# FINANCIAL STABILITY

2008

## Contents

Financial stability means that the financial system is equipped to withstand shocks to the economy and financial markets, to mediate credit and payments, and to redistribute risks appropriately.

The purpose of the Central Bank of Iceland's *Financial Stability* report is:

- To promote informed dialogue on financial stability, i.e. its strengths and conceivable weaknesses, the macroeconomic and operational risks that it may face, and efforts to strengthen its resilience;
- To provide an analysis that is useful for financial market participants in their own risk management;
- To focus the Central Bank's work and contingency planning;
- To explain how the Central Bank carries out the mandatory tasks assigned to it with respect to an effective and sound financial system.

Published by:
The Central Bank of Iceland, Kalkofnsvegur 1, 150 Reykjavík, Iceland
Tel: (+354) 569 9600, fax: (+354) 569 9605
E-mail: sedlabanki@sedlabanki.is
Website: www.sedlabanki.is



Vol. 4 May 2008
Printing: Gutenberg
*Financial Stability* is also published on the Central Bank of Iceland website.
ISSN 1670-584X


Icelandic letters:
ð/Ð (pronounced like th in English this)
þ/Þ (pronounced like th in English think)
In *Financial Stability*, *ð* is transliterated as *d* and *þ* as *th* in personal names, for consistency with international references, but otherwise the Icelandic letters are retained.

*The Central Bank's assessment*

# Current conditions test the banks' resilience

In the analysis published in *Financial Stability* 2007, the Central Bank of Iceland concluded that the financial system was broadly sound. That has not changed.

The chain of events that began in mid-2007 and its effect on the global financial markets were quite unexpected. Risk appetite yielded to risk aversion, and there is no end in sight to the uncertainty that surfaced as a liquidity squeeze and broad-based concerns about the economic outlook. The Central Bank did not expect the heavy weather to turn into the tempest that ensued; however, in *Financial Stability* 2007 the Bank warned that challenging waters lay ahead. The report states as follows: "The Central Bank underlines that global market conditions can take a sudden turn for the worse and it is important to be on the alert and prepared for such a contingency. The current episode of ample liquidity and lower interest rates which has been ideal for risk-seeking investors may change unexpectedly." It goes on to state: "One major vulnerability of the Icelandic economy at present is the risk of a rapid and unforeseen rise in international interest rates and premia."

These projections have now materialised. The present report attempts to evaluate the strength of the financial system under the currently reigning conditions.

**Tighter global credit markets …**

The changes in the global credit market can be traced to the United States, but the roots of the problem are deeper and extend to a broader area. Over the past several years, a segment of the housing loan market had developed in the US, focusing on borrowers with extremely limited capacity to pay: the so-called sub-prime market. Financial institutions used the majority of sub-prime loans to create structured securities, adding to them loans with a much higher credit rating – including bond issues from the Icelandic banks – and overall, the structures received good credit ratings. When delinquency began to rise on housing loans in the US and real estate prices to drop, these structures began selling at discounts. As a result, rating agencies lowered the credit ratings on many of them. When investors attempted to reduce their positions in structured instruments, the secondary market dried up. Icelandic banks invested very little in these securities but have nonetheless been indirectly affected by their fate.

Losses on these and other risky investments have been a heavy burden for a number of banks in the US and Europe. Uncertainty concerning the extent to which banks had invested in them pressed interbank interest rates sharply upwards. The supply of short-term credit contracted markedly because banks squirreled away liquid assets and

mistrusted one another as counterparties. A number of banks have been forced to write off enormous losses, which has undermined their capital position. Many of them have had to obtain new capital as well, and it is likely that other banks will follow suit.

As a result of the liquidity crisis in the global interbank market during the fall of 2007, central banks in the United States, Europe, and the United Kingdom adopted a variety of measures in order to provide their banks with short-term credit. In addition, governments on both sides of the Atlantic have directly or indirectly lent support to individual financial institutions and guaranteed their deposits over and above the protection provided by guarantee funds.

**... puts the banks' resilience to the test**

The 2007 annual accounts of Iceland's financial companies, particularly the three largest banks, show that they remain robust. Their capital position, profitability, and liquidity are sound, as is confirmed by the stress tests conducted by the Financial Supervisory Authority (FME) and the Central Bank. Their interim accounts for the first quarter of 2008 bear out this assessment. Because they owned ample foreign currency, they did not suffer losses because of the depreciation of the Icelandic króna in the early months of the year; in fact, they gained on it.

Roughly half of the banking groups' combined assets are in foreign subsidiaries, and a large proportion of the parent banks' lending is to non-residents. It is considered advantageous that the banks' portfolios and funding be well diversified. The largest banks in Iceland have greatly expanded their overseas activities in the past few years. They are European banks no less than Icelandic, and they comply with the regulatory framework governing banks in Europe. Their income is diverse and well distributed geographically. Together, the three largest banks now generate more than half of their income from operations outside Iceland. It is also to their advantage that they have used different business models in their expansion. Their portfolios and funding derive largely from Western Europe and North America.

In many ways, Iceland's banks were well prepared to face the liquidity crisis that emerged in 2007 and its impact on their regions of operation. To some extent, this preparedness can be attributed to their response to the headwinds they faced early in 2006, though that problem was not an international one. Now they must deal with reduced asset prices, increased cost of capital, and limited access to foreign credit markets.

This report discusses in depth the position, risk, funding, and resilience of the Icelandic banks. Also included is an analysis of the banks' loan portfolio quality based on the banking groups' lending activity; that is, a risk classification of resident and non-resident borrowers, an estimate of expected and unexpected loss. The results of the analysis indicate that the banks are well prepared to withstand increased delinquency and loan losses, which have been extremely low to date. It is necessary, however, to point out risk factors that could prove challenging under the conditions that may be in the offing. In 2007 the banks' large exposures increased as a proportion of capital, as did the proportion of holding companies among borrowers. There

is good reason to monitor this development. A considerable number of loans are still secured by equities, and the value of that collateral has dropped in the recent term. There have been few forced sales due to margin calls, however, and the banks' margining levels are ample, according to data from the Financial Supervisory Authority (FME).

**Economic adjustment proves burdensome for household and business balance sheets …**

The conditions in the banks' principal market areas are satisfactory, but uncertainty has mounted. Lending to Icelandic residents constitutes a smaller part of financial institutions' loan portfolios than it did several years ago but remains an important part of lending activity. Economic developments and changes in asset values will affect the quality of these portfolios. The economic imbalances that have been discussed in *Financial Stability* in recent years have now led to a sharp depreciation of the króna, among other developments. This weakens the balance sheets of those households and businesses, which have stepped up their borrowing in recent years and taken on foreign exchange risk as well. High inflation makes it more problematic than otherwise to battle the economic contraction that inevitably accompanies a strong downturn in asset markets. This is why it is critical that the Central Bank attain the inflation target as soon as may be, so as to build confidence in the króna.

Increased foreign exchange risk among households and businesses without foreign-currency income is food for thought, as is the growing share of loans to indebted holding companies. Nonetheless, foreign-denominated household debt constitutes only a small proportion of total household debt, and the bulk of foreign-currency loans have been granted to borrowers with sizeable foreign-currency income. These borrowers will be less hard hit by the drop in the exchange rate, but those not protected by foreign-currency income will be more vulnerable, and the problem is compounded by a simultaneous decline in the market value of the assets used to secure collateralised loans. It is very important, however, that the loan-to-value ratios for banks' housing loans dropped year-on-year and are acceptable from the standpoint of financial stability.

Despite the accumulation of debt, households' net position has improved in recent years. On the whole, the debt burden is quite manageable if disposable income does not fall too sharply. However, many households will be faced with an uphill climb over the next few years. Among the most indebted households, the level of debt has increased far in excess of the average, and these households could find themselves in financial difficulties as a result. Many indicators suggest that house prices are far above long-term equilibrium; therefore, the price of residential and commercial housing can be expected to fall in real terms over the next few years as the cost of capital increases. Turnover in the housing market has contracted rapidly in the recent term, and real prices have begun to fall.

Businesses now feel the effects of increased cost of capital, which weakens their position and forces them to adapt their activities to the banks' increased restraint in granting credit. To some extent,

the financial institutions' higher cost of capital has already begun to affect businesses and households adversely. Although financial institutions can thereby recover a portion of their expense and reduce their operating costs, this inevitably undermines their competitive position, especially in foreign markets.

**... the banks respond ...**

Under normal conditions, a bank with a satisfactory capital position should not have difficulty funding its activities. Because of uncertainty and risk aversion, however, access to capital has become more limited and credit ratings have suffered. These conditions affect the Icelandic banks more than they might otherwise because foreign market funding constitutes a relatively large share of their debt. Extensive foreign funding requires an excellent credit rating and a sound reputation. Since the fall of 2007, the banks have avoided public issues on foreign credit markets and sought other avenues for funding.

They have responded to the tight credit market by slowing their lending growth, engaging in private issues, strengthening their deposit business, and reducing costs. For example, plans to acquire foreign financial institutions have been abandoned, and asset financing and mortgage lending operations abroad have been divested so as to free up capital for other uses. In general, the banks have been successful at increasing deposits, and at year-end 2007 more than two-thirds of the three main commercial banks' deposits were from non-residents. Various market areas have seen moderate fluctuations in deposits. The banks' CDS spreads dropped significantly in April, after rising sharply toward the end of 2007 and early in 2008.

For the short term, the banks' most critical task is to gain better access to foreign credit and reduce their borrowing requirement. The confidence of investors and depositors is also vital to their success. It is unlikely that conditions in the international markets will improve to any dramatic extent in the near future, and when they do, investors will undoubtedly demonstrate more caution and conservatism than they did previously

**... and public authorities strengthen their preparedness**

In the past several years, public authorities in Iceland – that is, the Government, the Financial Supervisory Authority, and the Central Bank – have strengthened their collaboration in contingency affairs.[1] They also engage in broader international cooperation, including participation in a Nordic-Baltic contingency exercise held in September 2007 and participation in European Union financial stability committees.

European authorities have sharpened their focus on preparation for the situations that could arise in financial undertakings with cross-border operations. An example of this is the newly concluded agreement among the ministries of finance, financial supervisory authorities, and central banks of the EU nations. Such cooperative

1. Among the documents on the Central Bank of Iceland website are the Memorandum of Understanding among the Icelandic public authorities, the Memorandum of Understanding among the Nordic central banks (as well as a joint press release from the banks), and an Appendix on cooperation by government authorities, which appeared in Financial Stability 2006.

work is extremely important, especially for smaller countries where large banks have their headquarters.

Through its membership to the European Economic Area, Iceland enjoys operating conditions similar to those within the European Union. Nonetheless, it retains various features that influence economic advancement, such as a rather business-friendly tax environment, efficient public administration, and a flexible labour market. Surveillance and monitoring are of considerable importance, and the Financial Supervisory Authority has been strengthened. Iceland's payment and settlement systems have been bolstered as well, so that the risk of shocks of technical origin is at a minimum, and counterparty risk has been eliminated.

The strong position of the Treasury is of paramount importance. There have been budgetary surpluses in recent years, and the Treasury's deposits in the Central Bank are sizeable. Net external Treasury debt, including foreign reserves, is nonexistent. The foreign reserves were doubled in 2006 and the Central Bank's capital position was strengthened, which is quite fortunate in the current circumstances, and the Government has expressed its willingness to strengthen them still further. However, it is critical not to create a moral hazard in the process.

Critics have asserted that the Icelandic banks have grown too large. This might be true if a major financial crisis were imminent and the Icelandic Government were forced to resolve a critical situation affecting banking operations both in Iceland and abroad. In other respects, however, it should not cause difficulty if companies choose the operational arena that suits them and where they enjoy comparative advantage – for example, Iceland's fishing and aluminium industries, whose domestic operations far outstrip the needs of the country. Iceland is a full participant in the internal market of the European Union, including the internal market for financial services. Ever since 1992, when the policy was formulated concerning the internal market for products, services, capital, and labour, the objective has been to ensure that it functions as a single unit. There has been encouragement to engage in cross-border trade and enhance cross-border operations. Nowhere has it been suggested that the banking systems of individual countries should be subjected to size limitations, and protests have been made against preventing foreign investors from acquiring domestic banks. There are examples of countries whose banks are largely headquartered abroad – for instance, the Baltic nations – and of the reverse, countries whose domestic banks are active in other markets – such as Iceland, Luxembourg, Holland, Great Britain, Denmark, and Ireland.

**The financial system is sound, but contingency plans are necessary**

The main financial system vulnerabilities are presented in Table 1. They centre on a sensitive foreign exchange market and limited access to capital, which implies short-term risk. For the longer term, vulnerabilities centre rather on the effects of higher cost of capital and the risk of diminished asset quality.

In the final analysis, the critical factor is how strong and well equipped the financial system is to withstand shocks; i.e., its resilience. The second table highlights factors that contribute to financial system resilience. These are a positive long-term economic outlook, a satisfactory position among the banks, a sound institutional and supervisory framework, and secure payment and settlement systems, as well as a financially strong Treasury. These same factors were specified in the last issue of *Financial Stability*, but the banks' position has weakened since then, especially because of the contraction in global credit supply.

Many of the factors that were considered cause for concern in that report have materialised, such as a depreciation of the króna, falling stock prices, a cooling real estate market, rising interest rate premia, and others. It is likely that a range of risks will have to be faced, but efforts must be made to minimise the probability of a financial crisis that could harm potential output and erode living standards. The experience of other countries shows how important this is.

On the whole, the Central Bank's finding is still that the financial system is broadly sound. Iceland's banking system meets the demands made of it, and it performs well on stress tests conducted by the Central Bank and FME.



Table 1 Main vulnerabilities

| *Risk* | *Explanation* |
|---|---|
| Foreign exchange market | The current account deficit and possible changes in carry trade entail the risk of volatility and depreciation beyond that already experienced. The FX market is both a spot market and a swap market. It relies on three market makers and is relatively thin. The banks themselves are well protected against depreciation of the króna, but some of their borrowers have little or no protection against exchange rate fluctuation. |
| Access to capital | High dependence on market funding and deposits on call makes credit ratings and global market conditions crucial for the commercial banks. The banks have responded to changed conditions and must continue to do so. Access to capital is more limited than before, and credit ratings have been lowered. |
| Cost of capital | Significant increase in risk premia reduces output growth and widens the current account deficit. Businesses' higher cost of capital undermines their competitive position and increases customers' debt service burden. |
| Asset quality of commercial banks | Prices of equities and real estate have fallen. Increasing write-offs of loans and other assets can be expected. Default and impairment were at a minimum at year-end 2007 but will inevitably increase in the near future. |

Table 2 Resilience

| *Resilience* | *Explanation* |
|---|---|
| Economy | The economy is flexible and, in the past, has shown itself capable of tackling cyclical swings through prompt adjustment of imports and private consumption. Investment and output growth have been robust, and the long-term economic outlook is favourable. |
| Strength of the commercial banks | The banks' capital ratios are satisfactory, profit ability is strong from broad-based operations, and assets are diversified. Their liquidity has been ample but will be put to the test in 2008. |
| Institutional and supervisory framework and payment systems | Iceland's framework is the EEA Agreement, and its guidelines are international best practice and transparency. Financial supervision has been boosted, and extensive cross-border cooperation is in place. Payment systems meet internationally recognised standards. |
| Fiscal position | The Treasury's position is strong, with consecutive fiscal surpluses. Net external Treasury debt, including foreign reserves, is nonexistent. |

# Purpose, presentation and context

**Purpose of the report**

The purpose of the Central Bank of Iceland's *Financial Stability* report is to identify the risks that the financial system may face and assess its resilience to conceivable shocks. *Financial Stability* 2008 should be seen in the context of the previous reports, cf. the summary in Box 1.

**Presentation of material**

The Central Bank strives to give a clear presentation of its assessment and the highlights of the underlying analysis. The Central Bank's overall assessment is presented on the preceding pages, with tables summarising the factors that the Bank considers the main areas of vulnerability and resilience in Iceland's financial system. In the following sections, the principal points are summarised in an introduction. Short boxes and longer appendices focus on specific issues that are connected with and reinforce the main coverage of the report.

**Main sections**

Three main chapters form the backbone of the report. They are accompanied by boxes, as is shown in the table of contents. The first chapter is an analysis of the macroeconomic environment and financial markets. It contains an assessment of the possible developments in domestic and global economic affairs over the next several years and the effects of those developments on the earnings and balance sheets of households, businesses, and the financial system as a whole. Also included are discussions of changes in the global financial markets, the liquidity crisis, and increased risk aversion. These are followed by a chapter that focuses on the position of Iceland's most important financial companies – in particular, the largest commercial banks – by analysing the financial statements of the commercial banks and savings banks and identifying their main strengths and weaknesses. The third main chapter discusses recent measures aimed at enhancing the security and effectiveness of payment and settlement systems.

**Appendices**

*Financial Stability* 2008 contains four appendices. These provide a more in-depth discussion of loan portfolio quality among the largest commercial banks, Icelandic banks' credit default swap spreads, liquidity management, and accounting in foreign currency.

Credit risk has grown in recent years, in line with increased lending activity; therefore, it is important to analyse the banks' capacity to withstand loan losses. Loan losses are commonly divided into two categories: expected losses and unexpected losses. In this report, the banks' expected loan losses are assessed in a manner similar to that in *Financial Stability* 2007. It also includes an estimate of unexpected losses and banks' resilience to shock related to credit risk. Databases were used to estimate default frequency, and foreign research and the Basel II rules were used to estimate the recovery ratio. The find-

ings were examined in light of the amounts that have been put aside to meet loan losses; that is, credit provisioning accounts and own funds.

The appendix on the CDS spreads of Icelandic banks attempts to examine the technical reasons behind their recent volatility. The Icelandic banks' CDS spreads have been under frequent discussion in the recent term. They are based on two main factors – the probability of default and the recovery ratio – plus a special risk premium for each company. Because these factors are also of fundamental importance in credit ratings, there should be a clear connection between the quantities. The connection seems readily apparent with respect to financial companies in general but is unclear in the case of Iceland's banks. An examination of interim and annual financial statements and liquidity position gives cause to assume that the position of the Icelandic banks is generally sound. This was not reflected, however, in their CDS spreads, which rose dramatically in the first months of 2008 but have fallen once again. Liquidity management is in the limelight because of the liquidity squeeze in the global credit markets. Internationally, Liquidity monitoring has not developed in the same manner as capital adequacy monitoring; however, regulatory authorities are in the process of revising liquidity management rules and guidelines for financial undertakings. The appendix includes a review of the chief liquidity management methods used by financial institutions and an analysis of their advantages and disadvantages. This is followed by an examination of the work carried out by international regulatory authorities and the monitoring arrangements in use. The appendix concludes with a summary of liquidity rules in Iceland, the liquidity management procedures, and the measures taken by the Central Bank of Iceland in order to bolster the liquidity position of financial undertakings.

Accounting in foreign currency has been the subject of considerable discussion over the past year. In this context, it is important to distinguish between two elements: corporate accounting – that is, the presentation of financial statements – and the listing of equities and the settlement of equity transactions. There is no direct connection between the authority to carry out accounting and present financial statements in a foreign currency and a decision to list shares and settle stock trades in a foreign currency. The Register of Annual Accounts authorises companies to carry out their accounting in currencies other than the Icelandic króna provided that certain conditions are met. The decision to register and trade a company's shares in a foreign currency, however, is in the hands of a shareholders' meeting in the company concerned. Government authorities have no say in that decision if domestic and rules concerning security and efficiency are followed.

Box 1

## Analyses of financial stability 2000-2008

The Central Bank of Iceland began to conduct regular analyses of financial stability in February 2000, when it published its first summary of the strengths and weaknesses of the financial system in its *Monetary Bulletin*. In 2005 the Bank began issuing a separate *Financial Stability* report.

The history of these analyses has been reviewed at press conferences and meetings related to the Bank's publication activity. Reference has been made to the key words in the Bank's findings, with symbols used to indicate whether the financial system has become stronger or weaker or has remained unchanged since the last analysis. This assessment takes into account both the risk facing the financial system and the system's capacity to withstand shocks. As the following table shows, the Central Bank's assessment has undergone significant change over the past eight years, as can be expected in view of economic fluctuations and the transformation of important financial institutions and markets.

Table 1 Analyses of financial stability 2000-2008

| | | | |
|---|---|---|---|
| 2000 | Feb | ▶ | Position positive, but grounds for caution |
| | Nov. | ▼ | Growing imbalances |
| 2001 | May | ▼ | More risk, less resilience |
| | Nov. | ▼ | Conditions worse, but changes made in response |
| 2002 | May | ▲ | Positive turnaround |
| | Nov. | ▲ | Strengthened position, but with repercussions |
| 2003 | May | ▲ | Improvements, with overall position quite acceptable |
| | Nov. | ▶ | Position sound but has not strengthened |
| 2004 | Mar. | ▶ | Position satisfactory, but concerns over lending, foreign debt, and asset prices |
| | Sep. | ▶ | Position satisfactory, but growing uncertainty |
| 2005 | Apr. | ▶ | Broadly sound financial system in spite of imbalances |
| 2006 | May | ▼ | A challenging course to navigate ahead |
| 2007 | Apr. | ▶ | Commercial banks more resilient |
| 2008 | May | ▼ | Current conditions test the banks' resilience |

# Financial market conditions have deteriorated

*In* Financial Stability *2007, the Central Bank cautioned that the Icelandic economy had become quite sensitive to changes in the international markets, due in part to an unsustainable current account deficit, high asset prices, and substantial indebtedness among households and businesses. Recent developments highlight just how appropriate that warning was. The superabundance of global liquidity has largely dried up, and risk premia have skyrocketed. Investors and financial institutions all over the world have become warier of risk than they were previously – or their assessment of risk has changed. The sub-prime mortgage crisis that began in the United States has engendered a sense of uncertainty in many parts of the world, including Europe, due to the structured securities purchased by financial institutions in recent years. The impact of the liquidity crisis and the growing risk aversion can already be felt in Iceland, where it has triggered depreciation of the króna, policy rate hikes and spiking lending rates, which in turn affect asset prices. Stock prices have plummeted after the dizzying increases in the first half of 2007. Housing inflation, which continued until the end of the year, has ground to a halt, and real estate market turnover has slowed accordingly. Last year's rising house prices and the increase in mortgage interest rates have cut into real estate purchasing power. Many indicators suggest that house prices are far above long-term equilibrium. That being the case, the price of residential and commercial housing can be expected to fall in real terms over the next few years as the cost of capital increases. Global housing inflation has begun to taper off, and house prices have already dropped considerably in the US and a few other countries as well. Household and business indebtedness has continued to mount in the past year. While asset values rose rapidly until the latter part of 2007, the outlook is for unfavourable developments on the asset side of the balance sheet in the years to come. Increased debt service coupled with shrinking employment and falling real disposable income will increase the likelihood of arrears among some groups of borrowers, but delinquency has been rare in recent years. Many companies and individuals who have made leveraged securities purchases could be in a tight position. Households' exchange rate and interest rate risk have risen over the past year because of increased foreign-denominated borrowing at variable interest rates. The past few months' depreciation of the króna will exacerbate the problems faced by households that have borrowed substantial sums in foreign currency, even though the exchange rate drop may prove temporary.*

## Macroeconomic conditions for financial stability

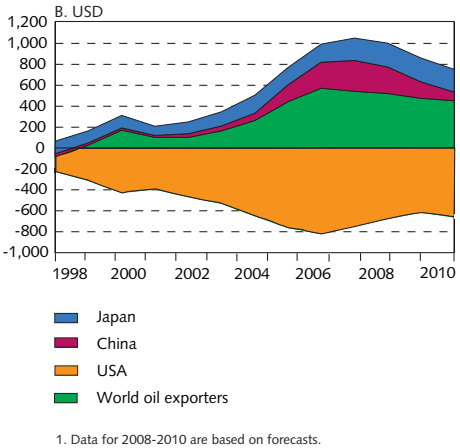
**Global economic outlook poorer than a year ago**

The global economic outlook has deteriorated markedly since *Financial Stability* was published a year ago. The likelihood of a recession in the United States has increased in recent months, with various indicators suggesting that it has already begun. Although the underlying supply of savings – especially from leading Asian countries and oil export countries – remains ample worldwide, the first cracks in the global economic structure that has reigned for the past decade are surfacing. The economic structure entailed emerging markets and oil export countries holding the exchange rate of their currencies at a low level and using their considerable trade surpluses to purchase debt instruments in developed countries, thus promoting low global interest rates. Furthermore, policy rates in developed nations were very low for an extended period. Low interest rates tempted investors to seek

Chart 1

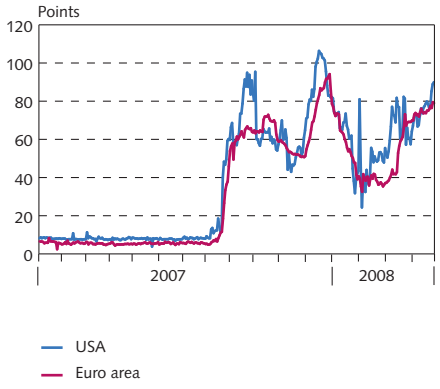
Current account balance 1998-2010[1]

China, USA, Japan and world oil exporters



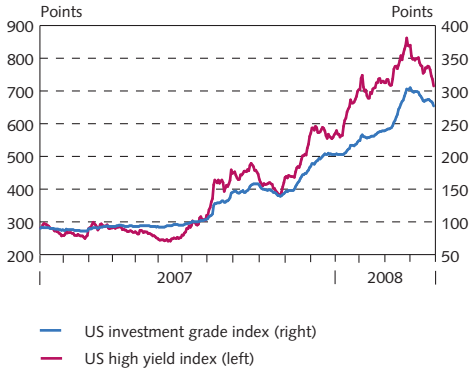

1. Data for 2008-2010 are based on forecasts.
*Source*: Global Insight.

Chart 2
Spreads of three-month interbank rates to three-month expected policy rates[1]
Daily data January 1, 2007 - April 8, 2008




1. Three-month LIBOR over comparable overnight index swap rates.
*Source:* Bloomberg.

Chart 3
Corporate bond spreads[1]
Daily data January 1, 2007 - April 21, 2008




1. Option-adjusted spreads over government yields.
*Sources:* Merrill Lynch, Reuters EcoWin.



out riskier investments so as to enhance their returns – for example, new types of structured products that combined high returns and a good credit rating and made it easier for banks to increase their supply of credit. The US sub-prime crisis and the repercussions of it can be viewed as the consequence of investors' tendency to increase the proportion of risky investment and lending during the recent low-interest episode. Now that the risk has become apparent, investors have changed their risk assessment. The demand for some types of securitised instruments has contracted sharply, and banks have been forced to meet their off-balance sheet commitments. Financial institutions' demand for liquidity and low-risk financial assets has therefore increased.

It is unclear how widespread the impact will be. At present, the effects on the real economy are limited primarily to the United States. In Europe there has been some contagion through the financial system, and central banks have taken steps to prevent a serious liquidity shortage. In the Icelandic banks' principal European markets, GDP growth has remained broadly stable despite slowing trends. As long as the impact of the financial market unrest remains relatively isolated, the difficulties experienced by Icelandic financial companies will likely be limited for the most part to tighter access to financing. Additional effects concern the exchange rate of the króna and domestic demand, which in turn affect the balance sheets of Icelandic households and businesses. If the US recession proves deep and protracted, however, it is likely that the direct impact on Icelandic financial companies' other market areas will be substantial. Some analysts have touted a so-called decoupling theory, according to which economic activity in Europe and many other areas will not be dramatically affected by a recession in the US. It has been pointed out that the United States' share in euro area exports, for example, is not very prominent and that demand from emerging market economies could offset the contraction in demand from North America. Others have argued that the contagion through the financial markets will weigh heavier and will lead to a sharp drop in global output growth.

**Continuing uncertainty about the extent of the sub-prime crisis**

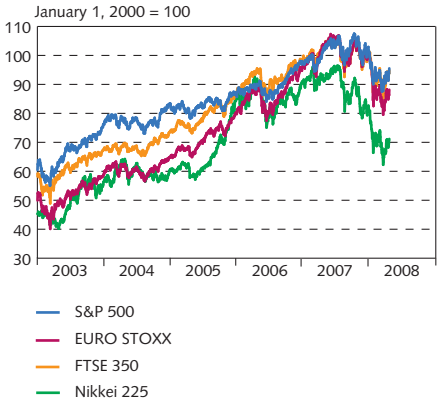
Global financial market conditions continue to reflect the great uncertainty concerning the real extent of the losses on structured securities related to US sub-prime mortgages, as well as on other financial instruments. The root of the problem is the increased delinquency on the class of mortgage loans called sub-prime mortgages, which were granted to homebuyers who would most likely not have passed a general credit evaluation (see Box 1). The problem is not limited to the sub-prime market, however. Delinquency on other types of loans has also increased in the recent term, including car loans and credit card debt, which have also been used as collateral for securitised instruments.

According to the International Monetary Fund's (IMF) financial stability report, which was published in April, the loss due to structured securities could total as much as 945 billion US dollars. Less than one-tenth of that estimate can be attributed to sub-prime mortgages. The IMF estimates that banks will be required to absorb nearly half

of the loss and that insurance companies, pension funds, money market funds, and hedge funds will have to absorb the rest. Banks have already written off losses amounting to 200 billion US dollars.

The uncertainty concerning the scope of risky investments has made market agents suspicious of one another's ability to abide by financial commitments, and broadened the difference between policy interest rates and interbank rates (see Chart 2). Doubts have surfaced concerning the value of numerous financial instruments that have been priced with the assistance of complex models. The supply of new types of financial instruments, where the boundaries between short-term and long-term financing are unclear, has increased sharply in recent years. This uncertainty fuelled a sudden spurt in demand for liquid assets and safer investments, increasing the difference between Treasury bond yields, on the one hand, and interbank rates or yields on bonds held by individuals and corporations, on the other. The uncertainty concerning sub-prime structured securities seems to have undermined the market's faith in rating agencies' credit ratings. In many instances, credit default swaps have risen without any change in credit ratings, particularly in the case of the banks. In some markets, the supply of credit has shrunk, though there are few signs of this in the euro area. On most markets, the unrest in the financial markets has emerged in plunging stock prices since the end of summer 2007.

Chart 4
Equity prices
Daily data January 1, 2003 - April 18 2008




*Source:* Reuters EcoWin.



Box 1

## Financial market turmoil – causes and consequences

A prolonged episode characterised by global savings in excess of investment coupled with lax monetary policy among leading economies resulted in extremely low interest rates in the world's principal markets. Investors in search of higher yields increasingly sought out investments that were riskier and potentially more profitable than bonds. In some instances, they chose paths that were previously untried. Growing risk appetite pressed risk premia down to lower levels than had prevailed for a long period of time.

**The US sub-prime crisis**

Among the developments that flourished in this environment in the United States was a relatively new mortgage lending market, the so-called sub-prime market, which focused on borrowers with limited or unknown capacity to pay. In the sub-prime market, loans were generally granted on initially favourable terms, which included a high loan-to-value ratio, low interest rates, and no repayment of principal. After a specified period of time, interest rates rose to market interest rate levels plus a substantial premium, and they changed thereafter in accordance with market interest rates. After a great wave of such lending, the interest rates on sub-prime mortgages rose in accordance with loan terms, at a time when market interest rates were on the rise. Beginning in mid-2005, there was evidence of growing delinquency on sub-prime loans, with default rates many times higher than on conventional housing loans.

Sub-prime mortgages constitute approximately 14% of all housing loans in the United States.[1] The original lenders generally sold sub-prime debt instruments to financial institutions, which then typically repackaged them into complex financial instruments

1. In a speech by Ben S. Bernanke at a conference on competition in the banking market, it was revealed that 14% of first-priority mortgage liens are sub-prime loans, and an additional 8-10% is near-prime loans. See also Ben S. Bernanke (2007), "The Subprime Mortgage Market", 43rd Annual Conference on Bank Structure and Competition, Federal Reserve Bank of Chicago, Illinois, May 2007.

called collateralised debt obligations (CDOs). By packaging these unsecured mortgage loans together with other underlying assets, it was possible to obtain good credit ratings from the rating agencies that assess financial product risk. On the surface, these structured credit products appeared relatively sound and offered good returns. The demand for CDOs was brisk, from investors inside and outside the United States. But when real estate values in the US began falling and delinquency rates rose, CDOs began trading at substantial discounts. Because the original loan-to-value ratio and real estate values were high, the underlying collateral often proved insufficient to guarantee the collection of debts in arrears.

**Spreading turmoil**

It appears as though banks, insurance companies, and other financial institutions were the main investors in CDOs, but in some instances the investors included parties such as municipalities, which had much less knowledge of the underlying risk and yet invested significant amounts in these structured securities. The crisis assumed greater proportions when two investment funds managed by the American investment firm Bear Stearns began experiencing serious financial difficulties in mid-2007. Other funds quickly followed suit. As a result, rating agencies began lowering the credit ratings of a number of securities linked to sub-prime loans. As uneasy investors responded by attempting to thin out their positions, it became apparent that the secondary market for CDOs was quite shallow. There was a substantial difference between the calculated value of the products and the actual market value once it was revealed that they were riskier than previously assumed.[2]

**Repercussions in the financial markets**

The discounts on these investments have affected the financial position of a large number of banks in the US and Europe. Most of the banks have not invested directly in sub-prime CDOs but have done so indirectly, through funds called special-purpose vehicles (SPVs). SPVs were usually not on the banks' balance sheets and were therefore not subjected to the stringent rules and close official monitoring that pertained to the banks' other investments. They were generally funded through the issuance of short-term securities called asset-backed commercial papers (ABCP), which were secured by sub-prime CDOs, among other things, and often backed up by some sort of guarantee from the bank concerned.[3] After two German banks announced enormous losses in the summer of 2007 as a result of special-purpose vehicles, demand for ABCP issued by SPVs contracted sharply. As a result, the yields on these bonds rose sharply. Banks that were directly or indirectly responsible for their funding were forced to seek funding in the interbank market.

Uncertainty concerning which banks had positions in SPVs related to sub-prime mortgages pressed interbank lending rates sharply upwards. The supply of short-term credit shrank dramati-

2. At this point, it became virtually impossible to sell CDOs related to sub-prime mortgages, and their value plummeted to near zero.

3. Conduits, Structured Investment Vehicles (SIV), and SIV-lites are the most common types of such specialised investment funds. The difference in these various types of investment funds lies particularly in how they are funded and to what degree the bank establishing them guarantees their obligations.

4. The primary reason that banks invest in sub-prime CDOs through special-purpose vehicles is that SPVs do not appear on the banks' balance sheets; therefore, the banks are not required to meet the customary liquidity and capital adequacy requirements (according to Basel I) in accordance with their risk. When conventional funding channels dried up (that is, when the SPVs could no longer fund themselves), the financial institution in question was forced to enhance its liquidity position in order to meet its obligations vis-à-vis the SPV. Many banks were therefore in a position of considerable uncertainty concerning their own liquidity requirements, as well as those of other banks. As a result, the supply of credit in the interbank market contracted sharply. It is still quite uncertain which banks are involved in SPVs and how large their commitments are.

cally because, in general, banks sought to improve their liquidity position in view of the increased uncertainty.[4] In addition, banks were reluctant to lend to one another because of uncertainty about which banks were involved in the crisis and how large the commitments in question were.

**Central banks on both sides of the Atlantic facilitate market activity**

As a result of the unrest in the interbank market during the fall, the European Central Bank, Bank of England and the US Federal Reserve resorted to various measures to guarantee banks access to short-term funding. In the euro area, the measures entailed granting banks unlimited loans at no extra cost and at the ECB's policy rate. The Federal Reserve took similar action and has lowered the federal funds rate by a total of 3.25 percentage points in seven separate rate cuts since the end of August 2007.

In September the Bank of England was forced to assist the British mortgage lender Northern Rock after it emerged that the bank's funding, which was based largely on the issue of short-term bonds, had collapsed. Ultimately, due to difficulties in the bank's funding, the British government announced in February 2008 that Northern Rock would be nationalised, the first such nationalisation to occur in the UK since the 1970s. In mid-March the investment bank JP Morgan made a takeover offer to Bear Stearns shareholders after it came to light that Bear Stearns was experiencing severe liquidity problems and was headed for collapse. The Federal Reserve facilitated JP Morgan's takeover in a move that indicated a clear policy change, as the Fed is generally disinclined to involve itself in the activities of investment banks.

**Sub-prime CDOs are a heavy burden for many banks**

Many of the world's largest financial institutions, including Citigroup, Morgan Stanley, Merrill Lynch, and UBS, have announced write-offs amounting to tens of billions of US dollars because of losses on transactions with CDOs related to sub-prime mortgages. These losses have cut a large swath out of those banks' earnings for 2007.



**Diminishing output growth, but inflationary pressure in the US**

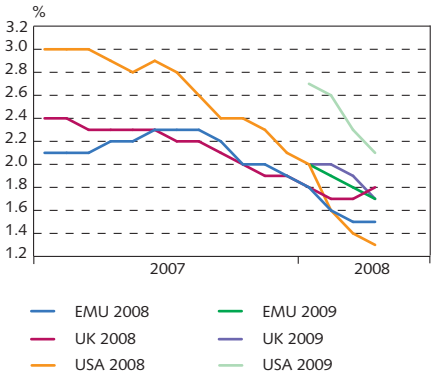
There is a growing likelihood that the sub-prime mortgage crisis and the downturn in the construction sector in the US will trigger a broad-based recession there in the first half of 2008. According to Consensus Forecasts, however, GDP growth in the United States is projected at 1.3% for the year as a whole. As of February, house prices had fallen by 13% over a 12-month period, and further decreases are expected. Diminished housing wealth among households has a deterring effect on private consumption growth. However, government economic measures will bolster demand, and the low US dollar exchange rate has stimulated exports.

The robust but slower GDP growth in Asia's leading emerging markets – particularly China and India – will tend to offset the economic slump in the US. Nonetheless, global economic growth is expected to slow down significantly. The IMF forecasts real output growth at 3.7% for the year 2008, 1.25 percentage points lower than in 2007. Experts from the IMF estimate a 25% likelihood that worldwide GDP growth will be under 3%, which is defined as a global recession. Due to the current financial market climate, forecasts of economic growth are subject to much more uncertainty than they

Chart 5

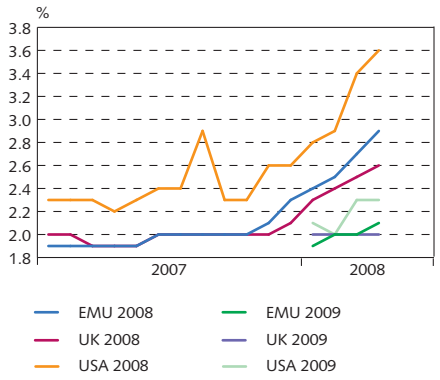
Output growth forecast for euro area, UK and USA[1]

Time axis shows month of forecast



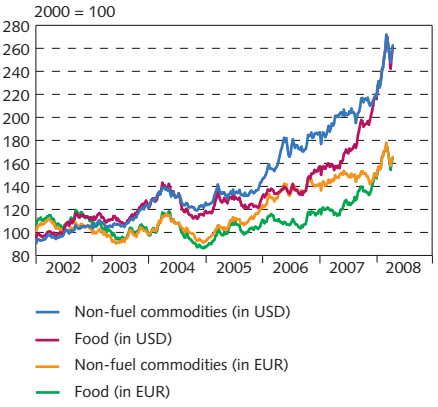

1. The first forecast of output growth in 2009 was published in January 2008.
*Source:* Consensus Forecast.

Chart 6
Inflation forecast for euro area, UK and USA[1]
Time axis shows month of forecast



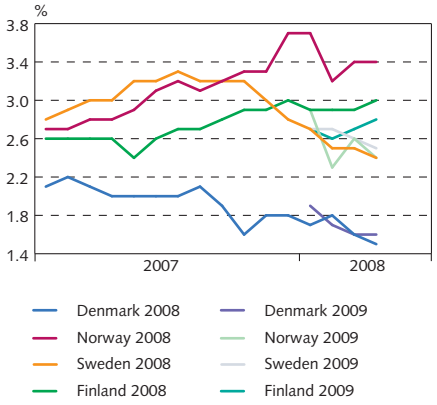

1. The first forecast of inflation in 2009 was published in January 2008.
*Source:* Consensus Forecast.

Chart 7
Commodity prices in international markets
Weekly data January 4, 2002 - April 18, 2008




*Source:* Reuters EcoWin.

Chart 8
Output growth forecast in the Nordic countr
Time axis shows month of forecast




1. The first forecast of output growth in 2009 was published in January 2008.
*Source:* Consensus Forecast.

would otherwise be. It appears more likely that growth will be below than above forecasted levels.

Although output growth has slowed, inflation rose in most parts of the world at the end of 2007, largely due to increases in oil, commodity, and food prices. In general, inflation is expected to remain high in 2008 and then fall in 2009, provided that slowing output growth has a dampening effect on rising commodity prices. In order for this to happen, however, the second-round effects of price increases in oil, food, and commodities will have to be modest.

**Underlying supply of global savings still substantial, but the repercussions of prolonged imbalances are coming to the fore**

Economic developments in the past several years have been characterised by escalating imbalances in global trade. The roots of the problem lie partly in the fact that various emerging and oil exporting nations have adopted an economic policy based on maintaining a low real or nominal exchange rate vis-à-vis the US dollar. Exports in these countries have grown by leaps and bounds, and sizeable trade surpluses have accumulated as a result. The rapid growth of these emerging countries, led by China, has resulted in staggering increases in oil prices and has boosted trade surpluses in oil exporting nations. In consequence, emerging nations and oil exporters have built up considerable foreign exchange reserves, which consist largely of government bonds issued by developed countries. The accumulation of reserves, together with low policy interest rates among developed countries, sustained very low long-term interest rates for a considerable period of time. This stimulated investor demand for investment options that were more profitable than government bonds, albeit more risky. As a result, the premia on market interest rates fell as well. These conditions promoted low levels of saving and a corresponding current account deficit in the US and other developed countries.

Doubts about the sustainability of this arrangement have been voiced for a long while, as have concerns about the problems associated with a return to equilibrium. In the past year, the consequences of increased risk in the financial system have come to the fore. Businesses and individuals who relied to a growing degree on short-term financing at low interest rates and frequent refinancing, as opposed to long-term financing at fixed rates, are faced with rising cost of capital as credit risk emerges. The adjustment towards global economic equilibrium has only just begun, however. The countries that have been the primary source of global savings continue to be so. Rising inflationary pressure – for example, in China – could force them to abandon their low-exchange rate policy and raise interest rates so as to contain domestic inflation. Appreciation of the Chinese yuan and other currencies could then fuel inflation and interest rate hikes in developed countries when demand for imported goods increases, export prices rise, trade surpluses in Asia diminish, and demand for developed countries' government bonds contracts. Such a turn of events would drastically limit the scope for central banks in developed countries to respond to financial difficulties by easing monetary policy. A rapid adjustment of this type could prove especially trying for the

countries that have had the largest current account deficits in recent years and are extremely dependent on ready access to global credit markets.

**Conditions in the main market areas of Icelandic financial companies' are broadly favourable, but uncertainty has grown**

With the exception of Iceland, which has a wide current account deficit, it is not likely that such an adjustment at the global level would prove overly burdensome in the main operating markets of Iceland's financial companies. Economic developments in the Nordic region have been relatively in balance and GDP growth broadly robust. Inflation has risen, however. The banks and the general economy in the Nordic countries have not sustained any significant damage as a result of the US sub-prime crisis; however, real estate prices are high in many areas and could fall in the next few years, especially if conditions in the financial markets remain difficult. It is likely that the British housing market is at a turning point. House prices have begun to drop, and the outlook is for continued housing deflation. The same is true of the real estate markets in the Nordic countries; for example, Denmark. If house prices drop in these countries, private consumption growth will probably slow down as a result.

**Deteriorating global financial market conditions will dampen domestic growth in the wake of the sharp drop in the exchange rate …**

The upheaval in the global financial markets has already made a palpable impact on the Icelandic economy; however, that impact has yet to emerge in full. The recent glut of liquidity in the international financial markets, together with low interest rates, enabled households and businesses to sidestep the Central Bank's tight monetary policy for a long period of time. For example, because of competition in the domestic market and advantageous conditions abroad, interest rates on long-term indexed loans continued to fall for 1½ years after the Central Bank began raising the policy rate. As a result, a substantial policy rate hike was needed to contain inflation and, in retrospect, even that was insufficient.

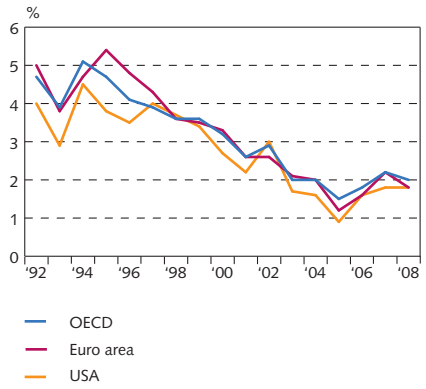
The abundance of liquidity played a key role in stimulating domestic demand, as well as strengthening the króna and fostering a housing boom. The same has occurred in other small, open economies such as that in New Zealand.[1] But conditions have changed dramatically since then. Interest rates on long-term indexed loans rose sharply in 2007. Since November 2005, when interest rates bottomed out at 4.15%, the Housing Financing Fund (HFF) and the commercial banks have raised their rates considerably. The HFF's rates are now 0.6 percentage points higher than they were before the banks entered the housing loan market in the fall of 2004, and the banks have raised their indexed lending rates even further. After rising risk premia rendered the banks incapable of competing with the HFF in the market

1. See, for example, the speech by Alan Bollard, Governor of the Reserve Bank of New Zealand, "*Financial stability* challenges for small open economies", 7 March 2008.

Chart 9

Average real long-term interest rates in the OECD[1], the USA and the euro area 1980-2008

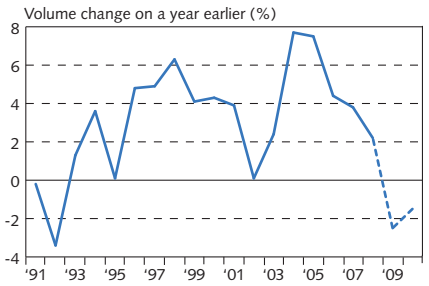
Annual data for ten-year Treasury bonds interest rates, in real terms based on the CPI




1. Weighted average for OECD countries, weights based on GDP in 2000 and purchasing power parities. Data for 2008 are based on OECD forecast.
*Sources:* OECD, Central Bank of Iceland.

Chart 10

Economic growth 1991-2010[1]

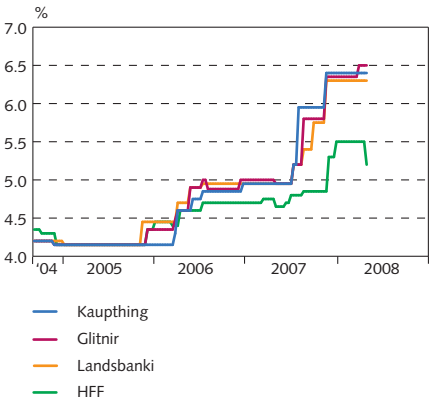



1. Central Bank baseline forecast 2008-2010.
*Sources:* Statistics Iceland, Central Bank of Iceland.

Chart 11

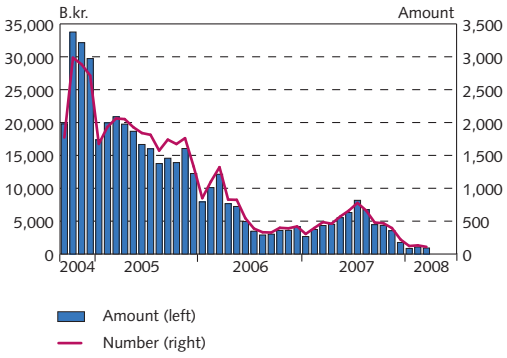
Interest rates on indexed housing loans

Housing loans' lowest interest rates




*Sources:* Housing Financing Fund, Central Bank of Iceland.

Chart 12
Number and amount of new indexed housing loans from DMBs
September 2004 - March 2008

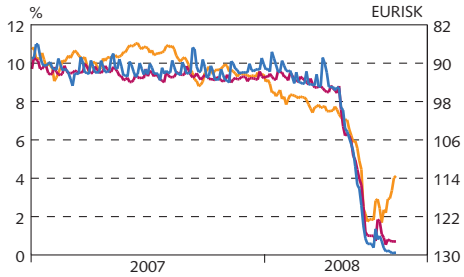



*Source:* Central Bank of Iceland



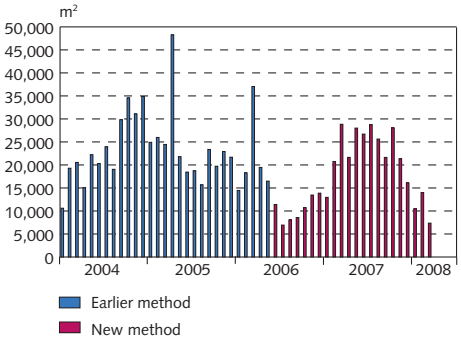


Chart 13
FX swap-implied ISK rates minus LIBOR and the exchange rate of the króna against the euro
Daily data August 1, 2007 - April 8, 2008




*Sources:* Bloomberg, Seðlabanki Íslands.

Chart 14
Turnover of new residential housing[1]
January 2004 - March 2008




1. Since June 2006 , the Land Registry of Iceland has specified whether transactions involved new property, but before that time, estimates were used.
*Source:* Land Registry of Iceland.

for indexed mortgage loans, they directed demand more and more towards foreign-denominated loans. Foreign credit markets have been virtually closed in the recent term, and the credit that Icelandic financial institutions have been able to obtain has borne a much higher premium than before. The premium on the interbank interest rates of foreign-denominated bank loans has reflected this trend, raising the interest rate of the loan by 3-6 percentage points and, in some instances, to as much as 7 percentage points. These developments, more stringent loan terms, and the banks' generally greater reluctance to grant such credit triggered a sharp decline in the banks' mortgage lending early in 2008. The banks had been the primary source of household credit during the period 2004-2007. The Housing Financing Fund and the pension funds have picked up a portion of the slack, but with loan-to-value ratios and loan amounts that are lower than the banks had granted previously.

Because these changes in the financial markets have occurred so recently, their full effects have yet to emerge. Stock prices dropped by roughly half from their record highs in mid-2007 until the end of March 2008 but have risen somewhat since then. In the short run, this may not have a dramatic effect on the Icelandic economy as a whole, but given the substantial number of leveraged securities purchases, the impact could be greater later on. Falling stock prices can also be expected to affect the real estate market. If share prices begin to fall once again, the effects will be felt on the general economy.

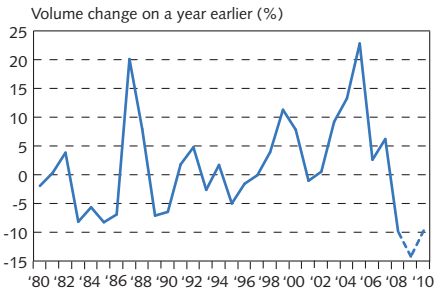
Despite a large current account deficit, which has been pinpointed in previous issues of *Financial Stability* as the likely source of exchange rate volatility, the króna was relatively stable until this year. In March, the króna depreciated precipitously, however, and bottomed out at nearly 25% below year-end levels. The fall in the króna can be traced largely to spiking premia on financial institutions' foreign loans, which meant that the interest rate differential in the currency swap market virtually disappeared. Because the foreign exchange swap market has been the principal channel for carry trade, this drastically reduced position-taking in the króna among foreign investors.[2]

The depreciation of the króna will lead, among other things, to a rapid contraction in imports and a narrowing of the deficit on the merchandise and service accounts. The impact on the balance on income will be negative, however. According to the macroeconomic forecast in *Monetary Bulletin* 2008/1, the trade account will broadly return to balance as a result of a considerable contraction in demand, while the current account deficit will approach 10% of GDP because of the remaining income account deficit. Whether the income account deficit will require an overall economic adjustment depends on whether the value of outward foreign direct investment is actually much higher than official figures indicate.[3] If the market value of foreign assets is substantially greater than their book value indicates, it is not a given that a large-scale adjustment will be required; however, current finan-

2. For further discussion, see Box III-1 in *Monetary Bulletin* 2008/1, pp. 26-29.
3. See the paper by Daníel Svavarsson, (2008), "International investment position: market valuation and the effects of external changes", in *Monetary Bulletin* 2008/1, pp. 89-99.

cial market conditions generate considerable uncertainty about the pace of the adjustment.

Chart 15
Real house prices 1980-2010[1]




1. Central Bank baseline forecast 2008-2010.
*Sources:* Statistics Iceland, Central Bank of Iceland.

**... and lead to substantial declines in real estate prices ...**

In all likelihood, the real estate market will play an important role in bringing demand into line with potential output. If house prices fall as they have done, for example, in the United States over the past year, this would trigger a number of second-round effects, as is discussed further later in this report. The demand for real estate and the supply of credit to purchase it could contract sharply and amplify the downturn. The last Central Bank forecast projected that house prices would fall 30% in real terms until 2011.

The first signs of cooling in the housing market emerged late in 2007. Turnover dropped sharply in the early months of 2008, in comparison with the levels of last fall – including turnover in new property – and housing inflation came to a halt. The number of new indexed mortgage loans issued by banks has diminished greatly. So far in 2008, the banks have granted just over 100 loans per month, as against a monthly average of 490 in 2007. The average loan amount has also declined.

Residential investment as a proportion of GDP was slightly more than 7% in 2007, or approximately twice as much as before the housing boom began in the 1990s. Thus it is likely that there will be a substantial contraction, especially if foreign workers leave Iceland and population growth slows down. Only in Spain, Denmark, and Ireland is residential investment proportionally greater. A decline in residential investment would have a profound effect on GDP growth and employment levels.

**... which will exacerbate the economic contraction over the next few years**

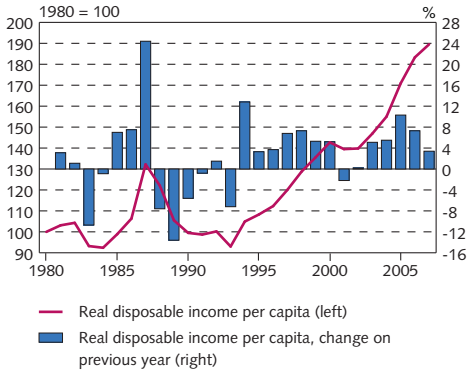
It is difficult to predict how much impact a chain of events like that described above might have on the national economy. The conditions reigning in recent years have been unique in many respects. Households and businesses are more indebted than ever before; the current account deficit has never been wider; in real terms, lending has grown at an unprecedented pace; and asset prices have reached record highs. Furthermore, the global integration of the Icelandic financial system has no historical parallel. Thus the economic models used under other conditions can hardly generate a realistic view of possible developments. One of the alternative scenarios in the April issue of *Monetary Bulletin* assumes that residential investment will contract by roughly 50% and return to proportional levels similar to those prior to the housing boom. Clearly, such a development would hit the construction industry quite hard.

## Domestic borrowers

**Households faced with a more difficult position in the next few years**

After the economic upswing that strengthened their balance sheets considerably, households are now faced with an adjustment period

Chart 16
Real disposable income per capita 1998-2007[1]

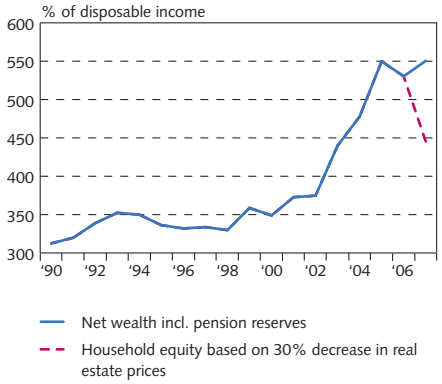



1. Estimate for 2007.
*Sources:* Statistics Iceland, Central Bank of Iceland.



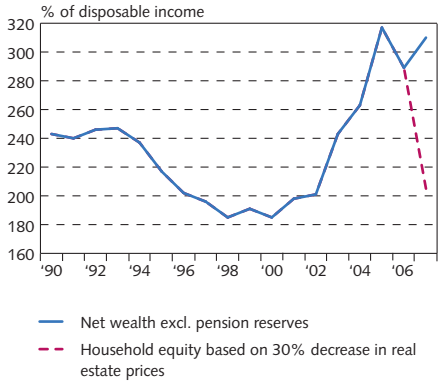


Chart 17
Net wealth of households including pension reserves 1990-2007[1]




1. Equities are estimates and for 2007 disposable income is estimated.
*Sources:* Statistics Iceland, Central Bank of Iceland.

Chart 18
Net wealth of households excluding pension reserves 1990-2007[1]




1. Equities are estimates and for 2007 disposable income is estimated.
*Sources:* Statistics Iceland, Central Bank of Iceland.

that could entail a significant setback. Developments in 2004 and 2005 were very much to their benefit. Real disposable income soared, as did asset prices; employment levels were on the rise, lending rates fell sharply, and the supply of long-term credit increased. These developments strengthened household balance sheets and reduced debt service in spite of mounting indebtedness. Households' margin for collateralised borrowing rose as well. A reversal occurred in 2006, when a sliding króna dampened real wage growth, but the situation proved temporary, and the trend was broadly upwards until the end of 2007. Households' equity rose once again in 2007 because rising house prices and increased investment more than offset rising debt. Even though interest rates shot up in two separate spurts – in early 2006 and in late 2007 – real estate prices continued their upward climb, primarily because real disposable income grew rapidly as a result of hefty wage hikes, cuts in taxes on income and consumption, and sustained high levels of employment. Thus the operational conditions for households were generally good in 2007 despite rising interest rates.

However, higher interest rates and rising housing prices drastically reduced households' real estate purchasing power in 2007. The impact was only slight for most of the year but began to escalate towards year-end, when housing inflation ground to a halt. Both households and lenders responded to the domestic interest rate hike by stepping up their foreign currency-denominated borrowing (see Box 2). By directing their demand for credit toward foreign currency-denominated loans, borrowers reduced their short-term debt service but took on increased foreign exchange risk. The result is a balance sheet that is more vulnerable to exchange rate movements than before, as many households have most likely discovered in the recent term. Furthermore, the share of low-yielding currencies, especially the yen and the Swiss franc, has increased as the premia on foreign interbank rates have risen.

Although the net asset position of households has improved overall in the past few years despite much greater indebtedness, this does not mean households are better prepared to withstand shocks than they were before. A great deal depends on the distribution of assets and liabilities. In recent years, the generally favourable operating conditions of households have rested on high employment rates, growing disposable income, rising house prices, and a relatively stable exchange rate. The likelihood that indebted households will experience financial difficulties has increased in the wake of the fall in the króna, and forecasts now project falling house prices, rising unemployment, and a contraction in domestic demand. The rapid accumulation of assets and liabilities in recent years has made the balance sheets of those households that have taken increased risk instead of preparing for a possible downturn more vulnerable to shocks, while other households have become much stronger.

**Dramatic changes on the asset side of household balance sheets**

Households' assets are substantial and far greater than liabilities. Rising property and stock prices and substantial residential investment have bolstered households' assets in the past few years. Nonetheless,

the asset side of the balance sheet is sensitive to any economic slump that could press real house prices downwards. According to the Central Bank's macroeconomic forecast, asset values will fall in the next few years.

At the end of 2007, household assets excluding pension reserves totalled approximately 3,680 b.kr., some 560 b.kr. more than at year-end 2006. Of that amount, the value of real estate exclusive of contents and automobiles increased by 366 b.kr. The 15% rise in nominal real estate prices over the year 2007 explains the bulk of the increase. The value of households' automobiles also rose somewhat.

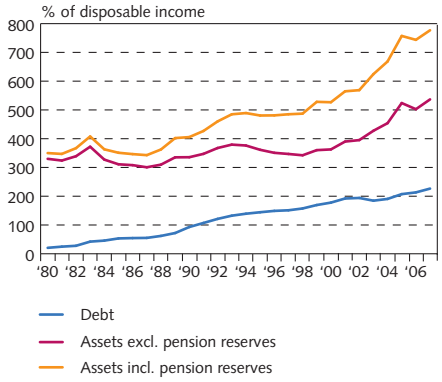
Households' shareholdings have dropped in value in the recent term, however. Share prices skyrocketed in the first half of 2007, but virtually the entire increase reversed before the end of the year, with prices continuing to fall in the first months of 2008. While reliable information on households' shareholdings is not available, it can be assumed that equity holdings are concentrated largely among relatively few individual investors. Households' equity holdings may be indirect to some extent, however; that is, in the form of private limited companies, some of them leveraged. When share prices fall sharply, financial institutions that have provided credit for the purchase of the securities may demand increased collateral. In some instances, this could conceivably result in a household balance sheet liability that was originally an off-balance sheet item.

The upswing in the housing market seems to have come to an end. Last year's rise in house prices, despite disadvantageous interest rate developments, can probably be traced to the temporary effects of tax cuts and the developments in employment levels and wages, which in turn pressed disposable income sharply upwards. The tax cuts delayed the economic adjustment for the short term, but they have no effect on long-term housing market equilibrium. If financial conditions deteriorate at the same time that the effects of these measures peter out, a marked decline in house prices will be more likely.

As is stated earlier in this report, the inflation forecast published by the Central Bank on April 10 assumes that house prices will drop by 30% in real terms over the next three years. Such a decrease would reduce household equity, including pension reserves, from 550% of disposable income to 445%. The uncertainty attending such forecasts is enormous. The real decrease assumed in the inflation forecast would merely be an average figure, however, if the periods of deflation that followed 24 similar housing inflation episodes in 15 OECD nations over the past three decades are any indication of likely developments. The Central Bank's forecast assumes somewhat swifter than average housing deflation, however.[4] The housing boom was an international phenomenon, and it appears as though the ensuing deflationary period will be international in scope as well. In many major cities in the United States, Great Britain, the Nordic countries, New Zealand, and elsewhere, house prices have already fallen sharply; for example, US real estate prices have fallen by 13% on average in a single year, with the one-year price drop in real terms approaching 20-25% in

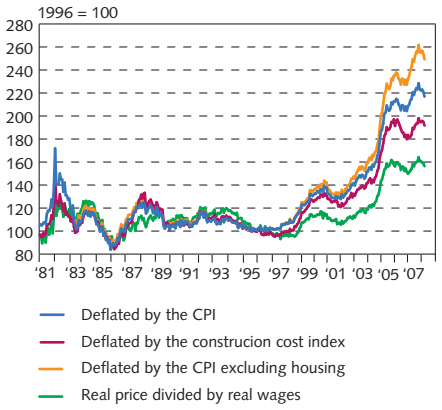
4. See, for example, Goldman Sachs, Global Economics Weekly, April 16, 2008.

Chart 19
Household assets and debt 1980-2007[1]



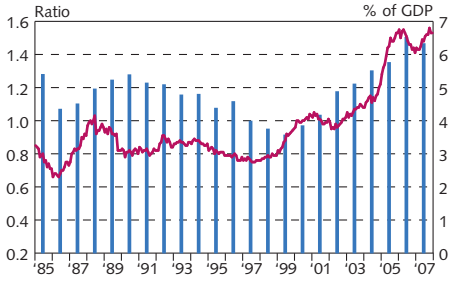

1. New classification of lending from 2003. Equities are estimates and for 2007 disposable income is estimated.
*Sources:* Statistics Iceland, Central Bank of Iceland.

Chart 20
Price in real terms of detached residential housing in the greater Reykjavík area
January 1981 - March 2008




*Sources:* Land Registry of Iceland, Statistics Iceland, Central Bank of Iceland.

Chart 21
Housing market prices, construction cost and residential investment 1985-2007[1]




1. The red line indicates the ratio of market prices of apartments in the Greater Reykjavík Area to construction cost. Both indices are normalised to the average for 1985-2004.
*Sources:* Land Registry of Iceland, Statistics Iceland.

Box 2

# Households' foreign debt

Icelandic households' foreign debt has soared in the past four years, but from a low level. By the end of 2007 it was nearly 13% of total household debt in the credit system. In March 2008, foreign currency-denominated loans constituted some 23% of total lending to households by deposit money banks, as opposed to 4.5% in January 2004. Such loans became available to households only a short time ago. While foreign loans were initially granted primarily for motor vehicle purchases, borrowers have begun in ever greater measure to take foreign currency-denominated mortgage loans for residential property purchases. When Icelandic banks began lately to lose ground in competition with the Housing Financing Fund (HFF), the HFF was able to offer indexed mortgage loans at lower interest rates than the banks were offering, and the banks responded by offering a greater number of foreign loans. It can also be assumed that the demand for foreign loans increased as a result of persistent inflation.

Foreign-currency loans are accompanied by three main types of risk: interest rate risk, foreign exchange risk, and the risk attached to changes in the risk premium. The recent economic upswing in Iceland led to tight monetary policy and a wider interest rate differential with abroad at a time when the real exchange rate of the króna was high in a historical context. The broad interest rate differential encouraged borrowers to take foreign loans despite the fact that the strong króna entailed heightened foreign exchange risk. The likelihood of a drop in the króna increases as the exchange rate rises above long-term equilibrium. It is difficult to estimate the equilibrium real exchange rate precisely; furthermore, deviations from equilibrium are often prolonged, and it is impossible to state exactly when a return to equilibrium might occur. Therefore, expectations of exchange rate movements could easily develop in a manner that underestimates foreign exchange risk.

Foreign borrowing by Icelandic households increased considerably in 2007 despite the appreciation of the króna. This indicates that households did not expect greater foreign exchange risk even though the króna had become stronger. Because of the depreciation of the króna over the past few months, debt service on foreign loans has increased markedly. This increase has been greatest on loans in low-yielding currencies such as the yen and the Swiss franc, which is unfortunate because borrowing in those currencies has increased more than borrowing in the euro and the US dollar. These low-yielding currencies are very weak from a historical perspective and could potentially appreciate substantially, especially the yen. Further depreciation of the króna concurrent with appreciation of low-yielding currencies would make a profound impact on the debt service of such loans. An interest rate hike in Japan, for example, where interest rates are near their historical low, could trigger a rise in the exchange rate of the yen and a fall in the króna. Therefore, in such instances, interest rate risk and foreign exchange risk are interrelated.

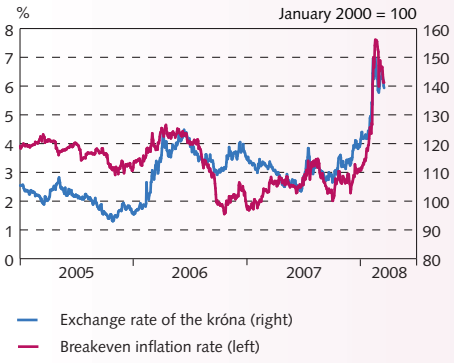
Even though base interest rates remain low, there is no guarantee that interest rates on foreign-denominated loans will not rise. This has already happened, in fact. Icelandic banks have not been sheltered from the problems in the global financial markets, and their risk premia have risen considerably in recent months. The terms offered on foreign loans in the future will take account of this, and interest rates will rise, even on outstanding loans.

As an illustration of fluctuations in debt service on foreign loans, it is useful to look at an example of a borrower who purchased a home at 25 m.kr. in June 2007. In the example, the homebuyer borrowed 60% of the purchase price of the property,

Chart 1

Breakeven inflation rate and exchange rate of the króna[1]

Daily data January 4, 2005 - April 28, 2008

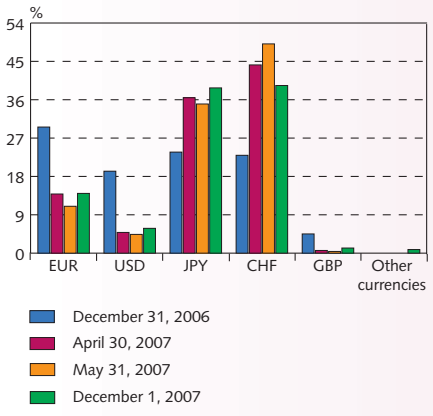



1. Spread between RIKB 13 0517 and HFF150914. Exchange rate of the króna according to a broad trade index.
*Source:* Central Bank of Iceland.

Chart 2

Currency composition of households' foreign currency-denominated borrowing

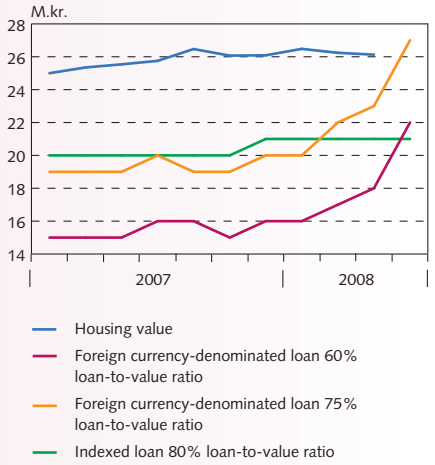
Kaupthing, Landsbanki, Glitnir




*Source:* Central Bank of Iceland.

and the currency composition of the loan was the average currency basket for foreign loans taken by Icelandic households. Given these premises and the developments in interest rates and exchange rates, the monthly payments on the loan would have risen by 44,000 kr., from just under 94,000 kr. in mid-2007 to 138,000 kr. in the beginning of April 2008. The outstanding balance of the loan would have been 6.6 m.kr. higher than the original loan amount. Given the developments in real estate prices in the greater Reykjavík area over the same period, it can be assumed that the market value of the purchased property rose by just over 1 m.kr., which would bring the loan-to-value ratio to almost 83%, as opposed to 60% at the beginning of the loan period. If the purchaser were to sell the property at that time – for example, if he did not have the wherewithal to meet the required debt service – he would have lost a large share of the equity he contributed to the purchase. It is appropriate to bear in mind, however, that the króna has appreciated somewhat since the beginning of April which is used in the example.

Chart 3
Comparison of indexed and foreign currency-denominated housing loans and development of housing value[1]
June 2007 - April 2008



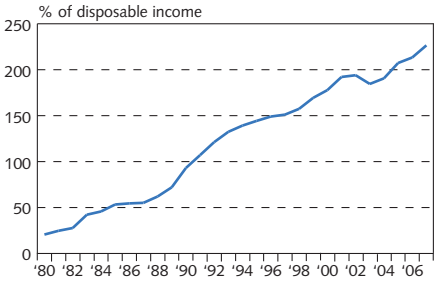

1. Loan-to-value ratios correspond to common loan-to-value ratios in June 2007. A foreign currency-denominated loan with 75% loan-to-value ratio is also calculated.
*Sources:* Housing Financing Fund, Reuters Ecowin, Central Bank of Iceland.



some cities. It is also appropriate to bear in mind that, if the Central Bank's forecast materialises, real house prices will only have fallen to the average for 1995-2007 by the beginning of 2011.

There are a number of reasons for the assumption that such a large drop will occur in real house prices in such a relatively short period of time. First, the recent housing inflation period in Iceland entailed one of the most dramatic spikes known in real house prices, with values rising by 128% between 1997 and 2008. Second, most of the catalysts of the housing boom – soaring disposable income, plummeting real long-term interest rates in 2004-2005, increased supply of credit (larger loan amounts, higher LTV ratios, and longer maturities than previously known), and enhanced opportunities to refinance household debt and use housing equity as collateral – have lost steam quickly. These drivers of the housing upswing have either lost momentum entirely or are on the wane. The supply of credit has shrunk, interest rates have risen, the króna has fallen, and the outlook is for a contraction in employment and real disposable income. All of these elements are conducive to a contraction in demand concurrent with a considerable supply of new property on the market. A drop in real property values will exacerbate financial institutions' reluctance to grant loans secured by real estate. Furthermore, a poor inflation outlook and high inflation expectations limit the scope for a monetary policy response to an economic contraction.

Chart 22
Household debt as a % of disposable income 1980-2007[1]



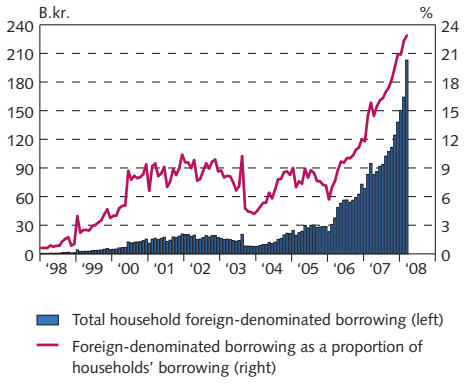

1. New classification of lending from 2003. Disposable income for 2007 is estimated.
*Sources:* Statistics Iceland, Central Bank of Iceland.

**Household debt and currency risk have increased**

As in previous years, household debt rose significantly in 2007, totalling 1,552 b.kr. at year-end, having increased by 229 b.kr. year-on-year, nearly 11% in real terms. As a proportion of disposable income, debt increased from 213% to 226% between January and

Chart 23

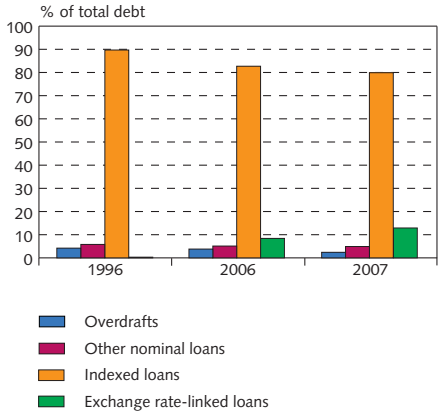
Foreign currency-denominated borrowing by households and as a share of their total borrowing




*Source:* Central Bank of Iceland.

Chart 24

Composition of household debt with the credit system at year-end 1996, 2006 and 2007




*Source:* Central Bank of Iceland.



December 2007. In nominal terms, the increase was even greater than in 2005, when the wave of increased borrowing and refinancing reached its peak. The salient feature of the increase, however, was the large share of foreign currency-denominated debt among new loans taken by households in 2007. As a result, the balance sheets of the households concerned are much more sensitive to fluctuations in the exchange rate of the króna. Increased demand for foreign currency-denominated loans is a response to soaring interest rates on indexed mortgage loans over the past year. The increased weight of foreign-currency loans means that the real interest rate burden, assuming a stable exchange rate, has increased less than it would otherwise have done, even though the maturity of the foreign loans is most likely shorter. However, the depreciation of the króna will reverse this trend temporarily.[5] In addition, interest rate premia on foreign currency-denominated loans have risen even though policy interest rates in most of the borrowed currencies remain low. Other things being equal, the fall in the króna should make it more advantageous for households to borrow in foreign currencies. A lower real exchange rate reduces the likelihood that the price of foreign currency will rise more than the domestic price level. The problem is, however, that the supply of foreign-currency loans has shrunk and the terms have deteriorated.

As a proportion of total household debt in the credit system, foreign-currency loans increased from 8.4% at year-end 2006 to just under 13% at the end of 2007. By the end of March 2008, that figure had risen to 23% of household debt in the Icelandic banking system. Over the same period, the proportion of indexed loans to total household debt fell from just under 83% to 80%. Although foreign-denominated loans constitute a lower share of household debt in Iceland than they do in various countries in Eastern Europe and elsewhere, it is clear that many households now face much greater foreign exchange risk than they did previously. Because virtually the entire household debt stock is either indexed or denominated in foreign currency, and the domestic price level is extremely sensitive to large exchange rate movements, a depreciation of the króna causes a dramatic increase in the debt stock. A small portion of the work force receives its wages in foreign currency and is therefore exposed to limited foreign exchange risk.

**Debt rose proportionally more among those most indebted**

A growing ratio of debt to disposable income is an imperfect indicator of the risk faced by the credit system as a result of indebted balance sheets. Longer-term loans at lower interest rates impose a greater debt burden on households without straining their payment capacity to the breaking point. But the risk is more dependent on the distribution of the debt than on the total proportion. Data on debt

5. During the lifetime of a 30-year loan, the interest rate differential should be in favour of the foreign-currency loan in an amount equivalent to the risk premium on the króna. The maturity of the loan may also be shorter, which reduces the total interest burden over the entire loan period. Fluctuations are much greater, however, because of exchange rate movements and variable interest rates. Thus it is extremely important that the borrower's payment capacity allows for such fluctuations.

Box 3

# Household debt according to income tax return data

At year-end 2007, average household debt in Iceland totalled 230% of disposable income. Carrying debt amounting to 230% of one's disposable income on a 30-year indexed mortgage annuity bearing 5% interest leads to debt service equalling 15% of that same income, which is considered a manageable service burden under normal circumstances. However, a credit institution's risk depends more on the financial position of the weakest debtors than on that of the average debtor; therefore, averages give limited information about the risk associated with the position of debtors. To get a closer view of distributions, the Central Bank sought assistance from the Director of Internal Revenue in order to compile income tax return data on the distribution of household assets and debt, as it did prior to the publication of *Financial Stability* 2007. These data make it possible to carry out a more in-depth analysis; however, they are not available until tax return processing is complete, some 7-12 months after the end of the tax year.

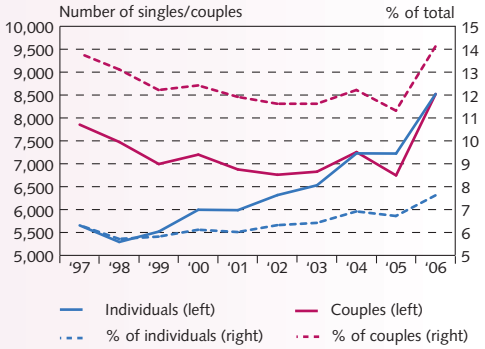
Particular scrutiny was given to individuals and couples whose debt exceeded their assets[1] as well as exceeding twice their after-tax income (plus benefit payments).[2] The size of these groups can be seen in Chart 1. They declined in number in 2005 in spite of a surge in lending growth, as real estate values rose considerably more than debt and income; therefore, some of the tax returns dropped out of the group under scrutiny. In 2006, however, the number of individuals in this group increased by 18% and the number of couples by 26%, as debt rose more than income and considerably more than property values.

The debt carried by these groups has increased in the past few years. In particular, couples' debt has increased substantially in excess of disposable income, as can be seen in Chart 2. The amount owed by indebted individuals does not seem to have increased in excess of disposable income; however, it is conceivable that the increase in the number of persons who meet above criteria was concentrated among those who were near the limit. The same seems to be true of the drop in the debt ratio among couples in 2006, as it comes to light that if a large enough number of the least-indebted 2006 couples are omitted, so that the number of couples examined rises in tandem with the total number of couples, the debt ratio rises rather than dropping slightly ("proportional increase" in Chart 2). This is not the case for the individuals examined.

It is by no means certain that households whose debt exceeds the asset and income levels specified above will experience difficulty paying their debts. If a (typical Icelandic) 30-year indexed mortgage annuity bears 4½% interest and the loan amount is twice the borrower's disposable income, debt service will amount to 12% of that income, whereas with a rate of 6%, the service burden is 15%. Such debt service is usually manageable. However, it has been asserted that if total debt service equals or exceeds 30% of disposable income, the probability of default is vastly increased.[3] This is why there is good reason to focus in particular on those who are even more indebted.

Chart 1

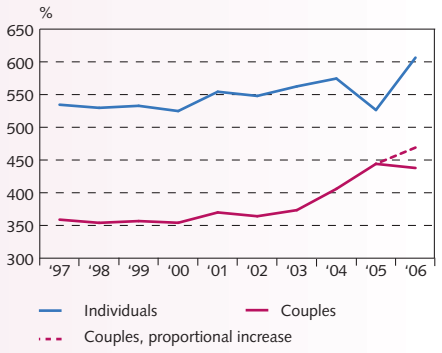
Number of highly indebted taxpayers 1997-2006[1]




1. Tax returns with debt in excess of double post-tax-income as well as negative equity.
*Sources:* Internal revenue data, Central bank of Iceland.

Chart 2

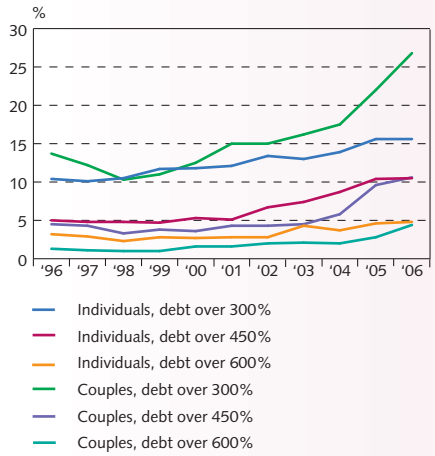
Debt in % of disposable income 1997-2006[1]




1. Tax returns with debt in excess of double disposable income as well as negative equity.
*Sources:* Internal revenue data, Central bank of Iceland.

1. Equities are significantly underreported here. They appear in tax returns as "nominal" value, which is essentially equal to the number of shares.
2. Hereinafter the term "disposable income" is used, although this usage is not precisely correct. Also examined were those owing more than 80% of assets and at least twice their disposable income; however, this increased the size of the group by less than 1% for all years. The previously defined group was therefore considered sufficient.
3. See Girouard, N., M. Kennedy and C. André, (2006). "Has the rise in debt made households more vulnerable?" OECD Economics Department Working Paper no. 535, 2006. Published as an appendix in *OECD Economic Outlook*, December 2006.

Chart 3
Number of highly indebted taxpayers
1997-2006[1]




1. Debt in excess of 300%, 450% or 600% of post-tax income.
*Sources:* Internal revenue data, Central bank of Iceland.

Chart 3 illustrates the percentage of all individuals and couples who report debt in excess of 300%, 450%, and 600% of their after-tax income. Assuming that the debt bears a 5% real interest rate and is repaid in annuity payments over 30 years, debt service will be 20%, 29%, and 39%, respectively, of that income. The chart shows that the number of borrowers in the more indebted groups has grown in recent years. The 450% group has expanded rather quickly from 5% to 10% of the total, and the 600% group approaches 5% of the total and grew significantly in 2006, especially among couples. It is interesting to note that there are proportionally more individuals than couples in the more indebted groups. This could be attributable to student loans and calls for further examination. At all events, income tax return data confirm the correlation between increased indebtedness and the rising number of households with a high ratio of debt to disposable income, and they confirm that a growing number of taxpayers are heavily in debt.



distribution among individual groups are available with a time lag, however, as they are based on figures from income tax returns, which are currently available only through 2006 (see Box 3). These data show that the number of households whose debt exceeds their assets and is more than double their disposable income rose proportionally in 2006. In particular, the number of couples owing more than three times their disposable income has increased rapidly. The number of those most heavily in debt – that is, those owing 450% to 600% of after-tax income – doubled between 2003 and 2006. When debt reaches 600% of income, debt service approaches 40% of after-tax income and becomes even higher if the terms of a portion of the debt are more unfavourable. Some borrowers will probably end up in this group because of temporary conditions such as youth, leave from paid work, or short-term difficulties. For those who cannot expect their income to increase in the future, such a high proportion of debt is an indication that they are quite likely to experience repayment difficulties.

The risk is probably greatest, however, among those who purchased housing at a very high loan-to-value ratio in 2007, when real prices were near their peak, and after a sharp increase in indexed interest rates.[6] Given the weakening of the króna in the past month, the value of a foreign-denominated mortgage loan taken in the summer of 2007 has increased by an amount equivalent to the equity presented by the buyer at the time of purchase (see Box 2).

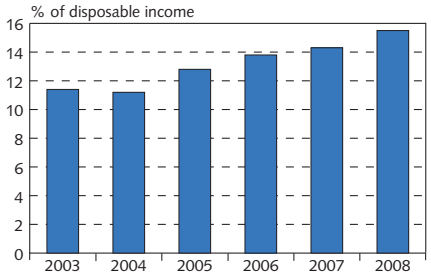
**Real estate purchasing power considerably reduced**

The position of people buying their first home has deteriorated considerably. The drop in mortgage interest rates in 2004-2005 has reversed,

6. For further discussion of the increased risk of negative equity when real housing prices are historically high, see the paper by Gudmundur Gudmundsson, "Risks in higher loan-to-value ratios of housing," in *Monetary Bulletin* 2005/2, pp. 57-62.

and the 90% rise in average house prices since 2003 is now emerging fully in the form of curtailed real estate purchasing power, especially as regards the foreign exchange and interest rate risk accompanying foreign-currency loans. This has taken place despite the rapid growth in disposable income in 2007. In chart 25 it is assumed that a couple with average after-tax income purchases a 100-m2 apartment and borrows 80% of the purchase price.[7] For this couple, the proportion of mortgage payments to disposable income rose from 11% in 2003 to 15% in 2008,[8] and it could rise still further if real disposable income contracts and unemployment increases.

Chart 25
Real estate purchasing power of couples with average income 2003-2008[1]

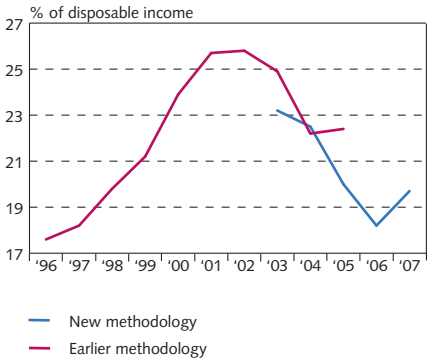



1. Data for 2008 and disposable income data for 2007 are estimated.
*Source:* Central Bank of Iceland.

**Rapid growth in disposable income and increased debt service**

After having fallen for several years, household debt service as a percentage of disposable income increased in 2007, despite rapid growth in disposable income (see Box 4). This is due in particular to higher interest rates on new loans, plus continuing debt accumulation, which reflects the increase in house prices to some extent. The bulk of household debt is at fixed interest rates, however. Increased debt service therefore affects households to varying degrees and is likely to hit new homebuyers hardest. The króna remained rather strong in 2007; therefore, it can be assumed that the increased proportion of foreign currency-denominated debt, which bears lower real interest rates than indexed debt, has counteracted it somewhat. On the other hand, the depreciation of the króna has raised debt service for a large number of households. In addition, it is appropriate to bear in mind that the figures for 2007 represent total payments in that year; they do not indicate changes in debt service within the year. Furthermore, average figures can give a misleading view of the position of individual groups. For households purchasing their first property and those purchasing considerably more expensive property than they owned previously, debt service has increased in particular as a result of the rise in the CPI.

Chart 26
Household debt service 1996-2007[1]




1. Earlier and recent Central Bank estimates.
*Sources:* Statistics Iceland, Central Bank of Iceland.

**Diminished resilience of household balance sheets against shocks**

Economic developments in 2007 were unusually advantageous to households. Disposable income and employment levels rose substantially, as did asset prices. If the forecasts of a forthcoming economic contraction are borne out, household balance sheets will be weakened as a result; however, the majority of households have some margin for error. The depreciation of the króna will increase debt service as domestic demand contracts. Real estate prices rose in 2007, even though they may have been far above long-term equilibrium. This increases the risk of a swift decline. The past six months' drop in stock prices is quite a blow for households that have made leveraged securities purchases, though that group is probably a small one. Inflation has surged in the wake of the fall in the króna, and according to the Central Bank's most recent inflation forecast, the inflation target will

7. Based on an indexed 40-year annuity loan bearing average interest rates at any given time.
8. Based on estimated figures for disposable income in 2007 and 2008.

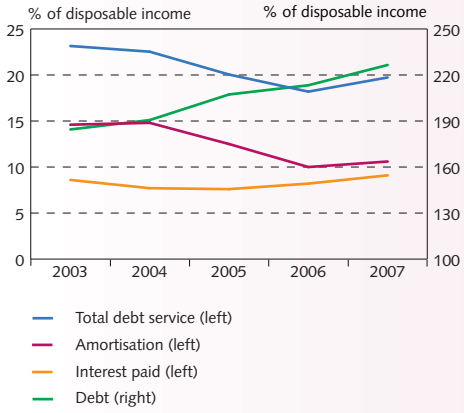
Box 4

# Household debt service

Prior to the publication of *Financial Stability* 2007, the Central Bank improved its methods for the compilation of information on household balance sheets and debt service during the period from 2003 to 2006.[1] Data on amortisation and interest payments on household loans were obtained from the main banks and pension funds, while previous data compilation had relied on data from the Housing Financing Fund (HFF) and the Icelandic Student Loan Fund (LÍN), as well as rough estimates of debt service on loans from banks and pension funds. Revised data for the period 2003-2006 are now available, as are data for 2007. The revised data on amortisation payments on household debt reveal somewhat lower figures than were used for *Financial Stability* 2007. This can be attributed to the fact that, in some instances, older data made no distinction between amortisation payments and prepayment of loans. Now it was especially specified that only amortisation be taken into account and not prepayment, as this provides a more accurate view of debt service. However, this does not change the overall conclusions concerning developments in total debt service over the past several years.

Chart 1

Debt service and debt as a ratio of disposable income 2003-2007




*Sources:* Statistics Iceland, Central Bank of Iceland.

## Household debt service rose as a percentage of disposable income in 2007

Household debt service as a proportion of disposable income rose from 18% in 2006 to nearly 20% in 2007. In 2007, total amortisation payments on household debt increased considerably year-on-year after having remained relatively stable since 2003. Total interest payments have increased considerably since 2005, however, which is consistent with rising interest rates on new mortgage loans. Because the bulk of household debt has been at fixed interest rates since 2004-2005, when many homeowners refinanced with new mortgage loans bearing lower interest rates and longer maturities, the effect on average debt service is not significant. The increase in debt service affects only those who take new loans.

It is also appropriate to bear in mind that households' disposable income rose sharply in 2007, or by 10% year-on-year; nonetheless, debt service increased as a percentage of disposable income. On the other hand, the increase is far from offsetting a decrease of 5 percentage points in debt service between 2003 and 2006. During that period, debt increased by 48% in real terms, while real disposable income rose by 28%.[2] The factor that was most important in reducing debt service during that period was the fact that households had the option of refinancing a large portion of their outstanding debt at lower interest rates and much longer maturities. The lengthening of the repayment period had the greatest effect, as Chart 1 shows. Consequently, debt service as a percentage of disposable income remained somewhat lower in 2007 than in 2003 despite the fact that the interest burden rose somewhat between those years.

## Outlook for rising debt service in coming years

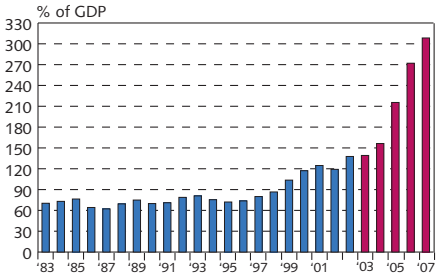
Although the financial position of households was broadly sound in 2007, such a comprehensive picture can camouflage underlying problems. Changes in 2007 and the early months of 2008 have made a decisive impact on households. Their financial conditions have deteriorated. These developments are most burdensome for new borrowers and those who have taken foreign-currency loans in recent years. The figures for 2007 reflect this group's difficulties only to a limited degree. In the wake of the debt accumulation of the past several years, many household balance sheets are more vulnerable to unforeseen shocks than they were previously.

1. See the discussion on household debt, assets, and debt service in Appendix 1 of *Financial Stability* 2007, pp. 33-39.
2. Based on disposable income figures from Statistics Iceland. The figures for 2007 are estimated.

not be reached until 2010. Thus interest rates will have to remain high in the near term despite the probability of an economic slump. Because of the rise in indexed debt and the increasing proportion of foreign-currency debt, the depreciation of the króna has shifted household debt upwards at the same time that asset prices have fallen.

Because the bulk of indexed household debt is at fixed long-term interest rates, however, the vast majority of households are in a good position to face temporary shocks, provided that unemployment does not lead to a sizeable and prolonged loss of income. If they have used long maturities as an opportunity to take on even more debt, however, it could prove difficult for them to respond to difficulties by lengthening loan maturities. In some instances, the interest rates on commercial banks' indexed mortgage loans are reviewed every five years. In those cases, the interest rates on indexed mortgage loans granted in the fall of 2004 will be subject to review in 2009, and the interest burden could increase if real interest rates remain high.

Chart 27
Corporate debt 1970-2007[1]



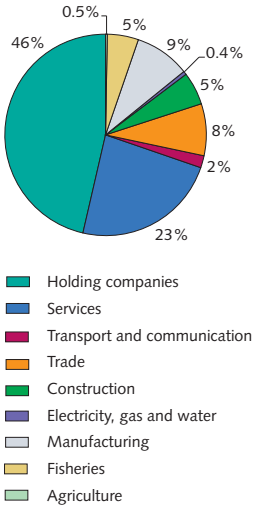

1. New classification of lending from 2003. Two columns are shown for that year: blue for the older classification and red for the new one.
*Source:* Central Bank of Iceland.

**Corporate balance sheets have grown substantially in recent years**

Of loans granted to Icelandic residents, approximately 70% of loans from the credit system and 60% from Deposit Money Bank (DMB) institutions represent loans to companies. Business debt has increased threefold in four years' time and has therefore risen even faster than household debt. At the end of 2007, business debt was more than three times Iceland's GDP (see chart 27), following an increase amounting to 40% of GDP. Corporate assets have also increased astronomically, but their true value is surrounded by greater uncertainty. Leveraged purchases of shares and direct acquisitions of foreign companies are largely responsible for the growth of Icelandic companies' balance sheets in recent years. Icelandic financial companies have played an important role in channelling borrowed funds obtained in the global markets into domestic firms that have invested in foreign companies. In many instances, holding companies are behind the purchases of foreign share capital and foreign companies. A large proportion of outstanding business debt to the banking system consists of holding company debt, which accounted for 46% of outstanding debt in March 2008. An assessment of loan portfolio quality must therefore depend on the liability position. Because holding companies' activities take place both in Iceland and abroad, however, it is extremely difficult to assess the impact of domestic economic developments on their overall position. Holding companies have increased rapidly in number in recent years. In 2007, new holding company registrations numbered 740, and for the past three years the annual increase has averaged 36%. The year-2007 balance sheets of the largest unlisted holding companies for which data have been compiled show that the proportion of liabilities to equity has risen considerably among holding companies in the past two years, while the equity ratio has fallen correspondingly over the same period.

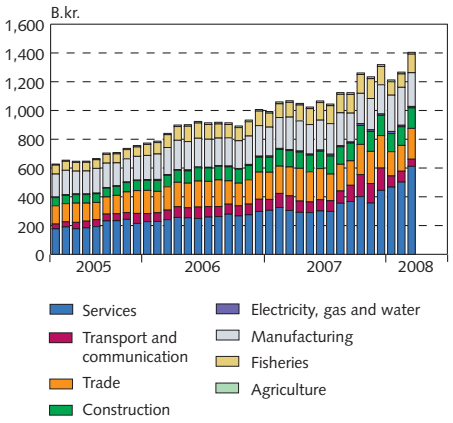
Another striking change is the increased proportion of foreign-denominated business debt. At the end of March, 67% of business debt to DMB institutions was denominated in foreign currency, as opposed to 62% at the same time in 2007. The increased weight

Chart 28
Deposit Money Bank (DMB) lending to businesses by sectors
March 2008



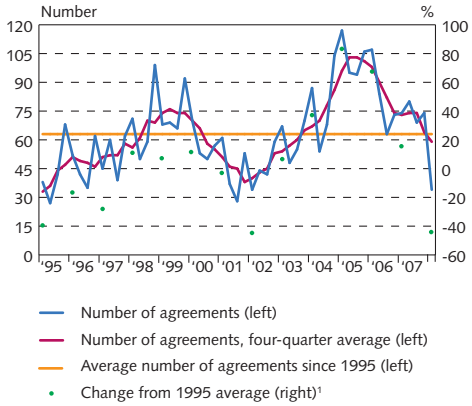

*Source:* Central Bank of Iceland.

Chart 29
Deposit Money Bank (DMB) lending to businesses (excl. holding companies)
April 2005 - March 2008



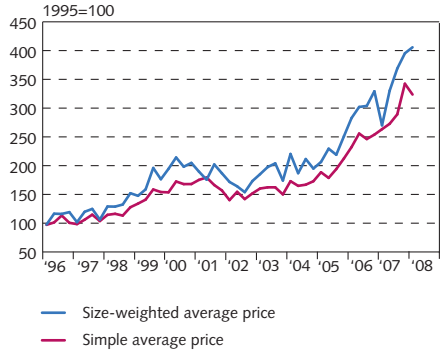

*Source:* Central Bank of Iceland.

Chart 30
Turnover of commercial housing
Number of registered sales agreements for commercial housing




1. Shows the percentage change of the first quarter of each year from the average of number of contracts since 1995.
*Sources:* Land Registry of Iceland, Central Bank of Iceland.

Chart 31
Price of commercial housing in the greater Reykjavík area, in real terms[1]
Q1/1996 - Q1/2008




1. Deflated by the credit terms index.
*Sources:* Land Registry of Iceland, Central Bank projections.

of foreign-currency debt is largely traceable to foreign investments financed with foreign loans; however, the proportion of foreign financing seems also to have increased dramatically among companies not engaged in overseas operations. This applies, for example, to companies involved in the services and construction sectors. Virtually all of the past few years' accumulation of debt is due to foreign-denominated loans, while indexed and overdraft loans have become relatively fewer. In these sectors, there has also been a surge in new company registrations in recent years.

**Growth in foreign-denominated debt among construction companies cause for concern**

There is reason to examine trends in borrowing among companies in the construction industry because of the phenomenal growth in the sector in the recent past and the corresponding likelihood of a contraction in the next few years. Foreign-currency debt more than doubled in the sector in 2007, while overdrafts and indexed loans declined. It appears as though construction companies fled high domestic interest rates and inflation, especially around the middle of 2007. The exchange rates of the currencies most commonly borrowed have risen by approximately 40% since the lion's share of the foreign-denominated loans were taken. If residential and commercial real estate prices fall in the next few years and turnover falls off as well, the increased debt service among construction companies could cause operational problems later on, at least for some of them.

There are clear signs of cooling in the residential housing market, as has already been described in this report. The commercial housing market seems to lag somewhat behind the residential market in this respect; however, the first signs have already emerged. The number of purchase agreements registered in the first quarter of 2008 was down 54% year-on-year and is now some 46% lower than the average since 1995. Given that real commercial property prices have risen in excess of residential price levels, a sharp decline can be expected in the next few years. If such a decline does indeed occur and construction companies are left with a portfolio of properties that are difficult to sell, they could be faced with serious problems.

Although many indicators suggest that the position of construction companies will deteriorate in the next few years, data compiled from the larger companies in the sector imply that their 2007 balance sheets were well cushioned against a downturn. Their credit risk ratio does not appear to have deteriorated much, and the proportion of liabilities to equity fell somewhat. The same is true of real estate companies. This is primarily because of soaring prices, however, which more than offset the increase in liabilities. Increased debt following an exchange rate drop and expected deflationary episode in the housing market will, reduce the equity position, however.

**Increased foreign exchange risk in service sectors as well**

Apart from holding companies, the services sector is the most indebted industrial segment in Iceland. Just like the construction companies, the service sectors have accumulated a vast amount of debt, with

most of the increase in foreign currency. How much risk this entails for the quality of assets in the banking system depends primarily on three factors: the value of the assets offsetting the liabilities, the proportion of revenues in foreign currency, and the potential for those companies without significant foreign-currency revenues to pass rising expense through to price levels. Furthermore, the extent of hedging against foreign exchange risk is of considerable importance, at least for the short term. Foreign-currency debt among retail companies has increased as well, but it seems as though the move towards foreign debt took place somewhat earlier than it did among other service companies.

**Waning turnover and rising debt ratios among listed companies**

The problem in analysing the position of companies lies in the fact that, although detailed information is available about the liability side of the balance sheet, data on the asset side are not available until more than a year after the close of the accounting year. Furthermore, in many cases a considerable proportion of corporate assets are intangible assets, which are difficult to evaluate. For this *Financial Stability* report, the Central Bank compiled balance sheet data from several large unlisted companies. The most comprehensive information for the past operational year is from the balance sheets of listed companies. According to these data, the position of these companies has weakened considerably over the past year. The companies continued to grow vigorously, but profits tapered off, equity ratios declined, and the proportion of liabilities to equity rose. Operating revenues increased proportionally more than liabilities, however. In general, listed companies, most of which are engaged in exports or have extensive operations abroad, seem quite strong. On the other hand, in some cases their shares have dropped sharply since mid-2007, and worsening financial conditions could make operations more challenging in the next few years.

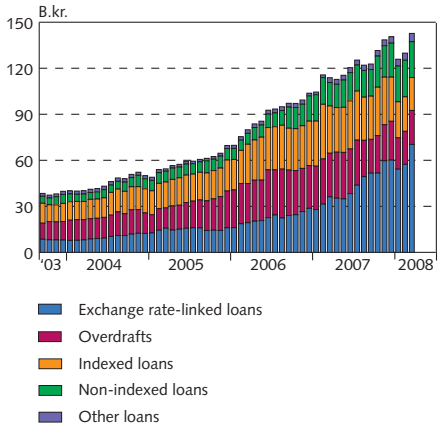
Table 1 Indicators of listed companies' operations and position

| | *2007* | *2006* | *2005* |
|---|---|---|---|
| Increase in turnover, % | 26.2 | 53.5 | 55.5 |
| Operating rev. before financial items (EBITDA), % | 8.6 | 9.1 | 10.1 |
| Profit, % | 1.6 | 1.7 | 6.7 |
| Financial expenses/turnover, % | 3.1 | 4.6 | 2.2 |
| Working capital/turnover, % | 6.7 | 7.7 | 7.0 |
| | | | |
| Debt ratio (total liabilities/equity) | 2.91 | 2.50 | 2.35 |
| Total liabilities/operating revenues | 0.89 | 1.01 | 1.01 |
| Interest-bearing debt/total assets, % | 53 | 51 | 40 |
| Working capital ratio | 1.01 | 1.03 | ... |
| Equity ratio, % | 25.6 | 28.6 | 29.8 |

**Considerable uncertainty concerning businesses' overall position**

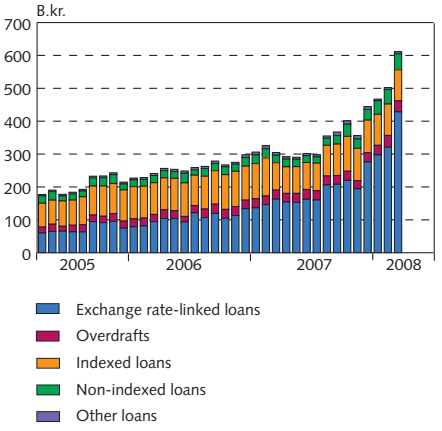
Although there is great uncertainty concerning the asset side of the balance sheets of businesses as a whole, it is clear that the balance sheets of many companies have become weaker in the wake of the depreciation of the króna. Many companies have a considerable cush-

Chart 32
DMB lending to the construction sector
September 2003 - March 2008



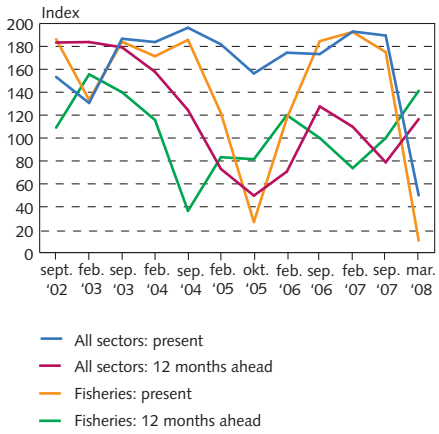

*Source:* Central Bank of Iceland.

Chart 33
DMB lending to service companies
April 2005 - March 2008




*Source:* Central Bank of Iceland.

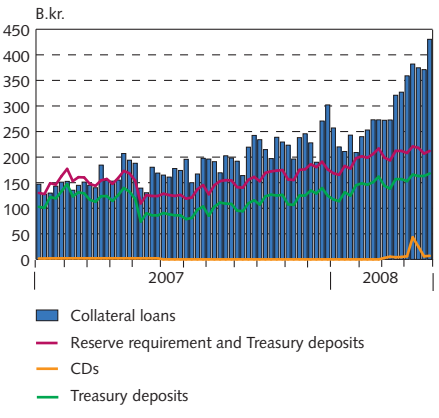
Chart 34
Business sentiment surveys
September 2002 - March 2008




*Source:* Capacent Gallup.



Chart 35
Collateral loans, CDs, Treasury deposits and reserve requirement
Weekly data June 3, 2007 - April 30, 2008




*Source:* Central Bank of Iceland.

ion, however. On the other hand, increased foreign exchange risk in sectors without significant foreign-currency income – for example, the construction industry – is cause for concern. The substantial lending to holding companies is also a source of uncertainty. The same is true of service companies that have accumulated sizeable debt in recent years. More detailed data are required, however, in order to assess the effects of these changes on the composition of businesses' debt to the banking system.

## Domestic financial markets

### Tight foreign liquidity position

As is described above, the financial markets in Iceland and abroad have been extremely volatile since the summer of 2007. Domestic financial companies' access to foreign credit markets has been limited for most of that period, and interest premia are higher than before. These conditions, together with the strong domestic demand for foreign currency, have prompted the banks to hold tight to the foreign currency they are able to obtain. The high premia that the banks must pay on foreign interbank interest rates virtually cancelled out the interest rate differential that they could offer on foreign exchange swap agreements, and it no longer reflects the difference between interbank rates in krónur and foreign currencies. As a result, there is considerable reluctance to make such swap agreements. Foreign investors hesitate to hedge their positions through the money market because of increased counterparty risk. These conditions are the primary reason for the plunge in the exchange rate of the króna in March.

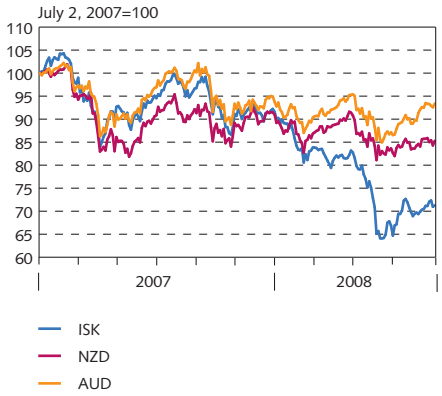
### Issuance of transferable certificates of deposit

The market failure that led to the depreciation of the króna, among other things, creates problems in monetary policy transmission and can cause problems in the financial system as well, if no action is taken. Thus the Central Bank considered it necessary to take steps to facilitate activity in the foreign exchange market. Among the measures adopted by the bank is the issue of fully transferable, electronically registered certificates of deposit. These CDs have enabled investors to hedge short króna positions, hold long positions, and open new positions. Because of this, they have eased the downward pressure on the króna in the FX market. Purchasing krónur in the foreign exchange market and investing them in the certificates of deposit is equivalent to concluding a swap agreement whereby investors receive krónur interest rates but pay foreign rates. To an extent, the CD issuance supplants the foreign exchange market, which has been beset by domestic investors' lack of foreign currency liquidity in the recent term. The CDs have also been an attractive option for foreign investors who have limited authorisation to make deposits in Icelandic banks and are seeking risk-free króna investments, which have been difficult to find because Treasury-guaranteed króna bond series are so small. Outstanding CDs amount to 75 b.kr. at present.

By issuing certificates of deposit, the Central Bank has attracted liquid assets from the króna market. Information from domestic and

foreign investors indicates that the issue has made a positive impact on the FX and currency swap markets.

Chart 36
Exchange rate index of the Yen against AUD, NZD and ISK
Daily data July 2, 2007 - April 30, 2008




*Sources:* Reuters, Central Bank of Iceland.

**Liberalised rules on reserve requirements and collateral**

Concurrent with the changes in its certificates of deposit, the Central Bank amended its rules concerning reserve requirements and collateral for transactions with financial institutions. The purpose of changing the rules on reserve requirements was to co-ordinate the Central Bank's rules with those of the European Central Bank to the extent possible. The new rules assume that the obligations of Icelandic banks' foreign branches do not constitute a foundation for reserves. This amendment considerably lightens the reserve requirements of banks with foreign branches and thereby increases liquid assets in foreign currencies. The specific impact on individual financial companies varies greatly, however.

The liquidity crunch has not yet increased volatility in the domestic money market. Domestic financial institutions appear more cautious than before in their transactions with one another, however, and have increased their overnight loan transactions with the Central Bank as a result. In a two-step move made in January and April 2008, the Bank liberalised its rules on collateral for regular transactions and overnight loans. Foreign-denominated bonds are now accepted as collateral if they meet the requirements for registration, credit rating, etc. Covered bonds are also approved if they meet stringent credit rating requirements, and issuers can now use their own securities as collateral. Liquidity facilities have increased somewhat as a result of these amendments to Central Bank rules.

The Treasury's balance with the Central Bank has continued to increase, but the condition of Treasury finances has been excellent. Balances fluctuate to a degree, but they have generally been on the rise.

**Króna under pressure**

Trading on the currency market has been brisk so far this year. The króna depreciated sharply in March, due in part to the banks' difficulties in foreign credit markets and the resulting problems in the currency swap market. The policy rate hike and the above-mentioned measures taken by the Central Bank stopped the exchange rate drop, and the króna strengthened somewhat in April.

Higher cost of capital and limited access to credit have prompted investors to unwind leveraged positions in all markets. While this is clearly visible in the stock market, it is also discernible in the currency market. The exchange rate of most high-yielding currencies – for example, the Icelandic króna, the South African rand, and the Hungarian forint – has fallen, while low-yielding currencies such as the Japanese yen and the Swiss franc have appreciated in value. Carry trades in these currencies have therefore generated considerable losses in the recent term.

The banks greatly enhanced their forward foreign exchange position in 2007. Their position in forward foreign-denominated assets has changed little in the past three months. Most indicators

imply that foreign investors continue to hold their long positions in the Icelandic króna. The balance has decreased, however, measured in foreign currency. Domestic investors' foreign currency purchases seem to have contributed to the plunge in the exchange rate of the króna. Many Icelandic investors owe money in foreign currency. Due to tight foreign liquidity, it is likely that domestic financial institutions will direct borrowers away from foreign loans and into loans in krónur.

Box 5

## The importance of averting a financial crisis

The world has been faced with financial crises at fairly regular intervals throughout modern history. In a recent paper, Reinhart and Rogoff (2008) focus in particular on five severe crisis episodes that have occurred since 1800. The shocks are measured, among other things, as the proportion of nations that could not pay their debts when due or were required to restructure debt due to financial difficulties (see Chart 1). The Icelandic state has never defaulted on a loan.

Assessing the repercussions of a financial crisis is a complex matter. In reality, such an assessment is only viable afterwards, when the crisis has passed. A large number of crises have struck economies around the world in the past several decades, with the World Bank data base identifying 160 episodes in the past 35 years. This database can provide an indication of the cost of cleaning up after financial crises and can aid in estimating losses due to the drop in GDP growth that generally follows. It does not include an estimate of the fiscal cleanup costs in all instances; however, for the 56 countries where such an estimate has been made, the cleanup cost averages 14.3% of GDP (standard deviation 14.6%). In 75 countries an attempt has been made to estimate lost GDP growth, with the average at 19.7% of GDP (standard deviation 23.3%). An estimate has been made of both fiscal cleanup costs and lost GDP growth in 30 countries. In those countries, the average cleanup cost is 17.6% of GDP (standard deviation 16.4%) and lost GDP growth 16.6% of GDP (standard deviation 14.3%). If these assumptions are applied to the Icelandic economy, the cleanup cost from a financial crisis could total 14-18% of GDP, or 179-230 b.kr., with a very wide margin for error, as is mentioned above. The subsequent loss of GDP growth could total 17-20% of GDP, or 217-256 b.kr., with a similarly wide margin for error. Based on these assumptions and caveats, the total loss could therefore amount to 400-500 b.kr. or about 30%-40% of one year GDP but world be dispersed over a number of years.

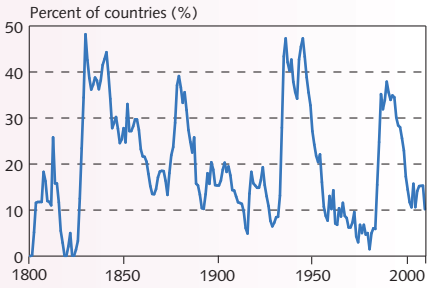
Currency depreciation and unfavourable interest rate terms are common consequences of a financial crisis. It is possible to construct an example of the impact of exchange rate movements on the Icelandic economy's foreign assets and liabilities and the effects of interest rate changes on the cost of foreign-denominated loans. The results of a recent study in *Monetary Bulletin* 2008/1,[1] which takes into account the estimated market value of foreign direct investment (FDI), suggest that the first round effects of a 30% depreciation of the Icelandic króna would entail that the net international investment position (IIP) would improve by 19% of GDP.[2] The analysis further shows that when book value of FDI is used in the calculation the effect is reversed. i.e., instead of the IIP improving, the net position deteriorates by 14% of GDP.

1. See Svavarsson, Daniel (2008).
2. The analysis is based on the IIP at the end of year 2006.

A 1% interest rate hike translates to an 88 b.kr. rise in interest expense, on average, for the period 2008-2012, or 6.9% of GDP. This assumes specified premises concerning repayment period and interest rate variability, including the assumption that interest rate changes emerge very quickly in short-term loans but are distributed over four years in the case of long-term debt. The example uses year-end figures from the compilation of balance of payments and international investment position statistics.

While the figures presented here are actually based on conjecture, they are based on an assessment of the impact of financial crises around the world over the past several decades, and the margin for error is quite wide. If the Icelandic economy should experience such a crisis, it is unclear how severe it would be or what measures would be required to resolve it. On the other hand, it is beyond doubt that there is every reason to avoid a financial crisis through appropriate, timely responses by market participants and governmental authorities.

Chart 1
Sovereign external debt 1800-2007
Percent of countries in default or restructuring




*Source:* NBER.

*Sources:*

Carmen M. Reinhart and Kenneth S. Rogoff, *This Time is Different: A Panoramic View of Eight Centuries of Financial Crises*, NBER Working Paper No. 13882, March 2008.

Dell'Ariccia, Detragiache, Enrica and Rajan Raghuram, *The Real Effect of Banking Crises*, IMF, October 2004.

Frydl, Edward J. *The Length and Cost of Banking Crises*, IMF Working Paper, 1999, WP/99/30.

Klingebeil, Daniela, Laeven, Luc, *Managing the Real and Fiscal Effects of Banking Crises*, World Bank, Discussion Paper no. 428, WDP428, January 2002.

Svavarsson, Daniel (2008). "International investment position: market valuation and the effects of external changes", in *Monetary Bulletin* 2008/1, pp. 89-99.

*Financial companies*[1]

# Focus on funding and lending quality

*Despite the unusual turbulence in the financial markets from the latter half of 2007, the commercial banks' return on equity has been very high, their assets have grown, and they continued to consolidate their activities in Iceland and overseas. At the end of 2007, almost half of the total assets of the largest commercial banking groups were accounted for by foreign subsidiaries; furthermore, a large portion of the parent banks' lending was to non-residents. Thus the banks have broadened their income base and further diversified their risk. Lending growth was strong in 2007, and at year-end the principal indicators suggested that loan quality was quite satisfactory. Delinquency and impairment remained at a historical low. Nonetheless, experience has shown that a surge in lending growth like that in recent years may eventually lead to greater loan losses. Over the past year, large exposures increased as a proportion of the banks' own funds. This is a source of concern from the standpoint of financial stability; futhermore, a considerable proportion of lending is secured by equities, which poses a risk in the event of a drop in stock prices. Foreign market funding constitutes a high proportion of the banks' liabilities, and their access to foreign funds has tightened considerably. In response to the stormy financial market climate, the banks have stayed their hand in foreign credit markets, reduced their lending, and bolstered their deposit business. At year-end 2007, more than 2/3 of deposits were from non-residents. Heavy foreign currency-denominated funding underlines the importance of credit ratings and reputation for the banks. The banks' capital and liquidity position have been acceptable. A sound capital and liquidity position is critical to the stability of the financial system.*

## Turmoil in the capital markets

The financial markets, both in Iceland and overseas, have been quite turbulent from the second half of 2007. The first six months of 2007 continued in the vein of the past few years, with rising equity prices and an abundance of credit. In the second half of the year, however, the market turned around, with falling stock prices and a shrinking supply of credit.

**Liquidity squeeze in global financial markets**

The year 2007 saw an increase in default on American mortgage loans, particularly sub-prime mortgages. Many of the world's largest financial institutions were forced to write off enormous amounts in the latter half of the year as a result of losses on structured securities related to sub-prime mortgages. These losses made a marked impact on the earnings of many foreign banks in 2007. Iceland's banks had invested very little in financial instruments related to sub-prime lending, however, and had limited need for write-offs as a result. In the fall of 2007, illiquidity began to surface in the global markets. As a result, Icelandic banks became aware of a tightening credit supply, and their CDS spreads rose. Because of market conditions, the banks remained more or less on the sidelines in the latter half of the year, focusing instead on strengthening their deposit business. They also responded

1. This chapter discusses the aggregate position of Iceland's largest banking groups, its largest savings banks, and miscellaneous credit undertakings.

Table 1 Total assets of the bank's foreign subsidiaries at year-end 2007[1]

*In b.kr.*

| *Kaupthing Bank hf.* | | *Glitnir Bank hf.* | | *Landsbanki Íslands hf.* | |
|---|---|---|---|---|---|
| FI Holding AS | 1,395 | BNbank ASA | 582 | Landsbanki Luxembourg | 478 |
| Kaupthing UK – Group | 677 | Glitnir-Lux SA | 197 | Heritable Bank | 157 |
| Kaupthing Bank Luxembourg S.A. | 524 | Glitnir Bank Norway ASA | 86 | Landsbanki Securities UK | 47 |
| Kaupthing Sverige AB | 195 | Glitnir Oyj | 43 | Kepler Equities | 41 |
| Singer & Friedlander Isle of Man Ltd | 56 | Glitnir Securities ASA | 20 | Landsbanki Holding Europe | 24 |
| Kaupthing Norge AS | 24 | Glitnir AB | 15 | Landsbanki Guernsey Ltd. | 21 |
| Norvestia Oyj | 16 | Glitnir-Norway AS | 1 | Landsbanki Holding UK | 14 |
| K-Invest Holding S.A. | 1 | Glitnir Marine Finance AS | 1 | LI investment AB | 14 |
| | | | | LI Investment Ltd. | 8 |
| | | | | Merrion | 7 |
| Foreign subsidiaries, total | 2,888 | Foreign subsidiaries, total | 945 | Foreign subsidiaries, total | 811 |
| Total assets of the group | 5,347 | Total assets of the group | 2,949 | Total assets of the group | 3,058 |
| Share of foreign subsidiaries,% | 54 | Share of foreign subsidiaries,% | 32 | Share of foreign subsidiaries,% | 27 |

1. The three largest commercial banks. Exchenge rate at year-end 2007. Largest subsidiaries, excluding foreign branches.

*Source:* Financial Supervisory Authority.



to deteriorating market conditions by slowing down their growth and enhancing transparency and information disclosure to the market. To this end, Kaupthing Bank and Landsbanki abandoned plans to acquire foreign entities, and all of the banks reduced their lending activity in the latter part of the year. Equity prices were not excluded from the volatility in the markets. Shares in most companies dropped in late 2007 and the first quarter of 2008, and the largest banks were no exception, with share prices falling between 29% and 44% from their summer-2007 highs by the end of March 2008. The share prices of banks in Iceland's neighbouring countries and many large international banks dropped by a similar proportion, or even more. The turmoil in the global financial markets is discussed further in Box 2 in Macroeconomic environment and financial markets chapter.

**Continuing consolidation of operations**

The banks' international expansion and their acquisitions of financial companies began only a very few years ago. Acquisitions of large foreign financial companies were a salient part of the Icelandic banks' activities in 2004 and 2005.[2] The main characteristic of 2006 and 2007 was consolidation of activities both in Iceland and abroad, with less pronounced changes in group structure than in the preceding years.[3] At the end of 2007, 41% of total assets of the largest commercial bank groups were accounted for by foreign subsidiaries, as Table 1 shows.

2. In 2004, Kaupthing Bank acquired the Danish FIH bank to become the largest banking group in Iceland. Highlights in 2005 were Glitnir's acquisition of BNbank of Norway and Kaupthing Bank's acquisition of the UK bank Singer & Friedlander.

3. This principal changes in 2007 were Glitnir's acquisition of the Finnish asset management firm FIM Group and Landsbanki's acquisition of the UK securities firm Bridgewell. In addition, Kaupthing divested its operations in the Faeroe Islands and purchased deposit bank Derbyshire (Isle of Man) Ltd., as well as Belgium's Robeco Bank, which specialises in asset management.

### Changed and more dispersed risks

Expansion outside Iceland and lending by parent banks to non-residents have broadened the commercial banks' income base, thereby changing and diversifying their risk. The banking groups' income from outside Iceland has surged, and so have their foreign assets. At the same time, the three banks' different business structures in other countries also disperses risk. In 2007, 58% of group income originated outside Iceland, compared with 48% in 2006. Credit to non-residents accounted for 59% of total lending to customers at the end of 2007, as against 61% at the end of the previous year.[4] The proportion of foreign income was highest at Kaupthing (67%), and 73% of its lending to customers was to non-residents, as is shown in Table 2. A broader income base and more dispersed risk leave Icelandic banks less vulnerable to domestic shocks, but correspondingly more susceptible to a more diverse range of financial shocks.[5]

### Commercial banks' credit ratings

International agencies assess the credit ratings of Iceland's three large commercial banks; i.e., Kaupthing Bank, Glitnir and Landsbanki. Credit ratings are extremely important to the banks for their access to market funding. Tables 3, 4, and 5 show their credit ratings.[6]

Table 2 Income and lending abroad by the commercial banks at year-end 2007[1]

| | *Foreign income, %* | *Foreign lending, %* |
|---|---|---|
| Kaupthing Bank hf. | 67 | 73 |
| Glitnir Bank hf. | 55 | 54 |
| Landsbanki Islands hf. | 46 | 41 |
| Total | 58 | 59 |

1. The three largest commercial banking groups. Income outside Iceland as a proportion of total income Lending to non-residents as a proportion of total lending to customers.

*Sources*: The banks' annual reports, Central Bank of Iceland.

Table 3 Moody's credit rating for Iceland's three largest commercial banks

| | *Announced* | *Long-term* | *Short-term* | *Financial strength* |
|---|---|---|---|---|
| Kaupthing Bank | February 2008 | A1 | P-1 | C- |
| Glitnir Bank | February 2008 | A2 | P-1 | C- |
| Landsbanki | February 2008 | A2 | P-1 | C- |

*Source:* Bloomberg.

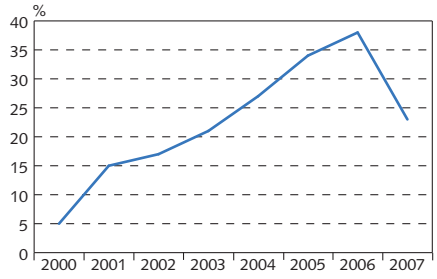
Table 4 Fitch Ratings' credit rating for Iceland's three largest commercial banks

| | *Announced* | *Long-term* | *Short-term* | *Individual* | *Support* |
|---|---|---|---|---|---|
| Kaupthing Bank | August 2006 | A | F1 | B/C | 2 |
| Glitnir Bank | August 2006 | A | F1 | B/C | 2 |
| Landsbanki | February 2006 | A | F1 | B/C | 2 |

*Source:* Bloomberg.

4. Lending to customers excludes lending to financial companies.
5. The rapid expansion of the Icelandic banks and a comparison with other Nordic banks were discussed in a report by the Nordic central banks, Nordic Banking Structures, published in August 2006. See the Central Bank of Iceland website: www.sedlabanki.is
6. Assessment as of the end of April 2008. The credit ratings of the Icelandic banks were discussed in detail in Appendix 2 to the Financial Companies chapter of *Financial Stability* 2006, pp. 69-77.

Chart 1
Return on equity 2000-2007[1]
Profit as a ratio of average capital position less profit

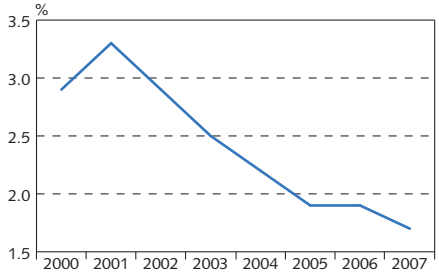



1. Largest commercial banks' consolidated accounts. ROE for 2000-2004 based on earlier accounting methods.
*Sources:* Commercial banks' annual reports, Central Bank of Iceland.



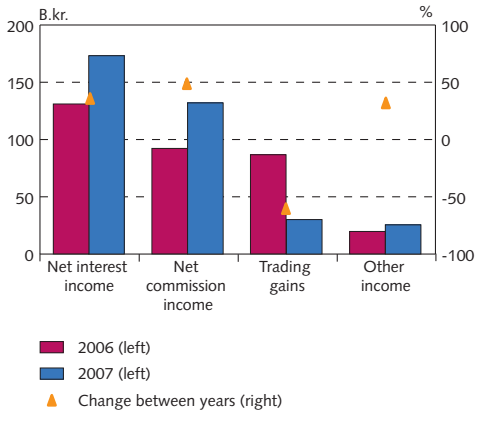


Chart 2
Interest margin 2000-2007[1]
Net interest income as a ratio of the average between total assets at the start and end of the period




1. Largest commercial banks' consolidated accounts. Interest margin for 2000-2004 based on earlier accounting methods.
*Sources:* Commercial banks' annual reports, Central Bank of Iceland.

Chart 3
Net operating income 2006 and 2007[1]




1. Largest commercial banks' consolidated accounts.
*Sources:* Commercial banks' annual reports, Central Bank of Iceland.

Table 5 Standard & Poor's credit rating for Glitnir Bank

| | *Announced* | *Long-term* | *Short-term* |
|---|---|---|---|
| Glitnir Bank | April 2008 | BBB+ | A2 |

*Source:* Bloomberg.

# Main commercial banks

## Operating results

### A year of turning points

The banks' financial statements for 2007 reflected changes in domestic and international financial markets, among other things. Early in the year, domestic and foreign equity prices soared. The trend reversed after mid-year, however, and at the end of the year listed Icelandic equities had fallen by 1%, while stock prices in most of Iceland's neighbouring countries had risen marginally. Yields on domestic indexed and nominal bonds rose somewhat, and the króna appreciated. Inflation remained high during the year, approaching 6%. The long period of abundant credit drew to a close in the second half of the year, placing strain on the banks' funding.

### Healthy returns

Profitability was strong at the largest commercial banks in 2007.[7] The combined returns of the banks totalled some 23%, which was quite satisfactory. The positive results can be traced to increased interest income following a surge in lending and sizeable income from fees and commissions, while gains on securities portfolios were less than in 2006.

### Interest income grew, while interest margin contracted slightly

Net interest income is the commercial banks' largest income item.[8] Other main sources of income are net fees and commissions and trading gains. In 2007, the net interest income of the largest commercial banks amounted to 173 b.kr., compared with 131 b.kr. in 2006, a 32% increase year-on-year. Although net income grew, the interest margin diminished slightly year-on-year to 1.7% in 2007.[9] The banks own considerably more indexed assets than liabilities. Additional assets are funded at nominal interest rates, and despite high inflation during the year, high nominal interest rates led to a contraction in the interest margin. Increased foreign exchange imbalances narrowed the interest rate spread as well. Growth in foreign currency-denominated lending, mortgage loans, and lending by foreign subsidiaries has narrowed the spread in recent years.

7. The main commercial banks comprise Kaupthing Bank, Glitnir and Landsbanki. Consolidated figures are quoted here unless otherwise stated. Discussion of the aggregate position may diverge from that of individual financial companies.
8. Interest income less interest expenses.
9. The ratio of net interest income (interest income less interest expenses) to the average between total assets at the start and end of the year.

### Trading gains dropped substantially

Net fees and commissions[10] grew sharply year-on-year, rising by 43%, from to 92 b.kr. in 2006 to 132 b.kr. in 2007. Proportionally, the greatest growth was in fees and commissions originating outside Iceland. The banks' trading gains[11] contracted by 65% year-on-year, totalling 30 b.kr. in 2007, as against 87 b.kr. in 2006. Returns on equity positions diminished, and there were losses on bond investments. The banks have substantial bond holdings because of their liquidity position. Other income[12] also increased somewhat year-on-year, totalling 26 b.kr. in 2007.

### Rising cost/income ratio but low impairment

In recent years the cost/income ratio[13] of the largest commercial banks has decreased yearly, mainly driven by a surge in operating income. In the past two years, however, the cost/income ratio has risen, reaching 51% in 2007. All of the banks have now sharpened their focus on cutting operating expenses.

Impairment on loans and advances for the main commercial banks was 18.6 b.kr. in 2007, while provisions totalled 15.8 b.kr. the year before. The ratio of impairment on loans and advances to net interest income was 11% at end-2007. The low impairment ratio is linked to the low level of arrears among the banks' customers.

### Acceptable core income

Although position-taking in securities is a part of investment bank activities, gains cannot always be taken for granted. If the banks had shown zero trading book gains in 2007, their profit before tax would have been 22% instead of 27%, and their cost/income ratio would have risen from 51% to 55%;[14] therefore, even with no trading book gains, their profitability in 2007 would have been quite acceptable. Nonetheless, it is clear that deteriorating market conditions, including global illiquidity, will put the banks' business model to the test in the near future.

## Credit

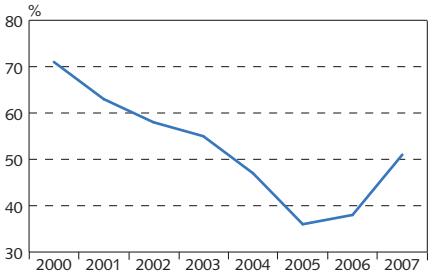
### Large-scale operations in neighbouring countries

The bulk of the commercial banks' assets is in the form of lending. At the end of 2007, their outstanding loan stock totalled 7,302 b.kr., an increase of 32% year-on-year. Some 59% of customer loans are granted to non-residents.

Chart 4

Cost/income ratio 2000-2007[1]

Operating expenses as a proportion of net operating reven



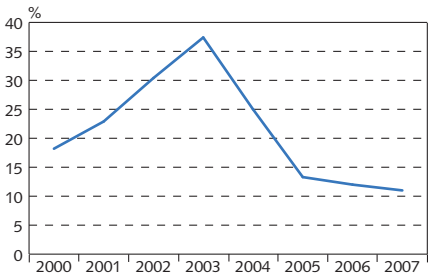

1. Largest commercial banks' consolidated accounts. Cost/income ratio for 2000-2003 based on earlier accounting methods.

*Sources:* Commercial banks' annual reports, Central Bank of Iceland.

Chart 5

Impairment of loans 2000-2007[1]

Impairment as a ratio of net interest revenues




1. Largest commercial banks' consolidated accounts. Impairment and net interest revenues for 2000-2003 based on earlier accounting meth

*Sources:* Commercial banks' annual reports, Central Bank of Iceland.

10. Income from fees and commissions net of fees and commission expenses.
11. Including dividends.
12. Net operating income comprises net interest income, net fees and commissions, trading gains and dividends, and other income. Other income comprises net income on insurance activities, earnings from holdings in associates, gains on sale of disposal groups held for sale and sundry operating income.
13. Operating expenses as a proportion of net operating income.
14. This assumes that other income and expenses remain unchanged. This is a simplified assumption, however; for example, remuneration in the investment banking sector is partly performance-linked, and net fees and commissions are unlikely to remain unchanged during a downturn in the securities market.

Box 1

## Stress tests and contingency exercises

The contingency work carried out within the Central Bank has two basic functions: first, to assess the resilience of financial institutions – that is, their ability to withstand shocks – and second, to prepare the Bank and the pertinent governmental authorities to deal with financial shocks. Contingency work includes contingency plans, contingency exercises, and cooperation among domestic and foreign governmental authorities.

**Resilience – stress tests**

One of the methods that the Central Bank uses in order to assess financial undertakings' resilience to shock involves so-called stress tests.

Stress tests involve examining financial institutions' resistance to shock by staging extreme crisis scenarios. The results of the tests are then used to evaluate their impact on key aggregates for the financial institution in question. Over the past year, the development of stress tests within the Central Bank has been directed at liquidity and credit risk. The Central Bank receives monthly information on the liquidity position of deposit institutions in accordance with the Bank's Rules on Liquidity Ratio.[1] The institutions' liquidity position then undergoes stress tests and sensitivity analysis. Further discussion of stress tests for credit risk and an assessment of financial undertakings' resilience can be found in Appendix 1.[2]

Despite their advantages, stress tests often elicit a simplified view of the impact of shock on a financial institution. They tend to focus on one risk factor at a time and do not take into account the interplay of several concurrent risk factors. It is therefore important to continue developing stress tests so that they include a greater number of criteria. Many central banks work toward developing methods for assessing risk within the financial system as a whole rather than concentrating on each financial institution separately. Despite considerable research and development work, few such models are fully developed.[3]

**Contingency plans – contingency exercises**

An assessment of risk factors and weaknesses within the financial system can never, in and of itself, provide sufficient preparation for a smooth response to events that may jeopardise financial stability; therefore, many central banks and financial authorities hold so-called contingency exercises so as to examine and practise the official response to an envisaged financial shock. This requires, among other things, smooth flow of information among the authorities concerned, co-ordination of efforts, and effective and co-ordinated decision-making under extreme time pressure.

Contingency exercises are held regularly. The Central Bank of Iceland participates in three types of contingency exercises. The first type focuses on payment systems, with the participation of those who work with these systems on a daily basis. Such an exercise was last held in Iceland in January 2007,[4] and another is planned for later

1. A more detailed discussion of liquidity rules and liquidity managment in Appendix 3 on p. 75.
2. See Appendix 1 on p. 61 and Appendix 1, "Estimating the commercial banks' loan portfolio quality," in *Financial Stability* 2007, p. 62.
3. An example of parallels is the DSG equilibrium model, which has been developed by Goodhart, Sunirand, and Tsomocos. See also: Goodhart Sunirand and Tosmocos, 2006. "A Time Series Analysis of Financial Fragility in the UK Banking System." *Annals of Finance*, 2:1-21. The Austrian central bank, Österreichische Nationalbank, presented a model of the interbank market and credit and market risk. See also: Elsinger, H.A. Lehar and M. Summer., *Risk Assessment for Banking Systems*. The Bank of England has build on this methodology; see Alesssandri, P., P. Gai, S. Kapadia N. Mora, C. Puhr 2007. "A Framework for Quantifying Systemic Stability." Bank of England. The Bank of England model is expected to be complete in two to three years.
4. See further discussion of the exercise in *Financial Stability* 2007, p. 75.

this year. The second type of contingency exercise, which focuses on the financial system as a whole, is held jointly by governmental authorities. These exercises test the efficacy of the arrangements that the authorities have made concerning financial stability and contingency exercises.[5] The Financial Supervisory Authority (FME) and the Central Bank held such exercises in 2004 and 2006. The third type involving the Central Bank centres on international contingency exercises. In September 2007 a Nordic-Baltic contingency exercise was held, with the participation of FME, the Ministry of Finance, and the Central Bank on behalf of Iceland. The other participants were the corresponding authorities in the other Nordic countries and the central banks of the Baltic nations. The Nordic exercise was particularly interesting because it offered the opportunity to rehearse responses to a cross-border crisis. The authorities are interested in participating in a pan-European contingency exercise next year.

5. In February 2006, a Memorandum of Understanding was concluded between the Office of the Prime Minister, Ministry of Finance, Ministry of Commerce, Financial Supervisory Authority and Central Bank of Iceland. The MoU can be found in its entirety in *Financial Stability* 2006, pp. 93-94 and on the Bank's website.



According to Financial Supervisory Authority (FME) data on foreign lending by Icelandic commercial banking groups, borrowers in the Nordic countries account for the largest share. The largest lenders there are the Danish FIH Bank, which is part of the Kaupthing Bank group, and BNbank of Norway, which is part of the Glitnir group. Just over one-fourth of foreign lending is in the UK, headed by Singer & Friedlander in the Kaupthing Bank group. Considerable amounts have also been lent to Benelux, mainly Luxembourg. In all, 90% of the commercial banks' foreign lending is to Europe and North America. Further discussion of the classification of the banking groups' lending and loan portfolio quality can be found in Appendix 1.

Table 6 Proportional distribution of foreign lending by geographical area

| *Region/Country* | *2007, %* |
|---|---|
| Nordic countries | 43 |
| United Kingdom | 27 |
| Benelux | 8 |
| North America | 4 |
| Germany | 4 |
| Other European countries | 3 |
| Other countries | 11 |
| Total | 100 |

*Source*: Financial Supervisory Authority.

**Strong lending growth among the banks' parent companies**

Lending by the commercial banks' parent companies at the end of 2007 amounted to 4,857 b.kr., an increase of 66% year-on-year. There was exceptionally strong growth in lending to non-residents, which rose 129% year-on-year to 1,843 b.kr. Lending to residents

grew by 42% to 3,014 b.kr. Loans to domestic businesses grew by 37% last year and loans to households by 22%. Although lending growth has remained strong, lending to businesses and households, especially mortgage lending, has slowed over the past year.

Table 7 Lending by the commercial banks[1]

| | *Year-end 2006, b.kr.* | *Year-end 2007, b.kr* | *Increase, b.kr.* | *Increase, %* |
|---|---|---|---|---|
| Total lending | 2,924 | 4,857 | 1,933 | 66 |
| To residents | 2,120 | 3,014 | 894 | 42 |
| To businesses | 1,522 | 2,087 | 565 | 37 |
| To households | 538 | 654 | 116 | 22 |
| To non-residents | 804 | 1,843 | 1,039 | 129 |

1. The three largest commercial banks. Parent companies.

*Source:* Central Bank of Iceland.



**Mortgage lending, loan-to-value ratios, and fixed interest rate risk**

Since the fall of 2004, the commercial banks have greatly increased their mortgage lending. This will strengthen their position if the returns prove satisfactory, because experience has shown a low rate of delinquency and write-offs on such credit. Write-offs of mortgage loans could increase, however, if real estate prices fall or loan-to-value ratios rise. According to the FME, loan-to-value ratios have fallen. At year-end 2007, roughly 9% of the parent banks' mortgage loans had a loan-to-value ratio over 90%, down from 16% at year-end 2006. Furthermore, as Table 8 shows, the proportion of mortgage loans with a loan-to-value ratio below 70% rose from 42% at year-end 2006 to 59% at the end of 2007. A lower LTV ratio reduces the likelihood of losses due to real estate depreciation. As a rule, the commercial banks' mortgage loans are CPI-indexed, with a fixed interest rate and a maturity of up to 40 years. So far, the banks have only matched part of their mortgage lending with funding of a similar profile. Thus their fixed

Table 8 Loan-to-value ratio of the commercial banks' mortgage loans[1]

| *%* | *Year-end 2006, %* | *Year-end 2007, %* |
|---|---|---|
| LTV ratio 0-50 | 20 | 34 |
| LTV ratio 50-70 | 22 | 25 |
| LTV ratio 70-90 | 34 | 23 |
| LTV ratio 90-100 | 8 | 5 |
| LTV ratio over 100 | 8 | 4 |
| LTV ratio unknown | 8 | 9 |

1. The three largest commercial banks. Parent companies.

*Source:* The Financial Supervisory Authority.

Table 9 Commercial banks' fixed interest risk[1]

| | *Year-end 2006, b.kr.* | *Year-end 2007, b.kr.* | *Increase, b.kr.* |
|---|---|---|---|
| Loss due to 1% rise in market interest rates | 33 | 42 | 9 |
| Proportion of own funds, % | 3.6 | 4.3 | |

1. The three largest commercial banks. Parent companies.

*Source:* The Financial Supervisory Authority.

interest risk has increased, after being virtually non-existent before 2004. According to data from the FME, the largest commercial banks could have lost 42 b.kr. if market interest rates had risen by 1%, based on the parent companies' lending book positions at the end of 2007. Measured as a proportion of own funds, the banks' fixed interest risk was 4.3% at the end of 2007, up from 3.6% at the end of 2006.

### Continuing growth in foreign currency-denominated lending to households

At year-end 2007, the outstanding stock of foreign-denominated loans by parent commercial banks stood at 3,452 b.kr., an increase of 1,663 b.kr. (93%) year-on-year. Just under half of the parent banks' foreign-currency lending is to residents. While the vast majority is to businesses, foreign-currency lending to households grew as well, or by 69 b.kr. (114%) year-on-year. Because households generally do not have income in foreign currency, it could be questionable for them to assume debt in currencies other than the króna. Foreign currency-denominated lending by parent commercial banks to non-residents continued to grow in 2007, reaching 1,843 b.kr. at the end of the year, an increase of 139% year-on-year.

Table 10 Commercial banks' foreign-currency lending[1]

| | *Year-end 2006, b.kr.* | *Year-end 2007, b.kr.* | *Increase, b.kr.* | *Increase, %* |
|---|---|---|---|---|
| Total foreign currency-denominated lending | 1,789 | 3,452 | 1,663 | 93 |
| To residents | 1,018 | 1,609 | 591 | 58 |
| To businesses | 936 | 1,273 | 337 | 36 |
| To households | 60 | 129 | 69 | 114 |
| To non-residents | 771 | 1,843 | 1,073 | 139 |

1. The three largest commercial banks. Parent companies.

*Source:* Central Bank of Iceland.

### Most borrowers have substantial foreign currency income

The vast majority of the parent banks' foreign-currency borrowers have significant foreign-currency income. At year-end 2007, approximately 70% of foreign-denominated loans and derivative contracts were to non-residents and 30% to residents. Among residents, some gross 43% of lending and derivative contracts were to customers with more than 2/3 of their income in foreign currency and 18% to customers with 1/3 to 2/3 of their income in foreign currency. This left 39% of lending and derivative contracts involving residents who earned less than 1/3 of their total income in foreign currency or had no foreign-currency income at all.[15] The share of foreign currency-denominated lending and derivative contracts with the borrower group that is most susceptible to a possible depreciation of the króna therefore increased year-on-year.[16]

15. This category includes businesses with a strong enough market position to be able to pass on to prices the extra cost resulting from the depreciation of the króna.
16. This ignores the possibility that borrowers may hedge against currency fluctations with derivatives.

Table 11 Foreign-currency loans and derivative contracts[1]

| *Distribution by residency and foreign-currency income* | *Year-end, 2006, %* | *Year-end, 2007, %* |
|---|---|---|
| To residents | 61 | 30 |
| Foreign-currency income < 33% of total income or none | 34 | 39 |
| Foreign-currency income 33% til 67% of total income | 25 | 18 |
| Foreign-currency income > 67% of total income | 41 | 43 |
| To non-residents | 39 | 70 |
| Total | 100 | 100 |

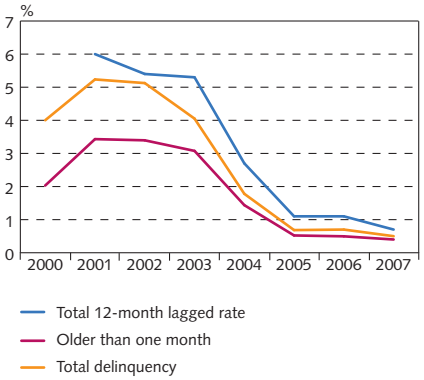
1. Foreign currency-denominated lending and derivatives. The three largest commercial banks. Parent companies.

*Source:* Central Bank of Iceland.

Chart 6

Delinquency rate 2000-2007[1]

Delinquency as a percentage of loans to customers

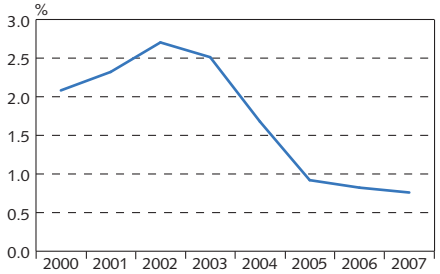



1. Commercial banks' parent companies.
*Source:* Financial Supervisory Authority (FME).

Chart 7

Loan loss reserves 2000-2007[1]

Ratio of total outstanding lending to customers




1. Largest commercial banks' consolidated accounts.
*Sources:* Commercial banks' annual reports, Central Bank of Iceland.

## Delinquency rate remains at a historical low

According to data from the FME, the delinquency rate[17] on lending by the commercial banks at the end of 2007 was 0.5%. This is the lowest delinquency rate recorded since regular compilation of data on arrears began at the end of 2000. The total amount of delinquency among the commercial banks' customers at year-end 2007 was just under 22 b.kr., virtually unchanged year-on-year.[18] Classified by duration, the longest and thereby most serious arrears accounted for 28% of total delinquency at the end of 2007, which is somewhat higher than the year before. Because new lending is unlikely to end up in arrears immediately, the lagged delinquency rate[19] is considered to give a representative picture of the trend. Measured in these terms, arrears have also been easing downwards to 0.7% at the end of 2007. Lower ratios of delinquency go hand in hand with the favourable economic climate for businesses and households. Most businesses recorded healthy profits in 2007, and the employment situation was unusually good. Therefore, it is likely that delinquency ratios have bottomed out.

## Ratio of loss provisions to lending unprecedentedly low

The combined credit provisioning accounts of the largest commercial banks amounted to 56 b.kr. at the end of 2007, an increase of 10 b.kr. (22%) from 46 b.kr. at the beginning of the year. Although they increased in nominal terms, credit provisioning accounts have shrunk relative to lending growth. As a proportion of total outstanding loan stock, the largest commercial banks' loan-loss provisions were 0.8% at the end of 2007, the lowest ratio ever. They were in the range 2.1-2.7% over the period 2000-2003. Low levels of delinquency are the main explanation for the low balance of credit provisioning accounts.

## Leveraged stock purchases

Lending by the largest commercial bank groups against share collateral amounted to 968 b.kr. at the end of 2007, or just over 13% of their total lending to customers, according to FME data. Over 92% of these loans had margining levels over 100%, and 46% had more than

17. Total arrears as a proportion of outstanding loans. Loan loss provisioning accounts are not deducted. Parent companies.
18. Arrears generally decrease in the fourth quarter, due to final write-offs. Arrears within the year may therefore easily exceed the end-of-year figure.
19. Total arrears as a proportion of outstanding loans one year before. Loan loss provisioning accounts are not deducted. Parent companies.

150% margining;[20] therefore, the banks had a certain cushion against falling equity prices at the beginning of the year. When a substantial, broad-based drop in market value occurs, the number of margin calls increases.[21] In recent months, the banks have had to request supplemental collateral for loans for equity purchases more often than they had previously. If the borrower is unable to submit acceptable collateral, the bank demands payment of the loan or appropriates the collateralised asset. In this way, financial institutions can acquire equities that have fallen in price and could trigger further depreciation if they are sold. If a large proportion of the shares listed on the OMX Exchange in Iceland (OMXI) are used as collateral, the original price drop could spiral and make a profound impact on the domestic equity market. At year-end 2007, 39% of shares used as collateral for loans were listed on OMXI. These shares were valued at nearly 17% of the total year-end market value of equities listed on OMXI.



**Lending to investment companies**

A large proportion of loans for securities purchases are granted to investment companies. Such companies invest in other companies (investment companies or operating companies) for liabilities and equity. The debt increases return on equity during economic upswings but magnifies losses during a downturn. Investment companies have seen their return on equity rise substantially in recent years, concurrent with spiking equity prices and healthy corporate profitability. They have also enjoyed beneficial credit terms, but those terms have not been in line with risk. When equities fall in price, as they have done recently, investment companies' equity falls much more rapidly than that of operating companies. Therefore, the banks' credit risk is much greater when they lend to indebted investment companies than when they lend to operating companies.

**Increase in ratio of large exposures**

According to FME data, the total large exposures of the largest commercial banks amounted to 931 b.kr. at year-end 2007, the equivalent of 95% of their combined own funds.[22] Among them, the banks had a total of 19 large exposures at the end of 2007. By comparison, total large exposures at the end of 2006 numbered 15, and their value was 547 b.kr., or 59% of own funds. The banks' large exposures therefore increased in number by four, and their value rose by 384 b.kr. year-on-year. This change is explained in part by increases in facilities granted to individual customers and related parties, which constitute large exposures in the books of more than one bank. There are cases where these same customers are among the banks' largest shareholders.[23] This increase in large exposures is therefore a source of concern

20. Margining indicates the market value of equity collateral for loans in proportion to the loans secured by it. A margining level above 100% indicates that the market value of the shares exceeds that of the loan they secure.

21. If the value of the equities falls below a specified minimum, additional collateral is required; this is referred to as a margin call.

22. Large exposures are exposures (lending, securities holdings, shares, guarantees granted, etc.) incurred by a financial undertaking with respect to a client or a group of financially connected clients, the value of which amounts to 10% or more of the own funds of the undertaking.

23. Transactions by banks with major shareholders and senior executives were discussed in Box 3 in Financial Stability 2007, on pp. 52-53.

from the standpoint of financial stability. In this context, it is worth mentioning that, in the past few years, the FME has placed strong emphasis on monitoring qualifying holdings, financial undertakings' transactions with related parties, and large exposures.

Box 2

## The relationship between equity prices and the exchange rate of the króna[1]

When position-taking in the króna mushroomed at the end of 2005, with the issuance of so-called Glacier bonds, the proportion of Icelandic krónur in international portfolios grew significantly. Similarly, rapid global expansion among Icelandic financial undertakings, burgeoning domestic demand for credit, and ready access to foreign capital spurred an increase in indebtedness to abroad.

Foreign investors' interest in the Icelandic economy has increased as well, and global influences penetrate more easily into the domestic financial system than they did previously. It is therefore likely that the correlation between domestic equity prices and the exchange rate of the króna has become stronger, as unrest in global financial markets and negative media coverage of the Icelandic economy could trigger a depreciation of the króna and a drop in the value of Icelandic stocks.

In the main, currency exchange rates should be determined by the interest rate differential with abroad, both the current differential and the expectations concerning its future development. In the same manner, current share prices should be determined by the estimated present value of future cash flow in the company in question. Therefore, if domestic interest rates rise over and above foreign interest rates, or if such an increase is expected, this tends to support the exchange rate of the króna. Furthermore, such an increase should press equity prices downward because it lowers the present value of a given stock and, other things being equal, reduces domestic demand and thereby dampens a company's potential earnings. Similarly, a stronger króna should compromise the competitiveness of domestic export and competitive sectors, and this in turn should lead to a drop in such companies' share price. In general, then, monetary policy shocks should generate a negative correlation between the exchange rate and stock prices.[2]

The correlation between the exchange rate and stock prices can also be positive, however. For example, if an economic upswing is expected in a given country, investors expect corporate revenues to rise, and they expect the central bank in that country to raise its policy rate, which will bolster the exchange rate of the domestic currency. In an Icelandic context, a positive correlation could also reflect the expectation that a drop in the exchange rate of the króna would make a negative impact on the financial conditions of domestic households and businesses, making it difficult for them to pay foreign-denominated loans and thereby reducing the profitability of domestic financial institutions, which constitute such a large proportion of the Icelandic share price index. This correlation is therefore determined entirely by what sort of shock the economy

1. This article is based on a forthcoming research paper by Bryndís Ásbjarnardóttir, an economist with the Financial Stability Department of the Central Bank of Iceland, "Dynamic relationship between stock prices and exchange rates in Iceland" (2008).

2. A general discussion of the interaction between exchange rates and stock prices can be found, for example, in Nieh, C., & Lee, C.F. (2001). "Dynamic Relationship between Stock Prices and Exchange Rates for G-7 Countries". ScienceDirect, and Yang, S., & S. Doong, S. (2004). "Price and Volatility Spillover between Stock Prices and Exchange Rates: Empirical Evidence from the G-7 Countries". International Journal of Business and Economics, Vol. 3, pp. 139-153. These effects emerge in the Central Bank's macroeconomic model (see Ásgeir Daníelsson, Lúdvík Elíasson, Magnús F. Gudmundsson, Björn A. Hauksson, Ragnhildur Jónsdóttir, Thorvardur T. Ólafsson, and Thórarinn G. Peterson (2006), "QMM: A quarterly macroeconomic model of the Icelandic economy", Central Bank of Iceland, Working Papers, no. 32, pp. 74-79.

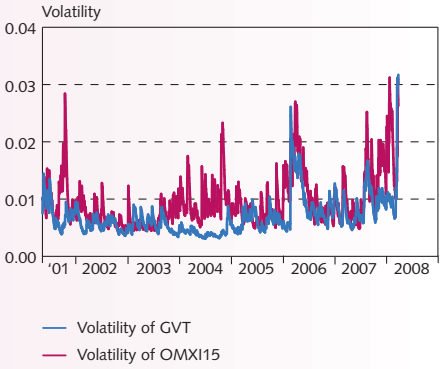
suffers. Monetary policy shocks call forth a negative correlation between currency appreciation and share price increases, while shocks related to productivity and terms of trade are conducive to a positive correlation.

The ISK exchange rate index and the OMXI15 share price index (continuous daily returns from May 2001 to March 2008) were used to study the correlation between domestic stock prices and the exchange rate of the króna. In order to assess how the correlation parameter has developed over time, a dynamic multivariate GARCH model was estimated.[3] Chart 1 gives an estimate of the volatility of the exchange rate index and the OMXI15 share price index.[4] As can be seen, there are periods where volatility is considerable, with the increase seemingly related to peaks in currency market trading volumes and increased discussion abroad of the Icelandic financial markets. In February 2006, for example, there was a significant increase in exchange rate volatility as compared with the years 2001-2006, with the fluctuations similar in size to the OMXI15 share price index volatility from February 2006 to November 2007.

Chart 2 shows an estimate of the correlation between changes in the exchange rate index and the OMXI15 share price index. Because the exchange rate index measures the price of foreign currencies, a rise in the exchange rate index means that the króna has fallen vis-à-vis foreign currencies. A negative correlation in Chart 2 means there is a positive correlation between appreciation of the króna and rising share prices. As the chart shows, there is little correlation until 2006. However, following the publication of the February 2006 report by Fitch Ratings, which issued a negative outlook for the Republic of Iceland's sovereign credit rating, this appeared to change, and the exchange rate of the króna fell concurrent with a drop in equity prices. Since that time, a positive correlation has gradually developed and strengthened, especially after the fall of 2007 when the appearance of negative news concerning the US economic outlook, also had a decisive effect on the Icelandic financial markets.

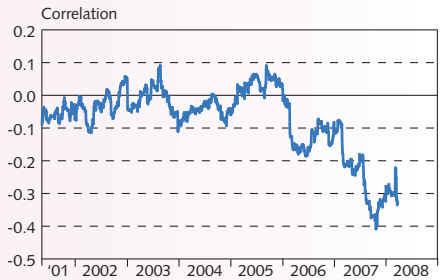
This positive correlation tends to increase the risk incurred by foreign investors wishing to invest in Icelandic stocks and by domestic investors who finance such investments with foreign-denominated loans and neglect to hedge their króna position. The blow of the simultaneous fall in the exchange rate and the domestic stock market is doubled, which, in the absence of other changes, should increase the risk premium on domestic financing. A positive correlation also shows how detrimental an effect a sudden plunge in the exchange rate can have on financial stability, as such a drop is likely to be accompanied by a substantial fall in stock prices.

Chart 1
Volatility of the exchange rate index and the OMXI15 share price index
Daily data May 3, 2001 - March 31, 2008




*Sources:* OMX Nordic Exchange Iceland hf., Central Bank of Iceland.

Chart 2
Correlation between changes in the exchange rate and the OMXI15 share price index
Daily data May 3, 2001 - March 31, 2008




*Sources:* OMX Nordic Exchange Iceland hf., Central Bank of Iceland.

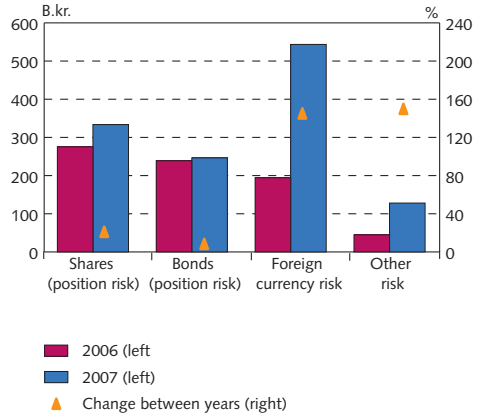
3. Engle, R.F., & Sheppard, K. (2001). "Theoretical and Empirical Properties of Dynamic Conditional Correlation Multivariate GARCH". Cambridge: National Bureau of Economic Research, Working Paper 8554.
4. Volatility is the square root of variance. The variance has then been standardised so that volatility is between -1 and 1.

## Marketable securities and foreign currency

### Increase in marketable securities portfolios

The largest commercial banks' total marketable securities portfolios, derivatives, and shareholdings amounted to 2,103 b.kr. at the end of 2007, an increase of 614 b.kr., or 41% year-on-year. The bulk of the marketable securities portfolio is in the form of bonds.

Chart 8
Market and foreign currency risk 2006 and 2007

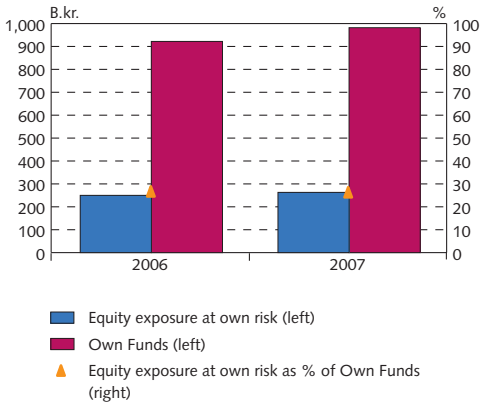



1. Riks according to risk weight base in capital adequacy rules. Largest commercial banks' consolidated accounts.
*Source:* Financial Supervisory Authority (FME).





Chart 9
Equity exposure 2006 and 2007[1]




1. Three largest commercial banks' consolidated accounts.
*Sources:* Commercial banks' annual reports, Central Bank of Iceland.

## Foreign currency balance continued to grow

The leading commercial banks' market and foreign currency risk[24] amounted to 1,252 b.kr. at year-end 2007, up 498 b.kr. between years. Among market risk items, the risk base due to equities is the largest.[25] The equity risk base stood at 334 b.kr. at the end of 2007, having risen by 21% over the year. The risk base on debt instruments rose marginally between years, totalling 246 b.kr. at year-end 2007. Other trading book risk increased considerably in 2007 and amounted to 128 b.kr. at the end of the year. Of that amount, risk related to derivatives totalled 81 b.kr., up 83% year-on-year. The foreign exchange position of the largest commercial banks continued to grow during the year. The currency risk base amounted to 544 b.kr. at the end of 2007, up by 349 b.kr. (180%) from the preceding year. Until recent years, the banks faced little exposure to currency risk. A large part of the current increase in reserves is due to hedging by banks against the impact of exchange rate movements on their equity and capital adequacy ratios.

## Banks' own market risk on equity exposures remained proportionally unchanged

As a result of derivative contracts with their clients, the largest commercial banks' market risk on equity exposures is not the same as their book value. Book value of equities amounted to 545 b.kr. at the end of 2007, but after adjustment for derivatives, their equity exposure at own risk was 263 b.kr.[26] The banks' stock of equities at own risk grew by 13 b.kr., but remained unchanged at 27% as a proportion of own funds.

## Equity derivative contracts

The most common term for equity derivative contracts is 3-6 months, which is often extendable. Derivative contracts reduce the banks' market risk from holding the equities, which in most respects is comparable to that accompanying a loan secured with collateral in shares. Thus the banks' risk may be underestimated in the event of default on a derivative contract following a fall in the price of the underlying equities. According to FME data, the commercial bank groups' forward contracts with leveraged equities as collateral amounted to 227 b.kr. at the end of 2007. Some 94% of forward contracts had more than 100% margining and 8% more than 150% margining.[27] Some 29% of shares used as collateral for forward contracts are listed on the OMXI Exchange.

24. Market and currency risk are assessed in accordance with the FME Rules on Capital Adequacy of Financial Undertakings.
25. The risk base represents the risk connected with a company's exposure in a given financial instrument, due to conceivable changes in its value.
26. Equities included among trading assets and financial assets designated at fair value in accordance with IFRS. Excluding the banks' holdings in associates owning shares in listed and unlisted companies.
27. Margining indicates the market value of equity collateral for forward contracts in proportion to the forward contracts with equities. A margining level above 100% indicates that the market value of the shares exceeds that of the forward contract they secure.

# Funding

## Composition of funding

Total liabilities and equity of Iceland's largest banking groups grew by 34% in 2007. Deposits grew sharply, or by over 93%, during the year. Securities issuance, one of the banks' principal means of obtaining funding, increased by only 7% year-on-year. This moderate increase is doubtless due to the liquidity squeeze resulting from deteriorating global market conditions.

## Securities issuance in foreign currency

Despite the significant increase in deposits, the banks remain dependent on market funding. At year-end 2007, the largest banking groups' borrowings totalled 5,137 b.kr., including new securities issuance of 1,231 b.kr., virtually unchanged since 2006.[28] Early in the year, credit was readily available, and in the first six months the banks issued securities for a total of 877 b.kr., or 71% of the year's total funding. In the latter half of the year, issuance amounted to 354 b.kr. During that time the commercial banks acquired funds through private placements and unconventional markets to a greater degree because of generally tighter credit markets. This is best observed in the changes in listed market funding, as the debt instruments of the three commercial banks totalled 4,118 b.kr., or 73% of total borrowings and subordinated debt at the end of the year. This represents a drop of 5% year-on-year. At the end of 2007, the vast majority of listed debt was in euros (45%) and US dollars (35%); however, issuance in Icelandic krónur has gained pace since 2006 and now constitutes some 5% of the total. European investors have been the largest purchasers of the banks' securities. Issuance in the form of European medium-term notes make up the bulk of the year's funding, and were 56% of all listed funding at year end.

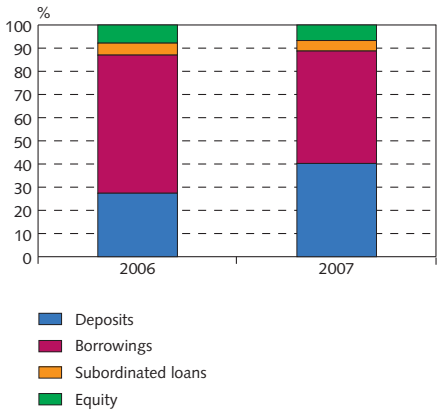
## Borrowings still a large proportion of balance sheets

Chart 11 compares the Icelandic banks' borrowing relative to balance sheet size and average maturity with the borrowing activity of other Nordic banks. The graph shows that borrowings constitute a much higher proportion of the Icelandic banks' balance sheets but that the average residual maturity is comparable. At Kaupthing and Landsbanki, average maturity has lengthened year-on-year. The size of the spheres indicates that outstanding balances of listed borrowings are lower among Icelandic banks than among most of the financial institutions in the comparison group.

The main commercial banks' refinancing need for 2008 is much less than it was for 2007. At year-end 2007, listed debt maturing in 2008 totalled some 690 b.kr., while listed debt maturing in 2009 totalled 737 b.kr. The bulk of this is due to parent companies. At the end of March 2008, the commercial banks had issued 383 b.kr. and had used part of the proceeds to buy back older issues. As of the end

28. Securities issuance excluding bank loans, according to information from the three main commercial banks.

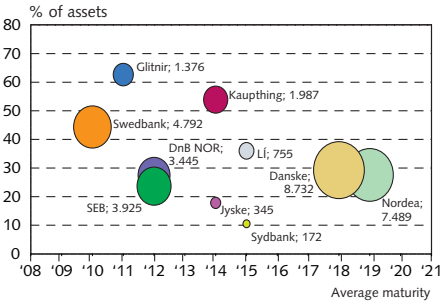
Chart 10
Composition of funding 2006 and 2007[1]




1. Largest commercial banks' consolidated accounts.
*Sources:* Commercial banks' annual reports, Central Bank of Iceland.

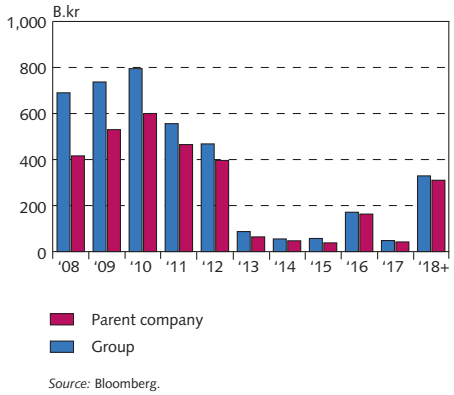
Chart 11
Nordic banks' funding

Market borrowings in ISK with regard to total assets and average maturity[1]



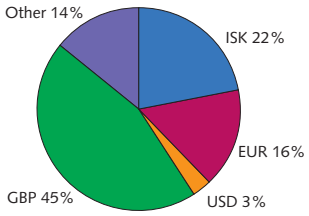

1. Size of sphere indicates quantity of market funding in ISK. Exchange rate as January 3, 2008
*Source:* Bloomberg.

Chart 12
Maturity profile of market funding
End of year, 2007




*Source:* Bloomberg.

Chart 13
Currency composition of deposits 2007[1]
Deposits to customers

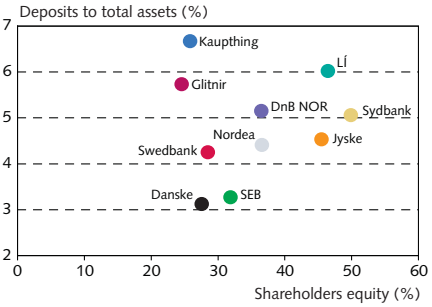



1. Largest commercial banks' consolidated accounts.
*Sources:* Commercial banks' annual reports, Central Bank of Iceland.





Chart 14
Nordic banks' funding[1]
Deposits and equity to total assets




1. As a % of balance sheet total.
*Source:* Bloomberg.

of March, listed debt maturing in 2008 totalled 586 b.kr., while listed debt maturing in 2009 totalled 927 b.kr.[29]

The banks' CDS spreads increased dramatically until the end of March, due in part to worsening external conditions and technical issues in the structure of the credit derivatives market, but they fell sharply in April. In all likelihood, the banks' debt issuance was referenced in unfunded synthetic collateralised debt obligations (CDOs). These issues were considered very desirable assets because their yields were much higher than those of other financial institutions with comparable credit ratings. Further discussion of credit default swaps can be found in Appendix 2.

**Deposit composition and growth**

In 2006, the largest banks were criticised for a lack of diversity in their funding profile, particularly for the low proportion of deposits in their funding. This prompted them to increase their emphasis on gathering deposits; e.g., through foreign deposit products. As a result, the proportion of deposits to total liabilities has risen from 28% to 40%. According to data from the banks' annual reports, the vast majority of deposits (over 78%) is in foreign currency, including 45% in sterling. Some 56% of deposits are time deposits, and 86% of those are time deposits with a maturity of three months or less. During the year, the banks increased their supply of time deposit products, and they plan to lengthen the maturity of their time deposits as well.

**Liquidity position in line with Central Bank rules**

When financial market difficulties began to surface, there was a reduction in Credit institutions' liquidity ratios as measured by the Central Bank's Rules on Liquidity Ratio. According to the Rules, the minimum liquidity ratio is 1; that is, weighted liquid assets one month and three months ahead shall be equal to or exceed liquid liabilities.[30] The liquidity ratio three months ahead remains somewhat above the required minimum, at 1.7 during the latter half of 2007. Previously, the liquidity ratio had risen steadily from year-end 2005, peaking at 2.4 in May 2007. At year-end 2007, credit institutions' weighted liquid assets exceeded liquid liabilities three months ahead by 1,669 b.kr., which is a year-on-year increase by 26%. Thus weighted liquid assets three months ahead rose by 39% in 2007, totalling 3,991 b.kr. at year-end, while liquid liabilities increased by 51% to 2,322 b.kr. at the end of the year. As they were a year ago, the largest asset items were marketable securities and claims against foreign credit institutions. Marketable securities increased by 51% between years, while

29. Converting outstanding debt to Icelandic króna does not account the depreciation of the currency. This increases outstanding debt since the króna depreciated significantly in the first quarter of 2008.

30. Credit institutions subject to minimum reserve requirements submit monthly liquidity reports to the Central Bank, wherein they specify the liquid assets and liabilities of the parent company 12 months ahead. Credit institutions subject to minimum reserve requirements are commercial banks, saving banks and other credit wundertakings. Assets and liabilities are allocated to periods of time and are assigned a weight according to the risk they are considered to represent. With consideration given to the weight, assets must exceed liabilities one month ahead and three months ahead. The liquidity ratio must be equal to or greater than 1. See futher discussion in appendix 3.

claims against foreign credit institutions have risen by 2% year-on-year. The largest weighted liability item was debt to foreign credit institutions, which grew by 98% year-on-year. The only item that diminished between years was securities issuance. At year-end, the amount maturing within three months was 42% lower than it was a year previously. Credit institutions total liquidity position is well hedged against changes in the exchange rate of the króna, as net liquid assets are almost entirely in foreign currency. The liquidity position varies among credit institutions and the Central Bank carries out stress tests on the liquidity position of Iceland's main commercial banks and examines each bank's chief risk factors.

**The banks' internal liquidity rules**

In addition to complying with the Central Bank's liquidity rules, the banks formulate their own rules on liquidity management. Generally speaking, the banks' internal rules are more stringent than those of the Central Bank. In most instances, internal rules require that liquid assets be adequate to cover outflows for the next 12 months without resorting to market funding. Furthermore, in some instances the haircut of assets is greater than is set forth in the Central Bank Rules. At year-end 2007, all of the banks had sufficient liquid assets to meet their commitments 12 months ahead without requiring market funding.

**Capital adequacy ratios diminished from unusually high levels**

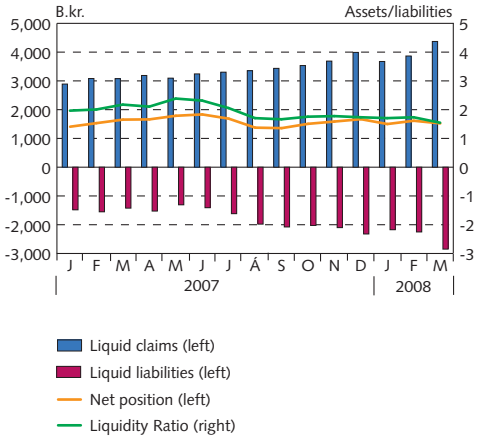
The book value of the largest commercial banks' equity totalled 710 b.kr. at year-end 2007, having increased by 80 b.kr. (13%) year-on-year. There has been a large increase in the commercial banks' subordinated debt in the recent term. Rapidly expanding balance sheets have called for more capital, and subordinated debt that meets certain conditions is considered by law as the equivalent of capital for the purpose of calculating capital adequacy ratios. At the end of 2007, the largest commercial banks' subordinated debt stood at 481 b.kr., an increase of 66 b.kr., or 16%, from the previous year. At year-end 2007, slightly less than half of the subordinated debt was classified as Tier I capital for the calculation of mandatory capital adequacy ratio.

As defined under FME rules, the capital adequacy ratio (solvency ratio) of the largest commercial banks was 11.6% at the end of 2007. The ratio had dropped since 2006, when it reached a record high following the establishment of capital adequacy requirements in 1992. During the year, growth in own funds did not keep pace with the risk base. Profits and increases in subordinated debt increased the banks' own funds, but deductions due to goodwill and ownership shares in financial companies, negative translation differences, and dividend payments had an offsetting effect. Despite the reduction, however, the banks' capital adequacy ratios remained very satisfactory. At year-end 2007, all of the banks passed the stress tests conducted by the FME, but their capital adequacy ratios fell by 0.6% to 1.2% based on the given stress.[31] A strong capital position is an important precondition for financial stability.

31. See the FME's website, www.fme.is.

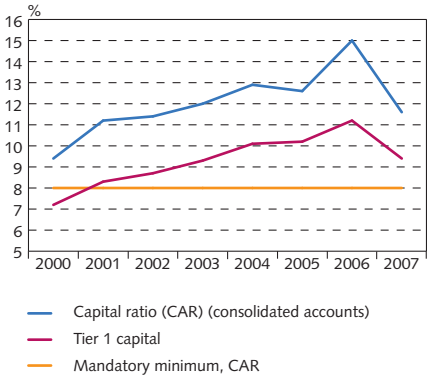


Chart 15
Credit institutions' liquidity position
January 2007 - March 2008[1]
0-3 month



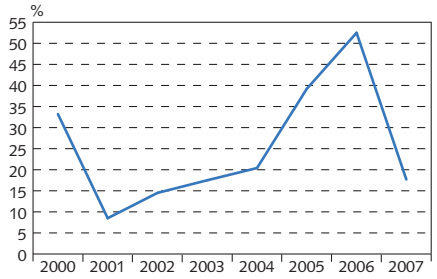

1. According to the Central Bank rules on liquidity.
*Source:* Central Bank of Iceland.

Chart 16
Capital ratio 2000-2007[1]
Own funds as a percentage of risk base




1. Largest commercial banks' consolidated accounts.
*Sources:* Commercial banks' annual reports, Central Bank calculations.

Chart 17
Return on equity 2000-2007[1]
Profit as a ratio of average capital position less profit

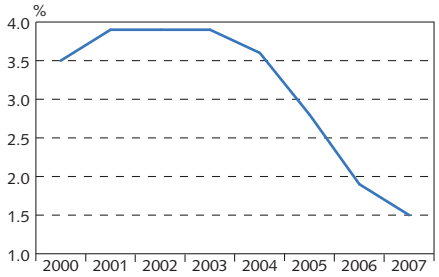



1. Largest savings banks' consolidated accounts.
*Sources:* Savings banks' annual reports, Central Bank of Iceland.



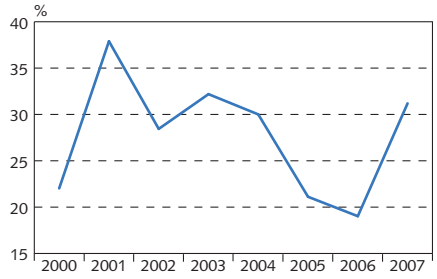


Chart 18
Interest margin 2000-2007[1]
Net interest income as a ratio of the average between total assets at the start and end of the period




1. Largest savings banks' consolidated accounts.
*Sources:* Commercial banks' annual reports, Central Bank of Iceland.

Chart 19
Impairment of loans 2000-2007[1]
Provisions as a ratio of net interest revenues




1. Largest savings banks' consolidated accounts.
*Sources:* Savings banks' annual reports, Central Bank of Iceland.

# The largest savings banks and miscellaneous credit undertakings

Iceland's savings banks are small in comparison with the commercial banks, and their assets correspond to less than one-tenth of the largest commercial banks' assets. Nonetheless, savings banks play an important competitive role in the domestic market.

## Reductions in trading gains and interest margins

Profitability diminished at the largest savings banks in 2007.[32] Their combined return on equity reached 18%, compared with the record level of 52% in 2006. The savings banks' lower returns can be traced largely to a drop in trading gains and other income, including their share in the losses recorded by associates.[33] In recent years, interest income has been decreasing as a proportion of the largest savings banks' net operating income, and their interest margins have fallen. One of the chief reasons for the past years' diminishing interest margin is increased mortgage lending and investments in marketable securities. The interest margin was 1.5% in 2007, and it is now lower than at the commercial banks. The declining weight of interest income and the low interest margin are surely a cause of some concern to the savings banks because experience shows that other income, especially trading gains, is volatile. Although position-taking in securities may form part of the savings banks' investment banking activities, it would be imprudent to assume that trading in market securities will always yield gains. If trading gains had been zero in 2007, the savings banks would have recorded negative returns for the year.[34]

## Increased impairment

Loan impairment rose year-on-year at the largest savings banks. In 2007 loan impairment totalled 2,1 b.kr., or 31% of net interest income, which was somewhat higher than in previous years. Loan impairment as a proportion of net interest income is rather higher at the savings banks than at the commercial banks.

## Substantial increase in lending in 2007

At the end of 2007, lending by the largest savings banks amounted to 377 b.kr., an increase of 37% year-on-year. Some 98% of the savings' banks lending is to Icelandic residents.[35] The majority of domestic

32. The largest savings banks are Sparisjóður Reykjavíkur og nágrennis (SPRON), BYR-sparisjóður, Sparisjóðurinn í Keflavík, and Sparisjóður Mýrasýslu. Figures are consolidated unless otherwise stated. Discussion of the aggregate position may diverge from that of individual financial companies. Mergers of savings banks may affect the calculation of financial ratios and comparative figures. For example, the accounts of Sparisjóður Kópavogs merged with those of Byr in November 2007; therefore, the savings bank's operations are not included in the annual accounts of Byr for the period January 1 through October 31, 2007. This has been considered in the discussion of the operations and financial position of the savings banks.
33. Some of the savings banks own shares in the investment company Kista fjárfestingarfélag, which has assets in Exista, among other assets. Kista recorded a substantial loss in 2007 due to the drop in Exista's share price.
34. Other income and expenses are assumed to remain unchanged. The assumptions are simplified.
35. Parent company figures.

lending is CPI-indexed, including mortgage loans to households. If it generates adequate returns, and if moderate loan-to-value ratios are maintained and fixed interest rate risk is kept to a minimum, increased mortgage lending should strengthen the savings banks' position because delinquency and impairment of such loans are historically low. Iceland's largest savings banks increased their holdings of marketable securities in 2007. At year-end, portfolio holdings and shareholdings in companies totalled 97 b.kr., an increase of roughly 15 b.kr. year-on-year. Domestic equities account for the bulk of their marketable securities portfolios.[36] The savings banks also owned significant holdings in associates and related companies.[37]

### Delinquency remains low

According to data from the FME, the delinquency rate on lending by the largest savings banks was 0.9% at the end of 2007.[38] This is the lowest delinquency rate recorded since regular compilation of data on arrears began at the end of 2000; nonetheless, the customer delinquency rate is higher for savings banks than for the commercial banks. Lower delinquency rates go hand in hand with the favourable economic climate for businesses and households. Concurrent with low delinquency rates, credit provisioning accounts have shrunk as a proportion of total lending in recent years. In 2007, however, the proportion of loan loss provisions to total lending rose slightly, to 1.3%. The low incidence of default contributes to the low provisioning account balance, as does the increased proportion of mortgage loans, because the risk of loss is generally lower for mortgage loans than for general loans. However, sharp lending growth in recent times may be seen as conducive to increased loan losses later.

### Funding largely derived from deposits

Unlike the commercial banks, the savings banks procure their funding largely in the domestic market. The largest single component of their funding is deposits, although the share has been declining in recent years. At the end of 2007, total deposits with savings banks amounted to 239 b.kr., which was 43% of their funding. Customer deposits grew substantially in 2007, or by 43%.

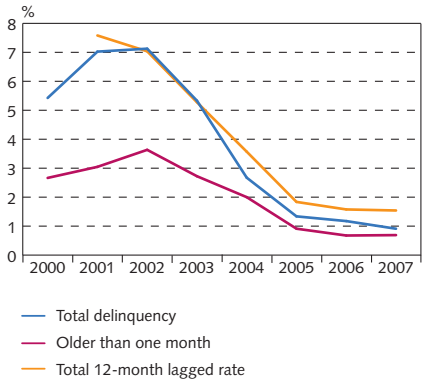
### Capital position

As defined under FME rules, the capital adequacy ratio (solvency ratio) of the largest savings banks was 23.4% at the end of 2007. The capital position of the largest savings banks varies, which means that some will be in a stronger position than others if their capital position is subjected to strain.

Chart 20

Delinquency rate 2000-2007[1]

Delinquency as a percentage of loans to customers

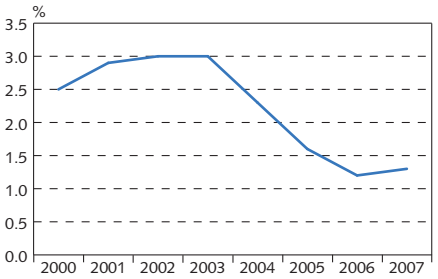



1. Largest savings banks' parent companies.
*Source:* Financial Supervisory Authority (FME).

Chart 21

Loan loss reserves 2000-2007[1]

Ratio of total outstanding lending to customers

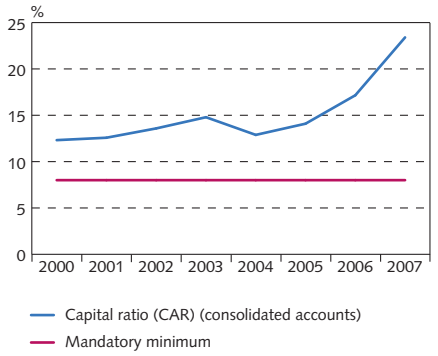



1. Largest savings banks' consolidated accounts.
*Sources:* Commercial banks' annual reports, Central Bank of Iceland.

Chart 22

Capital ratio 2000-2007[1]

Own funds as a percentage of risk base




1. Largest savings banks' consolidated accounts.
*Sources:* Savings banks' annual reports, Central Bank calculations.

36. Parent company figures.
37. Associates are generally defined as companies wherein the holding is between 20% and 50%. Related companies are generally defined as companies wherein the holding is between 0% and 20%.
38. Total arrears as a proportion of outstanding loans. Credit provisioning accounts are not deducted. Parent companies.

**Miscellaneous credit undertakings**

The assets of miscellaneous credit undertakings totalled 980 b.kr. in 2007.[39] The largest individual entity in this category is the HFF, whose assets constituted nearly 2/3 of the total assets of miscellaneous credit undertaking as of year-end 2007. HFF loans totalled 468 b.kr. at the end of the year, an increase of 59 b.kr., or 14%, over the previous year. Total lending by the Housing Financing Fund therefore rose by the same proportion in 2007 as did mortgage lending by deposit money banks. Households constitute the largest group of HFF borrowers, with over 80% of the Fund's total lending. Miscellaneous credit undertakings obtain most of their funding through securities issuance and borrowing, as they are not authorised to accept deposits. At year-end 2007 their securities issuance totalled 638 b.kr. As before, the HFF was the largest securities issuer among institutions classified as miscellaneous credit undertakings. The Fund's securities issuance totalled 580 b.kr. at year-end, including housing bond issuance of 512 b.kr.



39. Miscellaneous credit undertakings comprise the Housing Financing Fund, investment banks, leasing companies, payment card companies, and investment credit funds. In August 2007, Iceland's largest investment bank, Straumur-Burdaras, was granted a commercial banking licence; therefore, Straumur-Burdaras is not included among miscellaneous credit undertakings as of year-end 2007.

*Appendix 1*

# Credit risk and an assessment of commercial Banks' resilience

Loan portfolios constitute the bulk of the Icelandic banks' assets; therefore, it is important to analyse the banks' capacity to withstand loan losses. Loan losses are commonly divided into two categories: expected loss and unexpected loss. Expected loss is the loss that the bank allows for and prepares for by making contributions to a credit provisioning account, while unexpected loan loss is covered with capital.

*Financial Stability* 2007 presented the results of a study in which the expected loan loss of the three largest commercial banks – Kaupthing, Landsbanki, and Glitnir – were evaluated. The findings indicated that the banks' contributions to credit provisioning accounts were sufficient to cover expected loan loss. For this year's *Financial Stability* report, the Central Bank carried out an assessment of unexpected loss as well using a simple portfolio model. The banks' economic capital was estimated, and their capacity to tolerate unexpected loan loss was examined using stress tests.[1] For this year's assessment, more detailed information was obtained from the largest commercial banks concerning their year-end 2007 loan portfolios at the group level. The results indicate that the amount they have allocated to cover expected loan loss for 2008 is sufficient, and that their capital is sufficient to cover unexpected loss.

The objective of the study was to simulate the banks' credit risk and use the findings to estimate their resilience against loan losses and shocks to their loan portfolios. The results of any assessment based on available information are subject to uncertainty. Banks have more extensive information about the individual loans in their portfolios and therefore have the possibility of assessing the attendant risk much more precisely than can be done in a study like the present one.

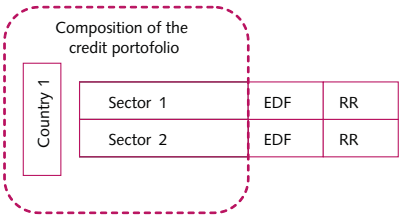
The following discussion centres on estimating loan losses and explains how losses are classified as expected or unexpected. It is followed by a description of the stress tests performed and a presentation of the findings.

### Assessment of loan loss

Loan loss is the loss that a lender sustains due to borrower default. It has proven difficult to construct a comprehensive model of credit risk because data are often lacking and it is unclear how to estimate the distribution of loan losses. The model used here is based on portfolio theory, which takes into account three main criteria in evaluating loan losses. First, the composition of the loan portfolio of the bank in ques-

1. This assessment is based on a study by the Swedish central bank on loan portfolio risk among the four largest banks in Sweden. See also Sveriges Riksbank (2006), pp. 75-88.

Chart 1
Main criteria in evaluating loan losses



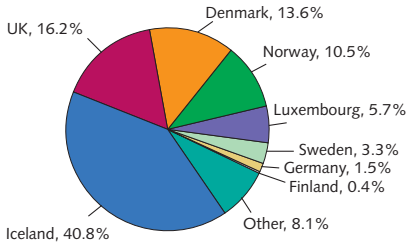

EDF: Expected default frequency
RR: Recovery rate

*Source:* Central Bank of Iceland.



Chart 2
Geographical classification of loan portfolio 2007

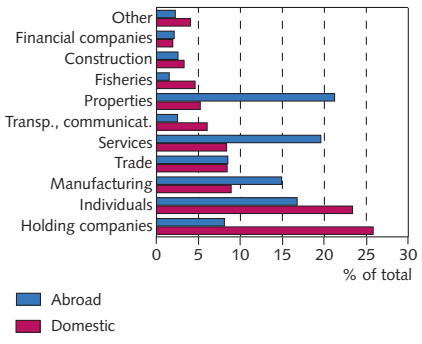
Largest commercial banks' consolidated accounts




*Source:* Central Bank of Iceland.

Chart 3
Sectoral classification of loan portfolios 2007

Largest commerical banks




*Source:* Central Bank of Iceland.

tion is examined. This information is used to estimate the probability that a borrower will default on a loan, which is termed the expected default frequency, and the proportion of a outstanding loan the lender will reclaim in case of default, which is referred to as the recovery rate. Below are a discussion of how these criteria are evaluated and a short explanation of how loan loss distribution is calculated.

**Loan portfolio composition of the main commercial banks**

The composition of the loan portfolio is an important element in estimating loan losses, as the expected default frequency varies by country and industrial sector. For this study, the loan portfolio was broken down as is shown in Chart 1.

Lending by Iceland's largest commercial banks increased by approximately one-third from year-end 2006 to year-end 2007, but geographical breakdown changed relatively little year-on-year. As Chart 2 shows, a large proportion of the banks' lending, or 41%, is to customers in Iceland, while 16% of loans are to customers in the UK and 14% to customers in Denmark.[2] The sectoral classification was also broadly unchanged year-on-year.[3] Of the banks' combined loan portfolio in Iceland (see Chart 3), roughly one-fourth of loans are to holding companies and almost one-fourth to individuals. The banks' lending to households grew significantly in 2004, when they began to grant housing loans, which constitute some 60% of loans to individuals.

The high percentage of loans to holding companies is noteworthy, as lending to this group has grown rapidly in recent years.[4] It is difficult to assess the underlying risk related to holding companies from the data available. For example, it is unclear to what sector they actually belong, and their risks could be of an entirely different type than those of operating companies.[5] It is also likely that a portion of the loans granted to them are secured by equities. If stock prices fall swiftly, the recovery rate for a loan in arrears could fall as well. These uncertainties indicate that the available data on holding company default, which are used to estimate loan losses, do not fully reflect the developments that could occur if circumstances change.

It is unlikely that all loans within the same sector are equally risky. The present study classified the banks' loan portfolio by loan quality so as to take this factor into account. For the study discussed in *Financial Stability* 2007, the banks' loans were placed in three quality categories, under the assumption that 10% of loans were in

2. The banks' lending was classified by the geographical location of the customer.
3. In *Financial Stability* 2007 it is revealed that 37.5% of the main commercial banks' loan portfolio consists of loans to companies in the service sector; here, the proportion is 8.4%. The reason for the difference is that, holding companies were classified as service companies, but they are now in a separate category.
4. The increase in lending to holding companies in recent years is largely because a new holding company registrations have increased considerably more than new registrations in other sectors in recent years. Holding companies comprised 21.5% of newly registered limited liability companies and private limited liability companies in 2007, as opposed to 6.6% in 2003. Statistics Iceland (2008).
5. This is discussed in further detail in the chapter entitled "Financial companies." Under adverse economic conditions, the equity position of holding companies can change much more rapidly than that of operating companies.

the highest category, 80% in the middle category, and 10% in the riskiest category.

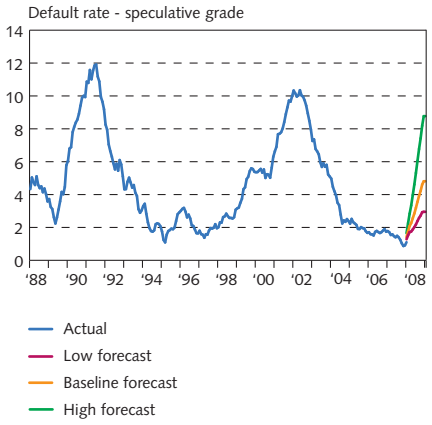
In the present instance, companies within each sector were divided into five quality categories.[6] The quality levels were distributed so that the top category included 25% of companies, those with the lowest expected default frequency. The second category included the next 25%, and the third included the following 25%. The fourth category included the next 15%, and the 10% with the highest expected default frequency were placed in category 5. In order to take into account the breakdown of the banks' loan portfolios by quality, approximate loan quality distribution data from the banks were compiled by country, and the proportion of the portfolio by quality category was assessed based on those data.

**Expected default frequency**

Expected default frequency is the probability that a borrower will default on a loan. Information on expected default frequency was obtained from companies that specialise in carrying out such assessments based on a variety of information about companies, such as financial statements, management, and historical development. Information on expected default frequency in Iceland was obtained from CreditInfo Ltd., while information pertaining to other countries was obtained from Moody's KMV database.[7]

Delinquency has been very rare in Iceland in recent years. However, it is expected to increase because of unfavourable economic conditions, in line with the trends in other countries.[8] Moody's estimated actual global default at year-end 2007 at about 0.91% (see Chart 4) but predicts that default frequency will shoot up to 4.6% by year-end 2008.[9]

Chart 4
Moody´s Default Rate Forecast
Companies with rating Baa1 or lower




*Source:* Moody´s.

**Recovery rate**

If a borrower defaults and it proves necessary to appropriate the collateralised asset, the loss should be limited if the asset used as collateral is a valuable one. The bank's position with regard to lien priority is also important with respect to any claim it may have against the loan in arrears. Therefore, an assessment of loan losses is also based on how much the bank expects to recover on the loan in question.

No information was available on recovery rates for the banks' loan portfolios. Moody's publishes a periodic summary of recovery rates for loans to companies that become insolvent. The principal findings indicate that the recovery rate for collateralised loans is about 50%, while the recovery rate for unsecured loans is 24%-37%.[10] The

6. The databases of CreditInfo Ltd. and KMV Moody's were used in assessing the quality categories for each sector in each country.
7. In 2008 CreditInfo Ltd. changed its definition of default. While the term previously referred to the probability that a company would become insolvent or would be subjected to unsuccessful distraint, it now refers to the likelihood that a company will be placed on a default register; therefore, the definition is now the same for all of the databases used.
8. Trends in delinquency are discussed in the chapter entitled "Financial companies".
9. See Moody's Investors Service (2008), p. 1.
10. See Moody's Investors Service (2008), p. 9.

Basel II rules stipulate, among other things, that the recovery rate on loans depends on the nature of the underlying collateral. For example, the maximum recovery rate for unsecured loans is 55%, while for mortgages 90%.[11] It was assumed that the recovery rate was 55% for loans other than secured mortgages.

## Distribution of loan losses

The distribution of a bank's loan losses indicates the level of risk accompanying the loan portfolio.[12] As is discussed above, the distribution of loan losses can be divided into expected and unexpected loss (see Chart 5). Expected loss is the amount that the banks assume they will lose and against which they protect themselves by provisioning (Item I in Table 1). The banks cover possible unexpected loan loss, up to specified tolerance levels, with capital. This is referred to as economic capital (Item II in Table 1). Unexpected loss in excess of the set tolerance levels (Item III in Table 1) is then estimated with stress tests and controlled by distributing the risk in the loan portfolio. It should be borne in mind that the loan losses examined in this study are based on the results for an entire year. Banks adapt readily to changes in their circumstances; therefore, their position at year-end 2007 – such as the size of their credit provisioning account – does not necessarily reflect their position for the year 2008.



Table 1 Expected and unexpected loan loss and resilience[13]

| | *Loan loss* | *Resilience* |
|---|---|---|
| I | Expected loan loss | Provisions |
| II | Unexpected loan loss up to 99.9% confidence level | Equity and/or provisions |
| III | Unexpected loan loss excess the 99.9% confidence level | Quantified using analysis and controlled with risk diversification |

### I Expected loss

The expected loss of the largest commercial banks was estimated on the basis of information about their loan portfolios at year-end 2007, the expected default frequency, and the expected recovery rate. A more in-depth explanation of the method for estimating expected loan loss can be found in *Financial Stability* 2007.[14]

11. See International Convergence of Capital Measurement and Capital Standards, (2006) pp. 62-69.
12. It is assumed that the loan portfolio distribution resembles a gamma distribution. See Chart 5.
13. CreditRisk+: A Credit Risk Management Framework (1997), p. 25.
14. Expected loan loss (ELL) are calculated using the following formula: ELL = NVD x EDF x (1-ERR), where NVD is the nominal value of the debt, EDF is the expected default frequency, and ERR is the estimated recovery rate.

### II Unexpected loss – economic capital

In order to estimate unexpected loss, the probability distribution of the commercial banks' loan losses was examined; that is, the distribution of the likelihood of loan losses. The model used was the CreditRisk+ model, which was developed by Credit Suisse Financial Products.[15] One of the advantages of the CreditRisk+ model is that relatively few variables are required to calculate the probability distribution, which is determined based on the composition of the loan portfolio, the expected default frequency, and the expected recovery rate. It is assumed that the probability of default is a random variable, and the model takes into account the standard deviation of default rate.[16]

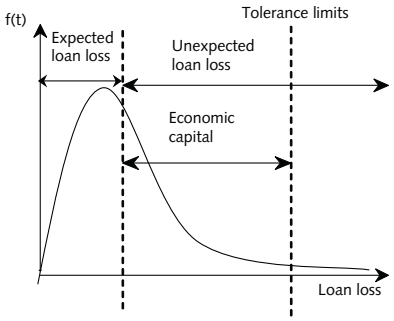
While unexpected loan loss can be significant, the probability diminishes as the losses become greater, as the probability distribution in Chart 5 suggests. Because unexpected loss can be extremely high, it is customary to calculate it up to set tolerance levels. Loan losses in excess of expected loss, up to the tolerance level, are defined as the bank's economic capital. The banks' economic capital was calculated based on 99.9% tolerance levels in accordance with the internal assessment method set forth in the Basel II mandates. According to this method, the tolerance level is an upper limit for the banks' economic capital, and there is little likelihood that loan losses will exceed it. Theoretically, losses are expected to exceed tolerance levels once in a millennium.

Many indicators suggest that models like this one underestimate risk such as that which has developed in recent months. For example, loan portfolio concentration and large exposures can have a significant effect on potential loan losses, yet the CreditRisk+ model does not take this fully into account. Dividing the loan portfolio into five quality categories, however, captures the effects of concentration to some extent. Because the model does not fully reflect the loan portfolio distribution, consideration is also given to large investments, as this assumes that loans in a given quality category within a sector will default either in full or not at all.[17]

### III Unexpected loss – stress-testing the model

In addition to estimating the banks' economic capital, stress tests were carried out by changing the premises of the model for the purpose of examining the banks' capacity to withstand sudden, dramatic changes in economic conditions. Three scenarios were constructed, and shocks were based on them (see Table 2).

Chart 5
Distribution of loan losses




f(t): Probability density function

*Source*: Credit Suisse.

15. The International Monetary Fund's (IMF) version of the model is used here. This is described in the paper by Avesani, R., Liu, K., Mirestean, A. and Salvati, J. (2006). Model 3 was used for this study.
16. The standard deviation for default frequency was estimated based on real data on default in Iceland over the past five years and on expected default frequency abroad for the same period.
17. When the CreditRisk+ model is used to estimate the probability distribution of loan losses, it is assumed that expected default frequency is a random variable that is affected by gamma-distributed systematic risk factors. In this study, the borrower's default is Poisson-distributed and takes a value of 0 or 1. The correlation between the expected default frequency of two borrowers develops only because their expected default frequency is dependent on the expected default frequency of the risk factors. See CreditRisk+ (1997), pp. 33-50, and Avesani et.al. (2006), pp. 5-13.

Table 2 Scenario of shocks I-III

| | *Scenario* |
|---|---|
| Shock I | Holding company arrears increase; credit quality drops by one or more category, recovery rate falls due in part to decline in equity prices. |
| Shock II | Default frequency rise substantially and recovery rate fall because of deteriorating economic conditions in Iceland. |
| Shock III | Deteriorating economic conditions in Iceland and abroad. |

It is desirable that such a staged shock takes into account the developments in the main variables in the model – that is, loan portfolio composition, default frequency, and recovery rate – under adverse economic conditions. A number of studies have been conducted on the interplay of these factors, and the findings indicate, among other things, that when economic conditions deteriorate, default rates rise and recovery rates fall.[18] The historical data upon which these studies are based, however, include default frequency and recovery rates in the US bond market, which probably do not reflect conditions in Iceland.

Shock I examines the effects of increased credit risk due to lending to holding companies. As is discussed above, loans to holding companies have increased substantially, and the underlying risk accompanying such lending is uncertain. Because some of these loans are secured with collateral in equities, it is likely that the recovery rate will drop as equity prices fall. It is assumed that default among holding companies will increase as recovery rates decrease.

The banks' resilience against deteriorating economic conditions in Iceland was examined in Shock II, which assumed more frequent default and a lower recovery rate. Shock III tested the banks' loan portfolios in Iceland and abroad, in a manner similar to that in Shock II.

## Results

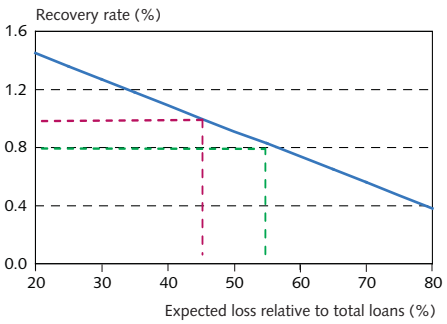
The following section discusses the results of the estimate of the commercial banks' expected loss and economic capital. Also included are a sensitivity analysis of recovery rates and an examination of the banks' resilience vis-à-vis expected loss and economic capital.[19]

### I Expected loss

As is described above, the banks allow for expected loan loss and cover them with loan loss provisions. The balance on their credit provisioning accounts amounted to 0.8% of total lending to customers at year-end 2007. According to calculations, expected loss was 0.8% of total lending by the main commercial banks; therefore, their credit provisioning account balance was sufficient to cover the losses.

Because there was considerable uncertainty concerning the estimated recovery rate, a sensitivity analysis was carried out in order to examine the effects of changes on the calculations. Chart 6 shows the banks' expected loan loss based on various recovery rates. If the recovery rate falls by 10 percentage points, the expected loan loss

Chart 6
Expected loss - sensitivity analysis on recovery rate




*Source:* Central Bank of Iceland.

18. See, for example, the summary by Allen and Saunders (2004) and Altman (2006).
19. Unless otherwise stated, the assumed recovery rate is 55% for the portfolio as a whole and 90% for loans granted to individuals and secured by real estate. See the preceding discussion of recovery rates.

rises by 0.2 percentage points. Therefore, the recovery rate is important in the assessment of loan losses.

### II Unexpected loss – economic capital

If loan losses exceed the amount that the bank has allocated to its credit provisioning account, the shortfall is covered with capital. According to Basel II, the banks' own funds should be at least 8% of the risk base, which consists of credit risk, market risk, and operational risk. The banks' combined capital ratio was just under 12% at year-end 2007. It is assumed that 85% of their risk base is due to credit risk. Unexpected loan loss up to 99.9% tolerance levels and economic capital was measured as a proportion of the banks' risk base.

The results indicated that the combined unexpected loan loss of the main commercial banks was 6.8% of the risk base. Excluding the amount that the banks contribute to their credit provisioning accounts, their economic capital equalled 6% of their risk base (Chart 7). According to this, the banks' equity ratio is high enough to cover economic capital. Despite the fact that the banks can cover economic capital with equity, it is expected that they will need to bolster their capital as losses increase in order to fulfil minimum capital adequacy requirements.

A sensitivity analysis was carried out on the recovery rate for economic capital. Chart 8 shows the banks' economic capital based on various recovery rates. As is stated above, economic capital related to credit risk was 6%, based on a 55% recovery rate. If the recovery rate were to fall by 10 percentage points, however, economic capital due to credit risk would total 7.3%, and the banks' capital is sufficient to cover it.

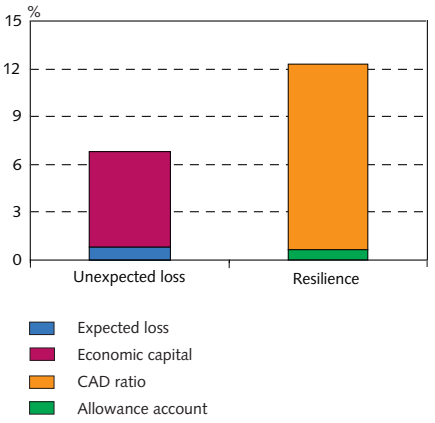
### III Unexpected loss – stress-testing the model

In order to examine the banks' resilience in greater depth, expected and unexpected loss were estimated based on the shocks specified in Table 2. Shock I assumed that Icelandic holding companies' default frequency would rise substantially – that is, it was assumed that all holding companies belonged to the quality categories with the highest default rate (4 and 5), and that the recovery rate on loans granted to them fell by 20 percentage points. Expected loan loss rose by 0.2 percentage points over and above the baseline scenario, and economic capital rose by 2.4 percentage points. This implies that the banks' capital is sufficient to cover the increased stress due to holding companies; however, it is necessary to increase credit provisioning account balances in response to such a shock.

Shock II assumed that it would be more difficult to recover loans in Iceland and that the recovery rate would fall by 20 percentage points.[20] It also assumed more frequent default, and the default rate was increase by half for all quality categories.[21] With these changes,

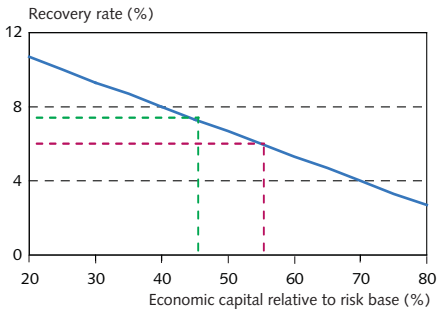
Chart 7
Loan losses and resilience

Calculated exepected loan loss and economic capital compairec to the CAD ratio and allowance account (base scenario)




*Source*: Central Bank of Iceland.

Chart 8
Economic capital - sensitivity analysis on recovery rate




*Source:* Central Bank of Iceland.

20. This is based on the paper by Frye (2000), who states that, under significantly adverse economic conditions, the recovery rate can fall by as much as 20-25 percentage points.

21. Moody's forecast on global default rate developments was used as a reference. See Chart 4. In constructing shocks, more stringent requirements were used for this study than, for example, for the study carried out by Sveriges Riksbank, which was used as a reference for this report. That study assumed that 5% in quality category 1 would be placed in the lowest quality category in Scenario 1 and that the recovery rate would fall by 10% in Scenario 2. See also Sveriges Riksbank (2006), pp. 75-88.

expected loan loss increased by 0.5 percentage points. It is clear that the banks' credit provisioning account balances would not be sufficient to address such an extreme situation. The banks' economic capital as a percentage of the risk base rose by 3.3 percentage points, and the banks do have adequate capital to meet this contingency.

Shock III assumed the same changes as in Shock II, but the shock was extended to loan portfolios both in Iceland and abroad. The banks' expected loan loss rose by one percentage point, and their economic capital as a percentage of the risk base increased by 3.5 percentage points. The banks' capital adequacy ratios therefore appear high enough to enable them to meet shocks II and III, but under such circumstances, they would need to increase capital so as to maintain the required minimum.



**Conclusion**

The primary conclusion based on the portfolio model is that the Icelandic banks are well prepared to face increased default in the coming year. According to the assessments carried out in this study, their credit provisioning account contributions are sufficient to cover expected loss. It can also be concluded that their capital position is strong enough to enable them to meet increases in unexpected losses, but they will need to bolster their capital as a result.

*References*

Allen, Linda and Anthony Saunders, (2004). "Incorporating Systemic Influences Into Measurements: A Survey of the Literature." *Journal of Financial Services Research* 26 (2), 161-192..

Altman, Edward I., (2006). "Default Recovery Rates and LGD in Credit Risk Modeling and Practice: An Updated Review of the Literature and Empirical Evidence." Working paper. Website: http://pages.stern.nyu.edu/~ealtman/.

Avesani, R., Liu, K., Mirestean, A. and Salvati, J., (2006). "Review and Implementation of Credit Risk Models of the Financial Sector Assessment Program." *IMF Working paper* No.134.

Basel Committee on Banking Supervision, (2006). "International Convergence of Capital Measurement and Capital Standards." *Bank for International Settlement*, June 2006.

Credit Suisse, (1997). "CreditRisk+: A Credit Risk Management Framework", London: Credit Suisse Financial Products.

Frye, John, (2000). "Collateral Damage Detected". Federal Reserve Bank of Chicago, *Emerging Issue Series*. October, 1-14.

Statistics Iceland, (2008). "New registrations of limited liability companies 2003-2007." Statistics Iceland Statistical series: Enterprises and turnover 2008/1.

Moody's Investors Service, (2008). "Moody's, Corporate Default and Recovery Rates", 1920-2007.

Moody's Investors Service (2008). Moody's, Corporate Default and Recovery Rates, 1920-2007.

Sorge, Marco, (2004). Stress-testing Financial Systems: an Overview of Current Methodologies. *BIS Working Papers* No 165.

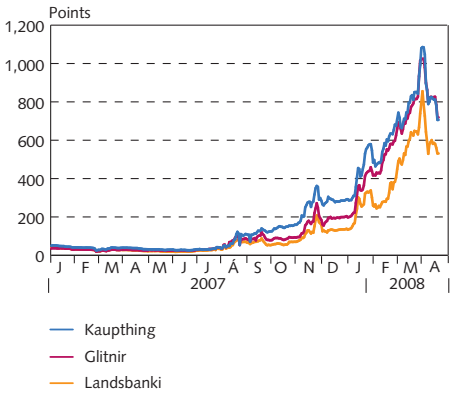
Sveriges Riksbank, (2006). "Using external information to measure credit risk", *Financial Stability Report* 2006/1, 75-88.

*Appendix 2*

# Credit default swaps and pricing determinants

The credit default swap (CDS) spreads of Iceland's three commercial banks have been discussed frequently in the recent term, especially in relation to the pricing of new bond issues and the probability of insolvency. CDS spreads rose exponentially between the the start of the global liquidity crisis in the summer of 2007 and the end of March 2008, and the term "Icelandic premium" is now well known. This Appendix attempts to shed light on the factors that could affect the Icelandic banks' CDS spreads.

Chart 1
CDS spread on 5 years senior issues
January 2007 - April 2008




*Source*: Bloomberg.

**What is a credit default swap?**

A credit default swap (or CDS) is a bilateral agreement where the purchaser of the swap pays the seller a fixed premium, called a CDS spread, for a given period of time. The traditional purchaser's objective is to protect his holding in the underlying third-party bond issue, as the issuer of the bond is usually not connected with the swap. In the event of a contractually agreed credit event, which usually involves some sort of arrears, the seller must pay the purchaser a predetermined amount. Examples of credit events are shown in Table 1. If there are no credit events during the term of the swap, the purchaser continues to pay the premium until maturity. Otherwise, the seller must pay the purchaser the nominal price of the underlying security to which the agreement refers.

Table 1 Credit events according to ISDA definitions

| |
|---|
| - Insolvency |
| - Default on any issue by a financial institution |
| - Refinancing due to, for instance: |
| -change in settlement currency |
| -mergers |
| -acquisitions |
| - Moratorium on payment |
| - Acceleration of payments |

*Source*: International Swaps and Derivatives Association.

CDSs can also be used to take a short call position in a given issuer; that is, instead of purchasing the issuer's bond, it is possible to achieve a similar position by selling CDSs on the issuer in question. In general, CDS spreads have been considered a good appromixation of the terms of the underlying securities; therefore, it has been possible to use CDSs to simulate the payment flow of the securities. There is an important difference between the two, however. Entering into a credit default swap does not require an initial investment of capital, and this makes it possible to take a leveraged position. Furthermore, it is possible to use issues as a reference, even though the maturity is not the same. CDSs also offer the possibility of taking a short put position in

a given issuer; that is, it is possible to purchase a credit default swap without owning the underlying financial instrument and therefore profit by the amount of the instrument if a credit event occurs.[1]

Credit default swaps were originally marketed to enable investors to reduce equity requirements related to issuer default risk by insuring their investment. At the outset, it was assumed that the underlying securities would be delivered upon the occurrence of a credit event. At the end of the 1990s, however, regulatory authorities withdraw this requirement due to the overleveraging of bond issues at that time. The direct connection between credit default swaps and bond issues was thereby broken. CDSs need not be directly related to default on specific securities; instead, they may be linked to credit events of the underlying issuer.

**What are the main determinants of CDS spreads?**

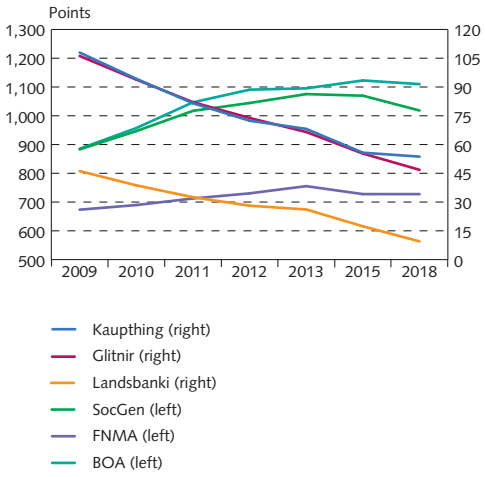
The pricing of credit default swaps is very similar to the pricing of other swap agreements, with the addition of two important factors: the probability of default and the recovery rate.[2] In theory, changes in these factors greatly affect the calculation of CDS spreads; however, in practice, their impact is very limited. This is because the probability of default and the recovery rate can only be estimated with a significant time lag, while CDS spreads change daily or even on an intraday basis. Therefore, the CDS spread in the market generally assumes a fixed recovery rate, and the probability of default is then derived from the spread itself.

Under normal market conditions, it can be assumed that CDS spreads will trend upwards, as CDS issuers demand higher premia for protection over a longer period of time. The derived probability of default thereby increases in accordance with the spread. However, CDS spreads can be inverted, which implies that market participants consider the likelihood of default greater in the short term and demand higher premia for short-term protection. It is nonetheless necessary to bear in mind why investors invest in CDSs for various periods of time. Short-term investors are those who own bonds issued by the banks and do not wish to sell the bonds from their portfolios or cannot sell them on acceptable terms due to market conditions. Short-term investors are also those closing their synthetic positions in complex credit derivatives, such as special purpose vehicles (SPVs) that are unwinding synthetic unfunded collateralised debt obligations (CDOs) or comparable credit derivatives.[3]

Longer-term investors, however, are likely to include speculators, hedge funds, and others wishing to trade in a deeper market such as the five-year credit default swap market. This is illustrated in Chart 2, which shows the credit default swap spreads ranging from one to 10 years for various financial institutions. A jolt in all of the paths in June 2013 – that is, in five-year agreements – indicates that this is a different kind of position-taking than that characterising other periods. The



Chart 2
CDS curves various financial companies
March 31, 2008




*Source*: Bloomberg.

1. See also Box 2 in *Financial Stability* 2006, p. 27.
2. See the discussion of default probability and recovery rates in Appendix 1.
3. Further discussion of collateralised debt obligations can be e.g. found in the financial stability reports issued by the International Monetary Fund (IMF) and the Bank for International Settlements (BIS) in 2005.

CDS path of Iceland's banks is inverted and reflects the discussion of their increased short-term funding and liquidity risk. The paths of the Federal National Mortgage Association (FNMA, or Fannie Mae), the Bank of America, and Société Générale are shown here as a reference, where the likelihood of a credit event increases over time.

The pricing of CDSs is therefore determined not only by underlying risk factors but also by the depth of the market and the reasons for the transaction.

**Correlation between credit default swaps and credit ratings**

A credit default swap spread is a measure of risk. For example, sellers demand a higher premium if they consider the issuer of the underlying bond risky. The difference in the CDS spreads of various issuers is therefore determined by the market's assessment of each issuer's operations and risk. Another measure of market risk is an issuer's credit rating, which is also affected to a large degree by the probability of default and the recovery rate. Thus it can be assumed that, under normal market conditions, there is a strong correlation between CDS spreads and credit ratings.[4] However, there is a fundamental difference between these two risk assessment criteria: their frequency. Credit ratings are reviewed every few months, or perhaps more seldom, while CDS spreads change daily. It can therefore be concluded that the CDS spread is a sort of "spot position", or the present market's risk assessment, and that it indicates what sort of changes the credit rating will undergo in the future. A change in the credit rating then confirms the risk assessment and the CDS spread.

Transactions with credit default swaps also take place on bond issues from various sovereigns. The spread should reflect the underlying risk factors attached to the sovereign, and those risk factors should be reflected in its sovereign credit rating. The risk factors include economic conditions, political stability, and productivity. Because these factors are also underlying risk factors pertaining to the operations of companies in the country in question, there should be a positive correlation between a given country's CDS spreads and those of its companies, especially when the country is a small one.

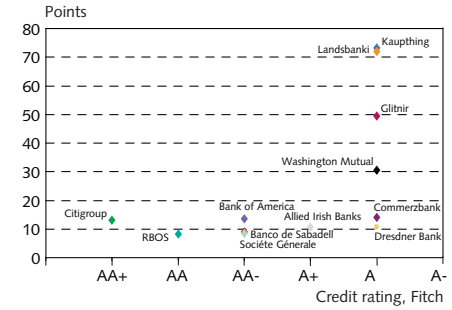
The CDS spread relative to the credit rating should therefore provide a fairly accurate view of the market's assessment of the risk attached to a company's operations as compared with a comparison group. These aggregates should correlate despite a lag. In cases involving extreme values, it is possible to estimate the possibility of profiting on trading in the company in question; that is, the pricing of the CDS is incorrect for some reason or a change in the credit rating is imminent.

**Developments in the CDS spreads of Icelandic banks**

Investors developed an interest in trading in the CDS spreads of Iceland's banks following the large bond issues in 2004 and 2005. Shortly thereafter, or in the first quarter of 2006, the Icelandic financial system

4. That is, companies with the same credit rating should have similar CDS spreads on comparable issues, plus a special premium related to operational fundamentals.

Chart 3
CDS spread to credit rating
March 31, 2006

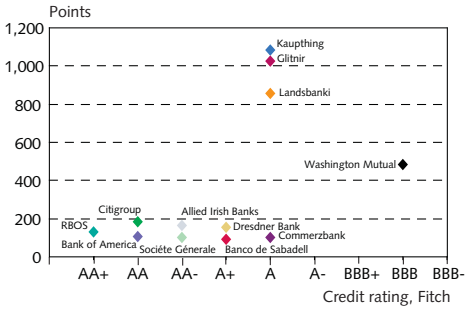



*Source*: Bloomberg.



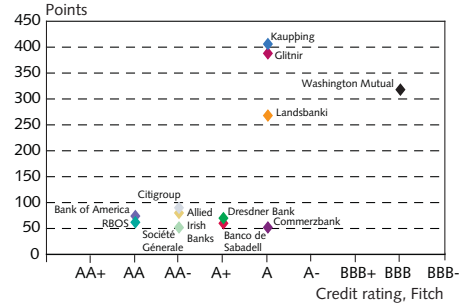


Chart 4
CDS spread to credit rating
March 31, 2008




*Source*: Bloomberg.

Chart 5
CDS spread to credit rating
May 6, 2008




*Source*: Bloomberg.

found itself battling an confidence crisis in the wake of negative media coverage and revised credit rating outlooks. The CDS spreads of the Icelandic banks rose sharply, giving the impression that the banks were very risky – far riskier than comparable financial undertakings elsewhere. This risk was attributed, among other things, to the small size of the banks and the Icelandic economy, the rapidity of their international expansion, and the composition of their balance sheets. The confidence crisis was short-lived, however, and was reflected only in changes in CDS spreads, not in downward revisions of credit ratings. This risk assessment by the market can be seen clearly in Chart 3, which shows CDS spreads in proportion to credit ratings at the end of Q1/2006. The extra premium – the so-called "Icelandic premium" – was in the neighbourhood of 40-60 basis points and was generally reflected in the Icelandic banks' terms for new bond issues. Other financial institutions' premia were usually in the range of 10-20 basis points.

Now, two years later, significant changes have occurred. Financial undertakings' CDS spreads remained broadly at the levels shown in Chart 3 until June 2007, when the beginning of the sub-prime crisis and liquidity crisis pressed spreads upwards worldwide. The increase is largely attributable to the rise in the pricing of risk related to financial undertakings because of their write-offs of sub-prime mortgages and related credit derivatives, not to mention illiquidity and investor flight to safety. Such circumstances have an extremely negative influence on the operations of financial undertakings and often herald a downward revision in their credit ratings. The Icelandic banks are no exception. After an uninterrupted spate of increases, CDS spreads peaked at around 1,000 basis points, which corresponds to an increase from six to eight times the average for the comparison group. The spreads reached their high point at the end of March. Chart 4 shows CDS spreads in relation to credit ratings. The Icelandic banks' spreads rose much more than those in the comparison group without their reporting a more negative operating performance or being exposed to sub-prime loans or complex structured derivatives. The banks' credit ratings from Fitch have not changed during this period, but both Moody's and Standard & Poor's have issued downgrades of one to two notches. Chart 4 shows that most of the comparison companies have a comparable CDS spread relative to their credit ratings. The Icelandic banks still show the extreme values, as the "Icelandic premium" during this period is much higher, even after the credit rating downgrade. For example, companies with a credit rating of BBB have a lower spread than any of the Icelandic banks. If the correlation between CDS spreads and credit ratings holds, either this was an arbitrage opportunity in selling Icelandic banks' credit default swaps, or substantial changes in underlying risk factors were in the offing and even further rating downgrades could be expected.

These changes in CDS spreads and credit ratings reflect, among other things, increasing likelihood of delinquency, more difficult credit market conditions and, to an extent, a more adverse economic situation in Iceland; however, they do not fully explain the sudden, drastic increase in the first quarter of 2008. Therefore, the increase must be attributable in part to technical problems in the credit derivative market.

**What are the technical reasons for increases in CDS spreads?**

There are two possible reasons for the difference between the CDS spreads of Icelandic financial institutions and those of foreign companies. The first possibility is that there have been changes in underlying risk factors in the issuer's operations and that these changes increase the likelihood of a credit event, which in turn increases the probability of default and/or reduces the expected recovery rate. The second possibility is that there are technical aspects of the bond or credit derivative market that cause price changes without a change in the risk factors underlying the issuer's operations. There has been copious discussion of the "Icelandic premium" due to underlying risk factors. The primary explanations that have been offered are the banks' business model, the low proportion of deposit funding, and leveraged buyouts, as well as credit rating changes; however, these alone cannot explain a rise in CDS spreads as dramatic and sudden as that experienced by Iceland's banks. A part of the explanation must lie in technical aspects of the structure and activity of the credit derivative market. The technical characteristics that are most likely to cause flawed price formation in the CDS market are these:

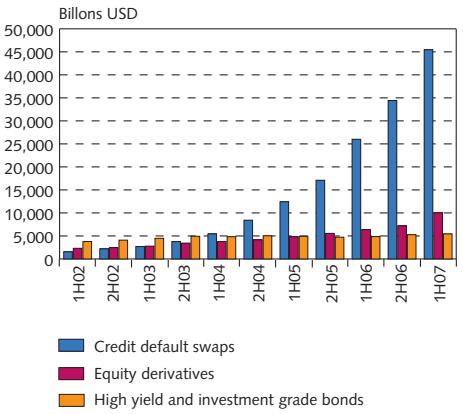
- *The size of the credit derivative market.* As Chart 6 shows, the notional amount of credit derivatives is exponentially larger than the underlying issue. Should difficult conditions arise in the credit markets, the number of parties selling protection will drop sharply, and purchasers must then even hold their contracts to maturity. The price of credit default swaps therefore rises as supply falls.
- *Lack of transparency in the credit derivative market.* Transactions with credit derivatives take place primarily on an over-the-counter market. It is therefore easy to affect price formation because there is limited monitoring of purchases and sales.
- *The definition of a credit event* is broader under the terms of credit default swaps than under the terms of bond issues, as Table 1 illustrates. Therefore, the issuer of credit default swaps demands a higher return than bond investors do. This is especially the case under the current conditions, where the probability of default has increased worldwide.
- *A shallow credit market* for the underlying securities and/or credit default swaps will generate a higher price for credit default swaps. The securities lending market in Iceland is very shallow; therefore, it is not possible to take a position in issuers' equities or debt instruments because they are not available on the market. In such cases, the credit default swap market is used instead.
- *Large financial companies are unwinding their positions in collateralised debt obligations (CDOs)* because of repricing of risk and losses on sub-prime loans.

CDOs are only one of a few credit derivatives that affect the CDS market. Issues by Icelandic banks were in demand as a part of CDOs. Under the market conditions that reigned from the beginning of 2006 until mid-year 2007, the banks' bond issues had higher yields than issues from other comparable financial institutions with the same credit rating (see also Chart 3). At one point, for example, the banks had a

Chart 6

Size of derivatives and bond markets

National amount of derivatives and market value of bond indices




*Sources:* Bloomberg, ISDA, Merrill Lynch.

rating of Aaa from Moody's but nonetheless paid considerably higher returns to investors. These issues were therefore a desirable option for the senior tranches of CDOs. Because the supply of actual bond issues was limited, credit default swaps were used to simulate their payment flow. When CDOs began to falter because of delinquency on sub-prime mortgages and broad-based reassessment of risk, they were downgraded by credit rating agencies. The resulting losses resulting have been enormous, and large financial companies have unwound them, with the accompanying CDS transactions.

Table 2 Moody's credit ratings from January 2006

| | *Kaupthing* | *Glitnir* | *Landsbanki* |
|---|---|---|---|
| 1 January 2006 | A1 | A1 | A2 |
| 1 February 2007 | A1 | A1 | A2 |
| 24 February 2007 | Aaa | Aaa | Aaa |
| 4 October 2007 | Aa3 | Aa3 | Aa3 |
| 28 February 2008 | A1 | A2 | A2 |

*Source:* Bloomberg.



**Indications based on current credit default swap spreads**

Various conclusions have been drawn based on the trends in the Icelandic banks' CDS spreads, especially with respect to the probability of default. It is questionable to rely on indications of default probability derived from CDS spreads. For example, historical data show that the highest probability of five-year default with a credit rating of A from Moody's is 1.12%, which should be reflected to some degree in the CDS spread.[5] In the case of Iceland's banks, the derived probability of default is far higher; for example, it was around 50% when CDS spreads reached their peak. Thus it can be assumed that the derived default probability based on the current CDS spread does not reflect the actual probability of default.

The bid/ask spread gives an indication of the market's opinion of the position of the Icelandic banks. A wide spread indicates market incertitude regarding the risk assessment. This is exactly the situation surrounding the banks' CDS spreads.

Since the end of March 2008, the banks' CDS spreads have fallen to five times the average for the comparison group (see Chart 5 pg. 70); however, the average of the comparison group has risen from 13 basis points to 95. If the CDS spread is still a reference for the terms of new bond issues, it is clear that such terms are unacceptable for the long term for Iceland's banks.

It can be assumed that a portion of the widespread rise in CDS spreads in Q4/2007 and Q1/2008 can be traced to technical shortcomings in the credit derivative market, as well as liquidity shortages and investor risk aversion. The situation was extremely trying for the Icelandic banks. After the substantial write-offs of CDOs, by foreign banks in the first quarter of the year as a result there is some hope that the dust has settled by now and that losses will begin to dwindle hereafter. In spite of this, it is difficult to assess whether and when balance will be established in the credit derivative market.

5. See Moody´s Investeors service (2008). Moody's Corporate Default and Recovery Rates, Average cumulative issuer weighted default rates 1920-2007.

*Appendix 3*

# Liquidity rules and liquidity management

In the wake of a liquidity crisis, regulatory authorities inevitably direct their attention towards the liquidity management and liquidity position of financial undertakings. In recent years, a great deal of work has been invested in enhancing and improving international rules concerning capital adequacy, while less attention has been directed toward rules on liquidity, as liquidity was abundant in the global financial markets. International regulatory authorities[1] are now paying increased attention to financial institutions' liquidity management and the risk associated with it, particularly funding liquidity risk.[2] The Central Bank of Iceland and the Financial Supervisory Authority (FME) collaborate in monitoring the liquidity position of domestic financial undertakings.





**Methods for managing liquid assets**

The business model of financial undertakings and conglomerates often forms the foundation for the management of liquid assets, as the nature of an undertaking's operations is what determines how much liquid assets a company must have.[3] The aim of liquidity management, however, is always to guarantee financial institutions' payment flow so that they can fulfil their commitments at any given time at a suitable expense, and so that financial stability will not be jeopardised because of liquidity problems experienced by a particular financial institution. Liquidity management can be carried out at the group level or within each operational unit. Whether it takes place at the group level or not, it is classified according to three principal approaches.

*1. Stock approach*

Managing liquidity with a stock approach requires that a financial undertaking own a portfolio of extremely liquid assets that can be sold for cash under any market conditions and are generally considered the equivalent of cash. These are usually assets with a short maturity; that is, less than 12 months. Among such assets are cash, government securities, repo-eligible securities, committed credit lines with or without material adverse change clauses, listed securities, securitisable bank loan portfolios, and the like. In general, the assets are assessed not at full price but with a haircut deducted. The portfolio is measured as a proportion of total assets, short-term assets or as a proportion of net capital outflow, where the assets in the liquid asset portfolio are the numerator. The proportion is then used as a measure of liquidity risk.

1. The Bank for International Settlements (BIS) and the Committee of European Banking Supervisors (CEBS), among others.
2. It should be emphasised that this is not the market liquidity risk that exists when financial institutions cannot divest their positions without making an impact on their pricing.
3. Financial undertakings are here as participating in the following activities: securities transactions, banking, or insurance. Financial conglomerates are undertakings with activities in at least two of these three lines.

One of the rationales for this method is that the more liquid assets a bank owns, the more readily the bank can deal with serious liquidity problems. The rating agency Moody's Investor Service uses a similar method in assessing the internal financial strength of financial institutions.[4] Liquidity management with a stock approach is best suited to companies engaged in securities trading or those with mixed operations, where the maturity of the assets and liabilities is shorter than one year and where asset values are subject to wide fluctuation.

*2. Mismatch approach*

Managing liquidity using a mismatch approach assumes that liquid assets are assessed by maturity, but only inflow from liquid assets is used to offset the outflow stemming from liquid liabilities, without consideration for the stock of liquid assets such as cash. Liquid asset inflow versus outflow is then classified by time periods, and the bank's future liquidity position is estimated in terms of the net cash position in each period. Inflow is assessed less a haircut, and it is assumed that the undertaking's lending obligations will be drawn upon.

*3. Mixed approach*

When a mixed approach is used in liquidity management, short-term liquid assets and capital inflow are used to offset short- and long-term outflow. Thus an attempt is made to achieve the principal benefits of both stock and mismatch approaches. It is necessary to deduct a haircut from liquid assets and capital inflow in evaluating access to each asset. Banks and insurance companies generally prefer this method.

**Regulatory framework for liquidity management**

The regulatory framework concerning liquid assets can be classified in a manner similar to that for liquidity management; that is, quantitative, qualitative, and mixed. Under quantitative monitoring, financial undertakings are required to account for and maintain a mandatory minimum – that is, a proportion of assets and liabilities – which is predetermined by the regulatory authorities in each country. Because many financial institutions are multinational, they may be required to meet various minimum liquidity requirements because the liquidity monitoring of subsidiaries and/or branches is carried out by the host country. One of the three liquidity management methods mentioned above is often used for measuring purposes. Under qualitative monitoring, the regulatory authority assesses the internal liquidity rules of the financial undertaking in question and bases its reporting on those rules. A mixed approach combines these two methods.

In the spring of 2007, the Committee of European Banking Supervisors (CEBS) conducted a survey among member states[5] in order to determine how liquidity monitoring was carried out. Most countries use a combination of qualitative and quantitative monitoring approaches. However, it was possible to determine which method was dominant, one-third of the countries surveyed use qualitative rules,

4. See Moody's Investor Service – Bank Financial Strength Ratings 2007.
5. Member states are countries in the EU and the EEA. The survey can be found at http://www.c-ebs.org/advice/documents/CfA_8_LiquidityStockTakesurvey.pdf

while two-thirds use quantitative rules. Most member states use the same liquidity rules for all financial undertakings, irrespective of their activities or operational form, and most monitor the liquidity position of conglomerates.

The diversity of the regulatory framework governing liquidity monitoring entails risks and hindrances for multinational financial institutions. Collaboration among the regulatory authorities in the home country and the host country is extremely important for international financial operations because differing rules and minimum levels can prove very costly in terms of liquidity management. The disadvantages of quantitative rules have been pointed out in this context. Furthermore, under quantitative rules there may be the risk that liquid assets will become quarantined within the parent or subsidiary because of so-called ringfencing; that is, the rules can obstruct the free flow of liquid assets from parent company to subsidiary. Differences in rules can generate extra expense in managing liquid assets and, at worst, could even cause a liquidity squeeze. The chief benefit of qualitative rules is their flexibility vis-à-vis the operations of the financial institution concerned. The drawback of qualitative rules is that they make co-ordinated monitoring and data compilation more difficult.

Access to guaranteed capital is of critical importance in a liquidity crisis. Therefore, it is necessary that central banks agree on the classes of assets that are eligible as collateral. This enables financial institutions to maintain a co-ordinated asset base that satisfies the requirements of numerous countries. The size of financial institutions is also an important factor in the formulation of a regulatory framework. Smaller undertakings within the EEA use the regulatory authorities' rules for liquidity management because their operations are much simpler and may not be multinational in scope. The use of qualitative rules would thus increase these undertakings' expenses to a considerable degree. Finally, it is also worth noting that when rules are reviewed and co-ordinated, financial stability must take precedence over financial undertakings' expenses in carrying out liquidity management.

**Central Bank of Iceland rules**

The current Rules on Liquidity Ratio,[6] first set in 1999, were based on the rules set by Bundesbank, the German central bank, and were last reviewed in 2006. The Rules can be classified as quantitative rules based on a mixed approach. At present, 42 companies submit monthly liquidity summaries to the Central Bank of Iceland. The companies can be classified in the following manner:

Table 1 Credit institutions subject to minimum reserverequirements

| | |
|---|---|
| Savings banks | 21 |
| Commercial banks | 5 |
| Credit institutions | 9 |
| Payment intermediaries | 3 |
| Other operations | 4 |

6. See, among other things, the discussion in *Financial Stability* 2007, p. 81.

This is a broad group of entities engaged in varying types of operations. Understandably, it is quite difficult to design rules that meet the needs of both the market and the companies in the market, and as can be seen in the discussion of the types of liquidity management in use, the current rules suit companies to a varying degree. Furthermore, the scope of finance management in a company's operations plays a large role in determining how prominent liquidity management will be.

Iceland's three largest commercial banks operate in accordance with internal rules that are more stringent than those set by the Central Bank. Because of the multi-faceted nature of their operations, the stock approach or a mixed approach to liquidity management is more suitable than the mismatch approach. Savings banks and credit institutions engaged in simple operations tend to use the mismatch approach because their payment flow is based on more regular inflow and outflow of payments. It can therefore be expected that, in Iceland, qualitative rules would suite larger commercial banks, while quantitative rule would be more appropriate for smaller savings banks and other financial institutions. It is likely that the work now conducted by international supervisors will influence the further shaping of the Central Bank's Rules on Liquidity Ratio.

In January 2008, the Central Bank of Iceland expanded its rules on securities eligible for repo transactions with the Bank.[7] That review was an element in the Bank's move towards greater co-ordination with practices abroad. Furthermore, at the end of March, the Central Bank amended its rules on minimum reserve requirements, collateral loan transactions, and certificates of deposit. These measures were part of the Bank's attempts to facilitate financial market activity.

In January 2008 The Financial Supervisory Authority issued Guidelines on best practice in liquidity management of financial undertakings. These Guidelines apply, as appropriate, to both parent companies and financial conglomerates, and are aimed primarily at commercial banks, savings banks, and credit institutions. They will supplant the FME Guidelines on Foreign Currency Liquidity Management, no. 2/2004.

*References*

Basel Committee on Banking Supervision (2000), "*Sound Practices for Managing Liquidity in Banking Organisations*", The Bank for International Settlements, February 2000.

Basel Committee on Banking Supervision (2006), "*The management of liquidity risk in financial groups*", The Bank for International Settlements, May 2006.

European Central Bank (2007), "*EU Banking Structures*", European Central Bank, October 2007.

Institute of International Finance (2007), "*Principles of Liquidity Management*", Institute of International Finance, March 2007

Moody's Investor Service (2007), "*Bank Financial Strength Ratings: Global Methodology*." Moody's Investor Service, February 2007.

7. Cf. the amendments to Central Bank Rules no. 35/2008, published on January 14, 2008.

# Payment intermediation – secure framework in uncertain times

*The Central Bank's RTGS system now uses a mechanism that enables participants to steer payment instructions in accordance with liquid assets at any given time. Payment instructions in excess of specified limits are now placed on a waiting list until the participant's treasury department has approved them, thus reducing the likelihood of rejection due to overdraft limits. At the same time, it has been possible to reduce the total amount of settlement collateral. The Central Bank's rules on payment systems, which were drafted in 2003, were reviewed and amended to reflect changes in market conditions. The tariff for the RTGS system has been revised, and fees now cover all costs for the operation of the system. In recent years, increased emphasis has been placed on contingency matters related to payment intermediation, and contingency exercises have been held in accordance with this sharpened focus.*

*Discussion of companies' adopting the euro as their accounting currency have been prominent in the recent term; however, the choice of foreign or domestic currency as the presentation currency for companies' financial statements has no effect on payment intermediation. On the other hand, share capital registration and trading are related to payment intermediation, as the monetary settlement of securities transactions takes place through the Central Bank's RTGS system. In recent months, settlement procedures have been systematically adapted to the needs of the market, although within the boundaries of the internationally recognised regulatory framework. In Appendix 1 is a detailed discussion of the premises for share registration in foreign currency, as well as the Central Bank's role and the international requirements made of securities settlement systems. Box 2 contains a summary of the chief recommendations made by the Bank for International Settlements (BIS) and the Committee on Payment and Settlement Systems and the Technical Committee of the International Organization of Securities Commissions (CPSS/IOSCO) concerning securities settlement systems.*

**Icelandic payment and settlement systems**

Three systemically important payment systems are in operation in Iceland, the largest and most important of which is the Central Bank of Iceland's real-time gross settlement (RTGS) system. All payment instructions in amounts of 10 m.kr. or higher take place through the RTGS system, where each individual set of instructions is carried out as soon as the balance on the account permits. Smaller payments are handled by the Fjölgreiðslumiðlun (FGM) netting system, and settlement between participants (financial institutions) is carried out on the basis of netting that takes place through the RTGS system. The methodology used in the securities settlement system is comparable to that in the netting system; i.e., payment instructions are netted out and the resulting amount settled in the RTGS system. Delivery of securities is effected as soon as payment from buyer to seller is completed.

**Central Bank RTGS system – queueing mechanism**

Most real-time gross settlement systems are equipped with control mechanisms that facilitate steering of payment instructions by participants and utilise liquid assets in the most efficient way possible. Such mechanisms enable participants to pair expected deposits and payments and schedule them in order of priority. The Central Bank's RTGS

system did not have such a mechanism until recently; however, in 2007 the Bank introduced equipment that enables participants to control payment instructions in accordance with liquid assets at any given time. Participants can now decide that payment instructions in the RTGS system that exceed specified limits must be placed on a waiting list and will not be carried out until the treasury department of the participant concerned has approved their execution. Although this equipment is less sophisticated than that in the newest real-time gross settlement systems, it nonetheless enhances finance management, reduces the probability that participants will exceed their authorised limits, and diminishes the likelihood that payment instructions will be rejected.

User fees in the RTGS system were reviewed in December 2007, and a new tariff entered into force at the beginning of 2008. The Board of Governors of the Central Bank decided that, beginning in 2008, user fees must cover all expenses for the operation of the system.[1]





**Changes in the netting system**

Early in 2007, automatic locks comparable to those in the Central Bank RTGS system were activated in the netting system. A decision was also made to increase the number of settlements taking place in the netting system. The final settlement of the netting system now takes place through the Central Bank's RTGS system before it opens in the morning and again after the RTGS system closes. The change has been a beneficial one. The implementation of technical locks was successful. These locks in the RTGS and netting systems prevent participants from exceeding their authorised limits, which are now fully guaranteed. In order to reduce the amount of capital required for collateral in the netting system, multilateral netting was adopted instead of the previous bilateral netting arrangement. To enhance operational security of the netting system still further and to reduce the likelihood that technical locks would be triggered outside the RTGS system's hours of operation, it was decided to transfer a portion of the unutilised collateral in the RTGS system to the netting system so as to raise authorised limits after the close of RTGS system operation.

The only change made to the tariff for the netting system was an increase in the transaction charge from 2.45 kr. to 2.65 kr. At the same time, the charges in the RÁS system for credit and debit card transactions dropped from 3.45 kr. to 3.20 kr. per transaction.[2]

**Collateral security in the payment systems**

Adequate collateral for payment system settlement is vital for ensuring the sound and efficient operation of the financial system in the event that a financial institution cannot honour its settlement obligations. Collateral amounts are determined by the financial institutions' agreed authorisations at any given time. Authorisations granted, both in the RTGS system and the netting system, are now fully secured. Collateral in the RTGS system totalled 24.6 b.kr. at the beginning of

1. Further information on the tariff for the RTGS system can be found on the Bank's website: www.sedlabanki.is.
2. Further information on the tariff for the netting system and the RÁS system can be found on the FGM website: www.fgm.is

Box 1

## The ten Core Principles for systemically important payment systems[1]

I. The system should have a well-founded legal basis under all relevant jurisdictions.

II. The system's rules and procedures should enable participants to have a clear understanding of the system's impact on each of the financial risks they incur through participation in it.

III. The system should have clearly defined procedures for the management of credit risks and liquidity risks, which specify the respective responsibilities of the system operator and the participants and which provide appropriate incentives to manage and contain those risks.

IV.[2] The system should provide prompt final settlement on the day of value, preferably during the day and at a minimum at the end of the day.

V. [2] A system in which multilateral netting takes place should, at a minimum, be capable of ensuring the timely completion of daily settlements in the event of an inability to settle by the participant with the largest single settlement obligation.

VI. Assets used for settlement should preferably be a claim on the central bank; where other assets are used, they should carry little or no credit risk.

VII. The system should ensure a high degree of security and operational reliability and should have contingency arrangements for timely completion of daily processing.

VIII. The system should provide a means of making payments which is practical for its users and efficient for the economy.

IX. The system should have objective and publicly disclosed criteria for participation, which permit fair and open access.

X. The system's governance arrangements should be effective, accountable and transparent.

1. Bank for International Settlements (BIS): Core Principles for Systemically Important Payment Systems.
2. Systems should seek to exceed the minima included in these two principles.



2007 and 18.6 b.kr. at year-end. The reduction is attributable to more effective finance management among participants, which emerges in a lower collateral requirement. Collateral security in the netting system totalled 5.9 b.kr. at the beginning of 2007 and 4.5 b.kr. at year-end. In this instance, the reduction is due primarily to changes in netting arrangements.

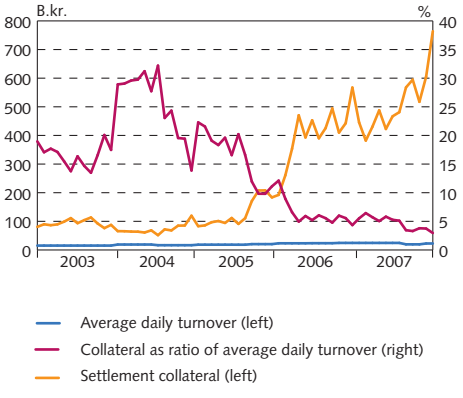
### Central Bank rules on payment systems

In 2003, the Bank issued the Rules on the Central Bank of Iceland Real-Time Gross Settlement System and the Rules on the Activities of Netting Systems. Both sets of rules were reviewed in 2007 and amended to reflect changes in market conditions.[3]

Chart 1

Average daily turnover in the RTGS system and settlement collateral

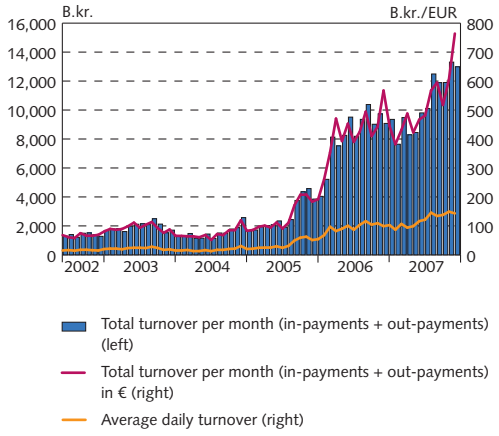
At end of month January 2003 - December 2007




*Source:* Central Bank of Iceland.

3. The new Rules on the Central Bank Real-Time Gross Settlement System, no. 312/2007, and the Rules on Activities of Netting Systems, no. 313/2007, can be found on the Bank's website: www.sedlabanki.is.

Chart 2
RTGS system turnover
At end of month June 2002-December 2007

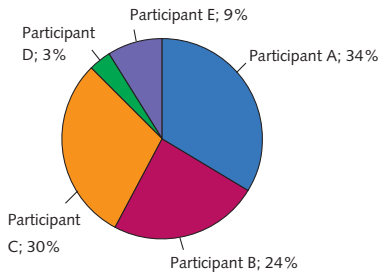



*Source:* Central Bank of Iceland.



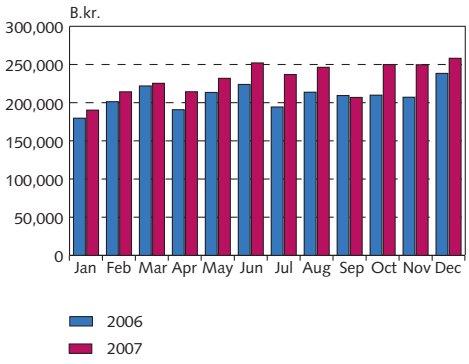


Chart 3
Participants' share in the RTGS system
Percentage of total transactions




*Source:* Central Bank of Iceland.

Chart 4
FGM netting system




*Sources:* Central Bank of Iceland, FGM.

## Payment system contingency exercise

At the beginning of 2007, a special contingency exercise was held for payment systems (for further description of the contingency exercise, see *Financial Stability* 2007, p. 75). In the fall of 2007, a Nordic-Baltic contingency exercise was held. A cross-border financial crisis was staged, and a part of the exercise was devoted to payment systems. A special payment system contingency exercise is planned for later in 2008.

## Payment system turnover

*RTGS system*

Total turnover (deposits and withdrawals) in the RTGS system amounted to 125,702 b.kr. in 2007, which equals an average of 10,475 b.kr. per month or 511 b.kr. per day.[4] In comparison, total deposits and withdrawals amounted to 98,430 b.kr. in 2006. Turnover in the RTGS system therefore increased by nearly 28% year-on-year. However, based only on original payment instructions from participants, total turnover in the system amounted to 62,799 b.kr. in 2007, which corresponds to 5,233 b.kr. per month or 255 b.kr. per day.[5] Calculated in this manner, total daily turnover corresponds to 20% of GDP in 2007, while it corresponds to 40% of GDP if calculated based on total deposits and withdrawals. Chart 2 shows RTGS system turnover by month, and Chart 3 shows individual participants' share in system turnover.

The total number of transactions (deposits and withdrawals) in the RTGS system exceeded 388 thousand in 2007, as compared with just over 319 thousand in 2006. The number of transactions (deposits and withdrawals) therefore rose by 21.6% year-on-year. If withdrawals alone are counted – that is, the number of instructions to transmit payment from participants' accounts – the total number of transactions amounted to slightly more than 195 thousand in 2007. An examination of transaction distribution by month shows that the greatest number of payment instructions was issued in April and the fewest in August and November. The charts show the distribution of transactions by month and by participant. The average amount of payment instructions issued by RTGS system participants in 2007 was just over 322 m.kr.

The system's up-time ratio was 99.92% in 2007. Nine system incidents that took place during the year.

*Netting system*

Total turnover (deposits and withdrawals on participants' accounts) in the FGM netting system rose from 2,504 b.kr. in 2006 to 2,776 b.kr. in 2007, an increase of nearly 11% year-on-year. Turnover was greatest in December 2007, at just over 258 b.kr., and least in January, when it totalled 190 b.kr. This pattern is similar to the turnover pattern for 2006. Average monthly turnover in 2007 was 231 b.kr., which is roughly equal to 7.6 b.kr. per day, 365 days a year. Weekend and holiday turnover is generally low, however, and average weekday turno-

4. The average daily turnover in the RTGS system is based on the days the system is open.
5. This only takes into account withdrawals from participants' accounts. Deposits to participants' accounts are not included in turnover figures.

ver correspondingly higher. Total transactions in the netting system were just over 72 million in 2007, as opposed to slightly less than 69 million in 2006, a 5% year-on-year increase. The average transaction amount was 38,556 kr. in 2007, compared with 36,466 kr. in 2006.

*Securities settlement system*

In 2007, 125 thousand transactions were made through the Icelandic Securities Depository (ISD) system, with a total value of 2,314 b.kr., an increase of 3% in the number of transactions and 82% in terms of total turnover. In 2006 some 122 thousand securities transactions took place, and turnover totalled 1,273 b.kr. In addition to these were transactions were made in connection with off-exchange trading and asset transfers relating to the winding-up of estates, etc.

**International developments in payment system infrastructure**

*Target – Target2*

The European Central Bank (ECB) is in the process of replacing its real-time gross settlement system with a new system called Target2, which will be fully operable in the fall of 2008. The new system, which is a centralised real-time gross settlement system for the entire euro area, will be one of the largest payment systems in the world. Several Icelandic financial institutions are considering participating directly in Target2 through the assistance of the Bank of Finland, in connection with their plans to carry out their securities transactions in euros. If these plans materialise, the new RTGS system will be used not only for monetary settlement of securities transactions in euros; financial institutions will also be able to use it in connection with currency transactions in euros, which will result in enhanced security and efficiency.

*Target2-Securities*

The ECB is planning to develop a new securities settlement system, Target2-Securities, with monetary settlement of securities transactions linked to the Target2 RTGS system. Development of this system is still in the preliminary stages. The underlying reason for these plans is the fact that the current arrangement for securities settlement is rather complicated and non-transparent, and it obstructs attempts to enhance efficiency and effectiveness.

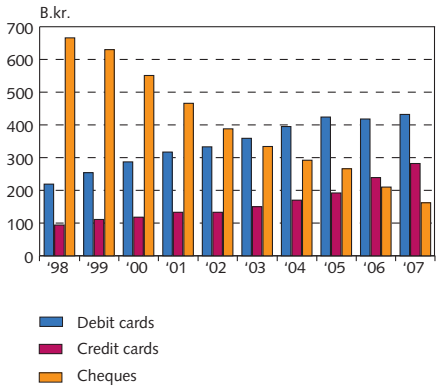
*SEPA*

Parties to the Single Euro Payments Area (SEPA) project include 31 European nations: Iceland, Liechtenstein, Norway, Switzerland, and the 27 member states of the European Union. The project involves collaboration concerning electronic payment intermediation in euros, and its aim is to co-ordinate the intermediation of both domestic and cross-border payments in euros. Furthermore, the cost of payment intermediation is to be the same, irrespective of the recipient's location, provided that he is within the SEPA area. The project is divided into three main phases: SEPA Credit Transfer, SEPA Direct Debit, and SEPA Cards Framework. The first phase, SEPA Credit Transfer, became effective on January 28 2008, and the second phase, SEPA Direct Debit, is scheduled for implementation in the fall of 2009.

Chart 5

Debit cards, credit cards and cheques

Turnover 1998-2007

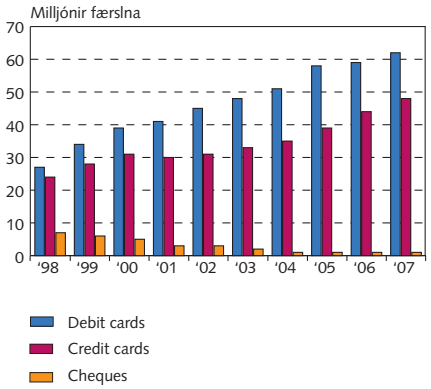



*Source:* Central Bank of Iceland.

Chart 6

Debit cards, credit cards and cheques

Turnover 1998-2007




*Source:* Central Bank of Icleand.

Box 2

## Recommendations for securities settlement systems[1]

In November 2001, BIS and IOSCO technical committee, put forward 19 recommendations regarding securities settlement systems. The recommendations are listed below. They are intended to reduce risk in the systems, increase efficiency and protect the investors interests.

*1. Legal framework*
Securities settlement systems should have a well founded, clear and transparent legal basis in the relevant jurisdictions.

*2. Trade confirmation*
Confirmation of trades between direct market participants should occur as soon as possible after trade execution, but no later than trade date (T+0). Where confirmation of trades by indirect market participants (such as institutional investors) is required, it should occur as soon as possible after trade execution, preferably on T+0, but no later than T+1.

*3. Settlement cycles*
Rolling settlement should be adopted in all securities markets. Final settlement should occur no later than T+3. The benefits and costs of a settlement cycle shorter than T+3 should be evaluated.

*4. Central counterparties (CCPs)*
The benefits and costs of a CCP should be evaluated. Where such a mechanism is introduced, the CCP should rigorously control the risks it assumes.

*5. Securities lending*
Securities lending and borrowing (or repurchase agreements and other economically equivalent transactions) should be encouraged as a method for expediting the settlement of securities transactions. Barriers that inhibit the practice of lending securities for this purpose should be removed.

*6. Central securities depositories (CSDs)*
Securities should be immobilised or dematerialised and transferred by book entry in CSDs to the greatest extent possible.

*7. Delivery versus payment (DVP)*
CSDs should eliminate principal risk by linking securities transfers to funds transfers in a way that achieves delivery versus payment.

*8. Timing of settlement finality*
Final settlement should occur no later than the end of the settlement day. Intraday or real-time finality should be provided where necessary to reduce risks.

9. CSD risk controls to address participants' failures to settle
CSDs that extend intraday credit to participants, including CSDs that operate net settlement systems, should institute risk controls that, at a minimum, ensure timely settlement in the event that the participant with the largest payment obligation is unable to settle. The most reliable set of controls is a combination of collateral requirements and limits.

1. Committee on Payment and Settlement Systems (2001), "Recommendations for securities settlement systems", Bank for International Settlements (BIS) and International Organization of Securities Commission (IOSCO) technical committee.

*10. Cash settlement assets*
Assets used to settle the ultimate payment obligations arising from securities transactions should carry little or no credit or liquidity risk. If central bank money is not used, steps must be taken to protect CSD members from potential losses and liquidity pressures arising from the failure of the cash settlement agent whose assets are used for that purpose.

*11. Operational reliability*
Sources of operational risk arising in the clearing and settlement process should be identified and minimised through the development of appropriate systems, controls and procedures. Systems should be reliable and secure, and have adequate, scalable capacity. Contingency plans and backup facilities should be established to allow for timely recovery of operations and completion of the settlement process.

*12. Protection of customers' securities*
Entities holding securities in custody should employ accounting practices and safekeeping procedures that fully protect customers' securities. It is essential that customers' securities be protected against the claims of a custodian's creditors.

*13. Governance*
Governance arrangements for CSDs and CCPs should be designed to fulfil public interest requirements and to promote the objectives of owners and users.

*14. Access*
CSDs and CCPs should have objective and publicly disclosed criteria for participation that permit fair and open access.

*15. Efficiency*
While maintaining safe and secure operations, securities settlement systems should be cost-effective in meeting the requirements of users.

*16. Communication procedures and standards*
Securities settlement systems should use or accommodate the relevant international communication procedures and standards in order to facilitate efficient settlement of cross-border transactions.

*17. Transparency*
CSDs and CCPs should provide market participants with sufficient information for them to identify and evaluate accurately the risks and costs associated with using the CSD or CCP services.

*18. Regulation and oversight*
Securities settlement systems should be subject to transparent and effective regulation and oversight. Central banks and securities regulators should cooperate with each other and with other relevant authorities.

*19. Risks in cross-border links*
CSDs that establish links to settle cross-border trades should design and operate such links to reduce effectively the risks associated with cross-border settlements.

*Appendix 1*

# Settlements in foreign currency

**Financial statements in foreign currency – share capital registration in foreign currency**

Accounting in foreign currency has been the subject of considerable discussion over the past year. In this context, it is important to distinguish between two elements: corporate accounting – that is, the preparation and presentation of financial statements – and the listing of equities and the settlement of equity transactions. These two elements are often discussed as though they were related, but this need not be the case. The former – accounting and financial statement presentation – involves measuring companies' performance and financial position and presenting the underlying numerical data. In the case of financial institutions, this also involves management of liquid assets, equity composition, foreign exchange balance, and the transmission of Central Bank of Iceland monetary policy, which is reflected through the banks and savings banks that engage in transactions with the Central Bank. The Register of Annual Accounts authorises companies to carry out their accounting in currencies other than the Icelandic króna provided that certain conditions are met. The Central Bank of Iceland has no hand in this decision other than to submit an opinion to the Register of Annual Accounts when financial undertakings request such authorisation.

The latter item involves both the registration of share capital and other electronic securities in a foreign currency and the monetary settlement of transactions conducted with such securities. Current Icelandic legislation authorises limited liability companies that are listed on a regulated securities exchange to determine their share capital in foreign currency. Such a decision is made by a shareholders' meeting in the company in question, and neither the Register of Annual Accounts nor any other official body has any voice in the matter. An authorisation by the Register of Annual Accounts to carry out accounting (and present financial statements) in foreign currency and the registration of share capital in foreign currency are not the same thing. It is sensible, however, for companies that have been authorised to prepare and present their financial statements in foreign currency to register their share capital in that same currency, provided that it is the company's functional currency. This will reduce the likelihood of a mismatch between the market value of a company's shares and its financial position and operations as presented in the company accounts, insofar as information in the financial statements affects market value. The precondition for this, however, is it be technically possible to conduct stock exchange activity in a foreign currency. A solution to this problem is now in sight. But it is unnecessary, and even misleading, to register a company's share capital in a foreign currency while carrying out its accounting in Icelandic krónur, the company's functional currency. The authorisation to register share capital in a

foreign currency should therefore be limited to those companies that have met the statutory requirements for financial statement preparation and presentation in foreign currency. The current regulatory framework, however, is more liberal.

**Conditions for registration of share capital in a foreign currency**

Act no. 131/1997 does not stipulate that electronically registered securities in a foreign currency must be registered with an Icelandic securities depository. Despite the fact that the legislature has authorised the registration of share capital and other securities in foreign currencies, there are no clear provisions stating how monetary settlement of transactions with such securities shall take place. Act no. 131/1997 stipulates that the Central Bank of Iceland shall receive deposits from account operators that are members of a domestic securities depository and shall arrange the settlement of their transactions in electronic security certificates. This implies that the settlement of securities transactions in Iceland currently take place with the assistance of the Icelandic Securities Depository, on the one hand, and the Central Bank of Iceland, on the other. The Central Bank of Iceland carries out the monetary settlement of securities transactions but can only do so in its own currency. If it were to settle transactions in another currency, the Central Bank would always have to have unlimited access to the currency in question so as to fulfil the most stringent international requirements concerning security in payment intermediation, as is discussed in greater detail below. The payment systems in any given country handle the domestic currency in that country, but they generally do not allow for payment intermediation in other currencies.

**Securities transactions**

The settlement of securities transactions is actually a two-step process. Ideally, the two steps – delivery and payment – should take place simultaneously (delivery versus payment, or DvP). Delivery involves the transfer of title to electronic securities from the seller to the purchaser, while payment involves the transfer of money from the purchaser to the seller. As regards the settlement of securities transactions, it is necessary to ensure that the monetary settlement of the underlying trade can take place in as secure a manner as the transfer of the securities, so that the completion of the transaction can be guaranteed.

**Monetary settlement of securities transactions in foreign currency**

The Act on the Central Bank of Iceland, no. 36/2001 contains no explicit provisions forbidding the Central Bank to carry out monetary settlement of securities transactions in foreign currency; however, there is no precedent for central banks' handling securities settlement in any other currency than their own. This is because central banks have limited access to foreign currencies, and this entails a risk that can only be eliminated through the direct or indirect involvement of the central bank that issues the foreign currency in question. This same risk applies no less to commercial banks and is actually much greater than when central banks are involved. International rules stipulate that an attempt must always be made to ensure that the comple-

tion of payment instructions is secured with central bank funds. This implies that the RTGS system of the central bank in question must be used, as appropriate, in each instance if possible. If other payment systems are used, either real-time gross settlement systems or netting systems, the final settlement of those systems must take place through the RTGS system of the central bank that issues the currency in question. It is a key requirement that, in order to conduct payment settlements in a foreign currency, the bank in question must handle and guarantee final settlement of the transactions and must have secure access to funds in the settlement currency. If this requirement were not met, it would inevitably increase settlement risk. The settlement process must also adhere to the Recommendations of the Bank for International Settlements (BIS) and the International Organization of Securities Commissions (IOSCO) concerning securities settlement systems (see Box 2).



**International requirements for securities settlement systems**

In November 2001, BIS and IOSCO issued the Recommendations for Securities Settlement Systems. The Recommendations concern the structure, operations, and supervision of securities settlement systems, and it is intended that they be followed so as to reduce risk, enhance efficiency, and protect investors. The BIS and IOSCO Recommendations specify the chief types of risk and the methods for protecting against individual risk factors. The primary single risk factors are default risk – that is, the risk that the counterparty will not complete the transaction on the settlement date – and liquidity risk, which is the risk that the counterparty will not complete the transaction in full when it is payable but will do so at a later date. During a time of illiquidity and uncertainty in the financial markets, attention is directed even more at underlying risk factors and risk management.

The BIS report presents 19 recommendations, together with explanations, and contains minimum standards that securities settlement systems must meet. They are intended to apply to settlement systems for any type of securities. The Recommendations and the accompanying explanations discuss the legal framework for the system, internal rules, risk management, efficiency, administration, participation requirements, transparency, and monitoring. They apply both to individual systems and to cross-border links between systems. The main parties to whom the Recommendations apply are securities depositories, central banks, securities exchanges, intermediaries, custodians, securities firms, and investors.

**How can monetary settlement of securities transactions in foreign currency take place?**

As has been discussed previously, a few Icelandic companies have been authorised by shareholders' meetings to register their share capital in foreign currency. In most cases, the currency of choice is the euro. The Icelandic Securities Depository has expressed an interest in providing the necessary services so that these plans can be implemented. If the ISD cannot provide these services or is not competitive in terms of price and service level, the companies have the option of moving their share capital registration overseas and having securities

transaction settlement carried out abroad. As is explained above, current statutory provisions require the involvement of the Central Bank of Iceland in the monetary settlement of securities transactions taking place in Iceland, yet the Central Bank cannot carry out that task when settlement must take place in a currency other than its own.

In the Central Bank's estimation, there is no other solution than to engage a central bank in the euro area to carry out the monetary settlement of securities transactions in euros. The ISD has discussed with the Bank of Finland (BoF) the possibility of handling such settlement, as the BoF has conducted the monetary settlement of euro transactions for the Swedish securities depository, VärdePappersförvarare och Clearings-organisation (VPC), for quite some time. That arrangement was made when Riksbanken, the Swedish central bank, decided not to participate in the new euro area RTGS system, Target2.

The BoF expressed an interest in taking on the monetary settlement of euro transactions registered in Iceland following the implementation of the Target2 system. This new arrangement, which is currently in preparation, requires a number of adaptations by the ISD and the participating companies. Trading is scheduled to begin in the fall of 2008. Under the new arrangement, participating Icelandic financial companies will participate in the Target2 system as well and will have the option of using that system for euro payment intermediation as well as for securities settlement. This new RTGS system is one of the most advanced available, and its use should dramatically reduce the risk of default related to foreign exchange transactions in the currency in question.



**Committee participation**

In December 2007, the Minister of Commerce appointed a committee to review the statutory provisions pertaining to the settlement of transactions with domestic securities listed in a foreign currency. The committee completed its work in February 2008. Its conclusions involve a proposal to amend current legislation so that the monetary settlement of securities transactions in foreign currency will take place through a securities depository, with access to the currency in question guaranteed in a manner equivalent to that stipulated in Act no. 90/1999.

**The Central Bank of Iceland's role in foreign currency settlement**

As has been explained previously, the Central Bank of Iceland has a dual role in payment intermediation: RTGS system operation and an oversight and monitoring role. However, when payment intermediation and settlement take place in a foreign currency, the Central Bank is no longer a direct participant in payment intermediation and is not responsible for settlement. In such instances, the responsibility is transferred to the bank that handles the monetary settlement of the securities transaction. However, the Central Bank continues to function in its oversight and monitoring capacity in collaboration with the FME. Furthermore, in accordance with the provisions of Act no. 90/1999, the Central Bank is required to submit recommendations to the Minister of Commerce concerning the approval of new payment and settlement systems or proposed changes to existing arrangements.