How much is inflation affected by monetary policy?

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Economic Commentaries

Economic Commentaries are short analyses of issues relevant to the Riksbank. They may be written by individual members of the Executive Board or by employees at the Riksbank. Employees' commentaries are approved by their head of department, while Executive Board members are themselves responsible for the content of the commentaries they write.

How much is inflation affected by monetary policy?

Since 2021, inflation has risen and monetary policy has been tightened in many countries. Central banks have raised their policy rates by several percentage points and started to reduce their holdings of financial assets. These are significant changes in monetary policy that are expected to last for several years, and longer-term interest rates have therefore also risen. A key question for central banks is how much tightening is needed to stabilise inflation? Or in other words: How large are the effects of monetary policy on inflation?

In this commentary, we discuss the effects of monetary policy on inflation using a number of macroeconomic models. Many empirical studies and model estimates may give the impression that monetary policy has relatively small effects on inflation. Our message is that changes in monetary policy that are expected to be temporary have only small effects on the economy and inflation. However, today's more persistent changes may have significantly larger effects. Our calculations reflect part of the Riksbank's overall assessment of the effects of monetary policy. The Riksbank's forecasts include a number of other factors that, in different situations, influence the assessment of the impact of monetary policy.

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1   Introduction

Since 2021, inflation has risen and monetary policy has been tightened in many countries, as central banks have both increased their policy rates and reduced their holdings of financial assets. For example, the Riksbank has raised its policy rate from zero per cent in February to 2.5 per cent in November, and the forecast for the policy rate at the end of 2024 has simultaneously been raised from 0.25 per cent to 2.8 per cent. Since November 2021, the expected policy rate at the end of 2024, as can be measured in financial markets, has also risen by around 2 percentage points, and longer-term market rates have risen by roughly the same amount. Central bank policy rates are thus expected to be considerably higher for several years to come than financial market participants expected just a year ago, and this is reflected in the interest rates for households and companies.

A key question for central banks is how much tightening is needed to stabilise inflation at the inflation target. Or in other words: How large are the effects of monetary policy on inflation? This question has been discussed in the media recently, partly based on model estimates presented by the Bank of England (2022) and the National Institute of Economic Research (2022).[2] These estimates give the impression that monetary policy has relatively small effects on inflation. In this commentary, we discuss the effects of monetary policy on inflation using a number of macroeconomic models. Our message is that changes in monetary policy that are expected to be temporary have only small effects on the economy and inflation. However, changes that are expected to last for a longer period of time, such as those we are seeing now, can have significantly larger effects.

2   Measuring the effects of monetary policy on the economy

How to measure the effects of monetary policy on the economy is a much-discussed issue in economics. It is difficult as monetary policy is not conducted independently of economic developments, but as a reaction to what happens in the economy. Monetary policy is thus said to be "endogenous". In addition, monetary policy affects the economy with a certain time lag.

For example, a rise in inflation after monetary policy has been tightened is not necessarily due to the contractionary policy. It is more likely that monetary policy is being tightened because the central bank is trying to dampen inflation that is already rising by increasing the interest rate, but it takes time before inflation is affected. To get around this problem, researchers and central bank economists try to identify "exogenous" changes in monetary policy, that is, changes that are not driven by other events in the economy, and that were not previously expected by economic agents. Researchers and economists can then be more confident that the effects measured after

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[2] See for example Svenska Dagbladet (2022).

such a change are actually due to monetary policy, and not to something else that has happened in the economy.[3]

3 How is inflation affected by changes in monetary policy?

Figure 1 shows how an unexpected "exogenous" increase in the policy rate affects inflation and GDP in two macroeconomic models adapted to Swedish conditions: the Riksbank's model Maja and the National Institute of Economic Research's model Selma.[4] These two models are similar in many ways, but one difference is that Selma contains a more detailed structure for fiscal policy. Maja is estimated on Swedish data, while Selma is a calibrated model, based in many dimensions on Maja's parameter estimates.

Figure 1. Effects of an interest rate increase in two models

Percentage points and per cent respectively
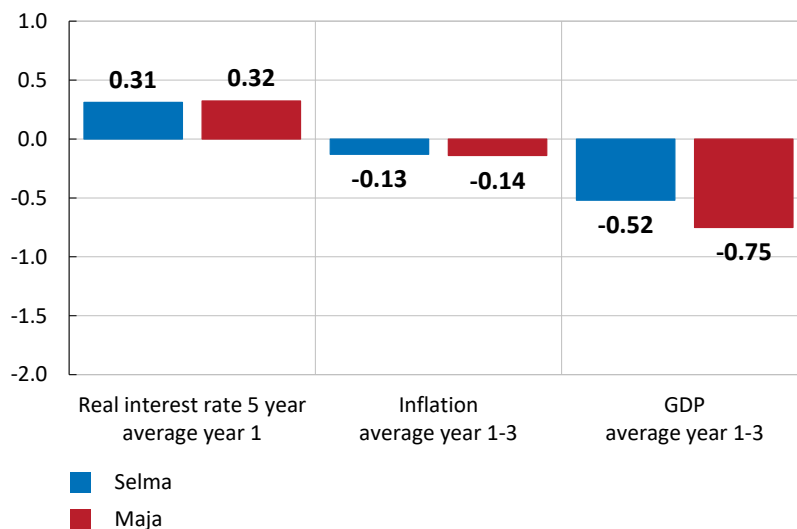
Note. The figure shows the effects of an unexpected increase in the policy rate by an average of one percentage point over a year.

Source: Akkaya et al. (2021), Corbo and Strid (2020) and own calculations.

The figure shows the effects of an unexpected change in monetary policy that increases the policy rate by an average of one percentage point over a year. After that, monetary policy returns to its normal pattern. As mentioned above, the two models are quite similar, and the effects on inflation and GDP are also very much the same. We can see that if the policy rate is raised by one percentage point over a year, inflation falls by an average of just under 0.15 percentage points over the first three years,

[3] Christiano et al. (1999) discuss how to identify exogenous changes in monetary policy, and Sims (2011) provides a historical perspective. There is currently a rich literature studying the transmission mechanism of monetary policy using various empirical methods; see for example Kuttner (2001), Romer and Romer (2004), Coibion (2012), Ramey (2016), Nakamura and Steinsson (2018) and Antolín-Díaz and Rubio-Ramirez (2018).

[4] See Corbo and Strid (2020) and Akkaya et al. (2021), respectively, for documentation of the two models.

while GDP falls by an average of 0.5–0.75 per cent per year. To reduce inflation by one percentage point, the policy rate would then have to be raised by as much as seven percentage points.

But such an interpretation can lead to incorrect conclusions. The reason why monetary policy has such small effects on inflation in Figure 1 is that the change in interest rates is not particularly persistent. We see this if we study the five-year real interest rate, which in the models is an average of the expected policy rate over the next five years, adjusted for expected inflation over the same period. It rises only marginally, by 0.3 percentage points over the first year. This very small increase is mainly due to the expectation that the policy rate will return relatively quickly to its initial level. Thus, despite the one percentage point increase in the policy rate, longer-term policy rate expectations, or longer-term market rates, are hardly affected at all.

4 Effects of more persistent changes in monetary policy

When inflation started to rise rapidly at the end of 2021, the Riksbank was eventually expected to adjust its monetary policy quite substantially. The Riksbank also started to do this in April 2022. Since then, the Executive Board has raised the policy rate by 2.5 percentage points, and the interest rate path has been revised upwards significantly. At the end of 2024, financial market participants now expect the policy rate to be more than 2 percentage points higher than they expected in November 2021. This is reflected in the fact that yields on 5- and 10-year government bonds have also risen by about 2 percentage points, while yields on five- and ten-year index-linked government bonds have risen by about 1.5 percentage points.

One way of analysing the effects of such changes in monetary policy that are also expected to last for a longer period of time is to look at more persistent changes in the policy rate in the macro models. Figure 2 shows the effects of monetary policy as the median of a large number of different structural models estimated using data from the US and the euro area, assuming different degrees of persistence in monetary policy.[5] We start with a rate increase that is highly temporary and thus has very minor effects on the five-year real interest rate. Next, we study an increase that more closely follows the normal pattern of exogenous changes, leading to an increase in the five-year real interest rate in line with Maja and Selma in Figure 1. Finally, we show the effects of a rate rise that is more persistent than historical patterns and thus leads to a

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[5] To show that the results do not depend on the choice of a particular type of macro model, we study a large variety of macro model types, which have been compiled in "The Macroeconomic Model Data Base" (MMB version 2.3, www.macromodelbase.com), see Wieland et al. (2016). We use 57 models of which 40 are estimated on US data and 17 on euro area data. What is shown in Figure 2 is the median of these 57 models. The results are not sensitive to whether we also include models where agents' expectations adjust gradually. Monetary policy is determined in all models by the same monetary policy rule, and we vary the persistence of monetary policy rate changes by changing the interest rate smoothing parameter in the rule. For a temporary, normal and persistent change in interest rates, we have calibrated the parameter to 0.081, 0.8103 and 0.95, respectively. An alternative approach to calculating expected interest rate paths is discussed in Laséen and Svensson (2011). For each model and experiment, we calculate the effects of an unexpected increase in the policy rate by an average of one percentage point over the first year.

larger increase in the five-year real interest rate. In all three cases, the policy rate is initially raised by an average of one percentage point over a year.[6]

Figure 2. Effects of an interest rate increase with different persistence in a number of models

Percentage points and per cent respectively
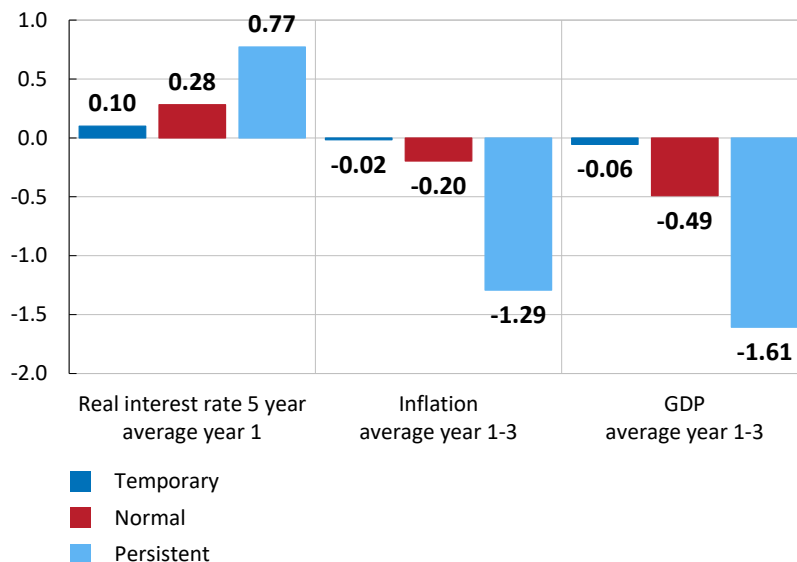
Note. Median effects in 57 different models of an unexpected increase in the policy rate by an average of one percentage point over one year with different degrees of persistence.

Source: Wieland et al. (2016) and own calculations.

To begin with, note that Figure 2 shows that a "normal" increase in the policy rate has effects very similar to those for Maja and Selma that we saw in Figure 1. We can also see that an even more temporary increase has almost non-existent effects. But when the rate rise is expected to be more persistent, the effects are significantly larger: the five-year real interest rate rises almost three times more than usual, while inflation reacts more than six times more to monetary policy. The strength of the interchange between monetary policy and inflation and GDP thus depends to a large extent on the expected persistence of a policy rate change.[7] The reason for this is that a rate increase that is more persistent has much larger and longer-lasting effects on the interest rates offered to households and companies, and thus has greater effects on aggregate demand in the economy.[8]

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[6] Figure 2 shows the median of the effects in the different models, but the average is not significantly different from the median. We obtain similar results if we do this experiment in Maja and Selma.

[7] Coibion (2012) shows that the size of the effects of exogenous changes in monetary policy in empirical time series models depends on the size of the monetary policy shock and the persistence of the interest rate change. The fact that the strength of the interchange between monetary policy and inflation depends on the persistence of monetary policy is thus also an important aspect in purely empirical models.

[8] Almenberg et al. (2022) show a similar result for housing prices. They show that if housing prices reflect user costs and households are forward-looking, higher expected interest rates in the longer term have the largest impact on price developments.

Since 2021, monetary policy has been tightened in many countries, including Sweden. In most of these cases, this is expected to be a very persistent change in monetary policy, and longer-term interest rates have already risen significantly. Figure 2 suggests that such a large and persistent change in monetary policy could have large effects on inflation and the wider economy. Or conversely: If monetary policy had not been tightened in the way it is being now, inflation would have been considerably higher than we now expect.

Thus, the estimates of the impact of monetary policy on inflation that are often reported have small effects because these changes are not expected to last for a long time. They therefore risk misrepresenting the impact on inflation of the interest rate increases that have now been implemented.

This is not to say that it will be an easy task for central banks to bring inflation back to target. There are many other influencing factors, such as how the economy develops, how fiscal policy is conducted and what further shocks occur along the way.

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