Staff memo

How do Swedish banks change their listed mortgage rates when the Riksbank changes the policy rate?

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SVERIGES RIKSBANK

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Staff Memos

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Summary

How are Swedish banks' listed mortgage rates affected by changes in the Riksbank's policy rate – and does the pass-through change when the policy rate is negative? This study provides new, data-driven insights into how monetary policy affects mortgage rates – not just on average, but bank by bank and day by day. The focus is on how quickly and how much interest rates tend to adjust after an announcement, and how this pattern changes in different interest rate environments, especially when the policy rate is negative. The study shows both how mortgage rates usually react after an interest rate announcement and also tries to separate out the part of the changes that is probably due to the Riksbank's decision – rather than to other factors that can affect both mortgage rates and the policy rate at the same time. In this way, the study sheds light on the impact of monetary policy over time, the drivers of change and how the pattern varies in different interest rate situations.

The impact on mortgage rates is clear but gradual. For short-term rates, the pass-through is more or less total, while it is weaker for longer interest fixation periods – as expected. When the policy rate is negative, the pass-through weakens. Unlike some previous studies, the results do not suggest a complete break in transmission, but rather a gradual weakening. The study thus contributes new knowledge about the effectiveness of monetary policy in different interest rate environments.

For households with mortgages, this has several implications. First, mortgage rates with short fixed terms are clearly influenced by the Riksbank's announcements, but the adjustments tend to happen gradually. This means that households are not exposed to the full change in interest rates right away, giving them some time to adapt – for example, by reviewing their finances, renegotiating loan terms, or adjusting their consumption. Second, banks respond at different speeds and to varying degrees, which makes it possible for households to reduce their costs by comparing mortgage rates. In a negative interest rate environment, the pass-through tends to be weaker, meaning that households may not experience as much relief from rate cuts when the policy rate is close to its lower bound.

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1 Introduction

How quickly and to what extent do Swedish banks adjust their listed mortgage rates following an interest rate announcement from the Riksbank?[2] This question is at the centre of this study. Of particular interest is how the pass-through varies across different interest rate environments – for instance, when the policy rate is negative – and whether banks behave differently depending on whether rates are raised or lowered.

The pass-through of monetary policy to household borrowing costs is an important part of the transmission to the real economy.[3] But what happens when the policy rate falls below zero? Can banks still pass on interest rate changes to mortgage customers in the same way as before – or does the pass-through collapse at the effective lower bound (ELB)?[4] International studies, including Adolfsen and Spange (2020) and Eggertsson et al. (2024), suggest that transmission to mortgage rates weakens when policy rates turn negative. This study explores the question in a Swedish context, using new data and methods.

The analysis draws on daily-frequency panel data for the period 2009–2025, covering listed mortgage rates with various fixation periods across nine Swedish banks. It begins with a descriptive event-study analysis, visualising changes in mortgage rates before and after policy announcements over several years. This approach provides an intuitive sense of the speed and direction of rate adjustments.

To identify causal effects, the analysis then employs a local projection method (Jordà, 2005), combined with a two-stage instrumental variable strategy. By instrumenting the change in the policy rate with unexpected market reactions to the Riksbank's announcements – measured by changes in 1-year swap rates – the exogenous component of monetary policy is isolated. The model is estimated on a daily basis following each announcement, which allows for a detailed view of the dynamics of banks' interest rate adjustments.

While examining correlations between policy rates and mortgage rates may suffice for forecasting or descriptive purposes, understanding the underlying causal mechanisms – which is the aim of this analysis – requires a causal identification strategy.

[2] Listed rates are the interest rates that banks publicly advertise as their standard rates for mortgages. These serve as a starting point in negotiations and are often adjusted based on individual factors such as the loan amount, the loan-to-value ratio, the customer's creditworthiness, and other dealings with the bank. It is therefore common for customers to negotiate a lower rate than the advertised list rate. Since discounts are typically negotiated when the loan is refinanced or renewed, and may remain in place for several years thereafter, changes in listed rates tend to be reflected in the actual rates households pay over time.

[3] See also Kaplan and Njie (2024), who study how monetary policy affects the variable mortgage rate in Sweden. They develop a framework in which the pass-through is affected by banks' deposit bases and the sensitivity of deposit rates and find a slightly lower pass-through in the latest rate hike cycle compared to previous ones. Unlike my analysis, they do not study the day-to-day dynamics of interest rate announcements but focus on variation across policy cycles. Our approaches are thus different but complementary: while Kaplan and Njie provide a structural and general interpretation, this study focuses on the short-term reaction of banks and allows for a causal interpretation of the pass-through from the policy rate to listed mortgage rates. See also Erikson and Vestin (2019, 2021).

[4] The effective lower bound is the level at which further reductions in the policy rate are judged to have limited or negative effects on the economy. The ELB need not coincide with zero, but may be negative, depending on institutional and financial conditions.

A particular strength of the analysis is that it enables comparisons across different monetary policy regimes: periods with positive interest rates, negative interest rates, and times when the policy rate is at its effective lower bound. By interacting policy rate changes with an indicator for ELB periods, the analysis compares pass-through during normal times with that under negative interest rate conditions.

The results show that Swedish banks systematically adjust their listed mortgage rates in response to changes in the policy rate – both when the rate is increased and when it is cut, and this holds even for mortgages with longer fixation periods. The adjustment is clear but occurs with a delay, and the pass-through is stronger for shorter maturities than for longer ones. For short-term mortgage rates (three-month and one-year fixation), the average pass-through is complete – that is, the mortgage rate increases by the same amount as the policy rate after one to two months. For three-year fixed rates, the pass-through is approximately 75 per cent after two months.

A more in-depth analysis shows that the impact of monetary policy is roughly half as strong during periods of negative interest rates compared to normal periods. This difference is statistically significant and robust across various specifications. In contrast to Eggertsson et al. (2024), which finds a more abrupt break in monetary policy effectiveness under negative interest rates, this panel analysis suggests that the policy rate continues to have an effect – but that the strength of the pass-through declines.

The analysis contributes to a deeper understanding of how monetary policy affects the mortgage market in several important ways. It draws on high-frequency panel data from multiple Swedish banks over an extended time period, allowing for a more detailed and bank-specific view than previous time series studies. By estimating the effects of exogenous changes in monetary policy using high-frequency instruments, the study provides a firmer basis for causal interpretation. Moreover, the findings are contextualised with reference to both Swedish and international research, with a particular focus on the behaviour of the Swedish mortgage market under negative interest rate conditions.

Taken together, the analysis offers new empirical evidence to the ongoing discussion about the effectiveness of monetary policy in both positive and negative interest rate environments.

2 How do banks change their listed mortgage rates – an initial descriptive analysis

To describe how Swedish banks adjust their listed mortgage rates in connection with changes in the policy rate, I first use a simple descriptive approach. The aim is to visualise the average adjustment of mortgage rates following a policy rate announcement – without yet making any assumptions about causality or other factors that may affect mortgage rates.

The analysis follows a so-called event study approach, in which a number of clearly defined periods are identified around the Riksbank’s policy rate increases and cuts. For each such event, an "event time" is created with day 0 set to the date of the interest rate announcement, and then each bank is tracked over 30 days before and 30 days after this date. The interest rate studied is the bank's listed mortgage rate with the chosen fixed period (e.g. 3 months), adjusted to be zero at day -30. This makes it possible to visually compare all rate series regardless of their level. To also allow for quantitative comparison across events and banks, a simple pass-through ratio is calculated: each bank's mortgage rate change is divided by the simultaneous change in the policy rate. For example, if a bank's variable mortgage rate is raised from 3.00 to 3.15 per cent when the Riksbank raises the policy rate by 25 basis points, this means a mortgage rate change of 15 basis points. The ratio is then 0.6, which shows that the bank has passed on 60 per cent of the increase.

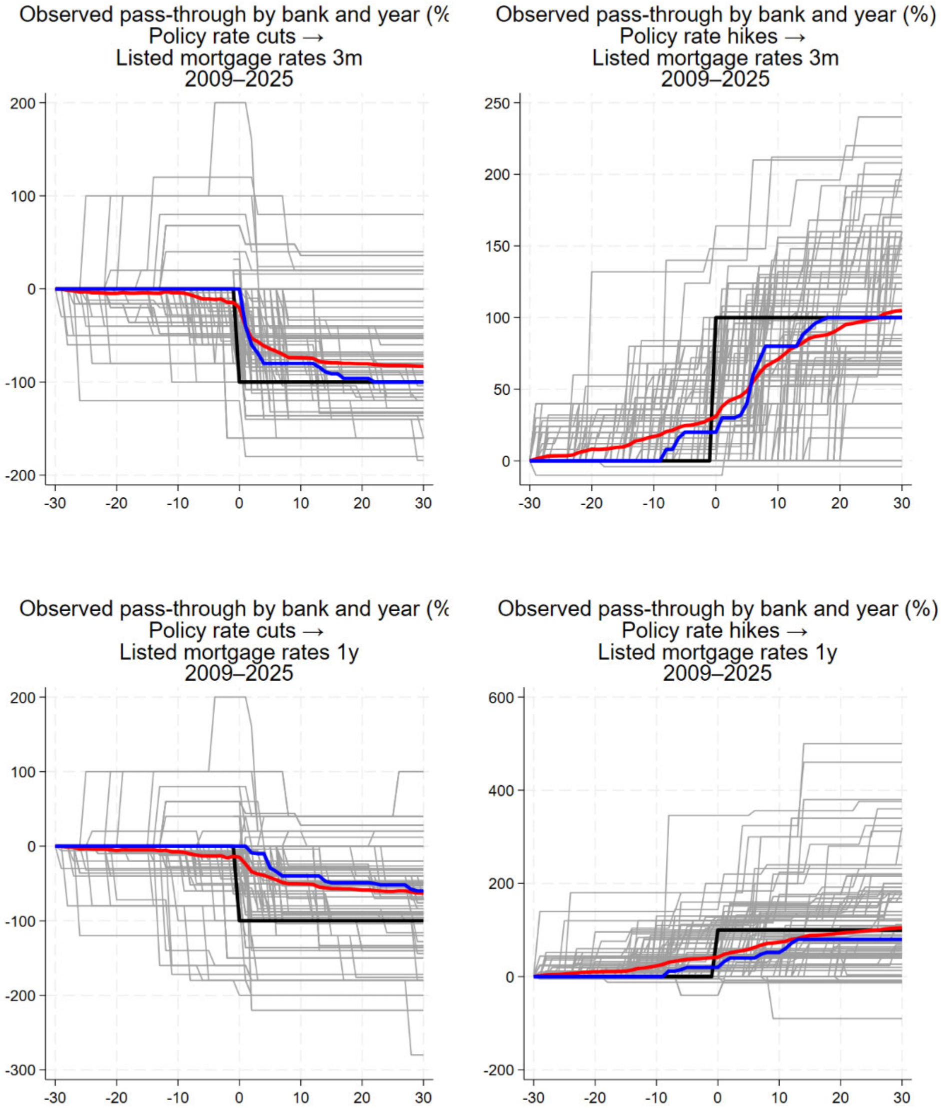
The top left-hand panel of figure 1 shows the development of listed mortgage rates with a three-month fixation period in the context of policy rate cuts. Each grey line represents the behaviour of an individual bank at a particular rate cut announcement, while the black line shows the cumulative change in the policy rate over time. The red line shows the average of all banks per time period, and the blue line the median. This allows both the analysis of central tendency and dispersion in banks' behaviour. The top right-hand panel of figure 1 shows the corresponding picture for policy rate increases. The structure is identical, making it possible to compare increases and decreases directly.

The two panels in figure 1 illustrate several important patterns:

- **Clear impact over time.** In both cases, banks adjust their listed rates gradually after the announcement of the policy rate. A rising trend is observed for increases, and a falling trend for decreases.
- **Strong co-movement.** On average, listed rates move in the same direction as the policy rate, although the pace of adjustment varies over time and across banks.
- **Anticipatory effects before the announcement.** Adjustments are not only made following the Riksbank's decision. It is clear that banks often act in advance – especially when raising interest rates. While the median bank usually adjusts the mortgage rate after the announcement, the mean tends to change even before this. This suggests that some banks are pricing in upcoming changes earlier, which may reflect both market expectations and strategic considerations.
- **Asymmetric adjustment?** At first glance, rate cuts seem to have a faster impact than rate increases – the median line falls more steeply in the top left panel of figure 1 than it rises in the right one. But this pattern may be due to specific episodes, such as the 2008-2009 financial crisis. More formal methods are required to determine this (see later section).
- **Variation across banks.** There is significant variation across banks and over time, as illustrated by the many grey lines in the figures. Some banks adjust quickly, others more cautiously. This suggests that differences in business model, risk appetite or customer base may influence how and when interest rates change. For detailed results by bank, see the Appendix.

Figure 1. Normalised change in listed mortgage rates with a 3-month and 1 year fixation period 30 days before and 30 days after policy rate changes:

Per cent of policy rate change.

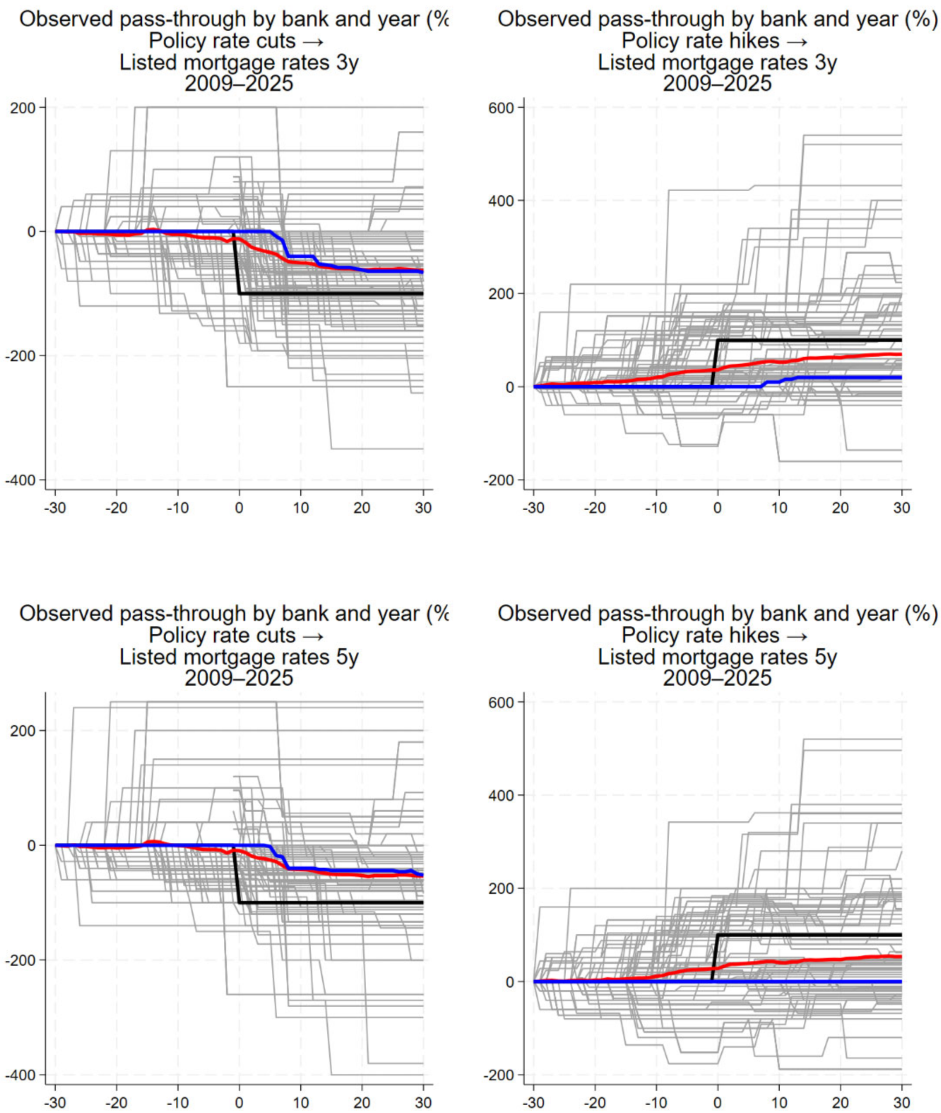


Note. The figure shows the normalised change in listed mortgage rates with a 3-month (top panels) and 1-year fixation period (bottom panels), from 30 days before to 30 days after a change in the policy rate. The change is expressed as a percentage of the current change in the policy rate. Each thin line represents an individual raise or cut episode for a bank in the sample, where the mortgage rate is put in relation to the level 30 days prior to the Riksbank's policy rate announcement. To allow comparison between different episode, each bank's mortgage rate change has been divided by the corresponding change in the policy rate. The time axis shows the number of days before and after the interest rate change (which occurs at time 0). The black line shows the average path of the normalised policy rate. The red line shows the arithmetic mean and the blue line the median of banks' mortgage rate changes at each point in time

Sources: The Riksbank, Compricer and own calculations.

Figure 2. Normalised change in listed mortgage rates with a 3-year and 5-year fixation period 30 days before and 30 days after policy rate changes:

Per cent of policy rate change.



Note. The figure shows the normalised change in listed mortgage rates with a 3-year (top panels) and 5-year fixation period (bottom panels), from 30 days before to 30 days after a change in the policy rate. The change is expressed as a percentage of the change in the policy rate. Each thin line represents an individual raise or cut episode for a bank in the sample, where the mortgage rate is put in relation to the level 30 days prior to the Riksbank's policy rate announcement. To allow comparison between different episode, each bank's mortgage rate change has been divided by the corresponding change in the policy rate. The time axis shows the number of days before and after the interest rate change (which occurs at time 0). The black line shows the average path of the normalised policy rate. The red line shows the arithmetic mean and the blue line the median of banks' mortgage rate changes at each point in time

Sources: The Riksbank, Compricer and own calculations.

What happens to longer-term mortgage rates?

The descriptive analysis can easily be extended to include mortgage rates with longer fixation periods, such as 1 year, 3 years and 5 years. The results show that these rates also tend to move systematically in conjunction with the Riksbank's interest rate announcement, although the impact is smaller than for shorter maturities.

As with 3-month rates, the pattern of rate increases and decreases is similar: listed rates adjust gradually in the direction taken by the policy rate, with some time lag. However, the average change in listed rates is smaller the longer the fixation period studied. This is in line with the fact that longer-term interest rates are largely determined by expectations of future monetary policy and term premiums – factors that do not necessarily change as much with individual interest rate announcements.

At the same time, it is noteworthy that even 5-year listed rates move in conjunction with monetary policy decisions. This suggests that monetary policy, at least to some extent, affects households' long-term financing conditions. If this relationship is causal (which is examined in later sections using instrument variable methods), it implies that monetary policy has not only immediate, but also long-lasting effects on households' interest rates and consumption behaviour.

Overall, the descriptive analysis provides strong visual support for the hypothesis that listed mortgage rates adjust to the policy rate – both in the short and long run.

3 Correlations or causality?

In the previous section, I showed that Swedish banks' listed mortgage rates tend to move in line with changes in the Riksbank's policy rate. When the policy rate is raised, mortgage rates usually rise as well – and vice versa when rates are lowered. This is a relatively clear pattern. But it raises an important question: does it mean that the policy rate *causes* changes in mortgage rates?

Here we need to make a crucial distinction between correlation and causation. It is entirely possible for policy rates and mortgage rates to move together without one actually *causing* the other to move. Both can be influenced by other factors – for example, international interest rates, market expectations or economic signals. Therefore, it is not enough to simply look at how the variables covary; we must try to identify what happens after a change in the policy rate caused by none other than the Riksbank, given all the information that was available. This is not easy – but the fact that it is difficult is no reason not to try.

Before turning to the challenge of distinguishing cause and effect, I begin by revisiting the correlations. To do so, I use a local projection model (Jordà, 2005). This method estimates how mortgage rates evolve day by day following an observed shift in the policy rate – and it does so without relying on strong assumptions about the structure of the economy. In that sense, the approach is closely related to the descriptive correlation analysis presented in the previous section.

Rather than looking only at the change in mortgage rates in response to the policy rate, I estimate two separate dynamic regressions for each horizon $h = 1,2, \dots, 90$ (days) following a change in the policy rate: one for the mortgage rate and one for the policy rate. Taking the ratio between the two gives a measure of the percentage impact:

$$\Delta r_{b,t+h} = \alpha_b + \beta_h^r \Delta i_t + \gamma' X_t + \varepsilon_{b,t+h}^r \,, \quad (1)$$

$$\Delta i_{t+h} = \alpha + \beta_h^i \Delta i_t + \gamma' X_t + \varepsilon_{b,t+h}^i \,, \quad (2)$$

where, $\Delta r_{b,t+h}$ is the change in the listed bank mortgage rate b from the day before the policy rate announcement to h days after.[5] $\Delta i_{t+h}$is the corresponding change in the actual policy rate. Δi_t is the change in the Riksbank's policy rate at the time t. X_t is a vector of control variables that includes international financial factors (e.g. US and European swap rates, stock indices, the VIX index). α_b is a bank-specific fixed effect. β_h^r and β_h^i are the coefficients of the policy rate in the respective equation h days after the announcement. The error terms $\varepsilon_{b,t+h}^r$ and $\varepsilon_{b,t+h}^i$ capture other factors affecting interest rates. The equations are estimated for each h separately, which makes it possible to study the dynamic behaviour – how quickly and to what extent mortgage rates adjust following a monetary policy change. By calculating the ratio between β_h^r and β_h^i, a measure of the pass-through in per cent is obtained:

$$Genomslag_{t+h} = 100 \frac{\beta_h^r}{\beta_h^i} \,. \quad (3)$$

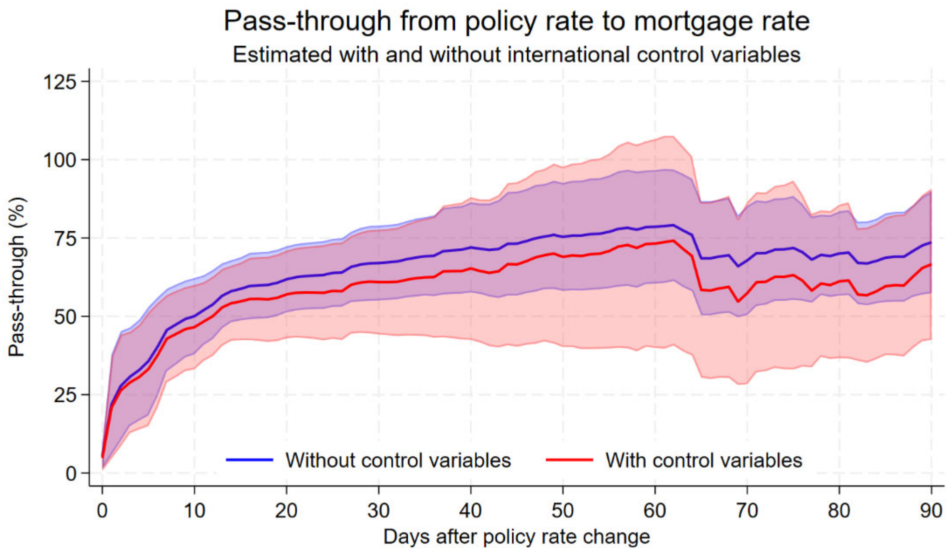
Figure 3 shows that a change in the policy rate has a clear and statistically significant effect on mortgage rates in the first few weeks after the announcement. The effect grows over the first 10-20 days and then levels off at around 75 per cent. When control variables reflecting international financial conditions – such as US and European government rates, risk premiums and the exchange rate – are included in the model, the effect of the Swedish policy rate becomes more uncertain but remains in line with the results without control variables. Uncertainty increases partly because of multicollinearity between the financial variables and partly because the introduction of more control variables reduces the remaining variation in the Swedish policy rate.

Nevertheless, the estimate of the policy rate effect remains stable in both magnitude and direction, suggesting that the results are robust even when international financial factors are taken into account.

Unlike figures 1 and 2, the pass-through in figure 3 is measured from the time of the monetary policy meeting. If the change in listed mortgage rates in figures 1 and 2 is also calculated from the meeting date, the pass-through is also around 75 per cent. This suggests that both the policy rate and mortgage rates are affected by common factors, not just by the Riksbank's decisions.

[5] The standard errors in the regression models are estimated according to Driscoll and Kraay (1998), which means that they are robust to both heteroskedasticity and cross-sectional dependence as well as autocorrelation within each unit over time. The method is based on Newey-West-like corrections but adapted for panel data with a large time sample. It does not require the panel to be balanced and is particularly useful in contexts where the number of units is small but the number of time periods is large.

Figure 3. Dynamic correlation between the policy rate and listed mortgage rates.
Pass-through in per cent



Note. The figure shows the estimated dynamic effect/association of a change in the policy rate on mortgage rates with three-month fixation periods, calculated using local projections (Jordà, 2005). Two models are compared: one without (blue) and one with (red) US and European financial control variables. The y-axis shows the average change in the mortgage rate (in percentage points) relative to a change in the policy rate, for each day after the policy announcement. Shaded areas represent 95 per cent confidence intervals.

Sources: Compricer, the Riksbank and own calculations.

How is the causal impact of the policy rate estimated?

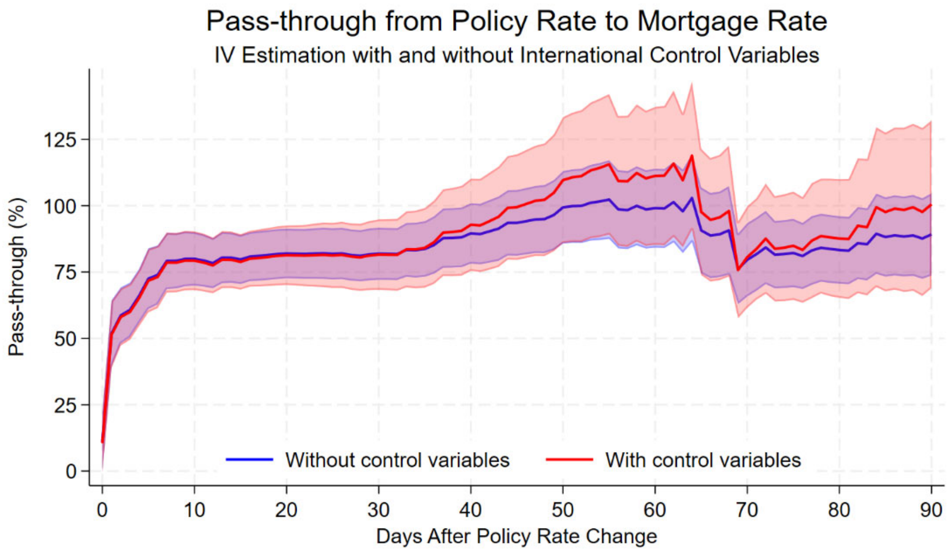
Up to this point, I have focused on correlations. To isolate the causal effect of the Riksbank's policy rate on listed mortgage rates, I apply the local projection approach above but combine it with a two-stage instrumental variable approach.[6]

Since changes in the policy rate are not necessarily exogenous – they may respond to the same factors that affect mortgage rates – Δi_t is instrumented with an exogenous variable, Z_t. I use the high-frequency change in the 1-year swap rate described in Almerud et al. (2024). The instrument captures market surprises at times when the Riksbank announces monetary policy decisions or interest rate adjustments. These interest rate

[6] Two-Stage Least Squares (2SLS) is used to estimate causal effects when the explanatory variable is suspected to be endogenous – that is, correlated with the error term in the regression model, for example due to simultaneity, reverse causality, or omitted variables. In this context, I aim to estimate the causal effect of the Riksbank's policy rate on banks' lending rates. In the first stage, the policy rate is instrumented using a variable that satisfies two conditions: (i) it is correlated with the policy rate (relevance condition), and (ii) it affects bank lending rates only through its impact on the policy rate and is uncorrelated with the error term in the lending rate equation (exogeneity condition). Suitable instruments might include external monetary policy shocks or market-based measures of unexpected rate announcements. The predicted component from the first-stage regression – the instrumented policy rate – captures only the exogenous variation in the policy rate. In the second stage, this instrumented variable is used as an explanatory variable in a regression of bank lending rates. Under the assumptions above, the second-stage coefficient provides a consistent estimate of the structural causal effect of the policy rate on lending rates.

movements are relevant for monetary policy, but they do not contain information on bank pricing, so they fulfil the theoretical criteria of both relevance and exogeneity. Standard tests also show that the instrument is statistically strong. [7]

Figure 4. Pass-through from the policy rate to mortgage rates.
Pass-through in per cent



Note. The Figure shows the estimated dynamic effect/association of a change in the policy rate on mortgage rates with three-month fixation periods, calculated using local projections (Jordà, 2005). Two models are compared: one without (blue) and one with (red) US and European financial control variables. The y-axis shows the average change in the mortgage rate (in percentage points) relative to a change in the policy rate, for each day after the policy announcement. Shaded areas represent 95 per cent confidence intervals. The change in the policy rate is instrumented with a 1-year swap rate. The instrument is strong (F = 41.3) and the model is accurately identified. The results indicate a clear and statistically significant causal relationship between monetary policy and banks' pricing of mortgages.

Sources: Compricer, the Riksbank and own calculations.

The estimation is carried out using two-stage least squares (2SLS) with fixed effects per bank b, which controls for time-invariant heterogeneity such as differences in business models, customer bases, or risk exposures. In the first step, Δi_t is predicted using the $Z_t$instrument. The predicted component is then used in the second step to estimate the causal effect on $\Delta r_{b,t+h}$ and Δi_{t+h}respectively.

The standard errors are clustered at the panel unit (bank) level, making them robust to heteroskedasticity and autocorrelation within each bank. This provides more reliable measures of uncertainty by correcting for both heteroskedasticity and serial correlation, for example whether a bank's interest rate changes are influenced by persistent

[7] The results of the first-stage regression show that the instrument Z_t (1-year swap rate) has a strong and statistically significant effect on the instrumented variable Δi_t. The F-test for excluded instruments gives a value of 41.26, which exceeds the critical values from Stock-Yogo for weak instruments by a good margin (e.g. the 10% level is 16.38). The Kleibergen-Paap rk Wald F-statistic is also 41.26, confirming that the instrument is strong even under heteroskedasticity.

internal factors or recurrent reactions to monetary policy. As each horizon h is estimated separately, a set of 2SLS regressions is conducted, with each regression capturing the dynamic relationship between a change in the policy rate and the cumulative adjustment in the mortgage rate h days later.

Figure 4 presents the estimated pass-through using this instrumental variable approach, both with and without international financial control variables for listed mortgage rates with a three-month maturity. The appendix contains the corresponding results for one and three-year maturities.[8] I show that the pass-through for listed mortgage rates with a one-year maturity is roughly the same as for three-month fixed rates. For three-year fixed rates, the pass-through is around 75 per cent after two months. If the policy rate is raised or lowered by one percentage point, listed mortgage rates with a three-year fixed interest period will thus change by 0.75 percentage points.

Interpretation of estimated pass-through: IV compared to reduced form

The comparison between estimates with and without instrumental variables reveals a clear difference in the estimated pass-through from the policy rate to listed mortgage rates. In figure 3 – where the change in the policy rate is used directly as an explanatory variable – the maximum pass-through is around 75 per cent. This implies that a change in the policy rate of 1 percentage point is on average accompanied by a change in the mortgage rate of 0.75 percentage points. When the same model is instead estimated using an instrument variable – which isolates exogenous variation in the policy rate – the estimated pass-through rises to around 100 per cent (figure 4).

The quantitative impact of the IV estimate is both expected and economically meaningful. There are several complementary interpretations to this result:

First, the lower coefficient in the reduced form may be due to endogeneity bias. The policy rate is not an exogenous variable: The Riksbank adjusts its monetary policy on the basis of economic developments, which means that both the policy rate and mortgage rates can be affected by common underlying factors such as economic prospects, inflation, the labour market and international interest rate changes. If these factors also affect mortgage rates directly – which is likely – then the estimated coefficient in reduced form will underestimate the causal effect of the policy rate. This is a classic case of downward simultaneity bias, where the correlation between the explanatory variable (the policy rate) and the error term in the regression leads to a dampened estimated relationship.

The IV approach – using, for example, the 1-year swap rate as an instrument – aims to isolate the exogenous variation in the policy rate, i.e. the part that is not driven by domestic macroeconomic outcomes but rather by external interest rate shocks or market-based monetary policy surprises. This type of variation is particularly well-suited for identifying a causal pass-through. The fact that the IV estimate is therefore larger is consistent with theoretical expectations.

[8] The appendix also presents results addressing whether the size of a policy rate change affects how banks adjust their listed mortgage rates. Larger interest rate changes do not have a stronger (or weaker) pass-through than smaller ones.

Second, the difference can be interpreted in terms of the Local Average Treatment Effect (LATE). The IV estimate does not necessarily capture the average effect of the policy rate in all situations, but rather the effect for those situations where the variation in the policy rate is driven by the instrument. This means that the estimate is representative of a particular type of monetary policy change – for example, unexpected or market-driven interest rate announcements – that may have a particularly strong impact on bank pricing. If these situations trigger more significant interest rate adjustments by banks than other types of policy changes, it is natural that the IV coefficient will be larger than the reduced form.

To summarise, the higher IV estimate should not be interpreted as an overestimation of the impact of the policy rate, but rather as a cleaner measure of the causal effect of exogenous policy impulses. The lower reduced-form estimate captures an average across both exogenous and endogenous variations in the policy rate – with some of these variations being jointly caused by other factors that also affect mortgage rates.

Is the pass-through from the policy rate asymmetric?

An important follow-up question to the estimated pass-through effect is whether the pass-through differs depending on whether the Riksbank raises or lowers the policy rate. There are several theoretical reasons to expect asymmetry. For instance, banks' interest income and margins may be affected differently depending on whether interest rates are high or low; adjustment costs may lead to slower transmission of rate cuts; and the competitive dynamics of the mortgage market may result in stickier adjustments in one direction than the other.[9]

To empirically investigate this asymmetry, the local projection method is extended by allowing separate effects for interest rate increases and decreases. This is done by splitting the change in the policy rate (Δi_t) into two parts: a positive part for increases and a negative part for decreases. The estimated model for each horizon h after the policy change is as follows:

$$\Delta r_{b,t+h} = \alpha_b + \beta_h^+ max(0, \Delta i_t) + \beta_h^- min(0, \Delta i_t) + \varepsilon_{b,t+h}$$

Here, β_h^+ is the pass-through of interest rate increases, while β_h^- captures the effect of interest rate cuts. This model is estimated on a day-by-day basis, as in the symmetric specification.

To isolate the causal effect, the same instrumental variable strategy is used as before. However, each part is now instrumented separately. The positive part of Δi_t (interest rate increases) is instrumented with the positive part of the change in the swap rate, and the same is done for interest rate decreases:

$$Z_t^+ = max(0, \Delta Z_t) \; och \; Z_t^- = min(0, \Delta Z_t)$$

[9] A theoretical explanation for asymmetric pass-through is provided by Stiglitz and Weiss (1981), who show that banks in markets with asymmetric information do not necessarily have an incentive to adjust interest rates symmetrically. Instead, lower interest rates can lead to increased risk exposure by attracting less creditworthy borrowers (adverse selection) or changing borrower behaviour (moral hazard). In some situations, banks may therefore choose not to pass on a rate cut in full.

These measures capture the market's unexpected reactions to monetary policy announcements and thus fulfil the requirements of both relevance and exogeneity. In the first step, each policy rate component is predicted by the respective instrument, and in the second step the predicted components are used to estimate the impact on the mortgage rate.

This approach allows for a direct comparison of the causal impact of increases and decreases, with the results presented in the same figure. Differences in size, timing and precision between β_h^+ and β_h^- provide a picture of possible asymmetries in the transmission of monetary policy to banks' mortgage conditions.

Figure 5 shows the estimated dynamic pass-through from positive and negative changes in the policy rate on Swedish banks' listed mortgage rates.

The overall picture that emerges is that the impact of the policy rate on mortgage rates is quantitatively similar regardless of whether the rate is increased or decreased. This suggests that, on average, banks adjust their listed rates proportionally to the size of the interest rate change, regardless of the direction of the decision. At the same time, there are indications of some asymmetry in the short-term dynamics. When interest rates are cut, mortgage rates tend to adjust slightly faster than when they are raised. One possible explanation for this pattern is that banks have incentives to quickly adjust interest rates downwards to attract new customers, especially in times of weaker demand or increased competition for mortgage customers.

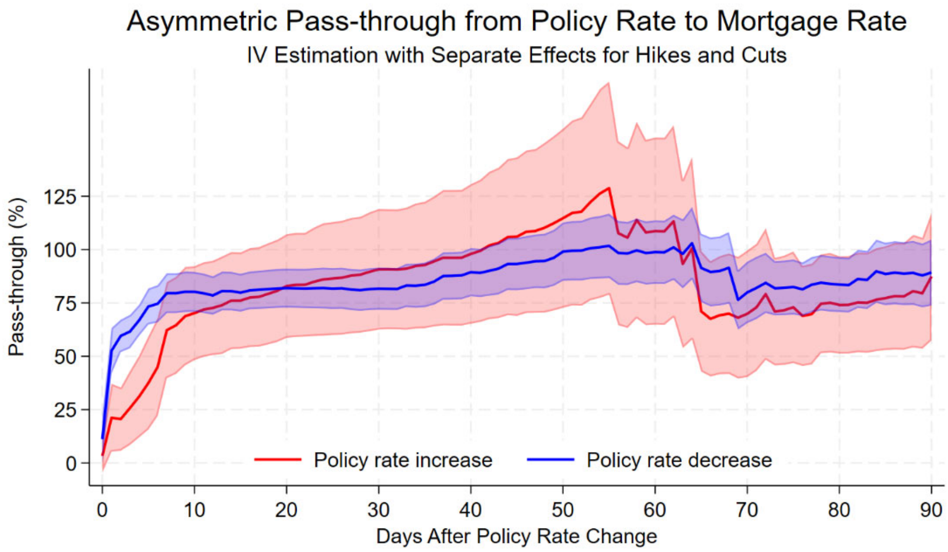
However, the faster pass-through of interest rate cuts appears to be largely driven by observations from the 2008-2009 financial crisis. When this period is excluded from the analysis, the differences between increases and decreases weaken. During the crisis, banks may have had greater incentives to cut interest rates quickly to stabilise the housing market and credit supply.

The uncertainty in the estimates, as illustrated by the shaded confidence intervals, is generally smaller for interest rate cuts than for interest rate increases. Several factors may account for this. First, interest rate cuts have been more common during the period under review, resulting in more observations and thus more precise estimates. Second, banks may respond to rate hikes with varying degrees of caution, depending on their risk assessments, margin targets, and liquidity preferences – contributing to greater heterogeneity in the speed and magnitude of upward adjustments in listed rates.

To summarise, the results in figure 5 suggest that the aggregate pass-through from monetary policy to the mortgage market is relatively symmetric, but that the speed of adjustment and the reliability of the estimates may vary depending on whether the policy rate is increased or decreased.

Figure 5. Pass-through of positive and negative policy rate changes to banks' listed mortgage rates.

Pass-through in per cent



Note. The Figure shows the estimated dynamic effects of changed in the policy rate on mortgage rates with three-month fixation periods, calculated using local projections (Jordà, 2005). Instead of assuming a symmetric pass-through, the policy rate change is split into two components: one for interest rate increases (positive changes) and one for interest rate decreases (negative changes). The effects are estimated separately for these two components using a two-step IV approach, whereby the change in the policy rate is instrumented with the positive and negative components of a 1-year swap rate. The y-axis shows the average pass-through (in per cent) from a change in the policy rate to the mortgage rate, for each day after a monetary policy announcement. The red line shows the effect of an interest rate increase, and the blue line shows the effect of an interest rate decrease. Shaded areas represent 95 per cent confidence intervals. The strength of the instruments is well documented in the first-stage regressions: The F-test for excluded instruments is 86.3 for interest rate cuts, which is well above the Stock-Yogo critical value for weak instruments (e.g. 10% level = 7.03). The Kleibergen-Paap statistic is also sufficiently high (8.37), suggesting that the results are robust even under heteroskedasticity. Together, this provides support for a causal interpretation of the effects.

Sources: Compricer, the Riksbank and own calculations.

4 Does pass-through collapse when the policy rate is negative?

An important question in the research and debate on the effectiveness of negative policy rates is whether the pass-through to household borrowing rates deteriorates when monetary policy reaches the effective lower bound. In other words, do policy rate cuts work equally well when interest rates are negative? Several studies have examined this, including Eggertsson et al. (2024), which shows that Swedish mortgage rates appear to be less responsive to monetary policy after 2015, when the Riksbank cut the policy rate below zero. A similar study for Finland (Kwan, Ulate & Voutilainen, 2023) finds that the impact continues in a negative interest rate situation, but that it is weaker than in the case of positive policy rates.

To examine this in the Swedish context, I use the same local projection model with an instrumental variable strategy as in the earlier analysis, now with a particular focus on differences in pass-through under negative interest rates. By comparing episodes of policy rate cuts – including the 2016–2019 period when the rate was negative – with other periods, I estimate how the pass-through changes as the policy rate approaches or falls below zero.

One potential explanation for weaker pass-through in a negative rate environment is that banks' net interest margins are compressed, reducing the incentive to pass rate cuts on to households. This has been highlighted in both theoretical research (Ulate, 2021) and empirical studies from the euro area (Beyer et al., 2024).

To investigate this empirically, the local projection model is extended to include an interaction between the change in the policy rate and an indicator variable for periods when the negative interest rate applies (ELB = 1). The estimated model for each horizon h is as follows:

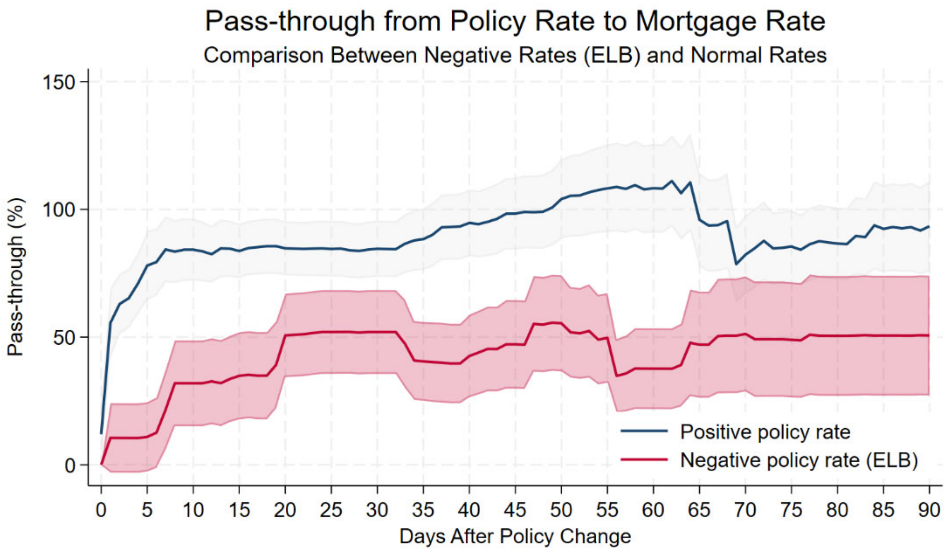
$$\Delta r_{b,t+h} = \alpha_b + \beta_h \Delta i_t (1 - ELB_t) + \beta_h^{ELB} \Delta i_t ELB_t + \varepsilon_{b,t+h}$$

Here, β_h is the pass-through in normal periods, while β_h^{ELB} captures the pass-through when the policy rate is negative. This model is estimated on a day-by-day basis, as in the symmetric specification. This model makes it possible to quantify whether monetary policy has less impact when it is constrained by the effective lower bound. A significant difference between β_h and β_h^{ELB} can be interpreted as evidence that monetary policy transmission is weakened - or changed - when the policy rate is negative.

Figure 6 compares the estimated dynamic impact of changes in the policy rate on Swedish banks' listed mortgage rates when the policy rate is positive and when it is negative.

Figure 6. Pass-through of positive and negative policy rate changes to banks' listed mortgage rates.

Pass-through in per cent



Note. The figure shows the estimated dynamic pass-through from changes in the policy rate to mortgage rates with a three-month fixation period, estimated using local projections (Jordà, 2005) and a two steps IV strategy. Instead of assuming a uniform pass-through in all periods, differences are allowed here depending on whether the policy rate is at the effective lower bound (ELB = 1) or not (ELB = 0). This is done by interacting the policy rate change with an indicator variable for the ELB period and instrumenting the respective component separately with corresponding parts of a 1-year swap rate. The y-axis shows the average pass-through in per cent – that is, how large a percentage of a change in the policy rate is passed on to mortgage rates – for each day after a monetary policy announcement. The blue line shows the effect in normal periods (ELB = 0), while the red line shows the effect under negative policy rates (ELB = 1). Shaded areas represent 95 per cent confidence intervals. For $\Delta i_t ELB_t$, the F-statistic is 58.0 (SW = 73.2), which clearly exceeds the Stock-Yogo critical limit for weak instruments (e.g. 10% level = 7.03). For $\Delta i_t (1 - ELB_t)$ the SW statistic is 42.0. This supports the view that both components are sufficiently strongly instrumented, allowing a causal interpretation of the results.

Sources: Compricer, the Riksbank and own calculations.

The results show that the monetary policy pass-through to banks' listed mortgage rates is weaker when the policy rate is negative, compared with normal periods. The pass-through is about half as large during negative interest rates as in normal times. The difference is statistically significant and robust to instrumentation.[10]

This result is in line with and complements the empirical evidence previously presented by Eggertsson et al. (2024), which shows that traditional monetary policy channels work less well when interest rates are negative. Their study compares interest rates for loans with different interest rate fixation periods before and after the inter-

[10] The robustness of the difference to instrumentation means that the result remains even when the analysis is adjusted to better isolate the part of the policy rate change that is not affected by other contemporaneous factors. This means that the difference in pass-through between negative and normal interest rates is not only visible in a simple comparison, but also when trying to capture a more causal relationship by using an external measure of the unexpected part of the interest rate decision.

est rate turned negative. They find that the short-term mortgage rate adjusts significantly less following an announcement of an interest rate cut during negative interest rate environments than during positive interest rate environments. Their conclusion is that the pass-through collapses. My analysis builds on this by using the full panel of bank data at daily frequency (Eggertsson et al. uses the same data but a shorter time period. They also aggregate lending rates from all banks and estimate a time series model).

My methodological approach also strengthens the causal interpretation of the results. In contrast to the purely descriptive comparison in Eggertsson et al. (2024), a two-step IV approach is used here, which identifies the unexpected component of the interest rate change, using a high-frequency market-based indicator (1-year swap rate). The results show that although the policy rate formally changes during negative interest rate environments, the pass-through to mortgage rates is weakened. However, to speak of a collapse in transmission is, in my view, an exaggerated interpretation.

This is also in line with the theory of Eggertsson et al, who emphasise that negative interest rates may encounter a "reversal interest rate", i.e. a level at which further reductions not only have a diminishing effect but are potentially counterproductive. One important reason is that banks cannot fully pass on negative interest rates to deposit accounts, which puts pressure on their net interest margins and weakens incentives to lower lending rates. Our empirical analysis indicates precisely this type of asymmetry: even if the Riksbank implements an interest rate cut, banks are less likely to respond with a corresponding reduction in listed mortgage rates when the interest rate is already negative.

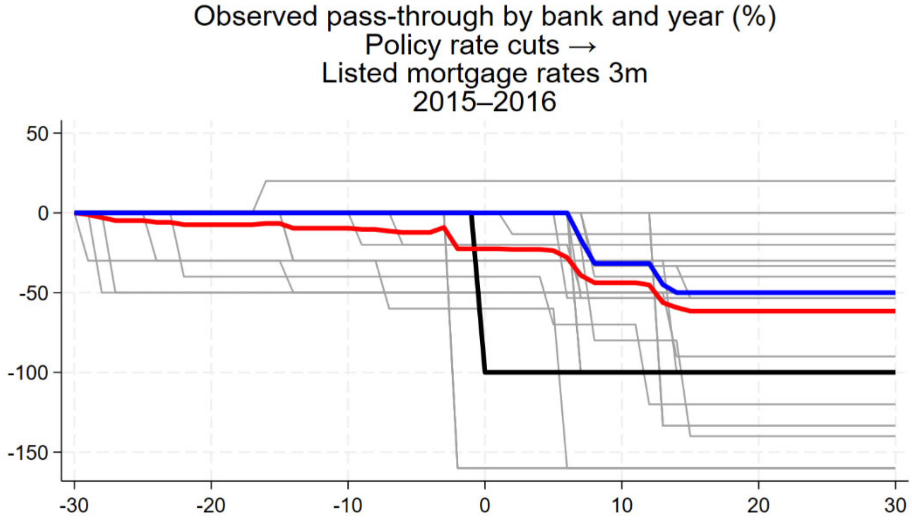
To better understand the difference between the results in Eggertsson et al. (2024) and the results I find, I have produced a normalised change in the listed mortgage rates with a three-month fixation period, 30 days before and 30 days after policy rate changes during the period 2015-2016 - i.e. at the beginning of the negative interest rate (ELB period). I compare this with the specific sample analysed in Eggertsson et al, namely the interest rate changes in July 2015 and April 2016. As in their analysis, the median change in listed mortgage rates shows no clear effect – the level remains broadly unchanged.

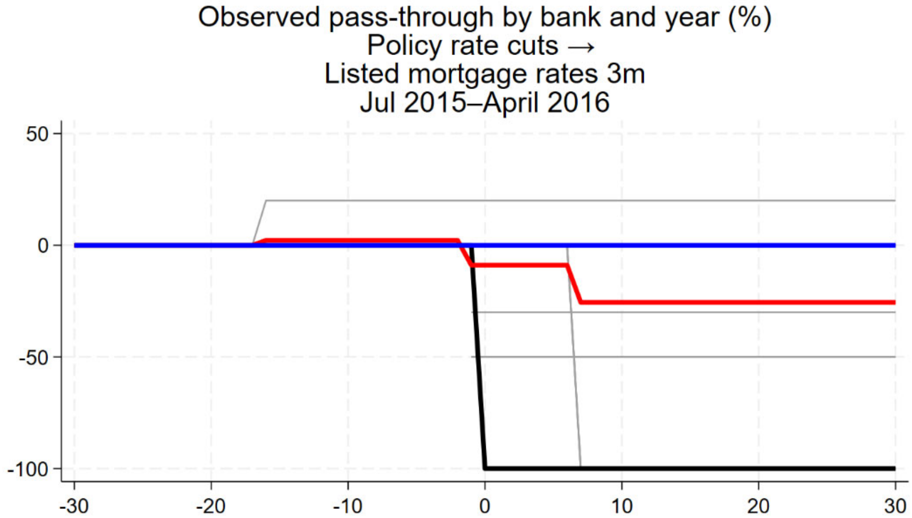
However, if we also include the rate cuts that took place before this narrower period, a clearer picture emerges (upper panel of figure 7): the banks then lowered their listed rates in conjunction with the cut in the policy rate. This difference in the time horizon may partly explain why the results of my panel-based analysis point to some impact even during negative interest rates, while Eggertsson et al. find a more abrupt break in the effectiveness of monetary policy around the summer of 2015.

To summarise, this Swedish panel analysis shows that monetary policy is not ineffective in a negative interest rate environment, but that its power is less. The results complement existing research and highlight the need to adjust monetary policy tools when the policy rate approaches its effective lower bound.

Figure 7. Normalised change in listed mortgage rates with a 3-month fixation period 30 days before and 30 days after repo rate changes in 2015-2016 compared with the sample studied in Eggertsson et al. (2024).

Per cent of policy rate change.





Note. The Figure shows the normalised change in listed mortgage rates with a 3-month fixation period between 2015 and 2016 (top figure) and in the sample that Eggertsson et al. (2024) study (bottom figure), from 30 days before to 30 days after a change in the repo rate. The change is expressed as a percentage of the current change in the repo rate. Each thin line represents an individual rate raise or cut episode for a bank in the sample, where the mortgage rate is put in relation to the level 30 days prior to the Riksbank's policy rate announcement. To enable comparison between different episode, each bank’s mortgage rate change has been divided by the corresponding change in the policy rate. The time axis shows the number of days before and after the interest rate change (which occurs at time 0). The black line shows the average path of the normalised policy rate. The red line shows the arithmetic mean and the blue line the median of banks' mortgage rate changes at each point in time

Sources: The Riksbank, Compricer and own calculations.

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APPENDIX - Additional results

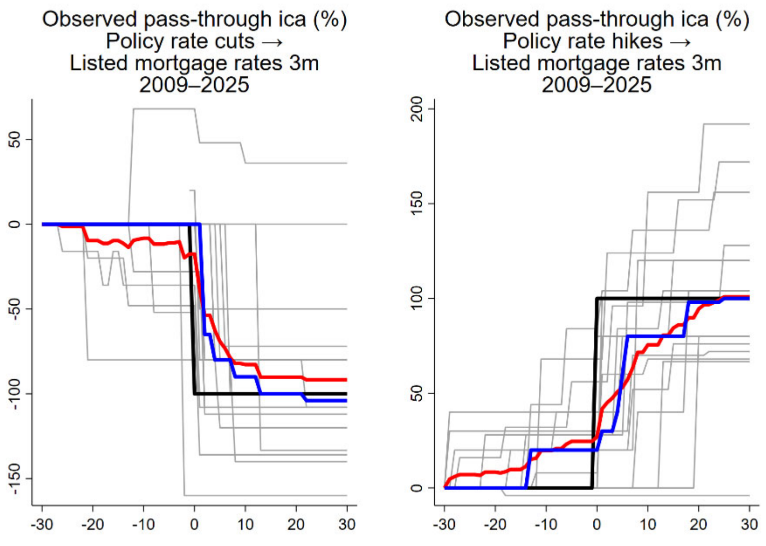
Change in listed mortgage rates with 3-month maturity by bank

This section presents a descriptive analysis of how Swedish banks' listed mortgage rates with a three-month fixed-rate period change in connection with the Riksbank's policy rate announcement. The figures below show the evolution of interest rates for each individual bank and episode.

Skandiabanken is the only bank where the median does not reach a 100 per cent impact thirty days after a policy rate cut. In the case of policy rate hikes, only Ikano Bank shows a median that does not converge to 100 per cent pass-through.

Figure 8. Normalised change in listed mortgage rates with a 3-month fixation period 30 days before and 30 days after policy rate changes: ICA

Per cent of policy rate change

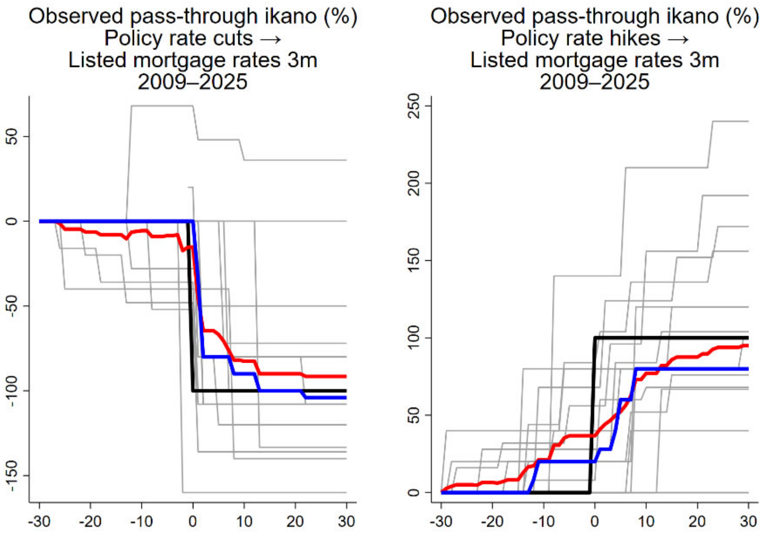


Note. See Figure 1. Each thin line represents an individual raise or cut episode for a bank in the sample, where the mortgage rate is put in relation to the level 30 days prior to the Riksbank's policy rate announcement. To enable comparison between different episode, each bank's mortgage rate change has been divided by the corresponding change in the policy rate. The x-axis shows the number of days before and after the interest rate change (which occurs at time 0). The black line shows the average path of the normalised policy rate. The red line shows the arithmetic mean and the blue line the median of banks' interest rate changes at each point in time.

Sources: The Riksbank, Compricer and own calculations.

Figure 9. Normalised change in listed mortgage rates with a 3-month fixation period 30 days before and 30 days after policy rate changes: Ikano.

Per cent of policy rate change

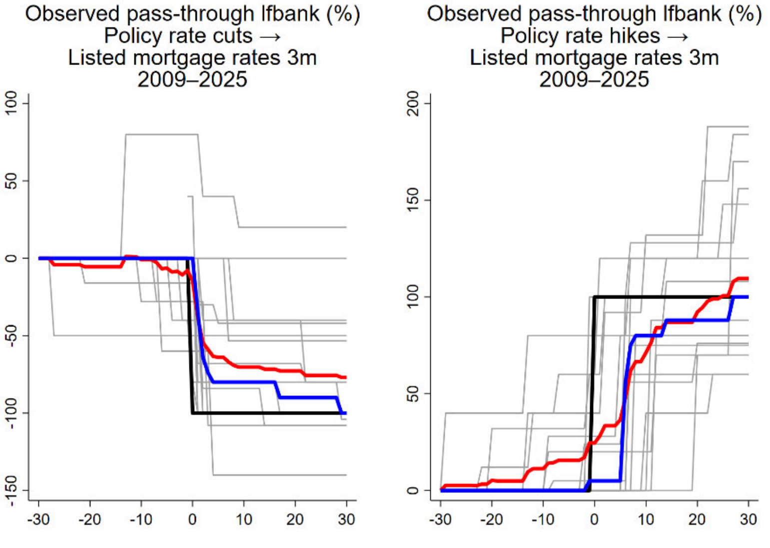


Note. See figures 1 and 8.

Source: The Riksbank, Compricer and own calculations.

Figure 10. Normalised change in listed mortgage rates with a 3-month fixation period 30 days before and 30 days after policy rate changes: Länsförsäkringar Bank.

Per cent of policy rate change

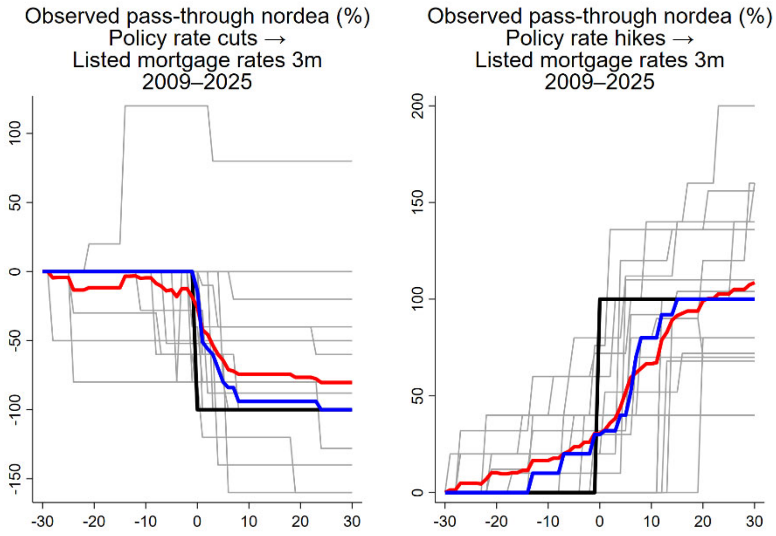


Note. See figures 1 and 8.

Sources: The Riksbank, Compricer and own calculations.

Figure 11. Normalised change in listed mortgage rates with a 3-month fixation period 30 days before and 30 days after policy rate changes: Nordea.

Per cent of policy rate change

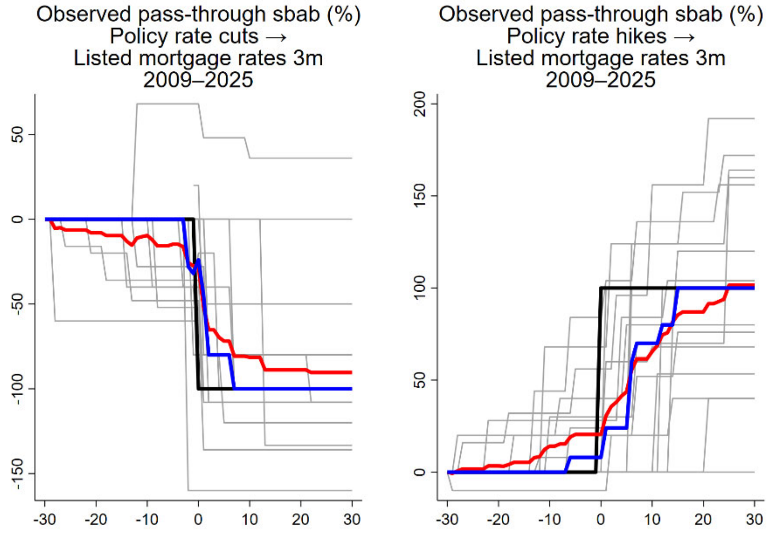


Note. See figures 1 and 8.

Sources: The Riksbank, Compricer and own calculations.

Figure 12. Normalised change in listed mortgage rates with a 3-month fixation period 30 days before and 30 days after policy rate changes: SBAB.

Per cent of policy rate change

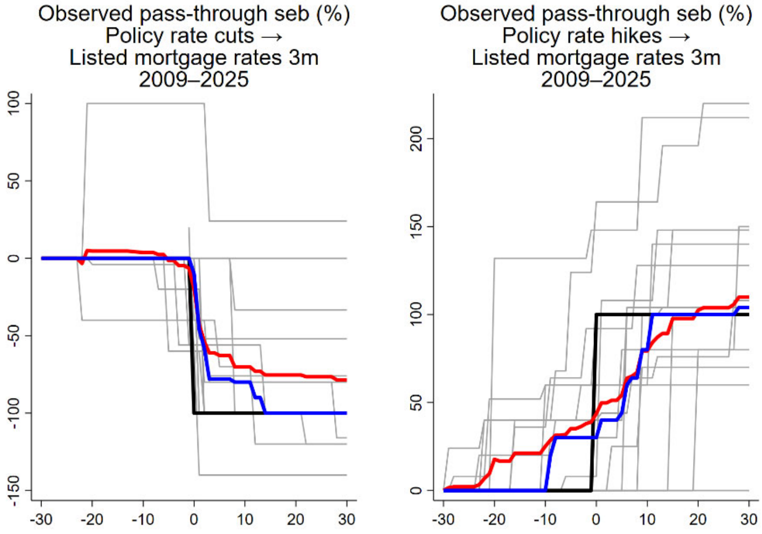


Note. See figures 1 and 8.

Sources: The Riksbank, Compricer and own calculations.

Figure 13. Normalised change in listed mortgage rates with a 3-month fixation period 30 days before and 30 days after policy rate changes: SEB

Per cent of policy rate change

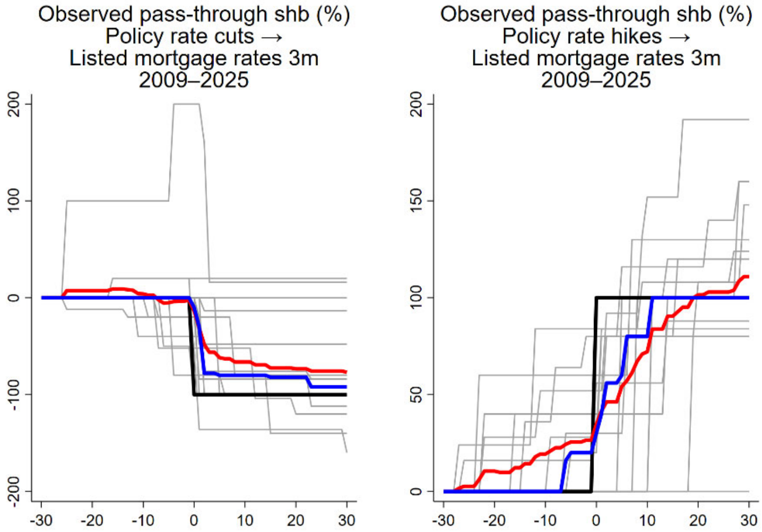


Note. See figures 1 and 8.

Sources: The Riksbank, Compricer and own calculations.

Figure 14. Normalised change in listed mortgage rates with a 3-month fixation period 30 days before and 30 days after policy rate changes: SHB

Per cent of policy rate change

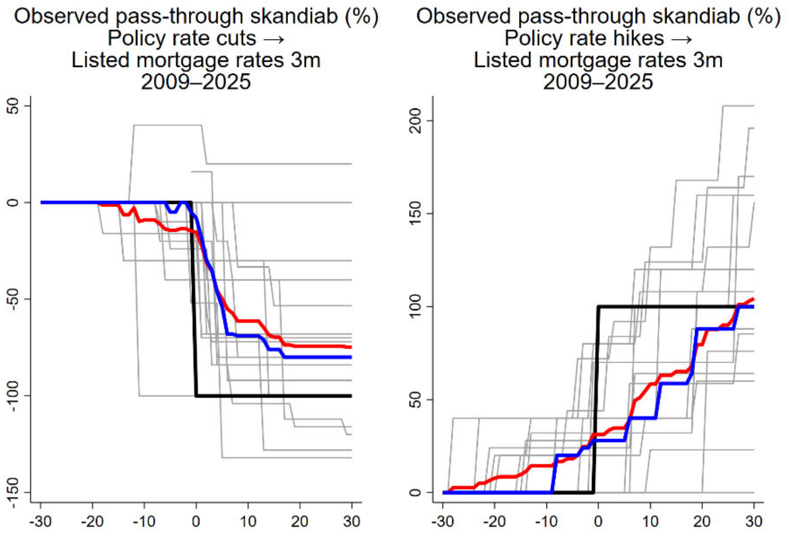


Note. See figures 1 and 8.

Sources: The Riksbank, Compricer and own calculations.

Figure 15. Normalised change in listed mortgage rates with a 3-month fixation period 30 days before and 30 days after policy rate changes: Skandiabanken

Per cent of policy rate change

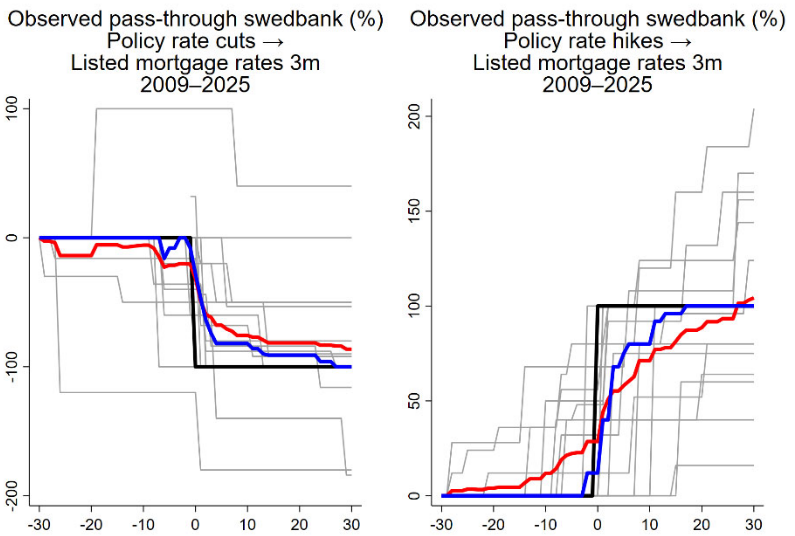


Note. See figures 1 and 8.

Sources: The Riksbank, Compricer and own calculations.

Figure 16. Normalised change in listed mortgage rates with a 3-month fixation period 30 days before and 30 days after policy rate changes: Swedbank

Per cent of policy rate change



Note. See figures 1 and 8.

Sources: The Riksbank, Compricer and own calculations.

How do the banks adjust their listed mortgage rates in connection with monetary policy decisions where the Riksbank leaves the policy rate unchanged?

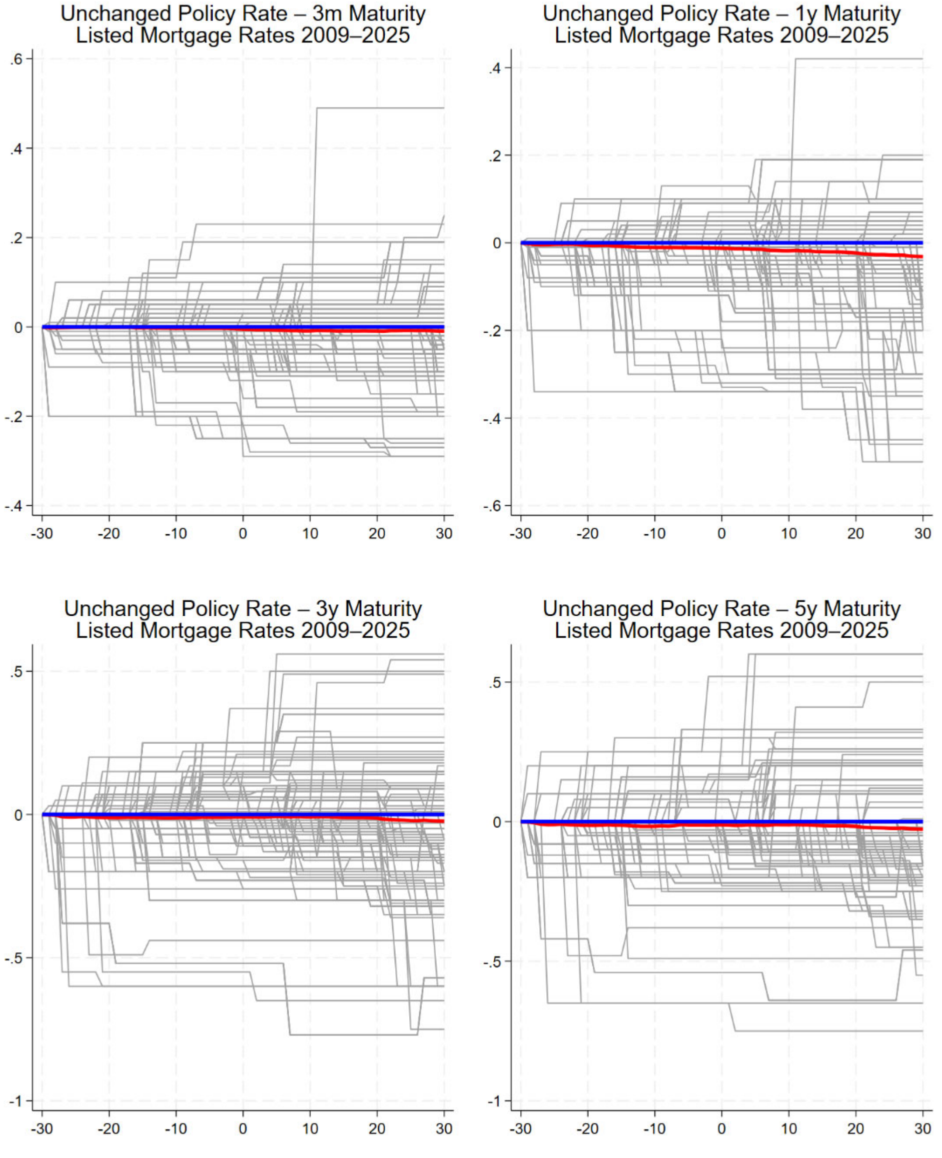
To further illustrate how Swedish banks adjust their listed mortgage rates in conjunction with monetary policy decisions, this Appendix studies the cases where the Riksbank leaves the policy rate unchanged. The aim is to investigate whether and how the banks' interest rate setting is also affected by interest rate announcements that do not entail a change in the policy rate, for example as a result of changed expectations, signals in communication or other concurrent factors.

The methodology follows the same descriptive event study approach as in the main analysis, focusing on a 61-day period around each monetary policy decision (30 days before and 30 days after the decision). Day 0 is defined as the date of the interest rate announcement, and each bank's listed mortgage rate is adjusted to zero at day -30. This allows a visual comparison over time between different banks and events, regardless of differences in baseline levels.

Figure 17 shows how the banks' listed mortgage rates evolve in these situations, as well as the extent to which there are patterns that are similar to, or different from, those observed for actual changes in the policy rate. The Figure shows that, on average, the banks do not change their listed mortgage rates at different maturities (3 months, 1 year, 3 years and 5 years) in the period around these interest rate announcements. The absence of clear movements in the Figure suggests that monetary policy decisions without a change in the policy rate do not, on average, give rise to systematic adjustments in banks' listed mortgage rates. This contrasts with the results for actual interest rate changes, where a clear pattern can be observed.

Figure 17. Normalised change in listed mortgage rates with different maturities 30 days before and 30 days after monetary policy decisions where the Riksbank leaves the policy rate unchanged.

Percentage points compared with the mortgage rate 30 days before the respective monetary policy decision.

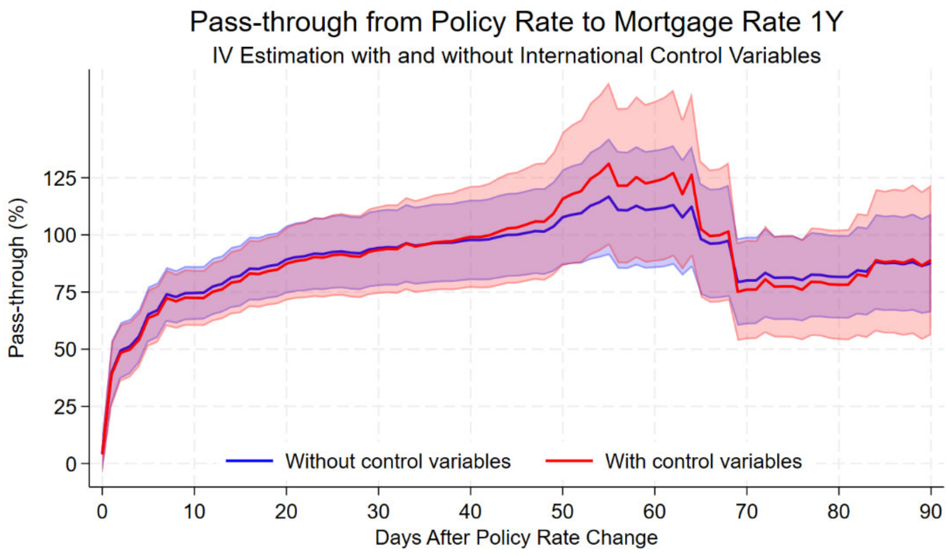


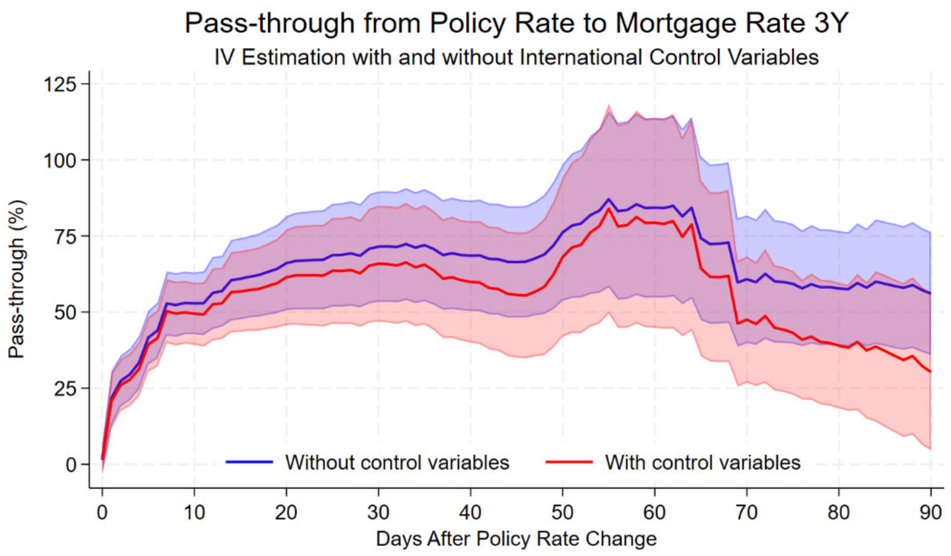
Note. See figure 1.

Sources: The Riksbank, Compricer and own calculations.

Pass-through from policy rate to one- and three-year fixed-rate mortgages

Figure 18. Pass-through from policy rates to one- and three-year fixed mortgage rates.
Pass-through in per cent





Note. The figure shows the estimated dynamic effect of a change in the policy rate on mortgage rates with one-year (top) and three-year (bottom) fixation periods, calculated using local projections (Jordà, 2005). Two models are compared: one without (blue) and one with (red) US and European financial control variables. The y-axis shows the average change in the mortgage rate (in percentage points) relative to a change in the policy rate, for each day after the policy announcement. Shaded areas represent 95 per cent confidence intervals.

Sources: Compricer, the Riksbank and own calculations.

Do bigger changes in interest rates have a bigger impact?

An additional question for the analysis of the average pass-through from the policy rate is whether the *size* of the change in the policy rate affects how the banks adjust their listed mortgage rates. There are several possible reasons why larger interest rate changes may have disproportionately large (or small) effects. For example, major changes can be interpreted as more significant policy shifts, creating greater repricing in markets. At the same time, thresholds, adjustment costs or regulatory expectations may dampen the impact of minor changes.

To investigate this, an extended version of the local projection method (Jordà, 2005) is used, which also includes a *nonlinear* component. It is based on the idea that the cubed change in the policy rate — i.e. $(\Delta i_t)^3$ — captures non-linear effects, as the cube function grows faster for larger deviations from zero but retains the sign. This approach is proposed in Tenreyro and Thwaites (2016), among others. The estimated model for each horizon h after the policy change is as follows:

$$\Delta r_{b,t+h} = \alpha_b + \beta_h \Delta i_t + \gamma_h (\Delta i_t)^3 + \varepsilon_{b,t+h} \qquad \text{(A1)}$$

where:

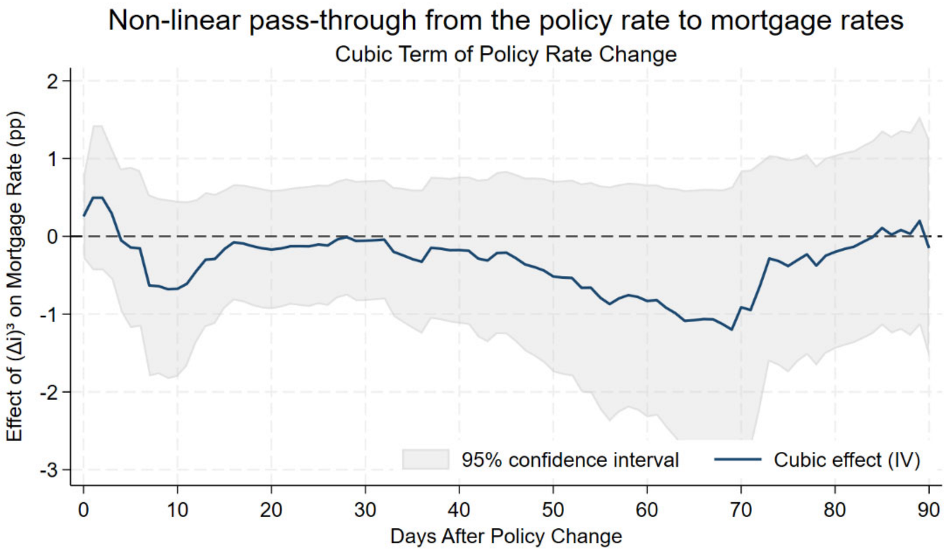
- $\Delta r_{b,t+h}$ is the change in the bank mortgage rate b, h days after a change in the policy rate.
- Δi_t is the daily change in the Riksbank's policy rate.
- $(\Delta i_t)^3$ is the policy rate change to the third power, which captures asymmetric and non-linear effects.
- α_b are bank-specific time-independent effects, and $\varepsilon_{b,t+h}$ is an error term.

To isolate the causal effect, both components — Δi_t and $(\Delta i_t)^3$ — are instrumented with the corresponding terms in the change in a 1-year swap rate: Z_t and $(Z_t)^3$. These variables capture surprises on monetary policy announcement days and are therefore relevant but exogenous to banks' interest rate decisions.

This methodology identifies whether major policy rate changes have a systematically different impact on banks' listed mortgage rates than minor changes. A significantly positive (or negative) γ_h is interpreted as evidence that larger interest rate changes have a stronger (or weaker) impact than smaller ones, regardless of direction.

Figure 17 shows that γ_h is not significantly different from zero. Thus, larger interest rate changes do not have a stronger (or weaker) impact than smaller interest rate changes.

Figure 19. Non-linear pass-through from policy rate to mortgage rates



Note. The figure shows the estimated dynamic effect of large changes in the policy rate on banks' listed mortgage rates with a three-month fixation period. The effects are estimated using an extended local projection model (Jordà, 2005), where a cubic term of the change in the policy rate is included as an explanatory variable. This allows us to analyse whether the pass-through from monetary policy is non-linear – that is, whether large changes in interest rates have a disproportionately larger or smaller effect than small changes, regardless of their direction. The y-axis shows how a change in the policy rate $(\Delta i_t)^3$affects the mortgage rate in percentage points (pp) for each day after a monetary policy decision. The blue line shows the estimated effect of the cubic term, while the shaded area represents a 95 per cent confidence interval. A positive and statistically significant value would indicate that large interest rate changes have a stronger impact than small ones, while a negative value would indicate the opposite. The results thus provide a picture of the non-linear transmission of monetary policy, which is particularly relevant when the policy rate approaches effective limits, or in the event of major unexpected policy announcements.

Sources: The Riksbank, Compricer and own calculations.

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