REPORT
CENTRAL BANK OF ICELAND

No. 4

Monetary policy in Iceland after capital controls

Report from the Central Bank of Iceland to the Minister of Economic Affairs

December 2010

Central Bank of Iceland

Monetary policy in Iceland after capital controls

Available on the Central Bank of Iceland website (http://www.sedlabanki.is)

ISSN 1670-8830

Monetary policy in Iceland after capital controls

Report from the Central Bank of Iceland to the Minister of Economic Affairs

16 December 2010

Executive summary

The main objective of this report is to describe the issues most relevant for the decision on the monetary and exchange rate framework to be adopted in Iceland after the conclusion of the Government-IMF programme and the abolishment of the capital controls.

It is important to examine the options available in view of the fact that the monetary policy regime adopted earlier in the decade has not proved sufficiently successful. Although based on best practices as suggested by the economic literature and the experience of many successful countries, inflation performance has been poor for most of the period since the adoption of the inflation-targeting regime (see **Section 2**).

There are likely to be a number of reasons for this. For example, the structure of the Icelandic economy makes independent monetary policy more difficult to implement, domestic and international economic and financial market conditions have been highly unusual, and the formulation of monetary policy, which did not succeed in gaining sufficient credibility, was somewhat imperfect. Moreover, increased globalisation of the domestic financial system and its rapid growth are likely to have weakened the transmission channels of monetary policy and increase the underlying risk in the financial system which magnified the volatility of the exchange rate. Sufficient co-ordination between monetary and fiscal policy was also lacking, which exacerbated the negative side effects of monetary restraint (see **Section 3**).

A fixed exchange rate regime has advantages and disadvantages. One of the main advantages is that the uncertainty accompanying exchange rate fluctuation is reduced, particularly if the peg proves credible and speculative attacks can successfully be avoided. On the other hand, monetary autonomy is lost. To a greater degree, economic adjustment to external shocks will therefore have to take place through real economic variables such as employment and output. This is debatable, however, as fluctuations in economic activity may also be partly attributable to exchange rate volatility. If Iceland were to adopt a fixed exchange rate regime, it would be most obvious from an economic point of view to peg the króna to the euro. Such a regime could be implemented in different ways. However, euroisation through EMU

membership in connection with EU membership appears to be the most obvious option compared to other forms of pegs (see **Section 4**).

Experience from the financial crisis, both in Iceland and elsewhere, indicates a need for further strengthening of monetary policy and macroeconomic policy in general. The experience of recent years highlights the importance of implementing stabilisation policy so as to hinder rapid, unsustainable asset price inflation, which is usually accompanied by an excessive credit expansion, increased indebtedness, and risk-taking that can cumulate in a sharp reversal and, if worse comes to worst, a full-scale financial crisis. It is also important to prevent the banking system from creating risks that are beyond the ability of the national authority to deal with. The financial crisis has revealed serious flaws in the financial system and financial supervision worldwide. Central banks need to look beyond price stability since financial instability can emerge even when price stability has been attained. Another lesson from the financial crisis is that the conventional interest rate tool need not necessarily be the most effective tool to combat underlying imbalances in financial markets. Neither is it possible to rely entirely on the interest rate tool if the goal is to ensure monetary and financial stability simultaneously. More tools are therefore needed. This report discusses different variations of such additional tools, which by now are commonly referred to as macro-prudential tools. Among such macro-prudential tools are rules on variable maximum loan-to-value ratios and capital adequacy ratios, and restrictions on liquidity and exchange rate risks. In addition to these tools, a more active foreign exchange intervention strategy can be used to offset large capital inflows that can magnify the credit and asset price cycles and can also serve to smooth the exchange rate cycle. An accumulation of foreign exchange reserves can also be used to reduce the risk of financial crisis in economic downturns. Finally, it is necessary to improve the fiscal policy framework, for example, through the use of fiscal rules and a more systematic co-ordination of monetary and fiscal policy (see **Section 5**).

In addition, there is reason to examine other aspects of the inflation targeting framework. One option is to lengthen the target horizon, which would increase the scope for monetary policy to lean against underlying asset market imbalances. Moreover, the reference price index of the target could be changed, thus moving towards a price measure closer to what is used by many other European countries, although the arguments in favour of this option are not unequivocal (see **Section 6**).

This combination of improvements to the inflation target itself, the use of systematic intervention in the foreign exchange market, increased application of macro-prudential tools, and improvements in the fiscal policy framework are referred to as “inflation targeting-plus.” This report is intended to provide a general overview of possible improvements, whereas a detailed execution tailored to Icelandic conditions awaits the relevant policy decisions.

1 Introduction

In the past two years, the formulation of monetary policy has reflected the capital controls, and more recently, foreign exchange market intervention, together with the more conventional interest rate tool with the aim of promoting exchange rate stability and declining inflation. This has prepared the ground for the financial restructuring of financial institutions and the corporate and household sectors. The capital controls cannot remain in effect indefinitely, once the IMF programme has run its course, without radical changes in Iceland's stance on economic and international affairs. In addition to the undesirable microeconomic costs, the capital controls are in contravention of Iceland's international obligations, including the European Economic Area (EEA) agreement. Thus when Iceland's collaboration with the IMF concludes, the country requires a new monetary policy framework. It is inevitable that the new framework will reflect the poor performance of independent monetary policy in Iceland in the past decade, and in fact, its entire monetary history since the Icelandic króna was separated from the Danish krone. It is therefore important to ask how it is possible to ensure similar monetary stability as has been achieved in most other countries, both industrial and emerging market. At the request of the Prime Minister, the Central Bank prepared a short report on this issue in June 2009.[1] That report explores the options that are considered most viable in more detail.

The main emphasis of the report is to highlight the issues that are important when considering the appropriate monetary and exchange rate arrangements for Iceland, on the basis that it will continue with its own currency. Decisions in these matters must obviously take account of the fact that Iceland is currently engaged in accession negotiations with the European Union (EU). The results of those discussions and the national referendum on the matter will determine Iceland's long-term monetary regime. That, however, will not have been determined by the time the IMF programme concludes. Consequently, it is necessary to formulate a monetary policy arrangement that can be followed until the EU question is determined and, if EU membership is rejected in a national referendum, for the longer term. It should also be kept in mind that several years may pass from a vote in favour of EU membership until the euro would be adopted as the country's currency.

If EU membership is rejected (and membership in the Economic and Monetary Union (EMU) with it) it is likely that the outcome will be a monetary policy with an independent currency. Whether the framework is meant as an interim arrangement or as a long-term solution, it is therefore important to formulate a sound and durable framework.

The main conclusion of this report is that Iceland's current inflation-targeting monetary policy is insufficient on its own. Monetary policy will need to look beyond inflation. In particularly, it is important to consider

[1] Central Bank of Iceland, *Advantages and disadvantages of changing Iceland's monetary policy framework.* Report to the Prime Minister, 30 June 2009 [only available in Icelandic].

the underlying imbalances that emerge in large fluctuations in credit growth, indebtedness, and asset prices. In order for the Central Bank of Iceland to be able to respond to such developments, it is desirable that the Bank have at its disposal a greater number of tools that would be wielded either by the Bank itself or by other authorities, in accordance with the Bank's directives. This report explores a variety of ways to put such tools in operation. Among these tools are those classified as "macro-prudential" tools, which are directed at the stability of the financial system as a whole and not merely on individual institutions. In general, it should be expected that the application of macro-prudential tools will tend to supplement monetary policy, particularly under conditions like those reigning in Iceland in the run up to the financial crisis. Among such macro-prudential tools are rules on variable maximum loan-to-value ratios and capital adequacy ratios, and restrictions on liquidity and exchange rate risks. In addition to these, it would be possible to use more active foreign exchange intervention so as to lean against large capital inflows and the associated exchange rate cycle, and to accumulate and use the foreign exchange reserves in support of financial stability. Furthermore, there is reason to examine whether the inflation target itself should be revised. One option would be to lengthen the target horizon. This would increase the scope for monetary policy to lean against underlying imbalances in asset markets. Changing the reference price index might also be an option, thus moving towards a price measure closer to what is used by many other European countries.

Moreover, it is highly desirable to improve the co-ordination of monetary and fiscal policy. Fiscal rules could play a role in making the co-ordination between monetary and fiscal policy more effective, as is mentioned in the aforementioned report to the Prime Minister.

In combination, the above-mentioned improvements in monetary policy formulation, with support from active foreign exchange intervention, introduction of macro-prudential tools and improved fiscal policy, should enhance the likelihood that the inflation target will be achieved without excessive strain on the exchange rate or on financial stability. These changes can be referred to collectively as "inflation targeting-plus", as it entails improvements to the inflation targeting policy practised in Iceland before the financial crisis.

This report is intended to provide a general overview of possible improvements, whereas a more detailed execution tailored to Icelandic conditions awaits the relevant policy decisions.

The report is structured as follows: Section 2 gives a general overview on the role of monetary policy. Section 3 discusses inflation developments in Iceland and the possible explanations for the poor record over the past decade. Section 4 explores various versions of possible fixed exchange rate regimes, ranging from a conventional unilateral fixed exchange rate peg to a unilateral adoption of another currency or participation in a currency union. Section 5 discusses the necessary improvements in macroeconomic policy implementation, including

macro-prudential tools that could support monetary policy and fiscal rules conducive to improve the co-ordination of monetary and fiscal policy. The final section focuses on possible refinements to the inflation target itself.

2 The role of monetary policy

2.1 The goals of monetary policy

In general, it can be said that the role of macroeconomic policy should be to maximise the economic welfare of the general public. This entails, among other things, promoting as much growth in economic activity as the economy's potential allows, i.e. attaining the level of growth in output and employment that is consistent with low and stable inflation. This also involves reducing, insofar as is possible, business cycle volatility as it tends to exacerbate uncertainty and lead to inefficient utilisation of economic resources. In the worst-case scenario, large business cycles can lead to a currency and/or banking crisis, which is usually associated with high social costs and can seriously undermine the sustainability of public finances.

Monetary policy is an important element of macroeconomic policy; therefore, it seems appropriate that the goals of monetary policy be thought of in a manner similar to macroeconomic policy in general. Before the crisis, however, the formulation and implementation of monetary policy assumed that, in general, the monetary authorities had only one tool at their disposal – the policy rate – and that monetary policy was therefore restricted to aim towards achieving one goal, which was the promotion of low and stable inflation. This was based both on academic research and on international experience from the inflationary years of the 1970s. This view has changed somewhat since the financial crisis struck, however, and it is now more generally recognised that central banks do (or at least should) have further tools at their disposal which can also be applied to promote financial stability (see, for example, Blanchard et al., 2010).

Monetary policy implementation that ensures price stability and anchors inflation expectations should also reduce business cycle volatility, as less volatile inflation expectations should be accompanied by more stable real interest rates and real exchange rates, which in turn should mitigate fluctuations in demand and output. If inflation expectations are credibly anchored – that is, if economic agents are confident that monetary authorities can keep inflation at target – interest rate changes necessary to control inflation in the event of temporary deviations from target should be smaller than if inflation expectations are sensitive to short-term price and exchange rate fluctuations. As a result, the more firmly anchored inflation expectations are, the greater the scope of monetary policy to respond to economic shocks.

This interaction between price stability and a more stable real economy is demonstrated most clearly when inflation rises in the face of a positive

demand shock. Increased monetary restraint then serves to bring demand back into line with potential output, and ensure that inflationary pressures diminish. The same applies in the case of a negative demand shock. In this case, capacity is underutilised and inflation falls below target: less monetary restraint leads to increased demand that serves to close the slack that has emerged and push inflation back up to target again.[2]

But inflation can also be driven by other shocks than originate on the demand side of the economy, which makes monetary policy implementation more complicated. When inflation rises due to a supply shock, such as a rise in oil or commodity prices, increased inflation and deterioration in terms of trade tend to go hand in hand, which – other things being equal – would lead to a contraction in economic activity. Raising interest rates in order to reduce inflation would therefore exacerbate the contraction. In that case, it may be appropriate to allow inflation to rise temporarily, trusting that it will not affect long-term inflation expectations and will therefore have a limited impact on long-term inflation prospects. If monetary policy is not sufficiently credible, however, there is the risk that the temporary inflation shock becomes entrenched. Firmly anchoring inflation expectations will thus increase the scope of monetary policy to support the economy when it is hit by a negative supply shock.[3]

The above description of monetary policy implementation assumes that promoting price stability also promotes financial stability. The recent financial crisis has shown, however, that financial instability can develop even when price stability has been achieved. Consequently, it may be necessary to provide central banks with a greater number of instruments if they are to be entrusted with the task of promoting financial stability. This is discussed further in Section 5.

2.2 Monetary policy on the basis of inflation-targeting

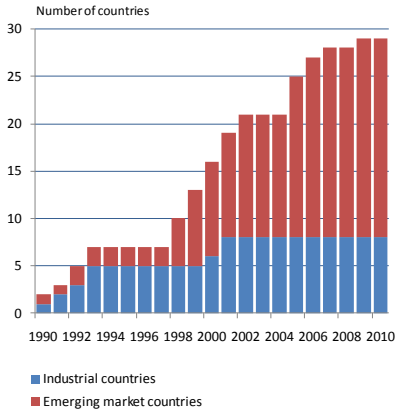
In March 2001, the Central Bank of Iceland adopted an inflation target and with an amendment to the Bank's act in May the same year, price stability was defined as the primary objective of monetary policy, in line with the above-described ideas on monetary policy implementation and the experience of other countries. The price stability goal was further specified in the joint declaration by the Government and the Central Bank as a numerical inflation target. According to the joint declaration, the Central Bank was to ensure that year-on-year inflation remained as close as possible to 2½%.

This arrangement was similar to the monetary policy framework that had become more common around the world after New Zealand adopted an inflation target in early 1990. By the end of 1998, 10 countries had adopted a formal inflation target. In the ensuing five years, that number had roughly doubled, and now there are 29 countries that

[2] This is sometimes referred to as the "divine coincidence" of monetary policy.
[3] This does not change the fact that monetary policy cannot prevent changes in relative prices and their impact on households and businesses.

follow inflation-targeting monetary policy (see Pétursson, 2010, and Hammond, 2010). As Chart 1 shows, the increase in the past decade has been concentrated largely among emerging market economies.[4]

Chart 1
The number of inflation countries



Sources: Pétursson (2010), Hammond (2010).

One of the main objectives of inflation targeting is to provide a stronger anchor for inflation expectations than may otherwise be possible. The idea is to try to increase the effectiveness of monetary policy in controlling inflation and give it more scope to contribute to general well-being, within the framework set by the inflation target. Although the details of inflation-targeting frameworks vary from country to country (see, for example, Hammond, 2010), the gist of it is that price stability is defined as the primary objective of monetary policy, for the reasons set forth in Section 2.1. Price stability is defined more precisely as a numerical inflation target that is made public so as to enhance the likelihood that inflation expectations will be consistent with the target and better enable the public to monitor whether monetary authorities achieve the set objective.[5] The central bank's independence from political authorities is generally strengthened as well, in order to protect it from political pressures and ensure that monetary policy formulation is properly guided by long-term objectives rather than narrow, short-term interests. Increased transparency and a stronger focus on disclosure of information to the public also characterise the inflation-targeting framework.[6]

2.3 International experience of inflation-targeting

In recent years, a number of studies have been published analysing whether inflation targeting has led to improved inflation control. As Table 1 shows, inflation among inflation-targeting countries fell, on average, from 12.6% before the adoption of inflation targeting to 4.4% afterwards. Inflation volatility has diminished as well. This is visible among both industrial and emerging market inflation targeters, although the improvements are much more visible in the latter group. The adoption of an inflation target therefore appears to coincide with lower and more stable inflation. Nevertheless, it is difficult to assert that this improvement is indeed attributable to inflation targeting, as similar developments can be seen among the non-targeting countries.

In order to determine whether inflation targeting is responsible for the improvements, it is necessary to do formal empirical analyses that controls for the general improvement in inflation performance. A

[4] Finland and Spain adopted an inflation target when they abandoned their fixed exchange rate policy early in the 1990s, before joining the EMU in 1999. Slovakia also adopted an inflation target in 2005 but abandoned it upon joining the EMU at the beginning of 2009. It could also be argued that Iceland departed temporarily from its inflation target in the wake of the financial crisis. Despite these exits, inflation targeting has proven to be one of the most enduring monetary policy frameworks in the history of monetary policy regimes (see, for example, Mihov and Rose, 2008).

[5] If monetary policy has numerous and loosely-defined objectives, it becomes very difficult for the public to evaluate its success.

[6] In fact, it can be argued that many of these characteristics apply to the monetary policy pursued by most countries, irrespective of whether the they follow an inflation-targeting regime or not, although inflation-targeting countries have been instrumental in their formulation and have taken them farther than other countries.

number of such studies suggest that the adoption of an inflation target has led to lower, more stable inflation, even when controlling for the global decline in inflation level and fluctuations and for the developments of other economic variables (see, for example, Pétursson, 2005 and 2010, Vega and Winkelried, 2005, and Mishkin and Schmidt-Hebbel, 2007).[7]

Table 1 Inflation and business cycle volatility 1989-2004

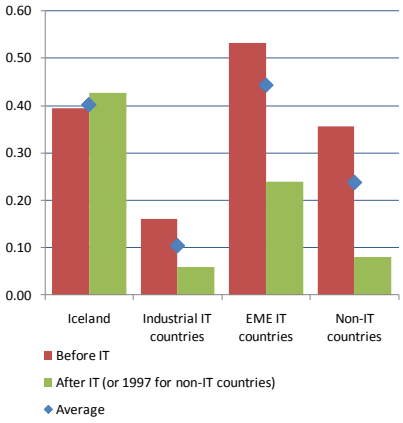
	Inflation (%)		Inflation volatility (%)		Output volatility (%)	
	Before	After	Before	After	Before	After
Inflation-targeting						
All countries	12.6	4.4	3.9	2.6	3.0	2.2
Industrial countries	4.7	2.3	2.2	1.4	2.0	2.2
Emerging countries	18.6	6.0	5.2	3.6	3.8	2.3
Non-targeters	4.0	2.1	1.4	0.8	4.0	2.1

The table shows average inflation, the standard deviation of inflation and the standard deviation of GDP growth before and after the adoption of an inflation target in inflation-targeting countries and before and after 1997 (the average year of inflation target adoption) for the non-targeting countries.
Source: Schmidt-Hebbel and Mishkin (2007).

The empirical studies suggest that, in general, the adoption of an inflation target not only led to declining inflation and reduced inflation volatility but has made inflation more predictable (Corbo et al., 2001) and reduced its persistence; that is, permanent shocks to the price level had a less pronounced impact on inflation and were less entrenched than before the adoption of the inflation target (see, for example, Pétursson, 2005, and Siklos, 1999). These studies also indicate that the adoption of an inflation target has improved the monetary authorities' ability to control inflation expectations. Johnson (2002), for example, found that adopting an inflation target led to declining inflation expectations, while Gurkaynak et al. (2006 and 2007) find that short-term economic news tend to have a stronger effect on long-term inflation expectations in non-targeting countries than in targeting countries. Finally, Walsh (2009) and Siklos (2010) have shown how the adoption of an inflation target has led to a decline in the distribution of inflation expectations in survey responses and how these expectations have gradually converged with the inflation target and remained there, even though headline inflation has sometimes risen temporarily above the target.

The adoption of an inflation target also appears to have been associated with a decline in exchange rate pass-through. This can be seen in Chart 2, which shows that exchange rate pass-through has diminished after the adoption of an inflation target, although it remains somewhat more pronounced among emerging market countries than industrial countries. The chart reveals, however, that developments have been similar among non-targeting countries; therefore, it is not clear whether the change is

Chart 2
Exchange rate pass-through
Cumulative effect of 1% depreciation after 2 years



Source: Pétursson (2010).

[7] These findings are especially clear in the inflation-targeting emerging market economies, but they are less so when the analysis only includes industrial countries (see, for example, Ball and Sheridan, 2005).

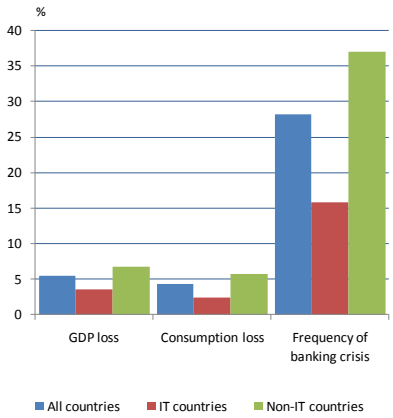
due to the adoption of an inflation target or to some other general trend, such as an overall decline in inflation worldwide. Mishkin and Schmidt-Hebbel (2007) and Edwards (2007) suggest, though, that this development may to some extent be attributable to inflation targeting.

The main criticism of inflation target among economists is that excessive emphasis on inflation control may be at the cost of other economic policy objectives, primarily the stability of the real economy (see, for example, Friedman, 2004). If this is so, the adoption of an inflation target should go hand-in-hand with greater output volatility and even less output growth. As Table 1 shows, the introduction of an inflation target has generally been accompanied by reduced output volatility, although output volatility has also declined in non-targeting countries. In fact, the findings of Corbos et al. (2001) and Walsh (2009) suggest that greater real economic stability may be due to global developments rather than to the adoption of an inflation target. In emerging market countries, however, inflation targeting appears to have reduced not only fluctuations in inflation but in output as well (Goncalvas and Salles, 2008). Furthermore, lower and more stable inflation following the inflation targeting does not appear to have been achieved at the expense of output growth (see, for example, Pétursson, 2005, and Walsh, 2009).

Moreover, Pétursson's (2009) findings indicate that the adoption of an inflation target has generally not led to an increase in excess exchange rate volatility; that is, exchange rate fluctuations that are in excess of those that can be attributed to fluctuations in economic fundamentals.

Finally, in a recent study analysing the cross-country variation in the impact of the global financial crisis on 46 medium- to high-income countries, Ólafsson and Pétursson (2010) found that inflation-targeting countries tended to weather the crisis better than non-targeting countries, after adjusting for various pre-crisis variables and country characteristics (see Chart 3). The contraction in output and consumption appears to have been less on average in inflation-targeting countries, and the probability of a systemic banking crisis smaller (see also Carvalho Filho, 2010).

Chart 3
Impact of financial crisis - Comparison of IT and Non-IT countries



Source: Ólafsson and Pétursson (2010).

Given the general positive experience of inflation targeting, Iceland's experience of inflation targeting is especially striking. Although, inflation was successfully brought down to target and kept there from mid-2002 to mid-2004, after a sharp increase in inflation following the floating of the króna, it rose gradually afterwards and has for the most part remained well above the target. Moreover, Pétursson's findings (2009) indicate that Iceland is one of few countries that have experienced an increase in excess exchange rate volatility following the adoption of an inflation target. As Chart 2 shows, exchange rate pass-through also appears not to have diminished in Iceland, unlike the experience of other countries. Finally, it is clear that the global financial crisis has had much more severe impact in Iceland than in most other countries: the contraction was deeper and more protracted and the banking crisis was more widespread than elsewhere. Furthermore, the country

experienced a currency crisis as well. Why Iceland's experience of inflation targeting has been so poor in comparison to other targeting countries is therefore a question of pressing importance. The following section attempts to highlight the most important reasons for this poor experience.

3 Monetary policy in Iceland

3.1 Inflation developments in a historical context

The Icelandic króna was at par with the Danish krone until 1920, when they were formally separated. The Danish krone now trades at about 20 Icelandic krónur, but adjusting for the redenomination of the Icelandic króna in 1981, the Danish krone is now worth approximately 2,000 pre-1981 krónur. The value of the Icelandic króna versus the Danish krone is therefore only 0.05% of its 1920 value or, to put it differently, the Icelandic króna has lost 99.95% of its value vis-à-vis the Danish krone over this 90-year period.

The purchasing power of the króna has eroded even more. In terms of the overall consumer price index (CPI), the value of each króna in June 1944 was equivalent to 7,147 old krónur (71.47 new krónur) by August 2010. In terms of the CPI excluding the housing component, the 1944 króna was worth 10,377 old krónur (103.37 new krónur), which means that the value of the currency has fallen by 99.99%. The monetary history of Iceland has therefore been a rocky path right from the start, irrespective of which monetary and exchange rate regime the country has followed.

Table 2 Average inflation in various periods (%)

Decade	Consumer price index	Consumer Price Index excluding housing
1941-1951	12.9	14.3
1951-1961	4.5	6.4
1961-1971	12.0	12.8
1971-1981	37.9	38.9
1981-1991	29.0	29.2
1991-2001	3.2	3.0
2001-2009	6.2	5.4

The table shows average annual inflation in various decades.
Source: Statistics Iceland.

The erosion of the króna has not been a steady process, but periods with low and stable inflation are few and brief. As Table 2 shows, it was only in the 1990s that inflation in Iceland was comparable with other countries.[8] During that period, Iceland followed a fixed exchange rate regime, pegging the króna to a trade-weighted exchange rate index. Except for two currency devaluations in 1992 and 1993, the Central Bank was able to hold the króna relatively stable from 1991 to 2000. The

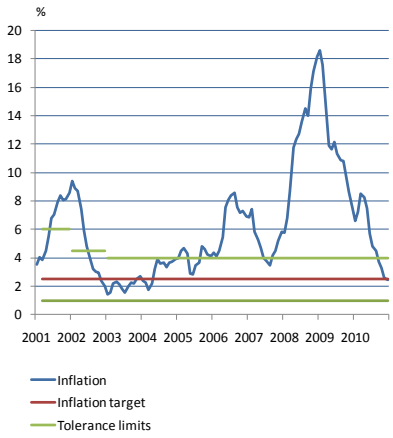
[8] Even during this period, inflation was somewhat higher here than in most OECD countries. The difference was smaller, however, than before and after this period.

exchange rate band was first expanded when exchange rate pressures began to mount, and in March 2001, Iceland abandoned the fixed exchange rate policy, floated the króna, and adopted an inflation target as a new nominal anchor, as is described in Section 2. At that time, it was widely agreed that, with free international capital movements, it would be extremely difficult to maintain a unilateral fixed exchange rate, especially in such a small currency area.

3.2 Inflation developments in the inflation-targeting era

As is stated in Section 2, the joint declaration on 27 March 2001 introduced the 2½% inflation target (see *Monetary Bulletin* 2001/2, p. 45). The March declaration also defines a tolerance limit of 1½ percentage points on either side of the 2½% target. The primary objective of the tolerance limits is to trigger a requirement that the Central Bank submit a special report to the Government explaining the reasons for the deviations from the target. For the first year, the upper threshold for inflation was set at 6%, but it was lowered to 4½% in 2003 and to 4% from 2004. Chart 4 shows the developments in inflation during the inflation-targeting period. As can be seen in the chart, inflation was close to target – and well within the tolerance limits – from mid-2002 to mid-2004, but then it rose gradually and exceeded the upper limit in early 2005. Inflation has been above the upper tolerance limit until just recently, with the exception of short periods in mid-2005 and mid-2007.

Chart 4
Inflation and inflation target in Iceland



Source: Statistics Iceland.

Table 3 Inflation developments and inflation target in Iceland (%)

	CPI	CPI excl. housing	HICP
Average			
April 2001 – December 2004	4.2	3.6	3.9
April 2001 – December 2007	4.7	3.2	3.6
April 2001 – December 2010	6.3	5.9	6.3
Standard deviation			
April 2001 – December 2004	2.5	3.2	2.9
April 2001 – December 2007	2.2	2.8	2.6
April 2001 – December 2010	4.0	5.6	5.4
Absolute deviations from target			
April 2001 – December 2004	2.0	2.4	2.3
April 2001 – December 2007	2.4	2.2	2.0
April 2001 – December 2010	3.9	4.4	4.4
Frequency of inflation above upper tolerance limit			
April 2001 – December 2004	35	33	37
April 2001 – December 2007	55	32	37
April 2001 – December 2010	65	49	54

The table shows the average, standard deviation, and absolute deviations from the 2½% inflation target during three different time periods. It also shows the number of months when inflation is outside the upper 4% tolerance limit relative to the relevant period. CPI represents the consumer price index; CPI excluding housing is the consumer price index excluding the housing component, and HICP is Eurostat's Harmonised Index of Consumer Prices.
Source: Central Bank calculations based on Statistics Iceland data.

Table 3 shows that inflation has, on average, been significantly above the target and has fluctuated widely. Furthermore, it can be seen that

inflation performance deteriorated gradually: inflation rose and become more volatile, deviations from target increased, and the frequency of inflation above the upper tolerance limit increased. The table shows a similar development for the CPI excluding housing and Eurostat's Harmonised Index of Consumer Prices (HICP), which also excludes house prices. Although their standard deviation is greater than that of the CPI, inflation according to these price indices has less often moved above the upper tolerance limit.

Because the inflation target was adopted following a failed fixed exchange rate regime, it was highly likely that inflation would rise temporarily in the wake of exiting the peg, as there were significant downward pressures on the exchange rate towards the end of the fixed exchange rate period. Thus it may be appropriate to exclude the early part of the inflation-targeting period, as inflation developments in that period reflect primarily the impact of that depreciation; however, inflation performance has been poor even if measured since the beginning of 2003. From 2003 to the present time, inflation has averaged 6.4%, while it averaged 4.2% from 2003 to 2007.

3.3 Possible causes of poor inflation outcomes

There are doubtless a variety of possible reasons for the poor inflation outcomes and the general lack of success of stabilisation policy in Iceland. The following discussion explores those that are probably the most important. Apart from monetary policy itself and its interaction with other parts of macroeconomic policy, the difficulties appear to lie chiefly in the structure of the Icelandic economy and the extraordinary global economic conditions during recent years. Poor outcomes can probably be attributed to a combination of all these factors.[9]

3.3.1 The structure of the Icelandic economy

The salient features of the Icelandic economy are its small size and the homogeneity of its production structure, which probably make the Icelandic economy relatively more exposed to larger shocks than the large and more diversified economies. This is of course not limited to Iceland but is true of all small economies that must rely heavily on international trade while specialising in a relatively narrow production structure. This combination of openness and specialisation makes Iceland more vulnerable to terms of trade shocks and makes the economy more volatile.[10]

These characteristics make it more difficult for the economy to absorb large-scale investments, and make the economy especially exposed to developments in key sectors. Furthermore, the financial system in small economies is often less developed which makes risk diversification more difficult than in larger economies that can spread risk over a larger group

[9] It is highly probable that Iceland's large business cycles are due not only to exogenous shocks such as terms of trade shocks, but can also be explained by poor stabilisation policy, including monetary policy.

[10] Furceri and Karras (2007), for example, find a clear negative relationship between the size of the economy and economic volatility.

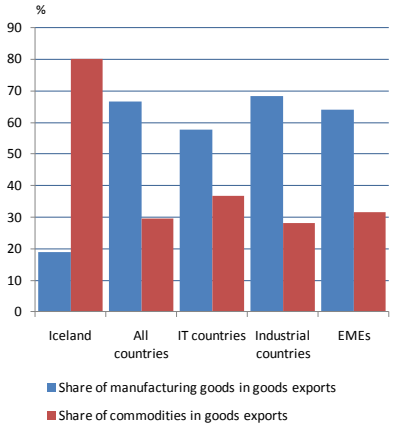
of economic agents. Expenditure smoothing is therefore likely to be more difficult for the private sector than in larger economies.

It is also likely that the large share of natural resources and commodities in Iceland's production and export structure make the Icelandic economy particularly sensitive to global commodity price shocks (see Chart 5). Fluctuations in commodity prices translate into more volatile terms of trade than in most other countries. As is stated in Section 2, this makes monetary policy formulation more difficult. In addition, fluctuations in fish catches have an important impact on the domestic business cycle, which are relatively unconnected to the global business cycle (see, for example, the findings of Guðmundsson et al., 2000), although the introduction of the fishing quota system has somewhat reduced fluctuations in fish catches. As the experience of recent years shows clearly, it can be extremely difficult to pursue independent monetary policy in a small open economy which is subject to large idiosyncratic shocks and thus with a business cycle that is largely out of sync with the global business cycle. Finally, the fixed costs associated with building up public institutions and providing efficient public services, for example in terms of business cycle stabilisation, are likely to be relatively higher in small economies than in larger ones.[11]

As Honjo and Hunt (2006) show, the trade-off between inflation and output volatility is much less favourable in Iceland than in other small, open inflation-targeting countries. This will, other things being equal, lead to greater difficulty in maintaining low and stable inflation in Iceland. The general trend, until the global financial crisis struck, was that business cycles had become considerably less pronounced in most countries – often referred to as the "great moderation" – and Iceland was no exception. Nevertheless, fluctuations in inflation and output continue to be greater in Iceland than in other industrial countries (see Chart 6).[12] Honjo and Hunt (2006) and Sighvatsson (2007) also argue that the large size of economic shocks in Iceland may force the Central Bank to respond more aggressively to keep inflation at target, thus leading to greater volatility in output and employment than in other countries. The relatively high sacrifice ratio in Iceland can also lead to less confidence in the inflation target if private agents doubt that the Central Bank and the authorities are actually willing to do what is necessary to keep inflation at target. This makes the fight against inflation more difficult than it would be otherwise.

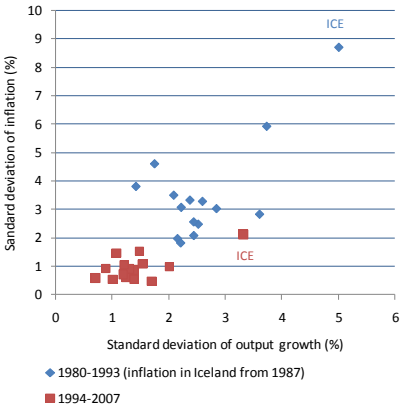
In this context, it is also noteworthy that Iceland has long maintained a high employment rate and low unemployment, in fact a much lower

Chart 5
Export composition 2006



Source: United Nations (UNCTAD).

Chart 6
Standard devation of inflation and output in 15 industrial countries



Sources: Statistics Iceland and IMF.

[11] Iceland's volatile business cycles are particularly prominent when looking at fluctuations in private consumption, but less so in terms of fluctuations in GDP. In part, this reflects small countries' widespread use of international trade to smooth business cycles. Large fluctuations in private consumption can also be linked to unsuccessful stabilisation policy and the effects of large exchange rate movements. For further discussion, see Box IV-1 in *Monetary Bulletin* 2010/2, pp. 42-46.

[12] The question of whether improved stabilisation policy is responsible for the great moderation, or whether it simply reflects structural changes or just pure luck, is still being debated (see, for example, Walsh, 2009). Ásgeir Daníelsson (2008) argues that more moderate business cycles in Iceland are mainly attributable to changed conditions in the fishing sector rather than to improved stabilisation policy.

unemployment rate than in neighbouring countries. At the same time, inflation has been much higher in Iceland. This may reflect underlying preferences towards high employment even at a cost of high and volatile inflation, which seems different from what is generally found in other countries (see, for example, Fischer and Huizinga, 1982).[13] As a result of this attitude towards the short-term trade-off between inflation and employment, the general understanding of the role of monetary policy measures may be limited. Although central banks must often resort to unpopular actions, it is important that there is a certain level of understanding of those actions and that the measures themselves receive general support. If Icelanders in general view the burdens of unemployment, on the one hand, and inflation, on the other, very differently from other countries, and are therefore opposed to tolerating short-term unemployment in order to ensure low and stable inflation over the medium-term, monetary policy is likely to experience greater difficulties in delivering price stability.[14]

Another factor that may be affected by the small size of the economy is the size of the exchange rate pass-through. As is discussed in Section 2, exchange rate pass-through in Iceland appears to be stronger than in other inflation-targeting countries and closer to that experienced in many emerging market economies. Moreover, unlike other countries, this pass-through appears not to have diminished in Iceland in recent years (see Chart 2). This could be due to the fact that it is relatively more costly for foreign suppliers to analyse market conditions in Iceland, which leads to more widespread use of producer-currency pricing that tends to exacerbate the impact of exchange rate fluctuations on domestic prices. Another factor that may also raise the rate of exchange rate pass-through in Iceland is that importers of goods to Iceland often do not have to compete with domestic producers of similar products. Their competition is limited to other importers of the same goods, which are subject to the same exchange rate shocks. As Pétursson (2009 and 2010) has pointed out, strong exchange rate pass-through in Iceland could also be linked to a lack of credibility of monetary policy, due to poor inflation performance (see also Gestsson, 2010). Consequently, the strength of exchange rate pass-through could, to some extent, be a vicious cycle that is difficult to break out of.

3.3.2 Global conditions: abundant liquidity and cheap credit

The poor performance of domestic monetary policy in recent years cannot be understood fully unless it is examined in the context of the extraordinary circumstances reigning in international financial markets during a period of when the Icelandic economy was hit by extremely

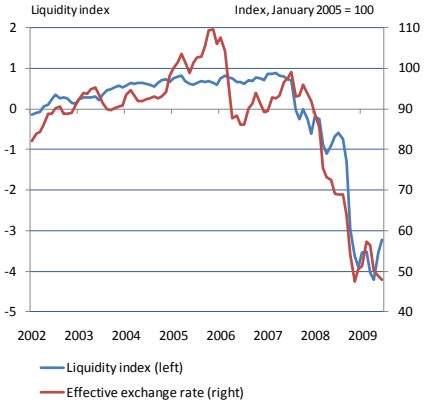
[13] If it is true that the authorities and the general public in Iceland take a milder view of inflation than other countries, widespread inflation indexation of financial contracts could be a contributing factor. The general public may consider indexation of savings as an effective protection against inflation, not available in most other countries.

[14] It should be emphasised that this trade-off between inflation and economic activity only exist in the short term. In the long-run there are other forces than monetary policy that determine the level of economic activity, although experience suggests that high and volatile inflation tends to have adverse effects on economic activity in the long-run.

large investment shocks (cf. Sighvatsson, 2007). That period was characterised by a glut of liquidity in global financial markets: access to credit was unusually easy, global interest rates were at record lows, and risk appetite among international investors keen. Domestic agents – financial institutions, corporations, and households alike – took generous advantage of these circumstances.

The strong risk appetite enabled many countries, like Iceland, to finance a steep current account deficit at unusually low costs. These extraordinary global conditions also fostered a domestic asset price bubble that emerged in large increases in house and share prices and a strong appreciation of the króna exchange rate (see Chart 7).

Chart 7
International liquidity and exchange rate of the króna



The liquidty index shows the number of standard deviations from the mean. It is based on a moving average of nine different measures of liquidity, normalised from the average value for 1999-2004.
Sources: Bank of England, Central Bank of Iceland.

These conditions were not restricted to Iceland, however. Similar developments occurred in many small, open economies – for example, in Ireland (see, for example, Lane, 2010) – independent of the particular monetary policy regime in place in each country. Other studies reach similar conclusions: There appears to have been little link between monetary conditions in each country and the amount of risk-taking and the creation of asset bubbles, suggesting that the global liquidity glut was a more pivotal factor. For example, IMF (2009a) find no link between monetary conditions in individual countries and the rise in house prices, while Merrouche and Nier (2010) find limited connection between monetary conditions in individual countries and risk-taking in domestic banking operations.

3.3.3 Imperfections in the formulation of monetary policy

Another possible reason for poor performance in controlling inflation in recent years is sup-optimal monetary policy implementation. In the public debate, it appears that most observers agree that the Central Bank of Iceland's monetary policy has been beset by considerable flaws and that mistakes were made in the formulation of policy. There are divergent opinions on where these flaws lie, however (see, for example, Daníelsson, 2010).

Jónsson (2009), Baldursson (2009), and Daníelsson and Zoëga (2009), for example, have criticised the Central Bank for raising rates too aggressively in the run up to the crisis. They argue that the interest rate channel was more or less ineffective due to substantial foreign borrowing, widespread financial indexation, and easy access to mortgage credit through the Housing Financing Fund (HFF). They argue that too excessive use of the interest rate tool led to a marked appreciation in the exchange rate of the króna, which created a false wealth effect that, in turn, stimulated domestic demand instead of reducing it.

The OECD (2006, 2008), the IMF (2007), and the Parliamentary Special Investigation Commission (2009) among others, on the other hand, have criticised the Central Bank for having raised interest rates too little and too late. They argue that this led the Bank to fall behind the curve and meant that the Bank was never able to fully gain control of inflation and inflation expectations, which in turn meant that interest rates had to be

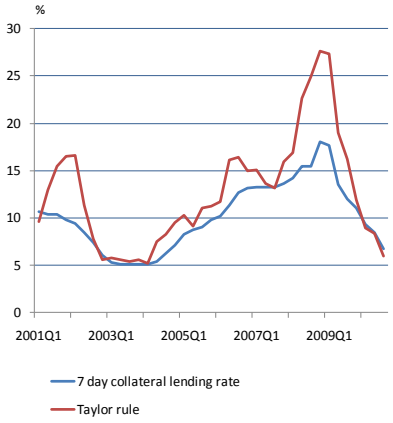
raised higher than would otherwise have been necessary. They point out that interest rate hikes – for example, in 2005 – were too small given the deteriorating inflation outlook and that this, together with the messages communicated by the Board of Governors at the time, had led to serious doubts about the Central Bank's genuine determination to control inflation. These doubts, in turn, served to weaken the impact of the Bank's interest rate hikes through the yield curve to long-term rates. Beginning in 2007, an attempt was made to strengthen the expectation channel of monetary policy through the publication of conditional forecasts of the Bank's interest rate path, but there was grave doubt about whether the forecasted path truly reflected the opinions of the Board of Governors and therefore diminished the usefulness of such a signalling device.[15]

The conventional way of assessing whether monetary conditions are appropriate is to compare central bank rates with interest rates as calculated using the Taylor rule (see, for example, Taylor, 1993), which is thought to give a reliable description of central bank monetary policy conduct around the world.[16] The Taylor rule is thus often cited in the public debate on monetary policy, in academic analysis, and as a benchmark in central bank analysis. In its simplest and most common form, the rule is as follows (assuming the Central Bank of Iceland's 2½% inflation target):

$$R_t = (RR_t + 2.5) + 1.5(\pi_t - 2.5) + 0{,}5Y_t$$

where R is the Central Bank interest rate, RR is the natural rate of interest,[17] π is annual inflation (excluding consumption tax effects), and Y is the output gap. Chart 8 compares the Central Bank's collateralised lending rate and interest rates according to the above-defined Taylor rule.[18] As can be seen, the Central Bank's interest rates were lowered too quickly at the beginning of the inflation targeting regime and remained too low until early 2003, when they were more or less in line with the Taylor rate. When the economy began to overheat significantly in late 2004, however, it appears that the policy rate was raised too little and too slowly and remained too low for virtually the entire period. In

Chart 8
Central Bank of Iceland collateral rate compared to a Taylor rule based rate



Source: Central Bank of Iceland.

[15] Previously, the central banks of New Zealand, Sweden, Norway, and the Czech Republic had successfully published such an interest rate path. See, for example, Mishkin (2004) and Walsh (2009).

[16] See, for example, Box 5 in *Monetary Bulletin* 2002/2 and Box I-2 in *Monetary Bulletin* 2007/3.

[17] This is the interest rate that reflects the internal and external balance of the economy; it is determined by economic factors such as productivity of capital, the propensity to save, and long-term growth in potential output. It can be argued that, due to relatively high productivity of capital and a low level of saving, this interest rate is somewhat higher in Iceland than in larger, more developed economies. According to Daníelsson (2009a), it is likely that this interest rate was just over 4% before the crisis; in this discussion, it is assumed to be 4.5%. It is assumed to have fallen to 3% in the wake of the crisis, however, and to begin gradually rising again towards its pre-crisis level from late 2011.

[18] The Taylor rule sometimes incorporates a lagged interest component, reflecting monetary authorities' desire to smooth interest rates. When comparing actual rates to a Taylor rate path, however, it is more appropriate to omit the lagged component because it tends to force the Taylor interest rate to artificially follow the actual interest rate too closely, thus creating the illusion that monetary policy was more in line with the Taylor rule than was the case.

addition, it appears that the policy rate was far too low during the financial crisis, probably reflecting the impact of the capital controls, which enabled the Central Bank to maintain lower interest rates than would otherwise have been possible. A comparison of the policy rate and an interest rate implied by the Taylor rule therefore appears rather to support the opinion of the critics who asserted that monetary policy was too lax in the run-up to the crisis than that of the critics citing excessive restraint.[19]

Other aspects of monetary policy implementation during the pre-crisis period have also been criticised. For example, Portes and Baldursson (2007) point out that, towards the end, the Central Bank allowed itself to be led into a position that required defending the currency from depreciation, which gave international investors an opportunity for virtually risk-free profit.[20] In doing so, the Bank unwittingly promoted even greater inflows of unstable short-term capital, thus amplifying the imbalances. Although it is difficult to find a precise foundation for this assertion in the statements issued by the Central Bank's senior management at the time (see, for example, Daníelsson, 2010), the criticism describes the difficulties that monetary policy can experience in the event of severe imbalances in domestic demand and exchange rate developments, where domestic balance sheets are vulnerable to sudden reversals in the exchange rate. Consequently, it gives good cause for the Central Bank to examine in depth how such a situation can be prevented in the future, as is discussed in Section 5.

The report by the Parliamentary Special Investigation Commission (2009) also criticises a number of aspects of monetary policy implementation. The report criticises the Bank, for example, for not having intervened in the foreign exchange market in order to shore up the foreign exchange reserves; for having reduced reserve requirements following the privatisation of the commercial banks, first in 2003 and then, with respect to foreign deposits, in 2008; for poor liquidity management, which eventually resulted in the Bank's losing control of the money supply; and, towards the end, for far exceeding the framework of conventional market operations, in effect, transforming market operations into a lender of last resort facility without a proper evaluation of the quality of the collateral accepted.[21] The Central Bank has already addressed some of these issues, while others are discussed more fully in Section 5.

[19] It is likely, though, that the chart overestimates the deviation, based on the real-time information available to the Central Bank at any given time. The natural interest rate was estimated to be lower than is currently assumed, and a revision of the output gap has revealed that it was considerably higher, particularly since 2004, than was thought at the time.

[20] This criticism is similar to that directed at Alan Greenspan, former chairman of the US Federal Reserve Bank, for having actually created a floor for equity prices in the US (the so-called Greenspan put).

[21] In the report, consideration is also given to whether the original preparation for inflation targeting was adequate. It raises the question whether there was a lack of understanding among politicians and the general public, and whether the framework therefore lacked a broad consensus. This was unlike Norway's preparation for the adoption of an inflation target, which occurred at the same time but following a longer preparation period.

3.3.4 Problems in the transmission mechanism

If monetary policy is to be successful, the transmission of the interest rate decisions from short-term market rates to long-term market and lending rates and, eventually, to the real economy must be relatively reliable and predictable. This has been significantly lacking in Iceland in recent years. There are likely to be many reasons for this, most of them interdependent.

Clearly, the global liquidity glut, the underpricing of risk, and the shallow domestic bond market combined to weaken the interest rate channel and place increasing weight on the exchange rate channel. This surfaced not only in increased carry trading but also in short-term foreign borrowings by domestic commercial banks and subsequent relending to domestic borrowers.[22] These short-term positions, which to some extent funded an enormous current account deficit, made the transmission of monetary policy vulnerable to sudden changes in investors' risk assessment and therefore complicated monetary policy conduct markedly. This set of circumstances also magnified the negative side-effects of tight monetary policy. The increased importance of the exchange rate channel made monetary policy transmission more uncertain and unpredictable, as it is extremely difficult to forecast the short-term exchange rate movements, particularly in an environment of severe macroeconomic imbalances and a large trade deficit financed by short-term credit from abroad. Thus, the effective transmission of monetary policy was hampered.

It can also be argued that, with increased globalisation, the interest rate channel in small, open economies was weakened at the expense of the exchange rate channel (see, for example, Guðmundsson, 2008).[23] Theory suggests that, as financial markets became more interlinked, domestic interest rates are determined in ever greater extent by global long-term rates, and domestic monetary policy's ability to affect them is then reduced. Indications of this were visible in Iceland during the boom years, when rising short-term interest rates made little impact on domestic long-term rates, although other factors were probably at play as well, as is discussed below.

Furthermore, it is likely that monetary policy was complicated by limited Treasury bond issuance, as Treasury bond yields generally forms the basis for the yield curve that transmits Central Bank interest to the general economy. The shallow Treasury bond market made price formation ineffective and erratic. As a result, the pricing of other bonds became ineffective as well. The authorities' reluctance to maintain a sufficiently deep Treasury bond market during a period of low Treasury debt probably hampered monetary policy transmission and muted its effect on the longer end of the yield curve.

[22] For a long period of time, the banks' strong credit ratings gave them virtually unlimited access to foreign credit through the issuance of bonds, many of which were bundled into complex financial instruments based on strong credit ratings.

[23] This is not universally agreed upon among economists, however. For further discussion, see Box III-1 in *Monetary Bulletin* 2007/3, pp. 22-23.

Iceland's outsized domestic banking system also greatly complicated monetary policy transmission during the boom years. The banks' attempts to protect their capital base had a profound effect on the exchange rate of the króna, and the aggressive competition between the banks and the HFF for market share in the residential housing market (which the banks funded largely from abroad) diluted the effect of monetary policy at the longer end of the yield curve. Almost unlimited access of households and businesses to bank credit further complicated monetary policy. The banks' large share in the domestic foreign exchange, money, and bond markets also created an oligopolistic environment that served to undermine effective price formation. When conditions in the global financial markets finally deteriorated and concerns about the financial soundness of the banks escalated, the króna was further undermined and price formation in the domestic securities markets became even more distorted. In the end, the key monetary policy transmission channels became virtually ineffective.

Although inflation indexation of financial obligations is far from a uniquely Icelandic phenomenon, it is seldom as widespread as in this country. This extensive use of financial indexation can affect how monetary policy is transmitted into the economy through the interest rate channel, and it is possible that such widespread indexation served to dilute the effects of monetary policy in the attempt to use higher interest rates to dampen domestic demand and inflationary pressures.[24] It is important to bear in mind, however, that it is not financial indexation by itself that diminishes the effectiveness of monetary policy. Monetary policy works through its effect on expected real interest rates. If the domestic bond market is reasonably effective and there is some substitutability between nominal and indexed bond yields, Central Bank interest rates should affect indexed rates and in real yields on nominal bonds in broadly the same manner. What broad-based financial indexation has done, however, is to provide access to long-term credit, usually at fixed real interest rates, which would otherwise not be available. It provides borrowers with a somewhat greater protection from monetary policy, which actually weakens the short-term impact of monetary policy, at least in the short- run.[25] What probably further reduces the impact of monetary policy is the fact that most of the mortgage loans are annuities. This implies that the borrower distributes the debt service attributable to high interest at the time of borrowing

[24] The pros and cons of financial indexation are not discussed here in any detail (for a discussion see, for example, Daníelsson, 2009b). It should be kept in mind that although indexation can be positive for borrowers in that it ensures a predictable real flow of payments for financial obligations and facilitates access to long-term loans that would not otherwise be available, it can also harm them if it means that monetary policy must be applied more aggressively because it becomes less effective. Financial indexation can also make inflation control more difficult to the extent that support for that battle diminishes, as it provides better protection from the harm caused by high inflation.

[25] Widespread use of long-term fixed-rate mortgages is not limited to Iceland; it is known, for example, in the US and in many European countries (see, for example, OECD, 2008). Empirical studies suggest that the effectiveness of monetary policy is less in countries where long-term fixed-rate loans are more common than long-term variable-rate loans. See, for example, Miles (2004).

over an extremely long period of time instead of paying relatively more upfront. Another factor that diluted the effects of monetary policy during the upswing years is the fact that HFF lending terms appeared relatively immune to current monetary conditions (see, for example, a detailed discussion of this point in OECD, 2008).

Finally, as is discussed in Section 2.2, it is important for effective monetary policy that it is granted explicit statutory independence vis-à-vis political authorities. Provisions to this effect were included in the Act on the Central Bank of Iceland in 2001, somewhat later than in other central bank legislation. Nevertheless, the independence of the Central Bank of Iceland is probably not as securely enshrined in the law as could be hoped. In addition, the appointment of former political leaders as governors of the Central Bank have been criticised (for example, by the OECD, 2009). It is argued that this practise gave the impression in the public's view that the Central Bank was less independent than was indicated in the letter of the law. These doubts about the Central Bank's real independence may have exacerbated doubts about the Bank's willingness to apply monetary policy in order to control inflation during the boom years, thus weakening monetary policy transmission.

It is possible that doubts about the Central Bank's resolve to achieve the inflation target could help explain why households and businesses appear to have considered the actual inflation goal not to be the stated 2½% target, but rather 4%, the upper tolerance limit. At the same time, these doubts also emerged in persistent expectations of imminent interest rate cuts, which can partly explain why long-term rates were resistant to Central Bank rate hikes.[26] These doubts concerning the Bank's resolution could have diluted the impact of monetary policy. Therefore, the globalisation of the domestic banking system, the widespread use of long-term credit at fixed rates, and the unique status of the HFF probably explain to some extent the weak transmission of Central Bank interest rates to long-term real rates. Persistent expectations of monetary easing, however, served to keep long-term interest low, and the lack of a credible anchor for inflation expectations meant that expected long-term real rates were lower than they would otherwise have been.

It is likely, however, that a part of the problem centred on a severe underestimation of demand growth and inflationary pressures during the upswing in the macroeconomic forecasts prepared by both the Central Bank and other analysts. This is particularly true of the beginning of the upswing – for example, in 2004. For a long period of time, other analysts forecasted considerably lower inflation than the Central Bank did.

[26] Long-term interest rates are generally determined by current short-term rates and expectations of short-term rates over the maturity of the long-term bonds. Central banks can therefore raise long-term rates by raising short-term rates now and/or by creating expectations of high short-term rates in the future. Academic research indicates that these expectations concerning future interest rates (the expectation channel of monetary policy) play a bigger role in determining short-term market rates (see, for example, Woodford, 2003).

3.3.5 The co-ordination of monetary and fiscal policy

The experience of recent years shows also that co-ordination between monetary and fiscal policy was sorely lacking in Iceland during the boom years, with these two arms of macroeconomic policy arguably pulling in opposite directions.

There was a surplus on Government operations during this period, due largely to sizeable temporary tax revenues from turnover and income during the upswing. The lesson to be learnt from the upswing, however, is that a fiscal surplus is not a sufficient measure of fiscal restraint and its contribution to stabilisation policy (see, for example, Kaminsky et al., 2004). A better measure is the change in expenditures and taxes, which indicates that fiscal restraint in Iceland was far from adequate during the pre-crisis period. Taxes were cut significantly, and expenditures regularly exceeded budgetary targets.

The policy mix becomes even more insufficient if viewed in a broader context. It is clear that the major development projects undertaken with the support of the Government in the early part of the decade severely strained the economy's resources and should, all other things being equal, have required a much more contractionary fiscal policy to offset them.[27] The privatisation of Iceland's large commercial banks and the structural changes in the domestic housing market, which greatly facilitated access to credit and triggered aggressive competition between the publicly owned HFF and privately owned commercial banks for the most advantageous lending terms, also represented an extremely unhelpful contribution to stabilisation policy, promoting even more demand growth and house price inflation (see, for example, Elíasson and Pétursson, 2009).

As a result of limited support from other aspects of macroeconomic policy, monetary policy was placed under inordinate strain. Consequently, the negative side effects of monetary policy were exaggerated more than necessary. This emerged in an unusually large interest rate differential with abroad, with the associated currency appreciation fuelled by carry trade. Fiscal policy which would have been more directed towards attaining the inflation target would have served to offset these negative side effects and help stabilise the economy. More unequivocal Government support of the Central Bank inflation target would also have enhanced the target's credibility.[28]

[27] Because the public sector played a considerable role in the decision to invest in power stations and associated industrial production (both Kárahnjúkar and the Grundartangi expansion), these projects can be viewed as public investments in a policy context. To illustrate the scope of these projects, investment in energy and aluminium totalled 10½-12½% of GDP in 2005 and 2006, and while the main construction project was underway – from 2003-2007 – these investments totalled roughly 47% of GDP for the year 2003.

[28] Repeated calls by political leaders for interest rates cuts during these years, also served to erode the credibility of monetary policy (see, for example, OECD, 2008).

4 Alternative versions of exchange rate pegs

This section focuses on the possibility of pegging the króna to another currency. It discusses briefly the main arguments for and against such an arrangement and explores which currency would be most feasible if such a solution were chosen. Finally, it discusses various ways to peg the króna to another currency; that is, via a unilateral fixed exchange rate or a currency board. In addition, it examines the possibility of abandoning the currency and adopting another, either through unilateral adoption or through membership in a currency union. A more detailed discussion of these options will be presented in an in-depth report on the advantages and disadvantages of EMU membership, which is currently being prepared by the Central Bank and is planned to be published late next year or in early 2012.

4.1 Pros and cons of fixed exchange rate regimes

There are a number of costs associated with an independent currency, including the cost of issuing the currency and that of building up the institutions needed to formulate and implement independent monetary and exchange rate policy. It is likely that these costs are relatively higher in small countries than in larger ones. An independently floating currency is also associated with greater exchange rate volatility, which can cause greater uncertainty and risks in international trade and can reduce the information content of cross-border prices, thereby reducing the restraint of international competition on domestic producers. An independent currency also appears to reduce the access of domestic agents to global financial markets, thus limiting their possibility to diversify risk effectively. While it is possible to reduce some of these costs by pegging the exchange rate of the króna to another currency, the greatest reduction in costs and increased trade can be expected with membership in a larger currency area (see Breedon and Pétursson, 2006).

But there may also be costs associated with a fixed exchange rate policy. The main drawback is that the country loses its monetary autonomy. For example, it becomes impossible to mitigate the contractionary effects of a negative domestic economic shock through lower interest rates and a depreciation of the currency. Instead, monetary policy becomes determined by the country issuing the currency to which the króna is pegged (or determined jointly by the currency union, based on the aggregate needs of the currency union). This is particularly difficult if the business cycles are not symmetric; for example, if Iceland is experiencing a downturn while the core country is experiencing an upswing. In such an instance, the core country may decide to tighten monetary policy at a time when less restraint would be more appropriate in Iceland. A fixed exchange rate policy could therefore exacerbate the contraction in activity in Iceland. The chief benefit of a flexible exchange rate can lie in the fact that, when economic shocks occur, the necessary adjustment takes place in part through exchange rate movements, reducing the need for adjustment in real variables such as employment and output,

which are likely to be more painful. The more asymmetric the domestic business cycle and that of the core country are, the greater the advantage of exchange rate flexibility should therefore become. This seems particularly relevant in the case of Iceland. As Chart 9 shows, there it appears that the link between Iceland's business cycle and that of the euro area is relatively weak compared with the links between the euro area countries.[29]

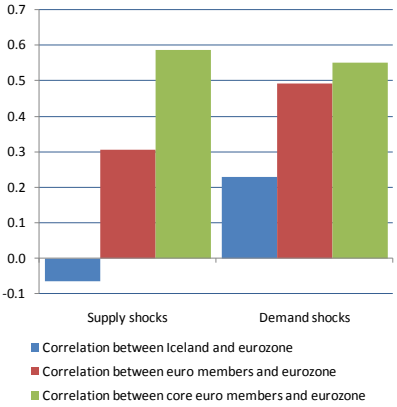
Many economists have questioned the importance of this benefit of exchange rate flexibility, however. If this benefit is so important, one would expect volatility in economic activity to be greater in fixed exchange rate countries than in those with a flexible exchange rate regime. A number of studies indicate that this is not the case (see, for example, Baxter and Stockman, 1989, and Flood and Rose, 1995). This can also be seen in Chart 10, which reports a neglectable difference between output volatility in countries with fixed and floating exchange rates. An independent floating exchange rate could therefore be a source of shocks rather than a shock absorber (see also Pétursson, 2009).

The debate of the pros and cons of fixed exchange rate regimes has intensified in the wake of the global financial crisis. Some have pointed out the benefits of being able to allow the currency to depreciate in the aftermath of the crisis, asserting that this would dampen the effect of the crisis on the real economy and expedite recovery. Others, however, have pointed out the increased risk of a currency crisis, which tends to exacerbate the real economic costs of the crisis (see, for example, Hutchinson and Noy, 2005). A study carried out by Ólafsson and Pétursson (2010) suggests that countries following a fixed exchange rate policy outside EMU were particularly hard hit by the crisis, while countries within the monetary union fared better (Chart 11). The contraction in economic activity appears to have been similar, on average, among EMU countries and those with a flexible exchange rate.

4.2 Pegging the króna: against which currency?

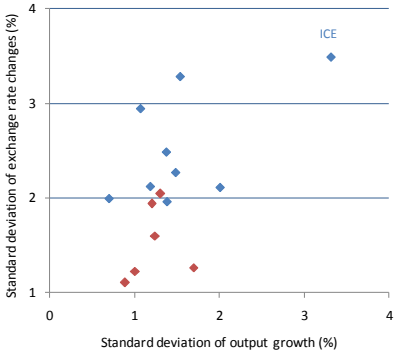
In considering the appropriate currency to which to peg the króna, there are three main factors that should be borne in mind. First, it is desirable to peg against a country with sound monetary policy. The peg serves to import the credibility of the core country's monetary policy and thus promote domestic economic stability. As is discussed above, it is also desirable that the domestic business cycle is symmetric with that of the core country. This is also closely linked to the extent of trade with the core country, as the business cycle and the structure of production are generally closely related in countries that trade heavily with one another.

Chart 9
Correlation of supply and demand shocks



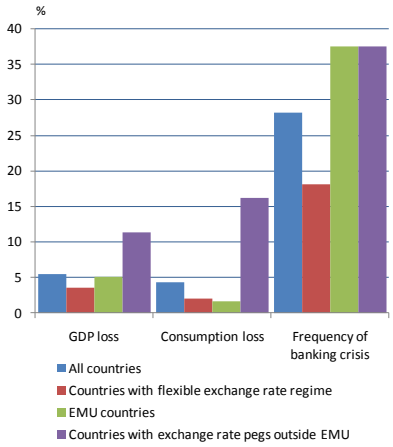
Core countries are: Belgum, Holland, Luxembourg, France, Italy and Germany.
Source: OECD (2009).

Chart 10
Standard deviation of nominal exchange rates and output in 15 industrial countries 1994-2007



The chart shows the standard deviation of GDP growth and quarterly nominal effective exchange rate changes. Blue diamonds show countries with flexible exchange rate frameworks, while red diamonds show countries with fixed exchange rate frameworks.
Sources: Statistics Iceland, IMF and BIS.

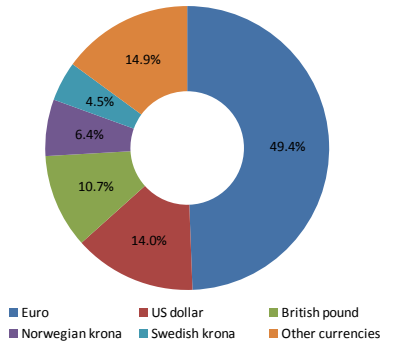
Chart 11
Impact of financial crisis - Comparison of countries with different exchange rate regime



Source: Ólafsson and Pétursson (2010).

[29] The chart shows the correlation between supply and demand shocks, obtained from a structural VAR model estimated for the period 1997-2007. See OECD (2009, pp. 76-77). Guðmundsson et al. (2000) use the same approach for the period 1960-1998 and obtain virtually the same correlations for Iceland.

Chart 12
Share of currency areas in Iceland's external trade 2000-2009



83 countries with trade shares in 2000-2009 above 0.01%. Countries with pegs towards euro and US dollar are included in their respective shares.

Sources: Statistics Iceland, Central Bank of Iceland.

An examination of Iceland's external trade reveals that almost half of Iceland's goods trade is with EMU countries or with countries that peg their currencies to the euro (see Chart 12). Far behind the euro are the US dollar, the pound sterling, and the Norwegian krone and Swedish krona.[30] If Iceland were to peg the króna to a single currency rather than a currency basket, by far the most obvious choice from an economic viewpoint would be to peg the króna to the euro rather than the US dollar, British pound sterling, or the independently floating Nordic currencies.[31]

In addition, there are additional complications associated with pegging the króna to save-haven currencies such as the US dollar, which tend to appreciate in global recessions – times where a depreciation would probably be more appropriate for Icelandic circumstances.[32] Similarly, pegging the króna to the currency of an oil exporter such as Norway could cause problems.

4.3 Various forms of fixed exchange rate regimes

4.3.1 Unilateral peg

With a unilateral fixed exchange rate similar to that pursued in Iceland until 2001, it is possible to obtain some of the benefits of pegging the króna to another currency, but not all of them. Nominal exchange rate volatility would certainly diminish, but the microeconomic benefits of participation in a larger currency area would be less pronounced. The same can be said about the impact on international trade. Empirical studies show that it is primarily a common currency rather than reduced nominal exchange rate volatility that contributes to increased international trade (see, for example, Breedon and Pétursson, 2006).

History shows that the biggest problem with a unilateral fixed exchange rate policy is its exposure to speculative attacks. The economic cost of defending a fixed exchange rate policy in the face of a speculative attack can be immense, as can be seen, for example, in the experience from the 1990s: in a number of European countries early in the decade, and in Southeast Asia in the latter part of it. This problem is particularly severe in the modern financial environment, where cross-border movements of capital are basically unrestricted. It may well be that such a peg would require enormous foreign exchange reserves and perhaps continued capital controls.

A conventional unilateral fixed exchange rate regime would therefore be accompanied by problems that would be difficult to solve without the support of the central bank of the core country, and it is doubtful that such a policy would be an improvement over the current arrangement.[33]

[30] The Danish krone is included in the euro area share. The weight of the EMU itself is 41%, and that of the US is just under 10%.

[31] As has already discussed, there are additional arguments for pegging against a currency of a large currency area. This would point towards a peg against the Euro or the US dollar, rather than the small floating Nordic currencies.

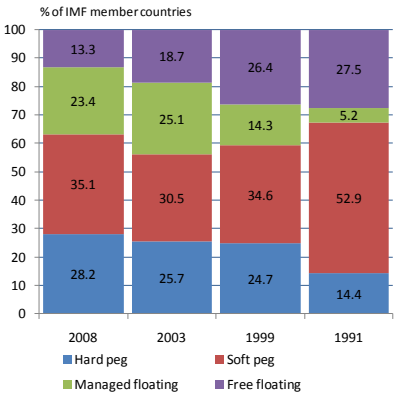
[32] This need not be limited to the US dollar, however. The same could apply to the euro, or even to the Norwegian krone.

[33] Bilateral co-operation on a fixed exchange rate policy with the central bank of the core currency could increase the credibility of the regime, however. In the instance of

Sooner or later, a fixed exchange rate regime would be put to the test, and there is the risk that it would eventually have to be abandoned, at considerable economic cost. Not surprisingly, such regimes are generally found to be short-lived (see, for example, Mihov and Rose, 2008).

Thus it is no coincidence that the number of countries following a unilateral peg has gradually declined. As Chart 13 shows, roughly one-third of IMF member countries pursue a fixed exchange rate policy of some sort today, as opposed to about half in 1991. On the other hand, the number of countries with a more rigid fixed exchange rate policy – participation in a currency union or a currency board – has risen over the same period. The increase has more or less corresponded to the decline in the number of countries with a floating currency. The number of countries that try to manage their currencies without specifying an explicit exchange rate target has increased as well. It is likely that this trend has continued since the financial crisis.

Chart 13
Different exchange rate arrangements



Hard pegs include monetary unions and currency boards. Soft pegs are other types of pegs.

Sources: IMF, Pétursson (2000).

4.3.2 Currency board

One major disadvantage of conventional unilateral pegs is that the authorities' commitment to maintain the peg can never be fully credible. Investors know that, at some point, a large enough shock could hit the economy such that the cost of maintaining the peg would be unacceptably high, and the currency would then be devalued. In order to enhance the credibility of the peg, it could therefore be desirable to ensure that the cost of renegading on the commitment is high enough so that the authorities will hesitate before devaluing the currency.

One way to make the devaluation option more costly is to establish a so-called currency board. If a currency board were established in Iceland and the króna pegged to the euro, the Central Bank would guarantee that the public could convert krónur to euros upon demand at a given exchange rate. The Central Bank would ensure this by holding large enough foreign exchange reserves. In order to enhance the credibility of the currency board still further, a legal commitment to the peg is common, implying that a change in law is needed to devalue the currency (even, in some instances, a constitutional amendment).[34]

Thus, under a currency board arrangement, each time the Central Bank issued Icelandic krónur it would have to purchase the equivalent amount of euros. Monetary autonomy would therefore be even less than under a unilateral peg, which typically does allow for some flexibility.

---

a peg to the euro, the ECB would pledge to support the Icelandic króna if it were under pressure. This should reduce the vulnerability of the peg and enhance its viability (cf. Denmark), as it would be somewhat futile to attack a currency if the issuer of the reference currency stands ready to defend it. On the other hand, it is important to bear in mind that it is not the EU that would decide on such support but the ECB itself, which is fully independent of political authorities. It is virtually impossible that the ECB would be willing to use its monetary policy to protect the currency of a country that is not an EU member state.

[34] Countries that have used currency boards include Bosnia-Herzegovina, Bulgaria, Estonia, Hong Kong, Lithuania, and several small countries in the Pacific. Argentina also used a currency board between 1991 and 2002. It was successful early on, but ultimately the currency board collapsed, at enormous economic cost.

But in order for a currency board to be fully credible, it is not enough for the Central Bank to hold foreign exchange reserves equivalent to outstanding banknotes and coin in krónur because demand deposits in banks can also be converted to euros. For the arrangement to be sufficiently credible, the Bank might therefore need to hold foreign exchange reserves at least equivalent to banknotes and coin in circulation, financial institutions' current account deposits with the central bank, and even demand deposits in the banking system as well; that is, the narrow money supply (M1). At end-October 2010, banknotes and coin in circulation and financial institutions' balances with the Central Bank totalled just over 348 b.kr., and M1 was slightly less than 488 b.kr. At the same time, the Bank's foreign exchange reserves amounted to nearly 473 b.kr., or 136% of the above-specified Central Bank obligations, and 97% of M1. Given that the foreign exchange reserves largely consist of borrowed funds, however, the true reserve cover is much less. Consequently, it is clear that the Bank would need to have much larger foreign exchange reserves at its disposal, and the net reserves would have to be much larger than they currently are in order to ensure sufficient confidence in a currency board.

The accumulation and maintenance of large foreign exchange reserves would be costly. That expense will be a more pressing problem if a currency board is viewed as a temporary measure preliminary to EMU membership because, with EMU membership, the domestic money supply will be exchanged for euros at no cost to Icelanders.

Another problem with a currency board is that the Central Bank's ability to provide last-resort loans to domestic financial institutions would be further restricted. This generates uncertainty if problems emerge in the financial system, and it could undermine financial stability, especially if the financial system is weak and confidence is lacking, as is the case at present.[35]

4.3.3 Unilateral adoption of another currency

Another option that has often been mentioned is the unilateral adoption of another currency, typically the euro. In many ways, the benefits of adopting the euro unilaterally are similar to those of a currency board. But because domestic currency would no longer exist, pegging the currency would no longer be an issue. As a result, it is even more difficult to exit and re-float the currency than is the case with a currency board. The credibility of the arrangement is therefore even greater. Furthermore, it is likely that the link between domestic and foreign interest rates would be even stronger than with a currency board.[36]

The disadvantages are also similar, but in addition, Iceland would have to bear the expense due to loss and deterioration of banknotes and coin, and the country whose currency was adopted would get the seigniorage.

[35] This would be less of a problem if domestic financial institutions were foreign-owned so that they could seek liquidity facilities from the home country's central bank through their parent companies.

[36] Ecuador, El Salvador, and Panama have adopted the US dollar, while Kosovo and Montenegro have adopted the euro.

Because it would be necessary to use the foreign exchange reserves to exchange the domestic supply of money, adoption would be expensive, particularly in view of the fact that the switch would be carried out at no cost to Iceland if it were to join the EMU. Another important disadvantage would be that the Central Bank's ability to provide liquidity or act as a lender of last resort would be strictly limited to the amount of its euro holdings. Moreover, it has been explicitly stated that unilateral adoption of the euro would be expressly against the wishes of the European Central Bank (ECB) and the EU. There is therefore doubt about whether domestic financial institutions would have ready access to liquidity facilities from the ECB (see, for example, Buiter, 2000).

Furthermore, the political credibility of unilateral euro adoption has been cast into doubt because domestic monetary policy would be fully transferred to the ECB, yet the ECB could not be held responsible for monetary and financial stability in Iceland because Iceland would not be a member of the EU (Buiter, 2000, and Winkler et al., 2004).

4.3.4 Currency union membership

Joining the EMU as a part of joining the EU appears to be the most obvious option if the króna is to be pegged to the euro or the euro adopted as domestic currency. This route would ensure the benefits of a credible peg but at lower expense than that accompanying either a currency board or unilateral adoption of the euro. The Central Bank of Iceland would also gain membership to the ECB and a share in EU seigniorage. Domestic financial institutions would also have access to euro-denominated liquidity facilities from the ECB through the Central Bank of Iceland, which would be a part of the European System of Central Banks.

On the other hand, it is appropriate to stress that, irrespective of whether Iceland becomes a member of the EMU, a number of amendments to the current monetary framework will be required because EMU membership could not take place until several years from now. In addition, recent experience within the EMU has revealed a pressing need for a number of improvements in monetary policy implementation and stabilisation policy in general. Some of the amendments discussed below would be necessary even if Iceland were to become a member of the EMU.

5 Improving the policy framework

The financial crisis has highlighted important flaws in the structure of the global financial system and in financial supervision worldwide, as well as uncovering a variety of problems in monetary policy implementation around the world. These flaws do not directly relate to the inflation targeting framework as such. The epicentre of the crisis was the non-inflation targeting US and crisis then spread around the world, irrespective of whether the countries were inflation targeters or not. In fact, recent studies suggest that inflation-targeting countries have in

general fared better than others during the recent crisis (see Chart 3). Furthermore, there is nothing in the inflation targeting structure that prevents monetary policy from responding to financial turmoil. Financial crises are usually characterised by tighter access to credit, negative wealth effects, declining activity, and reduced inflationary pressures. Other things being equal, monetary policy responds to these circumstances by lowering interest rates,[37] which is fully compatible with the inflation-targeting framework. It can also be argued that a credible inflation target could reduce the risk of deflation, which helps reducing the risk of further debt-driven decline in activity (see, for example, Walsh, 2009).

On the other hand, it is clear that the financial crisis has highlighted the need to review monetary policy formulation in inflation-targeting and non-targeting countries alike. It has shown that central banks need to focus on financial stability no less than price stability, and that underlying imbalances in credit and asset markets could feed an asset price bubble and eventually trigger a financial crisis when the bubble bursts, irrespective of whether price stability has been achieved. Consequently, the crisis has highlighted the need of greater focus on the development of credit and asset prices in the formulation of monetary policy.

Another lesson from the financial crisis is that although the conventional monetary policy tool – the policy rate – which serves to regulate the pricing of debt and therefore, other things being equal, influences the level of debt, cannot be relied upon alone to achieve these goals. The interest rate tool is primarily useful for affecting overall demand for credit, but it is ill suited to address underlying weaknesses in the financial system. The interest rate tool is also a general tool that cannot be applied specifically to certain sectors where the roots of the problem are considered to lie. Furthermore, under certain conditions, monetary policy can even be conducive to the formation of bubbles in one asset market while working against bubble formation in another asset market. An obvious example is the case of a small, open economy where interest rate hikes aimed at controlling bubble formation in the real estate and equity markets can simultaneously fuel a bubble in the foreign exchange market. Finally, it is clearly impossible to use the interest rate tool alone to ensure both price stability and financial stability. In order to achieve both, central banks need more tools. The recent debate has focused in part on what additional tools would enable central banks to achieve these objectives.

Increasingly, the supplementary tools called for are so-called macro-prudential tools (see Crockett, 2000). In general, macro-prudential tools can be defined as regulations and other instruments that focus on the overall stability of the financial system rather than individual financial

[37] In the context of Iceland, "other things being equal" plays a key role because Iceland also experienced a currency crisis, which required tighter monetary policy in order to protect vulnerable private sector balance sheets from further exchange rate instability.

institutions. More specifically, these tools attempt to take into account the interaction of the macroeconomy, the linkages between financial institutions and financial markets in which they operate, and the aggregate pricing of risk (see, for example, Turner, 2010). Thus the aim of macro-prudential policies is to reduce the incentives for unsustainable debt accumulation during upswings and to better prepare the financial system to respond to financial crises (see, for example, Corbo, 2010). These supplemental tools are generally considered more suitable than the interest rate tool in the battle with credit-driven bubbles, although it is likely that they will ultimately be used jointly. The following discussion touches on a number of tools that have been mentioned as ways to promote the achievement of these objectives. It should be borne in mind, however, that some of these ideas are still being developed and that, apart from the experience of few countries in Asia, have not been thoroughly tested internationally. A detailed outline of many of these ideas and their long-term consequences remains. As a result, the description will inevitably be somewhat general in nature.

It is also appropriate to bear in mind that completely averting a financial crisis will never be possible. The aim is therefore rather to reduce the likelihood of such financial crises and to limit the economic damage they cause if they do occur.

Finally, it is appropriate to stress that increased emphasis on financial stability and its relationship to monetary stability does not change the fact that the primary objective of monetary policy is, and should continue to be, price stability. These tools will thus not replace conventional monetary policy but will instead be complimentary. However, increased emphasis on financial stability in monetary policy implementation will inevitably complicate the formulation of monetary policy, even though separate committees within the central bank (a Monetary Policy Committee and a Financial Stability Committee) would focus on price stability and financial stability, respectively. This could further test the central banks' independence and lead to increased demands for central bank transparency. Central bank legislation may need to be refined to give the banks clearer mandate to take decisive action when they believe financial instability to be mounting. Legislation may also need to be reviewed so as to strengthen the banks' mandate to pursue price stability.

The new additional tools will have to be designed carefully so as to ensure that their effect on conventional monetary policy transmission channels are minimised. It is likely, for example, that the relationship between the central bank policy rate and retail lending rates will change. The cost of capital could also rise somewhat. As Ingves et al. (2010) point out, however, this increased cost of capital can be thought of as an insurance premium that a society is willing to pay in order to reduce the likelihood of a financial crisis. As they also point out, this increased cost of borrowing can be viewed as an example of a Pigovian tax, correcting for the externality imposed by lenders' and borrowers' actions on taxpayers, who usually pick up the bill in the wake of a financial crisis.

5.1 Leaning against asset price cycles

For years, economists have debated how monetary policy should be used to respond to asset price bubbles (see, for example, Ingves et al., 2010). Some are in favour of leaning against the bubble in an effort to counteract the asset price cycle. When asset prices rise, the value of underlying collateral increases, and credit becomes more readily available. Income rises, making increased consumption and further accumulation of assets possible, which could eventually lead to an unsustainable credit-driven consumption boom. Rising asset prices also appear to be associated with rising loan-to-value (LTV) ratios and a tendency to underestimate the risk of a downturn, thus distorting the pricing of risk. All this can then combine to fuel further asset price inflation, triggering a vicious cycle of expansion in activity and rising asset prices that ultimately ends with a crash when the asset price bubble bursts.[38] As a result, asset price cycles can magnify the business cycle and can cause significant damage and strain in the financial system. It may therefore be appropriate to maintain tighter monetary policy during upswings than is strictly warranted by the inflation outlook alone, in an attempt to contain asset price increases. Reducing asset price inflation during upswings also reduces the risk of sharp reversions when the cycle turns, thus cushioning the economic damages of the downturn. This leaning against the wind policy may therefore help smoothing business cycles, thus supporting both price stability and financial stability.

The leaning against wind approach is not without problems, however. Sometimes it can be difficult to assess in real time when a rise in asset prices is based on economic fundamentals and when it is an unsustainable bubble, which is necessary for timely responses. Thus, there is the risk that an increase in asset prices that is justified by economic fundamentals could unnecessarily be curtailed and the associated economic benefits lost. If the central bank responds too aggressively or too late, a sharp reversal in asset prices could result. Another potential problem is political pressure on the central bank if it begins to use monetary policy explicitly to contain asset price increases that it considers unsustainable. Such measures could make the bank extremely unpopular among those who benefit from rising asset prices, and this could surface in political pressure and the threat to reduce the bank's independence.[39] Thus it is important that central bank legislation

[38] In general, in small, open economies, asset price bubbles are also manifested in a swelling balance sheet vis-à-vis abroad, and a growing current account deficit. A sudden stop of funding such a deficit usually triggers a sharp currency depreciation and an abrupt contraction of domestic demand, which can also fuel a drop in the price of other assets, which in turn leads to a further contraction in activity; cf. the Icelandic financial crisis. As De Gregorio (2010) points out, leaning against asset price bubbles can be quite consistent with the aim to reduce the risk of balance of payments crises.

[39] The rise in housing prices around the world appeared to be to everyone's benefit, at least until it proved to be unsustainable: low-income households could more easily purchase new homes, activity and employment in the construction sector grew, revenues in the financial sector boomed, treasury revenues from all sources increased, and politicians enjoyed greater popularity (see, for example, Corbo, 2010). For example, when the Reserve Bank of Australia raised interest rates in an effort to

be reviewed with the aim of further protecting it from political pressure. It is also clear that leaning against the wind requires increased transparency and communication on the part of the central bank. Central bank accountability will also become more difficult, as is always the case when central banks are given multiple targets of which some are difficult to quantify.

For these reasons, others have argued that monetary policy should restrict itself to "clean up afterwards", i.e. by aggressively easing the policy stance once the bubble bursts, although the global financial crisis has probably affected general opinion of the appropriateness of this approach. For example, experience suggests that this approach may lead to asymmetric responses to asset price cycles; that is, monetary policy does not respond to asset price increases but responds aggressively when asset prices fall in an attempt to mitigate the effect of weaker asset prices on the real economy. This can lead to increased moral hazard problems, which would encourage risk-taking and fuel imbalances in the financial system. The idea that central banks should try to contain credit-driven bubble formation, through interest rates and other tools at their disposal, therefore appears to be gaining support (see, for example, Blinder, 2010). The difficulties associated with smoothing asset price cycles are simply considered less important than the enormous costs that can accompany a financial crisis after a credit-driven bubble bursts. However, this does not imply that monetary policy should be given a formal target for asset prices in a similar fashion as with inflation.

5.2 Foreign exchange intervention

Because most inflation-targeting countries are relatively small and open to international trade, exchange rate developments are typically very important for inflation developments and monetary policy formulation in those countries. Exchange rate movements are an important channel for monetary policy transmission, both directly, through the price of imported goods and services (especially where exchange rate pass-through is strong; cf. Chart 2), and indirectly, through the effect of exchange rate movements on economic activity. Exchange rates also play an important role in adjustments to external shocks, such as changes in global commodity prices (see also Section 4).

On the other hand, it can be argued that exchange rate developments should be even more important in monetary policy decisions in small, open economies with relatively undeveloped financial systems, such as Iceland and a number of other inflation-targeting countries. In such instances, wide exchange rate fluctuations can be particularly harmful, especially if foreign-denominated borrowing is widespread, as is commonly the case in small, open economies with less developed financial systems, an insufficient regulatory framework, weak financial supervision, and a poor inflation record. In cases like these, a sharp

contain rising asset prices, a number of government ministers criticised the bank harshly (see Ball, 2004).

currency depreciation can damage domestic balance sheets and, under certain circumstances, lead to widespread bankruptcy and ultimately to a financial crisis.

The global financial crisis and the run up to it have also clearly shown the danger that can accompany an excessive currency appreciation. A steep currency appreciation not only undermines the competitiveness of the tradable sector, which can also be difficult to recover once the exchange rate reverts, but it can also encourage inflows of capital that foster domestic asset bubbles (see, for example, Plantin and Shin, 2010). The risk is that such inflows could stop suddenly, causing a collapse of the exchange rate and amplifying the contraction in domestic demand due to the aforementioned vulnerability of domestic balance sheets to exchange rate movements.

Volatile exchange rate movements can also increase uncertainty, which can be harmful in itself. Because a large share of consumer durables and investment goods in Iceland are imported, these consumption and investment decisions can become concentrated during periods when the currency is strong, leading to inefficient resource utilisation. Excessive exchange rate movements can therefore have negative repercussions, and under certain circumstances, they can exacerbate the business cycle instead of mitigating it, as is discussed in Section 4.

There are therefore sound arguments for attempting to smooth the exchange rate cycle. However, it is not clear that the policy rate is the best instrument for this purpose. If a currency appreciation reflects increasing optimism, significant financial leverage, rapid balance sheet expansion, and an asset bubble, the impact of an interest rate cut can be limited and can even exacerbate the bubble by fostering a rise in domestic asset prices. If inflation is also a problem, an interest rate cut could also undermine confidence in the central bank's ability to control inflation.

Intervention in the foreign exchange market is another possible tool to combat excessive exchange rate movements.[40] The intervention would, however, need to be sterilised so that it would not affect the domestic money supply. For example, the central bank would purchase foreign currency when the exchange rate is rising and accumulate foreign exchange reserves while reducing, through offsetting measures, the domestic liquidity created by the foreign exchange purchase. Sterilised intervention can actually lead to increased capital inflows by pushing the domestic interest rate upwards. Under some conditions, it can also be difficult to sterilise the intervention fully except with an interest rate hike, which also contributes to further inflows. Consequently, sterilised intervention is unlikely to have a strong, lasting impact on the exchange rate (see, for example, Sarno and Taylor, 2001). The expanded foreign

[40] Fiscal policy can also play an important role by reducing domestic demand, thereby reducing the current account deficit. This eases external funding and reduces the adverse side effects of tight monetary policy, which are manifested in an increased current account deficit. It also reduces the risk of a sudden stop of external financing and an abrupt depreciation of the domestic currency.

exchange reserves that result could however enhance confidence in monetary policy, as the reserves could be used to support the currency when it is subject to downward pressures.

Larger foreign exchange reserves can also enhance financial stability; for example, by increasing confidence in the banking system or mitigating foreign liquidity problems. For example, many countries used their foreign exchange reserves for this purpose when there was a run on international banks' foreign funding following the collapse of Lehman Brothers in September 2008.

Systematic and transparent use of sterilised intervention to smooth the exchange rate cycle need not be inconsistent with an inflation-targeting regime. The intervention can help to reduce exchange rate fluctuations and, as stated above, can help smooth the business cycle as well. The danger of a sudden exchange rate reversion, which could dramatically affect demand and inflation, would also be less pronounced. Although sterilised intervention generally has a limited long-term impact on the exchange rate, it can provide the central bank with an additional instrument for use in reducing short-term exchange rate volatility – to the extent that capital mobility is not perfect, which is probably the case over a relatively short time horizon (see, for example, Blanchard et al., 2010). The interest rate tool could then be used to combat domestic inflationary pressures in accordance with the inflation target.

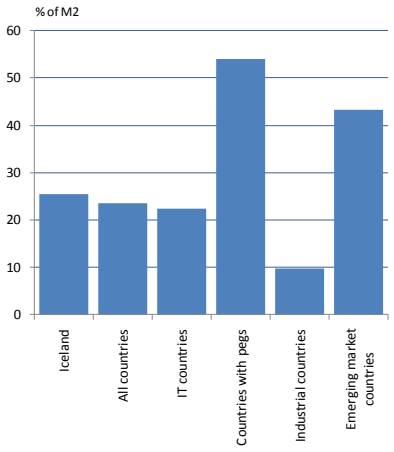
The use of sterilised intervention is not without its problems, however, in part for the reasons described above. Experience of such intervention prior to the floating of the króna in 2001 suggests very limited impact on the exchange rate, for example (see Ísberg and Pétursson, 2003). It is also not completely clear how beneficial such foreign exchange market intervention in the run-up to the financial crisis would have been. Perhaps it would have been possible to intervene in the foreign exchange market in 2005, when the króna was at its strongest, so as to build up reserves to address the expected reversal later on. Such a correction eventually took place in 2008, but given the severe foreign liquidity shortage plaguing the Iceland's financial institutions at that time, enormous foreign exchange reserves would have been required in order to resist the resulting downward pressure on the króna. It is not impossible, however, that steadily building up the reserves through systematic intervention might have tempered the appreciation of the króna, thus diminishing the scale of the ensuing correction. It is extremely difficult to assert that this would have been the case; however, other countries, such as Brazil and Chile, that accumulated reserves during the upswing preceding the global financial crisis appear to have benefited from doing so (see, for example, DeGregorio, 2010, and Meirelles, 2010), although the imbalances and liquidity problems besetting those countries' domestic financial systems were certainly far smaller in scope than Iceland's.[41]

[41] The Reserve Bank of Australia also has a long experience in the use of sterilised intervention to smooth exchange rate volatility in the context of an inflation targeting regime (see, for example, Kim and Sheen, 2002). In recent years, the Reserve Bank of

It is crucial, however, to avoid using intervention as a means of achieving or maintaining a given exchange rate level. Experience shows that this is extremely difficult, as the impact of sterilised intervention on the exchange rate is negligible in the long run. Furthermore, it can give market agents an opportunity to profit easily at the expense of the central bank, which could lose its foreign exchange reserves extremely quickly if intervention is not used carefully, and ultimately undermine confidence and prompt capital flight.

Neither are large foreign exchange reserves a guarantee against economic shocks such as the global financial crisis and its consequences.[42] As Chart 14 illustrates, the Central Bank of Iceland's foreign exchange reserves as a share of the banking system's domestic obligations (that is, broad money, M2) was about 25%, which is similar to that in other inflation-targeting countries. The share was actually somewhat higher than in other industrial countries, but it was also lower than in emerging market economies. Ólafsson and Pétursson's (2010) findings also suggest that the size of the foreign exchange reserves did not play a major role in determining the magnitude of the economic contraction following the financial crisis, although they do find tentative evidence indicating that larger reserves did contribute to reducing the likelihood of a banking crisis.

Chart 14
Size of foreign exchange reserves in 2007



Source: IMF.

This does not tell the whole story, however, as the Central Bank's foreign reserves as a ratio to the external short-term liabilities of the economy was very low in the run up to the crisis – far below what is typically recommended – reflecting the oversized balance sheet of the domestic banking system.[43] The risk of a foreign currency liquidity problem if access to global credit markets would suddenly be curtailed was therefore substantial, as indeed became evident in the financial crisis.

Large foreign exchange reserves are also important to be able to provide liquidity assistance in foreign currency. For example, the central banks of many countries that escaped relatively lightly from the recent financial crisis were nonetheless forced to provide foreign currency liquidity assistance. Norway is an example of this (see, for example, OECD, 2010, p. 31).

Finally, it is of vital importance for Iceland that it builds up sufficient non-borrowed reserves in coming years so as to enable the Treasury to

New Zealand has also intervened in the foreign exchange market in order to smooth exchange rate volatility and ensure the effectiveness of the foreign exchange market (see, for example, Eckhold and Hunt, 2005).

[42] This is likely to be of particular relevance in the case when the foreign exchange reserves are mostly borrowed. Similar buffers can be obtained through international foreign exchange swap agreements; cf. the swap agreements between the US Federal Reserve and a number of other central banks at the height of the crisis (see, for example, Allen and Moessner, 2010). Such agreements are not always available, however. For example, the US Federal Reserve refused Iceland's request for such an agreement in 2008.

[43] A common measure is the Greenspan-Guidotti rule that states that reserves should at least equal short-term external liabilities. In mid-2008, the Central Bank of Iceland's foreign reserves were equivalent to just under 6% of external short-term liabilities. In comparison, the foreign exchange reserves of emerging market economies at the same time were about 150% of their short-term liabilities (see, for example, IMF, 2009b).

service its foreign obligations, which have increased substantially in the wake of the financial crisis.

On the whole, the experience of other countries suggests that accumulation of reserves is generally positive during the appreciation phase, so as to build up reserves which can be used to support the domestic financial system during times of possible foreign liquidity shortages, thus trying to smooth the most extreme exchange rate fluctuations. Systematic and transparent sterilised intervention can therefore be a useful supplement to current stabilisation policy, although it cannot be expected to do more than dampen the largest peaks and troughs in the exchange rate cycle, unless additional measures are used to exert some control over capital flows.

Another way to counteract excessive appreciation of the domestic currency – and one that has received increasing attention – is to tax capital inflows. More and more emerging market countries have resorted to this in the recent term. Among them are Brazil and Korea, which tax foreign investment in the domestic bond market, and Thailand, where a portion of the inflows are tied up in interest-free accounts in the central bank, with the tied period varying inversely with the length of the investment project. Many other countries have also adopted such rules or are contemplating them.

5.3 Macro-prudential policy

Problems related to a lack of market discipline and flawed micro-prudential policy came to the fore in the wake of the financial crisis.[44] A review of the financial market regulatory framework is therefore needed. A great deal of work related to such a review is already under way internationally. In addition, work is being done to develop various macro-prudential tools. A BIS-appointed committee first pointed out the need for such tools in the 1970s, but only now are these ideas gaining broad-based support (Clement, 2010). While a tremendous amount of work has been done, a clearly defined framework with a strong international consensus is still a long way off (see Caruana, 2009, 2010b, 2010c, and Borio, 2010). As has been mentioned previously, the aims of macro-prudential policy centre on the stability of the financial system as a whole and not necessary on individual elements of it. As such, macro-prudential policy links together central banks' macroeconomic analysis and financial supervisors' tools.

It should not come as a surprise that the discussion of macro-prudential policy has been revived in the wake of the recent economic turmoil; indeed, many are sure to wonder whether a macro-prudential regulatory framework might have mitigated the imbalances that eventually led to the collapse. Optimism generally increases during an economic upswing, and unrealistic expectations of the longevity of the bull market, with ever-rising asset prices, appears to take hold. As was obvious in the run-up to the global financial crisis, it is common at such times that financial

[44] Micro-prudential policy focuses on the stability of individual financial institutions (see, for example, Yue, 2001).

institutions, corporations, and households take on more debt and expand their balance sheets through increased leverage. This tends to fuel an unsustainable asset price bubble and stimulate domestic demand. In the end, the bubble bursts and economic activity contracts abruptly, leaving households, firms, and financial companies with exposed balance sheets and escalating loan losses. This blow to balance sheets exacerbates the contraction still further and can cause a serious financial crisis.

Table 4 Various instruments of macro-prudential policy

Instrument	Example
Contain systemic risk over the business cycle	
Capital buffers linked to macroeconomic developments	China[1] (credit growth), New Zealand[1] (LTV ratio)
Counter-cyclical loan-loss provisioning	China, Colombia, India, Spain
Variable LTV ratios	China, Hong Kong, Korea, Singapore, Malaysia, Thailand, New Zealand[1]
Direct controls on lending to specific sectors	Korea, Malaysia, Philippines, Singapore
Caps on ratios of debt service to income	Hong Kong, Korea, Malaysia, Thailand
Adjustments to risk weights	India, Turkey
Loan–to-deposits requirements	Argentina, Hong Kong, China, New Zealand, Korea
Capital surcharges	Under consideration by the Basel Committee on Banking Supervision
Variation in minimum margins or haircuts on funding contracts	Proposal from CGFS[2]
Variable mortgage interest levy	New Zealand[1]
Contain systemic risk at all times	
Capital surcharges for systematically important banks	China, India, Philippines, Singapore
Liquidity requirements	India, Korea, Philippines, Singapore
Limits on currency mismatches	India, Malaysia, Philippines, Poland
Ratio of property lending to total lending	Hong Kong
More stringent credit assessments for borrowers (e.g. with higher interest than contracts indicate)	Canada
Limitations on frequency of mortgage loan applications in areas where speculative activity is a problem	Korea
Higher taxation of profit on real estate sales than on other sales profits	Korea, New Zealand[1]
Limits on non-residents' real estate purchases	Malaysia
Easing of supply side of the real estate market	New Zealand[1]
Tax on financial institutions' debt in excess of deposits	Korea
Restriction on disposal of profit	Proposal from CGFS[2]
Restrictions on lending growth	Proposal from CGFS[2]
Restrictions on foreign currency lending	Proposal from CGFS[2], Hungary
Subsidiarisation	Proposal from CGFS[2]
Cap on maturity of loan agreements	Proposal from CGFS[2]
Mortgage valuation rules	Proposal from CGFS[2]
Restrictions on interbank market concentration	Proposal from CGFS[2], India

1. Under consideration at the time of writing. 2. Committee on the Global Financial System.

Sources: Committee on the Global Financial System (2010), Reserve Bank of New Zealand (2006), Saurina (2009), Central Bank of India (2009), Bank for International Settlements (2009), Department of Finance, Canada (2010), Chang-Lok (2006), Yung (2006), Hong Kong Monetary Authority (2002), and Central Bank of Malaysia (2009).

To a degree, the systemic risk in the financial system is rooted in the core of banking operations – in its asset transformation role of receiving

short-term loans (through the interbank market and deposits) and converting them to long-term loans to companies and individuals. Given the pro-cyclical nature of credit growth, the banking system's liquidity risk has a tendency to rise in upswings. But a turn in the cycle can call forth a dramatic change, and banks can be subject to a sudden liquidity problem. In such instances, they must contract their balance sheets and restructure them, which usually means reducing lending and selling assets, which is likely to deepen the contraction still further. The result can be a financial crisis.

Because these characteristics are often the root of instability and increased systemic risk in the financial system, it is important that central banks have at their disposal the tools necessary to diminish the financial acceleration effect of financial leverage, as well as reducing the likelihood that excessive liquidity risk will accumulate. But these are not the only problems facing the financial system. Currency mismatches are an important problem facing financial systems in small, open economies like Iceland. If borrowers with domestic-currency income take on foreign currency-denominated debt, wide fluctuations in exchange rates can have a strong impact on their balance sheets and even lead to bankruptcy.

A number of tools have been suggested that could be useful in combating the problems mentioned here, thereby promoting financial stability. Table 4 presents a summary of some of the instruments most widely discussed in Iceland and internationally. These tools can be divided into tools that deal with financial risk over the business cycle and tools that address systemic risk. However, this division is not clear as many of the tools can be implemented in various ways.

5.3.1 Counter-cyclical tools

As has been mentioned previously, the idea of counteracting cyclical imbalances in the financial markets has gained momentum in the wake of the recent financial crisis. It has already been argued that the interest rate tool alone is unlikely to suffice, and that central banks will need additional tools to achieve these goals. Ideally, such tools should be easy to apply and transparent in implementation; furthermore, it is desirable that they be relatively automatic or that they be specifically linked to developments in specific economic variables. The tools can focus on specific sectors where imbalances are developing, or on the financial system as a whole, if the imbalances are not limited to a certain part of it. It is also important that the effectiveness of the tools be symmetric; that is, that they counteract both upturns and downturns (see, for example, Committee on the Global Financial System, 2010).

Over the years, the Basel II regulatory framework has been criticised on the grounds that it is in effect pro-cyclical. The provisions on equity composition mean that these requirements become less constraining during upswings; for example, when asset prices are rising, which enables the banks to expand their balance sheets as long as the upswing lasts. When markets turn, the opposite happens: asset prices fall, so that

the composition of financial institutions' balance sheets changes. As a result, selling assets is often unavoidable in order to fulfil the Basel II standards, and more often than not, assets sell at prices below book value. This can cause further declines in asset prices, with the associated sale of assets, and a vicious cycle of further declines and asset sales can result.

The Basel regulatory framework is undergoing constant development, and the third version of the standards has recently been introduced. The plan is that the new standards will be implemented in steps over the next few years. The main change is that capital requirements consist of two elements: a fixed minimum requirement and an additional cyclically adjusted levy. This renders banks' funding more expensive, which will be reflected in higher borrowing costs. This alone reduces private sector indebtedness and cuts the banking system's credit risk. It therefore works against excessive credit expansion during booms, thereby reducing the risk of asset bubble formation. Banks would also be forced to contribute more to contingency funds during upswings, which would enable them to use those funds during downswings. The Basel Committee's recommendations also allow for supplemental macro-prudential tools, assuming that such tools would be adapted to the circumstances in each individual country (Caruana, 2010a).

Central banks around the world have been aware of the flaws in the Basel II framework and have proposed a number of improvements. The Reserve Bank of New Zealand (2006), for example, has pointed out the necessity of addressing the weaknesses in the Basel II standards. The Reserve Bank argues that it is possible to link financial institutions' capital adequacy requirements to maximum LTV ratios at any given time. A higher LTV ratio would therefore be accompanied by a lower capital requirement, which would facilitate lending in downturns and tend to restrict credit growth in upswings. Furthermore, the Chinese authorities have been considering introducing a counter-cyclical layer of capital that would be linked to credit growth. Experience has shown that, when credit growth is strong, a time comes when banks grant riskier loans than before. When market conditions change dramatically, these borrowers are the first to end up in financial distress; therefore, it is appropriate to require that banks tie up more capital to offset these risky loans that find their way into their loan portfolios during periods of strong credit growth. Another means of establishing such counter-cyclical measures is, instead of changing capital requirements, to implement dynamic provisioning; i.e., to link loan-loss provisioning contributions to credit growth. Such an arrangement exists in Spain, where the central bank has developed a formula that determines loan-loss provisioning account contributions in this manner. Other countries, such as India and Colombia, have formulated similar instruments based on the Spanish model. Spain's experience indicates, however, that such a rule does not suffice to prevent asset price bubbles, although it does contain the growth of credit risk among financial institutions (Saurina, 2009).

Another way to affect the composition of banks' balance sheets is to change the risk weighting in the Basel rules. The capital ratio according to the Basel framework is calculated as a weighted average of asset classes, where the weights are based on the assessed risk in each asset class. It would be possible to link the weights to movements in macroeconomic conditions, thus introducing a counter-cyclical capital ratio. This would encourage the banks in question to restructuring their asset composition according to changes in the risk weights; otherwise, they would have to tie up further capital. It would also be possible to use changes in Basel weights to reduce foreign currency mismatches by assigning foreign assets lesser weight in the calculation of capital ratios (further discussion of foreign exchange imbalances can be found below). The possibility of introducing restrictions on financial institutions' funding has also been discussed. For example, it is possible to introduce maximum debt-to–deposits ratio, thus affecting whether the institution funds its activities with deposits or in the wholesale market. This would make it possible to prevent the banks from engaging in a credit expansion far in excess of increases in deposits. These ideas are in line with the previously mentioned review of the Basel framework.

Rules of this type not only help to reduce excesses during upswings and promote the build-up of strong reserves that can be used during times of need; they are also conducive to reducing excessive risk-taking and reducing the likelihood that banks will be weakened from within through significant dividend and bonus payments during upswings. In addition to focusing rules on the level and composition of the capital base, it is possible to reduce under-pricing of risk by adopting a variable minimum premium or haircut on financial institutions' loan agreements. Applying such a tool would reduce the likelihood of a sharp contraction in the supply of wholesale collateralised loans if assets suddenly lose collateral value.

As the global financial crisis showed so clearly, loans that appear to be secured by good-quality collateral can suddenly become worthless when the business cycle turns and the economy begins to contract, particularly if the turnaround is accompanied by a sharp reduction in asset prices. Proposals focusing on the asset side of financial institutions' balance sheets have therefore also been mentioned. Various ideas about the regulatory framework for lending have been presented in recent years, most prominent among them the idea of setting a ceiling on LTV ratios for mortgages. Such ratios could be linked to credit growth and could therefore discourage overheating in the housing market, as borrowers would have to contribute more capital, which could discourage asset bubble formation and work to counteract adverse selection problems among borrowers. Another ratio that could be used is the ratio of debt servicing to income. This would make it possible to impose a cap on how much debt individuals could take on, thus improving their ability to service their debt in downturns. If such a measure were used appropriately, it would render banks' loan portfolios less vulnerable to downturns. The Reserve Bank of New Zealand (2006) suggests imposing

a levy on general mortgage interest rates. If such a levy were linked to credit growth or changes in collateral values, it would be possible to control further credit growth and possible asset price bubbles. Finally, it is worth mentioning that various Asian countries – for example, Korea, Malaysia, the Philippines, and Singapore – rely on a regulatory framework that authorises restrictions on financial institution lending to certain sectors. This allows them to restrict lending to overheated sectors of the economy, thus reducing the risk of abrupt downturns later on.

Yet another tool that may be useful for reducing the risk of increased imbalances is counter-cyclical taxation of financial transactions. For example, the current stamp fee structure in Iceland should exert a restraining influence on real estate prices because stamp fees are calculated as a percentage of the amount of the mortgage bond used for the transaction. In addition, a portion of the stamp fee is linked to the official appraised value of the property. As a result, higher-priced real estate bears higher stamp fees. It might be possible to construct a system in which the stamp fee percentage varies over the business cycle, which could serve to enhance the counter-cyclical effect of the stamp fee even further. It is also possible to construct counter-cyclical property taxes that would rise systematically in tandem with property prices. Another way to use the tax system to smooth cyclical fluctuations is to link corporate taxes to asset price developments (Cable, 2008).

5.3.2 Tools to contain systemic risk

Escalating systemic imbalances make the financial system vulnerable to shocks. An example is when the banking system is too large relative to the economy. A large banking system is often accompanied by increased risk. For example, it increases the risk of regulatory capture, i.e. that the financial industry will have an abnormal impact on supervision and legislation, which can dramatically increase moral hazard problems (see, for example, Demirguc-Kunt and Serven, 2009). The share of cross-border operations will also become larger as the system itself grows, with the result that a larger share of its balance sheet is therefore in foreign currency. This can prove a serious problem in countries using a currency that is not considered an international reserve currency. In such instances, the domestic central bank has very limited ability to ensure financial system access to liquidity in its main operational currency unless it has enormous foreign exchange reserves, which is extremely costly (see, for example, Buiter and Sibert, 2008). Experience in Iceland also shows that such a large financial system can undermine the stability of domestic payment systems and public sector finances and can lead to a serious balance of payments crisis.[45]

When banks become so systemically important that they are deemed "too big to fail," a moral hazard problem is created in that the banks do not take into account the negative externality that their activities may

[45] Ólafsson and Pétursson's (2010) results indicate that countries with large banking systems fared significantly worse in the financial crisis: the contraction was deeper, and there was more risk of a systemic banking and currency crisis.

have on the financial system and the economy as a whole. A similar moral hazard problem can develop in small, open economies with an independent currency because of private sector currency mismatches. For example, increased demand for foreign-denominated loans by Icelandic households and businesses, particularly from the latter half of 2007, greatly increased systemic risk in the domestic financial system. To the extent that the borrowers in question did not have foreign-denominated income, the risk mounted of a serious debt crisis in the event of a sharp depreciation of the króna, which indeed happened. The moral hazard problem developed because neither lenders nor borrowers gave sufficient consideration to the risk that their behaviour created for the economy as a whole. This problem is far from being a uniquely Icelandic phenomenon: a number of Eastern European countries have experienced similar problems, and the same type of debt crisis has emerged in earlier financial crises, such as those in South America in the 1980s and 1990s, and in Southeast Asia in the late 1990s.

As is the case with the counter-cyclical tools, it is desirable that the tools for containing systemic risk be as simple and transparent as possible. The common element among the tools under discussion here is that they have been used to work directly against the development of systemic risk. As has been mentioned previously, the distinction between these tools and the counter-cyclical tools are not always clear. Doubtless it would be possible to implement some of them so that they could be extended to cover both areas.

Several Asian countries have resorted to imposing additional capital surcharges on systemically important banks, with the aim of reducing financial institutions' incentive to engage in excessive credit expansion. The extra capital surcharge means that the banks must, to some extent, take account of the externality they impose on the financial system as a whole. This method is not without problems, however. For example, implementation would be rather complicated in Iceland because, in such a small and undeveloped financial system as that in Iceland, most if not all banks can be considered systemically important. Another thing that should be borne in mind is that such a tool must not end up channelling financial services out of the regular banking system and into the shadow financial system, where supervision is perhaps not as effective.

Another way to contain banks' expansion is to impose a tax on liabilities in excess of deposits. This could reduce the incentive to swell balance sheets via wholesale funding. It can be argued that a financial system that is mainly funded with deposits is not as vulnerable to a sudden funding squeeze; therefore, it probably entails less systemic risk.[46] Other ideas centre on restrictions on the disposal of financial companies' profits, such as bonus and dividend payments (see, for example, Committee on the Global Financial System, 2010).

[46] The experience from the current financial crisis suggests that banks are more vulnerable to runs by the financial markets – that is, a sharp turnaround in access to market liquidity – than to a conventional bank run by depositors (see, for example, Borio, 2009).

Without doubt, rules on reserve requirements are one of the best-known tools focusing on the asset side of financial institutions' balance sheets. Such rules force financial institutions to hold a certain percentage of their deposits on account with the central bank. The impact of reserve requirements depends in part on the interest paid on reserves. If that rate is below market interest, it is the equivalent of a tax on the banking system and increases the interest rate differential, which could contain lending growth to an extent. As banking system funding becomes more deposit-based and access to markets becomes more restricted, changes in reserve requirements can also affect credit availability. Direct restrictions on credit expansion should have a similar impact, insofar as they are effective.

The liquidity ratio is another tool that focuses on the asset side of bank's balance sheet and has been used in Iceland, as well as in several Southeast Asian countries. The liquidity ratio is generally defined as the ratio of liquid assets to short-term liabilities, therefore reflecting the share of liabilities that could be paid at short notice.

An example of yet another tool is a ceiling on the ratio of mortgage loans to total bank lending. The Hong Kong Monetary Authority set such rules in 1994 in order to contain the upswing in the residential housing market. The rule was revoked four years later, after the markets had settled down once again (see Hong Kong Monetary Authority, 2002). These measures taken by the Hong Kong authorities focused on lenders; however, there are examples of tools that centre on borrowers. In Canada, for instance, credit assessment requirements have been tightened. It can be said that borrowers are made to undergo a sort of stress test that assesses their ability to pay at higher interest rates than are offered them at the time the loan is taken. This represents an automatic cap on indebtedness. Such a measure better prepares borrowers for periods of tighter monetary policy. As another example, the Korean central bank responded to overheating in the housing market in 2003-2006 by imposing restrictions on the number of mortgage applications in areas where speculation was considered a problem and by taxing real estate sales proceeds at a higher rate than other capital gains. These measures are believed to have played a role in preventing a housing bubble without slowing down other economic sectors excessively.

As has been mentioned previously, banking is based on asset transformation. When asset transformation takes place, maturity mismatches develop between the bank's asset and liabilities, as the bank funds its activities with deposits and other short-term loans but lends for longer periods of time. If these mismatches increase, it can cause systemic risk, as in the case of Iceland, whose banks relied increasingly on short-term wholesale funding. As a result, they had problems with refinancing after their credit lines had been closed down. In order to respond to such problems, the Committee on the Global Financial System has suggested that restrictions be placed on the maturity of loan

contracts, on both the borrowing and lending sides (Committee on the Global Financial System, 2010).

As has also been mentioned previously, mismatches in banking operations can also arise from the currency composition of assets and liabilities. Such currency mismatches can cause systemic risk if borrowers' income is to a large degree in other currencies than their debt. In order to combat this, it is possible to impose regulations that restrict or prevent such risk-taking. Such rules could take the form of explicit prohibition or increased capital requirements for banks wishing to grant such loans. With a sufficiently high surcharge, the results would be the same: foreign-denominated loans would no longer be available to those without income in the same currency, either because they would be prohibited or because they would be so unattractive that neither supply nor demand would exist.[47] Several countries have adopted such rules; for example, new loans denominated in foreign currency have been prohibited in Hungary, and in Poland the borrower must make a larger down payment if he or she takes a foreign-denominated mortgage loan. The rules that have been in use in India entail restrictions on banks' foreign debt not related to international trade, prohibitions on various currency-related financial instruments, and restrictions on domestic real estate purchases by foreign nationals (Reserve Bank of India, 2009).

Other options that have also been discussed are to introduce a regulatory framework for the valuation of loan agreements and the possibility of making the supply side of the real estate market more flexible so as to contain price increases due to excess demand. Subsidiarisation has also been mentioned as a solution to the problem that develops when a banking group has branches in other countries. By requiring that the group establish a subsidiary for its foreign branches, it is possible to limit the impact of foreign operations on domestic systemic risk.[48] A highly relevant example for Iceland is the Landsbanki Icesave deposit accounts in the UK and Holland. It is also possible to tighten the rules on financial company structure that centre on ownership and the scope of transactions among financial institutions. This could reduce systemic risk and counteract the contagion of individual banks' problems to the entire financial system (see, for example, Reserve Bank of India, 2009).

5.3.3 Implementation of macro-prudential policy

Macro-prudential policy is implemented differently from country to country, although the effect is similar if not the same. The main difference lies in how systematic the implementation is. Systematic implementation of macro-prudential tools has the benefit of being more transparent, and private agents know what to expect from the supervisory authority. Systematic implementation also has the

[47] As Ingves et al. (2010) point out, foreign-denominated lending can also be viewed as an externality that the banking system imposes on the entire financial system and on taxpayers, and that it is therefore appropriate to tax these external effects with a Pigovian tax.

[48] This is not permissible under the EEA Agreement and the EU regulatory framework, but has been considered by the Committee on the Global Financial System.

advantage of reducing the impact that political pressure can bring to bear on the supervisory authority's decisions. On the other hand, it may sometimes prove necessary to resort to discretionary measures.

Finally, it is appropriate to emphasise that the tools discussed here cannot guarantee that financial crises will become a thing of the past. For example, tools that focus on a single sector of the economy could cause imbalances in other sectors. Private agents will respond by trying to circumvent rules in various ways. Furthermore, it is possible that the rules will distort incentives and lead to increased risk taking in markets not covered by the rules. And as has been stated previously, it is often extremely difficult to determine whether an asset bubble is forming or whether a rise in prices is simply reflecting economic fundamentals. In the case of a fundamental-driven asset price increase, applying these tools could have a distorting effect on the economy.

5.4 Fiscal policy and its co-ordination with monetary policy

Monetary policy is mandated by law with the task of promoting price stability and is required to work towards that goal regardless of what macroeconomic policy the authorities adhere to in other respects. Fiscal policy and macroeconomic policy in general can however make it either easier or more difficult for the central bank to achieve its goal and can affect the short-term trade-offs entailed. Fiscal policy can also counteract or magnify any possible negative effects of monetary policy; for example, in the form of an increased current account deficit, which inevitably accompanies tighter monetary policy. In this way, fiscal policy helps controlling demand and reduces the risk that the interest rate differential with abroad becomes too large. As recent experience shows clearly, a policy mix that involves excessively lax fiscal policy and a tight monetary policy increases the likelihood of large capital inflows, which can easily reverse when uncertainty and risk aversion increase. This is particularly important in a small, open economy where the burden of tight monetary policy can affect different sectors of the economy very differently. This can lead to rising criticism of monetary policy and undermine support for it. Under such circumstances, it is important that fiscal policy play a larger stabilisation role (see, for example, Schmidt-Hebbel, 2006). This is even truer under conditions like those in Iceland, where the business cycle is more volatile than is the generally found in other countries (see Section 3).

As is discussed in Section 3, recent experience show that the co-ordination of monetary and fiscal policy was greatly lacking in Iceland; as a result, monetary policy was excessively strained and its negative side effects – a growing current account deficit and a strong currency – were exacerbated.

The global financial crisis has also shown the importance of accumulating war chests through fiscal surpluses in good times so as to support the economy in downturns. To create this extra "fiscal space", larger surpluses than were previously considered necessary therefore seem to be called for (see, for example, Blanchard et al., 2010). This is also an

important element of creating a credible framework for dealing with the large public debt that has emerged after the financial crisis. This is important not only to ensure fiscal sustainability, but also for the effective achievement of the inflation target (see, for example, Leeper, 2010).

In order to make fiscal policy more effective and enhance its ability to support monetary policy, a number of improvements to the fiscal framework are needed as well. It is necessary to examine whether it might be beneficial to follow the example of many neighbouring countries and establish an independent institution that appraises the cost of budget plans and evaluates whether they are consistent with the objective of fiscal sustainability, both at the national and local level. Such an institution could also advise the Government on stabilisation policy measures so as to reduce the likelihood of repeating the mistakes of the recent past.

Other improvements, such as adopting well-defined fiscal rules, can also be helpful, as such rules can enhance the transparency of fiscal decisions and increase fiscal policy accountability. This should bolster the credibility of measures to contain the large public debt, but it can also improve monetary policy transmission (see, for example, Leeper, 2010). Introducing nominal rather than real expenditure targets, as in the Government-IMF economic programme, is also an important improvement. Setting expenditure targets that are consistent with the inflation target increases the effectiveness of automatic fiscal stabilisers, as well as strengthening the official ownership of the inflation target, which serves to enhance its credibility and help monetary policy delivering inflation at target.

Finally, it is important that the authorities consider the long-term effects of the austerity measures that have proven necessary in the wake of the sharp increase in public debt following the financial crisis. According to a number of studies and the experience of other countries, it is possible to achieve a more sustainable success in reducing the public debt through expenditure cuts rather than tax hikes. Historically, the most effective way to reduce the debt burden is through economic growth, to the extent that it is not leveraged and in excess of the country's output capacity. Increased taxes can, however, reduce the incentive for revenue creation, especially if they are imposed on elastic tax bases. Thus measures focusing on the revenue side of public sector finances could be likelier to weaken long-term potential output than expenditure-side measures; therefore, other things being equal, expenditure-based measures could prove more successful in the long run than tax-based measures (see, for example, Alesina and Perotti, 1996, and Collier and Gunning, 1999).

6 Refining the inflation target

This section explores possible changes to the formulation of the Central Bank's inflation target in the light of recent experience, both in Iceland and abroad. It examines the advantages and disadvantages of changing the numerical inflation target, lengthening the horizon for the target, widening its tolerance limits, and changing the inflation measure used for formulating monetary policy. Any such changes to the inflation target would be in addition to the macro-prudential tools and foreign exchange market intervention previously discussed.

6.1 Changing the numerical target for inflation

It has sometimes been suggested in the domestic debate that the Central Bank's numerical inflation target should be raised. A similar discussion can be found internationally, particularly in the wake of the financial crisis, but on entirely different grounds. The international debate has centred on the risks of too low inflation in the major economies such as the euro area, the US, and leading inflation-targeting countries, where the formal or informal target is to keep inflation as close as possible to 2% or even lower. The idea there is that such a low rate of inflation can create difficulties in responding to severe economic shocks – such as the global financial crisis – with lower interest rates. When inflation is this low, interest rates are generally very low as well; therefore, there may be little scope to cut rates before hitting the zero lower bound, as nominal interest cannot be negative. Blanchard et al. (2010) therefore raise the question whether it is desirable to raise these countries' inflation target to, say, 4%, on the grounds that the economic costs involved in being unable to cut rates enough in a crisis because of the lower bound are perhaps greater than the costs associated with higher average inflation. One of the risks associated with the inability to ease monetary restraint is that the economy becomes stuck in a deflationary cycle, where falling prices cause the real debt service burden on debt bearing fixed nominal interest to rise. This deepens the contraction, which in return exacerbates the deflationary pressures. Japan's experience indicates that it can prove difficult to break out of such a vicious cycle.

Although these are valid arguments, response has been negative on the whole.[49] It has been pointed out that raising the inflation target could undermine the hard-fought credibility gained after a protracted and painful battle with inflation in the past; furthermore, a higher inflation level is usually accompanied by more volatile inflation, which entails additional economic costs. The idea also runs counter to findings of academic studies indicating that the optimal inflation target is indeed around 2% or below, even when taking the zero lower bound into

[49] Among them are ECB executives, including Jean-Claude Trichet, Axel Weber, Jurgen Stark, and Athanasios Orphanides, and Ben Bernanke of the US Federal Reserve (see the report in *Business Week* earlier this year: http://www.businessweek.com/news/2010-02-25/ecb-officials-reject-imf-proposed-inflation-target-update1-.html).

account (see, for example, Coibion et al., 2010, and Schmidt-Grohe and Uribe, 2010).

In any case, these arguments in favour of raising the numerical target for inflation have limited relevance in Iceland, where the inflation target is somewhat higher and where inflation has long been well in excess of the Central Bank's inflation target and interest rates well above the lower bound. The debate in Iceland has centred rather on whether inflation control is so difficult in this country that raising the target could enhance the likelihood that it will be attained. The argument in favour of a higher inflation target on the grounds that it reduces the likelihood of deflation and the costs associated with it is also less relevant to Iceland for other reasons as well. Because the country is so small and open to international trade, it should be somewhat easier to generate inflation through currency depreciation. In addition, output growth in Iceland has generally been export-driven, which should be stimulated rather than compressed by deflation because, other things being equal, a falling domestic price level leads to increased competitiveness of the tradable sector. In addition, the widespread use of financial indexation serves to protect borrowers from the rising real debt servicing burden that comes from deflation. Deflation would therefore, other things being equal, have a positive balance sheet effect because it would reduce their nominal debt. Declining domestic wages and producer prices, which would otherwise accompany deflation, would obviously offset this, however.

Raising the Central Bank's inflation target would therefore generate limited improvements. First of all, inflation expectations would adapt to the new target, and long-term nominal interest rates would rise accordingly. The experience of other countries also suggests that the credibility of monetary policy would be further undermined and the increase interpreted to imply that the inflation target would simply be raised again the next time inflationary pressures must be addressed. Brazil's experience, for example, indicates that the Central Bank of Brazil has had to maintain higher interest rates since the bank's inflation target was raised early in the decade. Similar experiences can be seen in Turkey after the upward revision of the country's inflation target in 2008 (see, for example, Danske Bank, 2008).

6.2 Extending the target horizon

Implementing an inflation target requires defining the time horizon over which the target is to be achieved. Too short a horizon can be problematic, in that achieving the target can become more difficult and it can also lead to additional instrument volatility, which in turn could cause increased uncertainty and volatility in economic activity. On the other hand, too long a target horizon could undermine the credibility of the inflation target. Lack of credibility can therefore limit the scope to lengthening the target horizon. Thus, it is common that central banks set

short-term inflation targets during the disinflation towards a longer-term target.[50]

The target horizon has generally been interpreted in terms of the transmission lags in monetary policy to demand and inflation, which is commonly viewed as being 2-3 years (see, for example, Smets, 2003). A further consideration is that the target horizon be long enough so that the transitory effect of relative price changes and effects of various supply shocks on inflation will taper out without calling for a monetary policy response (see also Section 2.1).

Similar arguments can be used concerning exchange rate fluctuations. Thus it could be appropriate to ignore the temporary effects of a strong currency on inflation when formulating monetary policy, and take a longer-term view and take account of the likely exchange rate reversal later on (see, for example, Guðmundsson, 2009).

In the wake of the financial crisis, support has grown for the view that it is appropriate to lengthen the target horizon so as to allow for response to long-term underlying imbalances in asset prices, which can be traced to asset price bubbles or unsustainable lending growth (see, for example, Borio and White, 2004). Asset price bubbles and the economic imbalances associated with them have a tendency to develop over a relatively long period of time; therefore, it could be appropriate to lengthen the target horizon. With a longer horizon, it would be easier to justify tighter monetary policy, even if the outlook is for modest inflation in the coming 2-3 years, so as to lean against the asset price bubble which can lead to increased inflation later on and have harmful effects on households and businesses when the bubble eventually bursts (see Section 5). It has also been argued (see, for example, Mishkin, 2004) that lengthening the target horizon is appropriate because a longer horizon increases the scope to maintain low interest rates in the wake of a serious financial shock without needing to respond to the temporary spike in inflation that could accompany the aggressive easing of monetary and fiscal conditions aimed at containing the contraction.

Thus there are strong grounds for lengthening the Central Bank of Iceland's target horizon, similar to what has been done in Australia and New Zealand, where the aim is to keep inflation close to target "over the business cycle". In this way, monetary policy would have increased scope to respond to unexpected shocks that would cause inflation to deviate temporarily from target, but without undermining public confidence in the inflation target. On the other hand, the current lack of credibility of the inflation target could limit the Bank's scope to extend the target horizon, at least at first. It may therefore be the case that an improved track record in maintaining inflation at target over an extended period is a prerequisite for the lengthening of the target horizon to be successful.

[50] This can be seen in how monetary policy implementation in Israel and New Zealand, for example, has changed gradually as confidence in the inflation target has increased. Early on, while the framework lacked credibility, the inflation target and its horizon were interpreted very strictly, but this has changed and become more flexible credibility has increased. See Pétursson (2005).

6.3 Widening the tolerance limits

As previously discussed, the joint declaration made by the Government and the Central Bank in March 2001 also defines a ±1½ percentage point tolerance limit around the 2½% target. Another way to increase the flexibility of the inflation-target framework might therefore be to widen this range. This would signal that the Central Bank would be willing, under certain circumstances (such as when faced with large terms of trade shocks), to tolerate larger temporary deviations from the inflation target without needing to respond. In the same way, it might be necessary to accommodate larger and longer-lived deviations from the inflation target if monetary policy is also to be used to lean against excessive asset price cycles.

The advantages and disadvantages are the same as those pertaining to extending the target horizon: tolerance limits that are too narrow could lead to excessive instrument volatility, while an excessively wide range could undermine public confidence in the framework. Furthermore, temporary breaches of the tolerance limits need not necessarily be a cause of concern, if they, for example, reflect terms of trade shocks that monetary policy does not want to respond to. Such breaches might even give the Bank opportunity to explain the reasons for the deviation and how inflation can be brought back to target over time.

These arguments are perhaps even more applicable in Iceland, where underlying economic volatility is greater and the trade-off between inflation and output volatility is less favourable than in other inflation-targeting countries (see Section 3). However, consistent with the experience of other countries (see, for example, Sveriges Riksbank, 2010), the role of the tolerance limits in the formulation of monetary policy in Iceland has gradually declined.

The benefits of re-emphasising the tolerance limits while simultaneously widening them are therefore not obvious. Again it need also be borne in mind that the current lack of monetary policy credibility may limit the scope to introduce very wide tolerance limits for the inflation target. Another option, though, would be to abandon the tolerance limits altogether. At the time the inflation target was introduced, the tolerance limits were conceived primarily as a tool to enhance the accountability of monetary policy by requiring that the Central Bank submit a report to the government on how it intended to respond. Because the Bank issues in-depth forecasts and analysis in its quarterly *Monetary Bulletin*, the value of further reporting is questionable. In addition, the current framework is somewhat flawed in that it only requires a report when inflation moves outside the tolerance limits; there is no such requirement if inflation remains outside the range for protracted periods of time. Consequently, the Central Bank last published such a report in September 2005, while inflation has remained outside the tolerance limits until very recently.

6.4 Changing the price index targeted

The Central Bank of Iceland's inflation target is based on annual inflation in terms of the headline consumer price index (CPI), as measured by Statistics Iceland. This is consistent with almost all other inflation-targeting countries, although it is also common to monitor various measures of underlying (or core) inflation (see, for example, Hammond, 2010). The idea behind such measures is to exclude volatile items, items that reflect supply shocks, or those beyond the influence of monetary policy, based on the arguments present in Section 2.1.[51]

This is particularly important in small, open economies where terms of trade shocks can have a large effects on the price of imported goods and services, and therefore on the CPI. In this light, theory suggests that it is more appropriate to target domestic price inflation than CPI inflation (e.g. Clarida et al*.,* 2002). In addition, there are theoretical grounds for arguing that the target should be based on the stickiest measure of inflation, which could even be wage inflation rather than CPI inflation (see, for example, Aoki, 2001, and Woodford, 2003). The use of core measures of inflation that exclude volatile items is consistent with these arguments. So is the emphasis on anchoring inflation expectations, as it focuses on preventing relative price shocks from having second-round effects on medium-term price and wage inflation; therefore, the emphasis is also indirectly on wage inflation.

On the other hand, the implementation of inflation targeting in Iceland is unique in that the headline CPI index, on which the target is based, includes the market price of residential housing, through the imputed rent subcomponent. This reflects the high proportion of home ownership in Iceland (over 80%) and the correspondingly small rental market with rental prices frequently subject to official intervention (see, for example, Box 1 in *Monetary Bulletin* 2003/4).

The option of basing the inflation target on the CPI excluding the housing component was originally considered. There are several reasons why this option was not chosen. First, the headline CPI is used for indexation of financial obligations. It was deemed desirable that the target measure should include the broadest possible selection of goods and services, which would reflect the actual consumption pattern of the general public; thus it was thought detrimental to the credibility of the framework and its public support if the target measure would be different from the price index used for financial indexation. Second, Pétursson's (2002) findings suggested that inflation including the housing component were less volatile than headline CPI inflation (see also Table 3, Section 3), and that the housing component had a statistically significant predictive value for future inflation. Third, it was also considered beneficial to include the housing component in the

[51] The Central Bank of Iceland also monitors a number of measures of core inflation in formulating its monetary policy: first, the CPI excluding agricultural products, vegetables, fruit, and petrol (core CPI 1); second, core CPI 1 also excluding public services prices (core CPI 2); and third, core CPI 2 also excluding the effects of mortgage interest rates (core CPI 3). In addition, the CPI and core indices excluding changes in consumption taxes are also monitored.

target measure, as that would automatically lead to a policy of leaning against house price cycles, something that has repeatedly been argued for in recent years, not least in the wake of the global financial crisis (see Section 5.1). Increased current inflation due to rising house prices would thus lead to a monetary policy tightening which would serve to counteract future inflationary pressures that could stem from rising consumption due to a positive wealth effect and to reduce the risk of a potential future house price bubble.

The use of the CPI including the housing component as a target measure is not without problems, however.[52] First, it seems inconsistent with the theoretical arguments outlined above, which suggest that the stickiest measure of inflation should be targeted. Second, targeting a price index that includes components that monetary policy may have limited affect on can be counterproductive. House prices can by quite volatile, just as other asset prices. Because the impact of the interest rate tool on asset prices is sometimes limited, it could therefore be appropriate to base the inflation target on the CPI excluding the housing component.

Excluding the housing component from target measure need not be inconsistent with the argument for leaning against the house price cycle. It would still be possible to lean against house prices (or asset prices in general) and the headline CPI could still be monitored, even though the formal target would be CPI excluding the housing component. The Central Bank's chances of attaining the target could be increased, however, and the credibility of the inflation target thus be enhanced (see, for example, Table 3). The arguments for excluding the housing component from the target measure are not unequivocal, however.

If it is decided to change the target measure, it would probably be most appropriate to use Eurostat's Harmonised Index of Consumer Prices (HICP). This index is based on standardised international methodology and is used by the ECB as its reference target; it is also used by a number of European countries outside EMU, such as the Bank of England.[53] The Maastricht Treaty is also based on this index, and should Iceland approve EU membership in a national referendum, it may be appropriate to adopt the HICP in the formulation of monetary policy in Iceland prior to membership in the monetary union.[54]

[52] Recent criticism of this target measure can be found, for example, in OECD (2009).

[53] Currently, the HICP does not include owner-occupied housing, but work is being done to include a housing component in the index, although market prices will not have the same impact as in the housing component of the Icelandic CPI. The Bank of England is also currently examining the advantages and disadvantages of including asset prices in its target measure.

[54] If this decision is taken, it would be desirable to do so when HICP inflation is on a par with, or higher than, CPI inflation. This would reduce suspicion that the change entailed reduced emphasis on price stability. It would also be necessary to examine whether the reference index for indexation of new financial obligations should be changed accordingly.

References

Alesina, A., and R. Perotti (1996). Fiscal adjustment in OECD countries: Composition and macroeconomic effects. NBER, *Working Paper Series,* no. 5730.

Allen, W. A., and R. Moessner (2010). Central bank co-operation and international liquidity in the financial crisis of 2008-9. BIS, *Working Papers*, no. 310.

Aoki, K., (2001). Optimal monetary policy response to relative price changes. *Journal of Monetary Economics*, 48, 55-80.

Baldursson, F. M., (2009). What lessons can be drawn from economic development and policy in Iceland in the 20th century? – Economic historians answer S. Agnarsson. *Saga*, 47, 17-19.

Ball, L., and N. Sheridan (2005). Does inflation targeting matter? In *The Inflation Targeting Debate*. Eds. B. S. Bernanke and M. Woodford. Chicago: University of Chicago Press.

Ball, S., (2004). Inflation-plus targeting at the Reserve Bank of Australia. *The Australian Economic Review*, 37, 391-401.

Bank for International Settlements (2009). *BIS 80th Annual Report.* Bank for International Settlements.

Baxter, M., and A. C. Stockman (1989). Business cycles and the exchange rate regime. *Journal of Monetary Economics*, 23, 377-400.

Blanchard, O., G. Dell'Ariccia and P. Mauro (2010). Rethinking macroeconomic policy. IMF, *Staff Position Note*, 10/03.

Blinder, A. S., (2010). How central should the central bank be? *Journal of Economic Literature*, 48, 123-133.

Borio, C., (2009). Ten propositions about liquidity crises. BIS, *Working Paper*, no. 293.

Borio, C., (2010). Implementing a macroprudential framework: Blending boldness and realism. Keynote speech at the BIS-HKMA conference Financial Stability: Towards a Macroprudential Approach. Hong Kong, 5-6 July 2010.

Borio, C., and W. White (2004). Whither monetary and financial stability? The implications of evolving policy regimes. BIS, *Working Paper*, no. 147.

Breedon, F., and T. G. Pétursson (2006). Out in the cold? Iceland's trade performance outside the European Union and European Monetary Union. *Cambridge Journal of Economics*, 30, 723-736.

Buiter, W. H., (2000). Is Iceland an optimal currency area? Central Bank of Iceland, *Working Paper*, no. 10.

Buiter, W. H., and A. Sibert (2008). The Icelandic banking crisis and what to do about it: The lender of last resort theory of optimal currency areas. CEPR, *Policy Insight*, no. 26.

Cable, V., (2008). Speech at the annual assembly of the Institute of Fiscal Studies. Bloomberg (London). 7 July 2008.

Caruana, J., (2009). The international policy response to financial crises: Making the macroprudential approach operational. BIS, *Speeches*, 21-22 August 2009.

Caruana, J., (2010a). Basel III: Towards a safer financial system. BIS, *Speeches*, 15 September 2010.

Caruana, J., (2010b). Macroprudential policy: Working towards a new consensus. BIS, *Speeches*, 23 April 2010.

Caruana, J., (2010c). The great financial crisis: Lessons for the design of central banks. BIS, *Speeches*, 20 May 2010.

Carvalho Filho, I. de, (2010). Inflation targeting and the crisis: An empirical assessment. IMF, *Working Paper Series*, no. 10/45.

Central Bank of Malaysia (2009). *Financial Stability and Payment Systems Report 2009*. Central Bank of Malaysia.

Chang-Lok, K., (2006) Perspectives on macroprudential supervision from individual financial institutions. *IMF Macroprudential Supervision Conference: Challenges for Financial Supervisors*.

Clarida, R., J. Galí and M. Gertler (2002). A simple framework for international monetary policy analysis. *Journal of Monetary Economics*, 49, 877-904.

Clement, P., (2010). The term "macroprudential": Origins and evolution. BIS*, Quarterly Review*, March 2010.

Coibion, O., Y. Gorodnichenko and J. Wieland (2010). The optimal inflation rate in New Keynesian models. College of William and Mary and University of California, Berkeley, August 2010. Worki in progress.

Collier, P., and J. W. Gunning (1999). The IMF's role in structural adjustment. IMF, *Working Paper Series,* no. 99/18.

Committee on the Global Financial System (2010). Macroprudential instruments and frameworks: A stocktaking of issues and experiences. *CGFS Papers*, no. 38.

Corbo, V., (2010). Financial stability in a crisis: What is the role of the central bank? In Perspectives on inflation targeting, financial stability and the global crisis. BIS*, Papers*, no. 51, 27-30.

Corbo. V., C. Landerretche and K. Schmidt-Hebbel (2001). Assessing inflation targeting after a decade of world experience. *International Journal of Finance and Economics*, 6, 343-368.

Crockett, A., (2000). Marrying the micro- and macro-prudential dimensions of financial stability. BIS, *Speeches*, 21 September.

Daníelsson, Á., (2008). The great moderation Icelandic style. Central Bank of Iceland, *Working Papers*, no. 38.

Daníelsson, Á., (2009a). QMM: A steady state version. Central Bank of Iceland, *Working Paper*, no. 44.

Daníelsson, Á., (2009b). Indexation and monetary policy. Central Bank of Iceland, *Economic Affairs*, 1.

Daníelsson, Á., (2010). Interest and exchange rates when inflation is at target. Central Bank of Iceland, *Economic Affairs*, 3.

Daníelsson, J., and G Zoëga (2009). The collapse of a country. London School of Economics and University of Iceland. Work in progress.

Danske Bank (2008). Turkey: TCMB raises inflation target… huge blow to credibility. Danske Bank, *Flash Comment*, 5 June 2008.

De Gregorio, J., (2010). Recent challenges of inflation targeting. In Perspectives on inflation targeting, financial stability and the global crisis. BIS*, Papers*, no. 51, 9-13.

Demirguc-Kent, A., and L. Serven (2009). Are the sacred cows dead? Implications of the financial crisis for macro and financial policies. World Bank, *Policy Research Working Paper*, no. 4807.

Department of Finance Canada (2010). *Government of Canada takes action to strengthen housing financing* (http://www.fin.gc.ca/n10/10-011-eng.asp).

Eckhold, K., and C. Hunt (2005). The Reserve Bank's new foreign exchange intervention policy. Reserve Bank of New Zealand*, Bulletin*, 68, 12-22.

Edwards, S., (2007). The relationship between exchange rates and inflation targeting revisited. In *Monetary Policy Under Inflation Targeting*. Eds. F. S. Mishkin and K. Schmidt-Hebbel. Santiago: Banco de Chile.

Elíasson, L., and T. G. Pétursson (2009). The residential housing market in Iceland: Analysing the effects of mortgage market restructuring. *Housing Studies*, 24, 25-45.

Fischer, S., and J. Huizinga (1982). Inflation, unemployment, and public opinion polls. *Journal of Money, Credit, and Banking*, 14, 1-19.

Flood, R. P., and A. K. Rose (1995). Fixing exchange rates: A virtual quest for fundamentals. *Journal of Monetary Economics*, 36, 3-37.

Friedman, B. M., (2004). Why the Federal Reserve should not adopt inflation targeting. *International Finance*, 7, 129-136.

Furceri, D., and G. Karras (2007). Country size and business cycle volatility. *Journal of the Japanese and International Economies*, 21, 424-434.

Gestsson, M. H., (2010). Monetary uncertainty, trade and pricing in general equilibrium. In *Essays on Macroeconomics and Economic Policy*. Doctoral dissertation, Århus University, 2010.

Goncalvas, C. E. S., and J. M. Salles (2008). Inflation targeting in emerging economies: What do the data say? *Journal of Development Economics*, 85, 312-318.

Guðmundsson, M., (2008). Financial globalisation: Key trends and implications for the transmission mechanism of monetary

policy. In Financial market developments and their implications for monetary policy. BIS*, Papers*, no. 39, 7-29.

Guðmundsson, M., (2009). Monetary union or inflation targeting plus for small open economies. Panel comments at the Eur50 Group. Paris, 20 November 2009.

Guðmundsson, M., T. G. Pétursson and A. Sighvatsson (2000). Optimal exchange rate policy: The case of Iceland. In *Macroeconomic Policy: Small Open Economies in an Era of Global Integration*. Eds. G. Zoëga, M. Guðmundsson and T. T. Herbertsson. Reykjavík: University Press, 2000.

Gurkaynak, R. S., A. T. Levin and E. T. Swanson (2006). Does inflation targeting anchor long-run inflation expectations? Evidence from long-term bond yields in the US, UK and Sweden. Federal Reserve Bank of San Francisco, *Working Paper Series*, 2006-09.

Gurkaynak, R. S., A. T. Levin, A. N. Marder and E. T. Swanson (2007). Inflation targeting and the anchoring of inflation expectations in the Western Hemisphere. In *Monetary Policy Under Inflation Targeting*. Eds. F. S. Mishkin and K. Schmidt-Hebbel. Santiago: Banco de Chile.

Hammond, G., (2010). State of the art of inflation targeting. Centre for Central Banking Studies, *Handbook no. 29*. Bank of England.

Hong Kong Monetary Authority (2002). Bank lending and property prices in Hong Kong. *Quarterly Bulletin* 8/2002.

Honjo, K., and B. Hunt (2006). Stabilizing inflation in Iceland. IMF, *Working Paper Series*, no. 06/262.

Hutchinson, M. M., and I. Noy (2005). How bad are twins? Output costs of currency and banking crises. *Journal of Money, Credit, and Banking*, 37, 725-752.

Ingves, S., M. Apel and E. Lenntorp (2010). Monetary policy and financial stability – Some future challenges. Sveriges Riksbank, *Economic Review* 2/2010, 5-28.

International Monetary Fund (2007). *Iceland: 2007 Article IV Consultation – Staff Report*. International Monetary Fund.

International Monetary Fund (2009a). *World Economic Outlook: Lessons for Monetary Policy from Asset Price Fluctuations*. International Monetary Fund.

International Monetary Fund (2009b). Iceland: Staff Report for First Review under Stand-By Arrangement and Requests for Extension of the Arrangement, Waivers of Nonobservance of Performance Criteria, and Rephasing of Access. *IMF Country Report* no. 09/306. International Monetary Fund, October 2009.

Ísberg, G., and T. G. Pétursson (2003). Central Bank intervention in Iceland's foreign exchange rate market and its effect on the exchange rate of the króna. *Monetary Bulletin* 2003/1, 47-71.

Johnson, D. R., (2002). The effects of inflation targeting on the behavior of expected inflation: Evidence from an 11 country panel. *Journal of Monetary Economics*, 49, 1521-1538.

Jónsson, Á., (2009). *Why Iceland?* New York: McGraw-Hill.

Kaminsky, G. L., C. M. Reinhart and C. A. Végh (2004). When it rains, it pours: Procyclical capital flows and macroeconomic policies. NBER, *Working Paper*, no. 10780.

Kim, S. J., and J. Sheen (2002). The determinants of foreign exchange intervention by central banks: Evidence from Australia. *Journal of International Money and Finance*, 21, 619-649.

Lane, P., (2010). Ireland and the global financial crisis. Paper prepared for the conference The Euro Area and the Financial Crisis, Bratislava, Slovakia, 6-8 September 2010.

Leeper, E. M., (2010). Monetary science, fiscal alchemy. Speech delivered at the Federal Reserve Bank of Kansas conference in Jackson Hole, Wyoming, August 2010.

Meirelles, H., (2010). Crisis lesson: Better to rely on international reserves than IMF credit says Brazil. Interview with MercoPress.com(http://en.mercopress.com/2010/03/24/crisis-lesson-better-to-rely-on-international-reserves-than-imf-credit-says-brazil).

Merrouche, O., and E. Nier (2010). What caused the global financial crisis? Evidence on the drivers of financial imbalances 1997-2007. IMF, *Working Paper Series*, no. 10/265.

Mihov, I., and A. K. Rose (2008). Is old money better than new? Duration and monetary regimes. *Economics: The Open-Access, Open-Assessment E-Journal*, 2, 2008-13.

Miles, D., (2004). *The UK Mortgage Market: Taking a Longer Term View*. London: HM Treasury.

Mishkin, F. S., (2004). Can central bank transparency go too far? In *The Future of Inflation Targeting*. Eds. C. Kent and S. Guttmann. Canberra: Reserve Bank of Australia.

Mishkin, F. S., and K. Schmidt-Hebbel (2007). Does inflation targeting make a difference? In *Monetary Policy Under Inflation Targeting*. Eds. F. S. Mishkin and K. Schmidt-Hebbel. Santiago: Banco de Chile.

OECD (2006, 2008, 2009). Iceland. *OECD Economic Surveys*. OECD Publishing.

OECD (2010). Norway. *OECD Economic Surveys.* OECD Publishing.

Ólafsson, T. T., and T. G. Pétursson (2010). Weathering the financial storm: The importance of fundamentals and flexibility. Central Bank of Iceland , *Working Paper*, no. 51.

Parliamentary Special Investigation Commission (2009). *Report of the Parliamentary Special Investigation Commission*, Vol. 1. Reykjavík: Parliament of Iceland.

Pétursson, T. G., (2000). Exchange rate or inflation targeting in monetary policy? *Monetary Bulletin* 2000/1, pp. 32-40.

Pétursson, T. G., (2002). Evaluation of core inflation and its application in the formulation of monetary policy. *Monetary Bulletin* 2002/4, pp. 52-61.

Pétursson, T. G., (2005). Inflation targeting and its effects on macroeconomic performance. *SUERF Studies* 2005/5.

Pétursson, T. G., (2009). Does inflation targeting lead to excessive exchange rate volatility? Central Bank of Iceland, *Working Paper*, no. 43.

Pétursson, T. G., (2010). Inflation control around the world: Why are some countries more successful than others? In *Twenty Years of Inflation Targeting: Lessons Learned and Future Prospects*. Eds. D. Cobham, Ø. Eitrheim, S. Gerlach and J. F. Qvigstad. Cambridge: Cambridge University Press.

Plantin, G., and H. S. Shin (2010). Carry trades and speculative dynamics. Toulouse School of Economics and Princeton University, May 2010. Work in progress.

Portes, R., and F. M. Baldursson (2007). The internationalisation of Iceland's financial sector. Iceland Chamber of Commerce, November 2007.

Reserve Bank of India (2009). *Report on Trend and Progress of Banking in India 2008-2009*. Reserve Bank of India.

Reserve Bank of New Zealand (2006). Supplementary stabilisation instruments. Reserve Bank of New Zealand*, Bulletin*, 69, 40-43.

Sarno, L., and M. P. Taylor (2001). Official intervention in the foreign exchange market: Is it effective and, if so, how does it work? *Journal of Economic Literature*, 34, 839-868.

Saurina, J., (2009). Dynamic provisioning – The experience of Spain. The World Bank Group, *Crisis Response Note*, no. 7.

Schmidt-Grohe, S., and M. Uribe (2010). The optimal rate of inflation. In *Handbook of Monetary Economics Vol. 3*. Eds. B. M. Friedman and M. Woodford. Amsterdam: Elsevier/North-Holland.

Schmidt-Hebbel, K., (2006). New Zealand's monetary and exchange-rate policy in international comparison. In *Testing Stabilisation policy limits in a Small Open Economy: Proceedings From a Macroeconomic Forum*. Eds. B. Buckle and A. Drew. Wellington: Reserve Bank of New Zealand.

Sighvatsson, A., (2007). Paddling in an ocean of global money – The problems of running independent monetary policy in a very small, open economy at a time of large demand shock and ample global liquidity. *Fjármálatíðindi* [in Icelandic], 54, 56-79.

Siklos, P. L., (1999). Inflation-targeting design: Changing inflation performance and persistence in industrial countries. Federal Reserve Bank of St. Louis, *Review*, 81, 46-58.

Siklos, P. L., (2010). Relative price shocks, inflation expectations, and the role of monetary policy. In *Inflation in an Era of Relative Price Shocks*. Eds. R. Fry, C. Jones and C. Kent. Canberra: Reserve Bank of Australia.

Smets, F., (2003). Maintaining price stability: How long is the medium term? *Journal of Monetary Economics*, 50, 1293-1309.

Sveriges Riksbank (2010). The Riksbank removes the tolerance interval from its specified monetary policy target. Announcement from Sveriges Riksbank, 31 May 2010.

Taylor, J. B., (1993). Discretion versus policy rules in practice. *Carnegie-Rochester Conference Series on Public Policy*, 39, 195-214.

Turner, P., (2010). Central banks and the financial crisis. In Perspectives on inflation targeting, financial stability and the global crisis. BIS, *Papers*, no. 51, 21-25.

Vega, M., and D. Winkelried (2005). Inflation targeting and inflation behaviour: A successful story. *International Journal of Central Banking*, 1, 153-175.

Walsh, C. E., (2009). Inflation targeting: What have we learned? *International Finance*, 12, 195-233.

Winkler, A., F. Mazzaferro, C. Nerlich and C. Thimann (2004). Official dollarisation/euroisation: Motives, features and policy implications of current cases. ECB, *Occasional Paper Series*, no. 11.

Woodford, M., (2003). *Interest and Prices: Foundations of a Theory of Monetary Policy*. Princeton: Princeton University Press.

Yue, E., (2001). Marrying the micro- and macro-prudential dimension of financial stability; The Hong Kong experience. BIS, *Papers*, no. 1.

Yung, L. J., (2006). Macroprudential supervision in Korea: Experiences and case studies. *IMF: Macroprudential Supervision Conference: Challenges for Financial Supervisors*.

Central Bank of Iceland Reports

Monetary policy in Iceland after capital controls. No. 4, 2010.

Verðtrygging lánsfjármagns og vaxtastefna á Íslandi. No. 3, 1998.

Efnahags- og myntbandalag Evrópu – EMU. No. 2, 1997.

Úrlausnir kvartana til bankaeftirlits Seðalabanka Íslands á árunum 1990-1996. No. 1, 1997.