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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 in 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 main 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

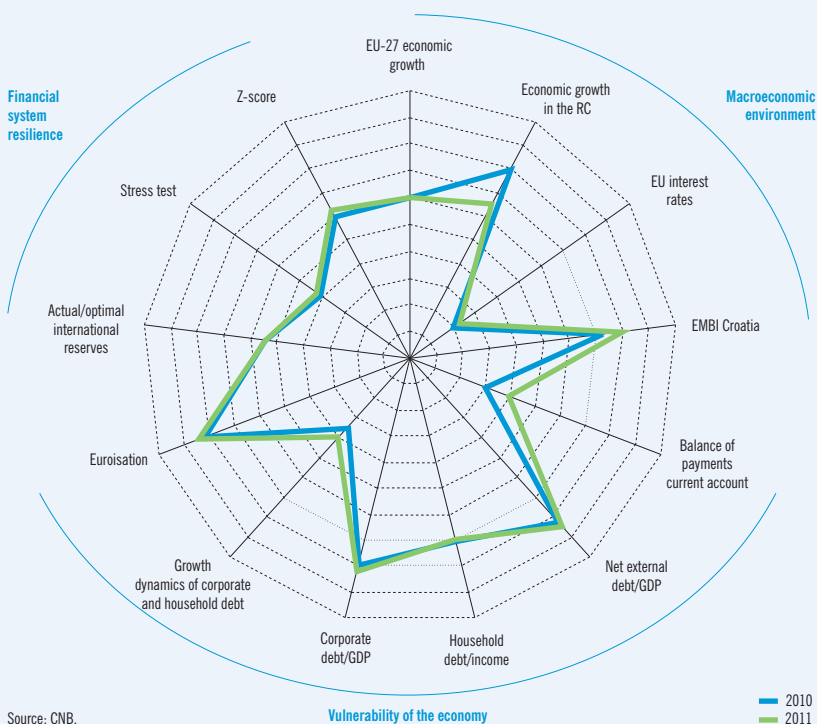
Services Supervisory Agency (HANFA), which are responsible for the regulation and supervision of non-banking financial institutions. Furthermore, owing to the high degree of banking system internationalisation, which is reflected in the foreign ownership of the largest banks, the CNB also cooperates 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 take adequate safeguards should these risks actually occur. It also aims at enhancing the transparency of CNB actions to address the main vulnerabilities and risks and strengthen financial system 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.

Global economic recovery is expected to continue in 2011, but it will be coupled with lingering uncertainties in global financial markets. In view of the high level of debt of domestic private and public sectors, such an international environment will keep risks to financial stability elevated. Available buffers in the form of bank high capitalisation levels and solid international reserves will maintain financial stability in the short run. However, in the long run, it is crucial to reduce macroeconomic vulnerabilities and ease the reallocation of resources on a microeconomic level.

The main financial stability indicators for Croatia are summarised in Figure 1. The financial stability map shows changes in key indicators of the possibility of occurrence of risks related to the domestic and international macroeconomic environment and vulnerability of the domestic economy, as well as indicators of financial system resilience that can eliminate or reduce the costs should such risks materialise. The map shows the most

recent market developments or projections of selected indicators and their values in the comparable period, i.e. the previous year. For each variable, an increase in the distance from the map centre indicates greater risks or system vulnerability and lesser resilience, as well as a greater threat to stability. Hence, an increase in the map area suggests an increase in risks to financial stability, while a decrease in the area suggests a reduction.

The global economy rebounded strongly in 2010 after the deepest recession in the last 70 years, with solid economic growth expected to continue in 2011. However, numerous risks that could threaten this growth dynamics are still present. Growth still hinges on exceptional monetary and fiscal stimuli that are to be withdrawn soon, with an uncertain impact on growth. In addition, the world economic recovery is unevenly distributed across regions and accompanied by pronounced global imbalances. Rising capital inflows in many emerging market economies threaten to create financial bubbles similar to those that triggered the most recent crisis, while growth in some countries continues to be very fragile. These differences are particularly visible in Europe, i.e. between the “core” eurozone countries and “peripheral” eurozone countries, where weak fundamentals in an adverse interaction with a deteriorated public finance situation threaten public debt sustainability.

All this raises uncertainties in financial markets, which could keep the risk aversion of investors elevated and highly volatile in the forthcoming period. A number of actions to rescue the most vulnerable countries, which were taken to secure sufficient time to implement fiscal adjustment programs and put public finances back on a sustainable path, have successfully prevented the crisis from escalating again. However, should markets continue to impose prohibitive financing costs on an increasing number of countries, some costs of their debt restructuring could be transferred to creditors by the remaining EU member states. In the worst case, banks all over Europe would suffer huge losses since they are exposed to risky countries, which would shake up the European banking system again.

In this macroeconomic environment, the gradual economic recovery in Croatia, which began in mid-2010, is expected to continue in 2011, mostly thanks to rising foreign demand. Nevertheless, the ongoing uncertainties in global financial markets and high debt levels of the domestic private and public sectors will keep risks to financial stability high in 2011. As the expected pace of recovery will not be sufficient to reverse the negative trends in the labour market, unemployment will continue to rise. The number of vulnerable households could steadily increase, albeit at a slower rate than in 2010, and household demand for loans could remain relatively weak. With a slight growth in loans, household debt indicators should continue to improve, provided there is no major exchange rate or other shock. Corporate indebtedness is expected to grow at a pace similar to that in 2010, which will moderately increase corporate indebtedness indicators.

A gradual strengthening of domestic demand could widen the current account deficit from that in 2010, reversing the downward trend. Accordingly, external debt will continue to grow in 2011, but the expected economic recovery could slow down the rise in its ratio to GDP. Fiscal expansion will add to the rise in external imbalances, which will further increase the vulnerability of the Croatian economy if adverse scenarios for global financial markets materialise.

The growing number of vulnerable households paired with persistently weak corporate business performance will add to the

growth in non-performing loans in 2011, a process that could lose steam towards the end of the year. Nevertheless, favourable stress test results showing that banks’ profits could be somewhat higher in 2011 should be interpreted with caution, for several reasons. First, during the crisis, banks reduced the coverage of non-performing loans by value adjustments to a level much below the several-year average. Although the rise in non-performing loans will slow down, their costs are expected to remain high since additional value adjustments will have to be made for existing non-performing loans. Furthermore, positive stress test results are associated with a relatively optimistic baseline macroeconomic scenario. The high degree of uncertainty in financial markets and the substantial fiscal risks in EU member states shift the balance of risks to much worse scenarios. The banking system would remain stable even under an extreme stress scenario, but individual segments of vulnerable (primarily small) banks would then need additional capital. The rise in banks’ insolvency risks is indicated by worse Z-scores as well as projections of the probability of migration and the structure of CAMELS ratings for banks (see Box 6 Modelling of bank risks based on composite CAMELS ratings). Finally, the dynamic growth in the capital-to-assets ratio of banks that lasted for several years almost came to a standstill in 2010 because of weaker business performance of banks and a decrease in reinvested earnings due to a bleaker outlook for credit expansion.

This report sends several important messages to relevant actors about key policies needed to support the maintenance of financial stability in the current domestic and international environment. Previous editions of this publication warned in particular of risks to financial stability stemming from an adverse interaction of weak economic performances due to poor international competitiveness and persistently weak fiscal indicators. The postponement of fiscal adjustment and weak fundamentals have recently prompted one of the major rating agencies to lower the sovereign rating for Croatia, so that the government bond rating by all three main agencies is now at the lowest investment grade. In case of severe disturbances in the international environment, a sudden increase in the risk aversion of financial market participants would again put in motion a downward spiral of economic activity and fiscal sustainability, put the country’s investment grade rating at risk and make debt refinancing abroad more difficult and more expensive for all sectors. In such circumstances, the government would be forced into prompt fiscal consolidation with certain pro-cyclical effects on the economy.

Also, there is still high uncertainty regarding the financial strength of banks and expected losses on non-performing loans. Banks should use an anticipated slowdown in the growth of non-performing loans in 2011 to speed up the process of portfolio clean-up. The relatively high level of capitalisation should allow banks to increase value adjustments for non-performing claims without major pains, which would provide a more realistic picture of the actual level of capitalisation. This is also a precondition for the redirection of credit to enterprises that are alone able to initiate a new growth cycle based on the expansion of foreign demand. This is particularly important if one bears

in mind a significant adjustment in the sectoral structure of lending to Croatian enterprises, which has already been implemented by foreign creditors, mostly parent banks, and which is not yet evident in domestic lending.

In contrast with fiscal risks and possible hidden losses in bank balance sheets, which affect financial stability in the short and possibly medium run, credit policies of banks will have a crucial impact on the maintenance of financial stability in the medium and long run. The policy to keep or increase exposures to more risky among the existing debtors, which banks pursued during the crisis (see Box 4 Patterns of corporate lending in crisis situations), slowed down the reallocation of resources to more propulsive activities, in particular export activities, and thus increased medium-term risks to financial stability.

In such circumstances, the CNB has continued its efforts to maintain banking sector liquidity at high levels, to the extent that this

does not threaten exchange rate stability. Findings of research conducted show that more liquid banks increased their corporate lending during the crisis, so that the policy of maintaining a high level of banking system liquidity probably gave an impetus to corporate lending. International reserves of the central bank have remained at a level that enables the bridging of stops in capital inflows in case of any renewed escalation of the global financial turmoil. In implementing its supervisory function, the central bank has also encouraged banks to adopt a conservative approach to risks and thus helped the reallocation of resources to more promising enterprises. At the same time, available analytical capacities further aid the early identification of banks with potential problems and enable timely action with minimal fiscal resources. Such central bank policies help to achieve long-term external and fiscal sustainability, which is prerequisite for the maintenance of financial stability, and thus faster economic growth. Nevertheless, the impact of such policies will be relatively limited without the concerted action of all relevant actors.

Macroeconomic environment

The crisis in the eurozone sovereign bond market, with its potential negative impact on the banking sector, has reached proportions that require the establishment of a permanent, sustainable mechanism to stabilise the situation and reduce uncertainties in financial markets. In such turbulent circumstances, financial markets have put a stronger pressure on countries with weaker fiscal and external positions to reduce imbalances and implement structural reforms to achieve more dynamic growth.

Although the global economy has continued to recover after the most severe recession since the end of World War II, the global macroeconomic environment is still weighed by lingering uncertainties about sustainable economic growth, due to the high instability in international financial markets (Table 1).

The centre of financial instability moved in 2010 to the European sovereign bond market, where market participants' concerns about the solvency of some peripheral eurozone countries sharply increased risk premiums because these countries' fiscal deficits and public debt during the recession had grown to levels unsustainable in the long run (Tables 2 and 3 and Figure 5).

The crisis escalated in spring 2010, when financial markets closed for Greece. This prompted a rescue action in May under which the EU, in cooperation with the IMF, set up a financial package that enabled Greece to temporarily bridge the financial gap until it implemented radical fiscal consolidation to reduce its financing needs and become able to obtain funds

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

	Annual GDP growth rate		Quarterly GDP growth rate, $\Delta Q/Q_{t-1}$		Annual rate of change in exports of goods		Annual rate of change in industrial production (seasonally adjusted)	
	2010 ^a	2011 ^b	Q2/10	Q3/10	Q2/10	Q3/10	Q2/10	Q3/10
USA	2.7	2.1	0.4	0.6	36.1	24.0	7.5	5.0
EU	1.8	1.7	1.0	0.5	22.1	20.0	8.2	6.9
Germany	3.7	2.2	2.3	0.7	24.9	22.7	12.9	10.3
Italy	1.1	1.1	0.5	0.3	17.5	18.1	7.9	5.9
Slovenia	1.1	1.9	1.0	0.3	15.7	17.2	10.3	8.3
Slovak R.	4.1	3.0	1.0	1.0	25.6	21.7	24.5	15.4
Czech R.	2.4	2.3	0.8	1.0	19.2	19.9	9.9	11.0
Poland	3.5	3.9	1.2	1.3	24.8	19.1	10.9	12.3
Hungary	1.1	2.8	0.4	0.8	22.5	22.2	12.1	12.5
Estonia	2.4	2.4	1.9	0.7	34.3	43.2	18.9	25.8
Latvia	-0.4	3.3	1.2	0.9	30.0	36.9	12.3	19.4
Lithuania	0.4	2.8	0.5	0.6	37.2	35.6	4.4	7.8
Bulgaria	-0.1	2.6	0.5	0.7	39.1	43.8	1.4	5.1
Romania	-1.9	1.5	0.3	-0.7	31.7	27.0	4.2	4.4
Croatia	-1.5	1.4	-1.0	1.9	22.3	18.1	-4.7	0.1

^a Estimate. ^b Forecast.

Sources: Eurostat, CBS, CNB, Bloomberg and OECD.

in the market again. At the same time, the European Financial Stability Fund (EFSF) was set up to provide assistance to other eurozone countries facing problems with their public finances.

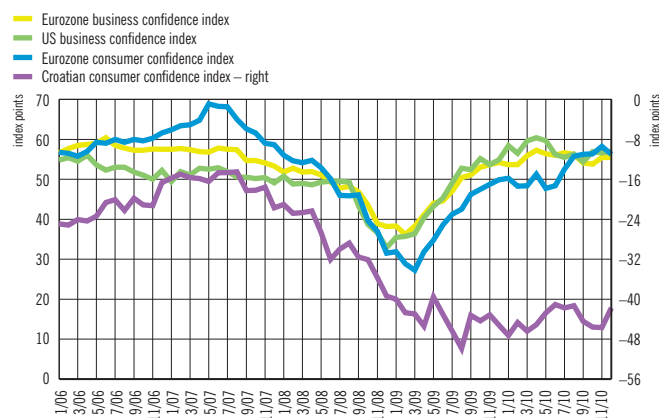
The rescue action helped reduce the risk premium on Greek debt substantially, but only briefly – financial markets estimated that the configuration of slow growth under budget restrictions and low competitiveness paired with a high public debt did not

guarantee solvency, so that risk premiums again hit prohibitive levels. Market attention turned to other eurozone countries with weak public finances, above all Ireland and Portugal, and their risk premiums started to grow as well (Figure 4).

The crisis in the European sovereign bond market gained new momentum in October 2010, when the risk premium on Irish debt grew markedly. This reflected market concerns about the country's solvency; its public finances were considerably impaired after the government's bailout of the banking system, which had become insolvent due to losses caused by the burst of the real estate bubble. This increased the lack of market confidence in stress test results for the main European banks, published in July 2010. Concerns about the country's solvency were further heightened by the fact that, as part of its efforts to stabilise the system, the Irish government had provided guarantees for all bank liabilities at the outbreak of the financial crisis, while the situation was further aggravated by the steady outflow of bank deposits (Figure 4).

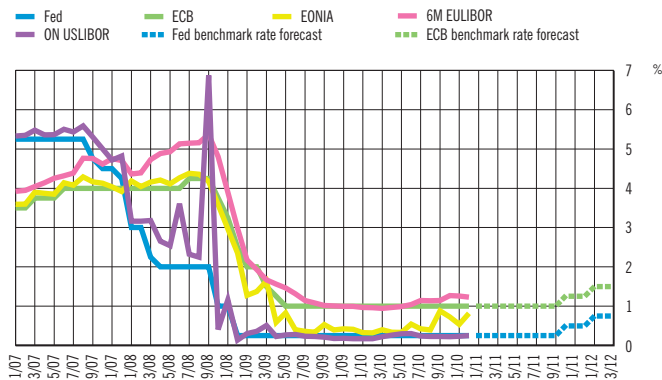
To address the situation that threatened to spread to other eurozone countries, a financial assistance package for Ireland was set up from EFSF and IMF funds, intended for banks and the government. However, the rescue action failed to alleviate market fears about Ireland's solvency. Risk premiums dropped only slightly and briefly. Towards the year-end, they started to grow again to levels that threatened public debt sustainability. The same path was followed by risk premiums for Portugal (although at a slightly lower level) and Spain; risk premiums for

Figure 2 Business and consumer confidence indices



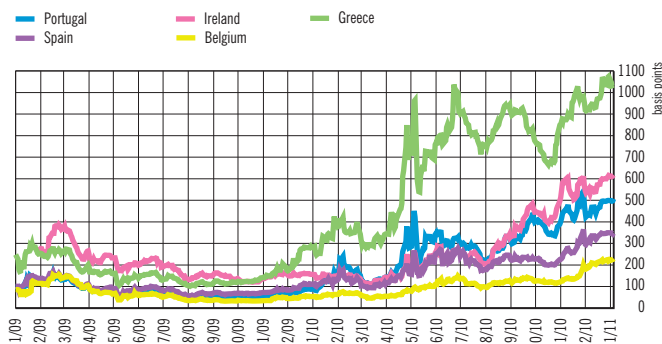
Sources: Bloomberg and CNB.

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



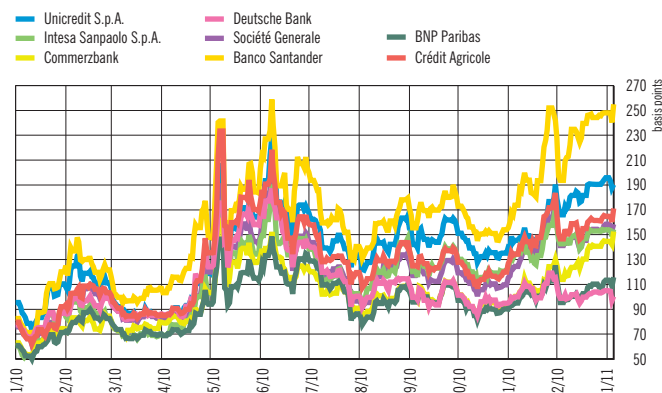
Sources: Fed, ECB and Bloomberg.

Figure 4 CDS^a spreads for 5-year bonds of selected 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.

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

	Fiscal balance, as % of GDP (ESA 95)			Current account balance, as % of GDP		
	2009	2010 ^a	2011 ^b	2009	2010 ^a	2011 ^b
USA	-11.3	-8.9	-7.9	-2.7	-3.2	-2.6
EU	-6.8	-6.8	-5.1	0.3	-0.1	0.1
Germany	-3.7	-2.7	-1.8	4.9	6.1	5.8
Italy	-5.0	-4.3	-3.5	-3.2	-2.9	-2.7
Portugal	-9.3	-7.3	-4.9	-10.0	-10.0	-9.2
Ireland	-14.4	-32.3	-10.3	-3.0	-2.7	-1.1
Greece	-15.4	-9.6	-7.4	-11.2	-10.8	-7.7
Spain	-11.1	-9.3	-6.4	-5.5	-5.2	-4.8
Slovenia	-5.8	-5.3	-4.7	-1.5	-0.7	-0.7
Slovak R.	-8.2	-5.3	-5.0	-3.2	-1.4	-2.6
Czech R.	-5.8	-5.2	-4.6	-1.1	-1.2	-0.6
Poland	-7.9	-6.6	-6.0	-1.7	-2.4	-2.6
Hungary	-3.8	-4.7	-6.2	0.2	0.5	0.7
Estonia	-1.0	-1.9	-2.7	4.5	4.2	3.4
Latvia	-7.7	-7.9	-7.3	8.6	5.5	2.9
Lithuania	-8.4	-7.0	-6.9	4.2	1.9	0.2
Bulgaria	-3.8	-2.9	-1.8	-9.5	-3.0	-3.1
Romania	-7.3	-4.9	-3.5	-4.5	-5.1	-5.4
Croatia ^c	-4.1	-5.6	-6.0	-5.5	-2.4	-2.7

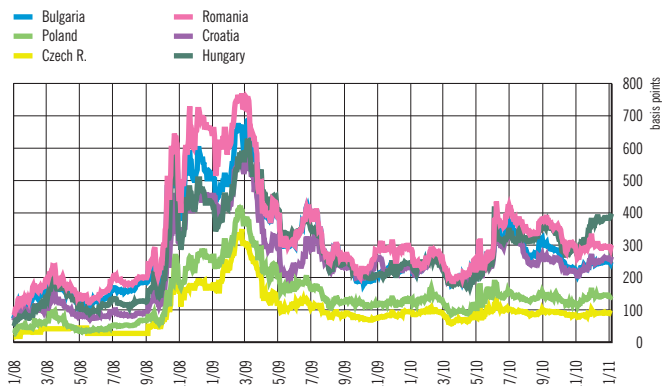
^a Estimate. ^b Forecast. ^c CNB is the source of data for Croatia.
Sources: European Commission, *Economic Forecast*, autumn 2010; IMF, *World Economic Outlook Database*, October 2010 and CNB.

the latter country are lower due to a better fiscal position and the stronger banking sector, though concerns about the stability of Spanish housing savings banks have been mounting.

The lack of market confidence was also caused by fears that the EFSF funds actually available would be insufficient if large eurozone economies needed assistance. Concerns were further raised when Germany, which is the major financier, took the position that under a future permanent mechanism to stabilise the euro, to be introduced in 2013 and replace the current EFSF, investors would have to participate in costs if a country needed to restructure its debt.

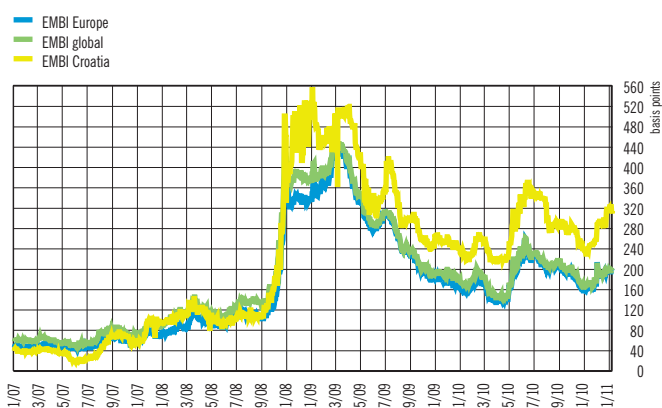
The problems in the sovereign debt market are further aggravated by the fact that almost all major banks in developed eurozone economies are highly exposed to bonds of other eurozone countries. If debts are not paid or restructured, these banks will suffer large losses, which could undermine the stability of the European banking sector and trigger a new recession in the region. In conditions of market globalisation, this crisis would have strong negative repercussions on the global economy (Figure 5).

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



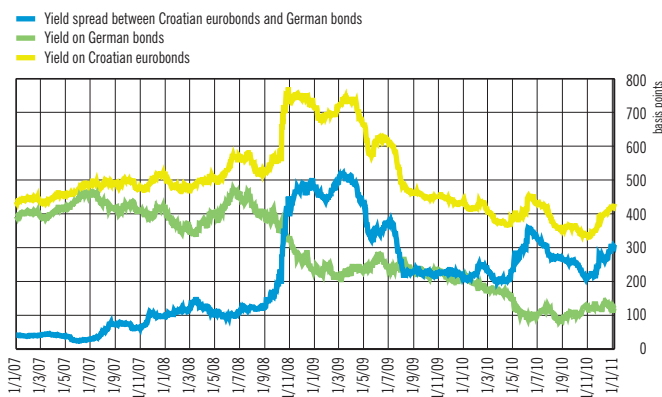
Source: Bloomberg.

Figure 7 EMBI spreads



Source: J. P. Morgan.

Figure 8 Yields on Croatian and benchmark German bonds maturing in 2014 and their spread



Source: Bloomberg.

Table 3 Public and external debt in selected European emerging market countries as % of GDP

	Public debt		External debt	
	2009	6/2010	2009	6/2010
Slovenia	35.4	37.5	114.2	119.6
Slovak R.	35.4	38.9	72.6	75.0
Portugal	76.1	80.6	227.2	239.6
Ireland	65.5	79.6	1.040.5	1.115.7
Greece	126.8	132.9	175.6	188.1
Spain	53.2	56.7	168.2	168.3
Czech R.	35.3	36.7	44.1	46.4
Poland	50.9	54.3	62.9	59.8
Hungary	78.3	83.7	146.2	n.a.
Estonia	7.2	6.9	125.6	124.2
Latvia	36.7	43.2	157.8	167.8
Lithuania	29.5	35.0	86.7	89.8
Bulgaria	14.7	15.1	109.3	110.4
Romania	23.9	28.9	70.3	75.4
Croatia ^a	35.3	37.1	95.0	96.4

^a Total external debt excludes round-tripping transactions. For more details on round tripping, see *CNB Bulletin*, No. 154, Box 4 Round tripping and its impact on Croatian statistical data.

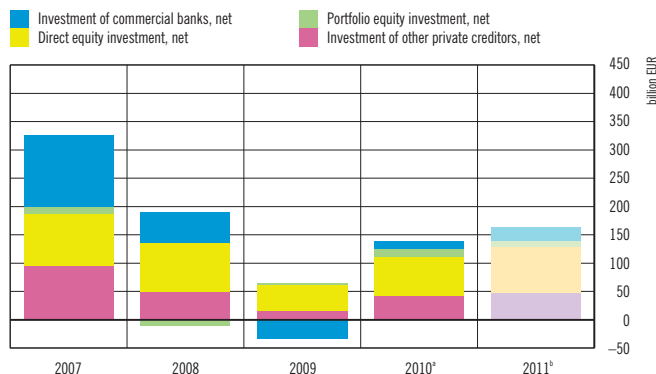
Sources: Eurostat; World Bank, *Quarterly External Debt Statistics* and CNB.

The negative feedback loop between the government and banking sectors as well as the corporate sector has proved to be a key mechanism in the development of the crisis so far. In countries with public finance problems, banks also had difficulties in raising funds in international markets, which closed completely in some cases.

In such conditions, the ECB was the only liquidity source for banks in these countries. This postponed the full completion of its exit strategy, i.e. withdrawal of the liquidity injected into the system at the peak of the financial crisis (Figure 3). Growing risks to euro area financial stability, which stem from the correlation between the government debt market and banks, coupled with efforts to secure the efficiency of the monetary policy transmission mechanism, induced the ECB to start buying bonds of financially distressed eurozone countries after the escalation of the crisis in May so as to stabilise the bond market, and thus the entire financial and economic system.

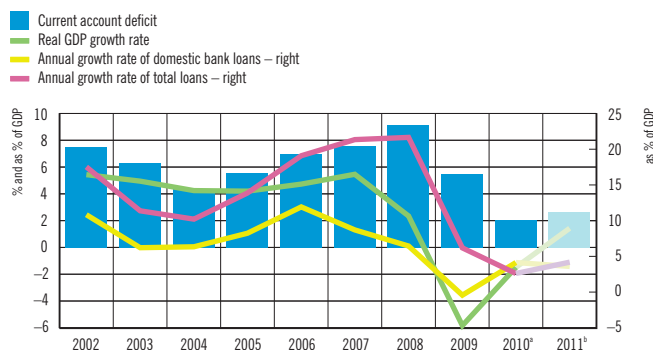
Although these actions helped soothe financial markets in the short run, they also raised the issue of the long-term sustainability of such a policy, which would deviate from the ECB's mandate if continued or pursued more vigorously, for it would eradicate the difference between monetary and fiscal policy, increase the risk of loss on the ECB bond portfolio, and eventually become an enormous threat to euro stability.

Figure 9 Capital inflows to European emerging market countries



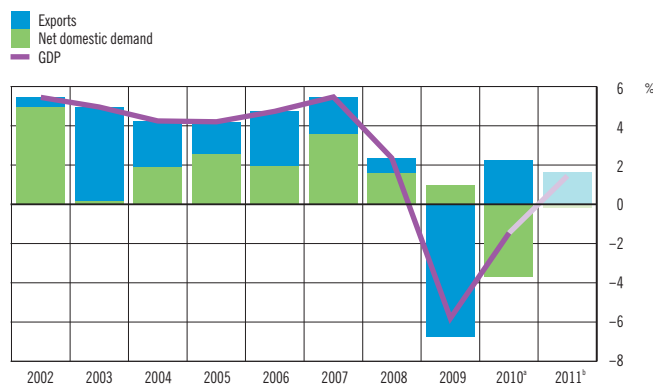
* Estimate. † Forecast.
Sources: International Institute of Finance, *Capital Flows to Emerging Market Economies*, October 2010 and Bloomberg.

Figure 10 Foreign capital inflows and GDP growth in Croatia



* Estimate. † Forecast.
Note: FDI in the form of loans excludes round-tripping transactions. For more details on round tripping, see *CNB Bulletin*, No. 154, Box 4 Round tripping and its impact on Croatian statistical data.
Sources: CNB and CBS.

Figure 11 GDP growth pattern (contribution to growth)



* Estimate. † Forecast.
Source: CBS.

Therefore, it is obvious that permanent financial stabilisation of the eurozone requires institutional strengthening in terms of the establishment of a mechanism that would provide coordination between fiscal policy and the other economic policies of member states and their alignment with the ECB's monetary policy to maintain financial and macroeconomic stability of the eurozone.

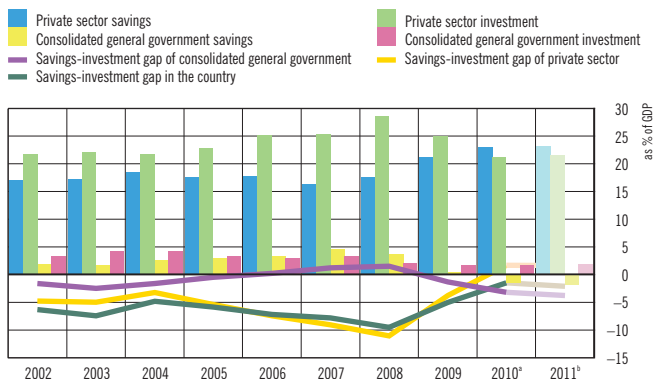
This is also the objective of efforts to recapitalise the ECB and thus increase its capacity to assume risks associated with interventions in the eurozone bond market, and of the European stabilisation mechanism, which will in 2013 replace the current (temporary) stabilisation fund to provide financial assistance to individual countries at times when the systemic stability of the eurozone is at risk. In exceptional circumstances, when a country's debt needs to be restructured, a part of the costs will have to be borne by investors, to reduce moral hazard. Time will show whether this plan will successfully stabilise the markets or whether it will be necessary in the meantime further to strengthen the current EFSF and/or take other measures.

The stabilisation of the sovereign debt market and maintenance of stability of the eurozone banking sector are crucial for financial stability and growth in European emerging markets, due to high contagion risk. The downward trend in the risk premium on their sovereign bonds observed with minor fluctuations since mid-2009 came to a stop in May 2010 when the eurozone sovereign debt crisis erupted and the risk premium soared by around 100 basis points. After the intervention by European and international institutions to rescue Greece and ECB stabilisation interventions, the downward trend in the risk premium continued until the Irish crisis in November 2010, which pushed up the premium by around 40 basis points (Figure 7).

Markets make a distinction between countries with regard to their fiscal position and other fundamentals that affect a country's solvency. Together with Hungary, Romania and Bulgaria, Croatia is in the group of countries with slightly higher risk premiums, which is the result of its relatively unfavourable fiscal and external position and growth outlook (Tables 2 and 3 and Figure 6). Still, these premiums are lower than those for the most vulnerable eurozone countries, which is also due to a rather sound banking sector owned by eurozone banks that are relatively less exposed to the countries engulfed by the crisis (Figure 5). Nevertheless, the crisis transmission channel to European emerging markets through parent banks of domestic banks could become a source of risks if the eurozone crisis spreads. This is also supported by the fact that an agreement in the context of the so-called Vienna Initiative, under which eurozone banks agreed to maintain their exposure to emerging market economies in the midst of the crisis, expired in late 2010.

The stabilisation of the eurozone sovereign bond market, which is a prerequisite for long-term growth, requires substantial fiscal consolidation in countries with weak public finances (Table 2). Coupled with the slower growth expected in fast-growing Asian emerging economies, this will probably slightly decelerate eurozone growth in 2011 compared with the previous year.

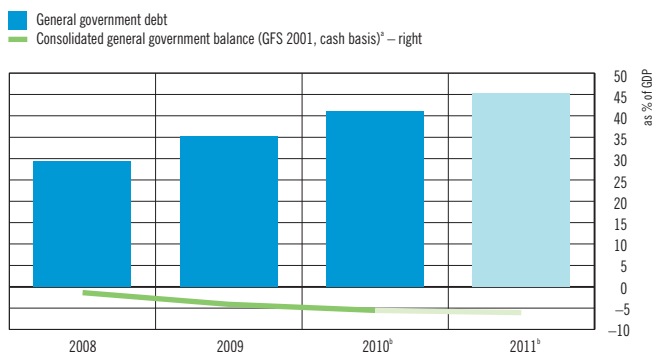
Figure 12 Savings and investment – total and by sector



* Estimate. * Forecast.

Sources: MoF and CNB (estimate).

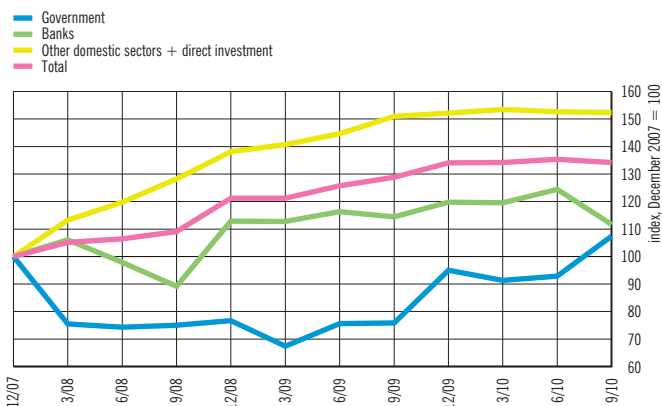
Figure 13 General government fiscal position



* All data used in the balance calculation are shown on a cash basis, with the exception of CR data which are shown on an accrual basis. Data were adjusted by the change in arrears of the government and local government units, annual repayments of debt to pensioners and paid guarantees. * CNB projections.

Sources: MoF and CNB.

Figure 14 External debt by domestic institutional sector



Source: CNB.

However, the opposite effect could be produced by faster US growth, fuelled by a new package of monetary and fiscal stimuli (Table 1 and Figure 3).

As in 2010, the eurozone growth dynamics in 2011 will be the main determinant of the economic recovery in European emerging markets, particularly in those that, due to weaker fiscal positions, have to rely on a rise in export demand as the main generator of economic growth (Table 1).

This is also true for Croatia, which had to continue with macroeconomic adjustments in 2010 to reduce its external deficit. This required the generation of a positive net savings balance in the private sector, i.e. a further reduction of domestic demand and reliance on exports as the main generator of growth (Table 1 and Figures 10, 11 and 12). However, as the necessary reallocation of resources to the export sector requires some time, the rise in exports was insufficiently dynamic to offset the fall in domestic demand, so that GDP dropped by some 1.5%. This coincided with the fall in tax revenues and the rise in fiscal expenditures, all of which together pushed up the general government budget deficit and public sector debt even further, to around 5.6% and 41% of GDP, respectively, with no major changes being expected in 2011 (Figure 13).

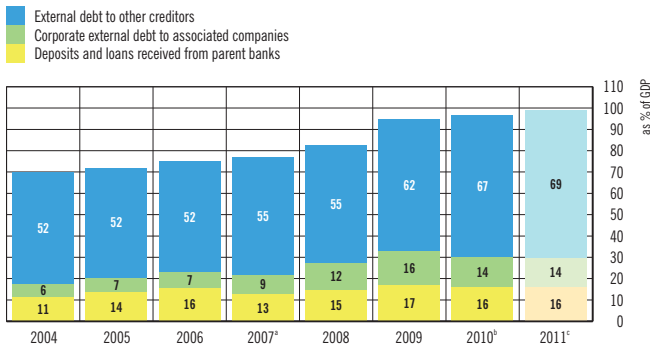
The expected continuation of the economic recovery that began in the third quarter of 2010 should produce a relatively slight GDP growth of around 1.4% in 2011 as domestic private sector demand will remain subdued, while exports growth will not be sufficient to offset the modest rise in domestic demand, constrained by the deleveraging process going on in most sectors of the economy (Table 1 and Figure 11). In such circumstances, no room for fiscal consolidation has been made so that the budget deficit planned for 2011 is at around 6% of GDP. Coupled with the refinancing of the debt falling due, this entails substantial government funding needs, of around 10% of GDP (Figure 13).

In addition, Croatia continued its external adjustments in 2010 by reducing the current account deficit to around 2.4%, with the deficit in 2011 expected at less than 3% of GDP. However, the external vulnerability associated with the high level of external debt will increase external (re) financing risks for all sectors (Table 2, Figures 10 and 14 to 18).

These risks are particularly high against the background of the still unstable situation in the European sovereign debt market and large public debt financing (refinancing) needs of eurozone countries, which may limit the amount of funds channelled to European emerging markets (Figure 9), particularly when they must compete with non-European fast-growing markets with better macroeconomic fundamentals. Also, unfavourable indicators of external vulnerability may keep the price of capital for countries with weaker financial positions at a level that does not provide long-term debt sustainability.

Inflows of bank loans to Southeast European countries, which mostly held steady in 2010, will not grow much as banks in the eurozone face problems with market financing, which are

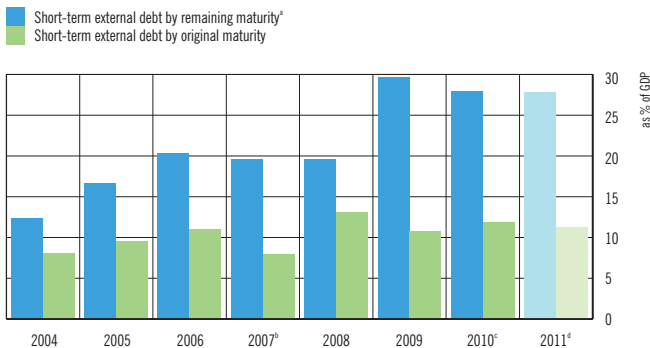
Figure 15 Total external debt by creditor



^a Since end-2007, external debt has been calculated according to the new methodology. ^b Estimate. ^c Forecast. Note: External debt to associated companies excludes round tripping transactions. See note under Figure 10.

Source: CNB.

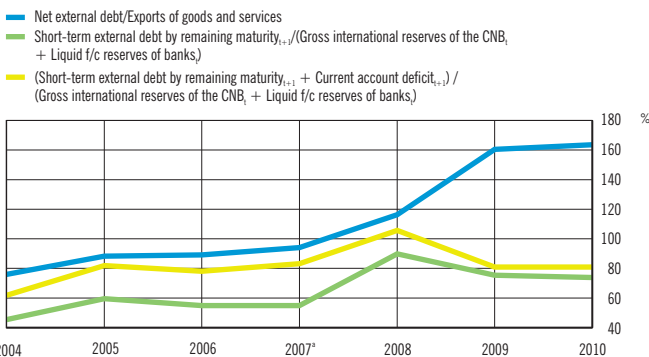
Figure 16 Short-term external debt



^a Short-term external debt by remaining maturity at the end of the current year is the sum of long-term debt maturing in that year and the balance of short-term debt at the end of the previous year. ^b Since end-2007, external debt has been calculated according to the new methodology. ^c Estimate. ^d Forecast.

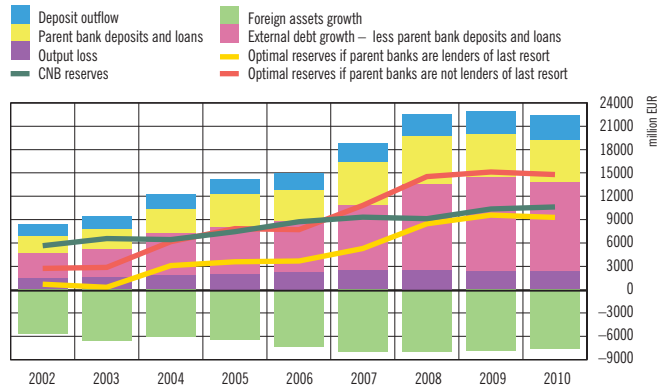
Source: CNB.

Figure 17 Selected indicators of external vulnerability



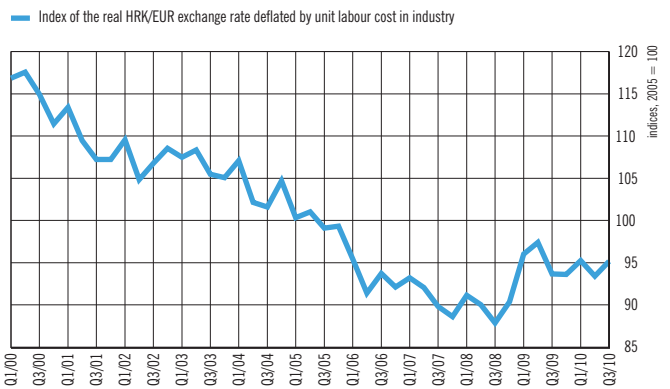
^a Since end-2007, external debt has been calculated according to the new methodology. Source: CNB.

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.

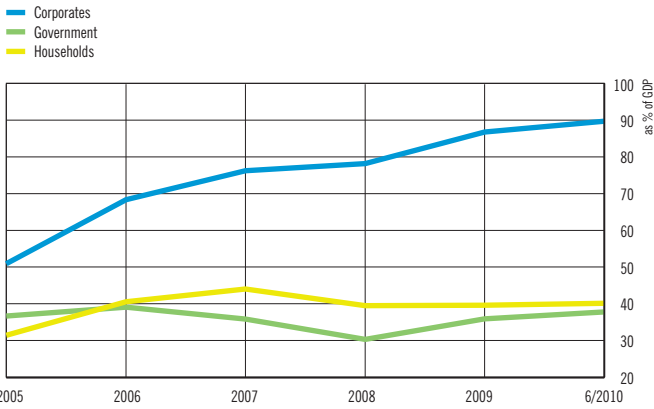
Sources: CBS, CNB and CNB calculations.

Figure 20 Unit labour cost



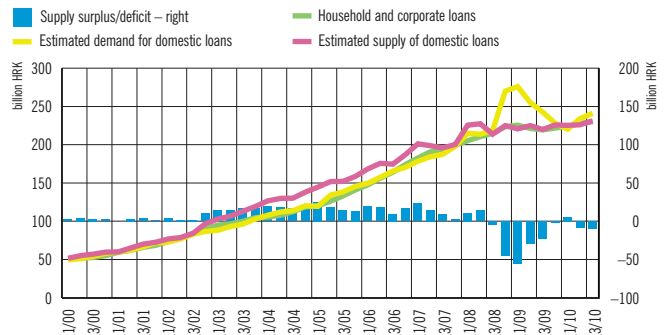
Sources: CBS, CNB and CNB calculations.

Figure 21 Total debt by sector



Source: CNB.

Figure 24 Estimated credit demand and supply in the domestic market^a



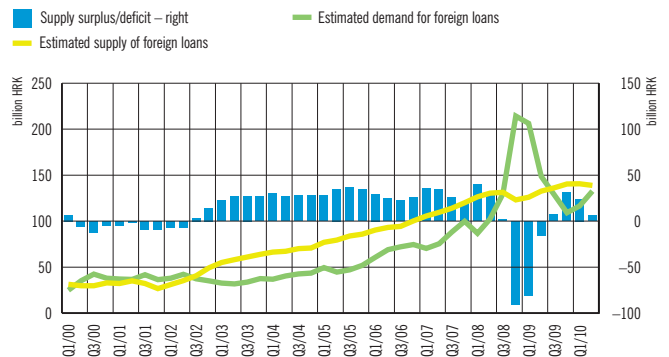
^a Based on the results of the model used to estimate the impact of demand and supply on the Croatian credit market from Box 2 Credit market disequilibrium, *Financial Stability*, No. 5, July 2010. Source: CNB calculations.

Figure 22 Net position of domestic sectors with respect to the rest of the world by instrument



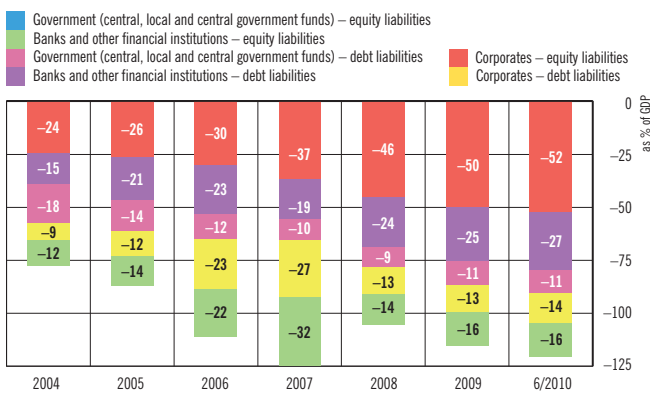
Source: CNB.

Figure 25 Estimated demand for and supply of foreign loans^a



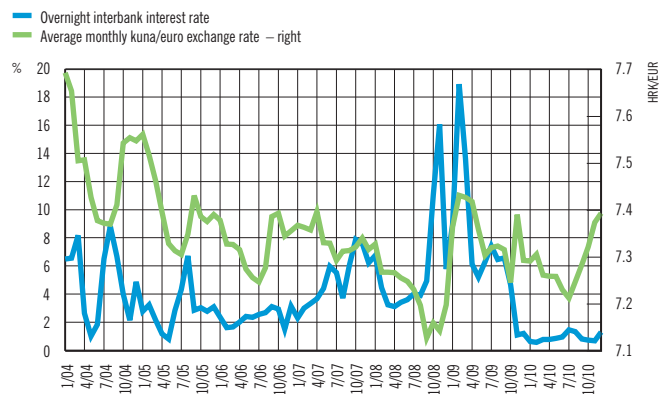
^a Based on the results of the model used to estimate the impact of demand and supply on the Croatian credit market from Box 2 Credit market disequilibrium, *Financial Stability*, No. 5, July 2010. Source: CNB.

Figure 23 Net financial position of selected domestic sectors with respect to the rest of the world by equity and debt instrument



Source: CNB.

Figure 26 Kuna/euro exchange rate and overnight interest rates



Source: CNB.

associated with risks of losses on government bond portfolios and tougher capital requirements under Basel III. A clearer picture of the situation will be provided by a new stress test of European banks, to be conducted in early 2011. Therefore, there is also a danger that parent banks might withdraw funds from banks in some countries due to potential changes in the financing and/or business strategy.

In such circumstances, Croatian economic policy must maintain financial market confidence to secure sufficient external funding at an acceptable cost. This will depend on the ability to ensure long-term sustainability of both public finance and overall external debt by a credible economic policy, which entails the creation of institutional preconditions to raise potential growth rates.

Important steps in this direction were made in 2010 and relate to changes in the pension system, which are to be continued in the forthcoming period, and the adoption of the Fiscal Responsibility Act, which introduces a fiscal rule under which the share of total public expenditures in GDP is to be reduced by one

percentage point a year until a zero primary deficit is attained. In line with projected economic growth rates, this should be achieved by 2015, after which a zero or positive primary balance is to be maintained. However, public debt sustainability will be adversely affected by the expected activation of existing government guarantees to government enterprises.

In the midst of public and external debt consolidation, more dynamic economic growth and the maintenance of banking sector stability require a substantial increase in corporate competitiveness, above all in terms of productivity growth and innovation. This entails intensification of structural reforms aimed at improving the investment climate, which, among other things, includes the strengthening of creditor protection and the rule of law, enhanced public administration and public sector efficiency and increased labour market flexibility (Figures 19 and 20).

In turn, more dynamic growth based on sustainable foundations will ensure overall financial stability and create firm economic grounds for Croatia's integration into the EU.

Box 1 Financial accounts for Croatia

Financial accounts describe financial relations among institutional sectors of the domestic economy and their relations with the rest of the world. By presenting total inter-sector claims and liabilities of particular sectors and their net financial position, which indicates the sectors that are sources of financial surpluses and the sectors that are sources of financial deficits, financial accounts also provide an insight into financial instruments used in inter-sector financial transactions as well as

their currency and maturity breakdown. These constitute key information needed to make an economic analysis for the purposes of economic and business policy makers, for both the public and private sectors. The table below presents the several-year dynamics of certain aspects of inter-sector financial relations that are particularly interesting for the analysis of financial system stability.

Table 1 Inter-sector claims and liabilities at end-2009 and end-June 2010

as % of GDP

Liabilities		Claims												Total liabilities	
		Domestic sectors										Rest of the world			
		Corporates		Financial sector		General government		Households		Total					
		2009	6/2010	2009	6/2010	2009	6/2010	2009	6/2010	2009	6/2010				
Corporates	Monetary gold and SDRs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Currency and deposits	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Securities other than shares	0	0	2	2	0	0	0	0	2	2	1	1	3	3
	Loans	0	0	40	42	0	0	0	0	40	42	43	44	84	87
	Shares and equity	39	38	3	3	26	26	17	17	86	85	24	23	110	107
	Insurance technical provisions	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Other claims and liabilities	29	29	1	2	6	6	2	2	38	38	10	11	48	49
	Total	68	67	47	48	32	32	20	19	166	167	79	79	245	246
Financial sector	Monetary gold and SDRs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Currency and deposits	14	14	19	19	3	2	50	52	86	86	14	14	100	100
	Securities other than shares	0	0	0	0	0	0	0	0	0	0	2	2	2	3
	Loans	0	0	7	6	0	0	0	0	7	6	25	24	31	31
	Shares and equity	2	1	2	2	9	9	4	4	16	17	18	18	34	34
	Insurance technical provisions	1	1	1	1	0	0	13	15	15	17	0	0	15	17
	Other claims and liabilities	1	1	1	1	0	0	1	1	4	3	1	1	4	4
	Total	18	17	29	29	12	11	69	73	128	130	59	59	187	189
General government	Monetary gold and SDRs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Currency and deposits	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Securities other than shares	0	0	18	19	0	0	0	0	18	19	8	7	25	26
	Loans	0	0	7	7	0	0	0	0	7	7	3	4	10	11
	Shares and equity	0	0	0	0	28	30	0	0	28	30	0	0	28	30
	Insurance technical provisions	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Other claims and liabilities	4	4	0	0	0	0	0	0	4	4	0	0	4	4
	Total	4	4	25	27	28	30	0	0	56	61	11	11	67	72
Households	Monetary gold and SDRs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Currency and deposits	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Securities other than shares	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Loans	0	0	39	40	0	0	0	0	39	40	1	1	40	40
	Shares and equity	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Insurance technical provisions	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Other claims and liabilities	0	0	1	1	0	0	0	0	1	1	0	0	1	1
	Total	0	0	40	41	0	0	0	0	40	41	1	1	41	41
Rest of the world	Monetary gold and SDRs	0	0	1	1	0	0	0	0	1	1	0	0	1	1
	Currency and deposits	0	0	16	16	0	0	3	3	18	19	0	0	18	19
	Securities other than shares	0	0	21	19	0	0	0	0	21	19	0	0	21	19
	Loans	0	0	1	1	0	0	0	0	1	1	0	0	1	1
	Shares and equity	9	9	2	2	0	0	0	0	10	11	0	0	10	11
	Insurance technical provisions	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Other claims and liabilities	3	4	0	0	0	0	0	0	4	4	0	0	4	4
	Total	12	12	41	39	0	0	3	3	55	55	0	0	55	55
Total	Monetary gold and SDRs	0	0	1	1	0	0	0	0	1	1	0	0	1	1
	Currency and deposits	14	14	35	35	3	2	53	55	105	105	14	14	119	119
	Securities other than shares	0	0	41	41	0	0	0	0	41	41	11	11	53	52
	Loans	0	0	94	96	0	0	0	0	94	96	72	73	166	170
	Shares and equity	49	49	7	7	63	66	21	21	140	143	42	40	182	183
	Insurance technical provisions	1	1	1	1	0	0	13	15	15	17	0	0	15	17
	Other claims and liabilities	37	37	4	3	6	6	3	3	50	50	11	11	61	61
	Total	102	101	182	184	71	73	91	95	446	453	150	150	596	603

Source: CNB.

Box 2 Credit dynamics and economic activity

A strong positive correlation between credit and economic activity is a well-researched and documented economic regularity. Numerous researches have shown that the pace and intensity of economic recovery after recession are closely linked to developments in the financial sphere and that financial disturbances that restrain the lending activity of banks are usually connected with deep and long-lasting recessions, which makes the maintenance of financial stability one of the key prerequisites for recovery. In this context, both a high level of banking sector stability in Croatia and credit recovery are necessary to exit recession and return to the growth path.

However, recent analyses of the correlation between monetary and economic developments indicate that this correlation is not always equally firm or stable and that it usually weakens in periods immediately after the recession bottom. It has been established that periods of economic recovery often begin without significant credit growth; loans begin to grow after a recovery gets a strong foothold.¹ In the literature, such episodes are referred to as “Phoenix miracles”.²

Nevertheless, recent researches attempting to explain this phenomenon show that the dynamics of economic activity in the recovery stage actually depends on the newly-granted loans that increase in that period.³ A theoretical model explaining this correlation is based on the assumption that investments are financed from newly-granted loans and that a change in GDP is not only a function of the change in the loan balance but also a function of the change in the credit flow relative to economic activity, i.e. credit impulse:

$$y_t = \frac{(1 - \delta)(\Delta D_t - \Delta D_{t-1})}{Y_{t-1}} + \frac{(2\delta + r)\Delta D_t}{D_{t-1}} \cdot \frac{D_{t-1}}{Y_{t-1}}$$

(credit impulse) (credit growth)

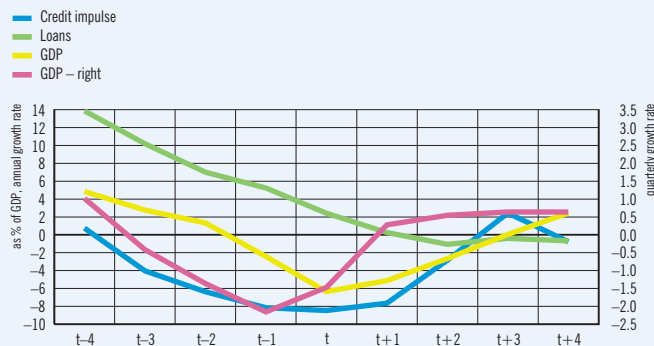
where y is the GDP growth rate, δ is the rate of amortisation, r is the interest rate and D is the level of loans. An explanation of the described correlation between the credit impulse and economic activity is supported by the fact that economic activity is a flow variable, while loans are a state variable, which means that the level of economic activity in a certain period should be correlated also with the change in the amount of loans, and not only with their balance. By analogy, the GDP growth rate should be correlated not only with the (usual) change in the loan balance but also with the change in newly-granted loans. Therefore, a slowdown in credit contraction may occur in parallel to substantial amounts of new loans, which also implies a boost to economic recovery.

1 Calvo, G. A., A. Izquierdo, and E. Talvi (2006): *Phoenix Miracles in Emerging Markets: Recovering without credit from systemic financial crises*, NBER Working Paper Series No. 12101, March; Abiad, A., G. Dell’Ariccia, and B. Li (2010): *Creditless Recoveries*, IMF Working Paper, awaiting publication; Claessens, S., M. A. Kose, and M. E. Terrones (2008): *What happens during recessions, Crunches and Busts?*, IMF Working Paper, No. 08/274.

2 Calvo et al. (2006).

3 See Biggs, M., T. Mayer, and A. Pick (2009): *Credit and economic recovery*, De Nederlandsche Bank, Working paper, No. 218, July.

Figure 1 Average developments in credit and economic activity in reviewed countries during recessionary episodes

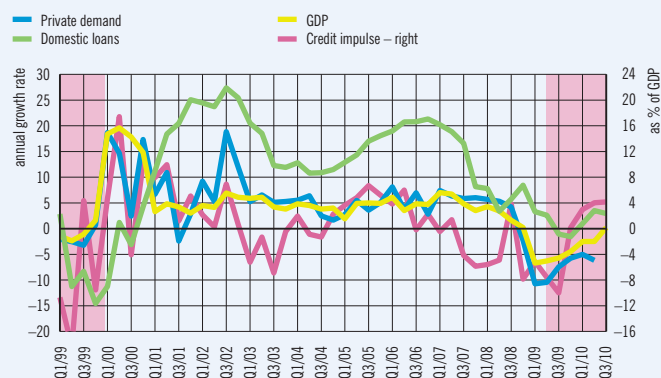


Note: The letter “t” denotes a period when the annual GDP growth rate was the lowest in the crisis episode.
Sources: Eurostat, IFS, CNB and CNB calculations.

This box presents the results of studies into the correlation between credit and economic activity in Central and Eastern European (CEE) countries and tests the hypothesis that economic activity is more correlated with the flow of new loans than with the change in the loan balance during recovery stages that follow a sharp economic slowdown. The presented findings thus have important implications for expectations about Croatian economic recovery.

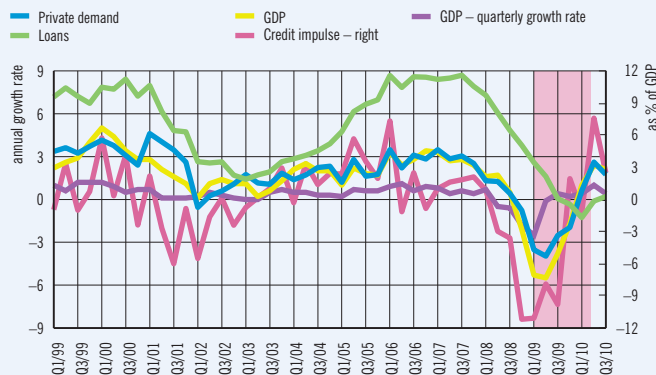
Figure 1 shows average annual growth rates of GDP and domestic loans, the average quarterly GDP growth rate and newly-granted loans approximated by the change in the credit flow relative to economic activity, i.e. «credit impulse», calculated for 19 episodes of recovery averaging four quarters, which were identified on a sample of European emerging market countries. The rate of change in economic activity bottoms out at the moment when the credit impulse is also at its lowest, the quarterly GDP growth rate lags behind the credit impulse by one quarter on average, while the year-on-year rate of change in loans decreases over

Figure 2 Credit and economic activity in Croatia



Note: The shaded areas show the periods of recovery.
Sources: CBS, CNB and CNB calculations.

Figure 3 Credit and economic activity in the eurozone



Note: The shaded area shows the period of recovery.
Sources: Eurostat and CNB calculations.

the following two quarters, after which it usually stays at a low level. This represents a departure from the usual correlation between credit and economic activity.

The phenomenon of a weaker correlation between credit growth and real activity with a parallel maintenance of a strong correlation with the credit impulse in periods of recovery is also evident in the case of Croatia (Figure 2), with the eurozone exhibiting a similar pattern (Figure 3).

The described relation between credit growth and economic activity was checked by an econometric model estimated by the OLS method⁴ on a panel of 12 European emerging market economies.⁵ Used were quarterly data for the period from the first quarter of 1998 to the second quarter of 2010.⁶ In addition to the entire observed period, the same model was estimated on two sub-periods – the recovery period and the rest of the period. In the analysis, recovery periods were determined separately for each country and begin in the quarter in which the annual GDP growth rate starts to grow after a sharp slowdown, where its lowest value must fall to a level one standard deviation below the average GDP growth rate of the country in question. Recovery periods last to the quarter in which the growth rate again reaches the average value for the country concerned. As a rule, a recovery defined in this way slightly precedes the technical exit from recession, in a case in which GDP falls during the observed episode.

The dependent variable in all equations is the year-on-year rate of change in real private demand, i.e. the sum of real personal demand and real investment. Independent variables are the credit impulse and the year-on-year rate of change in real loans to the corporate and household sectors. As data on the amount of newly-granted loans are not

4 Due to heteroskedasticity and autocorrelation, variances were corrected by the Newey-West procedure.

5 Bulgaria, the Czech Republic, Croatia, Estonia, Latvia, Lithuania, Hungary, Poland, Romania, the Slovak Republic, Slovenia and Turkey.

6 The empirical approach used closely follows the authors who examined the role of the credit impulse on examples of developed and developing economies.

Table 1 Results of the estimated model for domestic loans broken down by period

Independent variable	Coefficients		
	Entire period	Recovery period	Rest of the period
Number of observations	570	81	488
Credit growth	0.142 ^a	-0.063	0.125 ^a
Credit impulse	0.195 ^a	0.207 ^b	0.184 ^a
R ²	0.26	0.07	0.25

^a Significant at the level of 1%. ^b Significant at the level of 5%.
Source: CNB calculations.

Table 2 Results of the estimated model for total loans broken down by period

Independent variable	Coefficients		
	Entire period	Recovery period	Rest of the period
Number of observations	570	81	488
Credit growth	0.148 ^a	-0.004	0.125 ^a
Credit impulse	0.196 ^a	0.194 ^b	0.192 ^a
R ²	0.29	0.07	0.27

^a Significant at the level of 1%. ^b Significant at the level of 5%.
Source: CNB calculations.

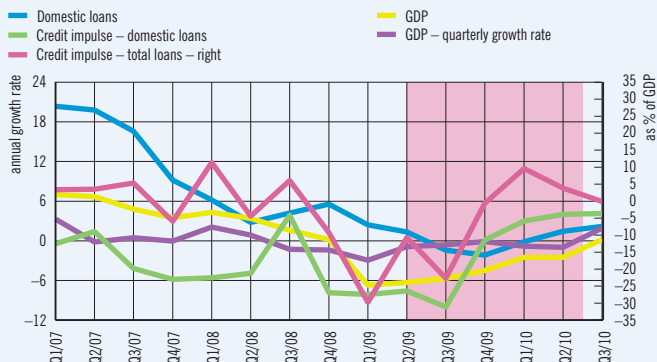
available for many countries, the credit impulse is defined as the change in credit growth relative to economic activity. Credit indicators are calculated for both domestic and total loans.⁷

Results of the estimated regressions confirm the patterns found in basic descriptive statistics (Tables 1 and 2). For domestic loans, both estimated parameters are, as expected, significant and positive over the entire period and in the sub-period that excludes recovery episodes. This correlation between credit and economic activity marked the entire period of strong financial deepening and substantial growth in Central and Eastern Europe. However, in the recovery period, the parameter with the credit growth variable becomes insignificant, while the parameter with the credit impulse continues to be equally strong and statistically significant. Similar results were obtained for total loans.

This confirms that in Central and Eastern European countries as well, the usual correlation between economic growth and credit dynamics, typical for the major part of the business cycle, also changes in recovery periods, when the correlation between the credit impulse and economic activity becomes more important. With reference to this, it should be emphasised that the model does not indicate the direction of the cause

7 Total loans are a sum of domestic and foreign loans, where foreign corporate and household loans are approximated by data on the exposure of BIS reporting banks (adjusted by the exchange rate) to non-banking sectors of the countries under review.

Figure 4 Economic and credit activity in Croatia – rates of change



Note: The shaded area shows the period of recovery.
Sources: Eurostat and CNB calculations.

and effect relationship between credit and economic activity, although one may notice that a recovery in the credit impulse slightly precedes economic recovery. Instead, the model attempts to assess the strength of that correlation in various stages of the business cycle. Regardless of the direction of that correlation, data on the credit impulse may serve as a leading indicator of economic recovery and exit from recession.

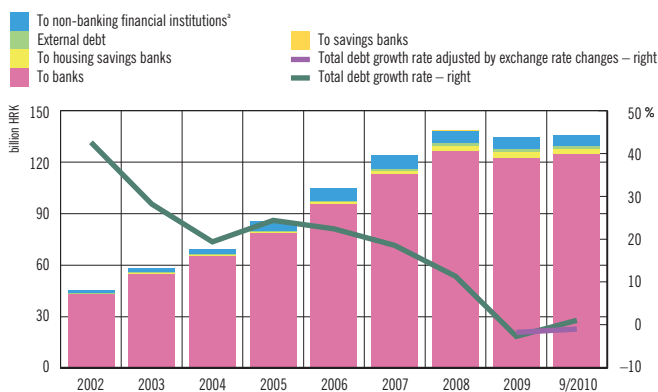
Although a high level of Croatian banking system stability was maintained throughout the most recent recessionary episode, the level of corporate and household loans granted by domestic banks steadily decreased in 2009. Nevertheless, the recovery in the credit impulse for domestic and total corporate and household loans began already in mid-2009; it followed the decrease in the negative annual GDP growth rates and heralded the recovery of the real sector and, soon after, the recovery of the loan balance, which started to grow mildly in early 2010 (Figure 4). Total loans began to recover slightly earlier, spurred by the stabilisation of global financial markets and the fall in the risk premium for emerging economies, including Croatia.

Economic recovery coupled with the stabilisation of lending rates could lead to a slight increase in loan demand in the forthcoming period. In addition to the strong capitalisation and liquidity of the banking sector, this could result in moderate credit growth and the maintenance of relative equilibrium in the credit market.⁸

⁸ See Figures 24 and 25.

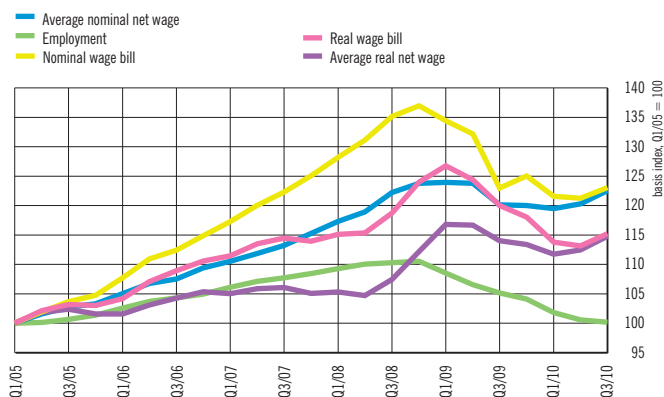
Household sector

Figure 27 Household debt



*Data on household debt to leasing companies and insurance companies are based on estimates.
Sources: CNB and HANFA.

Figure 28 Employment and wages (seasonally adjusted)



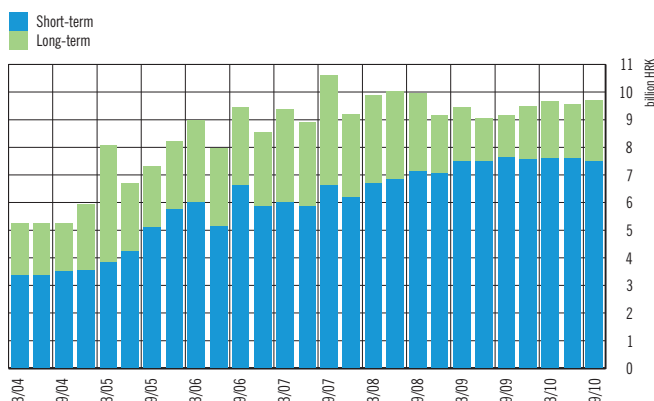
Source: CBS.

Having improved in 2009, household debt indicators deteriorated in 2010 due to the strengthening of the Swiss franc and the drop in household disposable income. These indicators may improve in 2011 under the influence of slight income growth and a moderate increase in household debt, although the number of vulnerable households may continue trending up due to the expected steady fall in employment.

Households responded to the financial crisis by toning down their expectations for future wages and other income, and by reducing personal consumption and borrowing needs. The household sector has been steadily deleveraging since mid-2009 although its debt increased in nominal terms in 2010 due to the substantial strengthening of the Swiss franc, the currency to which nearly one third of all household loans is indexed. Having fallen by HRK 3.8bn (-2.7%) in 2009, total household debt rose again to its mid-2009 level at the end of September 2010, growing year-on-year by HRK 1.4bn (1.0%) (Figure 27). However, if the exchange rate effects on the kuna amount of foreign currency-indexed household loans are excluded, households continued to reduce their debt in 2010, although at a slower pace than in 2009.

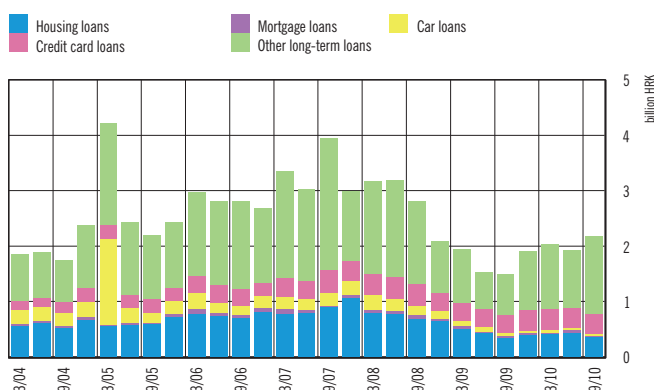
The described debt dynamics was primarily the result of the slump in household demand for loans, which was due to the unfavourable labour market trends that continued into 2010, the maintenance of interest rates at high levels, and impeded access to new loans due to the reduced risk appetite of banks (see Box 3 Credit policy of banks and household debt in 2009). The tax changes introduced early in the third quarter of 2010 led to a one-off increase in net wages and, coupled with the expected repeal of the higher special (crisis) tax rate in late 2010,

Figure 29 Maturity breakdown of newly-granted household loans



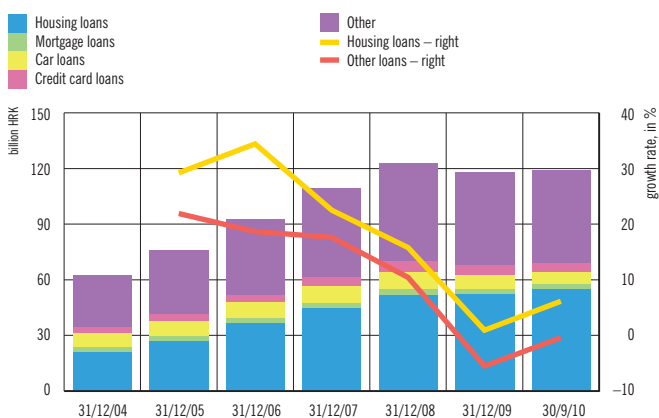
Source: CNB.

Figure 30 Newly-granted long-term household loans by purpose



Source: CNB.

Figure 31 Household loans by purpose



Source: CNB.

somewhat alleviated the negative impact of rising uncertainty on household demand for loans (Figure 28).

The pace of the economic recovery in 2011 will be sufficient only to mitigate the downward trend in employment, while the persistently high credit risk will keep in check the decline in interest rates. The expected recovery in wages will probably reverse the falling trend in household debt, although no stronger growth is to be expected until the labour market recovery is on a stronger footing.

The slower fall in total household debt is also evident from the increase in the amount of newly-granted loans to this sector (Figures 29 and 30). The amount of new long-term household loans, which dropped substantially during the crises, began to grow again in late 2009. The credit recovery was mostly due to larger amounts of granted other long-term loans (e.g. any-purpose cash loans) and credit card loans; their total amount at end-September 2010 grew for the first time since the end of 2008, which also considerably slowed down their year-on-year rate of fall. Newly-approved housing and mortgage loans and car loans have not yet begun to grow strongly, so that the faster year-on-year growth in total housing loans (6.1% at end-September) was mostly the result of exchange rate changes related to the appreciation of the Swiss franc (two-thirds of the total increase in housing loans) (Figure 31). Interest rates on newly-granted long-term household loans, which began falling in early 2010, further contributed to the continued replacement of short-term household loans by longer-term loans in the second half of the year.

Newly-granted long-term household loans are still mostly indexed to foreign currencies so that their share in the total amount of household loans, which has been steadily growing since end-2008, rose to nearly 73% by the end of September 2010 (Figure 32). The bleak picture of exchange rate risk exposure is somewhat brightened by the fall in the share of Swiss franc-indexed loans in total household loans. The kuna/Swiss franc exchange rate has exhibited a much higher degree of volatility than the kuna/euro exchange rate (see Box 5 Materialisation of currency-induced credit risk in Swiss franc-indexed loans). Household exposure to the risk of an increase in loan payments due to changes in interest rates has also stayed at its usual high level (96%) (Figure 33).

The combination of reduced debt and increased income had a favourable impact on household debt indicators in 2009, while the fall in disposable income¹ and materialisation of credit risk for Swiss franc-indexed loans undermined their improvement in 2010. Thus, the ratio of household debt to disposable income in the first three quarters of 2010 nearly returned to the historical high of end-2008 (Figure 35). The exchange rate risk associated with Swiss franc appreciation affected also the ratio of interest payments to household disposable income, which grew

¹ Estimated disposable income of households does not include some forms of income generated in the official economy (e.g. royalties, temporary service contracts and income from capital) or income from the unofficial economy (grey economy).

Figure 32 Currency breakdown of household loans

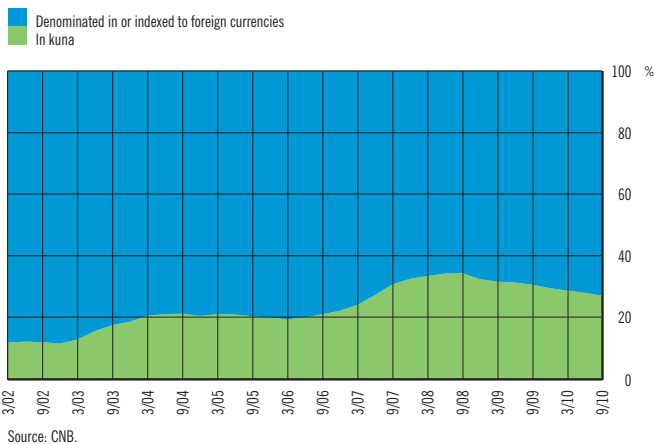


Figure 33 Household loans by interest rate variability

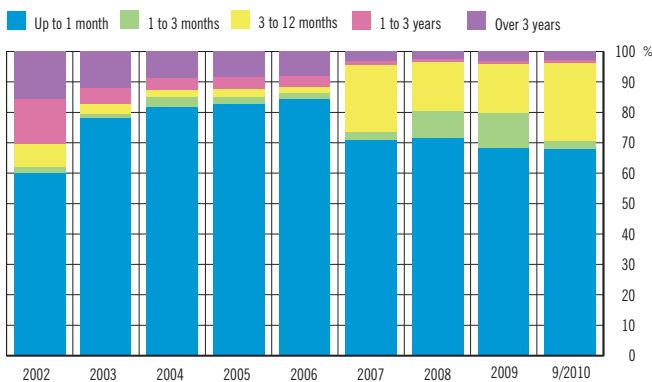
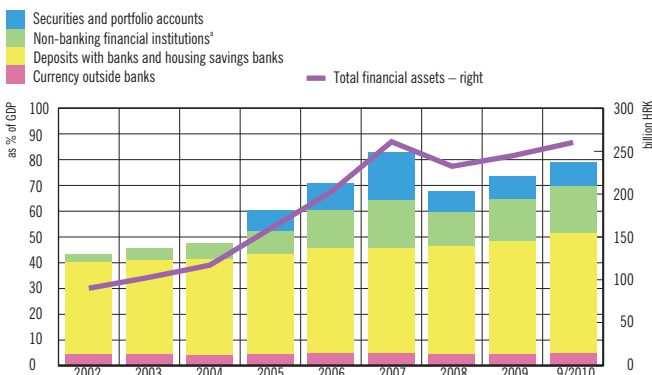


Figure 34 Household financial assets



¹ Data on household claims against open-end and closed-end investment funds and data on claims against insurance companies are based on estimates.
Sources: CNB, HANFA and CDCC.

mildly in 2010 despite somewhat lower interest rates. In contrast, the increase in household savings sustained the improvement in related household debt indicators. The year-on-year growth rate of savings with banks doubled in the period from the beginning of 2010 to end-September. This improved the ratio of household deposits to total debt, which hit a five-year high late in the third quarter of 2010. The value of other forms of household financial assets also increased in 2010, particularly investments in investment funds (Figure 34). Higher returns on investment compared with interest rates on bank deposits attracted new and brought back some of the former investors, particularly to the least risky investment funds, so that the ratio of household debt to total liquid financial assets² grew by the end of September 2010 to its end-2007 level (Figure 35).

The repeal of the higher rate of the special tax on salaries, pensions and other income in late 2010 will have a favourable effect on household income, which could grow mildly in 2011. Coupled with persistently weak borrowing activity and subdued personal consumption, this could additionally improve household debt indicators. However, the most likely scenario for 2011 shows that the number of vulnerable households and their share in total debt could continue to trend higher largely because the decline in employment is expected to continue, albeit at a slower pace than in 2010. In addition, substantial foreign exchange and interest rate risks do not exclude the possibility of a major deterioration in household vulnerability in the case of the materialisation of larger-than-anticipated shocks.

Household sector vulnerability

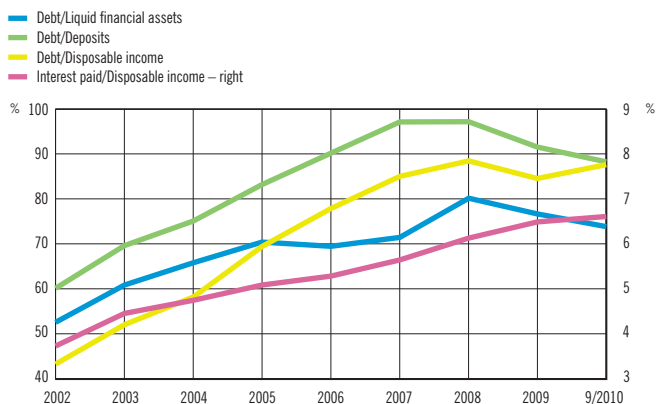
Unfavourable macroeconomic developments in 2010 steadily eroded households' debt-servicing capacity, which was evident from the increase in the share of non-performing loans granted to this sector. This is consistent with the results of household sector stress tests. To quantify the impact of various adverse scenarios, including the fall in employment, the weakening of the kuna exchange rate and the rise in lending rates of banks as well as the impact of their combination on the dynamics of bank exposure to potentially vulnerable households in 2011, household sector stress tests conducted included all these shocks.³

As in previous stress tests, the vulnerability indicator applied was based on the concept of financial margin, i.e. the income reserve available to a household after subtracting from household income the amount of loan payments and minimum living costs derived from the at-risk-of-poverty threshold, which is defined by the CBS for each type of household. If disposable income is not sufficient for loan repayment and minimum costs, a

² Household financial assets exclude foreign cash and deposits with foreign banks since their level cannot be precisely estimated.

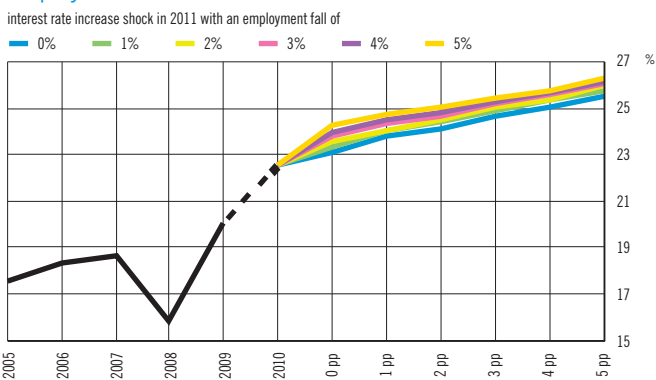
³ Based on the Household Budget Survey for 2009, the Institute of Economics, Zagreb and the Croatian National Bank carried out an analysis of household indebtedness in 2009 (*Household Credit Risk in Croatia: An Analysis Based on the Household Budget Survey (2009)*).

Figure 35 Household debt and debt burden



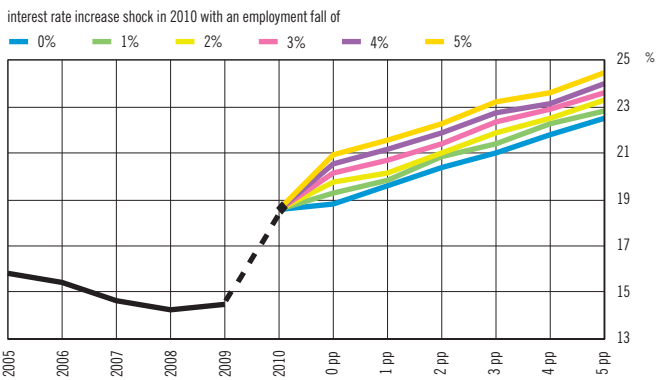
Sources: CNB, HANFA and CDCC.

Figure 36 Share of vulnerable households in the total number of indebted households after the combined impact of employment and interest rate shocks



Sources: CNB and EIZG.

Figure 37 Share of vulnerable households' debt in total sector debt after the combined impact of employment and interest rate shocks



Sources: CNB and EIZG.

household is classified as vulnerable. The current methodology is slightly different from that applied in previous simulations so as to use additional Household Budget Survey (HBS)⁴ data to capture the tested shocks as best as possible.⁵

According to 2009 data, the share of vulnerable households' debt in total sector debt remained about the same as in the previous year (14.5% of the total portfolio of loans to households included in the survey), which is consistent with the stagnation in the ratio of non-performing household loans in that period, although the number of vulnerable households grew slightly more (20.0% of indebted households were vulnerable in 2009). The simulation of changes in these household vulnerability indicators, which was made based on the same HBS data and estimated movements in observed macroeconomic and financial variables for 2010, shows a strong upturn in the number of vulnerable households and their debt, which is also followed by the trends in non-performing household loans in that year. The share of vulnerable households in the total number of indebted households rose to 22.5%, while bank exposure to these households grew to 18.5% of total loans, four percentage points up from the previous year. The fall in employment mostly contributed to the increase in the share of debt held by vulnerable households (around 2 percentage points), while the impact of the kuna weakening against the Swiss franc was much smaller (0.4 percentage points). As interest rates on household loans remained relatively stable in 2010, their contribution to the rise in the sector's vulnerability was negligible. The rest of the increase in banks' exposure to risky households (around 1.5 percentage points) was the result of a combined impact of employment and exchange rate depreciation shocks on household creditworthiness, which suggests that the cumulative effects of several shocks are much stronger than their individual effects.

A wide range of intensity of the three observed shocks⁶ was simulated for 2011, some of which are highly unlikely, though plausible. Simulated were the impact of individual shocks and the impact of a combination of two shocks⁷ that are to some extent viewed as economic policy alternatives (Figures 36, 37, 38 and 39).

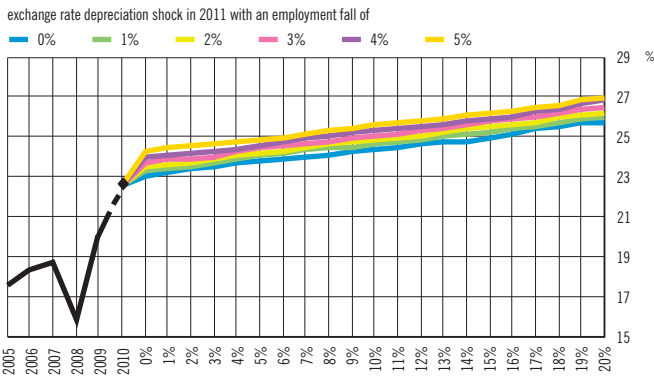
4 The Household Budget Survey (HBS) is carried out annually by the Croatian Bureau of Statistics and gathers data on individual types of household income, assets and consumption.

5 The impact of the rise in interest rates on the amount of annual loan payments was determined from new data on outstanding principal amounts (instead of the total amount of loan taken), while the simulated exchange rate shock takes into account also movements in the kuna/Swiss franc exchange rate. Simulations also include the impact of institutional changes in the period observed, so that the shock in the form of a fall in employment now takes into consideration new, i.e. higher, unemployment benefits. For more on the methodology and results of the former analysis, see Box 4 Household Resilience to Financial and Macroeconomic Shocks, *Financial Stability*, No. 4, February 2010.

6 Simulations included an employment fall of 1% to 5%, a 1%-20% weakening of the kuna exchange rate and an increase in lending rates of banks of 1-5 percentage points.

7 A fall in employment and weakening of the kuna, and a fall in employment and an increase in interest rates.

Figure 38 Share of vulnerable households in the total number of indebted households after the combined impact of employment and exchange rate shocks

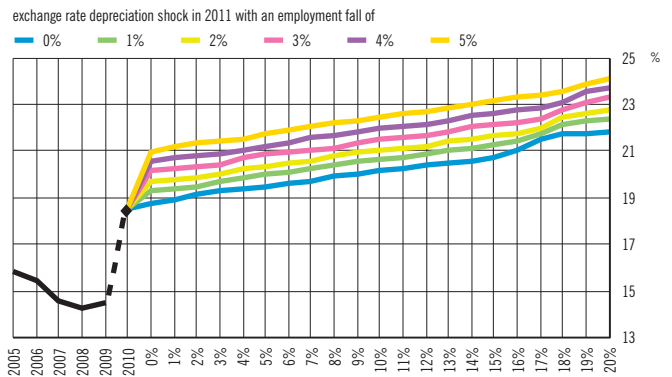


Sources: CNB and EIZG.

Simulation results for 2010 show that the impact of observed shocks on vulnerable households is not linear but depends on the actual combination of shocks and on their intensity. Simulated combinations of shocks thus show that, for a given decrease in employment, the impact of a one percentage point increase in interest rates is approximately equal to the impact of a 5% weakening of the kuna, but this ratio decreases with each unit of increase in interest rates.

The deterioration in macroeconomic conditions in 2010, particularly in the labour market, impaired creditworthiness of indebted households and increased overall exposure of banks to potential credit losses. These trends could continue throughout most of 2011, though they should be less steady and intense. In

Figure 39 Share of vulnerable households' debt in total sector debt after the combined impact of employment and exchange rate shocks



Sources: CNB and EIZG.

line with this, the simulations conducted show that the increase in the share of debt held by vulnerable households under the most likely scenario for 2011 (which assumes a slower increase in unemployment and relatively stable interest rates and kuna exchange rate) could decelerate considerably after increasing sharply in 2010, which means that the rise in non-performing household loans could lose steam. Much stronger shocks would be necessary for a significant increase in household vulnerability. Still, the results presented should be taken with a grain of salt due to the possibility that households facing difficulties in adjusting to lower income begin to delay their loan payments even before their financial margin becomes negative, as well as due to a potential bias of the HBS data and possible errors that could result from implicit assumptions underlying the simulations.

Box 3 Credit policy of banks and household debt in 2009

Pro-cyclicality of lending standards, particularly with regard to household loans, is often singled out in analyses as one of the main reasons for the current crisis.¹ In the case of Croatia, there is also evidence that relaxed lending standards were a powerful contributing factor to the strong growth of household debt.² Lending to households was the main generator of credit expansion and considerably increased total household sector debt, but it decreased steadily from the outbreak of the crisis in Croatia. This box attempts to establish to what extent the 2009 fall in total household debt was due to potentially destabilising changes in lending standards, which took the form of limits on the supply and amount of new loans (more restrictive credit policies of banks) and to what extent it was due to a slump in household demand for credit. For that reason, an analysis of household borrowing was made based on the micro-data from the Household Budget Survey (HBS) for 2008 and 2009.³ A stochastic frontier analysis (SFA) approach,⁴ which is well-known in the literature, was used to separate the impact of supply and demand on the change in the total amount of newly-granted household loans, complemented by quantile regressions, which enable further analysis.

The maximum loan amount ($\max(Y_i)$) that banks are ready to grant to households in a certain year represents loan supply. However, in reality only approved loans are known, and not potential maximum loan amounts. By using the stochastic frontier it is possible to establish the maximum loan amount, the so-called credit limit⁵ that a bank with its credit policy (β) is prepared to grant to a household with certain socio-economic and demographic characteristics (X_i), based on the realised loan amount (Y_i) and efficiency of household borrowing (u_i):

$$\log(Y_i) = \beta \log(X_i) + v_i - u_i,$$

where v_i are random errors. SFA was an innovation to the standard production function; it added to the model an additional random component that represents production line efficiency. In lending to households, this additional random component denotes the possible unused credit potential, while the ratio of the estimated credit limit to realised loan amounts shows how efficient households are in using these limits, i.e. their demand for loans. The difference in assessed credit limits between 2008 and 2009 will show the effect of supply (i.e. credit policy of

banks), while the ratio of realised to estimated maximum loan amounts that banks are ready to grant to households shows the impact of household demand for loans on the household debt dynamics in that period.

SFA shows that, despite the deepening of the economic crisis in 2009, banks increased the amount of new loans offered to households, particularly in smaller loan amounts (Figure 1). However, due to the necessary assumption about the form of distribution of efficiency⁶ in using the credit limit, SFA may lead to biased results. In addition, SFA does not enable correction for sample selection bias, which arises from the fact that the analysis is made on a sample of indebted households that are not randomly selected from the population of all households; i.e. it does not take account of the impact of bank policies on decisions regarding households to which loans are granted at all or of the impact of demand on decisions to obtain a loan.⁷ More precisely, banks can modulate their credit policies in two segments of the credit process: setting the criteria which a household must meet to be granted a loan and/or deciding on the maximum loan amount to a household that meets the loan criteria. The use of the SFA approach makes it possible to discern changes only in the segment of maximum loan amounts banks are ready to grant to creditworthy households, while the correction for the sample selection bias helps identify the impact of changes in loan criteria.

Under SFA, it is also difficult to separate the impact of a change in bank credit policies from that of a change in the creditworthiness of indebted households on movements in their debt. A change in the creditworthiness of indebted households will over the course of time affect the debt balance regardless of changes in credit policies, so such a distinction is crucial for the determination of the impact of supply and demand on household debt dynamics.

For these reasons, quantile regressions (QR)⁸ were used as an alternative to SFA; they do not assume a definite form of efficiency distribution and enable an empirical determination of the impact of loan demand and bank credit policies (approximated by estimated QR coefficients) on the entire distribution of the newly-granted loan amount. At lower quantiles of household debt, demand probably has a crucial impact on the debt amount. However, it is more likely that the limiting factor for the debt of the most heavily indebted households consists of bank credit policies. For that reason, the maximum loan amount available to each indebted household is determined based on that household's characteristics and coefficients estimated with characteristics of indebted households at the highest percentiles of the conditional distribution of new loan amounts. Credit limits for both observed years were calculated based on coefficients estimated at the 80th percentile,⁹ and were addi-

1 Mian, A., and A. Sufi: *The Consequences of Mortgage Credit Expansion: Evidence from the U.S. Mortgage Default Crisis*, Quarterly Journal of Economics, November 2009.

2 Herceg, I., and V. Šošić: *The Anatomy of Household Debt Build Up: What Are the Implications for the Financial Stability in Croatia?*, <http://www.hnb.hr/dub-konf/16-konferencija/herceg-sosic-2.pdf>.

3 This analysis was made within the project *Household Credit Risk in Croatia: An Analysis Based on the Household Budget Survey (2009)*, prepared by the Institute of Economics, Zagreb and the Croatian National Bank.

4 SFA is commonly used for estimating production frontiers and technical efficiency of the production process. For more details on the use of SFA in analysing household debt, see Herrala, R.: *Credit crunch? An empirical test of cyclical credit policy*, Bank of Finland Research Discussion Papers, 10/2009.

5 Credit limits were estimated separately for 2008 and 2009.

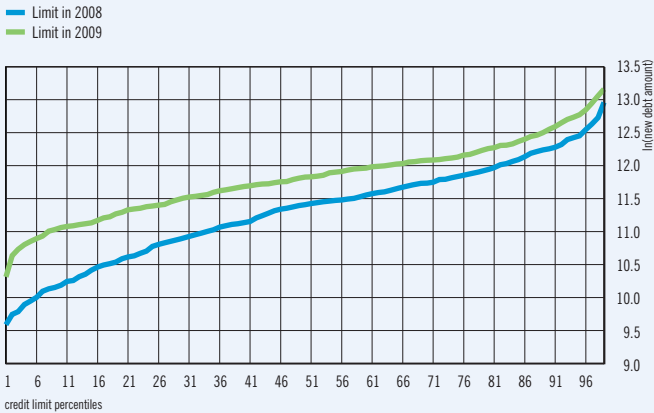
6 Efficiency (u_i) is usually characterised by a one-sided probability distribution.

7 The selection of the reviewed indebted households in a particular year is not random but depends on a household's decision to apply for a loan and on a bank's decision to approve the loan application.

8 Quantile is a general term used for statistical placement values that divide a data set ordered by size (in our case, the amount of household loans) into a specific number of equal parts. Thus, deciles divide an ordered data set into 10 equal parts and percentiles into 100 parts equal in number.

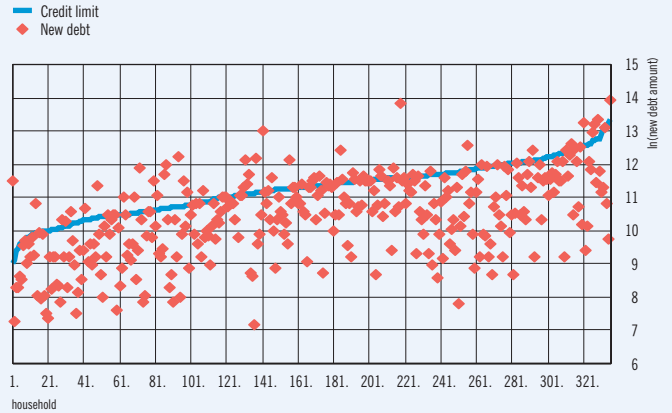
9 The choice of percentiles that will present limitations posed by bank credit policies is arbitrary. The 80th percentile was selected because credit limits calculated based on coefficients estimated at that percentile on average follow well the developments in SFA limits.

Figure 1 Supply of new bank loans (credit limits)



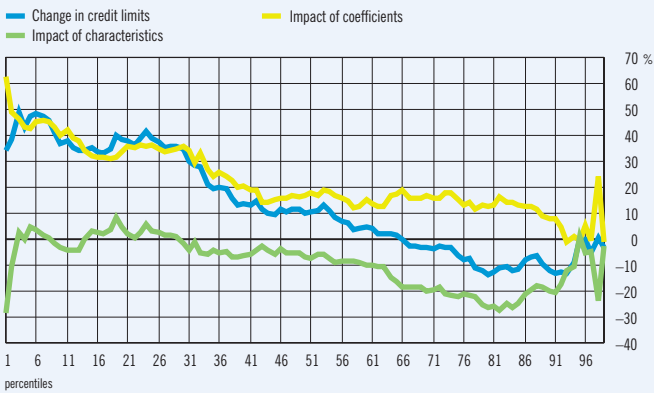
Sources: CNB and EIZG.

Figure 4 Use of credit limits in 2008



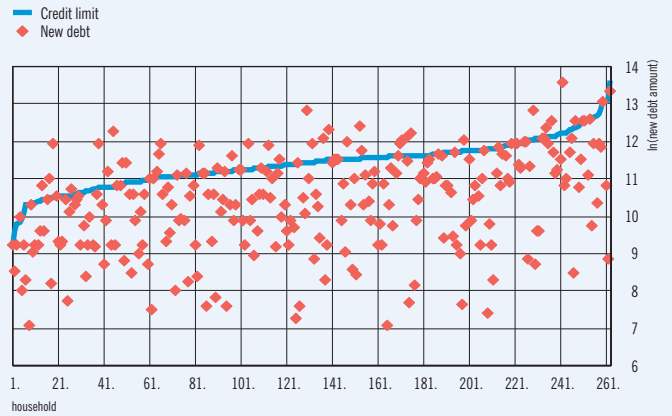
Sources: CNB and EIZG.

Figure 2 Decomposition of changes in credit limits between 2008 and 2009



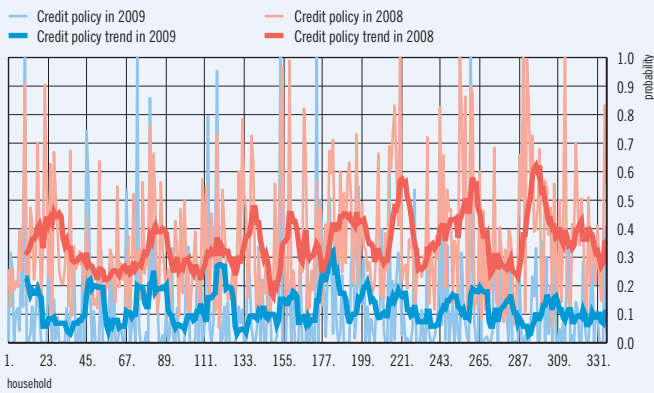
Sources: CNB and EIZG.

Figure 5 Use of credit limits in 2009



Sources: CNB and EIZG.

Figure 3 Loan approval probability estimated for households in 2008 with credit policies in 2008 and 2009



Sources: CNB and EIZG.

tionally corrected for the sample selection bias.¹⁰ Furthermore, using the Machado-Mata decomposition technique, the effect of changes in the creditworthiness of indebted households (approximated by their characteristics) was separated from the effect of changes in credit policies of banks (approximated by the estimated QR coefficients) on the dynamics of household credit limits.

The QR analysis shows that in the period from 2008 to 2009, household credit limits mostly increased (by 13.5% on average); credit limits of the least indebted households grew most (Figure 2), which is similar to SFA findings. Findings are somewhat different with regard to the most heavily indebted households whose credit limits decreased in that period under the QR approach. The increase in the maximum loan amount

10 On the correction for the sample selection bias and the Machado-Mata decomposition method, see Box 3 Impact of household debt growth in the pre-crisis period on financial stability, *Financial Stability*, No. 5, July 2010.

was primarily a consequence of relaxed credit policies of banks in the segment of the granted loan amount, while characteristics of indebted households mostly deteriorated in the same period.

A decomposition of the increase in credit limits corrected for the sample selection bias includes the impact of changes in the loan approval probability into the effect of estimated coefficients. When characteristics of households that borrowed in 2008 are included in the estimated equation for the probability of raising a new loan in 2009, on average, one may see a substantial fall in the loan approval probability (Figure 3), which indicates that credit policies were somewhat tightened in that period. The tightening did not imply limits on loan amounts but the introduction of stricter loan criteria.

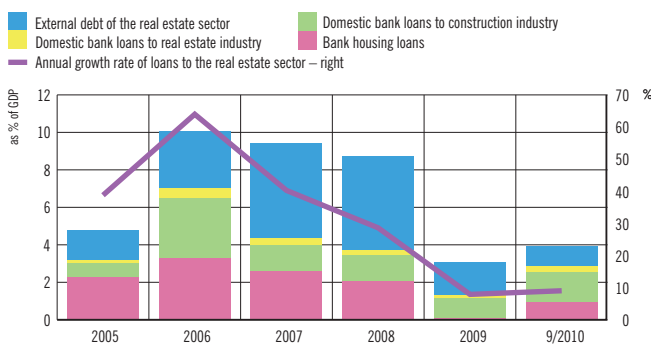
Although it was harder for households to obtain a bank loan in 2009 than in the year before, households that were assessed as creditworthy

had at disposal larger maximum loan amounts. Nevertheless, available credit limits were used much less in 2009 than in 2008, which is indicated by a larger dispersion of realised loans around maximum loan amounts (Figure 5).

This analysis shows that domestic banks responded to the financial crisis by a partial tightening of their credit policies, above all a stricter selection of households, while maximum loan amounts that banks granted to households deemed creditworthy were even larger than in 2008. However, due to the relatively smaller utilisation of credit limits, i.e. the fall in demand for loans, the year 2009 witnessed a fall in the total amount of newly-granted loans and in total household debt to banks. This research indicates that the crucial impact on the household debt decline in 2009 was made by the fall in household demand for loans, although it was to some extent also due to the tightening of bank credit policies, which resulted in loans being less available.

Real estate sector

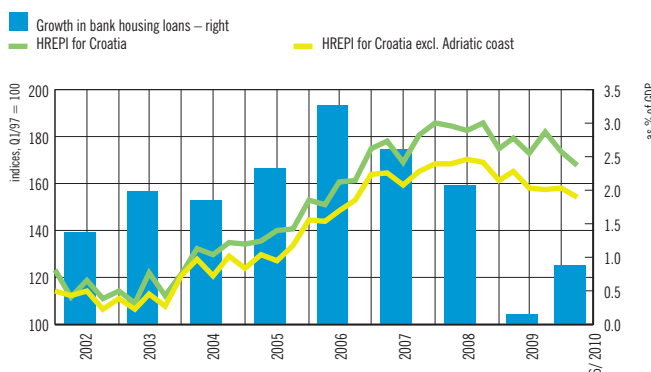
Figure 40 Annual growth in domestic and foreign loans to the real estate sector



Note: The figures relating to domestic loans granted to the real estate sector before 2010 were slightly modified due to the new classification of activities.

Source: CNB.

Figure 41 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.

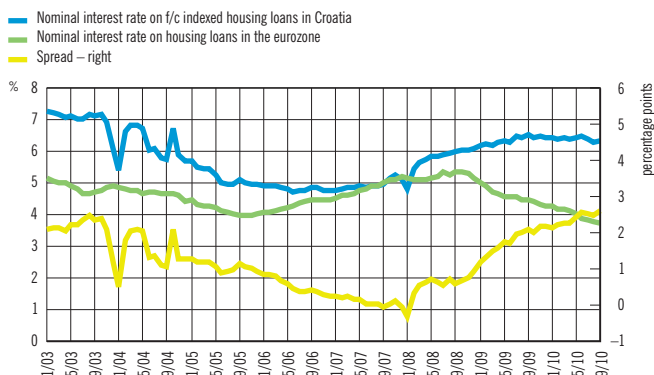
Source: CNB calculations.

Negative trends in the labour market that marked 2010 are expected to prevail throughout most of 2011. This will keep in check household demand for new housing loans and reinforce downward pressures on prices of residential property despite the improvement in the financial availability of residential property.

Lending to the real estate sector slowed down considerably in 2009 and held steady in 2010. The nominal increase in debt of the real estate sector, from 7.8% in late 2009 to 9.1% in September 2010 was thus mostly due to exchange rate changes (Figure 40). The structure of the increase in debt shows a shift towards domestic sources, while the growth in external borrowing continued to decrease due to the reallocation of foreign loans towards the tradable sector (Figure 47). Within domestic borrowing, construction sector debt grew the most, while the rise in housing loans was largely due to exchange rate changes. Nearly two-thirds of the increase in housing loans was due to the weakening of the kuna against the Swiss franc, the currency accounting for almost half of total foreign currency-indexed housing loans. Excluding the exchange rate effect, housing loans almost stagnated in 2010 as well.

The drop in residential property prices, which began in early 2009, continued in the first half of 2010 (Figure 41). The year-on-year decrease in prices of residential property slowed down briefly in late 2009 and early 2010 due to the rise in real estate prices on the Adriatic coast, but picked up pace again in the second quarter of 2010 (6.9%), so that prices fell to their mid-2007 levels. As residential property prices on the Adriatic coast continued to be more resilient to price corrections, the year-on-year decline in real estate prices excluding the real property prices on the coast was even stronger in mid-2010 (7.7%).

Figure 42 Comparison of interest rates on housing loans in Croatia and the eurozone

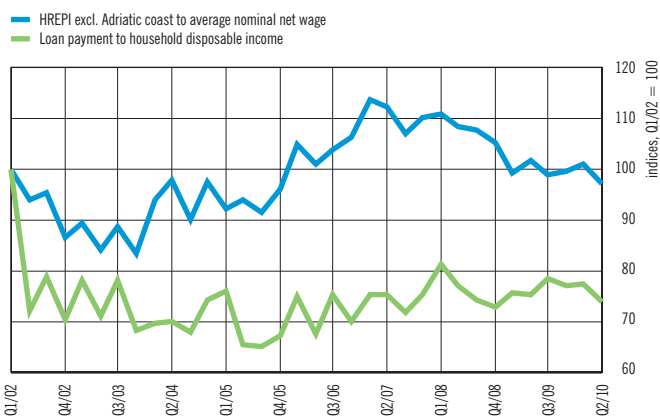


Sources: CNB and ECB.

Such trends in residential property prices were due to changes in key determinants of demand for real estate. The weakening of inflationary pressures in early 2010 in conditions of relatively stable but high nominal interest rates on housing loans (Figure 42) considerably raised real interest rate levels. In addition, unfavourable trends in the labour market further reduced disposable household income. Coupled with adverse changes in the kuna/Swiss franc exchange rate, this increased the current loan servicing burden and decreased demand for new housing loans.

The financial availability of residential property improved from end-2009 to the end of the first half of 2010 (Figure 43) as the

Figure 43 Financial availability of residential property

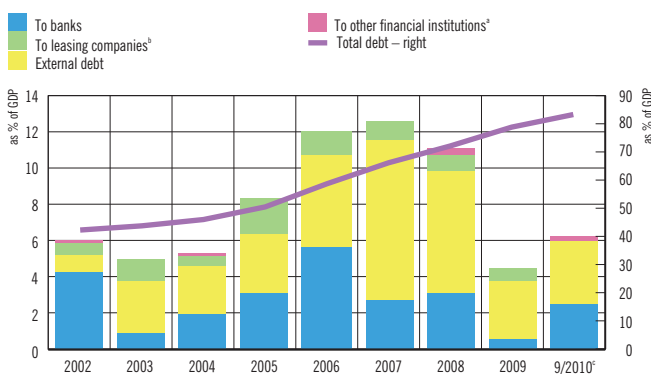


Sources: CBS and CNB calculations.

drop in real estate prices outpaced the fall in wages and overall household disposable income. The repeal of the higher rate of the special tax on income in late 2010 will increase household disposable income and further improve the financial availability of residential property, as well as somewhat alleviate the negative impact of the steady fall in employment. By contrast, the uncertainty caused by the announcement of the introduction of property tax could dissuade some households from buying residential real estate. Persistent negative trends in the labour market and an abundant supply of previously finished residential property coupled with currently high lending rates will continue to exert downward pressures on prices in the residential real estate market throughout most of 2011.

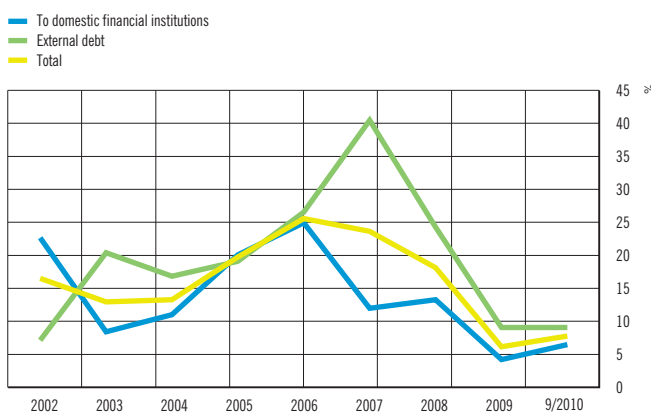
Non-financial corporate sector

Figure 44 Change and non-financial corporate debt stock



^a Data on debt to insurance companies refer to June 2010 (interest included).
^b Estimate. ^c Year-on-year increase in debt as at end-September 2010.
 Sources: CNB and HANFA.

Figure 45 Annual growth rate of non-financial corporate debt



Sources: CNB and HANFA.

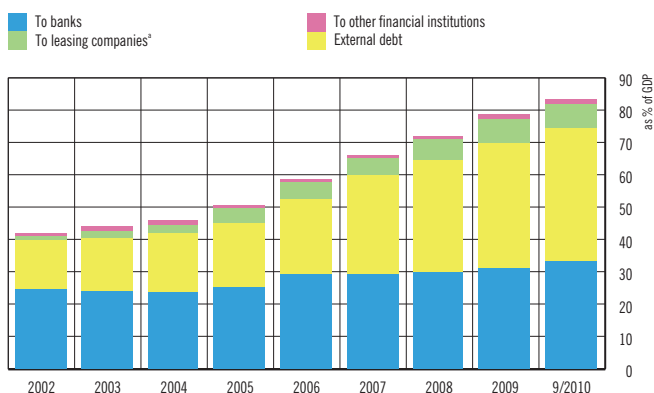
The gradual stabilisation of economic movements spurred corporate borrowing, particularly from domestic banks, which was also supported by the steady decline in lending rates. Notwithstanding its slight decrease, exposure of non-financial corporations to exchange and interest rate risks has remained high. Coupled with further debt growth expected in 2011, this will increase debt servicing risks.

Borrowing of the non-financial corporate sector was reduced substantially in 2009 but grew moderately in 2010. The debt increase was due to stronger borrowing from domestic banks, while the rise in external debt remained at the previous year's level. This is confirmed by the increase in newly-granted loans from domestic banks compared with 2009, when the recession peaked. Despite the recovery in domestic financing, the major portion of the increase in total debt is still accounted for by external financing, which also recorded a higher year-on-year growth rate (9% vs a 7% increase in domestic financing). Financial leasing in 2010 held steady at its 2009 level, but its structure changed in favour of financing investment in production processes, while a reduction was recorded in financing the purchase of goods vehicles and real estate (Figures 44 and 45).

As a result of these movements, total debt of the non-financial corporate sector grew from 78.5% of GDP at end-2009 to 83.5% of GDP at end-September 2010. The relatively weak inflow of new debt did not much change the structure of total debt: foreign sources and domestic banks still accounted for around 50% and around 40%, respectively, of total financing (Figure 46).

Stronger foreign demand was the main driver of growth in 2010. Accordingly, financing of manufacturing enterprises in-

Figure 46 Non-financial corporate debt



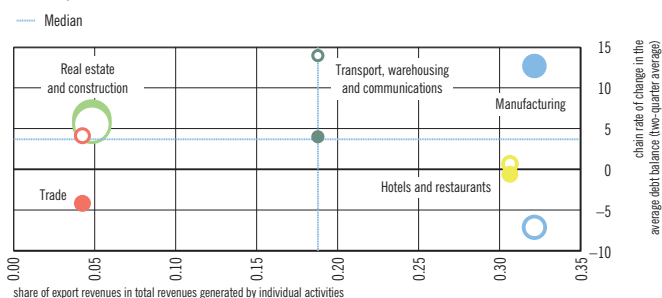
*Data on debt to leasing companies are based on estimates.

Sources: CNB and HANFA.

creased substantially since they are, on average, more export-oriented than the rest of the economy. The redirection of credit was particularly evident in foreign funding sources; the rise in external debt of enterprises in the manufacturing industry was the highest among observed activities in the period from March to September 2010. At the same time, foreign funding of enterprises in the sectors of trade, transport, warehousing and communications, and hotels and restaurants was reduced, while financing to real estate and construction activities remained above-average, though without any significant growth (Figure 47).

In contrast to new foreign borrowing, whose structure changed considerably from 2009 to 2010, the sectoral structure of domestic lending remained almost unchanged. Corporates dealing in construction and real estate activities continued to account for the bulk of credit growth, partly compensating for

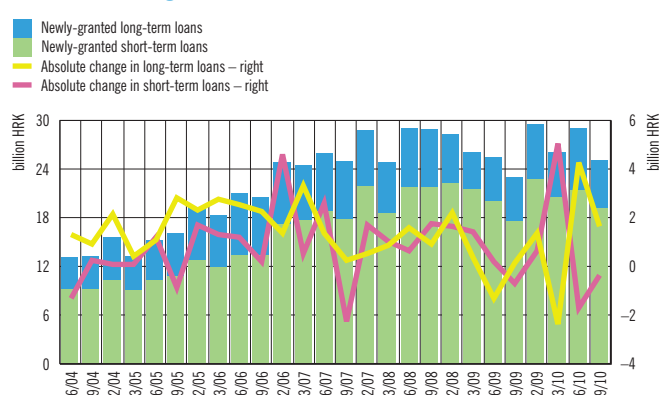
Figure 47 External debt allocation by sectors from March to September 2010



Note: A full circle denotes the debt dynamics in the last two quarters observed (debt balance at end-September 2010 relative to the debt balance at end-March 2010). An empty circle denotes the same change in the debt balance in the previous period (debt balance at end-September 2009 relative to the debt balance at end-March 2009). The size of the circle denotes the significance of a particular activity's share in total external debt of non-financial corporations, with the debt balance at end-September 2010 used as the debt indicator. Activities accounting for a relatively minor share in total

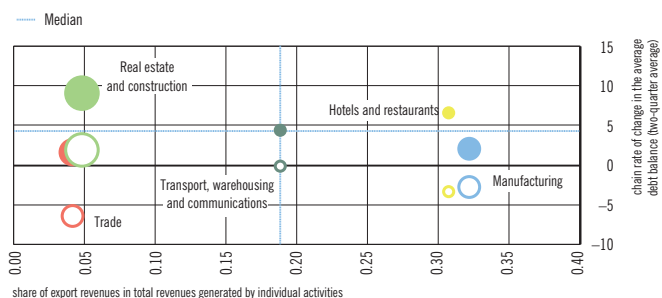
Sources: CNB (external debt) and FINA (export and total revenues).

Figure 49 Newly-granted bank loans and absolute change in the stock of gross loans



Source: CNB.

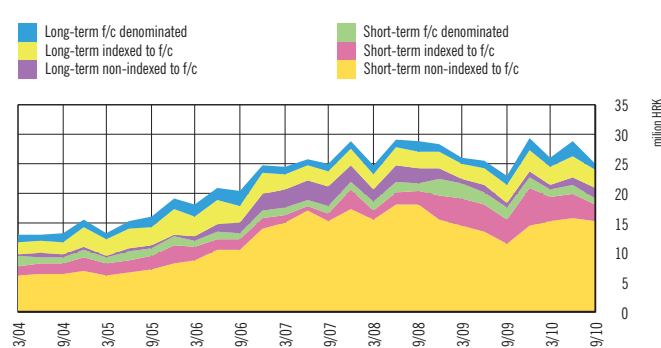
Figure 48 Allocation of domestic bank loans by sectors from March to September 2010



Note: A full circle denotes the debt dynamics in the last two quarters observed (debt balance at end-September 2010 relative to the debt balance at end-March 2010). An empty circle denotes the same change in the debt balance in the previous period (debt balance at end-September 2009 relative to the debt balance at end-March 2009). The size of the circle denotes the significance of a particular activity's share in total debt of non-financial corporations to domestic banks. Activities accounting for a relatively minor share in total debt are not presented.

Sources: CNB (loans by activity) and FINA (export and total revenues).

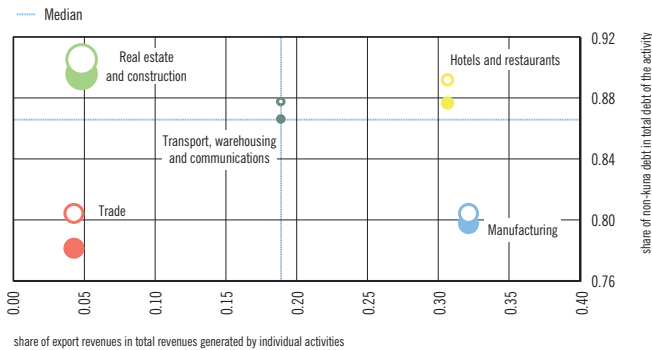
Figure 50 Breakdown of newly-granted loans to non-financial corporations by maturity and currency



Note: Short-term loans comprise personal overdrafts, which are statistically recorded as newly-granted loans in each month.

Source: CNB.

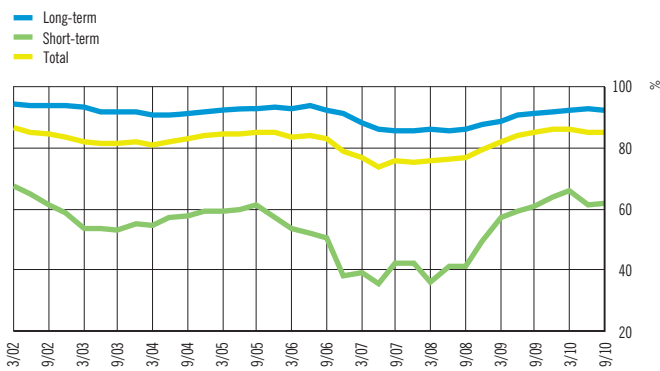
Figure 51 Currency exposure in September 2010



Note: A full (empty) circle denotes the share of non-kuna debt in September 2010 (March 2010). The size of the circle denotes a particular activity's share in total debt of non-financial corporations. Activities accounting for a relatively minor share in total debt are not presented.

Sources: CNB (loans by activity) and FINA (export and total revenues).

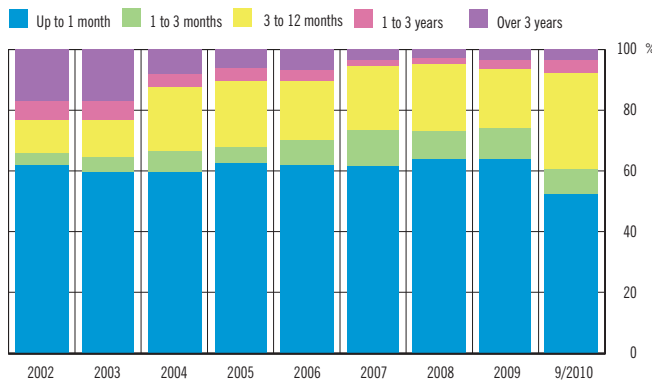
Figure 52 Share of corporate non-kuna debt^a in total loans



^a It is assumed that total external debt is denominated in foreign currencies.

Source: CNB.

Figure 53 Breakdown of bank loans to non-financial corporations by interest rate variability



Source: CNB.

weak foreign lending, while lending to the manufacturing sector was below the average value for all activities (Figure 48).

At the same time, the structure of newly approved domestic bank loans in 2010 shows a slightly more dynamic increase in long-term loans, which indicates a gradual improvement in long-term corporate investment (Figure 49).

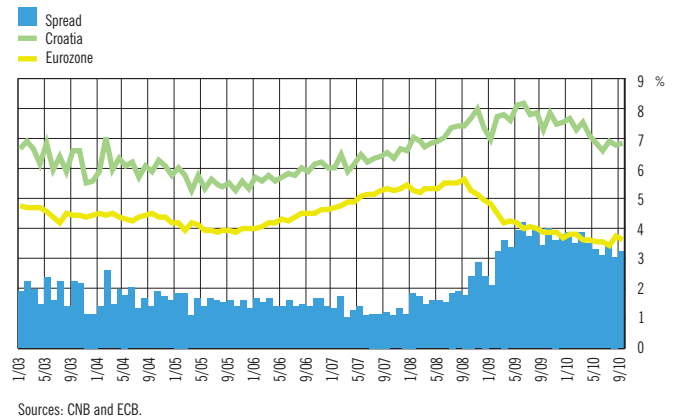
The sectoral allocation of loans shows that domestic banks in mid-2010 continued to increase strongly their exposure to corporations from the non-tradable sector, thus retaining the existing structure of lending. By contrast, foreign creditors turned to enterprises that participate more in foreign trade, which are thus better protected against currency risks and have higher growth potential (as indicated by the results shown in Box 4 Patterns of corporate lending in crisis situations).

After a sharp drop in kuna loans granted by domestic banks in 2009, corporates obtained more such loans in 2010. The change in the currency structure of new loans was noticeable both in short- and long-term corporate loans; the share of kuna loans in both types of loans gradually returned to the pre-crisis level (Figure 50). However, these changes had only a marginal impact on the currency structure of total loans to the non-financial corporate sector, i.e. on the reduction of exposure to currency risk, which stayed at a relatively high level (Figures 51 and 52).

Exposure of non-financial corporations to interest rate risk remained high in the first nine months of 2010. Loans made with interest rates variable within a year continued to account for more than 90% of total corporate loans, although the average period in which interest rates are variable within a year slightly lengthened, which means that banks continued to transfer interest rate risk to their clients (Figure 53).

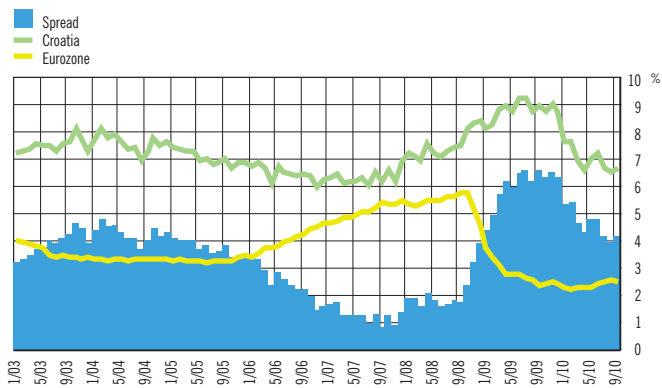
The waning of the financial crisis and recessionary forces, and easier access to foreign funding sources sustained the downward trend in domestic banks' interest rates on long- and

Figure 54 Interest rates on long-term loans to non-financial corporations in Croatia and the eurozone



Sources: CNB and ECB.

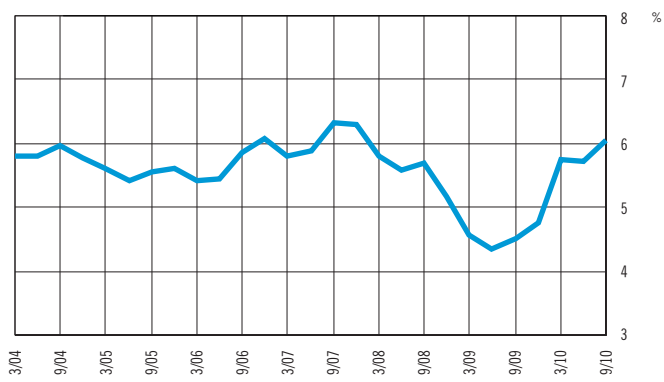
Figure 55 Interest rates on short-term loans to non-financial corporations in Croatia and the eurozone



Sources: CNB and ECB.

short-term corporate loans that began in late 2009. The fall in interest rates was more pronounced for short-term kuna loans (mostly on loans maturing in 3 to 12 months), which reacted to the financial turmoil of late 2008 much more strongly than long-term kuna loans. This slightly lowered the spread between interest rates on corporate loans in Croatia and the eurozone from its exceptionally high level in 2009, which reflected the country's growing risk premium (Figures 54 and 55). The narrowing of this interest rate differential may be expected to continue in 2011 due to the expected growth in interest rates in the foreign market. This may be accompanied by a slight decrease

Figure 56 Ratio of transaction account deposits of non-financial corporations to gross value added



Source: CNB.

in domestic interest rates, which is, however, constrained by persistently elevated risks. Coupled with rising debt, this interest rate level will have an adverse effect on debt servicing costs of non-financial corporations in 2011.

The steady increase in bank lending to corporates and the recovery of their operations improved the liquidity of non-financial corporations. The ratio of transaction account deposits of non-financial corporations and gross value added, which returned in 2010 to the pre-crisis level, will reduce default risk in 2011 (Figure 56).

Box 4 Patterns of corporate lending in crisis situations

Stagnation in aggregate loans to the economy during a recession often hides tumultuous lending activity that unfolds at a micro level and is crucial for successful restructuring of the economy. During recessions, banks mostly try to reduce their exposure to enterprises in distress, often by writing off loans, and turn to new and promising projects, thus providing a boost to economic growth. For example, as in previous recessions, US banks strongly reduced the level of existing corporate loans during the current crisis.¹ Still, banks sometimes respond to a sharp deterioration in the quality of placements by extending time limits for loan repayments to borrowers in default and hide the actual quality of placements hoping that difficulties of borrowers are only temporary or because of the fear that a bank's position in the market or management's position vis-à-vis owners may be threatened. Such responses of banks to unfavourable macroeconomic movements can slow down the movement of production resources to propulsive activities, hinder the entry of new entrepreneurs to the market and negatively affect potential growth. It is very difficult to draw the line between a bank's patience with clients in temporary distress and an intention to hide non-performing placements. Still, examples from practice, such as the Japanese, clearly show that a several-year prolongation of bank loans may keep resources in inefficient enterprises and contribute to a long-lasting economic stagnation, which in turns adds pressure on bank stability.

For these reasons, this publication has always devoted great attention to changes in the sectoral allocation of loans and to the relative dynamics at which banks recognise credit losses. For this reason, aggregated data for individual activities were previously used and bank risk management policies were compared.² This research aims at a direct analysis of the dynamics of bank exposure to individual enterprises during the crisis and the establishment of the extent to which banks changed the structure of placements. Recent economic research also supports the thesis that the flow of newly-granted loans is more important for economic growth after a recession than the change in the total loan amount (see Box 2 Credit dynamics and economic activity).

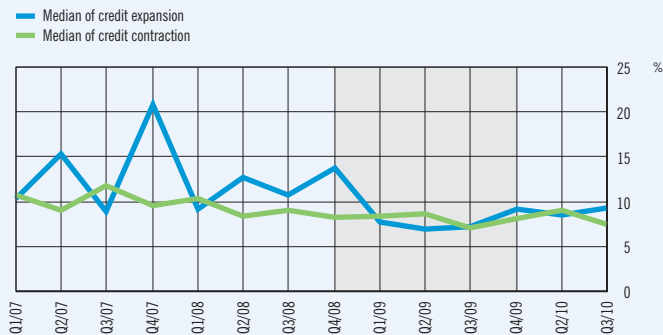
Figure 1 shows the creation and reversal of loans for a median bank in Croatia from the first quarter of 2007 to the third quarter of 2010. The creation was calculated as the sum of increases in total loan amounts to an individual client, while the reversal was calculated as the sum of decreases in total loan amounts to an individual client relative to their balance at the end of the previous period. At the onset of the recession, the creation of new loans decelerated sharply, while the reversal of loans also decreased, which is related to the fact that non-performing loans were not paid, though it may also be a sign of increased loan rescheduling.

Determinants of changes in loans to individual enterprises were examined to establish in more detail the lending patterns during the crisis

¹ See the paper by Contessi, S., and J. L. Franicis (2010): *U.S. Commercial Bank Lending through 2008Q4: New Evidence from Gross Credit Flows*, Federal Reserve Bank of St. Louis, Working Paper Series.

² See Box 4 Validation of placement classification systems by using data on multiple debtors and Box 5 Credit risk materialisation in Central and Eastern European countries, *Financial Stability*, No. 5, July 2010.

Figure 1 Credit expansion and contraction for a median bank³



³ Data for the first quarter of 2010 are excluded because they are not comparable with those for the previous period due to changes in the data collection methodology. Source: CNB.

and to identify potential differences relative to the pre-crisis period. The sample comprises data on loans to individual enterprises that banks have to report to the CNB under the Decision on the classification of placements and off-balance sheet liabilities of credit institutions.³ This sample was further reduced, to enterprises that do business with at least two banks, which enables the monitoring of bank interaction in lending to these enterprises. Corporate lending, which is a dependent variable to be explained, is shown in a regression as the change in the share of loans in corporate average assets, while independent variables in the panel of data are financial indicators of banks and enterprises with their additional structural characteristics. The fourth quarter of 2008 was taken as the beginning of the crisis period, with data to the end of 2009 being available under a uniform methodology. The pre-crisis period, which serves as a reference for comparison, was set at the same duration (five quarters), beginning from the third quarter of 2007.

The analysis results suggest that performance indicators of individual banks, like capitalisation, liquidity and profitability, were not significant in the pre-crisis period, while they considerably affected loan amounts granted in the crisis period. On average, strongly capitalised and more liquid banks granted more loans in the crisis period. In addition to these variables, the ratio of non-performing loans to total loans (NPLR) also proved to be an important determinant for granting loans during the crisis, while this indicator was not statistically significant in the pre-crisis period. Banks that had a more risky portfolio on the eve of the crisis were less apt to grant new corporate loans during the crisis. Other characteristics of banks under review, like profitability and size, did not influence the rise in loans to enterprises with which they do business in either period. The results obtained need not necessarily be interpreted as evidence of rationing of corporate loans since enterprises could “move” between banks. Therefore, it is possible that clients substituted loans from well capitalised and more liquid banks for loans from poorer banks, so that this phenomenon needs to be analysed in more detail before arriving at a more complete conclusion.

³ OG 1/2009, 75/2009 and 2/2010.

Table 1 Shares in the absolute change in loans relative to the riskiness of enterprises

in %

Riskiness of enterprises	Credit contraction		Credit expansion		Difference between credit expansion and contraction	
	30/6/2007 – 30/9/2008	30/9/2008 – 31/12/2009	30/6/2007 – 30/9/2008	30/9/2008 – 31/12/2009	30/6/2007 – 30/9/2008	30/9/2008 – 31/12/2009
Enterprises with above median Z-score	11.3	17.7	25.3	17.5	13.9	-0.2
Enterprises with below median Z-score	23.5	27.6	39.9	37.2	16.3	9.6
Total	34.9	45.3	65.1	54.7	100.0	100.0

Note: The absolute change in loans was obtained by summing up absolute values of positive and negative changes in loans.

Source: CNB.

The findings on the impact of individual corporate characteristics on loans received are key elements in the analysis; they speak of the risk profile of bank loans during the recession, as well as of broader implications of bank credit policy for economic restructuring. The results of this segment of the analysis also indicate the possibility of credit rationing to individual corporate segments during the crisis. In that period, medium-sized and large enterprises obtained on average more loans than small enterprises, which is in contrast with the pre-crisis period, when there were no such differences. By contrast, the sector in which an enterprise operates and the geographical location of its head office did not significantly affect the change in loans in either period.

A key result of the analysis relates to the risk profile of borrowing enterprises. Negative changes in loans relative to assets were larger for enterprises with good financial standing, while positive changes in loans were larger for financially less stable enterprises, which yields a conclusion that banks concentrated new loans in financially weaker enterprises⁴ during the crisis period. This finding is opposite to trends that characterised bank operations before the crisis, when loans to financially stable enterprises grew more. The conclusion is that banks concentrated new loans on riskier enterprises in the crisis period. This is also suggested indirectly by the previously established weakening of loan reallocation at the peak of the crisis. In the crisis period, weaker enterprises repaid fewer old loans and raised more new loans. A downward trend in the relative exposure of a bank that is the biggest individual creditor to an enterprise is evident in both periods. Such behaviour may be related to efforts of enterprises to increase the number of banks with which they do business (as evident from the increase in the total number of enterprises doing business with several banks)⁵ or the desire

of banks to limit overall exposure to individual enterprises. However, in contrast to this trend, banks that were major creditors reduced their exposure to riskier enterprises less.⁶ All this leads to the conclusion that lending profiles were probably less a result of the relative dynamics of demand and more a reflection of negative selection by banks, which often directed new loans to their existing bad borrowers. The same conclusions are suggested by Table 1, which shows that the credit contraction increased more for less risky enterprises (with an above the median Z-score), while the expansion of loans to these enterprises decreased more relative to the pre-crisis period. In the crisis period, the expansion/contraction difference between risky and less risky enterprises from the sample increased from 2.4% to 9.8% of total loan flows in the pre-crisis period.

The analysis results lead to the conclusion that banks directed relatively more placements to financially riskier enterprises in the period from the beginning of the crisis to the end of 2009. This is particularly true for cases when a bank that was a major creditor of an enterprise was prone to enabling the survival of that enterprise by granting it new loans. With regard to existing placements, banks often opted for the wait-and-see strategy, i.e. they did not opt for major write-offs but maintained or even increased their exposure to clients. Although most new clients were of a better quality than old ones, due to the lower reallocation of loans relative to the pre-crisis period, such clients were granted fewer loans. Due to the banks' policy of directing loans to existing, more risky borrowers, the overall quality of banking sector assets deteriorated further during the crisis. If it turns out that these enterprises were troubled only temporarily and they recover in the new growth cycle, the banks' strategy will prove successful because they stood by their clients during bad times and helped them overcome problems. However, if these enterprises fail to recover and banks continue to prolong loans and thus hide potential losses, banks' total losses will be higher than they would have been if such loans had been written off earlier. In addition, the tying up of capital in non-productive enterprises will lead to further macroeconomic costs through weaker growth and increase risks to financial stability.

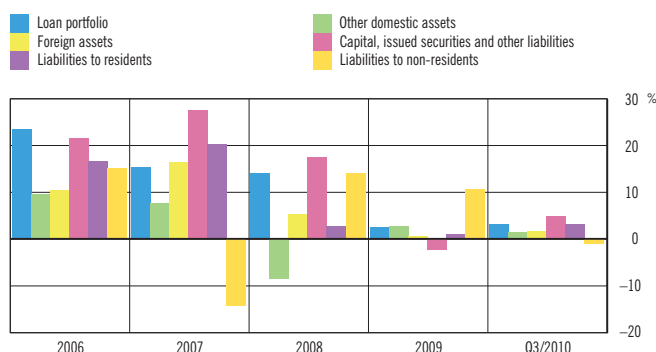
⁴ Z-score was used as an indicator of an enterprise's financial position; for the crisis period, it was based on end-2008 financial statements, and for the pre-crisis period, it was based on statements for end-2007. Z-score was calculated as a linear combination of five indicators showing profitability, efficiency (capital intensity), funding sources, debt and liquidity. The construction of the Z-score was taken over from Eidelman, G. J. (1995): *Z-Scores – A Guide to Failure Prediction*, CPA Journal Online. Additional explanations on the selection of coefficients may be found in: Altman, E. I. (1968): *Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy*, Journal of Finance.

⁵ The share of loans and contingent liabilities to enterprises doing business with more than two banks (for which data on the classification of placements are available) in total loans and contingent liabilities went up from 61.7% at end-2006 to 65.0% at end-2009. Viewed by the number of enterprises, the share of those having two or more creditors increased from 14.9% to 16.3%.

⁶ Risky enterprises were defined as those with a Z-score below the sample median.

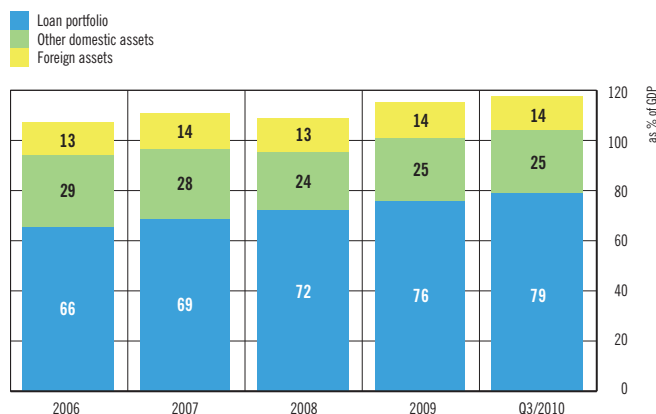
Banking sector⁸

Figure 57 Major banking sector balance sheet items,^a year-on-year rates of change



^a An increase in balance-sheet items at end-September 2010 was calculated relative to September 2009.
Source: CNB.

Figure 58 Banking sector assets



Source: CNB.

The situation in the banking sector continues to reflect the recessionary environment with increased risks, as witnessed in the lack of any major recovery in lending, stagnation in interest rates at relatively high levels and high value adjustment costs that put pressure on bank earnings. As neither significant economic and credit growth nor a recovery in bank earnings is expected in the forthcoming period, strong capitalisation of the banking sector and high foreign currency liquidity reserves are necessary for banking sector stability.

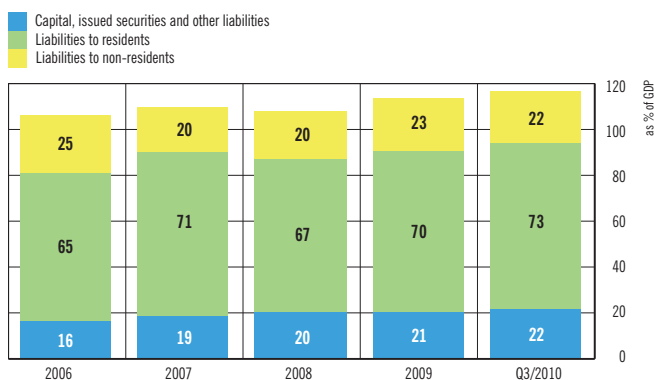
Balance-sheet vulnerabilities

Against the background of subdued demand for loans and very pronounced credit risk, the aggregate balance sheet of banks continued to grow moderately in the first three quarters of 2010, as in 2009. Influenced strongly by the strengthening of the Swiss franc against the kuna, total assets of banks grew at the annual rate of 2.7%, and in proportion to GDP went up from 113% to 119% between September 2009 and September 2010, which was also due to a slight fall in GDP (Figure 58).

The continuation of aggregate trends from 2009 hid structural changes in balance sheets that occurred behind the scene. Resident deposits, which held constant at pre-crisis levels for nearly

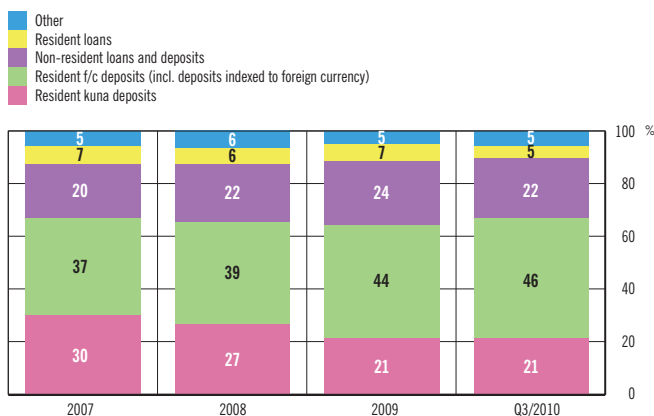
⁸ New pieces of subordinate legislation adopted under the Credit Institutions Act (OG 117/2008, 74/2009 and 153/2009) entered into force on 31 March 2010. This completed the alignment of domestic banking regulations with relevant EU directives. The most significant change from previous regulations is the introduction of Basel II standards into the calculation of the capital adequacy ratio of credit institutions.

Figure 59 Banking sector liabilities



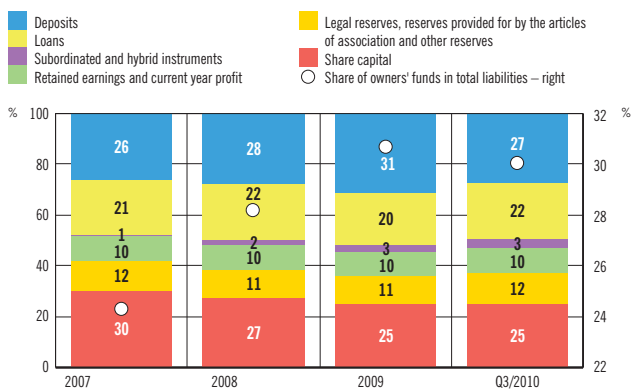
Note: Collectively assessed impairment provisions represent the difference between banking sector assets and banking sector liabilities and capital.
Source: CNB.

Figure 60 Structure of liabilities



Source: CNB.

Figure 61 Breakdown of bank owners' funds by instrument



Source: CNB.

two years, grew strongly in the first nine months of 2010 (year-on-year growth rate of 4.6% in September) (Figures 57 and 59). The growth in household deposits, which was steady from late 2009, picked up pace, while corporate deposits also grew strongly, particularly in the third quarter of 2010, in contrast to the former trend. The rise in corporate deposits was partly a result of corporate borrowing abroad and the temporary depositing of these borrowed funds with domestic banks in the form of kuna deposits, and is therefore not indicative of a permanent change in the downward trend of corporate deposits.

Banks used some of the increase in resident deposits to finance credit growth, while the remaining funds were used for the restructuring of liabilities and restoration of liquid forms of domestic and foreign assets (Figure 57).^{9,10} After correction for exchange rate changes, the corporate sector¹¹ alone recorded credit growth (of 8%) in the first nine months of 2010, while the amount of loans granted to households was reduced; housing loans were the only type of household loans that increased (by around 2%).¹²

The restructuring of liabilities largely related to the repayment of liabilities to non-residents, which reduced dependence on market funding as well as operating costs, in conditions of somewhat more abundant domestic funding sources, the growth of which exceeded seasonal fluctuations. The reliance of banks on owners' funds decreased only marginally. Banks

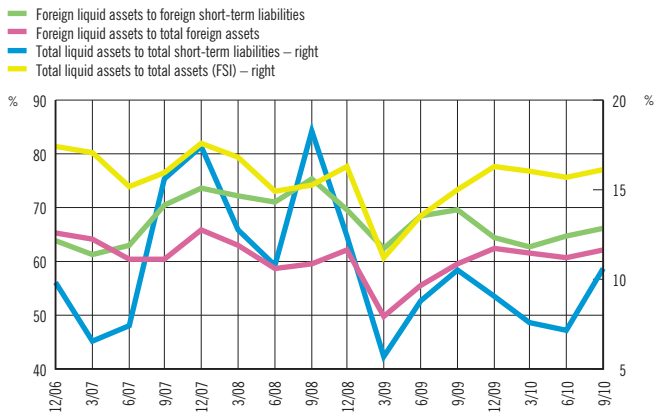
9 The loan amount presented in bank statistical reports as at 30 September 2010 includes loans and, in some banks, debt securities held in the portfolio of loans and receivables. In bank reports, the value of loans is presented on the net principle, i.e. the value of granted loans is reduced by the amount of value adjustments on these loans. Also, the value of loans and deposits is expressed in kuna, which means that exchange rate changes may decrease or increase non-kuna items. From the end of 2009 to the end of September 2010, the kuna appreciated against the euro by 0.2% and weakened against the Swiss franc by 12%, so that the exchange rate considerably influenced nominal loan growth in the observed period.

10 The Decision on liquidity risk management (OG 2/2010) entered into force on 31 March 2010. This decision prescribes the minimum qualitative requirements for liquidity risk management and quantitative requirements for the purposes of reporting to the Croatian National Bank. Credit institutions are obliged to submit regular (monthly) reports on readily marketable assets, expected inflows and expected outflows, the minimum liquidity coefficient, the concentration of sources (if they account for more than 2% of total liabilities) and the form on behaviour assumptions if a credit institution uses its own assumptions. The minimum liquidity coefficient (MLC) is the ratio of cash inflows (readily marketable assets included) and cash outflows in two different time periods (up to one week and up to one month) and it must be higher than or equal to 1. Inflows and outflows, i.e. assets and liabilities are reported according to the estimated or remaining agreed maturity and do not represent the actual cash flow, but the cash flow under an acute short-term stress scenario specified by the CNB. According to data for September 2010, banks credibly meet these requirements.

11 This increase was somewhat due to the reclassification of CM from the government sector to the corporate sector early in the year.

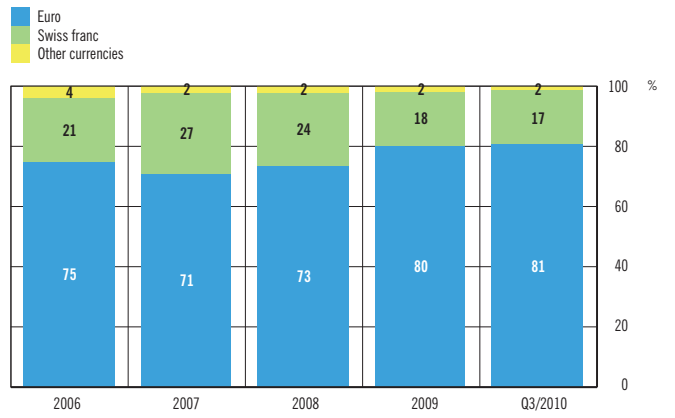
12 The total increase in net loans without correction for exchange rate changes was 3.3%. Housing loans grew by 6%. However, as a substantial share of these loans is indexed to the Swiss franc, they grew by around 2% after including the effect of exchange rate changes. The issue of loans indexed to the Swiss franc is discussed in more detail in Box 5 Materialisation of currency-induced credit risk in Swiss franc-indexed loans.

Figure 62 Liquidity indicators



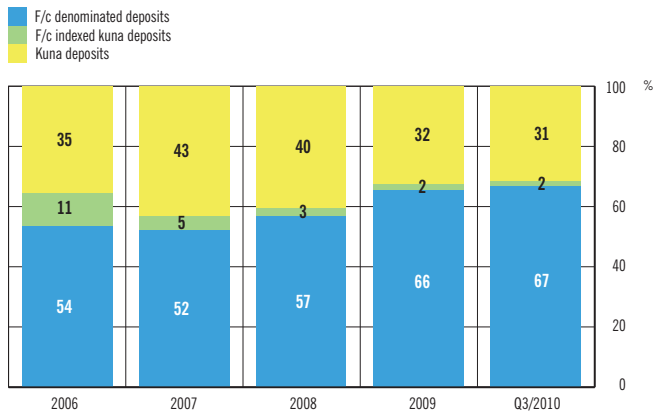
Source: CNB.

Figure 65 Currency breakdown of non-kuna loans



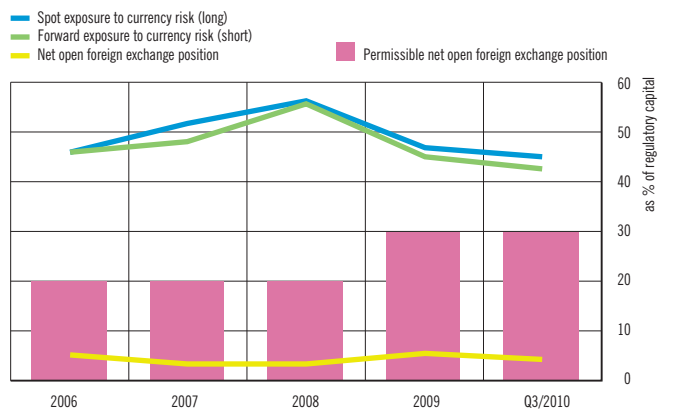
Source: CNB.

Figure 63 Currency breakdown of deposits



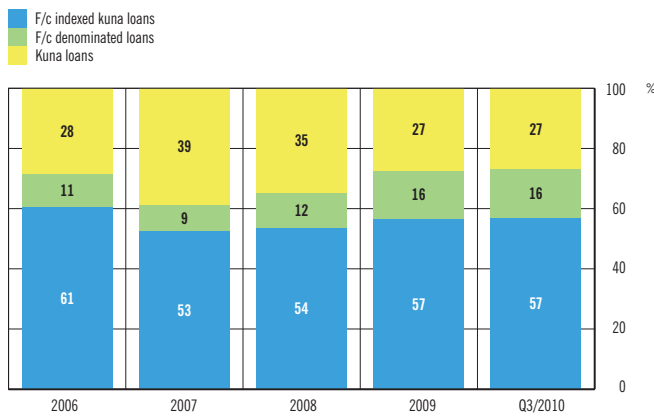
Source: CNB.

Figure 66 Bank exposure to currency risk



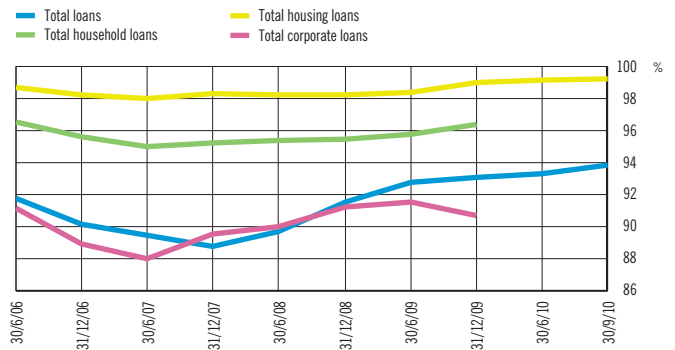
Source: CNB.

Figure 64 Currency breakdown of loans



Source: CNB.

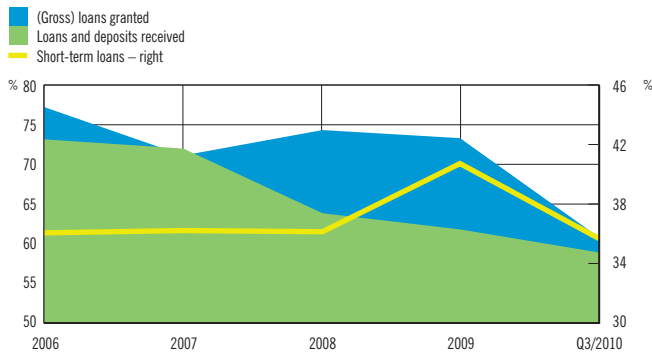
Figure 67 Share of unhedged loans in total loans exposed to CICR



Note: Under new rules, CICR and several other risks have been transferred to the second pillar of the new framework of capital calculation, i.e. regulations on internal capital of credit institutions.

Source: CNB.

Figure 68 Share of (gross) loans and liabilities of banks with interest rate variable within three months in total (gross) loans and liabilities of banks



Source: CNB.

used these funds to compensate for the loss of resident deposits at the peak of the crisis, while the readiness of owners to keep or even increase their exposure to local subsidiaries together with the continued growth in the share of liquid assets would enable banks to bridge possible financial difficulties in case of a renewed escalation of the crisis (Figures 57, 60 and 61). By investing in high quality, mostly foreign debt securities, banks kept liquidity and security at high levels (Figure 62). In addition, in view of the specific structure of the rise in resident deposits, which need not be permanent, banks would still dispose of sufficient funds for continued credit growth in case of negative shocks associated with domestic sources.

The changes in the sectoral structure of funding sources in 2010 affected the currency structure of the banking system's balance

sheet; the recovery in kuna (mostly transaction) corporate deposits, which dropped in 2009, helped stop the upward trend in the share of foreign currency deposits (Figure 63). At the same time, on the asset side, the weakening of the kuna against the Swiss franc offset a mild increase in kuna loans. Furthermore, due to the strengthening of the Swiss franc against the euro, euro dominance in non-kuna loans has grown faster than suggested by the nominal data (Figures 64 and 65).¹³

The steady fall in loans indexed to the Swiss franc, investment in domestic securities and a slight recovery in kuna loans shortened the traditionally long spot position of banks in foreign currencies, so that the net open foreign exchange position of banks was slightly reduced, to 4.2% (Figure 66). However, in contrast to direct bank exposure to currency risk, indirect exposure to this risk continued to grow, due also to the steady growth in housing loans, which are mostly unhedged against CICR (Figure 67).

At the peak of the crisis in 2009, banks substantially shortened the maturity of newly-granted loans in light of new risks and postponement of investment projects. In 2010, they used the recovery of relatively stable funding sources to increase long-term lending, which implies a gradual revival of investment in the economy (Figures 68 and 77).

The share of capital in the liabilities of banks stayed at around 14% in 2010 under the influence of the relatively high capitalisation level and reduced expectations of owners in terms of needs to finance future growth. In such circumstances, the ratio of reinvested earnings to profit before taxation was reduced in 2010.

¹³ The kuna/euro exchange rate is calculated based on turnover, while the exchange rate of the kuna against all other currencies is obtained by multiplying the kuna/euro exchange rate by the exchange rate of the euro against other currencies, which is published on the Frankfurt exchange. For more details on the consequences of depreciation on Swiss franc-indexed loans, see Box 5 Materialisation of currency-induced credit risk in Swiss franc-indexed loans.

Box 5 Materialisation of currency-induced credit risk in Swiss franc-indexed loans¹

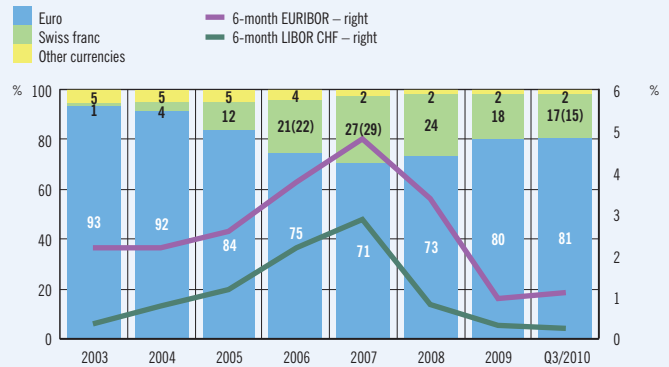
Due to the volatility of the Swiss franc against the euro, which is the reference currency for the Croatian kuna, Swiss franc-indexed loans are a constant source of currency risk to borrowers. This problem became particularly pressing in the second half of 2010, when the Swiss franc reached a historic high. However, these loans are not a novelty in Croatia. Banks began to grant larger amounts of such loans as early as 2004 and their share in total loans peaked in late 2007, when they accounted for almost 30% of all non-kuna loans (Figure 1). Although they are granted in a number of countries, their widespread use in Croatia was due to a combination of international (large interest spread between sources in the euro and sources in the Swiss franc) and domestic circumstances (strong competition among banks, habit of households to borrow in foreign currencies, a high level of financial system development and the presence of Austrian banks that adopted the practice of lending in the Swiss franc in their home country as well).

Due to the interest spread, the Swiss franc was particularly attractive for clients in need of long-term loans. Therefore, it is not surprising that most Swiss franc-indexed loans are housing and car loans (73% and 10% respectively of total Swiss franc loans) granted to households. In addition, Swiss franc-indexed loans account for a majority (70%) of foreign currency-indexed car loans and slightly less than a half of foreign currency-indexed housing loans (Figure 2). The outbreak of the financial crisis led to the convergence of interest rates on the Swiss franc and euro and, coupled with higher exchange rate volatility, induced banks in 2008 to gradually remove from their range loans indexed to the Swiss franc. Nevertheless, due to the long average maturity of granted loans, the decline in the share of Swiss franc-indexed loans has been relatively slow and it will soon slow down even more once car loans are paid up and only housing loans with long-term maturity stay in bank balance sheets.

Higher currency risk inherent in those loans has gradually become evident; such a risk is characteristic of loans in the exchange rate regime of a managed kuna float against the euro. The Swiss franc appreciated against the kuna by slightly less than 2% on average in 2008, it appreciated by almost 7% in 2009 and by around 8.5% in the first nine months of 2010. The intensity of exchange rate shocks increased (Figure 3) and labour market indicators deteriorated; in 2009 and 2010 in particular, they responded to extremely unfavourable macroeconomic developments, which led to the rise in unemployment and the drop in disposable income.

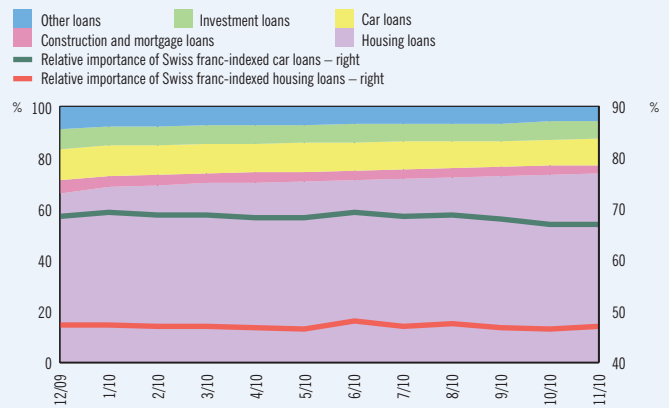
Due to the time lag with which loan quality responds to exchange rate changes, the effect of the kuna depreciation against the Swiss franc in 2010 will become evident as late as in 2011. Still, a major deterioration in the quality of loans indexed to the Swiss franc, particularly household loans, was already evident in 2010. The ratio of non-performing loans in total housing loans indexed to the Swiss franc nearly doubled in the first eleven months of 2010, while the rise of that ratio

Figure 1 Share of Swiss franc-indexed loans in total non-kuna loans and benchmark interest rates



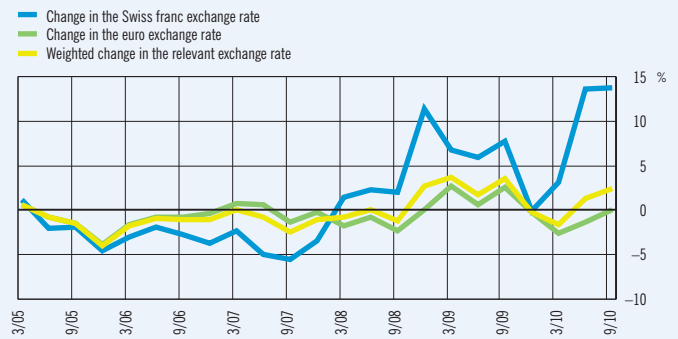
Note: Figures in brackets show the share of Swiss franc-indexed loans adjusted by exchange rate changes. Source: CNB.

Figure 2 Distribution of Swiss franc-indexed loans



Source: CNB.

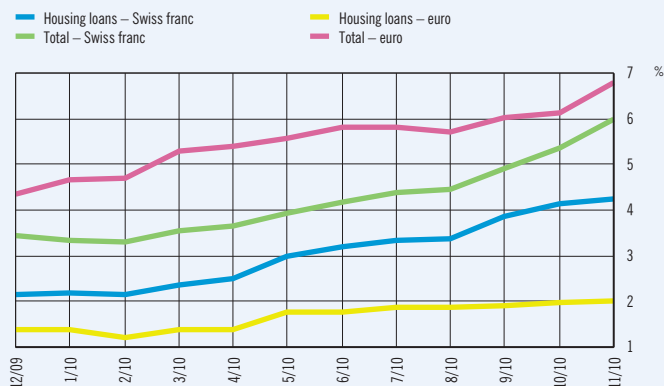
Figure 3 Exchange rate of the kuna against the euro and the Swiss franc, year on year rate of change



Note: The weighted change in the exchange rate of the kuna against the euro and the Swiss franc is calculated by using the shares of loans indexed to these two currencies in total non-kuna loans. Source: CNB.

1 The new method used by the CNB to collect and store data (implemented as of 2010) enables, among other things, an analysis of banks' balance sheets in terms of the currency of indexation.

Figure 4 Non-performing loans ratio (net of provisions) by loan categories according to the currency of indexation



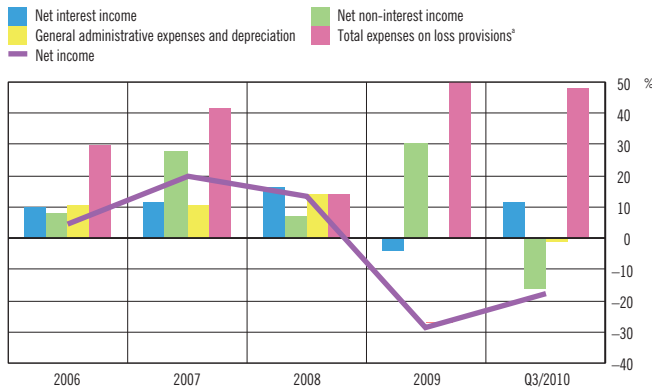
Source: CNB.

for loans indexed to the euro was twice as low.² However, the effect of changes in the Swiss franc exchange rate cannot be precisely separated from the impact of differentiated changes in interest rates on loans in various currencies, for which there is no sufficiently detailed statistics. In addition, this impact can be neither separated from potential differences in the financial strength of households that took on various loans nor from the impact of years when loans were obtained or the value of collateral for each loan type, etc. However, the scale of differences in the quality deterioration of Swiss franc- and euro-indexed loans indicates that loan quality is highly sensitive to changes in the exchange rate of the currency to which loans are indexed (Figure 4).

In view of the relatively high share of Swiss franc-indexed loans in total loans and their long average maturity, these loans will remain in bank balance sheets for a long time. Still, the ageing of the credit portfolio in that currency should gradually decelerate further deterioration in their quality.

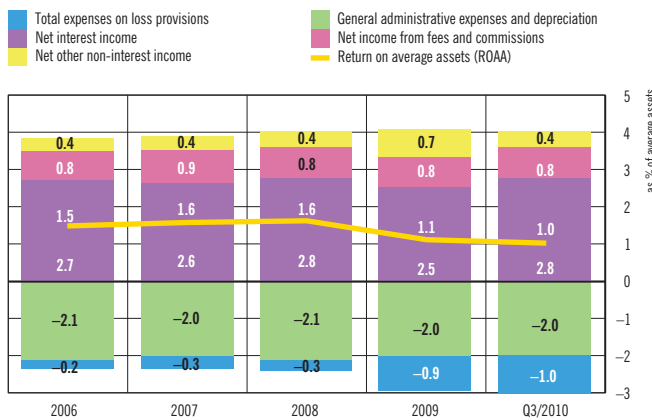
² It is interesting to note that the quality of car loans, which are mostly linked to the Swiss franc, continued to improve. This is probably related to the measures of loan rescheduling and prolongation taken by banks in which such loans are concentrated. In addition, data on the quality of loans broken down by the currency of indexation are available only for the period after 31 December 2009, which hampers such analyses.

Figure 69 Change in selected business performance indicators



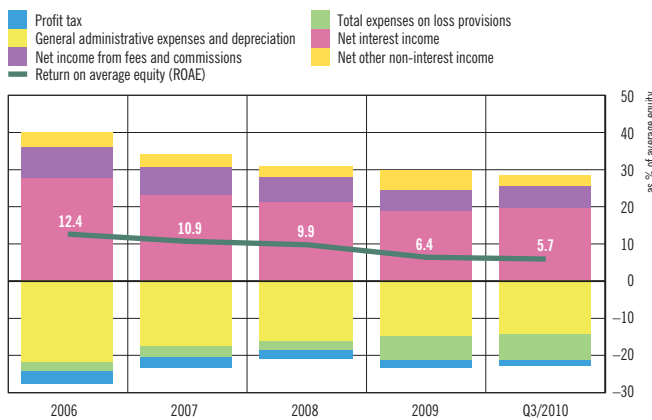
* Total expenses on loss provisions increased by around 230% in 2009.
Source: CNB.

Figure 70 Contribution of ROAA categories



Source: CNB.

Figure 71 Contribution of ROAE categories



Source: CNB.

Strategic risks¹⁴

Control of administrative expenses coupled with the still high interest margin enabled banks to maintain net operating income in 2010 at a level only slightly below that in 2009. However, value adjustment costs, which soared by 230% in 2009, rose by another 48% by the end of September 2010, which reduced banks' net income by some 20% (Figure 69). The parallel increase in total assets and capital of banks further contributed to the decline in relative profitability indicators, so that return on average assets (ROAA) fell to 1.0%, while return on average equity (ROAE) dropped to 5.7% (Figures 70 and 71), falling by about one-third from their pre-crisis level, i.e. to the lowest level in the last decade.

A slight decrease in the ratio of interest income to assets of banks in 2010 was due to a gradual decline in lending rates, which surged in 2009. By contrast, the gradual fall in deposit rates, which began in mid-2009, reduced somewhat more the share of interest expenses (Figures 69 and 70). This interest rate policy was actually a reaction of banks to loan stagnation and speedy deterioration of the quality of banks' loan portfolio, which increases value adjustment costs and reduces interest income (due to the rising share of irrecoverable loans).

The drop in interest expenses of banks was partly due to the relative stability of ZIBOR¹⁵ in 2010. Interest expenses grew strongly in 2009, when exceptional volatility of ZIBOR increased the costs on loans indexed to this benchmark interest rate. This led to a decline in non-interest income in 2010, which had grown in 2009 as banks took steps to protect themselves from volatility of benchmark interest rates and offset their impact on aggregate bank earnings.

Despite the described dynamics of lending and deposit rates, the interest spread on new loans narrowed due to the rise in the share of cheaper long-term loans in total newly-granted loans (Figure 77). Still, the adjusted net interest margin stayed high because of the large share of interest-bearing assets in total assets of banks (which was also due to the reduction in regulatory costs brought about by the cut in the reserve requirement rate) and slow transfer of current market interest rates to the interest margin (Figure 76).

Some income statement items for 2010 were also affected by the weakening of the kuna against the Swiss franc as banks mostly lack sources in Swiss francs and obtain them by various financial derivatives. These exchange rate developments influenced gains from exchange rate differences on loans, which

¹⁴ Income statement items for September 2010 were annualised to be comparable with those for the preceding whole year periods. This was done by summing up banks' business results in the last quarter of 2009 and the first three quarters of 2010.

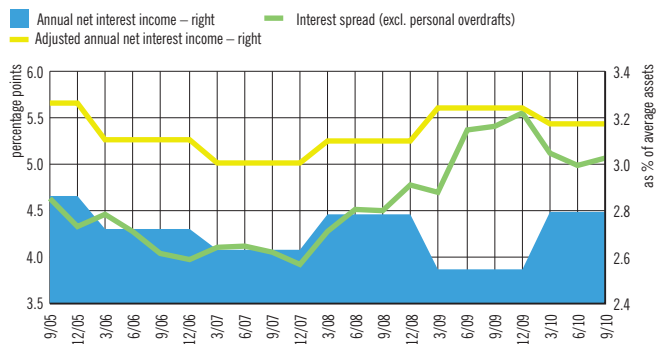
¹⁵ The impact of ZIBOR on bank earnings is explained in more detail in the Banking sector section of *Financial Stability*, No. 4, February 2010.

Figure 72 Structure of total income



Source: CNB.

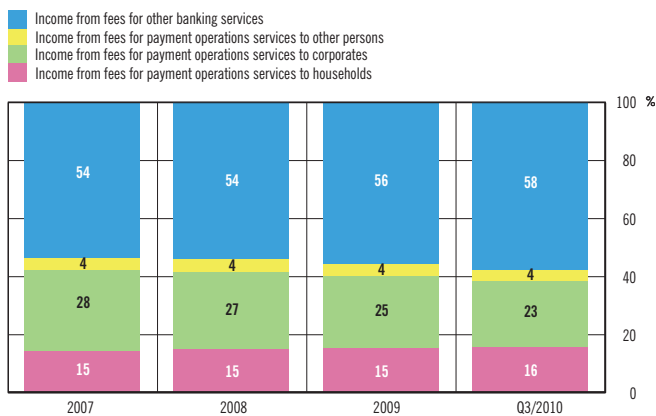
Figure 75 Interest spread (quarterly average of monthly interest rates) and annual net interest income



Note: Net interest income of banks has been adjusted by income from trading activities and exchange rate differences.

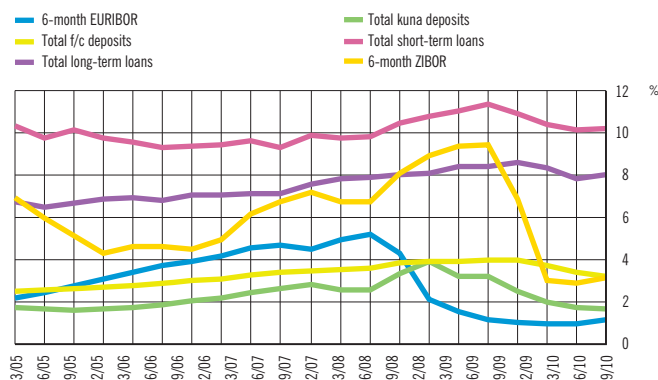
Source: CNB.

Figure 73 Structure of income from fees and commissions



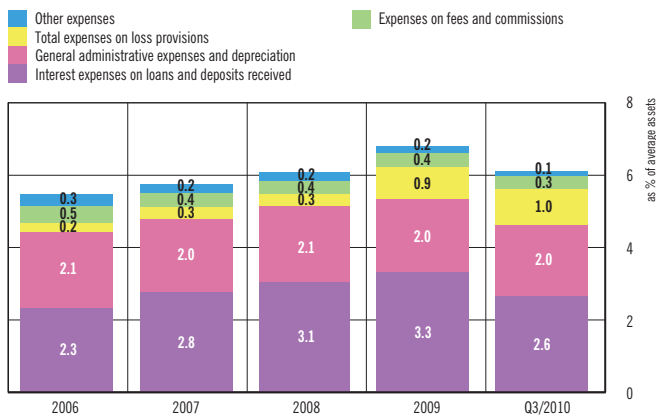
Source: CNB.

Figure 76 Selected interest rates (quarterly average of monthly interest rates)



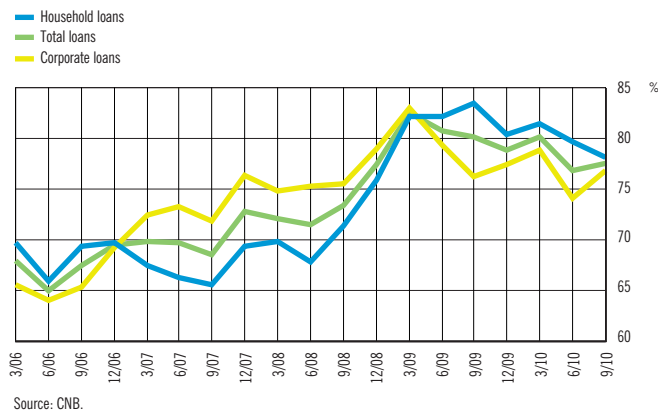
Source: CNB.

Figure 74 Structure of total expenses



Source: CNB.

Figure 77 Share of short-term loans in total newly-granted loans, quarterly average



Source: CNB.

were offset by the negative income from trading activities, i.e. the fall in the value of the said financial derivatives (Figure 72).¹⁶ Nevertheless, the described developments in individual items offset each other within net non-interest income and do not lead to distortion in main elements of the income statement.

In addition to supporting interest rate efficiency, banks influenced their operating results by carefully managing administrative expenses and increasing fees and commissions. Nevertheless, growth potential of these income sources is limited in the context of slow economic activity, which particularly refers to income from payment services. Its relative share has been fall-

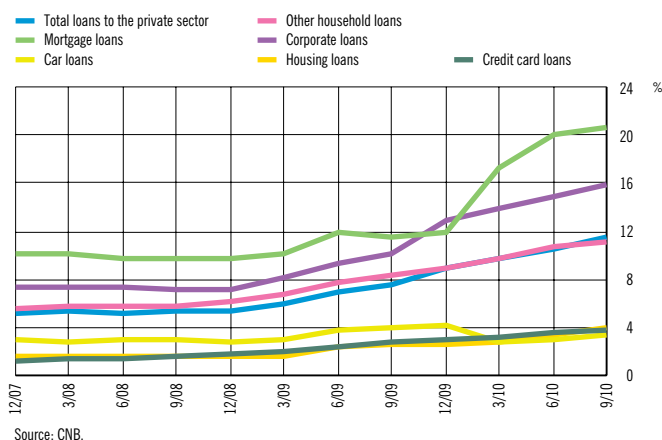
ing since the onset of the crisis, while the relative share of income from fees for other banking services has been increasing (Figures 72 and 73).¹⁷

Despite efforts taken, business results of banks continued to deteriorate, while the banks' ability to influence them is very limited in view of the moderate credit growth expected in 2011. Attempts to increase some types of income (by shorter lending terms, higher commissions and fees and lending rates) may worsen the financial position of bank clients, further erode the quality of bank assets and increase charges for value adjustments, which will remain high in 2011.

¹⁶ By entering into forward contracts, banks protect themselves from the volatility of exchange and interest rates. In this way, negative exchange rate differences and an increase in interest expenses are offset by higher income from trading activities.

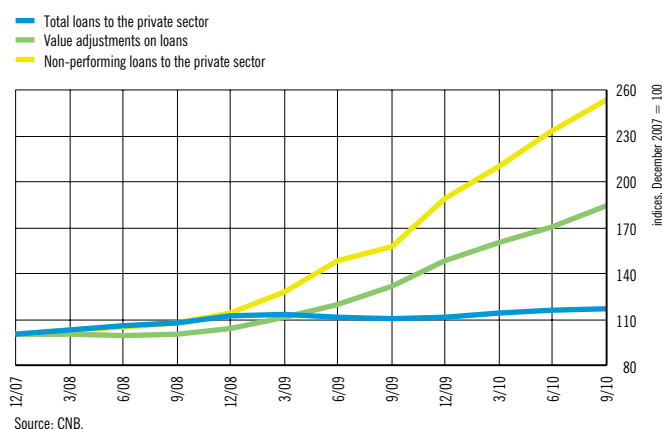
¹⁷ Fees for: issuing guarantees or other commitments, mandated operations, safe-keeping securities and security transactions in the name and for the account of other persons, safe custody services, keeping of deposit accounts, services of issuing and managing unused credit lines, consultancy and advisory services to clients, issuing and using bank credit cards, collecting credit card receivables from buyers when the bank does not keep these receivables in its books, and other services.

Figure 78 Ratio of non-performing loans to total loans



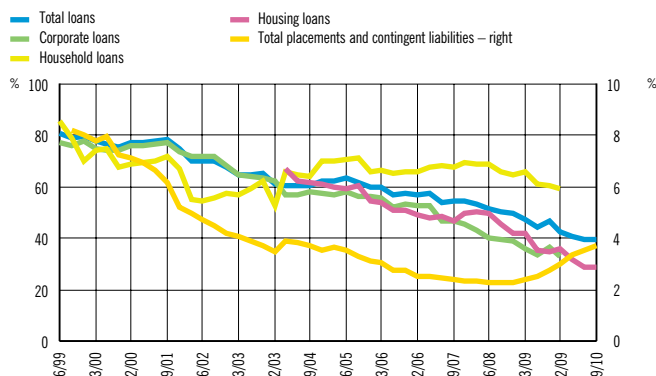
Source: CNB.

Figure 79 Loans, non-performing loans and value adjustments



Source: CNB.

Figure 80 Coverage of total placements and contingent liabilities by value adjustments



Source: CNB.

Credit risk and bank capital adequacy

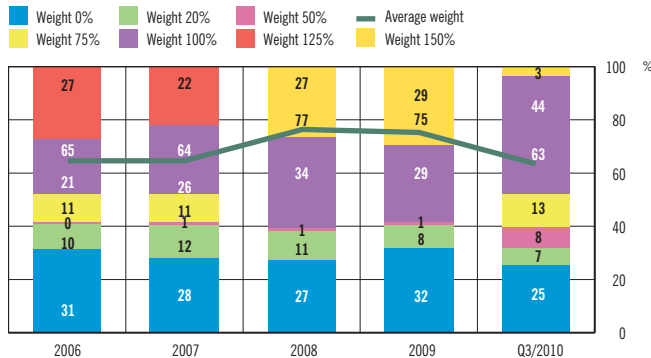
The deterioration in the quality of banks' loan portfolios continued in the first nine months of 2010 at a pace similar to that in 2009 but slowed down towards the end of the observed period. In the first nine months of 2010, the ratio of non-performing loans to total loans (NPLR) went up from 7.8% to 10.2% (and from 8.9% to 11.4% for loans to the private sector), after growing by 2.8 percentage points in 2009 (Figure 78). The rise in NPLR was further spurred by central bank orders and, to a lesser extent, regulatory (accounting) changes in effect from the beginning of the year.¹⁸

Still, corporate loans continued to contribute most to NPLR growth because they responded very quickly and intensely to changes in the macroeconomic environment. Having deteriorated substantially in 2009, non-performing corporate loans grew from 12.5% to 15.9% in the first nine months of 2010. Non-performing household loans responded much less in 2009 due to the time lag with which macroeconomic disturbances spread to the labour market. As the fall in wages and employment gained momentum as late as in 2010, the ratio of non-performing loans in total household loans grew substantially in the first three quarters of that year (from 5.8% to 7.5%). An additional powerful impetus to these developments was provided by the depreciation of the kuna against the Swiss franc. This may also explain the fact that half of the absolute increase in non-performing household loans relates to housing loans; the share of non-performing housing loans doubled and stood at 4.0% at the end of the period under review. Although car loans are most often linked to the Swiss franc, they continued to be the only type of household loans of a high and stable quality. This may probably be explained by the loan rescheduling policy, which was pursued by banks in which such loans were concentrated.

The coverage of non-performing loans, which had become stable just before the recent crisis, began to decrease parallel

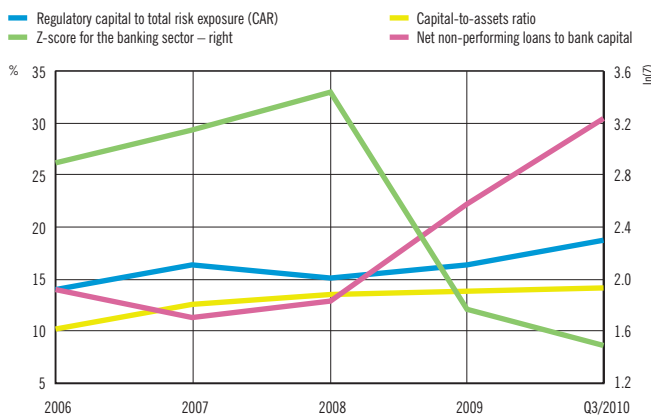
18 New rules on the classification of placements and off-balance sheet liabilities have been in effect since 31 March 2010. The most relevant changes relate to the exclusion of the available-for-sale portfolio from placements subject to impairment provisions (value adjustments); the obligation to test for individual significant exposures arising from placements and off-balance sheet liabilities at the level of group of connected persons (for which credit institutions must assess credit risk on an individual basis); the definition of adequate instruments of collateral and the classification of placements not covered by adequate collateral into risk groups based primarily on a debtor's timeliness in settling liabilities; the option to recognise interest income from placements whose value has been reduced in the income statement even before their collection, etc. For the purpose of this analysis, placement classification by portfolio resulted in an important change and a break in the series of data on loans granted. Data on granted loans, which previously included loans (as instruments) and, in some banks, debt securities classified into the portfolio of loans and receivables, from 31 March 2010 onward include only the amount of loans in the portfolio of loans and receivables. The exclusion of the available-for-sale portfolio from the calculation of credit exposure contributed to the decrease in the amount of total placements and off-balance sheet liabilities. As this portfolio mostly consists of securities issued by the Croatian and by foreign central governments, i.e. highest quality securities, this change led to an increase in the share of placements and off-balance sheet liabilities classified in groups B and C relative to the previous periods.

Figure 81 Distribution of bank assets by assigned weight and the average weight



Note: Due to changes in the methodology, data for September 2010 are not comparable with data for the end of 2009. Source: CNB.

Figure 82 Capital adequacy ratios



Source: CNB.

to the strengthening of inflows of new non-performing loans, which are at first classified into less covered loan categories. As the rise in non-performing loans was even faster than the rise in value adjustments for these loans, the coverage of non-performing loans has steadily decreased, albeit at a much slower pace (Figures 79 and 80). In time, banks will have to set aside larger value adjustments for a portion of these loans, although they may try to postpone so doing by subordinating a prudent presentation of asset quality to the maintenance of earnings and profitability. Capital has been increasingly burdened since the onset of the crisis due to the fall in the coverage of non-performing loans, so that uncovered non-performing loans grew from 22.2% to 30.5% of capital in the course of 2010.

As the quality of credit portfolios responds to changes in economic activity with a time lag, one may hardly expect that the rise in NPLR will come to a stop before the end of 2011, even under relatively optimistic scenarios. Therefore, the dynamics of non-performing loans will continue strongly to influence the business results of banks.

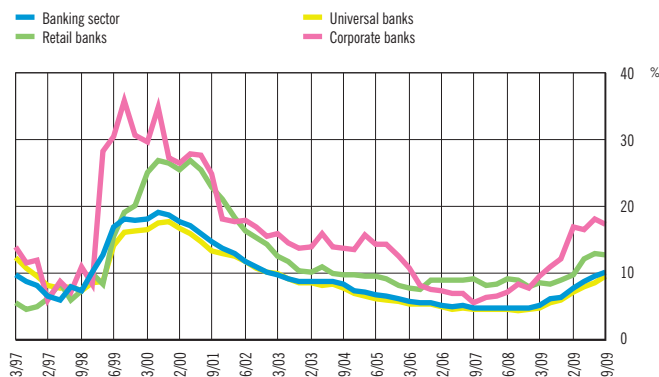
The decline in profitability has adversely affected banking sector stability, as indicated by the fall in the Z-score, which measures banks' insolvency risk (Figure 82).¹⁹ In addition, the weaker performance of banks was also reflected in the expected deterioration of their CAMELS ratings.²⁰

As a result of the transition to Basel II and the abolition of special risk weights on bank assets exposed to currency-induced credit risk, which led to a fall in the average risk weight applied to bank assets from 75% to 63%, the capital adequacy ratio rose from 16.4% to 18.7% in the first nine months of 2010 (Figure 81). However, due to a parallel increase in the required minimum capital adequacy ratio from 10% to 12%, the relative capital buffer stayed approximately the same. Still, this capital buffer is appropriate bearing in mind the risk of adverse shocks that could additionally increase non-performing loans and exacerbate the decline in profits, as well as bolster the expected increase in value adjustments for existing non-performing loans.

19 For a more detailed description of Z-score see Box 5 Assessing banking sector stability in terms of Z-score, *Financial Stability*, No. 1, June 2008.

20 The initial approach to the analysis and modelling of the dynamics and distribution of bank risks is given in Box 6 Modelling of bank risks based on composite CAMELS ratings.

Figure 83 Dynamics of NPLR by bank groups



Source: CNB.

Banking sector resilience

Credit risk materialisation, which gained speed in mid-2009, has led to a steady and strong deterioration in banks' placement quality. As the decline in quality was first evident in corporate loans, banks concentrating on the corporate sector (i.e., corporate banks) were the first to face the fall in asset quality. By the end of September 2010, their NPLR nearly tripled (to 17.3%) relative to its pre-crisis level. The deterioration in the quality of the corporate loan portfolio lost momentum in mid-2010, while the decline in the household loan portfolio gained speed. This led to an increase in non-performing loans granted by retail (to 12.7% at end-September 2010) and universal banks (to 9.5%), which make up the lion's share of the banking sector and have a crucial impact on aggregate indicators (Figure 83).

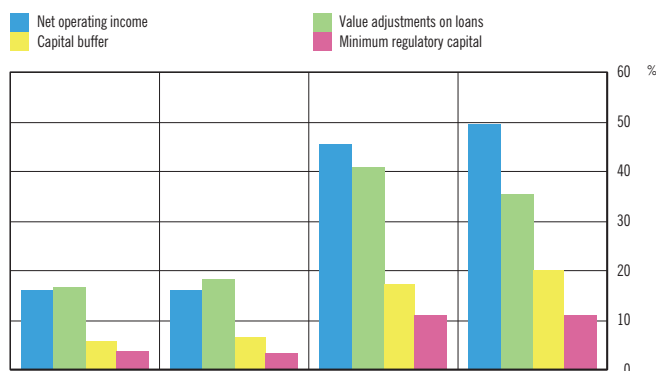
The materialisation of credit risk heavily burdened the operations of banks by a strong increase in value adjustments; they amounted to half of the net operating income of the entire banking sector in the first nine months of 2010, or 11% of the minimum regulatory capital. Nevertheless, the ratio of these costs to total regulatory capital stayed relatively stable, and slightly decreased relative to the amount of current value adjustments (Figure 84). All this indicates that the banking sector as a whole has so far successfully offset materialised credit risks by earnings made.²¹

This does not apply to a small group of (retail and corporate) banks, which operated at a loss in the first three quarters of 2010. A reason for concern is that these banks have tried to attract deposits by offering relatively high deposit rates and thus keep up with the rest of the banking sector in terms of asset growth (the shaded area in Figure 86). Without a major improvement in the quality of placements, this strategy could further raise costs and weaken operating results of these banks.

Despite the still unfavourable economic climate in 2010, a few banks have continued to report an improvement in loan quality, which indicates that caution is warranted in interpreting their business performance and capital adequacy indicators (Figure 85). Banks compensate for the rather optimistic assessment of the quality of placements by maintaining a quite high coverage of non-performing loans by value adjustments, although the dispersion of the coverage shows that a few banks have relatively low NPLR and coverage of total loans (the shaded area in Figure 87).

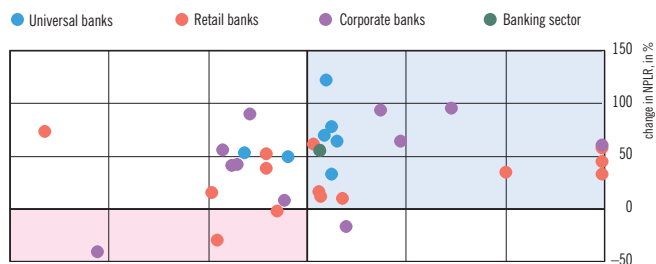
The steady decline in the coverage of non-performing loans by value adjustments lowered their ratio to a level much below that at which it had been in the pre-crisis period. This means

Figure 84 Relative importance of charges for value adjustments



Source: CNB.

Figure 85 Change in bank earnings and NPLR in the first three quarters of 2010 relative to the previous three years' average



change in net operating income, in %

Note: The light blue shaded area shows banks with more solid business results and a more prudent risk assessment of the credit portfolio relative to the previous three years' average. The pink shaded area encompasses banks in which earnings declined but which made more optimistic assessments of their credit portfolio quality despite a deterioration in macroeconomic conditions.

Source: CNB.

²¹ Several small banks raised capital in the last year. This may be expected to continue in the forthcoming period as the capital adequacy ratio of several small banks is currently near the minimum 12%.

Figure 86 ROAA and average interest rate on f/c deposits in the first three quarters of 2010

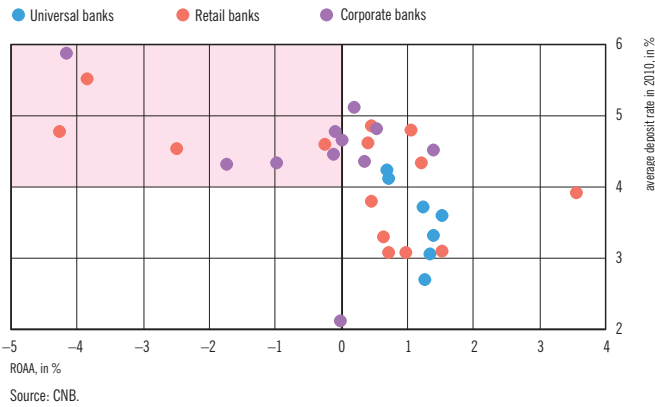


Figure 87 Coverage of non-performing loans by value adjustments and NPLR by bank groups, as at 30/9/2010

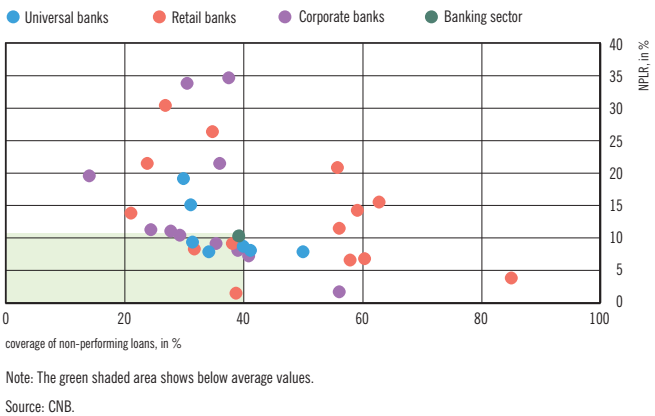
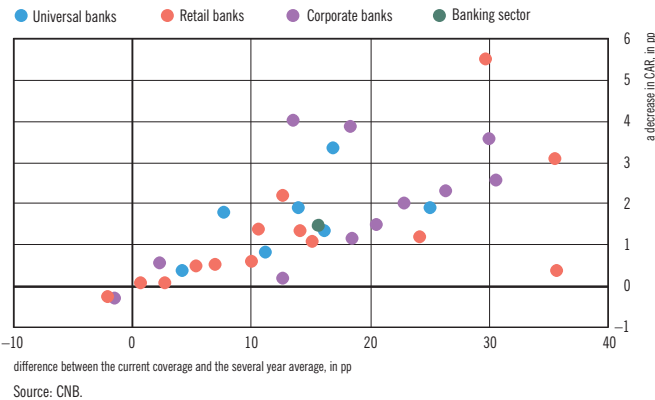


Figure 88 Adjustment of the CAR as at 30/9/2010 by the fall in the coverage of non-performing loans relative to the average (2003-2010)



that the expected strong increase in value adjustments is likely to continue for a while after the rise in non-performing loans slows down, and put pressure on bank earnings and capital. Simulating the shock of an increase in non-performing loans to the assumed stable level may approximate the effect of additional provisions on existing non-performing loans. An instantaneous increase in the coverage of non-performing loans to the average level in the last seven years (i.e. by 16 percentage points) would lower the capital adequacy ratio of the banking sector by 1.5 percentage points (Figure 88). This shock would occur gradually and gain momentum parallel to the increase in the intensity of macroeconomic shocks. However, as stress testing exercises do not capture this shock, their results somewhat underestimate the final impact of shocks on bank capital and may hence be considered optimistic.

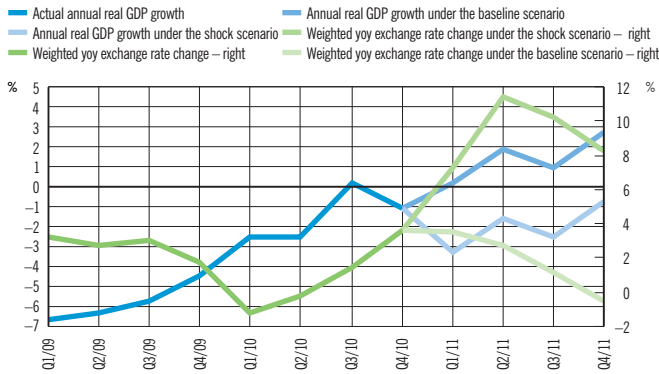
The macroeconomic credit risk model²² used so far has been updated and assessed to stress test the banking sector. The exchange rate variable was modified by weighting bilateral changes in the exchange rate of the kuna versus the euro and the Swiss franc by shares of these two currencies in total non-kuna loans to account for the impact of fluctuations of the kuna against the Swiss franc.²³ The baseline scenario, in other words the most likely outcome, assumes a 1.4% increase in real GDP in 2011 and a mild appreciation of the composite exchange rate of the kuna, i.e. its return from a slightly elevated level in late 2010.²⁴ The shock scenario, which represents stress testing for a highly unlikely but plausible combination of shocks, simulates the impact of much more unfavourable economic developments; in addition to a 2% GDP decline in 2011, it also implies a 10% depreciation of the exchange rate of the kuna against the euro (Figure 89).

22 The model and its improvements were described in more detail in *Financial Stability*, Nos. 1, 3 and 4.

23 The weighted change in the exchange rate is explained in Box 5 Materialisation of currency-induced credit risk in Swiss franc-indexed loans. In addition to quarterly weighted changes in the kuna exchange rate for 2011, NPLR movements were projected by the use of quarterly real GDP growth rates.

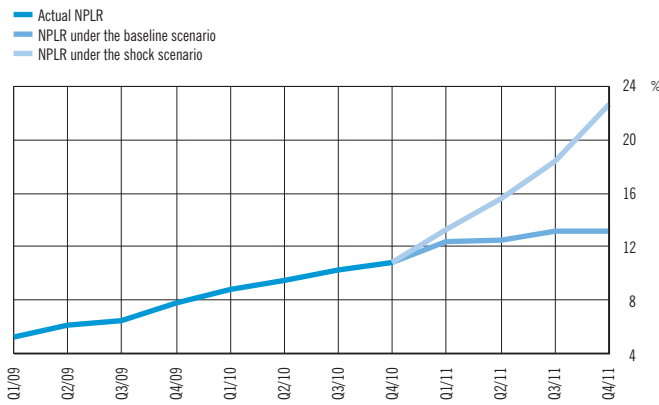
24 The projected HRK/CHF exchange rate is derived from expected movements in the CHF/EUR exchange rate (*Consensus Forecasts*) and the assumption of a stable HRK/EUR exchange rate.

Figure 89 Projections of macroeconomic variables under various scenarios



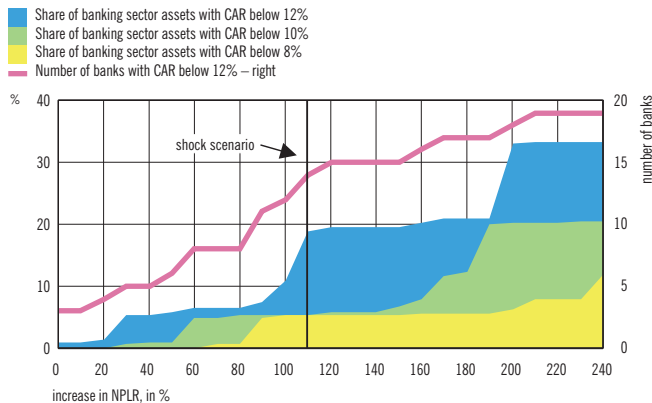
Source: CNB.

Figure 90 Projections of NPLR under various scenarios



Source: CNB.

Figure 91 Assets and number of banks under the shock scenario under an aggregate credit risk model for 2011



Source: CNB.

Table 4 Dynamics of NPLR and CAR after shocks by bank groups under an aggregate credit risk model

	CAR (%) 30/9/2010	31/12/2011			
		Baseline scenario		Shock scenario	
		CAR (%)	Change in CAR relative to the initial level (pp)	CAR (%)	Change in CAR relative to the initial level (pp)
Banking sector	18.7	20.7	2.1	16.4	-2.3
Universal banks	19.0	21.3	2.3	17.0	-2.0
Retail banks	17.9	18.1	0.2	13.1	-4.8
Corporate banks	14.6	15.1	0.4	10.2	-4.4

Note: Both scenarios include the effect of net operating income, while the shock scenario also includes the immediate exchange rate effect.
Source: CNB.

A projection of the non-performing loan dynamics by the end of 2011 was prepared based on an improved macroeconomic credit risk model and the described assumptions on changes in macroeconomic variables. Under the baseline scenario, which assumes the continuation of economic recovery and the maintenance of a stable exchange rate in 2011, NPLR growth should slow down by mid-2011 and finally come to a stop by the end of the year at a peak of 13%. The stress scenario, which tests banking sector resilience to a highly unlikely but still plausible set of shocks, implies a renewed strong economic contraction accompanied by a kuna depreciation. Under this scenario, NPLR would grow by some 110% in 2011, to around 23% at the end of the year (Figure 90).

Under the baseline scenario, net income of banks²⁵ should continue to be more than sufficient to absorb overall expenses on value adjustments, so that the capital adequacy ratio of the banking sector would grow by two percentage points relative to 2010. This mostly refers to large universal banks, while the expected aggregate net income of corporate and retail banks is only slightly higher than projected charges for value adjustments, which implies that their capital adequacy ratio would remain unchanged (Table 4).

In line with the standard methodology, a much sharper NPLR increase under the shock scenario is considered in parallel with lower projected bank earnings and the direct impact of any kuna weakening, which will automatically bring about a decrease in the capital adequacy ratio of the banking sector as banks' capital is expressed in kuna, while their assets are predominately denominated in euro. The total decline in the

²⁵ Net income of banks projected by the internal model based on banks' business performance in the first nine months of 2010 and developments in interest rates and balance sheet items expected in the following year. Under the baseline scenario, net income of the banking sector in 2011 corresponds to that realised in 2010, while this buffer falls by 13% under the shock scenario.

capital adequacy ratio (CAR) under that scenario would be 2.3 percentage points by the end of 2011; the CAR of universal, corporate and retail banks would fall by 2.0 percentage points, 4.4 percentage points and 4.8 percentage points respectively. However, even under that scenario, the sector as a whole would stay well capitalised and its CAR would stand at 16.4% at the end of 2011 (Table 4).

Under that scenario, by end-2011, the CAR would fall below 12% for 14 banks holding 19% of banking sector assets and below 8% for five banks holding 5.5% of bank assets (Figure 91). These projections are based on the assumption that banks raise no additional capital, which would actually bolster their capital adequacy. This indicates the need to intensify the process of injecting new capital into banks and prepare a consolidation strategy for this segment of the banking industry so as to maintain financial stability and minimise fiscal costs.

Although the aggregate CAR of the Croatian banking sector seems exceptionally high, stress tests suggest that in the case of additional macroeconomic shocks, including moderate exchange rate shocks that would activate currency-induced credit risk, current capital would experience a substantial fall.

Because of its strong possible consequences for the Croatian banking sector, this risk should be borne in mind in drafting regulatory rules. With Basel II²⁶ implementation in Croatia as of March 2010, the minimum capital adequacy ratio was raised from 10% to 12%, which largely offset the effect of more lenient rules for the calculation of risk exposure (not taking account of currency-induced credit risk). It also ensured a bridge to the period that will ensure a smooth transition to Basel III capital requirements, which should not be much more stringent than the current ones.

The transition to Basel III could affect allocation of capital in international groups of which largest domestic banks are members. In terms of profitability, Croatian banks are currently in the set of below-average members in their groups, which may

Figure 92 ROE in comparable countries



Note: Data for 2010 refer to March. A fall in profitability in the Baltic countries was: 57% for Estonia, 48% for Latvia, 42% for Lithuania in 2009 and 30% for Lithuania in 2010.

Source: *Global Financial Stability Report*, IMF, October 2010.

induce owners to redirect funds to the most profitable parts of the group and/or rehabilitate those parts that suffered large losses (Figure 92). Nevertheless, the stress tests conducted suggest that any significant payment of retained earnings would significantly erode the capital adequacy of their local branches in case of major shocks.

For these reasons, it is crucial to maintain adequate capitalisation of banks. However, it should be borne in mind that owners' exposure to banks in Croatia is approximately twice as high as their capital levels (due to the amount of loans and deposits with subsidiaries), which would provide an additional buffer to domestic banks should serious risks materialise. Though still satisfactory, return on equity of the Croatian banking sector has steadily declined due to progress in the balance sheet clean-up process. In view of uncertainties regarding the future dynamics of this process, as indicated by stress test results, a significant decrease in owners' exposure could threaten bank stability.

²⁶ New subordinate regulations on the capital adequacy of credit institutions implementing the rules under Basel II and relevant EU Directives came into effect on 31 March 2010: the Decision on own funds of credit institutions (OG 1/2009, 41/2009, 75/2009 and 2/2010) and the Decision on the capital adequacy of credit institutions (OG 1/2009, 75/2009 and 2/2010). The new regulations aim at promoting the capital adequacy framework through two dimensions – development of regulations that, apart from the minimum capital requirements (pillar 1) as a quantitative dimension, include a qualitative dimension – supervisory review (pillar 2) and market discipline (pillar 3). The changed rules in the area of credit risk aim at increasing risk sensitivity either by relying on external credit risk assessments used in the standardised approach or by using own client data (internal ratings-based approach – IRB approach). A credit institution may use the latter approach only if it meets a number of criteria and subject to approval of the supervisory authority. In addition to capital requirements for credit and market risks, the new regulatory framework for the first time introduces an explicit capital requirement for operational risk and sets the minimum capital adequacy ratio at 12% (it was 10%). Five banks had capital adequacy ratios below 13% and another four had capital adequacy ratios between 13% and 14% at the end of September 2010. Furthermore, almost a third of banks, i.e. 10 out of 32 (mostly small banks) recorded net losses at the end of September.

Box 6 Modelling of bank risks based on composite CAMELS ratings

In assessing risks in operations of individual banks and the overall banking sector, in practice analysts often rely on various early warning models, which enable an early identification by supervisors of banks faced with potential operating difficulties and their enhanced supervision. For that purpose, the CNB uses an early warning model based on data from the late 1990s, the last time when several banks failed.¹ Still, the reliance on relatively old historical data in changed economic conditions reduces the usability of such models, which is always a problem in their application. For that reason, also often used are models to predict difficulties in bank operations constructed based on certain recent market indicators, such as prices of bank shares or risk premiums on their borrowing, as well as models forecasting changes in bank ratings. Given the relatively abundant data (compared with instances of bank failures), these models can be frequently updated, which also improves projections based on them. Supervisory forecasts that a low rating will be assigned to a bank proved particularly useful as supervisors often update ratings that herald difficulties relatively well, as supervisors have access to privileged information.

One often used comprehensive system that supervisors apply to assess business performance of banks relies on the quality assessment of capital, assets, management, earnings, liquidity and sensitivity to market risk (CAMELS).² Under that system, banks are rated in all these sub-categories on a scale from 1 (the best rating) to 5 (the worse rating); the same scale is used to derive a composite rating, which takes into account all individual ratings but is not their simple average.³ As this box presents several models to predict changes in CAMELS ratings, it complements the operating models for signalling bank failures and indicates the future dynamics of risks in the overall banking system.

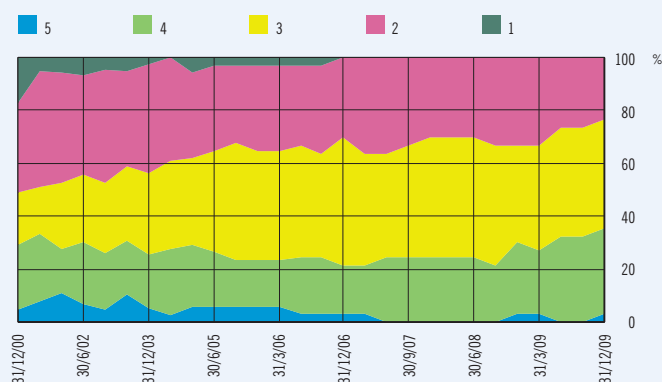
Observing the CAMELS ratings assigned to domestic banks during the last decade, one can see that banks were grouped around the medium rating, largely due to the decrease in the number of worst-rated banks, which lasted till the crisis outbreak. At that time, banks with slightly better ratings fell to the medium rating and the number of banks with slightly worse ratings⁴ began to rise again (Figure 1).

1 For some elements of the early warning model, see Kraft, E., and T. Galac (2007): *Deposit interest rates, asset risk and bank failure in Croatia*, Journal of Financial Stability, Vol. 2, No. 4, March 2007.

2 CAMELS ratings have been assigned by CNB analysts during off-site examinations from the end of 2000; each analyst assesses a bank for which he/she is in charge. Their assessments are not subject to further revision.

3 Banks whose risk management is assessed as satisfactory, i.e. those assessed to be the least risky, are assigned a composite rating of 1. A lower, but still satisfactory rating of 2 is assigned to banks with detected minor weaknesses in operations. Banks assigned a rating of 2 are considered basically sound; no single component of their CAMELS rating is less than 3 and there is no need for frequent supervision. More frequent supervision or even the taking of some measures is needed in banks with sub-optimal risk management, the composite rating of which is 3. Banks with poor business results and serious management weaknesses that indicate a certain probability of bank failure are rated 4. The lowest rating of 5 is assigned to banks which are very likely to fail and for which the central bank assesses whether rehabilitation is justified.

Figure 1 Distribution of (composite) CAMELS ratings



Source: CNB.

There are two usual approaches to the development of an early warning system based on supervisory assessment. Under the first approach, modelled are rating migrations between two assessment cycles, where a critical threshold is a rating level that divides banks into a group of “good” banks (in international studies, mostly those rated 1 and 2) and a group of “bad” banks (rated 3, 4 or 5). For several reasons, this will be the approach used in this box. First, this approach should make results comparable to other studies in the area of modelling downgrading of bank ratings. Second, the number of transitions is the largest. This is not surprising since the number of “good” and “bad” banks so defined strongly fluctuates in the period under review. One of the banks lost a better rating 29 times and fell to rating 3 or worse, while in 21 instances a bank’s rating improved to above that critical threshold (Figure 2). Generally speaking, a ten year sample shows that it is twice as likely for a “threshold” rating to be downgraded than to be upgraded (8% vs 4%). As expected, this was even more evident in the recent (pre-crisis and crisis) period.

Apart from predictions on the lowering of ratings, the forecasting system will be complemented by predictions on the raising of ratings to forecast better the dynamics of bank risks. In view of limitations of the rating downgrading model, which due to the actual distribution of bank ratings is more an indicator of systemic risks than an early warning system for individual banks (only a minority of banks are rated 3 or better according to the most recent data available), the other approach that models rating levels of all banks simultaneously will also be tested. The difference from the first approach lies in somewhat more complex results, which for every bank provide the probability interval for each rating. This enables the forecasting of the rating distribution for all banks by

4 Within CNB off-site supervision, bank operations have been assessed systematically since 2000 (CAEL). From 2007 on, this assessment has been complemented by indicators on the quality of bank management (M) and sensitivity to market risks (S). This “complementation” of the rating system did not affect aggregate ratings, which is confirmed by the econometric analysis. This may be due to the correlation between variables on which business performance is assessed for individual CAMELS categories, as well as due to subjectivity of supervisors. Accordingly, the uniform term “CAMELS” is used for the aggregate estimate throughout all periods.

use of a single model, as well as the derivation of the probability of change in each individual rating.

Modelling probability of changes in CAMELS ratings

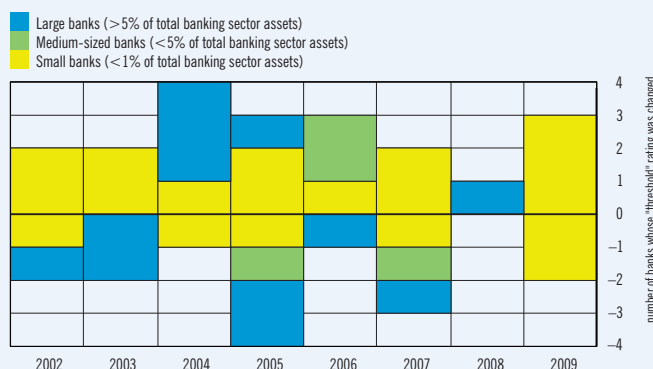
To model the migration of banks between categories of “good” and “bad” banks, estimated were four statistical probability models of rating changes (logistic regression) and an additional model of probability that a bank has a certain rating in the prediction horizon (ordered logistic regression). The testing included a total of 76 potential independent variables, which cover all segments of bank operations (from the raising of funds and their placement through to risk management and business results).⁵

Probability models of rating changes were estimated in two different time windows: under the first approach, a change in the rating over a given year was estimated, according to bank indicators for the end of the previous year (model 1 for the rating deterioration and model 2 for the rating improvement); the second approach modelled a change in the rating within a four-quarter rolling window (model 3 for the rating deterioration and model 4 for the rating improvement). Results of probability models of rating changes are shown in Table 1.

The alternative approach is based on modelling the position of each CAMELS rating (from 1 to 5) by using ordered logistic regression; it predicts the probability that a bank has a certain rating a year after the period to which data refer. Results of this model are shown in Table 2.

Although most of the variables tested somewhat affect future ratings, the study isolated independent variables that best explain typical epi-

Figure 2 Change in bank ratings to below and above the "threshold" rating by bank size



Note: Positive (negative) values indicate a deterioration (improvement) in the rating.
Source: CNB.

⁵ As a relatively large number of potential independent variables was tested, they could not be simultaneously used in the model due to the limited variation of the dependent variable. Therefore, for their selection used were a stepwise algorithm, where variables are added gradually, and a genetic algorithm that, by combining a great number of randomly estimated models, gradually improves their power to explain the dependent variable. The area under the ROC curve and optimisation of the statistical measures *sensitivity and specification* (logistic regression), as well as the Kendall's tau-b rank correlation coefficient (ordered logistic regression) were used as criteria for comparing different models.

Table 1 Estimated logistic regression parameters

Dependent variable ^a	Model 1	Model 2	Model 3	Model 4
	Coefficient (marginal effect)			
Independent variables				
Constant	-0.107	1.302	6.211	0.452
Coverage of non-performing loans and contingent liabilities	-0.032 ^b			0.025
	(-0.005)			(0.002)
Interest rates on f/c deposits	0.388 ^c			
	(0.058)			
Ratio of net interbank position to total assets	-0.075 ^b		-0.067	
	(-0.011)		(-0.011)	
Implicit deposit rate		-1.088		
		(-0.021)		
Share of loans 90 days overdue		-0.169 ^b	0.162	
		(-0.003)	(0.026)	
Operating income to assets ratio		0.666		
		(0.013)		
Share of loans in total placements and contingent liabilities			0.076	
			(0.012)	
Ratio of non-performing loans (including contingent liabilities) net of provisions to capital				-1.038
				(-0.002)
Deposits-to-assets ratio				-1.052
				(-0.003)
McFadden R ²	0.14	0.27	0.16	0.20
Area under the ROC curve (AUROC)	0.73	0.80	0.77	0.83
Threshold value for distinguishing between stable ratings and rating decreases	0.20	0.09	0.23	0.12
Percentage of accurately predicted stable ratings	61.0	86.3	79.3	69.1
Percentage of accurately predicted rating decreases or increases	84.2	93.3	64.9	83.8
Percentage of accurately predicted changes in the rating	65.6	86.9	76.0	70.8

^a Models in which a dependent variable is at an annual frequency:
A) Change in the rating over a specific year (based on end-of-year data):
Model 1: Binary variable: 0 (stable rating of "healthy" banks) and 1 (a decrease in the threshold rating)
Model 2: Binary variable: 0 (stable rating of "bad" banks) and 1 (an increase in the threshold rating)
B) Change in the rating over a four-quarter rolling window:
Model 3: Binary variable in the next four quarters: 0 (stable rating of "healthy" banks) and 1 (a decrease in the threshold rating)
Model 4: Binary variable in the next four quarters: 0 (stable rating of "bad" banks) and 1 (an increase in the threshold rating)
^b Significant at the level of 5%.
^c Significant at the level of 10%.
Source: CNB.

Table 2 Estimated ordered logistic regression parameters (model 5)

Dependent variable	
CAMELS rating (1, 2, 3, 4, 5)	
Independent variables (four-quarter lagged) ^a	Coefficient
Share of loans 90 days overdue	0.077
ROAA	-0.369
Average net liquid assets	-0.046
Interest rates on kuna loans	0.153
Ratio of non-performing loans (including contingent liabilities) net of provisions to capital	0.022
Cut-off value 1	-2.107
Cut-off value 2	1.358
Cut-off value 3	3.619
Cut-off value 4	7.360
McFadden R ²	0.217
Percentage of accurately predicted ratings:	
1	0.0
2	73.4
3	61.6
4	44.3
5	30.0
Total	58.5

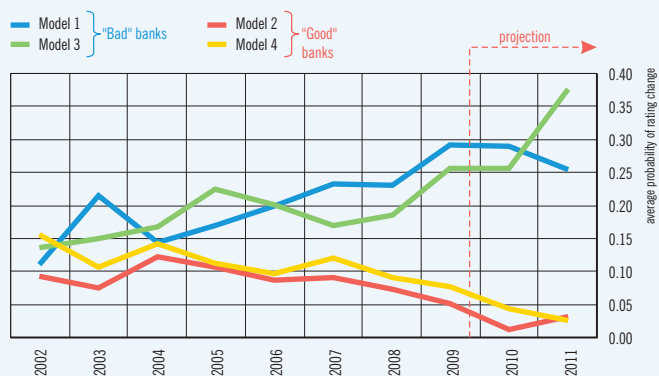
^a All variables are significant.
Source: CNB.

sodes of deterioration or improvement in a bank rating as well as groups of independent variables typical for each rating. It is encouraging that several groups of significant variables regularly appear in all approaches used and that their signs are always in line with expectations.

The first group relates to the quality of bank loans, where an improvement in quality and an increase in the coverage of non-performing loans indicate a better rating and vice versa. Various models in this group show that the significant variables are the share of loans 90 days overdue, the coverage of non-performing loans by value adjustments and of total non-performing loans, and the ratio of non-performing loans net of provisions to bank capital. The significance of these indicators is not surprising in view of the impact of deterioration in the loan portfolio quality on business results of banks as well as on their risks.

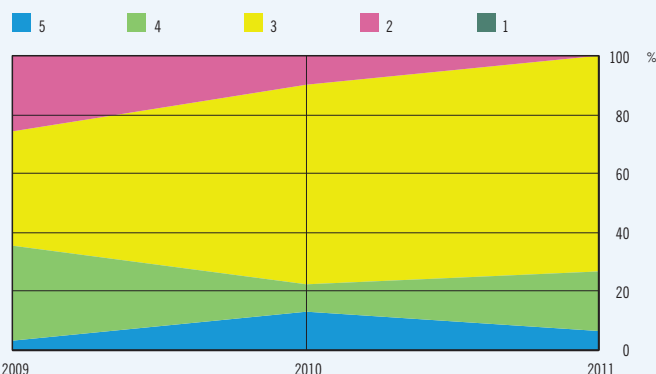
The second group of variables relates to the funding policy and liquidity of banks, where a more conservative balance sheet structure and higher liquidity indicate an increase in the rating and vice versa. The most prominent in that group are the net interbank position (showing whether a bank acts in the interbank market as a debtor or creditor), the interest rate on foreign currency deposits (which are the main funding source for banks in Croatia), the implicit interest rate on all deposits and the deposits-to-assets ratio of banks (which shows the dynamics of resources).

Figure 3 Developments in the average probability of rating change relative to the threshold rating based on models 1-4



Source: CNB.

Figure 4 Projected distribution of (composite) CAMELS ratings based on model 5



Source: CNB.

The third group comprises variables that describe business results, where higher profitability, in terms of ROAA and the ratio of operating income to assets, increases the probability of rating improvement. In addition, one model singles out as significant the ratio of loans to total placements, which shows a bank's risk appetite, i.e. its attempt to increase earnings by increasing the share of riskier items in the asset structure, thereby reducing the share of liquid assets in the form of bonds and deposits.

In general, although all four models of rating changes use indicators from various groups, certain regularities are evident. All models, without exception, include some information on the quality of placements. Models forecasting a rating decrease particularly rely on variables that provide information on the funding method and liquidity of banks, while models that indicate a rating improvement include information on bank profitability.

Based on the models used one may forecast the probability of a change in the CAMELS rating and the rating itself for each individual bank.

Projections based on the most recent data available as a rule show an increase in the probability of deterioration of ratings for “good” banks to below the threshold rating, i.e. a decrease in the probability of improvement in ratings of “bad” banks to above the threshold rating (Figure 3). The results obtained based on the model of individual CAMELS estimates (model 5) are roughly consistent with these projections (Figure 4), but estimated probabilities of rating changes are somewhat higher as the model specification differs from that of other approaches.

Finally, the assessed models mostly identify variables from same areas as the early warning model of bank failure, though there are certain

differences, particularly in some areas where assessed models clearly rely on a wider range of variables. Also, as models of rating changes give a better insight into the riskiness of the entire sector, and not just of vulnerable banks, they also provide additional information that is useful from a macroprudential perspective. In that sense, the prediction of rating changes is potentially a useful complement to the current early warning system. An additional potential use of the estimated models relates to checks of the potential impact of subjectivity in the rating analyst (which is increased by frequent changes of analysts in the course of supervision, past experience of each analyst and so on).

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Abbreviations and Symbols

Abbreviations

bn	– billion
CAR	– capital adequacy ratio
CBS	– Central Bureau of Statistics
CDCC	– Central Depository & Clearing Company
CDS	– credit default swap
CEE	– Central and Eastern European
CICR	– currency-induced credit risk
CNB	– Croatian National Bank
EAD	– exposure at default
ECB	– European Central Bank
EIZG	– Institute of Economics, Zagreb
EMBI	– Emerging Market Bond Index
EMU	– Economic and Monetary Union
EONIA	– Euro Overnight Index Average
ERM	– Exchange Rate 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
FSI	– financial soundness indicators
GDP	– gross domestic product
GFS	– Government Finance Statistics
HANFA	– Croatian Financial Services Supervisory Agency
HBS	– Household Budget Survey

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
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

Symbols

–	– no entry
....	– data not available
0 used	– 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

