Abstract

This paper analysis the choice of exchange rate regimes in microstates. It is found that the optimal currency area criteria have important limitations. Microstates should have a tendency to have a fixed exchange rate and that is confirmed by the data. The experience of Iceland is analysed in some detail. Iceland was in a monetary union at the beginning of the 20th century but begins the 21st with a floating exchange rate. The problems with the new regime and some future alternatives are discussed. The question about the optimality of Iceland sustaining an independent currency is still unanswered.

Keywords: Exchange rate regime, Optimal currency area, Inflation, Microstates, Iceland

* Paper prepared for the conference Iceland and the World Economy: Lessons for Small Countries in the Era of Globalisation, organised by the Center for International Development at Harvard University, May 2002. The views expressed in this paper are mine and do not necessarily reflect those of the Central Bank of Iceland. I would like to thank Rannveig Sigurðardóttir and Jón Magnús Sigurðsson for research assistance. I would also like to thank my colleagues Arnór Sighvatsson and Thórarinn G. Pétursson for collaboration and valuable discussions through the years about the issues in this paper.
I. Introduction

Exchange rate arrangements are much influenced by the degree and the manner to which countries are integrated into the global economy. The development towards less restricted and increased volume of global capital movements has radically changed the environment for operating monetary policy in small open economies and the viable options for exchange rate arrangement. This has led to a tendency of a bipolarisation of the choices of exchange rate regimes towards either hard pegs of or floating exchange rates. The choice of exchange rate regimes can in turn affect in a significant way how the relationship between small economies and the global economy evolves. Thus, recent studies have indicated membership in a monetary union will strongly increase trade.

This paper analysis the issue from the standpoint of microstates. The specific case of Iceland is analysed in some detail. The general considerations underlying the choice of exchange rate regimes are discussed in Chapter II. The chapter ends with a section on the relationship between country size and the choice of exchange rate regime. Chapter III looks at the empirical distribution of exchange rate regimes between countries with a special emphasis on the question of how the distribution is different for microstates than other countries. Chapter IV gives a historical overview of exchange rate policy in Iceland. In Chapter V an analysis is made of the role of the exchange rate in the inflation process in Iceland. In Chapter VI the optimal currency area criteria are applied to Iceland. It is followed by an analysis in Chapters VII-IX of the actual choices made regarding exchange rate policy in Iceland in recent decades. Chapter X gives a preliminary assessment of exchange rate policy in Iceland and discusses the options for the future. Conclusions are given in Chapter XI.

II. The choice of exchange rate regime

At least three issues need to be considered when choosing the appropriate exchange rate regime for a country. First, it needs to be determined whether the structure of the economy is more suitable for a fixed or a flexible exchange rate regime. Second, whether the country can provide a framework for a credible monetary policy on its

---

1 Stiglitz (2001) analysis the same issue but with an emphasis on financial stability.
own, or whether it needs to import credibility from outside sources. Finally, the political motives for joining a currency area need to be considered.²

II.1. The theory of optimal currency area

The theory of optimal currency areas (OCA) (cf. Mundell, 1961), tries to organise the economic considerations that motivate the choice of an exchange rate regime. According to this theory a country is more suited to join a currency area:³

• The more open the economy is and the more integrated it is with the proposed currency area.

• The more symmetric the shocks that impinge on the domestic economy and the proposed currency area are.

• The more flexible the domestic labour market is in terms of wage flexibility and labour mobility.

The reason for the criteria on openness and integration is twofold. First, tradable goods are an important part of the overall price level in open economies. Nominal wages are therefore likely to be strongly linked to the exchange rate in open economies through import and export prices. An exchange rate devaluation will therefore have little effect on the real exchange rate since the effects of the devaluation will transmit quickly to the domestic price level and to nominal wages. Furthermore, as fixing the exchange rate in a more open economy goes further toward anchoring the inflation rate than in less open economies. Second, transaction costs associated with international trade, such as the cost of trading one currency for another, are reduced when the exchange rate is fixed. As the importance of these transaction costs is likely to be proportional to the openness of the country, a fixed exchange rate becomes more appropriate the more open the economy is.

The reason for the second criteria is that if two economies are regularly hit by asymmetric supply or demand shocks, an adjustment in relative prices between the two countries is the least costly measure to restore equilibrium when prices and wages are sticky. Exchange rate flexibility may speed up this adjustment. It is though important to consider whether shocks originate on the supply or demand side of the economy, cf. Henderson (1979). When real supply shocks are the dominant source of fluctuations in the domestic economy, a flexible exchange rate might be more

² Another important issue, not discussed here, is the extent of fiscal transfers within the monetary union, which can speed up adjustment to asymmetric shocks by transferring purchasing power from booming to depressed countries.

³ See Tavlas (1994) for a survey of the literature.
appropriate. If, however, financial shocks are more important, a fixed exchange rate is preferred.

Changes in nominal wages or labour mobility may work as the adjustment mechanism to asymmetric shocks instead of the exchange rate. Thus, labour market flexibility reduces the need for an independent monetary policy.

II.2. The limitations of the OCA criteria

Despite some criticism (see, for example, Gros, 1996), the OCA theory has been the dominant framework for thinking about the choice of an exchange rate regime for the last three decades. But The OCA-criteria have their limitations. Firstly, they may not be exogenous. Joining a monetary union increases trade with other union members, which in turn leads to more symmetric business cycles. Secondly, they assume that exchange rate flexibility is used optimally and thus overlook problems of credibility and the misuse of monetary independence. Thirdly, they overlook the problems of uncertainty and incomplete markets that through volatile expectations and herd behaviour will make exchange rates more volatile than justified by economic fundamentals, and sometimes much more so.

A clear distinction should be made between two distinct but connected issues in this regard. One is the optimal degree of fixity or flexibility of a given currency. The other is the question of whether to have a separate currency at all. Issues of credibility and monetary independence only arise in the context of a separate currency. If credibility is low and/or there is a high probability that monetary independence will be misused a policy of a stable exchange rate (with a separate currency) can impose the necessary discipline, even if the OCA-criteria suggest otherwise. That is the basis for the use of the exchange rate as an anchor for disinflation in many countries. The problems of uncertainty and incomplete foreign exchange markets will arise irrespective of the exchange rate policy used so long as there is a separate currency. Added to this is the complication that it has become very difficult to sustain soft

4 Several authors have though questioned the relevance of the OCA criteria for a successful monetary union (cf. Flandreau, 1995). For example, the Scandinavian currency union (which Iceland was a part of) from 1873 to 1913 has been called “the most successful of all European currency unions” (de Cecco, 1992 p. 67), even though intra-Scandinavian trade was relatively unimportant, labour mobility was relatively small, and the economic structure of the participant countries differed considerably (Bergman, 1999). In addition Bergman (1999) finds that country-specific shocks in the Scandinavian countries were not highly symmetric during this period, leading him to conclude that the Scandinavian countries did not form an optimal currency area according to the OCA criteria.
exchange rate pegs with free capital movements, even if economic arguments, including the OCA-criteria, would be for such a course.

Below some of the limitations of the OCA-criteria are analysed further.

II.3. The endogeneity of the OCA criteria
A further shortcoming of the OCA criteria is that they fall victim to the Lucas critique. As argued by Frankel and Rose (1998), the extent of trade between countries and business cycle correlation will critically depend on each country’s policy choices, including its choice of exchange rate regime. Thus, participation in a monetary union may in itself change the structure of the economy in such a way that a country may qualify for a monetary union membership *ex post* even when not *ex ante*. This view has, however, been challenged by Bayoumi and Eichengreen (1993) and Krugman (1993). They argue that greater trade integration will lead to concentration and specialisation of manufacturing industries, thus reducing income correlations.

Theoretically, trade integration thus has an ambiguous effect on business cycle correlations, so empirical evidence is required to determine which effect dominates. Frankel and Rose (1998) provide such evidence for 21 industrial countries over the period 1959 to 1993. They find that there is a significant positive effect from trade integration on income correlations, suggesting that increased trade integration leads to more correlated business cycles. This implies that although historical evidence might suggests that a country does not satisfy the OCA criteria, increased trade with the members of a prospective monetary union and, subsequently, increased income correlations might result in it satisfying the criteria in the future.

II.4. Credibility of monetary policy
The OCA approach assumes that economic policies, under a flexible exchange rate regime, are pursued in an optimum way such as to make full use of the potential benefits of flexible exchange rates. If monetary independence is not applied in an optimum way or is abused it may result in an erosion of credibility which makes monetary independence quite costly. Under those circumstances the constraints that a membership in a monetary union puts on these policies may still make it preferable to an independent currency. It should be noted in this context that when the OCA criteria are applied to identify the optimum exchange rate arrangement, no distinction is usually made between participation in a fully-fledged monetary union and a unilateral
fixed exchange rate. This distinction is, however, critical as a unilateral peg can never be fully credible. Hence, the actual results of these two options can be vastly different. Neither does the OCA criteria provide answers as to the appropriate degree of flexibility. Considering that completely free floating hardly exists (although the main currencies come close) and that all forms of a pegged exchange rate are adjustable to some degree, the OCA criteria do not provide a precise answer to the question of whether a given countries exchange rate arrangement is indeed optimal or not.

II.5. Uncertainty and incomplete foreign exchange markets

The credibility deficit may not always come as a result of bad policies. In some cases it may result from the inefficiency of markets in evaluating changes in a highly uncertain external environment. The problem of uncertainty and herd behaviour in expectations driven foreign exchange and capital markets is not explicitly addressed by the OCA approach, but may substantially reduce the benefits of monetary independence.5

There is, however, a growing literature addressing this issue (see Coleman, 1999 for a survey). For example, Neumeyer (1998) shows that if exchange rates are more volatile than justified by economic fundamentals (as empirical evidence clearly suggests), an independent currency may be a source of economic shocks, rather than the ideal mean of adjustment to shocks, by introducing additional random noise into prices. Hence, if the foreign exchange market is incomplete, an independent currency may have destabilising effects on the economy. Joining a monetary union can therefore be welfare improving, by insulating the real economy from speculative bubbles originating in foreign exchange markets.

Furthermore, if foreign exchange and capital markets are indeed prone to overshooting, monetary authorities may actually be forced to tighten monetary policy at a time when easing (resulting in a measured depreciation) would be more appropriate considering the economic conditions. This problem has been clearly demonstrated during the recent crisis in emerging markets, and hotly debated in the context of IMF programs. Thus, although a flexible exchange rate regime does provide protection against one-way speculation, such a regime is not immune from destabilising speculation and overshooting originating in foreign exchange markets.

5 Many economists, such as Williamson (1999), have used this argument against floating regimes.
II.6. Exchange rate volatility and trade

The OCA literature concentrates on the macroeconomic costs of fixed exchange rates, while more or less overlooking the potential microeconomic benefits of a single currency. These mainly involve the reduction of transaction costs and price uncertainty that follow from the use of separate currencies in international trade. To the extent that these factors reduce trade, there will be fewer gains from economic specialisation. The reason that the potential microeconomic benefits are so often overlooked is simply that economists have found modelling them exceedingly difficult (cf. Krugman, 1995). That does not, however, imply that they are less important than the macroeconomic costs of a common currency.

What are the possible costs of exchange rate volatility? One channel is simply through the uncertainty that exchange rate fluctuations create for exporters, importers and those engaged in foreign direct investment. That could lead a reduction in these activities with harmful effects on growth and economic welfare. But there are some theoretical arguments against these effects being very large when financial markets function reasonably well. Firstly, there is the possibility of hedges, either through financial instruments or through shifting purchases and sales through time and space. Secondly, global (unhedgeable) risks as reflected in output or consumption fluctuations has not been of such magnitude as to be able to generate major effects through this channel of exchange rate volatility.

Another channel through which exchange rate volatility can be costly is through risk premia in domestic interest rates, which in turn will affect investment, public sector debt burdens and financial sector development. But exchange rate volatility is only truly costly if it is “excess” volatility. Exchange rate movements may be an efficient part of the adjustment mechanism of a given country and trying to quell those might transfer the underlying problem to other parts of the economy, which in the end might prove to be more costly.

The real economic costs of exchange rate volatility have proven hard to quantify. Estimates of the effects on trade and growth are usually much smaller than

---

Although one might expect that the importance of these costs would decline with increasing financial innovation, they should not be discounted altogether. For example, McCallum (1995) finds that trade among Canadian provinces is substantially greater than trade between Canadian provinces and nearby US states. The most important explanation for this seems to be that the Canadian provinces share a common currency.
seem to be implicit in the discussion of many politicians and businessmen.\footnote{See for instance Rogoff (1998). Levine and Carkovic (2001) get similar results in a panel study of the growth equation covering 73 countries over the period 1960-1995.} Furthermore, there does not seem to be a significant trade-off between exchange rate volatility and the volatility of important macroeconomic variables.\footnote{Flood and Rose (1995).} On the other hand there is a literature that indicates that the existence of separate currencies might be a much strong impediment to trade. Andrew Rose has in several empirical papers found that a membership in a monetary union increases trade with the other members very significantly at the same time as trade diversion seems to be small. Increased trade in turn increases growth.\footnote{See Rose (1999) and Frankel and Rose (2002).} Further evidence is provided by Frankel and Wei (1995), using a gravity model of bilateral trade, who find that membership in the EU increases trade with other EU members by at least 60%.

One possible way to square these results, for at least smaller countries, is to say that if you do have your own currency then its volatility within the bounds usually observed does not matter that much. However, if de facto and expected volatility vis-à-vis natural trading partners goes all the way to zero the effects will be strong.

II.7. \textit{Country size}

How might the criteria and considerations discussed in this chapter be different in very small countries? Smaller economies are in general more open than bigger economies.\footnote{In a sample of 160 countries examined for this paper a clear negative relationship emerged between population size and openness defined as the sum of exports and imports of goods and services as a percentage of GDP. India and China were excluded when estimating the relationship.} This should make smaller countries more inclined to have a fixed exchange rate, other things being equal.

It is not clear how the nature and symmetry of shocks are affected by country size. Small countries tend to have few principal industries in their trading goods sector in order to reap the benefits of scale economies through international trade. That makes these countries more vulnerable to industry specific shocks. On the other, hand small countries might be more vulnerable to shocks among their trading partner countries due to higher degree of openness, thus contributing to more symmetric cycles.

The argument can be made that labour market flexibility could be greater in very small economies, especially if they are relatively homogenous, than in bigger
ones. One reason could be that information problems are smaller in smaller economies. Another reason could be that it might be easier to get the population to see the need for the real income changes that are the results of external shocks and even to achieve the necessary social consensus that would be needed for a general nominal wage cut. The third reason is that the population of smaller countries is more internationally mobile than of bigger once. These propositions have though not a sound theoretical base and their empirical validity has to our knowledge not been ascertained.

The other considerations mentioned above seem on the whole to point in the direction that smaller countries should lean more towards a monetary union than towards floating, to take the two extremes on the scale of exchange rate regimes. Smaller countries tend to have less developed and less liquid financial markets. That will, in the absence of interventions, contribute to more exchange rate volatility and there will be less developed means of dealing with it. Furthermore, smaller countries might benefit more from the trade creation effects of monetary unions.

Taken together we can draw the conclusion that smaller countries will in general benefit more from a fixed exchange rate than bigger countries. To the degree that they are more open and the conclusions on shocks and labour market flexibility are uncertain, their macroeconomic cost of having a fixed exchange rate is also smaller. This conclusion can be summarised in the following diagram.
III. Empirical assessment of exchange rate regimes

The purpose here is to examine whether the distribution of exchange rate arrangements among microstates differs from that of larger ones and if the same trend towards bipolar solutions that has been observed for all states during the last decade, can be discerned when we look at microstates alone.\textsuperscript{11}

For this purpose all IMF member states were divided into two groups, according to population size in the year 2000, the breaking point being 1 million. The term \textit{microstates} is used for countries with population under 1 million.

The \textit{de facto} classification of exchange rate arrangements based on the observed behaviour of states is adopted here, not the \textit{de jure} classification of exchange rate arrangements based on the publicly stated commitment of the central bank. We compare two years, 1991 and 1999/2000. The classification for the year 1999/2000 is taken from the IMF’s Annual Report 2000\textsuperscript{12}. For the year 1991 the developed states are classified according to observed behaviour but the classification in Fischers (2001)\textsuperscript{13} is used for all other IMF states.

\begin{itemize}
  \item \textsuperscript{11} In this section we use:
    \begin{itemize}
      \item a) Data on population and GDP per capita, from the World Development Indicators (WDI) database.
      \item b) Data on exchange rates, from the International Monetary Fund and EcoWin databases.
    \end{itemize}
  \item \textsuperscript{12} As the classification in the Annual Report 2000 most often referees to the situation on December 31, 1999, it is used in the text.
  \item \textsuperscript{13} Fisher, 2001. Tables 4 and 6.
\end{itemize}
States are grouped by exchange rate arrangements into three regimes: hard pegs, intermediate and floating regimes. The hard pegs group includes states with no separate legal tender or with currency board arrangements. The intermediate group includes states with conventional pegged arrangements, pegged exchange rate within horizontal bands, and those with crawling pegs or crawling band arrangements. The last group consists of states with managed and independently floating arrangements.

Fisher (2001) has pointed out how IMF states moved away from the center between 1991 and 1999 mostly towards more flexible exchange rate arrangements. When the whole sample is divided into two groups according to population size, a difference between them is observed, both in the distribution between regimes and regarding the change in the distribution between exchange rate regimes over time.¹⁴

Figure 1. Exchange rate regimes, 1999
All IMF member states

Figure 1 show how different the distribution between the three exchange rate regimes is for microstates on one side and for larger states on the other. While 50% of the larger states have chosen floating exchange rate arrangements, the distribution among

¹⁴ For his comparison, Fisher uses information for all member states each year 1991 and 1999, but we use only information for those who are members both years or we have adequate information on. We have therefore excluded from our study 26 states; 20 newly independent states, the others were either not members in 1991 or we lack information on the de facto exchange rate arrangements. 19 out of 26 of the states that we leave out belonged to the former Soviet Union or Yugoslavia, and it may be noted here that over 60% of them have floating arrangements in 1999. Leaving these states out does not alter the general picture. It is also of interest to note that Fisher observes the same trend towards bipolarisation when he looks at emerging market economies only. The countries we leave out Armenia, Aruba, Azerbaijan, Belarus, Bosnia and Herzegovina, Brunei, Cambodia, Dem. Rep. of Congo, Croatia, Eritrea, Estonia, Georgia, Kazakhstan, Kyrgyz Rep., Latvia, Lithuania, Macedonia, Moldova, Netherlands Antilles, Palau, Slovak Rep., Slovenia, Tajikistan, Turkmenistan, Ukraine and Uzbekistan.
microstates is heavily skewed towards the pegged exchange rate arrangements, with less than 10% of the microstates each year committed to floating arrangements. This is in line with what was argued in the last section, i.e. that smaller countries should be more inclined towards fixed than floating exchange rate arrangements.

**Figure 2. Exchange rate regimes, 1991 and 1999**

*States with populations larger than 1 million*

![Figure 2](image)

Figure 2 shows what happens to the distribution of exchange rate arrangements when microstates are excluded. First, the hollowing out of the middle becomes even more apparent than was the case in the whole sample. For all states (Figure 1) the proportion of states with intermediate arrangements dropped from over 60% in 1991 to 36% in 1999, but falls to 30% when microstates are excluded (Figure 2). Furthermore, in Figure 2 it can be seen that the movement towards floating arrangements is even more evident than for all IMF countries.
Looking at the changes in distribution of exchange rate regimes among microstates (Figure 3), quite another picture emerges. Surely the movement between 1991 and 1999 is away from the soft pegged arrangements in the middle, but it is not sufficiently strong so that a bipolarisation can be stated. In a more refined classification it emerges the distribution between regimes is heavily skewed towards the pegged exchange rate arrangements, with less than 10% of the microstates each year committed to floating arrangements. This is in line with what was argued before, that smaller countries should be more inclined towards fixed than floating exchange rate arrangements.

The sample was also used to examine whether there is a correlation between exchange rate volatility and the size of the economy, given the exchange rate regime. Exchange rate volatility\(^{15}\) in the period 1998 – 2000 was tested against both GDP and population size (2000), for each of the three regimes. No such relationship was found.

IV. Historical overview of exchange rate policy in Iceland

The history of exchange rate policy in Iceland broadly reflects international developments. Iceland started the century in a monetary union and ironically, at the end of the 21st century, the question of belonging to a monetary union has again

\[^{15}\text{We measure volatility as the standard deviation of the percentage changes of the monthly exchange rates.}\]
become relevant. Table 1 provides an outline of the various phases of Icelandic exchange rate arrangements since the late nineteenth century.  

<table>
<thead>
<tr>
<th>Period</th>
<th>Characteristics of exchange rate regime</th>
</tr>
</thead>
<tbody>
<tr>
<td>1873-1914</td>
<td>Nordic currency union, gold standard.</td>
</tr>
<tr>
<td>1914-1922</td>
<td>Gold standard abolished in August 1914, but parity with Danish krone maintained.</td>
</tr>
<tr>
<td>1922-1925</td>
<td>After a 23% devaluation against the Danish krone in June 1922, a floating exchange rate regime is established. The British pound replaces the Danish krone as a reference currency. The króna depreciates against the pound until 1924, after which the króna appreciates under a policy of revaluation.</td>
</tr>
<tr>
<td>1925-1939</td>
<td>Iceland’s longest period of exchange rate stability. After the pound was taken off the gold standard in 1931 the króna and other Nordic currencies continued to be linked to the pound. Icelandic authorities responded to a deteriorating competitive position by foreign exchange restrictions and protectionism.</td>
</tr>
<tr>
<td>1939-1945</td>
<td>After 14 years of exchange rate stability the króna was devalued by 18% in the spring of 1939. As terms of trades improved and the pound depreciated, the króna was linked to the US dollar. Over the period the króna depreciated against the dollar but appreciated against the pound. An overheated economy led to a surge in inflation, leading to doubling of domestic relative to foreign prices over the period.</td>
</tr>
<tr>
<td>1946-1949</td>
<td>Growing external imbalances in the first years after the war were initially cushioned by very large foreign exchange reserves and favourable external conditions, but were at a later stage met by extensive capital controls and protectionism. In 1949, when the pound (and soon after most other European currencies) was devaluated by 30½% against the dollar, it was decided to let the króna follow the pound. Due to the large share of European countries in Icelandic trade, however, the country’s competitive position did not change much as a result of it.</td>
</tr>
<tr>
<td>1950</td>
<td>After Iceland became a founding member of the IMF in 1947, an attempt was made to bring the external accounts closer towards a sustainable equilibrium under liberalised trade. This included a 42,6% devaluation of the króna. This experiment failed i.a. due to unfavourable external conditions. Moreover the devaluations did not seem to be sufficient to bring about sustainable external balance.</td>
</tr>
<tr>
<td>1951-1959</td>
<td>After the devaluation of 1950 failed to achieve external balance, a regime of multiple exchange rates and extensive export subsidies was established. The arrangement implied a substantial effective devaluation, but did not suffice to balance the external account.</td>
</tr>
<tr>
<td>1960-1970</td>
<td>A more fundamental and far reaching effort to restore sustainable external balance was made in 1960, when the króna was devalued by 1/3 to 57%, depending on the relevant exchange rate premium on foreign exchange transactions. In effective terms, this brought the real exchange rate back to the level of 1914 and 1939 and much lower than in 1950. The devaluation was followed up by extensive trade liberalisation. Moreover, the flexibility of the exchange rate regime was enhanced, as the Central Bank assumed the power to change the exchange rate, no longer requiring a change in law. During the period the króna was devalued on several occasions in response to external as well as internal macroeconomic disturbances.</td>
</tr>
<tr>
<td>1970-1973</td>
<td>After the Bretton-Woods system of pegged but adjustable exchange rates fell apart and the dollar was devalued, the Icelandic króna broadly followed the dollar. During this</td>
</tr>
</tbody>
</table>
period, however, the króna was devalued once (1972) and revalued twice (1973) against the dollar, until the króna was effectively floated in December 1973.

1974-1989 During the period to 1983 the Icelandic exchange rate regime became increasingly flexible and could be characterised as managed floating. However, in the mid-1980s the monetary and exchange rate policy stance became more restrictive. Over the period 1974 to 1989 the króna was devalued 25 times. Moreover, the króna was allowed to depreciate gradually (without formal announcements) during the period March 1975 to January 1978. An effective devaluation was also achieved in 1986 and 1987 by changing the currency basket. Over brief intervals the value of the króna was kept stable, first against the dollar and then against various baskets of trading partner currencies.

1990-1995 During the first half of the 1990s the role of the exchange rate as a nominal anchor received stronger emphasis. A path-breaking moderate wage settlement in early 1990 was supported by a public commitment to a stable exchange rate, which became the cornerstone of a disinflation strategy that proved successful. However, there were two devaluations during this period, in 1992 and 1993, in both cases in response to external shocks. In 1994 regulation of long-term capital movements was abolished.

1995-2000 Regulation of short-term capital movements was abolished in 1995. Exchange rate flexibility was gradually increased in the latter half of the 1990s. The fluctuation band was increased from ±2½% to ±6% in September 1995 and subsequently to ±9% in February 2000. The room of manoeuvre was used to a greater degree during the end of the period and inflation prospects got a greater role in the formulation of monetary policy.

2001- Iceland went on an inflation target and adopted a floating exchange rate on March 27, 2001. The long run target was set at 2½% with ±1½% tolerance limit. During 2001 the higher tolerance ceiling was set at 6% and at 4½% during 2002.

As the review in Table 1 indicates, the exchange rate regime has gone through fundamental changes throughout the 20th century. In the last 30 to 40 years we have seen a gradual return to the environment of relatively free trade that characterised the beginning of century. One could argue that these periods of relatively free trade were only interrupted by two world wars and a depression that led to extensive restrictions on international trade and capital movements. The restrictions imposed in the wake of the Great Depression and World War II took a long time to unwind, especially in Iceland. There have been two relatively brief periods of floating or semi-floating exchange rates, the first one in the context of a return to a liberal trading regime after World War I and the second after the collapse of the Bretton-Woods fixed rate system.

Otherwise, the Icelandic króna has been pegged against or at least managed with respect the currency of some trading partner country or a basket of currencies, but with varying degree of adjustability and commitment. Consequently, the line between a peg and managed floating is often rather blurred. At times commitment has been so weak that the exchange rate regime could be characterised as one of managed floating, rather than an adjustable peg.
It is interesting to note that when looking at the development of the real exchange rate over the period from 1914 to date, one may conclude that, excluding the two periods of extensive restrictions of foreign trade and foreign exchange transactions, there is no obvious trend in the real exchange rate, indicating that PPP may indeed hold in the very long run. Over the medium term, however there has been substantial variability, though fluctuations have tended to moderate in recent decades.\textsuperscript{17} Figure 1 shows the development of the real exchange rate.\textsuperscript{18}

**Figure 4. The real exchange rate**

![Graph showing the development of the real exchange rate from 1914 to 1994.](image)

Source: Gudmundsson, Pétursson and Sighvatsson (2000).

## V. Inflation and disinflation

Throughout most of the post-war period, inflation in Iceland was substantially higher than the OECD average (see Figure 5). Following the classification of Dornbusch and Fisher (1991),\textsuperscript{19} Iceland’s inflation was low from 1945 until 1973 as it averaged just above 9½% per annum and never went above 15% for more than two years in a row (Figure 5). In 1974 inflation moved into the high range where it stayed until 1984.

\textsuperscript{17} The finding that deviations from PPP are large and persistent is not specific to Iceland. See, for example, Rogoff (1996). A Dickey-Fuller unit root test rejects a unit root in the real exchange rate at the 5% critical level, supporting the claim that the real exchange rate is stationary.

\textsuperscript{18} Numerical definitions of inflation are far from being standardised and, to clarify the concept used and avoid including short-term supply shock episodes, it is necessary to complement the numerical definitions with a specific timeframe. In the following, we shall mainly follow the suggestions by Dornbusch and Fischer and refer to inflation as \textit{moderate} when annual price increases are in the 15-30% range over periods of at least 3 years, as \textit{low} for annual price increases under 15%, as \textit{high} for annual price increases in the 30-100% range, as \textit{extreme} for annual price increases in the 100-1000% range and as having reached a state of \textit{hyperinflation} when price increases exceed 1000%. 

16
averaging 49%. According to the terminology in Easterly (1996), there were two inflation crises during the high inflation period. The first, caused by the domestic response to the international oil crisis, occurred during 1974-75 and was followed by stabilisation in 1977-1978. The second, due to negative supply shocks reinforced by a strong devaluation bias, took place in 1978-1983 and at the end of that crisis, inflation was threatening to become extreme. The stabilisation that followed in 1983-1984 reduced inflation in Iceland to the moderate range.20 It stayed in this range until the second phase of disinflation brought it into the low range in 1990 and subsequently to the vicinity of the operational definition of price stability21 from 1994 until 1998. Due to overheating in the economy inflation began to increase in 1999 and gained further momentum when the exchange rate started to slide in the middle of 2000. Annual inflation peaked at 6.7% in 2001 but has recently been on a declining trend as overheating has turned into slack and the exchange rate has appreciated. The Central Bank predicts it to be 2.3% in 2003.

**Figure 5**

![Inflation in Iceland during the post-war period](image)

**Graph 1**

Inflation in Iceland during the post-war period


It is not the intention here to give a detailed analysis of inflation and disinflation in Iceland22, but to look at the role of exchange rate policy in this process. In order to do that it is necessary to analyse briefly the roots of high inflation in Iceland and the two

---

20 During the period of moderate inflation from 1984 to 1989 inflation averaged nearly 25%.
21 Here we are referring to an inflation rate in the 1-3% range; see also Fischer (1996).
22 See Andersen and Gudmundsson (1998) for such detailed analysis.
stages of disinflation from high inflation to price stability, i.e. the one initiated in 1983 and the second one that took place in the early 1990s.\textsuperscript{23}

\section*{V.1. Roots of high inflation}

High inflation in Iceland from 1974-1984 was caused by a combination of a relatively high frequency of external shocks, policy responses to these shocks with a significant devaluation bias; a generally accommodating monetary stance; a very tight labour market reflecting the full-employment policy of the authorities; and various institutional arrangements that eased the perceived costs of high inflation.

The relationship between external shocks, exchange rate depreciation and inflation can be seen in Figure 6 and Table 2. In Figure 6 external shocks have been proxied by the annual percentage change in the purchasing power of exports (or "real" export revenue), measured as export revenue deflated by import prices.\textsuperscript{24} As the figure shows, inflation (measured by either consumer prices or unit labour costs) usually peaks one or two years after the economy is hit by negative external shocks (defined as a decline in real export revenue) and these peaks are always associated with a devaluation.\textsuperscript{25} Secondly, as can be seen from Table 2, there was an increased frequency of negative external shocks. When the Icelandic economy was hit with the shock in 1967-1968, due to the collapse of the Icelandic-Norwegian herring stock, it had been nine years since the last negative shock. There were then six good years until the economy was hit with the shock of 1974-1975. Then shocks came with increased frequency; i.e. the second oil price shock in 1979-1980 and then in 1982 a significant fall in fish catches.\textsuperscript{26} The devaluation bias seems to have become progressively stronger in the course of the high inflation period. This can be deduced

\textsuperscript{23} Using the methodology of Ball (1993) and Debelle (1996), four disinflation periods in Iceland can be identified for quarterly data since the early 1960s. The first stage of disinflation discussed here lasted 17 quarters from 1983.Q1 to 1987.Q2 and took inflation from 65% to 21%. The second stage lasted 25 quarters from 1989.Q1 to 19954.Q2 and took inflation from 24% to 1½% (Andersen and Gudmundsson \textit{op. cit.}).

\textsuperscript{24} As defined, external shocks are measured as the product of the quantity of exports and the terms of trade. The terms of trade can be assumed to be mostly given for an economy as small as that of Iceland and the quantity of exports is also to a great extent determined by exogenous factors, such as the fish catch and foreign demand. The purchasing power of export revenue is thus a reasonably good measure of external shocks and has actually been the driving force of the Icelandic economy over the medium run. Nearly 90\% of the variance in national income over the period 1960-1994 can be explained by an error correction model using only this variable.

\textsuperscript{25} The exchange rate is defined as an index of the Icelandic króna-price of foreign currency and measured in effective terms, with an increase in the index indicating a depreciation of the króna.

\textsuperscript{26} It was checked whether relatively high output variability during the high inflation period could be an alternative explanation to the increased frequency of shocks. This, however, is not the case, as the standard deviation of output growth was actually the same during the high inflation period 1974-1983 (3.1\%) as during the disinflation period 1984-1995 and lower than during the period 1961-1973 (5.1\%).
from Table 2 by comparing the size of the shocks and the cumulative rate of depreciation from the last year before the shock to the year of the inflation peak.

**Figure 6. Inflation, exchange rate adjustment and export revenue (%)**

![Graph showing inflation, exchange rate depreciation, and real export revenue over time.]

The tight labour market and the institutions of wage formation were conducive to fueling inflation. In particular, this applied to the widespread use of wage indexation, which is especially problematic when negative shocks are hitting the economy. There was also an element of pure wage push in the seventies, especially around 1974. Unemployment was well under 1% during the 1970s and even though it increased somewhat during the mid-1980s, it stayed below 1½% until 1989. At the same time, the vacancy rate exceeded the unemployment rate until 1989 when it actually became negative, indicating that employers wanted to shed labour. The labour market was thus in a chronic state of excess demand during most of the 1970s and 1980s.

The net result of these developments was that each successive shock in the seventies and early eighties led to successively higher inflation peaks. At the final peak in 1983, inflation was threatening to go into the extreme range. This prompted measures to drastically reduce the rate of inflation.
Table 2. Negative external shocks 1962-1996 and exchange rate behaviour

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Cumulative % change in real export revenue</td>
<td>-20.0</td>
<td>-17.0</td>
<td>-4.7</td>
<td>-9.7</td>
<td>-13.6</td>
</tr>
<tr>
<td>(2) Inflation peak %</td>
<td>21.7</td>
<td>49.0</td>
<td>58.5</td>
<td>84.3</td>
<td>25.5</td>
</tr>
<tr>
<td>(5) Real exchange rate % change</td>
<td>-36.3</td>
<td>-21.9</td>
<td>-11.6</td>
<td>-13.9</td>
<td>-21.1</td>
</tr>
<tr>
<td>(6) Cumulative nominal depreciation</td>
<td>50.0</td>
<td>36.1</td>
<td>63.3</td>
<td>65.3</td>
<td>37.6</td>
</tr>
<tr>
<td>(7) Response ratio = -(6)/(1)</td>
<td>2.5</td>
<td>2.1</td>
<td>13.5</td>
<td>6.7</td>
<td>2.8</td>
</tr>
<tr>
<td>(8) Success ratio = -(5)/(6)</td>
<td>0.7</td>
<td>0.6</td>
<td>0.2</td>
<td>0.2</td>
<td>0.6</td>
</tr>
</tbody>
</table>


V.2. First stage of disinflation

Following the 1982 external shock, the annual rate of inflation even reached more than 100% during the early months of 1983 and with the threat of even higher rates later in the year, a range of stabilisation measures were adopted in May. These included a temporary suspension of wage indexation (subsequently made permanent), ceilings on wage increases for the rest of the year, a policy of exchange rate stability (following an initial 15% devaluation) and compensatory social security and tax changes to protect living standards. Despite the temporary nature of the incomes policy measures, the rate of inflation fell to about 30% in 1984 and more or less stayed at that rate over the next three years. Moreover, despite the contractionary policies, GDP growth accelerated to over 4% following a 2% fall in 1983.

Although the combination of disinflation brought about by stabilisation policies and higher growth looks unique and, at a first glance, counter-intuitive, the experience of Iceland during this first stage of disinflation is, in fact, common to many other countries which have disinfated from high initial levels of inflation.\(^{27}\) Many similar examples are analysed in Végh (1992), Bruno and Easterly (1995) and Easterly (1996). The 1983-measures were mainly taken in response to a shock-induced inflation crisis and were similar to the so-called "heterodox"-programs that were adopted in many high-inflation countries in Latin-America and in Israel during the middle of the eighties.\(^{28}\) The same can be said about the results.

---

\(^{27}\) It is, of course, well known that hyperinflation can be eliminated rather quickly with virtually no costs to output and employment. Under hyperinflation, backward looking expectations are virtually absent and stabilisation policies introduced to stop hyperinflation enjoy a high degree of credibility; see Sargent (1982) and Végh (1992). The latter could suggest that to increase credibility the authorities might consider postponing the implementation of stabilisation policies until inflation has reached a level where it is the key concern of the population.

\(^{28}\) See, for instance, Végh *op cit* and Leiderman (1993).
V.3. The second stage of disinflation

The second stage of disinflation that took place during the early 1990s differed from the first in several respects. First, although imbalances caused by severe overheating of the economy and adverse external shocks did play an initiating role, the policy measures were not a response to a specific inflationary crisis. Secondly, the various policy changes were not confined to one specific stabilisation package imposed by the government; rather, they involved a sequence of events and responses. Thirdly, the new policies were to a large degree based on a consensus between the government and the partners in the labour market, whereas the 1983 stabilisation package had been imposed by governmental decree against, at least, verbal opposition from the labour unions. This consensus made the disinflation easier and possibly less costly; it was probably also instrumental in generating a moderate economy-wide wage settlement in February 1990 based on forward-looking expectations of inflation. Fourthly, the second stage contained a reorientation of policy priorities and strategies towards reducing inflation and keeping it low and away from maintaining full employment. Finally, it involved reducing inflation from a moderate level of 20-25% to below 3% which, historically, has proved to be much more difficult than reducing high inflation.

At this time, a fundamental shift in attitudes among the public at large towards inflation and in policy priorities of the government was taking place. The experience of the 1978-1983 inflation crisis and the widespread application of price indexation to household debt from the beginning of the eighties contributed strongly to this change of attitude among the public. Along with the negative experience of high and variable inflation in general, this led to a growing awareness that the interest of households was best served by low inflation and stable economic conditions.

Shifts were also taking place in economic policy priorities, based on international influences and a growing realisation that Iceland would have problems of keeping up with other European countries if the roots of inflation were not tackled. Coinciding with these shifts was also the realisation that devaluations which are not supported by the stance of macroeconomic policies and/or by the necessary slack in the economy will have short-lived real effects and mainly result in higher inflation. The fact that nominal and real interest rates would respond differently to changes in the exchange rate following the removal of interest rate controls probably played an additional role in the reorientation of exchange rate policy. Hence, one important part of the second stage was a significantly lower devaluation bias with the most visual
The effect of that reorientation being the fundamental change in the labour market that took place around 1989.29

These various policy shifts all materialised when a new government took over during the autumn of 1988. Although a small devaluation in September 1988 of 3% was part of the policy package presented by the new government, the main emphasis was put on the tightening of fiscal policy and on a statutory incomes policy, with a total wage freeze until February 1989. A large-scale rescheduling of debt in the traded goods sector was also part of the package, partly to reduce pressures in the export sector for a large devaluation. In fact, it was not until a new wage settlement had been reached in May 1989 that the króna was depreciated significantly and then, in the beginning of December 1989, pegged again to a trade weighted basket. However, by this time macroeconomic conditions had changed significantly as employment contracted in 1989 for the second year in a row, unemployment was reaching highs not seen since the economic crisis of 1968/69 and the positive GDP gap was greatly reduced. The result was that in 1990 the real exchange rate had fallen to a level not seen since 1985 and with a much lower inflation peak than had usually accompanied such a fall in the real exchange rate during the high inflation period. As demonstrated in Table 2, the devaluation-bias had thus been greatly reduced, with the nominal devaluation during the 1988-92 shock much smaller in relation to the size of the shocks than during the high inflation periods and the "success"-ratio (i.e. the ratio between real and nominal depreciations) was also higher. Actually, both of these ratios were back to their levels of the late sixties and early seventies.

The economy wide wage settlement in February 1990 that involved most of the private and public sector unions was a very important part of the second stage of disinflation. There were no significant fiscal concessions but the government promised exchange rate stability and lower nominal interest rates; this was, anyway, to be expected when the fall in inflation materialised. The settlement was for 1½ years, with CPI-thresholds that could trigger further wage increases. The outcome was in all cases close to these thresholds as wages increased by around 11½% in total during the contract period compared with an envisaged 10½% rise. The most important element of this settlement was its forward looking nature as it involved an annual rate of wage increase of nearly 7% at a time when the 12-month rate of inflation was running above 20%. It was the declared aim of the settlement to keep real wages constant during 1990 and then raise them during 1991. The role of

---

29 There is also some econometric evidence that the determination of inflation and unemployment underwent structural changes during the second half of the eighties. Recursive estimates of the wage equation in annex A show that the unemployment term only became significant during the middle of the eighties and the real money supply variable during the early nineties. Gudmundsson and Zoega (1997) found a structural break in the expectations-augmented Phillips curve around 1988; moreover, unemployment became more sensitive to cyclical changes in output after 1987.
leadership enters here in two ways. First, by convincing the labour unions that they should believe in inflation predictions rather than looking at past inflation. Secondly, by co-ordinating the process so that it became economy wide, which was a precondition for its success.

To many in Iceland, the general wage settlement in February 1990 is seen as the main cause of disinflation during the 1990s. That, of course, is an exaggeration, as macroeconomic policies and possibly structural measures as well had created the necessary underlying conditions for its realisation. The importance of the wage settlement in the whole process is, though, very large and it can easily be argued that the costs of disinflation would have been higher without it.

V.4. Conclusions on the role of the exchange rate

The exchange rate policy played a very important role both during the acceleration of inflation during the 1970s and 1980s and during the disinflation process. Accomodative monetary policy and the linked devaluation bias contributed to high inflation from the middle of the 1970s to the middle of the 1980. Both stages of disinflation was exchange rate based. That is hardly surprising giving the lack of alternative nominal anchor for monetary policy in Iceland during this period. Of course, in policy regimes of relative exchange rate flexibility the exchange rate is an endogenous variable. But ultimately, inflation is a monetary phenomena. A monetary expansion of some sort is a necessary corollary of inflation and a monetary restraint a corollary of disinflation. However, the channels through which this occurs differ, depending on the specific circumstances and conditions. In Iceland the exchange rate played a main role until financial market liberalisation and monetary reforms during 1990s created similar framework for monetary policy as exists in most industrial countries.

VI. The OCA and Iceland

In this chapter the optimal currency area criteria are applied to Iceland.

VI.1. Size, the degree of openness and the direction of trade

The fact that the Icelandic economy is very small would immediately suggest that it is too small to function as an independent currency area. The small size of the economy would also suggest an open economy, measured in terms of the share of international trade in aggregate activity. It turns out, however, that this is not necessarily the case.
Table x gives a measure of the degree of openness by using the sum of exports and imports of goods and services as a percentage of GDP for Iceland and selected countries for comparison. It also gives the share of merchandise exports going to the EU, as the Euro-area is the most the most natural monetary union for Iceland to consider.

Table 3. Openness and merchandise exports to EU as a percentage of GDP

<table>
<thead>
<tr>
<th>Countries</th>
<th>Openness</th>
<th>Exports to EU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iceland</td>
<td>71.6</td>
<td>15.0</td>
</tr>
<tr>
<td>Norway</td>
<td>75.5</td>
<td>23.6</td>
</tr>
<tr>
<td>Belgium &amp; Luxembourg</td>
<td>143.4</td>
<td>48.0</td>
</tr>
<tr>
<td>Denmark</td>
<td>68.6</td>
<td>18.6</td>
</tr>
<tr>
<td>Germany</td>
<td>49.8</td>
<td>13.6</td>
</tr>
<tr>
<td>Netherlands</td>
<td>100.0</td>
<td>43.0</td>
</tr>
<tr>
<td>Ireland</td>
<td>155.1</td>
<td>47.9</td>
</tr>
<tr>
<td>Switzerland</td>
<td>75.2</td>
<td>17.7</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>57.3</td>
<td>10.9</td>
</tr>
<tr>
<td>United States</td>
<td>25.0</td>
<td>1.7</td>
</tr>
<tr>
<td>Average of EU-countries</td>
<td>76.0</td>
<td>21.1</td>
</tr>
<tr>
<td>Average of Euro-area-countries</td>
<td>74.3</td>
<td>22.1</td>
</tr>
</tbody>
</table>

The share of international trade is defined as imports and exports of goods and services as a percentage of GDP. The share of exports to the EU area is defined as the share of exports of goods to the EU area as a percentage of GDP. Sources: Central Bank of Iceland: Hagtölur mánaðarins, January 1999 for Iceland and IMF: Direction of Trade Statistics, September 1998 and IMF: International Financial Statistics, February 1999 for the other countries.

Table 3 clearly indicates that although Iceland is a relatively open economy, many European economies are more open. In the regression analysis of the relationship between size and openness that is quoted in section II.7. Iceland emerges as an “outlier”. According to these estimates, exports and imports as a ratio to GDP should be about 130% for Iceland instead of the actual 76%. This result should be taken with care but the conclusion seems to be that Iceland seems to be less open than its small size would suggest. One of the reasons for this result is probably Iceland’s production structure. In many other small European countries, imports of intermediate goods is an important source of international trade, as these economies import intermediate goods and export them as processed or final goods. This leads to large shares of imports and exports of industrial goods. This “throughput” is much lower in Iceland’s case due to its heavy reliance on natural resources as the main source of exports. Value added in the export sector as a share of GDP is therefore probably relatively higher than the share of gross exports.30

30 The theoretically most accurate measure of openness would be value added in international trade as a percentage of GDP. This measure is, however, not available.
Table 4. Direction of trade: The share in effective exchange rate and merchandise exports

<table>
<thead>
<tr>
<th>Country</th>
<th>Currency basket</th>
<th>Export share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Euro area</td>
<td>31.7</td>
<td>45.0</td>
</tr>
<tr>
<td>United States</td>
<td>27.0</td>
<td>14.7</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>14.8</td>
<td>20.0</td>
</tr>
<tr>
<td>Denmark</td>
<td>8.7</td>
<td>5.9</td>
</tr>
<tr>
<td>Norway</td>
<td>6.1</td>
<td>4.0</td>
</tr>
<tr>
<td>Sweden</td>
<td>4.4</td>
<td>0.9</td>
</tr>
<tr>
<td>Japan</td>
<td>4.4</td>
<td>5.9</td>
</tr>
<tr>
<td>Switzerland</td>
<td>1.7</td>
<td>2.2</td>
</tr>
<tr>
<td>Canada</td>
<td>1.4</td>
<td>1.6</td>
</tr>
</tbody>
</table>

Source: Central Bank of Iceland.

Table 4 shows that only just over 30% of Iceland’s total trade is with the Euro area, whereas close to 60% is with the EU area. The share of merchandise exports going to the Euro area is significantly higher, or 45% and for the EU it is over 70%. These high trade shares and the close economic integration of Iceland with the EU through the EEA agreement make EMU the most natural monetary union to consider. But these figures also suggests that the effects of EMU on Iceland critically hinge on whether the three EU countries that have not joined EMU will eventually join the union. This especially applies to the United Kingdom as it is the biggest single country merchandise export market of Iceland.

VI.2. Correlations of business cycles and the nature of shocks

In order to assess to what degree Iceland fulfils the second OCA-criteria for forming a monetary union with the EU three measures of symmetry of cycles and the nature of shocks are looked at.31 These are, firstly, the symmetry of fluctuations with the EU area, secondly the symmetry of permanent and transitory shocks and thirdly an investigation of the nature of the shocks hitting the Icelandic economy.

Table 5 shows the symmetry of fluctuations with the EU-area over the period 1961-1995 for Iceland and several other countries for comparison. The degree of symmetry is defined as the percentage share of the fluctuation in the relevant variable that is explained by the contemporaneous fluctuation of the corresponding variable for the EU. The table shows very clearly that economic fluctuations in Iceland are insignificantly correlated with the EU. The correlations are also insignificant both for output growth in the case of Norway, for output growth in the case of Ireland and for the terms of trade in the case of the UK. In other cases the correlations are mostly highly significant.

---

31 The analysis in this chapter is reported in more detail in Gudmundsson, Pétursson and Sighvatsson (2001).
### Table 5. Symmetry of fluctuations with the EU area 1961-1995 (%)

<table>
<thead>
<tr>
<th>Country</th>
<th>Output growth</th>
<th>Terms of trade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iceland</td>
<td>5.0</td>
<td>0.3</td>
</tr>
<tr>
<td>Belgium</td>
<td>63.2</td>
<td>76.3</td>
</tr>
<tr>
<td>Denmark</td>
<td>63.1</td>
<td>71.6</td>
</tr>
<tr>
<td>France</td>
<td>71.2</td>
<td>83.1</td>
</tr>
<tr>
<td>Netherlands</td>
<td>62.6</td>
<td>60.0</td>
</tr>
<tr>
<td>Ireland</td>
<td><strong>6.9</strong></td>
<td>52.0</td>
</tr>
<tr>
<td>Norway</td>
<td>7.2</td>
<td><strong>0.0</strong></td>
</tr>
<tr>
<td>Sweden</td>
<td>48.5</td>
<td>63.0</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>48.9</td>
<td><strong>12.3</strong></td>
</tr>
<tr>
<td>United States</td>
<td>33.9</td>
<td>65.5</td>
</tr>
</tbody>
</table>

Symmetry of fluctuations is measured by $R^2$ from the regression of the relevant variable for each variable for each country on the corresponding variable for the EU area as a whole. Bold numbers indicate insignificance at the 95% critical level.

Source: Central Bank of Iceland (1997).

In order to look closer at the correlation of shocks in Iceland with those of other countries and the EU, a structural VAR model along the lines of Bayoumi and Eichengreen (1993) is estimated. It includes real output and consumer prices in Iceland and 19 other countries for the period 1960 to 1998 (annual data). This information set identifies two structural shocks, by allowing one shock to have a permanent effect on output and the other only a transitory one. Table 6 reports the correlation coefficients of permanent and transitory shocks in Iceland and some of the countries included in the study. The results are very much in line with those found in Table 5, with practically no correlation between shocks in Iceland and the other countries. This result holds both for permanent and transitory shocks.

### Table 6. Correlation coefficients of underlying shocks between Iceland and other countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Permanent shocks</th>
<th>Transitory shocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denmark</td>
<td>0.07</td>
<td>-0.05</td>
</tr>
<tr>
<td>Finland</td>
<td>0.09</td>
<td>0.34</td>
</tr>
<tr>
<td>Germany</td>
<td>0.07</td>
<td>0.08</td>
</tr>
<tr>
<td>Holland</td>
<td>0.07</td>
<td>0.19</td>
</tr>
<tr>
<td>Norway</td>
<td>0.18</td>
<td>0.29</td>
</tr>
<tr>
<td>Spain</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Sweden</td>
<td>-0.23</td>
<td>0.22</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>-0.02</td>
<td>0.05</td>
</tr>
<tr>
<td>United States</td>
<td>-0.20</td>
<td>-0.06</td>
</tr>
<tr>
<td>European Union</td>
<td>-0.06</td>
<td>0.15</td>
</tr>
</tbody>
</table>

Source: Gudmundsson, Pétursson and Sighvatsson (2000)

---

32 For more details on the methodology and identification approach see Gudmundsson, Pétursson and Sighvatsson (2001).
Finally the nature of shocks hitting the Icelandic economy is analysed. If shocks with permanent real effects are the main source of aggregate fluctuations, a flexible exchange rate would seem the most appropriate exchange rate policy. When shocks alter the equilibrium real exchange rate an adjustment of the exchange rate can be used to help restore internal and external balance more quickly than any other instrument of adjustment. If financial shocks hitting the demand side of the economy dominate a fixed rate is to be preferred.\textsuperscript{33}

To analyse this issue an annual structural VAR model of the Icelandic economy covering the period 1950 to 1998 was estimated in Gudmundsson, Pétursson and Sighvatsson (2000). The variables are output, investment, consumption (all measured per capita), the terms of trade and fish catch. The estimation period is 1950 to 1998. Three permanent shocks driving output, investment and consumption were identified, with two remaining transitory shocks. The three permanent shocks are interpreted as a terms of trade shock, a resource shock and a domestic shock.\textsuperscript{34} The identification of these shocks is obtained by assuming that the domestic shock has no long-run effect on the fish catch and the terms of trade, and that the terms of trade shock has no long-run effect on the fish catch. It has to be born in mind when interpreting the findings that the domestic shock includes an amalgamation of factors like domestic productivity shocks but also possibly domestic demand shocks with very persistent effects (e.g. some type of fiscal shocks).

The results indicate that the forecast uncertainty in the data is almost fully accounted for by the three permanent shocks, or 80 to 95\% of the variation at the one-year horizon. The two transitory shocks have almost no significance, even in the short run. Only in the case of the fish catch and investment is there some evidence of significant effects of transitory shocks.

As discussed above it is not clear how much of the domestic shocks can be attributed to supply shocks. Although many would argue that most, if not all, permanent shocks to real variables are from the supply side, nothing in this analysis precludes that an important element of the domestic shocks comes from the demand side. The uncertainty in the interpretation of the domestic shocks is probably most prominent in the short-term; in the long run, most of the domestic shocks are likely to be domestic productivity shocks.

\textsuperscript{33} See Henderson (1979) who analysis this question for an open economy with imperfect substitutability between domestic and foreign assets.
\textsuperscript{34} See Gudmundsson et. al. op. cit. for details.
It is, however, clear that the resource and terms of trade shocks are true supply shocks. They, therefore give an estimate of the lower bound for the importance of supply shocks for the variation of aggregate variables. Thus, supply shocks explain at least half of the variation in output, over 90% of the variation in consumption and 80% of the variation in investment at the one-year horizon. At the five-year horizon the lower bound estimates range from over 50 to over 70%. As the forecast horizon increases, domestic shocks become more important, especially for output. If one is willing to accept that most of the domestic shocks in the long run are productivity shocks, it becomes clear that supply shocks are indeed the dominant source of economic fluctuations in Iceland at all horizons.

Thus, permanent, or at least very persistent, real (supply) shocks account for most of the fluctuations in output, investment and consumption, even in the short run. These results are consistent with results from other countries. For example, King et al. (1991) find that permanent shocks are very important for the US economy and Gavosto and Pellegrini (1999), Mellander et al. (1992) and Bergman (1999) reach the same conclusion for Italy, Sweden and the Scandinavian countries, respectively. The results here imply that permanent, real (supply) shocks are even more important than for those economies.

Taken together, the findings support the view that the Icelandic business cycle is largely unconnected with the business cycle in other countries. The empirical results suggest that the shocks hitting the Icelandic economy are mainly shocks that are not shared by other countries. This implies that Iceland does not fulfil the second OCA criteria for joining the EMU or pegging the króna to its currency. Furthermore, the fact that the economy seems to be dominated by persistent real (supply) shocks, even in the short run, implies that a flexible exchange rate is more appropriate than a fixed rate.

Hall et al. (1998) cannot reject that the “regular” cycles in Iceland and Europe are the same. They obtain this result by testing whether the parameters in an AR(2) regression for output growth in Iceland and Europe are the same. The problem with this approach is that it is not relevant for the policy issue at hand. Two countries can have exactly identical AR parameters even though the business cycles in the two countries are completely independent. Furthermore, the statistical power of this test is very low. For short annual series, the AR parameters (especially the second one) are usually relatively poorly determined, making it hard to reject that they are identical across countries. For example, when this procedure is followed for Iceland and Ghana (to take a randomly chosen country), it could not be rejected that the AR(2) parameters are the same (p-value = 0.19).
VI.3. Labour market flexibility

Real wages have in the past been very flexible in Iceland. This real wage flexibility was accomplished in spite of widespread wage indexation. Facing a negative shock, wage indexation was simply put aside and real wages decreased with an exchange rate depreciation. A study of real wage flexibility among 16 OECD countries during the period 1981 to 1996\textsuperscript{36} showed that Iceland ranked highest along with Portugal. The standard deviation of annual changes in real wages was 7.7% in Iceland compared to 5.6% in Portugal, 0.9% in the US and a 2.3% simple average for all the 16 countries. The ratio between the standard deviation of real wages and output was also highest in Iceland and Portugal or 2.6 in both cases compared to 1.2 for the simple average. There was also a strong correlation between real wage growth in Iceland and current and previous two years output growth, not only suggesting a strong connection between real wages and the state of the economy but also that output growth leads real wage growth.

Real wage flexibility in the past occurred mostly in a high inflation environment. It is likely to be significantly lower in a low inflation environment as it will require cuts in nominal wages to replicate the variations of the past. A decrease in nominal wages for the economy as a whole only happened once during the last four decades, i.e. in 1959. A fall in nominal wage growth in the face of smaller productivity shocks could though be sufficient to keep the growth of unit labour cost consistent with an inflation target. The issue becomes more difficult in the case of major negative shocks that would require nominal wage cuts in order to avoid major changes in employment when exchange rate adjustment is excluded. It is therefore highly unlikely that real wage flexibility can play the same role in the adjustment process in the future as in the past and that Iceland cannot be expected to fulfil this OCA criteria within the current low inflation regime.

Due to the geographical location of Iceland and the language barrier, labour mobility, especially in to the country, has not been so great as to make an important difference in the adjustment to exogenous shocks. There has been some movement of labour out of the country during recessions, especially to the other Nordic countries. This relatively low mobility of labour might, however, be changing in the wake of Iceland’s membership in the EEA, that implies free movement of labour vis-à-vis EU countries, and with the opening up of the Eastern European labour market. This

\textsuperscript{36} Central Bank of Iceland (1997).
resulted in an increased import of a highly mobile foreign labour during the last upswing.

To give an idea of the effects of the business cycle on labour mobility in Iceland, the net emigration per 1,000 inhabitants (nt) was regressed on the past year’s output growth for the period 1962 to 1997. The resulting regression gave (t-values in parenthesis)

\[ n_t = 1.862 - 0.290 \Delta \ln y_{t-1} + 0.348 n_{t-1} \]

OLS, \( T = 36, R^2 = 0.29, SE = 2.5\% \)

Previous year’s output growth therefore reduces net emigration significantly. A 1% permanent reduction in output growth leads to a net outflow of 0.03% of the total population in the following year and a permanent net emigration of 0.045% of the population in the long run. In terms of the current population in Iceland (280 thousand) this implies a net outflow of 80 people the year after the output shock and 125 people in the long run. A temporary shock to output growth has no long-run effects on net emigration. More than half the number of people who move out of the country in the year of the recession will return the year after although the full adjustment to the new steady state can take up to nine years from the initial shock to output growth.

Turning to the domestic labour market, changes in labour participation and hours worked offer an additional source of flexibility. During the stagnation period from 1988 to 1995 the labour participation rate fell from over 80% to 76% and average working hours of skilled and unskilled workers fell by approximately two hours per week. Thus, the labour market responded to stagnating activity with reduced labour participation and fewer hours worked, preventing unemployment from rising more than it actually did. For example, if labour participation and average hours had remained stable at the 1980-1995 average, the unemployment rate would have risen to about 7% instead of the actual 5% at the bottom of the recession in 1995. However, one can argue that labour market adjustment through the participation rate and hours worked is in practice akin to changes in the unemployment rate in the sense that they involve, at least partly, involuntary aspects and is therefore not fully optimal as an adjustment mechanism.

Together, these results imply that although the effects of the business cycle on labour mobility are significant they are still too small numerically to be of critical importance for the adjustment mechanism in the face of shocks to the Icelandic economy.

---

37 Similar results are obtained by Hall et al. (1998) in a simulation exercise.
economy within a time span relevant for monetary policy. This OCA criterion does therefore not seem to be fulfilled by Iceland. Again, it should be emphasised that these results might be changing and might change dramatically if an independent monetary policy was not available to reduce the short-term effects of adverse shocks.

VII. Why then exchange rate targeting until 2001?

It has been demonstrated that Iceland is a candidate for a flexible exchange rate arrangement based on the structural characteristics of the economy as captured by the OCA criteria. In spite of this Iceland adopted a stable exchange rate as the intermediate target for monetary policy during most of the 1990s.\(^{38}\) Several other episodes of targeting the exchange rate also occurred in the past as described above. The apparent conflict between what the OCA criteria seem to suggest and the adopted framework has in practice been resolved by devaluations in the past and flexibility of the exchange rate within a wider band during 1997-2001. The actual flexibility has thus been substantial, notwithstanding formal commitment to a stable exchange rate.

But why an exchange rate target at all? Why did Iceland not adopt some other nominal anchor for monetary policy and allow the exchange rate to float much sooner than it did? After all, it can in the end be damaging to credibility to announce a certain target but have frequently to deviate from it.\(^{39}\) The reasons are the following:

- There was a lack of credible alternative nominal anchor and Iceland needed one for its disinflation strategy.
- Iceland lacked in the early 1990s the market infrastructure for a floating exchange rate.
- Inflation targeting was only in the first stages of being (re)invented in the early 1990s.
- There was some “fear of floating” and central bank independence lacked support. The result was that Iceland exited exchange rate targeting to late.

It has to be borne in mind in this connection that although there were several problems associated with exchange rate targeting it served Iceland well during the disinflation period. Indeed the close link between the exchange rate and the price level in a very small open economy as the Icelandic one is what makes exchange rate targeting so attractive. Furthermore, exchange rate targeting has the benefit of being transparent and easily understood among the public and politicians. The limitations of

\(^{38}\) The stability was interrupted by two government decided devaluations by 6% in November 1992 and by 7½% in June 1993.
the OCA criteria have also to be considered. The “fear of floating” is in general not totally unfounded due to excess volatility and overshooting in foreign exchange markets. In a very small economy with underdeveloped and thin financial markets, as was indeed the case in Iceland during the early 1990s, it was even better founded.

But the problems with an exchange rate peg are, however, many. The now well known problem of maintaining soft pegs with free capital movements will be discussed in the next section. Another difficulty is the possibility of a conflict between the currency peg and price stability for countries with a fluctuating equilibrium real exchange rate, such as Iceland, which is frequently hit by external shocks. Furthermore, under such a policy, deciding when and when not to adjust the exchange rate became of critical importance. Too frequent or excessive adjustments would undermine the credibility of such a policy. Discrete devaluations of the exchange rate in response to external shocks probably had adverse effects on inflation expectations given the long history of inflation in the country. Given the substantial degree of uncertainty about the size and durability of external shocks when decisions were taken on exchange rate adjustments, there was a risk of excessive reaction so that expectations would adjust to a future path of exchange rates that _ex post_ turned out to be excessively low. If these expectations were validated, the real exchange rate would return to its long-term equilibrium path when the impact of negative external shocks petered out, by means of rising wages and prices rather than exchange rate realignment, since the adjustable peg was operated in such a way that adjustments were only downwards. Under such circumstances a more flexible exchange rate framework with an alternative nominal anchor might be more appropriate.

One alternative would be some type of monetary target, which became popular in the 1970s in many countries. Although monetary targets have been used successfully in some of them, like Germany and Switzerland, most countries which tried monetary targeting, have now turned to some other nominal anchor, because monetary aggregates became less and less reliable indicators of nominal income and inflation due to financial innovation. As the former governor of the Bank of Canada, Gerald Bouey, once said, “We didn’t abandon monetary aggregates; they abandoned us”. Mishkin (1999).
does not ensure that the desired inflation will result.\textsuperscript{41} Hence, the monetary target may not be a sufficiently good signal about the appropriate stance of monetary policy. The problem of not hitting the announced target is, however, not a major one for countries with highly credible central banks, such as Germany and Switzerland, but could be a serious problem for countries trying to establish a credible central bank, such as Iceland. For this reason, targeting monetary aggregates has been considered untenable for Iceland.\textsuperscript{42}

Although Pétursson (2000) has found a reasonable and stable demand function for M3, it requires controlling for the effects of financial innovation on the opportunity cost of money, changes which can be difficult to predict in the future. In addition, other studies have found that the causation seems to run from prices to money rather than the other way around (cf. G. Guðmundsson, 1994). The explanation for this is probably the accommodating monetary policy followed in Iceland for most of the period 1979-1993. Were money targeting to be adopted this causation should be reversed. But the relationship might not even withstand the regime shift and could break down completely. Despite the lack of information in money on future inflation, M3 has been found to be a reasonably good indicator of contemporaneous nominal GDP and is therefore considered an important indicator variable for the conduct of monetary policy in Iceland.

Another alternative would be targeting nominal GDP, which could be seen as attractive possibility due to its built-in countercyclical properties. The lag and the fact that quarterly GDP only very recently became available in Iceland and are then subject very significant revisions are, however, serious drawbacks.

The final alternative considered in this section is inflation targeting that has very much gained favour in the world in recent years. But when the Icelandic authorities were considering the alternative exchange rate regimes for its stability oriented policies in the beginning of the 1990s it had not gained the prominence it has today. Iceland lacked anyhow the market infrastructure for a floating exchange rate which did not only exclude inflation targeting but also monetary and GDP targeting. Iceland

\textsuperscript{41} Another potential problem with money targeting is that whereas the central bank can control narrow money, it has much less control over broader measures of money. This makes money targeting very difficult, especially in countries such as Iceland where money multipliers have been very unstable.

\textsuperscript{42} Furthermore, Svensson (1999) shows that money targeting is only the optimal intermediate-targeting rule if money is the sole predictor of future inflation. Since this is not the case, money is in general not the ideal intermediate target variable.
adopted inflation targeting and a floating exchange rate in March 2001 as discussed below, but by that time the market infrastructure had been in place for several years.

VIII. Exchange rate policy and the liberalisation of capital movements

Financial markets were radically transformed in Iceland during the 1990s. This in turn changed the available options for an exchange rate policy. To paint it with stark colours it could be said that at the beginning of the 1990s a soft exchange rate peg was almost the only option but at the end of the 1990s such a policy was no longer viable. The reason is the lifting controls on capital movements and the development of money and foreign exchange markets.

Domestic financial markets had been liberalised during the middle of the 1980s with the liberalisation of interest rates and the development of the bond market. The money market developed in 1992/93 with the close of the overdraft facility of the Treasury in the Central Bank and the auctioning of T-bills. The lifting of restrictions on capital movements had begun in the 1980s but gained momentum when the membership of Iceland in the EEA (1993) became imminent. A planned process of a gradual liberalisation of capital movements thus took place from 1990 onwards, culminating in the lifting of the last restrictions on short term capital movements in the beginning of 1995.43

In the beginning of the 1990s the Central Bank was a market maker in foreign exchange. It was clear that this system would be unsustainable with free capital movements. An inter-bank market was thus established in 1993. It has since developed and grown considerably with annual turnover going from less than one billion USD in 1994 to almost 2½ b. USD in 1997 and nearly xx billion in 2001.

The Icelandic krona was pegged to a trade-weighted basket in December 1989 as a key element of the disinflation strategy. It was very stable until November 1992 when it was devalued by 6% due to the turmoil on European foreign exchange markets and then again by 7.5% in June 1993 due to supply shocks in the fishing industry. After that came a relatively long period of exchange rate stability. When the foreign exchange inter-bank market was established in 1993 the allowable fluctuation band for the krona was set at ±2¼%. It was then widened to ±6% in September 1995. The wider band was at the time considered more to be precautionary due to the newly
liberalised capital movements than to give flexibility for independent monetary policy. But as the boom of 1996-2000 gained momentum the need for more tight monetary policy in order to counteract inflationary pressures became ever more pressing. The goal of exchange rate stability had come into conflict with the goal of price stability. The compromise that evolved implied ever greater use of the fluctuation band and a bigger role of inflation prospects in the setting of monetary policy. When the band began to constrain monetary tightening around the beginning of 2000, it was widened to ±9% at the beginning of that year. The scene was set for inflation targeting.

IX. Inflation targeting

Iceland went on an inflation targeting and adopted a floating exchange rate with a joint declaration of the government and the Central Bank on March 27th. The Central Bank was at the same time granted instrument independence by a unilateral decision of the government that it would not use its power to intervene in the setting of interest rates. That has since been enshrined in law. With this move Iceland became the smallest inflation targeting country and one of the smallest countries to have a floating exchange rate.

The inflation target is 2½% 12-month change in the headline CPI. This is slightly higher than the central target in most industrial countries, but the same as in the UK (Iceland’s biggest export market for goods) and Norway and close to the current average inflation among trading partners. The headline CPI was chosen as it is widely known and financial indexation is based on it. Statistics Iceland will also calculate 1 or 2 measures of underlying inflation and monetary policy will take account of those. There are tolerance limits of 1½% in either direction, giving a tolerance interval of 1-4%. If inflation goes outside the limits the Central Bank shall take measures to bring in inside the limits as quickly as feasible and send a public report to the government as to the causes, it’s response and it’s estimate of when inflation will be within the limits again. The Central Bank is requested to publish a quarterly inflation forecast at least two years ahead and to make an assessment of the uncertainty surrounding it. Furthermore, it is requested to give account of it’s success

See Gudmundsson and Kristinsson (1997) for more details on these and related financial sector reforms.
or failure in meeting the target in its publications and before ministers and parliamentary committees.

At the time of the announcement the 12-month rate of inflation was around 4%. An adjustment path to the inflation target was thus needed. The Central Bank shall reach the goal of 2½% no later than at the end of 2003. During 2001 the upper tolerance limit will be 6% and 4½% during 2002.

Even if the fluctuation band for the exchange rate has been abolished the exchange rate will continue to play an important role in the formulation of monetary policy, as it is a very important part of the inflation process in a small open economy like the Icelandic one. Furthermore, the Central Bank will reserve its rights to intervene in the foreign exchange market to further its inflation goals or if it thinks exchange rate fluctuations are a threat to financial stability.

Iceland went on an inflation target under conditions of severe macroeconomic imbalances. The recovery that began in 1996 was initially investment led and rather well balanced. By 1998 the negative output gap had been closed and signs of overheating began to emerge. The boom was increasingly fuelled by a private credit boom that was financed by capital inflows. The corollary of that was that a significant current account deficit opened up (7% in 1998 and 1999 and 10% in 2000). Inflation started to pick up in 1999. At the same time the strains on monetary policy based on exchange rate stability became to the fore. On the one hand exchange rate stability and a higher interest rate differential was fuelling capital inflows and thus the credit expansion by reducing perceived exchange rate risks. On the other hand the exchange rate band was increasingly acting as a constraint on monetary policy.

The exchange rate continued to strengthen until the spring of 2000 (see Figure 7). Then adverse supply shocks and the perception of markets that the imbalances in the economy were more severe and persistent than thought before began to put pressure on the exchange rate. It depreciated by 9% in the course of 2000 and then by a further 2.3% from the beginning of 2001 to the regime shift. The depreciation would have been much bigger were not for heavy interventions by the Central Bank. Concerns were raised about the possible financial stability implications if the imbalances were to result in a full scale foreign exchange crises.

44 The issues raised by this development for both monetary and financial stability are analysed in Stiglitz (2001).
With the regime shift and the absence of interventions by the Central Bank the imbalances resulted in a very significant depreciation of the króna and exchange rate volatility increased also markedly. When it bottomed in late November 2001 it was 18% lower than at the regime shift. The result was a significant inflation shock. Inflation went above the tolerance ceiling of 6% in June and peaked at over 9% in January 2002. That does not change the fact that the adjustment has been both smoother and faster than there were good reasons to fear. The current account deficit has almost disappeared and although problem loans have increased somewhat they are still well within manageable limits. Restrictive monetary policy that was needed to contain the inflation burst has also with other factors contributed to a recession in 2002. But inflation is falling rapidly and is predicted to reach the 2½% inflation target in 2003 (see Figure 8) and the exchange rate had appreciated by 18% from its bottom in November 2001 to the middle of May 2002.
X. Assessment and future options

Exchange rate volatility has increased significantly since Iceland adopted a floating exchange rate. That is partly temporary due to the aftershocks of the imbalances in the economy. But it is also to be expected to be a permanent feature of the new system, although not to the degree seen during the first year. Furthermore, there has been a significant interest rate differential in recent years between Iceland and its trading partners. Icelandic industry is complaining about this differential and claiming that it will seriously hamper investments and growth prospects. Part of the differential reflects an inflation differential and a part reflects the economic cycle as Iceland was booming much more than its European trading partners. But there is no doubt that risk premiums due to exchange rate volatility and less liquid financial markets than among trading partners are also significant.

This raises the issue of whether Iceland will in the end be better served by going into the other corner of the triangle, i.e. by either entering EMU or adopting a hard peg against the euro. Buiter (2000) and Gudmundsson et. al (2000) show that membership in EMU dominates the other hard peg options, i.e. unilateral euroisation and a currency board. Furthermore, a bilateral peg is probably excluded due to the precedent it will give and unilateral pegs are out in the environment of free capital movements. Significant benefits will flow from EMU membership. The most important once are the positive effects on trade and growth (see Frankel and Rose...
and the exchange risk free access to bigger and more liquid financial markets. But there will also be risks due to asymmetric shocks. Anyhow, membership in EMU is linked to the more general issue of membership in the EU, but a discussion of the pros and cons of that is underway in the country.

XI. Conclusions
The optimal currency area criteria cover only a part of the aspects that are relevant for the actual choice of exchange rate regimes. Economic theory will predict that very small states will have a tendency towards fixed exchange rates. That is confirmed by the data. But as the experience of Iceland demonstrates, no one correct time independent answer can be given on the choice of exchange rate regime. The actual choices will be affected by the stage of development of the economy and its financial markets, the external environment and the options that exist in terms of monetary unions with trading partners.

Iceland began the 20th century in a monetary union and the 21st century with a floating exchange rate. Exchange rate policy played a crucial role in the inflation process in Iceland during the last decades. The liberalisation of capital movements and asymmetric shocks to the economy forced Iceland to abandon the fixed exchange rate policy it followed in the beginning of the 1990s. But it is not certain that Iceland has found its resting place. Will exchange rate volatility associated with floating be unacceptable? Will Iceland be able to gain monetary credibility and reduce risk premiums in domestic interest rates? Iceland does not meet the OCA criteria for membership in EMU when assessed by the historical data. But recent studies indicate that there might be significant gains in terms of trade and growth. Furthermore, the criteria might be satisfied ex post if not ex ante. The more general question about the optimality for Iceland of sustaining an independent monetary regime is thus still unanswered.
Appendix: Key macroeconomic indicators in Iceland 1970-2002

Percentage changes between annual averages, percentages or ratios

<table>
<thead>
<tr>
<th>Year</th>
<th>Exports of goods and services</th>
<th>Terms of trade</th>
<th>Gross domestic product</th>
<th>National expenditure</th>
<th>Current account (% of GDP)</th>
<th>Output gap</th>
<th>Unemployment Inflation</th>
<th>Nominal effective exchange rate</th>
<th>Real effective exchange rate</th>
<th>Bank lending</th>
<th>International investment position</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>16.5</td>
<td>8.8</td>
<td>7.5</td>
<td>10.4</td>
<td>1.5</td>
<td>-5.0</td>
<td>1.3</td>
<td>13.1</td>
<td>9.6</td>
<td>18.3</td>
<td>-20.1</td>
</tr>
<tr>
<td>1971</td>
<td>-8.2</td>
<td>11.4</td>
<td>13.1</td>
<td>28.8</td>
<td>-6.8</td>
<td>1.4</td>
<td>0.7</td>
<td>6.8</td>
<td>2.9</td>
<td>22.7</td>
<td>-19.9</td>
</tr>
<tr>
<td>1972</td>
<td>14.5</td>
<td>-2.1</td>
<td>6.2</td>
<td>-1.8</td>
<td>-2.4</td>
<td>2.0</td>
<td>0.5</td>
<td>9.9</td>
<td>-4.8</td>
<td>4.3</td>
<td>21.3</td>
</tr>
<tr>
<td>1973</td>
<td>8.7</td>
<td>10.1</td>
<td>6.8</td>
<td>12.8</td>
<td>-2.6</td>
<td>2.9</td>
<td>0.4</td>
<td>21.4</td>
<td>-7.9</td>
<td>11.5</td>
<td>35.2</td>
</tr>
<tr>
<td>1974</td>
<td>-2.7</td>
<td>-6.6</td>
<td>5.7</td>
<td>13.9</td>
<td>-10.6</td>
<td>2.3</td>
<td>0.4</td>
<td>42.4</td>
<td>-10.0</td>
<td>13.7</td>
<td>55.6</td>
</tr>
<tr>
<td>1975</td>
<td>2.6</td>
<td>-11.1</td>
<td>0.6</td>
<td>-5.5</td>
<td>-10.2</td>
<td>-2.3</td>
<td>0.5</td>
<td>49.4</td>
<td>-36.1</td>
<td>-20.6</td>
<td>32.1</td>
</tr>
<tr>
<td>1976</td>
<td>13.1</td>
<td>7.8</td>
<td>6.0</td>
<td>-3.5</td>
<td>-1.5</td>
<td>-2.0</td>
<td>0.5</td>
<td>32.4</td>
<td>-11.8</td>
<td>11.8</td>
<td>26.8</td>
</tr>
<tr>
<td>1977</td>
<td>8.9</td>
<td>7.0</td>
<td>8.8</td>
<td>15.0</td>
<td>-2.3</td>
<td>2.0</td>
<td>0.3</td>
<td>30.3</td>
<td>-11.7</td>
<td>9.5</td>
<td>40.5</td>
</tr>
<tr>
<td>1978</td>
<td>15.2</td>
<td>0.3</td>
<td>5.9</td>
<td>2.1</td>
<td>1.2</td>
<td>2.7</td>
<td>0.3</td>
<td>44.0</td>
<td>-29.8</td>
<td>-6.9</td>
<td>47.3</td>
</tr>
<tr>
<td>1979</td>
<td>6.3</td>
<td>-8.6</td>
<td>4.9</td>
<td>3.5</td>
<td>-0.7</td>
<td>3.7</td>
<td>0.4</td>
<td>44.5</td>
<td>-25.3</td>
<td>-5.0</td>
<td>58.1</td>
</tr>
<tr>
<td>1980</td>
<td>2.7</td>
<td>-2.8</td>
<td>5.7</td>
<td>5.7</td>
<td>-1.9</td>
<td>4.6</td>
<td>0.3</td>
<td>61.8</td>
<td>-27.4</td>
<td>0.0</td>
<td>66.4</td>
</tr>
<tr>
<td>1981</td>
<td>3.2</td>
<td>-0.5</td>
<td>4.3</td>
<td>5.6</td>
<td>-4.0</td>
<td>3.6</td>
<td>0.4</td>
<td>50.8</td>
<td>-25.2</td>
<td>4.4</td>
<td>72.2</td>
</tr>
<tr>
<td>1982</td>
<td>-8.9</td>
<td>-0.8</td>
<td>2.2</td>
<td>5.0</td>
<td>-7.9</td>
<td>1.7</td>
<td>0.8</td>
<td>51.0</td>
<td>-36.1</td>
<td>-8.2</td>
<td>92.0</td>
</tr>
<tr>
<td>1983</td>
<td>11.0</td>
<td>-1.3</td>
<td>2.2</td>
<td>-2.2</td>
<td>-1.9</td>
<td>-3.2</td>
<td>1.0</td>
<td>84.2</td>
<td>-45.8</td>
<td>-5.8</td>
<td>85.6</td>
</tr>
<tr>
<td>1984</td>
<td>2.4</td>
<td>0.6</td>
<td>4.1</td>
<td>6.4</td>
<td>-4.6</td>
<td>-2.2</td>
<td>1.3</td>
<td>29.2</td>
<td>-14.0</td>
<td>4.9</td>
<td>43.0</td>
</tr>
<tr>
<td>1985</td>
<td>11.1</td>
<td>-0.9</td>
<td>3.3</td>
<td>2.7</td>
<td>-3.9</td>
<td>-2.4</td>
<td>0.9</td>
<td>32.4</td>
<td>-21.8</td>
<td>-1.6</td>
<td>29.7</td>
</tr>
<tr>
<td>1986</td>
<td>5.9</td>
<td>5.4</td>
<td>6.2</td>
<td>4.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.7</td>
<td>21.3</td>
<td>-13.1</td>
<td>2.0</td>
<td>19.1</td>
</tr>
<tr>
<td>1987</td>
<td>3.3</td>
<td>4.3</td>
<td>8.6</td>
<td>15.7</td>
<td>-3.4</td>
<td>4.5</td>
<td>0.4</td>
<td>18.8</td>
<td>-3.6</td>
<td>9.5</td>
<td>42.1</td>
</tr>
<tr>
<td>1988</td>
<td>-3.6</td>
<td>-0.8</td>
<td>0.1</td>
<td>-0.6</td>
<td>-3.5</td>
<td>3.4</td>
<td>0.6</td>
<td>25.4</td>
<td>-12.5</td>
<td>5.2</td>
<td>37.2</td>
</tr>
<tr>
<td>1989</td>
<td>2.9</td>
<td>-3.9</td>
<td>0.3</td>
<td>-4.4</td>
<td>-1.3</td>
<td>2.2</td>
<td>1.6</td>
<td>21.1</td>
<td>-20.5</td>
<td>-8.1</td>
<td>25.2</td>
</tr>
<tr>
<td>1990</td>
<td>0.0</td>
<td>-2.0</td>
<td>1.1</td>
<td>1.5</td>
<td>-2.1</td>
<td>1.9</td>
<td>1.8</td>
<td>14.8</td>
<td>-10.2</td>
<td>-3.2</td>
<td>11.0</td>
</tr>
<tr>
<td>1991</td>
<td>-5.9</td>
<td>3.5</td>
<td>0.1</td>
<td>3.8</td>
<td>-4.0</td>
<td>1.2</td>
<td>1.5</td>
<td>6.8</td>
<td>0.0</td>
<td>2.6</td>
<td>11.6</td>
</tr>
<tr>
<td>1992</td>
<td>-1.9</td>
<td>-0.5</td>
<td>-3.3</td>
<td>-4.6</td>
<td>-2.4</td>
<td>-3.5</td>
<td>3.0</td>
<td>3.7</td>
<td>-0.5</td>
<td>0.0</td>
<td>5.3</td>
</tr>
<tr>
<td>1993</td>
<td>7.0</td>
<td>-4.2</td>
<td>0.9</td>
<td>-3.8</td>
<td>0.7</td>
<td>-4.4</td>
<td>4.4</td>
<td>4.1</td>
<td>-7.7</td>
<td>-5.4</td>
<td>5.0</td>
</tr>
<tr>
<td>1994</td>
<td>9.9</td>
<td>0.1</td>
<td>4.1</td>
<td>2.1</td>
<td>1.9</td>
<td>-2.0</td>
<td>4.8</td>
<td>1.5</td>
<td>-4.9</td>
<td>-5.4</td>
<td>-1.3</td>
</tr>
<tr>
<td>1995</td>
<td>-2.1</td>
<td>1.2</td>
<td>0.1</td>
<td>2.2</td>
<td>0.7</td>
<td>-3.9</td>
<td>5.0</td>
<td>1.7</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
</tr>
<tr>
<td>1996</td>
<td>9.9</td>
<td>3.0</td>
<td>5.2</td>
<td>7.2</td>
<td>-1.8</td>
<td>-1.8</td>
<td>4.3</td>
<td>2.3</td>
<td>-0.2</td>
<td>0.3</td>
<td>11.8</td>
</tr>
<tr>
<td>1997</td>
<td>5.7</td>
<td>2.5</td>
<td>4.6</td>
<td>5.5</td>
<td>-1.7</td>
<td>-0.3</td>
<td>3.9</td>
<td>1.8</td>
<td>1.3</td>
<td>0.9</td>
<td>12.7</td>
</tr>
<tr>
<td>1998</td>
<td>2.2</td>
<td>5.1</td>
<td>5.6</td>
<td>13.5</td>
<td>-7.0</td>
<td>1.5</td>
<td>2.8</td>
<td>1.7</td>
<td>1.6</td>
<td>1.6</td>
<td>30.4</td>
</tr>
<tr>
<td>1999</td>
<td>4.8</td>
<td>0.3</td>
<td>3.6</td>
<td>4.0</td>
<td>-6.9</td>
<td>1.6</td>
<td>1.9</td>
<td>3.4</td>
<td>0.2</td>
<td>1.8</td>
<td>22.7</td>
</tr>
<tr>
<td>2000</td>
<td>6.1</td>
<td>-3.3</td>
<td>5.5</td>
<td>6.6</td>
<td>-10.1</td>
<td>3.4</td>
<td>1.3</td>
<td>5.0</td>
<td>-0.1</td>
<td>2.9</td>
<td>26.7</td>
</tr>
<tr>
<td>2001</td>
<td>7.6</td>
<td>1.8</td>
<td>3.1</td>
<td>-3.0</td>
<td>-4.4</td>
<td>3.0</td>
<td>1.4</td>
<td>6.7</td>
<td>-16.7</td>
<td>-12.9</td>
<td>19.8</td>
</tr>
<tr>
<td>2002</td>
<td>1.9</td>
<td>0.7</td>
<td>-0.5</td>
<td>-2.6</td>
<td>-2.0</td>
<td>-0.3</td>
<td>2.8</td>
<td>5.3</td>
<td>0.2</td>
<td>3.4</td>
<td>13.0</td>
</tr>
</tbody>
</table>

1. Annual change over year.
2. National Economic Institute forecasts with the following exceptions: Unemployment rate and inflation rate are Central Bank forecasts. Change in exchange rate between 2001 and 2002 is assuming that the nominal exchange rate remains stable from April (average) throughout the year 2002. Change in bank lending is the 12-month change to March 2002.

Sources: National Economic Institute, Statistics Iceland, Directorate of Labour, Central Bank of Iceland.
References


Central Bank of Iceland (1997), The Economic and Monetary Union in Europe – EMU, [in Icelandic], Central Bank of Iceland, Special Issue, 2.


