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# Financial Stability

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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, as finance is based on confidence, it is inherently exposed to a high degree of uncertainty, i.e. cyclical swings in the perceptions and behaviour of financial market participants. 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, 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 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 – 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 foreign ownership of the largest banks, the CNB also cooperates with the home regulatory authorities and central banks of parent financial institutions.

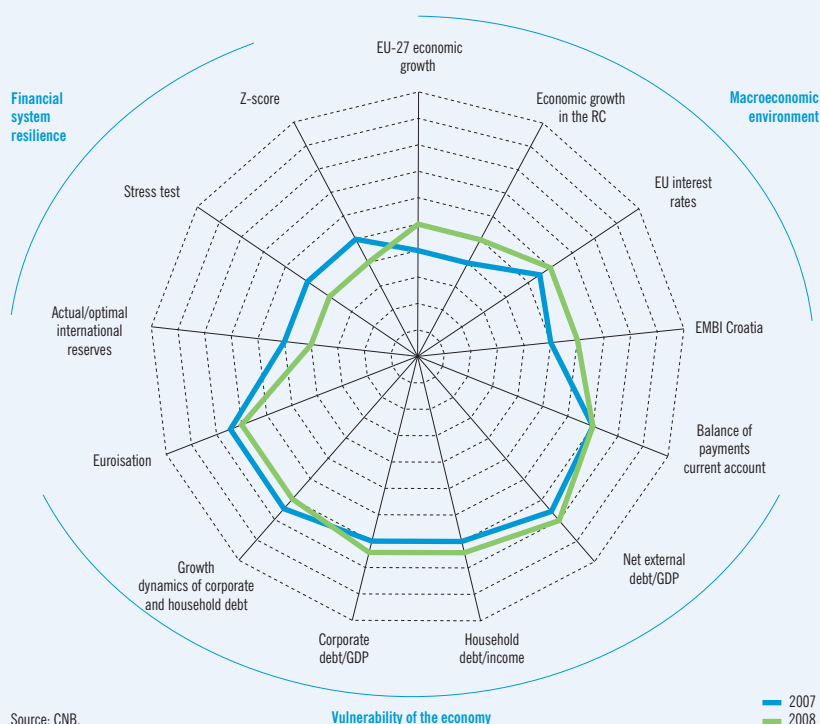
The publication *Financial Stability* continues from the former publication *Macroprudential Analysis*, but puts more emphasis on future developments in assessing financial stability. It analyses the main risks to banking system stability stemming from the macroeconomic environment of credit institutions and the situation in the main borrowing sectors, as well as the 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 ease a broader professional discussion on financial stability issues. All this together should help maintain confidence in the financial system and thus its stability.



# Overall Financial Stability Assessment

Figure 1 Financial Stability Map



Source: CNB.

Synthesising all the main financial stability indicators, Figure 1 suggests that, despite greater risks and vulnerabilities, the degree of financial stability has remained relatively high in 2008 due to enhanced system resilience to potential shocks.

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 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. 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 lower and a decrease in the area suggests higher financial system stability.



Although Croatia has remained relatively unscathed by the turbulence in the international financial markets, the map suggests that all the main categories of the domestic and international environment have deteriorated in 2008 compared with last year. GDP growth was strong in 2007, but is expected to slow down in 2008, with downside risks gaining momentum. The international environment is also expected to be less favourable for the maintenance of a currently high level of domestic financial system stability, which is reflected in an economic slowdown in the EU Member States and rising interest rates on foreign borrowing by domestic banks, corporates and government. The vulnerability indicators of the Croatian economy have also continued to trend upward, albeit at a slower pace. External imbalances will stay at high levels or increase further in 2008. Slightly slower growth dynamics of total corporate and household debt and a lower level of euroisation relative to 2007 somewhat mitigate the rising vulnerability of the domestic economy.

In contrast with these two groups, indicators of system resilience have mostly improved. Banks are much better capitalised, their profitability is still high and they are generally capable of withstanding relatively large shocks, while the CNB maintains a high level of international reserves. These resilience indicators are the direct result of monetary and prudential policy measures taken by the central bank.

The CNB's central projection for Croatian GDP growth of 4.5% in 2008 suggests its relatively brisk pace in the rest of the year, which should continue to support financial stability. Still, this projection implies an economic slowdown relative to last year, with heightened risks of adverse shocks. To a large extent, these shocks are related to a deteriorating international economic environment that negatively affects domestic financial stability via several channels. In particular, slower growth in major European economies leads directly to decelerating foreign demand and exports. In addition, the changes in investors' risk perception and aversion made foreign borrowing more expensive as early as in the second half of 2007, with the risk premium on Croatian securities remaining elevated in 2008 as well. This makes the refinancing of external debt and new foreign borrowing more expensive.

Relatively high GDP growth rates fuelled by strong capital inflows characterised the entire Central and Eastern European region in the previous periods. Hence, an additional channel for growth deceleration is the diminished availability of foreign capital (a detailed description of the channels through which the deterioration in the international environment affects the domestic economy and their quantification is given in Box 1). All this together should not excessively reduce the Croatian GDP growth rate, which is reflected in its central projection,

but it does affect risk distribution by increasing the downside risk to GDP growth and the probability of an adverse scenario materialising. The changes in the macroeconomic environment and the related risks described are discussed in the first chapter.

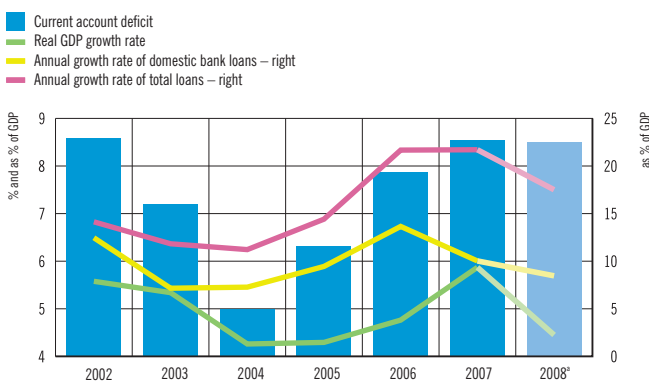
The deterioration of external vulnerability indicators recorded in 2007 is expected to continue in 2008, though at a somewhat slower pace. The current account deficit widened last year and could remain relatively high in 2008. Rising external imbalances have until recently mostly stemmed from domestic investments growing faster than domestic savings. Nevertheless, both investments and savings of the corporate and household sectors declined last year. In addition to the fact that the lion's share of loans went to the non-tradable and household sectors, this could negatively affect the external debt-servicing capacity. Although foreign borrowing costs have increased, net external debt growth could be stronger in 2008 than last year. A slight pick up in net external debt growth is based on the expectation that non-financial corporations will continue to borrow rather heavily abroad. Still, growth of the total debt of households and non-financial corporations should decelerate in 2008 compared with 2007. In addition, declining euroisation of the Croatian economy should reduce vulnerability.

A less favourable international environment and increased vulnerability of the Croatian economy underscore the need for placing stronger buffers in the system to eliminate or reduce the impact of potential negative shocks. In this context, international reserves, which are currently at comfortable levels, provide a major buffer. It should be noted that the assessment of the desired level of reserves takes into account a low-probability but plausible scenario of a sudden halt in capital inflows. If it could not be absorbed by international reserves, this sudden stop would lead to a real GDP contraction and kuna depreciation, as well as a corresponding increase in non-performing loans in banks' balance sheets, negatively affecting financial stability. Therefore it is particularly important to strengthen banking system resilience to such shocks. The 2007 wave of capital-raising by the banks increased banking sector capitalisation and, coupled with stable profitability, enhanced its resilience to the potential materialisation of credit risks. Though the banking sector as a whole is sufficiently strong to withstand relatively large shocks, certain banks are less resilient (results of the analysis are given in the chapter on banking sector resilience).

Within its realm of responsibility and in view of objective constraints, the CNB uses monetary and prudential policy measures to mitigate economy and banking sector vulnerabilities and enhance resilience to potential shocks. This is discussed in more detail in the concluding chapter.

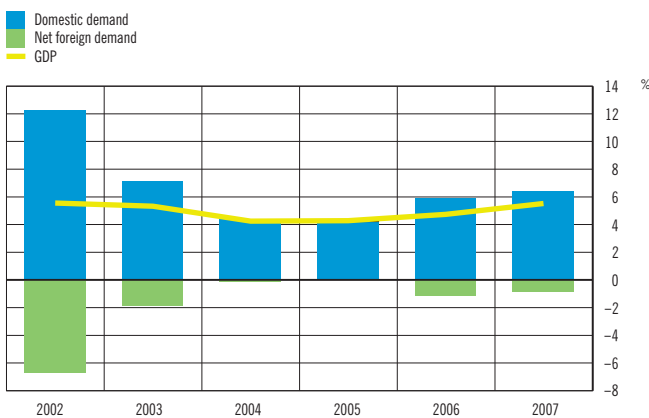
# Macroeconomic Environment

Figure 2 Foreign Capital Inflows and GDP Growth



\* Forecast.  
Sources: CNB and CBS.

Figure 3 GDP Growth Pattern



Source: CBS.

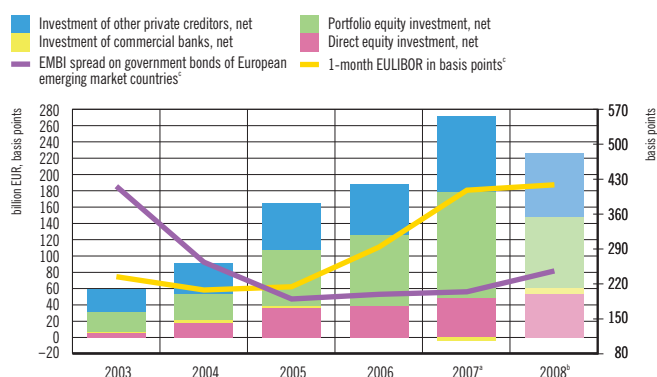
## Macroeconomic Risks

Deterioration of the international macroeconomic environment has this year been accompanied by expectations of a slight domestic economic slowdown. Considerable external financing needs, given the size of the matured external debt and the current account deficit, will be met in an environment of less abundant capital flows to emerging markets. In the short-run, financing needs should be satisfied without a considerable worsening of financing conditions. Still, economic resources should in the medium-term be directed towards the tradable goods and services sectors in order to reduce vulnerabilities and ensure the sustainability of Croatia's external position in the long-run.

Strong economic growth of 5.6% in 2007, which continued a several-year trend of relatively rapid convergence of per capita income to EU levels, was boosted by fast domestic demand growth that, coupled with somewhat slower export growth, led to a relatively high current account deficit of 8.6% of GDP.

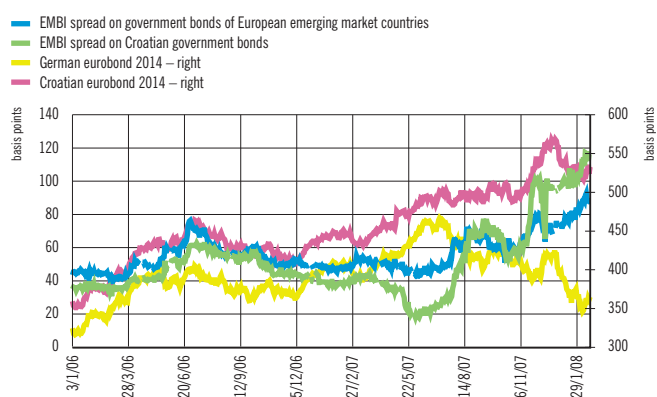
This growth pattern, which has characterised the Croatian economy since early in the decade, was supported by considerable foreign capital inflows (Figures 2 and 3). Increased global financial integration, accompanied by shifts in the regional distribution of global savings, declining real interest rates and risk premiums, has spurred substantial capital inflows to emerging markets, although not all of them had savings-investment gaps. The Central and Eastern European region was the only emerging market region that relied substantially on net foreign savings (Figures 4 and 5).

Figure 4 Capital Inflows to European Emerging Market Countries



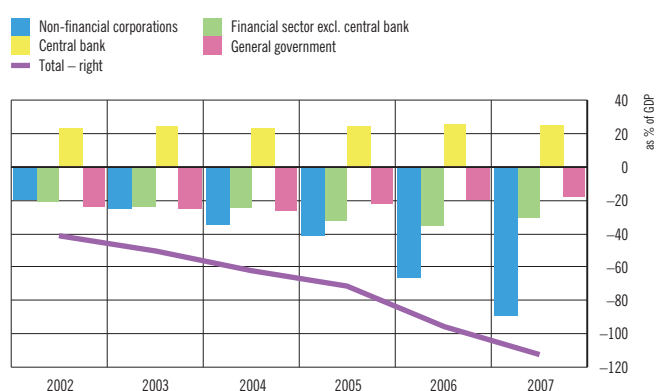
\* Estimate, \* Forecast, † In the first quarter of 2008.  
Sources: International Institute of Finance, *Capital Flows to Emerging Market Economies*, March 2008 and Bloomberg.

Figure 5 EMBI Spread and Yields on Croatian and Benchmark German Bonds



Source: Bloomberg.

Figure 6 Net Financial Position of Domestic Sectors to the Rest of the World



Source: CNB.

Although Croatia financed the bulk of the current account deficit in the observed period by inward foreign direct investment (FDI) flows, total net capital inflows exceeded the current account deficit by a large margin and were dominated by the foreign borrowing of domestic sectors. In this regard, banks have become major intermediaries for capital inflows to the Croatian economy, which has been facilitated by their integration in foreign financial groupings after privatisation early in the decade (Figures 6 and 7).

2007 saw a continuance of strong foreign capital inflows: FDI inflows hit a record high of some 10% of GDP, while external debt grew slower, which increased the external debt-to-GDP ratio by 2.3 percentage points.

In 2007, the aggregate domestic savings-investment gap, which is financed by foreign capital inflows, stayed almost the same as in 2006. The savings-investment gap of the private sector increased since its savings declined, whereas investments remained about the same as in 2006. The general government sector recorded a rise in surplus savings mostly due to a cyclical increase in public revenues (Figure 8).

These macroeconomic developments are the outcome of positive processes of real convergence and financial integration. However, as financing of the current account deficit and refinancing of matured external debt necessitate significant capital inflows, these developments also increase the economy's vulnerability since disruptions in capital inflows could have major negative effects (Box 1).

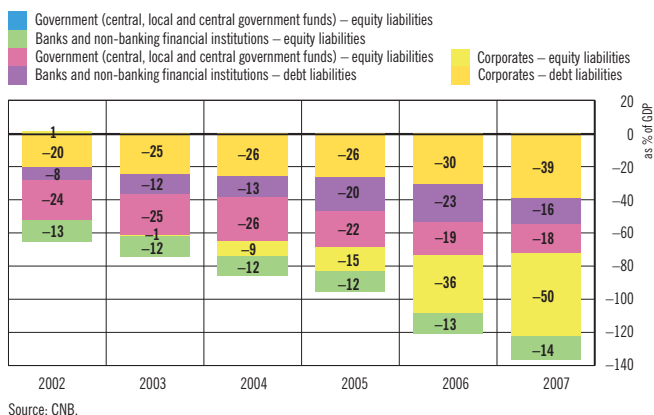
Considering external debt falling due, short-term external debt on the remaining maturity basis, which had to be refinanced in 2007, amounted to 22% of GDP. A large share of this debt related to bank liabilities to their parent banks and corporate liabilities to associated companies which, under normal circumstances, diminishes refinancing risk (Figures 9 and 10).

Notwithstanding a slowdown in import growth resulting from a slower rise in GDP, the current account deficit is projected to stay at a relatively high level of 8.5% of GDP in 2008, largely due to the global market increase in prices of oil and other crude materials, as well as food.

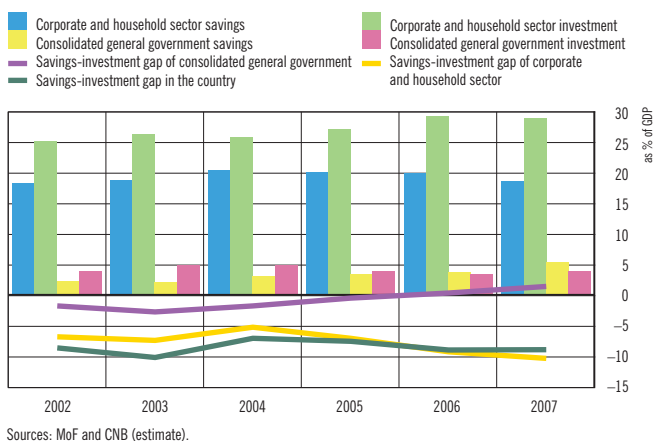
Together with the debt falling due, which amounts to 25% of GDP, this will create significant external funding needs. At the same time, conditions on the global capital markets have tightened due to the turmoil in the US subprime mortgage loan market. This crisis has only mildly affected emerging markets so far. Nevertheless, in addition to higher borrowing costs resulting from increased risk premiums, capital inflows to emerging markets are expected to slow down, primarily through debt instruments.

The risk premium on Croatian securities has increased by some 100 basis points since mid-2007, to a level slightly higher than the average risk premium on securities of European emerging markets. At the same time, the country's stable credit rating, which is supported by both prudent economic policies aimed

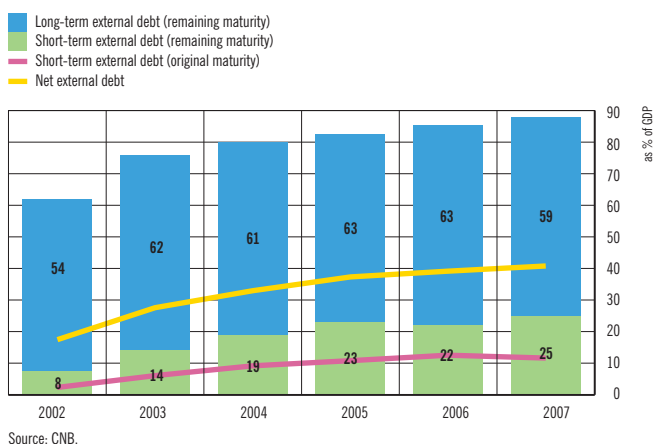
**Figure 7 Net Foreign Financial Position of Selected Domestic Sectors by Equity and Debt Instrument**



**Figure 8 Savings and Investment – Total and by Sector**



**Figure 9 Maturity Breakdown of Total External Debt**



at curbing external imbalances and adjustment reforms related to preparation for EU accession, provides open access to international capital markets.

In addition, the CNB conducts an international reserve policy that ensures international liquidity even under large disturbances. Deterioration in standard external liquidity indicators has slowed down in recent years (Figure 11), and the estimate of optimal reserves suggests that in late 2007 official reserves were at a level that ensured international liquidity, i.e. the financing of all mature liabilities and the current account deficit in 2008 even in the event of a shock arising from disruption of capital inflows (Box 2).

However, the long-term sustainability of Croatia's international financial position requires that resources be directed towards the tradable sector. This can be achieved by structural policies aimed at improving the investment climate, including the reduction of the tax burden and the government's role in the economy.

Croatia's external vulnerability arising from significant needs for foreign capital inflows is further aggravated by a high level of euroisation of all institutional sectors' liabilities to domestic financial institutions. A major change in the kuna/euro exchange rate triggered by an external shock would create debt servicing problems and large losses to domestic financial institutions. This would threaten the financial stability of the entire system and have an extremely adverse impact on the economy (see figures in Box 3).

For this reason, the policies that reduce external vulnerability and the risk of major exchange rate changes coupled with the policies to strengthen resilience of the financial system are crucial to preserve its stability as well as the stability of the entire economy.

In this context, a particularly important role is played by the banking sector – it is the main generator of loan supply and an important channel for both foreign capital inflows and economic growth, but also a sector that is mostly exposed to risks associated with external imbalances. For this reason, the central bank policy regarding the banking sector has macroprudential objectives, striving to preserve external and domestic stability, i.e. exchange rate and price stability in conjunction with sustainable economic growth.

This policy aims at both containing bank credit growth within limits that will not add to the rise in external imbalances and strengthening the banks' ability to absorb potential losses caused by shocks to capital inflows.

Sustainability of the external financial position and the stability of the financial system and the entire economy are also influenced by the sectoral allocation of capital. Foreign capital and domestic loans have so far mostly gone to the non-tradable sector (Figures 12 and 13) and the household sector.

This allocation was market-induced by the higher returns in these sectors that resulted from significant supply-demand

### Box 1 Assessing the Impact of External Shocks on the Croatian Economy

The international financial market turmoil triggered by the US subprime mortgage crisis has highlighted the issue of its potential effects on the Croatian economy. For this purpose, a VAR model that quantifies the impact of major (external) real and financial shocks on the Croatian economy (GDP) was estimated. The model was estimated by using quarterly data for 1998-2007.

The model comprises five variables divided into two blocks. The external block consists of the real GDP of the 27 EU Member States. The domestic block contains the cost of foreign borrowing for the domestic economy measured by the spread on Croatian government bonds, real GDP, HRK/EUR exchange rate, and the corporate and household loans of domestic banks. The division of variables into external and domestic is suitable to model a small open economy where external variables influence domestic variables but not vice versa. Structural shocks were identified by the Cholesky decomposition, with the following sequence of variables: EU GDP, spread, loans, GDP, exchange rate.

Response of domestic GDP and loans was in most cases assessed to be significantly different from zero, particularly in the case of domestic shocks (Table 1 and Figure 1). Directions of domestic variable responses to external and domestic shocks are mostly in line with expectations. Slower (faster) EU economic activity, i.e. rising foreign demand, leads to slower (faster) Croatian GDP growth, in a 1-to-1 relationship. The current general decline in risk appetite on international financial markets coupled with a higher risk assessment for Croatia is expressed as an increase in the Croatian government bond spread. A growing spread decelerates Croatian GDP and domestic loan growth and leads to nominal exchange rate depreciation as the possible consequence of capital outflows. More precisely, a spread increase by one standard deviation (23 basis points) slows down GDP growth by 0.37 percentage points at the moment of shock and cumulatively by 0.5 percentage points after four quarters.

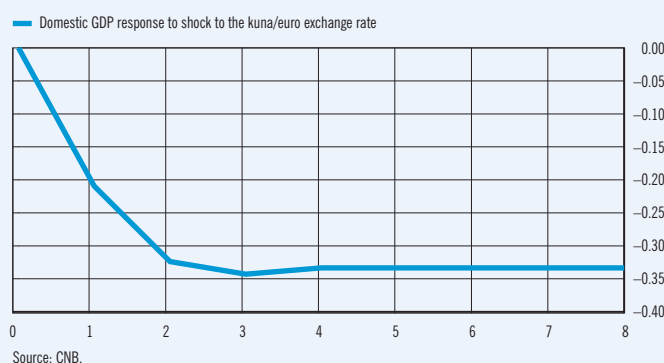
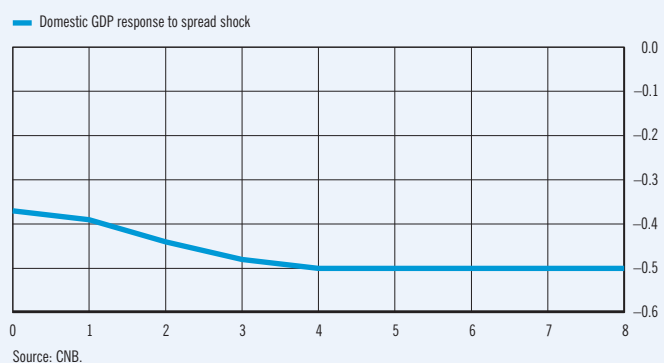
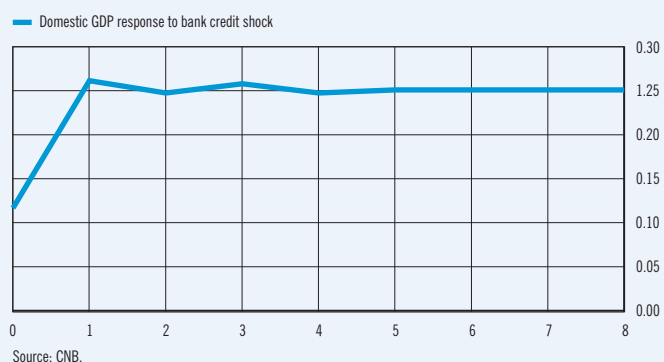
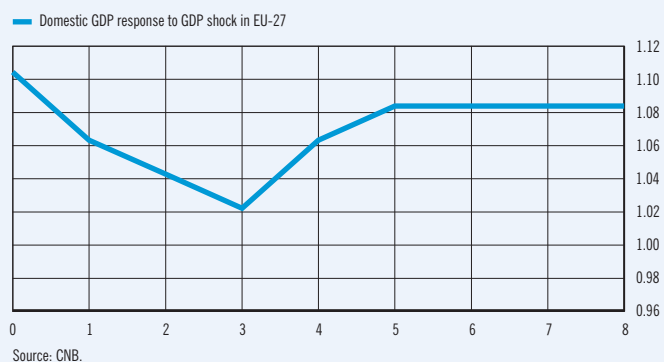
In addition to prices (spread), the credit crunch in international financial markets may be reflected in the absolute reduction in funding sources for Croatian corporates and households. In particular, in addition to direct corporate borrowing abroad, a substantial share of domestic

**Table 1 Accumulated Response of Bank Credits and GDP (in percentage points) to One-Unit Shocks to GDP in EU-27, Credits, Domestic GDP and the Kuna/Euro Exchange Rate and to One Standard Deviation Shock (23 basis points) to Spread**

	Horizon (quarters)	GDP in EU-27	Spread	Credits	GDP	HRK/EUR
Credits	0	-0.69	-0.50	1.00 <sup>b</sup>	0.00	0.00
	1	-0.50	-0.47	1.13 <sup>b</sup>	1.31 <sup>b</sup>	-0.76 <sup>b</sup>
	4	-0.81	-0.75 <sup>a</sup>	1.19 <sup>b</sup>	1.46 <sup>b</sup>	-1.14 <sup>b</sup>
GDP	0	1.10 <sup>b</sup>	-0.37 <sup>b</sup>	0.12 <sup>b</sup>	1.00 <sup>b</sup>	0.00
	1	1.06 <sup>b</sup>	-0.39 <sup>b</sup>	0.26 <sup>b</sup>	0.99 <sup>b</sup>	-0.21 <sup>b</sup>
	4	1.06 <sup>a</sup>	-0.50 <sup>a</sup>	0.25 <sup>b</sup>	1.27 <sup>b</sup>	-0.33 <sup>a</sup>

<sup>a</sup> 68% significance. <sup>b</sup> 95% significance. Source: CNB.

**Figure 1 Accumulated Response of GDP (in percentage points) to One-Unit Shocks to GDP in EU-27, Credits and the Kuna/Euro Exchange Rate and to One Standard Deviation Shock (23 basis points) to Spread**



bank lending is financed by foreign capital. Hence, a fall in domestic bank loans of 1% leads to a decline in GDP of 0.12%, or 0.25% in cumulative terms (after a year). A similar impact is observable in the VAR model comprising total (domestic and foreign) corporate and household borrowing. This suggests that economic growth would slow down if foreign funding became harder for Croatian banks and corporates to obtain.

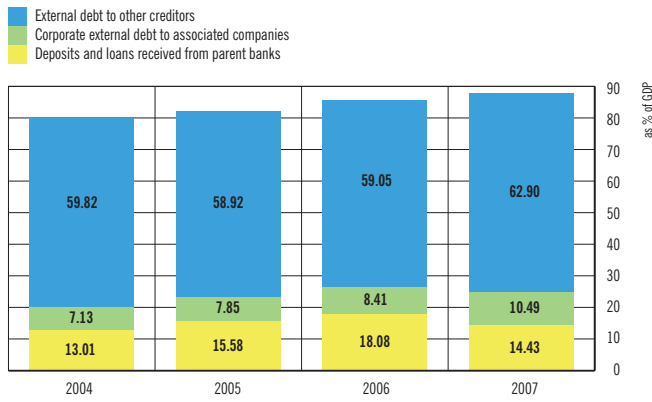
The variance decomposition (Table 2) measures the contribution of each variable to spread, loans, GDP and exchange rate variability since 1998. The estimates obtained suggest that domestic output variability was mostly influenced by EU GDP (22% in  $t = 1$  and 18% after a year) and magnitude of funding expressed in terms of bank loans (8% in  $t = 1$  and 17% after a year), with the spread (10% in  $t = 1$  and 8% after a year) and exchange rate (5% after a year) being somewhat less important. The most important determinant of bank loan variability was domestic GDP (14%) and, to a much lesser extent, the HRK/EUR exchange rate (7% after a year).

Table 2 Variance Decomposition of Domestic Variables

	Horizon (quarters)	GDP in EU-27	Spread	Credits	GDP	HRK/EUR
Spread	1	2%	98%	0%	0%	0%
	4	13%	47%	11%	26%	3%
Credits	1	1%	3%	96%	0%	0%
	4	2%	2%	75%	14%	7%
GDP	1	22%	10%	8%	60%	0%
	4	18%	8%	17%	52%	5%
HRK/EUR	1	4%	0%	0%	17%	78%
	4	6%	5%	4%	16%	68%

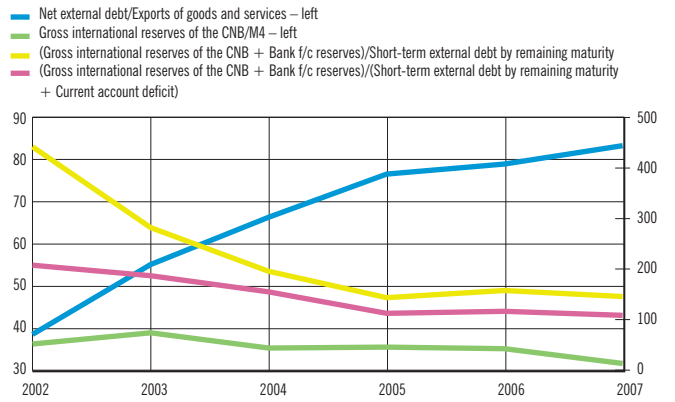
Source: CNB.

Figure 10 Bank External Debt to Parent Banks and Corporate External Debt to Associated Companies



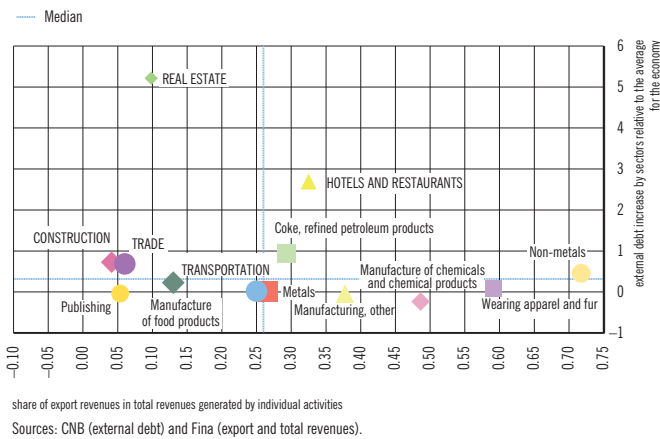
Source: CNB.

Figure 11 Selected Indicators of External Vulnerability



Source: CNB.

Figure 12 External Debt Allocation by Sectors in 2002-2007



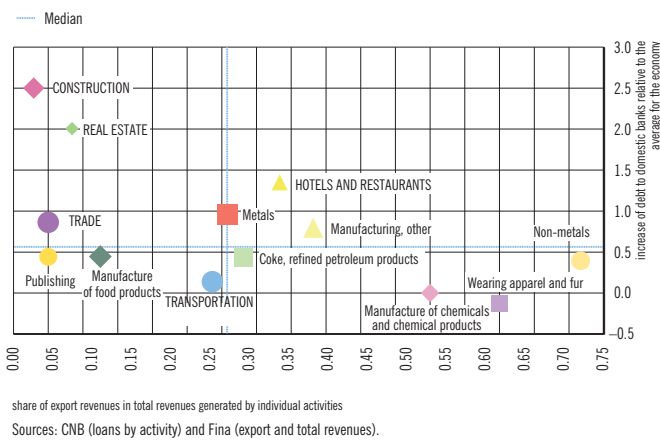
Sources: CNB (external debt) and Fina (export and total revenues).

mismatches. However, it was also affected by the banks’ policy of relatively low interest rates on exchange rate-indexed loans. This policy did not take account of the risks related to abrupt exchange rate changes but instead assumed exchange rate stability consequent on central bank policy. This was also true of borrowers not hedged against currency risk by the generation of foreign currency income.

These factors added to excessive lending growth and its unfavourable sectoral allocation in view of the long-term sustainability of the external financial position, which increased the risks to banking sector and overall economic stability.

By discouraging excessive credit growth and increasing the risk weights applicable to bank assets exposed to indirect exchange rate risks, the CNB has striven to reduce these risks and enhance bank resilience by strengthening their capital base. At the same time, it has tried to indirectly influence the allocation of loans to the tradable sector. All this should reduce the economy’s external vulnerabilities and enhance financial system resilience to external shocks.

Figure 13 Loan Allocation by Sectors in 2002-2007



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

## Box 2 Optimal CNB International Reserves

Central banks hold international reserves for two main reasons. The first is to ensure external liquidity so as to mitigate abrupt changes in the current account balance and the related decline in domestic demand in the event of sudden stops in foreign capital inflows. This role of the international reserves is even more important in highly euroised economies such as that of Croatia, due to the threat of weakening confidence in the domestic currency, as well as conversion of kuna deposits into foreign exchange deposits and their withdrawal. The other reason is that international reserves enable central banks to intervene in the foreign exchange market to reduce exchange rate volatilities. Both these reasons for holding international reserves are stated in the Act on the Croatian National Bank.

Many developing countries have accumulated vast international reserves in the last ten years. This is characteristic of economies with a substantial domestic savings surplus, such as China and oil exporters. In some countries, it results from experience with the 1997 Asian financial crisis when a sudden stop in foreign capital inflows and an insufficiency of international reserves led to current account correction and decreased domestic demand in Eastern Asian countries.

This trend of international reserve accumulation has not passed Croatia by. CNB international reserves almost quadrupled in the 1998-2007 period. Nevertheless, the short-term debt of the economy increased almost five times,<sup>1</sup> whereas banks' foreign currency deposits increased by some two and a half times in the same period. A model of optimal international reserves has been developed to estimate whether the current level of international reserves is sufficient to ensure external liquidity and prevent adverse effects of a potential stop in foreign capital inflows. The model assumes that the optimal level of international reserves is the level that enables inter-temporal smoothing of personal consumption and thereby maximises the population's welfare. This, in turn, is defined by the extent to which reserves cover potential short-term net foreign currency liabilities of domestic sectors in case of a sudden halt in short-term foreign capital inflows.<sup>2</sup>

The model distinguishes between two situations that may occur in a certain period with a certain probability: a period of stability and a period of crisis. Consequences of crises were specified according to international experience with BOP crises and the experience of a temporary interruption in foreign capital inflows to Croatia during the 1998 banking crisis. The model assumes that foreign creditors cease to grant short-term loans to domestic corporates, banks and government during a period of crisis. In addition, production falls and the exchange rate depreciates during a crisis.<sup>3</sup> Due to a lack of confidence in the domestic currency, households substitute a part of kuna for euro deposits, with a certain share of kuna and euro deposits being withdrawn from banks due to increased mistrust of the banking system. Lacking access to foreign credit markets, households hold withdrawn euro funds "under

<sup>1</sup> Short-term debt of all economic sectors includes also principal payments on maturing long-term debt. Banks' debt includes non-resident deposits with maturity up to 1 year and deposits maturing in over 1 year that may presumably be easily withdrawn in the event of a crisis.

<sup>2</sup> The model results are only indicative and do not define an operational objective of the CNB policy.

Table 1 Model Parameter Values in the Baseline Calibration

Parameter	Parameter values (baseline calibration)
Probability of crisis	10%
Exchange rate depreciation	8%
Output loss <sup>a</sup>	5.70%
Withdrawn deposits	17%
Kuna deposits converted into euros	19%

<sup>a</sup> Output loss is expressed as the difference between nominal GDP and its potential level.

Source: CNB.

Figure 1 Actual and Optimal International Reserves (baseline calibration)

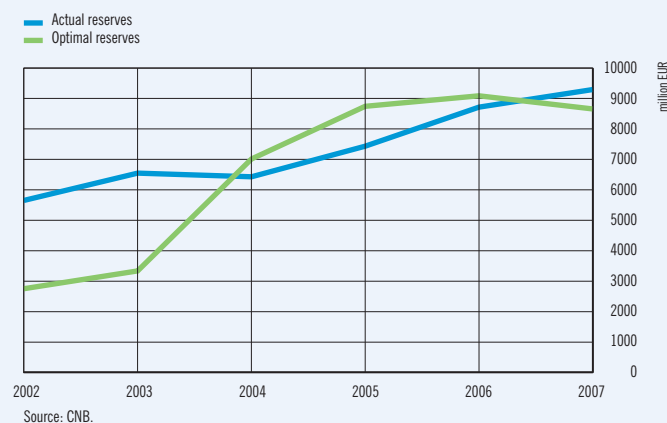
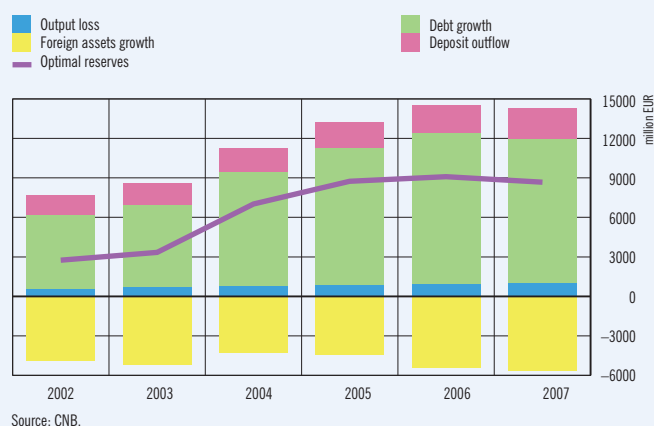


Figure 2 Contribution of Individual Components of Optimal International Reserves (baseline calibration)





mattresses”, whereas corporates and banks use their foreign assets to compensate for the shortage of short-term foreign loans.

A formula for the optimal level of international reserves may be analytically deduced from the central bank decision on the international reserve level that provides a safety cushion in the event of a crisis while maximising economic welfare. Under that formula, the optimal level of international reserves would increase if the short-term external debt of banks, corporates and government grew or if corporates and banks decreased their reserves and foreign assets that might offset the lack of foreign loans during a crisis. Furthermore, due to a high degree of euroisation, the central bank will hold higher international reserves as a buffer against a potential withdrawal of a part of foreign currency deposits. Also, the optimal international reserve level depends on the model parameters. This level, for example, will be higher if there is an increase in: the probability of crisis, expected production losses, the share of deposits withdrawn, or the share of kuna deposits changed into euro deposits, and in the event of exchange rate depreciation during a crisis.

The model parameters were calibrated according to developments in variables during a temporary interruption of foreign capital inflows and the banking crisis in Croatia in 1998 (baseline calibration).

On the basis of variables that determine optimal reserves we calculated the optimal level of CNB reserves in 2002-2007.

The optimal CNB reserves at end-2007 calculated present the level needed to mitigate the negative impact of a potential crisis in 2008. At the start of the observed period, the CNB held reserves at a higher than optimal level. After 2003, the difference between actual and optimal reserves decreased mostly due to a large increase in optimal reserves in 2004. At end-2007, the CNB held reserves at a level slightly higher than that needed to offset the negative impact of a possible crisis in 2008 (Figure 1).

The described movements in the optimal reserve level are determined by the structure of contributions by individual optimal reserve components (Figure 2). The optimal level of central bank reserves is determined by the contributions from the difference between possible production loss, short-term external debt growth<sup>4</sup> and deposit outflows on the one hand<sup>5</sup> and the rise in foreign assets of corporates and banks on the other hand. The 2004 sudden increase in optimal reserves may be attributed to a large expansion in bank and corporate debt and a decrease in bank foreign assets. The decline in optimal reserves in late 2007 was mostly caused by the expected slowdown in banks debt growth due to limits introduced on credit growth.

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3 The reasons for production fall and exchange rate depreciation are not explicitly covered by the model. Still, the experience of dollarised countries during the periods of interrupted capital inflows suggests that the exchange rate depreciates due to increased demand for foreign exchange as foreign currency deposits and foreign capital flee the country. A production decline is the consequence of banking system's solvency problems caused by difficulties which households and corporates have in the repayment of loans denominated in or indexed to foreign currencies.

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4 A debt increase refers to the difference between projected and actual debt. The only source of uncertainty in the model is the probability of crisis.

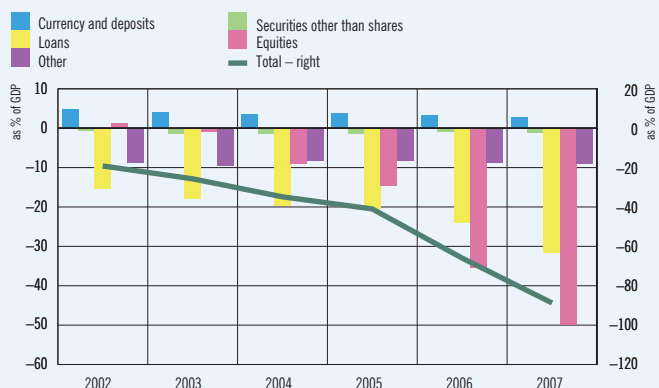
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5 It should be noted that each component of international reserves receives a weight arising from the maximisation problem of the central bank. For example, a contribution coming from the debt increase does not reflect the actual stock of direct debt.

### Box 3 Preliminary Financial Accounts for Croatia

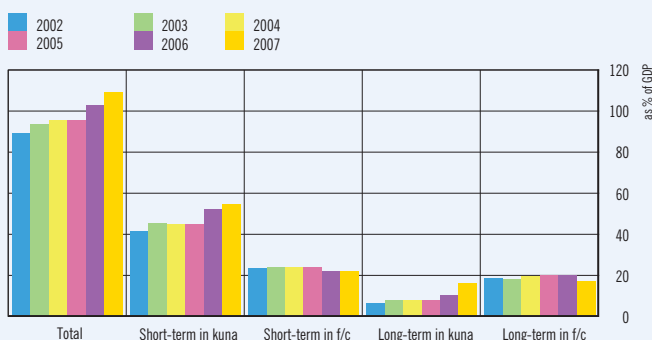
Financial accounts describe financial relations among institutional sectors of the domestic economy and their relations with the rest of the world. By presenting total inter-sector claims and liabilities of particular sectors and their net financial position, which indicates the sectors that are sources 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 text below presents a several-year dynamics of certain aspects of inter-sector financial relations that are particularly interesting for the analysis of financial system stability.

Figure 1 Net Financial Position of the Corporate Sector to the Rest of the World by Instrument



Source: CNB.

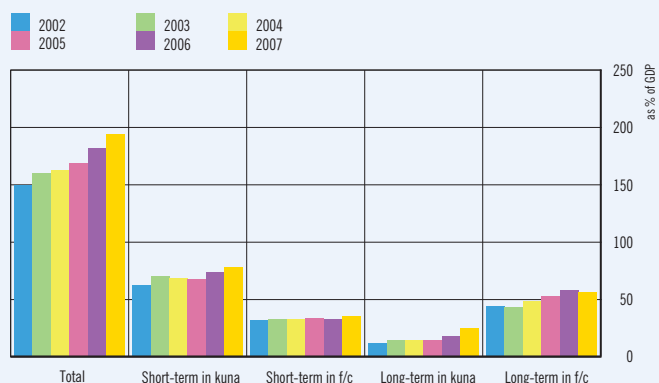
Figure 2 Corporate Sector Claims by Maturity and Currency<sup>a</sup>



<sup>a</sup> The currency and maturity structure of domestic sector assets and liabilities is derived on the basis of cash, deposits (time, savings and demand deposits held with banks), securities (except equities), loans and other assets and liabilities in corporate balance sheets (to suppliers, workers and the government). Maturity has been determined on the remaining maturity basis. Kuna liabilities and assets indexed to foreign currencies are included in foreign currency assets and liabilities.

Source: CNB.

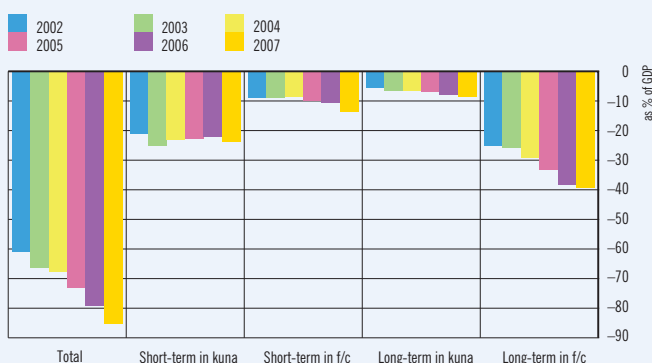
Figure 3 Corporate Sector Liabilities by Maturity and Currency<sup>a</sup>



<sup>a</sup> See note to Figure 2.

Source: CNB.

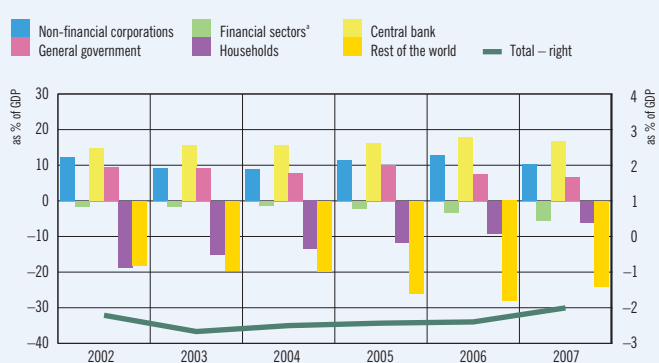
Figure 4 Net Financial Position of the Corporate Sector by Maturity and Currency<sup>a</sup>



<sup>a</sup> See note to Figure 2.

Source: CNB.

Figure 5 Net Financial Position of the Banking Sector by Sector



<sup>a</sup> Excluding central bank.

Source: CNB.

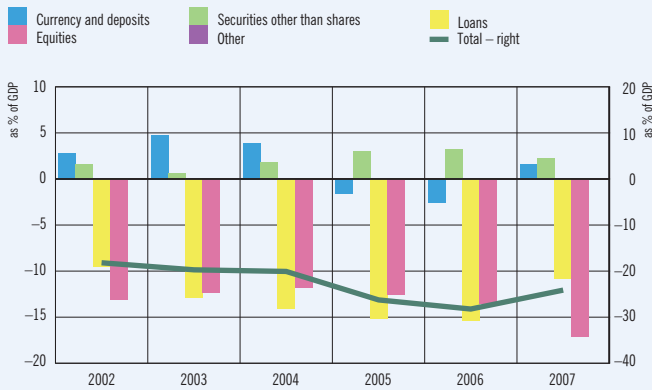
Table 1 Inter-Sector Claims and Liabilities at the end of 2006 and the end of 2007

as % of GDP

Liabilities		Claims												Total liabilities	
		Domestic sectors										Rest of the world			
		Corporates		Financial sector		General government		Households		Total					
		2006	2007	2006	2007	2006	2007	2006	2007	2006	2007				
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	4	5	0	0	0	0	4	5	0	0	4	5
	Loans	32	36	38	38	0	0	0	0	70	74	26	33	96	107
	Shares and equity	29	24	4	8	29	24	58	47	119	102	40	56	159	158
	Insurance technical provisions	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Other claims and liabilities	39	38	4	4	31	31	8	8	81	81	2	3	83	84
	<b>Total</b>	<b>100</b>	<b>98</b>	<b>50</b>	<b>54</b>	<b>60</b>	<b>54</b>	<b>65</b>	<b>55</b>	<b>275</b>	<b>261</b>	<b>66</b>	<b>92</b>	<b>342</b>	<b>353</b>
Financial sector	Monetary gold and SDRs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Currency and deposits	19	21	24	25	5	6	53	53	101	105	13	11	114	116
	Securities other than shares	0	0	0	1	0	0	0	0	0	1	2	1	2	2
	Loans	1	1	3	4	0	0	0	0	4	4	24	21	28	25
	Shares and equity	2	3	1	2	2	3	7	12	13	19	16	19	28	38
	Insurance technical provisions	2	2	0	0	0	0	11	13	13	15	0	0	13	15
	Other claims and liabilities	4	5	0	0	0	0	1	1	5	5	0	0	5	5
	<b>Total</b>	<b>28</b>	<b>31</b>	<b>28</b>	<b>31</b>	<b>8</b>	<b>9</b>	<b>72</b>	<b>78</b>	<b>136</b>	<b>150</b>	<b>55</b>	<b>52</b>	<b>190</b>	<b>202</b>
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	5	5	15	13	0	0	0	0	19	19	11	9	30	28
	Loans	0	0	5	5	0	0	0	0	5	5	9	8	14	13
	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	0	0	0	0	0	0	0	0	0	0	0	0
	<b>Total</b>	<b>5</b>	<b>5</b>	<b>20</b>	<b>19</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>25</b>	<b>24</b>	<b>20</b>	<b>18</b>	<b>44</b>	<b>42</b>
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	43	0	0	0	0	39	43	0	0	39	43
	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	0	0	0	0	0	0	0	0	0	0	0	0
	<b>Total</b>	<b>0</b>	<b>0</b>	<b>39</b>	<b>43</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>39</b>	<b>43</b>	<b>0</b>	<b>0</b>	<b>39</b>	<b>43</b>
Rest of the world	Monetary gold and SDRs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Currency and deposits	3	3	23	25	0	0	0	0	27	28	0	0	27	28
	Securities other than shares	0	0	18	16	0	0	0	0	18	16	0	0	18	16
	Loans	0	0	0	1	0	0	0	0	1	1	0	0	1	1
	Shares and equity	5	7	2	4	0	0	0	0	7	10	0	0	7	10
	Insurance technical provisions	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Other claims and liabilities	1	1	0	0	0	0	0	0	1	1	0	0	1	1
	<b>Total</b>	<b>10</b>	<b>10</b>	<b>43</b>	<b>46</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>53</b>	<b>56</b>	<b>0</b>	<b>0</b>	<b>53</b>	<b>56</b>
Total	Monetary gold and SDRs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Currency and deposits	22	24	47	49	5	6	53	53	128	133	13	11	141	144
	Securities other than shares	5	6	36	35	0	0	0	0	41	41	12	11	54	52
	Loans	33	37	86	90	0	0	0	0	119	127	59	62	178	189
	Shares and equity	37	33	7	13	31	26	65	59	139	131	55	75	195	206
	Insurance technical provisions	2	2	0	0	0	0	11	13	13	15	0	0	13	15
	Other claims and liabilities	44	44	4	5	31	31	8	8	87	87	2	3	89	90
	<b>Total</b>	<b>142</b>	<b>145</b>	<b>181</b>	<b>192</b>	<b>68</b>	<b>63</b>	<b>137</b>	<b>133</b>	<b>527</b>	<b>533</b>	<b>142</b>	<b>162</b>	<b>669</b>	<b>695</b>

Source: CNB.

Figure 6 Net Financial Position of the Banking Sector to the Rest of the World by Instrument



Source: CNB.

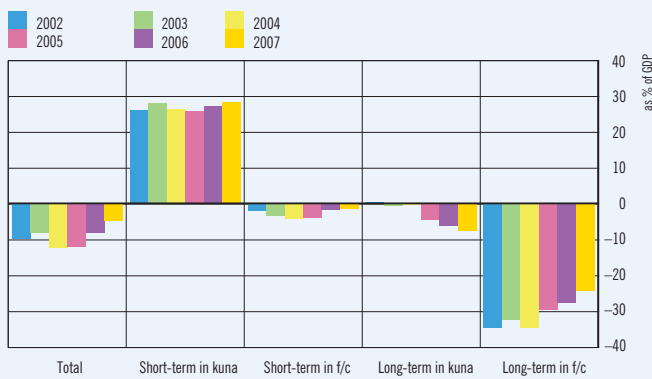
Figure 7 Net Financial Position of the General Government Sector<sup>a</sup> to the Rest of the World by Instrument



<sup>a</sup> This includes central government, central government funds, local government and the CBRD.

Source: CNB.

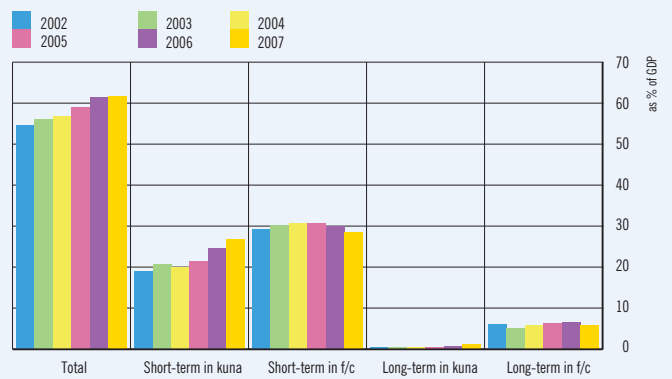
Figure 8 Net Financial Position of the General Government Sector<sup>a</sup> by Maturity and Currency



<sup>a</sup> See note to Figure 7.

Source: CNB.

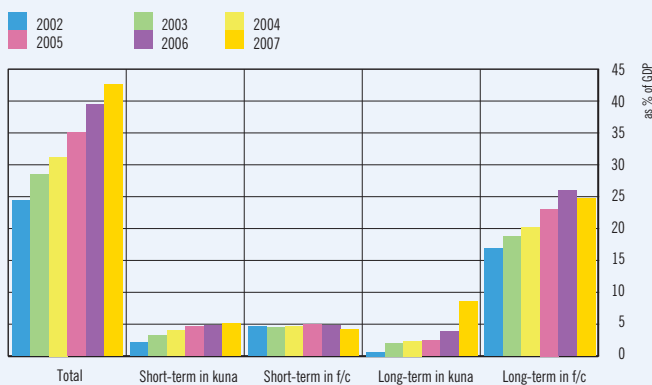
Figure 9 Household Sector Claims by Maturity and Currency<sup>a</sup>



<sup>a</sup> See note to Figure 2.

Source: CNB.

Figure 10 Household Sector Liabilities by Maturity and Currency<sup>a</sup>



<sup>a</sup> See note to Figure 2.

Source: CNB.

Figure 11 Net Financial Position of the Household Sector by Maturity and Currency<sup>a</sup>



<sup>a</sup> See note to Figure 2.

Source: CNB.

Table 2 Financial Position of Domestic Sectors, as % of GDP

A) CORPORATES <sup>a</sup>	2002	2003	2004	2005	2006	2007	Difference between 2007 and 2002
Total net financial position <sup>b</sup> /GDP	-175.6	-180.0	-180.7	-187.7	-199.9	-208.6	-33.0
Net financial position in equities <sup>c</sup> /GDP	-114.6	-113.6	-113.1	-114.6	-120.6	-123.2	-8.6
Net financial position in other instruments <sup>d</sup> /GDP	-61.0	-66.4	-67.6	-73.1	-79.3	-85.4	-24.4
To the rest of the world	-13.1	-16.9	-19.3	-20.0	-23.6	-32.6	-19.5
To domestic sectors	-48.0	-49.5	-48.3	-53.1	-55.7	-52.8	-4.9
<b>Net currency position of corporates<sup>d</sup></b>							
Net position in domestic currency	-26.9	-31.7	-29.7	-29.6	-30.1	-32.4	-5.5
Net position denominated in or indexed to foreign currencies	-34.1	-34.7	-37.9	-43.5	-49.2	-53.0	-18.8
a) To the rest of the world	-12.9	-14.8	-17.2	-19.3	-23.7	-31.9	-19.0
To domestic sectors	-21.2	-19.9	-20.7	-24.2	-25.5	-21.0	0.2
b) Long-term	-25.3	-25.9	-29.2	-33.4	-38.5	-39.3	-14.1
Short-term	-8.9	-8.8	-8.8	-10.1	-10.7	-13.6	-4.8
B) HOUSEHOLDS <sup>e</sup>	2002	2003	2004	2005	2006	2007	Difference between 2007 and 2002
Total net financial position <sup>b</sup> /GDP	115.0	111.8	106.3	105.3	97.4	90.4	-24.6
Net financial position in equities <sup>c</sup> /GDP	84.7	84.2	80.8	81.4	75.4	71.3	-13.4
Net financial position in other instruments <sup>d</sup> /GDP	30.3	27.6	25.5	23.9	22.1	19.1	-11.2
<b>Net currency position of households<sup>d</sup></b>							0.0
Net position in domestic currency	16.3	15.5	13.7	14.7	16.2	13.7	-2.6
Net position denominated in or indexed to foreign currencies	14.0	12.1	11.8	9.2	5.9	5.4	-8.5
Long-term	-10.7	-13.6	-14.4	-16.7	-19.4	-18.9	-8.1
Short-term	24.7	25.7	26.1	25.8	25.2	24.3	-0.4
C) GENERAL GOVERNMENT <sup>f</sup>	2002	2003	2004	2005	2006	2007	Difference between 2007 and 2002
Total net financial position <sup>b</sup> /GDP	32.4	32.9	26.0	24.7	23.3	21.8	-10.6
Net financial position in equities <sup>c</sup> /GDP	42.0	40.9	38.0	36.5	31.2	26.3	-15.7
Net financial position in other instruments <sup>d</sup> /GDP	-9.6	-8.0	-12.0	-11.8	-7.9	-4.5	5.1
To the rest of the world	-23.7	-25.0	-25.9	-22.3	-19.5	-17.6	6.1
To domestic sectors	14.1	17.0	13.8	10.5	11.6	13.0	-1.1
<b>Net currency position of the government sector<sup>d</sup></b>							0.0
Net position in domestic currency	26.6	27.4	26.3	21.4	21.3	20.7	-5.8
Net position denominated in or indexed to foreign currencies	-36.1	-35.5	-38.3	-33.2	-29.2	-25.2	10.9
a) To the rest of the world	-23.7	-25.0	-25.9	-22.3	-19.5	-17.6	6.1
To domestic sectors	-12.5	-10.4	-12.5	-10.9	-9.7	-7.7	4.8
b) Long-term	-34.4	-32.2	-34.4	-29.5	-27.5	-24.1	10.4
Short-term	-1.7	-3.2	-3.9	-3.7	-1.7	-1.2	0.6

<sup>a</sup>This sector comprises public enterprises, private and mixed non-financial corporations and banks undergoing bankruptcy proceedings.

<sup>b</sup> This comprises all assets and liabilities in the financial accounts.

<sup>c</sup> This includes liabilities/assets on the basis of issued/purchased equities and paid-in insurance premiums.

<sup>d</sup> This includes all instruments (currency and deposits, all securities other than shares, loans and other financial claims and liabilities) and excludes equity securities and insurance premiums.

<sup>e</sup> This sector comprises natural persons and non-profit organisations.

<sup>f</sup> This sector comprises central government, central government funds, local government and the CBRD.

It should be said that these are the first preliminary results of financial accounts compilation for the Republic of Croatia and that they still contain a number of open methodological issues. Although they are here presented only as a rough illustration of inter-sector relations, they can be useful in the detection of the main trends.

The increasing share of corporate external debt financed by equity instruments rather than loans has mostly been the result of the 2007 rise in share values (Figure 1).

Observing non-equity debt instruments alone, one may notice a continued upward trend in currency exposure of the corporate sector, particularly regarding the long-term segment, with 2007 witnessing a replacement of a part of the exposure to domestic sectors by exposure to the rest of the world. However, this has had no major impact on overall currency exposure as domestic long-term liabilities are also linked to exchange rate movements (Figures 2, 3 and 4).

As intermediaries, commercial banks mostly have a balanced net financial position. However, a falling trend is observable in their net debt to the household sector, which held steady throughout 2007, and a decline in net foreign liabilities and net claims on the government and

corporate sectors under the influence of monetary and fiscal policies (Figure 5).

An increase in the net liquid foreign claims of commercial banks, a fall in loan liabilities and a rise in equity liabilities indicate reduced financial sector vulnerabilities to external shocks (Figure 6).

The country's net external deficit has to a large extent been cut due to the repayment of maturing bonds and, to a lesser extent, to the fall in foreign loans caused by the policy of favouring domestic market funding (Figure 7).

Currency exposure of the government sector has also been reduced on the basis of both net foreign liabilities and liabilities to domestic sectors, as most of these long-term liabilities are linked to exchange rate movements (Figure 8).

The net currency position of the household sector has been deteriorating for several years due to rising long-term liabilities to banks that are mostly linked to exchange rate movements. It should be noted that a slight change indicating a possible reversal of this trend was recorded in 2007 (Figures 9, 10 and 11).

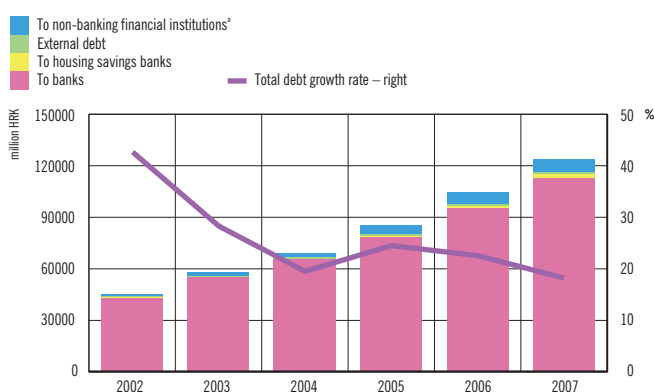
# Household Sector

Figure 14 Unemployment, Employment and Wages



Source: CBS.

Figure 15 Household Debt



\*Data on household debt to leasing companies, insurance companies and savings and loan associations are based on estimates. Sources: CNB and HANFA.

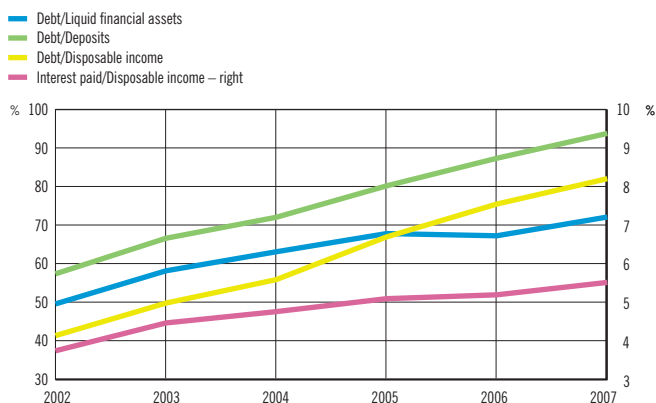
The growth of household debt will continue to decelerate in 2008, mostly due to limitations placed on bank lending. However, as disposable income growth will also slow down, household net debt and its debt service burden will continue to increase at only a slightly slower pace than in 2007. Currency exposure of households has been slightly reduced but remains rather high, whereas their exposure to interest rate risk has been growing and may become especially important in the global environment of rising interest rates.

A prolonged period of economic expansion has significantly reduced the unemployment rate and increased employment. In addition to a steady rise in wages and other sources of household income, this has considerably improved household creditworthiness in a low inflation environment (Figure 14). Rising household demand for loans, spurred by the increasingly more favourable loan conditions of domestic banks, has increased household debt in recent years (Figure 15). This increase exceeded the rise in estimated disposable income by a large margin, leading to a deterioration of household debt indicators (Figure 16).

The growth of household debt slackened in 2007, particularly during the second half of the year, under the influence of CNB regulatory measures tightening limitations on bank lending.

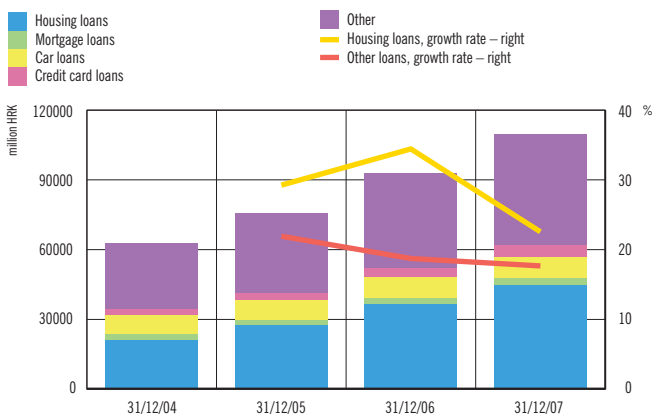
Housing loans increased at a slower pace in 2007 than in the year before, while the growth rate of other loans did not fall much (Figure 17). In conditions of further regulatory tightening, banks turned to more expensive, albeit riskier, types of loans to sustain their profitability.

Figure 16 Household Debt and Debt Burden



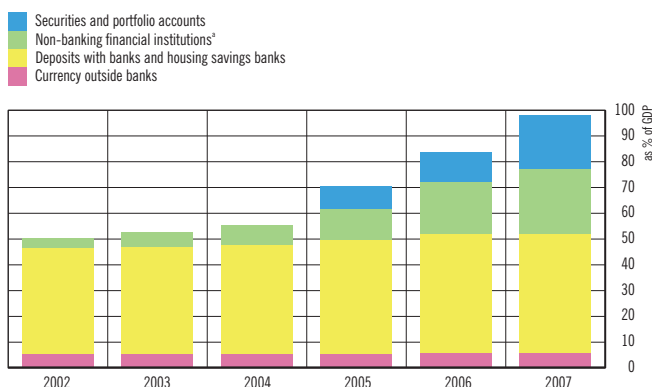
Sources: CNB, HANFA and CDA.

Figure 17 Household Loans by Purpose



Source: CNB.

Figure 18 Household Financial Assets



<sup>1</sup> Data on household claims against open-end and closed-end investments funds are based on estimates.

Sources: CNB, HANFA and CDA.

Ratios of total household debt to estimated disposable income and to savings in banks and housing savings banks are the household debt indicators that deteriorated the most. The stock of household debt nearly reached household deposits and grew to over 80% of estimated disposable income. However, owing to the parallel lengthening of loan maturities, the debt service burden, measured as the ratio of outstanding short-term debt by remaining maturity to estimated disposable income, recorded no major changes.

In assessing the financial position of the household sector, one should note an upward trend in household financial asset growth (Figure 18). In addition to a rise in savings, household financial assets increased due to the rise in share prices during recent years.

Notwithstanding rapid debt growth, this mitigated the worsening of the ratio of household debt to total liquid financial assets. Still, the downturn in share prices in late 2007 and early 2008 decreased the value of total liquid financial assets of households, implying that this debt indicator may also be expected to increase rapidly in 2008.

Deposits with banks and housing savings banks still account for a major share in household financial assets.<sup>1</sup> At end-2007, they accounted for half of total household financial assets, although their share has been falling in recent years. The fastest growing item of household financial assets consists of direct investments in securities (particularly shares), spurred by share price increases and public offerings of shares from the government portfolio in which Croatian citizens can exercise the right of pre-emption at privileged prices.

The share of household financial assets held with other financial institutions (pension funds, investment funds and insurance companies) in total financial assets slightly declined in 2007. As the capital market slump of late 2007 continued into early 2008, households are expected to be less inclined to invest in the capital market in the forthcoming period and to invest more in safer deposits with banks.

The ratio of household interest burden to estimated disposable income has in recent years grown at a slightly slower pace than other debt indicators due to a gradual fall in bank lending rates. However, a reversal of the interest rate trend in the second half of 2007 provided additional momentum to the rise in interest burden, which could continue into 2008.

Slower household debt growth, which continued into 2008, will not be fully reflected in a slower increase in household debt burden due to the projected slowdown in economic activity and the related slower growth in disposable income. Mounting inflationary pressures will also decelerate real income growth and consequently reduce households' debt-servicing capacity.

The debt repayment burden is also exposed to exchange rate risk (kuna depreciation) due to a substantial share of foreign

<sup>1</sup> Household financial assets exclude foreign cash and deposits with foreign banks since their level cannot be precisely estimated.



Figure 19 Currency Breakdown of Household Loans

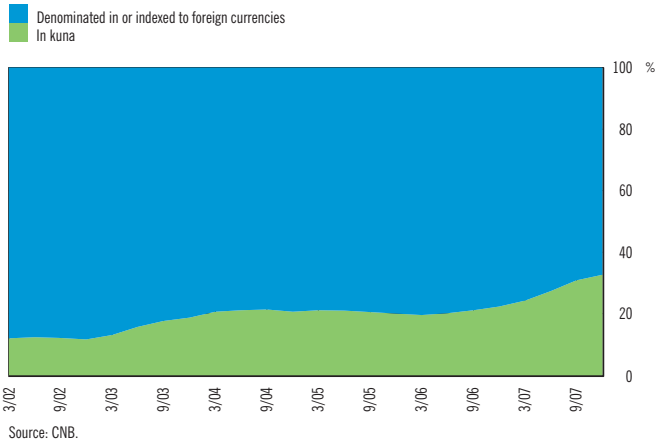


Figure 20 Comparison of Interest Rates on Housing Loans in Croatia and the Eurozone

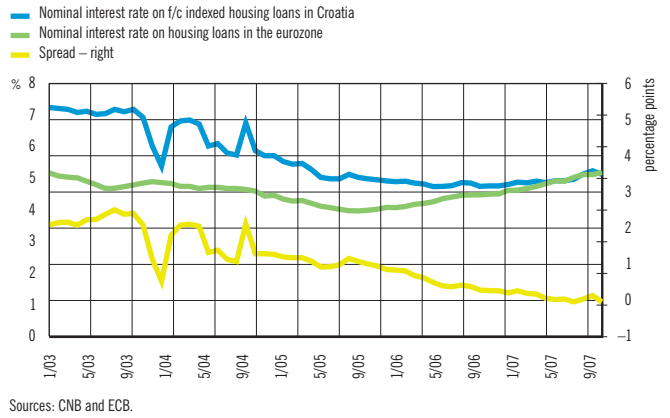


Figure 21 Breakdown of Household Loans by Remaining Maturity

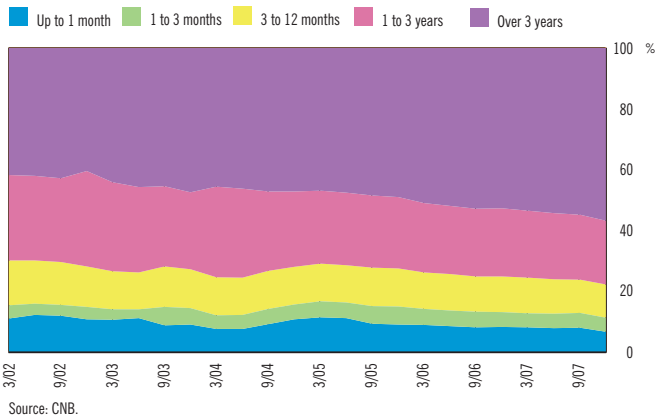
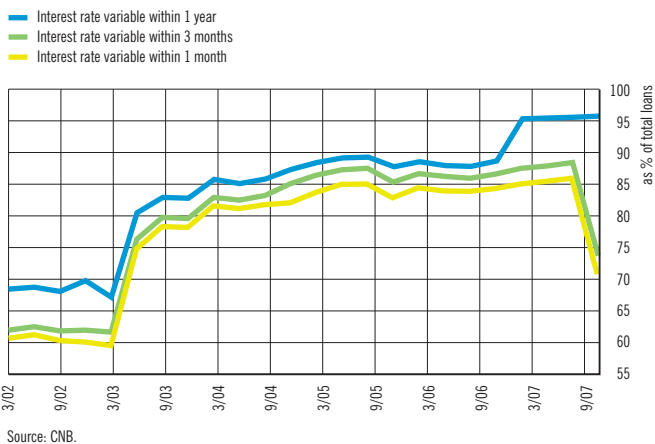


Figure 22 Loans by Interest Rate Variability



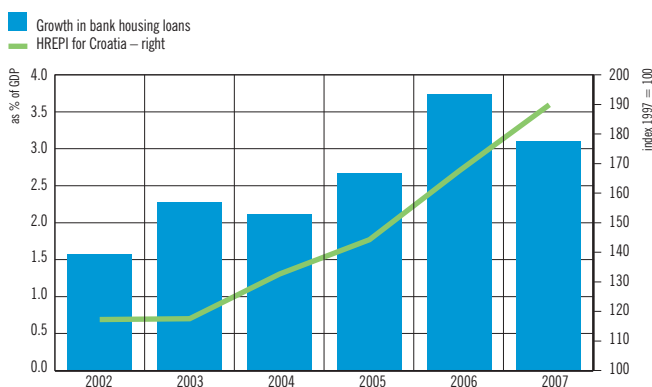
currency denominated loans in total household loans (Figure 19). The share of loans denominated in or indexed to foreign currencies in total household loans decreased in 2007, but is still relatively high. These loans accounted for some two-thirds of total household loans at end-2007. The decline in their share was influenced by the increase in the risk-weights applicable to assets exposed to indirect exchange rate risk in 2006, which particularly relates to households who mostly have no sources of foreign currency income. Also, a large number of banks raised capital in 2007, which supplied kuna funds available for lending. Against this background, banks increased the availability of kuna loans, offering them at relatively low interest rates.

The weighted interest rate on newly-granted housing loans with a currency clause has moved around the relatively low level of 5% since 2006, although it has shown a slight upward trend since mid-2007 (Figure 20). At the same time, the benchmark interest rate in the eurozone hit its lowest level at end-2005 and has been on a steady rising trend ever since, following EURIBOR movements. The rate on housing loans in the eurozone was equal to the comparable domestic interest rate in the second half of 2007, which implies that domestic banks underestimate the credit risk associated with foreign currency-indexed housing loans. This risk could materialise if there were a sudden exchange rate depreciation, since the bulk of household income is in kuna.

A significant, and rising, share of long-term household loans (Figure 21) is contracted at variable interest rates, which exposes households to yet another risk (Figure 22). The upward tendency of global interest rates prompted the banks to shorten the period in which interest rates are fixed, thus transferring the risk to their borrowers. In late 2007, banks reduced the share of household loans the interest rates of which may vary within a month and three months, and increased the share of household loans with interest rates variable within a year, to a record high of 95.6% at end-2007. Still, this policy exposes banks to potential credit risk if the rising household debt burden leads to loan delinquencies (interest rate-induced credit risk).

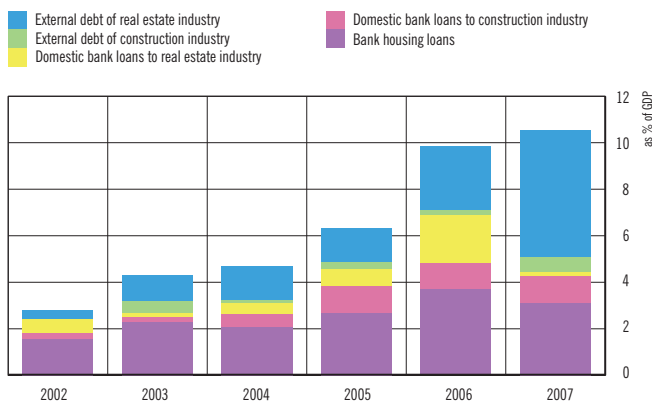
# Real Estate Sector

Figure 23 Housing Loans and HREPI<sup>a</sup>



<sup>a</sup> The hedonic real estate price index takes into account qualitative characteristics of the real estate.  
Source: CNB calculations.

Figure 24 Growth in Domestic and Foreign Loans to the Real Estate Sector



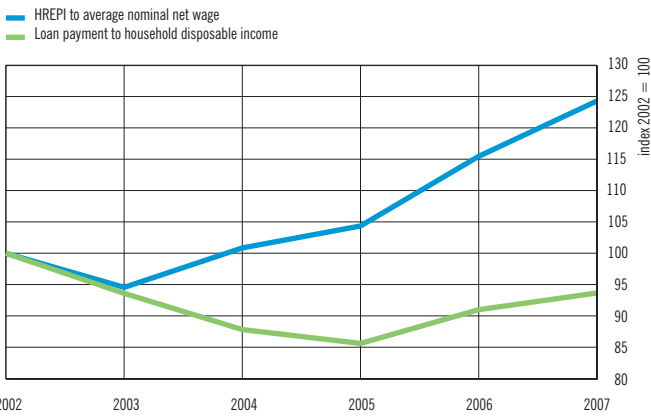
Source: CNB calculations.

The strong growth in real estate prices spurred by abundant lending slackened considerably in the second half of 2007. Although there are currently no immediate threats to financial stability stemming from the real estate sector, a high concentration of loans and exchange rate risk exposure, coupled with relatively lax lending standards could cause difficulties in loan repayment in case of severe macroeconomic disturbances.

The strong growth in the residential real estate market, which lasted for several years, slowed down considerably in the second half of 2007 (Figure 23). Real estate demand was pushed up by rapid growth of lending to this sector supported by the relaxation of credit conditions (Figure 24). Bank interest rates on housing loans decreased considerably in the last few years and other financing terms also relaxed, including the extension of maturity periods. Robust demand for residential real estate was also boosted by the increase in employment and household disposable income. In a setting of relatively restricted supply, this led to an upsurge in residential real estate prices.

Rapid growth in the prices of residential real estate reduced its financial availability. In previous years, this growth outstripped that of the average nominal net wage, gaining additional momentum from 2005. In this period, the financial availability of real estate in Croatia, measured as a change in the ratio of average prices to wages, was reduced by a fifth. Still, lower interest rates and longer maturities tempered the increase in the average housing loan payment and increased the availability of residential property until 2006 when rates on housing loans stabilised. Since then, the financial availability of real estate, measured as the ratio of the average loan payment to average household disposable income, has deteriorated (Figure 25).

Figure 25 Financial Availability of Housing Loans



Sources: CBS and CNB calculations.

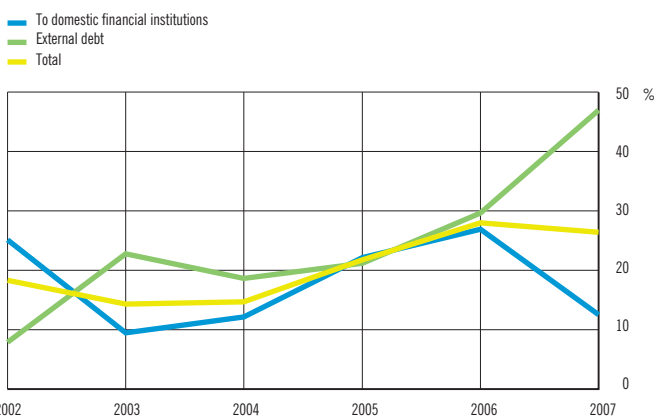
The rise in real estate sector loans, which was rapid in the previous years, slowed down in the second half of 2007, from 41% at the end of the first half of 2007 to 36% at the end of the year. This was mostly due to a much slower increase in domestic bank loans, whose annual growth rate went down from 36% at the end of the first half of 2007 to 21% at end-2007, with housing loan growth slowing down from 28.7% to 16.6%. This decline in domestic borrowing was to a large extent substituted by foreign loans, mostly to public enterprises, which grew by nearly 75% in 2007.

The annual growth rate of the hedonic real estate price index (HREPI) almost halved in the second half of 2007 when a slowdown in domestic loans (particularly housing loans) began. In addition to the stated reduction in the financial availability of residential property, this led to slower HREPI growth. Its year-on-year rate of change fell from 17.7% at the end of the first half of 2007 to 9.1% at end-2007, its lowest level since end-2005. Similar trends in domestic loans and real estate prices are expected to continue in 2008.

Risks to financial stability associated with the real estate sector arise from the fact that bank balance sheets comprise a high proportion of foreign currency-indexed loans to this sector, whereas borrowers' income is mostly denominated in kuna. In the event of major exchange rate adjustments triggered by an external shock, this would create serious loan repayment problems and bank losses. Although most of these loans are secured by mortgages on real estate, if there were a major macroeconomic shock, real estate market demand could take a plunge, followed by a fall in both prices and collateral value. This risk is even greater because banks mostly grant loans with a relatively high loan-to-value ratio (LTV).

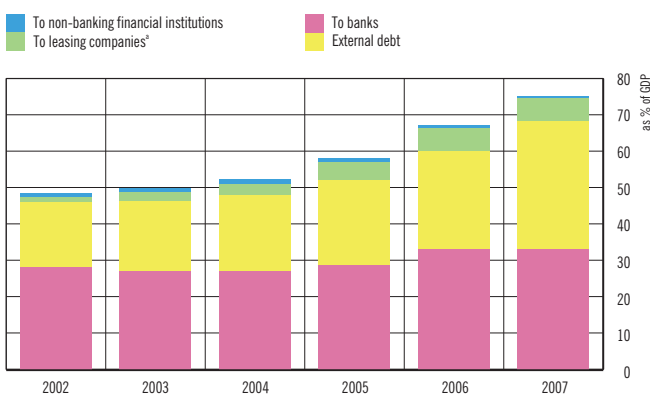
# Non-Financial Corporate Sector

Figure 26 Growth Rate of Non-Financial Corporate Debt



Sources: CNB and HANFA.

Figure 27 Non-Financial Corporate Debt



² Data on debt to leasing companies are based on estimates.

Sources: CNB and HANFA.

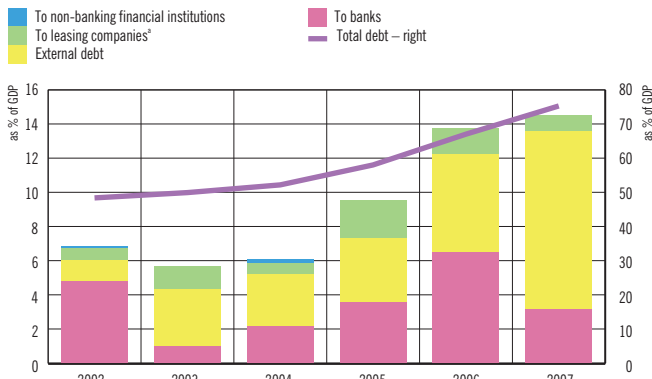
The increase in corporate sector debt has slowed down, with direct corporate borrowing abroad growing faster than domestic borrowing. Strong reliance on foreign funding sources makes the corporate sector particularly vulnerable to changes in foreign investors' sentiments. The main risks to this sector still arise from the fact that foreign currency-indexed domestic loans and foreign loans are concentrated within the non-tradable sector, which does not generate foreign currency income.

The growth rate of the non-financial corporate sector debt was somewhat slower in 2007 than in 2006 but still higher than the average rate for the last five years: total debt went up 24%, while its ratio to GDP increased by 8 percentage points. At the same time, financing conditions deteriorated.

Slower debt growth was the outcome of slower growth in bank credit, with the external sector becoming the main funding source in 2007. The first debt deceleration recorded in the last five years was due to a considerably slower increase in bank financing (11%), while corporate external debt grew by as much as 42% in 2007 (Figures 26 and 27). Such trends were mainly the result of limits on bank lending imposed by the central bank.<sup>2</sup> To a large extent, corporates replaced domestic sources by foreign sources, with foreign borrowing accounting for over 70% of their total debt growth in 2007 (Figure 28).

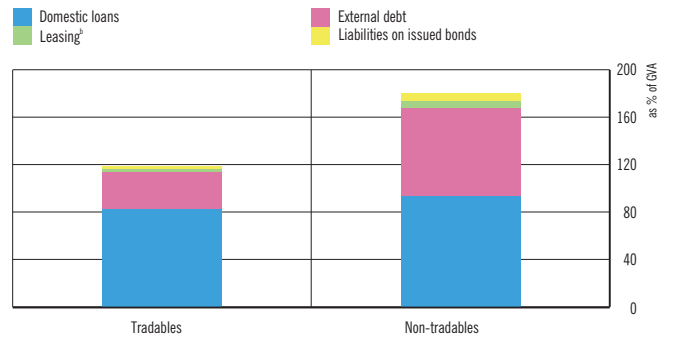
<sup>2</sup> In late 2006, the central bank adopted the Decision on the purchase of compulsory CNB bills to slow down annual growth in bank placements. Under this Decision, banks whose annual placement growth exceeded 12% in 2007 were required to purchase low-yielding CNB bills maturing in one year. The Decision was modified several times over the year to achieve the planned placement growth at the annual level.

Figure 28 Change and Non-Financial Corporate Debt Stock



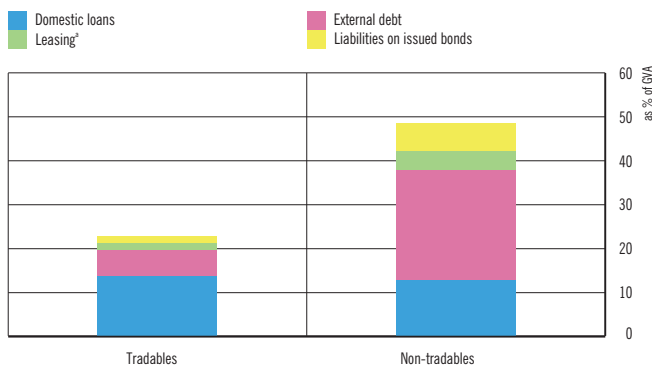
<sup>a</sup>Data on debt to leasing companies are based on estimates.  
Sources: CNB and HANFA.

Figure 29 Non-Financial Corporate Debt<sup>a</sup> by Sector and Creditor in 2006



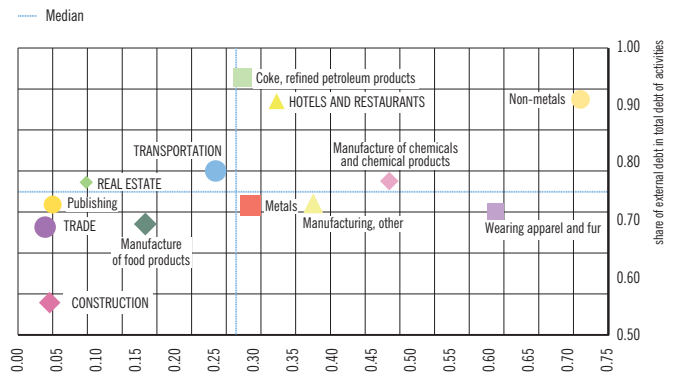
<sup>a</sup> The tradable sector includes manufacturing, and hotels and restaurants.  
<sup>b</sup> Data on debt to leasing companies are based on estimates.  
Sources: Fina and CNB calculations.

Figure 30 Non-Financial Corporate Debt by Sector and Creditor, change in 2002-2006



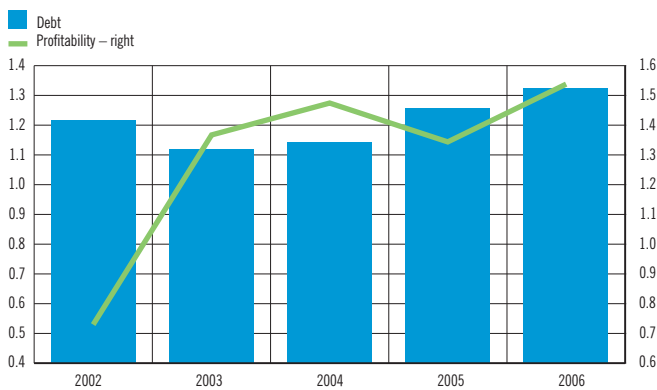
<sup>a</sup> Data on debt to leasing companies are based on estimates.  
Sources: Fina and CNB calculations.

Figure 31 Currency Exposure in 2002-2007



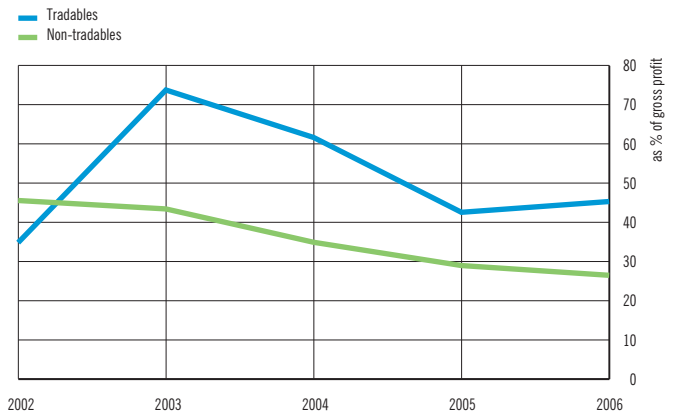
share of export revenues in total revenues generated by individual activities  
Sources: CNB (loans by activity) and Fina (export and total revenues).

Figure 32 Profitability to Debt Ratio in Tradable and Non-Tradable Sectors



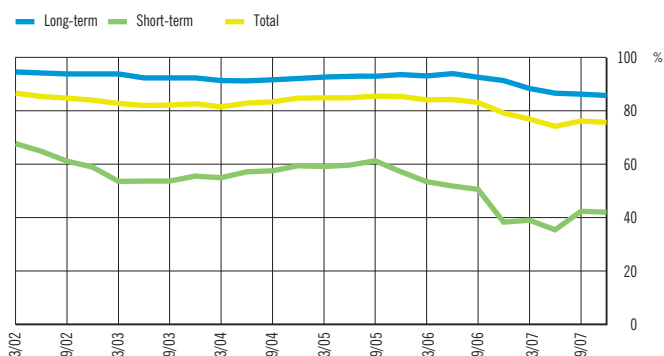
Sources: Fina and CNB calculations.

Figure 33 Interest Burden



Sources: Fina and CNB calculations.

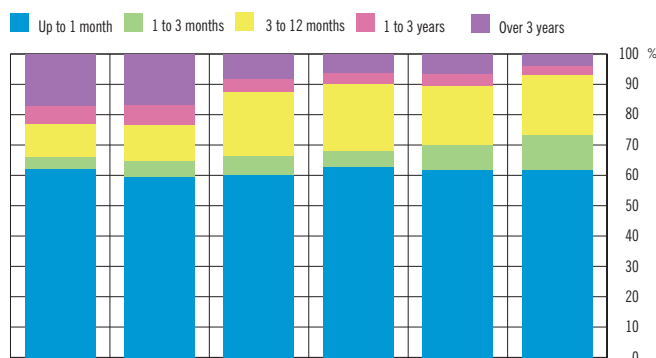
Figure 34 Share of Bank Non-Kuna Loans and Non-Financial Corporate External Debt\* in Total Loans



\*It is assumed that total external debt is denominated in foreign currencies.

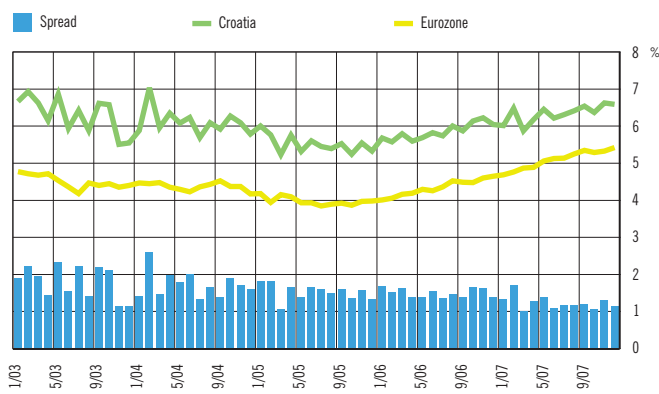
Source: CNB.

Figure 35 Breakdown of Bank Loans to Non-Financial Corporations by Interest Rate Variability



Source: CNB.

Figure 36 Interest Rates on Long-Term Loans to Non-Financial Corporations in Croatia and the Eurozone



Sources: CNB and ECB.

As the CNB has continued its policy of curtailing bank lending in 2008, it may be assumed that foreign sources will continue to play a dominant role in total corporate financing. The increase in foreign borrowing is expected to slow down once the effect of its huge leap in mid-2007 wears off. The leap was due to a one-off transfer of the debt owed to domestic banks to foreign parent banks, thus making room for additional domestic lending. Heavy reliance on foreign borrowing growth exposes corporates to a refinancing risk that could materialise if there were changes in foreign investors' risk perception. This risk is somewhat alleviated by the fact that foreign sources of loans to Croatian corporates are usually the parent banks of domestic banks.

Risks associated with balance-sheet imbalances, which could deteriorate in the event of external shocks, are highly concentrated in the non-tradable sector, which is relatively more indebted and relies more on foreign funding (Figure 29). Should there be any larger exchange rate fluctuations, corporates would face loan repayment difficulties due to a substantial share of foreign funding sources and liabilities with a currency clause to domestic financial institutions. This particularly refers to corporates from the non-tradable sector mostly lacking considerable foreign currency income as it is they that have generated the bulk of external debt of the non-financial corporate sector in recent years. Within the non-tradable sector, the largest debt increase was recorded by corporates dealing in construction and real estate activities. A strong real estate market provided for above-average profitability growth in these activities. Indebtedness of the tradable sector grew only half as fast as indebtedness of the non-tradable sector during 2002-2006 (Figure 30).

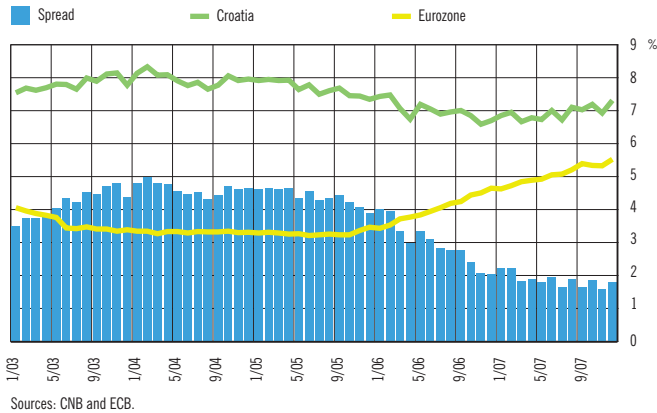
The non-tradable sector has been increasingly more profitable than the tradable sector. For this reason corporates in that sector have realised a higher return on equity compared with those in the tradable-sector, while the difference in profitability between these two sectors has been growing since 2003 spurred by strong growth in infrastructure and real estate investments (Figure 32).

Interest burden has markedly reduced in the last three years. Corporates in the non-tradable sector recorded a solid business performance that enabled them nearly to halve their interest burden in the 2002-2006 period, despite continuous debt growth.

The tradable sector has also reduced its interest burden owing to a steady several-year downward trend in interest rates (Figure 33). Nevertheless, rising interest rates in the European market and their effect – rising domestic interest rates, could add to the interest burden. Furthermore, the 2007 investment slowdown and the economic slowdown expected in 2008 could reduce business performance of the non-tradable sector in relative terms.

At end-2007, slightly over 75% of the debt of non-financial corporations was denominated in foreign currencies, which means that they were exposed to considerable currency risk (Figure 34). Along with a high level of euroisation, owing to

Figure 37 Interest Rates on Short-Term Loans to Non-Financial Corporations in Croatia and the Eurozone



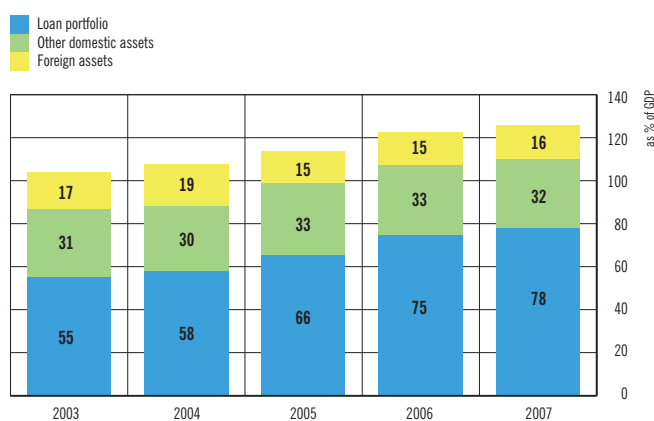
which more than 50% of domestic loans are foreign-currency denominated, the rising share of total foreign currency liabilities is also attributable to strong growth in corporate foreign borrowing. The traditionally high share of such loans (80-90%) has slightly fallen since September 2006 when banks, in response to central bank measures related to foreign currency liquidity and risky foreign currency placements, began to restructure their balance sheets by increasing their kuna sources and placements. However, such restructuring has limited effects as a major portion of bank funding sources (deposits and loans) is still linked to foreign currencies.

In addition to currency risk, Croatian corporates are sensitive to interest rate changes as over 70% of bank loans have been granted with interest rates variable within three months (Figure 35). If this is added to foreign loans, which are mostly issued at variable rates, corporate exposure to interest rate risk is even higher. Notwithstanding the rising spread on Croatian eurobonds, data available for end-2007 do not indicate a deterioration in foreign financing terms for Croatian corporates that would exceed the deterioration caused by the increase in benchmark interest rates. However, in case of major changes in regional risk perception, both domestic and foreign financing terms for corporates could significantly worsen.

Bank interest rates on corporate loans were on average 1-1.5 percentage points higher in Croatia than in the eurozone. Since early 2006, interest rates on long-term corporate loans have grown in line with those in the eurozone (Figure 36) so that the interest rate spread remained stable. On the other hand, interest rates on short-term loans continued to converge to those in the eurozone until as late as mid-2007 when they started to follow the upward trend of short-term interest rates in the eurozone (Figure 37).

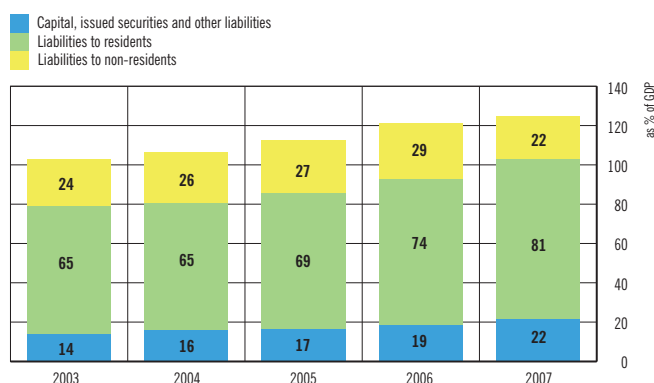
# Banking Sector

Figure 38 Banking Sector Assets



Source: CNB.

Figure 39 Banking Sector Liabilities<sup>a</sup>



<sup>a</sup> Collectively assessed impairment provisions represent the difference between banking sector assets and banking sector liabilities and capital.

Source: CNB.

Under the impact of limitations placed on lending, increases in marginal reserve requirements on foreign liabilities and higher weights on currency-induced credit risk, banks have started to replace foreign borrowing by raising new capital and attracting more domestic kuna deposits. In addition to capital strengthening and liabilities restructuring, banks have kept profitability at high levels, which makes the banking sector resilient to shocks. Notwithstanding widely-spread euroisation, banks are not exposed to direct currency risk as they match the currency structure of their assets and liabilities. However, due to mismatches in the balance sheets of their clients, which are mostly exposed to currency risk, effects of exchange rate changes on banks come in the form of credit risk. Simulations based on a macroeconomic credit risk model suggest that the banking sector as a whole is capable of absorbing the effects of a relatively large macroeconomic shock.

## Balance-Sheet Vulnerabilities

Loans account for a major portion of banking sector assets. As lending decelerated in 2007 in response to CNB measures, the rise in the ratio of this sector's assets to GDP also slowed down. The large share of credit portfolios in total banking sector assets

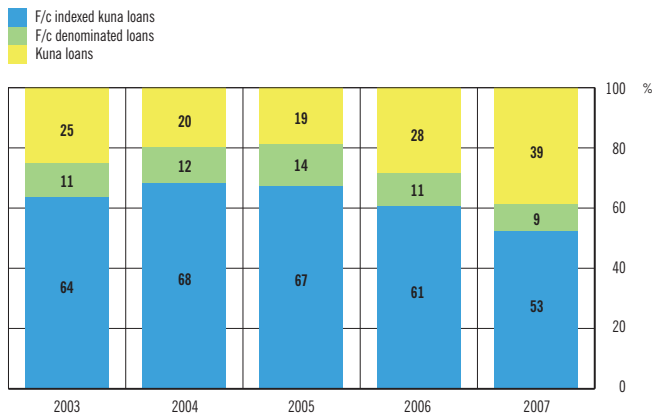


Figure 40 Annual Growth Rate of Major Banking Sector Balance Sheet Items



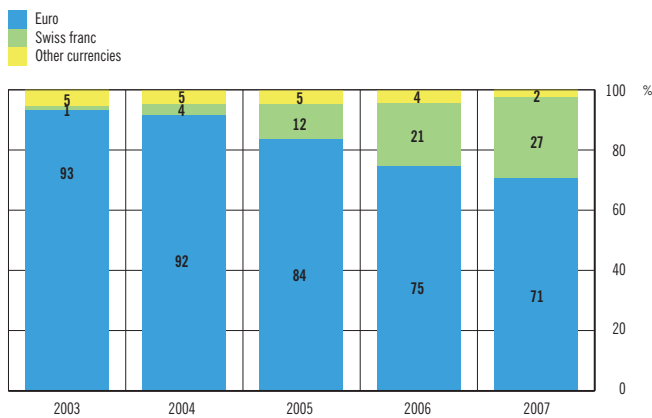
Source: CNB.

Figure 41 Currency Breakdown of Loans



Source: CNB.

Figure 42 Currency Breakdown of Non-Kuna Loans



Source: CNB.

indicates the importance of credit risk for this sector’s stability (Figure 38).

Other domestic assets of banks are mostly made up of deposits with the central bank. Securities held by banks mostly relate to government debt securities. This means that banks are less exposed to changes in the value of securities and are not directly exposed to equity market price risk.

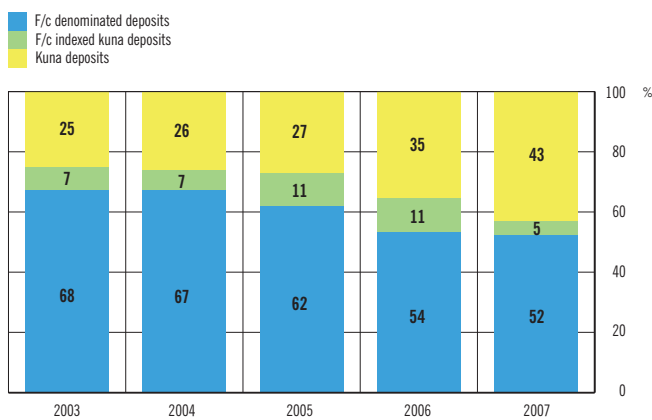
Within bank liabilities, the share of resident deposits, which are the main source of bank funds, grew strongly in 2007, while the share of foreign funding decreased. This restructuring of secondary sources was due to the impact of CNB measures aimed at reducing foreign borrowing by raising its costs arising from marginal reserve requirements on foreign liabilities (Figure 39).

In efforts to curtail regulatory costs and secure funds to finance lending, many banks have raised capital in order to reduce reliance on loans and deposits from non-residents. Against the backdrop of limited credit growth, this led to a rise in banks’ foreign assets and a decrease in their net foreign liabilities, this trend being expected to continue into 2008 (Figure 40).

The 2008 rise in the share of resident deposits in banking sector liabilities was further strengthened by unfavourable capital market developments early in the year, which added to the attractiveness of bank deposits with safer returns.

In 2007, banks embarked on currency restructuring of a large portion of their credit portfolios, mainly in response to regulatory measures aimed at strengthening their resilience to currency-induced credit risk. In particular, banks acquired fresh kuna sources by raising new capital and attracting more kuna deposits, which enabled them to offer more favourable terms for kuna loans non-indexed to foreign currency. These loans have much lower risk-weights and hence require lower capital

Figure 43 Currency Breakdown of Deposits



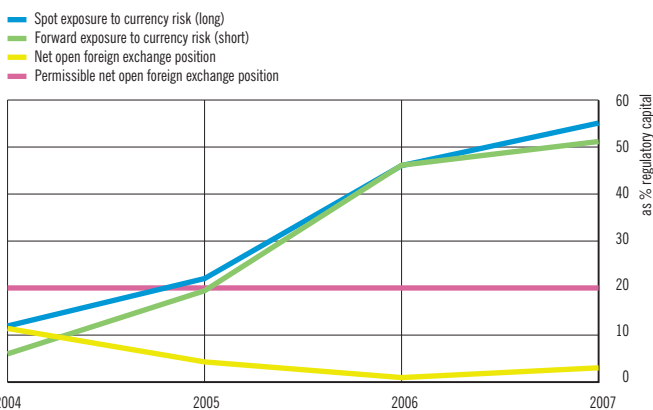
Source: CNB.

coverage than foreign currency-indexed loans (Figure 41). The outcome of restructuring is that the share of kuna loans went up to 39% and is expected to continue rising in 2008.

Loans in euros still account for a major share of non-kuna loans, although the share of loans indexed to the Swiss franc has been strongly growing since 2005. The latter loans are often interesting to clients due to their lower nominal interest rates but are also riskier since the kuna/euro exchange rate is much more stable than the kuna/Swiss franc exchange rate (Figure 42).

Strong 2007 growth in the share of kuna deposits was also affected by changes in regulations concerning banks' foreign currency liquidity, which broadened the coverage of foreign currency liabilities. In addition, banks replaced foreign currency-indexed kuna liabilities to non-residents by pure kuna liabilities (Figure 43).

Figure 44 Bank Exposure to Currency Risk

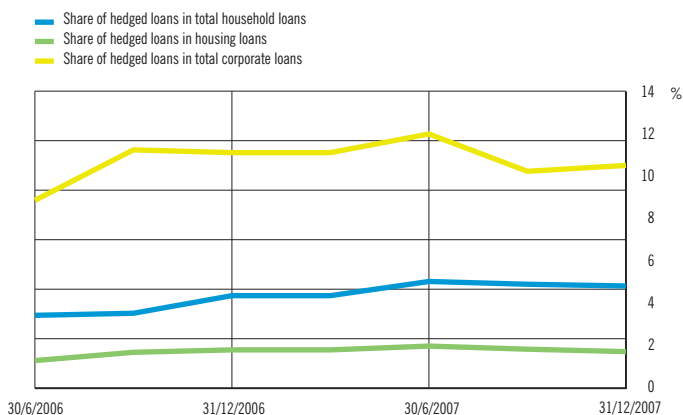


Source: CNB.

Owing to a large share of non-kuna claims, banks traditionally have a long spot position in foreign currencies. This position exceeded 50% of banks' regulatory capital at end-2007. To attain a net open foreign currency position within the prescribed limit of 20% of regulatory capital, banks enter into forward agreements with non-residents so as to take short positions in currencies for which they record long spot positions. Hence, their net currency exposure has been low, at below 5% in the last three years (Figure 44).

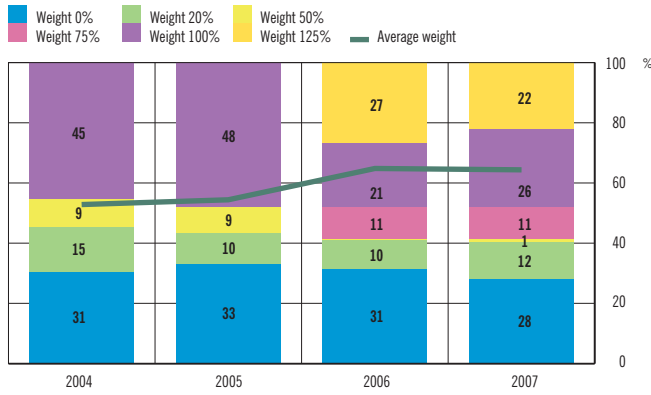
However, banks are exposed to considerable currency-induced credit risk as most of their clients have no foreign-currency cash flow matching their foreign-currency liabilities. Tightening of prudential regulations, as of June 2006, requires banks to monitor and assess their clients' exposure to currency risk on the basis of their foreign-currency cash flows and liabilities. Data available since then indicate that the share of household loans hedged against currency-induced credit risk is usually

Figure 45 Share of Loans Hedged against CICR



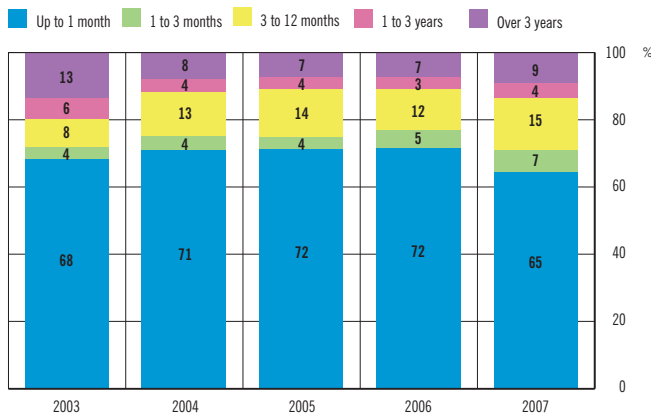
Source: CNB.

Figure 46 Distribution of Bank Assets by Assigned Weight and the Average Weight



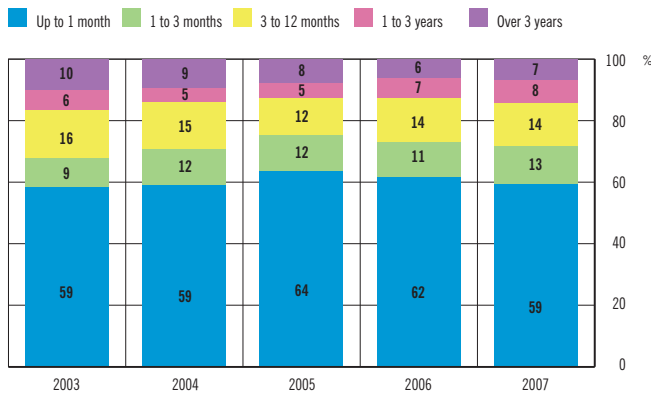
Source: CNB.

Figure 47 Loans by Interest Rate Variability



Source: CNB.

Figure 48 Received Deposits and Loans by Interest Rate Variability



Source: CNB.

some 5% (some 2% of housing loans are hedged), which is particularly important bearing in mind that household loans account for about half of total bank loans. On account of exports, the corporate sector is somewhat more protected than the household sector, but only some 10% of loans to this sector are hedged (Figure 45).

Since the materialisation of currency-induced credit risk could have a strong adverse impact on banking sector stability and since, under growing competition for market shares, banks do not include the premium for this risk in the loan price, the CNB stimulated higher levels of capitalisation by increasing risk weights applicable to bank assets on two occasions and thereby enhanced banking sector resilience to that risk. Risk weights applicable to placements to borrowers unhedged against currency risk were increased in June 2006 (to 75% and 125%) and by additional 25 percentage points in March 2008. These changes increased the average weight per asset unit by some 10 percentage points<sup>3</sup> in each case (Figure 46).

Received loans and deposits with interest rates variable within a year accounted for 86% of total received loans and deposits at end-2007, whereas gross loans with interest rates variable within a year accounted for 87% of total gross loans. This means that banks are not directly exposed to significant interest rate risk (Figures 47 and 48). However, if they transfer interest rate risk to their borrowers, banks will expose themselves to interest rate-induced credit risk.

## Strategic Risks

In line with their asset structure, a major source of banks' income is interest income on loans the share of which in average assets further increased in 2007. An important income source is also income from fees and commissions the share of which in

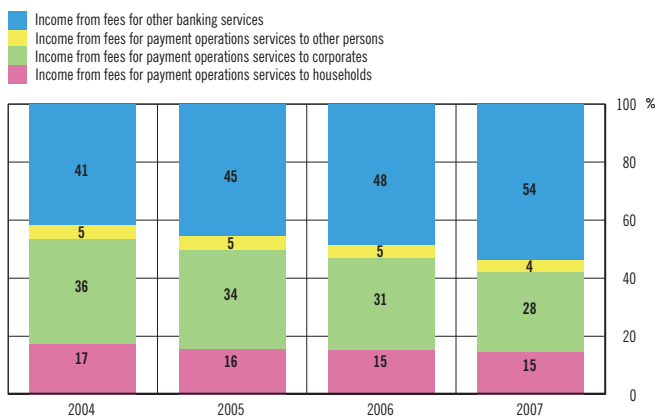
<sup>3</sup> Placements whose weighting according to a degree of risk has changed since June 2006 are shown in the chapter on banking sector resilience.

Figure 49 Structure of Total Income



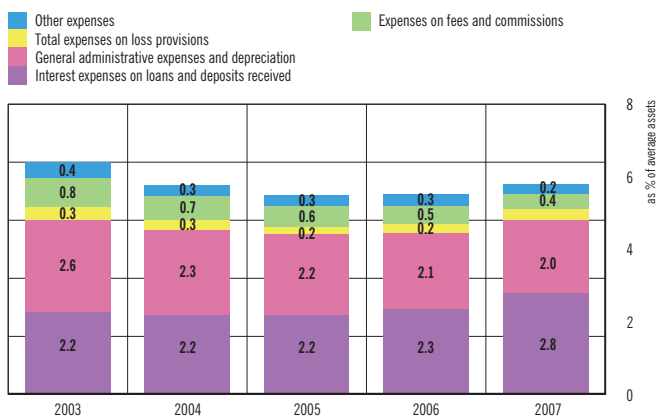
Source: CNB.

Figure 50 Structure of Income from Fees and Commissions



Source: CNB.

Figure 51 Structure of Total Expenses



Source: CNB.

average assets has been stable over the last three years (Figure 49). Income earned from debt securities and trading activities has also shown a mild upward trend.

Income from fees and commissions comprises income from fees for payment operations services (mostly from corporates) and income from fees for other banking services (e.g. account management and fees for banking packages), whose growth trend reflects the banks' strategy in conditions of interest rate convergence and limitations on lending (Figure 50).

Interest expenses on loans and deposits received, which account for the largest share in total bank expenses, strongly grew in 2007 due to the interest rate increase in the eurozone and central bank measures (Figure 51).

Expenses on loss provisions account for a relatively minor share in total expenses, which is characteristic during the upward phase in the credit and economic cycle when banks have a relatively low risk perception. This favourably affects business performance and stimulates bank lending. The procyclical nature of loss provision expenses leads to overestimation of capital and weakens the banks' capacity to absorb losses that may occur during the downward phase in the credit cycle or in case of large macroeconomic shocks.

Net income of the banking sector has recorded positive but volatile growth rates. Its robust growth in 2007 was the outcome of solid growth in net interest income and significantly accelerated growth in net non-interest income (Figure 52).

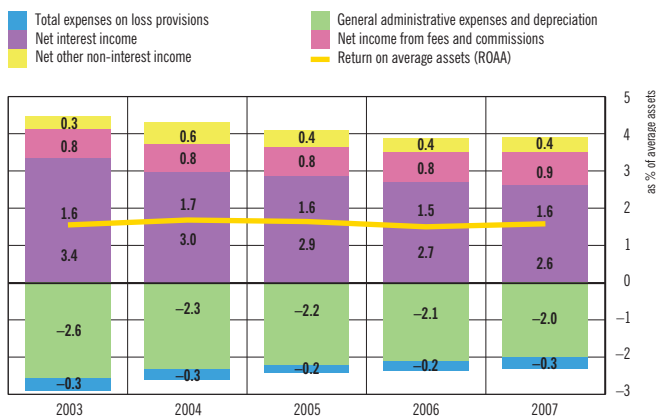
In recent years, a rise in banking sector gross earnings has been accompanied by a rise in average assets. Hence, return on average assets (ROAA) has been stable and is expected to exhibit similar trends in 2008. Return on assets has been mostly boosted by net interest income, which has slightly drifted lower, reflecting the narrowing interest spread (Figure 53).

Figure 52 Growth in Selected Business Performance Categories



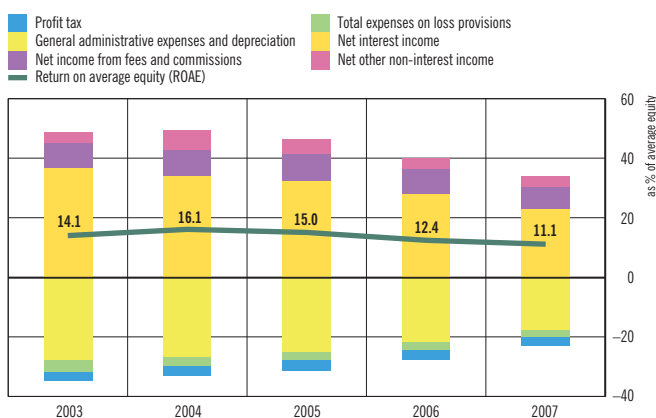
Source: CNB.

Figure 53 Contribution of ROAA Categories



Source: CNB.

Figure 54 Contribution of ROAE Categories



Source: CNB.

Return on average equity (ROAE) has recorded a fall in the last two years due to substantial capital increases, which outpaced the increase in bank earnings (Figure 54). These developments were caused by regulatory measures that aimed at strengthening banking system resilience to systemically important currency-induced credit risk.

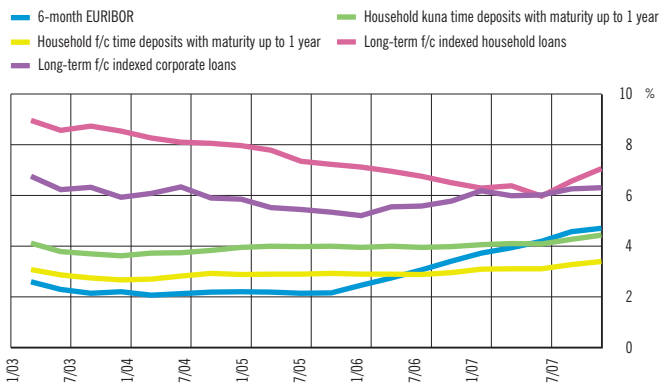
During the period of rapid lending growth many of the banks competed for market shares. This is the reason why lending rates, particularly to the household sector, mostly continued on a downward trend even when benchmark rates on bank foreign borrowing increased. Even a narrower interest spread was sufficient to ensure satisfactory profitability in the period of rapid credit growth. When credit growth slowed down in 2007, banks raised their lending rates. On the other hand, deposit rates mostly drifted up slightly until mid-2007 when their growth gained momentum as banks aggressively restructured their liabilities (Figure 55).

The overall interest rate spread narrowed markedly in 2003-2006 due to a parallel fall in lending rates and a rise in deposit rates. The spread briefly increased in mid-2007 due to the rise in lending rates but fell to 3.9 percentage points by the year-end.<sup>4</sup> The interest margin, measured in terms of annual net interest income, also narrowed in line with the decrease in the interest spread (Figure 56).

As slower credit growth is expected to continue in 2008, the interest margin has already increased due to the rising share of loans with higher interest rates in total new loans. By focusing on non-interest income and cost control, banks rely on the interest margin increase to achieve the targeted profitability level against the background of slower credit growth.

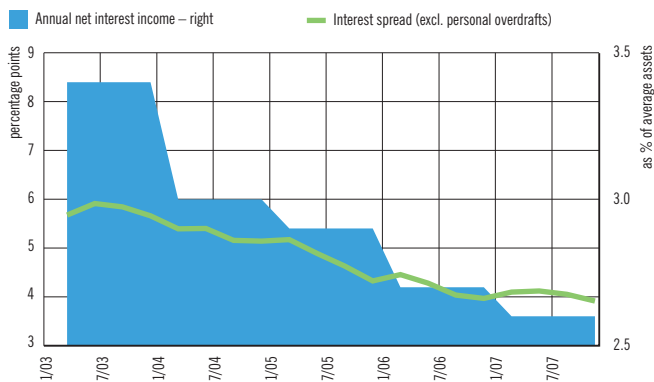
<sup>4</sup> The interest spread is calculated as the difference between the interest rate on total loans and the interest rate on total deposits, with personal overdrafts being excluded from loans. In the interest rate statistics, they are recorded as newly-granted loans in each month, which overestimates their share in total loans. Together with high nominal interest rates, this artificially increases the interest spread by some 2 percentage points.

Figure 55 Selected Interest Rates (quarterly average of monthly interest rates)



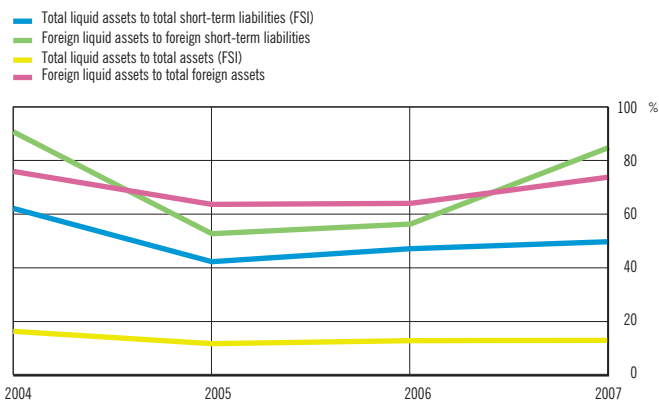
Source: CNB.

Figure 56 Interest Spread (quarterly average of monthly interest rates) and Annual Net Interest Income



Source: CNB.

Figure 57 Liquidity Indicators



Source: CNB.

## Liquidity Risk

Banking sector liquidity, measured as the ratio of total liquid assets to total assets, has been stable over the last three years, standing at 12.7% at end-2007, while the ratio of total liquid assets to total short-term liabilities drifted up slightly, to 49.6% (Figure 57).

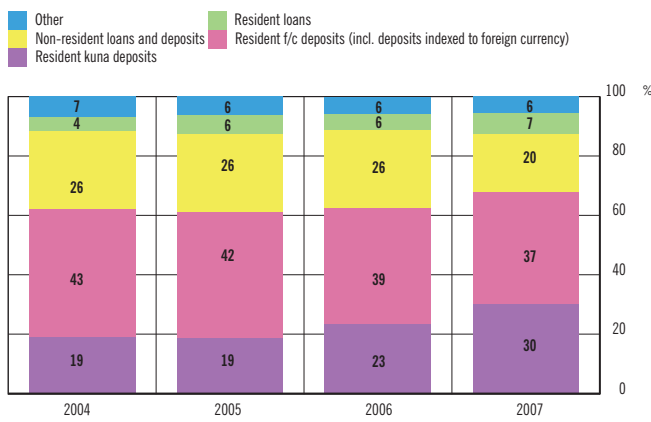
Foreign currency liquidity indicators have remarkably improved. The ratio of foreign liquid assets to foreign short-term liabilities was 84.8% at end-2007, while the ratio of foreign liquid assets to total foreign assets was 73.7%. The last year's increase in these indicators was the result of the replacement of banks' foreign borrowing by capital injections from majority-owners, which was due to limitations on bank lending (Figure 58).

The substitution of foreign borrowing by new equity, which has been triggered by macroprudential measures of the CNB, has enhanced banking sector resilience to foreign currency liquidity risk, which is particularly important in case of disturbances in global financial markets.

Although Croatian banks are not directly exposed to the ongoing international market crisis, they are dependent on funding from foreign parent banks that are themselves exposed to risks arising from the current turmoil. This may affect their funding policy regarding Croatian subsidiaries.

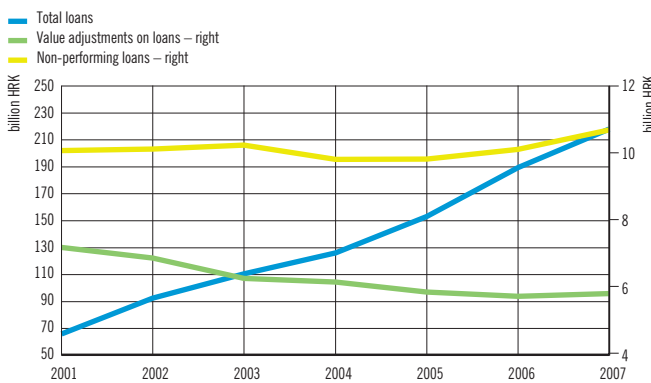
In a highly euroised economy such as Croatia, the issue of foreign currency liquidity of both banks and the entire economy is particularly sensitive. The foreign currency liquidity management of banks is regulated by the Decision on the minimum required amount of foreign currency claims. Banks meet this requirement by using transactions with non-residents, which implies that slower or interrupted capital inflows from abroad would cause difficulties in the maintenance of foreign

Figure 58 Structure of Liabilities



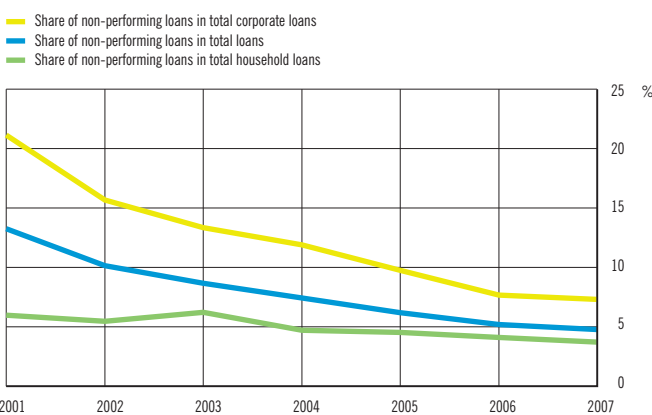
Source: CNB.

Figure 59 Changes in Loans, Non-Performing Loans and Value Adjustments



Source: CNB.

Figure 60 Ratio of Non-Performing Loans to Total Loans



Source: CNB.

currency liquidity of Croatian banks. This means that banks need to assess their resilience to foreign currency liquidity risk and develop contingency plans for crisis management, including the change in their parent banks' strategy.

Considering its major implications for the entire economy, the CNB policy of maintaining adequate international reserves, with international reserves currently running at a satisfactory level (see Box 2), also ensures external liquidity of the economy.

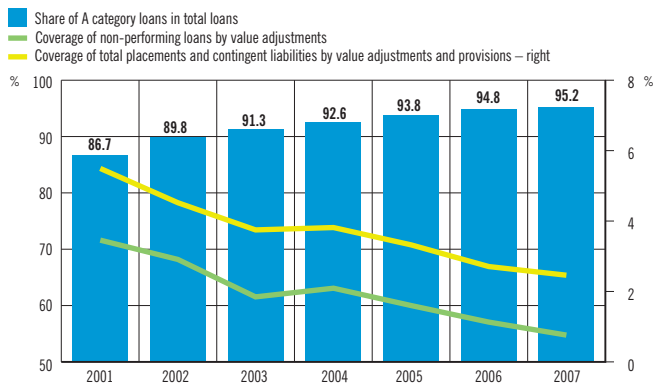
### Credit Risk and Capital Adequacy

In conditions of rapid growth in loans and in the economy, banks assessed their asset quality as excellent. The absolute amount of non-performing loans stagnated and the absolute amount of value adjustments on loans fell accordingly. Still, the 2007 slowdown in credit growth concurred with a noticeable increase in non-performing loans and a moderate increase in value adjustments on such loans. Nevertheless, relative indicators stayed low as total loans increased more rapidly (Figure 59).

Both loans and the total economy are expected to grow slower in 2008. This could further increase the amount of non-performing loans and value adjustments but should not significantly deteriorate relative indicators.

According to bank estimates, the quality of loans to all sectors has improved in the last five to six years, with the largest reduction in the ratio of non-performing loans to total loans being recorded by corporate loans, from 20.6% at end-2001 to 7.3% at end-2007. Household loan quality assessed in terms of this indicator also improved, from 6.0% at end-2001 to 3.7% at end-2007, which suggests that household loans are estimated to be of a relatively better quality mostly on account of high quality collateral instruments (Figure 60).

**Figure 61 Loan Quality and the Coverage of Loans and Placements by Value Adjustments**



Source: CNB.

Coverage of non-performing loans by value adjustments, which has been falling steadily, was 54.7% at end-2007, 16.9 percentage points less than at end-2001. Coverage of total placements and contingent liabilities by total value adjustments, provisions for identified losses and collectively assessed impairment provisions has moved in the same direction; it gradually decreased from 5.1% at end-2001 to 2.3% at end-2007 (Figure 61).

Bank capital is the main source for covering unexpected losses. Injections of new capital into banks, prompted by CNB measures, marked both 2006 and 2007 and substantially improved their capital adequacy indicators. Although the ratio of non-performing loans to capital has been reduced, capital strengthening has increased banks' resilience to unexpected losses that may arise from macroeconomic shocks (Figure 62).

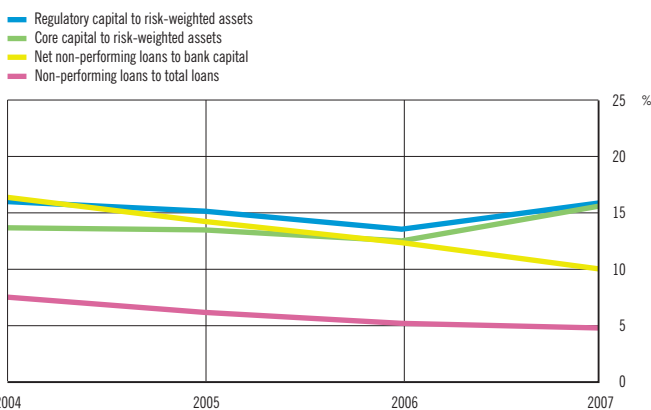
## Banking Sector Resilience

As the Croatian financial system is extremely bank-centred, its stability depends on banking sector resilience to possible shocks and its ability to absorb incurred losses and continue providing financial services to the real sector.

In addition to sensitivity to the emergence of individual risks, our assessment of banking sector resilience examines the effect of the simultaneous emergence of several risks combined together in a consistent macroeconomic scenario. The impact of simulated shocks is quantified on the basis of resulting changes in the banks' capital adequacy ratio.

The sensitivity analysis performed for end-2007 shows that the Croatian banking sector is resilient to direct market risks. Given the relatively small open foreign exchange positions of banks and the predominance of floating interest rates both on the asset and liability side, sensitivity to direct market risks in

**Figure 62 Capital Adequacy Ratios**



Source: CNB.



### Box 4 Impact of the Macroeconomic Environment on Credit Risk

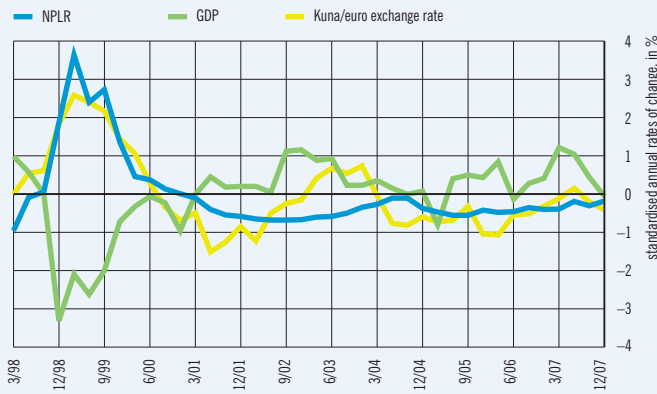
Credit risk, i.e. the risk that a client falls in arrears with loan payments, is a major risk to which Croatian banks are directly exposed. The reasons for a debtor’s default on a loan may be various. The lion’s share of bank loans in Croatia is linked to foreign currencies, granted to clients without foreign currency income and at floating interest rates. Hence, in assessing banking sector stability, in addition to direct credit risk of commercial banks, it is of particular importance to assess induced credit risk.

The analysis performed to assess credit risk is based on the links between loan quality and changes in the macroeconomic environment that are described by the dynamics of macroeconomic variables: GDP, the kuna exchange rate and interest rates.<sup>1</sup> Loan quality is sensitive to changes in corporate and household income, which depend on the

currency depreciation increases the debt burden of borrowers whose income is denominated in the domestic currency (Figure 1).

The assumed link was modelled by applying the linear ordinary least squares regression method to quarterly data for 1997-2007. The coefficients obtained by the regression present the sensitivity of loan quality to a specific macroeconomic variable. The following variables at the quarterly frequency were used: the annual rate of change in the ratio of non-performing loans to total loans (NPLR) as the dependent variable, and the annual rate of change in both GDP and the nominal exchange rate of the kuna against the euro as independent variables. The results obtained mostly confirmed the assumptions – coefficients with GDP and exchange rate are statistically significant and of expected directions. This means that domestic currency depreciation and slower economic growth are positively correlated with the rise in non-performing loans (Figure 2). The interest rate was not proved to be statistically significant as an explanatory variable for loan quality. Specifically, the ten-year

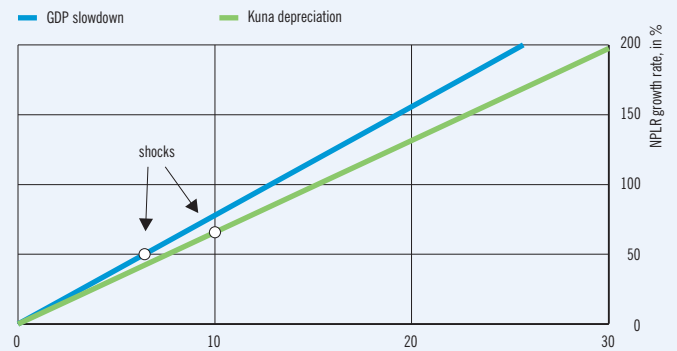
Figure 1 Correlation between NPLR, GDP and the Kuna/Euro Exchange Rate



Source: CNB.

business cycle. An economic slowdown reduces both corporate income and household disposable income, which creates difficulties in loan repayment and therefore lowers the overall quality of bank portfolios. A rise in interest rates may increase debtors’ liabilities on existing loans, which increases the chance of client delinquencies. In situations where a major portion of bank loans is indexed to a foreign currency, domestic

Figure 2 NPLR Sensitivity to GDP Slowdown and Kuna Depreciation

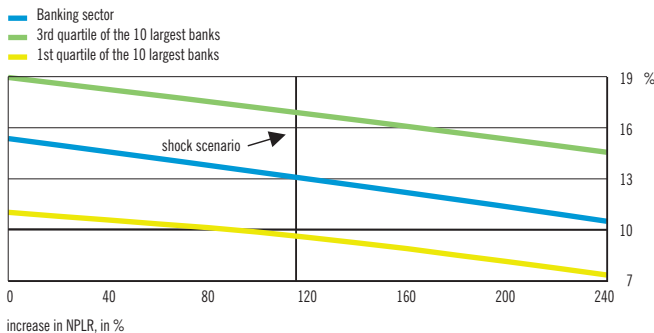


Source: CNB.

period covered by the analysis was characterised by a high initial level of interest rates and their steady downward trend prompted by foreign bank entry. With the convergence of domestic interest rates to those in other European countries, one may expect that their movements will increasingly influence loan quality. Also, some other variables, such as inflation and debt level, did not prove to be statistically significant.

<sup>1</sup> The indicator of overall loan quality is the ratio of non-performing loans to total loans.

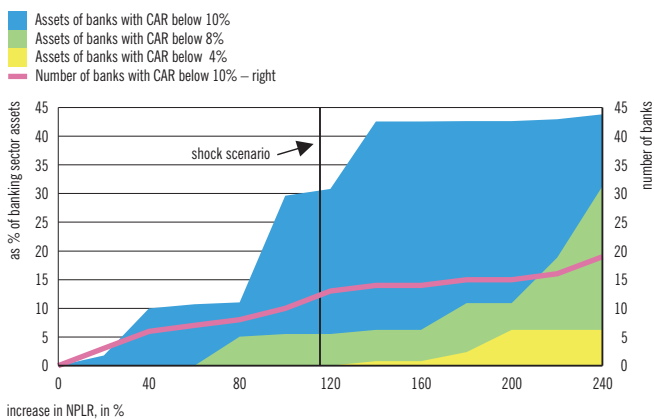
**Figure 63 Capital Adequacy Ratios of Bank Peer Groups Following the Increase in NPLR**



Note: Small banks are those with share in total banking sector assets below 1%, medium sized banks are those with share in total assets between 1% and 5%, and large banks are those with share in total assets above 5%.

Source: CNB.

**Figure 64 Banking Sector Assets Following the Shock Scenario**



Source: CNB.

**Table 1 Change in Bank Capital Adequacy Ratios under the Shock Scenario (the increase of NPLR of 116%)**

	Before shocks	After shocks	Change
CAR at the system level	15.4	13.1	2.3
CAR of the best capitalised bank	45.8	43.6	2.2
CAR of the worst capitalised bank	10.1	4.9	5.2
Number of banks with CAR below 10%	0	13	13

Source: CNB.

the form of exchange- or interest-rate changes has been found negligible, as expected, even in case of large shocks.

Since banks have transferred market risks to their clients, whose debt-servicing capacity strongly depends on the macroeconomic environment, a realistic assessment of the credit risk impact on the banking sector's capital adequacy ratio requires the estimation of a combined effect of macroeconomic shocks on clients. For this purpose, the impact of changes in the macroeconomic environment on credit risk was estimated (see Box 4).

The results of the macroeconomic credit risk model were used to assess the effect of an extreme but plausible macroeconomic scenario on banking sector resilience. In view of high economic vulnerability to external shocks, primarily a possible sudden stop in foreign capital inflows, we simulated the impact of a shock in the form of capital inflows disruption on domestic economic growth and the domestic currency exchange rate. It should be noted that loans play a major role in the modelled mechanism of an external shock's impact on the domestic economy, which is reflected in slower economic growth.

The scenario simulating an external shock is based on a 6.5% lower GDP growth rate compared with the baseline scenario, which implies a 2% real GDP decline and a 10% depreciation of the nominal exchange rate of the kuna against the euro in contrast to its assumed stability in the baseline scenario. All this would increase NPLR by 116% relative to the baseline scenario. The shock scenario is based on actual developments in observed macroeconomic variables in the late 1990s when the economy was experiencing a stop in foreign capital inflows and a minor banking crisis. Consistency of the macroeconomic scenario was additionally checked by the model given in Box 1, which quantifies the relations between external shocks and domestic macroeconomic variables. The analysis suggests that under this scenario the banking sector's capital adequacy

Table 2 Changes in Risk Weights

Prior to changes in June 2006
A 50% risk weight
Loans fully and completely secured by mortgages on residential property that is or will be occupied or let by the borrower
A 100% risk weight
Claims not covered by bank deposits or adequate pledged property
Tangible assets
Investments in securities of other banks included in their regulatory capital
Prepayments and other income where the bank is unable to determine the counterparty
All other balance sheet assets
After changes in June 2006
A 50% risk weight
Kuna loans fully and completely secured by mortgages on residential property that is or will be occupied or let by the borrower
Foreign currency loans and loans with a currency clause fully and completely secured by mortgages on residential property that is or will be occupied or let by the borrower, granted to debtors with a hedged currency position
A 75% risk weight (a 100% risk weight as of March 2008)
Foreign currency loans and loans with a currency clause fully and completely secured by mortgages on residential property that is or will be occupied or let by the borrower, granted to borrowers with an unhedged currency position
A 100% risk weight
Kuna claims not covered by bank deposits or adequate pledged property
Foreign currency claims and claims with a currency clause not covered by bank deposits or adequate pledged property on clients with a hedged currency position
Tangible assets
Investments in securities of other banks included in their regulatory capital
Prepayments and other income where the bank is unable to determine the counterparty
All other balance sheet assets
A 125% risk weight (a 150% risk weight as of March 2008)
Foreign currency claims and claims with a currency clause (including debt securities) not covered by bank deposits or adequate pledged property (on clients with an unhedged currency position)

Source: CNB.

would decrease by 2.3 percentage points. While banking system capitalisation would remain much above 10% (Figure 63), the capital adequacy ratio (CAR) of a significant number of banks (13) would fall below the regulatory minimum (Table 1 and Figure 64).

An important indicator of banking sector resilience is the share in total sector assets held by banks whose capitalisation under a shock would fall below the prescribed minimum of 10%. In case of the simulated shock (the increase of NPLR of 116%), the CAR would fall below 10% for banks holding 31% of banking sector assets and below 8% for banks holding 6% of assets.

The results of the simulated impact of a low-probability but plausible macroeconomic shock on losses and capital adequacy suggest that the banking sector could withstand relatively large shocks, which considerably enhances its stability. It should be stressed that the current CAR already incorporates substantial capital buffers, as risk weights applicable to assets exposed to currency risk were raised in mid-2006 and 2008. This increased both risk-weighted assets and the capital needed to attain the minimum required capital adequacy ratio (Table 2).

In other words, the said increase in risk weights has cumulatively decreased the banks' CAR by some three percentage points, which corresponds to the increase of NPLR of around 150%. This means that the central bank's prudential measures have increased banking sector resilience to a level where it can absorb an exceptional but plausible macroeconomic shock and thereby preserve both its own stability and the overall economic stability.

## Box 5 Assessing Banking Sector Stability in Terms of Z-Score

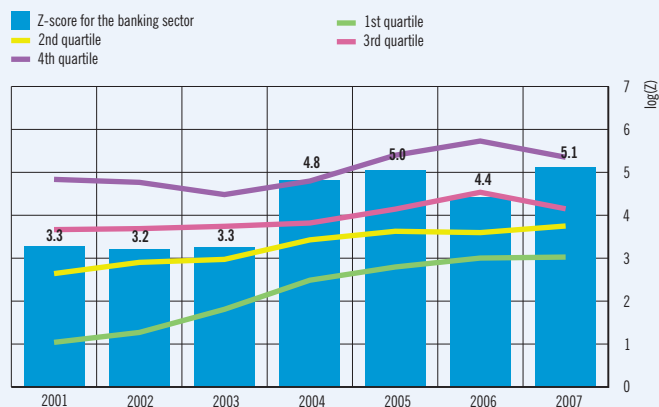
### 1 Introduction and Methodology

Z-score is often used in banking sector analyses as a measure of financial stability. Its wide use arises from the link between its definition and the insolvency risk of a particular bank. More precisely, the score presents the lower limit of a number of standard deviations for which a bank's ROAA must fall below expectations in order to completely drain its capital. With a given type of return distribution, one may calculate the probability of bank failure.

The basic form of Z-score is defined as the following ratio:

$$z = \frac{\mu + \kappa}{\sigma}$$

Figure 1 Z-Score for the Banking Sector by Quartile



Source: CNB.

where  $\mu$  is the expected return on average assets,  $\kappa$  is the share of capital in assets, and  $\sigma$  is the standard deviation of return on average assets. It may be shown that a higher Z-score implies a lower probability of bank insolvency.

Z-scores for the entire banking sector<sup>1</sup> and individual banks in 2001-2007 were constructed as a stability measure of the sector and of individual banks on the basis of banks' annual data on net income, assets and capital.<sup>2</sup> In the second step, a panel-regression was

1 Z-score for the banking sector was calculated based on aggregate data on bank assets, capital and profit.

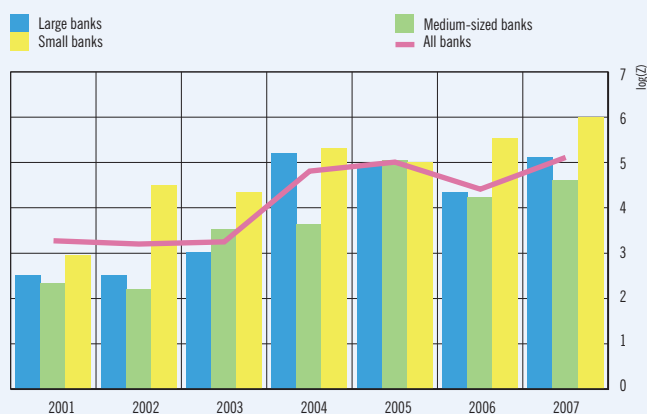
2 The pre-2001 data were left out due to their lower quality and unreliability (a large number of bank liquidations and rehabilitations, large differences in banks' statistical reporting, misreporting, structural breaks, etc). Data used in the analysis cover 24 banks that were in operation during the entire observed period, with share in total bank assets above 0.3%.

run to identify some of the Z-score determinants, which are also the determinants of domestic bank stability. The analysis covered the period characterised by relatively high and stable bank profits, which, as a rule, implies high banking sector stability in terms of Z-score. Due to the limited availability of data, it was impossible to analyse the Z-score dynamics and its links with the corresponding determinants in periods of crisis. Hence, the established relations may not necessarily hold during such periods.

### 2 Descriptive Analysis of Z-Score

The value of the Z-score for the banking sector decreased in 2006 owing to a fall in the aggregate ROAA of banks and a parallel increase in its standard deviation, while it resumed growing in 2007 due to the wave of banks raising capital and a slight increase in their profitability (Figure 1). The increase was mostly due to several large banks, while the stability of mostly small banks (14 banks) decreased. This slightly

Figure 2 Z-Score for the Banking Sector and by Bank Peer Group



Source: CNB.

decreased the simple average Z-score for individual banks in 2007 compared with the year before.

The level of Croatian financial stability in terms of Z-score is similar to that in EU Member States and higher than in non-EU countries in the region.<sup>3</sup>

Figure 2 shows changes in Z-score by bank peer groups on the basis of asset size.<sup>4</sup> Small banks recorded the highest Z-score in the last two

3 Based on the results of similar researches and analyses for other groups of countries (Machler et al., 2005, Bank of Slovenia, 2007, Hesse and Čihak, 2007).

4 Small banks are those with share in total banking sector assets below 1%, medium sized banks are those with share in total assets between 1% and 5%, and large banks are those with share in total assets above 5%.

Table 1 Z-Score Determinants

	Variables								Indicator variables			
	Liquidity: current assets to short-term liabilities	NPLR	External financing: foreign liabilities to total assets	Loan growth rate	Squared growth rate of loans (growth pace)	Share of loans in assets	Gross domestic output gap	Nominal kuna/euro exchange rate logarithm	Banks transformed from savings banks	Small banks	Large banks	Banks mostly lending to households
Simple average	1.34	0.08	0.12	0.29	0.25	0.53	0.00	2.01	0.04	0.58	0.24	0.32
The lowest value	0.50	0.00	0.00	-0.50	0.00	0.17	-0.02	1.99				
The highest value	6.33	0.49	0.52	3.20	10.56	0.80	0.01	2.02				
Elasticity coefficient	0.33	-4.60	-1.93	0.27	-0.30	2.15	14.73	-16.13	-3.14	0.78	0.58	0.35

Source: CNB.

years, while its increase in 2007 was largely due to medium sized and large banks raising capital.

### 3 Determinants of the Z-Score for Commercial Banks

Using the obtained Z-scores for banks, in panel regressions we quantified the impact of several indicators on a bank's insolvency risk. Although the methodology employed does not allow a formal identification of the cause and effect relationship between the Z-score and individual indicators, this decomposition still provides an insight into the sources of insolvency risk and its correlation with indicators at the micro level.

Table 1 presents partial elasticities of the Z-score relative to the indicators used. In addition, dummy variables were used to check the impact of a particular feature on a bank's insolvency risk – e.g., a bank transformed from a savings bank, belonging to a group of small/large banks or a bank mostly lending to households.

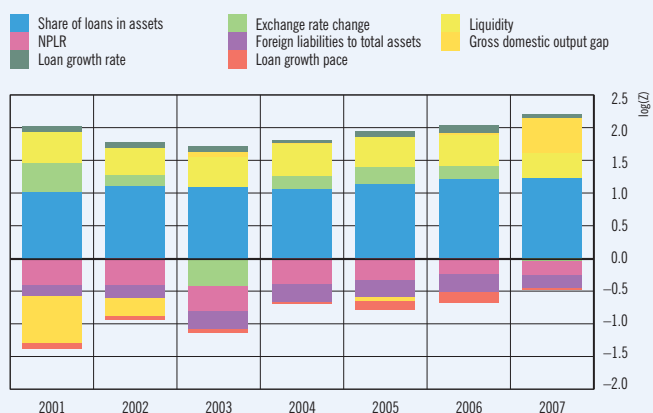
Directions of estimated coefficients are in line with expectations (Figure 3). The domestic output gap is positively correlated with bank stability so that GDP growth above the equilibrium rate is on average related to a higher Z-score for banks. In contrast, the Z-score is on average adversely related to changes in the nominal exchange rate of the kuna against the euro, which means that kuna depreciation against the euro deteriorates bank stability. This result shows that domestic currency depreciation leads to worse Z-scores, even excluding its impact on the rise in non-performing loans in bank portfolios, and to a GDP slowdown.

Bank credit growth is positively related with the Z-score. This is not surprising since robust credit growth was the main source and basis for the increase in bank profits and ROAA in the observed period. However, the correlation between insolvency risk and the variable representing the pace of bank lending (squared growth rate) was of a different sign, which clearly indicates that excessive bank credit growth adversely affects financial stability.

Furthermore, a higher share of loans in bank assets contributes to financial stability. The liquidity indicator, calculated as the ratio of current assets to short-term liabilities of commercial banks, was on average positively correlated with bank Z-scores. This means that banks with higher current liquidity were more stable in the observed period. The rise in the ratio of non-performing loans (irrecoverable and partly recoverable loans) to total bank loans was on average, as expected, accompanied by reduced financial stability. Commercial bank dependence on foreign funding, calculated as the ratio of liabilities to non-residents to total assets, is also adversely correlated with bank stability and puts additional emphasis on external exposure risk.

The estimated negative coefficient with the indicator of banks transformed from savings banks shows that, taking account of the impact of other variables on the Z-score, these banks were less stable than others. Similarly, small and large banks were more stable than medium sized banks. Finally, the variable for banks mostly lending to households, i.e. banks with an over 55% share of household loans in total domestic private sector loans, proved to be significant and positive. This may be linked to the fact that the household sector is traditionally more reliable regarding loan repayment and that these loans are more profitable for banks.

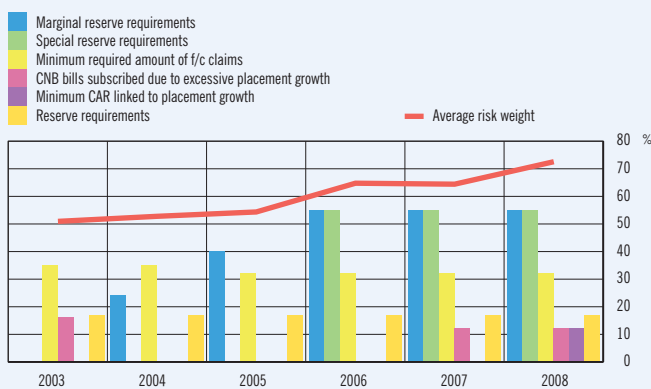
Figure 3 Individual Variable Contribution to Z-Score



Source: CNB.

# Main Challenges to the Policy of Maintaining Financial Stability

Figure 65 Changes in Key Monetary and Prudential Policy Measures



Source: CNB.

The main risks to financial sector stability identified in this publication could materialise under an extreme but plausible scenario of a sudden slowdown or stop in foreign capital inflows to Croatia. In this situation, economic growth would considerably slow down and depreciation pressures would mount due to lower foreign currency inflows, which would together adversely affect the credit risk level and domestic financial system stability with a negative feedback on the economy. These risks arise from significant domestic economic vulnerabilities associated with a substantial current account deficit and high levels of external debt and financial euroisation. This is further supported by the fact that deterioration in the overall net external position of Croatia has been largely due to rising debt of the household and non-tradable sectors, which mostly do not generate foreign currency income.

Bearing these risks in mind, the main challenge to the CNB with respect to the maintenance of financial stability is the implementation of monetary and prudential policy measures with two objectives: containing the external imbalances, i.e. the system's vulnerability to potential risks of a stop in foreign capital inflows; and strengthening its resilience in case these risks actually occur (the main measures are summarised in Figure 65).

Given the constraints to monetary policy implementation (see Box 6), the policy of maintaining financial stability has mostly focused on administrative monetary policy measures and prudential measures. The measures already in force, which require the maintenance of high marginal reserves for additional foreign borrowing of banks and a high level of liquid foreign assets, have recently been joined by reintroduced credit controls (controls were already introduced in 2003) and a several-fold increase in risk weights applicable to assets exposed to currency-induced credit risk. The most recent increase in risk weights applicable to assets exposed to currency-induced credit risk, which came into effect early in 2008, will reduce the risk-weighted CAR of the banking system by more than 1.5

percentage points, which is similar to the effect of the first wave of the weight increase in 2006.

The set of monetary policy instruments has been broadened in 2008 by a measure that links a bank's minimum CAR to its placement growth – banks whose placement growth exceeds 12% must maintain a higher capital adequacy ratio than the prescribed minimum, with this ratio being also dependent on the structure of funding sources. This measure represents a “new generation” of macroprudential measures that will, under future conditions of full liberalisation of capital movements, provide sufficient banking sector capitalisation to cover the risks taken during the upward phase in the credit cycle. This will also be the objective of future prudential measures based on the second pillar of Basel II. On the basis of stress tests, these measures will link capital requirements to the impact of potential macroeconomic shocks.

The simulations presented suggest that the additional capital that banks accumulated due to increased capital requirements, i.e. the increase in risk weights in 2006 and early 2008, could

absorb the rise in non-performing loans associated with large macroeconomic disturbances. Banks' efforts to change the currency structure of their liabilities and assets in order to reduce the need for additional capital lead to the desired goal – a decrease in the extent of exposure to currency-induced credit risk.

At the same time, the financial system has sufficient foreign currency reserves that could alleviate a shock caused by a sudden stop in capital inflows. However, the measures taken by the CNB are of limited effect, which additionally underscores the need for continued fiscal adjustments to narrow the domestic savings-investment gap and reduce the economy's reliance on steady foreign savings inflows. Together with more rapid restructuring of the domestic economy, increased labour market flexibility and financial system diversification, as well as improvement of the overall investment climate, this would ease market reorientation of capital and other resources to the tradable sector. In the long-run, this would eliminate the existing domestic economic vulnerabilities and ensure continued rapid convergence of per capita income to EU levels.

## Box 6 Monetary Policy Constraints in a Small Open and Euroised Economy

Monetary policy implementation in a small open economy such as Croatia faces certain constraints, which are crucial for the formulation of monetary measures. The key constraint that greatly reduces room for independent setting of domestic interest rates and money supply arises from the relative freedom of international capital flows between Croatia and other countries, and the need to maintain a stable nominal exchange rate of the kuna in view of the highly euroised economy. Thus, an increase in interest rates aimed at slowing down monetary and credit expansion would be offset by capital inflows attracted by higher interest rates. In such conditions, market interest rates and the amount of money in the monetary system react more to changes in foreign interest rates and liquidity, as well as investors' risk perception and appetite than to changes in interest rates that are under direct CNB control.

Furthermore, CNB measures influence the operation of the banking system, which is still dominant in Croatia, although its share in the

financial system has been steadily decreasing. The flourishing of other forms of financial intermediation, coupled with easier direct access of domestic non-financial corporations to foreign funding sources, increases the part of the financial system not covered by monetary policy measures.

Finally, a high level of financial euroisation limits the CNB's role of a lender of last resort as it freely creates only kuna liquidity, whereas the level of international reserves limits its actions with regard to providing foreign currency liquidity. In this context, the ability to create additional kuna liquidity in the case of an adverse shock is also limited as it would add to depreciation pressures on the domestic currency and decrease international reserves, in addition to the amount of short-term external debt and current external payments, by a substantial amount of liquid assets.

All of the above reduces room for a counter-cyclical monetary policy in Croatia to curb the accumulation of macroeconomic and financial imbalances, and creates the need to maintain a high level of central bank international reserves and external liquidity of the entire financial system so as to enhance its resilience to external shocks.

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## Abbreviations and Symbols

### Abbreviations

b.p.	– basis points
bn	– billion
CAR	– capital adequacy ratio
CBS	– Central Bureau of Statistics
CICR	– currency-induced credit risk
CNB	– Croatian National Bank
ECB	– European Central Bank
EMBI	– Emerging Market Bond Index
EU	– European Union
EUR	– euro
f/c	– foreign currency
Fina	– Financial Agency
FSI	– financial soundness indicators
GDP	– gross domestic product
GVA	– gross value added
HANFA	– Croatian Financial Services Supervisory Agency
HREPI	– hedonic real estate price index
HRK	– Croatian kuna

LTV	– loan-to-value
m	– million
MoF	– Ministry of Finance
NPLR	– ratio of non-performing loans to total loans
RC	– Republic of Croatia
ROAA	– return on average assets
ROAE	– return on average equity
SDR	– special drawing rights

### Symbols

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

