
# Sveriges Riksbank Economic Review

2025 no. 1

S V E R I G E S  R I K S B A N K

**Sveriges Riksbank Economic Review**

Issued by Sveriges Riksbank

Editors: Marianne Nessén and Ulf Söderström

Advisory editorial committee: Mikael Apel, Anders Kärnä, David Kjellberg, Katja Rehnberg Taylor and the Communications Division
Sveriges Riksbank SE-103 37 Stockholm
Telephone +46 8 787 00 00



The Review is published on the Riksbank's website
www.riksbank.se

ISSN 2001-029X

# Dear readers,

This issue of the Economic Review contains three articles, each dealing with developments in inflation targeting from different perspectives. The first article summarises a research conference on inflation targeting organised by the Riksbank in May 2024. One of the papers from the conference is reproduced here in full as the second article. The final article provides a broad description of the evolution of inflation targeting.

- **The quest for nominal stability: lessons from three decades of inflation targeting**

  *Stefan Laséen, Marianne Nessén* and *Ulf Söderström*, all of whom work at the Riksbank, summarise the six papers presented at an international research conference in Stockholm in May 2024 and the discussions that took place at the conference. The conference brought together a large number of researchers and practitioners with extensive experience in inflation targeting.

- **Inflation targets: practice ahead of theory**

  *Mervyn King*, former Governor of the Bank of England, describes the practical evolution of inflation targeting, which initially focused on creating transparent processes for monetary policy decision-making. He also makes recommendations on how inflation targeting should be developed in the future.

- **30 years of inflation targeting: from simple to complex**

  *Magnus Jonsson* and *Anders Vredin*, both employees at the Riksbank, describe the development of inflation targeting from a practical, theoretical and institutional perspective. Approaches to inflation targeting have evolved over time as the macroeconomic and financial environment has changed.

Read and enjoy!
Marianne Nessén and Ulf Söderström

# Contents

# The quest for nominal stability: lessons from three decades of inflation targeting

Stefan Laséen, Marianne Nessén and Ulf Söderström*
Stefan Laséen and Marianne Nessén are senior advisors at the Riksbank's Monetary Policy Department, Ulf Söderström is Head of the Riksbank's Research Division.

Over the past 30 years, inflation targeting has emerged as the dominant approach to conducting monetary policy. To reflect on this development and draw lessons for the future, Sveriges Riksbank organised a conference on 23–24 May 2024, titled '*The quest for nominal stability: Lessons from three decades with inflation targeting*'. The conference brought together leading researchers, economists, and policymakers to discuss experiences, challenges, and areas for improvement in inflation targeting. This article summarises the presentations and discussions from the conference, highlighting new insights into the role of monetary policy in a changing world and strategies to strengthen the framework for future challenges.

## 1 Introduction

Inflation targeting has long guided monetary policy in many developed countries and has also become more common in emerging economies. An inflation targeting policy means that the central bank has a numerical target for the inflation rate, set either by the central bank itself or by the country's Government or Parliament. The central bank then independently uses monetary policy instruments – primarily the policy rate – to stabilise inflation around the target.

The Reserve Bank of New Zealand was the first to introduce inflation targeting in 1989. Other central banks, such as the Bank of Canada, the Bank of England, and the Riksbank, followed in the early 1990s, and Norway in the early 2000s. Inflation targeting has proved to be a successful strategy. Until the upturn in inflation in 2021–22, the average rate of inflation in Sweden, Norway and the United Kingdom was around 2 per cent or slightly below, that is, significantly lower than the double-digit levels that characterised the 1970s and 1980s. Even during the high inflation of recent years, caused by historically large and unusual shocks, the inflation targeting regime has helped to moderate inflation without imposing excessively high real economic costs. This is partly due to the fact that inflation expectations have been significantly more stable compared to previous episodes of high inflation.

* We thank Martin Flodén, Jesper Lindé, Torsten Persson and Anders Vredin for valuable comments on the article. The opinions expressed in this article are the sole responsibility of the authors and should not be interpreted as reflecting the views of Sveriges Riksbank.

This success story, as well as the challenges that inflation targeting has faced over the years, formed the background for a conference organised by the Riksbank on 23–24 May 2024 entitled '*The quest for nominal stability: Lessons from three decades with inflation targeting*'. The conference consisted of six panel discussions, with each panel being initiated by a main speaker who presented a research paper. This was followed by two commentators who gave their views on the paper and related questions, and a general discussion in which all conference participants were given the opportunity to participate. The participants at the conference consisted of academic researchers and economists, as well as decision-makers from central banks and international organisations. The programme for the conference is available in the Appendix.

This article summarises the presentations and discussions at the conference. One of the conference papers, by Lord Mervyn King, is published in full in this issue of the Economic Review.[1]

## 2 Institutions that foster nominal stability

The first panel of the conference discussed the institutional arrangements to foster nominal stability. **Guido Tabellini** (Bocconi University in Milan) presented a paper titled 'Optimal contracts and inflation targets revisited' written together with **Torsten Persson** (the Institute for International Economic Studies at Stockholm University). The starting point of the paper is the research conducted during the 1970s, 1980s and 1990s to analyse the causes of high inflation and how institutions can be designed to reduce the likelihood of high inflation.

Inflation targeting was introduced in several countries during the late 1980s and early 1990s, after a period of high and variable inflation. A central idea in the academic literature that underpinned the reforms was that high inflation was not a policy mistake but a result of systematic incentives. The view was that it paid off for politicians to stimulate the economy in the short term, which, however, led to higher inflation. In this way a so-called 'inflation bias' arose. The main objective of introducing an inflation target delegated to an independent central bank was to create incentives for those who governed the central banks to focus on low and stable inflation. Thirty years later, we can conclude that the new framework gave credibility to low inflation.

However, after the global financial crisis of 2008–09, a new problem arose, that inflation was instead too low. As it was not considered possible to lower the policy rate sufficiently far below zero per cent, the central banks' most important tool was constrained. This made it difficult for central banks to conduct monetary policy that was sufficiently expansionary to make inflation rise toward the target. The question posed by Persson and Tabellini is how institutions should be designed not only to keep inflation and expectations low during normal times but also to keep inflation

[1] Most papers and presentations from the conference are available on the Riksbank's website: The quest for nominal stability: Lessons from three decades with inflation targeting 23–24 May 2024 | Sveriges Riksbank. Video recordings from the various panel discussions are also available on the website.

expectations up during periods when monetary policy is constrained and cannot be made sufficiently expansionary.

The previous academic literature has analysed a one-sided credibility problem that deals with measures to avoid excessive inflation. In their paper, Persson and Tabellini analyse a situation with another credibility problem – avoiding inflation becoming too low. They use a simple model in which production and demand in an economy are determined and influenced by one another, by monetary policy and by various shocks. The role of monetary policy is to stabilise inflation and resource utilisation when shocks occur. At the same time, monetary policy faces two credibility problems.

On the one hand, what is called an *inflation bias* arises, which means that the central bank, in the absence of binding commitments, tends to conduct an overly expansionary monetary policy. This is because the equilibrium level of economic activity is often considered to be lower than the level the central bank seeks to maximise welfare. To try to raise activity to a higher level, the central bank stimulates the economy, which leads to higher inflation than is compatible with the inflation target.

On the other hand, there is another credibility problem that concerns a *deflation bias*. This problem arises when the central bank faces a lower bound for the policy rate and is unable to lower the interest rate sufficiently to stimulate the economy in the event of major negative shocks. The result is a situation with too low inflation and sometimes deflation, which can exacerbate economic downturns and lead to a deeper recession.

Persson and Tabellini first show that if a central bank, acting in an economy with these dual credibility problems, is able to commit itself to an optimal monetary policy, the average inflation rate will be higher than the inflation target. However, if the central bank cannot commit itself (that is, it acts under *discretion*), the outcome becomes more uncertain. Average inflation can either exceed or fall below the inflation target, depending on which of the two credibility problems weighs the heaviest. For example, the inflation bias may dominate if the central bank prioritises increasing resource utilisation, while deflation bias may dominate if the lower bound is binding with sufficiently high probability. This result is similar to insights in previous studies, for example Eggertsson and Woodford (2003).

The new issue analysed by Persson and Tabellini is how a contract between the central bank's principal ('the state') and a central bank acting under discretion in an environment with these two credibility problems can best be designed. The principle is to give the central bank incentives to act in such a way that the economy develops as close as possible to the commitment solution.[2] Persson and Tabellini show that such a contract means the central bank shall only be held liable when the interest rate is above its lower bound. The contract can also include both rewards and penalties, depending on how likely it is that the interest rate reaches the lower bound. If inflation deviates from the target, for example, the state can 'punish' the central

[2] Persson and Tabellini (1993) and Walsh (1995) analyse optimal contracts in an environment with only the classic inflation bias problem.

bank. If the probability of the policy rate hitting its lower bound is higher (or if the consequences are worse), the central bank should place greater emphasis on avoiding high inflation. This is similar to the traditional inflation targeting policy, but with a higher inflation target.[3]

How much higher should the inflation target be? The model in the paper is too simple to give a complete answer, but a calibration shows that the optimal inflation target can be between 2.5 and 3 per cent if the 'true' target is 2 per cent. The analysis also shows that one should only hold the central bank responsible for reaching the inflation target when the policy rate is above its lower bound, and that the central bank should attach equal importance to inflation above and below the inflation target.

Finally, Persson and Tabellini discuss possible directions to expand the analysis. Among other things, they advocate that the central bank should take financial stability into account in monetary policy. For example, quantitative easing can be used to reduce the risk of financial crises, but it can also create vulnerabilities if too much liquidity is created in the economy.

The paper was commented on by **Carl E. Walsh** (University of California, Santa Cruz) and **Donald Kohn** (Brookings Institution and former Vice Chair of the Board of Governors of the Federal Reserve System). **Walsh** agreed that it is important to take into account the incentives of decision-makers when studying how central banks should be governed, and argued that the analysis of Persson and Tabellini raises many new questions about how to design institutions in more complicated contexts than those analysed in the previous literature. Walsh said that there are also questions about how monetary policy can be made more robust against uncertainty, how central banks communicate about monetary policy and its possibilities, and what is the optimal level of the inflation target, because different agents in society are affected in different ways by inflation.

**Kohn** discussed four conclusions from the paper, partly in light of the Federal Reserve's reviews of its monetary policy strategy.[4] One conclusion is that monetary policy and the fulfilment of inflation targets should only be evaluated when the central bank has not been limited by the lower bound of the policy rate. Kohn argued that this is similar to the Federal Reserve strategy with an average inflation target, where the aim is for inflation to be above the target if it has been below the target for some time. A second conclusion is that the inflation target should be raised to reduce the risk of hitting the policy rate's lower bound. Kohn pointed out that it is important to take into account that higher inflation entails costs, such as the increased difficulty in interpreting the signals sent by price changes in a market economy. A third conclusion is that monetary policy needs to take financial stability into account. Here, Kohn believed that there are risks, such as inflation being too low, so it is better to develop macroprudential instruments to manage risks to the financial stability. It is

[3] Svensson (1997) has previously shown that an optimal central bank contract can be likened to an inflation target.

[4] The Federal Reserve conducts a review of its monetary policy strategy every five years. The next review is planned for 2025.

possible that quantitative measures can be tailored to manage financial stability risks without major effects on inflation and output. Finally, the fourth conclusion is that the accountability differs, depending on the regime in which the central bank has been. Kohn said that this would be very complicated in reality. Kohn also believed that accountability is in practice not so much about the design of contracts, but rather about public hearings, appointments and external evaluations (as in Sweden), and that the central bank's communication needs to be effective and directed towards more target groups.

# 3 Flexible inflation targeting

The second panel discussed how 'flexible' inflation targeting should be, that is, how much weight monetary policy should give to stability in inflation relative to the real economy. **Michael Woodford** (Columbia University in New York) presented a paper titled 'Flexible inflation targeting as optimal stabilization policy' written together with **Gauti Eggertsson** (Brown University).

The paper is based on an analysis made by Svensson (1999), which shows that an optimal monetary policy with a flexible inflation target can be described as a 'target criterion', where the central bank strikes an optimal balance between inflation and real economic stabilisation, rather than as a simple rule for the central bank's policy rate. However, the exact nature of the optimal balance, and which measure of real economic stability should be used, depend on the underlying model that is used. In early theoretical analyses of flexible inflation targeting, the importance of real economic stability was relatively small (see Woodford 2010).

Eggertsson and Woodford begin by showing how an optimal monetary policy looks in a simple New Keynesian model with sticky prices, in which monetary policy is designed to maximise the welfare of an average household. In this type of model, the measure of the real economy to which monetary policy is to be adjusted will be given by an output gap, that is, how aggregate output deviates from its efficient level, and inflation will develop proportionally to the change in the output gap rather than to its level. The weight of the output gap is determined by how often firms can change their prices and how close substitutes different goods in the economy are. A typical calibration of the model implies that the weight placed on real economic stability is low. This means that the main task of the central bank is to keep inflation stable around the target.

They then extend the analysis in different directions to see how the optimal target criterion for monetary policy is affected by assumptions in the model. They first analyse a model in which the degree of substitutability between different types of goods within a given sector differs from the degree of substitutability between different sectors (the latter being significantly lower than the former). Such a model implies that the central bank should put a larger weight on stabilising the real economy than in the simple model with the same degree of substitutability between all goods.

Next, Eggertsson and Woodford analyse a model where different sectors have different levels of productivity and where firms change their prices if productivity has changed sufficiently. This extension of the basic model provides a more realistic description of how firms change their prices. In the basic model, the time when firms change their prices is random, with no connection to economic fundamentals. In the extended model, firms alter their prices when they deviate sufficiently from economic determinants. In other words, it is optimal for firms to set different prices in different sectors, depending on their respective productivity. Eggertsson and Woodford show that the design of the optimal target criterion is similar to that of the basic model, although it is more complex, and that the implications for monetary policy are modest.

Finally, Eggertsson and Woodford develop a model in which household income volatility varies between households, and where households cannot fully insure themselves against variation in income. In this model, households' expected future income (and their permanent income) play an important role. The central bank should allow inflation to rise if household income more persistently is expected to be lower than anticipated, and allow inflation to fluctuate even if the efficient level of output changes (unlike in the simple model). The importance of real economic stabilisation is also higher than in the simplest New Keynesian model.

Eggertsson and Woodford conclude that in all the extensions of the simple New Keynesian model they study, the optimal monetary policy can be described as a relationship between inflation and the real economy, as in Svensson (1999). However, the importance of stabilising the real economy may be considerably greater than in the simple model, and there may be reason for monetary policy to respond to changes in the efficient level of production if income changes are expected to be persistent. One result that does not change, however, is that inflation should optimally depend not on the level of output (or output gap) but on its rate of change.

The paper was commented on by **Lucrezia Reichlin** (London Business School) and **Christopher J. Erceg** (the International Monetary Fund). **Reichlin** began by noting that the result of the paper is a strong defence of rule-based policy. Not for so-called simple rules that specify exactly how the policy rate should be set as a function of a few macro variables (such as a Taylor rule), but for criteria that describe how the different target variables of the central bank should be related to one another (a target criterion). It is then important that the central bank clearly explains and communicates its decisions in relation to changes in the economy, in the structure of the economy and in response to shocks. She also pointed out that there have been major changes in relative prices in recent years, especially following supply shocks that have different effects on different sectors, and emphasised that the monetary policy trade-off will be particularly difficult after shocks to energy prices. More research is therefore needed to understand the drivers and consequences of these relative price changes.

**Erceg** noted that the importance that monetary policy places on the real economy compared to inflation is particularly important after supply shocks, and that these have become more common following the pandemic. Therefore, more research is

needed to better understand what is a correct weight, and not let assumptions in the model determine the weight a priori. It is therefore also useful to combine welfare analysis (which Eggertsson and Woodford use) with analysis where one can more freely choose the weight that the central bank gives to real economic stabilisation, as in Svensson (2007).

# 4 Inflation targeting and financial stability

The next topic discussed at the conference was whether and how monetary policy should take financial stability into account. Central banks are usually responsible for both price stability and financial stability, the latter often including a stable payment system. A long-standing debate has been about whether central banks should explicitly take financial stability into account in their monetary policy decisions and, if so, how this should be done. One example is the strategy of 'leaning against the wind', which means that the central bank deliberately maintains a higher policy interest rate than otherwise to reduce risks to financial stability, for example in the event of rising asset prices or a rapid increase in household or corporate debt.

**Franklin Allen** (Imperial College London) presented a paper titled 'Inflation targeting and financial stability', written with **Jae Hyoung Kim** and **Ansgar Walther** (both at Imperial College). They note that prior to the global financial crisis, economists were typically sceptical about the idea that monetary policy should take financial stability into account, but that this view was reassessed after the financial crisis and that many now argue that financial stability needs to be an explicit objective for monetary policy as well. They also note that Norges Bank's central bank act gives greater importance to financial stability than the Sveriges Riksbank Act, which sees price stability as the overriding objective of monetary policy.

A central question is whether and how other policy areas can address problems with financial stability if monetary policy does not do so, and how effective such 'macroprudential regulation' is in practice. Allen and his co-authors see no strong support for macroprudential policy being effective enough. They take as an example the situation in China, where the real estate market developed dramatically over the years from the early 2000s until 2023, with very large increases in real estate prices, despite the fact that the authorities have introduced many different regulations to dampen this development. One reason why the regulations have not been sufficient is that the stock market in China is relatively undeveloped, which means that investments in the stock market have yielded much lower returns than the real estate market. They conclude that the authorities need to take into account the entire financial system in order to design effective regulations.

Allen and his co-authors also note that one alternative for central banks to 'leaning against the wind' is to ensure that there is sufficient liquidity in financial markets, thereby reducing the risk of financial instability. If banks face bank runs, the central bank can help the banks by providing liquidity. The authors illustrate this in a simple theoretical model. The cost of achieving financial stability may then be that inflation is higher, which in the model is good because it distributes the risks broadly in the

economy. The model does not capture the costs that can arise from high inflation, and nor does it capture frictions that create greater costs from financial crises. If the cost of a crisis is greater than the cost of high inflation, it may be beneficial to use liquidity instruments to increase stability. The mandate of the central bank should therefore take into account both price stability and financial stability.

**Frank Smets** (European Central Bank, now Bank for International Settlements) and **Ida Wolden Bache** (Governor of Norges Bank) commented on the paper. **Smets** began by noting that the discussion is a continuation of the one held at a conference at the Riksbank in 2013, where he himself presented a paper on monetary policy and financial stability (see Smets 2013).[5] In that paper, Smets described how the view of the relationship between monetary policy and financial stability had been affected by the experiences during the global financial crisis, and that it was possible to identify three different views on what conclusions could be drawn. Among the first category were those who considered that the view was largely unchanged, that is, that monetary policy and financial stability were separate policy areas, with different instruments. In the second category, there were those who believed that the crisis showed the value of 'leaning against the wind', that is, incorporating financial stability considerations into monetary policy decisions. In the third and final category, there were those who argued that the two policy areas cannot be distinguished, and that the very definition of financial stability includes price stability. Smets argued that Allen's analysis belonged to the third category. At the same time, Smets pointed out that the monetary policy that Allen analyses in his theoretical model is actually liquidity policy. Smets then discussed the ECB's strategy review in 2021, saying that he believes that elements from all three approaches can be found in the ECB's strategy. For the ECB, price stability is the primary objective, and financial stability risks should be addressed primarily by macro and micro-prudential regulation. But he also noted that financial stability and price stability are prerequisites for one another. Financial stability risks are primarily managed in the medium term, and how monetary policy reacts to such risks depends on the circumstances. The ECB therefore does not pursue a systematic policy of 'leaning against the wind' in the short term.

As regards the question of whether macroprudential policy is sufficiently effective, Smets considered that there is clear support in the research literature for this to be the case. At the same time, there are in practice problems with so-called 'inaction bias', that is, that policymakers are reluctant to tighten regulation, and 'leakage', that market participants are able to circumvent the regulations. The most important thing in order to maintain financial stability then is that the banks meet high requirements in terms of capital and liquidity buffers, and regulations are more effective than monetary policy in managing stability risks. Finally, he noted that liquidity measures may be a way of managing financial stability risks, but that more discussion is needed on whether it is possible to distinguish between measures aimed at making monetary policy more expansionary and those aimed at supporting the transmission of monetary policy.

[5] The discussions at the 2013 conference are summarised by Berg et al. (2013).

**Wolden Bache** first noted that the monetary policy mandates of Norges Bank and Sveriges Riksbank, in terms of monetary policy and financial stability, are perhaps less different than one would assume from reading the central bank acts alone; price stability is the overriding objective also in Norway. She stressed that financial regulation and supervision are the first line of defence to ensure financial stability, but that although macroprudential measures are important, they have limitations when it comes to fine-tuning credit cycles or dealing with bubbles in specific markets. Therefore, Norges Bank includes financial stability considerations in its monetary policy decisions as part of its risk management strategy.

Norges Bank has been clear that it leans against the wind if necessary, for example in 2016–17 and early 2022. Wolden Bache concluded by noting that financial stability considerations have not been a prominent factor in monetary policy in recent years, but that they may become relevant in the future depending on how the economy develops, what risks are judged to arise and how effective other tools are judged to be. She emphasised the importance of carefully weighing costs against the benefits of possible interventions and of having a holistic view of both macroprudential and monetary policy.

# 5 Inflation targeting and exchange rates

The fourth panel of the conference dealt with how monetary policy should be conducted in open economies when there are large movements in commodity prices and fluctuations in the exchange rate have a major impact on the economy. **Silvana Tenreyro** (London School of Economics, former external member of the Monetary Policy Committee at the Bank of England) began by presenting a paper titled 'Commodity shocks with diverse impacts: how can different central banks tailor their policies?', written together with **Thomas Drechsel** (University of Maryland), **Michael McLeay** (Bank of England) and **Enrico D. Turri** (London School of Economics).

In this paper, Tenreyro and her co-authors analyse how a central bank should conduct monetary policy in an environment with high volatility in commodity prices, and how the conclusions depend on whether the economy is an advanced economy or an emerging economy, and whether the economy exports or imports commodities. By advanced economy they mean a country whose borrowing costs on international capital markets are less sensitive to the amount of foreign currency debt that the country has, while the borrowing costs of emerging economies are more sensitive. They expand a New Keynesian model of a small open economy based on Svensson (2000) by including commodities traded globally that are used for both consumption and as inputs in other production. The model also takes into account that the conditions for foreign borrowing are affected by the fluctuations in commodity prices and whether the country exports or imports commodities, and that the conditions are more affected in emerging economies than in advanced economies. The authors study alternative ways of conducting monetary policy – fixed exchange rates or flexible exchange rates with an inflation target – when economies suffer shocks to commodity prices, and compare with a policy that maximises household welfare.

The authors show that a traditional inflation targeting policy with a flexible exchange rate is typically better than a fixed exchange rate policy. This applies to advanced economies, whether they export or import commodities, and to emerging economies that export commodities. A flexible exchange rate then helps to reduce the volatility in inflation and output. However, for emerging economies that import commodities, a fixed exchange rate is better, as it suppresses the effects on the economy of fluctuations in import prices. But in most economies, the authors argue that there are advantages in allowing the exchange rate to vary and focusing monetary policy on stabilising the domestic economy.

In her presentation, Tenreyro noted that the model they use concerns a small open economy, where the exchange rate is primarily affected by domestic monetary policy. In a multi-country model, there may be reason to coordinate policies between countries to achieve a development that is good for many countries. And to deal with issues of geopolitics and climate change, other types of models with policy tools such as taxes and subsidies are needed to influence investment, trade and situations where there is a shortage of important inputs.

The paper was commented on by **Maurice Obstfeld** (Peterson Institute for International Economics) and **Andréa Maechler** (Bank for International Settlements). **Obstfeld** began by putting the paper into a larger context by recalling the so-called 'impossible trinity', that is, that countries that choose a fixed exchange rate in a world with free capital movements must give up their monetary policy autonomy, and cannot simultaneously have other nominal targets, such as domestic price stability. However, research in recent years has asked how costly it is in practice to hold on to a fixed exchange rate or, conversely, what the value of a flexible exchange rate is, especially with regard to other objectives such as stability in inflation and the real economy or financial stability (see Rey 2013). Obstfeld noted that the paper makes an important analysis that fits well into the current debate. The analysis shows that independent monetary policy has a great value for most small open economies. However, he questioned the assumption that fixed exchange rates are entirely credible. This can imply that the benefits of a fixed exchange rate are exaggerated. In practice it is unlikely that fixed exchange rates are perfectly credible, neither in emerging economies nor in advanced economies. One alternative would be to assume that the risk premium in financial markets is affected by the credibility of the exchange rate regime. This would affect how the economy reacts to various shocks.

Another important issue to consider is that commodity price fluctuations do not occur in a vacuum, but are often driven by other shocks in the global economy, such as changes in monetary policy in large countries. This would make a flexible exchange rate even more attractive; if a tightening monetary policy globally increases the risk premium for emerging economies, a weakening of the exchange rate will dampen the negative effects on the domestic economy. Obstfeld concluded by noting that the analysis generally shows that inflation targeting with a flexible exchange rate is a good strategy, and that it supports the political choices that have been made in many emerging economies.

**Maechler** pointed out that the paper analyses a very topical issue: How robust monetary policy frameworks are in the event of supply disruptions when financial channels are important. She noted, however, that currency interventions are an additional possible tool for central banks in small open economies, and that emerging economies in particular have increased their foreign exchange reserves dramatically over the past 20 years. This also seems to have dampened the effect of various shocks to these economies. Currency interventions can thus be an important complement to monetary policy to stabilise the exchange rate and improve the trade-off between stabilising inflation and the real economy.

Maechler went on to note that debt has increased in many economies, in both advanced and emerging economies. The analysis in this paper focuses on countries' indebtedness in foreign currency, but also indebtedness in domestic currency has increased. It is therefore important to better understand how debt in general affects risk premiums and macro-financial stability.

# 6 Monetary and fiscal policy

The next panel discussed the interaction between monetary policy and fiscal policy. **Olivier J. Blanchard** (Peterson Institute for International Economics) presented a paper titled 'Fiscal policy as a stabilization tool. The case for quasi-automatic stabilizers'. Blanchard began by noting that much research on stabilisation policy has focused on monetary policy, particularly inflation targeting, but that insufficient focus has been given to fiscal policy. In the most common model of monetary policy analysis, fiscal policy is not needed to stabilise the economy; this can be done by monetary policy, while fiscal policy adjusts to the monetary policy conducted. In practice, however, there are many frictions that require fiscal policy to take an active role. For example, it is more difficult to use monetary policy to stabilise the economy when households face borrowing constraints, if there is sluggishness in real wages or the economy is hit by commodity price shocks, or when the policy rate is approaching its lower bound. In all cases, fiscal policy may be needed as an alternative to monetary policy to stabilise the economy.

The challenges in reality, however, are numerous. Fiscal policy decisions are made by politicians who may have an overly short time horizon. The fiscal decision-making process is often long. Changes in fiscal policy take longer to affect the economy compared to monetary policy adjustments. Automatic stabilisers, which do not require active decisions to operate, are therefore an important part of fiscal policy. Blanchard noted that the impact of automatic stabilisers, which can be large, depends on many factors, such as the progressiveness of the tax system. In such cases, the effect of an automatic stabiliser on the economy is not a conscious choice but rather a by-product.

Blanchard argued for the use of quasi-automatic stabilisers, which are activated when an observable variable, such as GDP or unemployment, reaches a certain threshold

level.[6] To function well, these stabilisers need to meet a number of criteria. They should be debt-neutral over time (so that public debt does not systematically rise or fall); they should stabilise resource utilisation (how output or employment fluctuate around their efficient levels); and they should be responsive and easy to implement. There are many possible tools that can act as quasi-automatic stabilisers. In his presentation, Blanchard focused on the effects of allowing the VAT rate on goods and services to vary depending on how resource utilisation develops. In a simple model, he showed how a time-varying VAT leads to inflation and output being less affected by demand shocks, if the VAT rate is automatically lowered in bad times and raised in good times. He concluded by discussing several aspects of implementation that can be complicated.

**Tommaso Monacelli** (Bocconi University in Milan) and **Signe Krogstrup** (member of the Board of Governors of Danmarks Nationalbank) commented on Blanchard's paper. **Monacelli** first noted that a time-varying VAT rate would have more direct effects on demand than monetary policy, as it directly affects the expenditure of all households in the economy. However, an important question is to what extent changes in the VAT rate are passed on to the final prices of goods and services. Empirical studies suggest that changes in the VAT rate have a limited effect on prices, and therefore mostly affect firms' profit margins. One might also suspect that increases in VAT affect prices more than decreases, as firms are more likely to keep prices at a higher level. Monacelli also presented empirical findings suggesting that changes in VAT rates mainly affect demand for durable goods, and such demand tends to fall significantly in recessions, as households experience increased uncertainty about their future. This may make changes in the VAT rate less effective in recessions, which is precisely when you want to stimulate the economy.

**Krogstrup** noted that public debt has increased sharply in many countries since the global financial crisis, limiting the ability to use fiscal policy actively to stabilise the economy. She discussed challenges in implementing a quasi-automatic VAT in practice. If this is based on, for example, an output gap, a large amount of judgement is still needed to determine the potential level of output. Another aspect that she raised was that a time-varying VAT rate will affect inflation, which can complicate monetary policy. She also argued that it can be effective to build buffers in advance to deal with economic disruptions.

# 7 Inflation targeting in practice

The final panel discussed experiences of conducting inflation targeting in practice. **Lord Mervyn King** (former Governor of the Bank of England) presented a paper entitled 'Inflation targets: practice ahead of theory', which is also published in this issue of Economic Review (see King 2025).

King pointed out that inflation targeting has been a successful regime, mainly because it changed the way central banks made monetary policy decisions and communicated

[6] In his model, Blanchard uses a gap, such as the deviation of unemployment from the natural rate of unemployment.

monetary policy. Transparency and accountability have been key elements of the regime, and are a natural part of monetary policy when there is considerable uncertainty about the monetary policy transmission mechanism.

When inflation targeting was first introduced, the objective was to achieve price stability in general, rather than to reach a specific inflation rate. This was very important after the high inflation of the 1970s and 1980s. Inflation targeting was combined with a gradual increase in the independence of central banks, with monetary policy decisions being made in most cases by a monetary policy committee, and with the central bank being held accountable for its decisions and the fulfilment of its objectives.

However, King is sceptical about the theoretical research literature on monetary policy and inflation targets. Theoretical modelling is useful for illustrating important mechanisms and has, for example, made inflation expectations an important part of monetary policy analysis. But models are always simplifications. And the models that have become dominant among central banks in recent decades have not been able to take account of the complex and growing financial system. They have also created a false impression that monetary policy can control inflation with great precision. The models currently in use often ignore measures of money supply and other nominal variables and their impact on inflation. King argues that this contributed to central banks underestimating the risks associated with the expansionary monetary policies pursued in most advanced economies in 2020–21. Models are also needed that explicitly model the credibility of monetary policy and how it is affected by target fulfilment.

Looking ahead, King sees two major challenges for monetary policy. One challenge is whether central banks will maintain their focus on stabilising inflation. Rising public debt in many countries and the trend toward increased protectionism are likely to lead to higher inflationary pressures and thus a more contractionary monetary policy. And high government debt can lead to increased political pressure on central banks, even if formal independence is not threatened.

A second challenge is to avoid major misjudgements. Because the world is characterised by radical uncertainty, where the underlying structure of the economy is constantly changing, King argued that models are less useful for understanding what is going on. It is therefore important that central banks have a good internal climate for discussion and debate. There is always a risk of ‘groupthink’, but this risk can be reduced by having a high degree of intellectual diversity within the central bank. In addition, there is a risk that the credibility of the inflation target will be undermined if the central bank is given too broad a responsibility.

King concludes with some suggestions for how to implement inflation targets and monetary policy in future:

- When forecasting inflation and other variables, explore different assumptions regarding the credibility of monetary policy.

- Focus less on the forecast in a main scenario and more on risks around the main scenario. Economic scenarios and uncertainty bands around the forecast are two ways of illustrating uncertainty and risk, and the two approaches can complement one another.
- Refrain from providing guidance on future monetary policy (so-called 'forward guidance'). As economic developments are uncertain, central banks do not know how the policy rate will develop. Monetary policy guidance confuses the central bank's reaction function with its forecast of economic developments and risks reducing the central bank's credibility if the guidance is not followed. It is more important to develop a narrative about the state of the economy, and that narrative will vary over time.
- Publish and discuss statistics on the evolution of monetary variables, in particular the growth rate of broad monetary aggregates.
- Stop publishing detailed minutes of monetary policy meetings. This does not increase transparency, but only leads to the important discussion taking place at other meetings and spontaneous dialogue not coming about.

King's paper was commented on by **Charles L. Evans** (former president of the Federal Reserve Bank of Chicago) and **Carolyn A. Wilkins** (external member of the Financial Policy Committee at the Bank of England and former Deputy Governor of the Bank of Canada). **Evans** focused his discussion on monetary policy under radical uncertainty. He stressed that radical uncertainty changes the rules of the game for monetary policy, requiring new approaches and an increased focus on factors that have been overlooked, and that the best thing a central bank can do when there is radical uncertainty is to analyse alternative scenarios. Unlike King, Evans believes that forward guidance has proved useful, but pointed out that there are different types of forward guidance.

He concluded with a few thoughts on the Federal Reserve's monetary policy. He stressed the importance of anchored inflation expectations and noted that central bank models do not automatically return to two per cent inflation if expectations are not anchored. He pointed out that the increases in the policy rate have been effective in limiting inflationary pressure and that it has been possible to implement a contractionary monetary policy, although it is more difficult to conduct an expansionary monetary policy at the lower bound of the policy rate.

**Wilkins** discussed the limitations of the models used to design monetary policy, the importance of transparency in central bank reaction functions, and how financial stability can support monetary policy objectives. She agreed with King that the model analysis at central banks could be developed, for example by analysing models where credibility can vary over time, develop the supply side, and possibly include monetary aggregates. She also agreed that there are risks with strong guidance on monetary policy because it could damage the credibility of the central bank, and suggested that central banks should communicate more clearly about their reaction function, even if it is not easy.

She also saw that micro- or macroprudential measures can help reduce risks of financial vulnerabilities, although there are many challenges when the financial sector

is developing rapidly. Therefore, central banks may need to develop new tools to support financial stability.

Finally, Wilkins stressed the need for more analysis of the interaction between monetary and fiscal policy, although coordination between the two policies is difficult. Nevertheless, the pros and cons of using asset purchases for monetary policy purposes versus fiscal stimulus can be analysed, and information should be regularly exchanged between the central bank and fiscal authorities to identify situations where fiscal measures may be preferable.

# 8 Concluding remarks

Inflation targeting has emerged over the past thirty years as the dominant strategy for monetary policy, mainly among advanced economies but increasingly among emerging economies. One reason was that earlier regimes with fixed exchange rates in many countries (like Sweden) were not successful in establishing a nominal anchor and contribute to economic stability.

Experience and evaluations show that the inflation targeting policy has been successful. Initially the policy was a recipe for reducing the average inflation rate without stifling economic growth. Later, during the period of very high inflation following the pandemic and Russia's invasion of Ukraine, inflation targeting policy helped to keep inflation expectations anchored around the target. This has facilitated a faster return to the inflation target and reduced the costs to the real economy.

The conference participants agreed that inflation targeting has been a highly successful strategy for achieving nominal stability. However, there are several areas where more research and further development of the framework may be needed. One area concerns the interaction between monetary policy and central banks' responsibility for financial stability. Another area is how monetary policy shall interact with fiscal policy. Additional areas concern how monetary policy should address uncertainty and shocks originating from abroad. [7]

One of the strengths of inflation targeting lies in its flexibility and adaptability in a changing world. Maintaining this success and meeting the challenges of the future will require continued research, innovation and close interaction between theory and practice. Properly adapted to new economic and financial challenges, inflation targeting can remain a cornerstone of stable and sustainable economic development.

[7] For further discussion, see Hansson et al. (2018) and Jonsson and Vredin (2025).

# References

Berg, Claes, Kerstin Hallsten, Virginia Queijo von Heideken and Ulf Söderström (2013), 'Two decades of inflation targeting: main lessons and remaining challenges', *Sveriges Riksbank Economic Review*, no. 3 pp. 4–28.

Eggertsson, Gauti B. and Michael Woodford (2003), 'The zero bound on interest rates and optimal monetary policy', *Brookings Papers on Economic Activity,* vol. 34, 139–235.

Hansson, Jesper, Marianne Nessén and Anders Vredin (2018), 'The calm after the storm – lessons for monetary policy analysis', *Sveriges Riksbank Economic Review*, no. 4, pp. 69–88.

Jonsson, Magnus and Anders Vredin (2025), '30 years of inflation targeting: from simple to complex', *Sveriges Riksbank Economic Review*, no. 1, pp. 41–71.

King, Mervyn (2025), 'Inflation targets: practice ahead of theory', *Sveriges Riksbank Economic Review*, no. 1, pp. 22–40.

Persson, Torsten and Guido Tabellini (1993), 'Designing institutions for monetary stability', *Carnegie-Rochester Conference Series on Public Policy*, vol. 39, pp. 53–84.

Rey, Hélène (2013), 'Dilemma not trilemma: the global financial cycle and monetary policy independence', Proceedings of the Jackson Hole Economic Policy Symposium, Federal Reserve Bank of Kansas City.

Smets, Frank (2013), 'Financial stability and monetary policy: how closely interlinked?', *Sveriges Riksbank Economic Review*, no. 3, pp. 121–160.

Svensson, Lars E.O. (1997), 'Optimal inflation targets, conservative central banks, and linear inflation contracts', *American Economic Review*, vol. 87, no. 1, pp. 98–114.

Svensson, Lars E.O. (1999), 'Inflation targeting as a monetary policy rule', *Journal of Monetary Economics*, vol. 43, no. 3, pp. 607–654.

Svensson, Lars E.O. (2000), 'Open-economy inflation targeting', *Journal of International Economics*, vol. 50, no. 1, pp. 155–183.

Svensson, Lars E.O. (2007), 'Optimal inflation targeting: further developments of inflation targeting', in *Monetary Policy under Inflation Targeting*, Frederic Mishkin and Klaus Schmidt-Hebbel (ed.), Banco Central de Chile.

Walsh, Carl. E. (1995), 'Optimal contracts for central bankers', *American Economic Review*, vol. 85, no. 1, pp. 150–167.

Woodford, Michael (2010), 'Optimal monetary stabilization policy', ch. 14 in *Handbook of Monetary Economics*, vol. 3, Benjamin M. Friedman and Michael Woodford (ed.), Elsevier.

# Appendix: Conference programme

Welcome address: **Anna Breman**, First Deputy Governor, Sveriges Riksbank

**Panel 1: Designing institutional arrangements to foster nominal stability**

| | |
|---|---|
| Main speaker: | Guido Tabellini, Bocconi University |
| | (with Torsten Persson, IIES, Stockholm University) |
| Commentators: | Carl E. Walsh, University of California, Santa Cruz |
| | Donald Kohn, Brookings institution |
| Moderator: | Jon Faust |

**Panel 2: Flexible inflation targeting**

| | |
|---|---|
| Main speaker: | Michael Woodford, Columbia University |
| Commentators: | Lucrezia Reichlin, London Business School |
| | Christopher J. Erceg, International Monetary Fund |
| Moderator: | Charles Bean, London School of Economics |

**Panel 3: Inflation targeting and financial stability**

| | |
|---|---|
| Main speaker: | Franklin Allen, Imperial College London |
| Commentators: | Frank Smets, European Central Bank |
| | Ida Wolden Bache, Norges Bank |
| Moderator: | Anders Vredin, Sveriges Riksbank |

**Panel 4: Inflation targeting and exchange rates**

| | |
|---|---|
| Main speaker: | Silvana Tenreyro, London School of Economics |
| Commentators: | Maurice Obstfeld, Peterson Institute for International Economics |
| | Andréa Maechler, Bank for International Settlements |
| Moderator: | Karolina Ekholm, Swedish National Debt Office |

**Panel 5: Monetary and fiscal policy**

| | |
|---|---|
| Main speaker: | Olivier J. Blanchard, Peterson Institute for International Economics |
| Commentators: | Tommaso Monacelli, Bocconi University |
| | Signe Krogstrup, Danmarks Nationalbank |
| Moderator: | Tore Ellingsen, Stockholm School of Economics |

**Panel 6: Inflation targeting in practice**

| | |
|---|---|
| Main speaker: | Mervyn King |
| Commentators: | Charles L. Evans, University of Chicago |
| | Carolyn A. Wilkins, Griswold Center, Princeton University |
| Moderator: | Anna Breman, Sveriges Riksbank |

**Organising committee**

Martin Flodén, Sveriges Riksbank
Stefan Laséen, Sveriges Riksbank
Jesper Lindé, International Monetary Fund
Marianne Nessén, Sveriges Riksbank
Torsten Persson, Institute for International Economic Studies, Stockholm University
Ulf Söderström, Sveriges Riksbank

# Inflation targets: practice ahead of theory

Mervyn King*
Lord Mervyn King is the Alan Greenspan Professor of Economics and Professor of Law at New York University and Emeritus Professor of Economics at the London School of Economics. He served as Governor of the Bank of England from 2003 to June 2013.

Inflation targets were introduced well ahead of the development of the theory of inflation targeting. The practice was successful because it comprised a new set of procedures and institutions for setting monetary policy in a transparent and accountable fashion; the later theory was less useful because it purported to be a theory of the determination of the price level. In the countries that were early adopters of inflation targets the focus was on creating new institutions to shape the way monetary policy was set in a world of increasing financial liberalisation and an absence of exchange controls. Inflation targeting was thus from the outset not seen simply as announcing a numerical target. It was rather a transformation of the way in which decisions on monetary policy were made and explained.

## 1 Introduction

In the early 1990s a new approach to monetary policy started to spread across the world. The essence of this new approach was the combination of a numerical target for inflation in the medium term and the flexibility to respond to shocks to the economy in the short run – and so the framework became known as flexible inflation targeting.

Inflation targets were introduced well ahead of the development of the **theory** of inflation targeting. The **practice** was successful because it comprised a new set of procedures and institutions for setting monetary policy in a transparent and accountable fashion – 'constrained discretion'; the later theory was less useful because it purported to be a theory of the determination of the price level. A target for inflation is an objective not a determinant of inflation. The two are not the same, a lesson ignored recently by many central banks – to their cost. Merely announcing a target does not guarantee its achievement.

* Paper prepared for the Riksbank Conference on '*The quest for nominal stability*. Lessons from three decades with inflation targeting', 23–24 May 2024. I am grateful to Charles Goodhart, Otmar Issing, Lars Svensson, Paul Tucker and participants at the Riksbank conference for helpful comments and suggestions. The opinions expressed in this article are the sole responsibility of the author and should not be interpreted as reflecting the views of Sveriges Riksbank.

An examination of the practice of inflation targets is revealing of how a target of 2% for CPI inflation emerged from the economic problems of the 1970s and 1980s. The motives behind the introduction of an explicit target for inflation can be summarised as follows:

First, following the 'Great Inflation' of the 1970s, there was a recognition that monetary policy should aim at achieving price stability in the medium term. Objectives such as raising economic growth or reducing inequality were to be left to the fiscal authorities and to governments. The clarity of that objective has been diluted in recent years with new objectives for reducing climate change, inequality and the promotion of diversity, as well as concerns about fiscal dominance during and after the pandemic.

Second, the experience of the 1980s was that intermediate targets for monetary policy were unreliable because their relationship to the final objective of inflation was unstable. They were also hard to explain to a wider public.

Third, since we cannot commit future generations – or even our own – to ensuring price stability, there was interest in how we could design an institutional framework that made it likely that money would retain its value.

In the modern era, inflation targets began in New Zealand (1990), Canada (1991), the United Kingdom (1992) and Sweden (1993). In all cases the move reflected the experience of high and volatile inflation of the 1970s following the end of the Bretton Woods system of fixed exchange rates and disillusion with the performance of intermediate targets, such as monetary aggregates, in the 1980s. In the UK and Sweden inflation targets were introduced following the collapse of a commitment to a fixed exchange rate in September and November 1992, respectively.

In all countries the focus was not on a new theory of inflation but on creating new institutions to shape the way monetary policy was set in a world of increasing financial liberalisation and an absence of exchange controls. That focus was especially clear in New Zealand where the 1988 budget contained a commitment to introduce legislation 'to make certain that no politician can interfere with the Bank's primary objective of ensuring price stability' (Reddell 1999, p. 65). Independence was enshrined in the Reserve Bank of New Zealand Act of 1989. Central to this was the relationship between government and central bank. Interestingly, the Act made no reference to an explicit inflation target but required that the Governor and the Treasurer negotiate and agree a Policy Targets Agreement (PTA). The initial PTA signed in March 1990 stated that, 'An annual inflation rate in the range of 0 to 2 percent will be taken to represent the achievement of price stability' (Reserve Bank of New Zealand 1990).

In February 1991, Canada became the second country to adopt an inflation target. At the time, CPI inflation was over 6% a year (almost double that in the US). An agreement between the Bank of Canada and the Department of Finance set out a target path for inflation to fall to 2 per cent by the end of 1995, with a 'control band' of plus or minus 1 percentage point around each of the path's steps (Carter, Mendes

and Schembri 2018). Again, the motivation was disillusion with previous reliance on intermediate targets.

In September 1992, the UK left the Exchange Rate Mechanism (ERM) after massive speculation against sterling. The level of interest rates implied by membership of the ERM was far too high for the needs of the domestic economy. Discussions between the Bank of England and the Treasury led swiftly to the announcement of an inflation target. After exit from the ERM, the case for central bank independence was openly discussed in the British press and recommended by both the Treasury Select Committee of Parliament and a number of independent experts. Chancellor Lamont wanted to go down this path, as had his predecessor Nigel Lawson. But Prime Minister Major, as had his predecessor Margaret Thatcher, refused to countenance such a move. As a substitute for independence, however, new powers were granted to the Bank along with requirements for greater accountability and transparency which became central to the UK framework. The first Bank of England *Inflation Report* was published in February 1993.[8]

Sweden also abandoned an exchange rate link and then adopted an inflation target in 1993. Even where inflation targets preceded formal independence of the central bank, as in the UK and Sweden, the institutional changes surrounding the introduction of inflation targets were a natural (though not inevitable) precursor to independence. It is no accident that because the Federal Reserve System was already independent, its adoption of an explicit inflation target lagged behind other central banks and it was the persistence of Ben Bernanke as Fed Chair, influenced by his presence at conferences that discussed inflation targets, that led to the adoption of 2% as the Fed's working definition of price stability in 2012. Japan followed in 2013.

By the time of my Mais lecture in 2005, the number of countries with inflation targets had risen to 22 (King 2005).[9] And some argue that the number of inflation targeting countries is now over 50. I do not in this paper assess the success or otherwise of inflation targeting. Views differ. But it is important to point out that inflation targeting was from the outset not seen simply as announcing a numerical target. It was rather a transformation of the way in which decisions on monetary policy were made and explained. Transparency and accountability were central to the project. Inflation targeting was seen as the natural way to conduct policy when there is a great deal of uncertainty about the transmission mechanism of monetary policy.[10]

The adoption of inflation targets followed the failure of several earlier false paths, often because apparently stable relationships turned out to be nonstationary. Narrow monetary aggregates failed because the hypothesis that the relationship between base money and the total money supply was stable was shown to be wrong by the experience of the 1980s and even more so by quantitative easing. The more stable long-run relationship between broad money and total nominal spending was disturbed by financial deregulation in the early 1980s. Exchange rate target zones

[8] Independence in respect of monetary policy was eventually granted in May 1997.

[9] The title of the lecture was 'Monetary Policy: Practice Ahead of Theory'.

[10] See the analysis in King (1997).

failed because the political cost of sticking to the regime in the face of asymmetric shocks proved too great, a possibility which the theory had largely ignored. In each case a key assumption of the theoretical model broke down. Discretion became inevitable.

But the use of that discretion could be constrained by institutional arrangements to promote the accountability, and hence credibility, of policymakers. Inflation targets were a logical way to achieve that, with central bank independence a natural partner. Inflation targeting was never meant as a non-monetary theory of inflation. Rather, it is a way to take decisions in a world of radical uncertainty. A similar approach was followed by those central banks that did not adopt formal inflation targets, such as the European Central Bank. In that sense, practice was ahead of theory.

# 2 Structure of inflation targeting

Inflation targeting has evolved over time and will surely continue to do so. To understand its main characteristics, it is helpful to distinguish five questions about monetary policy:

## 2.1 What is the objective?

At the outset, the objective was the continuous achievement of price stability rather than a particular number for the rate of consumer price inflation. After a period of high and volatile inflation, it was too ambitious to aim at a single numerical target and a range for inflation was typical of inflation targets, as in Canada. In Britain the Chancellor announced on 8 October 1992: 'I propose to set ourselves the objective of keeping underlying inflation within a range of 1–4%, and I believe by the end of the Parliament we need to be in the lower part of the range' and 'I believe we need to aim at a rate of inflation in the long term of 2% or less'.[11] Success in bringing down inflation led to a convergence on a point target of 2%. Over time the European Central Bank (ECB) gravitated to a symmetric 2% target for CPI inflation as its measure of price stability.

A symmetric target was important to convince the public that policymakers were not 'inflation nutters' determined to get inflation down to the lowest possible level. Ranges around the central target, however, created some confusion about the aim of policy. Was 2.9% as acceptable as 2% or even 1.1%? And what was the effective difference between 2.9% and 3.1%? In the end, policymakers were instructed to aim continuously at the central target and were judged by the average inflation rate over some past period. Anticipating that method of *ex post* judgement introduced an element of price-level targeting into the regime. *Ex ante*, policymakers were supposed to target inflation some eighteen months to two years ahead to avoid undesirable volatility of output – an approach that was understood from the beginning and became known as 'flexible inflation targeting'. *Ex post*, they were judged by the average rate of inflation during their period in office.

[11] Letter from the Chancellor to the Chairman of the Treasury and Civil Service Committee, 8 October 1992.

One largely unresolved issue is whether the flexibility (formally, the trade-off between the volatility of inflation and the volatility of output) should be left to the discretion of policymakers or mandated by legislatures. The horizon over which it is desirable to bring inflation back to target depends on the nature of the shocks hitting the economy. The choice of that horizon has typically been left to central banks, although that judgement has political consequences and in Britain in 2013 the new remit for the MPC, which instructed the Bank to use 'monetary activism' and forward guidance, created the room for the government to intervene in the choice of horizon.[12]

## 2.2 Who makes decisions on monetary policy and how should they be held accountable for their actions?

As already mentioned, the spread of inflation targeting was accompanied by a wave of interest in central bank independence. Both developments reflected the failure of previous attempts to achieve price stability.[13] But governments were slow to move to full independence in the wake of the introduction of inflation targets, and in principle central bank independence is neither necessary nor sufficient to achieve price stability. In Britain, the Chancellor retained the power not only to set the target but also to determine interest rates. But changes in the procedures followed in setting policy were clearly thought to be desirable, indeed necessary.

Mandating central banks to pursue an inflation target was the route followed in many countries. Who should set the target? In New Zealand and Canada, the target was the result of a negotiation between the government of the day and the central bank governor. In the former country, the Policy Targets Agreement was a contract to ensure good performance by the Governor. In the latter, a failure to agree the target led to the decision not to reappoint John Crow as governor in 1993. In the UK, the government sets the target which is reaffirmed at each Budget. But the ECB and the Federal Reserve define the target themselves.

Should the power to set policy rest with the Governor or be vested in a wider group in the form of a monetary policy committee? When the Bank of England was made independent in 1997, decisions on monetary policy were delegated with immediate effect to a committee of nine people deciding by majority vote – the Monetary Policy Committee (MPC). Individual votes were published and each member of the MPC was personally accountable to Parliament through regular appearances before the Treasury Committee. The aim was to avoid power being concentrated in the person of the Governor. By and large, this arrangement has proved to be a success – with different arguments set out in the minutes of MPC meetings, and in speeches of its members and at regular hearings in front of the Treasury Committee by all MPC members. From its creation in 1999, the ECB adopted a committee structure, although with less transparency about the views of individual members. And the

[12] See the letter to the governor with the new remit, chx_letter_to_boe_monetary_policy_framework_200313.pdf.

[13] Although the executive branch of government may misuse its power to raise taxes through inflation making the separation of monetary and fiscal instruments desirable (Tucker 2019).

Federal Reserve is very much led by its Chair, supported by the staff in Washington DC, with the regional presidents acting as a constraint.

Communication of the uncertainties of the effects of monetary policy is important to establish the credibility of the policy process. Changes in the process of making and communicating monetary policy were part and parcel of the move to inflation targeting, and measures to increase central bank independence were a natural partner to that move. Accountability is about how the 'constrained discretion' of decision-makers is exercised. As described in the New Zealand framework, 'the Governor would be assessed primarily on the judgements the Bank exercised in pursuit of the outcome, and the way it responded to new developments'. Credibility was to be achieved in part through a track record of keeping inflation close to the target, but also on the quality of the narrative about the state of the economy presented by policymakers. Unanticipated 'shocks' meant that inflation might deviate from target even if earlier decisions on interest rates were appropriate. This of course was an argument that major central banks used to explain the high inflation during 2020–23. It works only if the narrative is believed to be sensible and compelling, an issue to which I return below. Credibility of the explanations for actions – the narrative as described in speeches and inflation reports – is crucial in building and maintaining the reputation of policymakers and the belief among the wider population that inflation, even if on occasions it deviates from target, will come back to target.

## 2.3 What are the instruments to be used to achieve the objective?

The official short-term interest rate was the instrument to be used to control inflation, although fiscal policy had to be consistent with price stability. The fiscal theory of the price level had little influence on the decisions of policymakers with a clear mandate from parliaments to pursue price stability. Only in the immediate aftermath of the financial crisis did direct money creation through quantitative easing (QE) enter the armoury of central banks on a substantial scale. The description of QE as unconventional monetary policy is unfortunate. Open market operations to buy or sell government securities has always been seen as part of monetary policy, and in Britain in the 1980s there was regular discussion about the desirability of 'underfunding' and 'overfunding', QE and QT respectively. The move to inflation targeting did not alter the instruments available to achieve the target.

## 2.4 What is the theory relating changes in the instruments to changes in the objective?

Inflation targeting is a framework for making and communicating decisions. In its early years there was no suggestion that it provided a new theory of the transmission mechanism of monetary policy. What it did do was re-establish the view that inflation was a nominal phenomenon and was determined by nominal variables. That is now taken for granted, but much effort was devoted to the imposition of detailed direct wage and price controls in the 1960s and 1970s. Nicholas Kaldor, economic adviser to Labour governments in the 1960s, wrote in 1971 that 'It is also far more generally acknowledged – even by Conservative Prime Ministers – that the process of inflation

is 'cost-induced' and not demand-induced', with the evident implication that it can be tackled only by an incomes policy' (Kaldor 1971). Not many economists would give that answer today. It is striking that in the early period of inflation targeting policymakers believed that the announcement of a target did not in itself change the transmission mechanism of monetary policy. The same variables were used to form a view and construct a narrative about the likely path of inflation, and the risks around it, as had been central to policy before.

Over time, however, expectations came to the fore in the analysis of inflation. If inflation expectations could be anchored on the target, then inflationary shocks would become less persistent, thus altering the transmission mechanism. How were inflation expectations to be anchored on the target? In two ways. First, a successful track record in keeping inflation close to target. Second, using an empirical and theoretical framework that included all the variables materially relevant to the determination of inflation. Central banks were successful in achieving the first for almost thirty years until the recent inflation, an event that I discuss further in section 4. They were much less successful in the second. Small tractable theoretical models could not cope with the complexity of the growing financial system, and such models simply ignored money, banks and finance altogether. The relationship between money and credit and inflation appeared to be nonstationary. The fact that a relationship changes over time does not of course imply a lack of causation. The upshot was that standard models ignored money and other nominal variables. The richness of the monetary analysis of earlier thinkers, such as Keynes, Patinkin, Tobin, Friedman, Brunner and Meltzer, was lost. Instead, the models incorporated the assumption that central banks could be relied upon to 'do whatever it takes' to bring inflation back to target after any shock. Central banks were assumed to have perfect credibility irrespective of the actions they took. Or, equivalently, inflation expectations are determined by the inflation target.[14]

Building a sense of trust and credibility in the central bank leads to confidence that inflation will remain close to target. As Huw Pill, Chief Economist at the Bank of England, said in a recent speech, 'setting prices in line with the MPC's 2% inflation target becomes a self-reinforcing process at the aggregate level' (Pill 2024). There is much truth in the importance of this self-reinforcing process. But it cannot be independent of the setting of monetary policy instruments. Rational expectations are more accurately described as model-consistent expectations. And if the model omits variables that can affect inflation, and policy is driven by the model, then there will be times when not only inflation but also expectations of inflation drift away from the target. We need models in which the credibility of a central bank is endogenous to its actions. The assumption that expectations are determined by the target is misleading at best and dangerous at worst.

[14] I have described this concept elsewhere as the "King Canute" theory of inflation (King 2021).

## 2.5 What is the reaction function describing how changes in the economy map into changes in the instruments?

The emergence of inflation targeting coincided with the development of the New Keynesian consensus on macroeconomic theory. This framework offered a theoretical foundation for flexible inflation targeting. Central to the New Keynesian view is the assumption that some prices (including for labour) are 'sticky' and adjust slowly in response to shocks. There are shocks to supply as well as demand. External cost shocks sometimes drive inflation away from the target, as we saw recently with rises in world energy and food prices. Because other prices are 'sticky', attempts to keep inflation at target all the time would result in inefficient fluctuations in output. In the presence of supply shocks, there is, therefore, a trade-off between stabilising inflation and stabilising output. Any monetary policy can be described as a choice of (i) an *ex ante* inflation target and (ii) an optimal response to observable shocks. Following a cost shock, it is sensible to bring inflation back to target gradually.[15]

In this, by now conventional, framework, the objective of monetary policy is to minimise the variability of inflation around the target rate and the variability of output (or employment) around a sustainable path consistent with stable inflation.[16] Such an objective means that the central bank is effectively choosing a trade-off between the volatility of inflation and the volatility of output. That choice leads to a policy reaction function describing how the central bank responds to shocks hitting the economy.[17] Such a reaction function is a state-contingent monetary policy rule, the most famous being the Taylor Rule which implies that interest rates should rise if inflation is above its target and output is above its trend level and fall when the converse is true. The path along which inflation should return to its desirable long-run level will therefore vary according to the state of the economy.

In practice, radical uncertainty means that our understanding of the economy is incomplete and constantly evolving. Any monetary policy rule that is judged to be optimal today is likely to be superseded by a new and improved version tomorrow. In other words, there is no time-invariant policy reaction function which could describe the policy intentions of a central bank. Rather, monetary policy in practice is characterised by a continuous process of learning. In order to form expectations, the private sector needs to understand the central bank reaction function. That function is continually being updated, and so communication in the form of a narrative explaining how the central bank's understanding of how the economy works plays a crucial role in the formation of expectations. It also points to the problem of 'forward guidance' as a tool of monetary policy. Private sector expectations of future policy rates derive from the combination of a forecast of the economy and the central bank reaction function. There is no reason to assume that the private sector has the same

[15] See the formal analysis in King (1997).

[16] This specification of the objective function can be derived as an approximation to the maximisation of the welfare, defined over consumption and leisure, of a representative consumer with an infinite horizon (see Rotemberg and Woodford 1997).

[17] To implement such a policy reaction function requires an empirical judgement about the factors that drive the volatility of both inflation and output. In principle, these should include the banking and financial system, and movements in asset prices, that generate fluctuations in demand and output. In practice, however, rather little attention was paid to the role of the banking system.

view of the future path of the economy as the central bank. All the private sector needs to know is the policy reaction function. Forward guidance conflates the two. The attempt to forecast where its own policy rate will go when there is genuine uncertainty about the outlook damages the credibility of a central bank.

# 3 Dealing with overshoots and undershoots

The perpetual challenge for central banks is how to deal with overshoots and undershoots of the target. I examine the recent overshoot in section 4. Here I describe briefly an episode of an overshoot that was justified by concerns about output and employment and yet was consistent with maintaining credibility in the target. During the global financial crisis, the UK had to absorb the largest depreciation of sterling since the Second World War, as well as very large rises in oil and commodity prices. From the onset of the crisis in the third quarter of 2007 until the failure of Lehman Brothers in September 2008 the effective sterling exchange rate index fell by 9%. Between then and the introduction of QE with Bank Rate close to zero, the index fell by a further 19%. Those 'shocks' had an even larger first-round effect on consumer prices than the later impact from the Russian invasion of Ukraine. The Bank of England decided to accommodate the rise in the domestic price level resulting from the fall in the exchange rate to prevent further rises in unemployment. The magnitude of the rise in the price level implied by the policy of accommodation was estimated to be around 12 percentage points.[18] But domestically generated inflation (largely wage costs) remained low during the 'Great Recession' from mid-2008 to mid-2009 when GDP fell by just over 6%. As the economy recovered from mid-2009 until the end of 2012, consumer prices rose by 12.6%, a cumulative excess over the 2% target of around 5 ½ percentage points. The Bank of England's explanation was that this was a deliberate overshoot to minimise the damage from the recession and that domestically generated inflation was running below the target.

As the financial crisis started in 2007, CPI inflation was 2.1%. By the end of 2013 it was 2.0%. Accommodation of the large sterling depreciation was achieved without loss of credibility in the target.[19]

Undershoots have been less dramatic. In the 2010s, some central banks became worried that inflation was undershooting the target. In response the Fed launched the average inflation targeting framework in August 2020, an explicitly asymmetric approach to deviations from target. Core inflation had averaged around half a percentage point below the target for five years. From the perspective of the pioneers of inflation targets this would have been seen less as a failure and more as nirvana. But the focus on theoretical models had encouraged a belief that inflation could be controlled rather precisely. So the question became: how can we raise inflation up to the target from a little below? As the December 2021 National Bureau of Economic

[18] The assumption was that the depreciation of sterling would lead to a rise in the price of all tradable goods and services under the law of one price.

[19] Just before we both left office as central bank governors, Stan Fischer remarked to me at one of the BIS bimonthly meetings that the UK experience during this period had been a test of the inflation targeting framework: 'it has been tested and has proved its worth'.

Research Reporter explained, 'a major focus of research and practice was how to further stimulate these economies through unconventional monetary policy and raise their rates of inflation toward target levels'. By that time, inflation was already well above target and the approach of average inflation targeting has seemingly quietly disappeared.

# 4 The 2020–23 inflation

From the early 1990s until 2020, inflation in the major western economies averaged close to 2%. But after thirty years of low and stable inflation, central banks lost control of inflation during the pandemic. CPI inflation in the euro area peaked at 10.6% in October 2022, in the US at 9.1% in June 2022, and in Britain at 11.1% in October 2022. And although inflation fell quite sharply across the G7 economies during 2023, inflation had risen to its highest level for several decades. What went so badly wrong?

Part of the answer is the sharp rise in food and energy prices following the Russian invasion of Ukraine. But that is not the whole story. Excluding food and energy prices, in the first quarter of 2024 core CPI inflation remained well above target at around or over 4% in the US and UK and over 3% in the euro area. And that is despite a rise in official interest rates of around 5 percentage points. Central banks were slow to realise that the rise in inflation was more than a 'transitory' deviation from target.

We are all familiar with Milton Friedman's dictum that inflation is always and everywhere a monetary phenomenon. Yet money has disappeared from central bank analysis of inflation. Monetarism became discredited for three main reasons. First, the relationship between monetary aggregates and nominal incomes proved nonstationary. This told us less about the role of money and more about structural shifts in banking and the financial system. Second, Friedman and other American monetarists focused on the monetary base rather than broader monetary aggregates which could not be controlled directly by the central bank. But as the experience of QE has shown, base money is relevant to the determination of aggregate nominal demand only insofar as it affects broader measures of money.[20] Third, and somewhat bizarrely for a discipline that purports to be a science, as universities moved to the progressive left, so ideas associated with the Chicago boys of Milton Friedman appeared increasingly distasteful. For these three reasons, academic research turned its back on decades of monetary theory and decided to develop a theory of inflation without any reference to money at all. But inflation is a nominal variable. Any coherent theory of inflation must be related to nominal variables. The new models contained no theory of the nominal side of the economy – no banks, no money, no financial sector. The challenge of how to close the model and determine the price level in the medium term was solved by the assumption that inflation was determined by expectations and that expectations were determined by the official inflation target. In other words, the model assumed that inflation in the medium term would always return to the official inflation target of 2%. Milton Friedman's dictum had been

[20] The 'money multiplier' is much more unstable than the velocity of broad money.

replaced by the new dictum that inflation was always and everywhere a transitory phenomenon.

But a satisfactory theory of inflation cannot take the form 'inflation will remain low because we say it will'; it must explain how changes in policy – whether via QE or changes in interest rates – affect the economy. For a long while, central banks were successful in keeping inflation close to the target and so nothing disabused them of the strong assumption they were making – until the pandemic came along. Following a sharp reduction in potential supply – the consequence of the measures taken to prevent the spread of Covid – central banks decided to expand demand by a substantial programme of money printing through quantitative easing. Although most central banks are reluctant to describe it as such, QE is an expansion of the broad money supply because central banks buy bonds from investors who place the sale proceeds in their bank accounts adding to total deposits. Unlike its use after the banking crisis a decade or so ago, aimed at preventing a fall in broad money resulting from a contraction of commercial bank balance sheets, this time QE created a substantial monetary overhang. Growth rates of broad money accelerated rapidly, in the case of the United States to the highest levels since the end of the Second World War, at an annual rate of over 26% in the first half of 2021. In the UK broad money growth peaked at over 15% and in the euro area at almost 13%. Aggregate money demand exceeded aggregate supply valued at the current price level.

The case for substantial monetary expansion in March 2020 was framed as a response to 'dysfunctional markets'. But the monetary injection – as a market-maker of last resort – was not withdrawn once financial markets were operating normally. Substantial fiscal stimulus was being provided by governments. Further stimulus in the form of QE in 2020 and 2021 was unnecessary. The actions taken to deal with the pandemic reduced the supply of goods and services while giving fiscal support to households and businesses. Central banks increased the supply of money. This produced the time-honoured recipe for inflation – too much money chasing too few goods.[21] The possibility that aggregate nominal demand was excessive was ignored. A similar conclusion was reached by Eggertsson and Kohn (2023) who focus on tightness in the labour market. They show that the ratio of vacancies to unemployment in the US was, by late 2021, at its highest level since WWII, a record parallel to that of the broad money aggregates.[22]

I am not suggesting that policymakers respond in an automatic fashion to changes in the growth rates of monetary aggregates. But I do think it would have been sensible to ask in 2020 and 2021: if broad money is growing at 15%, and especially 25%, a year, what is going on here? In the past decade, central banks have unfortunately abandoned reporting on and monitoring the broad monetary aggregates.

In the models that now dominate central bank thinking, inflation is pinned down by a central bank reaction function which guarantees that interest rates, or QE, will be set so as to ensure that inflation returns to target. But in a world of radical uncertainty,

[21] Borio et al. (2024) document the statistically significant relationship between broad money growth and inflation in the recent inflationary episode.

[22] Bernanke and Blanchard (2023) espouse a contrary view.

where none of us know the true dynamics of the economy, we cannot be confident that central banks will in fact behave in a way consistent with hitting the inflation target. In such a world, expectations are too fragile to guarantee total central bank credibility.

Simple analytical models are immensely valuable as a way of generating insights which can be carried across to the policy process. But by design they do not include all relevant information and are not good ways of making a forecast. Policy must be set in the world, not in a model. There is an interesting parallel between the failure of models that assume inflation must converge on the official target and models of exchange rate target zones. In the latter, the original models implied that when the exchange rate was at the lower bound of the target zone then monetary tightening would lead to a rise in the exchange rate within the band (Krugman 1991). The target zone was inherently stabilising because of expectations of future policy changes.[23] A key assumption of the model is that the target zone is completely credible (Svensson 1992). The model ignores the possibility that the regime might change. Yet in 1992 that is exactly what happened in the European Exchange Rate Mechanism. A rise in interest rates led not to a rise in the exchange rate but to a loss of credibility in the continued existence of the regime. Equally, models of inflation that assume that inflation will always return to its target assume perfect central bank credibility. A lesson from the empirical failure of both sets of models to forecast what happened is that credibility needs to be modelled as endogenous to economic variables. That should be an important area for future research.

# 5 Proposals for the future

There are two major challenges facing monetary policy in the future. First, will central banks maintain their commitment to keeping inflation close to their target? Second, will central banks avoid the misjudgements of the recent past?

On the first, the relatively benign environment of the 1990s and early 2000s has given way to a much more difficult backdrop of high and rising sovereign debt levels and budget deficits (pushing up the equilibrium real rate of interest), and a shift away from trade liberalisation towards investment in domestic capacity to boost resilience. Both of these are likely to put some upward pressure on inflation and require higher interest rates to keep inflation close to target. In particular, the sharp rise in budget deficits in advanced economies during and following the pandemic has led to concerns that fiscal dominance is leading central banks to accommodate the consequences of high debt levels. Sovereign debt levels of 100% or more of annual GDP are increasingly common. The scale of QE during the pandemic was akin to monetisation of the increase in national debt. Prospects for putting fiscal policy on a sustainable path seem remote on both sides of the Atlantic. There will be greater interest in the monetary-fiscal policy mix. Life will not be easy for central banks seeking to reduce the size of their balance sheets and avoid monetisation of high levels of national debt. Goodhart and Pradhan (2020) and Afrouzi et.al. (2024) have

[23] This is a similar property to the Maradona theory of interest rates (King 2005).

argued that demographic and political economy factors mean that central banks will come under pressure to pursue more accommodative monetary policies. Although it seems unlikely that governments would rescind formal, or *de jure*, central bank independence, *de facto* independence could, and arguably has, come under question through the appointments of senior central bank personnel regarded as sympathetic to government.

On the second, it is instructive that most of the large past mistakes in judging the future path of the economy, and hence of inflation, reflected not a lack of sophisticated models but basic misjudgements – a failure to comprehend the fragility of the western banking system prior to the financial crisis and a misunderstanding of the balance between demand and supply as the pandemic evolved. In both cases insufficient attention was paid to monetary variables. In a world of radical uncertainty, in which the structure of underlying relationships is changing, decisions need to be taken before there is time to develop and estimate new models. The value of models is to gain insights that can be taken to the world, but they are not a description of the world. Small models are helpful in generating insights; large models can never capture the full complexity of the world and so are rarely helpful in forecasting at times when change means that a forecast would be useful. A key task for central banks is to ask and, if possible, answer the question 'what is going on here?'

For that to be feasible, discussion and debate inside the central bank are crucial. Most central banks are well equipped to do this. But a potential impediment is 'groupthink'.[24] It is striking that in 2020 and 2021, when outside commentators were divided between 'team transitory' and those increasingly concerned about inflation, there was unanimity within central bank policy committees (Eggertsson and Kohn 2023, and House of Lords 2023). Only later were interest rates raised. One way of reducing the risk of 'groupthink' would be consciously to introduce more intellectual diversity into central banks, both staff and policy-making committees.

The experience of inflation targets in practice suggests that the **commitment** to keeping inflation close to the target can be undermined by giving too many responsibilities to a central bank that inevitably reduce the time and focus of senior personnel on the main responsibility of achieving price stability (House of Lords 2023). To avoid some of the past mistakes, it is crucial not to rely on model forecasts but to analyse what is going on in the economy today. Models can help but they are no substitute for thinking through the likely consequences of developments for which there is no precedent.

Perhaps the most fundamental critique of inflation targeting is that the financial crisis demonstrated that price stability is not sufficient for economic stability more generally. Low and stable inflation did not prevent a banking crisis. Did the single-minded pursuit of consumer price stability allow a disaster to unfold? Would it have been better to accept sustained periods of below or above target inflation in order to prevent the build-up of imbalances in the financial system and the economy more

[24] The use of forward guidance makes groupthink more likely and suppresses differences of view on policy-making committees.

widely? Is there, in other words, sometimes a trade-off between price stability and financial stability?[25] The basic New Keynesian model omits a number of key factors and it lacks an account of financial intermediation, so money, credit and banking play no meaningful role. Those omissions obviously limit the ability of the model to help us understand the trade-offs between monetary policy and financial stability.

Such models do not provide a convincing account of the gradual build-up of debt, leverage and fragility that characterises the run-up to financial crises.[26] There is no mechanism for ensuring that misperceptions about the sustainable level of spending are corrected quickly. It may take many years before those beliefs are invalidated by experience. An equilibrium pattern of spending and saving can emerge that is stable temporarily but not sustainable indefinitely. If policymakers can, first, identify misperceptions, and second, correct them by changes in monetary policy – both highly uncertain empirically – then there is indeed a trade-off between hitting the inflation target and reducing the chance of a financial crisis down the road. This reinforces the case for thinking deeply, and from differing perspectives, about what is happening in the economy.

There may be circumstances in which it is justified to aim off the inflation target for a while in order to moderate the risk of financial crises. I do not see this as inconsistent with inflation targeting because it is the stability of inflation over long periods, not year to year changes, which is crucial to economic success. But it emphasises the importance of a credible narrative to explain and justify monetary policy.

I conclude with six suggestions for how to implement inflation targets and monetary policy in future:

1. When making model-based forecasts of inflation, and other variables, explore different assumptions about the credibility of policy. At present, many forecasts are made using models which assume that inflation will always come back to 2% because that is the target. It would be sensible to produce additional forecasts based on the assumption that inflation expectations follow a path that returns to the target over a much longer horizon. That would at least reveal how sensitive are the short-run dynamics of inflation to the assumption about the longer-term anchor of inflation. Simulations of this kind should be a regular feature of staff analysis presented to policy committees. Ideally, credibility would become an endogenous rather than an exogenous variable.

2. When presenting forecasts, far less attention should be directed to the central projection and much more on the risks around it. That was one of the recommendations of the Bernanke review of the Bank of England's forecasting processes: 'communicating to the public about the MPC's perceptions of the level of uncertainty and the balance of risks remains essential' (Bernanke 2024). It had also been the purpose behind the fan

[25] See the analysis of such a trade-off in terms of a Minsky-Taylor frontier in King (2012).

[26] Focussing on small deviations around the linearization of the steady-state of a dynamic stochastic general equilibrium model helped to divert attention away from the gradual build-up of big risks.

charts used by the Bank for many years and why they contained no line for a central projection but instead were designed to emphasise whether the balance of risks was judged to be on the upside or downside based on forward-looking judgements, not a mechanical projection of past outturns.[27] But after 2013, the Bank started to emphasise the central projection and play down the presentation of risks.[28] As Bernanke points out, 'For public communication, the importance the MPC attaches to the central forecast is illustrated by its prominence in all of the Bank's post-decision public releases'. This is contrary to the approach of the MPC during its first decade and a half which was to downplay the central projection and play up an assessment of the risks around the target.

3. When presenting risks there are many ways to skin a cat. In his review of the Bank, Bernanke proposes that the MPC focus on explaining the qualitative assessment of the degree of uncertainty. He recommends dropping all reference to and numbers for mean forecasts. To communicate the risks Bernanke recommends dispensing with fan charts and moving to a discussion of different scenarios. Bernanke argues that the construction of the fan charts is 'uncomfortably ad hoc'. But as Goodhart has commented, 'the number of potential scenarios is huge, and the choice of which scenario to adopt is, surely, even more ad hoc than the fan chart' (Goodhart 2024). Bernanke states in a footnote that 'the width and skew of fan charts are primarily determined by MPC members' judgement, informed by discussion of potential risks'. That is exactly what he argues elsewhere should determine the Committee's judgement about risks. The choice between fan charts and verbal discussion of scenarios is a matter of taste not economics, and the two are complements not substitutes. Both the Fed and the Bank of England underestimated the need to tighten monetary policy in 2020 and 2021 – one published and presented its views using the so-called 'dot plots' and the other fan charts. It made no difference. The real problem was the misjudgement.

4. Abandon forward guidance. The use of forward guidance as a tool of monetary policy is a dangerous game. It ran into trouble early on when guidance was linked to just one real variable, the path for unemployment. And markets have been only too happy to blame central banks when they feel they have been led up the garden path. The Federal Reserve does not know the short-term policy rate it will want to set six months from now, let alone what it will be in 2025 or 2026. For example, the markets' interpretation of guidance about the number of rate cuts during 2024 (a matter of months away) has varied during this year from zero to six. It would be better to be honest about the uncertainty. Associated with the use of

[27] Fan charts were first published by the Bank of England in the February 1996 *Inflation Report*, not in 1992 as reported by Bernanke (2024).

[28] Goodhart (2024) points out that 'the Bank at times itself downgraded their use [of fan charts]. For example, during Governor Carney's regime, the fan chart for inflation two years hence was kept at a constant width and zero asymmetry, that is, no skew.

forward guidance is the publication of a future path of policy rates – in the case of the Federal Reserve this takes the form of the well-known 'dot plots'. In March 2022, the range of projected Federal funds rates in 2023 for all FOMC members was 2.4 to 3.1%. The outturn was over 5%. Central banks do not know the future path of policy rates because the path of the economy is uncertain. It does know its own reaction function. Markets compute their estimate of the future path of interest rates by feeding their own view of the evolution of the economy into the central bank reaction function. Their view of where the economy is headed may well be different from that of the central bank. Forward guidance conflates the reaction function with the forecast of the central bank. There is nothing to be gained by doing this and much credibility to be lost. A central bank should focus on the setting of the policy instrument – interest rates and QE – today, not in three years' time. In a report on the monetary policy of the Swedish Riksbank, the late Marvin Goodfriend and I showed how damaging it was for their policy committee to be distracted from the immediate policy decision by an internal debate about where rates should be in three years' time (Goodfriend and King 2015). A more important task is to develop a narrative about the state of the economy that changes over time meeting by meeting, report by report.

5. Publish and report regularly on the evolution of monetary variables, especially the growth of broad money. Inflation is a nominal variable. Broad money is a useful check on the plausibility of the narrative that underpins policy decisions. This resembles the 'two pillar' approach to monetary policy developed by Otmar Issing at the start of the European Central Bank. As he later wrote: 'rejecting monetary targeting as a strategy for the ECB did of course not imply neglecting the overwhelming evidence for the long-run relation between money and prices and the undeniable fact that monetary policy has somewhat to do with money … any deviation of M3 growth would not trigger a mechanistic monetary policy reaction but would prompt further analysis to identify the reasons behind such developments' (Issing 2006).

6. Stop publishing transcripts of monetary policy meetings, as currently practised by both the Federal Reserve and Bank of England. There must be room for private conversations. Publishing transcripts does not enhance transparency. It merely distorts the policy process by moving the real conversation to a different, and usually earlier, meeting and means that at the final meeting for which transcripts are collected the contributions are repetitive statements by the participants prepared for subsequent publication. The spontaneity of a genuine conversation is lost.

Interestingly, many of the problems experienced by central banks during the recent episode of inflation were foreshadowed by the Swedish Riksbank in the wake of the financial crisis. In our review of the Riksbank's monetary policy, Marvin Goodfriend and I described the problems of over-reliance on a narrow set of models, the fallacy of using models that assume total credibility of the central bank and the dangers of focussing on forward guidance for the future path of the policy rate:

‘By far the most serious problem was the growing discrepancy between the future path for the repo rate forecast by the Riksbank itself and the future path implied by prices in financial markets. … There 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 became too easy to paper over major differences of view on the current stance of policy by expressing them in terms of differences of view about the likely future path of the policy rate’ (Goodfriend and King 2006, pp. 6–7). Moreover, the absence of clear authority for any other body to deal with growing imbalances and a rise in credit raised the question of whether there was a good case for a tighter monetary policy stance than was justified by looking solely at the inflation forecast eighteen months to two years ahead. During the short period 2012–2015, the Riksbank faced almost all of the challenges that emerged in other countries more recently. The fact that the Riksbank came through this episode is encouraging for the advocates of inflation targeting, albeit with the modifications advocated above.

# 6 Conclusions

The announcement of an inflation target was never seen as a substitute for a careful and deep analysis of what was going on in the economy, and in particular of developments in the nominal side of the economy. Inflation targets in practice were a way of setting monetary policy under a regime of constrained discretion, not a theory of inflation. A model based on optimising behaviour by rational agents may generate some useful insights into how to think about the economy (for example, the importance of expectations) but it is not a description of the economy and cannot make predictions. We should not throw out the baby with the bathwater (expectations matter) but policy has to contend with serious nonstationarities which make econometric estimation of past relationships a poor guide to the future. As Amar Bhidé has written, ‘evidence collaborates with and does not replace imagination’ (Bhidé 2024). A successful decision-making process must allow for a narrative to evolve after a debate and discussion.

The theory of inflation targets gradually evolved in a different direction. It shed any focus on developments in the nominal side of the economy and explained inflation in terms solely of real variables with the sole nominal variable being the inflation target. The growth of nominal demand was sidelined. In other words, it assumed that policymakers would always do the right thing. But if policymakers pursued a policy that was likely to lead to inflation moving above target – as I would argue occurred in their response to the pandemic when a reduction in aggregate supply was accompanied by a policy to boost aggregate demand way beyond anything that would maintain a balance between the two – the credibility of the inflation target would be challenged.

The weakness in the theory was similar to earlier failures of models, such as exchange rate target zones – policymakers deviated from the core assumption of the model. That possibility means that such models cannot be a reliable basis for forecasting

inflation. Models can provide extremely useful insights, but they are not a substitute for policymakers asking 'what is going on here?' The problem was not so much in the models as in the misuse of models.

Inflation targets have proved their worth in practice because they were implemented with a clear focus on institutional changes to impose effective constraints on the discretion desirable to respond to changes in a nonstationary economy. By airbrushing monetary and financial variables out of the picture, the theory of inflation targets has oversimplified the process by which inflation expectations are formed. Rational expectations are defined over a process determining the underlying variables, not by an objective of policy. Announcing an inflation target is no guarantee of achieving it. Setting policy in an uncertain nonstationary environment is difficult. Transparency and accountability are crucial to retaining credibility in the good faith and competence, though not infallibility, of central banks. That is the real achievement of inflation targets in practice.

Now is the time for central banks to take a gentle step back from being in thrall to the latest theoretical advance and avoid becoming the slaves of living economists.

## References

Afrouzi, Hassan, Marina Halac, Kenneth Rogoff and Pierre Yared (2024), 'Changing central bank pressures and inflation', Working Paper no. 32308, National Bureau of Economic Research.

Bernanke, Ben (2024), 'Forecasting for monetary policy making and communication at the Bank of England: a review', Independent Evaluation Office, Bank of England.

Bernanke, Ben and Olivier Blanchard (2023), 'What caused the U.S. pandemic-era inflation?', Working Paper no. 86, Hutchins Center on Fiscal and Monetary Policy at the Brookings Institution.

Bhidé, Amar (2024), *Uncertainty, Justification, and Enterprise*, Oxford University Press.

Borio, Claudio, Boris Hofmann and Egon Zakrajsek (2024), 'Money growth and the post-pandemic inflation surge: updating the evidence', Speech, Bank for International Settlements, 24 January.

Carter, Thomas J, Rhys Mendes and Lawrence L. Schembri (2018), 'Credibility, flexibility and renewal: the evolution of inflation targeting in Canada', Staff Discussion Paper no. 2018-18, Bank of Canada.

Eggertsson, Gauti and Don Kohn (2023), 'The inflation surge of the 2020s: the role of monetary policy', Working Paper no. 87, Hutchins Center on Fiscal and Monetary Policy at the Brookings Institution.

Goodfriend, Marvin and Mervyn King (2016), 'Review of the Riksbank's Monetary Policy 2010–2015', Reports from the Riksdag 2015/16:RFR6.

Goodhart, Charles (2024), 'The grass is always greener: farewell fan charts, welcome scenarios',in *The Bernanke Review: Responses From Bank of England Watchers*, edited by David Aikman and Richard Barwell, King's Business School.

Goodhart, Charles and Manoj Pradhan (2020), *The Great Demographic Reversal: Ageing Societies, Waning Inequality, and an Inflation Revival*, Palgrave Macmillan.

House of Lords (2023), 'Making an independent Bank of England work better', Report of the Economic Affairs Committee, 1st Report of Session 2023–24, London.

Issing, Otmar (2006), 'The ECB's monetary policy strategy: why did we choose a two pillar approach?', in *The Role Of Money – Money And Monetary Policy In The Twenty-First Century*, edited by Andreas Beyer and Lucrezia Reichlin, European Central Bank.

Kaldor, Nicholas (1971), 'Conflicts in national economic objectives', *Economic Journal*, vol. 81, no. 321, pp. 1–16.

King, Mervyn (1997), 'Changes in UK monetary policy: rules and discretion in practice', *Journal of Monetary Economics*, vol. 39, pp. 81–97.

King, Mervyn (2005), 'Monetary policy: practice ahead of theory', speech at the Mais Lecture, Cass Business School, 17 May, Bank of England.

King, Mervyn (2012), 'Twenty years of inflation targeting', speech at Stamp Memorial Lecture, London School of Economics, 9 October, Bank of England.

King, Mervyn (2022), 'Monetary policy in a world of radical uncertainty', *Economic Affairs*, vol. 42, no. 1, pp. 2–12.

Krugman, Paul (1991), 'Target zones and exchange rate dynamics', *Quarterly Journal of Economics*, vol. 106, no. 106, pp. 669–682.

Pill, Huw (2024), 'Monetary policy strategy', remarks given at Cardiff University Business School, 1 March.

Reddell, Michael (1999), 'Origins and early development of the inflation target', *Reserve Bank of New Zealand: Bulletin*, vol. 62, no. 3.

Reserve Bank of New Zealand (1990), 'Reserve Bank of New Zealand policy targets agreement', *Reserve Bank Bulletin*, vol. 53, no. 1, pp. 26–28.

Rotemberg, Julio and Michael Woodford (1997), 'An Optimization-Based Econometric Framework for the Evaluation of Monetary Policy', *NBER Macroeconomics Annual*, vol. 12, pp. 297–346.

Svensson, Lars E. O. (1992), 'An interpretation of recent research on exchange rate target zones', *Journal of Economic Perspectives*, vol. 6, no. 4, pp. 119–144.

Tucker, Paul (2019), *Unelected Power: The Quest for Legitimacy in Central Banking and the Regulatory State*, Princeton University Press.

# 30 years of inflation targeting: from simple to complex

Magnus Jonsson and Anders Vredin*
Magnus Jonsson is an advisor at the Monetary Policy Department and Anders Vredin is a senior advisor at the Monetary Policy Department.

The inflation targeting framework has enjoyed considerable success in achieving price stability since it was first introduced in the 1990s. At that time, the framework appeared simple. A short-term interest rate was the principal policy instrument and the primary transmission of monetary policy was through the interest rate channel. Thirty years later, inflation targeting is more complex. The precipitating factor was the outbreak of the Global Financial Crisis in 2008. However, deeper structural changes had been mounting in the background: a larger and riskier financial system, increasing financial stability risks, less national policy autonomy, supply side shocks becoming more important, rapidly developing new financial technologies, and a reconsideration of fiscal policy's role for monetary policy. Among other things, this has led to more attention being given to frictions in financial markets and to the implications for monetary policy of transmission channels through credit and risk taking. Policies such as asset purchases and lending programmes that affect the size and structure of the central bank's balance sheet are now part of the toolkit.

## 1 Introduction

After the turbulent macroeconomic periods of the 1970s, 1980s and early 1990s, a period with more credible economic policies, moderate business cycle fluctuations, and low and stable inflation followed. This period is often referred to as the Great Moderation.[29] Some of the factors behind this benign development were a new monetary policy framework that focused on price stability – so-called inflation

* This paper builds on earlier work with Stefan Ingves during his time as Governor of the Riksbank. His important input is gratefully acknowledged. We are also grateful to Claudio Borio and Martin Ellison for many useful comments, criticism and advice in early stages of the project. Finally, we thank Hanna Armelius, Aino Bunge, Carl Andreas Claussen, Daniel Hansson, Jens Iversen, Martin Kornejew, Anders Lindström, Stefan Laséen, Jesper Lindé, Marianne Nessén, Charlie Nilsson, Johan Schmalholz and Ulf Söderström for valuable comments, suggestions and other input. The opinions expressed in this article are the sole responsibility of the authors and should not be interpreted as reflecting the views of Sveriges Riksbank.

[29] The Great Moderation is typically interpreted as a period in the US broadly defined from the middle of the 1980s until the start of the Global Financial Crisis in 2008. We use the term to reflect the period from the mid-1990s to 2008, partly because inflation targeting was introduced in many countries in the 1990s. Furthermore, Europe did not experience any great moderation until the mid-1990s.

targeting – along with fiscal and other economic reforms. An additional factor was, in all likelihood, the absence of large macroeconomic shocks.

During the Great Moderation, the inflation targeting framework worked with ease and monetary policy appeared relatively simple. A short-term interest rate was the principal policy instrument and the main transmission of monetary policy was the interest rate channel, see for example Clarida et al. (1999).[30]

After some years with increasing financial imbalances and disturbances, the Great Moderation came to an abrupt end in September 2008 when the investment bank Lehman Brothers collapsed and the Global Financial Crisis broke out. The recession that followed was the most significant economic downturn since the Great Depression. From a central bank perspective, this gave rise to a debate about how monetary policy should take financial stability risks into account. It also gave rise to new regulations of the financial system to mitigate the negative effects of different frictions and risks in the financial system.

In the aftermath of the financial crisis more than a decade followed characterised by persistently low inflation and real interest rates. This led many central banks to lower their policy rate to levels near the effective lower bound, in some cases even to negative rates, and to undertake other 'unconventional' measures such as large-scale asset purchases. When the pandemic broke out in early 2020, new large-scale asset purchases were yet again undertaken.

The liberalisation of financial and capital markets in the 1980s and 1990s facilitated a rapid globalisation of financial services. In addition, increased wealth among households and firms led to higher demand for financial services. These factors contributed to a rapid growth of the financial system. In advanced economies the financial system approximately doubled its size from the mid-1990s to the early 2020s. At the same time, the risks in the financial system increased, partly because financial institutions attempted to circumvent new and old regulations, see Rajan (2005). New financial instruments, new forms of financial intermediation and international integration of financial markets thus contributed to more risk-taking. A growing importance of non-bank financial intermediaries gave central banks reasons to rethink the use of their instruments and their choice of counterparties, see for example Buiter et al. (2023).

A rapid process of financial integration across countries has led to less national policy autonomy, which affects both monetary and financial market policies. A greater international cooperation between central banks is one way to meet these challenges. It has also been noted that while the role of aggregate demand for inflation and monetary policy is often carefully analysed by central banks, changes in the conditions on the economy's supply side have not received the same attention. Systematic surprises of low or high inflation suggest that supply conditions deserve more

[30] The interest rate channel works by monetary policy influencing real interest rates that in turn affects aggregate demand and inflation. Other channels have been analysed in the macroeconomic literature on monetary policy, but not given the same importance in models of inflation targeting.

analysis.[31] In addition, new payment technologies have emerged that could streamline and make the payment system more efficient. However, the new technologies may also threaten central banks' control over the supply of money and liquidity.

A characteristic feature of the inflation targeting framework is the separation of monetary and fiscal policy decisions. The principal reason for this was the negative experiences of the stabilisation policies in the 1970s and 1980s. However, the experiences after the Global Financial Crisis have led to new discussions about the links between monetary and fiscal policy. Low interest rates and large central bank balance sheets are associated with new risks, possibly also for fiscal policy. At the same time, the level of interest rates and inflation are not purely 'monetary phenomena' but also affected by the design of fiscal policy. A complete separation of monetary and fiscal policy can therefore be questioned.

These observations suggest that the economic environment related to central banks' operations in many ways is different today compared to thirty years ago when inflation targeting was first introduced.[32] We argue in this article that inflation targeting has become more complex than it was perceived when introduced. For example, more attention is given to the role of frictions on financial markets and to transmission channels such as the credit and risk-taking channels. Policies such as asset purchases and lending programmes that affect the size and structure of the central bank's balance sheet are also part of the toolkit.

The paper is organised as follows. In the next section we discuss inflation targeting under the Great Moderation through the lens of the New Keynesian model. We make the point that inflation targeting appeared relatively simple in this period, especially according to the proposed theoretical framework, but also in the practical implementation. In section 3, we discuss inflation targeting after the Global Financial Crisis and factors we think have made inflation targeting more complex. Finally, section 4 concludes with eight takeaways based on our discussions.[33]

# 2 Inflation targeting under the Great Moderation

The Great Moderation was a period of relatively high macroeconomic stability in most advanced economies. Inflation was generally low and stable, and economic growth was reasonably strong. One factor behind this benign development was the introduction of an inflation targeting framework. Other factors also played a role. There were no large global shocks similar to the oil price shocks of the 1970s, and

[31] This is reflected for example in the reviews by de Brouwer et al. (2023) and Bernanke (2024), see section 3.1.

[32] There are also other changes in the economic environment – that are not discussed in this paper – that make inflation targeting more complex today than 30 years ago, for example, climate change, geopolitics, income and wealth developments, and increasing debt levels.

[33] We do not claim to present any new or original ideas. We provide many references to the literature, where the important ideas and sources can be found.

governments undertook fiscal and other economic reforms that increased economic efficiency.

The key features of inflation targeting were a focus on price stability and a high degree of independence for the central bank. The details of the inflation targeting framework differ slightly between countries, but the overall purpose is to establish a high level of credibility for low and stable inflation. A noticeable characteristic is a quantified target for inflation. But inflation targeting does not necessarily mean that the central bank only cares about inflation. Most central banks conduct what is known as 'flexible' inflation targeting, which means that in addition to stabilising inflation, some weight is assigned to stabilise output and employment, see Rogoff (1985) and Svensson (1997, 1998).

Central bank independence means, among other things, that monetary policy decisions should be taken without interference from the government or parliament. This increases the public's confidence in the inflation target and contributes to the central bank's credibility. However, with independence follows a stronger need to hold the central bank accountable for its decisions and assessments. Central bank transparency and openness are therefore important.[34] Transparency may also increase the effectiveness of monetary policy since the central bank's communication about future policy affects market interest rates already today, the so-called expectations and signalling channels.

During the Great Moderation, the key instrument considered necessary to keep inflation low and stable was a short-term interest rate controlled by the central bank, often called the policy rate. The key transmission channel of monetary policy was the interest rate channel. This view was reflected in early versions of the so-called New Keynesian model, see for example Clarida et al. (1999) and Galí (2015).

Many of the policy implications from the New Keynesian model guided monetary policy decisions during this period. If inflation was too high, the policy rate should be sufficiently raised to increase the real interest in order to contract demand, and vice versa if inflation was too low. In the case of demand shocks, the simple versions of the model predicted that there would be a 'divine coincidence', that is the interest rate changes needed to stabilise inflation would also stabilise real economic activity, see Blanchard and Galí (2007). If supply shocks appeared, however, they may give rise to a short-run trade-off between inflation and output stabilisation. The central bank should also be aiming at pushing inflation gradually back to the inflation target, since more drastic policy changes could lead to excessive output fluctuations. Finally, the credibility of future policy intentions played a key role. For example, if the central bank needed to reduce inflation and had a high degree of credibility, it could signal its intention to keep inflation low in the future and this signal would by itself reduce today's inflation with less output loss.

In this New Keynesian model, the central bank is by assumption exceptionally powerful in stabilising inflation and output. By identifying economic shocks to supply

[34] For comparisons of the degrees of central bank independence and transparency in different countries, see Dincer and Eichengreen (2014) and Dincer et al. (2022).

and demand, the central bank can fully stabilise both inflation and output in the case of demand shocks and there is, as mentioned, a trade-off in the case of supply shocks.

Even if these policy recommendations have had a large impact on actual monetary, especially during the Great Moderation, but also afterwards, the underlying model is very simple and can under certain conditions be misleading. For example, the policy rate is not the central bank's only instrument. The central bank's balance sheet offers many other instruments that can used, if needed.[35] The transmission mechanism in the New Keynesian model (the interest rate channel) is simple and stable because frictions on financial markets are typically ignored. Experience shows, however, that frictions may force central banks to use a wide set of instruments. The framework has also led to a strong focus on demand shocks in the policy work, although experience suggests that supply shocks often are very important for understanding the development of inflation. Finally, the implications of the simple New Keynesian framework for inflation targeting are often discussed in a closed economy context, and the implications for an open economy may be different due to for example effects from changes in the exchange rate.

# 3 Inflation targeting after the Global Financial Crisis

In this section, we discuss some of the key structural changes in the economic environment that have become apparent after the Global Financial Crisis and that in our view have contributed to make inflation targeting more complex.

## 3.1 A greater role for supply side conditions

Economists often make a distinction between short-term cyclical fluctuations and long-term structural phenomena. Short-term variations are viewed as fluctuations around a more stable trend, and these variations are often best understood as reflecting changes in demand.[36] Supply factors such as demography, technology, the functioning of the labour market, incentive effects of the taxation system, competitive conditions, etcetera, are assumed to explain the long-term trends. The role of monetary policy is assumed to be mainly about stabilisation of the short-term variations. Much of the discussions and analyses of monetary policy have therefore focused on demand factors, while the role of supply factors has not been given the same attention.

This is unfortunate. Many of the challenges that central banks have dealt with during the last decades have been related to changes in supply conditions, and not just to temporary, cyclical phenomena on the demand side of the economy, see Faust and Leeper (2015). Changes in regulations, a rapid technological progress and globalisation have led to various structural changes during the last decades. For example, liberalisations of trade and increased labour mobility have led to an increase

[35] A useful starting point to understand the central banks' instruments is the balance sheet, see Buiter (2024), Cecchetti and Hilscher (2024) and Bindseil (2018).

[36] In the so-called real business cycle models this interpretation was questioned, see for example Cooley (1995).

in the global labour supply that has contributed to low levels of global inflation. The strong focus on cyclical demand factors in forecasting and policy analysis can, against this background, lead to misleading conclusions for both forecasts and monetary policy. For example, changes in GDP and unemployment may be interpreted as caused entirely by changes in various demand components, although changes in supply could be just as important. The important role of supply factors became evident during the pandemic, the war in Ukraine, and the rapid increase in inflation during 2021–2022.[37] But changes in supply conditions have presumably been important for inflation also earlier.

The increasing use of larger-scale New Keynesian models with more frictions and a role for temporary and permanent changes in supply factors should in principle have mitigated the focus on demand side factors. However, even though these models have been widely used in internal analyses their impact on central banks' forecasts, policy and communication remains unclear. One explanation is probably that also these models have had limitations in the unusual crises central banks have had to deal with during the last fifteen years.

One indication of this is that many central banks overestimated the inflationary pressure after the Global Financial Crisis. In Figures 1 and 2 we show the Riksbank's forecast errors, but other central banks that publish their forecasts have had the same experience, see Filardo and Hofmann (2014). The need to raise the policy rate in the future was systematically overestimated (until 2022), as indicated by the Riksbank's own forecasts of the policy rate (dotted lines in Figure 2). One likely reason was that the inflationary pressure was overestimated (Figure 1).[38]

Starting from the New Keynesian model some potential explanations for these forecast errors naturally arise. A common explanation is that the so-called natural interest rate was overestimated, which gave rise to tighter monetary policy than planned. The natural rate is not observable and thus difficult to measure and forecast.[39] When estimating the natural rate, the global trend in the interest rate is often used as an input. As Figure 3 shows, global interest rates were trending downwards for a couple of decades. Presumably, this made it particularly difficult to estimate the natural rate during this period. There are also analyses which suggest that at least parts of the declining trend was due to supply conditions, for example lower global growth expectations, see Rachel and Smith (2017).

Another explanation is more directly related to supply conditions. Globalisation and the forces giving rise to it, led to increased competition and difficulties for firms to raise their prices. In terms of the New Keynesian model, this could have been interpreted as a series of positive supply shocks, but this message does not seem to have been sufficiently incorporated in the policy analyses and forecasts. Furthermore, the underestimation of inflation during 2021 and especially 2022 are probably related

[37] Guerrieri et al. (2023) discuss the roles of various factors behind the increase in inflation, including differences between the inflation processes in the US and Europe.

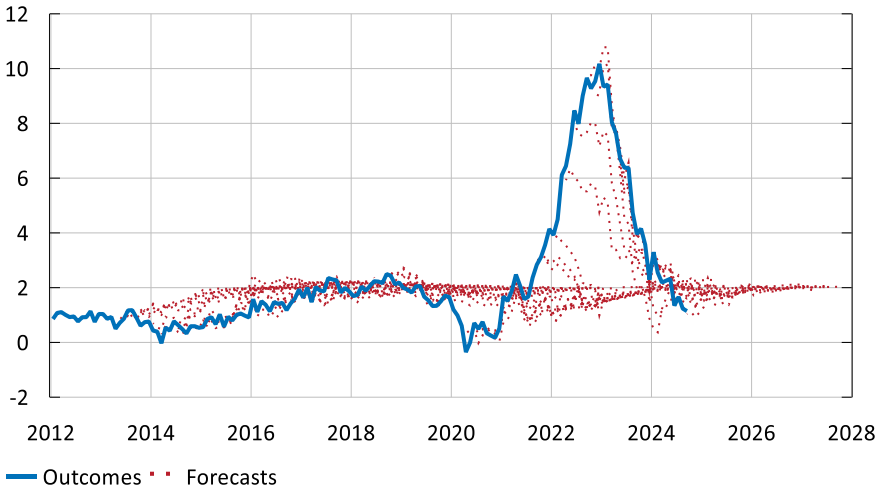
[38] See Sveriges Riksbank (2017a and 2017b) for an evaluation of the Riksbank's forecasts.

[39] There is a large literature on this subject. For a recent contribution and further references, see Buncic (2024).

to similar factors, but with opposite signs, that is, negative supply shocks, see Guerrieri et al. (2023).

**Figure 1. CPIF-inflation and forecasts**

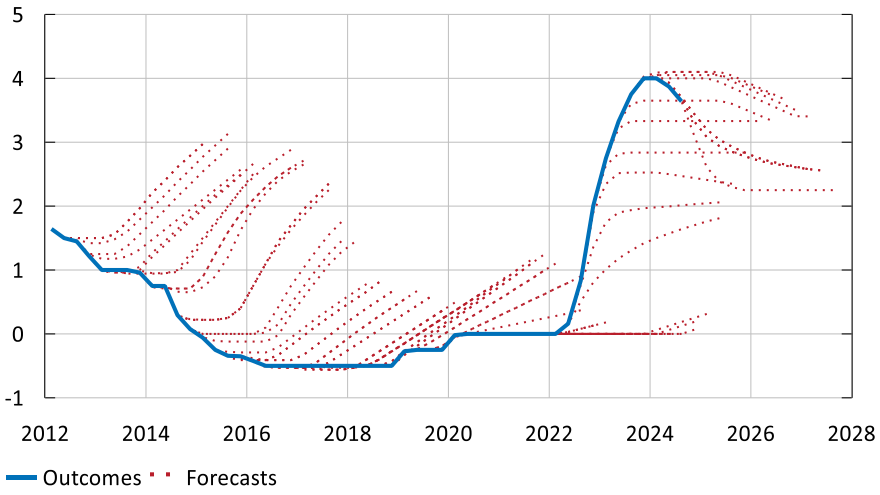
Annual percentage change




Sources: Statistics Sweden and Sveriges Riksbank.

**Figure 2. Policy rate and forecasts**

Per cent




Source: Sveriges Riksbank.

The need for a greater role for supply conditions in monetary policy analyses has been raised by several economists. The review of the Reserve Bank of Australia claims that supply side conditions (and fiscal policy) should play a larger role in the analysis, see de Brouwer et al. (2023).[40] In a review of the Bank of England's forecasting process,

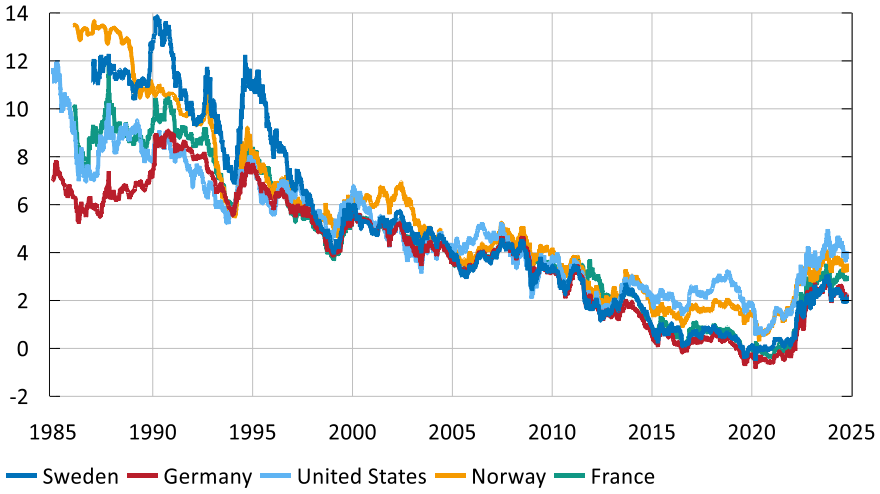
[40] For example, recommendation 9.3 says that 'The RBA should increase its forecasting and macroeconometric modelling capability, for example around the supply side of the economy and fiscal policy'.

Bernanke (2024) also discusses the importance of supply factors.[41] Similar arguments as in these reviews have been made for Sveriges Riksbank, see Hansson et al. (2018).[42] Based on the Riksbank's forecast revisions 1993–2022, Bylund et al. (2024) conclude that supply shocks have been dominating one third of the time. This is a larger role than supply side conditions seem to have played in the Monetary Policy Reports over the years, which means that the recommendations to the Reserve Bank of Australia and Bank of England are relevant also for Sveriges Riksbank.

Despite the pedagogical advantages of the early versions of the New Keynesian models for monetary policy, and the framework's usefulness during the early stages of inflation targeting, some of its limitations thus became apparent in the aftermath of the Global Financial Crisis.

**Figure 3. 10-year government bond yields**

Per cent




Note. Benchmark rates.

Sources: Norges Bank, Macrobond Financial AB and the US Department of Treasury.

## 3.2 A growing and riskier financial system

The financial system in the US and other advanced economies was heavily regulated in the period after the Second World War. This led to a stable financial system with small risks for disturbances both within and across countries. From the 1980s, deregulations and technological advances gave incentives to a rapid globalisation and a closer integration of the financial systems across the world. The financial systems grew fast and became more efficient, while financial risks were mounting in the background, see Rajan (2005). In advanced economies, the financial system

[41] Bernanke's (2023) recommendation 4e proposes 'greater attention to, and ongoing review of, supply-side elements and their role in the determination of inflation and growth. … Notably, analyses of inflation should consider supply-side factors as well as the state of aggregate demand.'

[42] See also Jonsson and Theobald (2019) who study the implications of structural changes on the labour market for inflation and other macroeconomic outcomes.

approximately doubled its size from around 300 per cent of GDP in the mid-1990s to around 600 per cent in the early 2020s, see Tables 1 and 2.

**Table 1. Domestic financial corporations' financial assets**
Share of GDP in per cent

| | Sweden (1995) | Sweden (2021) | EU 27 (1995) | EU 27 (2021) | US (1995) | US (2021) |
|---|---|---|---|---|---|---|
| MFI (bank, etc.) | 177 | 278 | 207 | 280 | 80 | 138 |
| Insurance, pension | 51 | 175 | 38 | 96 | 122 | 182 |
| Investment funds | 11 | 123 | 18 | 129 | 29 | 137 |
| Other fin. corp. | 20 | 85 | 33 | 159 | 79 | 110 |
| Total | 259 | 661 | 296 | 663 | 310 | 567 |

Note. Assets of foreign financial corporations, central bank and general government are not included. Note also that we compare the size of the financial sector, a stock variable, to the level of income and production, a flow variable. The financial sector's contribution to the value of production has not grown as fast as the stock of total assets. For a discussion of the development of the financial sector's share of the value of production, see Philippon and Reshef (2013).

Source: Eurostat.

If we look at the asset holdings of households and non-financial firms, the shares of risky assets have increased significantly. In the US, this is reflected in an increase of the holdings of listed shares in firms, while such shares are held more indirectly ('other equity'), through for example investment funds, in the EU and Sweden. The growth of investment funds and other non-bank financial intermediaries has been particularly rapid in Europe. Banks dominated in Europe in the 1990s, but non-bank financial intermediaries have in later decades become more important, as they have been in the US for a long time. The increased roles of non-bank financial intermediaries and risky assets reflect a growing importance of a market-based finance system compared to a bank-based financial system. It seems reasonable to conjecture that the increase to a large extent has been driven by higher demand for financial services due to an increase in private wealth, but changes in regulations have also mattered, see Acharya et al. (2024).[43] These structural changes in the financial system imply new risks that central banks should help mitigating. Central banks can for example supply liquidity also to non-bank financial intermediaries through loans or asset purchases.[44]

[43] See also the paper by Scharfstein (2018) that emphasises the role of pension systems for the development of the financial system. Waldenström (2022) provides historical data on wealth in Sweden.

[44] See for example the speeches by Hauser (2022) and Breeden (2022) about the Bank of England, and Buiter et al. (2023) about the central bank as a lender and market maker of last resort more generally.

**Table 2. Households' and non-financial corporations' financial assets**

Share of GDP in per cent

| | Sweden (1995) | Sweden (2021) | EU 27 (1995) | EU 27 (2021) | US (1995) | US (2021) |
|---|---|---|---|---|---|---|
| Currency, deposits | 42 | 83 | 70 | 106 | 45 | 88 |
| Debt securities | 17 | 7 | 22 | 6 | 30 | 16 |
| Loans | 22 | 84 | 17 | 44 | 7 | 7 |
| Listed shares | 21 | 77 | 16 | 28 | 58 | 157 |
| Fund units | 9 | 42 | 13 | 29 | 25 | 76 |
| Other equity | 54 | 346 | 49 | 164 | 62 | 107 |
| Insurance, pensions | 40 | 136 | 35 | 76 | 113 | 160 |
| Other | 60 | 38 | 41 | 51 | 45 | 77 |
| Total | 264 | 813 | 264 | 503 | 385 | 687 |

Note. Assets of foreign financial corporations, central bank and general government are not included. Note also that we compare the size of the financial sector, a stock variable, to the level of income and production, a flow variable. The financial sector's contribution to the value of production has not grown as fast as the stock of total assets. For a discussion of the development of the financial sector's share of the value of production, see Philippon and Reshef (2013).

Source: Eurostat.

### 3.2.1 Central banks' balance sheets reflect risks in the financial system

A central bank's activities largely reflect the properties of the financial system, see Capie et al. (1996). Still, over a longer period of time, the central banks' balance sheets have not, unlike the financial system as whole, shown an increasing trend. During the whole 1900s they were relatively stable in relation to GDP and were fluctuating at around 10 to 20 per cent as a share of GDP, see Figure 4. Ferguson et al. (2015) discuss four kinds of events where large expansions of central banks' balance sheets typically take place: a foreign exchange crisis (like in Sweden 1992), government financing (for example financing of wars), lender-of-last-resort operations, and demand stabilisation (the Global Financial Crisis is an example of both). These events are related to the historical reasons why central banks were created in the first place. They are examples of circumstances when the financial system is not sufficiently stable and efficient without the support of a central bank, that is, various frictions and imperfections need to be counteracted by central banks.[45] [46] The growth of central banks' balance sheets therefore partly reflects crisis

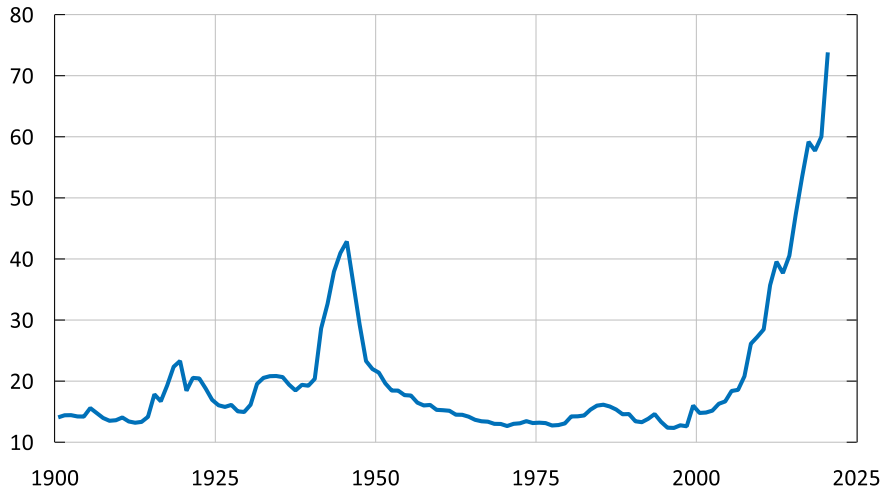
[45] See Capie et al. (1996). In his essay on 'Why do Banks Need a Central Bank?', Goodhart (1987) refers to the seminal and later Nobel-prize awarded contributions by Diamond and Dybvig (1984) and Bernanke (1983). For a survey of the central bank's role as liquidity provider, and further references to the academic literature, see Bertsch and Molin (2016).

[46] In addition, as stressed by Capie et al. (1996), central banks have been important as the government's bank. Ferguson et al. (2015) note that there is a strong positive correlation between large changes in central banks' balance sheets and in public debt. They interpret this as a sign of coordination of monetary and fiscal policy in crisis situations. Hall and Sargent (2022) present three case studies from US history.

measures that are reversed, in line with earlier historical experiences, but it may also reflect persistent structural changes in the financial system.

**Figure 4. Average international central bank balance sheet size**

Per cent of GDP




Source: See Ferguson et al. (2023) for data sources and countries included.

Ferguson et al. (2015, p. 13) suggest that 'the recent expansion of central bank balance sheets appears more like a return to previous, potentially safer levels of the ratio of central bank money to financial sector assets'. It should be noted, though, that this assertion was made already in 2014, and that central banks' balance sheets increased further later on. The growth of the financial system had a 'thin foundation of liquidity', see Ferguson et al. (2015, p. 3–4). All in all, experience shows that in situations with large disturbances to the macroeconomy and the financial system, the central bank cannot fine tune financial conditions, inflation or the economic activity by simply adjusting a short term interest rate, as in the simplest New Keynesian models of monetary policy. Other instruments are be necessary, such as asset purchases and loans to banks, including in foreign currency.[47]

## 3.3 A greater focus on financial stability risks

The discussion of monetary policy's role in contributing to financial stability before the Global Financial Crisis was mainly about whether monetary policy should 'lean' against signs of an asset price bubble ex ante, or just 'clean up' the effects of the bubble bursting ex post, see for example Cecchetti et al. (2000). The consensus was – but not without some disagreement – that stabilisation of asset prices should not be seen as an objective of central banking. After the financial crisis, the discussion was broadened to the question whether or not the central bank should have financial

[47] Buiter et al. (2023) suggest that the central bank should act as a lender and market maker of last resort to a wide set of counterparties and with a broad category of accepted collateral. But they do not argue that central banks' balance sheets should be large in normal times. See also Kolasa et al. (2025) for the effects of asset purchases.

stability as a separate objective for monetary policy in addition to price and output stability.[48]

A stable financial system is one of the prerequisites for central banks being able to conduct effective monetary policy. The financial markets and the way they function are critical for the transmission of monetary policy to market interest rates and other financial variables. In addition, the economic consequences of a financial crisis directly affects inflation and the economy more generally. The central bank may therefore, in its monetary policy, have reasons to take financial stability risks into account, not only because the degree of financial stability affects the transmission channels of monetary policy, but also because it affects overall welfare, see Woodford (2012).[49] Moreover, if the central bank needs to use monetary policy to promote financial stability, it has many instruments at its disposal. These insights are not new – see the review by Capie et al. (1996) – but they had no large impact on discussions of monetary policy during the Great Moderation.

The primary effect of monetary policy is on financial markets, but the effects go in both directions. The degree of financial stability has consequences for the effectiveness of monetary policy. The vulnerabilities of the financial system often accumulate during economic expansions due to higher credit volumes and more risk-taking. These vulnerabilities are affected by monetary policy, but the extent of the effect depends on the financial frictions. As mentioned above, the links between monetary policy and financial stability were little discussed prior to the Global Financial Crisis, with Borio and Lowe (2002) and Rajan (2005) being two notable exceptions. Still, it is clear that, in practice, at least part of central banks' frameworks for monetary policy – for example the standing facilities and the open market operations – have been designed not only for the purposes of price and business cycle stabilisation, but also with the objective of financial stability in mind, see Bindseil (2016).[50]

The early versions of the New Keynesian model deliberately lacked a realistic modelling of the financial system. This became apparent when the Global Financial Crisis broke out in 2008. The model could not be used to understand the implications of the financial crisis or how to handle it. Neither was it possible to study how the financial markets – that were considered dysfunctional – affected the transmission of monetary policy.

Today, however, there exists a variety of models in the New Keynesian tradition with financial frictions.[51] These models emphasise transmission channels of monetary

[48] See IMF (2015), Smets (2018), and Kockerols and Kok (2021) for analyses and summaries of contributions to this literature. An early contribution is Borio and Lowe (2002) who argued that monetary policy should take financial stability risks (and not only asset price bubbles) into account.

[49] Persson and Tabellini (2024) also argue that it may be desirable to expand inflation-targeting central bank mandates to encompass financial stability.

[50] The operational frameworks for implementation of monetary policy include rules about eligible counterparties, collateral requirements, etc. Such rules reflect financial stability considerations.

[51] See Gertler and Karadi (2013) for an early analysis of large scale asset purchases in an economy with financial frictions. See also Woodford (2012) and Sims et al. (2023) for two examples of simple New

policy such as the credit and risk-taking channels.[52] They also make a case for new monetary policy instruments in addition to the policy rate. Asset purchases (quantitative easing) can be used to counter credit market disturbances and to mitigate the effects of restrictions on the policy rate, for example the effective lower bound. In principle, the new models with financial frictions suggest that monetary policy should be used to counter financial market imperfections, not only when there is a financial crisis or when policy rates are constrained by a lower bound. This is neither surprising nor a completely new insight. The new models are in line with much of the historical experiences of central banking, as outlined by for example Capie et al. (1996). Frictions in financial markets are one important reason why central banks are needed.

There are thus reasons for central banks to lean against the wind, but there are also arguments against. The dominating view seems to be that monetary policy should not be the first line of defence against financial instability if micro- and macro-prudential instruments can be used instead.[53] [54] Other common arguments are often based on mechanisms that are important but seldom incorporated in formal analyses of monetary policy. One such argument refers to political-economy aspects. Given that it is desirable, for monetary policy purposes, to have a high degree of central bank independence, it may be necessary to limit both the numbers of objectives that the central bank should strive for and the set of instruments it can use. This argument has been presented by Acharya (2015) and Archer (2016). Another argument against the use of monetary policy to counter financial imbalances in normal times is that this may give rise to moral hazard problems. Risk-taking in the financial sector may increase if monetary policy makers are too willing to counter-act the negative effects of financial imbalances.[55] One further argument against the use of asset purchases as a standard instrument also in normal times is that such measures make the central bank more exposed to financial risk. Recent experiences show that the central bank's financial situation cannot be ignored in policy making, partly because a weak capital position may lead to lower independence.[56]

Keynesian models illustrating the importance for monetary policy of including financial frictions. These two models are special cases of more general mechanisms discussed by Ajello et al. (2022).

[52] The credit channel amplifies the effects of the interest rate channel through different financial frictions. In particular, the leverage in the financial system is an important factor. The risk-taking channel emphasises that changes in the return on safe assets may encourage or discourage investors to 'reach for yield' through higher risk-taking. This affects the vulnerability of the financial system.

[53] See for example the comments on Woodford (2012) by Svensson (2012). Smets (2013) provides an overview of the arguments presented soon after the Global Financial Crisis.

[54] This argument sometimes seem to be based on a 'one target, one instrument' principle associated with work by Jan Tinbergen, but the relevance of that principle for the question at hand has been questioned by Bryant et al. (2012).

[55] Buiter et al. (2023) emphasise the moral hazard argument in their discussion of the central bank as a lender and market maker of last resort.

[56] Broeders et al. (2024) offer analyses of the roles of the central bank's capital, from many different perspectives. Persson and Tabellini (2024) note that the financial risks implied by quantitative easing may call for more coordination between fiscal and monetary policy.

### 3.3.1 Monetary policy and financial stability in different central banks

In light of the experiences after the Global Financial Crisis, many central banks have reviewed their monetary policy process and frameworks. The implications are not always entirely clear, though, as somewhat different conclusions have been reached in different countries. **Norges Bank** explicitly stated in their Monetary Policy Report in March 2012 that the interest rate decision took the risk of financial imbalances into account over and above the outlook for inflation and resource utilisation. In other words, monetary policy was leaning against the wind. In 2013 the name of Norges Bank's reports on monetary policy was changed to 'Monetary Policy Report with financial stability assessment', but this change was reversed in 2023. In a new central bank law from 2020, Norges Bank was given a triple mandate with financial stability ranked above real stability.[57] The report still declares that 'Inflation targeting shall be forward-looking and flexible so that it can contribute to high and stable output and employment and to countering the build-up of financial imbalances'.[58]

After a review of its monetary policy strategy, the **Federal Reserve** in August 2020 declared that the FOMC is firmly committed to fulfilling its statutory mandate from the US Congress of promoting maximum employment, stable prices, and moderate long-term interest rates. It was recognised that sustainably achieving maximum employment and price stability depends on a stable financial system. Therefore, the FOMC's decisions reflect its longer-run goals, its medium-term outlook, and its assessments of the balance of risks, including risks to the financial system that could impede the attainment of the FOMC's goals.

An overview of the **European Central Bank**'s monetary policy strategy was published in July 2021. This led to the declaration that financial stability is a precondition for price stability and vice versa. In-depth assessments of the interaction between monetary policy and financial stability are to be conducted at regular intervals and considered at the monetary policy meetings. The ECB stressed that it would not be systematically neither 'leaning' nor 'cleaning'. On the other hand, the ECB's 'medium term orientation' was considered to provide flexibility for monetary policy to take both employment and financial stability into account.[59]

Following a review of the **Bank of Canada**'s monetary policy, the bank and the government published a joint statement in December 2021 which declared that monetary policy should continue to focus on price stability. It was acknowledged that a low interest rate environment can be more prone to financial imbalances, but that

[57] The mandate according to the law is: '(1) The purpose of the central banking activities is to maintain monetary stability and to promote the stability of the financial system and an efficient and secure payment system. (2) The central bank shall contribute to high and stable output and employment.'

[58] In her presentation at the Riksbank conference on 23 May 2024, Norges Bank's Governor Ida Wolden Bache presented the bank's 'holistic view' on monetary policy and financial stability. See The quest for nominal stability: Lessons from three decades with inflation targeting 23–24 May 2024 | Sveriges Riksbank.

[59] At the Riksbank conference on 23 May 2024, Frank Smets gave an updated description of his earlier (Smets 2013) categorisation of different strategies, and presented the relations between ECB's strategy, the Tinbergen principle ('Jackson Hole consensus') and leaning against the wind. See The quest for nominal stability: Lessons from three decades with inflation targeting 23–24 May 2024 | Sveriges Riksbank.

this risk should be handled by the government through financial regulation and supervision.

In a review of the **Reserve Bank of Australia** (RBA) de Brouwer et al. (2023) pointed out that the bank's responsibility for financial stability should be clarified in new legislation. There should be a dual objective for monetary policy – price stability and full employment – and flexible inflation targeting was considered to remain the best operational framework. The RBA should be required to explain how it is using its flexibility, including if and how financial vulnerabilities have been taken into account. The review recognised that the RBA contributes to financial stability through liquidity support and responsibilities for payments. The RBA's assessments of financial stability risks should feed directly into macroprudential decisions by the Australian Prudential Regulation Authority, and there should be close cooperation between the authorities.

At the **Reserve Bank of New Zealand** (RBNZ), decisions on monetary policy are taken by a Monetary Policy Committee (previously by the governor) from 2019 and onwards. The MPC's operational objectives are given by a remit and include an inflation target and to support maximum sustainable employment. In pursuing the operational objectives, the MPC shall (i) have regard to the importance of protecting and promoting the stability of the financial system, and (ii) seek to avoid unnecessary instability in output, interest rates and the exchange rate. RBNZ has a separate remit for financial stability.

In a new law which came into effect in 2023, **Sveriges Riksbank's** monetary and financial stability policy are deliberately separated in different chapters. The primary objective for monetary policy is to maintain low and stable inflation. Without prejudice to the price stability objective, the Riksbank shall also contribute to balanced development of production and employment. Financial stability is not a similar objective for monetary policy, but regulated in a separate chapter. On the other hand, in the preparatory work for the new law, the government concluded that financial imbalances may affect the speed with which monetary policy aims to achieve the inflation target.

In conclusion, among these central banks, Norges Bank is the central bank that most explicitly has declared that it is willing to lean against the wind. Bank of Canada seems to be furthest away from leaning, and the other central banks fall somewhere in between. ECB argues that they are not leaning, but seem willing to let their flexibility take both employment and financial stability into account, which is not very different from the approach of Norges Bank.

## 3.4 Reduced policy autonomy

The limits of monetary policy in an open economy are often discussed in terms of the classic monetary policy trilemma, based on work by Marcus Fleming and Robert Mundell in the 1960s, see Fleming (1962) and Mundell (1963). The trilemma postulates that an open economy can maintain at most two of the following three objectives: free cross-border capital movement, a fixed exchange rate, and monetary policy autonomy. Under the assumption of free capital movements, a small open

economy that wishes to use monetary policy to manage the domestic economy thus cannot have a fixed exchange rate. This reflects the belief that movements of interest rates and exchange rates are tied together by an equilibrium condition, the so-called uncovered interest parity condition, which among other things assumes that bonds from different countries are perfect substitutes. This implies that a flexible exchange rate is necessary for a small open economy to have some degree of monetary policy autonomy to respond to foreign shocks.

In an influential article, Rey (2016) challenged many of the assumptions underlying the trilemma. For example, domestic and foreign investors do not only have a single security denominated in each currency to allocate their savings in, but a whole range of different financial assets with different liquidity, expected returns and risk characteristics. Bonds from different countries are not generally perfect substitutes as the trilemma assumes. In principle, this could provide some autonomy for monetary policy even in a fixed exchange rate regime. However, Rey also makes the fundamental point that in an era of financial globalisation, a small open economy with free capital movement will inevitably be affected by the so-called global financial cycle, that is, financial conditions are becoming more synchronised among countries regardless of the exchange rate regime.[60] There are many examples of this. Long-term interest rates are strongly correlated also between countries with floating exchange rates, see Figure 3. The returns on risky assets such as mortgage bonds and stocks are correlated. Moreover, a weaker exchange rate is usually assumed to provide stimulus to aggregate demand by strengthening exports, but Rey points out that when domestic households and firms have debt denominated in foreign currency, a weaker exchange rate does not only have positive effects on aggregate demand.

The conclusion from Rey's paper is that it is difficult to combine national monetary policy with free movement of capital even with a floating exchange rate. If the financial conditions are largely determined by the outside world, the choice boils downs to national monetary policy or free capital movements. The trilemma is in fact a dilemma.[61]

In the EU, most member countries have chosen to give up national monetary autonomy. How large the actual degree of monetary autonomy is in the EU-countries which have chosen to stay outside the euro system is an open question. Rangvid (2024) stresses that the macroeconomic development in Finland, Denmark, and Sweden (and also Norway, which is not a member of the EU) has been rather similar, despite differences in monetary policy regimes. Bylund et al. (2024) also note that the macroeconomic development in Denmark, with a pegged exchange rate vis-à-vis the

[60] Borio (2014) also stressed the importance of the global financial cycle.

[61] If we consider the implications of international mobility not only of financial capital, but also of real capital and labour, the room of manoeuvre for domestic economic policy may be even smaller. It is well known, from international trade theory that, in principle, real returns to labour and capital can be equalised across countries already through trade in goods and services. If production factors are also mobile across countries, which they have become to an increasing degree, it is even harder to maintain cross-country differences in real wages and real interest rates. This question is very important for the possibility of national autonomy in monetary policy, but goes beyond the scope of the present paper (which presumes that it is meaningful to have stabilisation policy objectives for a national central bank).

euro, and Sweden, with a floating exchange rate and inflation targeting, has been similar.

A less discussed trilemma is the financial stability policy trilemma, which emphasises the limits of national financial policy, see for example Farelius et al. (2020) and the references therein. According to this trilemma, having objectives for national financial policy, cross-border financial integration, and financial stability is not possible, as only two of these three objectives can be achieved at the same time. For example, if the objectives are financial integration across borders and a stable financial system, financial policy cannot be national. In essence, when financial integration increases in a region, the incentives among national supervisors to act in a way that preserves financial stability in the region as a whole decreases. If the benefits of stability oriented policies spread to the region as a whole, the willingness of national supervisors to bear the cost of these polices decline.

Greater financial integration and large-scale capital flows between countries are thus likely to lead to less policy autonomy. This could, for example, lead to greater cooperation between central banks as well as between national supervisors. This has been the case in the area of supervision and regulation, manifested in the formation of organisations such as the Basel Committee on Banking Supervision, the Financial Stability Board and the European Systemic Risk Board. Although there are links between financial stability and monetary policy, as argued above, international cooperation in monetary policy is much less common – the common currency in the euro area being an important exception. Occasionally there has been some coordination related to monetary policy in crisis situations, such as currency swap agreements and coordinated interest rate decisions. But, at least officially, most countries have opted for monetary autonomy and flexible exchange rates. Ilzetzki et al. (2023) argue that many countries still place a large implicit weight on the exchange rate, in violation of the theoretical models of the floating exchange rate/inflation targeting strategy. Some inflation targeting central banks have indeed officially intervened to stabilise the value of their currencies, which shows that there are limits to how much they are willing to let their monetary development deviate from that in other countries.

## 3.5 New financial technologies pose a risk to central banks' control over liquidity

Both the theoretical literature and the practical implementation of inflation targeting have largely adopted a rather narrow – in an historical perspective – interpretation of monetary policy, the central bank's role in the financial system and the transmission mechanisms. If we consider the roles of the financial system and money in a broader context, it becomes apparent that the nature of the payment system matters for monetary policy.

The financial system has three main functions: providing a payment system, matching savers (lenders) with borrowers (investors), and making it possible for households and firms to handle risks through insurance and diversification. Money plays a critical role in these functions as a unit of account, a medium of exchange, and a store of value.

Ohanian (2001) shows how these different roles of money – depending on the kind of frictions that characterise asset and product markets – affect the transmission of monetary policy. In the New Keynesian model, with its focus on price and wage rigidities in product markets, it is the unit of account role that is critical for the transmission of monetary policy, while money's role as a medium of exchange is downplayed compared to more traditional macroeconomic models.

In today's financial system money is created by central banks as well as commercial banks. Central banks create two types of money: cash and so-called reserves, which are digital balances that financial institutions have on accounts at the central bank. One role of reserves is to facilitate settlement of payments between commercial banks. This money thus serves as a medium of exchange and store of value for commercial banks, but in addition to these roles it also together with cash determines the unit of account. Note that commercial bank money existed long before central banks became common in the 1800s. Hence, systems with only private money can exist, but these systems were not stable enough when the economy and the financial system grew, see Roberds and Velde (2016) and Capie et al. (1996).

Today, the use of central bank money in the form of cash is declining in many countries. Money used on a daily basis is mostly created by commercial banks. This money takes the form of bank deposits, from which payments are facilitated by for example debit cards connected to VISA or Mastercard. A key task for central banks is to stabilise the value of central bank money, but this also creates confidence in commercial bank money. Cash has played an important role for creating confidence in commercial bank money by providing a 'nominal anchor' for private money. A Swedish krona deposited in a commercial bank can be exchanged for a krona in the form of cash, and a krona deposited in one commercial bank is usually worth a krona in another bank. Confidence in commercial bank money has thus been reinforced by a high degree of substitutability between central and commercial bank money, but also by various regulations such as legal tender status, deposit guarantees, and supervision.

Central bank money used today is mostly in the form of reserves. Ohanian (2001) and Brunnermeier et al. (2019) argue that there is no strong reason to believe that monetary policy should be negatively affected if the public's use of cash disappears, as long as the unit of account function of central bank money remains. This is reflected in the New Keynesian model, where the unit of account is the principal role of money. The unit of account role of central bank money may be preserved if cash disappears since reserves are still used by commercial banks in their settlements between each other. However, if the use of reserves as a medium of exchange between commercial banks were to disappear, the unit of account function of central bank money would be threatened.

### 3.5.1 New forms of money

New financial technologies in the form of private digital assets such as Bitcoin and Ethereum, may, in principle, challenge the function of central bank money as a medium of exchange, but also as a unit of account. In their current state, however,

these currencies suffer from a number of problems. Bitcoin is not backed by anything and has no intrinsic value and as a result its value in terms of for example US dollar is very volatile. It also suffers from scalability issues, which prevents it from being an efficient medium of exchange and much less a unit of account.

Other cryptoassets, such as stablecoins, are supposed to maintain a stable value relative to a central bank currency, a basket of currencies or other safe assets. Stablecoins may have a better chance to be a viable medium of exchange, but they are not without problems. Like private money issued in the past – commercial banknotes of the 19th century, uninsured demand deposits, and money market mutual funds – stablecoins may be subject to destabilising runs if left unregulated, see Bertsch (2023) and Gorton and Zhang (2021, 2024). Fundamentally, stablecoins lack backing from the state and are therefore less credible than central bank money. Regulators arguably need to modernise the regulatory framework that handles various forms of cryptocurrencies to maintain confidence in the financial system, not least to avoid fraud.[62]

BigTech companies such as Apple, Google or Facebook are potential new entrants into the cryptocurrency market. These companies can challenge both commercial bank money and current cryptocurrencies as a medium of exchange, and by extension central bank money as a unit of account, see Brunnermeier et al. (2019). BigTech companies have the ability to create their own 'digital currency areas' where they use their own digital platform for peer-to-peer exchange without any third party involvement, for example commercial banks. In addition to payment services, they may include other functions that are attractive to users, for example social network services. Even if the techniques are different, this resembles the situation when the payment system was dominated by private actors before the development of modern central banking in the late 1800s and early 1900s. In this system, monetary policy had no ambition to stabilise inflation and economic activity like today. Focus was on stabilising the value of the currency vis-à-vis gold (and thereby vis-à-vis other countries' currencies).

A financial system that is concentrated around BigTech digital platform-based ecosystems could diminish the role of commercial bank money and impair the monetary policy transmission channel that goes through money's role as a medium of exchange in the banking system. However, if most financial contracts are written in the unit of account of BigTech companies and/or other cryptocurrencies, and if the relative prices of such digital currencies are free to float, the values of the contracts would vary with the perceived safety and credibility of the private monies. This would be a step back towards the inefficiencies of the private payment system that existed before central banks were created, see Gorton and Zhang (2024). It would also threaten the unit of account of central bank money and the transmission of monetary policy.

[62] Bertsch (2023) also stresses that the demand for stablecoins is endogenous and may be affected by monetary policy. A lower level of nominal interest rates increases the demand for stablecoins in relation to bank deposits. This is also a mechanism whereby monetary policy can affect the degree of financial stability.

### 3.5.2 Introducing a central bank digital currency

Central banks are currently in the process of examining the pros and cons of introducing so-called central bank digital currencies (CBDCs). One reason for this is arguably to ensure the unit of account role of central bank money, see Armelius et al. (2020). The CBDC would be a digital complement to commercial bank money and in this role it would help to ensure that the substitutability and competition between private digital currencies and central bank money is maintained. It would thus ensure a fixed relative price between central bank money and at least some private substitutes and contribute to the preservation of a central bank controlled money as a unit of account, as well as a medium of exchange and a store of value. This is comparable to when central banks received monopoly on note issuance in the late 1800s, see Grodecka-Messi and Zhang (2023). Other reasons for introducing CBDC include financial inclusion, maintaining a high degree of resilience in the payment system, and encouraging competition in the payment market, see Ingves (2020), Ingves et al. (2022,) and Bertsch (2023). Note also that a CBDC can be used to facilitate cross-border transactions. This may, however, require that national CBDCs will be developed in cooperation between different countries, giving rise to new issues about policy autonomy, in addition to those mentioned in the previous section.

There is yet no widely accepted definition of CBDC, much less any available practical solution, see for example Armelius et al. (2020) and Bossu et al. (2020). The intention is that it will be a liability of the central bank that could serve as a unit of account in the national currency, a medium of exchange and a store of value in the same way as cash and reserves. It would also be the safest type of digital money available to the public.

The economic literature is inconclusive on how the introduction of a CBDC could affect commercial banks' business model and by extension monetary policy and financial stability risks, see Grodecka-Messi and Zhang (2023) and the references therein. One reason for the inconclusiveness is that the effects on monetary policy and financial stability risks depend on how the CBDC will be implemented, which is yet not clear. If the CBDC would carry an interest rate there could be large shifts of money from private bank deposits to central bank money.[63] The CBDC could, in principle, be so attractive that it crowds out a large part of the commercial banks' deposit funding. Lower demand for other low-risk assets like money market mutual funds and Treasury bills may further impact the structure of financial intermediation and potentially reduce the availability of credit. In this scenario, the central bank would become the most important financial intermediary, which indeed was something commercial banks feared when central banks got monopoly on note issue around one hundred years ago. If so, the borrowing and transaction costs for households and firms are likely to increase.

[63] This could also happen if the CBDC carries a zero interest rate and private banks set a negative interest rate on their deposits, but this is economically similar to people buffering cash in a scenario with negative interest rates on deposits.

The risks of these negative effects can be mitigated. The CBDC could for example be non-interest bearing or the amount a user can have on its account could be limited.[64] This is in a way similar to cash, which is an imperfect substitute to commercial bank money. The design of the CBDC will imply some trade-offs, though. The CBDC should not be 'too successful' so that it significantly reduces the funding of commercial banks or increases the risk of bank runs, see Bindseil et al. (2024). At the same time, the CBDC should be 'successful enough' so that households and firms use it as a convenient payment instrument. This will contribute to maintaining the confidence and unit of account of central bank money, and thereby the transmission of monetary policy and the confidence of private money and the financial system more generally.

## 3.6 Fiscal policy's role for monetary policy

The 1970s and 1980s were characterised by high levels of inflation, often due to high government spending combined with accommodative monetary policy. Governments were generally unwilling to face the short-term output loss of disinflation. The design of monetary policy was shaped by the lack of confidence in the governments' and central banks' anti-inflationary ambitions. When implementing the new inflation targeting framework, there was a more or less explicit assumption that monetary and fiscal policy henceforth should function independently of each other. However, the two policy areas should still be consistent to achieve the society's objectives of low inflation and stable public debt, see Leeper (1991).

In practice, the new framework meant that the fiscal authority should focus on stabilising government debt and the budget deficit, while the central bank should have a high degree of independence and little or no interaction with the fiscal authority, to create credibility for price stability. Fiscal policy could still have a stabilising effect on the economy through various automatic stabilisers – for example income taxes and unemployment insurance – but fiscal policy activism should be avoided, in order to promote the credibility for stable debt and to minimise the risk of policy mistakes.[65]

### 3.6.1 The links and interactions between monetary and fiscal policies

A useful way to illustrate the links between monetary and fiscal policies is the consolidated budget constraint of the public sector, since it shows how the government's incomes and expenses are affected by the central bank and the fiscal authority. Central banks affects the government's income and expenses in different ways. The government's cost of borrowing is affected by the interest rate cost, which the central bank influences via changes in the policy rate. The profits of the central

[64] In the Commission's proposal for a regulation on the digital euro, it is for example proposed that the European Central Bank should have the right to set limits on digital euro accounts, see https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52023PC0369.

[65] A good summary of this view is given by Corsetti et al. (2023) for example on p. 8: 'To anchor expectations, government credibility was based on the explicit separation of the monetary, fiscal, and regulatory policy arms under the premise that the lack of coordination among them would ensure their independence. The monetary policy mandate focuses on price stabilisation, the fiscal policy mandate on anti-cyclical stabilisation and debt sustainability, and regulatory policies focus on the trade-off between financial stability and competition.'

bank are partly distributed to the government, or in the case of losses, the government may have to re-capitalise the central bank. The composition of government debt – government bonds and central bank liabilities (cash and reserves) – is another link. The government's financing is affected when the central bank buys government bonds by 'printing' new reserves. Monetary policy also has indirect effects on the government's budget via its effect on inflation, output and financial stability.

Many of the government's policies have implications for monetary policy. Taxation and government spending affect aggregate demand and thus inflation.[66] The government's budget deficit or surplus, and the associated development of government debt, have implications for interest rates and private wealth. The government's choice of financing between debt or taxes thus has consequences for inflation and real economic activity. According to the fiscal theory of the price level, under certain conditions prices adjust so that the real value of nominal government debt equals the present value of taxes less spending, see for example Cochrane (2023). Historically, there are many examples when fiscal policy has led to disruptions in the financial system with consequences for monetary policy. Episodes of hyperinflation are extreme examples, but there are examples from milder crises, for example, the euro zone's experiences during the European sovereign debt crisis in 2009–10 and the UK 2022 when Liz Truss's plans to raise fiscal spending and cut taxes were revealed.

The separation of monetary and fiscal policies is implicitly reflected in the New Keynesian model. The government's budget is typically assumed to be balanced each period through lump-sum taxes and government debt is assumed away, as pointed out by for example Leeper and Leith (2016) and Cochrane (2023). This assumption in the analytical framework may, together with the deliberate separation for more political reasons, over time have contributed to a situation where important links between monetary and fiscal policy have been overlooked in practical policy work.

The persistently low inflation after the Global Financial Crisis led many central banks to lower their policy rates to near the effective lower bound. The limited ability to stimulate the economy by further rate cuts initiated a discussion of fiscal policy's role in stimulating the economy. In Sweden the discussions have primarily been concerned with specific aspects of the fiscal policy framework.[67] However, it has also been argued that an excessively tight fiscal policy contributed to the Riksbank's difficulties to bring inflation back to target in the period after the Great Moderation, see Leeper (2018).[68] It has also been noted that the policy mix – low interest rates and declining government debt – has led to a structural change in the composition of national debt. The decline in public debt has been associated with an increase in private debt. Given the marked changes in public versus private debt, the policy mix may also have had implications for financial stability.

[66] It has been argued that the sharp rise in inflation in the US in 2021 largely could be attributed to fiscal policy, see for example Anderson and Leeper (2023), Cochrane (2022), and Guerrieri et al. (2023).

[67] See Jansson (2021) for comments on the Swedish discussion.

[68] Bianchi et al. (2023) also emphasise the importance of the policy mix between monetary and fiscal policy.

Some form of coordination or at least exchange of information between monetary and fiscal policy is arguably desirable. This is the message in a recent review of the Reserve Bank of Australia, which recommends 'increased joint work between the Treasury and the RBA on the relative roles of fiscal and monetary policy', see de Brouwer et al. (2023). There are different ways monetary and fiscal policy could be coordinated, while ensuring central bank independence, see for example Thedéen (2023). For example, central banks can publish scenarios to illustrate the effects on inflation and economic activity of fiscal policy, and the implications for monetary policy. More generally, it may be fruitful for the central bank and the government to have a dialogue about their respective views on the state of the economy. Each decision maker could clarify which assumptions and forecasts their decisions are based upon. Although this may seem like a natural recommendation for discussions without coordination, it would presumably involve more serious analysis of the interactions between monetary and fiscal policy than during previous decades of inflation targeting, at least in some countries, including Sweden.

# 4 Concluding remarks

A key factor behind the success of inflation targeting, not the least in stabilising inflation expectations and achieve price stability, has probably been its flexibility adapting to new economic circumstances. Inflation targeting central banks have – in response to large shocks and structural changes – been able to adapt their policies to promote price stability and stable economic growth in line with their mandates. Some lessons can still be learned from 30 years of inflation targeting. Here we suggest eight takeaways based on our discussions:

1. Central banks are important because the financial system is inherently fragile and the costs of financial crises and high and volatile inflation are very high. This means that financial stability risks have to be taken into account in the monetary policy analysis – in addition to price and output stability.
2. Incorporating models in the monetary policy analysis that better take into account frictions in the financial system should be given higher priority. This would improve our general understanding of the transmission channels of monetary policy, but could also lead to new recommendations for policy.
3. Central banks' operational frameworks for monetary policy typically take financial stability risks into account. Policies such as asset purchases and loans that affect the size and structure of the central bank's balance sheet should also be part of the standard toolkit. But more attention should be given to the transmission channels of such instruments and their implications for financial stability, for example via the credit and risk-taking channels.
4. High and growing debt levels are characteristic features of a modern financial system. But this gives rise to challenges for monetary policy and can, for example, create a trade-off between price and financial stability. This trade-off could in principle be handled similarly as the trade-off between price and output stability, unless sufficient financial stability can be achieved through other instruments than monetary policy.

5. While the role of aggregate demand for inflation and monetary policy has been much discussed, the conditions on the economy's supply side have not received the same attention. Systematic surprises of low or high inflation suggest that supply conditions deserve more analysis.
6. The links between monetary and fiscal policy are often overlooked by making too simplified fiscal policy assumptions. A greater role for models with a richer description of fiscal policy is needed in the monetary policy analysis in order to promote consistency between monetary and fiscal policies, given their different objectives.
7. Greater financial integration between countries has led to less national policy autonomy. This affects both monetary and financial market policies. To meet these challenges, greater international cooperation between central banks is necessary. This is well recognised in the areas of regulation and supervision, but a better understanding is needed of the implications of international integration also for monetary policy.
8. The unit of account role of central bank money is essential for monetary policy effectiveness, but new financial technologies may potentially threaten this role. The introduction of a CBDC may be one measure to mitigate the risks. Not only the consequences of a CBDC for efficiency and stability of the financial system need further study, but also the consequences for monetary policy.

We have discussed how structural changes in the economic environment have affected the central bank's main operations – monetary policy, financial stability risks and payments – and the links to fiscal policy. In the practical implementation of its operations, the central bank must create an organisation with separate functions: departments for monetary policy, financial stability, payments, asset management, etcetera. The central bank may also choose or be instructed to have separate decision making bodies for the different areas, and to communicate about them through different channels, for example, monetary policy reports, financial stability reports, etcetera. Regardless, if the different parts of the central bank's organisation, or the theories used to analyse or evaluate its activities, do not recognise the financial market imperfections and the links between the different operations, the central bank may in the end not fulfil its objectives to a satisfying extent. The nature of imperfections in financial markets determine the desired interventions by the central bank, not only in the form of normal monetary policy, but also the bank's measures to improve financial stability or the payment system.

# References

Acharya, Viral (2015), 'Financial stability in the broader mandate for central banks: A political economy perspective', Working Paper no. 11, Hutchins Center on Fiscal and Monetary Policy.

Acharya, Viral, Nicola Cetorelli and Bruce Tuckman (2024), 'Where do banks end and NBFIs begin?', Working Paper no. 32316, National Bureau of Economic Research.

Ajello, Andrea, Nina Boyarchenko, Francois Gourio and Andrea Tambalotti (2022), 'Financial stability considerations for monetary policy: Theoretical mechanisms', Finance and Economics Discussion Series no. 2022-005, Federal Reserve Board.

Anderson, Joe and Eric M. Leeper, (2023), 'A fiscal accounting of COVID inflation', Mercatus Special Study, Mercatus Center at George Mason University.

Archer, David (2016), 'A coming crisis of legitimacy?', *Sveriges Riksbank Economic Review,* no. 3, pp. 86–95.

Armelius, Hanna, Carl Andreas Claussen and Scott Hendry (2020), 'Is central bank currency fundamental to the monetary system?', *Sveriges Riksbank Economic Review,* no. 2, pp. 19–32.

Armelius Hanna, Gabriela Guibourg, Stig Johansson, and Johan Schmalholz (2020), 'E-krona design models: pros, cons and trade-offs', *Sveriges Riksbank Economic Review,* no. 2, pp. 80–96.

Bernanke, Ben S. (1983), 'Non-monetary effects of the financial crisis in the propagation of the Great Depression', *American Economic Review,* vol. 73, pp. 257–276.

Bernanke, Ben S. (2024), 'Forecasting for monetary policy making and communication at the Bank of England: A review', Bank of England, 12 April 2024.

Bertsch, Christoph (2023), 'Stablecoins: Adoption and fragility', Working Paper no. 423, Sveriges Riksbank.

Bertsch, Christoph and Johan Molin (2016), 'Revisiting the role of central banks as liquidity providers – old and new challenges', *Sveriges Riksbank Economic Review,* no. 2, pp. 89–158.

Bianchi, Francesco, Renato Faccini and Leonardo Melosi (2023), 'A fiscal theory of persistent inflation', *The Quarterly Journal of Economics,* vol. 138, pp. 2127–2179.

Bindseil, Ulrich (2016), 'Evaluating monetary policy operational frameworks', in *Designing Resilient Monetary Policy Frameworks for the Future*, Proceedings from the Jackson Hole Economic Policy Symposium, Federal Reserve Bank of Kansas City, pp. 179–277.

Bindseil, Ulrich (2018), 'An introduction to central banking – lecture notes', mimeo.

Bindseil, Ulrich, Marco Marrazzo and Stephan Sauer (2024), 'The impact of central bank digital currency on central bank profitability, risk taking and capital', in *Central Bank Capital in Turbulent Times*, *Central Bank Capital in Turbulent Times*, edited by Dirk Broeders, Aerdt Houben and Matteo Bonetti, Springer.

Blanchard, Olivier and Jordi Galí (2007), 'Real wage rigidities and the New Keynesian model', *Journal of Money, Credit and Banking*, vol. 39, pp. 35–65.

Borio, Claudio (2014), 'The financial cycle and macroeconomics: What have we learned?', *Journal of Banking and Finance,* vol. 45, pp. 182–198.

Borio, Claudio and Philip W. Lowe (2002), 'Financial and monetary stability: Exploring the nexus', Working Paper no. 114, Bank for International Settlements.

Bossu Wouter, Masaru Itatani, Catalina Margulis, Arthur Rossi, Hans Weenink, and Akihiro Yoshinaga (2020), 'Legal aspects of central bank digital currency: Central bank and monetary law considerations', Working Paper no. WP/20/254, International Monetary Fund.

Breeden, Sarah (2022), 'Risks from leverage: How did a small corner of the pensions industry threaten financial stability?', speech, 7 November 2022, Bank of England.

Broeders, Dirk, Aerdt Houben and Matteo Bonetti (2024), *Central Bank Capital in Turbulent Times*, Springer.

Brunnermeier, Markus, Harold James and Jean-Pierre Landau (2019), 'The digitalization of money', Working Paper no. 941, Bank for International Settlements.

Bryant, Ralph C., Dale W. Henderson and Torbjörn Becker (2012), *Maintaining Financial Stability in an Open Economy: Sweden in the Global Crisis and Beyond*, SNS Förlag.

Buiter, Willem H. (2024), 'Central bank capital adequacy: the simple analytics and complex politics', in *Central Bank Capital in Turbulent Times*, *Central Bank Capital in Turbulent Times*, edited by Dirk Broeders, Aerdt Houben and Matteo Bonetti, Springer.

Buiter, Willem, Stephen Cecchetti, Kathryn Dominguez and Antonio Sánchez Serrano (2023), 'Stabilising financial markets: lending and market making as a last resort', Reports of the Advisory Scientific Committee, no. 13, European Systemic Risk Board.

Buncic, Daniel (2024), 'Econometric issues in the estimation of the natural rate of interest', *Economic Modelling,* vol. 132, pp. 1–18.

Bylund, Emma, Jens Iversen and Anders Vredin (2024), 'Monetary policy in Sweden after the end of Bretton Woods', *Comparative Economic Studies,* vol. 66, pp. 535–590.

Capie, Forrest, Charles Goodhart and Norbert Schnadt (1996), 'The development of central banking', in *The Future of Central Banking: The Tercentenary Symposium of the*

*Bank of England*, edited by Forrest Capie, Stanley Fischer, Charles Goodhart and Norbert Schnadt, Cambridge University Press, pp. 1–261.

Cecchetti, Stephen G., Hans Genberg, John Lipsky and Sushil Wadhwani (2000), 'Asset prices and central bank policy', Geneva Reports on the World Economy, no. 2, International Center for Monetary and Banking Studies and Centre for Economic Policy Research.

Cecchetti, Stephen G. and Jens Hilscher (2024), 'Fiscal consequences of central bank losses', in *Central Bank Capital in Turbulent Times*, *Central Bank Capital in Turbulent Times*, edited by Dirk Broeders, Aerdt Houben and Matteo Bonetti, Springer.

Clarida, Richard, Jordi Galí, and Mark Gertler (1999), 'The science of monetary policy: A New Keynesian perspective', *Journal of Economic Literature,* vol. 37, pp. 1661–1707.

Cochrane, John (2022), 'Fiscal histories', *Journal of Economic Perspectives,* vol. 36, pp. 125–146.

Cochrane, John (2023), *The Fiscal Theory of the Price Level*, Princeton University Press.

Cooley, Thomas F. (1995), *Frontiers of Business Cycle Research*, Princeton University Press.

Corsetti, Giancarlo, Barry Eichengreen, Xavier Vives and Jeromin Zettelmeyer (2023), 'The international economic and financial order after the pandemic and war', The Future of Banking 5, Centre for Economic Policy Research.

de Brouwer, Gordon, Renee Fry-McKibbin and Carolyn Wilkins (2023), 'An RBA fit for the future', Review of the Reserve Bank of Australia, Australian Government, March 2023.

Diamond, Douglas W. and Philip H. Dybvig (1984), 'Bank runs, deposit insurance, and liquidity', *Journal of Political Economy,* vol. 91, pp. 689–721.

Dincer, N. Nergiz and Barry Eichengreen (2014), 'Central bank transparency and independence: Updates and new measures', *International Journal of Central Banking,* vol. 10, pp. 189–253.

Dincer, N. Nergiz, Barry Eichengreen and Petra Geraats (2022), 'Trends in monetary policy transparency: Further updates', *International Journal of Central Banking,* vol. 18, pp. 3331–348.

Farelius, David, Stefan Ingves, and Magnus Jonsson (2020), 'Financial integration in the Nordic-Baltic region vis-à-vis the EU: A Swedish perspective', Policy note no. 189, SUERF.

Faust, Jon and Eric M. Leeper (2015), 'The myth of normal: the bumpy story of inflation and monetary policy', in *Inflation Dynamics and Monetary Policy*, Proceedings from the Jackson Hole Economic Policy Symposium, Federal Reserve Bank of Kansas City.

Ferguson, Niall, Andreas Schaab and Moritz Schularick (2015), 'Central bank balance sheets: Expansion and reduction since 1900', Discussion Paper no. 10635, Centre for Economic Policy Research.

Ferguson, Niall, Paul Schmelzing, Martin Kornejew and Moritz Schularick (2023), 'The safety net: Central bank balance sheets and financial crises, 1587-2020', Discussion Paper no. 17858, Centre for Economic Policy Research.

Filardo, Andrew and Boris Hofmann (2014), 'Forward guidance at the zero lower bound', *BIS Quarterly Review*, March 2014, pp. 37–53.

Fleming, Marcus (1962), 'Domestic financial policies under fixed and floating exchange rates', *IMF Staff Papers*, vol. 9, pp. 369–379.

Galí, Jordi, (2015), *Monetary Policy, Inflation, and the Business Cycle*, Princeton University Press.

Gertler, Mark and Peter Karadi (2013), 'QE 1 vs. 2 vs. 3…: A framework for analyzing large-scale asset purchases as a monetary policy tool', *International Journal of Central Banking,* vol. 9, pp. 5–53.

Goodhart, Charles A.E. (1987), 'Why do banks need a central bank?', *Oxford Economic Papers,* vol. 39, pp. 75–89.

Gorton Gary B. and Jeffery Y. Zhang (2021), 'Taming wildcat stablecoins', *The University of Chicago Law Review*, vol. 90:2, pp. 909–971.

Gorton, Gary B. and Jeffery Y. Zhang (2024), 'Protecting the sovereign's money monopoly', *Alabama Law Review*, vol. 75:4, pp. 955–1007.

Grodecka-Messi, Anna and Xin Zhang (2023), 'Private bank money vs central bank money: A historical lesson for CBDC introduction', *Journal of Economic Dynamics and Control*, vol. 154, pp. 1–19.

Guerrieri, Veronica, Michala Marcussen, Lucrezia Reichlin and Silvana Tenreyro (2023), 'The art and science of patience: Relative prices and inflation', Geneva Reports on the World Economy 26, Centre for Economic Policy Research.

Hall, George J. and Thomas J. Sargent (2022), 'Three world wars: Fiscal-monetary consequences', *Proceedings of the National Academy of Sciences,* vol. 119.

Hansson, Jesper, Marianne Nessén and Anders Vredin (2018), 'The storm after the calm – lessons for monetary policy analysis', *Sveriges Riksbank Economic Review,* no. 4, pp. 69–88.

Hauser, Andrew (2022), 'Thirteen days in October: How central bank balance sheets can support monetary and financial stability', speech, 4 November 2022, Bank of England.

Ilzetzki, Ethan, Carmen M. Reinhart and Kenneth S. Rogoff (2019), 'Exchange rate arrangements entering the twenty-first century: Which anchor will hold?', *Quarterly Journal of Economics,* vol. 134, pp. 599–646.

IMF (2015), 'Monetary policy and financial stability', Staff Report, September 2015.

Ingves, Stefan (2020), 'Future money and payments', *Economic Commentaries* no. 9, Sveriges Riksbank.

Ingves, Stefan, Eva Julin, Stefan Lindskog, Gabriel Söderberg and David Vestin (2022), 'What is money and what is the role of the state in the payments market', *Sveriges Riksbank Economic Review,* no. 2, pp. 6–25.

Jansson, Per (2021), 'Is it time to review the division of roles in macroeconomic policy?', speech, 8 December 2021, Sveriges Riksbank.

Jonsson, Magnus and Emelie Theobald (2019), 'Changed labour market – effects on prices and wages, the Phillips curve and the Beveridge curve', *Sveriges Riksbank Economic Review,* no. 1, pp. 30–50.

Kolasa, Marcin, Stefan Laséen, and Jesper Lindé (2025), 'Unconventional monetary policy in a small open economy', manuscript, Sveriges Riksbank.

Kockerols, Thore and Christoffer Klok (2021), '"Leaning against the wind", macroprudential policy, and the financial cycle', *International Journal of Central Banking,* vol. 17, pp. 177–235.

Leeper, Eric M. (1991), 'Equilibria under "active" and "passive" monetary and fiscal policies', *Journal of Monetary Economics,* vol. 27, pp. 129–147.

Leeper, Eric M. (2018), 'Sweden's fiscal framework and monetary policy', *Sveriges Riksbank Economic Review,* no. 2, pp. 16–48.

Leeper, Eric M. and Campbell Leith (2016), 'Understanding inflation as a Joint monetary-fiscal phenomenon', in *Handbook of Macroeconomics*, vol. 2B, edited by John Taylor and Harald Uhlig, Elsevier.

Mundell, Robert (1963), 'Capital mobility and stabilization policy under fixed and flexible exchange rates', *Canadian Journal of Economics and Political Science*, vol. 29, pp. 475–485.

Ohanian, Lee E. (2001), 'Shrinking money and the effectiveness of monetary policy', in *Challenges for Central Banking*, edited by Anthony Santomero, Staffan Viotti and Anders Vredin, Kluwer Academic Publishers, pp. 229–245.

Persson, Torsten and Guido Tabellini (2024), 'Optimal contracts and inflation targets revisited', Working Paper no. 436, Sveriges Riksbank.

Philippon, Thomas and Ariell Reshef (2013), 'An international look at the growth of modern finance', *Journal of Economic Perspectives,* vol. 27, pp. 73–96.

Rachel, Lukasz and Thomas D. Smith (2017), 'Are low real interest rates here to stay', *International Journal of Central Banking,* vol. 13, pp. 1–42.

Rajan, Raghuram G. (2005), 'Has financial development made the world riskier?', in *The Greenspan Era: Lessons for the Future*, Proceedings from the Jackson Hole Economic Policy Symposium, Federal Reserve Bank of Kansas City, pp. 313–369.

Rangvid, Jesper (2024), 'Does the choice of monetary policy regime matter? Evidence from the Nordics', in *Economic Policy beyond the Pandemic in the Nordic countries*, Nordregio report 2024:12.

Rey, Hélène (2016), 'International channels of transmission of monetary policy and the Mundellian trilemma', *IMF Economic Review,* vol. 64, pp. 6–35.

Roberds, William and Francois R. Velde (2016), 'The descent of central banks (1400 – 1815)', in *Central Banks at a Crossroads*, edited by Michael Bordo, Öyvind Eitrheim, Marc Flandreau and Jan Qvigstad, Cambridge University Press, pp. 18–61.

Rogoff, Kenneth (1985), 'The optimal degree of commitment to a monetary target', *Quarterly Journal of Economics,* vol. 100, pp. 1169–1190.

Scharfstein, David S. (2018), 'Presidential adress: Pension policy and the financial system', *Journal of Finance,* vol. LXXIII, pp. 1463–1512.

Smets, Frank (2013), 'Financial stability and monetary policy: How closely linked?', *Sveriges Riksbank Economic Review,* no. 3, pp.121–160. Also available in *International Journal of Central Banking*, June 2014, pp. 263–300.

Sims, Eric, Jing Cynthia Wu and Ji Zhang (2023), 'The four-equation New Keynesian model', *Review of Economics and Statistics*, vol. 105, pp. 931–947.

Svensson, Lars E.O. (1997), 'Inflation forecast targeting: Implementing and monitoring inflation targets', *European Economic Review,* vol. 41, pp. 1111–1146.

Svensson, Lars E.O. (1998), 'Inflation targeting in an open economy: Strict or flexible inflation targeting?', *Victoria Economic Commentaries* 15-1, March 1998.

Svensson, Lars E.O. (2012), 'Comment on Michael Woodford, "Inflation targeting and financial stability"', *Sveriges Riksbank Economic Review,* no. 1, pp. 33–39.

Sveriges Riksbank (2017a), 'Evaluation of the Riksbank's forecasts', Riksbank Studies, May 2017.

Sveriges Riksbank (2017b), 'The Riksbank's experiences of publishing repo rate forecasts', Riksbank Studies, June 2017.

Thedéen, Erik (2023), 'The links between monetary policy, financial stability and fiscal policy ', speech at Swedish Economic Association, 23 May 2023, Sveriges Riksbank.

Waldenström, Daniel (2022), 'The national wealth of Sweden, 1810 – 2020', in *Banking, Bonds, National Wealth, and Stockholm House Prices, 1420–2020*, edited by

Rodney Edvinsson, Tor Jacobson and Daniel Waldenström, Sveriges Riksbank/Ekerlids Förlag, pp. 353–448.

Woodford, Michael (2012), 'Monetary policy and financial stability', *Sveriges Riksbank Economic Review*, no. 1, pp. 7–32.


**SVERIGES RIKSBANK**
Telephone +46 8 787 00 00
registratorn@riksbank.se
www.riksbank.se

PRODUCTION SVERIGES RIKSBANK
ISSN 2001-029X