MONETARY BULLETIN

2008 • 1

Contents

The objective of the Central Bank of Iceland's monetary policy is to contribute to general economic well-being in Iceland. The Central Bank does so by promoting price stability, which is its main objective. In the joint declaration made by the Government of Iceland and Central Bank of Iceland on March 27, 2001, this is defined as aiming at an average rate of inflation, measured as the 12-month increase in the CPI, of as close to 2½% as possible.

Professional analysis and transparency are prerequisites for credible monetary policy. In publishing *Monetary Bulletin* three times a year, the Central Bank aims to fulfil these principles.

Monetary Bulletin includes a detailed analysis of economic developments and prospects, on which the Board of Governors' interest rate decisions are based. It also represents a vehicle for the Bank's accountability towards government authorities and the public.

The framework of monetary policy and its implementation and instruments are described in section entitled Monetary policy and instruments, on pp. 113-116 of this edition of *Monetary Bulletin*.

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. 10 no. 1 April 2008

Printing: Gutenberg ehf.
Monetary Bulletin is also published on the Central Bank of Iceland website.
ISSN 1607-6680

Icelandic letters:

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

Symbols:

*	Preliminary or estimated data.
0	Less than half of the unit used.
-	Nil.
...	Not available.
.	Not applicable.

Monetary policy statement by the Board of Governors of the Central Bank of Iceland

Central Bank of Iceland raises the policy rate

The Board of Governors of the Central Bank of Iceland has decided to raise its policy interest rate by 0.5 percentage points to 15.5%. This increase follows a 1.25 percentage point increase announced on March 25, 2008. During the first quarter of this year, inflation was 2 percentage points higher than was forecast last November, and following the recent depreciation of the króna, it appears set to rise even further before beginning to taper off once again. The March 25 policy rate increase is followed with the decision announced today because inflation expectations remain very high. They have escalated and are now higher than they have been in a long time. It is imperative that they be reduced.

The macroeconomic forecast in the current *Monetary Bulletin* indicates that the economy will contract during the forecast horizon. Such a development is an inevitable adjustment after many years of economic imbalance. Despite the projected contraction, however, average output growth for the period 2005-2010 will be quite acceptable.

The inflow of foreign capital has shrunk, and funding the current account deficit will become more expensive than it has been in the past few years. Because of the high level of household and business indebtedness, the recent depreciation of the króna will contribute to a contraction of the economy. Persistent inflation will be most damaging to indebted businesses and households and can undermine financial stability for the long term. It is therefore of paramount importance that inflation be brought under control.

Low inflation is a precondition for applying monetary policy to soften contraction in the economy. The real exchange rate has approached its historical low, and the króna is undesirably weak. The real effective exchange rate may rise to its long-term equilibrium either through an appreciation of the króna or through rising prices. Under the current conditions, a prolonged low exchange rate passes quickly through to the domestic price level. There is still considerable tension in the labour market, and the output gap remains substantial. It is desirable that the króna recover from the sharp decline in March. The March 25 policy rate increase and the other measures announced at that time have supported the króna. It has appreciated as a result.

A policy rate increase in and of itself does not solve the problems that have developed in the FX swap market. Increased issuance of risk-free bonds that are accessible to foreign investors should open up other channels for currency inflow, however.

The Central Bank's most critical task is to reach the inflation target as soon as possible. The demand shocks of the past few years and unusual conditions in the global financial markets delayed the process. There is no reason to surrender any ground in the battle against inflation.

Economic and monetary developments and prospects[1]

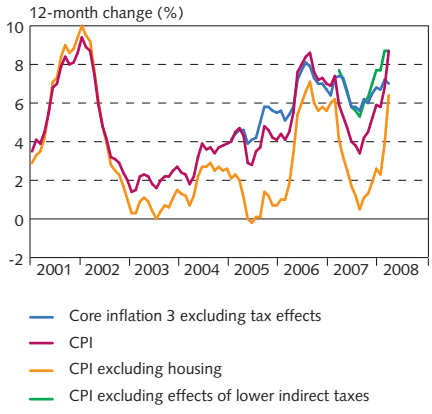
Marked deterioration in inflation outlook

The inflation outlook for both the short term and the long term has deteriorated markedly since November's Monetary Bulletin *was issued. The economy is likely on the verge of a rather sharp turning point. Until year-end 2007, the economic climate was characterised by burgeoning growth in demand, and most indicators suggest that growth remained brisk during the first quarter of 2008. Exports also gathered momentum toward the end of last year. On the other hand, credit terms have worsened dramatically over the past six months and equity prices have fallen. The impact of rising lending rates and shrinking credit supply is still limited primarily to asset markets. The depreciation of the króna has been far greater than was projected in the Central Bank's baseline forecast in November 2007; indeed, it has also surpassed the sizeable depreciation presented in an alternative scenario at that time. In the coming year, the inflationary effect of a weak króna will more than offset slowing demand growth. As time passes, however, it is probable that falling house prices and a narrower output gap will pull inflation downward, though continuing investment in aluminium smelter construction and expansionary fiscal policy will counteract that effect. In order to ensure that the inflation target is reached, monetary policy must be tight enough to anchor inflation expectations and bolster confidence in the króna. Disadvantageous developments in inflation and the exchange rate could press wages higher than provided for in the recent wage settlements, and the disinflation process could take an even longer time than projected in this* Monetary Bulletin*. It should be noted, however, that the real exchange rate of the króna is probably somewhat below its long-term equilibrium level. That being the case, the depreciation could be reversed at some time during the forecast horizon. The Central Bank has already responded to the sharp deterioration in the inflation outlook with a policy rate hike of 1.25 percentage points, announced by the Board of Governors on March 25. The policy rate path presented in the new baseline forecast allows for the attainment of the inflation target in late 2010, a year later than was forecast in November. Under the current global market conditions, however, there is enormous uncertainty surrounding exchange rate developments, which makes forecasting particularly difficult.*

I Inflation outlook and monetary policy

Inflation has risen dramatically since November, when the Central Bank published its last inflation forecast. In mid-March, inflation –, that is, the twelve-month rise in the CPI –, measured 8.7%. The pronounced increase in March is primarily attributable to three factors: the diminishing effect of the consumption tax cut a year ago on the twelve-month comparison, the marked depreciation of the króna, and a sharp increase in fuel prices. Underlying inflation – i.e., excluding volatile items and the effects of tax and interest rate changes – is roughly 7%. To some extent, increased inflation is explained by external factors such as rising food and fuel prices, but on balance, the surge in inflation is of domestic origin. Since the beginning of November, the effective exchange rate of the króna has been much lower than in the Central Bank's November forecast, especially following the rapid decline in March. By the end of March, the effective depreciation of the króna since November approached 30%.

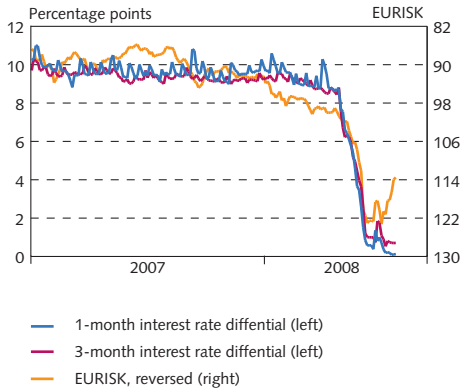
Chart I-1
Various inflation measurements
January 2001 - March 2008



Source: Statistics Iceland.

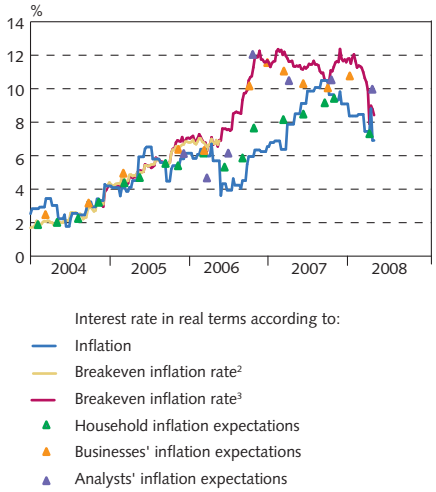
1. This article uses data available on April 8, 2008, but the forecast is based on data until March 29.

Chart I-2
FX swap-implied ISK rates minus LIBOR and the Icelandic króna
Daily data, August 1, 2007 - April 8, 2008



Sources: Bloomberg, Central Bank of Iceland.

Chart I-3
Central Bank policy interest rate in real terms[1]
Weekly data January 6, 2004 - April 8, 2008



1. The policy rate has been converted to annual yield. 2. Spread between RIKB 13 0517 and RIKS 15 1001. 3. Spread between RIKB 13 0517 and HFF150914. Household, business and analysts' inflation expectations are based on inflation one year ahead.
Sources: Capacent Gallup, Statistics Iceland, Central Bank of Iceland.

Dwindling capital inflow enforces ISK depreciation and contraction of domestic demand

The recent nose-dive taken by the króna dramatically changes the economic outlook, particularly as regards inflation. The drop is not wholly unexpected. It has been stated repeatedly in *Monetary Bulletin* that, given the wide current account deficit, which requires a continuous inflow of capital, deterioration in global financial market conditions could trigger a sharp depreciation of the króna. This is why the Bank has published alternative scenarios allowing for a considerable exchange rate drop. The recent decline, however, has been deeper and swifter than alternative scenarios have assumed to date. The sharp increase in premia that domestic financial companies pay on foreign credit and the strong domestic demand for foreign currency have thrown the foreign exchange swap market out of balance. This is reflected in the nearly complete narrowing of the interest rate differential between Iceland and other countries and has led to a precipitous depreciation of the króna (see Chart I-2 and Box III-1).

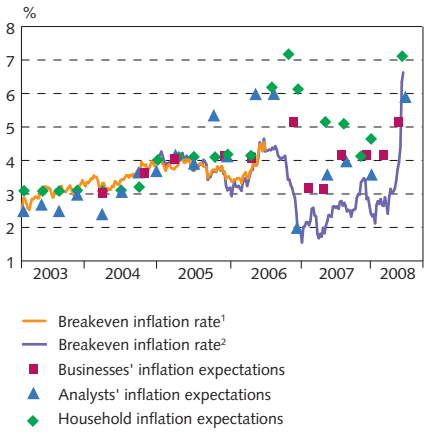
In a nutshell, the source of the exchange rate problem is an abrupt cessation of the inflow of capital needed to fund the current account deficit, due in part to the state of the Icelandic banks. This forces an adjustment that, for the short term, can only take place through a depreciation of the króna, though over the long term a return to external balance requires a contraction in real domestic demand. In view of the size of the current account deficit and the sudden deterioration in the terms for its funding, it is not possible to rule out further depreciation of the króna before domestic demand contracts to a level that obviates the need for foreign capital inflow. All exchange rate projections must therefore be interpreted with the utmost caution. A shortage of borrowed funds from abroad could result in a deeper contraction in the economy than is forecast in the baseline scenario. On the other hand, such a development would imply a quicker return to a sustainable trade balance, as the real exchange rate is likely somewhat below its long-term equilibrium value. Provided that monetary policy is appropriately tight, the depreciation of the króna could ultimately be reversed quite quickly, in which case inflation could fall off faster than is assumed in the baseline forecast. However, this depends entirely on whether the trend can be turned around before the lower exchange rate has been fully passed through to the domestic price level. When the real exchange rate falls below long-term equilibrium, the long-term adjustment can occur either through rising prices or through a currency appreciation. Clearly, it must be the aim of an inflation-targeting Central Bank to steer the adjustment as much as possible into the exchange rate rather than through the inflation channel.

Wage settlements entail the risk of wage drift

The largest private sector unions and the Confederation of Employers (SA) signed new wage settlements in February, and the impact on labour costs will probably apply to the private sector as a whole. On the surface, it appears as though the new wage settlements could be consistent with the inflation target. Experience from previous sett-

lements shows, however, that actual results often differ widely from original estimates. With the current wage settlements, there are two principal points of concern. First, although the average wage increase could be consistent with the inflation target, the lowest wages rise much more, or by up to one-third over a three-year period. These wage increases could creep up the pay scale, as they did following the supplementary settlements in 2006, particularly if the tension in the labour market does not subside quickly enough. The second point of concern is that the settlements are meant to secure real wages. Therefore, the contract includes review clauses, which could spur further wage increases if inflation is not contained sufficiently in time; for example, if the króna weakens further. However, the economic problems Iceland faces are not least due to the fact that real wages are higher than export revenues can support. If an adjustment of real wages is prevented, it will result in greater unemployment. On the other hand, the increase in the lowest wages will not creep as rapidly up the pay scale now as in 2006 and 2007, when the shortage of labour was dire. It is therefore vital that the tension that has characterised the labour market over the past few years subside quickly. The baseline forecast assumes that the review clauses will be triggered and that additional wage rises will be negotiated. The forecast does not assume, however, that the revision will result in substantial wage increases.

Chart I-4
Inflation expectations
Weekly data January 7, 2003 - April 8, 2008



1. Breakeven inflation rate is the spread between RIKB 13 0517 and RIKS 15 1001. 2. Breakeven inflation rate is the spread between RIKB 13 0517 and HFF150914. Household, business and analysts' inflation expectations are based on inflation one year ahead.
Source: Central Bank of Iceland.

The policy rate path in the last *Monetary Bulletin* would not have anchored inflation expectations firmly enough

Given the considerably cloudier inflation outlook, the policy rate path presented in November would not have sufficed to bring inflation to target within an acceptable horizon (see Box IX-1). Inflation would have risen much more than in the baseline scenario and would have tapered off much more slowly. It can be asserted with a fair degree of accuracy that inflation could have increased still further if the credibility of the inflation target had been compromised. When monetary policy is ineffective in anchoring expectations, an exchange rate-inflation spiral can ensue, and inflation can take off quickly as a result. Therefore, it was vital that the Central Bank take measures to prevent such a turn of events.

Inflation target attained later than previously assumed despite much higher policy rate

Despite the fact that the policy rate has already been raised considerably above the level assumed in the November forecast, the probability of attaining the inflation target within the time frame presented then is low. There are several reasons for this. First, at the beginning of the forecast horizon – that is, in Q2/2008 – inflation is approximately 5 percentage points higher than projected in November. Second, the current forecast assumes that the exchange rate of the króna will be 27% lower in the second quarter than was projected in November. Moreover, it will be lower throughout the forecast horizon (see Chart I-5b). Third, the output gap at the beginning of the horizon is greater than was estimated in November (see Chart I-5c). Fourth, the out-

look is for heftier wage increases during the forecast horizon than the previous forecast allowed for. Fifth, inflation expectations have risen recently and now exceed the levels estimated in November, and they are expected to remain high for most of the forecast horizon. The conspicuous lack of anchoring of inflation expectations – even long-term expectations – is cause for genuine concern (see Chart I-4).

The short-term effects of a higher policy rate are not strong enough to prevent a surge in inflation in the next few months.

Chart I-5
Baseline scenario in *Monetary Bulletin* 2008/1
Forecasting period: Q2/2008 - Q1/2011

Chart I-5a
Policy rate

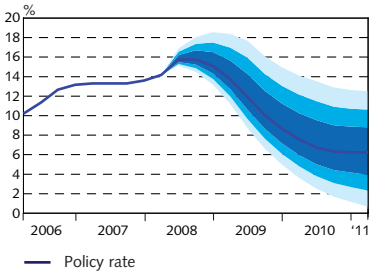


Chart I-5b
Effective exchange rate

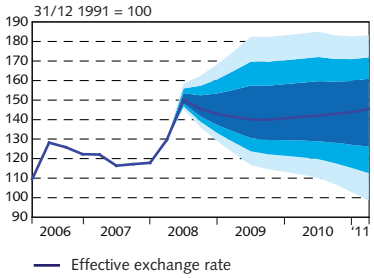


Chart I-5c
Output gap

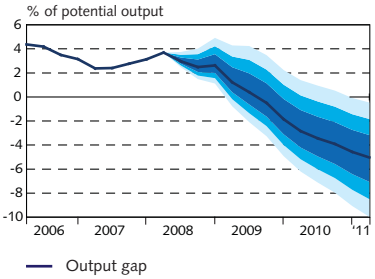
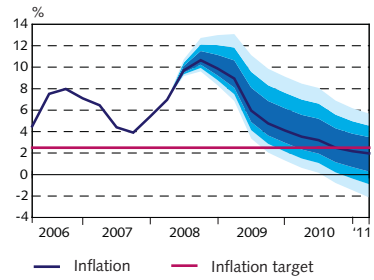


Chart I-5d
Inflation



Sources: Statistics Iceland, Central Bank of Iceland

According to the baseline forecast, inflation will peak at close to 11% in the third quarter of 2008. It will slow down rather rapidly beginning in the fourth quarter of 2009 and align with target a year later, in the third quarter of 2010 (see Chart I-5d). The policy rate rises by further 0.75 percentage points and starts to move downward again in the fourth quarter of 2008, and it is expected to reach neutrality when the inflation target is attained (see Chart I-5a).

This process will inevitably be accompanied by an economic downturn. GDP is projected to drop by 2½% in 2009 and by 1½% in 2010. The contraction in national expenditure will be even greater, just over 3% in both years. This decline is explained primarily by a reduction in private consumption. Investment will fall off as well, despite the large development project related to the Helguvík aluminium smelter and the accompanying power plant, but the contraction

will be less than previously forecast. As a result, the output gap will disappear in 2009 and turn negative. The ensuing slack will promote rather rapid disinflation, in spite of a lower policy rate and a slight dip in the exchange rate after 2010.

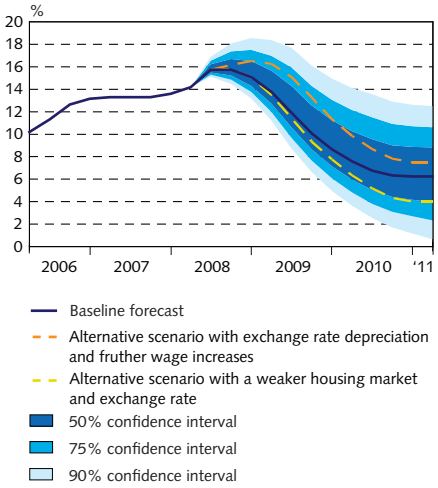
Adverse exchange rate developments and wage inflation could delay disinflation and raise the cost of bringing inflation to target

As is always the case following a sizeable and protracted economic imbalance, the return to equilibrium is fraught with uncertainty. For the past several years, *Monetary Bulletin* has included alternative scenarios in an effort to shed light on the most important elements of risk in the forecast, such as an unforeseen depreciation of the króna (see the actual discussion of alternative scenarios in Box IX-2). Such an alternative scenario was published, for example, in November. As it turned out, the depreciation was even steeper than presented in that alternative scenario. If the real exchange rate is somewhat below its long-term equilibrium level, as has been shown, it can be assumed that the risk of a substantial additional depreciation is lessened. The uncertain conditions currently reigning in global financial markets could potentially result in a larger overshoot than is assumed in the baseline forecast. This would further enhance the likelihood of more wage increases than in the baseline scenario. This sequence of events is described in the former of two alternative scenarios, which assumes a weaker króna than the baseline forecast. The divergence of the exchange rate from the baseline peaks at 13%. The alternative scenario also assumes that wages will rise further in 2009 so as to maintain constant real wages, in accordance with the current wage settlements. Under these conditions, the policy rate would have to be as much as 3 percentage points higher in order to allow the inflation target to be attained one quarter later than in the baseline scenario (see Charts I-6 and I-7). If this came to pass, the contraction would be delayed, peaking in 2010, but would be somewhat deeper.

Greater decline in house prices and contraction in residential investment could expedite disinflation

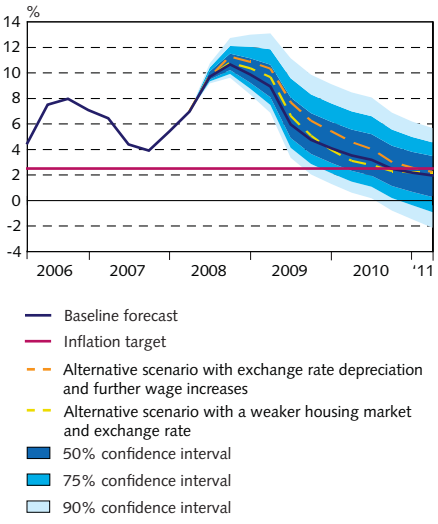
Sizeable increases in mortgage interest and a tighter credit supply could result in a sharper contraction of domestic demand than is assumed in the baseline forecast. Such a development is described in the latter alternative scenario in this *Monetary Bulletin*. In that scenario, it is assumed that, for each of the next three years, house prices will fall by about as much as they have in the past year in the US. In that event, the real price of housing would drop somewhat below long-term equilibrium. It is assumed that residential investment will contract quickly so that, as a proportion of GDP, it will fall back to pre-housing boom levels. The consequences of such a trend would be complex. Private consumption would shrink even more, or by more than one-fifth, in accordance with diminishing housing wealth. Unemployment would rise sharply, especially in the construction industry, although its extent would depend on how many of those losing their jobs left the country. In the alternative scenario, unemployment peaks at 6% at the end of the forecast horizon. Early on, a

Chart I-6
Policy rate - alternative scenarios



Source: Central Bank of Iceland.

Chart I-7
Inflation - alternative scenarios



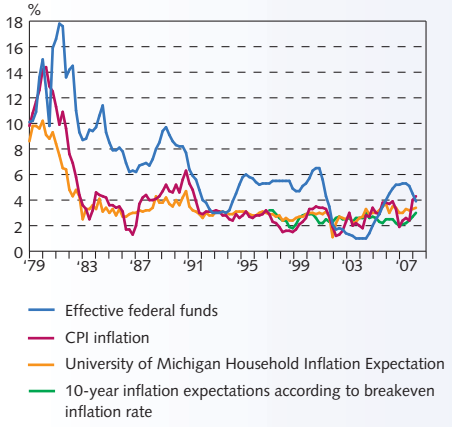
Sources: Statistics Iceland, Central Bank of Iceland.

Box I-1

The importance of anchoring inflation expectations

In the 1970s, inflation rose steadily in most parts of the world. Doubts about the efficacy of monetary policy in combating the problem were widespread.[1] A dramatic change in attitude ensued in the 1980s and '90s, among economists, central bankers, and politicians. As a result, central banks the world over embarked upon a long and costly campaign to contain inflation. Interest rates were kept high for years. Unemployment rose, many countries were faced with economic contraction, and central banks were criticised harshly for high interest rates. However, with a tight monetary stance, they managed to guarantee low, stable inflation and to build confidence in monetary policy as an effective tool for maintaining price stability. In most parts of the world, central banks place strong emphasis on not losing this trust that came at such a high price. This Box focuses on the US Federal Reserve Bank and the Reserve Bank of New Zealand: their battle with inflation, their attempts to enhance credibility, and the lessons that the Central Bank of Iceland can incorporate into its monetary policy implementation.

Chart 1
Policy rate, inflation and inflation expectations in the US
Q1/1979 - Q1/2008



Sources: BLS, Federal Reserve System, Central Bank of Iceland.

US federal funds rate averaged 10% between 1979 and 1990

In October 1979, the US Federal Reserve Bank, under the leadership of newly appointed Chairman Paul Volcker, declared war on inflation. At that point, inflation had hovered around 10% for some time and seemed set to climb higher. The Federal Reserve's discretionary monetary policy had reached a dead end and was stimulating fluctuations in inflation and economic growth without any genuine improvements in employment levels or output growth. A long, tough battle ensued. It took the Bank at least a decade to restore its credibility and bring inflation and inflation expectations down to around 2%, which appears to be its informal long-term inflation target.[2]

Chart 1 shows how long the federal funds rate remained high. It averaged 10% over the twelve-year period from 1979 to 1990, peaking at 19.1% in June 1981. The real federal funds rate topped out at approximately 9% and long-term rates at about 15% in the latter half of 1981. This monetary tightening was costly. The recession in 1981-82 was the deepest in US economic history since the Great Depression in the 1930s, with unemployment soaring to some 10% towards the end of 1982.

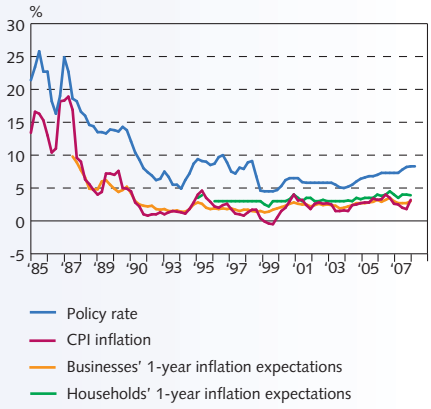
But tight monetary policy proved its usefulness, for inflation dwindled quickly over the following two years, and the Fed was able to stabilise it at acceptable levels. Since 1992, inflation in the United States has been low and stable, averaging 2.7%. Not least among the advantages of embarking upon the difficult path of fighting inflation at the cost of a short-term economic downturn was the establishment of monetary policy as an anchor for inflation expectations. This is the main reason why US inflation has remained low despite abundant output growth and low unemployment levels over a period of nearly two decades. The credibility of monetary policy is revealed in the fact that inflation expectations have remained low and stable, especially long-term expectations, despite a variety of ups and downs in the economy.[3] This has enabled the US Federal Reserve Bank to focus more closely on other factors than inflation – such as output growth and employment – in its implementation of monetary policy.[4]

1. See, for example, Goodfriend, Marvin (2007), "How the World Achieved Consensus on Monetary Policy", *Journal of Economic Perspectives*, Volume 21(4), Autumn.
2. See, for example, the speech given by Ben Bernanke on November 14, 2007, and the speeches given by Frederic Mishkin on March 23 and October 20, 2007.
3. See, for example, J. Roberts (2006), "Monetary Policy and Inflation Dynamics", International *Journal of Central Banking* (2), pp. 193-230, and M. Kiley, (2008), "Monetary Policy Actions and Long-Run Inflation Expectations", Federal Reserve Board *Finance and Economics Discussion Series* 2008-03.
4. See, for example, the speeches given by two members of the of the Federal Reserve's monetary policy committee, Frederic Mishkin (speech on January 11, 2008) and Ben Bernanke (speech on February 27, 2008).

Firmly anchored inflation expectations in New Zealand

The pioneering efforts of the Reserve Bank of New Zealand (RBNZ) are no less interesting to observe. It can be said that New Zealanders were the first to construct the institutional framework that is considered today to anchor inflation expectations with minimal sacrifice. The RBNZ managed this by adopting a numerical inflation target in 1990, the first central bank in the world to do so. The New Zealanders' experience is especially edifying because their economy is similar to Iceland's in many ways. Since the RBNZ adopted the inflation target in 1990, inflation has averaged 2.3%. In order to achieve this, the Bank has been forced to maintain a rather high official cash rate (policy interest rate) averaging approximately 5%. On average, the real policy rate in New Zealand has therefore been higher than that in Iceland since 2001. The Reserve Bank's target is to hold inflation in the range of 1-3% for the medium term, but flexibility in monetary policy implementation has increased as the bank's credibility has grown. Research carried out by RBNZ analysts indicates that enhanced credibility of monetary policy has been accompanied by a reduction in the undesirable effects of exchange rate volatility on the economy, including the effects on inflation.[5]

Chart 2
Policy rate, inflation and inflation expectations in New Zealand
Q1/1985 - Q1/2008



Sources: Reserve Bank of New Zealand, Central Bank of Iceland.

Insufficiently anchored inflation expectations leave limited scope for emphases other than inflation

The experience of the past three decades shows how costly it is to restore confidence in monetary policy if it loses credibility. Inflation expectations are one of the most important determinants of inflation. They ran free in the 1970s, when central banks placed insufficient emphasis on controlling inflation and convinced themselves that they could choose between inflation and unemployment – perhaps even for the long term. The cost of correcting the situation was a deep contraction. This experience underlines the importance of expectations and how critical it is to consider them in monetary policy-making.

The conclusion drawn by modern monetary economists – and borne out by experience – is that the most effective vehicle for anchoring inflation expectations is an independent central bank that formally pledges to maintain price stability and enforces its monetary policy in a systematic, transparent, and credible manner.[6] The credibility of monetary policy is therefore vital in controlling inflation successfully and reducing fluctuations in output growth and employment levels. If inflation expectations are not firmly anchored, there is limited scope to focus on anything else but inflation.

Inflation expectations in Iceland are high and volatile

Since adopting its inflation target in March 2001, the Central Bank of Iceland has not yet managed to maintain low, stable inflation except for a scant two-year period. There are numerous explanations for this, which are beyond the scope of this article.[7] The Bank has not yet built up the level of credibility that exists, for example, in the US and New Zealand. The fact that inflation expectations in Iceland are both high and sensitive to news bears witness to this. Long-term inflation expectations appear unstable and too far from the inflation target. The only way the Central Bank can garner the necessary credibility is to demonstrate in practice that it can guarantee lasting price stability. Though experience shows that the cost of breaking free of persistent inflation can be high for the short term, it is abundantly clear that the benefits of credible monetary policy are great, and that they increase over time.

5. See A. Drew, Ö. Karagedikli, R. Sethi and C. Smith, (2008), "Changes in the transmission mechanism of monetary policy in New Zealand", Reserve Bank of New Zealand *Discussion Paper Series* No. DP2008/03.
6. See, for example, the paper by Thórarinn G. Pétursson in *Monetary Bulletin* 2007/3.
7. See, for example, the paper by Arnór Sighvatsson (in Icelandic) in *Fjármálatíðindi* 2007.

weaker króna, which would likely accompany a more drastic housing slump, would have a greater effect on inflation than a more rapid contraction, but toward the end of 2009, the effects of the contraction would begin to weigh more heavily, and inflation would decline faster than it would otherwise, due both to reduced demand and the direct impact on the housing component of the CPI. Therefore, the policy rate could ultimately be lowered more, and more quickly, than in the baseline forecast.

It should be emphasised that a chain of events like that described in this example is highly unpredictable; therefore, it should be viewed as a plausible story rather than a forecast. The current conditions in the Icelandic economy are unprecedented. The current account deficit, real estate prices, and the indebtedness of households and companies – all these variables have drifted far from historical norms in the past few years. The return to historical norms will make a profound impact on the financial system, which is also in a position without historical parallel. The effects of adjustment on the financial system – that is, its ability to conduct financial mediation from savers to households and businesses – will be of paramount importance, but are very difficult to foresee.

Limited scope for countercyclical monetary policy

Given the current account deficit, the sharp downturn in global financial market conditions is likely to enforce a sharp contraction in domestic demand. This gives rise to the question of whether it would be possible to deploy monetary policy in order to soften the effects of an economic contraction without delaying the disinflation process unduly. It has been pointed out that the US Federal Reserve Bank has lowered its interest rates quickly in recent months despite the fact that inflation is higher than the bank considers desirable. This publication is not the proper forum in which to pass judgment on the decisions made by the Federal Reserve. But there is ample reason to point out that circumstances in Iceland and the US differ in many ways. First, inflation is much higher in Iceland than in the US and has risen sharply in the recent term. Inflation expectations are considerably higher, have been on the rise, and are generally less stable (see Box I-1). Second, under the current conditions a rapid downward cycle of the policy rate would doubtless trigger further depreciation of the króna and would have a negative impact on inflation expectations and the inflation outlook. In this respect, conditions in the US and Iceland are utterly different from one another. Exchange rate changes penetrate swiftly to price levels and inflation expectations in Iceland, while their short-term effects are negligible in the US.[2] Lack of concern regarding the inflation target would spark doubts about the conduct and actual goal of monetary policy and would further undermine confidence in

2. In Iceland, approximately 40% of exchange rate changes surface as a rise in the CPI within one year, as opposed to only 2% in the US, according to a recent study by Thórarinn G. Pétursson, "How hard can it be? Inflation control around the world", Central Bank of Iceland *Working Papers*, forthcoming.

the króna. Third, a further depreciation of the króna could unduly intensify the contraction in demand via its strong effect on the balance sheets of indebted households and businesses. In this respect as well, the situation in Iceland is dramatically different from that in the United States.[3]

Higher inflation antithetical to long-term financial stability

Not only would an untimely monetary policy relaxation leading to further depreciation of the króna be inconsistent with the inflation target, it could corrode financial stability in the long run. Therefore, the frequently expressed opinion that the Central Bank should toss the inflation target overboard so as to promote financial stability is based on a misconception. It is hard to see how banks' foreign-currency lending could depend on Central Bank facilities that are granted in Icelandic krónur. In order for domestic banks to be able to compete abroad on those premises, the policy rate in Iceland would have to be much lower, or a lasting exchange rate drop would have to compensate for the interest rate differential. Actually, this could happen automatically if the banks were to purchase foreign currency for the krónur that they borrowed from the Central Bank. The exchange rate decline, inflation, and contraction that would follow would quickly produce a heightened frequency of default among indebted households and businesses and would impair financial stability as time progressed. Were the Central Bank to reduce the policy rate in defiance of the inflation target and undermine confidence in the currency, it would merely compromise financial stability.

The importance of facing the inevitable

The Icelandic economy is headed for difficult times. In the current global financial market climate, a large current account deficit will not be as easy to fund as it was before. This has already triggered a sharp depreciation in the króna, and a substantial contraction in domestic demand seems unavoidable. To apply monetary policy to prevent adjustment is not only pointless, it could lead to a deeper recession further on, as the resulting higher inflation would further limit the room for manoeuvre to support recovery at a later time. The sooner inflation is brought into line with target, inflation expectations firmly anchored, and confidence in the currency regained, the more benign the after-effects will be, and the sooner recovery can begin.

3. Americans' foreign assets are largely in the form of equities (in the currency of the host state), while their debts are concentrated in US dollars. In Iceland, however, foreign-denominated debt exceeds foreign assets. Thus a drop in the exchange rate has a positive effect on Americans' balance sheets, while it has a negative effect in Iceland.

II External conditions and exports

The consequences of the contraction in the US residential housing market seem to have been more profound than previously expected. Since November 2007, the outlook has grown bleaker, and now it appears as though a US recession is in the offing or perhaps has already begun. The prospects for economic growth have also dimmed somewhat in Europe, though forecasts do not suggest such a sharp turnaround there as in the United States. The outlook in Japan has deteriorated, while continuing robust growth is expected in India and China, although growth prospects in China have weakened somewhat. The price of commodities, including food, is therefore expected to remain high. The outlook for terms of trade is positive, even though high commodity import prices offset advantageous export prices to some degree. Export growth in 2008 will be driven by aluminium exports, which are projected to increase by 72%. However, forecasts suggest that exports of marine products will diminish somewhat. If Europe and Asia are not affected more deeply by the US sub-prime mortgage crisis than is projected at present, foreign tourism and related services should continue to flourish. According to the baseline forecast, exports of goods and services will increase by 4.5% this year but remain essentially flat in 2009.

The current global expansion is winding down

Output growth slowed considerably in the US, the UK, Japan, and the euro area in Q4/2007, following increased growth in the third quarter. According to projections made by Consensus Forecasts (CF), output growth in these economies is set to decline considerably in 2008 and 2009 as compared with 2007; however, it is not yet assumed that GDP will contract between years.

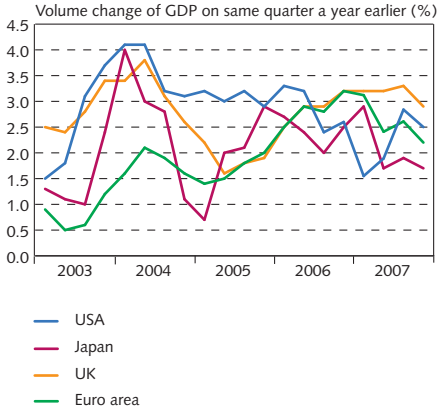
The expansion of the past several years was maintained to a significant degree by a high level of private consumption and a low level of savings in the US, which stemmed to some degree from the wealth effect of surging real estate prices. These effects are now being reversed, however, and many indicators suggest that the US economy is headed for a recession. In Q4/2007, annualised quarter-on-quarter GDP growth was only 0.6%, down from nearly 5% in Q3. The problems besetting the US economy are multi-faceted, with the housing market slump the most important factor. Indicators imply that falling house prices and a tightening credit market have begun to curtail private consumption. Recent oil price increases will also have a dampening effect in the months to come. Because of the large number of automobiles and the heavy use of fossil fuels for indoor heating and electricity production in the US, higher oil prices cut a considerable slice from US households' disposable income. Because there is as yet no indication that the residential housing market has achieved any sort of equilibrium, it is not possible to rule out further declines in house prices over the course of 2008. These two factors together – rising oil prices and falling housing prices – discourage private consumption, which is responsible for some 70% of GDP in the United States. In view of the tightening credit supply, it is likely that corporate

investment growth will lose momentum as well. Counteracting this, however, is the fact that businesses are generally sound and profits have been healthy.

In the euro area, output growth was 2.2% in the fourth quarter of 2007, down slightly from 2.6% in Q3, primarily due to slower growth in private consumption. There was also a considerable slowdown in export growth, which has been one of the main drivers of output growth heretofore. Quarter-on-quarter export growth dropped from 2.1% in Q3 to 0.5% in Q4, in part because of declining global trade in the wake of the contraction in the US and the appreciation of the euro vis-à-vis the US dollar, which compromises the competitive position of export sectors. Since year-end 2005, the European Central Bank (ECB) has raised its base interest rate by a total of 2 percentage points, to its highest level in six years.

Output growth in emerging markets and developing countries has not yet shown signs of having been influenced strongly by the recent turbulence in the capital markets. In China, growth measured 11.4% in Q4/2007, and in India the GDP increased by 9% during the same period. Productivity has risen sharply in tandem with the two countries' integration into the global economy. Chinese exports have maintained a healthy competitive position despite rising wage costs and a modest appreciation of the yuan against the falling US dollar. However, growth in industrial manufacturing and exports has diminished somewhat in the recent term. Among oil and commodity export countries, improving terms of trade have bolstered output growth.

Chart II-1
Economic growth in main trading areas
Real GDP growth Q1/2003 - Q4/2007



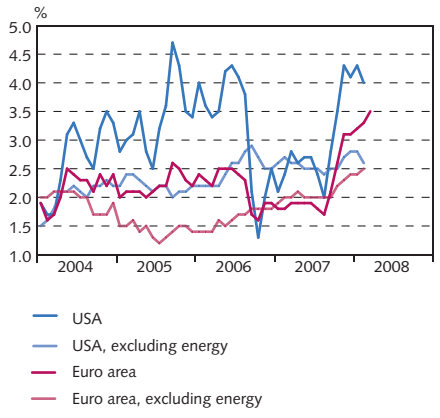
Source: Reuters EcoWin.

Rising inflation despite slowing growth

Although output growth has slowed down, the inflation outlook in most parts of the world has deteriorated sharply in recent months. Recent commodity price increases have passed through to inflation more quickly than before. Rising food prices make the greatest impact in developing and emerging market nations, where the proportion of food in the total consumption basket is higher than in developed countries. In Western countries, manufacturers' increases in agricultural product prices have contributed to rising consumer food prices; however, oil price increases have made the most striking impact, as they generally have an immediate effect on the retail price of fuel and energy.

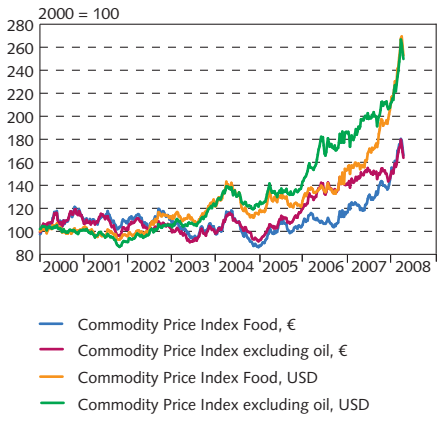
The inflation outlook in the United States has worsened substantially since the November issue of *Monetary Bulletin*. Inflation measured 4.1% in February 2008, as opposed to only 1.9% in August 2007, with the increase stemming primarily from rising oil and energy prices. In other respects, the depreciation of the dollar has a rather weak short-term effect on domestic consumer prices in the US. Because of the size of the home market, the fact that the US economy is relatively closed, and the international status of the dollar, exchange rate pass-through is relatively modest in comparison with other countries. On the other hand, the depreciation of the dollar has affected domestic commodity prices in the United States as well as prices in the global markets. Most global commodity trading – for example, trading in oil and metals – is carried out in US dollars.

Chart II-2
Inflation in the US and euro area
January 2004- February 2008[1]
Inflation including and excluding energy prices



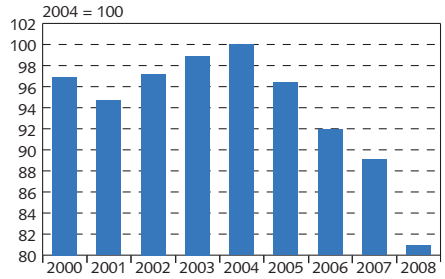
1. March data for euro area.
Source: Reuters EcoWin.

Chart II-3
World market commodity prices
Weekly data January 7, 2000 - March 30, 2008



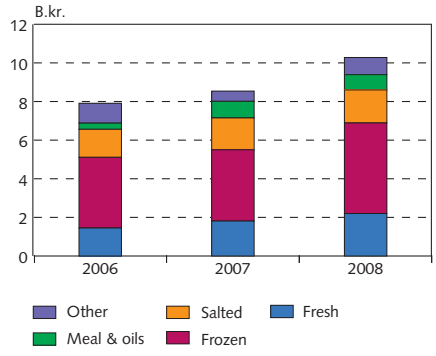
Source: Reuters EcoWin.

Chart II-4
Fish catch value 2000-2008[1]
At constant prices 2007



1. Annual data for 2000 - 2008, latest value for February 2008.
Source: Statistics Iceland.

Chart II-5
Marine export value 2006-2008
January - February



Source: Statistics Iceland.

In the euro area, inflation measured 3.3% in February. This is the highest rate of inflation since the adoption of the euro. The European Central Bank has the stated objective of maintaining inflation below but close to 2% over the medium term; therefore, inflation is considerably above the ECB inflation objective. It is generally thought unlikely that the ECB will reduce its base interest rate in the near future. Excluding energy prices, inflation measured 2.5% in February, having risen by 0.5 percentage points since September.

In the UK, inflation rose during the early months of 2008, measuring 2.5% in February. Core inflation, however, remains low at 1.2%. In the past several months, inflation in Japan has risen slightly, measuring 1% in February. In view of the fact that Japan has long battled persistent though modest deflation, this would be considered good news if demand growth were the principal driver of inflation rather than rising energy and commodity prices; however, annual consumer price deflation, excluding energy and food, totalled 0.1% in February. Inflationary pressure has also mounted elsewhere in Asia, particularly due to rising food prices. In China, inflation has reached a 12-year high, measuring 8.3% in February, primarily due to a 23% increase in food prices. A poor harvest resulting from inclement weather in China over the past several months partially explains the increase; however, rapid demand growth is the principal underlying cause of high food prices.

Elsewhere than in Japan, inflation is expected to rise considerably in 2008 and then taper off in 2009, provided that slower output growth eases demand pressure on commodity prices.

Global economic imbalances unwound considerably in 2007

The current account deficit in the United States amounted to 5.3% of GDP in 2007, down from 6.2% of GDP the year before. The narrowing of the deficit is due in part to the depreciation of the dollar and in part to slower demand growth in the United States. However, unrest in the global financial markets, coupled with the depreciation of the dollar, could make it difficult to fund the deficit in coming months. Further reductions in the US prime lending rate, juxtaposed with unchanged interest rates in Europe, contribute to a low US dollar exchange rate.

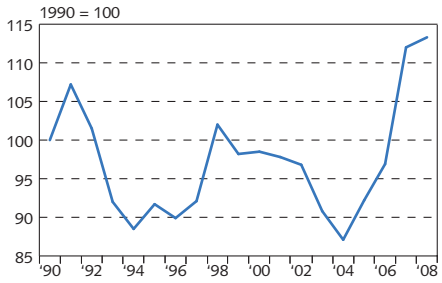
Fish catches smaller in early 2008

In Iceland, during the first two months of the year, both demersal catches – especially cod – and capelin catches were substantially lower than at the same time in 2007. Measured at constant prices, the value of the fish catch contracted by roughly 22% year-on-year. The condition of the capelin stocks is unusually poor, and the outlook for 2008 is for a notably small catch; furthermore, the total allowable catch (TAC) for blue whiting will be lower than it was in 2007. Added to this is the previously announced reduction of cod quotas for the current fishing year. At the end of February, the unfished proportion of cod quotas was somewhat higher than it was a year previously, which suggests that the cod catch might improve as the year progresses. In view of smaller cod quotas and a substantial reduction in the TAC for capelin and blue whiting, the export value of marine products, measured at constant prices, is expected to decline by approximately 8% in 2008. The Central Bank's November forecast projected a reduction of 6%.

High marine product prices counterbalance smaller catches

The export price of marine products has risen virtually uninterrupted since mid-2004. In 2007 the average increase in foreign-currency prices for marine product exports was just over 6%, while the price of demersal species rose by nearly 7%. Price changes for individual species have varied according to supply and demand. The price of demersals has risen more than that of other food products in recent years. Rising prices for grain products, including animal feed, have generated increases in the price of bread products, grains, dairy products, and poultry. Prices for other agricultural supplies – for instance, fuel and fertiliser – have also risen. These price increases will probably continue to push consumer food prices upwards in the medium term. The general rise in food prices will not necessarily generate corresponding increases in marine product prices, however, if consumers disproportionally curtail their consumption of more expensive foods such as seafood. Furthermore, in the past four years, prices of marine products have risen considerably more than those of other foods. Most domestic sellers expect a turning point ahead as consumer tolerance of price hikes runs out. The current forecast assumes that the weighted price of marine products will rise by roughly 3.5% between 2007 and 2008 and by 2% beginning in 2009-2010.

Chart II-6
Export prices of marine products[1]
At fixed prices 2008

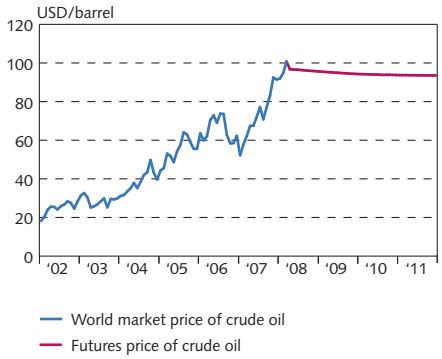


1. Deflated by the weighted CPI in main trading partner countries. Annual data for 1990-2007. The latest value is an average of January and February 2008.
Sources: Statistics Iceland, Central Bank of Iceland.

Oil prices at an all-time high

As before, the global oil market is characterised by limited supply, quotas set by the OPEC countries, rising demand, and a falling US dollar. Added to this is the fact that investors are directing their attention more towards commodity trading, partly in an effort to hedge against rising inflation, but also as a defence against the depreciation of the dollar. According to a recent forecast from the International Energy Agency, demand will increase by around 1.9% in 2008, as opposed to 1.4% in 2007. The growth in demand has been driven primarily by surging oil consumption in China and the Middle East; indeed, it is estimated that half of the increase in demand comes from these regions. Oil prices are expected to remain high, especially in view of the sterner tone taken by OPEC in recent weeks. The macroeconomic and inflation forecast assumes that oil prices, as measured in US dollars, will rise by one-third year-on-year in 2008, which is consistent with futures prices.

Chart II-7
World market price of oil[1]
Monthly data January 2002 - December 2011

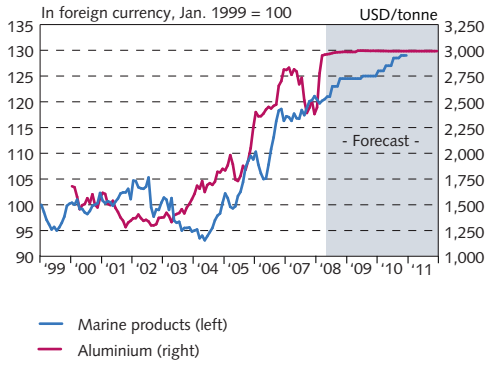


1. Forecast from end of March 2008.
Sources: Bloomberg, NYMEX, Reuters EcoWin.

Aluminium prices on the upswing

Aluminium prices began rising sharply near the end of January, bringing the average price for the first two weeks of March to a level more than one-fourth higher than the January average. Rising energy prices, together with temporary contractions in production in several large aluminium manufacturing countries, are considered the main driver of the past few weeks' spiking prices. It has also been noted that aluminium prices rose less than that of most other metals in the latter half of 2007. Forecasts of increased supply have not been borne out, while investor demand has grown. Though it was thought in 2007 that global production would outstrip demand, new forecasts (for example, from GFMS Metals Consulting) indicate that demand in 2008 will more or

Chart II-8
Prices of marine exports and aluminium



Sources: London Metal Exchange, NYMEX, Statistics Iceland, Central Bank of Iceland.

less keep pace with production. Production and demand in China are considered to be broadly in equilibrium, and no net exportation of aluminium is expected from China this year. Forecasts therefore indicate that aluminium consumption in China will increase by 16.5% in 2008 and that about 35% of global consumption will be concentrated there, while aluminium consumption in India is expected to rise by 8.7%. Demand in Europe and the US is expected to rise by 2.6% and 3.9% respectively. The Central Bank's baseline forecast assumes that the average year-on-year increase in the price of aluminium, calculated in US dollars, will be 11.5% in 2008 and 2.5% in 2009. These assumptions are based on futures prices during the period from February 20 to March 10, 2008.

Total exports will increase less than in the previous forecast

Judging by the path of import and export prices described above, terms of trade in goods and services will improve by 3½% this year. This is a considerably greater improvement than was forecast in November. Apart from this, the outlook is much as in the previous forecast, with a further improvement of almost 1% in 2009, followed by a slight decline in 2010.

Export growth slower than previously forecast

Export growth in 2008 and 2009 is expected to be considerably slower than forecasted in the November issue of *Monetary Bulletin*. The revision is explained by base effects due to higher than expected export growth in 2007, stemming from irregular aircraft transactions. Other important factors include a cut in the TAC for cod and a poor capelin catch. The forecast further assumes slow export growth in 2009 but projects that growth will pick up in 2010. However, growth is expected to be slower than forecast in November, despite the depreciation of the króna.

Table II-1 Exports and chief premises concerning the outlook for external conditions

	Change from previous year (%) unless otherwise stated[1]			
	2007	*2008*	*2009*	*2010*
Exports of goods and services	18.1 (4.2)	4.5 (14.1)	0.2 (5.0)	4.2 (5.2)
Marine production for export	-4.0 (-5.0)	-8.0 (-6.0)	0.0 (0.0)	0.0 (0.0)
Metals production for export	43.3 (47.6)	72.1 (71.4)	4.0 (4.5)	0.4 (0.0)
Export prices of marine products	9.5 (7.0)	3.5 (4.7)	2.0 (2.0)	2.0 (2.0)
Aluminium prices in USD[2]	8.0 (7.4)	11.4 (-2.1)	2.5 (1.4)	0.0 (-0.1)
Foreign fuel prices[3]	10.7 (5.4)	33.1 (10.3)	-1.3 (-3.5)	-1.0 (-1.4)
Terms of trade for goods and services	0.3 (-0.3)	3.6 (0.5)	0.9 (1.4)	-0.5 (0.2)
Global inflation[4]	2.2 (2.1)	2.5 (2.0)	2.0 (2.0)	1.9 (2.0)
Global GDP growth	2.6 (2.5)	1.8 (2.3)	2.1 (2.2)	2.5 (2.4)
Foreign short-term interest rates (%)[5]	4.4 (4.3)	3.7 (4.0)	3.1 (4.1)	3.1 (4.3

1. Change since *Monetary Bulletin* 2007/3. 2. Based on aluminium futures. 3. Based on fuel futures. 4. *Consensus Forecasts*. 5. Based on weighted average forward interest rates of Iceland's main trading partner countries.
Sources: Bloomberg, Consensus Forecasts, IMF, New York Mercantile Exchange, Statistics Iceland, Central Bank of Iceland.

Box II-1

The impact of the US sub-prime crisis

Financial conditions abroad have worsened dramatically since the last issue of *Monetary Bulletin*, as a result of turbulence in global financial and money markets. To some extent, the state of unrest currently dominating the global capital markets stems from the sharp rise in the delinquency rates on US mortgages, though the deeper roots of the problem lie in global imbalances and in the economic policy of the world's leading nations. Around mid-2005, the frequency of default began to rise but was limited initially to the class of housing loans called sub-prime mortgages, which were granted to homebuyers with poor credit ratings or a limited credit history. The problem has been magnified by falling house prices and rising debt service, especially as a result of the interest rate reset clauses that were a common provision of such loans. As a result of escalating delinquencies, in August 2007 the price of the asset-backed securities related to sub-prime mortgages started to fall and their liquidity was reduced.

Vulnerabilities in the financial markets emerge

The liquidity of mortgaged-backed securities and securitisations of various sorts suddenly contracted.[1] Credit rating agencies responded by lowering their ratings for a number of structured instruments, especially those linked to sub-prime mortgages. This exacerbated the unrest in the financial markets, which in turn made it more difficult for banks to sell new corporate bond issues that they had guaranteed, especially those related to leveraged buyouts. A number of banks were forced to hold those liabilities in their portfolios as a result. This exposed the banks to rising "warehousing risk", which strained the banks' equity position and boosted the demand for liquid assets.

Turmoil spreads to the money market

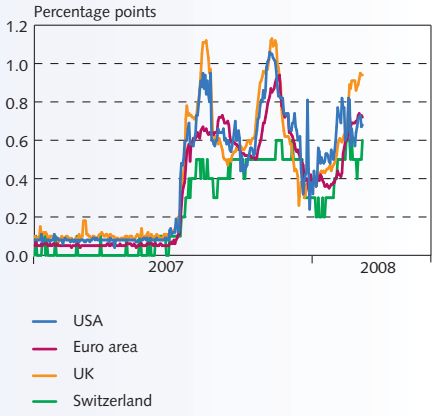
In July 2007, the unease began to make itself felt in the US money market. Interest rates suddenly shot upwards, far in excess of expected changes in key policy rates (see Chart 1). The disquiet spread quickly to other countries, particularly the euro area and the UK. The sub-prime crisis stimulated vastly increased demand and, at the same time, contributed to a tightened supply of short-term credit. There were several reasons for this. First, it was uncertain which financial institutions had exposures to sub-prime mortgage-related securities, and how large these exposures were. This greatly increased counterparty risk because money market transactions are unsecured. The uncertainty was greater than it would otherwise have been because financial institutions generally invested in these instruments through independently operated investment funds referred to as Special Purpose Vehicles (SPVs). These SPVs did not directly affect the balance sheets of the financial institutions concerned and were therefore not subjected to the same rules – for example, regarding transparency and capital adequacy ratios – as were other investments. In most cases, the SPVs had low capital buffers in proportion to total assets built into their structures, which left them little room to absorb losses.

Second, failures in the market for asset-backed commercial papers (ABCP) heightened demand in the money market. Banks began to bolster their liquidity position in case they needed to provide liquidity to related SPVs. They also saw the need to enhance their liquid assets to cushion themselves against increased funding needs in the event that they were forced to take on the liabilities of the SPVs. Investments in mortgaged-backed structured securities are gener-

Chart 1

Spread between interbank rates and expected policy rates[1]

Daily data February 2, 2007 - April 2, 2008



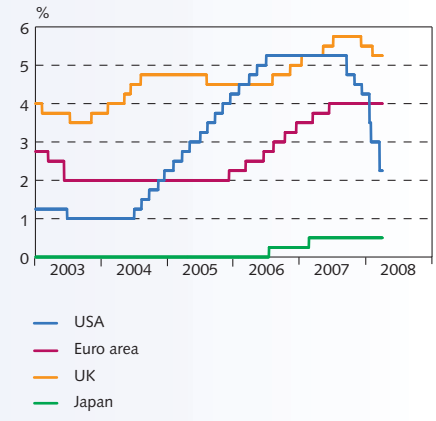
1. Spread between interbank rates and interest swap agreement for 3 months.

Sources: Bloomberg, Reuters.

Chart 2

Central Bank policy rate

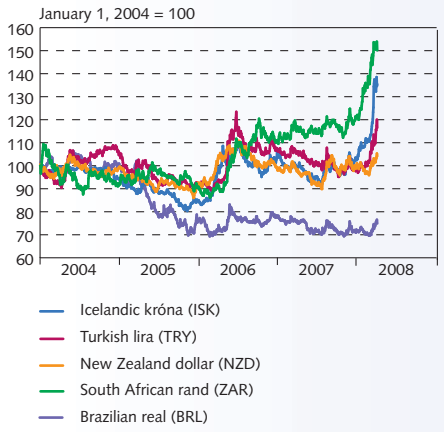
Daily data January 1, 2003 - April 2, 2008



Source: Reuters EcoWin.

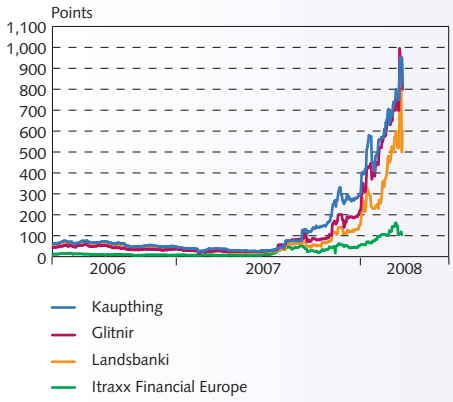
1. It is difficult to state with certainty, however, whether this alone is the principal cause of worsening financial market conditions or whether it is simply a side effect of more broad-based fundamental changes in the financial system.

Chart 3
Exchange rate of high-yielding currencies against the Euro
Daily data January 1, 2004 - April 1, 2008



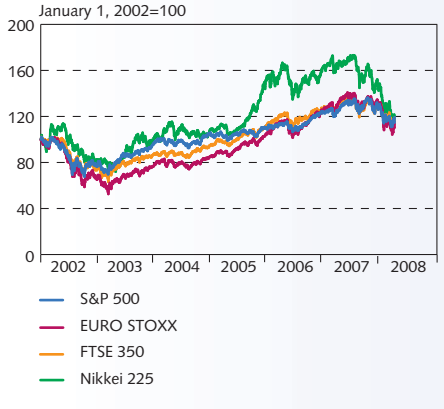
Sources: Bloomberg, Reuters EcoWin.

Chart 4
CDSs of Icelandic banks and Itraxx Financial Index
Daily data July 8, 2006 - April 2, 2008



Sources: Bloomberg, Reuters.

Chart 5
Equity prices
Daily data January 1, 2002 - April 1, 2008



Source: Reuters EcoWin.

ally long-term, but the SPVs were funded primarily through the issue of asset backed commercial papers (ABCPs). These short-term ABCPs were frequently secured by sub-prime structured instruments and often backed by some sort of supplemental guarantee from the bank concerned.[2] The collapse in the value of structured securities linked to sub-prime mortgages made it difficult for the investment funds to meet their funding needs through bond issues. The financial institutions connected with the SPVs were forced to come to the rescue and guarantee short-term funding in the interbank market.

Third, demand for credit escalated among money market funds seeking to improve their liquidity position in anticipation of a possible wave of withdrawals by investors.

Central banks lend assistance

Initially, the central banks in the US, the UK, and the EU responded to developments in the interbank markets by increasing banks' access to liquidity. Several central banks, led by the US Federal Reserve, also began to lower their policy interest rates considerably in order to appease the markets (see Chart 2). The European Central Bank and the Bank of Japan have not lowered their rates but have suspended interest rate hikes for the time being. 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, JP Morgan made a takeover bid to shareholders of the investment bank Bear Stearns, after it came to light that Bear Stearns was experiencing severe liquidity problems and was headed for collapse. The US Federal Reserve Bank facilitated the bid by JP Morgan. The rescue of an investment bank marks a significant change in Federal Reserve policy.

Reassessment of investment risk

Mounting market turmoil pressed Treasury bond yields down sharply when investors began to seek out safe returns. Despite the drop in base interest rates, credit terms deteriorated and the supply of credit shrank, especially in the United States. Europe was affected as well.

Following central bank intervention, the interbank markets more or less normalised towards the end of 2007. During the first months of this year, however, turbulence has resurfaced in the interbank markets (see Chart 1), and interest rates on loans with maturities of longer than six months are still higher than would be expected in a normal market climate. In general, credit spreads have risen steeply since the onset of the tumult in the financial markets. Changes in risk assessment can be seen, for example, in sizeable increases in the price of credit default swap (CDS) agreements. In part, however, these increases can be traced to technical issues in the credit derivatives market rather than to actual underlying risk factors. This is because credit default swaps are an important element in the pricing of structured securities and transactions with them. Serious flaws have come to light in these markets in the wake of the sub-prime crisis, which has fuelled general market distrust of structured financial instruments. Spreads on mortgage-backed bonds continue to rise. In the US, credit spreads on other bonds backed by prime mortgages, commercial real estate loans, credit card and automobile

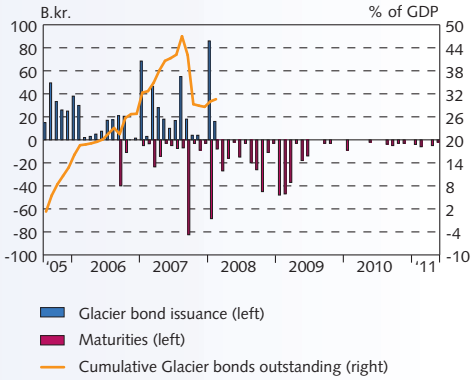
2. Conduits, Structured Investment Vehicles (SIV), and SIV-lites are the most common types of SPVs. The difference in these various types of investment funds lies particularly in how they are funded and to what degree the bank establishing them guarantees their obligations.

loans, and related derivatives have risen as well, primarily as a result of rising fear of increased delinquency on loans other than sub-prime mortgages.

Precipitous decline on asset markets and contraction in carry trading

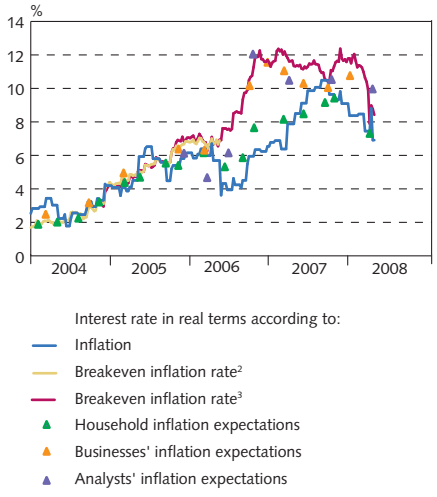
The developments in the global capital markets have made a strong impact on the world economy, especially in countries with a wide current account deficit – like Iceland – and those with a large financial system. Since mid-summer 2007, equity prices have plummeted on all of the world's principal markets (see Chart 5), with financial companies taking the brunt of the blow. Icelandic financials have been no exception. Their funding is complicated by high CDS spreads, and service of Iceland's foreign debt has become more expensive as a result. The position of the banks has undermined the króna, which has lost considerable ground. Other things being equal, this negatively affects the current account. In August, carry trading fell off significantly (see Chart 6), especially where the Japanese yen had been used as the funding currency. The yen appreciated markedly as a result, while high-yielding currencies dropped in value (see Chart 3). The interplay between these developments and the financial position of Iceland's banks (see Box III-1) is one of the chief reasons why the Icelandic economic climate has been so stormy of late.

Chart 6
Króna Eurobond issuance[1]
Monthly data



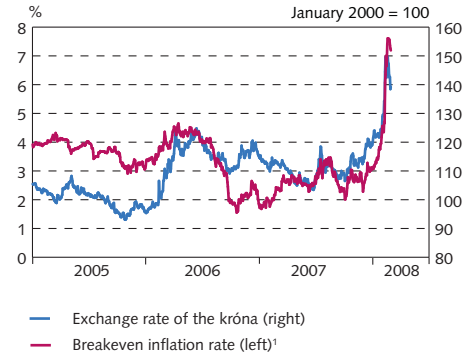
1. Data until April 2, 2008 inclusive.
Sources: Reuters, Central Bank of Iceland.

Chart III-1
Central Bank policy interest rate in real terms[1]
Weekly data January 6, 2004 - April 8, 2008



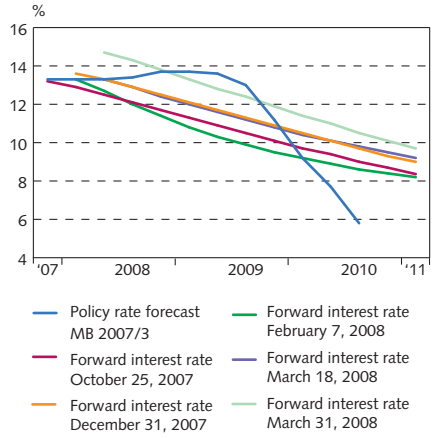
1. The policy rate has been converted to annual yield. 2. Spread between RIKB 13 0517 and RIKS 15 1001. 3. Spread between RIKB 13 0517 and HFF150914. Household, business and analysts' inflation expectations are based on inflation one year ahead.
Sources: Capacent Gallup, Statistics Iceland, Central Bank of Iceland.

Chart III-2
Breakeven inflation rate
and exchange rate of the króna
Daily data January 4, 2005 - April 8, 2008



1. Spread between RIKB 13 0517 and HFF150914.
Source: Central Bank of Iceland.

Chart III-3
Expected Central Bank policy rate based
on forward interest rates and policy rate
forecast in MB 2007/3
Q4/2007 - Q1/2011



Source: Central Bank of Iceland.

III Financial conditions

Since the last issue of *Monetary Bulletin* in November 2007, the real policy rate has dropped by all measures, despite two hikes totalling 1.7 percentage points. Inflation has escalated, and the real policy rate has fallen by nearly 3 percentage points relative to inflation over the past twelve months. Inflation expectations have risen substantially as a result of the depreciation of the króna in the first months of 2008. Based on the breakeven inflation rate on Treasury bonds, the real policy rate is now nearly 3.4 percentage points lower than in the beginning of November. Based on household inflation expectations as of March 2008, the real policy rate had dropped by more than 2 percentage points since the previous survey in October, and based on businesses' inflation expectations in March, it had fallen by more than 1% since December. The real policy rate based on analysts' inflation expectations had declined as well, by just over half a percentage point. Despite the declining real policy rate, businesses' and households' financial conditions have deteriorated as a result of rising risk premia and limited access to credit. The depreciation of the króna has also made a negative impact on the balance sheets of many households and businesses.

Depreciation of the króna

The exchange rate of the Icelandic króna and other high-yielding currencies has fallen sharply since the beginning of the year, with the Icelandic króna depreciating most. Though a variety of synergistic factors have contributed to the drop, there are two principal causes: Investors have changed their risk assessment in face of difficulties in the global financial markets, and there is less incentive for carry trading because foreign liquidity has become expensive for domestic financial institutions. As a result, swap rates for the króna have dropped significantly in the currency swap market, which is reflected in the nearly complete narrowing of the interest rate differential on the shortest swap agreements (see Box III-1). Furthermore, investors have growing concerns about the persistent current account deficit. They also fear that the króna will depreciate sharply and erode the relatively high interest rate differential, and that the Central Bank's foreign reserves are inadequate.

Expectations of higher policy rate

Yields on nominal Treasury notes and indexed Housing Financing Fund (HFF) bonds rose between mid-summer 2007 and the end of the year. Most likely, this reflected expectations of a higher policy rate, as is implied by the forward interest rates. It is also probable that some investors have sold bonds to remedy financial difficulties. Toward the end of 2007, however, yields on both indexed and non-indexed bonds began to fall. At that time, public discussion in support of lowering the policy rate to ease financial system difficulties intensified despite an increasingly negative inflation outlook. That discussion seems to have affected expectations. The declining forward interest rates during this period, which are illustrated in Chart III-3, are a clear indication of

this. After the exchange rate drop that began late February, yields on indexed HFF bonds declined as well. Fear of greater inflation fuelled demand for indexed bonds. Plunging equity prices probably contributed as well to the increased demand for bonds carrying a Treasury guarantee. Concurrent with these developments, however, yields on nominal Treasury notes rose in response to decreasing demand, which implies that the fear of inflation had gradually become the determining factor.

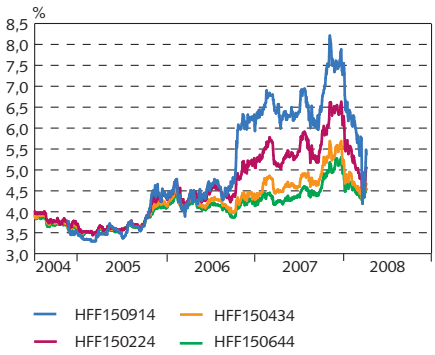
Banks' CDS spreads have risen

The Icelandic banks' CDS spreads have soared since the global financial market turbulence began in the wake of the sub-prime mortgage crisis in the United States (see further discussion of the sub-prime crises in Box II-1). Spreads have risen by some 4.8 to 6.6 percentage points since *Monetary Bulletin* was last issued, while European financial institutions' spreads rose by just over 0.5 percentage points during the same period. The banks' CDS spreads reached a historical peak at the end of March, but since the beginning of April they have fallen slightly. The CDS spreads of the Icelandic Government have also increased substantially and appear to have followed those of the banks, despite the fact that the Government carries little foreign debt and the Treasury is generally considered strong. CDS spreads do not necessarily provide an accurate measure of the actual cost of credit that domestic financial companies face. Financial institutions have issued few bonds so far in 2008, and credit terms have deteriorated.

Higher premia in foreign interbank markets

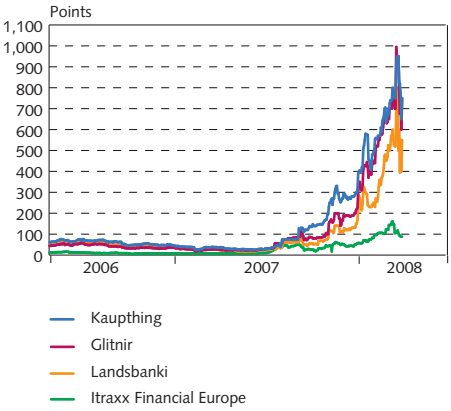
The US Federal Reserve has lowered its federal funds rate by 2.25 percentage points in four increments since the beginning of November. The market is expecting rate cuts to continue until this summer. In most other developed countries, however, policy interest rates have remained unchanged or even been raised, but the market is anticipating that some central banks will begin lowering their rates this autumn. Three-month interbank rates have dropped significantly in the US, concurrent with the cuts in the fed funds rate. In the euro area, interbank rates are broadly unchanged since early November, after having dipped at the beginning of the year in response to rising expectations of policy rate cuts. However, inflation has been higher than expected, which reduces expectations of lowered interest rates. Interbank rates have fallen off slightly in the UK, and in Switzerland and Japan they have changed little since the November issue of *Monetary Bulletin*. The LIBOR premium – that is, the difference between interbank rates and Treasury bill rates – has remained high since the global market turmoil began to surface. In the wake of actions taken jointly by the world's leading central banks last December, the tension in the interbank market subsided, but the premium has since risen once again. Central banks on both sides of the Atlantic have resorted to further measures in order to provide financial institutions with ready access to liquidity. Yields on five-year Treasury bonds have fallen, both in Europe and in the US, in contrast with the developments in Iceland.

Chart III-4
Yields on indexed long-term bonds
Daily data July 8, 2004 - April 8, 2008



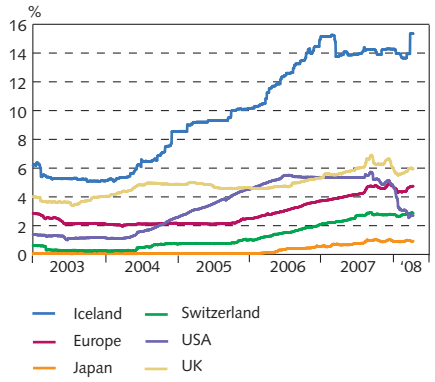
Source: Central Bank of Iceland.

Chart III-5
CDSs of Icelandic banks
and Itraxx Financial Index
Daily data July 8, 2006 - April 8, 2008



Sources: Bloomberg, Reuters.

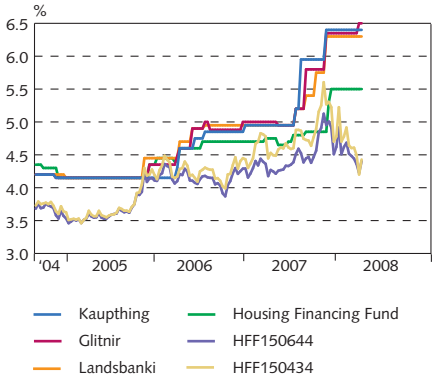
Chart III-6
3-month interbank rates
Daily data January 1, 2003 - April 9, 2008



Sources: Reuters EcoWin, Central Bank of Iceland.

Chart III-7
Interest rates on indexed housing loans[1] and HFF bond yields

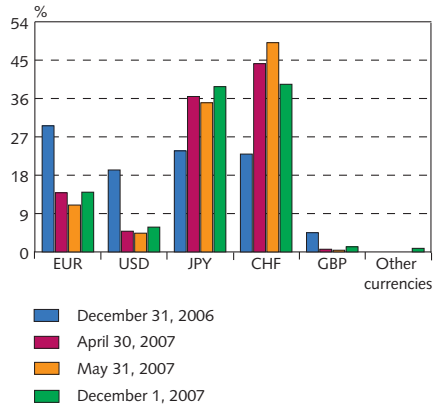
Daily data September 1, 2004 - 1 April, 2008



1. Interest with prepayment premium. For HFF, interest excluding prepayment premium prior to November 2005.
Sources: Housing Financing Fund, Central Bank of Iceland.

Chart III-8
Currency composition of households' foreign currency-denominated borrowing

Kaupthing, Landsbanki, Glitnir

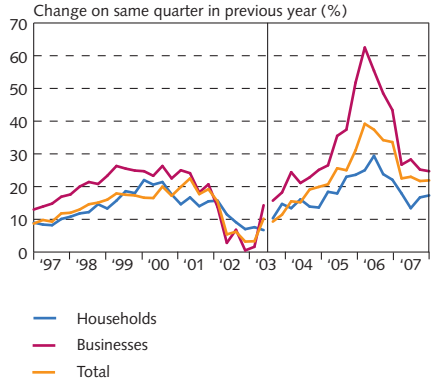


Source: Central Bank of Iceland.

Chart III-9
Credit system lending growth[1]

Q1/1997 - Q4/2007

Change on same quarter in previous year (%)



1. Due to a reclassification of lending, after September 2003 data by sector are not comparable with earlier data.
Source: Central Bank of Iceland.

Financial conditions have deteriorated

Financial conditions of households and businesses have worsened considerably since *Monetary Bulletin* was last published. Nominal interest rates and short-term lending rates have increased. Inflation has also risen, and consequently, the indexation on indexed loans has increased as well. Furthermore, interest rates on new indexed loans and variable-rate loans have risen by 0.45-0.7 percentage points. However, the Housing Financing Fund's lending rates may drop in the near future if real HFF bond rates continue to decrease. HFF did not hold an auction in Q1/2008; however, the Fund has announced that a portion of the planned issue will be moved to the second quarter. Lending by HFF was less than anticipated in the first quarter. One commercial bank has raised its mortgage interest rates so far in 2008.

Concurrent with the depreciation of the króna, foreign currency-denominated loans have risen sharply. Such loans constitute a large portion of businesses' debt and an increasing proportion of household debt; for example, foreign-denominated loans now total over one-fifth of deposit money banks' lending to households. The depreciation of the króna will affect the debt burden of foreign-currency loans much sooner than it will affect indexed loans. Low-yielding currencies such as the Swiss franc and the yen constitute almost 80% of the foreign-currency loans to households.

Prospective borrowers must fulfil more stringent credit assessment requirements for foreign-denominated loans than for indexed loans. Nonetheless, some borrowers who have financed the purchase of residential properties or motor vehicles with foreign-denominated loans may already be facing an outstanding loan balance greater than the value of the purchased asset. The debt burden of foreign-dominated mortgages has increased substantially. In cases where such loans constitute a large portion of an indebted household's liabilities, the risk of default may rise significantly if the króna depreciates, especially in circumstances when revenues fall due to economic contraction. This explains somewhat the recent reluctance to grant credit. Compounding this is the fact that interest premia on foreign currency-denominated loans have risen considerably. This has the most immediate impact on interest rates for new loans, but over time the terms of older loans can be affected as well.

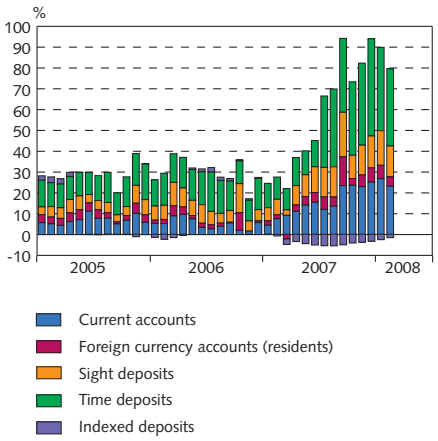
Credit supply limited in domestic and foreign currencies

Generally speaking, as the real exchange rate falls, it should be more profitable in the long run to borrow money in foreign currency. However, rising premia reduce the short-term benefits, and in many instances a tighter credit supply could make debt restructuring impossible.

The supply of ISK credit and foreign currency has contracted markedly, both to businesses and households. While there are indications that the supply of credit to businesses began to shrink as early as last autumn, households were not seriously affected until quite recently. Figures from the credit system for the fourth quarter of 2007 bear this out. The growth in lending to businesses contracted year-

on-year in the fourth quarter of 2007, while lending to households increased. Figures for deposit money banks for the first two months of 2008 reveal even more growth in debt excluding exchange rate adjustments and price indexation, despite indications of a curtailed credit supply. The acceleration in lending growth could stem from investors' closing forward contracts and taking loans instead. If this is so, it represents not an actual increase in lending but a transfer of off-balance sheet items to the balance sheet. It is also possible that difficulties in the corporate bond market have forced companies to borrow funds in order to pay off bonds that have matured in the past several months. If this is the case, there has been an increase in lending in the banking system, though actual corporate indebtedness has not increased.

Chart III-10
Contribution to deposit growth
January 2005 - February 2008



Source: Central Bank of Iceland.

Continuing substantial growth in money supply

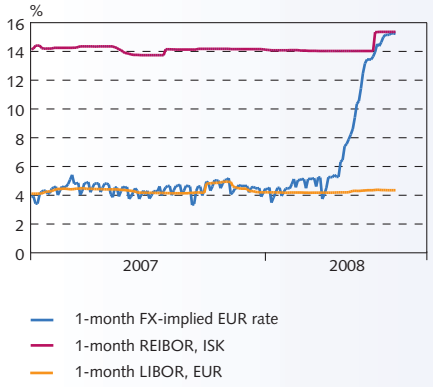
Growth in the money supply remains enormous, with annualised growth climbing to 50% and above since last autumn. It has been concentrated in sight deposits, which are the most liquid deposit accounts, but it can also be traced to a substantial increase in domestic foreign-currency accounts, both time deposits and sight deposits. Indexed deposits have contracted marginally during this period, particularly deposits held by households. The Icelandic banks have sought to increase their share of deposits, both domestically and abroad, in order to raise the proportion of deposits in their funding as a defence against the tight global financial markets. Most likely, some of the increased growth in the money supply stems from these efforts. Changed investor risk assessment due to financial market turmoil is another likely explanation of increased deposit activity, as unpredictable market conditions tend to fuel investor flight to less risky options, including deposits.

Box III-1

The recent turmoil in the Icelandic foreign exchange swap market

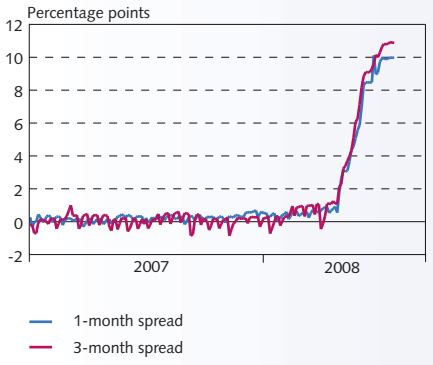
The rapid rise in credit premia on Icelandic financial institutions and a strong domestic demand for foreign currency have resulted in substantial tensions in the Icelandic foreign exchange (FX) swap market and a breakdown of the covered interest rate parity (CIP). The Icelandic interest rate differentials with abroad according to FX swap-implied rates have plummeted, being a primary reason behind the recent depreciation of the Icelandic króna (ISK). This box analyses the spillover of the international credit market turbulence to the Icelandic foreign exchange swap market.[1]

Chart 1
Icelandic and euro area interbank rates vs. FX implied swap-implied EUR rate
Daily data August 1, 2007 - April 8, 2008



Sources: Bloomberg, Central Bank of Iceland.

Chart 2
FX swap-implied EUR rates minus LIBOR rate
Daily data August 1, 2007 - April 8, 2008



Source: Bloomberg.

Strong demand for foreign currency

Before the start of the global credit crisis in mid-2007, foreign liquidity was relatively available and cheap, and there were few strings attached to raising foreign currency in foreign cash markets or launching offshore bond issuances. Turmoil in the international financial markets, however, resulted in soaring cost of overseas funding, and an Icelandic financing "risk premium" arose in global financial markets. Consequently, Icelandic investors turned to the FX market, as it offered advantageous funding relative to the deterioration in overseas borrowing conditions.

Chart 1 shows the Icelandic price for raising foreign funds through the FX market (FX swap-implied euro rates) and the euro area LIBOR (London Interbank Offered Rate). They co-moved quite closely in 2007, and the spread was normally in the range of +/-50 basis points. Funding cost through the FX swap market was thus lower than paying euro area LIBOR plus a risk premium. In late January 2008, however, the spread between the FX swap-implied euro rates and euro area LIBOR started to widen significantly, resulting in a very strong divergence by March 2008 (see Chart 2). This was also the case against other currencies like the US dollar. Hence, the risk premium of overseas funding – reflected in credit default swap (CDS) spreads on the Icelandic banks – has gradually been priced into the FX swap market. Chart 3 shows that the related FX swap-implied Icelandic rates fell substantially below onshore REIBOR (Reykjavik Interbank Offer Rate).

Even though the interest rate differentials between REIBOR and euro area LIBOR have been quite stable in recent months at around 10-11 percentage points, Chart 4 shows that the interest rate differentials between FX-swap implied Icelandic rates and euro area LIBOR have narrowed quite rapidly in 2008, especially at short maturities, where much of the trading in the Icelandic króna has hitherto taken place (three months and less).[2] Icelandic rates have effectively been lowered by around 10 percentage points on the FX swap market, and this has happened very quickly. Hence, it has been much less profitable to be long in the Icelandic króna. In fact, for a short while the interest rate differentials against the euro area were negative at short maturities (one day and one week) before the policy rate hike by 125 basis points in March. The hike raised onshore and FX swap-implied Icelandic rates by roughly the same amount and stopped the rapid weakening of the króna. A few days after the rate hike, however, domestic demand for foreign currency

1. For further reading, see the articles by Amatatsu, Y. and N. Baba (2007). "Price discovery from cross currency and FX swaps: A structural analysis", Bank of Japan working paper series no. 07-E-12; and Baba, N., F. Packer and T. Nagano (2008), "The spillover of money market turbulence to FX swap and cross-currency swap markets", BIS Quarterly Review, March 2008.
2. Whether FX swap contracts will be rolled forward at maturity depends on the attractiveness of the carry relative to the risk, often known as the carry-to-risk ratio (the FX swap-implied interest rate differential divided by the implied volatility).

intensified and thus narrowed the spread between FX swap-implied Icelandic rates and foreign interest rates again.[3]

The breakdown of the covered interest rate parity

One can recognise why domestic players choose to hoard foreign currency in the FX swap market via the covered interest rate parity (CIP), which implies that the interest rate differential between e.g. Iceland and the euro area should be reflected in the forward relative to the spot exchange rate (F/S); that is, the forward premium.[4]

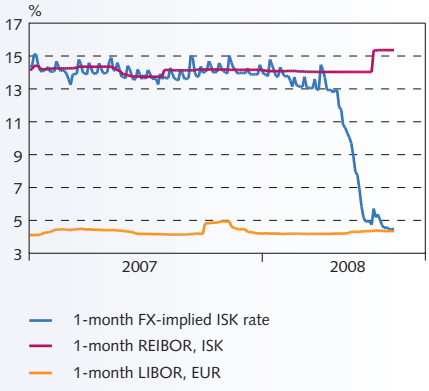
Arbitrage arguments explain why the CIP holds under normal conditions. First, when euro area funding costs are higher than FX swap-implied euro rates, Icelandic firms would prefer to borrow at domestic interbank rates and exchange Icelandic krónur for euros at the FX spot rate and make a contract to do a reverse position at the forward exchange rate. Second, in the absence of credit/counterparty risks, it would be attractive for non-residents to place money in Icelandic currency deposits (at the relatively high interest rate) and cover the exchange rate risk in order to lock in risk-free profit. Both factors would tend to make the CIP hold. The crucial assumptions behind the CIP are low transaction costs, no political risk, absence of credit/counterparty risk and liquidity risk. Since mid-2007 credit/counterparty and liquidity risks have become important considerations in the functioning of financial markets. Concerns about credit risks associated with the Icelandic banks are manifested, for example, in the reluctance of non-resident investors to place money in the Icelandic deposit market directly unless they are generously compensated. The risk that one counterparty will default – and the entire principal is lost on a deal – makes investors prefer entering the FX swap market where swapped assets in the two currencies serve as collateral.[5]

The lack of traditional equilibrium mechanisms due to domestic players hoarding foreign currency and a substantial Icelandic credit premium has resulted in a near collapse of the FX swap market.

Longer-term swap market severely distorted

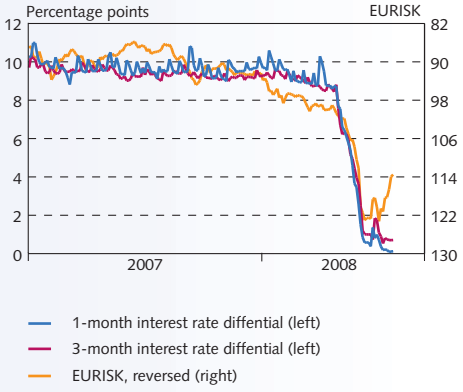
The longer-term cross-currency basis swap market (hereafter referred to as currency swaps) has also been severely affected by the global credit turmoil. Currency swaps are more regularly used than FX swap markets at longer maturities (currency swaps are similar to FX swaps, but the structure is a bit different)[6] and have been an important tool for hedging the Icelandic currency risk associated

Chart 3
Icelandic and euro area interbank rates vs. FX swap-implied ISK rate
Daily data August 1, 2007 - April 8, 2008



Sources: Bloomberg, Central Bank of Iceland.

Chart 4
FX swap-implied ISK rates minus LIBOR and the Icelandic króna
Daily data August 1, 2007 - April 8, 2008



Sources: Bloomberg, Central Bank of Iceland.

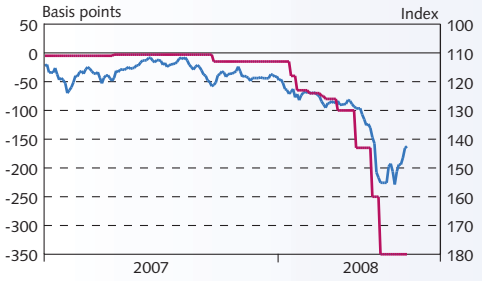
3. FX swap-implied Icelandic rates appear positively related to the policy rate, negatively to the Icelandic credit risk as well as one-sided order flow for foreign currency.

4. According to CIP the following holds:
$[1 + ((days/360)*r^{EUR})] = (F/S)*[1 + ((days/360)*r^{ISK})]$
S is amount of Icelandic Króna per euro whereas *F* is the similar forward exchange rate. The right side of the equation shows FX swap-implied EUR rates which should equal the euro-area Libor. The price of an FX swap is quoted as the forward minus spot (forward rate points). It is common to use the Reibor and forward rate points to calculate the FX swap-implied rates. Instead of Reibor, financial institutions will use their own internal funding costs.

5. The collateral does however not necessarily cover the entire credit risk. If a counterparty defaults during the contract period the loss is limited to the mark-to-market profit on the swap with the counterparty, reflecting the reconstructing of the position at the current market price. The credit risk should be rather small in short-term FX swaps (like one-week contracts), however, suggesting that impairment of liquidity is also a main reason behind the sharp decline in FX swap rates.

6. In a currency swap, an Icelandic financial institution effectively borrows foreign currency from a foreign institution and simultaneously lends Icelandic currency, with an exchange of principal at the start and maturity of the swap (like an FX swap) but with regular interest payments based on three-month Libor. The future payment of the principal is agreed at the start of the contract and hence avoids any foreign exchange risk. The swapped assets in the two currencies serve as collateral. However, interest rate payments are subject to foreign exchange risk and a counterparty risk premium remains.

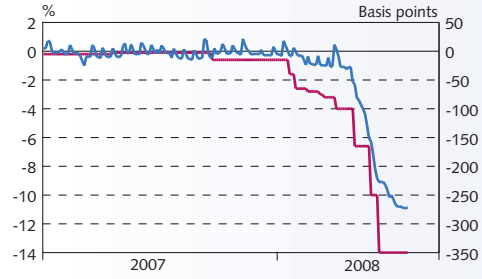
Chart 5
Cross-currency basis swap spreads vs. the króna
Daily data August 1, 2007 - April 8, 2008



Icelandic exchange rate index, reversed (right)
1-year currency swap, USDISK (left)

Source: Bloomberg.

Chart 6
Currency swap spreads widened first
Daily data August 1, 2007 - April 8, 2008



FX swap-implied ISK rate minus Reibor, 1-month (left)
1-year cross-currency basis swap, USDISK (right)

Source: Bloomberg.

with Eurobond (Glacier bond) issuances and for domestic banks' offshore bond issuances in foreign currency and swapping the proceeds back into Icelandic krónur.[7] Longer-dated cross-currency basis swap spreads are determined by the health of the banking system and the underlying transaction flow of cross-currency bond issuances. Hence, currency swap spreads – which equilibrate total demand and supply for Icelandic krónur – turn negative when there is a limited supply of foreign currency and a willingness to receive lower interest rate payments on the money lent in Icelandic krónur.[8]

The US dollar against the Icelandic króna currency swap spread for one-year maturity is shown in Chart 5. In the first part of 2007, the spread was close to zero but spreads began to widen slightly in November 2007, and by January they had widened to 50 basis points. The widening explains a part of the initial weakening of the króna.[9] Strains in the FX swap market first became apparent in January 2008, reflecting that tensions in the currency swap market have spilled over into shorter-term FX-implied rates (see Chart 6). It indicates that banks and other borrowers turned to short-term funding in the foreign exchange markets as long-term liquidity was drained. Currently, liquidity in the Icelandic currency swap market is very low (and market prices are not reliable).[10] Going forward, demand for new Eurobond issuances is likely to fade on the back of the substantial widening in currency swap spreads.[11]

Improvements in the FX swap market

An improvement in the funding conditions of the Icelandic banks seems to be a necessary condition for normalisation of the swap markets (since the Icelandic "credit premium" is tightly linked to the FX swap market). Potential triggers can be an easing in the global liquidity crisis or a reduction in CDS spreads for the Icelandic banks in the wake of favourable economic events. However, it does not mean that policy measures cannot contribute to improvements in the functioning of the FX swap market in the current environment.

One policy measure is the issuance of offshore accessible Government guaranteed certificates of deposit (CDs), which would make the relatively high onshore Icelandic interest rates attractive to non-resident investors and contribute to improved liquidity in the FX swap market. The idea is to make investors enter Icelandic CDs without involving the Icelandic banks and potentially sell the Ice-

7. See Barclays Capital (2008), "Basis swaps: The straw that may break the AUD's back". 25 March 2008; Ryan, C. (2007), "Some general observations from the kangaroo bond market", Reserve Bank of Australia speech, 29 March 2007; and Ólafsson (2005). "Króna-denominated Eurobond issues", Central Bank of Iceland, *Monetary Bulletin*.
8. The typical quoting of the currency swap is Icelandic REIBOR minus a margin (in basis points), where the borrower of US dollar funds agrees to receive REIBOR minus a margin every three months for paying US LIBOR.
9. Causation is likely to go in the other direction as well, with a weaker Icelandic króna increasing hedging pressures and contributing to wider currency swap spreads.
10. The severe tension in the Icelandic swap market is comparable to the Korean currency swap market from mid-2007, where dollar shortages on back of the US sub-prime crisis caused much wider currency swap spreads. As in Iceland, moderately high interest rates in Korea attracted Eurobond issuers and made domestic investors issue offshore bonds. Another case is the deterioration in the creditworthiness of Japanese banks in the later 1990s, which resulted in wider USDJPY currency swap spreads. Furthermore, in 2007 non-US banks converting euro into US dollar liquidity to support US conduits resulted in a widening in the EURUSD currency swap spread. See Federal Reserve Bank of New York (2008), "Treasury and federal reserve foreign exchange operations", February 2008; and Bank of Korea (2007), "Financial Stability Report", October 2007.
11. Eurobond issuances are only beneficial when the cost of switching Icelandic króna funding into foreign currency via currency swaps is lower than the cost of direct issuance in foreign currency; that is, the spread to swap in Iceland minus the currency swap spread premium paid is less than the spread to LIBOR that the issuer would have to pay abroad.

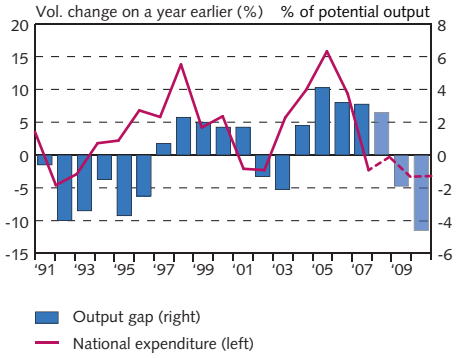
landic króna forward for foreign currency (in case investors want to avoid the foreign exchange risk). It will thus increase the supply of krónur on the forward market and drive down the forward price of the Icelandic króna. In addition, purchases of ISK in the spot market may drive up the spot price of the króna. Hence, it should enhance efficiency in the FX swap market and most likely narrow the spread between onshore and FX swap-implied Icelandic rates.

Another plausible policy measure is to provide further liquidity in the foreign exchange market through FX swaps, but these actions would require a larger amount of foreign exchange reserves or access to FX swap agreements with other central banks. In particular, the Central Bank of Iceland can play an active role concerning the distortions caused by liquidity shortages.

IV Domestic demand and production

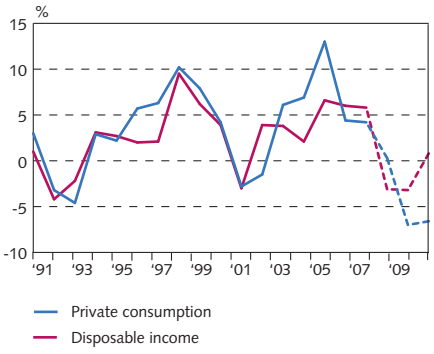
The Icelandic economy has undergone considerable changes since the Central Bank reported on the economic outlook in the November issue of *Monetary Bulletin*. The impact of the global credit crisis has intensified, e.g. with the sharp depreciation of the króna. An economic adjustment toward a more sustainable equilibrium can no longer be avoided, and a fairly deep contraction appears imminent. This adjustment will occur later than the Central Bank would have wished and is driven more by the weakening of the króna than by increasingly tight monetary policy, which was the Bank's aim. If economic balance had been achieved in a timely manner through monetary policy restraint, the economy would not be so vulnerable to the present credit crisis. It would have been possible to prevent a drop in the exchange rate from causing a tidal wave of inflation and an even more painful contraction in the economy. This is not the case, however, and as a result, the adjustment will be accompanied by higher inflation and higher inflation expectations than are consistent with the inflation target. The most important task of monetary policy is to prevent excessively high inflation expectations from taking root. The baseline forecast illustrates how monetary policy can promote the attainment of the inflation target during the forecast horizon, the anchoring of inflation expectations, and the accompanying economic adjustment.[1]

Chart IV-1
National expenditure and output gap 1991-2010[1]



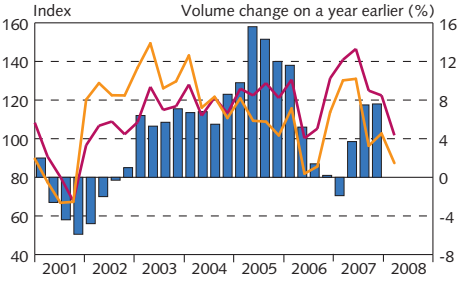
1. Central Bank baseline forecast 2008-2010.
Sources: Statistics Iceland, Central Bank of Iceland.

Chart IV-2
Private consumption
and disposable income 1991-2010[1]



1. Central Bank baseline forecast 2008-2010. Disposable income is the Central Bank's estimate.
Sources: Statistics Iceland, Central Bank of Iceland.

Chart IV-3
Private consumption and consumer confidence[1]
Q1/2001 - Q1/2008



1. Three-month average of Gallup confidence index.
Sources: Capacent Gallup, Statistics Iceland.

Swift turnaround in private consumption in 2008

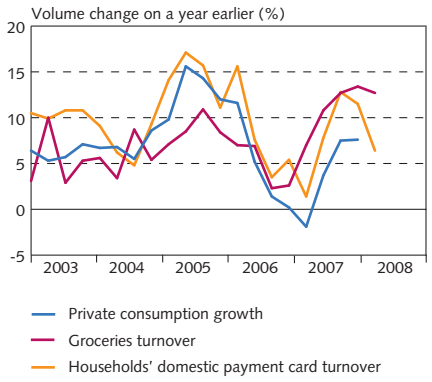
Private consumption growth gained momentum until the end of 2007, measuring 7.6% in the fourth quarter of the year. As in recent years, that growth is primarily due to a surge in disposable income (see Chart IV-2). Private consumption growth has been strong even though nominal and indexed lending rates have risen. Disposable income grew rapidly, the supply of foreign-denominated loans was ample throughout the year, and households stepped up their foreign-currency borrowing. But conditions have changed quite suddenly. A decreased supply of credit in both domestic and foreign currency, rising lending rates and interest premia, the plunge in the value of the króna, and mounting inflation will all contribute to a swift downturn in private consumption in 2008. The effects of these factors can already be felt clearly in the housing market. The substantial wage hikes following the recent wage settlements and the related measures taken by the Government will sustain disposable income at the outset, but they will not prevent a drop in disposable income as time passes (see Box V-1 on the impact of Government involvement).

1. As in recent issues of *Monetary Bulletin*, the baseline forecast is based on the policy rate path that the Bank's staff deem sufficient to bring inflation down to the inflation target within an acceptable time horizon and stabilise it near 2.5% thereafter. A more in-depth examination of the macroeconomic forecast can be found in Appendix 1 on page 63. The principal changes in the macroeconomic forecast since the publication of *Monetary Bulletin* 2007/3 are summarised in Box IV-1, and the main changes in the inflation forecast can be found in Box IX-1.

After considerable growth in H1/2008, private consumption will begin to contract rapidly

In the November issue of *Monetary Bulletin*, it was explained that households seemed to expect disposable income growth to remain strong, housing prices to stay high, and the supply of affordable credit to remain ample. The conclusion drawn in *Monetary Bulletin* was that these expectations were far too optimistic in view of the circumstances. It was forecast that private consumption would peak in the latter half of 2007 and then decline rapidly thereafter. It appears as though this projection will indeed be borne out. Turnover figures indicate, however, that growth in the first quarter of 2008 was considerable but nonetheless on the wane (see Chart IV-4). Household expectations have diminished markedly in the past several months, and the Gallup confidence index is currently at 87 points. It has not dropped below 100 points since July 2006 and has not been this low since the beginning of 2002 (see Chart IV-3).

Chart IV-4
Private consumption, groceries and payment card turnover
Q1/2003 - Q1/2008[1]

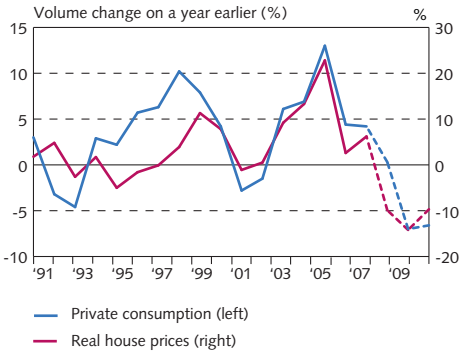


1. The Q1/2008 value is for February.
Sources: Federation of Trade and Services, Statistics Iceland, Central Bank of Iceland.

Growth in disposable income and an ample supply of credit have driven private consumption growth and sparked a housing boom …

Growth in private consumption and developments in real house prices have gone hand-in-hand in the past few years (see Chart IV-5). Rapidly rising disposable income, plentiful employment, and expectations of continuing income growth have stimulated private consumption and fuelled a housing boom. Higher real estate prices have increased available collateral, giving households enhanced scope for further borrowing and much easier access to credit. This coincided with increased demand caused by reductions in mortgage lending rates[2] and enabled households to increase their consumption beyond their disposable income, in line with their expectations of continuing economic upswing and secure employment.

Chart IV-5
Private consumption and real house prices 1991-2010[1]

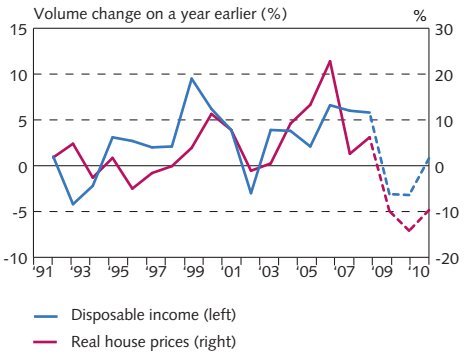


1. Central Bank baseline forecast 2008-2010.
Sources: Statistics Iceland, Central Bank of Iceland.

… but households will have to curtail their spending when house prices drop, disposable income contracts, and the credit supply dries up …

High inflation and the weakening of the króna have already increased households' debt burden for both indexed and foreign-currency debt. Slower-growing or declining real disposable income, deteriorating financial conditions, falling house prices, and higher debt burden will quickly curb private consumption. The recent turbulence in the economy affects expectations concerning employment income and the employment outlook, as the Gallup confidence index shows.

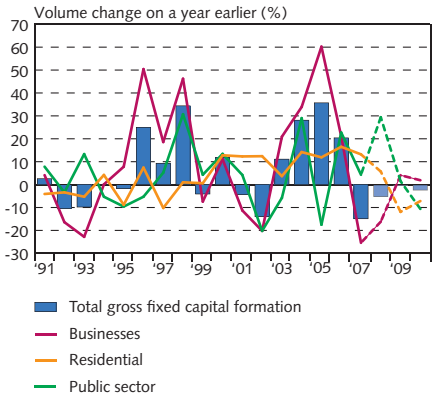
Chart IV-6
Disposable income and real house prices 1991-2010[1]



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

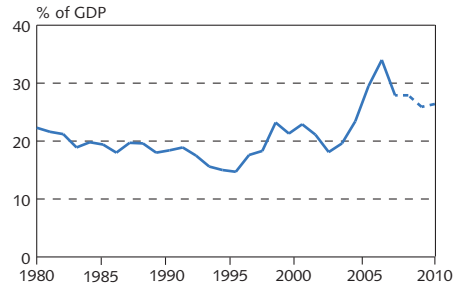
2. It has been shown that, in a large number of countries, there is a strong correlation among expected future income, house price developments, and consumption. Because of the role of real estate as collateral and its importance in securing access to credit, such studies generally place strong emphasis on how house price developments affect private consumption. See, for example, A. Benito, J. Thompson, M. Waldron and R. Wood, (2006): "House prices and consumer spending", Bank of England *Quarterly Bulletin,* and Chapter 3 of the IMF *World Economic Outlook*, April 2008. Housing wealth is one of the key drivers of public consumption in the Central Bank's macroeconomic model.

Chart IV-7
Gross fixed capital formation and its main segments 1991-2010[1]



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

Chart IV-8
Gross fixed capital formation as % of GDP 1980-2010[1]



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

... and the contraction in private consumption will be sharper and more enduring than the Central Bank previously assumed

According to the baseline forecast, private consumption will be 13% lower in 2010 than it was in 2007. This is a larger contraction than the Central Bank had previously projected but should be examined in light of the hefty growth in recent years. It is assumed that private consumption in 2010 will be similar to the average level for 2004 and 2005. Disposable income will fall by almost 2½% according to the forecast, despite the offsetting effects of tax cuts. Thus only a part of the last three years' sizeable increase in disposable income will unwind. The growth in recent years has been stronger than is consistent with the growth in underlying productivity and production capacity. Conditions for supporting further unsustainable growth in disposable income with the unavoidable current account deficit and foreign debt accumulation have deteriorated considerably; therefore, a contraction in disposable income is inevitable. Despite the contraction, disposable income in 2010 is projected to be at a level similar to that in 2006.

Helguvík aluminium smelter project included in the baseline forecast

The Central Bank now includes the construction of the first phase of the Helguvík aluminium smelter in its baseline forecast.[3] It is estimated that the total cost of smelter, power procurement, and transmission lines will be roughly 130 b.kr., or approximately 10% of last year's GDP. There is some uncertainty concerning the total cost of the projects and of various project components; however, the forecast assumes that the bulk of that construction will take place in 2009 and 2010. However, aluminium exports are not expected to increase as a result of the planned Helguvík smelter until after the end of the forecast horizon.

Business investment in 2007 was characterised by a reduction in investment in the aluminium and power sectors. Investment in these sectors is expected to fall in 2008 as well, and then rise again as the Helguvík project begins to take shape. The contribution of investment to the contraction in domestic demand during the forecast horizon is therefore less than in previous forecasts, while the contribution of private consumption is greater. Towards the end of the forecast horizon, investment as a proportion of GDP will still be considerably above the historical average of the past few decades, if the forecast is borne out (see Chart IV-8).

Considerable activity in commercial property construction ...

The baseline forecast assumes a contraction in business investment in 2008, followed by renewed growth over the following two years.

3. The July 2007 issue of *Monetary Bulletin* presented an alternative scenario describing the potential impact of aluminium smelter construction at Helguvík on developments in inflation and the policy rate. That scenario has been borne out, as have the November scenarios describing adverse developments in the wage settlements and the exchange rate (see *Monetary Bulletin* 2007/3, Box IX-2). The responses of the Board of Governors of the Central Bank are consistent with the policy rate developments in these scenarios.

This is a much higher level of business investment than in the previous forecast. In addition to the fact that construction in the aluminium and power sectors will increase, it is assumed that there will be significant investment in commercial property, particularly department stores and office buildings, as a number of large projects are already underway. Conditions in the financial markets create a given uncertainty, however, about whether all of the construction now in progress will be completed on schedule.

... but contractions in other business investment due to deteriorating financial conditions

Informal data suggest that financial institutions have greatly reduced their lending for new projects but have continued to grant credit for projects already commenced. This trend seems to have been on the rise since last autumn. In addition, the requirements for collateral have been tightened, reviews of credit terms are more frequent, and interest premia have risen. Thus it is likely that construction will be delayed on some projects or, at worst, work stopped entirely.

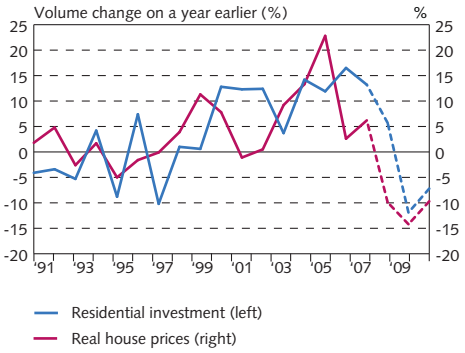
Based on their responses to the opinion poll carried out by Capacent Gallup between February 13 and March 12, 2008, executives in Iceland's 400 largest firms appear to believe the slump will be short-lived. Managers of nearly half of the companies surveyed considered conditions poor, as opposed to just under 20% in the last survey. The outlook is considered better than before, however. The responses may reflect the poorer initial position, as well as the fact that the survey was conducted before the steepest decline in the króna.[4] Mounting pessimism can be detected in the construction sector, while companies in industry and manufacturing are more optimistic about the future than they were previously.

After robust growth in residential investment in 2007, the contraction is expected to deepen as the forecast horizon progresses ...

In 2007, growth in residential investment intensified as the year progressed, reaching about 16% in the fourth quarter. Numerous projects are still underway in many parts of the greater Reykjavík area. The forecast assumes that this construction will be completed but that few additional projects will be launched. Growth in residential investment is projected to slow this year, and a considerable contraction is forecast in 2009 and 2010 (see Chart IV-9). In all, investment in residential housing is expected to fall by nearly 14% over the course of the forecast horizon; however, this contraction must be examined in the context of the burgeoning growth of the past few years. Despite the downturn, residential investment as a proportion of GDP will still be high in a historical context when the forecast horizon comes to a close.

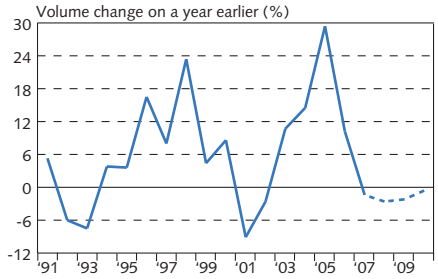
The past few years' growth in residential investment stems from the fact that house prices have risen far more than construction costs. The flexibility of the labour market has promoted this growth by channelling both domestic and imported labour toward employment sec-

Chart IV-9
Residential investment and real house prices 1991-2010[1]



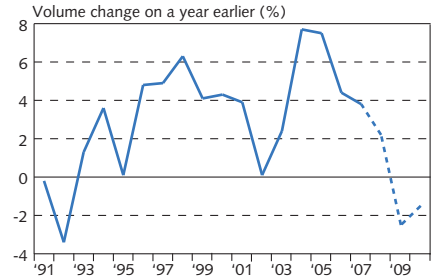
1. Central Bank baseline forecast 2008-2010.
Sources: Statistics Iceland, Central Bank of Iceland.

Chart IV-10
Import 1991-2010[1]



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

Chart IV-11
Economic growth 1991-2010[1]



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

4. Though the outlook is for similar or improved economic conditions six or twelve months ahead, this is not necessarily an optimistic view if the starting point is considered poor.

tors related to the housing market. A swift turnaround in the labour market is likely over the next few years, and the impact of reduced residential investment on the general economy will depend in part on how rapidly the labour market adjusts.

... and house prices to fall

The cooling of the housing market is already reflected in the virtual halt in house price increases – despite hefty rises in construction costs – and in rapidly declining turnover. The outlook is for a considerable decline in house prices, caused by a drop in disposable income, a tight credit market, and an increased supply of residential property. House prices are expected to fall by approximately 30% in real terms over the forecast horizon. If this does occur, the past five years' price rises in excess of general price level increases will be largely cancelled out; however, prices will still not be low in a historical context. There is enormous uncertainty about these developments, in part because they may have a measurable impact on the lending capacity of the financial system. It is not possible to rule out an even larger contraction in the real estate market (see the alternative scenario in Box IX-2).

Public investment brisk throughout the forecast horizon

The forecast assumes that public investment will grow by 30% in 2008 and remain high throughout the horizon. The countercyclical measures aimed at compensating for the cut in the cod quota and the reduction in other investment should peak in 2008 and 2009. The weight of these measures will be greatest when business investment begins to gain pace due to the planned aluminium and power sector construction.

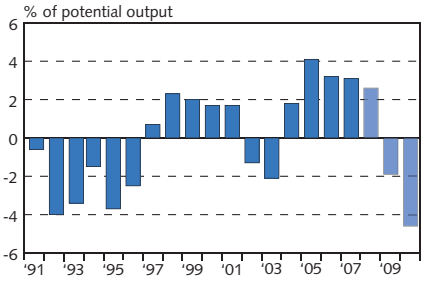
Foreign trade will sustain output growth in 2008 ...

The robust output growth in the period from 2003 to 2006 was driven by soaring domestic demand (see Charts IV-1 and IV-11). The year 2007, however, represented a turning point, as investment waned and output growth was sustained by increasing private consumption and a positive contribution from foreign trade. In 2008, private consumption is expected to make a minimal contribution to output growth, and investment will continue to decline. Because of increased exports, however, growth is forecast at just over 2%. Aluminium exports are growing by leaps and bounds, and the weaker króna stimulates other exports while deterring imports (see Chart IV-10). The contribution of foreign trade to output growth will therefore be distinctly positive.

... but the outlook has worsened, and monetary policy has minimal scope to support an economic recovery

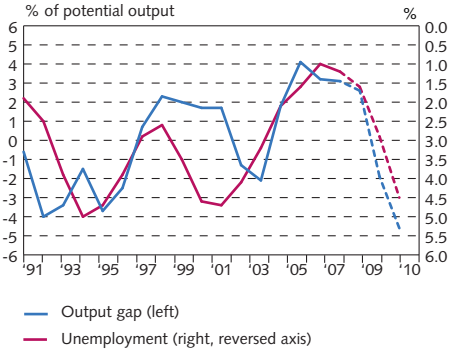
As is discussed in Box IV-1, national expenditure is expected to contract less than was forecast in November. The contraction will be protracted, however. The economic growth outlook has thus worsened, especially for 2010. In November the Bank projected that a new growth episode would begin then; now, however, the outlook is for a 2½% drop in GDP in 2009, followed by a 1½% dip in 2010 (see Chart IV-11). The slump will be more sustained than in the November forecast because unfavourable developments in inflation, inflation expectations, and the exchange rate greatly narrow the scope of

Chart IV-12
Output gap 1991-2010[1]



1. Central Bank baseline forecast 2008-2010.
Source: Central Bank of Iceland.

Chart IV-13
Output gap and unemployment 1991-2010[1]



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

Box IV-1

Changes in the macroeconomic forecast from *Monetary Bulletin* 2007/3

Even under the most auspicious circumstances, economic developments can deviate greatly from forecasts, and analyses of the economic outlook can change as new information surfaces. This Box describes the main changes in the macroeconomic forecast since *Monetary Bulletin* 2007/3, while Box IX-1 examines the changes in the inflation forecast and the drivers of those changes. The global economic climate has been quite capricious in recent months and the domestic economy equally changeable. The uncertainty surrounding forecasting has therefore been much greater than often before.

Policy rate rises higher, remains high longer, and falls more slowly than previously forecast

The Central Bank's last forecast, which appeared in November 2007, assumed that the policy rate would follow the path that the Bank's staff deemed sufficient to bring inflation as close as possible to the 2.5% inflation target within an acceptable time horizon and stabilise it near that level thereafter. The policy rate has already deviated from that path, however, as inflation developments have been considerably more adverse than assumed in the November forecast. In March 2008, the policy rate was raised by 1.25 percentage points, to 15%. The revised forecast assumes that the policy rate will rise further and remain unchanged until the fourth quarter of 2008, and then begin to fall more gradually than in the previous forecast. Despite the increase, the real policy rate remains lower than in the previous forecast until early in 2009. Inflation is projected to peter out gradually and align with the Bank's inflation target late in 2010, or roughly one year later than in the November forecast. The policy rate will be just above 6% at the end of the forecast horizon.

Demand growth for 2007 underestimated …

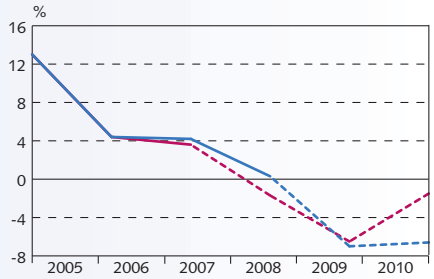
Demand proved stronger in 2007 than the previous forecast indicated. Private consumption grew by about 0.5 percentage points more, and investment contracted nearly 5 percentage points less, due in particular to increased investment in residential housing and in the aluminium and power sectors. Export growth was also considerably stronger than previously estimated mainly due to irregular aircraft exports. Output growth was therefore nearly 3 percentage points greater in 2007 than indicated in the forecast, or 3.8%. Output growth for 2005 and 2006 has also been revised upward by Statistics Iceland.

… but the strength of demand wanes sharply due to falling disposable income and adverse financial conditions

In the revised forecast, the economy is more vigorous early in the forecast horizon than in the November forecast, while tighter financial conditions, falling disposable income and asset prices, and a much weaker króna have a distinct dampening effect on demand. Private consumption continues to grow until mid-2008 but then declines swiftly. The contraction in private consumption is approximately 13% over the forecast horizon, as opposed to 9½% in the previous forecast. However, this contraction should be viewed in the context of the enormous growth of the past few years.

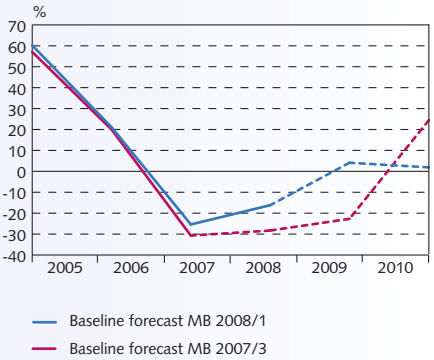
Business investment contracts much less during the forecast horizon than in the previous forecast, especially because the current baseline forecast includes construction related to the Helguvík aluminium smelter. Even excluding the aluminium and power sectors, business investment is greater early in the horizon as a result of commercial housing construction. Growth in residential investment has repeatedly outstripped expectations. The forecast assumes that residential investment will continue to grow through 2008 and then contract sharply, falling by nearly 14% over the course of the forecast horizon. This is a larger decrease than was assumed in the last forecast. The residential investment as a proportion of GDP is still quite high at the end of the forecast horizon.

Chart 1
Private consumption growth 2005-2010



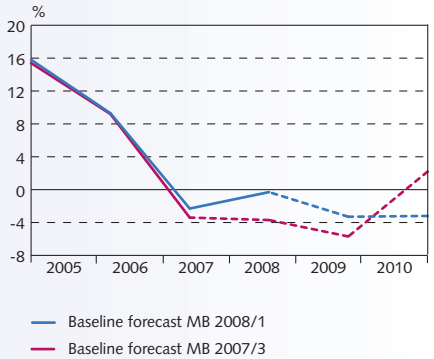
Sources: Statistics Iceland, Central Bank of Iceland.

Chart 2
Business investment growth 2005-2010



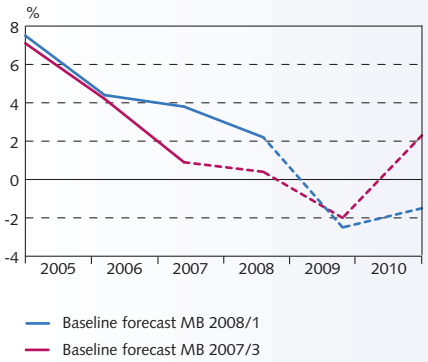
Sources: Statistics Iceland, Central Bank of Iceland.

Chart 3
National expenditure growth 2005-2010



Sources: Statistics Iceland, Central Bank of Iceland.

Chart 4
Economic growth 2005-2010



Sources: Statistics Iceland, Central Bank of Iceland.

Adjustment process more prolonged – and therefore more costly
National expenditure contracts by 6½% during the forecast horizon, which is half a percentage point less than in the previous forecast. As before, a downturn in domestic demand plays a key role in moving the economy toward a sustainable equilibrium. It would be incautious to interpret a smaller contraction in the forecast as evidence that the adjustment ahead will be less costly than was assumed in November. The adjustment in the revised forecast is slower and more protracted, and it depends to a greater degree on a reduction in private consumption, which is driven by deteriorating financial conditions, a drop in disposable income, and a housing market slump. Government measures related to wage settlements stimulate private consumption and delay this adjustment (see Box V-1). Delaying the adjustment beyond the time frame assumed in the previous forecast will entail higher inflation, a more lasting contraction of domestic demand, and less scope for monetary policy to support an economic recovery later in the forecast horizon. High inflation, elevated inflation expectations, and the delay in aligning both of these with the Bank's inflation target therefore prevent monetary policy from stimulating output growth at the end of the forecast horizon to the same degree as was assumed in November. The slump in domestic demand will not be over until some time beyond the forecast horizon, while the previous forecast projected a recovery beginning in 2010.

monetary policy to promote GDP growth. It is therefore necessary to keep the policy rate high for a longer period than previously believed, and it cannot fall below its neutral level until late 2010.

Persistent output gap will narrow more slowly than expected, with a slack emerging a year later than in the November forecast
Potential output has grown at a brisk pace over the past several years. Productivity has soared, and the factors of production have been fully utilised. But demand has grown even more vigorously. For this reason, an output gap has developed; that is to say, GDP has risen in excess of estimated potential output. Developments in unemployment give a similar indication of the tension in the labour market (see Chart IV-13). Potential output is now considered to have increased more between 2005 and 2007 than previously estimated. Productivity is believed to have grown even more rapidly, and new figures indicate greater growth in the factors of production. On the other hand, revised national accounts indicate that economic growth in 2005 and 2006 was greater than previously estimated, and growth in 2007 outpaced the Central Bank's forecast (see Box IV-1).

The output gap is assessed at just over a percentage point higher in 2007 because stronger GDP growth more than offsets increased growth in potential output. The assessment of the output gap for 2005 and 2006 is somewhat below previous estimates, however. It is believed that the output gap will narrow and a slack will emerge in mid-2009, a year later than assumed in the Bank's last forecast (see also Box IX-1). The resulting slack will grow throughout the forecast horizon. The negative output gap, which is necessary in order to bring inflation down, can be viewed as the cost of economic adjustment towards equilibrium after a period of sizeable imbalance.

V Public sector finances

The public sector surplus for 2007 was rather smaller than that for 2006. As output growth slows down over the next few years, the outlook is for a sharp contraction in Treasury revenues from taxes on consumption, profits and financial income. The financial position of local governments is also expected to deteriorate as investment declines and house prices fall. Pressure to increase spending could also mount as the economy cools down. With diminishing revenues and rising expenditures, public sector performance is expected to deteriorate by some 13% of GDP across the forecast horizon, with the estimated deficit amounting to 8% of GDP by 2010.

Treasury expenditure growth outpaced revenues in 2007, while local government expenditures remained unchanged

The surplus in the Treasury and the local governments was rather smaller in 2007 than in 2006. According to Statistics Iceland estimates, the Treasury surplus totalled 4½% of GDP. Revenues rose by approximately 3½% in real terms, mostly due to corporate and personal financial income taxes. Indirect tax revenues stagnated following the value-added tax reduction in March, while interest income and interest expenditure increased due to Treasury lending to the Central Bank. Real expenditures rose by roughly 8½%, led by fixed investment, which increased by 60%.

The local government surplus in 2007 amounted to 0.6% of GDP. Due to lower levels of investment, total local government expenditures remained virtually unchanged year-on-year despite a 4% increase in public consumption expenditures.

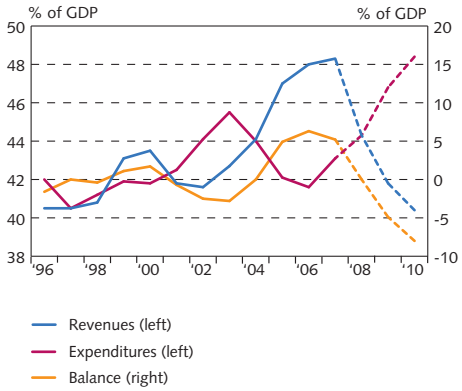
The 2008 budget: less surplus and more investment

According to the 2008 budget, the surplus from the Treasury and the social security system will be just over half that for 2007, or approximately 40 b.kr. Regular revenues are projected to drop by 3% in real terms due to reduced revenues from financial income tax and consumption taxes, while regular expenditures are expected to rise by approximately 8%. Again, the largest factor is a 75% rise in fixed investment expenditure, following the large increase in 2007.

Expensive, back-loaded wage agreements

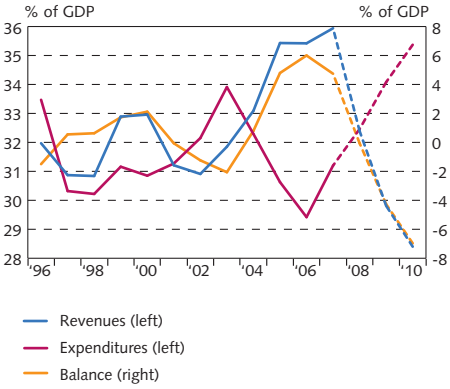
The Government pledges in connection with the February wage settlements weaken the Treasury balance by roughly 1% of GDP, though the demand effect of the expenditure may soften the negative impact (for more detailed discussion, see Box V-1). According to Central Bank estimates, the impact of these measures on public sector performance will be approximately 47 b.kr. in 2008-2010, after allowing for the offsetting effects of increased demand. Costs are expected to be even higher in 2011-2012, when the full effects of the personal allowance hike have come to the fore. The cost to the Treasury as a result of the wage agreements is therefore substantial, especially in the latter part of the settlement period.

Chart V-1
Public sector finance 1996-2010[1]



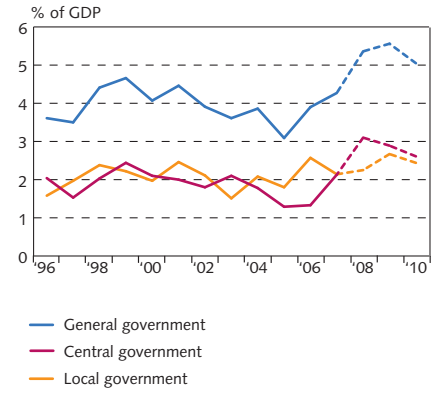
1. Central Bank baseline forecast 2008-2010.
Sources: Statistics Iceland, Central Bank of Iceland.

Chart V-2
Central government finance 1996-2010[1]
Including social security



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

Chart V-3
General government investment 1996-2010[1]



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

Box V-1

Government involvement in wage settlements: Cost to the Treasury

In connection with the signing of the private sector wage settlements on February 17, the Government issued a declaration containing various pledges, some with a specified time frame and some without. The Government's primary contributions consist of raising the tax-free income threshold by 20% in excess of price levels and lowering the corporate income tax rate from 18% to 15%, effective in 2009. It has also pledged to reduce income-linked cutbacks of child allowances and asset-linked reductions in mortgage interest allowances, and to raise the unemployment benefits in line with the rise in the lowest wage rates. Other pledges include raising rent subsidy allowances and easing the eligibility requirements for receipt of rent subsidy so as to include more households, increasing the number of loans pledged for subsidised residential rental housing with preferential interest rates, relaxing the collateral requirements on loans for rental housing, contributing to a Worker Rehabilitation Fund, and increasing the amount allocated to continuing education and adult education.

According to the Central Bank's estimates, the cost to the Treasury as a result of these pledges will approach 47 b.kr. over the forecast horizon – that is, from 2008 through 2010 – after accounting for the demand effect of the measures involved.[1] This is rather more than was assumed when the measures were announced on February 17. These costs will rise still further in 2011-2012, to about 41 b.kr., when the effects of the hike in the personal allowance have emerged in full.

In addition to the effect on Treasury revenues and expenditures, these measures will stimulate demand. The estimated net effect on the Treasury is negative in the amount of 1% of GDP. The net cost to the Treasury due to the lower corporate income tax rate and the higher tax-free income threshold totals some 36 b.kr. during the forecast horizon, but the impact will be significantly larger in 2011-2012. Contributions for continuing education, allowances and benefit payments, and rental apartments amount to some 21 b.kr. over the forecast horizon and a total of 39 b.kr. over the period 2008-2012.

Counterbalancing this to some extent are increased tax revenues due to greater economic activity, increases in households' disposable income, and lower corporate taxes. Revenues from consumption taxes therefore rise by around 10 b.kr. over the forecast horizon. The announced measures are estimated to increase private consumption growth by three-fourths of a percentage point in 2009 and by nearly 1½ percentage points in 2010. The impact on national expenditure growth is similar. The GDP growth effect is rather less – about one-fourth of a percentage point in 2009 and one-half of a percentage point in 2010 – because a part of the increase in demand will be directed at imported goods and services. The effects of the measures on the economy will be rather greater in 2011-2012.

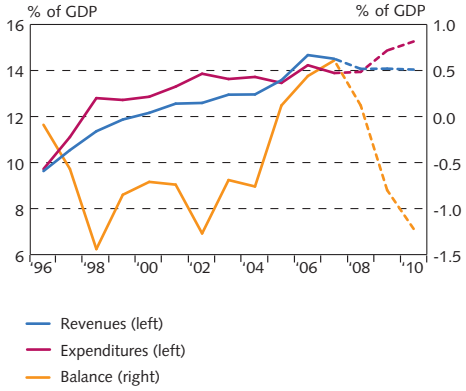
1. The assessment does not take into account the cancellation of stamp fees on loans for the purchase of a buyer's first home. This measure is scheduled to take effect on July 1, 2008, according to the legislative bill that has been presented before Parliament. Neither does the assessment take into account the various unscheduled pledges, such as the reduction of goods prices, concerning which the Government promised to exert its influence.

Persistent deficit due to waning output growth, wage agreements ...

According to the forecast published in this *Monetary Bulletin*, fiscal performance will weaken considerably over and above the effects of the Treasury's contribution to the current wage settlements, and the deficit will persist over the forecast horizon. The drop in revenues

from taxes on consumption and capital weighs heaviest as growth falls and the króna depreciates. Government investment seems likely to shrink somewhat as the horizon progresses; however, an economic downturn could intensify the pressure to increase public spending on healthcare, education, and social welfare. Treasury expenditures are projected to rise by nearly 9% in real terms during the current year, while revenues are expected to drop by 6%. The outlook is for a considerable year-on-year drop in revenues from taxes on corporate and financial income, with revenues under budget targets. In 2009, revenues will fall even farther when tax cuts compound the effects of economic cooling.

Chart V-4
Local government finance 1996-2010[1]



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

… and a growing local government deficit

Local governments control nearly one-third of public expenditures and about half of public investments. Because of the heavy weight of personal income taxes, equalisation grants and service revenues, local government revenues are not as sensitive to cyclical changes as those of the Treasury. However, the significant income that local governments have received from property taxes and construction fees in recent years can be expected to contract markedly over the next few years. Local government revenues are projected to increase marginally in 2008 and then drop by roughly 2% per year in real terms throughout the remainder of the forecast horizon. Expenditures are projected to rise by just under 11% at the same time, so that by 2009 local governments will begin to show a deficit that will grow as the end of the horizon approaches. The forecast assumes an increase in investment in 2008, followed by a decline towards the course of the forecast horizon.

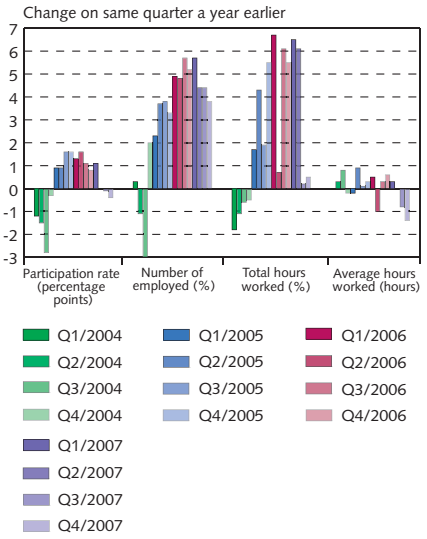
Bleaker outlook for public sector finances

The outlook for public sector performance is now considerably bleaker than in the last *Monetary Bulletin*. The fiscal balance is expected to deteriorate by some 13% of GDP during the forecast horizon, as opposed to the previously projected 10½%. The effect of the contraction on tax revenues totals approximately 8½% of GDP, and the effect of tax cuts is roughly equivalent to 1%. Expenditure growth broadens the fiscal deficit by about 3% of GDP, partly because the contraction spurs an increase in public benefit payments.

Based on the current macroeconomic forecast, public sector revenues will decline from 48½% of GDP in 2007 to 40½% in 2010, while expenditures as a percentage of GDP will rise from 43% to 48½%. The Treasury's deficit will then total roughly one-fifth of its revenues, and the local government deficit will approach 10% of revenues. Accordingly, the public sector deficit will total some 8% of GDP by 2010.

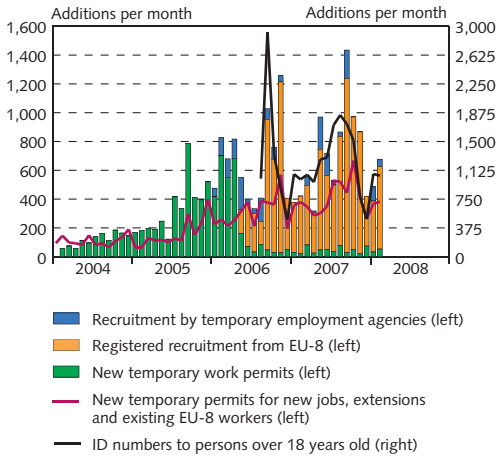
VI Labour market and wage developments

Chart VI-1
Changes in labour market
2003-2007



Source: Statistics Iceland.

Chart VI-2
ID number issuance and foreign labour registration



Sources: Directorate of Labour, the National Registry.

Unemployment remains virtually nonexistent in Iceland. The demand for labour is still robust and labour imports as strong as they were a year ago; however, indicators suggest that labour demand will weaken in the coming months as economic activity begins to slow down. The newly concluded wage settlements provide for direct wage increases that, on average, could be in line with the inflation target. Whether they actually will be hinges on whether the one-third incremental increase in the lowest wages creeps up the wage scale, as was the case following supplementary settlements in the summer of 2006. In view of recent inflation and exchange rate developments, there is also a risk that the review clauses in the wage settlements will be triggered in early 2009

More leisure time resulted in a negligible increase in hours worked

According to figures from Statistics Iceland, hours worked increased only marginally year-on-year in Q4/2007, as was the case in Q3. This is a change from the substantial growth in recent years. The number of persons who worked during the reference week in Q4 increased by 4% year-on-year, while average hours worked decreased by 1½ hours per week. However, the insignificant increase seems to be explained by supply-side factors, not by lower demand for labour, as most people who worked fewer hours than usual during the reference week claimed to have done so because they took time off for leisure during that week.

No decline in labour imports

It appears as though there is still a considerable labour shortage, which is largely met with imported labour, as in recent years. The number of new registrations at the Directorate of Labour during the first two months of 2008 was somewhat greater than at the same time last year, and the number of re-registrations was similar to that a year ago. The same applies to ID issuances to foreign nationals.[1]

Unemployment still virtually non-existent

In the first two months of 2008, unemployment rates were broadly unchanged from the latter part of 2007. Registered unemployment has been at or below 1% since mid-2007, and seasonally adjusted unemployment has been even lower, or roughly 0.8%.

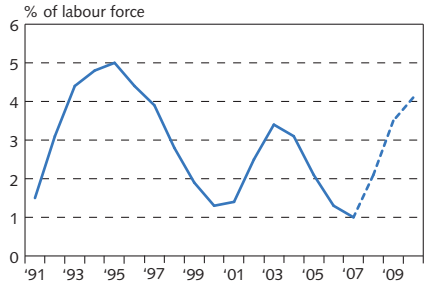
The demand for labour is expected to diminish in the next several months as economic activity slows down. Some plans for collective redundancies have already been reported to the Directorate of Labour; however, most of them will not take effect until the spring or summer. Declining demand for labour may not be passed directly through to unemployment levels, as many foreign workers may leave the country when demand for labour dwindles. Furthermore, in the

1. New registrations include extensions of temporary work permits and registrations of EU-8 nationals previously working in Iceland.

recent past, opportunities for employment and income generation have improved markedly in Poland, where the majority of Iceland's migrant workers come from. Moreover, the depreciation of the Icelandic króna makes working in Iceland less profitable for those foreign workers who send a portion of their wages home. Hence some foreign workers may leave even before demand contracts to a substantial degree. In that case, the tension in the labour market will ease more slowly than otherwise.

Projected unemployment has been revised downwards by half a percentage point for 2008 and 2009. Unemployment will begin to climb as the year progresses and reach just over 4% at the end of the forecast horizon, the same as in the previous forecast.

Chart VI-3
Unemployment rate 1991-2010[1]

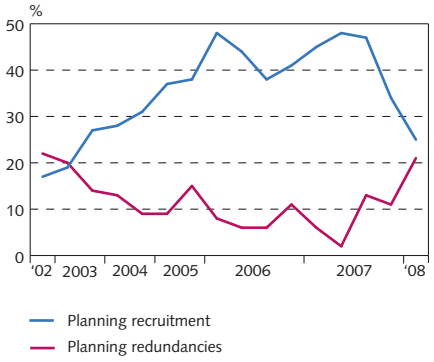


1. Central Bank baseline forecast 2008-2010.
Sources: Directorate of Labour, Central Bank of Iceland.

More businesses want to reduce staffing levels

A survey conducted in February and early March among the 400 largest companies in Iceland indicates that businesses have revised their labour requirements substantially from the previous survey in December 2007. The survey indicates that demand for labour will diminish somewhat over the next six months. Some 20% of companies surveyed in March expressed an interest in cutting back on staff, more than twice the number considering redundancies in September and December 2007. The proportion has not been as high since September 2002. The number of companies wanting to recruit has also dropped markedly after a peak in September 2007, when nearly half of businesses were planning to recruit. By December, only one-third of businesses wanted to recruit, and in March 2008 that proportion had dropped to one-fourth. Just under one-third of businesses in the greater Reykjavík area still expressed an interest in recruiting staff at the time the survey was carried out.

Chart VI-4
Recruitment and redundancy plans of businesses over the next 6 months

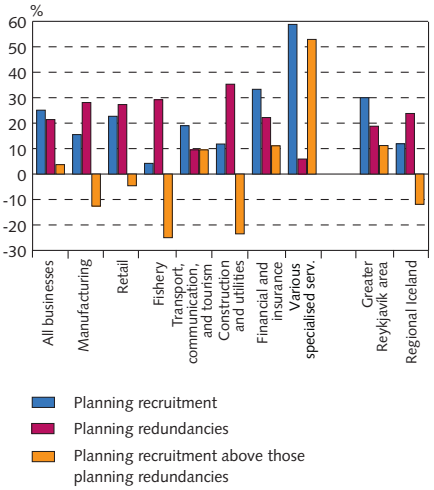


Source: Capacent Gallup.

The change was most striking in the retail and construction sectors

The change in attitude towards recruitment was most noticeable among companies in the retail and construction sectors. In the December survey, just under 4% of retail companies were considering redundancies, as opposed to nearly one-third in March. The number of retail companies wishing to recruit dropped by half between December and March, at which point roughly one-fifth were seeking to increase staffing. Some one-third of companies in construction sectors were considering redundancies in March 2008, compared with just over 6% in December 2007. By March, only 11% of construction companies wished to recruit new employees, down from one-third in December. In the March survey, only in specialised services, transport and utilities, and the financial and insurance sectors did companies wishing to recruit outnumber those considering redundancies.

Chart VI-5
Recruitment and redundancy plans of businesses over the next 6 months



Source: Capacent Gallup.

On average, direct wage increases could be consistent with the inflation target

Wage pressure has been greater than was assumed in the last forecast. The Statistics Iceland wage index showed wages in the private sector rising by 9.2% year-on-year in Q4/2007, and by 8.4% in the labour market as a whole.

Box VI-1

Wage settlements 2008

On February 17, 2008, new wage settlements were signed by the national member associations and the largest unions within the Icelandic Federation of Labour (ASÍ) and the Confederation of Icelandic Employers (SA). The wage settlements expire on November 30, 2010 and are identical in their fundamentals, and while they apply to roughly one-third of the labour force as measured in man-years, their impact on the cost of labour will probably apply to the private sector as a whole. The parties have estimated that total costs incurred by employers will rise by about 10½% during the term of the settlement, or by an average of 3½% annually.

There are three main pillars in the settlements: a "safety net" for wage developments, an increase in the lowest wage rates, and a review clause in 2009. A general wage rise is only included in the final year, but workers are guaranteed specified wage developments, the so-called safety net, during the first two years of the contract.

Table 1 Negotiating parties' estimate of contractual wage cost increases 2008-2010

%	*2008*	*2009*	*2010*	*Total*
Wage development guarantee	1.4	1.3	0	**2.7**
Wage rate increase	1.9	1.9	3.1	**7.0**
Other wage-related expense	0.7	0.1	0	**0.8**
Including				
Worker Rehabilitation Fund	0.13			**0.13**
Job training	0.05			**0.05**
Insurance	0.20			**0.20**
Children's illness	0.01			**0.01**
Paid seminar attendance	0.06			**0.06**
Increase in vacation days	0.25	0.10		**0.35**
Total per year	**4.0**	**3.3**	**3.1**	**10.5**

An initial 5.5% wage guarantee …

The new contract provides for a wage development guarantee to be implemented in two phases: upon signing in February 2008, and in March 2009. A wage increase of at least 5.5% is guaranteed for the period from January 2, 2007 until the effective date of the agreement in February 2008. Wage-earners whose wages have risen by less than 5.5% shall be awarded a rise equivalent to the shortfall from that figure.[1]

Basing the safety net provision on January 2, 2007 means that the 2.9% wage rise from the previous contract, which took effect on January 1, 2007, will not be deducted; instead, only wage drift during the reference period will be deducted. However, the increase that an employee receives as a result of basic wage rate hikes (see the discussion below) will be deducted in both years.

… plus 3.5% in 2009 …

On March 1, 2009, a similar safety net provision will take effect, guaranteeing employees a 3.5% rise.[2] The reference period for wage developments is from the effective date of the agreement until the end of February 2009. The cost increase due to the safety net provisions is estimated at just below 1½% for both years.

1. Only those who have been employed since January 1, 2007 are entitled to the entire 5.5% pay rise according to this provision. Employees who commenced work during the period from January 2, 2007 to September 30, 2007 are entitled to an increase of 4.5%. Those who began work for their current employers after the end of September 2007 receive no wage increase in accordance with the safety net provision.
2. Only those workers who were employed prior to February 1, 2008, the effective date of the agreement, are entitled to a wage increase in accordance with the safety net provision for 2009. A worker who commences employment after the effective date of the agreement must negotiate specially with his employer if he wishes to receive a safety net increase in 2009.

... and a general wage increase in 2010

In the last year of the current agreement, all wages will increase by 2.5%; this is a larger increase than the final increment provided for in the 2004 agreements.

Wage rates to approach actual paid wages

Another pillar of the agreement is an increase in basic wage rates. Wage rates for unskilled workers will rise by 18,000 kr. with immediate effect, by 13,500 kr. in 2009, and by 6,500 kr. in 2010. Wage rates for craftsmen and office workers increase by slightly more, or by 21,000 kr. at the signing of the agreement, by 17,500 kr. in 2009, and by 10,000 kr. in 2010. The lowest wage rates in use for unskilled workers will thus increase by nearly 15% in 2008 and by approximately 31% over the term of the agreement.[3] Office workers receiving, for example, overpay of 10,000 kr. on their wage rate will receive an immediate increase of 7% and a total rise of 25% over the term of the agreement, but a craftsman receiving the same overpay will receive 20% over the term of the agreement.

The negotiating parties estimate that wage costs will rise by 1.9% in 2008 and 2009, and by 0.6% in 2010, as a result of the increase in basic wage rates, and they expect overpay to be reduced somewhat in order to meet pay scale increases.

Other increases in wage costs

Wage-related costs other than actual wages paid will increase by 0.8% over the term of the agreement. The largest cost is due to an increase in vacation days from 28 to 30 for employees who have worked 10 years or more for the same employer. It was also decided to take the first step in developing support measures for employees who are injured or contract long-term illnesses. A new fund, the Worker Rehabilitation Fund, will be established to administer these services, and employers will contribute 0.13% of wages to the Fund as of June 1, 2008. The Government has pledged to contribute a matching amount to the Fund beginning in 2009, and the negotiating parties plan to request that pension funds do the same. The number of annual days of leave due to children's illnesses will be increased from seven to twelve; employer contributions to job training funds will increase, as will paid leave of absence for job training; accident insurance will become more extensive; and disability and death benefits will be increased.

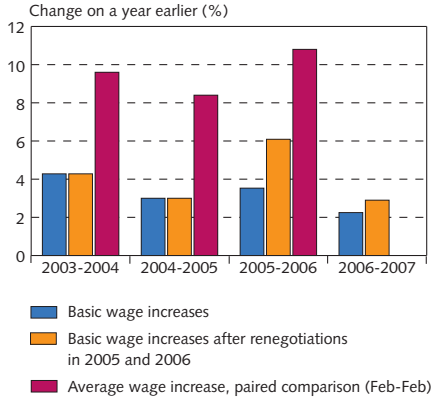
Assumptions concerning inflation and real wages

At the beginning of February 2009, a review committee will meet in order to discuss an extension of the agreement based on the assumptions underlying the wage settlements. If the assumptions have held, the agreement will be extended until November 30, 2010; if not, the parties will attempt to reach a consensus concerning their response to the changes. If this proves impossible, the agreement will expire at the end of February 2009.

The underlying assumptions are two. Real wages in the private sector, according to the Statistics Iceland wage index, must not fall between January and December 2008. The other assumption concerns inflation: inflation must be on the wane when the wage agreement is reviewed in February 2009, twelve-month inflation in December 2008 must be below 5.5%, and annualised inflation during the period from August 2008 to January 2009 must be less than 3.8%.

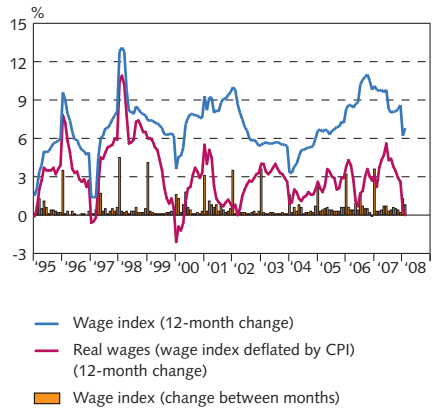
3. Fixed differential payments (bonuses in fish processing) do not increase during the first two years. The average wages in the fish processing industry will therefore increase by 17.5% during the first two years of the contract instead of 22%.

Chart VI-6
Negotiated wage rises and
average wage increases 2004-2007[1]



1. The red bars show paired comparison of wages from February to February. The first red bar shows the change between February 2004 and February 2005. During that period, two negotiatied wage increases came into effect: on March 1, 2004, and on January 1, 2005. The other bars show the contractually agreed wage increases during the calendar year.
Sources: Federation of Labour, Statistics Iceland, Central Bank of Iceland.

Chart VI-7
Nominal and real wages
Statistics Iceland wage index



Source: Statistics Iceland.

Newly concluded wage settlements between the national member associations and some of the largest unions within the Icelandic Federation of Labour (ASÍ) and the Confederation of Icelandic Employers (SA) entail a larger direct wage hike than was projected in the November forecast (the agreement is discussed in more detail in Box VI-1). The parties have estimated the direct increase in wage costs at approximately 3½% per year, which, on average, could be accommodated within the framework of the inflation target.

This is the same average increase as was estimated at the time the 2004-2007 wage settlements were signed. Two reviews during the term of the settlements raised the direct cost increase of the contracts to an average of 4½% per year, but as tension in the labour market remained considerable throughout the term of the settlement, actual wage hikes far exceeded the estimated increase in direct costs. A paired comparison of employee wages within the scope of the settlements by ASÍ and SA reveals that wages increased more than three times the original estimate, or by approximately 9½% per year.[2]

The goal is to target those who have been left behind …

In assessing the direct cost increase of the wage settlements, the parties assume that it is possible to limit wage increases primarily to the lowest-paid groups and to those who have not benefited from recent wage drift, as the objective is "*to prioritise the private sector's scope for wage increases in favour of those who are paid according to the basic rate and to those who have to a lesser extent been affected by wage drift.*"[3] SA has appealed to its members to implement the contract as prescribed; that is, the wage increases of the past year are to be deducted from the minimum wage development guarantee, and overpay is to be reduced to offset the rise in basic rates.

… but the experience from 2006 is cause for concern

The recent competition for employees has created workplace wage differentials over and above those already structured into the pay scales laid down by wage agreements. The new settlement strives to diminish these differentials by focusing in particular on raising wages of employees who have been left behind. As there is still palpable tension in the labour market, however, it is rather unlikely that they will succeed – at least not this year.

The experience from 2006, when similar solutions were negotiated following wage agreement review, revealed that overpayments were not reduced sufficiently to meet basic rate increases, and wages increased considerably in excess of what had been expected, although the pay hikes came to the fore more slowly than the Central Bank first projected. As it turned out, market forces re-established the differentials that initially existed. This confirms the substantial inertia of relative wages. The current forecasts suggest, therefore, that the cost

2. This is probably an underestimation of the wage increases, as the paired comparison of wages only extends over the period February 2004 – February 2007, while wage settlements remained in effect through December 2007. During the period from February 2007 until December 2007, the wage index rose by 4½%.
3. Taken from the Confederation of Icelandic Employers website on 3 March 2008.

of implementing the wage settlements will be somewhat higher than the parties estimate.

Review clauses likely to be triggered

Based on the inflation forecast published in this issue of *Monetary Bulletin*, it is deemed unlikely that the assumptions underlying the wage settlements will hold. The underlying assumptions are two: inflation must have slowed down in the latter half of 2008 and early 2009, and real wages in the private sector must not decline between January and December 2008.

According to the inflation forecast, inflation will be considerably above the level assumed in the agreement during the time horizon specified. In order for the real wage assumption to hold, wage rises during the year would have to exceed the parties' cost estimate by a substantial margin, and by an amount greater than is assumed in the current baseline forecast. Such a development would create wage pressures over and above what is assumed in the forecast, making it unlikely that the inflation assumption will be borne out.

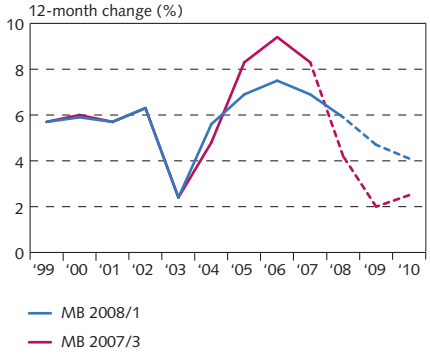
The forecast assumes that the review clauses in the wage settlements will be triggered in 2009. It is not expected, however, that the revision will result in very large additional wage increases, as it assumed that some slack in the labour market will have emerged as unemployment rises.

Unit labour cost not consistent with the inflation target until the very end of the forecast horizon

Given the cost increase inherent in the newly concluded wage settlements and the tension still existing in the labour market, the Central Bank's forecast for the rise in unit labour cost has been revised upwards over the forecast horizon, despite the fact that productivity growth is expected to increase somewhat more than assumed in the November forecast. Unit labour cost has been revised downwards in accordance with national accounts data for 2006 and 2007. This year it is expected to rise by 6%, with the increase tapering off towards the end of the forecast horizon, because the direct cost increase due to the new wage settlements will abate as the forecast horizon progresses, and wage drift will level off as unemployment rises.

If the labour market remains tighter than expected or if net immigration drops more than the demand for labour, unit labour cost could rise more than is assumed in the forecast. The opposite would hold if slack in the labour market emerges faster than projected. The alternative scenario in Box IX-2 describes the possible monetary policy response if wages rise faster than in the baseline forecast.

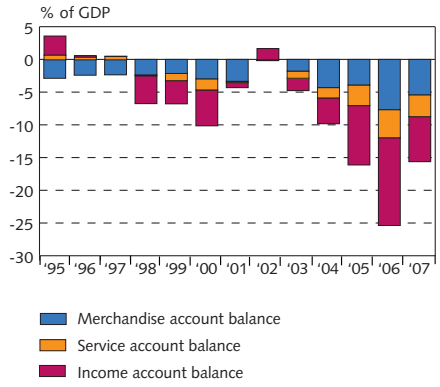
Chart VI-8
Unit labour cost 1999-2010[1]



1. Central Bank baseline forecast 2008-2010.
Source: Central Bank of Iceland.

VII External balance

Chart VII-1
Current account balance components[1]
Annual data 1995-2007



1. Net current transfer is included in balance on income.
Sources: Statistics Iceland, Central Bank of Iceland.

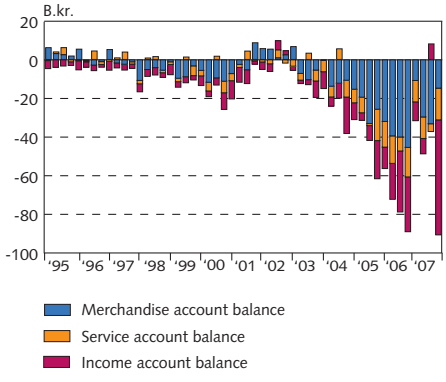
The current account deficit narrowed significantly in 2007; however, when irregular items are omitted, the change is less dramatic than it appears at first perusal. Excluding transactions involving ships and aircraft, the merchandise account deficit dropped from 131 b.kr. to 109 b.kr. This is a much less radical reduction than might have been expected, given the sizeable drop in aluminium and energy sector investments during the year. The income account deficit was also quite narrow in 2007, especially considering the substantial trade deficit and debt accumulation of the past few years and the rising global interest rates, which contribute to a growing deficit on net foreign interest payments. Because of the irregular items that generated an abnormally wide deficit in 2006 and a similarly "small" one in 2007, it can be assumed that the deficit will contract more slowly this year. Offsetting the drop in imports are the increased interest expense burden and a contraction in exports of marine products.

Macroeconomic imbalances remain considerable

The current account balance was negative in the amount of nearly 200 b.kr. in 2007, which is equivalent to 15.6% of GDP. This is more than 96 b.kr. less than in 2006, when the deficit equalled approximately 25.4% of GDP. The deficit contracted on all subcomponents, with the bulk of the contraction in the merchandise account, whose deficit dropped from 156.5 b.kr. in 2006 to just below 88 b.kr. in 2007. The income account deficit narrowed by nearly 22 b.kr. and the service account deficit by just over 7 b.kr. (see Chart VII-1).

Developments in irregular items in the merchandise and income accounts were particularly positive in 2007, as compared with 2006. In addition to the transactions involving ships and aircraft, net income receipts fluctuated considerably between quarters. Early in the year, developments in net income receipts were much more positive than forecasts had suggested. The balance on income in the third quarter, for example, was positive in the amount of nearly 9 b.kr.; however, this reversed itself in the Q4, when net income receipts were negative by more than 65 b.kr. (see Chart VII-2). Both income and expenditures were negative due to returns on equity holdings. Other things being equal, residents' holdings in foreign companies generate income for the Icelandic economy in the form of dividend payments and reinvested earnings.[1] In the fourth quarter, however, foreign companies owned by Icelanders recorded operating losses, and reinvested earnings were therefore negative, with the loss entered as negative reinvested earnings. On average, returns on shareholdings generated roughly 65 b.kr. per quarter in foreign income during the first three quarters of the year, while in Q4 they were negative by more than 13 b.kr. The same was true of returns on foreigners' shareholdings in Icelandic corporations. Residents' holdings in foreign corporations as

Chart VII-2
Current account balance components[1]
Q1/1999 - Q4/2007



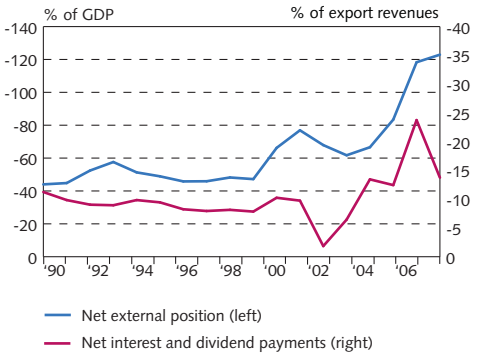
1. Net current transfer is included in balance on income.
Sources: Statistics Iceland, Central Bank of Iceland.

1. Reinvested earnings are the portion of a company's profit that is not paid out to its owners but is instead used to finance operations of the company concerned. Both, however, are considered as income and expenditure in the balance on income.

a percentage of total foreign assets are much greater, however, than foreign investors' holdings in Iceland as a percentage of total liabilities. Therefore, the positive effects of negative returns on foreigners' holdings in Icelandic equities were less. On average, expenditures related to this item totalled 31 b.kr. per quarter for the first three quarters of the year, while income in the amount of 2.6 b.kr. was registered in the fourth quarter.

Net interest expense rose year-on-year, from roughly 93.5 b.kr. in 2006 to nearly 154 b.kr. in 2007. The increase reflects increased foreign debt and deteriorating credit terms between years. Counterbalancing this was the fact that the exchange rate of the króna was 1.8% higher on average in 2007 than in 2006, which reduces the amount of Icelandic krónur paid out as net interest expense.

Chart VII-3
Net external position and payments
Annual data 1990-2007



Sources: Statistics Iceland, Central Bank of Iceland.

Net external position deteriorated still further year-on-year

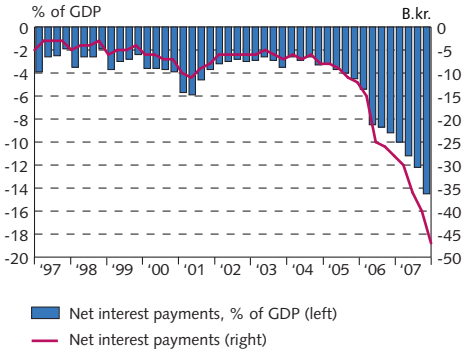
Foreign liabilities increased by nearly 2,138 b.kr. in 2007, while foreign assets increased by 1,945 b.kr. The net external position of the economy therefore deteriorated markedly between years, with the deficit totalling 125% of GDP at year-end 2007, as opposed to 110% at the end of 2006. During the period, the effective exchange rate of the króna rose by approximately 6%, however, offsetting the poorer external position of the economy. Because liabilities are greater than assets, a stronger króna reduces the value of foreign assets less than the value of liabilities.[2]

Among foreign assets, bond portfolios increased proportionally the most, or by 117%, while cash and deposits abroad increased by 116% and direct foreign investment by 59%. However, the Central Bank's foreign currency reserves decreased by 3% year-on-year in krónur terms. On the liabilities side, the increase in non-residents' deposits in domestic deposit money banks was proportionally greatest, or 254% year-on-year. Foreign short-term borrowings also increased substantially, or by 184%, while foreign long-term borrowings rose by 72%.

The balance on income will weigh heavily in the current account balance in coming months

It is likely that developments in net income receipts will remain disadvantageous and will probably become more so in the medium term. Deteriorating credit terms on foreign capital markets make a significant impact, as the Icelandic economy carries substantial foreign debt. Given the declining prices on global equity markets early in 2008, it is likely that residents' foreign shareholdings will yield limited returns in the first half of the year. Profitability of domestic companies also affects net income receipts, as dividend payments to foreign shareholders are recorded as expenses. Therefore, declining profitability among foreign-owned companies in Iceland will have a generally positive impact on the balance on income. The bulk of inward foreign

Chart VII-4
Net foreign interest payments
Q1/1997 - Q4/2007



Sources: Statistics Iceland, Central Bank of Iceland.

2. The effect of exchange rate fluctuations on the external position of the economy is discussed in depth in a paper by Daníel Svavarsson in this issue of *Monetary Bulletin*.

direct investment is connected to aluminium production, however, and is expected, on the whole, to generate healthy returns due to high global aluminium prices (see Chapter II).

Current account outlook bleaker than in the previous forecast

The Central Bank's baseline forecast assumes that the current account deficit will be wider than predicted in the November issue of *Monetary Bulletin*. The deficit is forecast at 16½% this year, two percentage points higher than in the previous forecast. This is mainly due to slower export growth than previously forecast, which outweighs a faster contraction of imports. Furthermore, the income account deficit is expected to be wider due to an increase in net foreign interest payments and lower net return on equity investments. The forecast also shows a slightly wider current account deficit in 2009, but the outlook for 2010 is broadly unchanged. In 2011 the merchandise and service accounts are forecast to be in balance. However, a sizable current account deficit remains at the end of the forecast horizon due to a substantial deficit in the income account.

VIII Price developments

Over the past several months, inflation has been considerably higher than forecast in November, with headline inflation measuring 8.7% in March.[1] Inflation is not limited to a few isolated subcomponents of the CPI but emerges in most of its components, chiefly because of the strong growth in domestic demand, which – in addition to the direct effect on price levels – has generated wage drift and rising real estate prices. To compound matters, the króna has depreciated much more than previous forecasts indicated, and global commodity prices have risen substantially. As a result, the price of imported goods – particularly fuel and food – has soared in recent months, even though the impact of the weaker króna has not yet emerged in full. Excluding volatile items, public services, consumption taxes and the effect of interest rate developments on housing costs, underlying inflation measures 7%. In March, however, the effects of last year's consumption tax cut had largely vanished from the twelve-month comparison. The surge in housing prices has virtually levelled off; however, its impact on CPI inflation is somewhat offset by the effect of rising real interest rates on the housing component. Inflation expectations have risen recently, in the wake of increased inflationary pressure and the depreciation of the króna.

Inflationary pressure rose toward the end of 2007

As 2007 drew to a close, inflationary pressure could be discerned in most of the subcomponents of the CPI. In Q4/2007, inflation stood at 5.4%, or 0.6 percentage points higher than was forecast last November. In Q1/2008, inflation continued to rise, pushing CPI inflation up to 7% year-on-year, or 7.9% if the effects of the March 2007 consumption tax cuts are excluded.

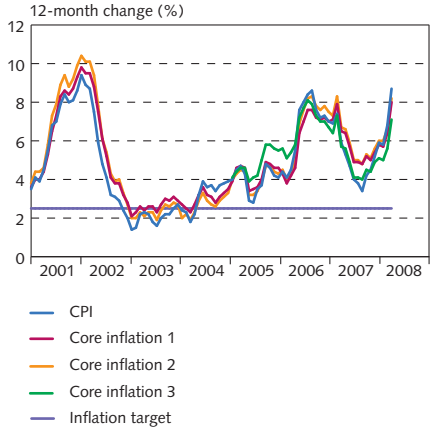
In February 2008, Statistics Iceland published Core Index 3 for the first time. Core Index 3 is Core Index 2, excluding the impact of changes in real interest rates on the housing component of the CPI (see Chart VIII-1). Estimates of underlying inflation usually ignore these effects because monetary policy has a direct effect on real interest rates. In March 2008, Core Index 3 excluding tax effects had risen by 7% over the past twelve months, but as is mentioned above, the impact of the consumption tax cut had more or less disappeared by then. CPI inflation is therefore higher than underlying inflation.

Cooling in the housing market

At the beginning of the year, housing inflation lost momentum and real estate market turnover dwindled after the rapid price rises and brisk activity of 2007, bringing housing market turnover more or less back to year-end 2006 levels. House prices have almost stopped

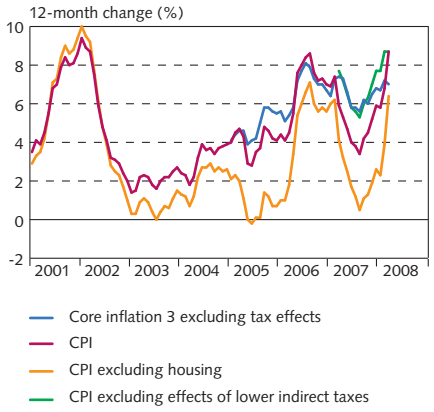
1. In January 2008, the Act on the Consumer Price Index was amended so that price information used to calculate the index is now gathered at mid-month instead of during the first two business days of each month. Therefore, in 2008 the year-on-year changes will reflect CPI changes over a period of slightly more than twelve months instead of showing twelve-month changes, as they did previously. Also, quarterly averages of the index are now simple three month averages rather than centered four month averages.

Chart VIII-1
Inflation January 2001 - March 2008[1]



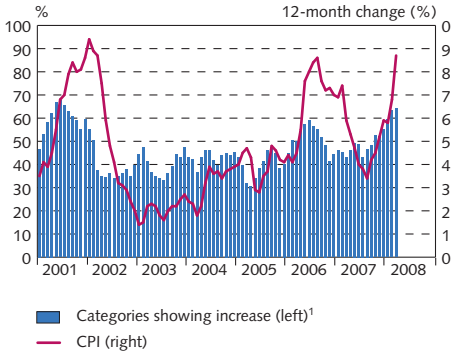
1. The core indices are compiled on the same basis as the CPI, with Core Index 1 excluding prices of agricultural products and petrol, and Core Index 2 excluding prices of public services as well. Core Index 3 also excludes the effect of changes in mortgage rates.
Source: Statistics Iceland.

Chart VIII-2
Various inflation measurements
January 2001 - March 2008



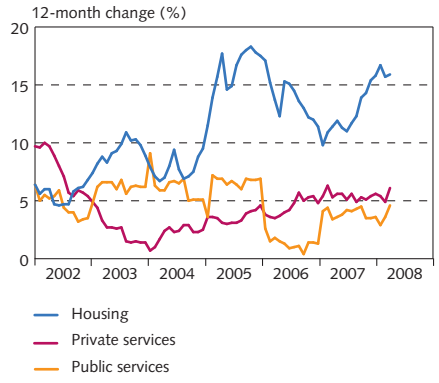
Source: Statistics Iceland.

Chart VIII-3
Distribution of price increases in CPI
January 2001 - March 2008



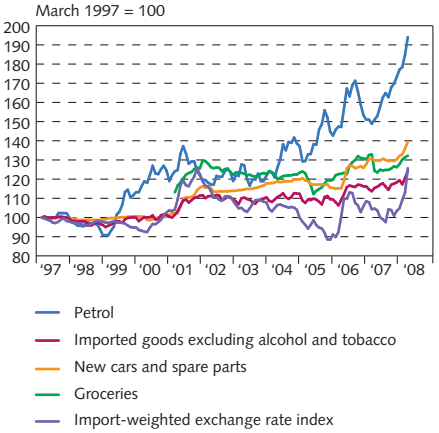
1. 3-month centred average.
Source: Statistics Iceland.

Chart VIII-4
Prices of housing and services
January 2002 - March 2008



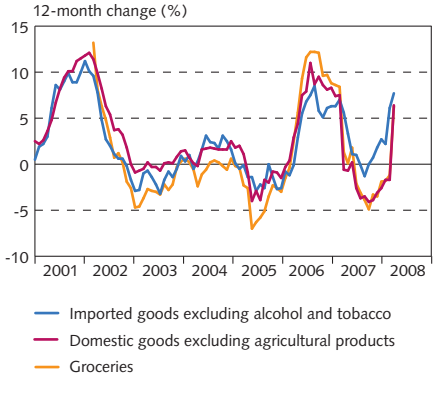
Source: Statistics Iceland.

Chart VIII-5
Import-weighted exchange rate
and import prices March 1997 - March 2008



Source: Statistics Iceland.

Chart VIII-6
Goods prices January 2001 - March 2008



Source: Statistics Iceland.

climbing; therefore, the composition of inflation will gradually change as house prices contribute less to overall price hikes. Twelve-month inflation excluding the housing component measured 6.4% in March 2008, having risen sharply since the previous summer. The annual increase in housing prices nationwide had tapered off to 14% by March, after rising steadily throughout 2007. Higher interest rates contributed to higher imputed (owner-equivalent) rent in the wake of the Central Bank's policy rate hike last November, explaining in large part the past few months' increase in imputed rent. If mortgage rates remain unchanged, this effect could contribute more than 1½ percentage points to the CPI in 2008.

Conditions in the housing market have changed markedly since the last issue of *Monetary Bulletin*. Households are now faced with curtailed access to credit, higher lending rates, and slower growth in disposable income, following several years of rapidly rising housing prices (see Chapter IV). The resulting drop in real estate purchasing power has begun to make its mark on the housing market. Because of the falling exchange rate of the króna and rising interest premia on foreign currency-denominated loans, debt service on those loans has increased considerably, which has cut into the amount of income that borrowers can allocate to other consumption (see Chapter III). Though housing inflation is characterised by a discernible inertia because the labour market remains tense and wages have risen substantially in recent months, the outlook is for falling real estate prices in the near term. The Central Bank's baseline forecast assumes a 9% drop in housing prices in 2009.

Increased wage costs could stimulate services price inflation

In the past year, there has been considerable pressure to raise services prices in line with rising domestic costs and increased domestic demand. Historically, however, prices of private services have often been more sensitive to rising wage costs than they have been in recent years. Apart from the impact of lower consumption taxes on the price of hotel and restaurant services, this trend could be explained by the fact that, to an increasing degree, foreign workers have been hired to fill service positions at lower wages than domestic workers would demand. Another explanation could be that input prices did not rise in tandem with wage costs in recent years, due in part to a strong króna. These premises have changed, however, in the past few months. The depreciation of the króna will push input prices upwards and reduce price-based competition with foreign parties in sectors such as tourism.

The newly concluded private sector wage agreements entail a substantial increase in the lowest wage rates. In the service sectors where wage costs will rise most sharply, it is likely that a portion of the increase will be passed through to prices, particularly if domestic demand remains robust. The price level measurements carried out in March reflect these changes only slightly, as most of the wage agreement provisions were not implemented until wages were paid at the end of March; however, direct effects of the pay hikes will be felt over the coming months. If the wage increase creeps up the pay scale, the

direct effect on services prices and the indirect effect on other sub-components of the CPI could prove substantial.

Imported goods prices have risen due to the depreciation of the króna

One of the main reasons inflation was higher than forecast in the last *Monetary Bulletin* is that the króna has depreciated much more than expected. At this point, the full effects of the depreciation are still far from apparent, however. As of mid-March, the exchange rate had dropped by 26% since the beginning of November 2007. The domestic price level is very sensitive to exchange rate volatility, and roughly 40% of the fluctuations can be expected to pass through to the CPI within a year.[2] Therefore, during the year 2008, the inflationary effect of a weaker króna will weigh more heavily than slowing demand growth.

External inflationary pressure has mounted rapidly since 2007. The price of fuel, food and motor vehicles has risen sharply in the past few months as a result of commodity price increases and the drop in the króna. Crude oil prices are currently at a historical high, and domestic fuel prices have climbed by some 29% over the past twelve months. The outlook for imported goods prices is therefore bleak in light of exchange rate developments in the past few weeks.

Food prices almost back to pre-tax cut levels

The November issue of *Monetary Bulletin* assumed that food prices would rise over the coming months in the wake of global commodity price increases, especially if the króna depreciated, as the impact on domestic food prices was still limited at that time. Food prices are now nearly as high as they were before the cut in value-added tax a year ago. The tax effect has mostly vanished from the twelve-month comparison. The outlook is for even higher food prices in the wake of the depreciation of the króna, as global food prices are expected to remain high. Moreover, the pay rises in the recent wage agreements weigh heavily in the food sector and could press prices upwards.

A survey conducted among the 400 largest firms in Iceland reveals that 86% of firms expect input prices to rise over the next six months, reflecting global inflationary pressure. On average, the firms' executives expect a price increase of 6.4%.

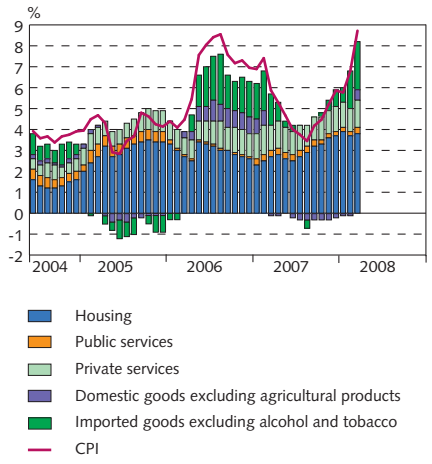
Inflation expectations rise by all measures

In recent months, the breakeven inflation rate in the bond market has risen steeply, concurrent with the depreciation of the króna, the turmoil in financial markets, and rising risk premia. The breakeven inflation rate averaged 3.7% between November 6, 2007 and April 8, 2008. Inflation expectations as measured by the difference between forward nominal and indexed interest rates have therefore risen dramatically. Twelve-month inflation ten years ahead is now expected to be just over 5% (see Chart VIII-9).

2. This means that a 1% drop in the exchange rate would lead to an approximately 0.4% rise in the CPI within a year.

Chart VIII-7
Components of the CPI
June 2004 - March 2008

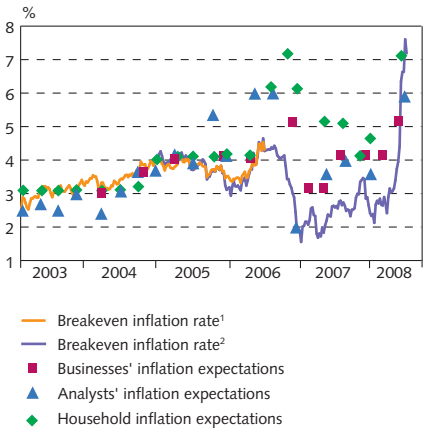
Contribution to CPI inflation in past 12 months



Source: Statistics Iceland.

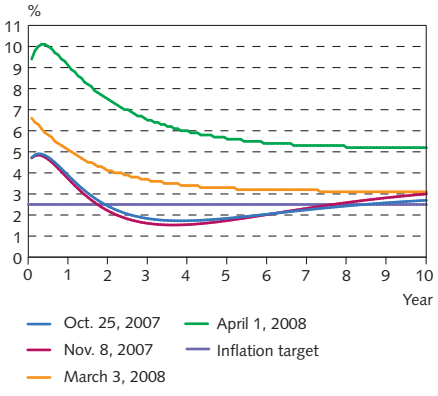
Chart VIII-8
Inflation expectations

Weekly data January 7, 2003 - April 8, 2008



1. Breakeven inflation rate is the spread between RIKB 13 0517 and RIKS 15 1001. 2. Breakeven inflation rate is the spread between RIKB 13 0517 and HFF150914. Household, businesses' and analysts' inflation expectations are based on inflation one year ahead.
Sources: Capacent Gallup, Central Bank of Iceland.

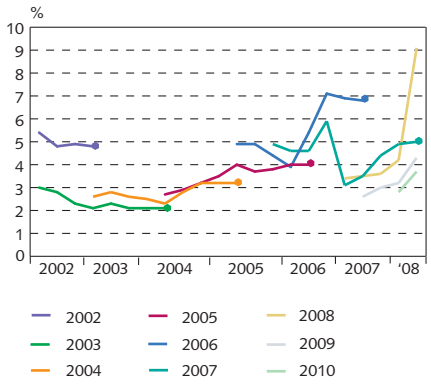
Chart VIII-9
Expectations of twelve-month inflation according to the difference between forward nominal and indexed interest rates[1]



1. Since inflation expectations are estimated according to the difference between forward interest rates, they are expectations about twelve-month inflation at a given time and not average inflation.
Source: Central Bank of Iceland.

Chart VIII-10

Financial market analysts' forecasts for average year-on-year inflation[1]



1. Points show actual rate of inflation for each year.
Source: Central Bank of Iceland.

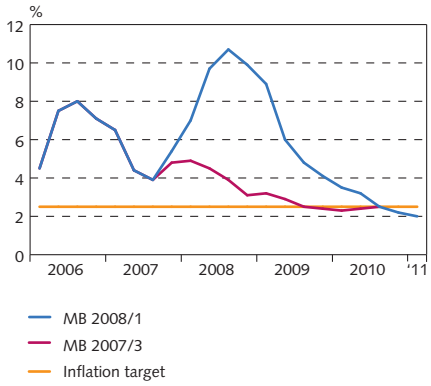
According to a survey conducted among financial market analysts in the beginning of April, analysts expect much higher inflation over the forecast horizon than in a comparable survey last October (see Appendix 2). On average, they forecast that inflation will be just over 9% in 2008, which is more than twice the level they forecast in the previous survey. They expect inflation to drop to 4.3% in 2009 and 3½% by 2010, compared to 3.2% and 2.8%, respectively, in the last survey.

In a March 2008 survey among Iceland's largest firms, their twelve-month inflation expectations had risen to 5%, up from 4% last December (based on the median). Inflation expectations among households had risen even more, according to a survey also carried out in March. Households expected inflation over the next twelve months to equal 7%, as opposed to 4.5% in a survey last October. There is a very high correlation between households' inflation expectations and actual inflation at any given time.

IX Inflation forecast

The inflation outlook has deteriorated markedly since the publication of the November forecast. For the long term, a growing sense of uncertainty has developed due to the impact of worsening financial conditions on domestic demand, uncertainty about the exchange rate of the króna, and the interaction of these two forces. Real estate market conditions are a factor in this uncertainty. Over the next few years, inflation could prove volatile and quite susceptible to developments in global financial conditions. According to the baseline forecast, inflation will subside rather rapidly as domestic demand contracts and the effects of a weaker króna fade out. With a revised policy rate path, the inflation target will be achieved in the third quarter of 2010.

Chart IX-1
Inflation - comparison with MB 2007/3



Sources: Statistics Iceland, Central Bank of Iceland.

Inflation higher than previously forecast

During the past two quarters, inflation has been considerably higher than was assumed in the November issue of *Monetary Bulletin*. At that time, inflation was forecast at 4.8% in Q4/2007, yet actual inflation measured 5.4%. In the first quarter of 2008, inflation rose still further, up to 7%, while in November, it was forecast to peak at 4.9% in the first quarter. The considerably higher inflation in the current forecast is partly the result of this unfavourable initial position. The outlook is for inflation to continue escalating over the near term, approaching 10% in the second quarter and peaking in the third at almost 11%. It will then taper off gradually and align with the target in the third quarter of 2010 (see Chart IX-1).

Inflation in the last two quarters exceeded the November forecast primarily because demand grew faster than projected. A weaker króna, hikes in the price of food, oil, and other commodities, and wage drift have all pressed prices upwards. Moreover, house prices have risen more than anticipated. The last forecast assumed that real house prices in Q1/2008 would be lower year-on-year. This has not been the case.

Weaker króna, greater tension, and underlying cost pressures

A number of assumptions underlying the last inflation forecast have changed substantially. The króna has depreciated sharply, and wage inflation will be higher. Both will kindle inflation in the quarters to come. In addition, public expenditure will rise and taxes will be cut in connection with the recent wage settlements. Moreover, construction of the aluminium smelter at Helguvík is assumed to commence this year but was not factored into the baseline forecast in the November issue of *Monetary Bulletin*. All of these have contributed to a sharp deterioration in the inflation outlook.

Steep decline in the króna influences near-term inflation prospects

Turmoil in the global financial markets and doubts about the domestic financial system have triggered a substantial depreciation of the króna since the last *Monetary Bulletin*. In March alone, the króna depreciated by 25%, and the Central Bank responded by raising the policy rate, as it had hinted in November.

While the last baseline forecast projected the exchange rate index at 117 during the first quarter of 2008, the actual level was 132, and by the end of March the index was above 150. The current baseline forecast assumes an exchange rate index of around 150 in the second quarter of 2008, as opposed to the November forecast of 120. This depreciation will raise import prices substantially over the next few months.

The revised baseline forecast projects that the króna will appreciate somewhat this year, with the exchange rate index close to 140 in mid-2009. This corresponds to the real exchange rate approaching its equilibrium during the forecast horizon. Beginning in year-end 2009, the exchange rate is projected to weaken somewhat due to a narrowing interest rate differential.

Review of private sector wage agreements likely

According to the newly concluded settlements, wages are likely to rise more than was forecast in November (see the discussion of the wage settlement in Box VI-1). It is probable that the rise in the lowest wage rates will creep up the pay scale to some extent. The agreements are based on premises concerning developments in disposable income and inflation and are subject to review if these developments prove disadvantageous. Given the inflation forecast presented here, it is highly unlikely that the contractual assumptions will hold; therefore, it is assumed that, in early 2009, wages will rise somewhat more than provided for in the agreement.

Considerable output gap until mid-2009

According to the baseline forecast, the output gap will not close until the second quarter of 2009. However, the November issue of *Monetary Bulletin* estimated that it would disappear roughly a year earlier than that. The main cause of this is the greater demand growth at the beginning of the forecast horizon and the expansionary measures that have been decided upon since November, such as the Helguvík aluminium smelter, now included in the baseline forecast for the first time, and the Government measures related to the new wage settlements. These measures entail sizeable expenditures and tax cuts, as is discussed in greater detail in Box V-1. The output gap will therefore narrow more slowly than assumed in November, and inflation will be correspondingly higher.

Despite a slowing of demand growth and a narrowing of the output gap in Q2/2008, inflation will continue to rise until the third quarter of this year. This is primarily because of the weaker króna and the fact that wage cost increases weigh more heavily early in the horizon. Higher inflation fuels expectations of more inflation in the future, which makes it harder to predict how quickly inflation will level off. If wage drift is greater than expected, or if the króna is weaker, it could take a longer time to bring inflation to target. On the other hand, it is conceivable that the disinflation will be more rapid; for example, if deteriorating financial conditions trigger a swifter contraction in demand and investment than the forecast suggests. The uncertainty surrounding the financial climate is unusually great at present.

Box IX-1

Changes in the inflation forecast from *Monetary Bulletin* 2007/3

This Box documents the main changes in the macroeconomic and inflation forecast since the issue of *Monetary Bulletin* 2007/3 and compares the current baseline forecast with the probability distribution of the previous one.

The inflation outlook has deteriorated markedly since November, when the Central Bank published its last forecast. The most salient single cause is the large depreciation of the króna. The policy rate path presented in the last *Monetary Bulletin* will therefore not suffice to anchor inflation expectations firmly enough, a prerequisite for attaining the inflation target within an acceptable time horizon. The Board of Governors of the Central Bank has already responded to this development by raising the policy rate. With the new policy rate path, it appears as though it will be possible to bring inflation to target within the forecast horizon and stabilise it near target levels until the end of the horizon. The inflation target is attained considerably later than in the previous baseline forecast, but within a time frame similar to that in the alternative scenario that assumed a depreciation similar to the one in the current baseline forecast.

Króna much weaker than assumed in the last baseline scenario

Between November 2007, when *Monetary Bulletin* was last published, and the end of March 2008, the exchange rate declined by 27%. Though the króna is expected to recover to some extent in the next few months, the current exchange rate path is lower throughout the forecast horizon than was assumed in November. As Chart 1 illustrates, the difference is greatest early on. However, the exchange rate at the end of the forecast horizon is expected to be broadly the same as it was at the outset, while the November forecast assumed that the króna would weaken somewhat as the horizon progressed. The current exchange rate path resembles that presented in the alternative scenario in the last *Monetary Bulletin*, though the depreciation is greater. For a short part of the forecast horizon, the new exchange rate path lies outside the 90% confidence interval of the last baseline forecast.

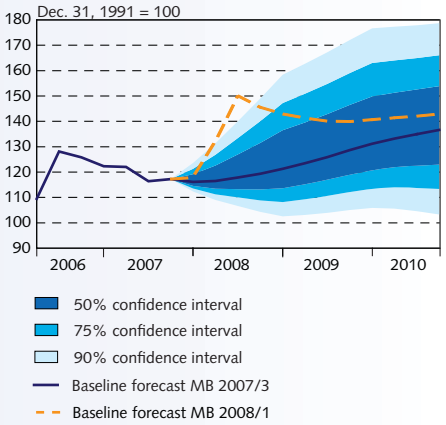
Slack develops a year later than previously assumed

Growth in potential output for 2006 is assessed at roughly one percentage point higher than in November. The output gap for that year is therefore correspondingly less. In 2007, this gradually reversed because output growth proved stronger than in the Central Bank forecast. By year-end 2007, the gap is estimated at over a percentage point more than was assumed in the last *Monetary Bulletin* (see Chart 2). Throughout the forecast horizon, the output gap remains somewhat wider than projected in November, despite the fact that the supply of credit has shrunk and uncertainty has mounted in domestic and global financial markets (see also Box IV-1). A slack will not emerge until the latter half of 2009, roughly a year later than previously projected. Unlike the November forecast, the slack is expected to peak after the end of the current forecast horizon, or at year-end 2011. As Chart 2 shows, last November it was considered rather unlikely that the output gap would develop as is projected now.

Inflation outlook two years ahead considerably darker

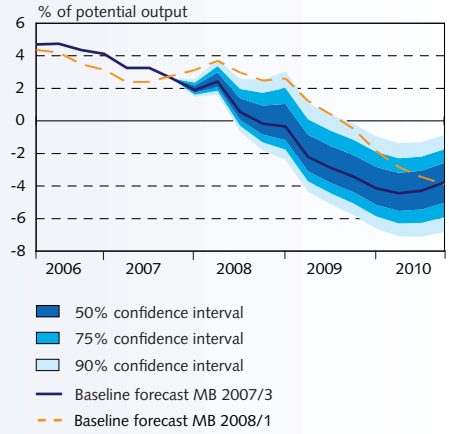
In the fourth quarter of 2007, inflation proved higher than was forecast in *Monetary Bulletin* 2007/3. It has also been higher in Q1/2008, when it measured two percentage points above the November forecast. The largest single contributing factor was the above-mentioned fall in the exchange rate, though its effects will likely be felt even more keenly in the second quarter. It is also clear that the underlying growth in demand was underestimated and that

Chart 1
Effective exchange rate
Baseline forecast and confidence intervals MB 2007/3 and baseline forecast MB 2008/1



Source: Central Bank of Iceland.

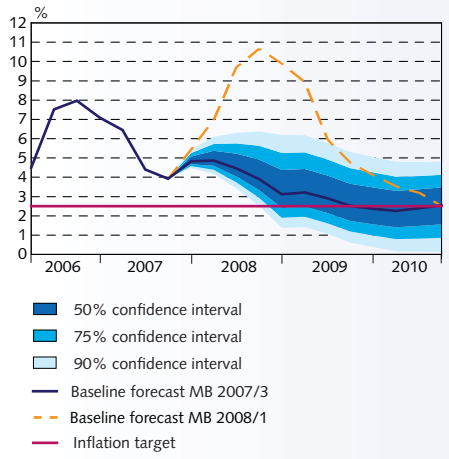
Chart 2
Output gap
Baseline forecast and confidence intervals MB 2007/3 and baseline forecast MB 2008/1



Sources: Statistics Iceland, Central Bank of Iceland.

Chart 3
Inflation

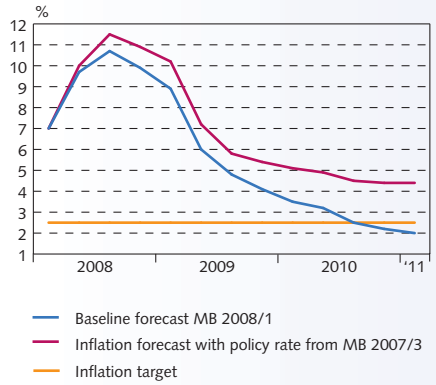
Baseline forecast and confidence intervals MB 2007/3
and baseline forecast MB 2008/1



Sources: Statistics Iceland, Central Bank of Iceland.

Chart 4
Inflation

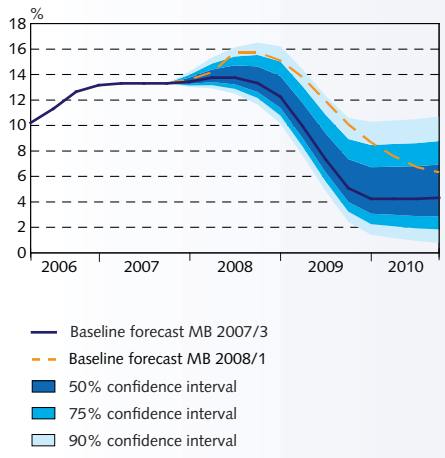
Baseline forecast and forecast with policy rate from MB 2007/3



Sources: Statistics Iceland, Central Bank of Iceland.

Chart 5
Policy rate

Baseline forecast and confidence intervals MB 2007/3
and baseline forecast MB 2008/1



Source: Central Bank of Iceland.

underlying cost pressures were similarly underforecast. Furthermore, global prices for various commodities and food products have increased substantially and are expected to rise even further.

Because inflation was much higher at the beginning of the forecast horizon than the November forecast indicated, the near-term inflation outlook is considerably gloomier. Inflation is forecast to approach 10% in the second quarter of 2008, instead of 4½%, and peak in the third quarter at nearly 11%, seven percentage points higher than was projected in November (see Chart 3). Thereafter it is expected to taper off, but much more slowly than in the November forecast, largely because of substantially higher inflation expectations during the forecast horizon. However, inflation is projected to reach target in the third quarter of 2010, more than a year later than indicated in the November forecast.

According to the probability distribution of the November forecast, the very high inflation now projected for this year was considered virtually inconceivable at the time. Inflation does not move inside the 50% confidence interval of the probability distribution until near the end of the forecast horizon.

Impact on the policy rate path in the baseline forecast

Because inflation and inflation expectations are higher than was forecast in November, monetary policy restraint as reflected in the real policy rate will be less than in the last baseline forecast. Offsetting this, however, is the fact that credit spreads have risen and households' and businesses' access to credit has shrunk to a measurable degree recently. Hence financial conditions have become worse, as is discussed in Section III.

With the policy rate path published in November, inflation would have risen even higher than in the baseline forecast, as the exchange rate would probably have continued to decline. Disinflation would also have been slower, and inflation would be just over 4% at the end of the forecast horizon instead of aligning with the target, as in the baseline forecast. Thus the policy rate path presented in November would not have sufficed to anchor inflation expectations firmly enough.

Though the policy rate is somewhat higher than in the last baseline forecast, the policy rate path is similar to that assumed in the alternative scenario from the last *Monetary Bulletin*, which described the response to a sudden decline in the exchange rate. The current baseline forecast assumes that the policy rate will be raised by 0.75 percentage points and remain unchanged until the fourth quarter of 2008, whereupon it begins to ease. In the current baseline scenario, the policy rate is lowered rather later and considerably slower than was assumed in November. This is primarily because of the significant deterioration in the inflation outlook as a result of the depreciation of the króna and the greater underlying demand and cost pressures previously mentioned. In addition, the neutral policy rate (the policy interest rate that neither stimulates nor restrains the economy) has been revised upwards in view of recent experience. Until now, the neutral policy rate has been estimated at 5½-6½% (that is, neutral real interest in the range of 3-4%, plus the 2.5% inflation target) but is now thought to lie closer to 6½-7½%. The neutral rate is estimated to be somewhat higher in Iceland than in the US and the euro area but close to that in New Zealand, a country that resembles Iceland in many ways, including high return on capital and a low propensity to save. The policy rate is therefore somewhat higher at the end of the forecast horizon than in the November forecast, though it remains within the 75% confidence interval of the previous forecast for most of the horizon (see Chart 5).

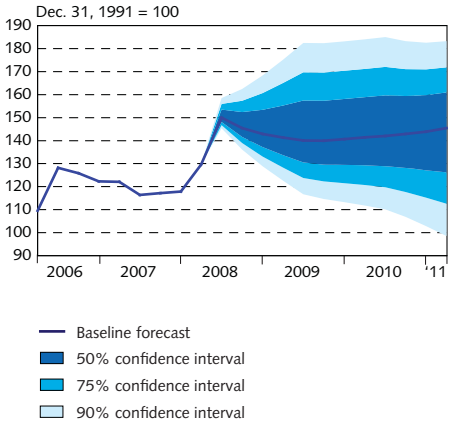
Uncertain prospects

The Central Bank's forecasts are based on economic models and analysts' assessments of various factors that could influence economic developments. Models are imperfect reproductions of reality, partly because they are based on historical data, which do not necessarily reflect new conditions in the economy. In many instances, it is necessary to make assumptions concerning important economic variables that have a substantial impact on future developments. Deviations from forecasts can therefore be sizeable at times. When imbalances are large and historical parallels or comparable conditions in other countries are lacking, guideposts are fewer and the uncertainty greater than it would otherwise be. This is the current situation in a nutshell. The current account deficit has never been larger, which adds to the exchange rate uncertainty. Real estate prices are at historical peak levels, and household and corporate debt at all-time highs. Together, these factors generate substantial uncertainty concerning the transmission of monetary policy through the financial system.

The major uncertainties in the current forecast are listed in Table IX-1. In the last *Monetary Bulletin*, a substantial depreciation of the exchange rate was considered the greatest uncertainty factor. It has now been shown unequivocally that this assessment was correct. Current global financial conditions still suggest the possibility of further depreciation, though perhaps not as dramatic as previously. Furthermore, because the real exchange rate is lower at present, the risk is more symmetric than before. Another risk discussed in the November *Monetary Bulletin* was that contractual wage agreements would prove more disadvantageous than the forecast allowed for, and that the fiscal stance would be correspondingly lax. It was also considered quite likely that further development in the aluminium sector would take place. All of these events have come to pass, and as a result, the inflation outlook is much worse than the November baseline forecast indicated.

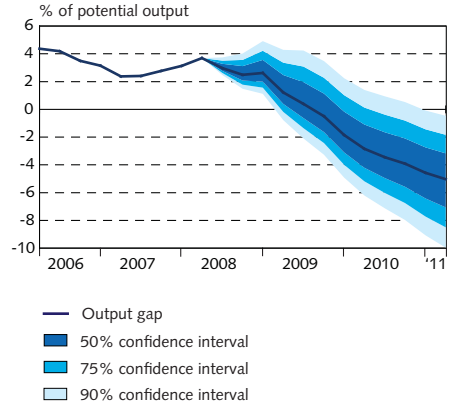
Currently, the most important uncertainties concern wage developments and asset prices. These two factors are therefore selected for further examination in the two alternative scenarios described in Box IX-2. In the former scenario, the króna is somewhat lower at the outset and remains weak throughout the forecast horizon. This triggers steeper wage increases than are assumed in the baseline forecast. In the example given, the Central Bank raises the policy rate more than in the baseline scenario in order to stave off a vicious cycle of falling exchange rate and rising inflation. The latter alternative scenario examines the developments in inflation and interest rates in the event of a more decisive downturn in the housing market than in the baseline scenario and a simultaneously weaker króna. The effects of a lower exchange rate weigh more heavily early on, and inflation will therefore be higher than in the baseline forecast. But this is reversed as 2009 progresses. By that time, inflation and interest rates will have fallen below the levels in the baseline scenario because of a more pronounced contraction in the real economy. This alternative scenario highlights the problems the Central Bank faces because inflation expectations have not been sufficiently anchored.

Chart IX-2
Effective exchange rate
Forecast period Q2/2008 - Q1/2011



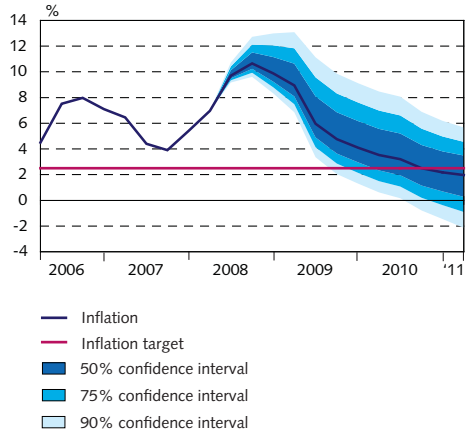
Source: Central Bank of Iceland.

Chart IX-3
Output gap
Forecast period Q2/2008 - Q1/2011



Sources: Statistics Iceland, Central Bank of Iceland.

Chart IX-4
Inflation
Forecast period Q2/2008 - Q1/2011



Sources: Statistics Iceland, Central Bank of Iceland.

Table IX-1 Main asymmetric uncertainties in the baseline forecast

Uncertainty	*Explanation*
Exchange rate developments	Reassessment of risk by foreign investors in the context of a still wide current account deficit could exert additional downward pressure on the króna. High inflation could affect businesses' pricing decisions, contributing to higher inflation than in the baseline forecast. This could surface, for example, in faster pass-through from króna depreciation to domestic prices.
Wage costs	Wage rises agreed in the recent settlements could increase more than assumed in the baseline forecast if contract review results in further pay hikes.
Housing market	House prices could fall faster, the contraction in the construction market could be deeper, and unemployment could rise higher than in the baseline forecast.
Transmission of monetary policy	If monetary policy transmission is swifter, inflation could taper off more quickly and the policy rate could be lowered sooner.

Inflation risk profile still tilted to the upside ...

In assessing the economic outlook, it is important to consider not only the baseline forecast but also the risk profile. Such an assessment includes calculating the probability distribution of the output gap, as well as that of the exchange rate, inflation, and the policy rate. The width of the probability distribution sheds light on the extent of the uncertainty, and its shape describes the shape of the risk profile. However, various uncertainties that are treated as exogenous are taken as given, such as global capital market developments and investments in energy-intensive industry.

The great uncertainty surrounding the exchange rate of the króna is reflected by the wide probability distribution of the forecast (see Chart IX-2). For the short term, the króna is considered more likely to fall than to rise above the level in the baseline scenario. At around the middle of the forecast horizon, the distribution becomes symmetrical; however, toward the end of the horizon, as the economy approaches equilibrium, it is more likely that the króna will be stronger than in the baseline forecast. As is mentioned previously, the output gap is expected to close in the second quarter of 2009. As before, the risk profile is skewed to the upside early in the forecast horizon because of possible underestimation of the output gap in historical data. The distribution of the output gap becomes symmetrical, however, as the forecast horizon progresses (see Chart IX-3). At that point, the possibility of a deeper contraction due to a weaker housing market weighs against the possibility of a lesser contraction due to heftier wage hikes, as is explored in the alternative scenarios.

Because of the uncertainties in the forecast, there is more than a 50% likelihood that inflation will exceed the level in the baseline forecast at the beginning of the horizon. There is the risk that the króna will remain weaker than forecasts suggest, which would generate increased cost pressures and higher inflation. Chart IX-4 shows

that there is some likelihood that inflation will be higher than in the baseline scenario during the coming quarters. Based on the probability distribution, there is a roughly 50% likelihood that inflation will be between 1-4% in the third quarter of 2010, when the inflation target is achieved according to the baseline scenario. There is very little chance of attaining the inflation target in Q3/2009, as was assumed in the November forecast.

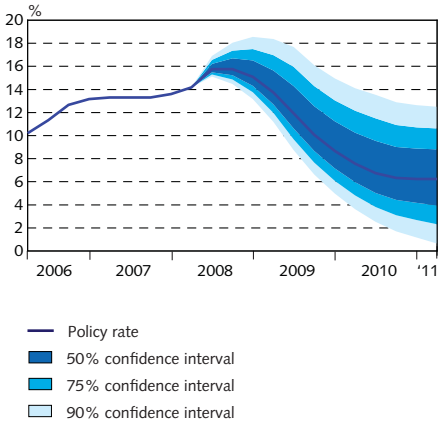
... strongly suggesting the need for a tighter monetary stance than indicated in the baseline forecast

The uncertainties involved in forecasting the macroeconomic and inflation outlook make it quite difficult to predict the policy rate path needed to attain the inflation target within an acceptable horizon. Should economic developments or monetary policy transmission take a different route than assumed in the baseline forecast, the policy rate must reflect those changes.

The policy rate path in the baseline forecast has undergone fundamental changes since the last *Monetary Bulletin*. On March 25, the Bank raised the policy rate by 1.25 percentage points, from 13.75% to 15%. According to the current forecast, the policy rate is raised by an additional 0.75 percentage points and remains unchanged until the fourth quarter of 2008, whereupon it begins to decline. The previous forecast estimated that the easing cycle would begin one quarter earlier. However, in view of the risk profile of the inflation forecast, it is highly likely that the Bank will need to raise the policy rate still further, and begin lowering it later. The first alternative scenario in Box IX-2 supports this conclusion. According to that scenario, it will be necessary to raise the policy rate further and begin easing it later than in the baseline forecast. The second alternative scenario, however, suggests that the policy rate could be lowered more rapidly in 2009 if the downturn in the economy proves steeper than the baseline forecast suggests. On the other hand, if the króna depreciates as the housing market weakens, policy rate cuts will be delayed.

The shape of the probability distribution of the policy rate path resembles that for inflation. As Chart IX-5 shows, there is a significant probability that the policy rate will average between 15¼% and 16½% in Q2/2008. In Q3, there is a corresponding likelihood that the policy rate will range from 15-17¼%. Further along the forecast horizon, the confidence interval widens sharply, underlining the great uncertainty currently surrounding economic developments.

Mynd IX-5
Policy rate
Forecast period Q2/2008 - Q1/2011



Source: Central Bank of Iceland.

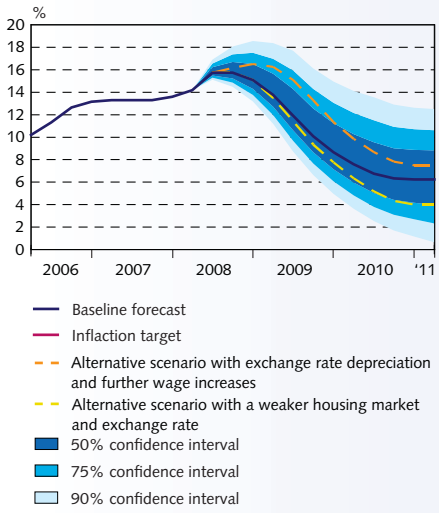
Box IX-2

Alternative scenarios

Unforeseen shocks and changes to important underlying assumptions can sometimes cause economic developments to deviate substantially from forecasts. It is therefore useful to analyse how sensitive the baseline forecast is to probable deviations in the development of various key economic aggregates. Potential deviations are numerous, of course, but an attempt is made to identify the principal risk factors and analyse more closely the effects of the two that are considered most important in each instance.

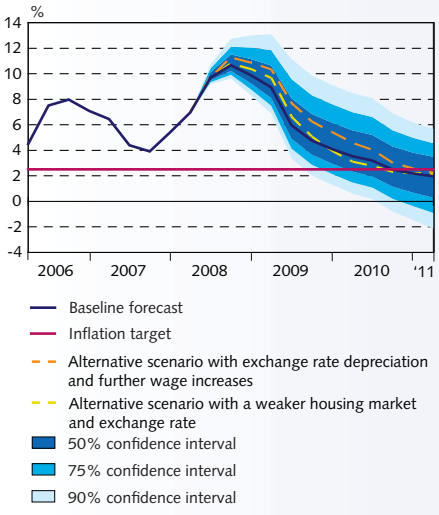
Previous forecasts have been accompanied by alternative scenarios describing the possible monetary policy response to the construction of an aluminium smelter at Helguvík, a sharp depreciation of the króna, and a less favourable outcome from the recent wage settlements than was assumed in the baseline forecast. All of these have either come to pass or are now considered likely enough to be included in the baseline scenario. At this point, the most important uncertainties are an adverse interaction between exchange rate developments and wage rises and a sharp contraction in the domestic housing market, which is linked to a weaker currency.

Chart 1
Policy rate - alternative scenarios



Source: Central Bank of Iceland.

Chart 2
Inflation - alternative scenarios



Sources: Statistics Iceland, Central Bank of Iceland.

Continued depreciation of the króna and further wage rises could necessitate a higher policy rate

The last *Monetary Bulletin* discussed the possible monetary policy responses to a dramatic depreciation of the króna and an increase in the interest rate spread on Icelandic residents' foreign liabilities. In the main, it can be said that this alternative scenario was realised, though it is important not to view alternative scenarios as actual forecasts. The real exchange rate has fallen considerably since November, reducing the likelihood of a further depreciation of the króna. Nonetheless, even more adverse exchange rate developments than the baseline forecast allows for cannot be ruled out. Given the current financial market conditions and the position of the banking system, it can be asserted that there is a considerable risk that exchange rate developments will be less favourable than assumed in the baseline forecast. A weaker króna entails the risk of greater wage increases than the baseline scenario assumes. In the worst case scenario, a vicious cycle of falling exchange rate and escalating wage demands could trigger steadily mounting inflation pressures if monetary policy does not immediately break such a chain of events and anchor inflation expectations firmly.

This alternative scenario assumes that the króna will remain weak and will not appreciate early on, as is assumed in the baseline forecast. The exchange rate index remains between 150 and 160 throughout the forecast horizon. The baseline forecast assumes that wage renegotiation early in 2009 will induce a rather modest additional increase in wages, but the risk is that the demands for pay hikes will become more vociferous as the króna continues to weaken. This alternative scenario assumes that wages will rise by nearly three percentage points over and above the baseline forecast early in 2009.

The inflation outlook is therefore considerably less favourable in this scenario than in the baseline forecast. Inflation is nearly a full percentage point higher in Q4/2008 than in the baseline forecast, with the difference between alternative scenario and baseline forecast peaking at 1½ percentage points in mid-2009. In order to prevent this negative inflation outlook from becoming entrenched, the Central Bank must respond by raising the policy rate. The policy rate is raised in mid-2008 by a total of 0.5 percentage points over and above the baseline forecast and does not begin to fall until early in 2009. Furthermore, the subsequent easing cycle is more gradual than in the baseline scenario. The divergence in the policy rate between the two paths peaks in mid-2009, when the policy rate in the

alternative scenario is three percentage points higher than in the baseline forecast (see Chart 1). At the end of the horizon, the policy rate is also higher than in the baseline scenario. This policy rate path ensures that the inflation target is attained near the end of the forecast horizon (see Chart 2).

More severe housing market slump offers the possibility of a more rapid policy rate easing

In the past decade, residential housing prices in the greater Reykjavík area and elsewhere in Iceland have more than doubled in real terms. They rose especially quickly in 2004 and 2005. A similar housing boom has occurred in many parts of the world, but price increases in Iceland have been among the steepest. In several countries, housing inflation has already begun to reverse, at least in real terms, while in a few countries – for example, the US and Ireland – nominal prices have fallen considerably.[1] In addition, residential investment has declined and unemployment in the construction industry has risen.

In the baseline forecast, as in all of the Bank's forecasts over the past year, it is assumed that nominal real estate prices will begin to fall toward the end of the current year. As the outlook is for considerably high inflation, the decline in real house prices over the next two years will be even greater. The baseline forecast also assumes that residential investment will contract somewhat. Although the drop in house prices seems large, by the end of the forecast horizon real house prices will only have returned to the 1995-2007 average; however, the increase over and above general price levels since 2003 will have been more or less reversed. Residential investment as a proportion of GDP will nonetheless approach 6% by year-end 2010, down slightly from its peak of 7% at the end of 2007. This is a bit above what has been considered the long-term equilibrium ratio of residential investment to GDP. That ratio is thought to have reached 7% in the 1970s, when large new neighbourhoods in the Reykjavík area were under construction, but it tapered off gradually to about 4% by the mid-1990s.[2]

The alternative scenario assumes that the credit squeeze and rising risk premia will trigger a deeper downturn in the housing market and a weaker króna than is assumed in the baseline forecast. House prices therefore decline more than in the baseline scenario, and the contraction in the construction sector will be considerably more pronounced. The near-term decline in real house prices will therefore be greater, but real prices will approach their long-term equilibrium at the end of the horizon. In all, real house prices fall by nearly 40% over the forecast horizon, which is similar to the reversals in some of the Nordic countries in the early 1990s. However, the decline in nominal prices would be smaller due to higher projected inflation in Iceland. Residential investment as a share of GDP is projected to fall gradually to about 3% by year-end 2010. Employment levels in the construction sector will fall, but as a result of repatriation of foreign workers, the increase in unemployment will not be correspondingly large. According to this scenario, unemployment will average 5% in 2010, whereas it is projected to approach 6% at the end of the forecast horizon. The contraction in domestic demand is therefore somewhat greater than in the baseline forecast. This is offset, however, by a weaker króna than in the baseline sce-

1. According to the Case-Schiller index, real estate prices in major urban areas of the United States have dropped by some 11% in the past year. In some cities, the decline has been considerably greater.
2. See Lúdvík Elíasson and Thórarinn G. Pétursson (2008), "The residential housing market in Iceland: Analysing the effects of the recent mortgage market restructuring", *Housing Studies*, forthcoming.

nario. Instead of appreciating slightly in the early part of the forecast horizon, as it does in the baseline forecast, the króna continues to depreciate throughout the horizon, and at the end of the forecast horizon it is 11% below the baseline path.

In this alternative scenario, the problem facing the Central Bank is that inflation expectations have not been anchored adequately. This limits the Bank's scope to respond quickly to a housing slump. The spillover into the labour market and from there to private consumption will therefore be greater than it would otherwise be. Initially, the effects of a weaker currency outweigh the effects of the weaker housing market; therefore, inflation is higher than in the baseline forecast until the latter half of 2009. At that point, however, the impact of a weaker economy begins to emerge more strongly. The policy rate is the same as in the baseline forecast until the first quarter of 2009, whereupon it begins to ease, ultimately falling more rapidly than in the baseline scenario. In the fourth quarter of 2009, the policy rate has fallen to roughly one percentage point below the level in the baseline forecast, and at the end of the forecast horizon, it is about two percentage points lower (see Chart 1). This policy rate path is conducive to bringing inflation to target in the third quarter of 2010 (see Chart 2).

The Central Bank's scope for response to shocks depends on the credibility of monetary policy

The above alternative scenarios demonstrate in a nutshell the problems that monetary policy in Iceland faces in the fight against inflation. On the one hand, the Bank risks losing control of inflation, which may ultimately cause a spiral of falling exchange rate versus rising wages and prices. On the other hand, the Bank may be faced with a sharp decline in demand, which it would be desirable to mitigate. However, the Bank's room for manoeuvre is limited due to high and unstable inflation expectations.

The alternative scenarios should not be viewed as forecasts in themselves, but rather as a way to show how some major risks to the baseline forecast could alter the inflation outlook and affect the monetary policy path. The strength of the response required will be determined to an extent by the credibility of monetary policy. If the Central Bank's ability and willingness to keep inflation at target is in question, a firmer policy response is needed. The alternative scenarios show how the Central Bank could respond to uncertainties in a systematic and predictable manner.

Appendix 1

Baseline macroeconomic and inflation forecast 2008/1

Table 1 Macroeconomic forecast[1]

		Volume change on previous year (%) unless otherwise stated			
	B.kr.		*Forecast*		
GDP and its main components	*2007*	*2007*	*2008*	*2009*	*2010*
Private consumption	746.6	4.2 (3.6)	0.3 (-1.7)	-7.0 (-6.5)	-6.6 (-1.5)
Public consumption	314.4	3.3 (3.2)	3.5 (3.4)	4.0 (3.0)	3.5 (3.0)
Gross fixed capital formation	351.6	-14.9 (-19.5)	-5.2 (-15.3)	-0.4 (-11.4)	-2.4 (11.5)
Business sector investment	213.1	-25.4 (-30.7)	-16.2 (-28.3)	4.1 (-22.7)	1.9 (24.4)
Residential construction	90.6	13.2 (9.5)	5.7 (1.9)	-11.9 (-4.3)	-7.2 (-3.0)
Public works and buildings	47.9	4.3 (2.0)	29.4 (14.0)	1.5 (10.5)	-10.6 (4.7)
National expenditure	1,415.6	-2.3 (-3.4)	-0.3 (-3.7)	-3.3 (-5.7)	-3.2 (2.2)
Exports of goods and services	451.7	18.1 (4.2)	4.5 (14.1)	0.2 (5.0)	4.2 (5.2)
Imports of goods and services	587.9	-1.4 (-8.6)	-2.6 (-0.1)	-2.2 (-4.9)	-0.6 (4.6)
Gross domestic product	1,279.4	3.8 (0.9)	2.2 (0.4)	-2.5 (-2.0)	-1.5 (2.3)
Other key aggregates					
Current account balance (% of GDP)		-15.6 (-18.0)	-16.6 (-14.4)	-12.2 (-10.5)	-9.9 (-10.0)
Output gap (% of potential output)		3.1 (1.9)	2.6 (-0.3)	-1.9 (-4.1)	-4.6 (-3.4)
Unit labour cost (change between annual averages in %)		6.9 (8.3)	5.9 (4.2)	4.7 (2.0)	4.1 (2.5)
Real earnings (change between annual averages in %)		5.8 (5.6)	-3.1 (-2.8)	-3.2 (-2.8)	0.8 (0.7)
Unemployment (% of labour force)		1.0 (1.1)	2.1 (2.7)	3.5 (4.2)	4.1 (4.0)
Foreign exchange index (Dec. 31., 1991 = 100)		118.4 (118.0)	142.6 (118.8)	140.5 (127.3)	142.6 (135.8)

1. Figures in parentheses show forecast in *Monetary Bulletin* 2007/3.

Table 2 Inflation and policy rate forecast (%)[2]

Quarter	*Policy rate*	*Inflation (Change on same period of previous year)*	*Annualised quarterly inflation*
		Measured value	
2007:1	13.3 (13.3)	6.5 (6.5)	2.0 (2.0)
2007:2	13.3 (13.3)	4.4 (4.4)	5.8 (5.8)
2007:3	13.3 (13.3)	3.9 (3.9)	5.6 (5.6)
2007:4	13.6 (13.4)	5.4 (4.8)	8.4 (5.9)
2008:1	14.2 (13.8)	7.0 (4.9)	8.2 (2.2)
		Forecast value	
2008:2	15.8 (13.8)	9.7 (4.5)	17.0 (4.1)
2008:3	15.8 (13.3)	10.7 (3.9)	9.3 (3.4)
2008:4	15.1 (12.3)	9.9 (3.1)	5.3 (2.7)
2009:1	13.8 (9.9)	8.9 (3.2)	4.6 (2.6)
2009:2	11.9 (7.3)	6.0 (2.9)	4.7 (2.9)
2009:3	10.1 (5.1)	4.8 (2.5)	4.4 (1.8)
2009:4	8.7 (4.3)	4.1 (2.4)	2.7 (2.1)
2010:1	7.6 (4.3)	3.5 (2.3)	2.3 (2.2)
2010:2	6.8 (4.3)	3.2 (2.4)	3.3 (3.4)
2010:3	6.3 (4.3)	2.5 (2.5)	1.6 (2.4)
2010:4	6.3	2.2	1.5
2011:1	6.3	2.0	1.4

Annual average	*Policy rate*	*Inflation*
2007	13.4 (13.3)	5.0 (4.9)
2008	15.2 (13.3)	9.3 (4.1)
2009	11.1 (6.7)	5.9 (2.7)
2010	6.7 (4.1)	2.8 (2.4)

2. Figures in parentheses show forecast in *Monetary Bulletin* 2007/3.

Appendix 2

Financial market analysts' assessments of the economic outlook

For each issue of *Monetary Bulletin*, the Central Bank surveys financial market analysts' assessments of the economic outlook. The latest survey was conducted in early April, and participants were Askar Capital and the research departments of Glitnir, Kaupthing Bank, and Landsbanki. The main changes from the previous survey in October 2007 are that analysts have revised their forecasts for 2008 sharply upwards for inflation and downwards for output growth. They also expect house prices to fall. Their forecasts concerning developments in the policy rate strongly resemble the policy rate path in the Central Bank's baseline forecast.

Decidedly bleak inflation outlook

The inflation outlook across the forecast horizon has worsened in the wake of the depreciation of the króna and the intensified inflationary pressure over the past few months. On average, analysts forecast that inflation will rise above 9% in 2008, which is in line with the Central Bank's baseline scenario. Most analysts expect that the inflation target will not be attained during the forecast horizon. On average, the analysts surveyed forecast 4.3% inflation in 2009 and 3½% in 2010. They expect inflation to stand at just below 4% in three years' time. In the Central Bank's baseline forecast, the inflation outlook for 2009 is more negative than in the analysts' forecasts, as the Bank expects 6% inflation. According to that forecast, the inflation target will be attained at year-end 2010.

Slowdown in output growth

The outlook is for a slowdown in economic activity concurrent with rising inflation. Analysts forecast less output growth in 2008 and 2009 than they did in the previous survey. On average, they expect growth to be minimal in 2008 and then rise to 1½% in 2009. One respondent, however, expects a contraction in both years. The Central Bank's baseline forecast assumes more growth in 2008, or just over 2%, due to the positive contribution of foreign trade, while it projects that a contraction in domestic demand will cause a 2½% output contraction in 2009. Most analysts expect the economy to revitalise somewhat by 2010, with growth exceeding 3%, which is similar to their responses in the last survey. The Central Bank's baseline forecast, however, projects a 1½% contraction.

Substantial uncertainty regarding exchange rate developments

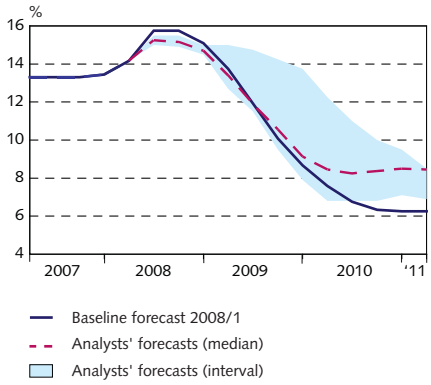
The króna has weakened considerably in recent weeks due to financial market unrest and declining interest rate differentials in the currency swap markets. Analysts consider the exchange rate path rather stable, however, and they project that the exchange rate index will average just below 140 in 2008 and 2009. Nevertheless, their responses cover

a rather wide range. The analysts' average forecast is broadly in line with the Central Bank's baseline forecast, which projects the exchange rate index at just over 140 in both years. In the long run, the analysts forecast a generally stronger króna.

High policy rate until 2009

At the end of March, the Central Bank raised its policy rate by 1.25 percentage points, to 15%, after having kept it unchanged since November. Analysts are unanimous in forecasting that the policy rate will remain high until next year. They forecast an average of 14.7% for 2008 and just below 12% for 2009, and they project the policy rate at 7.7% three years ahead. Most analysts expect monetary policy to be tighter during the forecast horizon than the Bank's baseline forecast suggests. Two respondents stated that the policy rate would be raised on the next decision date, April 10, and the majority expect a policy rate cut in the latter half of this year. The policy rate path presented by the analysts closely resembles that used as a basis for the Bank's baseline forecast (see Chart 1).

Chart 1
Policy rate path MB 2008/1 and analysts' forecasts
Forecasting period Q2/2008 - Q1/2011



Source: Central Bank of Iceland.

Changed conditions in asset markets

The equity market has been volatile in recent months, and the OMXI15 index has fallen. On average, analysts forecast an index value of almost 5,200 one year ahead and just over 6,100 two years ahead.

All of the analysts expect house prices to drop over the next twelve months, but real estate market activity has slowed considerably. On average, the analysts forecast a nearly 5% price decrease over the next twelve months. They are generally in agreement about the long-term outlook, and they forecast the twelve-month change at 2% two years ahead.

Table 1 Overview of financial market analysts' forecasts[1]

	2008			*2009*			*2010*		
	Average	*Lowest*	*Highest*	*Average*	*Lowest*	*Highest*	*Average*	*Lowest*	*Highest*
Inflation (year-on-year)	9.1	7.9	10.5	4.3	3.2	7.2	3.5	2.1	4.5
GDP growth	0.2	-0.5	1.0	1.5	-2.5	3.5	3.2	1.5	4.5
Effective exchange rate index of foreign currencies vis-à-vis the króna (annual average)	139	130	145	137	128	154	136	125	150
Central Bank policy rate (annual average)	14.7	14.5	14.9	11.8	10.5	14.4	8.6	6.9	10.7
	March 2009			March 2010			March 2011		
Inflation	5.7	3.8	9.8	4.0	2.1	5.0	3.7	2.7	4.5
Effective exchange rate index of foreign currencies vis-à-vis the króna	136	131	151	137	127	156	134	124	150
Central Bank policy rate	13.0	11.8	15.0	9.0	6.8	12.3	7.7	6.5	8.5
Nominal long-term interest rate[2]	8.7	7.2	11.5	7.9	6.5	11.0	7.1	6.5	8.0
Real long-term interest rate[3]	4.0	3.3	4.3	3.9	3.7	4.0	3.7	3.2	4.0
OMXI15 share price index	5,172	4,000	5,921	6,143	5,000	7,071	7,269	6,000	8,377
Housing prices (12-month change)	-4.7	-6.0	-2.9	2.0	0.0	3.0	4.2	3.0	5.0

1. The table shows percentage changes between periods, except for interest rates (percentages), the exchange rate index (index points) and the OMXI15 index (index points). Participants in the survey were Askar Capital and the research departments of Glitnir, Kaupthing Bank, and Landsbanki. 2. Based on yield in market makers' bids on non-indexed T-notes (RIKB 19 0226). 3. Based on yield in market makers' bids on indexed Housing Financing Fund bonds (HFF 150644).

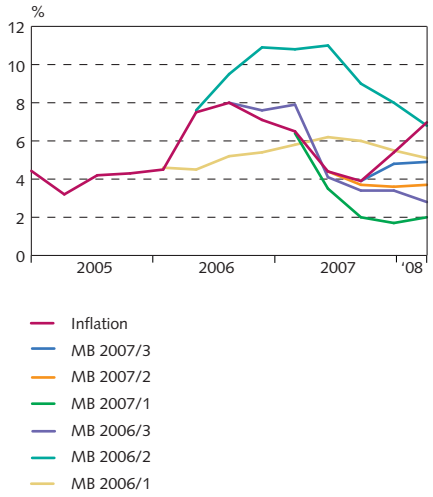
Source: Central Bank of Iceland.

Appendix 3

Forecast errors in Central Bank of Iceland inflation forecasts

The role of the Central Bank is to promote price stability. In order to fulfil that role satisfactorily, the Bank must follow closely the likely developments in inflation and economic affairs at all times, especially because there is a delay in monetary policy transmission. In this context, it can prove useful to examine how closely the Bank's inflation forecasts align with actual inflation and to determine, among other things, whether inflation has been systematically over- or underforecast over time.

Chart 1
Inflation forecasts MB 2006/1 - MB 2007/3 and inflation 2005 - Q1/2008



Sources: Statistics Iceland, Central Bank of Iceland.

The inflation forecast for 2007

Chart 1 shows the Central Bank inflation forecasts as published in *Monetary Bulletin*, together with actual developments in inflation from Q1/2005 to Q1/2008. It should be noted that assumptions regarding the policy rate vary in the Bank's forecasts. Policy rates were kept unchanged in forecasts until 2007, whereupon the Bank began publishing its economic forecast, together with the policy rate path that was considered most conducive to the attainment of the inflation target. The chart shows that, on two occasions during the period 2006-2007, the Bank's inflation forecast diverged markedly from actual CPI inflation. The former instance was the forecast that appeared in *Monetary Bulletin* 2006/1. The króna depreciated suddenly in the spring of 2006, triggering rising inflation and a gloomier inflation outlook. The Bank's baseline forecast at that time assumed an unchanged exchange rate. The latter instance was the forecast in *Monetary Bulletin* 2006/2, when inflation was significantly overestimated. There are two principal explanations for this. The short-term impact of the depreciation in the króna and the wage settlement review in June on wage developments was overestimated, thereby resulting in an overforecast of short-term inflation. However, it is interesting to note that, despite this divergence, the long-term effects on wage developments were forecast correctly. By year-end 2007, the entire wage drift projected by the Central Bank had surfaced – it merely emerged later than the Bank expected when it prepared its forecast in the summer of 2006. It should also be borne in mind that the Central Bank responded decisively to the inflationary effects of a falling exchange rate, thereby nullifying the assumptions lying behind the inflation forecast from *Monetary Bulletin* 2006/2. Therefore, by year-end 2006 inflation had fallen below the levels forecast in *Monetary Bulletin* 2006/2 and 2006/3. Added to this was the cut in indirect taxes – which was announced in the autumn of 2006, after the publication of the July issue of *Monetary Bulletin* – and its effect on the CPI in Q1/2007. Furthermore, the króna remained stronger than had been assumed in the Bank's forecasts. The forecasts appearing in last year's issues of *Monetary Bulletin* were much closer to actual inflation in Q4/2007, which was nonetheless underforecast.

Chart 2 compares the forecasts by financial market analysts and the Ministry of Finance for the period from September 2005 to October 2007 with the Central Bank's forecast for average year-on-year inflation in 2007.[1] The chart sheds light on whether the available information on the economy was well utilised by forecasters. However, it is worth noting that the Central Bank did not begin to publish its own projected exchange rate and policy rate paths until 2007; therefore, the forecasts during this period are based on different models. For example, the forecasts from 2005 assumed that the exchange rate and the policy rate would remain unchanged throughout the forecast horizon. These forecasts did not make full use of the Bank staff's assessment of the likely developments in these variables. Furthermore, it can be difficult to determine how well founded forecasts are by examining only a single year, as developments over one year's time may be rather random; that is, they may be subject to unpredictable events. In order to gain a more accurate view of the quality of forecasts, it is therefore necessary to examine a longer period and compare the primary criteria on which the forecasts are based, such as output growth, labour market conditions, and asset prices.

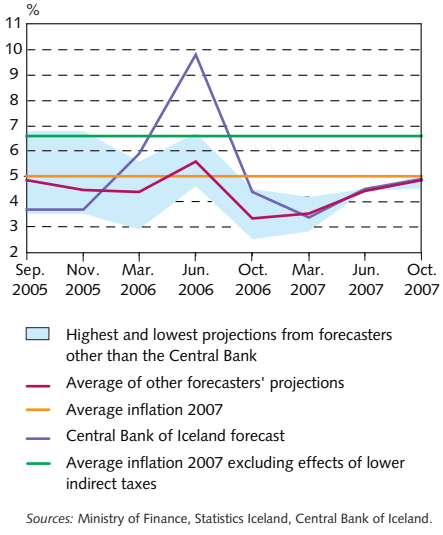
The blue area in Chart 2 reflects the highest and lowest values specified by financial market analysts and the Ministry of Finance in their forecasts of average inflation for 2007. In 2005, the estimated inflation levels for 2007 covered a broad range, but as time passed, of course, forecasters' opinions converged to a much greater degree. This is shown by a narrowing of the blue area in Chart 2. If the sample of forecasters were large enough, the average of the forecasts by analysts and the Ministry of Finance should be near the middle of the blue area. In 2005, forecasters projected that inflation would be in the range of 3.5-6.8%; however, they considered inflation more likely to be lower in 2007 than higher.

Until October 2006, market participants did not know that the Government would cut consumption taxes; therefore, their inflation forecasts do not include the effects of those reductions. The green line represents average inflation without tax effects for 2007, while the yellow line shows actual average inflation for that year. In 2005, market analysts, the Ministry of Finance and the Central Bank were all far from forecasting year-2007 inflation correctly, though the Central Bank's forecast from early 2006 was not far from accurate. In mid-2006, all forecasters revised their inflation forecasts upwards following the depreciation of the króna. In the autumn of 2006, all forecasters assumed that the impact of tax cuts would be greater than it actually was, and therefore they underestimated inflation levels.

Chart 2

Projections for annual inflation in 2007 published at different times

Forecasts of Central Bank of Iceland, market analysts and Ministry of Finance



Sources: Ministry of Finance, Statistics Iceland, Central Bank of Iceland.

Assessment of forecasting errors over a longer period

In assessing inflation forecasts, it is important to consider the mean forecast error (bias) and the root mean square forecast error (RMSFE) of the forecasts concerned. The mean forecasting error shows the fore-

1. The Central Bank of Iceland conducts a survey three times a year among financial analysts, where they are asked to forecast average year-on-year inflation 2-3 years ahead. Participants in the survey were Askar Capital hf. and the research departments of Glitnir, Kaupthing Bank, and Landsbanki. The Ministry of Finance's inflation forecast can be found in the Ministry's quarterly macroeconomic forecasts.

casts' mean deviation from actual inflation and thus whether inflation is being systematically over- or underforecast. The RMSFE measures how much, on average, the forecast value differs from the true value.

In order for such measures to be significant, the forecasts must have independent forecast errors, and the number of measurements must be sufficiently large. As forecasts extend farther ahead in time, the forecast error can be expected to increase as the level of uncertainty about developments in the main macroeconomic variables increases. Conversely, the mean forecast error should become smaller as the time frame of the forecast grows shorter because of the greater availability of information on which to base the forecast.

Table 1 shows the mean forecast error and RMSFE in the Bank's inflation forecasts up to four quarters ahead since 1994. By this criterion, inflation has been underforecast two, three and four quarters ahead, to an increasing degree as the horizon grows longer. The mean forecast error for the forecast one, two and three quarters ahead proved not to be statistically significant. The mean forecast error four quarters ahead, however, proved to be significant, as was the mean forecast error from Table 2, which shows forecast errors in the Central Bank inflation forecasts since Q2/2001. During the period in Table 1, the economy experienced a nearly continuous upswing; therefore, it may be that inflation was underforecast because the forecasts were based largely on preliminary figures, which have tended to be revised upwards. Furthermore, because there is generally a fair amount of uncertainty surrounding economic developments, it is, in a sense, misleading to publish point estimates only. Examples of factors that could result in substantial deviations from point estimates include changes in the global economy and exchange rate developments. The RMSFE in Table 1 increases as the forecast horizon lengthens, as can be expected given the greater uncertainty farther ahead in time.

Table 1 Central Bank of Iceland inflation forecast errors since Q1/1994

(%)	*Q1*	*Q2*	*Q3*	*Q4*
Mean forecast error	0.0	-0.3	-0.4	-0.7
RMSFE	0.4	1.2	1.5	2.0

Since adopting the inflation target in March 2001, the Central Bank has also published inflation forecasts two years ahead. Table 2 shows the mean forecast error and the RMSFE for the period since the Bank introduced inflation targeting. A comparison of Tables 1 and 2 shows that the RMSFE one year ahead for the period since the Bank adopted the inflation target (2.2%) is similar to that for the entire period (2.0%). Forecast errors have not increased despite larger variations in the exchange rate.

Table 2 Central Bank of Iceland inflation forecast errors since Q2/2001

	No. of measurements	*Mean forecast error (%)*	*RMSFE (%)*
Four quarters ahead	24	-0.9	2.2
Eight quarters ahead	21	-1.2	2.0

Since Q2/2001, the Central Bank has published its inflation forecast, together with the confidence intervals for the forecast. In evaluating the Bank's inflation forecast, it is necessary to examine forecasts several quarters ahead as well as examining the confidence intervals, since the forecast for each quarter is based on various uncertainties. Inflation is likely to be close to the baseline forecast if the forecast assumptions hold, but marked divergences may be expected if key assumptions behind the forecast change. Chart 3 compares inflation developments with the Central Bank's forecast for the first quarter of 2006, which appeared in *Monetary Bulletin* 2006/1. The chart illustrating the confidence intervals for the forecast shows the range in which inflation was 90% likely to lie. The red line illustrates quarterly inflation excluding tax effects. The chart shows that it is more difficult to forecast short-term inflation developments. The forecast 2-4 quarters ahead is therefore outside the 90% confidence interval, while later in the forecast horizon it moves within the confidence interval.

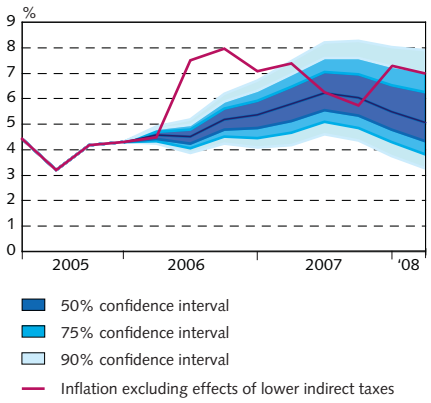
Chart 4 shows the distribution of measured inflation within the three confidence intervals (50%, 75%, and 90%); that is, where measured inflation lies with respect to the confidence intervals of the forecasts from the first quarter of 2005. It can be seen that the majority of forecasts one quarter ahead are within the 50% confidence interval, and in 90% of cases they are within the 90% confidence interval. Forecasts three to six quarters ahead, however, are more often outside the upper 90% confidence interval, which indicates that in recent years the Central Bank has underestimated the risk of inflation. This comes as no surprise, perhaps, in view of the fact that since 2004 and 2005 the economy has endured a series of demand shocks that were difficult to evaluate in advance. Forecasts seven to eight quarters ahead are more accurate than those three to six quarters ahead. In 50-67% of forecasts seven to eight quarters ahead, inflation lies within the 90% confidence interval, as opposed to only 11-33% of forecasts three to six quarters ahead.

Table 3 illustrates the frequency with which inflation has been within the confidence interval of the forecast four and eight quarters ahead. With a sufficiently large sample, half of the forecasts might be expected to fall within the 50% confidence interval, three-quarters within 75%, and nine out of ten within 90%. A comparison of the distribution of forecasting errors with the assumed probability distribution reveals that the actual proportions are rather lower for forecasts four and eight quarters ahead.

Table 3 Distribution of measured inflation based on forecasts from Q2/2001[2]

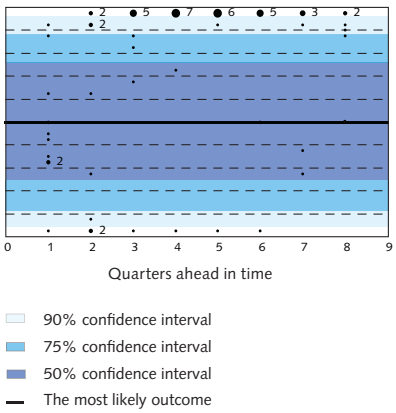
	No. of measurements	*50%*	*75%*	*90%*
Four quarters ahead	22	6 (27%)	10 (45%)	13 (59%)
Eight quarters ahead	19	7 (37%)	13 (68%)	16 (84%)

Chart 3
Central Bank's inflation forecast from MB 2006/1 and quarterly inflation excluding the effects of lower indirect taxes
Forecasting period: Q1/2006 - Q1/2008



Sources: Statistics Iceland, Central Bank of Iceland.

Chart 4
Confidence intervals of inflation forecasts and measured inflation since MB 2005/1



Sources: Statistics Iceland, Central Bank of Iceland.

2. In *Monetary Bulletin* 2004/1 and 2004/3, only a point estimate was published. Therefore, Table 3 includes only 22 measurements, while Table 2 includes 24.

Of twenty-two forecasts four quarters ahead, only six fell within the 50% confidence interval (27% of cases). Ten were within the 75% interval (45% of cases) and thirteen within the 90% interval (59% of cases). Therefore, inflation is frequently much higher than forecasts have suggested. Either the actual baseline forecast was inaccurate or the level of uncertainty underestimated. It is appropriate to bear in mind that, for a long period of time, forecasts assumed that the policy rate and the exchange rate of the króna would remain unchanged. In some instances, however, that assumption should have resulted in overestimation of inflation rather than the reverse.

In general, it is more difficult to forecast inflation over longer horizons. This is reflected in a broader confidence interval. Of the nineteen forecasts with a horizon of eight quarters, seven were within the 50% confidence interval (37% of cases), thirteen within the 75% interval (68% of cases), and sixteen (84%) within the 90% confidence interval. The forecasts eight quarters ahead seem to be considerably more accurate than those four quarters ahead; however, it is important to bear in mind that the confidence interval is generally twice as wide for a forecast eight quarters ahead than it is for a forecast four quarters ahead. If the forecasts allow for an endogenous monetary policy response, the effects should have more or less emerged eight quarters later. Therefore, errors in the forecasts of a central bank that is successful in operating an inflation target should not be systematic.

Appendix 4

The macroeconomic impact of fiscal policy

Fiscal policy consists of the finances of the national and local governments and reflects the tax collection needed to fund public services and transfers. Because it can also have macroeconomic effects, it can be argued that the public sector should also play a stabilising role; that is, that it should time its actions so as to minimise business cycles and promote low, stable inflation, as is the goal of monetary policy.

This Appendix discusses the macroeconomic effects of two public sector economic policy tools – expenditure changes and tax changes – as determined using the Central Bank's Quarterly Macroeconomic Model (QMM) (see Daníelsson et. al. 2006).[1] The effects are found to be very similar to those in other small, open economies.

Different views on the economic effects of fiscal policy

In recent years, great strides have been made in academic research on the conduct of monetary policy and its impact on the economy. Similar research on fiscal policy has been carried out less often, however, and economists still disagree somewhat on how important a role fiscal policy actually plays in stabilising the economy.[2]

Among classical economists, it was generally thought that fiscal policy really had no stabilisation role, as it was assumed that the factors of production were always fully utilised. Increased public sector activity would simply crowd out private spending so that aggregate demand would remain unchanged (and equal to aggregate supply). The Great Depression and the writings of John Maynard Keynes changed this view. The factors of production could be underutilised for extended periods of time, making increased public expenditure an effective tool for stimulating demand and employment levels. Many even believed that the increased activity would ultimately outpace the original increase in expenditure. The boost in public spending would not only have a direct effect on aggregate demand; it would also work indirectly, in that elevated employment and income levels would stimulate private spending. The so-called "multipliers" of fiscal policy were therefore thought to be greater than unity.

Both experience and recent research indicate, however, that these multipliers are much smaller than previously thought – and likely less than one – especially in small, open economies. The reason is that increased demand causes relative prices to adjust. For example, increased activity means that, other things being equal, interest rates

1. A comparable analysis of the effect of monetary policy can be found in Appendix 1 of *Monetary Bulletin* 2006/3, "The transmission mechanism of monetary policy in the Central Bank's quarterly macroeconomic model," pp. 57-60.
2. A detailed survey can be found in Hemming et. al. (2002). Dunstan et. al. (2007) also contains an accessible summary. See also the discussion of the role and impact of fiscal policy in the new OECD report on Iceland: *OECD Economic Surveys – Iceland,* February 2008.

rise (for instance, because the public sector needs more borrowed funds and because monetary policy responds to mounting inflationary pressure by raising the policy interest rate). When interest rates rise, increased public expenditure crowds out private spending, thus reducing the multipliers. This crowding-out effect is probably even more profound in small, open economies, where increased expenditure and rising interest rates tend to strengthen the local currency, which crowds out domestic demand and weakens the competitiveness of the domestic export and competitive sectors. Exports decline, while imports increase. A part of the boost to expenditure therefore "leaks" out of the economy, thus reducing the multipliers. The same applies to tax multipliers. Tax cuts increase households' disposable income and businesses' after-tax profits, but the impact on aggregate demand is less than the original tax reduction, as the private sector allocates only a portion of the increased income to expenses and may even decide to save more in anticipation of future tax increases. Tax multipliers are therefore somewhat below one as well. Most studies also indicate that they are slightly smaller than expenditure multipliers (see, for example, Hemming et. al., 2002). On the other hand, they could be more persistent than expenditure multipliers because households distribute the increased consumption resulting from tax cuts over a period of years.

The economic impact of fiscal policy will be less, the more forward-looking the private sector is and the more able it is to shift spending decisions from one period of time to another. Some economists have even gone so far as to say that this renders fiscal policy ineffective. Should the public sector increase its current level of expenditure in an attempt to stimulate aggregate demand, the private sector will understand that the increase must ultimately be funded through higher tax levies or a corresponding contraction in expenditure later on. Therefore, they will increase their savings in order to set aside funds to pay for future tax increases, with the result that the contraction in private spending exactly offsets the original increase in public expenditure. This is referred to as the Ricardian equivalence result (see Barro, 1974). Most research suggests that the Ricardian equivalence result may exist but that it is imperfect (see, for example, Masson et. al., 1995). This could be, for example, because individuals have limited possibilities for shifting consumer spending forward due to imperfect credit markets. Nevertheless, the effects of forward-looking expectations can complicate the effects of fiscal policy. For instance, expectations of future tax cuts could stimulate current expenditure because expected permanent income has risen. Similarly, a credible statement announcing a permanent reduction in public expenditure could increase aggregate demand because of expectations of lower future taxes (see, for example, Giavazzi and Pagano, 1990).

3. This discussion ignores the potential long-term effect of lower taxes on the supply side of the economy. If a tax cut promotes increased labour market participation or boosts investment, it will ultimately raise potential output. This discussion only focuses on the effect of fiscal policy on demand, which is most relevant for the conduction of monetary policy at any given time.

The effect of increased public expenditure

To assess the impact of fiscal policy on the domestic economy, the macroeconomic model of the Central Bank (QMM) is applied. The effect of public expenditure is examined by carrying out the following simulation. In a given quarter, public consumption increases by 1% of GDP, and that level of expenditure is maintained for five years. The increased expenditure corresponds to a roughly 8 b.kr. increase in annual public consumption in terms of year-2000 prices (just over 13 b.kr. in 2007 prices), which roughly equals a 4% real increase in public consumption. GDP rises immediately by 0.4 percentage points, and the effect peaks a year later, when the expenditure multiplier is around 0.6 (see Table 1). The expenditure shock therefore stimulates general demand quite quickly. Unemployment begins to fall, real wages rise, and asset prices increase (and therefore net wealth as well). This causes private consumption and investment to increase over and above the baseline scenario. Offsetting this is a rising real exchange rate, which causes a decline in exports with respect to the baseline scenario. Increased domestic demand and a rising real exchange rate direct a portion of the demand impulse towards imported goods and services, thus boosting imports considerably. Increased demand also fuels inflationary pressure and puts upward pressure on interest rates. After roughly two years, inflation peaks at about 0.2 percentage points above the baseline scenario, with interest rates about 0.5 percentage points above the baseline, assuming that monetary policy responds according to a conventional Taylor rule. As the table illustrates, the impact on GDP fades out gradually and has more or less vanished after slightly more than three years. The effects will disappear much more slowly, however, in the absence of monetary policy response.

Table 1 Effect of fiscal policy on GDP

	Expenditure multipliers (with monetary policy response)		*Tax multipliers (with monetary policy response)*	
	After 1 year	*After 3 years*	*After 1 year*	*After 3 years*
Iceland	0.60	0.12	0.31	0.50
New Zealand	0.61	0.06	0.19	0.03
United Kingdom	0.80	0.21	0.41	0.86
United States	1.10	0.00	0.30	0.50
	Expenditure multipliers (without monetary policy response)		*Tax multipliers (without monetary policy response)*	
	After 1 year	*After 3 years*	*After 1 year*	*After 3 years*
Iceland	0.65	0.72	0.33	0.91
Denmark	0.78	0.70	-	-
Euro area	1.06	1.01	-	-
United States	1.40	1.10	0.40	1.00

The calculations show the estimated effect of increased public consumption, on the one hand, and an income tax cut, on the other, in both instances amounting to 1% of GDP, either for five years (Iceland, New Zealand, and the UK) or permanently (US, Denmark, and euro area). The effect for New Zealand is obtained from the Reserve Bank of New Zealand's FPS model (Dunstan et. al., 2007). The effect for the UK is the average result from five models surveyed in Church et. al. (2000). The results for the US are obtained from the US Federal Reserve Bank's FRB/US model (Reifschneider et. al., 1999). The results for Denmark are obtained from the MONA model used by the Danish central bank (Danmarks Nationalbank, 2003). The results for the euro area are the average for 12 euro countries (Fagan and Morgan, 2005).

The effects of tax cuts

The macroeconomic effects of tax cuts are assessed as follows. In a given quarter, individual income taxes are reduced by an amount corresponding to 1% of GDP, and that tax rate is maintained unchanged for five years. On an annualised basis, the tax cut corresponds to just over 8 b.kr. in terms of year-2000 prices (slightly over 13 b.kr. in 2007 prices), or a 1.2 percentage point reduction in the income tax rate. Because the tax cut affects GDP only indirectly through private sector spending decisions and is not a direct part of aggregate demand, as public consumption is, this effect will take a longer time to emerge. Therefore, GDP rises immediately by just over 0.1 percentage points and peaks after approximately two years, at roughly 0.5 percentage points above the baseline scenario. The effect of the tax reduction on inflation, real exchange rate, and interest rates is comparable to that in the public expenditure example, offsetting the output stimulation. The peak effect on inflation emerges after just over three years, when inflation is about 0.2 percentage points higher than in the baseline example and interest rates some 0.5 percentage points higher. In the absence of monetary policy response, the tax multiplier continues to increase, peaking at around unity after approximately four years.

Comparison with other countries

Table 1 also gives a comparison of the results for several other countries. As the table shows, the expenditure multipliers in Iceland are similar to those in other small, open economies such as New Zealand and Denmark. They are smaller, however, than those in larger economies such as the US, the UK, and the euro area. This is probably caused by the additional crowding-out effect through the real exchange rate and the "leakage effect" of growing imports on small, open economies (see also Dunstan et. al., 2007). These results are consistent with the findings of Fagan and Morgan (2005) with respect to the euro area. They find that the short-run expenditure multipliers are usually greater than unity for larger countries – such as France, Italy, Spain, and Germany – and somewhat less for smaller countries like Luxembourg and Greece. These results are also in line with the findings of Hemmings et. al. (2002), who find that the short-run expenditure multipliers are usually between 0.6 and 1.4. Tax multipliers in Iceland, however, are similar to those in the US and the UK (for one year) and somewhat larger than those in New Zealand. They are also in line with the conclusions drawn by Hemmings et. al. (2002), who report that short-term tax multipliers generally lie between 0.3 and 0.8.[4]

4. There are fewer comparative studies of the effect on inflation; however, the effect seems to be similar for Iceland, the US, and the euro area. In the absence of monetary policy response, inflation in Iceland is 0.28 percentage points higher than it would have been two years after the expenditure increase, while it is 0.22 percentage points higher in the euro area (the average of 12 euro countries; see Fagan and Morgan, 2005) and 0.50 percentage points higher in the US (Reifschneider et. al., 1999). Corresponding to this is the effect of a tax cut on inflation after two years: 0.14 percentage points for Iceland and 0.10 percentage points for the US. The response of interest rates, if they are allowed to respond, is also similar in these three instances.

References

Barro, R. (1974), "Are government bonds net wealth?", *Journal of Political Economy*, 82, 1095-1117.

Church, K., P. Mitchell, J. Sault, and K. Wallis (2000), "Comparative properties of models of the UK economy", *National Institute Economic Review*, 161.

Daníelsson, Á., L. Elíasson, M. F. Gudmundsson, B. A. Hauksson, R. Jónsdóttir, T. T. Ólafsson, and T. G. Peterson (2006), "QMM: A quarterly macroeconomic model of the Icelandic economy", Central Bank of Iceland, *Working Papers*, no. 32.

Danmarks Nationalbank (2003), *MONA – a quarterly model for the Danish economy*, Danmarks Nationalbank.

Dunstan, A., D. Hargraeves, and O. Karagedikli (2007), "The impact of fiscal policy on the business cycle", Reserve Bank of New Zealand, *Bulletin*, 70, pp. 5-18.

Fagan, G., and J. Morgan (eds.) (2005), *Econometric Models of the Euro-area Central Banks*, Edward Elgar Publishing.

Giavazzi, F., and M. Pagano (1990), "Can severe fiscal contractions be expansionary? Tales of two small European countries", *NBER Macroeconomics Annual*, 5.

Hemming, R., M. Kell, and S. Mahfouz (2002), "The effectiveness of fiscal policy in stimulating economic activity – A review of the literature", *IMF Working Paper*, 02-87.

Masson, P., T. Bayoumi, and H. Samiei (1995), "Saving behavior in industrial and developing countries", *IMF Staff Studies for the World Economic Outlook*. World Economic and Financial Surveys.

Reifschneider, D., R. Tetlow, and J. Williams (1999), "Aggregate disturbances, monetary policy, and the macroeconomy: The FRB/US perspective", *Federal Reserve Bulletin*, 1/1/1999.

Financial markets and Central Bank measures[1]

Liquidity squeeze in the markets

Conditions in the global financial markets have deteriorated markedly since the last Monetary Bulletin *was published in November 2007. The capital markets have changed radically, interest premia have risen steeply, and in a sense, the market is actually closed to many issuers. The market for covered bonds, an important source of funding for financial institutions during the years from 2005 to 2007, has contracted, and liquidity is a growing problem among financial institutions, which have begun to baulk at engaging in transactions with one another for fear of further difficulties. The European Central Bank and the US Federal Reserve Bank have enhanced access to liquidity by relaxing the rules on securities eligible as collateral for transactions with them, and the Federal Reserve has lowered its federal funds rate by a total of 2.5 percentage points. It is widely held that, in the US, the current financial market crisis will lead to an economic recession. Icelandic financial institutions have also felt the effects of the situation. Their access to foreign capital is limited, and interest premia are high. There is a shortage of foreign currency, financial institutions hold fast to foreign liquidity, and the currency swap market is virtually non-functional, which obstructs the transmission of monetary policy. There is no shortage of krónur as yet, but the demand for foreign currency is keen, and the exchange rate of the króna has fluctuated widely.*

Foreign central banks increase access to liquidity

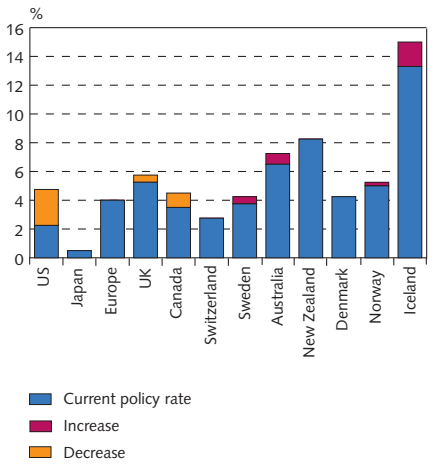
The financial market crunch that began in August 2007 with the US sub-prime mortgage crisis appears likely to continue with no immediate end in sight. Not only is it unclear how much of their assets banks will have to write off, but very little is known about who the owners of the worthless assets actually are. Banks are reluctant to lend to one another except for very short periods of time and with high interest premia. Banks' funding costs have risen substantially, and even the largest and most trustworthy financial institutions have limited access to bond market funding.

Central banks have responded by increasing banks' access to liquidity. Rules on collateral have been relaxed, and central banks have concluded swap agreements to guarantee access to foreign-currency liquidity. Since September the US Federal Reserve Bank has lowered its federal funds rate from 4.75% to 2.25% in five increments, despite mounting inflationary pressure. The European Central Bank has not lowered its base interest rate but has relaxed its collateral requirements, while the Bank of England has lowered its minimum bid rate by 0.5 percentage points, to 5.25%. The Bank of England and the central banks in the United States, Europe, Canada, and Switzerland have concluded agreements in order to increase banks' access to liquidity in currencies other than their own. They originally made such agreements in December 2007, thus demonstrating just how international the structure and operations of banking institutions are.

Lack of liquidity has already driven many financial institutions into a liquidity squeeze. The British government stepped in and nationalised the mortgage lender Northern Rock, and in the US, JP Morgan acquired securities broker Bear Stearns with support from the Federal Reserve. Many fear that there is more to come. Thus the current financial market situation could persist for some time.

Chart 1

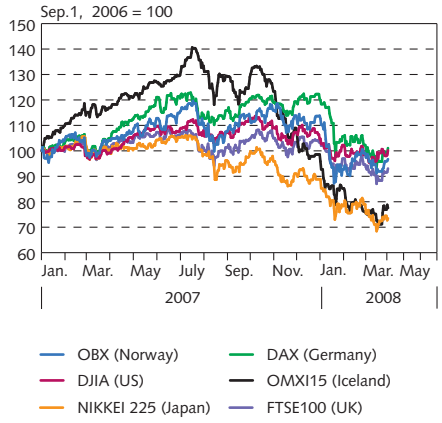
Changes in selected central banks' policy interest rates since the last *Monetary Bulletin*



Source: Reuters.

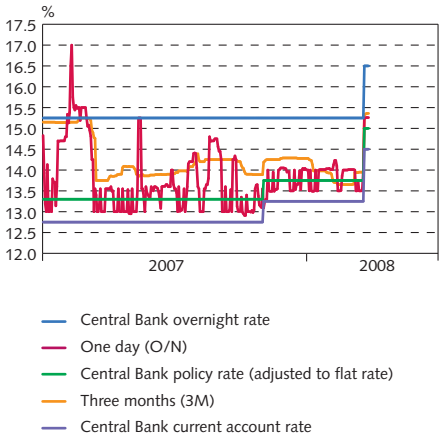
1. This article uses data available on April 7, 2008.

Chart 2
Development of selected share indices
Daily data January 1, 2007 - March 31, 2008



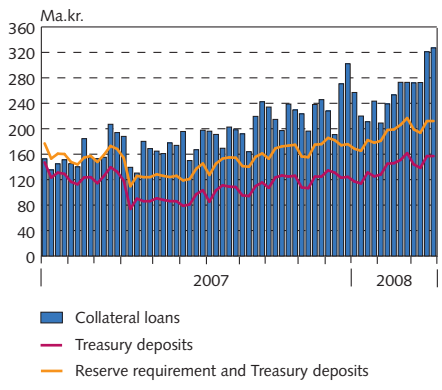
Source: Bloomberg.

Chart 3
Interest rates in the interbank market and Central Bank policy rate
Daily data January 3, 2007 - March 31, 2008



Source: Central Bank of Iceland.

Chart 4
Collateral loans, Treasury deposits and revenue requirements
Weekly data February 6, 2007 - March 26, 2008



Source: Central Bank of Icleand.

Equity prices have plunged all over the world, and investors have fled to less risky options such as government bonds.

The Central Bank of Iceland increases access to liquidity ...

Domestic financial institutions have felt the effects of the liquidity squeeze. They have limited access to foreign markets, and interest premia are higher than ever before. Banks hold tight to foreign capital, and as a result the currency swap market no longer reflects the differential between interbank rates in krónur and foreign currencies. Because of the high funding costs sustained by Icelandic banks, spreads on swap agreements have dropped precipitously, and there is great reluctance to make swap agreements at all. Foreign investors hesitate to hedge their positions through the money market because of increased counterparty risk. In March, the Treasury and the Central Bank responded with increased issuance of short-term Treasury notes and electronic registration of Central Bank certificates of deposit, which are fully transferable. These securities are a viable alternative for investors that have issued Glacier bonds but can no longer hedge their positions through swap agreements or deposits. The Treasury also held an auction of short-term Treasury notes (RIKB 08 1212) in order meet the demand for risk-free króna-denominated bonds, and sold T-notes for roughly 7.5 b.kr. in the auction.

... and adapts its rules to coincide with Europe

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. The amendments will take effect when regular information gathering concerning the balance sheet items of Icelandic financial companies' foreign branches has been implemented. Although no figures are currently available, it can be expected that this change will considerably lighten the reserve requirements of those banks that operate branches abroad; however, the effect on individual financial institutions varies greatly. The minimum reserve requirement in April was 53 b.kr.

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 March, the Bank liberalised its rules on collateral for regular transactions and overnight loans. It now accepts foreign securities if they meet the requirements concerning registration, credit rating, and so forth. Covered bonds are also accepted if stringent credit rating requirements are met, and securities submitted by the issuers themselves are likewise eligible. Liquidity facilities have increased somewhat as a result of these amendments to Central Bank rules.

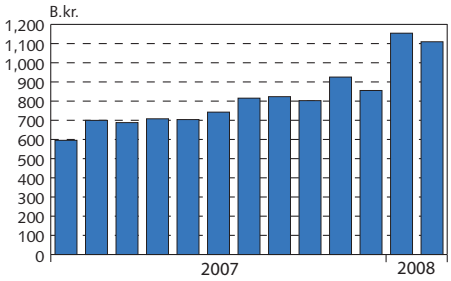
The Treasury's balance with the Central Bank has continued to increase, and Treasury finances have been sound. Balances fluctuate to a degree, but the trend is upward.

Foreign funding is difficult for the banks …

The Icelandic króna has depreciated substantially since *Monetary Bulletin* was issued in November. There is a discernible lack of foreign liquidity, and domestic financial institutions have had difficulty obtaining funding from abroad due to tight market conditions and high interest premia.

Unlike the situation in 2006, Iceland's banks are now far from being alone in a tight position, but their interest premia are much higher than those of other banks with similar credit ratings. It is likely that the collapse of the market for collateralised debt obligations (CDO) pressed domestic banks' CDS spreads upwards. Foreign bond issues by domestic banks have been popular in CDOs in recent years, as their interest premia have been high in relation to their credit ratings since 2005. Many CDOs have been unwound in recent months, and those who receive the securities hedge against the credit risk by purchasing credit default swaps. Another explanation for the high CDS spreads is that Iceland is not an active securities lending market, and there is a limited supply of securities for short sales. Short positions are therefore taken through the CDS market.

Chart 5
Forward currency position
of the commercial banks
At end of month February 28, 2007 - February 29, 2008



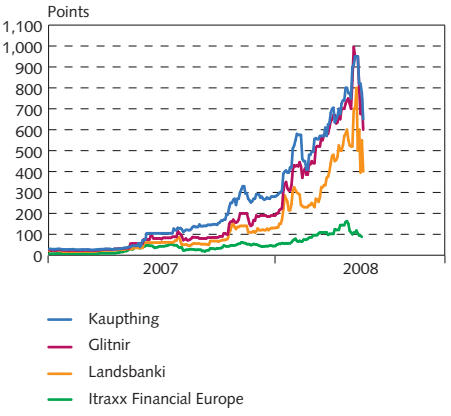
Source: Central Bank of Iceland.

Króna under pressure

Trading on the currency market has been brisk so far this year. March saw record trading volumes of 1,200 b.kr. In August 2007, the second-busiest month to date, volumes were quite a bit less, or 750 b.kr. The króna depreciated sharply in March, most likely due in part to the situation in the currency swap market. The króna recovered somewhat in early April. The currency swap market has not functioned normally due to lack of foreign liquidity, and investors have closed short positions on the currency markets and long positions in the króna, as is described above. It is difficult to envision the swap market returning to normal before access to foreign capital improves. However, the issue of securities short-term, risk-free securities denominated in krónur enables investors to hedge their exposures in the króna.

On March 25, the Central Bank responded to the deteriorating inflation outlook triggered by the drop in the exchange rate with a 1.25 percentage point increase in the policy rate. The policy rate hike, which was announced between scheduled interest rate decision dates, was an appropriate move in view of exchange rate developments and the Bank's announcements.

Chart 6
CDSs of Icelandic banks
and Itraxx Financial Index
Daily data May 2, 2007 - April 7, 2008



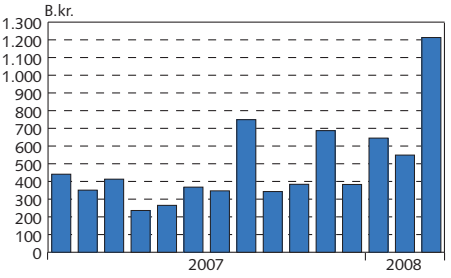
Sources: Bloomberg, Reuters.

The Central Bank slows down its foreign currency purchases

The Central Bank's foreign reserves now stand at 220 b.kr. After having been increased substantially through Treasury borrowing in late 2006. The reserves are invested in highly liquid debt securities with a high credit rating, and in cash. The Central Bank's net foreign reserves consist of euros (45%), US dollars (35%), pounds sterling (15%), and yen (5%), and now exceed the Treasury's entire foreign debt.

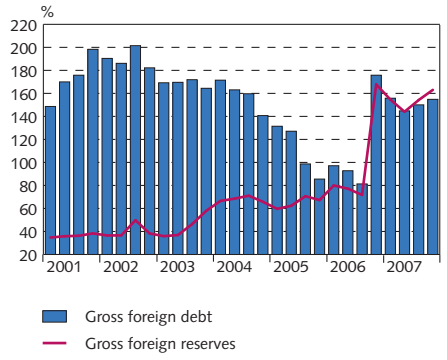
At the end of March, the Bank temporarily discontinued its regular purchases of foreign currency due to the turmoil in the markets and the tight foreign liquidity position of domestic financial institutions. However, it reserves the right to begin purchasing foreign currency

Chart 7
FX market turnover
January 2007 - March 2008



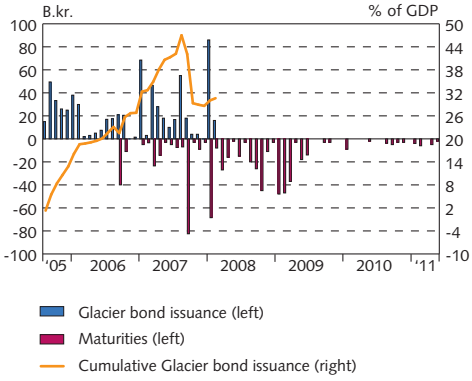
Source: Central Bank of Iceland.

Chart 8
Gross reserves and gross central government foreign debt
Q1/2001 - Q4/2007



Source: Central Bank of Iceland.

Chart 9
Króna Eurobond issuance[1]
Monthly data



1. Data until April 2, 2008 inclusive.
Sources: Reuters, Central Bank of Iceland.

again, in the same manner as before, without prior notice. The Bank's regular purchases totalled 6 million US dollars per week.

Positive net issuance of Glacier bonds

Glacier bond issuance increased significantly in January, when bonds valued at 68.5 b.kr. matured. In January alone, issuance totalled 86 b.kr., or just over 17.5 b.kr. net of maturities. However, no Glacier bonds have been issued by foreign parties since February. The banks' balance in forward foreign-denominated assets has also remained largely unchanged in the past three months, but there are few indications that foreign investors have closed out long positions in the króna. The balance has decreased, however, measured in foreign currency. The explanation for the steep decline in the exchange rate of the króna seems therefore to lie rather in currency purchases by domestic entities. Many Icelanders are indebted in foreign currency, and the recent depreciation of the króna has encouraged many of them to swap their debt into the króna. The banks also hold foreign reserves and, in accordance with the Central Bank Rules on Foreign Exchange Balance, are authorised to maintain a long position amounting to 30% of equity. It is possible to obtain an exemption from the Rules in order to protect the capital ratio. The Bank has granted such exemptions.

Bond market activity

The bond market has been lively so far in 2008. In the first three months of the year, turnover on the OMX Iceland exchange was 1,619 b.kr., as opposed to 2,430 b.kr. for all of 2007. An overwhelming proportion of total bond trading was in Treasury-guaranteed bonds. In 2007, bonds issued by the Treasury and the Housing Financing Fund (HFF) represented 95% of total trading on the exchange. For the first three months of 2008, they constituted 96% of total trading volume. The second-highest turnover is in bonds issued by banks and savings banks, with a 2% trade ratio, followed by corporate bonds. It must be considered disappointing that the trade ratio of bonds from issuers other than the Treasury and HFF should be no higher. One of the aims of the Treasury issues was to establish a foundation for the pricing of other bonds in the market. Market making in bonds issued by financial institutions and corporations – similar to that with HFF and Treasury bonds – would doubtless stimulate bond trading.

Trends in yields

Yields of the shortest series of Treasury notes have fluctuated between 12% and 15% since the beginning of the year and are now at the upper end of that range, which is positive from a monetary policy standpoint. Due to strong demand for short-term Government-guaranteed bonds, the Treasury decided to open the Treasury note series RIKB 08 1212 and expand it by up to 10 b.kr. The auction was held in March, and the size of the series is now 22 b.kr. According to the Treasury's Issuance Calendar for 2008, a new two-year Treasury note series will be introduced in November 2008, and it is expected that 12 b.kr. will be issued in that series this year. The auction of the shortest T-note series will not affect these plans. No Treasury bill issuance is ex-

pected this year, and no bills are currently outstanding. However, as is mentioned above, the Central Bank has issued certificates of deposit, which are transferable electronic securities. They are registered with the Clearstream settlement system, which should facilitate purchase by foreign investors.

Fluctuating yields …

Yields on indexed bonds peaked in November 2007 and remained high until mid-December, whereupon they declined considerably. In 2007, yields on Treasury notes developed in line with HFF bonds, rising steadily and peaking in mid-December. At that point, yields dropped quickly on all T-note series and bottomed out at the end of January. Since the beginning of February, Treasury note yields have diverged from HFF bond yields. In February and March, yields on nominal bonds rose sharply, while indexed yields continued to fall.

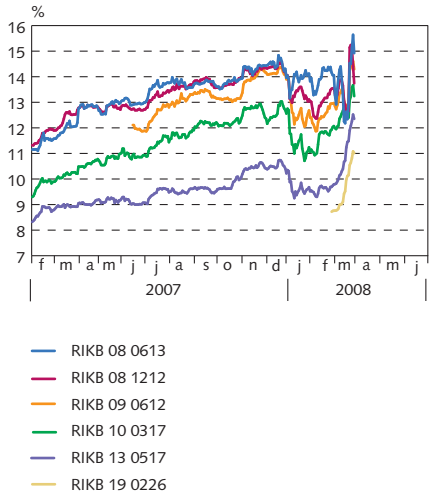
The Treasury introduced a new 11-year Treasury note in February. The market has been demanding longer Treasury note series for some time, and the first auction was a success. The second auction of the series was held under difficult market conditions, on a day of great volatility in all markets. As a result, it was decided only to accept bids for 3 b.kr. The size of the series is now around 14 b.kr., but the Treasury plans to expand it to 30 b.kr. this year.

Yields on Treasury notes and HFF bonds dropped in December, as investors reduced their exposure to risk and moved from equities to bonds late in the year. At that point, investors were most interested in nominal and indexed bonds. Concurrent with the depreciation of the króna in February, yields on indexed bonds fell, while they rose on Treasury notes. The market's inflation expectations therefore changed decidedly in a short period of time. The strengthening of the króna in the beginning of April has eased inflation expectations slightly.

… and falling equity prices

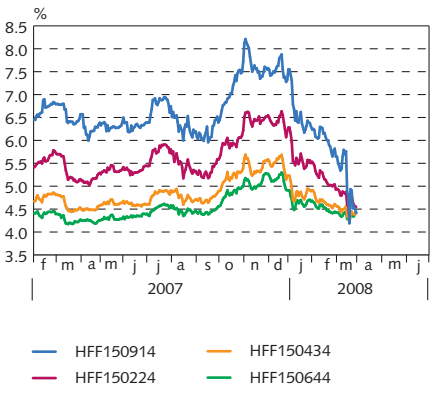
The OMXI15 index has declined significantly in a very short period of time. It stood at 8,200 points in the beginning of November but had fallen to 6,300 at the end of the year. Since then, the OMXI15 has dropped still further, falling to 4,500 points in March, a 50% decline from its peak in July 2007. Financial undertakings and investment companies have led the losses. 78% of the index is composed of the shares of Kaupthing, Glitnir, Landsbanki, FL Group, and Exista, which have fallen in price more than most other companies. Equity prices recovered somewhat in the beginning of April, and the OMXI15 stands at 5,400 as of this writing.

Chart 10
Treasury note yields
Daily data February 1, 2007 - March 31, 2008



Source: Central Bank of Iceland.

Chart 11
HFF bond real yields
Daily data February 1, 2007 - March 31, 2008



Source: Central Bank of Iceland.

Ásgeir Daníelsson[1]

Errors in macroeconomic forecasts

As the saying goes, it is difficult to predict – especially the future. Nonetheless, we must attempt to predict the future if we intend to respond in time and affect the course of the events to come. Weather forecasts, forecasts about fish stocks, macroeconomic forecasts, population projections, and forecasts of future traffic patterns are examples of predictions that are made on a regular basis. Although a great deal of work lies behind these forecasts – for it is important that they be as well prepared as possible – they are usually subject to significant uncertainty. Those who prepare forecasts and those who use them should therefore make a regular practise of scrutinising forecast errors in an attempt to learn from them. In Iceland, it is increasingly common that those who prepare macroeconomic forecasts publish previous forecasts together with the most recent actual figures concerning past periods. Both the Economic Department of the Ministry of Finance and the Central Bank do this on a regular basis. It is less common that a methodical review of these errors is carried out in an effort to determine how accurate the forecasts are, whether they are improving as time passes, and whether they contain systematic errors.[2]

Methods for assessing forecast quality

At first perusal, assessing forecast quality might seem simple. It can be done by comparing forecast values with actual measurements and assessing the quality of the forecast in terms of the size of the error. This is correct, of course, but many problems arise when an attempt is made to draw conclusions based on such a comparison. Naturally, it is not possible to draw broad-based conclusions from the outcome of a single forecast. When uncertainties exist, chance will always play some part in determining the success of individual forecasts; therefore, it is necessary to examine forecast errors over time in order to draw conclusions concerning forecast quality. It is then necessary to find a method for quantifying several forecast errors with a single figure. The most common method is to examine the average of the square of the errors (root mean square forecasting error, or RMSFE), but the average of the absolute value of the errors is also used.

The forecast with the smallest average error is presumably the best one. However, it could arise that one forecast appears best in terms of the RMSFE, while examining the average of the absolute values of forecast errors produces a different result. It is also possible that the forecast method that produces the best forecast for the cur-

1. The author is an economist at the Central Bank of Iceland Economics Department. He wishes to thank Thórarinn G. Pétursson for helpful comments and Gudjón Emilsson for assistance in processing data. The author alone is responsible for any errors that may remain. The views expressed in this paper are those of the author and do not necessarily represent the views of the Central Bank of Iceland.

2. Several appraisals of National Economic Institute forecasts have been carried out: Tryggvi Felixson and Már Gudmundsson, "Observation of economic forecasts by the National Economic Institute" (in Icelandic), 1974 to 1986, Fjármálatíðindi 1988/1, pp. 50-58; Björgvin Sighvatsson, "National accounts and macroeconomic forecasts in the light of experience" (in Icelandic), Fjármálatíðindi 1996/1, pp. 109-119; and Katrín Ólafsdóttir, "Appraisal of economic forecasts by the National Economic Institute, 1981-2002," Reykjavík University School of Business (VDHR-SBWP-2006-01). The paper by Ásgeir Daníelsson entitled "Accuracy in forecasting macroeconomic variables in Iceland" discusses errors in National Economic Institute forecasts, as well as errors in forecasts by the Central Bank of Iceland and others. The paper is forthcoming as part of the Central Bank of Iceland Working Papers series.

rent year may prove much less effective in forecasting for the following year.

Although it is convenient to assume that a decrease in the average error measured by RMSFE is an indication that forecasts are improving, this is not necessarily the case. It could be that forecasting has become easier due to changed conditions. For example, recent studies show that the variability of economic aggregates has diminished in many leading industrial nations. A similar development has taken place in Iceland as well.[3] This reduced variability has made it easier for economists to carry out forecasting. However, the errors in forecasts using some naïve forecasting method have decreased more than errors in forecasts using more sophisticated methods; thus the difference in quality between sophisticated and naïve forecast methods has diminished as well.

From a pure theoretical point of view, the best forecasting method is that which utilises all significant information that is known at the time the forecast is prepared, so as to minimise errors. Though this criterion is certainly important, it is not easy to use it in evaluating a given forecasting method because it is usually difficult to determine whether all significant information has been utilised. Therefore, the evaluation of forecasting methods has focused either on examining the properties of errors (mainly examining whether there is a significant bias or autocorrelation in the errors and, if so, improving the forecasts by correcting for it), on comparing the errors generated by a given forecasting method with those generated by some naïve method, or on comparing the errors with some measure of volatility in the variable being forecast.

Errors in National Economic Institute forecasts

The National Economic Institute is the only Icelandic institution that has carried out forecasting of changes in macroeconomic aggregates in Iceland for long enough that it is possible to conduct an in-depth appraisal of its forecasts. The Institute prepared forecasts of changes

Table 1 Errors in National Economic Institute forecasts

	September forecast		*Standard deviation*	*Standard deviation*	*March forecast*	
Unit %	*Mean error*	*RMSFE*	*Change in GDP*	*Change in National income*	*Mean error*	*RMSFE*
1974-1986	-2.95	3.76	3.14	4.83	-3.05	4.40
1987-2002	-1.57	2.84	3.05	3.59	-1.12	2.24
1974-1994	-2.52	3.66	3.43	4.65	-2.54	3.75
1995-2002	-1.32	1.99	2.25	2.26	-0.53	1.63
1974-2002	-2.19	3.28	3.12	4.14	-1.99	3.24

3. This is discussed in the paper by Ásgeir Daníelsson entitled "The great moderation, Icelandic style," which is forthcoming as part of the Central Bank of Iceland Working Papers series.

in macroeconomic aggregates from 1974-2002. Table 1 shows the measurements of errors in the National Economic Institute's forecasts for several periods. In the first two columns are the mean error and the RMSFE for the forecasts of changes in GDP. The forecasts were prepared in the fall of the previous year.[4]

The last two columns contain the same information about errors in the forecasts prepared in March or April of the year to which the forecast pertains.

Column 3 of Table 1 indicates the variability in GDP during the period concerned. The table shows that the standard deviation of proportional changes in GDP has diminished. It is quite clearly less during the period 1995-2002 than it was prior to that time. Column 4 shows that the variability in national income has diminished even further.

An examination of forecast errors reveals that there has been a strong tendency to forecast too little output growth. Testing to determine whether this bias is significant reveals that it is significant in all instances specified in Table 1, except for the period 1995-2002, when there were relatively few observations. However, no significant autocorrelation was found in the errors in any period.

Table 1 shows that, in several instances, the forecasts carried out in March contain more errors than those prepared six months prior. Other things being equal, forecasts that are prepared later – when a greater amount of information is available – can be expected to be better.

In Table 1, it can be seen that the errors in the National Economic Institute forecasts for changes in GDP are smaller during later periods. This could indicate that forecasting methods have improved,[5] but it could also be due to lesser variability. If the ratio of RMSFE (columns 2 and 6 in the table) to the standard deviation in changes in GDP and national income (columns 3 and 4) is used as a criterion, the quality of March forecasts has improved substantially in both cases. The September forecasts are better in terms of changes in GDP, while there is no difference in terms of changes in national income.

An examination of the National Economic Institute's September forecasts of changes in private consumption reveals that the errors are significantly negative in most cases and, although the errors diminish substantially, they diminish little more than does the variability in the aggregate being forecast. Errors in forecasts of investment, exports, and imports are also negative; however, the bias does not reach the 5% significance level, although the difference is small for the longest periods.

Errors in Central Bank forecasts

The Central Bank has included macroeconomic forecasts in its *Monetary Bulletin* ever since the first issue was published in November 1999. During the first years, the National Economic Institute prepared these forecasts. Following this was a period during which the staff of

4. These forecasts were published in the national budget issued by the Office of the Prime Minister.

5. For example, the Institute began to use an econometrically estimated model in its forecasting in 1989..

Table 2 Errors in Central Bank forecasts

Unit %	*GDP*		*Private consumption*		*Public consumption*	
Forecast prepared:	*Mean error*	*RMSFE*	*Mean error*	*RMSFE*	*Mean error*	*RMSFE*
(t-1) Q3	-1.231	2.221	-1.444	4.204	-1.173	1.550
(t-1) Q4	-1.436	2.321	-0.908	3.696	-1.005	1.274
t Q1	-1.755	2.146	-1.546	3.567	-1.118	1.407
t Q2	-1.305	1.938	-0.902	3.449	-1.018	1.311
t Q3	-1.502	1.684	-0.795	2.155	-0.888	1.230
t Q4	-1.449	1.815	0.035	1.128	-0.693	1.364

the Bank's Economics Department carried out the forecasts using the National Economic Institute model. Since the first quarter of 2006, however, the Central Bank has used its own Quarterly Macroeconomic Model (QMM) to prepare its forecasts.

In examining forecasts, it is very important to compare forecasts that are similar in terms of underlying information. This paper classifies the forecasts in *Monetary Bulletin* by date of publication. This classification means that the number of tests for errors in specific types of forecasts is very small, or 7-8.

Table 2 shows the mean forecast error and the RMSFE for the forecasts of changes in GDP, private consumption, and public consumption for the period 2000-2007. The top row shows the errors in the forecasts that were published in the third issue of *Monetary Bulletin* in the year prior to that to which the forecast pertains. The second row shows the errors in the forecasts that were published in the *Monetary Bulletin* issue immediately following, and so on. The bottom row shows the errors in the forecasts that were published in the fourth issue of Monetary Bulletin in the year to which the forecasts pertain.

Table 2 shows that the mean error was negative in all of the forecasts except one; that is, the actual growth in the aggregates was greater than was projected in all forecasts except one. Despite the small number of observations, the negative bias in the forecast for GDP is significant in many instances. The negative bias in the forecast for private consumption, however, proved not to be significant. In both instances, the RMSFE diminishes over time, as a greater amount of information becomes available. The reduction is greatest in the forecasts of changes in private consumption.

Some observers might conclude that it is rather simple to forecast public consumption and public investment, as these are decided in advance in national and local government budgets. In Tables 2 and 3, which illustrate the errors in these forecasts, it can be seen that the mean error in the public consumption forecast is negative. Although it is only negative by approximately 1%, this bias is significant because of the small variability of the error.

A simple forecast that always allows for unchanged public consumption is of extremely poor quality.[6] On the other hand, the method that predicts that public consumption will change as it is estimated to

6. This means that the public consumption forecast is considered good in terms of the value called Theil's U.

Table 3 Errors in Central Bank forecasts

Unit %	*Public investment*		*Exports*		*Resident. investment*	
Forecast prepared:	*Mean error*	*RMSFE*	*Mean error*	*RMSFE*	*Mean error*	*RMSFE*
(t-1) Q3	-1.920	20.600	-1.826	5.920	-6.432	7.715
(t-1) Q4	-6.464	21.760	-1.283	5.558	-7.465	8.914
t Q1	-7.877	21.980	-2.583	5.715	-4.303	9.284
t Q2	-6.814	22.344	-1.864	3.970	-3.853	7.549
t Q3	-3.660	19.037	-2.335	2.452	-4.245	4.719
t Q4	-6.052	19.284	-2.508	5.296	-4.278	5.553

have changed in the year immediately preceding[7] is more accurate than the official forecast.

The mean error in the forecasts of public investment is negative; however, the variability is great enough that the bias is not significant. These forecasts are of very poor quality; actually, they are so poor that forecasts assuming that changes in public investment would always be zero would have yielded a smaller error than did the actual forecasts, which were based largely on information from public entities. It is also interesting to note that neither public consumption forecasts nor those for public investment improve to any marked degree when further information becomes available.

An examination of errors in forecasts of exports and residential investment reveals that the mean error has been negative – often significantly negative. This is particularly the case with forecasts of residential investment. Errors in export forecasts diminish as time passes and further information becomes available. There is little difference, however, between the forecasts made in the third quarter of the previous year and those from the first quarter, when the forecasts are little better than forecasts predicting no change in quantities of goods exported.

Table 3 shows that errors in forecasts of residential investment diminish very little over time and that the RMSFE is very high in comparison with the standard deviation for changes in this variable.

Errors in first releases of data from Statistics Iceland

Table 4 illustrates the difference between the first figures from Statistics Iceland and the most recent figures, which were published in March 2008. These first releases can be viewed as forecasts of the final

Tafla 4 Errors in first releases of data from Statistics Iceland

Unit %	*Mean error*	*RMSFE*
GDP	-0.942	1.564
Private consumption	-0.005	0.484
Public consumption	-0.393	1.347
Residential investment	-3.337	8.097
Public investment	-0.152	12.488
Total investment	-2.997	7.195
Exports	-0.731	1.719
Imports	-0.430	1.076

7. This method gives the best forecasts when the aggregate being projected follows a random walk trajectory.

figures. Table 4 shows the mean error and RMSFE of these forecasts for the period 2000-2006.

As Table 4 illustrates, the mean error is always negative. Despite the small number of observations, the negative bias in the forecasts of changes in GDP approaches the 5% significance level. The bias in the forecasts of residential investment is considerable but not significant; however, the RMSFE is large. Although the mean error in the public investment forecasts is small, the RMSFE is large for these forecasts as well.

Conclusion

It is worth noting that there have been negative biases in various macroeconomic forecasts in Iceland. In many instances – particularly in forecasts of GDP growth – the negative bias is significant. A bias of this type is not common in forecasts prepared by corresponding parties abroad; therefore, it is difficult to explain it here in Iceland. One contributing factor may be the conservatism surrounding the treatment of investments in the power and aluminium sectors, which are not included in forecasts until they have been formally approved. Furthermore, it is difficult for public institutions to deviate substantially from government estimates for public consumption, fish catches, etc.

It is appropriate to reiterate that the findings concerning forecasts published by the Central Bank are based on relatively few observations. It is also a possibility that the rapid economic growth during the period 2000-2007 affects the results; for example, the negative bias in the forecasts. For this reason, it may be too early to begin to correct for the bias by adding a measured bias to that derived from the forecasts using current methods.

Daníel Svavarsson[1]

International investment position: market valuation and the effects of external changes

Iceland's foreign assets as a proportion of GDP are among the highest in the world, but its foreign debt is also one of the largest. This paper provides a breakdown of the international investment position (IIP) of the Icelandic economy by asset type and currency composition. The author estimates the market value of inward and outward foreign direct investment (FDI). The results give a somewhat different picture of the net-position and development of foreign assets and liabilities in recent years. The analysis suggests that it is likely that the value of both FDI assets and liabilities is significantly underestimated in the official statistics. The proportion of FDI to total foreign liabilities is much lower, however, than to total assets; therefore, the impact on the net IIP is positive. These findings are further used to examine the effects of radical changes in external conditions on the IIP. The analysis shows that in the event of major changes in external economic conditions and the domestic economic outlook, the composition of the asset and liability stock greatly affects the net international investment position.

Introduction

Since the full liberalisation of capital movements to and from the country, Iceland's foreign asset and liability stocks have mushroomed and their composition has changed significantly. Icelandic firms were swift to take advantage of enhanced freedom. Many of them have achieved rapid international expansion by acquiring foreign firms, establishing branch offices, and founding new companies. Icelandic investors have also stepped up their investments in foreign securities, equities in particular. For the economy as a whole, this has meant, among other things, that residents' foreign assets have grown enormously in the space of a very few years. This expansion has been financed largely through foreign borrowing. Official statistics also indicate that Iceland's foreign liabilities have grown considerably more rapid than its foreign assets. That entails that the net IIP has deteriorated markedly in the past few years and is now very negative in terms of GDP; in fact it is at one of the highest levels among member nations of the Organisation for Economic Co-operation and Development (OECD).

The primary purpose of this paper is to estimate the Icelandic economy's stock of assets and liabilities using different methodologies, as well as analysing its composition. A second objective is to determine the implications of the change in size and structure of foreign assets and liabilities on the IIP in the event of significant changes in external conditions. In this context, changes in external conditions are defined as substantial changes in stock market prices and in the exchange rate of foreign currencies vis-à-vis the Icelandic króna.

1. The author is an economist at the Central Bank of Iceland Economics Department. He would like to thank Pétur Örn Sigurdsson, Arnór Sighvatsson, Jakob Gunnarsson and Tryggvi Pálsson for their constructive comments. The author alone is responsible for any errors that remain. The analysis is based on data and information available February 1st, 2008.The views expressed in this paper are those of the author and do not necessarily represent the views of the Central Bank of Iceland.

The impact of foreign investment on the IIP

One of the most significant changes in the foreign asset position of the Icelandic economy lies in the phenomenal increase in outward FDI by Icelandic residents.[2] At year-end 1997, the stock of outward FDI amounted to roughly 3.7% of GDP which makes up 17% of Iceland total foreign assets. At that time, the inward FDI stock totalled 4.6% of GDP, roughly equivalent to 7% of foreign liabilities.[3] By the end of Q3/2007, the outward FDI stock had increased to 115% of GDP and 23% of residents' foreign assets. The inward FDI stock on the other hand totalled 59% of GDP, or 9% of foreign liabilities.

In the official statistics, which adhere to international standards set by the International Monetary Fund (IMF) and OECD, Icelanders' outward FDI stock and non-residents' inward FDI stock are recorded at book value. It is generally assumed, however, that asset prices will rise over the long term. If the proportion of direct investment in the external balance sheet is high, it is therefore likely that the official statistics on the IIP will not fully reflect the market value of foreign assets and liabilities. International corporate mergers and acquisitions have two types of effects in particular on the item listed as direct investment in the international investment position. First, an Icelandic firm's acquisition of a foreign company is entered as a foreign direct investment in the amount that the acquiring firm records as the book value of the acquired entity. In some instances, the actual acquisition price can be much higher. This discrepancy is affected by items such as impairment of goodwill. Therefore, the book value and the transaction value need not be the same, and the difference is reflected in a change in the net IIP. Second, if the acquisition is financed in full or in part with shares in the Icelandic firm, the transaction also affects non-residents' portfolio equity investment in Iceland. This is because the foreign investors (the former owners of the foreign company) receive payment in the form of shares in the Icelandic company and have thereby invested in Icelandic equities.[4] As long as the foreign investors hold on to their shares, non-resident portfolio equity investment in Iceland has increased as a result of an acquisition of a foreign company by an Icelandic firm.

In many cases, a foreign acquisition, or merger, affects both the asset and the liability side of the IIP. An acquisition of a foreign entity increases assets, while the financing of the acquisition increases foreign liabilities. These transactions as such do not necessarily affect the IIP. However, the different types of accounting treatments applied to various categories of assets could result in a change in the net IIP. Let's take for example an Icelandic firm that acquires a foreign firm for 100 m.kr. It pays for the acquisition with 50 m.kr. in shares in the

2. Foreign direct investment in a company consists of the proportion held of the book value of its equity and the net liability position vis-à-vis the company. An investor who grants credit to a subsidiary in another country increases his investment in the same way as with an equity capital contribution. When an investor owns 10% or more in an entity, this is defined as direct investment. Shareholdings under 10% are defined as portfolio equity investment.
3. Foreign investors include domestic entities that are registered abroad, such as holding companies and other entities domiciled abroad.
4. This assumes that the foreign entity's share in the Icelandic company is less than 10%.

Icelandic company and takes a long-term foreign-currency loan for the other 50 m.kr. The book value of the foreign company is only 75 m.kr., however. The effect of this transaction on the IIP would be as follows:

Foreign assets:	Direct investment: +75 m.kr.
Foreign liabilities:	Foreign loans: -50 m.kr. + portfolio equity: -50 m.kr. = -100 m.kr.
Net position:	-25 m.kr.

In this example, the net IIP deteriorates, even though the increase in foreign assets essentially equals the increase in foreign liabilities.[5] The differing composition of foreign assets and liabilities changing hands in this transaction also affects the value of asset and liability stock from one time to another. For instance, assuming that one year later the market value of the Icelandic parent company rises as much as that of the acquired foreign company, i.e. the value of both entities increases by 20% – the effects on the IIP would be as follows:

Foreign assets:	Direct investment: +75 m.kr. (book value unchanged)
Foreign liabilities:	Foreign loans: -50 m.kr. (unchanged) + portfolio equity: -50 m.kr. * 1.2 (increase of 20%) = 110 m.kr.
Net position:	-35 m.kr. (deteriorates by 10 m.kr.)

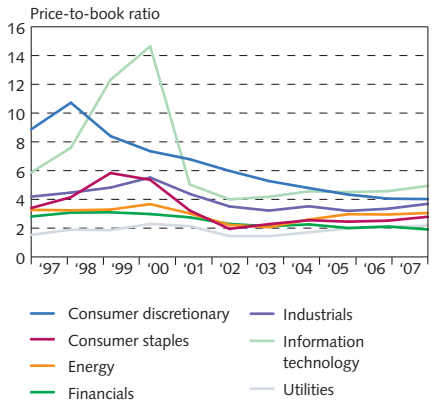
Here the net IIP deteriorates because the portfolio equity investment is recorded at market value. Portofolio equity is revalued on a quarterly basis in official statistics, while the FDI is entered at book value, which does not necessarily reflect the market value of the asset in question. Had the same method been used to enter the direct investment and the portfolio equity investment, the IIP one year after the acquisition would have been as follows:

Foreign assets:	Direct investment: +100 m.kr. (original market value) * 1.2 (increase of 20%) = +120 m.kr.
Foreign liabilities:	Foreign loans: -50 m.kr. (unchanged) + portfolio equity: -50 m.kr. * 1.2 (increase of 20%) = -110 m.kr.
Net position:	+10 m.kr. (improved by 10 m.kr. since the original acquisition and 45 m.kr. higher than if based on the above method)

In the long term, it is likely that the recorded value of the portfolio equity investment will increase over and above the recorded value of the direct investment. The fact that FDI is most likely underestimated in comparison with other types of assets in the IIP is of considerable importance for Iceland. This is because, in Iceland, the stock of FDI as a proportion of total assets is very high compared with other countries, as well as being much higher than the corresponding stock of assets held by non-residents in Iceland (see e.g. Svavarsson and Sigurdsson (2007)).

5. There are instances where large stakes in companies are purchased at a premium; that is, considerably above the last recorded market price. This example assumes that the purchase price reflects the actual market price of the asset.

Chart 1
Price-to-book value 1997-2007
Average values for S&P 500 industry sub-indices



Source: Reuters-EcoWin.

Foreign direct investment at market value

The IMF (1993) recommends that FDI be recorded at market value. Naturally, however, the market value of unlisted companies is an unknown quantity, and there is no generally accepted method for recording direct investment in unlisted companies at their estimated market value at any given time. As a result, most countries, including Iceland, have elected to record the stock of direct investment at book value. In instances involving companies not listed on a securities exchange, this method has a number of advantages from an accounting point of view. However, there are also a number of drawbacks, as is shown in the example above. Book value reflects recorded equity plus a company's aggregate profit, less dividends paid. Equity is defined as the difference between a company's assets and its liabilities.[6] In other words, if a company were dissolved, its book value should reflect the residual value to the owners after debts have been paid. The market value, on the other hand, is the amount that potential buyers are willing to pay for a share in the company at any given time. In general, market value is higher than book value because, in addition to reflecting the value of a company's equity, it incorporates the value of intangible assets such as goodwill and human capital.[7] The ratio of market value to book value of a company (the price-to-book or p/b ratio) generally varies by sector and fluctuates considerably over time (see Chart 1). For example, the p/b ratio tends to be lower in capital-intensive industries than in human resources-intensive sectors.

The methodology used in this paper to convert the book value of direct investment to estimated market value is relatively simple but considerably data-intensive. It is based on the assumption that the ratio of book value to market value for listed companies is comparable to that for unlisted companies.[8] The market value of direct investment in a given industry or sector is estimated by calculating the average p/b ratio of listed companies in that industry or sector in the country concerned. The book value of the unlisted asset is then simply multiplied by the resulting coefficient.[9]

In order to assess the market value of the stock of Iceland's FDI, it is necessary to compile data on the geographical distribution of the assets, on the one hand, and the sector distribution in each country, on the other. For this study, market data were collected on the p/b ratio of

6. The issue of new share capital increases the book value of listed companies, while dividend payments and purchases of own shares reduce book value.
7. This is far from a universal rule, however, because the market value of listed companies can also fall below book value. This happened, for example, in Norway in 2002, when the market value of listed companies was, on average, lower than the book value. In mid-March 2008, The Economist also estimated that the market value of up to 60% of companies on the Nikkei 225 index in Japan was below book value (Economist 2008).
8. This assumption is subject to various limitations. Among other things, it can be argued that the market value of unlisted companies should be lower than that of listed companies by an amount corresponding to the liquidity premium. Therefore, estimated market value calculated according to this method may be more likely to be an overestimation than underestimation.
9. This methodology is consistent with one of six methods that OECD (2008) recommends for estimating the market value of direct investment in its draft revision of the benchmark definition of foreign direct investment. Reference is made to the recommendations from OECD concerning recording foreign direct investment at market value in draft version of IMF's Balance of payments and international investment position manual (IMF 2007).

listed companies in the countries concerned, by sector. Itemised data were available for listed companies in the US, the euro area, and Iceland, but a breakdown by sector was not available for other regions. In those instances where a detailed itemisation by sector was not available, the ratios for the region's leading stock index were used instead.

The same method was used to assess the market value of the inward FDI stock. Early in the period covered by the study, however, a high proportion of the inward FDI stock was concentrated in sectors where no company was listed on the Icelandic stock exchange. In those cases, the study relied on the p/b ratio of the relevant sector extracted from the Standard & Poors 500 industrial index.

The findings show that the estimated market value of inward and outward FDI is, on average, more than twice the recorded book value (see Chart 2). These findings are consistent with the results of comparable studies carried out in Sweden and the United Kingdom (Blomberg and Falk 2006; Blomberg and Österberg 1999; Kubelec, Orskaug, and Tanaka 2007).[10] It is difficult to verify the estimated market value obtained using this method, however, because unlisted companies are not sold on stock exchanges. In all likelihood, however, this method gives a more accurate view of the actual market value of direct investment than book value does, and therefore provides a clearer view of Iceland's international investment position.

The net balance of FDI at estimated market value rose from just below 20% of GDP at year-end 2004 to over 150% of GDP at the end of Q3/2007. In 2004, the net balance of FDI in terms of book value was similar to that based on estimated market value. The increase between 2005 and 2007 is much less than the calculation of estimated market value suggests, however.

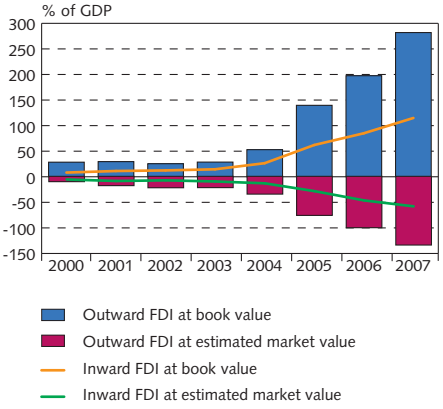
Net IIP considerably more favourable than previously believed

Chart 4 shows the net international investment position of the economy as a percentage of GDP, using both methods. There is a considerable difference in the results, depending on whether FDI is recorded at book value or at estimated market value. Based on the book value of FDI (as is done in the Central Bank of Iceland's official statistics), the net IIP deteriorated drastically between year-end 2003 and year-end 2006, or from -63% of GDP to -120% of GDP. Towards the end of Q3/2007, the proportion remains broadly unchanged year-on-year. Using estimated market value as a basis for calculation,

Chart 2

Foreign direct investment 2000-2007[1]

Comparison of estimated market value and book value

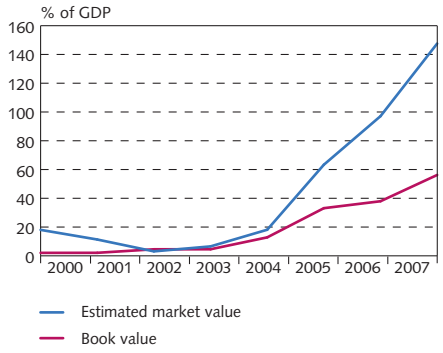


1. Data for 2007 are based on the IIP at the end of Q3.
Sources: Central Bank of Iceland and authors' calculations.

Chart 3

Net foreign direct investment 2000-2007[1]

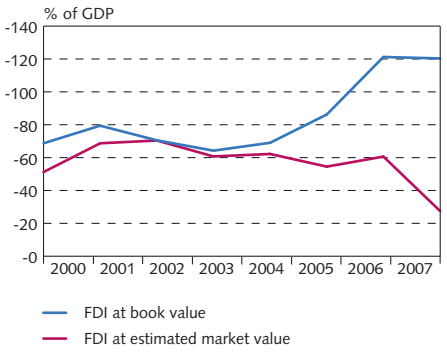
Based on book value and estimated market value



1. Data for 2007 are based on the IIP at the end of Q3.
Sources: Central Bank of Iceland and authors' calculations.

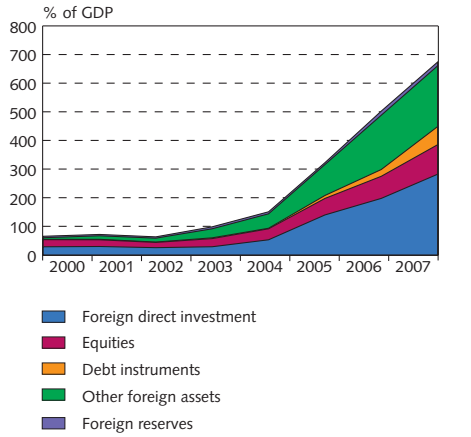
10. The methods used in these studies are not fully comparable, however, to the methodology employed here. Nonetheless, both methods are based on the same basic assumption: that market information on listed companies is a reliable indicator of developments in the value of unlisted companies. The Swedish method is based on using the previous year's price-earnings ratio (p/e ratio) of listed companies to determine estimated market value based on the profits of the unlisted companies. The average p/e ratio of listed companies in the 20 most important investment countries is weighted based on the book value of the FDI. The market value of the FDI is then determined by multiplying this weighted p/e ratio by the total profits reported by the FDI companies in each period. This method does not take into account the division of the investment base by sector. The British method is similar to that used here, except that a weighted p/b ratio of unlisted companies was initially estimated in a survey carried out in 1992. The market value of FDI is then simply assumed to change in line with developments in the stock indices in the countries concerned. This method does not take account of sectoral division of FDI in the determination of market value.

Chart 4
Net international investment position 2000-2007[1]
Based on FDI at book value and estimated market value



1. Data for 2007 are based on the IIP at the end of Q3.
Sources: Central Bank of Iceland and authors' calculations.

Chart 5
Composition of residents' foreign asset stock 2000-2007[1]
Balance at end of period from year-end 2000 to Q3/2007



1. Foreign direct investment is calculated based on estimated market value
Sources: Central Bank of Iceland and authors' calculations.

however, produces quite a different result. At year-end 2006, net IIP was -61% of GDP, nearly two times more favorable than suggested in the official figures. By the end of Q3/2007 it had improved still further, to -27% of GDP.[11]

Early in the period under study – i.e., in 2000 and 2001 – the net IIP based on estimated market value is considerably more positive than official figures indicate. In 2002 and 2003 the result is broadly the same, however, but from year-end 2004 onwards, the trend in net IIP as a percentage of GDP is much more positive if estimated market value of FDI is used as the basis for calculation. There are two reasons for this. First, the stock of FDI as a proportion of Icelanders' total foreign assets increases more rapidly than the corresponding proportion of non-residents' inward FDI (see Charts 5 and 6). Second, the weighted p/b ratio, which is used to estimate the market value of FDI based on book value, rises in the later half of the period. The p/b ratio falls consistently from 2000 - 2003 but then starts to rise. On the other hand, the corresponding ratio for non-residents' inward FDI rises during the period from 2000 - 2002, falls off slightly in 2003, increases in 2004, and then drops again in 2005 and 2006.

The composition of foreign assets and liabilities

As Charts 5 and 6 illustrate, Iceland's foreign assets and liabilities are enormous as a proportion of GDP. If FDI is calculated based on estimated market value, then foreign assets totalled 674% of GDP at the end of Q3/2007, as opposed to 563% at year-end 2006. However, if the evaluation of FDI is based on book value, foreign assets totalled 507% of GDP at the end of Q3/2007, and 390% of GDP at year-end 2006. The total stock of foreign assets was therefore the equivalent of 167% of GDP and 173% of GDP larger, respectively, based on the estimated market value of FDI.

Gross liabilities are also very large in proportion to GDP. Based on the estimated market value of the stock of inward FDI, foreign liabilities amounted to over seven times GDP for the year 2007, as compared with 563% in 2006.[12] Based on book value of FDI, foreign liabilities totalled 626% of GDP in 2007, up from 510% of GDP in 2006.

High proportion of equities in the total stock of foreign assets

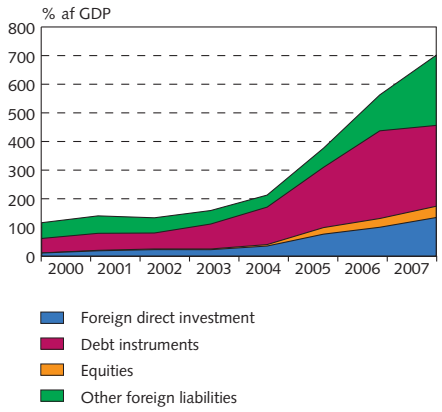
In the period 2000-2007 the proportion of equity assets (portfolio equity investment and direct investment) in the investment stock averaged 65% in terms of market value, as opposed to 55% in terms of book value. The proportion of corresponding non-residents' assets in Iceland to total liabilities was much lower, however, averaging 19% in terms of estimated market value and 11% in terms of book value. The net position of equity assets is therefore positive, while the net debt position is negative, which is not dissimilar to a hedge fund

11. It should be borne in mind that, because the asset stock and the liability stock are enormous as a proportion of GDP, relatively small movements in the asset and liability base could result in substantial changes in net IIP.
12. Based on IIP at the end of Q3/2007 and the Central Bank of Iceland forecast of year-2007 GDP in *Monetary Bulletin* 2007/3.

portfolio. A recent paper in *Monetary Bulletin* points out that the composition of leading industrial nations' outward investment stock increasingly resembles that of hedge fund portfolios (Svavarsson and Sigurdsson 2007). In other words, most industrial countries are net foreign borrowers and use the borrowed funds for outward direct and portfolio equity investment.

The vast increase in the IIP relative to GDP reflects to a significant degree the enormous overseas growth of Icelandic financial institutions. The balance sheets of Iceland's three largest banks have grown many times over in recent years, with assets totalling 11.354 b.kr. at the end of 2007, or the equivalent of 888% of estimated GDP. A significant proportion of their operations are therefore concentrated abroad. It is thus unlikely that the increase in foreign assets and liabilities attributed to the banks will have a significant direct impact on Icelandic households. However, it is probable that fluctuations in international financial conditions, and in the exchange rate of the króna, affect the banks' operating results, thereby affecting households and pension funds via their equity holdings. Indirect effects of extreme changes may further entail financial instability domestically with adverse macroeconomic ramifications.

Chart 6
Composition of foreign liability stock[1]
Balance at end of period from year-end 2000 to Q3/2007

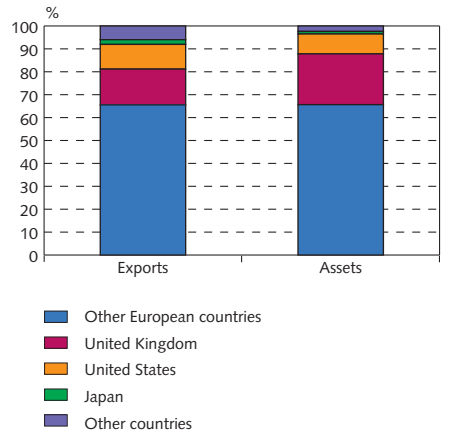


1. Foreign direct investment is calculated based on estimated market value.
Sources: Central Bank of Iceland and authors' calculations.

Investment concentrated in Europe, but net foreign liabilities mostly in US dollars

Chart 7 shows the geographical distribution of Iceland's merchandise exports in 2006 and a comparable geographical distribution of Icelanders' foreign asset stock. The chart shows clearly that Europe is by far Iceland's most important market, with over 80% of total exports. The proportion of Icelanders' foreign assets in Europe or in European currencies is even greater, nearly 90% of the estimated market value of the foreign asset stock. Naturally, it is to be expected that Icelanders will concentrate their investments in their main trading partner countries; however, this also makes them more vulnerable to economic volatility in the euro area and elsewhere in Europe. Therefore, a contraction in Europe's leading economies will likely affect demand for Icelandic exports while triggering a decline in the value of European equity assets and a depreciation of the euro. Chart 8 breaks down Iceland's external assets and liabilities. Most leading industrial nations are able to borrow funds in their own currency instead of issuing bonds in foreign currencies. In Iceland, however, liabilities in Icelandic krónur are essentially limited to equity assets, while other liabilities are in foreign currencies. It is primarily in US dollars and euros that Icelanders' liabilities exceed their assets. This entails that, when the króna weakens vis-à-vis these currencies, the net IIP deteriorates, and when the króna appreciates, foreign liabilities in krónur terms decrease more than assets. The graph also shows clearly, however, that Icelanders' net assets in pounds sterling have increased considerably since 2004. Therefore, changes in the ISK/GBP exchange rate have the opposite effect to changes in the króna vis-à-vis the dollar and the euro.[13]

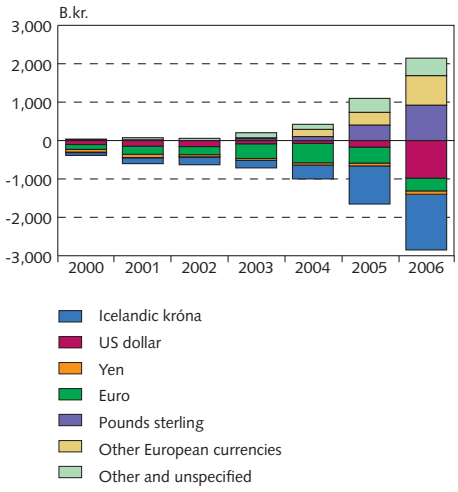
Chart 7
Exports and assets by region 2006[1]



1. Foreign direct investment is calculated based on estimated market value.
Sources: Central Bank of Iceland and authors' calculations.

13. This does not take into account the effects of possible foreign exchange hedging.

Chart 8
International investment position by currency 2000-2006[1]



1. Foreign direct investment is calculated based on estimated market value.
Sources: Central Bank of Iceland and authors' calculations.

Changes in external conditions – scenario analysis of the impact on net IIP

Different composition of assets and liabilities in terms of currencies and investment types can result in asymmetric valuation changes in the IIP. Recording FDI at estimated market value and a detailed decomposition of the IIP by currency and asset types enables a more thorough analysis of possible effects of major changes in the domestic and global economic outlook on the net IIP. Two factors, apart from the purchase and sale of assets, affect the value of assets and liabilities in terms of the domestic currency. First, changes in the exchange rate of the króna affect all foreign currency denominated assets. Second, changes in asset prices affect the market value of portfolio equity and direct investment.[14] In this section, the effects of four main scenarios on net IIP are examined, based on IIP at year-end 2006. The consequences of the simultaneous occurrence of two of these scenarios are also analysed separately. These scenarios do not represent forecasts of likely developments in the Icelandic or global economy. They are created solely with the aim of analysing the potential impact of dramatic changes in the exchange rate or in asset markets on net IIP.

The following scenarios were considered:
A. A 30% depreciation of the króna[15]
B. A 30% fall in global equity prices[16]
C. A 15% appreciation of the króna
D. A 15% rise in global equity prices

Table 1 gives the results of the analysis of scenario A and B. The first half of the table shows the results if direct investment is entered at book value, while the latter half (the last three columns) shows the results based on estimated market value.

A 30% depreciation of the króna greatly increases the value both assets and liabilities. In all, liabilities increase by 129% of GDP, while the market value of assets rises by somewhat more, or 148% of GDP. The effects of a weakening of the króna on liabilities are the same, regardless of whether the calculation is based on market value or book value, as FDI and portfolio equity liabilities are entirely in

14. As is stated above, official statistics do not take account of changes in the market value of FDI; therefore, it was necessary to estimate this variable specifically for this study. In the examples below, the effects on net IIP are calculated using both official book value and estimated market value of the foreign direct investment stock, as is described earlier in this article.
15. In Tchaidze's (2007) IMF Working Paper on Iceland's real equilibrium exchange rate, the author concludes that the real exchange rate of the króna needs to fall by 8-23% in order to guarantee external equilibrium in the Icelandic economy. According to calculations carried out by the Central Bank of Iceland (Monetary Bulletin 2007/3, pg. 64), this is equivalent to a 19-56% fall in the nominal exchange rate (Central Bank of Iceland 2007). Although a sudden 30% depreciation of the króna must be considered unlikely, it is not theoretically impossible.
16. Although it is unlikely that equity prices will decline so sharply over such a short time, such a development is far from unprecedented; for example, the MSCI stock index, which measures share price developments in all of the major global stock markets, fell by over 41% in a one-year period beginning in September 2000.

Icelandic krónur.[17] The overall effect on the IIP varies greatly, however, depending on which calculation method is used. If the calculation is based on the estimated market value of FDI, the effects are positive in the amount of 19% of GDP; however, if the calculation is carried out based on the book value of FDI, liabilities increase proportionally more than assets, and the net effect on IIP is therefore negative.

A 30% drop in global share prices reduces the market value of both asset and liability stock. However, the asset base declines by more than twice as much as the liabilities due to the much higher concentration of equities in the asset stock compared to the liability stock. The overall effect is that net IIP deteriorates by the equivalent of 43% of GDP.

Table 1 also shows the results of a 30% depreciation of the króna concurrent with a 30% decline in global equity prices. Despite the fact that the depreciation of the króna alone improves net IIP by some 19% of GDP, the drop in equity prices reduces net assets by a proportionally greater amount. The combined effects are more negative than the sum of the effects of each event separately because the effect of the decline in equity prices is compounded by the currency depreciation.

Table I Impact of substantial decline in asset prices and depreciation of the króna on IIP

	Based on book value[1]			*Based on market value*[2]		
	Assets	*Liabilities*	*Net position*	*Assets*	*Liabilities*	*Net position*
A. 30% depreciation of the króna	114	129	-14	148	129	19
B. 30% decline in global equity prices[1]	-23	-9	-14	-82	-39	-43
A and B	84	120	-35	41	89	-49

1. Foreign direct investment entered at book value. 2. Foreign direct investment entered at estimated market value.

The figures in the table indicate changes in the relevant base as a proportion (%) of GDP

Table 2 presents the results of an analysis of scenario C and D. Scenario C assumes that the króna appreciates by 15% against all major trading currencies, and scenario D assumes that domestic and global equity prices rise by 15%. The appreciation of the króna has the opposite effect on net IIP, depending on whether the calculation is based on book value or estimated market value of FDI. The overall effect on the net IIP is negative by 10% of GDP if estimated market value is used as the basis for calculation, while the overall effect is positive by 7% of GDP if FDI is entered at book value. These results are in line with the outcome from scenario A, which assumes a depreciation of the króna.

17. This only takes into account the first-round effects of the weakening of the króna on the FDI liability stock. Although the position is recorded in Icelandic krónur, the revenues of companies in the sectors in which inward FDI is most heavily concentrated are primarily in foreign currencies. The depreciation of the króna therefore entails that the value of foreign revenues, measured in Icelandic krónur, increases in proportion to the depreciation. Further, these companies' expenses are primarily in Icelandic krónur. Hence, in the medium term the value of the inward FDI stock should rise in line with increased revenues (measured in krónur) to the degree that concerned companies earn income in foreign currencies.

Tafla 2 Impact of increase in asset prices and appreciation of the króna on IIP

	Based on book value[1]			*Based on market value*[2]		
	Assets	*Liabilities*	*Net position*	*Assets*	*Liabilities*	*Net position*
C. 15% appreciation of the króna.	-57	-64	7	-74	-64	-10
D. Domestic and foreign equity prices rise by 15%	12	5	7	41	20	22
C and D	-47	-53	12	-39	-45	6

1. Foreign direct investment entered at book value. 2. Foreign direct investment entered at estimated market value.

The figures in the table indicate changes in the relevant base as a proportion (%) of GDP

An increase in share prices raises the value of foreign assets and liabilities; however, as a proportion of GDP, the asset stock will increase by more than twice as much as the liability stock because the proportion of equities is much higher in the asset stock than in the liability stock.

In the event of a simultaneous 15% appreciation of the króna and a 15% increase in equity prices, the effect on the estimated market value of the asset and liability stock will improve the IIP by roughly 6% of GDP. If the book value of FDI is used to calculate IIP, however, the effect is twice as much, or 12% of GDP.

Summary

The importance of tracking the developments in IIP increases as Iceland becomes more integrated into the global financial system. Current statistical data on Iceland's international investment position are limited by the fact that a significant portion of the asset stock – that is, foreign direct investment – is not recorded at market value. In this article, the market value of the inward and outward FDI stocks is estimated based on official book value data and market information concerning the ratio of market value to book value (p/b ratio) among listed companies in the same industrial sector and geographic region. The analysis suggests that it is highly probable that the value of both assets and liabilities is significantly underestimated in the official statistics. The proportion of FDI to total foreign liabilities is much lower, however, than to total assets. Therefore, the impact of the revaluation on net IIP is positive.

In the event of major changes in external economic conditions and the domestic economic outlook, the composition of the asset and liability stock can greatly affect the ensuing impact on the net international investment position. In turn, changes in the net IIP affect domestic economic developments and financial stability.[18] The higher the proportion of foreign assets to Iceland's total wealth, the greater the impact of global market changes will be on the domestic economy. Even if the net international investment position were in balance,

18. The composition of foreign liabilities can also contribute to financial instability. For example, if short-term liabilities constitute a large proportion of total liabilities, re-financing risk will increase. In the event of a serious liquidity squeeze in the global financial markets the financial stability of the overall economy might be jeopardised.

the domestic economy would remain extremely sensitive to external influences. The fact that foreign assets and liabilities are roughly equivalent to seven times GDP entails that relatively small changes in asset and liability values can result in a strong impact on the net IIP.

References

Blomberg, Gunnar and Maria Falk (2006). How do large current account surpluses co-exist with a weak international investment position? Sveriges Riksbank *Economic Review* 2006:1, pp. 37-57.

Blomberg, Gunnar and Johan Österberg (1999). Market valuation of external position - a new picture of Sweden's international dependence. Sveriges Riksbank - *Quarterly Review* 1999:2, pp. 29-42.

Economist (2008). The yen also rises. The Economist 386 (8572), pp. 73-74.

IMF (1993). Balance of payments manual. 5th ed. Washington D.C.: International Monetary Fund.

IMF (2007). Balance of payments and international investment position manual, sixth edition (draft). Statistics Department, International Monetary Fund.

Kubelec, Chris, Bjorn-Erik Orskaug and Misa Tanaka (2007). Financial globalisation, external balance sheets and economic adjustment. Bank of England *Quarterly Bulletin* 2007/Q2, pp. 244-257.

OECD (2008). OECD benchmark definition of foreign direct investment, 4th edition (draft). Organisation for Economic Co-operation and Development.

Central Bank of Iceland (2007). Economic and monetary developments and prospects - Appendix 3. *Monetary Bulletin* (2007/3).

Svavarsson, Daniel and Pétur Örn Sigurdsson (2007). Iceland's international investment position and balance on income. *Monetary Bulletin* 2007/2, pp. 53-74. Central Bank of Iceland.

Tchaidze, Robert (2007). Estimating Iceland's real equilibrium exchange rate. *Working Paper* (07/276): International Monetary Fund.

René Kallestrup[1]

The volatility of the Icelandic króna

It is often claimed that the Icelandic króna is more volatile than other currencies. This article takes a closer look at this contention and assesses whether it is a reasonable statement. First, the article analyses the historical variability and volatility of the króna and relates it to currencies with similar macroeconomic characteristics. Second, it examines market expectations of future exchange rate fluctuations, with particular emphasis on the evolving Icelandic option market. Third, it focuses on possible reasons for exchange rate volatility. The data period begins in April 2001, after the Icelandic currency was floated, and ends in March 2008. The conclusion is that the average volatility of the Icelandic króna is in the high end among developed market currencies but substantially below that of high-yielding emerging market currencies. On the back of the huge imbalances in the Icelandic economy, above-average volatility of the króna in 2006-2008 is probably not very surprising. That said, in 2008 foreign exchange volatility has been excessively high. Volatility is likely to remain relatively high during the rebalancing of the economy; however, it is reasonable to expect a reduction in volatility towards some historical average as the economy becomes more balanced, financial uncertainties are reduced, and Icelandic carry trades fade as the policy interest rate is lowered.

Introduction

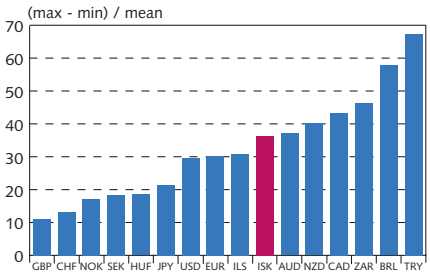
Foreign exchange volatility has attracted attention since the outset of floating exchange rates. More recently, economists have studied the theoretical and empirical impact of trade openness, financial integration, and other related factors on foreign exchange volatility across countries. Bravo-Ortega et al. (2005) find that open economies tend to have lower real exchange rate volatility.[2] Likewise, Devereux and Lane (2003) find that increased financial linkages between countries tend to be associated with lower exchange rate volatility. On the other hand, a high level of financial openness may also increase foreign exchange rate volatility if net liabilities become very large.[3] Hence, according to econometric and theoretical analyses, foreign exchange volatility is dependent on macroeconomic and financial factors, and this makes it interesting to take a closer look at the volatility of the Icelandic króna.

The remainder of this article is organised as follows: the second section focuses on the historical volatility of the króna, the third centres on the Icelandic foreign exchange option market, and the fourth section discusses general determinants of exchange rate volatility. The fifth section contains conclusions and a summary of points presented. A glossary of financial and statistical terms can be found in the appendix.

Chart 1

Trade-weighted foreign exchange trading ranges

Based on average monthly nominal exchange rates[1]
Daily data, April 2001 - March 2008



1. GBP: British pound, CHF: Swiss franc, NOK: Norwegian krone, SEK: Swedish krona, HUF: Hungarian forint, JPY: Japanese yen, USD: US dollar, EUR: Euro, ILS: Israeli shekel, ISK: Icelandic króna, AUD: Australian dollar, NZD: New Zealand dollar, CAD: Canadian dollar, ZAR: South African rand, BRL: Brazilian real, TRY: Turkish lira.

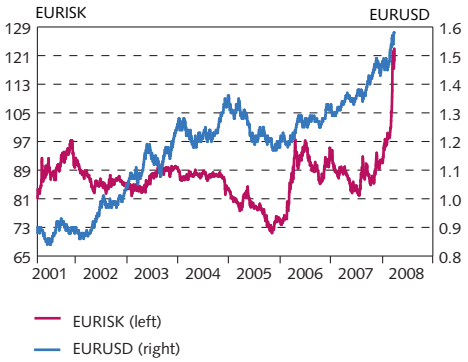
Sources: Bank of International Settlements (BIS) and author's calculations.

1. The author is an economist at the Central Bank of Iceland Economics Department. He would like to thank Arnór Sighvatsson, Thórarinn G. Pétursson, Regína Bjarnadóttir, Thorvarður Tjörvi Ólafsson and Ásgeir Daníelsson for their constructive comments. The author alone is responsible for any errors or omissions. The opinions expressed in this article are those of the author and do not necessarily represent the views of the Central Bank of Iceland.

2. Their focus, however, is not on very small open economies, which tend to be less diversified and more prone to idiosyncratic economic shocks and may therefore display higher exchange rate volatility. Devereux and Lane (2003) and Pétursson (2008) find, however, that smaller economies tend to have lower exchange rate volatility, and argue that they are more reluctant to tolerate fluctuations in the nominal exchange rate.

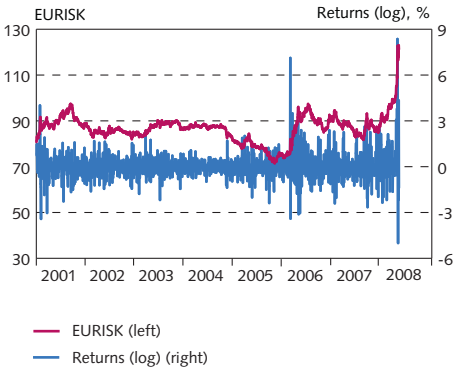
3. Devereux and Lane (2003) find different responses in industrialised and emerging markets countries in their sample period.

Chart 2
Bilateral foreign exchange trading ranges[1]
Daily data April 2001 - March 2008



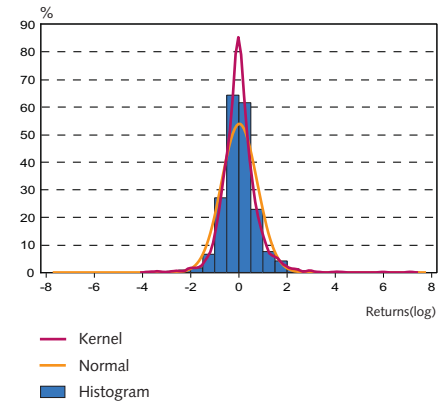
1. An increase is an appreciation of the euro (base) against the other currency.
Source: Bloomberg.

Chart 3
The Icelandic króna against the euro
Level and daily percentage changes, April 2001 - March 2008



Source: Central Bank of Iceland.

Chart 4
The Icelandic króna against the euro[1]
Daily percentage changes (log returns), April 2001 - March 2008



1. ISK per euro.
Source: Bloomberg.

Historical volatility

The Icelandic monetary framework, with an open capital account and independent monetary policy, implies that the exchange rate cannot be fixed against another currency. However, in view of the fact that foreign exchange markets seem to exhibit excess volatility, and given that exchange rates can diverge from fundamentals for lengthy periods, it is interesting to look closer at the behaviour of exchange rate fluctuations (see Gudmundsson, 2008). Relating historical volatility and variability, as well as skewness and kurtosis of the exchange rate, to other countries provides useful insight into this matter. Needless to say, this section concentrates on backward-looking (realised) measures of fluctuation, which ignore market expectations. The data period ranges from April 2001, after the independent floating of the Icelandic currency was introduced, to March 2008. This study uses daily data.

In assessing the uncertainty of the foreign exchange rate, one can approach the issue in different ways. The most popular measure of volatility in financial markets is the standard deviation of log returns.[4] It is possible to examine high-frequency (e.g., daily) or lower-frequency (quarterly or yearly) changes in the exchange rate. Volatilities based on daily returns are more directly related to the cost of hedging currency transactions in the foreign exchange markets via simple (plain vanilla) currency options.[5] Low-frequency changes can be equally important because they are more effective at capturing trend changes (level shifts) in a given currency and can be important for more exotic options. When a significant shift in the level of the currency has occurred, it is often too expensive to purchase financial products securing a reversion to the initial exchange rate.[6] The shift in the level of the currency can be called variability (thoogh other definitions of variability may appear in the literature). Both variability and volatility are very important for consumers, businesses and policy-makers because they may answer completely different questions.

Variability

Chart 1 shows the trading ranges of broad trade-weighted indices since 2001 for a group of different currencies. A currency trading in a narrow range relative to other currencies may increase the predictability for exporters and importers with transactions in a given currency. The trading range of the króna has been wider than that in several European currencies but slightly narrower than that for other so-called commodity currencies, such as the Canadian (CAD), Australian (AUD) and New Zealand (NZD) dollars. Of course, the shift in the level of the currency can be quite data-dependent. Interesting patterns may emerge if one looks at bilateral exchange rates as well. For instance, the variability of

4. Log returns are mathematically defined as $u[i]= \ln(S[i]/S[i-1])$, where S[i] is the value of the market variable at end of day i.
5. Options are defined as the right to purchase or sell at a given price at a specified point in the future.
6. A discussion of the importance of long-lasting exchange rate changes and the difficulties in hedging against them can be found in Kenen (2002).

the US dollar (USD) against the euro (EUR) has been greater than that of the Icelandic króna against the euro, with declines of 90% and 72% respectively, from the peak to the trough (see Chart 2).

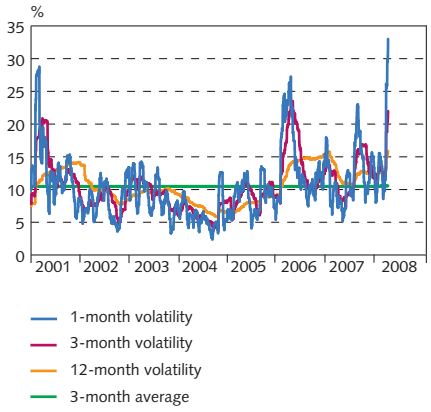
Volatility

When fluctuations in daily returns are large, volatility is said to be high; conversely, when fluctuations in returns are small, volatility is said to be low. While volatility does not necessarily capture periods of rapid and sustained changes in the spot exchange rate, the concept has important implications for hedging via simple options. If the Icelandic króna ends the quarter or year where it started – though it may have moved up and down frequently in the interim – according to quarterly sampling, it will not display any variability, whereas its high-frequency volatility can be relatively high.

Importantly, all uncertainty measures change over time, and focusing on average volatility over the entire sample may only convey a part of the whole story. Economists use different moving volatility windows (e.g. one, three, and twelve months) to show time variation across a sample. For instance, the one-month exchange rate volatility is the standard deviation over a one-month rolling window on the daily exchange rate change; that is, from April 1, 2001, to May 1, 2001; and then from April 2, 2001, to May 2, 2001.[7]

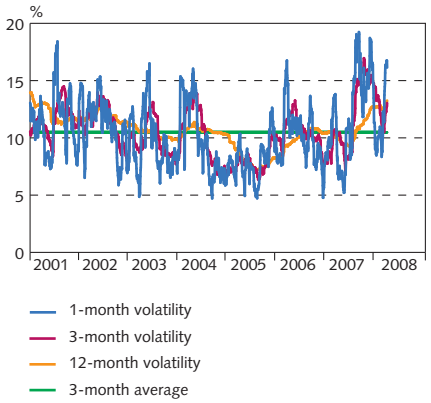
Chart 3 displays the daily fluctuations in the Icelandic króna against the euro, and Chart 4 illustrates the distribution of returns. They show how volatility varies over time, as well as giving indications that daily percentage changes have heavier tails than the normal distribution (a common finding for exchange rate returns). Tail events are more common for depreciation than appreciation (see the section on skewness and kurtosis).[8] Charts 5 and 6 illustrate the volatility of the Icelandic króna and the New Zealand dollar, respectively, against the euro. Volatility clustering is evident in both foreign exchange rates; i.e., periods of persistent high volatility are followed by periods of relatively low volatility. Overall, the average patterns of annualised volatility in the króna and the New Zealand dollar look very similar, but there are some marked differences nonetheless. Chart 7 summarises the one-month EURISK volatility shown in Chart 5. The average one-month volatility, at 10.4%, is driven by the large spikes above 20%, with one-month EURISK volatility fluctuating between 2.5% and 33% (the three-month and twelve-month volatility range is much narrower, however). In the period 2002-2005, the volatility of the króna was notably lower than that of the commodity currencies. However, in 2001 and 2006-2008, daily changes in the króna were greater than those in other developed currencies. Not surprisingly, the floating of the króna

Chart 5
EURISK volatility using a moving window[1]
Daily data April 2001 - March 2008



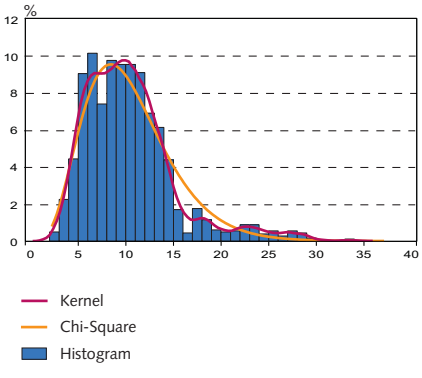
1. Volatility in exchange rates is annualised.
Source: Bloomberg.

Chart 6
EURNZD volatility using a moving window[1]
Daily data April 2001 - March 2008



1. Volatility in exchange rates is annualised.
Source: Bloomberg.

Chart 7
1-month foreign exchange volatility (EURISK)
April 2001 - March 2008

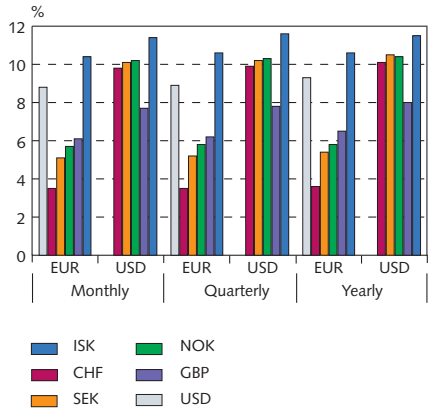


Sources: Bloomberg and author's estimates.

7. To facilitate the comparison of volatilities for different interval lengths, it is useful to express volatility in annual terms. In order to de-annualise the annual figures, one divides by the square root of trading days (square root of 252 for daily data). Therefore, if the one-year realised annual volatility in EURISK (Icelandic krónur per euro) is 9.5%, this corresponds to approximately 0.6% for daily volatility.

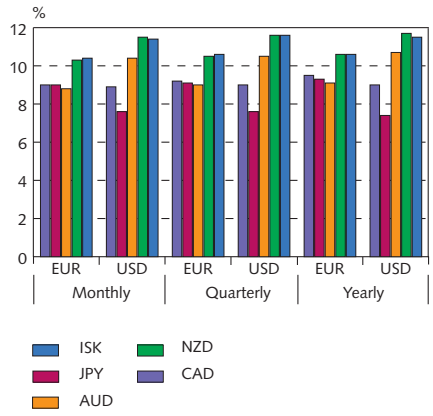
8. The normal distribution is shown with a constant sample mean and standard deviation. Jarque-Bera tests reject the null hypothesis of normality at a 1% significance level.

Chart 8
Volatility in the ISK and core European currencies
Average rolling volatility, April 2001 - March 2008



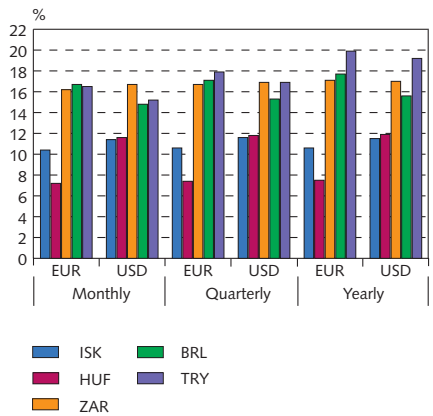
Source: Bloomberg.

Chart 9
Volatility in the ISK and other developed market currencies
Average rolling volatility, April 2001 - March 2008



Source: Bloomberg.

Chart 10
Volatility in the ISK and emerging market currencies
Average rolling volatility, April 2001 - March 2008



Source: Bloomberg.

in 2001 seems to have increased the volatility of the ISK.[9] Likewise, 2006-2008 was a period characterised by idiosyncratic economic and financial shocks, resulting in higher volatility (see the section on volatility drivers). In 2008, the volatility of the Icelandic króna has been excessively high and comparable to unstable periods in floating, high-yielding emerging market currencies.

Table 1 Average historical volatilities, April 2001-March 2008

	Monthly		*Quarterly*		*Yearly*	
Developed markets	*EUR*	*USD*	*EUR*	*USD*	*EUR*	*USD*
USD	8.8		8.9		9.3	
CHF	3.5	9.8	3.5	9.9	3.6	10.1
SEK	5.1	10.1	5.2	10.2	5.4	10.5
NOK	5.7	10.2	5.8	10.3	5.8	10.4
GBP	6.1	7.7	6.2	7.8	6.5	8.0
JPY	9.0	8.9	9.2	9.0	9.5	9.0
CAD	9.0	7.6	9.1	7.6	9.3	7.4
AUD	8.8	10.4	9.0	10.5	9.1	10.7
NZD	10.3	11.5	10.5	11.6	10.6	11.7
ISK	10.4	11.4	10.6	11.6	10.6	11.5
ILS	9.8	5.9	9.9	6.0	10.2	5.9
Emerging markets						
HUF	7.2	11.6	7.4	11.8	7.5	11.9
ZAR	16.0	16.7	16.7	16.9	17.1	17.0
BRL	16.7	14.8	17.1	15.3	17.7	15.6
TRY	16.5	15.2	17.9	16.9	19.9	19.2

Note: Based on Bloomberg daily closing prices. EUR and USD are base currencies.
Source: Bloomberg.

Table 1 shows the average volatility of various currencies against the euro and the US dollar, and Charts 8 to 10 give a graphic representation of the same data. Generally speaking, the volatility of the króna has been of similar magnitude, on average, to that of other developed high-yielding currencies, such as the Australian dollar and the New Zealand dollar, but greater than that of the core European currencies like the Swedish krona (SEK), Norwegian krone (NOK), Swiss franc (CHF), and British pound (GBP). The Icelandic króna, however, is much less volatile than high-yielding emerging market currencies such as the Turkish lira (TRY), South African rand (ZAR), and Brazilian real (BRL).

The core European currencies track fluctuations in the euro quite closely, which tends to reduce their volatility against the single currency. For instance, the Swiss franc and the euro co-move against the US dollar. This is partly explained by trade patterns and similar business cycles in the euro area and Switzerland (see European Central Bank (2006) for further discussion of systematic co-moving currencies). Based on volatilities, the Icelandic króna is currently not a "euro currency" because it tracks the dollar and the euro more or less equally (the Australian and New Zealand dollars seem to show similar characteristics). If the Icelandic business cycle followed that of the euro area

9. This is confirmed in an empirical analysis using a GARCH model in Ísberg and Pétursson (2003).

more closely and trade with the euro area were increased, it could be expected that the volatility of the króna against the euro would diminish.

Table 2 Distribution of changes in foreign exchange rates. Average monthly percentage changes divided into intervals, April 2001-March 2008

# *OBS*	*< -7.5%*	*[-7.5%;-5%]*	*[5%;7.5%]*	*> 7.5%*
USD	-	-	-	-
EUR	-	-	-	-
CHF	-	-	-	-
SEK	-	-	-	-
NOK	-	-	-	-
GBP	-	-	-	-
JPY	-	-	-	-
CAD	-	-	-	-
AUD	-	-	-	-
NZD	-	2	-	-
ISK	3	2	-	-
ILS	-	1	-	-
HUF	-	1	-	-
ZAR	4	4	4	-
BRL	3	4	3	3
TRY	9	5	3	-

Note: Nominal effective exchange rates, 81 observations.

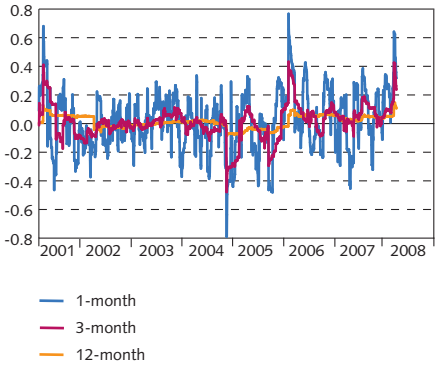
Source: Bank of International Settlements.

Table 2 illustrates the average monthly foreign exchange return distribution of the currencies above. The table shows clearly that large average monthly percentage changes are relatively more common in emerging market currencies. The next section analyses tail events more closely.

Skewness and kurtosis

Skewness reflects the distribution's asymmetry around its mean and thus indicates a deviation from the normal distribution, where skewness is zero. The skewness of EURISK (Icelandic krónur per euro) had a tendency to be positive in 2001, as well as in 2006-2008 (see Chart 11), on the back of the occasional large daily depreciation of the króna, in the range of 2-6%. Among currency investors, this is popularly known as downside risk. Other high-yielding currencies like the New Zealand and Australian dollars exhibit similar tendencies (although to a somewhat lesser degree), and this pattern is widespread among emerging market currencies as well. Significant selling pressures of the currency, combined with low liquidity in the foreign exchange market (see Section 4), resulted in something that resembles a jump in daily data for EURISK in 2006 and 2008.[10] Low-yielding currencies, however, tend to be skewed towards an appreciation, partly reflecting the low and

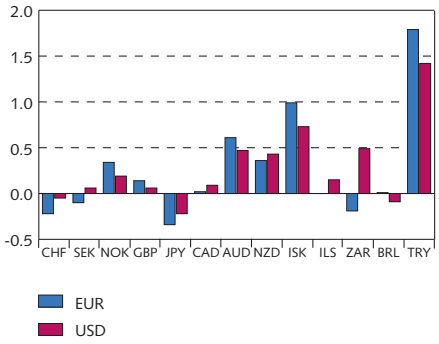
Chart 11
EURISK and rolling skewness
Daily data April 2001 - March 2008



Source: Bloomberg.

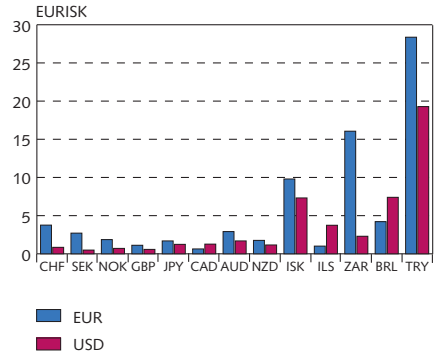
10. A liquid market can be described as a market where large transactions can be executed with small impact on prices; cf. Galati (2000).

Chart 12
Foreign exchange skewness[1]
Based on daily returns over the entire period
April 2001 - March 2008



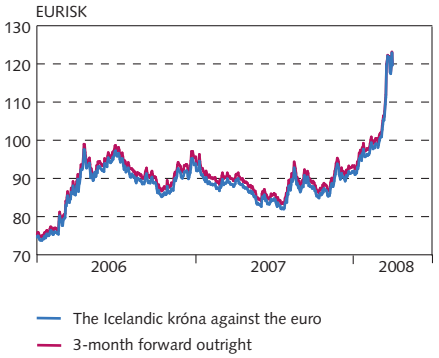
1. EUR and USD are base currencies.
Sources: Bloomberg, author's calculations.

Chart 13
Foreign exchange kurtosis[1]
Based on daily returns over the entire period
April 2001 - March 2008



1. EUR and USD are base currencies.
Sources: Bloomberg, author's calculations.

Chart 14
Spot and 3-month forward exchange rate contract
Daily data January 2006 - March 2008



Sources: Bloomberg, local sources.

stable inflation regime of these countries. Skewness for some currencies is shown in Chart 12.[11]

The negative skew in the króna (positive skew of e.g. EURISK) is closely related to the high level of kurtosis, which is a measure of extreme returns.[12] A high kurtosis is characterised by a high peak near the mean, declining somewhat rapidly and with heavy tails. A kurtosis exceeding three means a higher probability of large positive or negative returns than under the normal distribution. Data on kurtosis in different countries in Chart 13 correlate with those in the skewness chart. The following section discusses financial protection against potential shifts in the currency. The non-technical reader may skip directly to Section 4 without any loss of continuity.

Forwards and options

Hedging currency transactions via the forward exchange rate, where the investor is obligated to buy/sell at a specified price in the future, is very popular due to its simplicity.[13] A forward outright contract enables the investor to neutralise future exchange rate fluctuations by, for example, receiving a currency at a fixed price. According to the covered interest rate parity (CIP), the interest rate differences of any particular maturity between two countries (e.g., the euro area and Iceland) should equal the percentage difference between the forward exchange rate and the spot exchange rate (the so-called forward premium). This no-arbitrage condition should hold – at least approximately – in countries where capital is free to move between bank deposits. Hence, the CIP is used to price forward outright contracts. Foreign currency liquidity shortages and differential country risk premia may result in deviation from the CIP, however (see Box III-1). Chart 14 shows the three-month exchange rate contract, which is characterised by fairly good liquidity (at least before January 2008).[14] Because interest rates are higher in Iceland than in the euro area, the Icelandic króna will be worth fewer units of euro forward than the spot (that is, the króna is traded at a discount).

According to the "forward premium puzzle" in economics, however, the forward exchange rate is not a good indicator of market expectations of the future exchange rate.[15] In fact, high-yielding currencies like the Icelandic króna tend to appreciate, on average, not depreciate. This empirical fact is exploited in the so-called currency carry strategy and has been an argument against selling high-yielding currencies based on forward contracts. That said, some investors tend

11. Skewness = $(1/N)\Sigma[(x_i-\mu)/\sigma]^3$
12. Kurtosis = $(1/N)\Sigma[(x_i-\mu)/\sigma]^4$
13. Alternatively, the related FX swap can be more flexible.
14. Quoted forward points can be found in one-week, one-month, and 12-month regularly in the foreign exchange market; cf. Bloomberg. Cross-currency basis swaps against the euro and the US dollar are traded regularly on the one-year, 18-month, two-year, and three-year horizon (at least before January 2008).
15. The *uncovered* interest rate parity (UIP) implies that the interest rate difference should reflect the expected depreciation of the high-yielding currency against the low-yielding one. The UIP is different from the CIP in that investors do not cover the exchange rate risk on the forward exchange market.

to overlook the fact that high-yielding currencies have a tendency to depreciate significantly when risk aversion rises in financial markets.[16]

Implied volatility

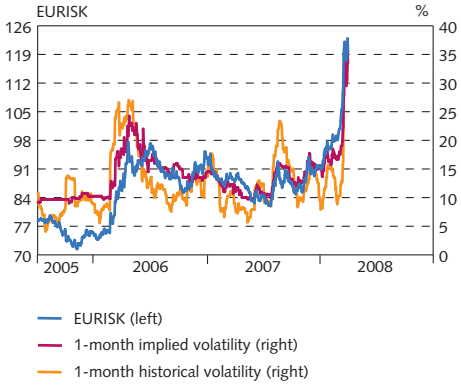
Further insight into market expectations about future uncertainty can be gained by looking at foreign exchange options. The price of protection – for example, put options, which give the owner the right to sell at a particular price at a specified time in the future – depends on market expectations for future exchange rate volatility, called implied volatility. In the market, quoted options on EURISK are available at fixed time-to-maturities: one, three, six and twelve months.[17] For instance, one-month (at-the-money) implied volatility is the market's estimate for realised one-month volatility in one month's time. Chart 15 reveals that implied volatilities tend to follow historical volatilities, but some large differences can be observed as well.[18]

In recent years, (at-the-money) implied volatilities of EURISK have become more liquidly traded; therefore, the main focus is on data since July 2005. This period is characterised by relatively high implied volatility, fluctuating between 9% and 35%. In foreign exchange markets, implied volatility tends to be higher than the most recent realised volatility in order to compensate volatility sellers for the inherent uncertainty concerning future fluctuations.[19] That said, when implied volatility systematically trades higher than realised volatility, it is typically expensive to purchase an option. Fortunately, new ways to circumvent this are being addressed by so-called countdown options, with the optionality in terms of realised rather than implied volatility. Chart 15 shows a high positive correlation between spot changes and (at-the-money) implied volatility; i.e., a depreciation of the Icelandic króna tends to imply a rise in implied volatility.[20]

Asymmetry in foreign exchange rates

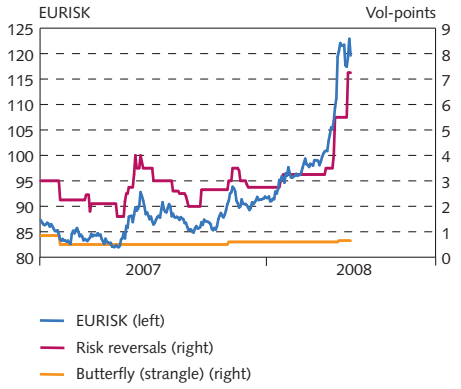
Foreign exchange option traders use risk reversals – where the investor simultaneously purchases an out-of-the-money call option and sells an out-of-the-money put option – to reflect the expected skewness in the distribution. Chart 16 illustrates the one-month risk reversal for EURISK during May 2007 - March 2008, a period when the market consistently expected a depreciation of the Icelandic króna.[21] The pos-

Chart 15
EURISK implied volatility
Daily data July 2005 - March 2008



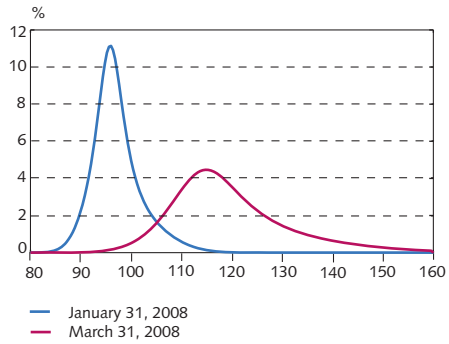
Source: Bloomberg.

Chart 16
Risk reversals and strangles (1M, 25-delta)[1]
Daily data May 2007 - March 2008



1. See footnote number 23.
Sources: Bloomberg, investments banks.

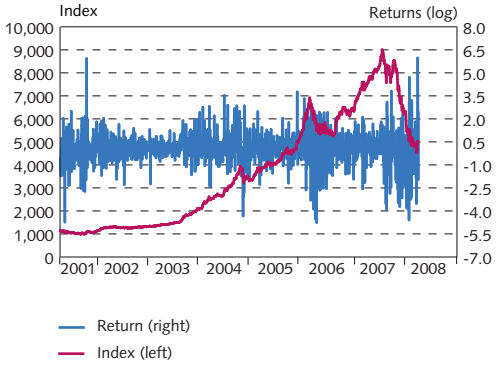
Chart 17
1M EURISK risk-neutral probability functions[1]



1. 25-delta risk reversal: 3.25 (7.25), 25-delta butterfly spread: 0.60 (0.65), at-the-money implied volatility (mid): 16.50 (33.5), forward rate: 97.87 (119.8), interest rate: 14.088 (15.36). Volatility smile fitted according to Malz (1997).
Sources: Bloomberg, investment banks, auther's calculations.

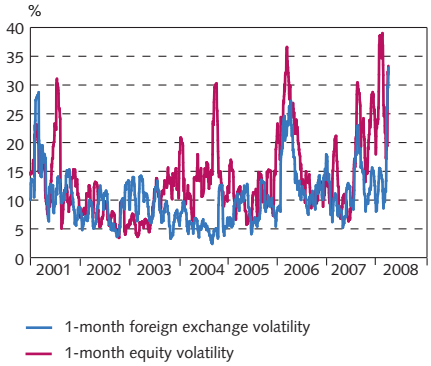
16. See Section 4 of this article. Furthermore, Gyntelberg et al. (2007) show that expected carry trade returns do in fact reflect downside risk.
17. The implied volatilities are traded over the counter.
18. According to market convention, currency options are quoted in terms of implied volatility and strike relative to forward prices. The latter is known as the Black-Scholes delta; for example, a 25-delta option has approximately a 25% probability of expiring in the money. The liquid quotes are 25-delta, 10-delta, and at-the-money options corresponding approximately to 50-delta. Implied volatility varies with maturity and strike price, and it is known as the "volatility smile" in volatility/strike space. At-the-money volatility gives the location of the volatility smile, the risk reversal prices indicate the skew, and the strangle prices gives the degree of curvature of the volatility smile.
19. When sudden unexpected changes in the exchange rate occur, realised volatility will have a tendency to surpass implied/traded volatility.
20. This pattern is common in foreign exchange markets, and stochastic volatility models exhibit a correlation between spot and volatility changes. See Carr (2007).
21. 25-delta out-of-the-money EUR calls were trading at 3.25 volatility points higher than a put on January 31, 2008 (according to indicative quotes from Bloomberg).

Chart 18
Stock market volatility in Iceland
Daily data April 2001 - March 2008



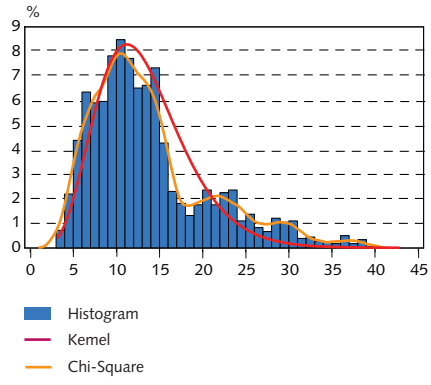
Source: Bloomberg.

Chart 19
EURISK vs. stock market volatility
1-month moving window based on daily returns
Daily data April 2001 - March 2008



Sources: Bloomberg and author's calculations.

Chart 20
1-month stock market volatility (OMXI15)
April 2001 - March 2008



Source: Bloomberg.

itive correlation between spot changes and changes in risk reversals is strong. One could call it a kind of momentum in foreign exchange markets (see, for example, Campa, et al., 1998), as a weaker currency is related to a high probability of a further large future depreciation. One reason for this is that a strong depreciation of the króna indicates that the adjustment costs of a further depreciation could be large (for instance, in anticipation of investors' being forced to sell their long króna exposures, which would not be the case if the currency appreciated).[22]

Investors expecting a large movement in the exchange rate in any direction (excess kurtosis) simultaneously buy an out-of-the-money put and an out-of-the-money call (called a strangle; see Chart 16).[23] Time variation in both risk reversals and strangles is evident, with risk reversals exhibiting a larger standard deviation than strangles.

Risk-neutral foreign exchange distribution

The previous section explains how options, like strangles and risk reversals, provide new information about the expectations of the market's assessment of future exchange rate movements, whereas the forward exchange rate is merely a reflection of the traded interest rate differential and the current spot exchange rate (by the risk premium-adjusted covered interest rate parity). Assuming a smooth "volatility smile" based on actual option prices, one can extract an implied risk-neutral probability density function (PDF) that the market attaches to the future exchange rate. Bahra (1997), Bank of England (2002), Castrén (2005) and Gereben (2002) elaborate on the procedure. Chart 17 illustrates the exchange rate horizontally and the probability vertically, with the area under the curve summing to 100%. It is important to notice that, when a risk premium is present, the forward rate is a biased indicator of market expectations concerning future exchange rates, and the risk-neutral probabilities do not necessarily provide an actual perception of asset price movements held by market participants.[24] In the chart, one spots a skew towards a large appreciation of the euro against the Icelandic króna rather than an equivalent depreciation (due to the non-zero risk reversals).[25]

The accuracy of the PDF depends on the quality of the quoted option prices. If daily quotes on options reflect limited liquidity – which can be the case in the Icelandic market – the implied PDF may become volatile. It is difficult to establish a market price in the tails of potential outcomes, which reflects the diverging perception of the likelihood of

22. Risk reversals are an indication of non-normally distributed exchange rate returns, and the positive correlation between spot and skewness points out that market participants do not expect a stable, narrow nominal trading range (since, in this case, the correlation would be negative).

23. A 25-delta butterfly spread is defined as the difference between the average implied volatility of a 25-delta call and a 25-delta put and the delta-neutral straddle implied volatility.

24. Hence, the difference between risk-neutral and the actual expected distributions is closely associated with a time-varying risk premium that, for example, compensates risk-averse investors for holding the Icelandic currency. The economics literature indicates that the risk aversion primarily changes the location of the distribution (the mean) and still makes it useful to interpret measures of implied skewness and kurtosis (see, for example, Bliss et al., 2002).

25. Since the mean is equal to the forward rate in a risk-neutral distribution, one cannot interpret it as an indication that appreciation is more likely than depreciation.

large changes in the exchange rate, hedging activity, and expected option order flows. However, the simulations do not seem to show large differences between indicative market quotes and the interpolated smile, suggesting that the derived foreign exchange distribution is fairly accurate.

Volatility drivers

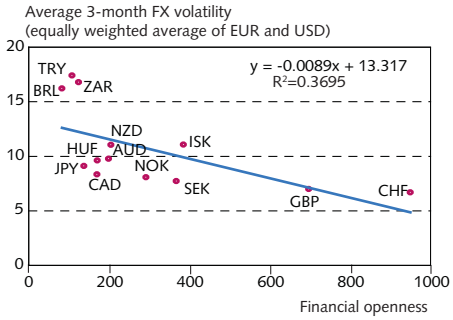
The realised foreign exchange volatility of the króna remains below that in the Icelandic stock market (see Charts 18-20), but the strong co-movement of the two volatilities suggests that they may be driven by common factors. This section examines the level of foreign exchange volatility and the co-movement with macroeconomic factors across countries. Although it is difficult to separate the different factors, it is nonetheless useful to attempt to suggest a plausible causality. The introduction of this article discusses how financial openness seems to co-move negatively with volatility, a pattern that is documented in Chart 21. Other determinants of exchange rate volatility are examined below, using an approach inspired by Cairns et al. (2007). The data period remains from April 2001 to March 2008, and an equally weighted average of the historical volatility against the euro and the US dollar is used.

First, a currency tied to a high net external financing requirement is very dependent on global risk sentiment and changes in country-specific economic and financial factors. Hence Chart 22 reveals a negative relationship between volatility and the average quarterly current account surplus. For instance, when global risk perception increases, investors withdraw from funding large current account deficits, triggering in large foreign exchange depreciations. New Zealand, Australia and Iceland are all developed countries that have had persistent current account deficits.

Second, higher inflation and inflation variability tend to co-move positively with high-frequency exchange rate volatility in the sample appearing in Chart 23. When inflation domestically and abroad is at significantly different levels, the exchange rate is expected to reflect these differentials and show greater volatility, whereas low and stable inflation will require less adjustment. Reverse causality may also appear, however. Pétursson (2008) finds that a more volatile exchange risk premium leads to more volatile inflation rates. According to Pétursson's results, the countries that tend to have a more volatile exchange rate risk premium are very small, open economies and emerging market economies. The perceived risk of holding the currency could be a result of the more volatile nature of these economies, more frequent idiosyncratic shocks, or less developed foreign exchange markets.

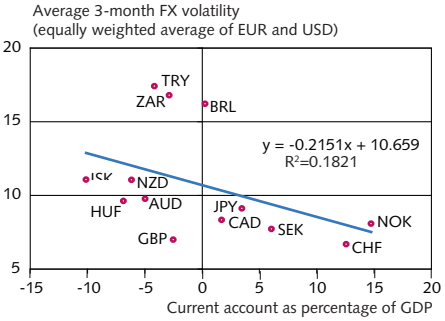
Third, speculative currency carry trades are related to risk appetite, which lead to foreign exchange dynamics known as "up the stairs, down in the elevator" (see Plantin et al., 2007). Hence, high-yielding currencies tend to appreciate slowly, followed by a period of large depreciation. This phenomenon explains the consistent downside risk priced in Icelandic foreign exchange options. A high policy interest rate – which is a result of an imbalanced economy and high inflation – attracts short-term foreign capital, making the exchange rate vulnerable

Chart 21
Foreign exchange volatility and financial openness[1]
Average quarterly data, April 2001 - March 2008



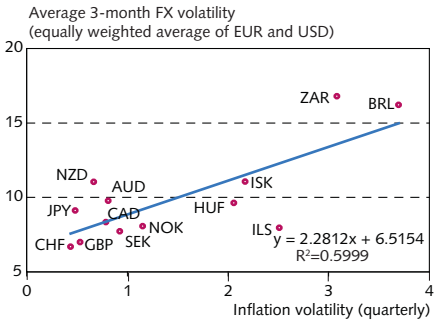
1. Financial openness = (Assets + Liabilities) / GDP, average 2001-2006.
Sources: International Financial Statistics (IMF), OECD.

Chart 22
Foreign exchange volatility and current account
Average quarterly data, April 2001 - March 2008



Sources: International Financial Statistics (IMF), OECD.

Chart 23
Foreign exchange and inflation volatility[1]
Average quarterly data, April 2001 - January 2008

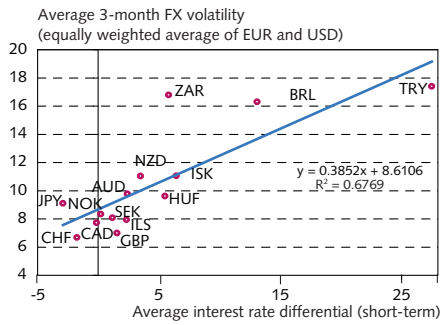


1. Turkey has very high inflation volatility.
Sources: International Financial Statistics (IMF), OECD.

Chart 24

Foreign exchange volatility and interest-rate differentials

Average quarterly data, April 2001 - March 2008

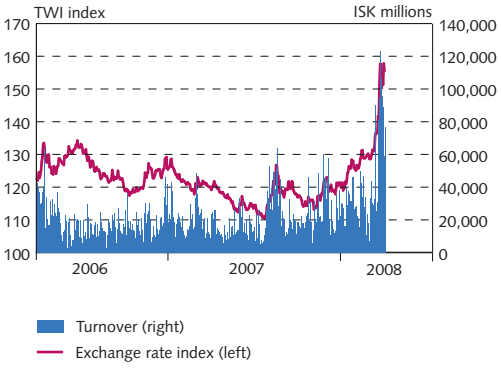


Sources: International Financial Statistics (IMF), OECD.

Chart 25

Daily turnover in the Icelandic interbank FX market and the exchange rate index

Daily data April 2006 - March 2008



Source: Central Bank of Iceland.

to investor sentiment. This relationship is documented in Chart 24. When sentiment deteriorates sharply, a large foreign exchange selling pressure tends to have a greater impact on the Icelandic króna than in more liquid foreign exchange markets (see Chart 25).[26]

Conclusions

In 2006-2008, the volatility of the Icelandic króna has been elevated in the wake of country-specific and global shocks amid large domestic macroeconomic imbalances. These shocks and imbalances lifted the average realised volatility of the Icelandic króna up to the high end among developed market currencies, and the average is now slightly above countries like New Zealand and Australia. However, the average volatility remains substantially below that of other high-yielding emerging market currencies. In 2008, foreign exchange volatility has been extremely elevated. From a policy-maker's perspective, excessive exchange rate volatility is not desirable because it increases the cost of international trade and financial transactions, as well as raising the cost of hedging this risk. In Iceland, foreign exchange volatility is likely to have a greater impact than it would have in a larger country, simply due to the fact that the Icelandic economy is very small and open, it faces a rapid and large asymmetric exchange rate pass-through to general price levels (see Pétursson, 2008), and it has a high degree of domestic financial indexation. In addition, consumers' and businesses' sizable debt in foreign currency makes exchange rate volatility more costly and may reduce the effectiveness of the exchange rate's response to external shocks. Going forward, as domestic imbalances fade and inflation becomes better anchored to the inflation target, the Central Bank will be able to reduce interest rates, which should contribute to lower foreign exchange volatility in the medium term.

References

Bahra, Bhupinder (1997). Implied risk-neutral probability density functions from option prices: theory and applications. *Bank of England Working Paper*.

Bank of England (2002). Notes on the Bank of England option-implied probability density functions.

Bliss, R., and N. Panigirtzoglou (2002). Testing the stability of implied probability density functions. *Journal of Banking and Finance* 23 (2-3), 381-422.

Brave-Ortega, C., and J. di Giovanni (2005). Remoteness and real exchange rate volatility. IMF *Working Paper* 05/01.

Cairns, John, Corrinne Ho and Robert McCauley (2007). Exchange rates and global volatility: implications for Asia-Pacific currencies. *BIS Quarterly Review*, March 2007.

Campa, José M., P.H. Kevin Chang and Robert L. Reider (1998). Implied exchange rate distributions: evidence from OTC option markets. *Journal of International Money and Finance* 17, 117-160.

Carr, Peter, and Liuren Wu (2007). Stochastic skew in currency options. *Journal of Financial Economics* 86, 213-247.

Castrén, Olli (2005). Estimating and analysing currency options implied risk-neutral density functions for the largest new EU member states. ECB *Working Paper Series* no. 440, February 2005.

26. Data do not permit a comparison of volatility and foreign exchange turnover across countries.

Devereux, Michael B., and Phillip R. Lane (2003). Understanding bilateral exchange rate volatility. *Journal of International Economics*. Volume 60, issue 1, 109-132.

European Central Bank (2006). How close are the co-movements of main currencies? ECB *Monthly Bulletin*, April, 54-56.

Galati, Gabriele (2000). Trading volumes, volatility and spreads in foreign exchange markets: Evidence from emerging market countries. BIS *Working Paper* No. 93.

Gereben, Áron (2002). Extracting market expectations from option prices: an application to over-the-counter New Zealand dollar options. Reserve Bank of New Zealand *Discussion Paper Series*.

Gudmundsson, Már (2008). Financial globalisation: key trends and implications for the transmission mechanism of monetary policy. Forthcoming publication by the Bank of International Settlements.

Gyntelberg, Jacob, and Eli M. Remolona (2007). Risk in carry trades: a look at target currencies in Asia and the Pacific. BIS *Quarterly Review*, December 2007.

Hau, Harald (2002). Real exchange rate volatility and economic openness: theory and evidence. *Journal of Money, Credit and Banking*, Vol. 34, (August), 611-630.

Ísberg, G., and T. G. Pétursson (2003). Central Bank intervention in Iceland's foreign exchange market and its effect on the exchange rate of the króna. *Monetary Bulletin*, 2003/1, 50-74.

Kenen, P. (2002), Currency unions and trade: Variations on themes by Rose and Persson, Reserve Bank of New Zealand *Discussion Papers*, DP/2002/08.

Malz, Allan M. (1997). Option-implied probability distributions and currency excess returns. Federal Reserve Bank of New York *Staff Reports*.

Pétursson, T. G., (2008). How hard can it be? Inflation control around the world. Central Bank of Iceland *Working Paper*, forthcoming.

Plantin, Guillaume and Hyun Song Shin (2007). Carry trade and speculative dynamics. Working paper.

Appendix: Financial Glossary[27]

At-the-money (ATM): An option whose strike is equal to the currency forward rate.

Call: An option that gives the holder the right (but not the obligation) to buy the underlying asset.

Delta: The ratio of the change in price of an option to the change in price of the underlying asset.

Forward contract: A contract that obligates the holder to buy or sell an asset for a predetermined price at a predetermined future time.

Implied volatility: The expected volatility in an asset's return derived from its option price, maturity date, exercise price, and the riskless rate of return, using an option pricing model such as Black-Scholes.

In-the-money (ITM): An option with non-zero intrinsic value. A call whose strike is below the current spot is ITM. A put whose strike is above the current spot is ITM.

Intrinsic value: The realised difference between spot (S) and strike (X) if exercised now, but no less than zero. Maximum(S-X,0) for a call and maximum(0,X-S) for a put.

Kurtosis: Measures the thickness of the tails of a probability distribution. A fat-tailed distribution has higher-than-normal chances of a big positive or negative realisation.

Mean: The average value of a random variable.

Option: Gives the buyer the right, but not the obligation, to buy or sell an asset at a set price on or before a given date.

27. Source: http://www.bloomberg.com/invest/glossary and others.

Out-of-the-money (OTM): An option whose intrinsic value is equal to zero. A call whose strike is above the current spot is OTM. A put with strike below the current spot is OTM.

Put: An option granting the right (but not the obligation) to sell the underlying asset.

Realised volatility: While the implied volatility refers to the market's assessment of future volatility, the realised volatility measures what actually happened in the past.

Risk reversal: Simultaneously purchasing an out-of-the-money call option and selling an OTM put option.

Skewness: Negative skewness means there is a greater-than-normal probability of a big negative return. Positive skewness means that there is a greater-than-normal probability of a big positive return.

Standard deviation: The square root of the variance. A measure of dispersion of a set of data from its mean.

Strangle: A strangle is a combination of a call and a put with the same expiry date, but with a different strike price.

Strike price: The price at which the underlying asset may be purchased (in the case of a call) or sold (in the case of a put) by the option holder upon exercise of the option contract.

Variance: The mathematical expectation of the average squared deviations from the mean.

Volatility: A measure of risk based on the standard deviation of the asset return.

Volatility smile: The variation of implied volatility with strike price.

Monetary policy and instruments

The objective and implementation of monetary policy

The objective of monetary policy is price stability. On March 27, 2001, a formal inflation target was adopted, as follows:[1]

- The Central Bank aims for an annual rate of inflation, measured as the twelve-month increase in the CPI, which in general will be as close as possible to 2½%.
- If inflation deviates by more than 1½% from the target, the Central Bank shall be obliged to submit a report to the Government explaining the reason for the deviation, how it intends to respond, and when it expects the inflation target to be reached again. This report shall be made public.
- The Central Bank shall publish inflation forecasts, projecting inflation at least two years into the future. Forecasts shall be published in the Bank's *Monetary Bulletin*. This shall also contain the Bank's assessment of the main uncertainties pertaining to the inflation forecast. The Bank shall also publish its assessment of the current economic situation and outlook.

Since monetary policy aims at maintaining price stability, it will not be applied in order to achieve other economic targets, such as a balance on the current account or a high level of employment, except insofar as this is consistent with the Bank's inflation target.

Macroeconomic and inflation forecasts perform an important function in monetary policy conduct. As of *Monetary Bulletin* 2007/1, the Bank's forecasts are based on the policy rate path that its staff consider appropriate for attaining the inflation target. The policy rate path is chosen with the aim of bringing inflation to 2½% within an acceptable horizon and stabilising it close to that target afterwards. Confidence limits are presented for the policy rate to underline the uncertainties surrounding the forecast, emphasising that the policy rate path is liable to change over time as new data become available.

The Central Bank announces interest rate decisions on scheduled, prearranged dates. Before an interest rate decision is made, the Board

Overview of Central Bank interest rates April 1, 2008

Traditional instruments	*Current rate (%)*	*Last change*		*Rate one year ago (%)*
		Date	*Percentage points*	
Current accounts	14.50	March 25, 2008	0.75	12.75
Overnight loans	16.50	March 25, 2008	1.25	15.25
Required reserves	14.50	March 25, 2008	1.25	13.00
Collateral loans – policy rate	15.00	March 25, 2008	1.25	13.30
Certificates of deposit, 7 days	14.75	March 25, 2008	1.10	13.20

1. Joint declaration of the Government of Iceland and the Central Bank of Iceland. Published on the Central Bank of Iceland website, sedlabanki.is.

of Governors convenes monetary policy meetings, as detailed in the Bank's internal rules on the preparation, arguments for and presentation of monetary policy decisions, which are set pursuant to the provisions of the Central Bank Act. The internal rules are published on the Central Bank website, www.sedlabanki.is.

Main monetary policy instruments

In particular, the Central Bank implements its monetary policy by managing money market interest rates, primarily through interest rate decisions for its collateral loan agreements with credit institutions, which then affect other interest rates. Yields in the money market also have a strong impact on currency flows and thereby on the exchange rate, and in the long run on domestic demand. Generally speaking, transactions with financial institutions can be classified as regular transactions and other transactions. Transactions between financial institutions and the Central Bank are subject to the Rules on Central Bank of Iceland Facilities for Financial Undertakings, no. 317 of April 2, 2008.

Regular transactions:

- Current accounts are deposits of the credit institutions' undisposed assets. These are settlement accounts for netting between deposit institutions and for interbank market trading, including transactions with the Central Bank. Interest rates on these accounts set the floor for overnight interest rates in the interbank market.
- Overnight loans are provided at the request of credit institutions and secured with the same securities that are eligible for collateral loan transactions (see below). Overnight interest rates form the ceiling for overnight interest rates in the interbank market.
- Certificates of deposit are issued with a maturity of 7 days, at the request of credit institutions. They are registered at the Icelandic Securities Depository and with Clearstream. Their function is to counteract temporary surplus liquidity in the banking system. The auction format is fixed-price. Financial institutions can also deposit funds in time deposit accounts bearing the same interest rate.
- Collateral loans are the Central Bank's main instrument. Auctions of 7-day agreements are held every week. Credit institutions must put up securities that are eligible as collateral, as specified in the Central Bank's Rules no. 317 of April 2, 2008. Auctions can be fixed-price or auctions where the total amount is announced. Fixed-price auctions have been used so far. The interest rate on collateral loans constitutes the Central Bank's policy rate.

Other transactions:

Other transactions take place as decided by the Board of Governors.

- Collateral loans, certificates of deposit, and time deposits with periods other than those assumed in regular transactions
- Currency swap agreements
- Repurchase agreements with securities that are deemed eligible as financial collateral according to Article 11 of the Rules on Central

Central Bank of Iceland interest rate decisions

Date Policy rate interest decision dates in 2008	Interest on collateral loans (%) Nominal rate[1] (policy rate)	Yield	Change
April 10, 2008	15.50		0.50
March 25, 2008	15.00		1.25
Previous decisions			
December 20, 2007	13.75		0
November 1, 2007	13.75		0.45
September 6, 2007	13.30		0
July 5, 2007[1]	13.30		0
May 16, 2007	(13.30)	14.25	0
March 29, 2007	(13.30)	14.25	0
February 8, 2007	(13.30)	14.25	0
December 21, 2006	(13.30)	14.25	0.25
November 2, 2006	(13.09)	14.00	0
September 14, 2006	(13.09)	14.00	0.50
August 16, 2006	(12.65)	13.50	0.50
July 6, 2006	(12.21)	13.00	0.75
May 18, 2006	(11.54)	12.25	0.75
March 30, 2006	(10.87)	11.50	0.75
January 26, 2006	(10.20)	10.75	0.25
December 2, 2005	(9.97)	10.50	0.25
September 29, 2005	(9.75)	10.25	0.75
June 3, 2005	(9.07)	9.50	0.50
March 22, 2005	(8.61)	9.00	0.25
February 18, 2005	(8.38)	8.75	0.50
December 2, 2004	(7.92)	8.25	1.00
October 29, 2004	(6.99)	7.25	0.50
September 17, 2004	(6.53)	6.75	0.50
July 1, 2004	(6.06)	6.25	0.50
June 1, 2004	(5.59)	5.75	0.25
May 6, 2004	(5.35)	5.50	0.20
February 10, 2003	(5.16)	5.30	-0.50
December 12, 2002	(5.63)	5.80	-0.50
November 6, 2002	(6.10)	6.30	-0.50
October 15, 2002	(6.57)	6.80	-0.50
September 18, 2002	(6.85)	7.10	-0.50
August 30, 2002	(7.31)	7.60	-0.30
August 1, 2002	(7.59)	7.90	-0.60
June 18, 2002	(8.15)	8.50	-0.30
May 16, 2002	(8.42)	8.80	-0.50
April 30, 2002	(8.88)	9.30	-0.30
March 26, 2002	(9.15)	9.60	-0.50
November 8, 2001	(9.60)	10.10	-0,80
March 27, 2001	(10.33)	10.90	-0.50

1. The policy rate as quoted until May 2007 is presented as a nominal discounted rate.

Bank of Iceland Facilities for Financial Undertakings. The purchases must take place on a regulated securities market.

Reserve requirements

Required reserves apply to credit institutions that are not dependent on Treasury budget allocations for their operations. The required reserve base comprises deposits, issued securities and money market instruments. The required reserve ratio is 2% for the part of the required reserve base that is tied for two years or less. The maintenance period is based on the 21st day of each month until the 20th of the following month, and the two-month average reserve is required to reach the stipulated ratio during the period.

Intervention in the foreign exchange market

Foreign exchange market intervention, in keeping with the declaration on the inflation target from 2001, is employed only if the Central Bank considers this necessary in order to promote its inflation target or sees exchange rate fluctuations as a potential threat to financial stability.

Economic and monetary chronicle

November 2007

On November 1, the Board of Governors of the Central Bank of Iceland decided to raise the Bank's policy interest rate by 0.45 percentage points to 13.75%.

On November 20, rating agency Standard & Poor's announced that it had changed the outlook for the Republic of Iceland's sovereign credit rating from stable to negative. The agency affirmed its foreign currency sovereign credit ratings of A+ for long-term obligations and A-1 for short-term obligations. The local currency sovereign ratings are AA for long-term obligations and A-1+ for short-term obligations.

December 2007

On December 6, the supplementary budget for 2007 was approved by Parliament. Estimated tax revenues increased by 20% from the original budget, and estimated fiscal performance improved from 9 b.kr. to 83 b.kr.

On December 12, the Norwegian Ministry of Finance approved the merger of Glitnir Bank ASA and BNbank. The merged entity has also been authorised to acquire all shares in Glitnir Factoring ASA and Glitnir Securities ASA, as well as a 70% share in Glitnir Property Holding AS, with the subsidiary Glitnir Property Group AS.

On December 13, the fiscal budget for 2008 was approved by Parliament, with revenues amounting to 473 b.kr., expenditures amounting to 434 b.kr., and a surplus of 39 b.kr. The increase in revenues over and above the 2007 budget was estimated at 0.3% and the increase in expenditures at 11½%. On the same day, Parliament approved a temporary reduction in oil charges, from 45 kr./l. to 41 kr./l., and an indefinite extension of the temporary reduction in the fee schedule for special per-kilometre fees for diesel vehicles.

January 2008

On January 14, the Government Debt Management Prospect for 2008 was announced. The Prospect described the proposed issue of Treasury notes with a nominal value of 47 b.kr., as well as a new benchmark series of 11-year Treasury notes. It also announced that the Treasury intended to discontinue the issuance of Treasury bills and pay up foreign debt maturing during the year.

On January 28, Moody's Investors Service issued a special comment on Iceland entitled, "Iceland's Aaa ratings are at a crossroads". The report did not announce any change in ratings on the Republic of Iceland.

On January 30, Kaupthing Bank announced that the bank and NIBC had decided to abandon Kaupthing's proposed acquisition of NIBC in view of financial market turbulence. Applications for approval by the pertinent regulatory authorities were withdrawn, and the purchase agreement was invalidated. As a result, the priority offering planned by Kaupthing for the first quarter of 2008 did not materialise.

On January 31, international rating agency Fitch Ratings affirmed Kaupthing Bank's credit rating and revised its outlook from negative to stable. The outlook for the rating had been negative since December 6. Kaupthing's rating is A for long-term obligations and F1 for short-term obligations. The individual rating is B/C, the support rating is 2, and the support rating floor is BBB.

February 2008

On February 1, the rules concerning the official customs clearance exchange rate were amended so as to base the customs price on the exchange rate registered by the Central Bank on the working day immediately preceding the customs clearance date.

On February 17, new wage settlements were signed by the national member organisations and the largest unions within the Icelandic Federation of Labour (ASÍ) and the Confederation of Icelandic Employers (SA). The wage settlements remain in effect until November 30, 2010, and are identical in their fundamentals. The negotiating parties have estimated that total costs incurred by employers will rise by just under 11% during the term of the settlement, or by an average of 3½% annually. There are three main pillars in the settlements: a "safety net" for wage developments, an increase in the lowest wage rates, and a review clause in 2009. No general wage rise is included until the final year; instead, workers are guaranteed specified wage developments during the first two years. The settlement also provided for the establishment of a Worker Rehabilitation Fund, whose function is to provide assistance and services to employees who are injured or have long-term illnesses. Further provisions include an increase in vacation days and in days of leave due to children's illnesses. The assumptions underlying the settlements are two. First, real wages in the private sector, according to the Statistics Iceland wage index, must not drop between January and December 2008. The other assumption concerns maximum inflation levels. At the beginning of February 2009, the review committee will meet in order to discuss an extension of the agreement based on the underlying assumptions. If they have held, the agreement will be extended until November 30, 2010; if not, the parties will attempt to reach a consensus on their response to the changes. If they cannot reach a consensus, the agreement will expire at the end of February 2009.

In connection with the signing of the private sector wage settlements on February 17, the Government pledged to raise the tax-free income threshold in excess of price levels, reduce income-linked cutbacks of child allowances and asset-linked reductions of mortgage interest allowances, lower the corporate income tax rate from 18% to 15% beginning with the income year 2008, raise unemployment benefits in line with the rise in the lowest wage rates, and contribute one-third to the Rehabilitation Fund beginning in 2009, against matching contributions from employers and pension funds. Other pledges include raising rent subsidy allowances, increasing the number of loans pledged for subsidised residential rental housing, and increasing the amount allocated to continuing education and adult education. The Ministry of Finance

estimates that the cost to the Treasury as a result of these measures will total approximately 35 b.kr. over the term of the settlement.

On February 20, an auction of a new series of Treasury notes, RIKB 19 0226, was held. The maturity date of the T-notes is in 2019. The objective was to sell notes in the series for a nominal value of 10 b.kr. A total of 76 valid offers totalling 32 b.kr. were received, and offers for 10 b.kr., with a yield of 8.9%, were accepted. Thereafter, primary dealers were offered the opportunity to purchase an additional 10% of the nominal value of the amount sold in the auction, or 1 b.kr., at the same yield. Each primary dealer was entitled to purchase in proportion to the amount purchased in the auction, and an additional 1 b.kr. was sold as a result.

On February 22, the Financial Supervisory Authority approved the merger of the savings banks Sparisjóðurinn í Keflavík, Sparisjóður Vestfirðinga, and Sparisjóður Húnaþings og Stranda. The savings banks have merged under the name Sparisjóðurinn í Keflavík. Sparisjóðurinn í Keflavík assumed all rights and obligations of Sparisjóður Vestfirðinga and Sparisjóður Húnaþings og Stranda as of July 1, 2007.

On February 28, international credit rating agency Moody's Investor Service announced a downgrade of Kaupthing Bank, Landsbanki Íslands, and Glitnir Bank. The banks' credit ratings for long-term obligations in local and foreign currencies were downgraded from Aa3 to A1 for Kaupthing and from Aa3 to A2 for Glitnir and Landsbanki, and all three banks' financial strength ratings were lowered from C to C-. The ratings for short-term obligations in local and foreign currencies remain unchanged at P-1. The outlook on all of the ratings is stable.

March 2008

On March 5, Moody's Investor Service announced that it had changed its outlook for the Republic of Iceland's Aaa Government bond ratings and the country ceiling on foreign currency bank deposits from stable to negative. The outlook remains stable for the Aaa/P-1 long- and short-term country ceilings for bonds and notes, as well as for the Aaa local currency bank deposit ceiling.

On March 13, the second auction of RIKB 19 0226 was held. Offers were accepted for 2,350 m.kr. nominal value at an average yield of 9.41%.

On March 13, Parliament approved a legislative bill amending the Social Security Act. The amendment abolished the cutbacks in pension benefits due to income earned by a pensioner's spouse, provided for a tax-free threshold for financial income and pension income, and raised the tax-free threshold for pensioners who remain employed, as well as increasing various benefit payments and allowances.

On March 18, Glitnir Bank announced a closed auction of convertible bonds in the amount of 15 b.kr. The bonds are subordinated and convert to Glitnir shares after five years. The issue is classified as Tier I capital.

On March 20, Standard & Poor's announced that it had placed Glitnir Bank hf. on credit watch with negative implications. The bank's rat-

ings for long- and short-term obligations are now A- and A-2, respectively.

On March 25, the Board of Governors of the Central Bank of Iceland decided to raise the Bank's policy interest rate by 1.25 percentage points to 15%. Also announced were amendments to internal Central Bank rules that were drafted with the aim of facilitating financial market activity, especially transactions with Icelandic krónur.

On March 27, a special auction of Treasury note series RIKB 08 1212 was held in the nominal amount of 10 b.kr. The auction supplemented the issue announced on January 14 in the Government Debt Management Prospect for 2008. The objective of the sale was to meet the demand for short-term securities bearing a Treasury guarantee. Offers were accepted for 7.2 b.kr. nominal value.

April 2008

On April 1, Fitch Ratings announced that it had revised the outlook for the Republic of Iceland's long-term foreign and local currency issuer default ratings from stable to negative. The long-term foreign and local currency issuer default ratings were affirmed at A+ and AA+, respectively, and the F1 rating for short-term obligations and the country ceiling of AA- were likewise affirmed.

On April 1, Fitch Ratings announced that it had placed Glitnir Bank, Kaupthing Bank and Landsbanki Íslands ratings for long- and short-term obligations and financial strength on ratings watch negative.

On April 1, Standard & Poor's announced that it had placed the Republic of Iceland's long-term ratings on credit watch with negative implications.

Tables and charts

Tables and charts are generally based on statistical information available on March 31, 2008, apart from financial market data, which are from February 29, 2008. A list of symbols is on p. 2.

A Tables

B Charts

Table 1 Main monthly indicators

	Consumer prices		Exchange rate		Yields (end of period, %)						Money and credit (end of period)[6]			
	% change in CPI[1] over the previous		% ch. in effective exchange rate [1,2]		Short-term			Long-term[5]			12-month % change			
	1 month	12 months	1 month	12 months	Central Bank collateral loans[3]	3-month REIBOR[4]	RIKB 10 0317	RIKB 13 0517	RIKS 15 1001	HFF 150644	Base money	M3	DMB lending	DMB foreign liabilities[7]
2004	.	3.2	.	2.1	7.92	8.6	7.8	7.4	3.6	3.5	3.9	17.1	39.5	59.2
2005	.	4.0	.	11.4	9.97	10.2	7.9	7.8	4.1	4.1	-3.9	17.7	51.5	96.4
2006	.	6.8	.	-10.5	13.30	15.2	9.8	8.9	4.9	4.2	33.1	15.4	41.4	73.5
2007	.	5.0	.	2.5	13.75	14.3	12.6	10.2	...	4.3	23.0	63.3	30.7	22.3
2006														
May	1.4	7.6	0.4	-10.1	11.54	11.9	9.9	8.9	4.0	4.1	8.5	22.2	57.7	94.0
June	1.2	8.0	-3.1	-14.9	11.54	12.5	10.3	9.1	4.4	4.2	36.8	20.0	52.1	96.4
July	0.5	8.4	0.4	-15.7	12.21	12.6	9.8	8.9	4.5	4.2	50.4	21.0	53.7	78.7
August	0.3	8.6	4.7	-12.2	12.65	13.3	8.8	8.0	4.3	4.1	30.7	17.9	52.1	80.0
September	0.6	7.6	1.0	-13.5	13.09	13.5	8.6	7.8	4.1	3.9	60.2	17.9	47.2	81.2
October	0.2	7.2	3.2	-13.8	13.1	14.3	9.2	8.0	4.6	4.2	37.3	19.3	42.2	75.1
November	0.0	7.3	-2.7	-16.2	13.1	14.5	9.7	8.4	4.8	4.3	25.4	9.4	39.5	75.4
December	0.0	7.0	-2.1	-15.4	13.3	15.2	9.8	8.9	4.9	4.2	33.1	19.4	36.8	73.5
2007														
January	0.3	6.9	0.3	-16.6	13.3	15.1	9.3	8.3	5.1	4.4	44.4	15.4	41.4	68.6
February	0.4	7.4	3.5	-10.9	13.3	15.3	9.9	8.8	5.5	4.4	-8.4	17.9	37.3	55.8
March	-0.3	5.9	-0.2	-3.1	13.3	13.8	10.5	9.1	5.0	4.3	102.7	14.9	32.1	40.1
April	0.6	5.3	1.0	6.4	13.3	14.1	10.8	9.2	.	4.3	28.2	26.1	27.8	31.7
May	0.9	4.7	3.6	9.7	13.3	13.9	10.8	9.1	.	4.3	46.0	28.2	26.6	34.1
June	0.5	4.0	1.0	14.3	13.3	13.9	10.9	9.1	.	4.4	48.5	32.1	24.8	33.1
July	0.2	3.8	1.7	15.8	13.3	14.1	11.4	9.5	.	4.6	61.7	38.5	22.1	10.5
August	0.0	3.4	-6.3	3.6	13.3	14.3	11.9	9.6	.	4.5	210.3	44.8	24.0	15.7
September	1.3	4.2	0.5	3.2	13.3	14.2	12.2	9.5	.	4.6	56.7	58.2	32.9	29.2
October	0.5	4.5	3.2	3.1	13.3	13.9	12.5	10.2	.	5.0	83.0	47.5	31.2	27.9
November	0.6	5.2	-2.1	3.7	13.8	14.3	12.2	10.4	.	5.3	182.0	50.6	30.6	21.5
December	0.7	5.9	-1.5	4.4	13.8	14.3	12.6	10.2	.	4.9	23.0	56.6	32.0	22.3
2008														
January	0.2	5.8	-3.6	0.4	13.8	13.9	11.1	9.5	.	4.7	85.6	63.3	30.7	21.2
February	1.4	6.8	-3.5	-6.4	13.8	13.7	12.1	9.8	.	4.4	...	51.2	44.7	...
March	1.5	8.7	-10.5	-16.1	15.0	15.4	13.2	12.3	.	4.4	...	...	...	...

1. Percentage changes between period averages. 2. Based on the official effective exchange rate basket (trade-weighted). A positive sign indicates appreciation of the Icelandic króna. 3. From June 2007 the presentation of the policy rate has been changed. It is now presented as a nominal rate instead of a yield. 4. Average yield on the interbank market in Icelandic krónur. 5. For Treasury bonds and HFF bonds, the quoted yield is in excess of changes in the CPI. Trading with HFF bonds began in July 2004; prior figures are for housing bonds. 6. Annual figures are changes over one year. Domestic borrowers only as of January 2002. Latest figures are preliminary. 7. DMBs = deposit money banks = commercial and savings banks and other institutions permitted to accept deposits from the public. Since July 2007, derivatives have been counted as foreign liabilities and the presentation of Central Banks' short-term position has been changed.

Table 1 (continued) Main monthly indicators

	Foreign exchange market and reserves				Foreign trade and external conditions					Labour market		Public finance	Asset prices 12-mo. % changes	
	Gross foreign currency reserves:			CB								Treasury		
		as ratio of:										financial		
	Position B.kr.	Merch. imports[8]	For. short-term liabil.[9]	net purchases (b.kr.)	Trade balance (b.kr.)	Merchandise exports (b.kr.)	Merchandise imports (b.kr.)	Marine product prices 12-mo.% ch.[10]	Real exchange rate of króna[11]	Unemployment	Wages, 12-mo. % change[12]	balance, % of revenues, from Jan.[13]	Equity prices[14]	Housing prices[15]
2004	65.6	3.6	0.24	27.2	-37.8	202.4	240.2	0.6	98.1	3.1	4.7	0.1	58.9	23.3
2005	67.3	2.9	0.16	24.6	-94.5	194.4	288.9	8.9	111.4	2.1	6.8	22.8	64.7	31.0
2006	68.5	2.8	0.20	18.0	-158.5	242.7	401.2	8.5	104.2	1.3	9.5	17.5	15.8	5.0
2007	72.1	2.9	0.08	19.4	-90.1	305.1	395.2	.	108.6	1.0	9.0	18.4	-1.4	15.0
2006														
May	70.4	2.3	0.08	1.8	-13.7	23.9	37.7	6.8	98.7	1.3	8.7	18.6	41.3	13.2
June	76.8	2.3	0.08	1.5	-15.4	26.4	41.8	8.3	96.4	1.3	8.8	16.2	32.4	13.1
July	74.3	2.3	0.08	1.7	-18.6	19.4	38.0	10.7	97.2	1.4	10.2	17.3	22.4	7.5
August	72.6	2.3	0.09	1.6	-14.4	16.6	31.0	10.7	101.9	1.2	10.6	14.8	28.6	10.8
September	71.3	2.3	0.10	1.4	-7.4	25.4	32.7	10.2	103.4	1.0	10.8	15.7	35.8	10.5
October	70.9	2.3	0.10	1.5	-9.1	20.0	29.1	11.1	106.8	1.0	11.0	16.1	35.1	7.2
November	92.4	2.9	0.11	1.6	-15.9	20.2	36.0	11.7	103.7	1.1	10.5	15.8	21.0	4.8
December	167.9	4.8	0.20	1.2	-20.9	20.1	41.0	11.2	101.1	1.1	9.8	17.5	15.8	5.0
2007														
January	160.4	4.9	0.17	1.9	-2.8	25.9	28.7	30.6	102.3	1.3	10.1	45.5	12.3	6.9
February	160.1	4.8	0.16	1.6	-5.0	23.9	28.9	22.5	105.6	1.3	9.8	35.0	10.8	5.0
March	154.6	4.8	0.14	1.6	-3.3	30.6	33.9	12.9	104.8	1.3	9.7	29.0	27.1	5.8
April	151.1	4.7	0.12	1.8	-11.1	21.8	32.8	1.5	105.9	1.1	9.8	23.5	39.1	5.0
May	144.5	4.7	0.11	1.5	-9.5	24.2	33.7	-3.0	109.9	1.1	9.6	22.4	43.1	5.8
June	143.7	4.7	0.10	1.5	-9.5	23.1	32.6	-7.0	111.5	1.0	9.8	19.5	51.6	5.3
July	145.0	4.8	0.08	1.6	-11.0	21.7	32.7	-6.8	113.6	0.9	8.3	19.2	63.7	9.3
August	151.9	4.8	0.07	1.4	-13.0	17.8	30.9	2.2	106.4	0.9	8.0	16.3	37.8	9.2
September	154.9	4.9	0.07	1.5	-9.6	21.0	30.6	4.7	107.9	0.8	8.1	16.2	26.9	12.7
October	156.7	4.9	0.08	1.8	-8.6	33.5	42.0	5.0	111.2	0.8	8.1	16.4	28.4	10.8
November	162.7	4.9	0.06	1.5	2.6	36.0	33.4	4.8	108.6	0.8	8.3	15.8	13.1	11.0
December	162.8	4.9	0.08	1.7	-9.3	25.5	34.8	3.5	107.5	0.8	8.6	18.4	-1.4	16.7
2008														
January	174.8	4.9	0.08	1.5	-9.5	24.2	33.7	5.6	103.9	1.0	6.2	44.2	-22.2	14.1
February	182.8	5.0	0.08	1.6	-12.5	19.5	32.0	13.2	101.1	1.0	6.8	36.9	-33.2	15.0

8. Gross foreign exchange reserves at end of period as a ratio of the average monthly value of merchandise imports. Calculated at fixed exchange rates. 8. Gross foreign exchange reserves at end of period as a ratio of the average monthly value of merchandise imports. Calculated at fixed exchange rates. 9. The denominator is foreign short-term liabilities of credit institutions and investment banks and includes derivatives as of July 2007. 10. Prices in SDR. Annual figures are % changes between annual averages. Since January 2007, the 12-month percentage change in marine product prices denominated in the króna. 11. Real effective exchange rate of the Icelandic króna based on relative consumer prices (a trade-weighted average of 17 trading partner countries' consumer prices is used), 2000 = 100. Average over periods. 12. Annual figures show change in annual averages. 13 Cash basis. Without privatisation revenues. Adjusted for changed timing of expenditure charges in Jan.-Nov. 2004. 14. OMXI15 index. Annual figures are % changes over year. 15. Residential housing in the greater Reykjavík area. Annual figures are % changes over year.

Sources: Directorate of Labour, Iceland Stock Exchange (OMX Iceland), Land Registry of Iceland, State Accounting Office, Statistics Iceland, Central Bank of Iceland.

Table 2 Historical economic indicators

	Consumer prices [1]		Króna effective exchange rate			Interest rates (%)			Money and credit			Ratio of		
									% change over year					
	Consumer price index[1]	CPI inflation (%)	Nominal exchange rate[2]	Real exchange rate[3]		Gov. bonds average yield[4]	Banks' secured lending (real yield)		M3	DMBs' lending	Credit system lending	gr. reserves to merch. imports[5]	Net external debt[6]	Growth of real GDP (%)
				Relative CPI	Relative ULC		Non-indexed	Indexed						
1978	3.5	44.0	13.9	107.1	117.7	3.3	-13.4	.	48.7	47.3	62.8	2.6	39.2	6.0
1979	5.0	44.5	18.7	101.7	111.2	3.5	-15.4	.	55.9	58.1	46.4	2.5	39.7	4.9
1980	8.1	61.8	25.9	101.8	110.4	3.5	-8.3	2.3	65.4	66.4	71.1	2.4	35.9	5.8
1981	12.2	50.8	34.7	106.2	115.5	3.2	-1.7	2.5	70.5	72.2	54.1	3.0	36.5	4.3
1982	18.4	51.0	54.5	97.7	113.2	3.5	-9.4	2.9	58.0	92.0	100.2	2.1	46.4	2.1
1983	33.9	84.2	100.0	91.8	94.5	3.8	-14.2	3.0	78.7	85.6	82.9	2.5	57.2	-2.2
1984	43.7	29.2	116.3	96.3	91.6	7.0	3.4	5.5	33.4	43.0	40.2	2.1	60.2	4.1
1985	57.9	32.4	148.7	94.8	91.5	6.9	-2.3	5.0	47.6	29.7	35.2	2.8	63.6	3.3
1986	70.2	21.3	171.0	97.1	92.4	8.5	4.3	5.2	35.0	19.1	20.1	3.6	56.5	6.3
1987	83.4	18.8	177.3	106.0	117.6	8.7	4.7	7.7	35.2	42.1	31.4	2.4	49.4	8.5
1988	104.6	25.4	202.6	111.4	127.1	8.7	11.8	9.2	24.0	37.2	34.0	2.4	51.3	-0.1
1989	126.7	21.1	254.7	102.4	110.7	7.4	6.5	7.8	27.2	25.2	33.8	3.0	56.8	0.3
1990	145.5	14.8	283.7	99.1	98.8	7.0	9.3	8.0	14.9	11.0	12.5	3.3	43.8	1.2
1991	155.4	6.8	283.6	101.7	100.7	8.1	10.0	9.2	14.4	11.6	15.4	3.2	44.9	-0.2
1992	161.2	3.7	285.0	101.7	102.0	7.4	11.8	9.3	3.8	5.3	11.8	4.0	53.0	-3.4
1993	167.8	4.1	308.8	96.2	94.0	6.7	11.5	9.1	6.5	5.0	11.1	4.3	58.9	1.3
1994	170.3	1.5	324.8	91.0	82.6	5.0	9.5	7.9	2.3	-1.3	4.5	2.6	53.3	3.6
1995	173.2	1.7	322.3	91.1	87.4	5.6	10.1	8.7	2.2	-8.5	5.9	2.4	52.0	0.1
1996	177.1	2.3	322.9	91.3	88.2	5.5	10.5	8.9	6.8	11.8	9.3	3.0	49.8	4.8
1997	180.3	1.8	318.7	92.2	89.6	5.3	11.1	9.0	11.5	12.7	11.8	2.6	51.3	4.9
1998	183.3	1.7	313.6	93.8	92.2	4.7	11.8	8.8	12.3	30.3	15.1	2.2	57.6	6.3
1999	189.6	3.4	313.1	96.3	96.7	4.4	8.0	8.6	19.0	26.3	17.3	2.6	67.1	4.1
2000	199.1	5.0	313.3	100.0	100.0	5.1	12.7	9.5	11.3	26.1	17.2	2.1	94.0	4.3
2001	212.4	6.7	376.3	87.3	86.9	5.1	9.4	10.2	16.7	12.6	19.2	2.1	102.0	3.9
2002	222.5	4.8	365.2	91.7	91.2	5.2	13.7	10.1	12.9	0.9	3.2	2.5	89.8	0.1
2003	227.3	2.2	343.3	96.0	96.5	4.4	9.4	9.1	21.3	14.8	11.4	3.5	93.3	2.4
2004	234.6	3.2	336.3	98.1	94.1	3.9	8.3	8.0	17.1	39.5	19.9	3.6	113.5	7.7
2005	244.1	4.0	301.8	111.4	105.8	3.7	10.7	7.2	17.7	51.5	31.1	2.9	152.4	7.5
2006	260.6	6.8	337.2	104.2	104.9	4.6	10.9	6.9	15.4	41.4	33.6	2.8	204.2	4.4
2007	273.7	5.0	328.9	108.6	117.9	6.0	14.3	8.0	63.3	30.7	21.9	2.9	246.4	3.8

1. Annual averages (May 1988=100) and changes between years. 2. Annual averages. Exchange rate of the króna against a trade-weighted average of foreign currencies. 1983=100. 3. 2000=100. ULC=unit labour cost. 4. Annual average yield of indexed Treasury bonds of all maturities. Yields on Iceland Stock Exchange (OMX Iceland) from 1987. Before that, primary market yields. 5. Gross foreign exchange reserves at end of period as a ratio of the average monthly value of merchandise imports. Calculated at fixed exchange rates. 6. External debt ratio is calculated as a percentage of accumulated GDP for the last four quarters at current exchange rate.

Table 2 (continued) Historical economic indicators

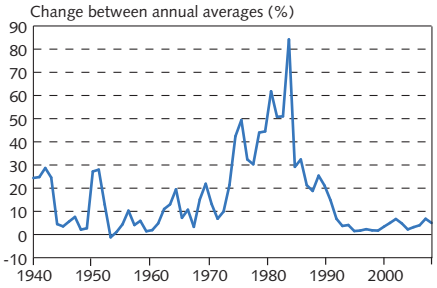
	Components of GDP (% change from previous year)			External trade (% change from previous year)							Labour market (% of labour force)		Wages (% change from previous year)	
				Goods & services (volume changes)				General government (% of GDP)[7]						
	Private consump-tion	Gross fixed cap. formation	National expendi-ture	Exports	Imports	Terms of trade	Curr. acc. balance (% of GDP)	Financial balance	Revenues	Expend-itures	Unem-ployment	Labour particip.[8]	Real wages[9]	Real disp. income per capita
1978	9.0	-5.5	2.1	15.2	3.7	0.2	1.2	0.0	33.8	33.8	0.3	73.6	.	8.5
1979	2.8	-1.8	3.4	6.3	2.5	-8.6	-0.7	0.9	35.1	34.2	0.4	73.0	.	2.0
1980	3.4	13.9	5.9	2.7	3.0	-2.8	-1.9	1.4	35.4	34.1	0.3	74.1	.	1.1
1981	6.2	1.2	5.6	3.2	7.1	-0.4	-4.0	1.3	36.8	35.5	0.4	76.8	0.7	5.4
1982	5.0	0.1	5.0	-8.9	-0.6	-0.7	-7.9	1.7	37.9	36.2	0.8	77.6	1.7	2.2
1983	-5.6	-12.7	-8.6	11.0	-9.7	-1.4	-1.9	-2.0	35.8	37.8	1.0	77.4	-16.7	-12.5
1984	3.7	9.4	6.4	2.4	9.2	0.7	-4.6	2.2	36.9	34.7	1.3	77.6	-3.1	-2.5
1985	4.2	1.0	2.7	11.1	9.4	-0.9	-3.9	-1.6	35.4	37.0	0.9	79.3	1.2	10.8
1986	6.9	-1.6	4.5	5.9	1.0	5.4	0.5	-4.0	35.4	39.4	0.7	80.9	5.7	9.5
1987	16.2	18.8	15.7	3.3	23.3	4.3	-3.4	-0.8	35.6	36.5	0.4	84.1	9.0	25.8
1988	-3.8	-0.2	-0.6	-3.6	-4.6	-0.8	-3.5	-2.0	39.5	41.5	0.6	80.1	2.2	-2.7
1989	-4.2	-7.9	-4.4	2.9	-10.3	-3.9	-1.3	-4.4	38.5	43.0	1.7	78.7	-9.1	-9.4
1990	0.5	3.0	1.5	0.0	1.0	-3.2	-2.1	-3.3	38.1	41.4	1.8	77.5	-4.9	-4.6
1991	3.0	2.6	3.5	-5.9	5.3	3.5	-4.0	-2.9	39.8	42.7	1.5	81.0	1.4	2.1
1992	-3.2	-10.4	-4.6	-2.0	-6.0	-0.5	-2.4	-2.8	40.8	43.6	3.1	81.8	-0.8	-2.7
1993	-4.6	-9.8	-2.9	6.5	-7.5	-3.7	0.7	-4.5	39.0	43.4	4.4	81.1	-2.6	-7.6
1994	2.9	-0.2	1.8	9.3	3.8	0.2	1.9	-4.7	38.6	43.2	4.8	81.3	-0.3	0.0
1995	2.2	-1.7	2.2	-2.3	3.6	1.1	0.7	-3.0	39.6	42.5	5.0	82.9	2.8	3.8
1996	5.7	25.0	6.8	9.9	16.5	-3.2	-1.8	-1.6	40.5	42.0	4.4	81.6	4.0	3.9
1997	6.3	9.3	5.8	5.6	8.0	2.1	-1.8	0.0	40.5	40.5	3.9	81.0	3.6	5.9
1998	10.2	34.4	13.8	2.5	23.4	5.1	-6.8	-0.4	40.8	41.2	2.8	82.3	7.6	7.0
1999	7.9	-4.1	4.2	4.0	4.4	-0.6	-6.8	1.1	43.1	41.9	1.9	83.2	3.3	4.7
2000	4.2	11.8	5.9	4.2	8.6	-2.4	-1.7	1.7	43.5	41.8	1.3	83.5	1.6	5.2
2001	-2.8	-4.3	-2.1	7.4	-9.1	0.3	-0.2	-0.7	41.8	42.5	1.4	83.6	2.0	-1.2
2002	-1.5	-14.0	-2.3	3.8	-2.5	0.6	1.5	-2.5	41.6	44.1	2.5	82.8	2.3	0.2
2003	6.1	11.1	5.7	1.6	10.8	-4.1	-4.8	-2.8	42.7	45.5	3.4	82.1	3.4	4.2
2004	6.9	28.1	9.9	8.4	14.5	-1.3	-9.8	0.0	44.1	44.0	3.1	80.7	1.4	5.3
2005	13.0	35.7	15.8	7.2	29.4	1.0	-16.1	4.9	47.0	42.1	2.1	81.9	2.6	8.0
2006	4.4	20.4	9.3	-5.0	10.2	3.6	-25.4	6.3	48.0	41.6	1.3	83.1	2.6	8.0
2007	4.2	-14.9	-2.3	18.1	-1.4	0.1	-15.6	5.2	48.3	43.1	1.0	83.0	3.8	.

7. Central and local governments and the social security system. 8. Participation rate as per National Economic Institute definition until 1990, but based on Statistics Iceland labour market survey from 1991. 9. Statistics Iceland wage index. Deflated by consumer prices. Since January 2007, the 12-month percentage change in marine product prices denominated in the króna.

Sources: Directorate of Labour, Iceland Stock Exchange (OMX Iceland), Ministry of Finance, Statistics Iceland, Central Bank of Iceland.

Chart 1

Consumer price inflation 1940-2007

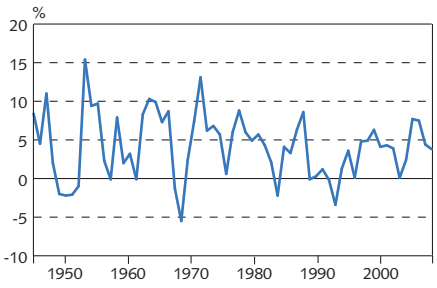


Sources: Statistics Iceland, Central Bank of Iceland.

Chart 2

Exonomic growth 1945-2007[1]

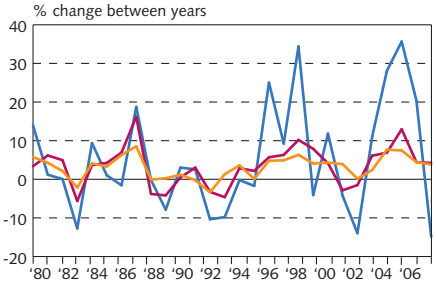
Change in real GDP between years



1. Preliminary 2007.
Source: Central Bank of Iceland.

Chart 3

Growth of GDP, private consumption and gross fixed capital formation 1980-2007[1]

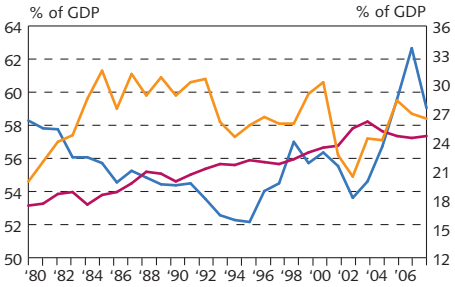


Gross fixed capital formation
Private consumption
GDP

1. Preliminary 2007.
Source: Statistics Iceland.

Chart 4

Private consumption, public consumption and gross fixed capital formation 1980-2007[1]



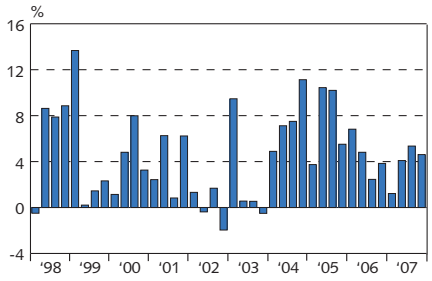
Gross fixed capital formation (right)
Public consumption (right)
Private consumption (left)

1. Preliminary 2007.
Source: Statistics Iceland.

Chart 5

Quarterly economic growth Q1/1998 - Q4/2007[1]

Volume change in GDP on a year earlier (%)

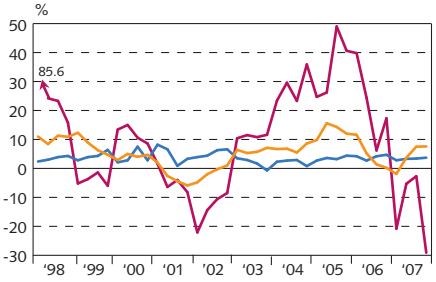


1. Latest data are preliminary.
Source: Statistics Iceland.

Chart 6

Components of economic growth Q1/1998 - Q4/2007[1]

Volume change on a year earlier (%)

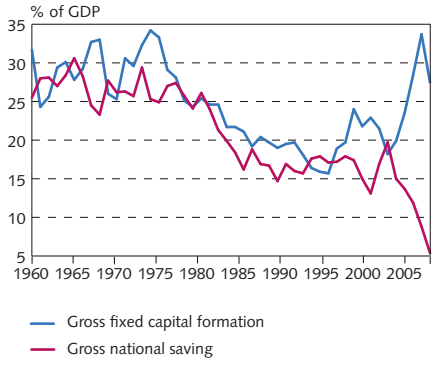


Public consumption
Private consumption
Gross fixed capital formation

1. Latest data are preliminary.
Source: Statistics Iceland.

Chart 7

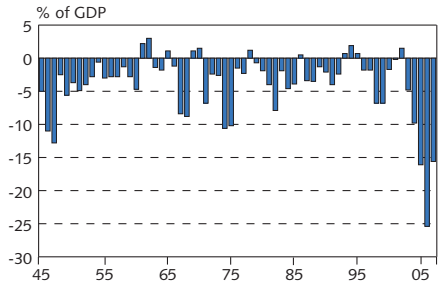
Gross national saving and fixed capital formation 1960-2007[1]



1. Preliminary 2007.
Sources: Statistics Iceland, Central Bank of Iceland.

Chart 8

Current account balance 1945-2007[1]

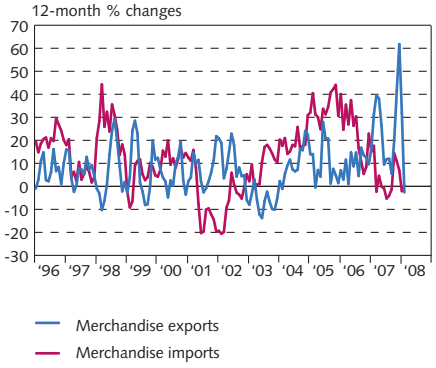


1. Preliminary 2007.
Source: Statistics Iceland

Chart 9

Merchandise trade January 1996 - February 2008[1]

3-month moving averages at fixed exchange rates

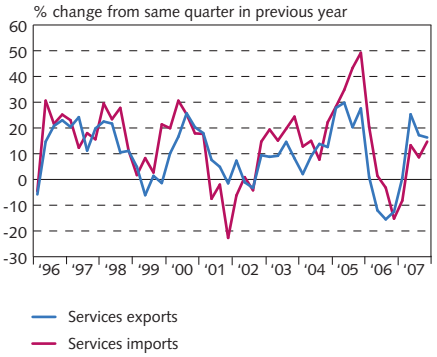


1. Latest data are preliminary.
Sources: Statistics Iceland, Central Bank of Iceland.

Chart 10

Exports and imports of services Q1/1996 - Q2/2007[1]

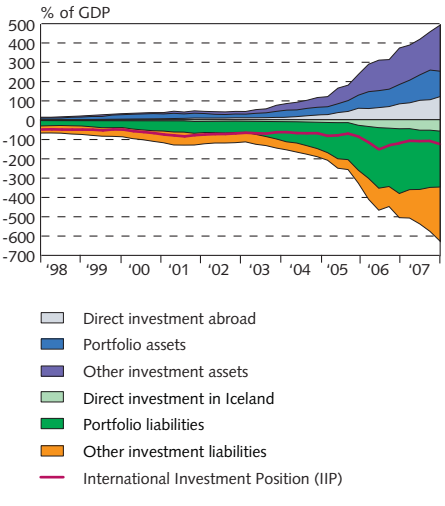
At constant exchange rate



1. Latest data are preliminary.
Source: Central Bank of Iceland.

Chart 11

External debt and assets Q1/1998 - Q4/2007[1]

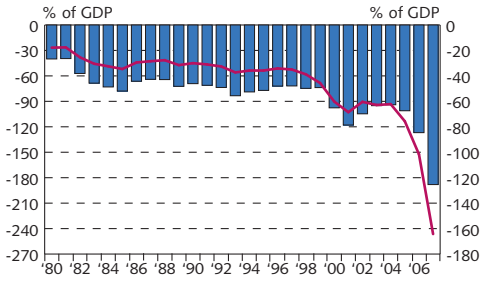


1. Latest data are preliminary.
Source: Central Bank of Iceland.

Chart 12

External debt position 1980-2007[1]

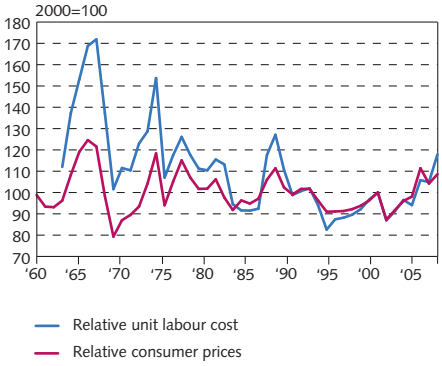
At end of year and latest quarter



1. Latest data are preliminary.
Source: Central Bank of Iceland.

Chart 13

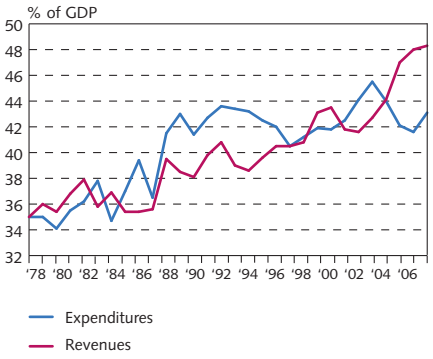
Real effective exchange rate of the Icelandic króna 1960-2007[1]



1. Preliminary 2007.
Source: Central Bank of Iceland.

Chart 14

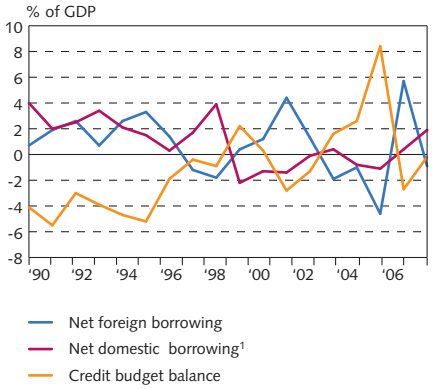
General government revenues and expenditures 1978-2007



Source: Statistics Iceland.

Chart 15

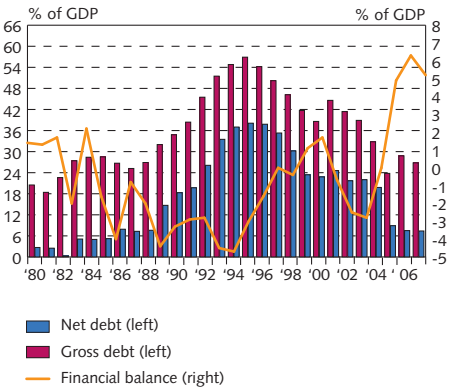
Treasury borrowing 1990-2007



1. Including reduction in pension fund commitments and outstanding long-term interest.
Source: Treasury accounts.

Chart 16

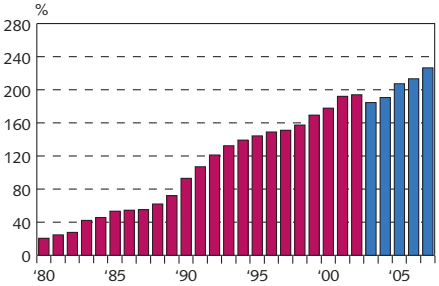
General government balance and debt 1980-2007



Sources: Statistics Iceland, Central Bank projections.

Chart 17

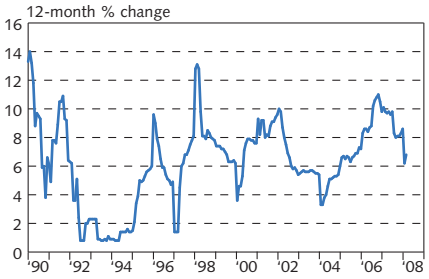
Household debt as percentage of disposable income 1980-2007[1]



1. New classification from 2003 (blue columns). Estimate for 2007.
Source: Central Bank of Iceland.

Chart 18

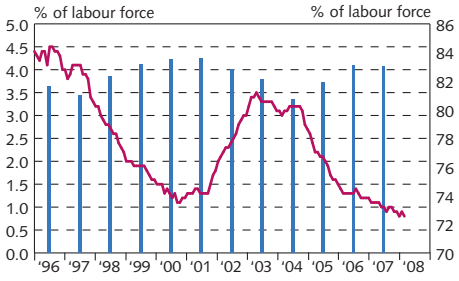
Real wages January 1990 - February 2008



Source: Statistics Iceland.

Chart 19

Unemployment and labour participation[1]
January 1996 - February 2008

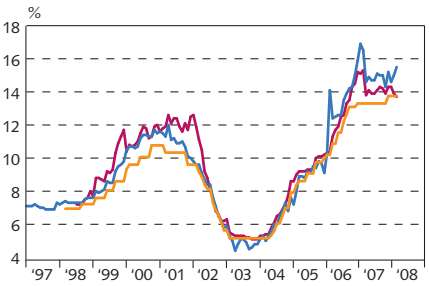


1. Statistics Iceland labour market survey 1996-2007.
Sources: Directorate of Labour, Statistics Iceland, Central Bank of Iceland.

Chart 20

Short-term interest rates
January 1997 - February 2008

At end of month

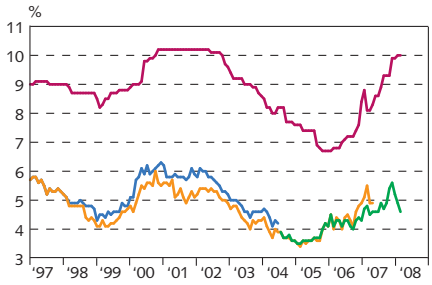


Source: Central Bank of Iceland.

Chart 21

Long-term interest rates
January 1997 - February 2008

At end of month

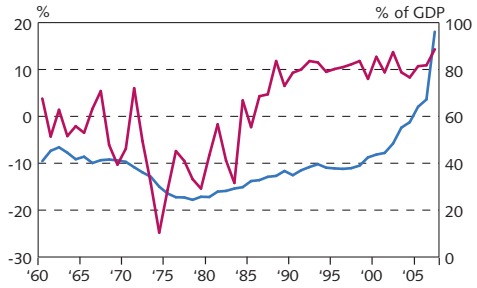


Source: Central Bank of Iceland.

Chart 22

Real yield and broad money 1960-2007[1]

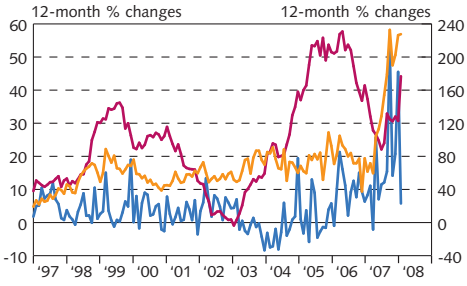
Real yield on non-indexed bank loans and M3 as percent of GDP



1. Latest data are preliminary.
Source: Central Bank of Iceland.

Chart 23

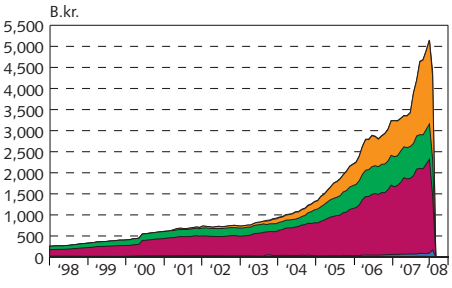
M3, DMB lending and base money
January 1997 - February 2008[1]



1. Latest figures are preliminary.
Source: Central Bank of Iceland.

Chart 24

Deposit money bank lending by sector
January 1998 - January 2008[1]

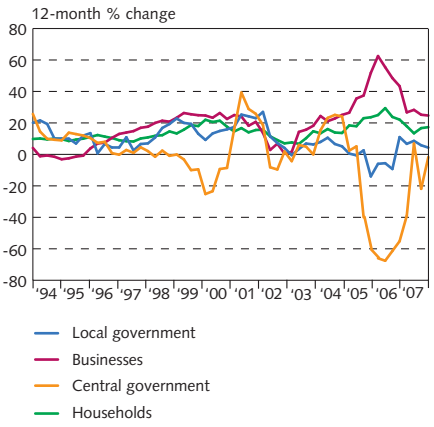


1. Reclassification of lending in September 2003 based on the ÍSAT-95 standard led to a reduction in household debt figures and an increase in business and municipalities' debt figures. Latest figures are preliminary.
Source: Central Bank of Iceland.

Chart 25

Growth of credit system lending 1994-2007

Lending by sector[1]

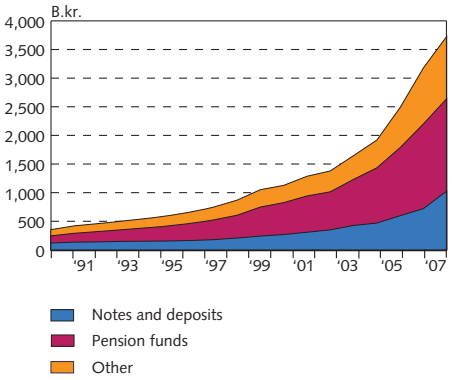


1. Reclassification of lending in September 2003 based on the ÍSAT-95 standard led to a reduction in household debt figures and an increase in business and municipalities' debt figures. Latest figures are preliminary.
Source: Central Bank of Iceland.

Chart 26

Credit system liabilities at end of year 1990-2007[1]

At current prices

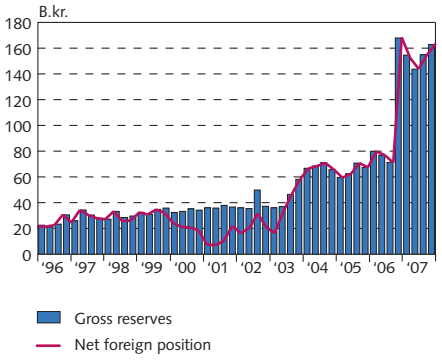


1. Latest figures are preliminary.
Source: Central Bank of Iceland.

Chart 27

Reserve assets and Central Bank net foreign position, Q1/1996 - Q4/2007[1]

Quarterly, at current exchange rates



1. Latest data are preliminary.
Source: Central Bank of Iceland.

Boxes and appendices

2007/3 Estimating Iceland's equilibrium real exchange rate
2007/2 Changes in the baseline forecast from *Monetary Bulletin* 2007/1
2007/1 Calculation of confidence intervals
2006/3 Forecasts errors in Central Bank of Iceland inflation forecasts
2006/3 Inflation developments in the face of a large króna depreciation
2006/2 New presentation of the macroeconomic and inflation forecast
2006/1 New quarterly macroeconomic model
2006/1 Central Bank inflation forecasting methods

Periodical boxes and appendices

2007/3 Financial market analysts' assessments of the economic outlook
2007/3 Alternative scenarios
2007/3 Baseline macroeconomic and inflation forecast 2007/3
2007/2 Financial market analysts' assessments of the economic outlook
2007/2 Alternative scenarios
2007/2 Macroeconomic and inflation forecast 2007/2
2007/1 Financial market analysts' assessments of the economic outlook
2007/1 Alternative scenarios
2007/1 Macroeconomic and inflation forecast 2007/1
2006/3 Financial market analysts' assessments of the economic outlook
2006/2 Financial market analysts' assessments of the economic outlook
2006/1 Financial market analysts' assessments of the economic outlook