario		Adverse scenario	
Indicators	2015	2016	2015	2016
Financing conditions on the foreign market				
ECB reference rate, %	0.05	0.05	0.05	0.05
EURIBOR (3M), %	0.07	0.07	0.87	0.87
GDP (real growth EU), %	1.50	2.00	–1.50	–0.60
Financing conditions on the domestic market				
Bond yields, change in p.p.	0.14	0.14	1.87	–0.37
Long-term interest rates, change in p.p.	0.00	0.05	0.72	0.42
Short-term interest rates, change in p.p.	0.09	0.04	1.92	–0.61
Money market interest rate, change in p.p.	–0.02	0.00	7.28	–2.60
Exchange rate				
EUR	7.63	7.63	8.39	8.39
CHF	6.25	6.19	7.49	7.49
Real sector				
Investment (private), real (yoy, %)	0.3	2.1	–3.9	–2.2
Personal consumption, real (yoy, %)	0.6	0.2	–2.1	–3.4
GDP, real (yoy, %)	0.2	0.8	–2.0	–2.2
Unemployment rate (%)	19.2	18.9	19.6	20.1
Real estate prices (yoy, %)	3.1	1.2	–1.8	1.2
Consumer prices (yoy, %)	0.0	1.0	1.8	4.0

Source: CNB.

The simulation of stress conditions shows satisfactory resilience of the domestic banking system to withstand highly unlikely but plausible impacts that might spread through interdependent channels in the real and financial spheres, putting a large pressure on their loss absorption capacities. Therefore, the current regulatory measures for the protection against credit, market, liquidity and reputation risks that may be of a systemic nature, seem well calibrated and there is still no need for instrument-tuning towards stricter capital and liquidity requirements.

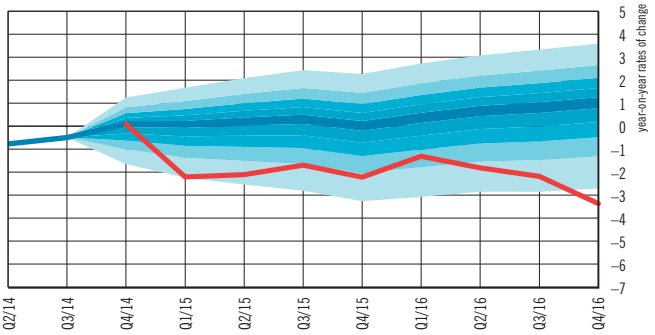
The stability of the financial system depends on the ability of credit institutions to withstand unexpected losses which might be generated by a combination of external shocks and disturbances in the domestic market. Projected for this purpose are the key determinants of their business operations, i.e. solvency and liquidity (credit portfolio and liquid assets quality, earnings, short-term net outflows and risk exposures) under normal and stress conditions.

The expected developments in the economy are based on forecasts used in CNB monetary projection[12], and on the assumption of stable conditions of financing in the foreign markets and a modest recovery of the European economy which is expected to have a positive impact on domestic real activity through growth in exports, despite stagnating capital investments, the absence of any significant increase in private consumption and

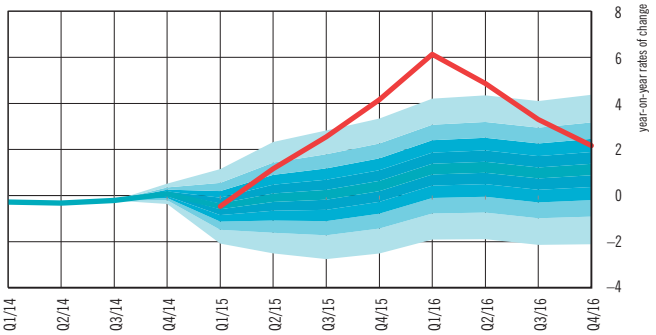
12 *CNB Bulletin*, No. 209, year XX, December 2014 (http://http://www.hnb.hr/publikac/bilten/arhiv/bilten-209/ebilt209.pdf).

Figure 93 Adverse scenario probability

a) GDP dynamics under the adverse scenario relative to the risks of materialisation of the baseline scenario



b) Consumer price dynamics under the adverse scenario relative to the risks of materialisation of the baseline scenario



Note: The baseline scenario is in line with the monetary projection of the CNB; the red colour represents the path of the underlying variable under the adverse scenario.
Source: CNB.

fiscal consolidation. The projection implies further favourable government borrowing in the international markets, at least in the period of general relatively small risk aversion.

The simulation of stress conditions reflects the actually possible sudden decline in the global risk appetite, while the negative effects on economic growth in the American and Asian economies would lead to a new contraction in the economic activity in the euro area, provided the expected effects of the expansive monetary policy of the ECB fail to materialise. The ensuing tensions in the financial markets would push upwards the costs of financing and combine with vulnerabilities in the domestic economy. Namely, the fall in foreign demand would almost instantly lead to a reversal in the projected trends in the domestic economy and a further fall in GDP (under an adverse scenario by 2,1% on average compared to the expected growth of 0.5% on average over a two year horizon). Such consequences would also largely reflect the risk of meeting the fiscal rules under such conditions, which would probably result in an additional increase in fiscal deficit and an increase in risk premium. This implies a yield increase of 187 basis points under the adverse scenario, which implies haircut of the government portfolio of 8% on average, i.e. potential losses on this basis. Following a shock in the first projection year, an inflexion might be expected as a result of initial financial stress calming.

The intensity of that stress under the described scenario would be high and would also be driven by potential capital outflows from peripheral European Union economies. These imbalances would have an impact on foreign exchange liquidity, while growing lack of confidence in the domestic currency would also lead to a significant exchange rate volatility (the exchange rate of the kuna against the euro would rise from 7.63 to 8.39 and the exchange rate of the kuna against the Swiss franc from 6.25 to 7.49) which would take some time for the central bank to reduce. At the same time, the interest rates on the money market would jump, by 728 basis points in the first year of stress, which is comparable with developments at end-2008 and in early 2009, and thus push upwards the costs of financing of the corporate and household sectors, which, though deleveraging, still carry a relatively high debt burden, which in turn weakens the domestic aggregate demand and increases the snowball effect risk. Such developments could also be supported by balance sheet effects due to the still relatively high exposure of the private sector to currency risk. The described circumstances would also lead to reduced demand for residential property and consequential price correction, however small (–0.9%), since the indicators of real estate overvaluation currently do not point to a potential problem of such nature, but certainly point to illiquidity in the real estate market, which continues to reduce their value as an eligible instrument of collateral.

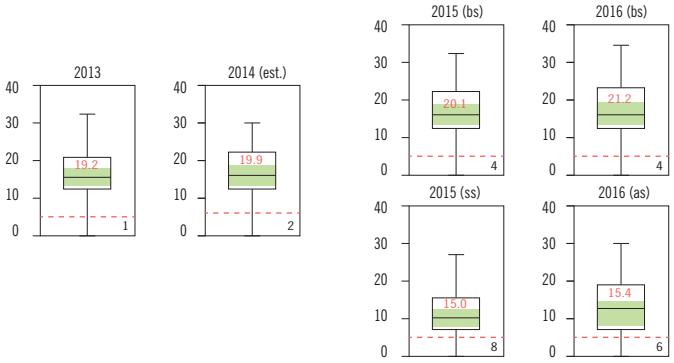
The joint probability of a thus-formulated adverse scenario (quantitative elements are shown in Table 5) is acceptably small, as shown by the probabilities of materialisation of negative risks for the expected economic growth and inflation in the projection horizon (Figure 93 and Box 5 New methodological approach to stress testing). However, it is specific in that it is used in stress testing of institutions which have been operating in recession conditions for several years, which has to an extent contributed to the exhaustion of the capacities of these institutions to absorb new significant potential losses. The net income fell cumulatively by approximately 20% by the end of 2013 (since 2011, when they had first begun to erode) and in 2014 significant dividends were paid out, which had a certain limiting effect on the strengthening of system capitalisation. These effects are asymmetrical as one third of credit institutions continue to report losses. Last year alone, a bankruptcy procedure was initiated in one bank and one bank escaped the procedure through multiple recapitalisations. Acting in the opposite direction were macroprudential measures such as the introduction of a structural systemic risk buffer and supervisory measures which had a positive effect on bank capital due to a stricter risk weight policy. The policy of accelerated provisions introduced towards the end of 2013 also had a similar effect, having prompted the credit institutions to distribute the burden of charges for value adjustments evenly through time. The

international asset quality review also made an initial contribution to this, having increased the coverage of non-performing placements and thus reducing the potential risks of underestimation of losses that may arise as a result of ageing of non-performing placements. The strategic orientation of banks to the financing of fiscal needs stabilised earnings temporarily, helped reduce risky assets and risk weights and improved further their liquidity positions, but opened at the same time a channel for the transmission of potential market risks to capital adequacy and potentially made regulatory liquidity requirements difficult for them to meet.

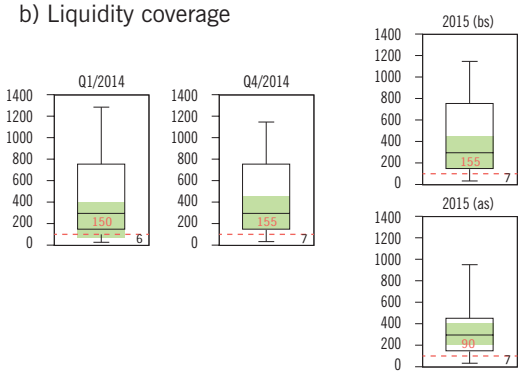
In view of the above-mentioned, both scenarios imply a further deterioration in credit portfolio quality but at a much faster speed under stress conditions (Table 6). Therefore, after an increase in the share of non-performing loans in the first nine months of 2014 from 15.7% to 17.2% (it is estimated that this share will stand at 17.5% at the end of 2014), the expectations are that such a trend will continue. By the end of a two-year horizon, their increase under the baseline scenario might stand at 3.6 percentage points cumulatively (19.5% in 2015 and 21.1% in 2016). This definitely reflects poor economic growth and relatively high imbalances with the related market uncertainties. Under stress conditions, these weaknesses would be more pronounced so that materialisation of credit risk would raise the share of non-performing loans by 4.0 percentage points in 2015 and 4.2 percentage points in 2016, compared to the results under the baseline scenario. By the end of the projection horizon, the share of non-performing placements would thus stand at 25.4%, with the biggest contribution to such dynamics coming from deterioration in corporate portfolio quality. By the end of the projection horizon, the share of non-performing corporate loans would exceed the level of 40% under the baseline scenario, and reach 50% under the adverse scenario. By the end of 2016, the share of non-performing housing loans under the respective scenarios would stand at 9% and 10%, respectively while the share of non-performing consumer loans would stand at 14.1% and 16.5%, respectively.

Figure 94 Solvency and liquidity of credit institutions under the baseline and adverse scenario

a) Capital adequacy



b) Liquidity coverage



Note: a)The red line shows the threshold value of the capital adequacy ratio of common equity tier 1 capital (6.5%), i.e. the liquidity coverage ratio (100%) ; b) The red colour represents the liquidity coverage ratio, i.e. the capital adequacy ratio on system level (based on the consolidated balance sheet, while for individual institutions, the negative accounting values of capital were reduced to zero); c) The number of institutions which have not passed the test (in the solvency and liquidity block) is shown in the lower right angle.
Source: CNB.

Moderate increases in charges for value adjustments under the baseline scenario do not represent a significant burden on the capital of banks as gross earnings provide sufficient buffer, and bank capitalisation continues to grow slowly but steadily: 20.1% in 2015 and 21.2% in 2016. Under the adverse scenario the earnings decline cumulatively in 2015 and 2016 by approximately one third compared to the baseline scenario. Still, the main determinants of capital adequacy under the adverse scenario are additional provisions which increase several times over compared to the expectations. At the same time, the currency shock additionally increases risk exposures. Nevertheless, the domestic banking sector has withstood the simulated

Table 6 Scenario elasticity of the non-performing loans ratio[a]

	Real GDP	Inflation	Exchange rate volatility	Real estate prices	Long-term interest rate on corporate loans	Interest rates on housing loans	Unemployment rate	EURIBOR	Total
Baseline scenario	–0.030	–0.152	–0.010	–0.016	0.010	0.000	–0.017	–0.003	2.359
Adverse scenario	0.212	–1.222	4.605	0.045	0.487	0.003	0.175	0.128	7.009

[a] See Box 2 Macroeconomic credit risk models for the corporate and household sector.
Source: CNB.

impact without much difficulty, even though the testing revealed weaknesses in a number of institutions whose inadequate resilience had already been observed on the stress testing radar. In total, eight credit institutions had capital adequacy ratios below the threshold values, while the system as a whole maintained a satisfactory level of capitalisation, above 15.0% of exposure to risks. The number of those institutions fell in 2016 since the initial shocks were calibrated within a time frame of four quarters, i.e. no new disturbances were induced in the second year of the projection horizon with the result that additional provisions held steady on an acceptably low relative level, even though stress conditions were still present as can be seen in the still reduced level of capitalisation at system level (Figure 94a).

At the same time the number of credit institutions that would not have been able to maintain the liquidity coverage ratio above the threshold of 100% over a period of one year did not change, even though, at system level, the LCR fell towards the end of 2015 to 90% (from the initial 155% estimated in 2014). During that period, in one fifth of credit institutions, surplus liquidity outflows relative to inflows exceeded the value of currently available liquid assets. The initial shocks threatened the most the short-term operations of these, initially vulnerable credit institutions, whose LCR's towards the end of 2015 would mostly be below the threshold of 60%. The biggest decline in the liquidity coefficient was seen in a number of smaller institutions, either due to a relatively high exposure to the government sector or to the growing insolvency risk in stress conditions that reveal their sensitivity to simulated reputation risks and possible runs on deposits. Observed at system level, the reduction in liquid assets, i.e. the decrease in inflows and the increase in outflows, induced by stress on the financial market, would probably be rather balanced, i.e. each of the said components necessary for the calculation of this coefficient would change by approximately 12% in 2015 (Figure 94b).

Based on the conducted stress testing, it can be concluded that the domestic financial system is capable of withstanding highly unlikely but plausible impacts which would spread through interdependent channels in the real and the financial sphere, putting pressure on capital reserves and current liquidity of institutions. It follows that current regulatory measures for the protection against credit, market, liquidity and reputation risks that may be of systemic nature are well calibrated and there is still no need for tuning the instruments towards stricter capital and liquidity requirements, for the quantification of capital deficit within the system shows that it cumulatively does not exceed 0.4% of the weighted assets. On the other hand, the additional liquidity requirement to compensate for the simulated deficits according to the rate of liquidity coverage at system level amounts to only 0.3% of net outflows. Nevertheless, a certain smaller number of credit institutions should make greater efforts in the future to improve their short-term liquidity positions.

Box 5 New methodological approach to stress testing

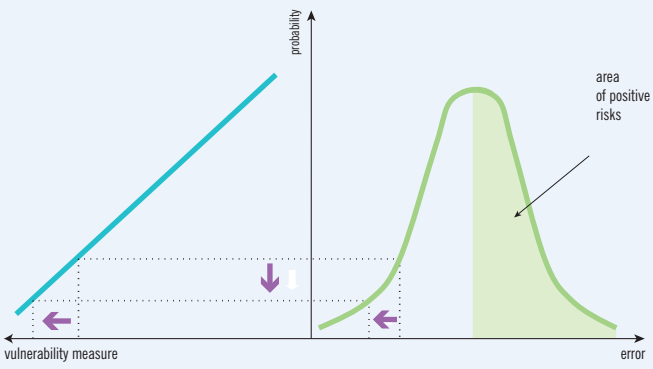
The improvement of the methodological framework for stress testing in 2015 is based on the integration of solvency and liquidity tests (SOLIST) of credit institutions, the third generation of this type of stress testing in the CNB, following separate testing of solvency and liquidity blocks conducted in the previous year, and following the use of solvency tests only in the previous period. This integration takes into account the complexity of financial links in the operation of credit institutions, thus ensuring a more precise estimate of the potential risks and their interplay. This is to a certain extent due to a new approach to the design of a macroeconomic adverse scenario which is the result of combining initial shocks through an econometric model, which ultimately makes it internally consistent and more flexible as it includes a larger number of channels through which developments in a macroeconomic environment may affect the banking sector. Below presented is a brief overview of the characteristics of this approach.

1 Calibration of initial shocks and design of a macroeconomic adverse scenario

The creation of an adverse scenario is essentially an iterative procedure which begins with calibration of the initial shocks based on vulnerabilities identified in the system, which makes the scenario consistent and the entire simulation aligned with analytical estimates of the evolution of risks described in other parts of the publication. Larger vulnerabilities thus determine that a greater shock be selected from the distribution, i.e. the selection of outcomes with lower probability (Figure 1). Such a negative shock may be derived from historical or model-estimated distribution of unfavourable outcomes.

In the case of historical distributions, the calibration of shocks is simpler and more direct, usually at levels of 5% or 1%. For instance, the historical distribution of negative annual changes in real estate prices was thus used for the gradation of the negative shock depending on the degree of overestimation suggested by two indicators: (i) deviation from an equilibrating level of real estate prices and (ii) real estate prices-to-income ratio from long-term average. If the first indicator points to a price overestimation, the level of the shock depends on the signal obtained on the basis of the second (control) indicator. In this way, the intensity of this type of shock changes over time depending on systemic risk accumulation, i.e. in successive stress testing exercises, it will depend on the conditions on the real estate market.

Figure 1 Principle of initial shock calibration



Source: CNB.

In addition to this example, the worst historical outcomes were used, as in the case of the exchange rate of the kuna against the euro which was calibrated in accordance with the stress episode of 1999. At the same time, the Swiss franc exchange rate shock was simulated based on the previously most unfavourable ratio of the Swiss franc to the euro. In other words, unlike the previously mentioned calibration of initial shocks, which depends on the degree of vulnerability, this type of shock remains unchanged in simulations as long as the historical distribution remains unchanged (i.e. until new, greater disturbances emerge).

On the other hand, model-estimated innovations include information on structural relations in the economy and enable separation of long-term from short-term shocks, i.e. facilitate the interpretation of changes in vulnerabilities in connection with potential stress disturbances. The examples are sectoral vulnerability indices (solvency and liquidity risks for households and corporates)[1] which determine the probability of structural shocks to private and investment consumption depending on their level and dynamics. At the same time, the related short-term shocks to investment and private consumption are determined by probability, which depends on a potential abrupt change in sentiment as measured by the levels of business and consumer confidence.

The calibration of the haircut on government bonds is a special case. For this purpose, credit ratings of international credit rating agencies[2], which show a clear correlation with public debt burden, were quantified. Although other factors, in addition to debt burden, also affect changes in ratings, this relationship clearly reflects the so-called inertia or snowball effect, i.e. the mutually conditioned relationship between debt burden, risk perception and yield (borrowing cost) which is quantified and used in the assumption on changes in bond prices.

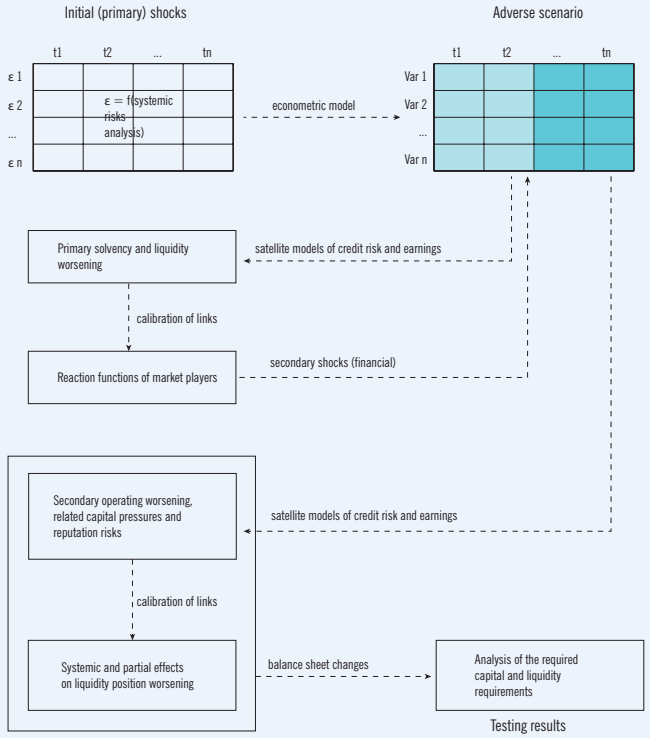
Such a group of initial shocks comprises the exogenous shocks in an econometric model that simultaneously brings together different parts of the economy into a logically consistent whole; the structure of the model is sufficiently rich and flexible for the simulation of a large number of scenarios[3]. The reaction of real and financial variables over a

1 See chapters Household sector and Non-financial corporate sector.

2 The quantification is based on ECB credit rating mapping key, additionally expanded in this approach by information on the expected credit rating development trends.

3 This is a structural macroeconometric model called PACMAN (Policy Analysis Croatian Macroeconomic Model) developed by the Modelling Department of the CNB for the purpose of simulating the effects of economic shocks and economic policy measures on the domestic economy. The model is written in the form of a system of simultaneous equations consisting of 27 behavioural equations and 75 identities and 102 endogenous and 45 exogenous variables.

Figure 2 Simulation process: from shock calibration to capital and liquidity requirements



Source: CNB.

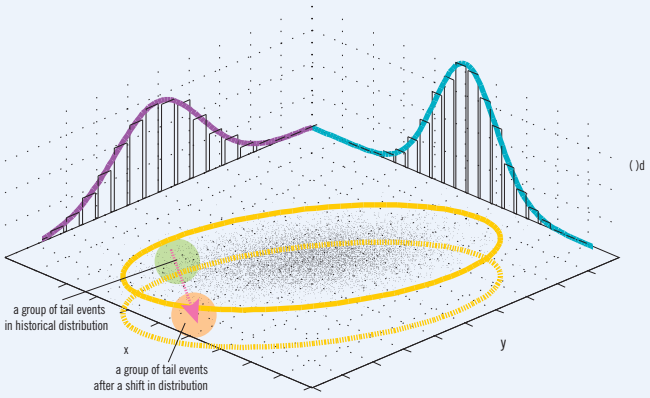
one-year horizon, simulated by means of that model, are determined by primary worsening of capital and liquidity positions (by means of satellite models of credit risk and bank earnings[4]). Their effects on financial markets in return generate a secondary impulse which leads to further worsening of capital ratios and reputation risks, depending on partial elasticities which in some credit institutions implies increased risk of deposit outflow, i.e. financial stress. The reaction of credit institutions implies an increase in deposit rates, depending on the degree of stress (determined by the number of institutions facing difficulties in meeting the liquidity requirements and sensitivity of the deposit base). In the final cycle, the macro scenario is completed and the final impacts on the balance sheets of banks are identified. In this form, the results of stress testing provide an insight into potential structural difficulties of banks that might threaten their operations and thus offer some of the information vital for formulating macroprudential policy and adopting supervisory measures (Figure 2).

4 See Box 2 Macroeconomic credit risk models for the corporate and household sectors, p. 35 and Box 3 Model of net operating income of credit institutions, *Financial Stability*, No. 13, July 2014.

2 Scenario probability

The new macroeconomic scenario, which is by nature much more complex than the isolated shocks used in the second generation of stress testing, features an extremely important characteristic of the probability function which is that the probability of the cross-section of two or more dependent events is always much smaller than the probability of isolated events (as shown by green-shaded area in Figure 3). Given that under the new approach to scenario design, the assumption of the inter-independence of a group of bad outcomes in the economy is no longer valid, this scenario is less probable than those used previously, thus making the whole picture much more realistic. However, it should be noted that, even though hardly conceivable since it always includes events from the tail of distribution, it is possible, as ensured by the described shock calibration.

Figure 3 Calibration of shocks and probability of events under different scenarios



Source: CNB.

Figure 4 Historical losses (impairments) materialised in large financial crises

Source: CNB calculation based on Moody's data.

For instance, the estimate of haircut on government securities comprises a group of available information on historical developments in the economy in stress episodes. By contrast, the catastrophic scenario would imply a shift in the entire probability distribution (as shown by the orange-shaded area in Figure 3) or the use of historical stress events in other economies which have been exposed to extreme shocks and consequential enormous losses.

The implications of the relationship between the stress and the catastrophic scenario can be clearly illustrated by the example of value impairment of a government portfolio. The potential losses under the catastrophic scenario (which could reflect the losses generated in historical episodes of financial crises, shown in Figure 4) are much bigger than those obtained in the simulation (8% on average). However, such an impact would imply extremely strong and difficult to envisage shocks for all other macroeconomic variables, and would probably also alter their relationships, which are commonly modelled or calibrated and therefore make such an analysis almost impossible to carry out.

3 Special operational assumptions

It is also necessary to take into account some special operational assumptions which affect capital adequacy and liquidity coverage calculations within the described stress testing framework, and which partly also include, directly or indirectly, the effects of vulnerabilities previously unmentioned.

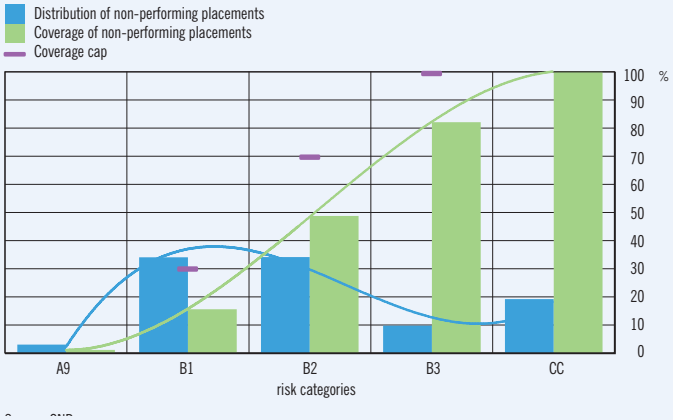
a) Coverage of bad placements

The estimated non-performing placements for individual portfolios on an aggregate level must be transformed in the expected losses of an individual institution due to an increase in sub-standard loans. The kuna amounts of value adjustment charges are obtained based on the assumption on the static balance sheet, i.e. by excluding the potential effects of asset increase (dilution effect), recapitalisation (effects of economic and ownership restructuring) and write-offs or sale of non-performing loans (effects of accounting and legal nature). These amounts are distributed into risk categories for each portfolio based on their historical distribution and provisions based on coverage distributions (Figure 5)[5]. However, this iteration of stress testing also includes the effects of placement ageing on coverage, assuming the increase in coverage over time. This means the abandonment of the earlier used assumption on the linear distribution of additional provisions.

b) Euroisation

The high level of euroisation of the economy poses a threat that will materialise in the event of highly unlikely but strong exchange rate volatility leading directly to a revaluation of foreign currency risk exposure. Indirectly, depreciation has a negative effect on deterioration in the quality of the credit portfolio in satellite models.

Figure 5 Distributions of non-performing placements and provisions of credit institutions (as at 30 September 2014)



c) Elements of solvency and liquidity integration

Credit institutions may also be exposed to different risks because of a specific business strategy, which was taken into account in this approach to stress testing. For example, by investing in government debt securities they improve their liquidity buffers but at the same time they increase exposure to market risks, so that in case of an increase in risk premium and the related price corrections, this buffer may prove to be a source of variation in liquidity ratios as well as a burden for earnings and capitalisation through trade portfolios. However, larger foreign-owned institutions which can reap certain benefits from the international reputation, the size and financial support of the parent, may be exposed to specific external shocks in the event of global financial disturbances, which might motivate their owners to make big profit payouts, reduce surplus capital or withdraw the available credit lines. This may also undermine their capitalisation and increase net outflows in liquidity coverage calculation. All this suggests that a somewhat weaker link between solvency and liquidity positions observable in good times, and which can to an extent be compensated for by stability of income and lower risk weight for exposure to the government, will strengthen in the situation of increased stress and uncertainty.

4 Critical test values

The new methodological approach also includes new test values of solvency and liquidity, i.e. the adequacy rate of the Common Equity Tier 1 capital and the liquidity coverage ratio (LCR). The critical value in

5 The effects of the Decision on the classification of placements and off-balance sheet liabilities of credit institutions which initially increased provisions and accelerated the process of recognition of non-performing loans, starting from end-2013 when a significant adjustment was observed in total value adjustments of approximately HRK 2bn (partly also due to the asset quality review in the context of EBA's stress testing exercise), were previously assessed separately but now are already included in the calculation of these expenses as a result of use of distributions which include new, higher coverage levels.

solvency stress testing of credit institutions stands at 6.5%. In quantitative terms, it equals the regulatory capital requirement of 4.5% increased by 2 percentage points, which is only slightly above the critical limit which implies the activation of early intervention measures (6%)[6].

Although the implementation of the liquidity coverage requirement was envisaged to take place in several phases[7], in the liquidity part, a 100% rate was used as the critical limit of the liquidity coverage ratio, in view of the general high liquidity of the domestic banking system in the past seven years, despite disturbances caused by the crisis. Before stress testing, an approximation of the coverage coefficient was made based on interpolation of a delegated Commission regulation which prescribes in more detail the general requirement for liquidity coverage into the liquidity requirements regulation. In addition to a precise definition of categories included in the calculation of net liquidity outflows, the new Commission regulation also provides an official definition of credit and liquidity lines, and, most importantly, clearly defined rates of outflows, inflows and haircuts associated with high-quality liquid assets which make the liquidity coefficient a stress instrument in itself. In that regard, standard stress conditions have been prescribed[8] which are treated as the baseline scenario in this simulation, while the creation of a macroeconomic adverse scenario is based on greatly worsened conditions which additionally increase the mentioned correction factors in LCRs.

5 Concluding remarks

The new methodological framework for stress testing offers a certain flexibility by ensuring that a broad scope of real and financial variables can be used in the making of an adverse scenario which provides ample room for the quantification of the estimated systemic risks. Such a framework will be regularly improved in all its segments (satellite models, macroeconometric elasticity model, new liquidity coefficient calculation based on revised supervisory data, widening of the of solvency and liquidity blocks integration, etc.). This will make the comparison of stress elements tests conducted in different time periods somewhat more difficult but will contribute to more precise measuring of and focussing on the sources of potential structural and cyclical risks and on the relationship between macroprudential and supervisory measures for the purpose of maintaining the stability of individual institutions and the financial system as a whole.

6 In accordance with Article 27 of Directive 2014/59/EU of the European Parliament and of the Council of 15 May 2014 establishing a framework for the recovery and resolution of credit institutions and investment firms and amending Council Directive 82/891/EEC, and Directives 2001/24/EC, 2002/47/EC, 2004/25/EC, 2005/56/EC, 2007/36/EC, 2011/35/EU, 2012/30/EU and 2013/36/EU, and Regulations (EU) No 1093/2010 and (EU) No 648/2012 of the European Parliament and of the Council.

7 The beginning of gradual implementation of the liquidity coverage requirement has been envisaged to take place in the second half of 2015, with a gradual increase in the rate of application, from 60% to 100% in 2018.

8 Article 5 of Commission Delegated Regulation (EU) No 2015/61 of 10 October 2014 to supplement Regulation (EU) 575/2013 of the European Parliament and of the Council with regard to liquidity coverage requirement for credit institutions (http://ec.europa.eu/internal_market/bank/docs/regcapital/acts/delegated/141010_delegated-act-liquidity-coverage_hr.pdf#141010-liquidity).

A brief commentary on the recent appreciation of the Swiss franc

The abandonment of the policy of the currency peg of the Swiss franc against the euro by the Swiss national bank and the ensuing appreciation of the exchange rate of that currency of 20% generated a shock that would, through a currency-induced credit risk, have a significant impact on the burden of loan repayment for debtors as well as on the quality of bank loans indexed to the Swiss franc.

The Parliament of the Republic of Croatia adopted a temporary measure (for the duration of one year), freezing the exchange rate of the Swiss franc against the kuna at 6.39 from 26 January 2015 for all household loans. The freezing of the exchange rate of the Swiss franc against the euro for all household loans for a period of one year means a loss of income to the banks of approximately HRK 400m. At the same time, however, estimates of the sensitivity of non-performing housing loans quantified on the basis of different specifications of partial credit risk models show that a 20% appreciation of the Swiss franc against the kuna may result, on average, in approximately the same amount of losses for the banks (mainly due to additional provisions), which implies similar costs even in the case where there had not been such a measure.

However, this is a temporary measure, which protects consumers over a period of one year, during which time the available alternatives will have to be examined. By alleviating the debt burden, the new measures to be adopted will be aimed at permanently eliminating the risk of the negative effect of changes in the exchange rate of the Swiss franc. Some of the options are elaborated in a CNB Press Release of 21 January 2015: "Some facts about loans in Swiss francs and some options for government intervention"[13].

Importantly, as shown by the results of stress testing of banks, there are no indications that this currency shock might generate systemic risks through feedback in the economy. The adverse scenario used in this issue of Financial Stability included a significant appreciation of the exchange rate of the Swiss franc against the euro and a strong depreciation of the kuna against the euro, as well as other real and financial shocks, simultaneously creating disturbances exceeding in terms of intensity the isolated shock brought on by the Swiss franc. This is also suggested by the fact that only 8.4% of total loans of the banking sector are denominated or linked to the Swiss franc while 64.2% of total loans or almost eight time more than those denominated in Swiss francs are denominated in the euro. Different modalities of solutions to this problem that will be examined in the forthcoming period might have an effect on the financial stability of the system, which will be closely monitored.

13 http://www.hnb.hr/priopc/epriopc.htm

List of figures and tables

Abbreviations and symbols

Abbreviations

bn	– billion
CAR	– capital adequacy ratio
CBS	– Central Bureau of Statistics
CCE	– Croatian Chamber of Economy
CDCC	– Central Depository & Clearing Company
CDS	– credit default swap
CEE	– Central and Eastern European
CES	– Croatian Employment Service
CICR	– currency-induced credit risk
CIHI	– Croatian Institute for Health Insurance
CM	– Croatian Motorways
CNB	– Croatian National Bank
DAB	– State Agency for Deposit Insurance and Bank Rehabilitation
EAD	– exposure at default
EBA	– European Banking Authority
EC	– European Commission
ECB	– European Central Bank
EFSF	– European Financial Stability Facility
EIZG	– Institute of Economics, Zagreb
EMBI	– Emerging Market Bond Index
EMU	– Economic and Monetary Union
EONIA	– Euro Overnight Index Average
ERM	– Exchange Rate Mechanism
ESM	– European Stability Mechanism
EU	– European Union
EULIBOR	– Euro London Interbank Offered Rate
EUR	– euro
EURIBOR	– Euro Interbank Offered Rate
f/c	– foreign currency
FDI	– foreign direct investment
Fed	– Federal Reserve System
FINA	– Financial Agency
FRA	– Fiscal Responsibility Act
FSI	– financial soundness indicators
GDP	– gross domestic product
GFS	– Government Finance Statistics
HANFA	– Croatian Financial Services Supervisory Agency
HBS	– Household Budget Survey
HH	– households
HREPI	– hedonic real estate price index
HRK	– Croatian kuna
ILO	– International Labour Organization
IMF	– International Monetary Fund
m	– million
MoF	– Ministry of Finance
MRR	– marginal reserve requirements
NFC	– non-financial corporations
NPLR	– ratio of non-performing loans to total loans
OECD	– Organisation for Economic Co-operation and Development
ON USLIBOR	– overnight US dollar London Interbank Offered Rate
pp	– percentage points
RC	– Republic of Croatia
ROAA	– return on average assets
ROAE	– return on average equity
RR	– reserve requirements
SDR	– special drawing rights
yoy	– year-on-year
ZIBOR	– Zagreb Interbank Offered Rate
ZSE	– Zagreb Stock Exchange

Two-letter country codes

BA	– Bosnia and Herzegovina
BG	– Bulgaria
CZ	– Czech Republic
EE	– Estonia
HR	– Croatia
HU	– Hungary
LT	– Lithuania
LV	– Latvia
MK	– The former Yugoslav Republic of Macedonia
PL	– Poland
RO	– Romania
SI	– Slovenia
SK	– Slovak Republic

Symbols

–	– no entry
....	– data not available
0	– value is less than 0.5 of the unit of measure being used
Ø	– average
a, b, c,...	– indicates a note beneath the table and figure
*	– corrected data
( )	– incomplete or insufficiently verified data

ISSN 1847-0017 (online)