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Lessons for Iceland from the Monetary Policy of Sweden

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Lessons for Iceland from the monetary policy of Sweden

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This report, prepared for a task force on monetary policy reform appointed by the government of Iceland, was presented on June 6, 2018 in Reykjavik, Iceland.

Abstract

The purpose of this report is to derive lessons from inflation targeting in Sweden for the choice of the future monetary policy regime of Iceland. Swedish inflation targeting has been a success in terms of reducing inflation and inflation volatility, but real economic volatility is not lower compared to previous periods. In addition, financial imbalances have grown rapidly. A key lesson is that the Riksbank has closely shadowed the policy of the European Central Bank due to financial integration. In other words, the Riksbank has behaved as if Sweden had a fixed exchange rate to the euro. Our analysis clearly indicates that a small economy cannot pursue an independent monetary policy from the rest of the world in a financially integrated world. Consequently, we suggest a fixed exchange rate arrangement for Iceland, preferably through a currency board. A currency board would provide exchange rate and price stability. A currency board would require domestic reforms to enhance price and wage flexibility as well as proper regulations on the financial system to minimize the risk of future banking crises.

Key words: Monetary policy; inflation targeting; financial stability; Riksbank; Sweden; Iceland; Central Bank of Iceland.

JEL codes: E4, E42, E43, E44, E47, E5, E52, E58, E62

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Introduction to the report:

In March 2017, the prime minister of Iceland appointed a task force, consisting of three economists, to assess the monetary policy framework of Iceland. A year later, in June 2018, the task force presented its main report on the Future of Icelandic Monetary Policy.

The task force condensed ten lessons from Icelandic monetary history. It put forth eleven proposals concerning reforms of the monetary policy framework, i. a. proposing that “financial stability shall take priority over price stability if conditions develop such that the former is jeopardized”.

In search for advice, the task force commissioned four reports by foreign experts, including the enclosed report on “Lessons for Iceland from the monetary policy of Sweden”.

The findings (in English) of the task force are available on:

<https://www.government.is/news/article/2018/06/05/Financial-stability-should-be-prioritised-over-price-stability/>

According to the chair of the task force, the present report on the Swedish experience of inflation targeting was a source of inspiration behind two proposals. First, the priority of financial stability over price stability. Second, the stress on following the ground rules of the monetary framework adopted at any given time. In the past, Iceland has not been able to adopt fully to the prevailing “rules of the game”, thus giving rise to persistent monetary stability.

Introduction

Inflation targeting is presently the preferred monetary strategy worldwide. Central banks such as the Federal Reserve, European Central Bank (ECB), Bank of England, Bank of Norway and the Swedish Riksbank target inflation. This movement towards inflation targeting started in the early 1990s with New Zealand and Canada as pioneers. Sweden followed soon after. Inflation targeting was adopted in early 1993, when the Riksbank announced an inflation target of 2 percent inflation as measured by the consumer price index (CPI), within a tolerance band of plus/minus 1 per cent starting from 1995.

The purpose of this report is to draw lessons for Iceland from the experience of inflation targeting in Sweden. We start with a short historical account of the evolution of monetary regimes in Sweden. In the following section, Section 2, we describe how the Riksbank has implemented the target. Here we show that the inflation-targeting regime of 1995-2017 should not be regarded as a homogenous period; rather, the regime has evolved over time. In our view, it is proper to make a distinction between three phases: first, the years of introducing and establishing the inflation target, 1995-2000; second, the years of relative success, 2000-2007; and finally the years 2007-2017, a period of crisis and policy experiments.

Next, in Section 3, we turn to the record of inflation targeting, answering the question: is inflation targeting a success in Sweden? Here we compare the macroeconomic outcome of the inflation-targeting period (1995-2017) with outcomes during the two previous monetary regimes, the Bretton Woods period (1953-1972) and the “accommodation” (full employment) regime (1973-1992). The answer is a mixed one. Inflation targeting has successfully reduced inflation and inflation volatility. However, the real economy has been as volatile as in previous regimes, and financial imbalances have grown to a scale never seen before.

Following our analysis of the macroeconomic performance under inflation targeting, we turn to a discussion of the monetary independence of the Riksbank in Section 4. We examine to what degree the Riksbank has shadowed the policy of major central banks and to what degree it has been able to implement an independent policy. Our results demonstrate the large influence of the European business cycle and the monetary policy by the ECB on the Riksbank. The Riksbank has almost behaved like a central bank with a fixed exchange rate by closely shadowing the interest rate set first by the Bundesbank and from 1999 by the ECB. This result suggests that a small open economy in a world of close financial linkages does not have monetary independence even when the exchange rate is flexible. In Section 5, we conclude our discussion about the monetary policy of the Riksbank with a summary of the first quarter of a century of inflation targeting in five lessons, pertinent for the case of Iceland.¹

¹ A few studies of the Swedish experience of inflation targeting cover shorter periods, but none covers the first 25 years of inflation targeting as we do here. The various contributions in Jonung (2003) deal with the introduction of the new monetary regime and the first decade of inflation targeting. The three reports by foreign economists on the policy of the Riksbank,

We turn next to Iceland with our Swedish insights. Starting from the characteristics of the Icelandic economy, we analyze the choice of monetary regime for Iceland in Section 6. We consider the pros and cons of alternative flexible exchange rate regimes, including inflation targeting, in Section 7. In the subsequent section, various fixed exchange rate arrangements such as Icelandic membership in a monetary union and a currency board for Iceland are discussed. Finally, based on our joint reading of Swedish and Icelandic monetary history, we present our answer to the question: Which monetary regime is best for Iceland? Here we stress that our choice of monetary regime should be supported by well-designed fiscal policies, strict financial regulations and proper labour market behavior in order for the regime to be sustainable and successful.

1. Monetary regimes in Sweden

The Riksbank is the world's oldest central bank, tracing its roots back to 1668. Over the years, Sweden has had a wide-range of different monetary regimes, including fixed exchange rates under different metal standards (gold, silver and copper), and flexible exchange rates combined with price level and inflation targeting.

Table 1 shows the monetary regimes since 1834. Twelve major regime changes have taken place during this time. The most successful regimes, measured by their duration, have been the silver and gold standards (39 and 41 years, respectively), followed by the Bretton Woods system of fixed exchange rates to the U.S. dollar (22 years) and inflation targeting (21 years so far). The average duration per regime is 16 years and the median duration is 11 years.

[TABLE 1]

Wars and major economic crises often cause regime changes. For example, the gold standard was abolished at the beginning of the First World War. Sweden adopted a gold bullion standard in the early 1920s, which ended at the start of the Great Depression in 1931. The Riksbank then pioneered price level targeting for a few years before it returned to a fixed exchange rate by tying the Swedish krona to the British pound.² In 1939, Sweden shifted from a fixed rate versus the pound to one versus the US dollar.

International developments have also been a factor behind the choice of monetary regime. The move from a silver standard to a gold standard in 1873 was taken to align Sweden with

commissioned by the Finance Committee of the Riksdag (the parliament), examine a limited number of years, overlapping each other. See Giavazzi and Mishkin (2006), Goodhart and Rochet (2010) and Goodfriend and King (2016).

² Sweden was the first country in the world to experiment with price level targeting, based on Knut Wicksell's monetary theory of the determination of the price level (Jonung 1979). This model provides today the theoretical foundation for inflation targeting

similar changes across the world. Swedish membership in the Bretton Woods system starting in 1951 had a similar background.

A clear pattern emerges from the Swedish history of exchange rate arrangements. Since its establishment, the Riksbank has consistently struggled to maintain a fixed exchange rate. Time after time, the Riksbank has been forced to abandon the fixed rate and accept a flexible exchange rate due to exogenous international or domestic events, notably wars and deep financial crisis. As a rule, the Riksbank has always gone back to a fixed rate arrangement, except in the case of the present regime of inflation targeting. Now inflation targeting represents the longest period of a flexible exchange rate arrangement.

2. Inflation targeting in Sweden 1993-2017

The era of inflation targeting starting in 1993 is commonly viewed as a single homogenous period. However, both the inflation target and the policy strategy behind it have evolved over time. It is possible to distinguish three periods of inflation targeting. The borderlines between these three periods are not precise, as the policy of the Riksbank has changed gradually.

In the first period, 1995-1999, the Riksbank developed the tools and strategy to implement the new policy. In the second period, 2000-2007, the Swedish economy grew steadily after the recovery from the crisis of the 1990s. During these years, the Riksbank followed the new set of rules successfully.

In the third period, 2007-2017, the Riksbank introduced a new policy framework, re-defined the inflation target twice, and came under heavy pressure from the global financial crisis and the euro area debt crisis. Specifically, the policy strategy that emerged during the late 1990s was modified in 2007, by moving from inflation forecasting to interest rate forecasting. In 2010, the tolerance band was abolished, only to be introduced again in 2017, now with a new name: “variation band”. The performance of the Riksbank became a subject of much more criticism during this period compared to the two previous periods.

Three governors have been in charge of the Riksbank in the period 1995-2017: Urban Bäckström (1994-2002), Lars Heikensten (2003-2005), and Stefan Ingves from 2006. Each governor has put his own mark on the Riksbank. However, the major changes to the inflation targeting regime were not caused by a change in governor. Each adjustment was initiated before the appointment of a new governor.

Next, we discuss the experience of Swedish inflation targeting in more detail. For simplicity, we examine each period separately.

2.1 Establishing the inflation target 1993-1999

The Swedish economy displayed high economic growth and low and relatively stable inflation in the 1950s and 1960s when Sweden was member of the Bretton Woods system. Macroeconomic stability was lost following the OPEC oil price shocks in 1973 (OPEC I) and 1979 (OPEC II). Excessive wage claims pushed up inflation and eroded the competitiveness of Swedish exports. The Riksbank devalued the krona five times between 1976 and 1982 to restore competitiveness without disinflation.

After the “super-devaluation” of 16 percent in 1982, the export sector recovered and growth improved. In November 1985, the Riksbank took a major step towards financial deregulation. The outcome was a credit-fueled boom that, combined with competitiveness problems, created a major economic crisis in the early 1990s.³ Sweden established a unilateral peg to the European Currency Unit in May 1991, but a series of speculative attacks against the krona, paralleling those against other Western European currencies, eventually forced the Riksbank to abandon the fixed exchange rate in November 1992.

The krona was now floating. The Riksbank needed to consider new goals for monetary policy. Inflation targeting appeared to be the best policy choice. Bank of Canada had pioneered inflation targeting and the Riksbank reached out for advice.⁴ A delegation arrived from Ottawa to Stockholm within a week. In January 1993, the Riksbank on its own initiative announced an inflation target, to come into effect from 1995. The Riksbank copied directly the Bank of Canada’s set-up, including the tolerance band around the inflation target, meant to illustrate that short-run volatility in consumer price inflation was outside the control of the Riksbank (Bäckström 1995).⁵

Actually, within the Riksbank there was some pessimism concerning the target of 2 percent. Many regarded it as too ambitious given the recent experience of persistent double-digit inflation. A rapid fall in the rate of inflation was not expected. For this reason, the Riksbank decided to announce the target in 1993 but did not expect to meet it until 1995.

³ See Jonung et al (2009) on the boom-bust process initiated by financial deregulation in Sweden.

⁴ As chief economist at the Riksbank, Krister Andersson took the initiative in 1992 to call the Bank of Canada, as he had been impressed by the Canadian central bank policy when working on the IMF team that prepared Article IV consultations with Canada. Andersson (2003) gives a detailed account of the Canadian influence on the Swedish framework for inflation targeting.

⁵ Sweden imported inflation targeting through Canada in a fairly rapid search process for a new monetary regime. It took about two months – from the fall of the fixed krona rate in November 1992 to the announcement of the inflation target in January 1993. The Canadian framework evolved in a much longer process of debate and interaction between the Bank of Canada, the ministry of finance and economists at universities. See Laidler (2015) for an account of the Canadian path to inflation targeting. On the other hand, Sweden has a much longer tradition of debate about price level targeting starting from Knut Wicksell and David Davidson. See Jonung (1979).

The Riksbank was aware that the implementation of an inflation target was more challenging than the management of a fixed exchange rate. With a fixed rate, the domestic interest rate equals the foreign interest rate plus a potential risk premium, reflecting expectations of devaluations, among other factors. Deviations from the policies necessary to maintain a fixed exchange rate cause capital flows that eventually can threaten the peg. With an inflation target, the interest rate is set in accordance with the state of the domestic economy, which requires a thorough analysis combined with a new communication strategy with the public. New policy tools, policy strategies, economic models, and a new communication approach had to be developed.

A period of innovation and experimentation began after the announcement of the inflation target. One of the first steps was the introduction of the publication *Monetary Policy Indicators*. The report provided information relevant for the Riksbank's policy decisions and acted as an important communication tool (Riksbank 1997:4). Eventually, the publication transitioned into a more extensive *Inflation Report* in 1996. Initially, most of the analysis focused on the past, but later reports shifted focus towards discussing possible future developments. The publishing of the Riksbank's inflation forecasts in 1997 was a significant step in this direction.

Three underlying (or core) inflation measures were introduced in the late 1990s as compliments to the consumer price index (CPI): consumer price inflation with a fixed mortgage rate (UND1X), imported consumer inflation (UNDIMPX) and domestic consumer inflation (UNDINHX). All featured in the inflation reports in the discussion of recent inflation developments, in particular when explaining why the target of 2 percent was not reached.

A new underlying index that removes the effect of changes in the mortgage rate was introduced in 2008 (CPIF) replacing the UND1X-index.⁶ The Swedish CPI-index includes the mortgage cost of owner-occupied homes. In the short run, CPI-inflation is therefore directly affected by changes in the Riksbank's repurchase rate (repo rate) via interest costs on mortgage rate. If the repo rate is raised, CPI-inflation increases. Likewise, if the repo rate is reduced, CPI-inflation decreases. In other words, when the Riksbank reduces the repo rate with the aim of raising inflation over the medium term, the short-run inflation effect is the opposite.⁷ The Riksbank disregards this effect of a change in the repo rate on CPI-inflation by focusing on the medium- to long-term inflation horizon, because "to try to counteract a reduction in CPI created by the direct effects of interest rate cuts with further cuts would, in terms of monetary policy, be tantamount to chasing one's own tail", (Heikensten 1999, p.10).

⁶ The Riksbank stopped producing and publishing alternative measures of inflation in 2008. The only additional measure to CPI was the new CPIF index that excluded the effect of changes in mortgage interest rates.

⁷ Palmqvist (2013) demonstrates that the CPI for Sweden is more sensitive to changes in the repo rate than the CPI of other countries is to changes in the policy rates of their central banks.

During periods of falling interest rates, such as 1995-1997 and 2008-2010, CPI-inflation declined due to reductions in the repo rate. To isolate monetary policy from these short-term effects, the Riksbank used UNDI/CPIF as its operational target. In 2017, the Riksbank officially changed from targeting CPI-inflation to targeting CPIF- inflation.

By the late 1990s, the Riksbank's communication and operational strategies were fully developed (Heikensten 1999). Simply put, the goal was to keep CPI-inflation close to 2 percent, within the band of +/-1 percentage point. The monetary policy strategy was forward looking and simple: "[t]he basic rule for monetary policy is simple: if forecast inflation one to two years ahead is above/below 2 per cent, the repo rate shall normally be raised/lowered in order to fulfil the inflation target. However, the rule is not applied mechanically and minor deviations from the target may be weighed against other factors" (Riksbank 2000).

This first period of inflation targeting was relatively successful, judging from the behavior of inflation. Inflation fell from a high level in the beginning of the 1990s and the public's inflation expectations became aligned with the Riksbank's inflation target. Figure 1 illustrates the successful disinflation of the Swedish economy. In the figure three measures of inflation are included covering the period 1990Q1-2017Q2. The first measure is CPI-inflation, the official target between 1995 and 2017. The second measure is CPIF-inflation, the measure of underlying inflation until 2017 and the official target thereafter. The third measure is the perceived rate of inflation of households, obtained through surveys, where a representative selection of respondents answers the question: "compared with 12 months ago, how many percent higher do you think prices are now?" The perceived rate of inflation is a valuable complement to official price indices as households to a major extent base their expectations of future inflation on their perceived rate of present inflation.⁸

[FIGURE 1]

Inflation fell from 10 percent in 1990 to 5 percent in 1993 and further to 2 percent by late 1995 according to all inflation measures. The Riksbank briefly tightened monetary policy in 1995-96 for fear of a return to the high inflation of the past. A reversal of the policy quickly followed when inflation continued to fall. The trend of high inflation of the 1970s and 1980s had finally been broken. Sweden had entered a low inflation regime for the first time since the early 1960s.

Because of the new low inflation environment, the differential that had persisted between the Swedish and the German/European nominal short-term interest rate disappeared (Figure 2). From 1997 onwards, the Riksbank's repo rate has closely followed first the rate set by the German Bundesbank, and since 1999, the rate set by the European Central Bank (ECB). Periods of temporarily higher and lower inflation have emerged, but they have been brief and

⁸ Jonung (1981) argues that perceived inflation is an excellent complement to Statistics Sweden's official consumer price index.

the differences have been small. The average interest rate difference between Sweden and Germany between 1997 and 2017 is 0.0 percent, in other words nonexistent.

[FIGURE 2]

Public confidence or trust in the inflation target emerged almost immediately as judged by the behavior of the inflation expectations of households and firms shown in Figure 3. Inflation expectations have varied over time but they have moved within the tolerance band with few exceptions since 1995. Initially, firms did not expect the Riksbank to achieve its target; their expectations exceeded the upper tolerance band until 1996. Households, however, had greater confidence in the policy of the Riksbank: their expectations were close to the 2 percent target already in 1993. We stress that inflation expectations have varied over time as inflation has varied, but crucially they have stayed within the bounds of the tolerance band.

[FIGURE 3]

2.2 Inflation targeting as a success, 2000-2007

The inflation target was well established by the early 2000s. The Riksbank had developed the tools necessary to implement it, and the rate of inflation as well as the public's inflation expectations were anchored within the tolerance band. The first years of the new century prior to the crisis of 2007 displayed high growth with no major economic shocks. The information technology bubble (dotcom bubble) that burst in 2000 reduced growth temporarily but the effect was small compared to the pattern of previous recessions.

Concerning monetary policy, the most notable change was the updated Riksbank act of 1988 (1988:1385), which came into force in 1999. It formalized the policy shift to inflation targeting. The new act assigned two main goals to the Riksbank: maintaining price stability, and promoting a safe and efficient payments system. No exact number for the inflation target was included in the law. After the new law went into force, the Riksbank decided by itself to maintain the existing inflation target at 2 percent. The Riksbank became politically independent from the Government with an independent Executive Board in charge of monetary policy decisions.

Because of the Riksbank's new political independence, a need for external evaluations of the Riksbank's performance arose. The Standing Committee on Finance of the Riksdag decided to undertake regular reviews of the Riksbank (Riksbank 2000). The first review was undertaken in 2006 by Giavazzi and Mishkin (2006), covering the period 1995-2005; the second in 2010 by Goodhart and Rochet (2010), covering 2005-2010; and the third in 2016 by Goodfriend and King (2016), covering 2010-2015.

Globally, financial imbalances began to emerge as reflected by rising house prices coupled with rising household debt. Sweden followed this international trend; household debt

increased from 105 percent of disposable income in December 1999 to 158 percent in December 2007 (see Figure 4). House prices increased in real terms by 79 percent during the same period (see Figure 5). In metropolitan areas such as Stockholm, real house prices increased by 150 percent, primarily driven by the rise in the price of tenant-occupied apartments.⁹ The real price of tenant-occupied homes increased by 250 percent between 2000 and 2007. Lower interest rates were the main cause of the rise in household debt and in house prices. Declining domestic interest rates reflected declining global interest rates (Andersson and Jonung 2015, 2016).¹⁰

[FIGURE 4]

[FIGURE 5]

The Board of the Riksbank became aware of the growing financial imbalances as early as in 2003 when one member raised concerns about lowering rates as these “could aggravate house price developments, resulting in a further increase in mortgages and household indebtedness.” (Riksbank 2003). However, the Riksbank decided against taking action and the policy focus remained on achieving the inflation target.

2.3 Crises and policy changes 2007-2017

Following a decade of relative calm, the global financial crisis 2007/08 marks the start of a new phase for the Riksbank characterized by crises, uncertainty, continuous changes to both the policy framework and the inflation target. The financial crisis and the ensuing euro area debt crisis changed the economic landscape. Previously apparently stable economic relationships disappeared. Several policy lessons from the early years of inflation targeting appeared no longer valid. Expansionary monetary policy in the wake of the global financial crisis contributed to a large and sustained rise in house prices. This made financial stability a major policy concern. New circumstances and experiences challenged the established consensus on how to conduct monetary policy under an inflation target.

During this period, the Riksbank made three changes to the inflation target. Most important, it revised the monetary policy strategy in 2007/2008 by moving from inflation forecasting to interest rate forecasting. In addition, it redefined the inflation target in 2010 and again in 2017. None of these changes was related to financial stability; actually, the Riksbank officially declared several times that financial stability was not a policy target for the Bank.

⁹<https://www.scb.se/hitta-statistik/statistik-efter-amne/boende-byggande-och-bebyggelse/fastighetspriser-och-lagfarter/fastighetspriser-och-lagfarter/pong/tabell-och-diagram/fastighetsprisindex-fastpi/>

¹⁰ See Andersson (2017) for a discussion of the causes behind falling global interest rates.

Interest rate forecasting

The policy strategy, introduced in 2007, originated from the work started within the Riksbank in 2003 to improve its forecasting ability by developing a new general equilibrium model of the Swedish economy.¹¹ In this model, the assumption that the policy rate was constant throughout the forecasting horizon was relaxed. Instead, the Riksbank forecasted the future policy rate under the assumption that inflation would reach 2 percent by the end of the forecasting horizon.¹²

In their review of the Riksbank, Giavazzi and Mishkin (2006) recommended that the Riksbank shifted to interest rate forecasting. According to them, the previous assumption of a fixed policy rate was an unrealistic assumption. This recommendation encouraged the Riksbank to switch from inflation forecasting to interest rate forecasting.

The design of the Riksbank policy model effectively shifted the focus from inflation forecasting to interest rate forecasting. By publishing the interest rate forecast, the Riksbank expected to influence expectations held by capital market participants and by the public of future rate changes. Thus, the interest rate forecast became a new and important tool for the Riksbank.¹³

The Riksbank published its first forecast of the interest rate path in 2007. Eventually, these forecasts had a major effect on the monetary policy discussions among the members of the Board, on the Riksbank's communication with the public, and on the debate on monetary policy in the media, creating new challenges for the Riksbank. Although the Riksbank made it clear that the forecasted interest rate path did not constitute a promise binding the future behavior of the Riksbank – but rather should be viewed as a forecast or educated guess – many viewed it as a forecast binding the behavior of the Riksbank. In addition, the uncertainty surrounding the forecasts was rarely discussed.

Figure 6 illustrates some of the problems arising from the new interest rate forecasting approach. The black line shows the actual repo-rate. The colored lines show the Riksbank's interest rate forecast published in the *Monetary Policy Reports*. The Riksbank forecasted the interest rate path three years into the future. The forecast fell short in every single case. At first, the forecast expected interest rates to return to the pre-crisis level of 4 to 4.5 percent. As

¹¹ The Riksbank's model RAMSES (since 2013 RAMSES II) is a dynamic stochastic general equilibrium model (DSGE model).

<http://www.riksbank.se/sv/Press-och-publicerat/Publicerat-fran-Riksbanken/Ovriga-rapporter/Occasional-Paper-Series/2013/No-12-Ramses-II--Model-Description/>

¹² The monetary policy strategy is described in Riksbank (2007) as “[t]he Riksbank's forecasts are based on the assumption that the repo rate will develop in such a way that monetary policy can be regarded as well-balanced. In the normal case, a well-balanced monetary policy means that inflation is close to the inflation target two years ahead without there being excessive fluctuations in inflation and the real economy”.

¹³ Jansson and Vredin (2003) examine the role of publishing central bank's interest rate forecasts.

interest rates continued to fall, the forecast partly adjusted the forecasted interest path to a lower level of 2 to 3 percent. When this also failed to materialize, the expected level was reduced to less than 1 percent.

[FIGURE 6]

Forecasting future changes in the economy is difficult for two main reasons: First, no model is an exact representation of the actual economy. Second, unexpected future events that are by definition impossible to forecast will affect the outcome. Figure 6 illustrates that no model could predict the unforeseeable. Instead, the models only predicted that the economy would return to a path for growth, inflation and interest rates close to the average path in recent years. The model's predictions are only as good as the recent past is a guide to the future. When the past is not a good guide, the model's forecasts are of limited value.

Some members of the Riksbank Board apparently took the forecasts very seriously despite flaws that became obvious over time. It is fair to say that they became prisoners of the forecasts and the econometric model behind them. In this process, their degree of freedom to discuss policy issues became restricted by the interest rate path.

The review by Goodfriend and King (2016) brings out the disadvantages of interest rate forecasting. They found that some members of the Board tended to be reluctant to change their views on future interest rates for fear of contradicting the forecast path they had argued for during the previous meeting, even when new information was available. The focus of the debate shifted towards the interest rate forecast. As Goodfriend and King (2016, p 89) put it: “[t]here is something surreal about the precision of the guidance provided by individual board members as to the future path of the repo rate when contrasted with the sheer uncertainty about the future and the fact that markets took rather little notice of the published path in determining their own expectations”.

It is trivial to say that all forecasts are uncertain. Still, some members of the Board argued for changes to the forecasted interest rate path several years into the future of as little as a few tenths of a percentage point. In this case, they displayed a strong belief in monetary policy fine-tuning, in spite of the lack of basic power in the forecasts.

The Riksbank's communication with the public

The switch from inflation forecasting to interest rate forecasting not only influenced the debate within the Riksbank, but also had negative effects on the Riksbank's communication with the general public.

Before under inflation forecasting, the Riksbank communication strategy with the public was rather simple. If the inflation forecast exceeded the inflation target, the Riksbank was expected to raise interest rates, if the forecast fell short of the target, the Riksbank was expected to reduce rates. With the interest rate forecast, communication turned into a more complex discussion about confidence intervals and forecast uncertainty. The limitations of the

forecast approach were lost in the public debate. The Riksbank projected an image of being able to forecast its policy rate several years into the future.

A second change that further complicated the Riksbank's communication with the public was the abolition of the tolerance band of +/-1 percentage point in 2010. The new inflation target was defined as "close to 2 percent" inflation as measured by the CPI. In support for this step, the Riksbank argued that CPI-inflation on several occasions had fallen outside the tolerance band due to the repo-rate's effect on mortgage costs of owner-occupied homes. To take one case, in 2009, CPI-inflation was -0.3 percent, while CPIF-inflation was 1.7 percent. The difference in inflation was the result of the aggressive interest rate cuts the Riksbank had undertaken as a response to the financial crisis in 2008.

According to the Riksbank, "[t]oday there is considerable understanding for the fact that monetary policy is conducted under uncertainty and that inflation can from time to time undershoot or overshoot the target. We at the Riksbank have long been careful to analyze and explain such deviations from the inflation target. This has meant that the tolerance interval has become obsolete" (Riksbank 2010).

The Riksbank hoped to gain greater flexibility by removing the tolerance band, but the effect turned out to be the opposite. Demands for the Riksbank to keep inflation exactly at 2.0 percent gained attention. Between 1995-2008, average inflation was 1.9 percent according to CPIF, only 0.1 percentage points from the target. CPI-inflation was 1.4 percent during the same period. This number was well within the tolerance band, but lower than CPIF-inflation due to the Riksbank's reduction of the repo rate that pushed down the cost of owner-occupied homes in the CPI. The Riksbank had in other word succeeded in fulfilling its inflation target as it was framed originally. Yet, some participants in the debate argued that deviations from 2.0 percent should be interpreted as evidence of a failure by the Riksbank to meet its target, either by mistake or intentionally (see e.g. Svensson, 2015).¹⁴ Those who claimed that the Riksbank had failed to reach its target also argued for lower interest rates. The fact that lower rates would have lowered CPI-inflation in the short term was lost in the discussion.

The combination of interest rate forecasting and the new inflation target without a band gave rise to the "tyranny of the tenths", according to deputy governor Henry Ohlsson (2016). Rather than focusing on trends and a broad analysis of the economy, the Board, the media and the public began to treat monetary policy as an exact science in which inflation was perfectly measurable and controllable by the Riksbank.¹⁵

As a response to the debate, the Riksbank reintroduced the tolerance band in September 2017, now calling it the "variation band", to "illustrate that monetary policy is not able to steer

¹⁴ While Svensson (2014, 2015) criticized the Riksbank for failing to hit the target of 2 percent, Andersson and Jonung (2014, 2015b) argued that the tolerance band should be taken into account when evaluating the policy of Riksbank. Doing so, they found that average inflation had been well within the tolerance band.

¹⁵ http://www.riksbank.se/PageFiles/56655/pro_penningpolitiskt_161220_eng.pdf

inflation in detail, but that inflation normally varies around the target” (Riksbank 2017a). At the same time, the Riksbank changed the official price index used to measure inflation from the CPI- to the CPIF-index. The CPIF was already the Riksbank’s unofficial price index that all their policy decisions and economic models were based on. Now it became the official price index for the inflation target. According to the Riksbank, these two changes will not affect the conduct of monetary policy. It is too early to evaluate their impact on the framing of monetary policy and on the communication of the Riksbank.

An important lesson from this period is that communication by the Riksbank with the media and the public plays a crucial role in building or reducing trust in monetary policy. The public easily understood the initial strategy of inflation forecasting based on a simple decision rule. Inflation forecasting combined with an inflation target with an explicit tolerance band gave the Riksbank sufficient flexibility to pursue a successful policy seen from the outside. The shift to interest rate forecasting and to a new inflation target changed the picture, making the communication with the public too complicated and eroding public trust in the Riksbank. Interest rate forecasting was based on three key but unrealistic assumptions i) that the Riksbank could forecast its own future policy rate, ii) that the model used was an adequate mapping of the actual economy, and iii) that the Riksbank had a more or less perfect control over the macro-economy. None of these assumptions turned out to be well founded.

External shocks

The Riksbank faced additional challenges due to the 2008/09 global financial crisis and the debt crisis in the euro area. The Riksbank responded rapidly when the financial crisis hit the world economy in 2008. First, the Riksbank cut the repo rate from 4.75 percent in September 2008 to 2 percent in December and 0.5 percent in April 2009. Second, the Riksbank provided liquidity support to commercial banks when international financial markets dried up following the collapse of Lehman Brothers.¹⁶ Overall, the policy was successful: no major Swedish banks collapsed and the Swedish economy soon began to recover. Sweden surmounted the international financial crisis with only minor direct economic costs.

In 2010, real GDP surpassed the pre-crisis peak. CPIF-inflation was slightly above the target in 2010, and the Riksbank began to tighten monetary policy. However, at this stage, the debt crisis in the euro area and the slow recovery in the United States reduced inflation and growth.

As the Swedish economy recovered, the Riksbank began to increase interest rates to reduce the debt build-up in the economy. It soon became clear that increasing the policy rate in Sweden at the same time as the Federal Reserve and the European Central Bank were pursuing expansionary monetary policies by reducing their policy rates was extremely difficult due to the openness of the Swedish economy (Ingves 2017). Capital started to flow into Sweden due to the higher interest rates, and the krona exchange rate began to appreciate, hurting the export sector.

¹⁶ Molin (2010) contains a summary of the Riksbank’s emergency measures.

Inflation fell and economic growth declined, while employment continued to grow, consistently hitting higher levels throughout the period. Inflation below the target level inspired criticism against the Riksbank for supposedly setting aside its inflation target deliberately, in this way causing unemployment (Svensson 2015). This criticism, although highly debatable (Andersson and Jonung 2014, 2015b), put pressure on the Riksbank.¹⁷ It contributed to a dramatic shift in policy in 2015, when the Riksbank established a negative repo rate and initiated a Swedish quantitative easing program.

A monetary policy aimed at limiting the effects of the global financial crisis in the United States and the euro area became official policy in Sweden despite the Swedish economy having escaped a domestic banking crisis. Monetary policy became expansionary at the time the Swedish economy experienced high growth and record employment rates, thus contributing to a pro-cyclical policy.¹⁸ In other words, Sweden obtained a crisis policy without a crisis.

Financial stability

The rapid expansion of credit flowed mainly to the household sector, which continued to take on more debt. Higher interest rates during 2010-2012 stabilized household debt at 169 percent of disposable income, and put a short brake on real property prices (Figure 4). The lowering of rates from 2013 onwards, especially the introduction of a negative policy rate, fueled a new credit boom and subsequent increases in property prices (Figure 5). As previously discussed, the price on tenant occupied homes soared by 45 percent between January 2014 and April 2017 (Riksbank 2017b). CPIF increased by 4 percent during the same period. Financial imbalances increased further, causing the Riksbank to warn against these developments while taking no action to address them.

Financial stability is one of the key historical responsibilities of a central bank (Goodhart 2010). The Riksbank's reluctance to reduce the policy rate in 2012-2014 was partly due to a fear of a credit-fueled boom. In 2013, however, the Swedish government decided to give responsibility for financial stability to the financial supervisory authority, *Finansinspektionen*, rather than the Riksbank. The Riksbank made it clear that it was going to focus solely on the inflation target in spite of any negative effects such a policy might have on financial stability in the long run.

¹⁷ Svensson (2015) based his criticism of the Riksbank on calculations of employment losses using estimates of the Phillips curve. Andersson and Jonung (2015b) argued that Svensson's estimates were not robust as they suffered from several econometric problems. In addition, in their opinion one-equation estimates are not sufficient to account for the wage-price-unemployment dynamics in an open economy like the Swedish one.

¹⁸ The employment rate reached 74.3 percent in 2008 before the financial crisis. It fell during the financial crisis but began to recover in 2010. The employment rate reached its pre-crisis level again in 2013 and has set new records thereafter. The employment rate in 2017Q1 was 76.8 percent, the highest since the early 1990s.

The Riksbank set a negative policy rate in 2015 and initiated a quantitative easing program totaling 300 billion krona (approximately 7 percent of GDP). The effects on household debt and property prices were large, as indicated by Figure 4 and 5. In recent years, the Riksbank has frequently warned against financial imbalances, at the same time as it has contributed to their build-up through an exceptionally expansionary monetary policy. The Riksbank (2017c) signaled in 2017 that it was willing to make monetary policy even more expansionary, despite the boom and the growing financial imbalances, to push inflation merely one or two tenths of a percentage points higher. In our view, the inflation target initially introduced to increase monetary stability turned during these years into a destabilizing force on asset markets.

2.4 A summary view of inflation targeting from 1995-2017

The Swedish monetary policy strategy under inflation targeting has evolved over time. Several revisions of the target and the policy strategy have been undertaken. The relative success of inflation targeting in the late 1990s and early 2000s probably contributed to a belief that the Riksbank could fine-tune the economy with a high degree of precision. The policy strategy from 2007 to 2017 was characterized by greater reliance on forecasts and econometric models and a belief in the Riksbank's ability to reach the target in due time.

The fact that Sweden avoided a deep domestic financial crisis in the wake of the global crisis of 2008 probably prevented this view from being challenged as in other countries. Crises are the catalyst from which important policy reforms follow in Sweden (Andersson 2016, Jonung 2000). As Sweden avoided the worst effects of the global financial crisis, it also avoided learning any new major policy lessons.

History shows that low inflation or even moderate deflation of consumer prices has no significant effect on the real economy (Borio et al 2015). However, credit and asset price booms followed by asset price deflations and crises have severe negative economic and political effects (Andersson and Jonung 2015a, Borio et al 2015). Recent financial developments have demonstrated the dangers of a narrow focus on inflation targeting. The future is likely to see further changes in the monetary policy regime. The present version of inflation targeting is unlikely to be the final destination for the framing of Swedish monetary policy (Jonung 2017).

A central lesson from recent monetary history is that financial stability does not automatically follow from consumer price stability (Leijonhufvud 2007, Carney 2014, Smets 2013). A debate has emerged on how to deal with financial stability. Should the central bank use the interest rate to stem unsustainable credit booms or should financial stability be the task of a financial supervisory agency, independent from the central bank, using macroprudential instruments? If the latter approach is adopted, which policies should be used and what effects will they have on the financial system and the economy? No consensus on these issues has so far emerged.

3. Has inflation targeting been a success?

How successful is the inflation targeting policy of the Riksbank? The answer depends on how success is measured. The Riksbank introduced an inflation target to reduce inflation following the failure of fixed exchange rates throughout the 1970s and 1980s. Initiatives to reduce inflation during the 1980s, for example the government's announced inflation target in 1984, failed due to a lack of credibility and the lack of appropriate policy tools (Feldt 1991).¹⁹ The Riksbank searched for an alternative regime when it was forced to accept a floating exchange rate for the krona in November 1992.²⁰ At that time, inflation targeting turned out to be the most attractive option.

Low inflation was the overall aim of the inflation target in the 1990s. However, the expectations concerning the benefits of an inflation target went further. Price stability was also expected to bring about macroeconomic stability (Government Bill 1997/98:40), that is high and stable economic growth and financial stability.

Has inflation targeting delivered the expected performance? As a simple test, we compare the economic outcome during the inflation-targeting regime (1995-2016) with the two preceding regimes: the Bretton Woods period (1951-1972) of fixed exchange rates, and the "accommodation" regime, when full employment was de facto the main goal despite a fixed exchange rate against either the Deutsche Mark or a basket of currencies (1973-1992). Sweden had a fixed exchange rate but devalued the *krona* several times to maintain full employment.

We evaluate the performance of the three regimes using five sets of indicators representing monetary policy, fiscal policy, trust in monetary policy, real economic developments, and financial developments. Table 2 summarizes the results. The headline number shows the average outcome during the period and the number below in parenthesis displays the standard deviation.

We use three measures of inflation to evaluate the success of monetary policy: CPI-inflation, CPIF-inflation and the GDP deflator. CPIF-inflation is only available from 1987 and onwards. CPI measures inflation in a selected set of consumer goods and services. The GDP deflator measures prices of "everything" produced in Sweden. The deflator is thus a broader price index than the CPI.

Inflation targeting has clearly been successful in bringing down inflation and making inflation less volatile. Average inflation was between 1.1 and 1.7 percent from 1995 to 2016,

¹⁹ The government introduced an inflation target in 1984 while Sweden had a fixed exchange rate, while lacking appropriate tools to implement the target. The policy consequently failed.

²⁰ The search is reflected in a report by the Riksbank published in December 1992, containing among other items accounts of the experience of floating exchange rates in New Zealand, Canada and Switzerland (Riksbank 1992). See also Andersson (2003).

depending on the inflation measure used. Inflation was slightly below 2 percent on average, but well within the tolerance/variation band of +/-1 percentage point. Inflation was higher both during Bretton Woods regime (between 3.8 and 4.0 percent) and during the full employment regime (8.3 and 8.4 percent). Inflation volatility fell by as much as 50 percent compared to the previous two regimes. Clearly, the Riksbank managed to control inflation under inflation targeting.

With an inflation target and a flexible exchange rate, monetary policy becomes the main tool to stabilize the economy. Fiscal policy is less potent in this case. A fiscal framework, including an advisory fiscal policy council, was gradually introduced in the late 1990s and the early 2000s to ensure long-term sustainable fiscal policies. Overall, fiscal policy, supported by the new fiscal framework, has kept the government budget almost balanced (a small average deficit of -0.1 percent of GDP) and a falling government debt-to-GDP-ratio since the mid-1990s (Jonung 2015). This compares favorably to government deficits in excess of 5.3 per cent during the full employment regime and a moderate deficit of 1.2 per cent during the Bretton Woods era.²¹

Table 2 thus suggests that fiscal policy has been synchronized with the inflation target, in this way supporting the new monetary regime.²² Likewise, the wage bargaining system in Sweden changed in the late 1990s in a way that facilitated low wage agreements, a clear break with the pattern of the 1970s and 1980s. In this way, nominal wage growth has been consistent with the inflation target of 2 percent.

Trust in monetary policy is difficult to measure. Survey questions asking respondents about their trust in the central bank are only available for the last ten to twenty years. An alternative approach, developed by Fregert and Jonung (2008), is to rely on the length of wage contracts. They derive trust in monetary policy by using the length and contents of collective wage agreements. These contracts reflect the employers' and the employees' expectations about future macroeconomic developments. If the social partners expect high and volatile inflation, the length of wage agreements will be short and vice versa. The length of the wage agreements is thus an indicator of the state of inflation expectations.

Trust in monetary policy has been the highest during the inflation-targeting period. Inflation expectations have been at the lowest and most stable level. They have also been in line with the inflation target on average, although as Figure 3 shows, they have varied over time as actual inflation has fluctuated. The length of wage contracts has increased: the average contract length has been 2.8 years during inflation targeting, versus 1.75 years during the Bretton Woods system and 1.46 years during the full employment regime.

²¹ The budget surplus is below the targeted level of 1 percent over the business cycle according to the fiscal framework, but the fiscal situation has clearly improved compared to the regime of accommodation.

²² Eklund (2003) argues that the new fiscal policy framework of the 1990s was a key ingredient in the new stabilization framework alongside with the inflation target.

So far, the analysis clearly demonstrates that the inflation outcome has been better under inflation targeting than under the earlier regimes. A less favorable picture emerges when turning to real economic growth. On average, economic growth (GDP), growth in the standard of living (GDP per capita), and productivity growth (GDP per hour) has been lower under inflation targeting than under the Bretton Woods regime but higher than under the full employment regime. The recent increase in growth relative to the 1970s and 1980s is not unique to Sweden. Most developed countries, irrespective of monetary policy regime, registered a rise in economic growth during the 1990s and early 2000s (Andersson 2017). It is therefore difficult to attribute the increase in growth to the inflation target.

Unemployment has been higher under inflation targeting than in the previous two periods. Unemployment has risen from an average of 2.0 percent during the Bretton Woods era to 3.1 percent during the full employment period to 7.8 percent under inflation targeting. Volatility has also been higher for growth and unemployment. The effect of the 2008-09 financial crisis increases the volatility. Removing the crisis years from the calculation reduces the volatility numbers, but they still remain as high as during the full employment regime. In the United States, real economic volatility fell in the late 1980s (the Great Moderation). There was no such effect in Sweden. The conclusion is that, the inflation target has apparently not reduced real economic volatility.

As discussed above, developments in the financial sector seem to be a major weakness of inflation targeting. Long-term financial stability requires that the volume of credit and asset prices in real terms do not to grow much faster than real economic growth for sustained periods. During the Bretton Woods regime, credit to the private sector as well as share prices expanded in line with real economic activity, while real house prices declined. Credit growth accelerated during the full employment regime, exceeding real economic growth. This contributed to the financial crisis of 1992-1993.

A few years of financial stability followed until the late 1990s, when a new period of credit expansion and asset price inflation began. Real credit growth to the private sector and to households has grown on average by 5.5 and 5.9 per cent per year, respectively, under inflation targeting. Real house prices have increased by 5.3 percent and real share prices by 9.3 percent, while average real economic growth has been 2.6 percent during these years. Low interest rates are the major factor behind the rapid debt build-up and rising property prices, although they are not the only cause of the rapid rise in house prices (Andersson and Jonung 2015a, 2016).

In hindsight, the process of financial deregulation in the second half of the 1980s had profound consequences for the financial system. A most significant outcome of the deregulation is the prolonged period of rapid expansion of the financial system, including rapid growth of credit and asset prices, that continues up until today. This trend suggests that an inflation target is not sufficient to avoid credit growth and asset price inflation getting out of hand.

Recently, calls for macroprudential policies to address financial risk have emerged. In Sweden these policies have mostly aimed at reducing household borrowing. Whether these types of credit controls will prove successful or lead to new unforeseen problems is still unknown. So far, these policies have not limited the growth of household borrowing.

Summary

Has inflation targeting been a success? The answer is yes if we adopt a narrow focus on consumer price inflation and inflation expectations held by the public. The answer is no if we take into account real economic stability and financial stability. The real economy is no more stable or less stable than in the previous two regimes depending on whether the years around the global financial crisis are included in the calculations or not. Credit growth and asset prices have clearly outpaced real economic growth under inflation targeting. Real economic and financial stability does not automatically follow from price stability.

4. Has the Riksbank exercised its monetary independence?

The Riksbank is an independent government agency free to make its own interest rate decisions without political interference following the Riksbank law of 1998. The idea of monetary independence assumes that a central bank under floating exchange rate has monetary autonomy to set its policy rate solely according to domestic concerns. Formally, the Riksbank has the legal right to set any interest rate it chooses to reach its policy goals. However, Sweden is a small open economy with free capital mobility. This openness may reduce the Riksbank's ability to set interest rates solely dependent on the state of domestic economy. International influences may tie the hand of the Riksbank and make it reliant on the policy of larger central banks.

Here we consider the question to what extent the Riksbank has acted as an independent central bank or followed the policy of two major central banks: the Federal Reserve, and the European Central Bank (German Bundesbank before 1999).

Figure 2 suggests that the Riksbank has closely tracked the Bundesbank/ECB policy rate since 1997. The Riksbank kept its policy rate above the German rate in 1995-96 but the exchange rate appreciated. As inflation and growth declined, the Riksbank reversed its policy. From then on, the average deviation between the Riksbank rate and the Bundesbank/ECB rate has been zero.

There are potentially several causes behind the Riksbank's choice to shadow the Bundesbank/ECB. One potential explanation is that Sweden is a small open economy highly integrated with the German/euro area economy. As the Swedish business cycle closely

follows the European business cycle, the interest rate set by the Bundesbank/ECB will thus also be the appropriate rate for Sweden.

Another potential explanation is that Swedish financial markets are highly integrated with global financial markets. Swedish commercial banks increasingly rely on foreign debt to finance their operations. In 2017, the four main banks had foreign debts outstanding amounting to 175 percent of GDP, corresponding to 45 percent of all their debts (Riksbank 2017b).

Recent studies have shown that financial integration reduces the independence of national central banks. Financial integration harmonizes credit flows, interest rates and asset prices among countries (Andersson and Jonung 2016, Borio 2014). Any attempt to deviate considerably from international developments creates large financial flows that put pressure on the exchange rate and thus spills over to the real economy and domestic inflation. Only small deviations in the interest rate are thus sustainable (Rey 2013, Ingves 2017).

To illustrate the Riksbank's dependence on international factors, we estimate the Riksbank's reaction function, i.e., how the Riksbank responds to developments in the Swedish economy and in the global economy. The regression model is based on the Taylor rule, where the central bank sets its policy rate based on the domestic rate of inflation and the domestic business cycle. We expand the model to take into account exchange rate movements, as they are important for a small open economy, and we add variables representing the global economy. These variables are policy rates, inflation and unemployment in Germany, and inflation and unemployment in the United States.²³

We estimate the following econometric model based on the Taylor rule:

$$\begin{aligned} \Delta i_t^{swe} = & \alpha_0 + \beta_1 \Delta i_{t-1}^{swe} + \beta_2 \Delta i_t^{ger} + \beta_3 \Delta i_t^{usa} + \beta_4 \Delta \pi_{t-1}^{swe} + \beta_5 \Delta \pi_{t-1}^{ger} + \beta_6 \Delta \pi_{t-1}^{usa} + \\ & \beta_7 \Delta u_{t-1}^{swe} + \beta_7 \Delta u_{t-1}^{ger} + \beta_8 \Delta u_{t-1}^{usa} + \beta_9 \Delta e_{t-1}^{swe} + \varepsilon_t \end{aligned} \quad (1)$$

where i is the central bank policy rate, π is inflation, u is the unemployment rate (measuring the business cycle), e is exchange rate index, ε is the error term, and Δ denotes the absolute change between two time periods. We assume that the Riksbank observes the US and German policy rates when deciding the Swedish rate. As data on unemployment and inflation are collected with a lag, we assume that the interest rate decision today is based on the interest rate of the last quarter.

We estimate the model for the full inflation-targeting period from 1995Q1 to 2017Q2. We also split the sample into two sub-samples, 2001Q1-2007Q2 and 2011Q1-2017Q2. These two

²³ Most central banks use forecasts to set the policy rate. However, all forecasts made by econometric models are based on available data and a forecast model. We can therefore use the available data in the regression model instead of using central bank forecasts. See Stock and Watson (2002).

sub-periods are of equal size and about four years apart. The first sub-period corresponds to the second period of Swedish inflation targeting, while the second sub-period corresponds to the third period of Swedish inflation targeting as studied by us.

As a comparison, we include Iceland and Germany in the analysis. Iceland introduced an inflation target in 2001 and Germany, as part of the euro area, adhered to an inflation target throughout the period. Table 3 shows the results. A grey background implies that the variable has a statistically significant effect on the interest rate decision of the central bank.

Global events clearly affect the Riksbank's interest rate decisions in the full sample and in the two sub-samples. In the full sample, the German interest rate has a significant effect on the Riksbank's rate, as do German unemployment and Swedish inflation. Splitting the sample reveals a change in the reaction function. In the first sub-sample (2001-2007), the Riksbank responds primarily to the German business cycle. In the second sub-sample, the Riksbank responds to interest rate changes by the ECB. A one percentage-point interest rate change by the ECB leads to a 0.9 percentage point adjustment by the Riksbank.

Our results suggest that the Riksbank's dependence on the ECB in the first sub-sample is the outcome of synchronized business cycles between Sweden and Germany. The dependence in the second sub-sample is probably due to financial integration of the Swedish economy into the global financial system. Due to financial integration, the extreme monetary policy undertaken by the ECB has been transmitted directly to Sweden. As previously discussed, the Riksbank's attempts to set a higher policy rate more suitable for the strong Swedish economy were eventually abandoned due to large financial flows and a pressure on the krona exchange rate.²⁴

The Riksbank's international dependence is not a binary variable where the Riksbank is either fully dependent or fully independent. As Figure 2 shows, the Riksbank has chosen to deviate from the Bundesbank/ECB rate by a few tenths of a percentage point on some occasions. However, none of the domestic variables (Swedish inflation and unemployment) has any significant effect on the Riksbank's interest rate decisions. Only changes in the European economy systematically trigger a response from the Riksbank.

[TABLE 3]

The Icelandic story is both similar to and different from the Swedish one. Icelandic interest rates were highly influenced by US interest rates up until the financial crisis of 2008. Capital controls introduced after the crisis reduced dependence on international developments. The exchange rate also affected Icelandic interest rate during the first sub-period, where an appreciation leads to lower rates and vice versa. After the crises, only domestic inflation has

²⁴ Ingves (2017) discusses why the Riksbank had to abandon an independent monetary policy due to the record low European rates.

had a weak systematic effect on the central bank's behavior. Interest rate decisions had no systematic pattern during this period.

The ECB's reaction function is markedly different from the responses of the Swedish and Icelandic central banks. As the central bank for a larger currency area, the ECB is more independent compared to both Sweden and Iceland. In the 2001-2007 period, the U.S. interest rate had some influence on the ECB but the effect is weak. The euro area business cycle was instead the main driver of ECB interest rates. This effect was stronger in the second sub-sample when the effect of U.S. interest rates disappeared. We conclude that financial globalization affects all countries, but a large currency area still has the ability to set an independent interest rate suitable for the currency area.²⁵

Summary

The Riksbank is independent from the government, but not from the global economy. International business cycle synchronization and deep financial integration have reduced the Riksbank's room to deviate from interest rates set globally. High domestic economic growth and growing financial imbalances suggest that Swedish interest rates should have been set higher in recent years. Financial integration makes such an outcome very difficult as long as the ECB carries out an expansionary policy based on extremely low policy rates. The ECB's policy to counter the financial crisis of 2008 and the debt crisis in the euro area has spilled over to Sweden in spite of the fact that Sweden did not experience a financial crisis. Eventually, this may contribute to a future crisis in Sweden through increasing domestic financial imbalances.²⁶

5. Monetary policy lessons from Sweden for Iceland

The economic policy debate often searches for the optimal policy that maximizes some form of utility or social welfare function. However, history shows that there is no optimal monetary policy regime that survives the test of time. The economic landscape facing central banks is constantly changing. Still, it is possible to draw a few policy lessons from recent Swedish monetary experience that could serve as a guide to the monetary future of Iceland.

First, monetary regimes do not last forever. Rules-based regimes where the central bank adheres to the rules, such as the gold standard or inflation targeting, last longer than regimes with uncertainty regarding the ultimate policy goal. The fixed exchange rate regimes of the 1970s and 1980s broke down because employment was the unofficial goal for stabilization

²⁵ A common European monetary policy does not imply that the policy rate of the ECB is the proper one for every member state. The period leading up to the euro area debt crisis demonstrates that interest rates were set too low for countries that later suffered from the bursting of the ensuing asset price bubbles.

²⁶ Presently the *Finansinspektionen* is in charge of financial stability. We do not expect this institution to be able to arrest the growth of credit within Sweden as long as the policy of the Riksbank is expansionary.

policy (Jonung 2017). Rules build trust by making policy predictable, which increases the expected lifetime of the regime. This suggests a policy rule that makes policy transparent and thus easy to pursue, to track and to communicate to the public.

Second, policy learning is an ongoing process, often driven by the experience of economic crises (Andersson, 2016, Jonung, 2000). The recent global financial crisis is one example of an event leading to policy lessons around the world. However, in Sweden the international financial crisis has had limited impact on the Swedish policy makers potentially because Swedish did not suffer directly from the crisis. The Riksbank has maintained a narrow focus on inflation targeting despite mounting evidence that its policy was creating growing financial imbalances. This suggests that the policy regime adopted should be subject to regular evaluations, preferably by a combination of foreign and national experts to improve policy learning. In other words, rules are important but there should be escape routes from prevailing rules when sticking to them threatens macroeconomic stability in the long run.

Third, the Swedish experience of inflation targeting demonstrates that clear and constructive central bank communication with the media and the public is an important prerequisite for a successful monetary policy. The Riksbank shifted from inflation forecasting to interest rate forecasting in 2007, and changed the inflation target in 2010 by removing the tolerance band. These two changes created the impression that the Riksbank could forecast the near future with a high degree of certainty, and that it could reach the target of 2 percent through fine-tuning monetary policy. In this environment, small deviations in actual inflation from the target were taken as evidence that the policy of the Riksbank was failing. To restore trust in the inflation target, the Riksbank turned to an extremely expansionary monetary policy in 2015-2017. Improved communication concerning the Riksbank's limited capacity to control the rate of CPI-inflation in a small open economy as Sweden might have prevented the Bank from going to such extreme measures.

Fourth, financial stability does not follow automatically from price (monetary) stability. However, price stability requires financial stability. The Swedish experience demonstrates that an inflation targeting policy that solely focus on price stability as measured by the CPI-index threatens to undermine financial stability in the long run. At this stage, it is not clear to what extent macro-prudential policies such as leverage rules on banks and capital restrictions can ensure financial stability in Sweden. However, such controls have likely unexpected and unintended effects. Households and firms usually find ways to avoid them. Macroprudential instruments can serve as complements to the use of the policy rate to control a credit-fueled asset price boom, but they are far from being full-fledged substitutes.

Fifth, the future is unknown and unpredictable. Monetary policy must consider this uncertainty and cannot rely on models trying to predict the unpredictable. The shift to interest rate forecasting has turned into a mistake. Inflation forecasting also suffered from similar problems, but here forecasts were merely a guide for changes in the policy rate, not for predicting the exact level of the future inflation rate.

Next, we will carry relevant parts of the above lessons from Sweden over to our discussion of the proper choice of monetary regime for Iceland.

6. Alternative monetary policy regimes for Iceland

Which monetary policy regime is most proper for Iceland presently? To answer this question, we start from the characteristic features of the economy of Iceland. These are the key to the choice of the regime, as no policy regime is “optimal” for all countries, regardless of size, trade patterns, geographical location, resource endowment etc. Next, we outline alternative monetary regimes of interest for Iceland. Here we conclude that Iceland can choose from two main sets of monetary policy regimes: a flexible exchange rate or a fixed exchange rate. In Section 7, we discuss the costs and benefits of a flexible exchange rate and in Section 8 we consider the costs and benefits of a fixed exchange rate. We conclude with a set of recommendations in Section 9.

6.1 Characteristics of the Icelandic economy

Iceland is a small economy with about 335,000 inhabitants, located at the periphery of the global economy. The Icelandic krona (ISK) is the smallest currency in the world supplied by an inflation targeting central bank, the Central Bank of Iceland (CBI). Iceland has a highly volatile monetary and financial history. Periods of high growth have mixed with periods of severe economic recessions. Recently, Iceland suffered from one of the greatest financial disasters experienced by a rich country, classified by some as the biggest crisis of all.²⁷

The domestic financial market is limited, implying that the government cannot rely on domestic sources to finance any prolonged period of public deficits. Iceland is also an open economy and thus subject to shocks from the world economy. The economy relies on a few export items. Fish used to be the staple export; later aluminum and most recently tourism have become the most important sources of foreign currency. Almost all other goods, from cars to food, are imports.

There are clear diseconomies of scale due to the small size of the Icelandic economy.²⁸ The restricted domestic market limits specialization. This means that Iceland must turn to foreign markets to reap the benefits of specialization, making the economy vulnerable to changes in external conditions. It also makes the exchange rate an important economic variable. Small changes in the exchange rate have large effects on economic welfare.

²⁷ There are numerous accounts of this financial disaster. See, e.g., the contributions in Aliber and Zoega (2011) for the run-up to the crisis, Gylfason et al. (2010), Gylfason (2015) and Jónsson and Sigurgeirsson (2016) for an analysis of the Icelandic boom-bust pattern.

²⁸ See Gylfason (2009).

Another negative consequence of smallness concerns the quality of governance by the public sector. The record of economic policymaking in Iceland, not least from the recent financial crisis, suggests that close ties between business groups and politicians in power have had an unduly influence on policy outcomes.²⁹ On the other hand, Iceland is exceptional in the sense that a number of bankers have received jail sentences, although it is an open question to what extent major culprits have been able to evade prosecution.

Being small also may have some advantages. For example, the public's preferences may more easily be reflected through the political system in a small country than in a large one. The volatile political performance of Iceland in recent decades lends mixed credence to this view. Smallness may invite economic as well as political instability. To sum up, the choice of the regime for Iceland must be based on the fact that Iceland is a very small open economy, heavily reliant on foreign trade.

6.2. Choosing the monetary regime

All monetary regimes have an international and a domestic aspect. The international aspect relates to how the value of the domestic currency is set in relation to other currencies of the world, and whether capital can flow freely across borders. The exchange rate can be flexible, allowing the market to set the value of the currency, or fixed (pegged), whereby the value against another currency, a basket of currencies or a commodity such as gold is determined by the central bank or the government.³⁰ The domestic aspect relates to the role of the central bank in the domestic economy: should the central bank try to influence domestic outcomes or be passive? The design of monetary policy depends on international arrangements, i.e., on the choice of a fixed or flexible exchange rate and whether capital restrictions are used or not.

In other words, the first step when determining the goal for monetary policy is to determine the exchange rate regime. In principle, Iceland has a menu of regimes to choose from, as summarized by Table 4. Each of the two major regime arrangements, fixed and flexible, is broken down into sub-sets reflecting, in the case of fixed exchange rates, the extent to which the rate is fixed, and in the case of flexible rates the possible domestic policy goal. It is possible to decide on a combination of regimes if capital restrictions are in force. Some of the regime options in Table 4 are currently in use, most prominently monetary unions, currency boards, various fixed exchange rate arrangements and inflation targeting. Others have existed in the past, such as the gold standard. Economists have also proposed additional regimes not included in Table 4.

Which regime in the catalogue of different regimes in Table 4 promises the best economic performance for a country like Iceland? The theoretical literature does not provide a clear answer. No optimal monetary regime can be derived from economic theory. However, theory

²⁹ See Sibert (2011) and Gylfason (2015).

³⁰ We use the term pegged as a synonym for fixed in our discussion of exchange rate regimes.

and history offers a few guidelines: First, rules-bound policy regimes provide greater economic stability. Second, the regime has to be credible. Third, monetary policy alone cannot provide economic stability. Fiscal policy and the behavior of the private sector also matter. For example, weak public finances or excessive wage claims can threaten the stability of any monetary policy regime. The reason credible and rules-based regimes are more successful is that the government and the private sector have aligned their behavior according to the rules of the regime. Their behavior thus indirectly supports the policy of the central bank and makes it easier for the central bank to reach its target.

Swedish monetary history as outlined above supports these arguments. Rules-based systems have lasted longer and regimes that lacked credibility. The fixed exchange rate regimes of the 1970s and the 1980s collapsed when labour unions demanded wage increases that undermined the competitiveness of Swedish exports.³¹ The recent success of inflation targeting in Sweden is largely explained by fiscal policy and collective wage agreements being consistent with the inflation target.

Our conclusion is that whatever regime Iceland chooses, it should be rules-based, credible, supported by the government through its fiscal policy and accepted by the general public as reflected in wage agreements consistent with the regime.

6.3 Alternative monetary regimes

Since the 1960s, economists have discussed the choice of regime starting from the monetary or macroeconomic trilemma. The trilemma states that among the three policy goals of a fixed exchange rate, free capital flows and monetary independence, no more than two goals are fully achievable at once.³² A fixed exchange rate and free capital flows form a common combination in economic history, with the classical gold standard as a prime illustration. Monetary independence and free capital movements is another possible combination; presently inflation targeting is the principal example. However, monetary independence is incompatible with a fixed exchange rate, unless there are controls over cross-border capital flows.

In recent decades, researchers have challenged the classic trilemma framework. Rather than a trilemma, they argue that financial globalization has reduced the problem to a dilemma given the scale of global financial markets and financial integration in recent years.³³ The only choice is between monetary independence through capital controls or monetary dependence

³¹ Bordo and Jonung (1997) survey the empirical evidence from different monetary regimes in a historical context.

³² The trilemma can be traced back to the Mundell-Fleming approach developed in the 1960s. It received considerable attention in the debate concerning optimal currency unions and the common European currency. Work in the 1990s gave empirical support to the trilemma. See Obstfeld and Taylor (2017) for a current review.

³³ See for example Rey (2013).

through no capital controls. This argument is supported by our analysis in Section 4 of the determinants of the policy rate of the Riksbank.³⁴

In short, the monetary autonomy of countries on a floating exchange rate that are financially well integrated is limited – although it is an open question how limited. The main channel limiting autonomy is the co-movement of interest rates across countries regardless of the exchange rate arrangement. Here, the Federal Reserve and the ECB hold a key role because of the sheer volume of financial assets denominated in dollars and euros, and thus depending on US and euro interest rates. As the analysis in Section 4 demonstrates, changes in the Federal Reserve or the ECB rate automatically spreads to smaller economies through financial linkages. Consequently, small countries like Sweden or Iceland with floating rates and with free capital mobility cannot isolate themselves from the monetary policy decisions made by the Federal Reserve and the ECB.

The policy conclusion is straightforward. If a country wants to keep its domestic monetary independence, even when adhering to a flexible exchange rate, it must consider measures to manage and restrict the flow of cross-border credit. However, such restrictions come with a cost; they are likely to reduce long-term economic growth. Without such restrictions, the central bank will be forced to shadow the interest rate path chosen by the major central banks, irrespective of the state of the domestic economy – as demonstrated by the case of the Riksbank in recent decades.

The first step is therefore to decide on open or closed borders for capital mobility. Given the limited size of the Icelandic economy and of its domestic financial markets, we recommend open capital markets. Closed capital markets would likely reduce economic growth in the long run. However, the central bank or some other government authority should have tools at its disposal to limit international financial flows if these flows threaten to destabilize the domestic economy (Rey 2013).³⁵ The second step is to choose between a flexible exchange rate and a fixed exchange rate. In Section 7, we discuss possible regimes based on a flexible exchange rate and in Section 8 possible regimes based on a fixed exchange rate.

7. A flexible exchange rate for Iceland

With a flexible exchange rate, a country like Iceland can adopt a number of monetary regimes. It can target the price level, the wage level, nominal GDP or the rate of inflation to mention some alternatives. We focus our discussion on inflation targeting as such a regime holds a central position in present debate on monetary policy.

³⁴ See e.g. Obstfeld and Taylor (2017).

³⁵ The exact tools used depend on the situation and the structure of the financial system. How effective full capital controls are in stabilizing the financial system and the economy is an open issue (see, e.g., Klein 2012). However, given the recent experience of destabilizing financial flows, the potential use of capital controls should not be discarded (Rey 2013).

7.1 Should Iceland target inflation?

Most central banks in countries with flexible exchange rates have adopted an inflation target. Iceland is no exception. It has an inflation target of 2.5 percent, which the CBI adopted in March 2001. The target has a tolerance interval of 1.5 percentage points, and the central bank must communicate with the government explaining actions undertaken to return inflation if it falls outside the tolerance interval. The Icelandic inflation target is stricter than the Swedish target. The Riksbank is concerned about inflation, but also to some extent about growth. The CBI only considers other macroeconomic variables when taking its interest rate decisions when inflation is within its tolerance band.³⁶

As already discussed, for a small country a strict inflation target is only feasible with some restrictions on international capital flows. The Swedish policy of deviating from the German policy rate in 1995-96 as well as in 2011-12 was quickly reversed. Sweden has in practice behaved as a country with a fixed exchange rate, as illustrated by the policy of shadowing the Bundesbank/ECB interest rate since 1997. In a recent speech, Stefan Ingves, head of the Riksbank, talked about “the elephant in the room”, where the elephant is the euro. The Riksbank has tied itself to this elephant (Ingves 2017).

Iceland is in a similar situation as Sweden, although still more exposed to international events due to the small size of its economy. Between 1995 and 2007, the CBI interest rate displayed the same movement as the Federal Reserve rate, confirming the results from our previous regression results. However, the Icelandic interest rate was persistently higher than the US interest rate (Figure 7). The higher Iceland interest rate was inspired by a relatively high inflation (Figure 8). Inflation was on upward trajectory from 2003 to 2008.

[FIGURE 7]

[FIGURE 8]

The rules of the inflation target dictate that to suppress inflation, interest rates should rise when inflation is high. For Iceland, inflation moved in the opposite direction. In response to higher domestic interest rates, commercial banks, firms and households on Iceland started to borrow from abroad in foreign currencies at lower interest rates, bringing capital into Iceland. Foreign actors entered as well, purchasing ISK-denominated assets offering higher returns than the global average, financing these purchases by borrowing in markets with low interest rates (the “carry trade”).

The interest-rate differential between Iceland and the rest of the world contributed, at an initial stage, to an inflow of capital, an appreciating ISK, a rapidly expanding domestic money stock and credit volume, rising domestic inflation and rising asset prices. This process

³⁶ <https://www.cb.is/monetary-policy/inflation-target/declaration-on-inflation-target/>

continued until the beginning of the international financial crisis in 2007/08 when the Icelandic krona began to lose value despite a growing interest-rate differential with the rest of the world. The appreciation had positive wealth effects, encouraging rising consumption and rising imports. The Icelandic exchange rate also appreciated, which fueled an increase in consumption of imported goods.

The commercial banking system expanded at an unprecedented scale: compared to the GDP of Iceland it grew from 170 percent in 2003 to 562 percent by 2006 and further to 971 percent in 2008.³⁷ A large part of the increase in lending from the Icelandic banks took place in other countries than Iceland, but domestic credit also expanded rapidly. Iceland's membership in the European Economic Area (EEA) gave access to European capital markets that made the increase in lending possible. This process gave rise to the idea that Iceland was turning into an international center for finance.³⁸

Given the framework of inflation targeting, the response of the CBI was to raise the policy rate in the hope that a higher policy rate would put a brake on inflation. However, the outcome was the opposite. It contributed to a cumulative process where higher interest rates gave rise to a monetary expansion, not a contraction, and to higher inflation rather than lower inflation.

In short, inflation targeting fueled a highly unstable dynamic process: higher policy rates by the CBI lead to higher asset price, greater private consumption, higher inflation, and higher interest rates. The outcome was growing financial imbalances. Eventually, the process came to a sudden stop. Iceland experienced a deep financial crisis starting in 2007 and peaking in the fall of 2008.

The inflation target and the policy pursued to reach the target was the main factor behind this catastrophic outcome.³⁹ Since the crisis, Iceland has returned to a policy of inflation targeting, while relying on capital controls and macroprudential tools, so-called "inflation targeting plus".⁴⁰ The gray area in Figure 8 illustrates the period with capital controls. Inflation targeting plus has successfully brought inflation down and stabilized it at around 2 percent. However, it is an open question if the CBI will be able to stabilize inflation in the future now that capital controls have been largely abolished – a step taken in early 2017. Comparing the inflation outcome between Sweden (Figure 1) and Iceland (Figure 8), we see that from 2014 onwards inflation has been more stable in Iceland compared to Sweden. To what extent the differences is due to capital controls is uncertain, but it is likely that the controls have increased the CBI's ability to control inflation in Iceland.

³⁷ For data on credit see <https://www.sedlabanki.is/hagtolor/hagtolor>.

³⁸ See various contributions in Aliber and Zoega (2011).

³⁹ See for example Danielson (2008) on the role of the targeting regime of the CBI.

⁴⁰ Capital controls have been lifted over time and were largely abandoned by early 2017, although some restrictions remain. See Central Bank of Iceland (2017) for an assessment of the inflation targeting framework of Iceland before and after the crisis of 2008.

To sum up, inflation targeting does not allow a small country such as Iceland to carry out a fully independent monetary policy without risking grave challenges. In the present globalized world, full monetary policy independence for Iceland requires capital restrictions, judging from Iceland's own recent experience.

An alternative to a specific numerical value for the inflation target is an inflation range. In this case, the central bank does not aim for an exact inflation number but rather it tries to hold inflation within a given range, e.g., within 0 to 4 percent inflation – a range suggested for Sweden by Andersson and Jonung (2017b). By targeting a range rather than a number, the central bank obtains some additional degrees of freedom to set the interest rate based on the state of the domestic economy. However, the increased freedom is still limited by free capital movements across borders.

To conclude, without permanent capital controls – which have negative long-term effects on economic growth – Iceland cannot pursue an independent monetary policy and achieve an inflation target.⁴¹ For this reason, we recommend that Iceland should *not* opt for a flexible exchange rate.

Let us now turn to a fixed exchange rate arrangements in our search for a better alternative.

8. Fixed exchange rate arrangements

There are several types of fixed exchange rate regimes (Table 4). The different regimes are characterized by how easy it is to adjust the exchange rate. Membership in a monetary union represents one extreme, with very high costs for changing the rate. A fixed but adjustable rate against a foreign currency is the other extreme, where the cost of changing the rate is relatively low. With a currency board, it is easier to adjust the rate than in a monetary union but harder than with an adjustable fixed rate

Each stable exchange rate regime has some unique characteristics. However, they also share similar advantages and disadvantages compared to a flexible rate arrangement. Before discussing types of stable exchange rates, we consider their common advantages and disadvantages compared to a flexible rate.

A stable exchange rate facilitates foreign trade, contributing to higher economic growth through greater specialization. The framing of monetary policy becomes a simple task. Theoretically, with a flexible exchange rate the central bank sets the interest rate dependent on the state of the economy. This requires an advanced analysis of the state of the economy to determine what the appropriate interest rate level is. With a stable exchange rate, the central

⁴¹ Even large countries such as the United States and the euro area have for long periods failed to reach their inflation targets. This suggests that inflation targeting in its present form has some major weaknesses.

bank's work is limited to maintaining the fixed rate by shadowing the international interest rate.

A disadvantage of a stable exchange rate is that the exchange rate cannot act as a buffer against economic shocks. A flexible exchange rate may at least partly insulate the domestic economy from some of the effects of either a domestic or an international economic shock. With a stable exchange rate, all adjustments for restoring stability from a shock must come within the domestic economy. The stable exchange rate thus requires that domestic prices and wages be flexible to be viable.

Relying entirely on wage and price adjustments can be difficult, especially if prices and wages are sticky and change slowly. It can also be necessary to use fiscal policy to counter a temporary economic shock. The government thus needs fiscal space to be able to stimulate the economy during a recession and the political strength to reduce demand during a boom.

The strengths and weaknesses of a stable exchange rate are illustrated by Figure 9, which shows an index of the real exchange rate for Denmark, Finland, Norway and Sweden between 1983 and 2017. The record of Iceland is depicted in Figure 10. The real exchange rate is calculated using the nominal exchange rate and the average unit labour cost. The index thus illustrates the country's labour cost in relation to its trading partners. An increase in the index implies that domestic wage costs have increased and a reduction implies that the domestic wage cost has decreased. The index takes the value 100 in 2000Q1.

Denmark is an example of a country with a fixed exchange rate throughout the period. Finland had a fixed rate 1983-1992 and joined the euro in 1999. Sweden had a fixed rate until 1992 and a flexible rate thereafter. Norway had a fixed rate until 1992, a semi-fixed until 2001 and a flexible rate with an inflation target thereafter.

[FIGURE 9]

The Danish real exchange rate has shown moderate fluctuations throughout the period, but there is no trend upwards or downwards. The boom in the 2000s led to an appreciation of the real exchange rate by close to 10 percent. It took Denmark about five years to restore the real exchange rate to the pre-boom level through wage restraint. Thus, average Danish wage growth has been close to the average among its trading partners. In this way, Danish labour market participants have aided the central bank in stabilizing the exchange rate by not putting pressure on it through rapid wage inflation.⁴² This was not the case in Sweden and Finland during the 1980s, where wage inflation eroded competitiveness and forced devaluations of the exchange rate in 1992.

⁴² Likewise, Danish fiscal policy has played a crucial role in creating credibility for the Danish exchange rate peg. See Andersen and Chiriaeva (2007).

Wage inflation in Finland and Sweden was partially the outcome of an uncontrolled domestic economic boom. Lack of confidence in the central banks' commitment to the fixed rate contributed to wage inflation. Finnish developments after Finland joined the euro mirror the Danish experience. Wage increases in Finland have been close to the average of its trading partners and Finland's competitiveness has experienced only minor variations.

Swedish wage growth has also been close to the international average and the Swedish nominal exchange rate versus the euro or the dollar shows no trend upwards or downwards. However, there have been prolonged deviations from the average rate (Andersson 2014). During international recessions such following the dot-com bubble in 2000 and the international financial crisis in 2008/09, the Swedish krona has lost in value. The real exchange rate has thus depreciated, in this way supporting economic growth in Sweden. Most noteworthy, the depreciation in 2009 facilitated recovery of the Swedish economy.

Norway stands out from the other Nordic countries for a major appreciation of the real exchange rate from 2001 until 2012. The appreciation was partly caused by a high central bank interest rate, above the ECB rate, and rising prices for oil, Norway's main export. The boom in the oil sector raised nominal wages. Part of the increase in the real exchange rate was due to wage inflation, although the major part of the rise was due to an appreciating real exchange rate. Normally, an appreciating real exchange rate slows down the economy, but the boom in the oil sector was too strong to be offset by the appreciating real exchange rate. A slowdown in the oil price and lower Norwegian interest rates have caused a depreciation since 2012. The large swings in the real exchange rate clearly have had a negative impact on non-oil exports. Norway's experience also illustrates that the exchange rate in itself is insufficient as economic regulator.

Iceland experienced a similar appreciation of the real exchange rate following the introduction of the inflation target in 2001. The appreciation ended in 2008 (Figure 10) and was followed by a steep depreciation in 2008-2009 and another period of appreciation from 2014-2017. Figure 10 also shows the exchange rate between the ISK and the US dollar and the ISK and the euro. These exchange rates are measured as an index (2000Q1=1000). A higher index number implies a stronger ISK. From 2000 to 2010, most of the variation in the real exchange rate index is due to variations in the nominal exchange rate (especially against the US dollar) and to a lesser extent due to high wage claims. Since 2014 there has been a wage-driven recovery of the real exchange rate in Iceland. As in Norway, changes in the nominal exchange rate have been insufficient to stabilize the domestic economy. Still, the depreciation of the real exchange rate clearly aided the recovery from the financial crisis.

[FIGURE 10]

This analysis reveals that a central bank needs the assistance of the private sector to maintain a stable exchange rate. The Danish case also illustrates that a country where both policy makers and the public are committed to the fixed exchange rate can maintain the rate over long periods. It is especially important that the labour unions support the exchange rate policy

in a country with a high unionization rate. This support was largely lacking in Sweden during the 1980s, in contrast to Denmark, where the public and policy makers have backed up the policy.⁴³

The analysis based on Figure 10 demonstrates that the adjustment process following a sharp rise in the real exchange rate can take a long time if it relies solely on wage restraint. Additional policies can facilitate the return to a stable economy when the possibility to adjust the exchange rate is not available. Fiscal policy can reduce the pain of adjustment. However, it requires fiscal space to run major deficits in a recession. A system of buffer funds is another approach.^{44 45} During normal times, buffers can be created to be used during downturns to stimulate the economy. Several states in the United States have established “rainy day funds” to stabilize their economies.

For a small country such as Iceland that relies on a few export goods, buffering against fluctuations in foreign demand may be crucial. A shock to one sector can easily cause destabilization of the entire economy. Iceland should examine the option to establish stabilization funds or buffer funds if it considers a fixed exchange rate. To avoid political interference, such a system of buffering should be designed as an automatic system that increases and decreases taxation based on observable indicators of economic performance such profit shares, exports, wages and the unemployment rate. Buffer funds may serve as automatic stabilizers during downturns without creating large budget deficits. The exact construction of such funds, which taxes to alter, the size of the variations in taxes and the exact mechanisms that triggers a change in taxation, requires a thorough analysis.

To sum up, to obtain the full benefits of a stable exchange rate, the private sector must support the exchange rate regime by acting according to its implicit rules. Stabilization funds in one form or another could help against large swings in international demand.

8.1 Should Iceland adopt a fixed but adjustable exchange rate?

A fixed but adjustable exchange rate was the dominant exchange rate arrangement from the Bretton Woods period until the introduction of the euro. With growing financial openness, the popularity of fixed rates declined significantly. Financial crises contributed to the decline,

⁴³ Germany during the international financial crisis in 2008-2009 is an example of labour union support for the monetary policy regime is. The relatively quick recovery of the German economy after the crisis is partly accredited to the behaviour of the unions (Möller 2010 and Burda and Hunt 2011). In Sweden, the labour market participants reached an agreement that facilitated adjustment to the same crisis.

⁴⁴ The Finish buffer funds served as an inspiration for the Swedish labour unions in the Swedish referendum on joining the euro in 2003. The labour union movement demanded the establishment of similar funds to buffer against booms and recessions as a prerequisite for joining the euro.

⁴⁵See OECD (1998).

prompting many countries to abandon their fixed rates. Today fewer than 60 per cent of all countries are on a fixed rate arrangement.⁴⁶

Scandinavia provides two interesting observations here – one a failure and one a success. Sweden had a pegged exchange rate in the 1970s and 1980s. Sweden devalued on several occasions to preserve the competitiveness of Swedish industry during these decades. After financial deregulation in the second half of the 1980s and an ensuing credit boom, Sweden suffered from speculative attacks on the krona. Eventually, the Riksbank replaced the fixed exchange rate by a floating rate. Norway and Finland followed a similar path.⁴⁷ On the other hand, Denmark has maintained its fixed rate since 1982. There have been sporadic speculative attacks on the Danish currency, but to no avail.⁴⁸

We do not recommend Iceland to follow the Danish approach of adopting a fixed rate to the euro at this stage. Such a step would require a degree of credibility that Iceland does not command. Financial markets are well aware of the volatile history of the Icelandic currency. As Iceland is much smaller than Denmark, the resources needed to maintain a credible peg for the ISK would come at a much higher price than for Denmark. A fixed ISK would eventually be the subject of speculative attacks – in particular in the absence of Icelandic capital controls. The welfare costs to Iceland of a pegged but adjustable rate would be higher than any conceivable benefits.

8.2 Should Iceland become a member of a monetary union?

A monetary union is a geographical area within which only one type of currency circulates as money that serves as the unit of account, the medium of exchange, and the store of value. Within a monetary union, the exchange rate is by definition irrevocably fixed – unless a country reverts to a new domestic currency. Introducing a new currency, however, is both difficult and costly.

All the members of a monetary union are using the same currency or the same currencies tied to each other at locked rates. *Vis-à-vis* the rest of the world, a monetary union has one exchange rate for converting outside currencies into the common currency.

For a country as small as Iceland, membership in a monetary union would offer several benefits. First, it would facilitate international trade within the monetary union to which Iceland belongs. Second, joining a monetary union would be a way to import monetary stability from the common central bank, fostering macroeconomic stability presuming that the common central bank has a credible policy. Third, membership in a monetary union would

⁴⁶ See Figure 4 in Obstfeld and Taylor (2017).

⁴⁷ See Jonung et al (2009).

⁴⁸ See Gylfason et al (2010).

give Iceland access to international financial markets without the exchange rate risk that an independent currency involves.⁴⁹

These main benefits should be compared to the costs of membership in a monetary union. The prime cost is the loss of an adjustment mechanism. Without a domestic currency, there is no exchange rate to offset the effect of large external shocks. Nor is there an escape clause that would allow the country to leave the union if the membership of the union destabilizes the economy. Adjustments of prices and wages in relation to other countries necessary to maintain international competitiveness are only achievable through flexible domestic wages and prices. Domestic rebalancing can be both difficult and time-consuming, as the experience of the euro area periphery since 2008 illustrates. In Greece, Italy and Portugal prices, wages and living standards have fallen as these economies have regained their economic balance after the financial crisis and the debt crisis. Ireland has fully recovered, but only after suffering several difficult years.

Much of the balance between the benefits and costs of a monetary union hinges upon the importance of having a flexible exchange rate serving as a shock absorber. For a country like Iceland, its monetary history serves as a guide here. As domestic monetary policy in Iceland by tradition has been a source of shocks, this tips the balance in favor of tying the hands of the domestic monetary authorities.

The euro area and the dollar area (the United States) are each an economic and a political union. However, a country can belong to a monetary union without belonging to a political union. In Europe, four small countries (microstates), Andorra, Monaco, San Marino and the Vatican City, use the euro without belonging to the European Union. In addition, Liechtenstein uses the Swiss franc without being in a political union with Switzerland. Several countries in Europe like Albania, Croatia, the Czech Republic and Serbia have widespread use of the euro alongside the national currency. Montenegro and Kosovo are euroised.⁵⁰

For Iceland, there are two possible monetary unions to join, the euro area or the dollar area. The choice is thus between euroisation and dollarisation. The euro is a common currency for invoicing Icelandic exports and imports and is the currency for financial reporting of major export companies as well. This process of euroisation is simple to explain. The EU is the main trading partner of Iceland.⁵¹ Iceland is already a member of EEA (the European Economic Area) and the Schengen area. It is fair to say that Iceland is already a partial member of the EU.

⁴⁹ Iceland was once a part of the Scandinavian currency union (SCU) because of being under Danish rule. The SCU functioned as a successful monetary union from the early 1870s until the outbreak of World War I (Jonung 2007), providing Iceland with the benefits of being a member of a monetary union.

⁵⁰ See Winkler et al (2004) and ECB (2017).

⁵¹ The determinants of euroisation are examined in ECB (2017).

The other Nordic countries, with the exception of Norway, are also geared towards the euro. Denmark has a fixed exchange rate to the euro. Sweden is more or less shadowing the euro, as seen from our previous account of the policy of the Riksbank. Finland and the Baltic countries are euro members. For these reasons, adopting the euro as the currency of Iceland would be more attractive than adopting the dollar.

The adoption of the euro can take the form of either a bilateral (or official) agreement or a unilateral decision. A bilateral route likely implies full membership in the EU. In that case, Iceland may influence monetary policy decisions in the euro area. However, the influence would be small given the size of the Icelandic economy. Joining the EU as a full member would be a very political and time-consuming decision that Iceland does not appear to be ready to take in the near future.

In our view, the most constructive route for Iceland at this stage is to settle for a unilateral approach. A number of steps to increase the domestic demand for euros can be considered. The Icelandic authorities could gradually introduce the euro as a parallel currency.⁵² The euro could even be adopted as legal tender within Iceland at the going market exchange rate. Employers could be encouraged to pay wages in euros and the capital account could be made completely open for transactions in euros. In this way, European commercial banks may feel more welcome to enter Iceland, a country still lacking in presence of foreign-owned commercial banks.

We recommend that such a unilateral route – if taken – should be combined with contacts and an exchange of information with the ECB and the EU.⁵³ We expect the ECB and the EU to be positive towards an increasing use of the euro by Iceland.

Competition between the two currencies, the euro and the ISK, would likely have a positive impact on the performance of the CBI. Eventually, Icelandic coins and notes could easily be converted to euros and taken out of circulation at the going exchange rate. The process can be a gradual one but once it has picked up speed, the actual transformation into the euro area can be rather short in time.

As discussed in the next section, the advantages of a membership in a monetary union discussed above can be obtained by a currency board arrangement for Iceland.

8.3 Should Iceland set up a currency board?

⁵² The use of parallel currencies is common historically. For example, along the border between Canada and the United States, US dollar and Canadian dollar both circulate although US dollars dominates on the US side and Canadian dollars on the Canadian side. Business establishment accept both currencies.

⁵³ For the institutional factors concerning euroisation, see ECB (2017).

A currency board is a form of a monetary union. It “issues notes and coins convertible into a foreign “reserve” currency at a fixed rate and on demand. It does not accept deposits. As reserves, a currency board holds high-quality, interest-bearing securities denominated in the reserve currency. A currency board’s reserves are equal to 100 per cent or slightly more of its notes and circulation, as set by law. (Commercial banks in a currency system need not hold 100 per cent reserves in reserve currency. The board generates profits (seigniorage) from the difference between the interest earned on the securities that it holds and the expense of maintaining its notes and coin circulation. It remits to the government or to another institution all profits beyond what it needs to cover its expenses and to maintain its reserves at the level set by law. The currency board has no discretion in monetary policy; market forces alone determine the money supply. (Here the money supply is defined as the public’s holdings of notes and coins plus deposits held with the commercial banking system.)” (Hanke, Jonung and Schuler 1992, p. 19).

In other words, the currency board is a fixed exchange rate arrangement, similar to a membership in a monetary union. Unlike with a fixed exchange rate system, there is no risk of a devaluation forced upon the country by outside factors, as the international reserves fully cover all domestic notes and coins in circulation plus commercial banks deposits at the central bank (i.e. the monetary base). The board only issues domestic currency to the extent that it has foreign reserves as backing. Table 5 highlights the differences between a typical currency board and a typical central bank.

As a rule, small countries have adopted currency board arrangements.⁵⁴ In the 1990s, several countries in Eastern Europe opted for currency boards. For Estonia and Lithuania, a currency board arrangement with the euro as the reserve currency served as stepping-stones into full membership of the euro area. Outside Europe, Hong Kong is a current example of a “country” with a currency board.⁵⁵

Turning to the case of Iceland, the euro would be the prime candidate to serve as the reserve asset of an Icelandic currency board. The EU is the main trading partner of Iceland and the euro is the main foreign reserve currency for Iceland. Euroisation has already taken place at a considerable scale, as discussed in the previous section (Section 8.2). In our view, a currency board would be a continuation of this process.⁵⁶

A currency board for Iceland based on the euro would have a number of advantages. They are identical to the benefits of membership in a monetary union as outlined in Section 8.2. First, it

⁵⁴ Imam (2010).

⁵⁵ Sometimes the experience of the convertibility plan of Argentina 1991-2002 is viewed as a case of a failed currency board. However, the convertibility plan did not follow the rules of a currency board. See e.g. Hanke (2008) and Spiegel (2002).

⁵⁶ A currency board for Iceland could serve as both a temporary and a permanent solution. The Estonian currency board paved the way for the adoption of the euro as the currency of Estonia. In case Iceland remains outside the EU, the Icelandic currency board would serve Iceland well as a permanent arrangement.

would immediately establish exchange rate stability between the Icelandic currency and the euro. Consequently, the risk premium imposed on Icelandic interest rates due to exchange rate uncertainty would be close to zero. Inflation and interest rates in Iceland would rapidly converge to euro area inflation and euro area interest rates. Eliminating the exchange rate risk would encourage foreign investment in Iceland, including direct investment, which tend to be less volatile than portfolio investment.

A currency board would protect the Icelandic currency from political pressure and manipulation better than the present inflation-targeting regime although the present regime has been isolated from political pressure.⁵⁷ Unfortunately, monetary policy in Iceland has a long record of political entanglement, which still reduces the credibility of the Central Bank of Iceland.⁵⁸ The administration of the currency board would absorb fewer management resources than central banking does at present because a currency board is much simpler to operate effectively. A currency board does not need any proper preconditions to work once it has been set up with sufficient volume of reserve assets. Moreover, a currency board would most likely start with a stronger reputation than the present CBI.

A psychological advantage with a currency board is that Iceland would be able to retain the present currency unit, the króna, denominated in the Icelandic language. This may appeal to nationalistic sentiments. There would still be a national currency as perceived by the public although it would have a fixed value versus the euro.

Converting the CBI into a full-fledged currency board would be easy. The principal steps for such a transformation are described in Hanke, Jonung and Schuler (1992, appendix IV) and summarized in Table 6. An important issue during this transformation concerns the proper size of euro reserves of the commercial banking system. In order to withstand any speculative attack on the commercial banking system, commercial bank deposits must be backed with safe euro denominated assets. A thorough analysis of the appropriate reserve-to-deposit ratio is required.

There is one major drawback with a currency board: Iceland would give up what limited monetary autonomy it has. In normal times, as argued above, this might not come with any major drawbacks. It may actually be a gain considering the past performance of the monetary policy of Iceland. However, it might be a problem if Iceland were to face a deep economic crisis or shock in the future. With a traditional currency board, there is no authority to act as a lender of last resort.

How should this disadvantage be addressed in the case of Iceland? In the traditional case, the role of the central bank as a lender of last resort is to support temporarily ailing banks during a liquidity crisis. In the severe scenario of a solvency crisis, the resources of a central bank are

⁵⁷ A radical solution to minimize political influence on the currency board would be to place its main office outside Iceland, for example in Frankfurt, close to the ECB.

⁵⁸ See chapter 7 in Gylfason et al. (2010), Gylfason (2016) and Sibert (2011).

commonly too limited. In this case, the government, that is, the taxpayers, has to step in – if, unlike the case during the crisis in Iceland in 2008, the banking system is not too big to be saved. This would also be a solution under a currency board. In other words, the resolution of a crisis can be managed by other government agencies than the currency board.

Under a currency board arrangement, the negative effects of a financial crisis can be minimized. One way is to impose strict capital requirements on the commercial banking system to limit the probability of a future banking crisis. A second method is to establish a stability fund in normal times that can step in and lend to ailing commercial banks during a crisis. Of course, there is always the option of allowing a failing bank to fail. Such a policy would reduce the moral hazard involved in any scheme where the government feel obliged to step in to give support.

As monetary history shows, unexpected shocks of great magnitude do occur. Having an escape clause is key to being able to adapt the regime to such shocks. Facing an extreme event, Iceland could always give up the currency board and the fixed exchange rate implied and return to a floating exchange rate in which the currency board would be transformed into a traditional central bank. Compared to a monetary union, a major advantage of the currency board is that it offers such an escape from the fixed exchange rate in case of an extreme event. It would then be possible to return to a currency board after a temporary “time-out”, although with some loss of credibility.

The cost of giving up the currency board should be high, which will ensure that the escape clause would only be used under exceptional circumstances. Strong safeguards should prevent politicians in power from abandoning the currency board at their discretionary will. For example, the constitution of the currency board should state that a supermajority (say, two-thirds) of the Icelandic parliament would be required to abolish the currency board and turn it into a central bank.

9. Which monetary regime is best for Iceland?

Which is the best monetary policy regime for Iceland at this stage? Table 7 summarizes the pros and cons of the various monetary policy regimes discussed above. No regime solves all monetary problems. Each regime has implications for the conduct fiscal policy, the design of financial supervision and the degree of flexibility required in terms of prices and wages.

One approach to find the best regime is through the guidance of monetary history. Our interpretation of the historical record points to five policy lessons: i) rules-based regimes where the monetary authority sticks to the rules last longer than policies based on discretionary policy decisions; ii) no regime has a permanent life – as the economy changes, so does the best choice of regime; iii) escape clauses from the rules are necessary when the rules become destabilizing rather than stabilizing; iv) small countries have great difficulty

pursuing internationally independent monetary policies; and v) real economic and financial stability does not automatically follow from inflation (price) stability.

Based on these lessons we rule out a flexible exchange rate and an inflation target for Iceland. A fixed exchange rate regime is our preferred choice. A pegged exchange rate regime such as Denmark's requires a high degree of trust in monetary policy and it is sensitive to international speculative attacks. A monetary union provides stability but does not offer any escape clause.

Consequently, we suggest that Iceland set up a currency board with the euro as the reserve currency. The króna would persist as the currency unit of Iceland, with the euro circulating as a parallel currency. A currency board would remove the devaluation (exchange rate) risk while giving similar benefits as a monetary union. In addition, a currency board would permit an escape clause if Iceland would be struck by an exceptionally large economic crisis. Using the escape clause should be costly to prevent the Icelandic government from breaking the rules of the currency board under normal circumstances.

A currency board would provide transparent and strict policy rules that make monetary policy predictable and credible. The international value of the króna would be fixed, which would enhance foreign trade. On the negative side, a currency board only delivers monetary stability. It is not sufficient for macroeconomic or financial stability. Without a flexible exchange rate as a buffer against external shocks, domestic prices and wages must be flexible to adjust to changes in competitiveness. The sole task of a currency board would be to exchange króna for euros. It would have no ability to finance government deficits or act as the lender of last resort during a banking crisis.

The introduction of a currency board should be accompanied by a wide-ranging reform package to foster fiscal stability, wage and price flexibility, and financial stability. These reforms should be undertaken preferably before or at least at the same time as the currency board is established. We suggest that Iceland consider a system of independent buffer funds to help stabilize the economy due to variations in international demand for its exports. Such funds will help to stabilize the economy and reduce the need for wages and prices to adjust.

All monetary policy regimes require the support of both the government and the general public. The first step to establish a currency board would be an open and frank dialogue with the Icelandic population about the pros and cons of the board. The aim of the debate would be to inform the public of the reasons to shift to a currency board. Such an open debate is necessary to build trust in the future monetary policy of Iceland.

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Table 1. Monetary policy regimes in Sweden 1834-2017

Regime	Introduced	Lasted (years)
Silver	1834	39
Gold	1873	41
Paper	1914	7
Gold bullion (de facto)	1922	9
Price level targeting	1931	2
Fixed vs British pound	1933	6
Fixed vs US dollar	1939	12
Member of Bretton Woods	1951	22
Member of Currency snake	1973	4
Fixed vs currency basket	1977	14
Fixed vs ECU	1991	1
Inflation target announced	1993	---
Inflation target came into effect	1995	22 (so far)

Source: Jonung (2000). <https://www.nationalekonomi.se/filer/pdf/28-1-lj.pdf>

Table 2. Macroeconomic performance under three monetary regimes in Sweden.

Performance Measure		Bretton-Woods 1953-1972		Full Employment 1973-1992		Inflation target 1995-2016	
Monetary	CPI-inflation (%)	3.8 (2.0)		8.3 (2.8)		1.1 (1.2)	
	CPIF-inflation (%)	---		---		1.5 (0.7)	
	GDP-deflator (%)	4.0 (2.0)		8.4 (2.7)		1.7 (0.8)	
Fiscal	Budget balance (% of GDP)	-1.2 (1.0)		-5.3 (3.9)		-0.1 (2.8)	
Trust in policy	Expected inflation, households (%)	---		6.3 (1.7)		1.9 (0.6)	
	Wage contracts (length years)	1.75		1.46		2.80	
Real economy	Economic growth (GDP, %)	4.1 (1.3)		1.5 (1.7)		2.6 (2.3)	
	Livnig standard GDP/capita, %)	3.3 (1.6)		1.5 (1.7)		2.0 (2.4)	
	Productivity (GDP/h, %)	4.4 (1.5)		1.5 (1.4)		1.8 (1.7)	
	Unemployment (%)	2.0 (0.7)		3.1 (1.1)		7.8 (1.4)	
Financial sector		Nominal	Real	Nominal	Real	Nominal	Real
	Credit to private sector (%)	9.5 (2.8)	4.6 (4.4)	12.2 (4.2)	3.8 (5.5)	6.6 (4.7)	5.5 (5.5)
	Credit to households (%)	---	---	10.2 (5.5)	2.9 (8.0)	7.0 (2.9)	5.9 (3.8)
	House prices (%)	5.2 (2.7)	-2.1 (3.6)	8.2 (7.7)	0.4 (8.4)	6.4 (3.9)	5.3 (4.2)
	Share price index (%)	8.4 (17.0)	4.6 (19.2)	15.8 (26.0)	7.4 (26.9)	10.4 (21.7)	9.3 (21.8)

Note: a. The “best” outcome is highlighted in grey. b. data on credit to households is only available from 1981 and onwards. c. wage contracts only for period 1952-2005. Updated version based on Jonung (2015).

Table 3. Reaction functions of the Swedish, Icelandic and German central banks, 1995-2017.

	Sweden			Iceland		Germany (ECB)	
	1995Q1- 2017Q2	2001Q1- 2007Q2	2011Q1- 2017Q2	2001Q1- 2007Q2	2011Q1- 2017Q2	2001Q1- 2007Q2	2011Q1- 2017Q2
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$\Delta i_{t-1}^{Domestic}$	.38 (.07)	-.19 (.04)	.22 (.22)	.30 (.21)	.14 (.16)	.23 (.23)	-.30 (.29)
$\Delta i_t^{Germany}$	.32** (.13)	.30 (.35)	.93** (.36)	-.64 (.81)	.61 (.67)		
Δi_t^{USA}	.12* (.06)	.12 (.10)	.19 (.41)	.68** (.24)	-.93 (.75)	.21** (0.08)	.09 (.25)
$\Delta \pi_{t-1}^{Domestic}$	.19*** (.06)	.07 (.11)	-.09 (.11)	.12 (.14)	.19* (.09)		
$\Delta \pi_{t-1}^{Germany}$	.04 (.08)	-.03 (.15)	-.04 (.14)	-.28 (.35)	.15 (.25)	.05 (.14)	-.12 (.12)
$\Delta \pi_{t-1}^{USA}$	-.13 (.14)	-.04 (.10)	-.04 (.08)	.38* (.21)	-.31 (.24)	-.03 (.08)	.13 (.08)
$\Delta u_{t-1}^{Domestic}$	.08 (.10)	-.12 (.27)	-.16 (.25)	-.01 (.21)	.03 (.11)		
$\Delta u_{t-1}^{Germany}$	-.31** (.14)	-.71** (.28)	-.32 (.51)	-.64 (.62)	-1.27 (.90)	-.48** (.20)	-.78** (.31)
Δu_{t-1}^{USA}	.30 (.28)	.50 (.45)	.27 (.23)	-.35 (.60)	-.53 (.44)	-.20 (.26)	.19 (.19)
$\Delta e_{t-1}^{domestic}$	.00 (.01)	.02 (.02)	.00 (.01)	-.05*** (.02)	.02 (.02)	.00 (.03)	.00 (.01)
Constant	.01 (.02)	0.00 (.02)	-.02 (.08)	.09 (.10)	-.12 (.14)	.00 (.10)	-.11** (.04)
Adjusted R ²	.81	.53	.33	.66	.26	.66	.24

*, **, and *** denotes statistical significance at the 10%, 5% and 1% level respectively.

Note: parameters that are statistically significant at the 5% significance level are highlighted in grey.

Table 4. Alternative exchange-rate arrangements. A stylized view.

A. Fixed exchange rates

- A1. Truly fixed rates: a monetary union with a common currency (euro area)
- A2. Fixed, adjustment possible but difficult: currency board (e.g., Hong Kong)
- A3. Fixed, adjustment possible but difficult: commodity money (e.g., gold, silver)
- A4. Fixed but adjustable: fixed exchange rate vs other currency or basket of currencies (e.g., Bretton Woods, ERM)

B. Floating exchange rates

- B1. Rules-based systems: inflation targeting (Sweden, UK, euro area), monetary targeting (Bundesbank pre-1999)
 - B2. Rules-based systems: multiple goals (inflation, employment) (United States)
 - B3. Discretionary systems: no fixed rules
-

Source: Updated version of Table 1 in Bordo and Jonung (1997, p 290). The table ignores the use of capital controls that enhance domestic monetary independence regardless of the regime adopted.

Table 5. A typical currency board versus a typical central bank.

<i>Typical currency board</i>	<i>Typical central bank</i>
Fixed exchange rate to the reserve currency	Floating or fixed exchange rate
Supplies only notes and coins in domestic currency	Supplies notes, coins and deposits in domestic currency
Foreign reserves of minimum 100 per cent	Variable foreign reserves
No independent monetary policy	Independent monetary policy
Not a lender of last resort	Lender of last resort
Not a regulator of commercial banks	Sometimes regulator of commercial banks
Protected from political pressure	Often politicized
Cannot finance spending by domestic government	Can finance spending by domestic government
Small staff	Large staff
Rapid monetary reform	Slow to reform

Note: The characteristics listed above are those of an “average” currency board or central bank, not of a theoretically ideal currency board or central bank.

Source: Revised version of Table 1.1 in Hanke, Jonung and Schuler (1993, p 6).

Table 6. How to convert a central bank into a currency board: a stylized approach.

-
1. Delegate to other bodies all central banking functions that do not directly concern influencing the supply of money
 2. Abolish the central bank's power to create credit
 3. Separate the central bank's commercial banking functions (if any) from its currency issuing functions
 4. Make sure that the existing reserves of commercial banks are sufficient
 5. Convert all remaining commercial bank reserves with the central bank into currency board notes and coins or into foreign assets, as the commercial banks prefer.
 6. Fix an exchange rate
 7. Ensure that foreign currency reserves are equal to 100 per cent of the note and coin circulation
 8. Transfer the remaining assets and liabilities of the central bank to the new currency board and open the board for business
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Note: This list is taken from Hanke, Jonung and Schuler (1992, appendix IV).

Table 7. Pros and cons of various monetary policy regimes. A stylized view.

Regime	Pros and cons
Inflation targeting	<p style="text-align: center;"><i>Pros</i></p> <ul style="list-style-type: none"> i) Monetary independence implying that the policy rate can be geared towards domestic conditions. ii) The exchange rate may serve as a buffer against big economic shocks. iii) In principle, no need for foreign reserves held by the central bank.
	<p style="text-align: center;"><i>Cons</i></p> <ul style="list-style-type: none"> i) Monetary independence restricted by global financial linkages for a very small economy like Iceland. (Capital controls may be used to increase independence.) ii) Exchange rate volatility in a very small economy like Iceland may reduce welfare. iii) In practice, large foreign reserves may be needed for a small open economy like Iceland. iv) Qualified professionals needed for the management of the central bank.
Fixed exchange rate	<p style="text-align: center;"><i>Pros</i></p> <ul style="list-style-type: none"> i) Facilitates trade. ii) Can achieve price stability by tying the exchange rate to a low inflation country. iii) The exchange rate can be changed in Escape clause possible if something goes wrong (i.e., devaluation).
	<p style="text-align: center;"><i>Cons</i></p> <ul style="list-style-type: none"> i) Monetary policy dependent on global interest rate. ii) Requires a credible policy. Risk premium can be high, depressing the domestic economy. iii) Invites speculative attacks on the fixed rate.
Currency board	<p style="text-align: center;"><i>Pros</i></p> <ul style="list-style-type: none"> i) Facilitates trade. ii) Can achieve price stability by tying the exchange rate to a low inflation country. iii) Instant monetary credibility. iv) Possible to revert to the national currency in case of extreme crisis.
	<p style="text-align: center;"><i>Cons</i></p> <ul style="list-style-type: none"> i) No monetary independence. ii) Foreign reserves necessary to set up the board (though in practice this problem has proved easy to address).
Monetary union	<p style="text-align: center;"><i>Pros</i></p> <ul style="list-style-type: none"> i) Facilitates trade. ii) Domestic policy credibility imported through monetary unification. iii) No foreign currency reserves needed. iv) Limited management resources necessary for running a monetary union.
	<p style="text-align: center;"><i>Cons</i></p> <ul style="list-style-type: none"> i) Monetary policy dependent on global interest rate. ii) In case of crisis, no escape clause is available through changes in the national currency. iii) Difficult to revert to domestic currency during a crisis.

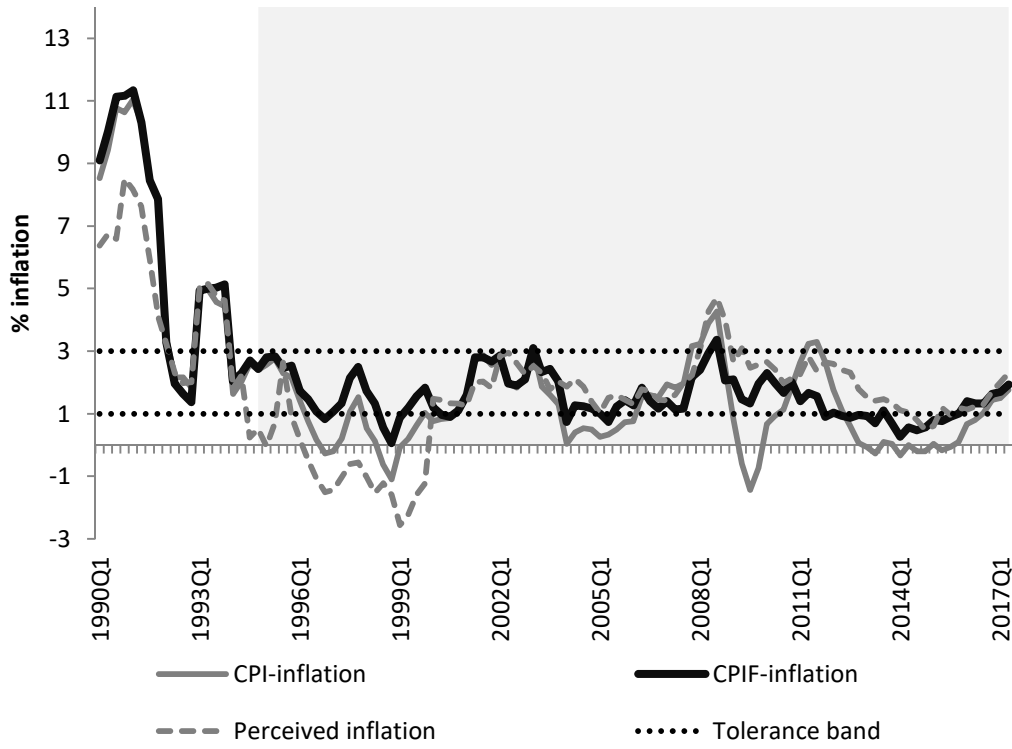


Figure 1. Inflation in Sweden according to the CPI-index and the CPIF-index from 1990Q1 to 2017Q2.

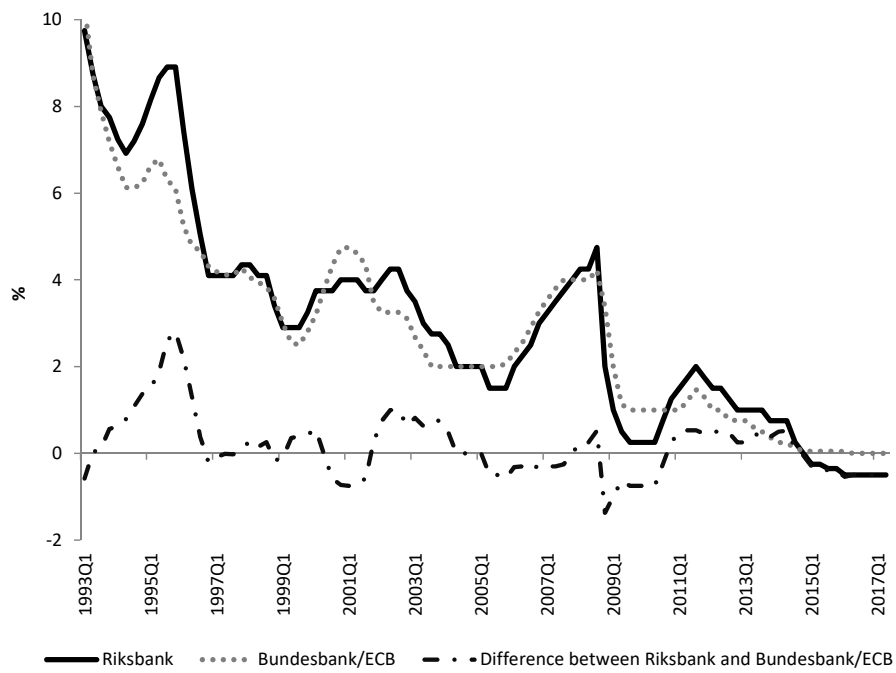


Figure 2. The central bank policy rate in Germany and Sweden, 1993Q1 to 2017Q2.

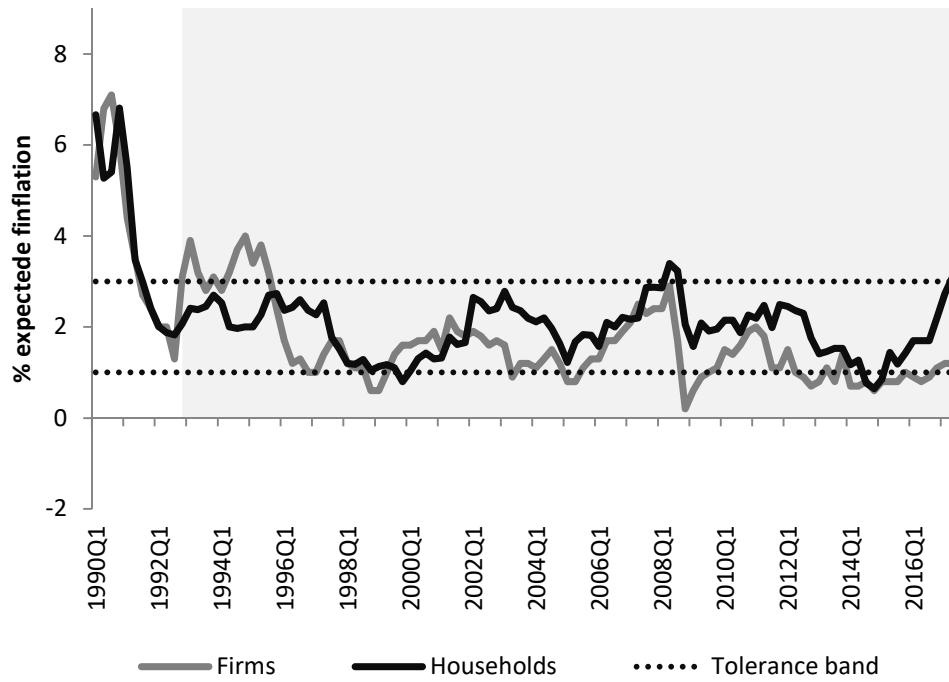


Figure 3. Expected inflation 12 months ahead for households and firms from 1990Q1 to 2017Q2 in Sweden.

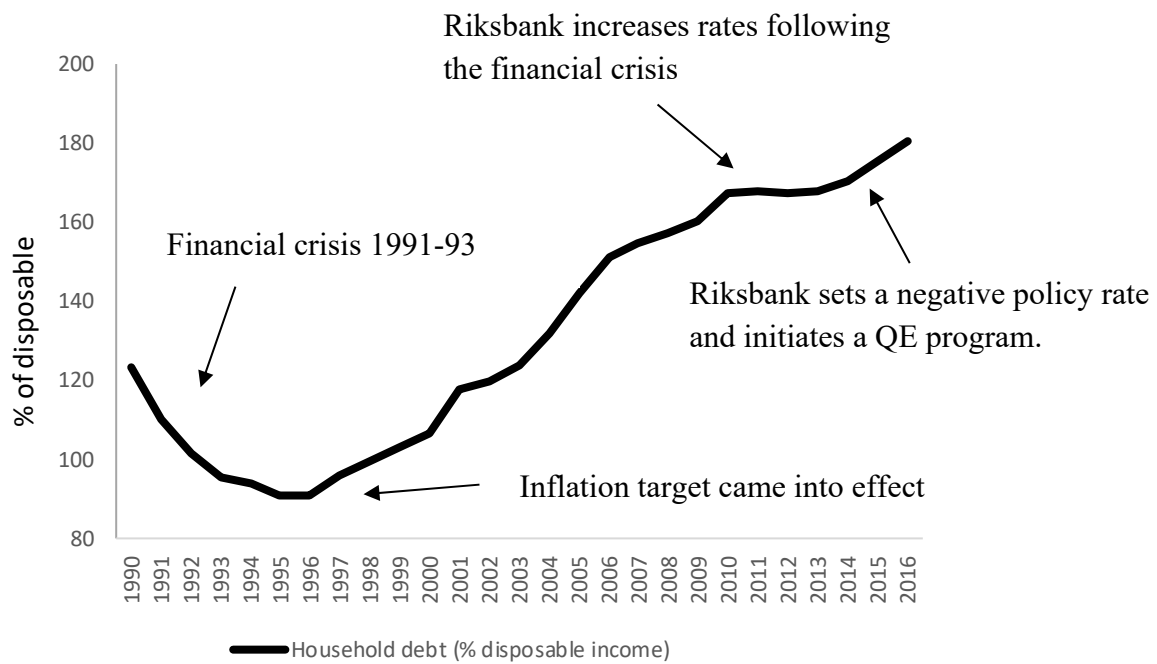


Figure 4. Household debt as percent of disposable income in Sweden, 1990-2016.

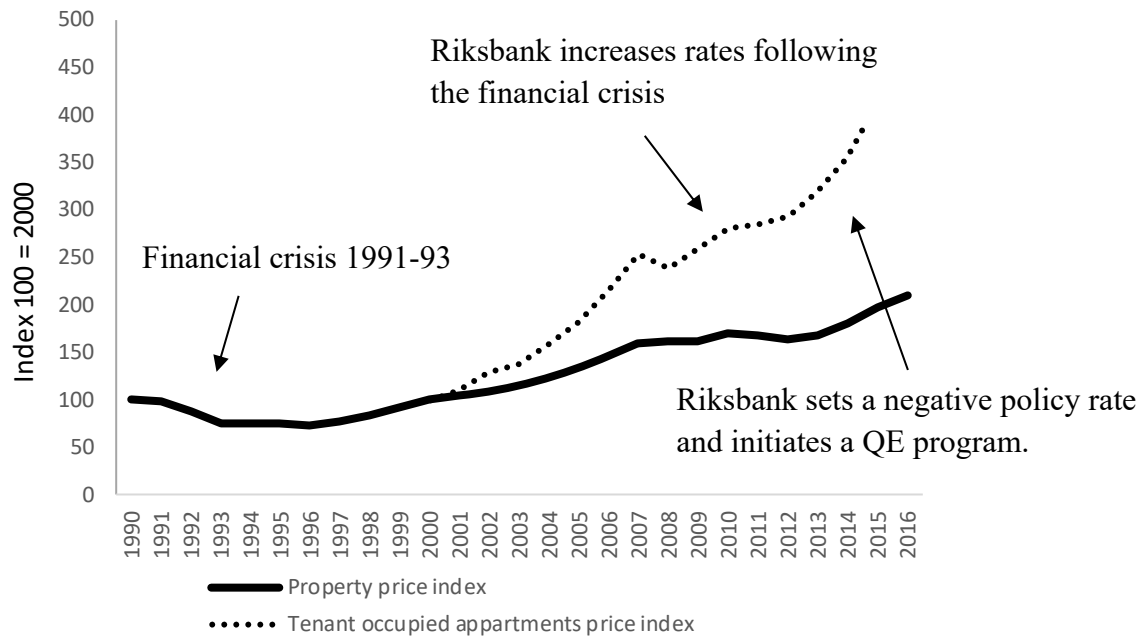


Figure 5. Real property price index and real tenant-occupied apartment price index in Sweden, 1990-2016.

Note: Price index for tenant-occupied homes is only available after the year 2000.

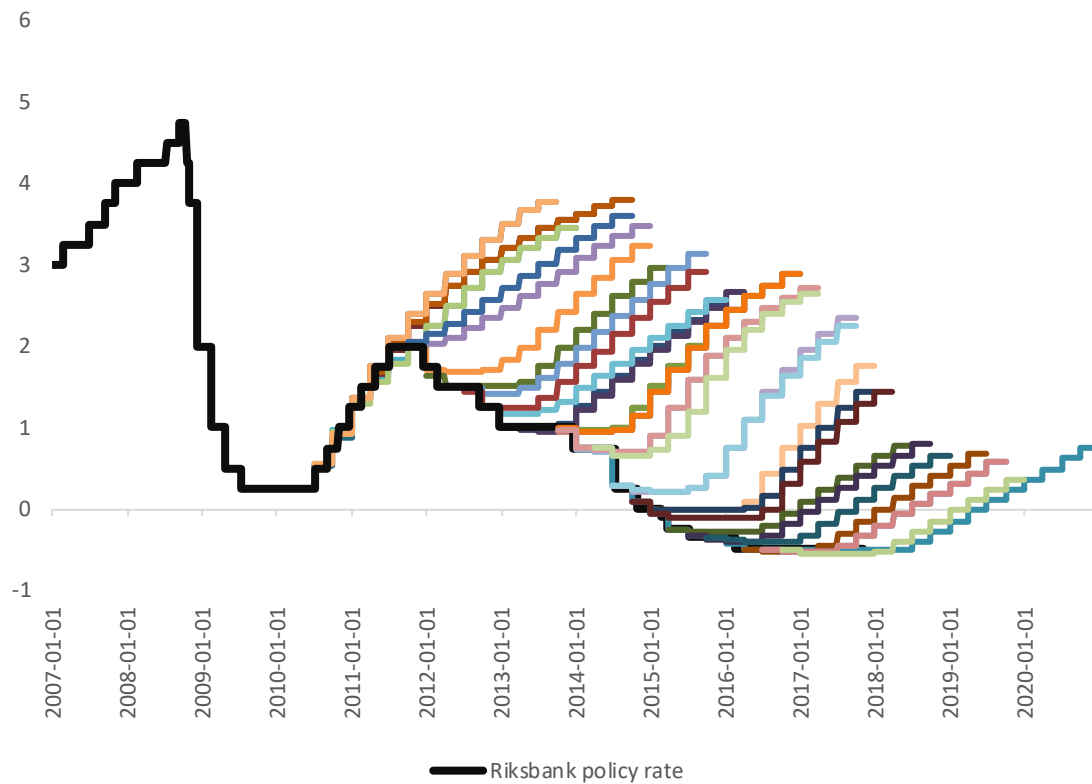


Figure 6. The Riksbank repo rate 2007-2017, and the Riksbank's forecasted repo rates 2010-2020.

Note: The actual repo rate is the black line. All other lines in color are the forecasted future rates.

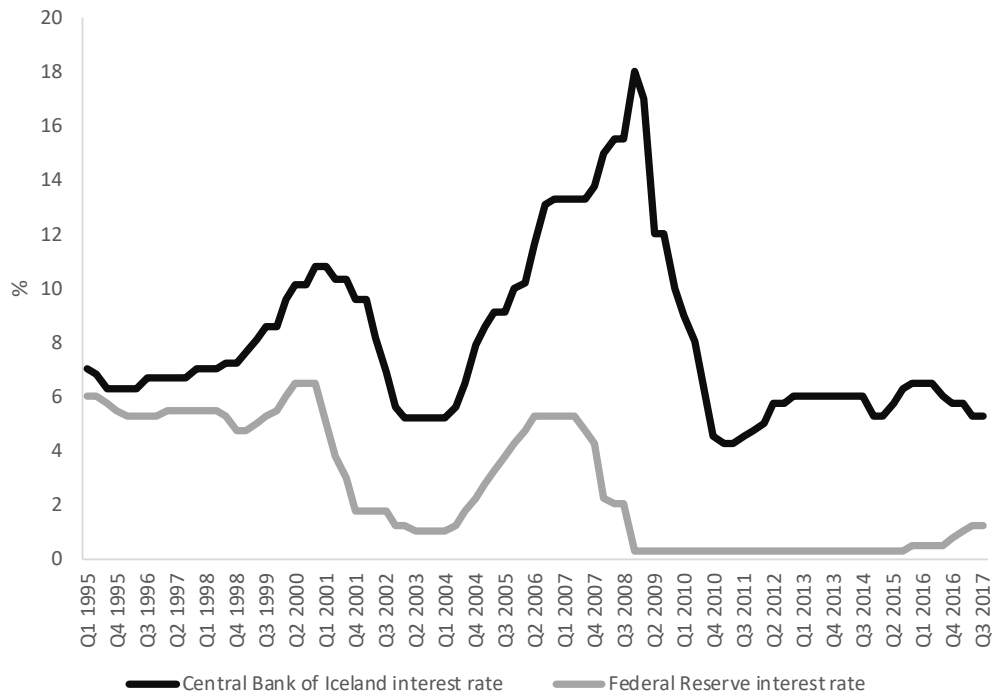


Figure 7. The Central Bank of Iceland policy rate, and the inflation rate of Iceland and the Federal Reserve interest rate, 1995-2017.

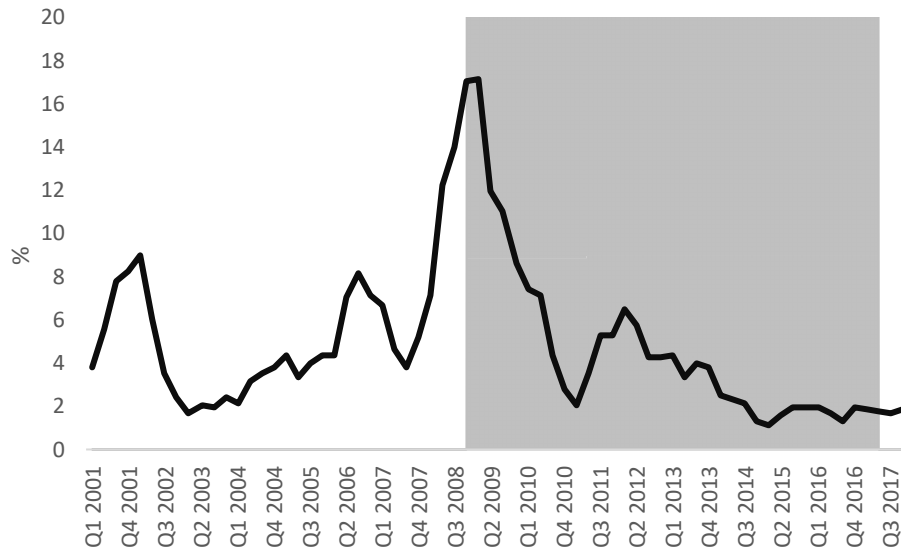


Figure 8. The inflation rate of Iceland, 2001Q1 to 2017Q4. Gray area illustrates the period with capital controls.

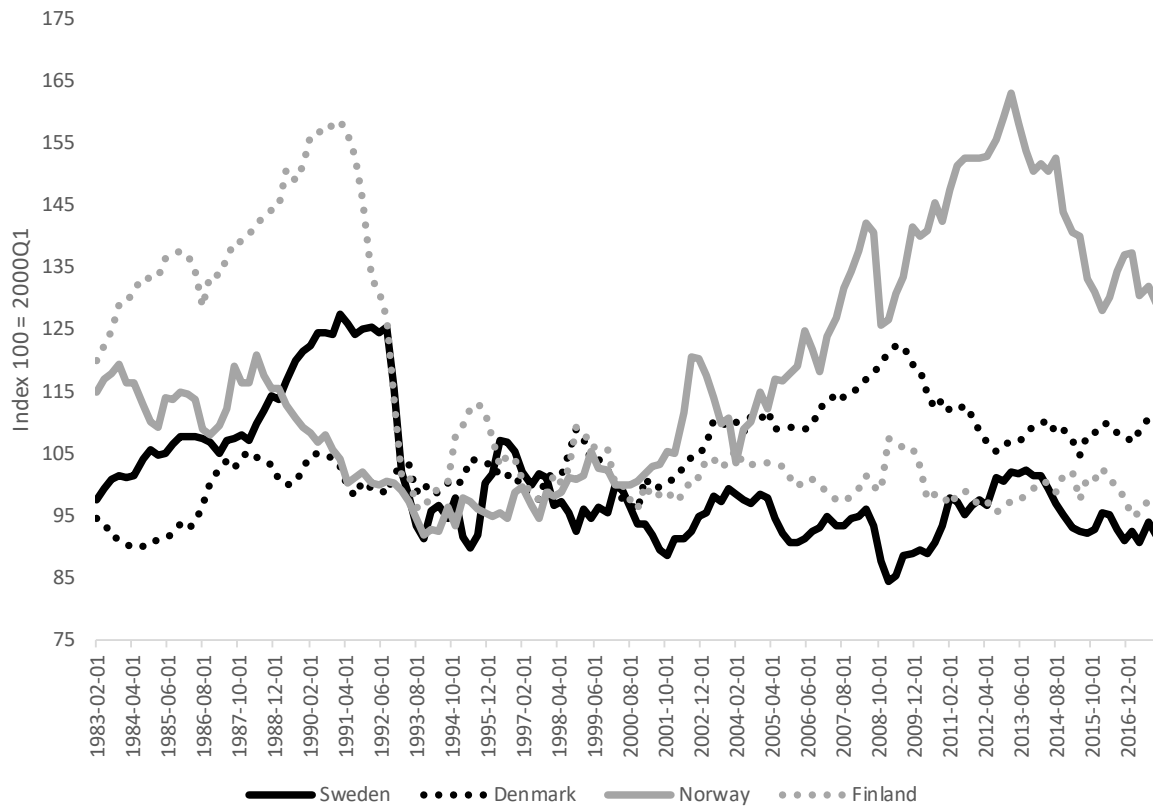


Figure 9. Real exchange rate index (2000Q1=100) for Denmark, Finland, Norway and Sweden, 1983-2017.

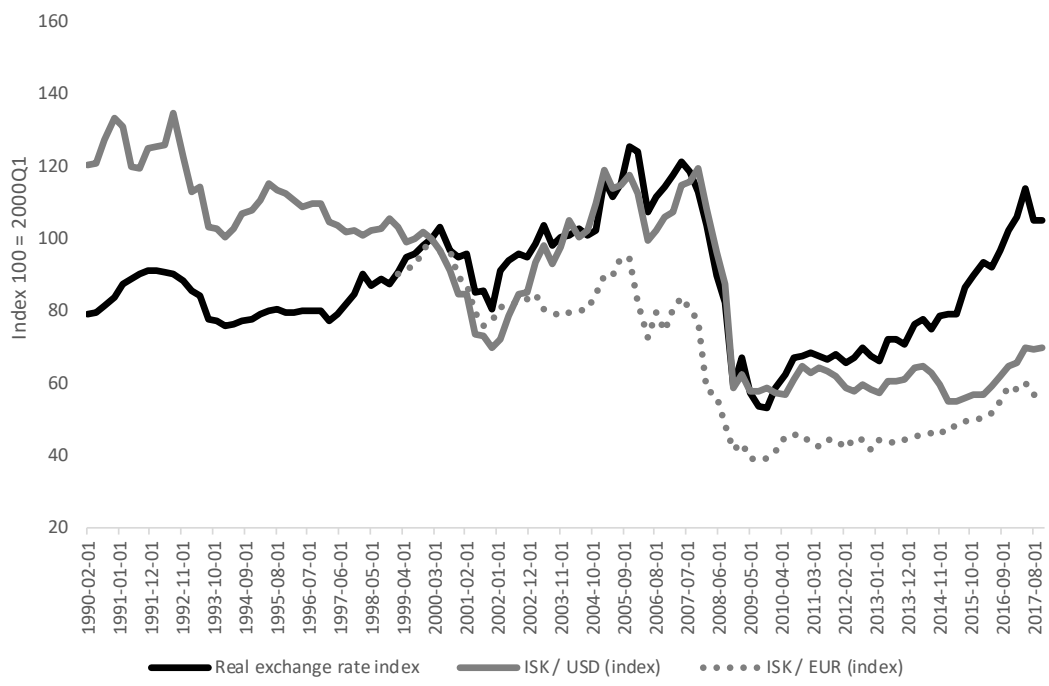


Figure 10. Real and nominal exchange rate indices for Iceland, 1990-2017.