

## ■ The effects of monetary policy on household debt

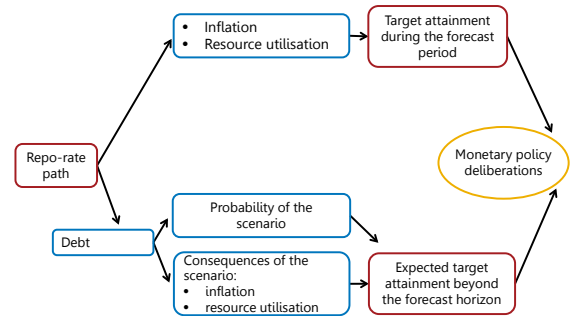
**A current issue in the monetary policy discussion is the attitude monetary policy should take to the build-up of financial imbalances. The financial crisis has demonstrated in several countries that such imbalances are often corrected in an abrupt and drastic way and that the real economic costs can be very substantial. In Sweden, the discussion has mainly focused on household indebtedness, which has increased substantially over the last 15 years. The Riksbank has previously discussed why there may be reasons for monetary policy to take imbalances into account and has presented a simple conceptual framework for how this can be done in practice. A first step in such an analysis is to estimate how changes in the repo rate affect household debt. A second step is to assess how much this in turn affects the risks of unfavourable outcomes in the future. This article focuses on the first of these steps and presents a quantification of the relation between the repo rate and household debt.**

### Monetary policy may need to take long-term risks into account

Since the 1990s, the Riksbank has conducted what is usually referred to as flexible inflation targeting. This means that the Riksbank aims to stabilise inflation around the target of 2 per cent and to stabilise production and employment around long-run sustainable paths of development.<sup>18</sup> The question of whether monetary policy should also take into account the build-up of financial imbalances has now been discussed for some time. The financial crisis of 2008-2009 intensified this discussion in both Sweden and abroad.

An article in the Monetary Policy Report of July 2013 described how a high level of indebtedness can make the economy more vulnerable so that the effects of a shock are more severe.<sup>19</sup> In the case of serious shocks and a rapid build-up of debt, financial stability may also be threatened, as was clearly demonstrated in several countries during the financial crisis. The article described a simple conceptual framework for how monetary policy may need to take account of the risks associated with imbalances that, among other things, can arise as a result of high indebtedness, see figure A15. An important question in this context is what impact monetary policy has on indebtedness.<sup>20</sup> In this article we therefore discuss how we can measure the effects of the repo rate on household debt and how great these effects may be.

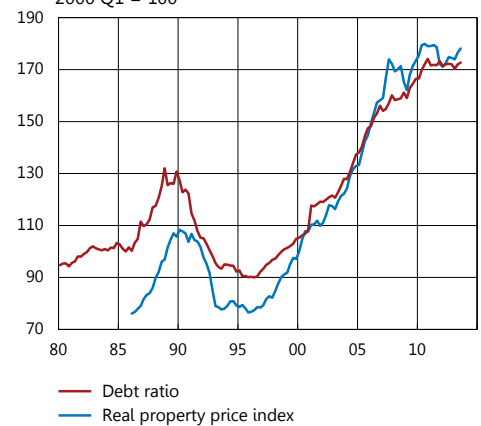
**Figure A15. Schematic outline of a monetary policy decision-making process that takes household indebtedness into account**



Source: The Riksbank

**Figure A16. Household debt and real property price index**

Per cent of disposable income and index respectively, 2000 Q1 = 100



Note. Property price index deflated with CPIF and then calculated as index 2000 Q1 = 100.

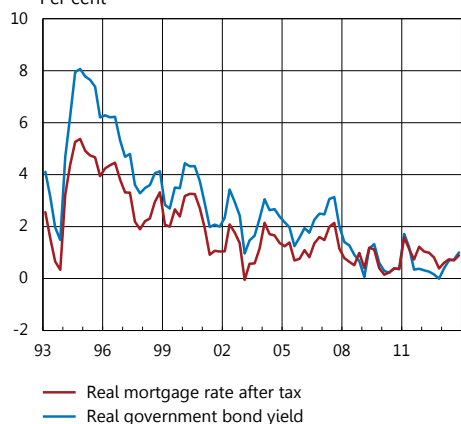
Sources: Statistics Sweden and the Riksbank

<sup>18</sup> See *Monetary Policy in Sweden*, 2010 Sveriges Riksbank.

<sup>19</sup> See "Financial imbalances in the monetary policy assessment". Article in *Monetary Policy Report*, February 2013. Sveriges Riksbank.

<sup>20</sup> Another important question that was addressed in the article in the Monetary Policy Report of July 2013 was how much the risks increase as the level of indebtedness increases. However, this question is not taken up in this article.

**Figure A17. Real mortgage rate after tax and real government bond yield, 5-year left to maturity**  
Per cent



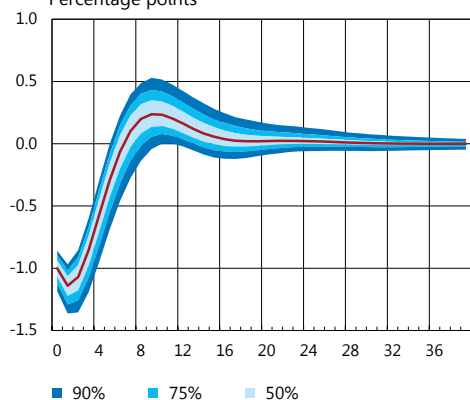
Note. Interest rates defined as ex-post real interest rates, measured in terms of the actual annual change in the CPIF.  
Source: The Riksbank

**Figure A18. Relation between long-term debt ratio and long-term real interest rate in a general equilibrium model**  
Per cent



Source: The Riksbank

**Figure A19. Repo rate changes**  
Percentage points



Note. The figure shows the effects of an unexpected lowering of the repo rate by one percentage point during a quarter. The blue fields show 90, 75 and 50 percent uncertainty intervals for these effects. The horizontal axis refers to the number of quarters after the shock occurs.

Source: The Riksbank

## The link between the real interest rate, house prices and debts

Household indebtedness is closely related to the development of housing prices as housing purchases are often financed by loans. In figure A16 it can be seen, for example, that a trend increase in both house prices and household indebtedness began in the mid-1990s but that this came to an end in connection with the outbreak of the financial crisis. There are a number of different factors that explain why both house prices and indebtedness have increased. Tax changes, a relatively low level of construction and demographic factors have contributed to this.<sup>21</sup> Another important explanation is that the real interest rate has fallen since the mid-1990s. Figure A17 shows that both the long-term real government bond yield and the long-term real mortgage rate after tax have fallen since the mid-1990s. As this has largely been a lasting change in the real interest rate it should have had a significant impact on both house prices and debts. The reason is that house prices and debts are not only determined by the current real interest rate but also by expectations of the future real interest rate. Whether the change in the real interest rate is perceived as temporary or lasting is therefore an important factor.<sup>22</sup>

One way of illustrating the effect on the debt ratio that could arise if there were to be a lasting change in the real interest rate is to calculate this in a model. Figure A18 shows how such a relation between the long-term real interest rate and the long-term debt ratio may look.<sup>23</sup> According to this type of calculation, a change in the long-term real interest rate can have a significant impact on the debt ratio, especially if the real interest rate is already low. In the model, the long-term debt ratio increases from just over 150 per cent to almost 200 per cent if the long-term real interest rate falls from two per cent to one per cent.

## Household debt and changes in the repo rate

In the long term, the real interest rate is determined by average productivity growth in the economy and not by monetary policy. However, in the shorter term a change in the repo rate will affect the real interest rate as the general price level adjusts slowly. How much this in turn will affect the development of indebtedness depends partly on how lasting the households believe the change in the repo rate will be and partly on how long a time horizon the households

<sup>21</sup> See *The Riksbank's commission of inquiry into risks on the Swedish housing market*, 2011. Sveriges Riksbank. See also Hansen Sten, Explanations of the development of household indebtedness since the mid-1990s. *Memo 1 of the analysis group of the Council for Cooperation on Macropudential Policy*. Finansinspektionen. See also Alsterlind Jan, Ulf Holmberg, Kristian Jönsson, Björn Lagerwall and Jakob Winstrand, Risks to the macroeconomy and financial stability from the development of household debt and housing prices. *Memo 6 of the analysis group of the Council for Cooperation on Macropudential Policy*. Sveriges Riksbank.

<sup>22</sup> See Svensson Lars E. O. (2013), "The Effect on Housing Prices of Changes in Mortgage Rates and Taxes", Working Paper, Swedish Institute for Financial Research. See also Alsterlind Jan, Ulf Holmberg, Kristian Jönsson, Björn Lagerwall and Jakob Winstrand, Risks to the macroeconomy and financial stability from the development of household debt and housing prices. *Memo 6 of the analysis group of the Council for Cooperation on Macropudential Policy*. Sveriges Riksbank.

<sup>23</sup> The calculations are made in the equilibrium model presented in Walentin Karl (2013), "Housing collateral and the monetary transmission mechanism", under publication in the *Scandinavian Journal of Economics*. The equilibrium relation in this model applies between the real interest rate and debts as a percentage of GDP. By assuming a constant relation between household disposable income and GDP the argument has been translated to a relation between the real interest rate and the debt ratio, here expressed as a percentage of disposable income.

have for the ownership of their housing and their indebtedness. If the households perceive the change in the interest rate to be temporary and they have a long time horizon for the ownership of their housing, then the effects of a change in the interest rate on indebtedness should be rather small.<sup>24</sup> If, on the other hand, the households perceive (rightly or wrongly) the change in the interest rate to be lasting, or they have a short time horizon for their ownership, the effects may be greater.<sup>25</sup> An extreme case is that the households perceive the change as permanent, which may result in very substantial effects as shown in figure A18. In order to see what the situation is in practice we must analyze actual data on the households' debts.

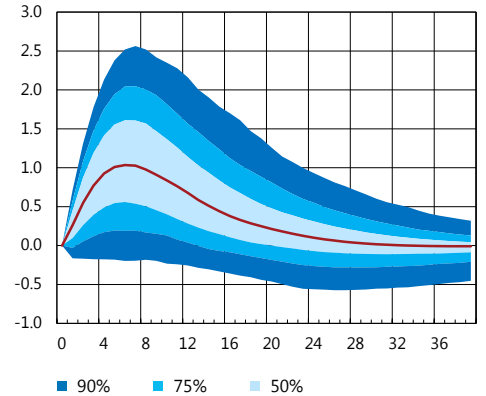
**A method for measuring the effects of the repo rate on debts**

A common way of investigating the effects a change in the policy rate has on variables such as GDP growth and inflation is to use a time-series model. The conclusion of this type of analysis is usually that both GDP and inflation increase for a while following a temporary lowering of the policy rate.<sup>26</sup> With the help of this method we can in the same way also analyse the effects of the policy rate on other variables, for example household debts.

The Riksbank uses different methods to measure the effects of the repo rate on growth, inflation and debts. One of these methods is the time-series model presented in a study by Laséen and Strid (2013).<sup>27</sup> The model is a vector autoregressive (VAR) model that includes foreign variables (which are important to a small open economy like the Swedish economy), (real) GDP, CPIF inflation, real housing prices, real debts and the repo rate.<sup>28</sup> The analysis shows that the effects of a change in the repo rate on GDP are similar to those identified in the Riksbank's macro model RAMSES.<sup>29</sup>

So, how large will the effect of a change in the repo rate be on household debt in the the VAR model? Figure A19 shows a lowering of the repo rate by one percentage point and then a gradual return. Figures A20 to A22 show the effects of an unexpected, temporary change in the repo rate.<sup>30</sup> The effects this has on real debts are shown in figure A20. Here it can be seen that the repo rate cut leads to an increase in real debts by, at most, approximately one per cent. The effect on debts is long-term but not permanent.<sup>31</sup>

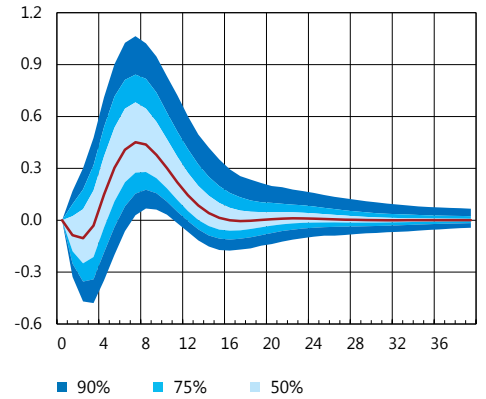
**Figure A20. Changes in the households' real debts**  
Per cent



Note. The figure shows the effects on real debts of an unexpected lowering of the repo rate by one percentage point during a quarter. The blue fields show 90, 75 and 50 per cent uncertainty intervals for these effects. The horizontal axis shows the number of quarters after the shock occurs.

Source: The Riksbank

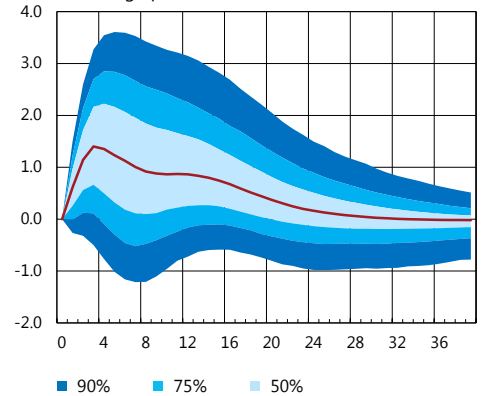
**Figure A21. Changes in GDP**  
Per cent



Note. The figure shows the effects on real GDP of an unexpected lowering of the repo rate by one percentage point during a quarter. The blue fields in the figure show 90, 75 and 50 per cent uncertainty intervals for these effects. The horizontal axis refers to the number of quarters after the shock occurs.

Source: The Riksbank

**Figure A22. Change in debts in relation to households' disposable incomes**  
Percentage points



Note. The figure shows the effects on the debt ratio of an unexpected lowering of the repo rate by one percentage point during a quarter. The blue fields in the figure show 90, 75 and 50 per cent uncertainty intervals for these effects. The debt ratio is converted to debts in relation to disposable incomes by assuming that the effect of the repo rate on disposable incomes is the same as for GDP. The response is then converted from per cent to percentage points by multiplying by a debt ratio that in the initial position is assumed to be 173 per cent. The horizontal axis refers to the number of quarters after the shock occurs.

Source: The Riksbank

<sup>24</sup> See Svensson Lars E. O. (2013), "Leaning Against the Wind Leads to a Higher (Not Lower) Household Debt-to-GDP Ratio", *Working paper*, Swedish Institute for Financial Research.

<sup>25</sup> The argument here applies mainly to the demand for loans. It may also be the case that the supply of loans can be affected if banks and other financial intermediaries perceive interest-rate changes to be more lasting than they actually are.

<sup>26</sup> Christiano Lawrence J, Martin Eichenbaum and Charles L. Evans (1998), "Monetary Policy Shocks: What Have We Learned and to What End?", *Handbook of Macroeconomics* Volume 1A. North-Holland Elsevier.

<sup>27</sup> See Laséen, Stefan and Ingvar Strid (2013), "Debt Dynamics and Monetary Policy: A Note", *Working Paper* no. 283. Sveriges Riksbank.

<sup>28</sup> The VAR model uses a method to identify the effects of monetary policy that is common in the academic literature and is described in Laséen and Strid (2013). In brief, this method is based on a so-called Choleski decomposition of the model's covariance matrix. Apart from inflation, the variables are also in levels, which means that monetary policy, according to these identifying assumptions, does not have any long-term effect on real GDP, real debts or real house prices. On the other hand, monetary policy will affect the price level itself even if the rate of inflation returns to its original level.

<sup>29</sup> See Adolfson, Malin, Stefan Laséen, Lawrence Christiano, Mathias Trabandt and Karl Walentin (2013), "Ramses II – Model Description", *Occasional Paper* no. 12. Sveriges Riksbank.

<sup>30</sup> The results here are based on the analysis presented in Laséen and Strid (2013).

<sup>31</sup> In dynamic models, the experiment itself tends to have an impact on the size of the effects. This is often an underestimated reason for the differences between the results of different studies.

Figure A21 shows that GDP increases by approximately 0.5 per cent at most when the repo rate is lowered in the way shown in figure A19. The debt ratio, expressed as debts in relation to the households' disposable incomes, increases by almost 1.5 percentage points at most when the repo rate is lowered by one percentage point, see figure A22.

### How certain are the results of the model?

Analysis methods that use historical data in order, for example, to measure the effects of monetary policy tend to be uncertain, and there are a number of different sources of this uncertainty.

One reason for this is that the time period studied may be decisive for the size of the effects arrived at. As a robustness check the model has also been estimated over different time periods. However, this does not change the results in any significant sense. Nor do different definitions of debts or other changes to the model appear to have any tangible effects on the results.<sup>32</sup>

There are also other sources of uncertainty. The blue fields in figures A19 to A22 show the uncertainty about the effects of the repo rate that arises because the model's parameters must be estimated. The unbroken lines show the most probable effects but the blue fields in the figures illustrate that effects may be greater or smaller. Figure A22 shows that there is a significant amount of uncertainty in the results for the effects on the debt ratio. It cannot even be ruled out that the ratio could fall when the repo rate is lowered, but it is most probable that it will increase.<sup>33</sup>

In discussions of monetary policy it has been argued that lowering the repo rate would *reduce* the debt ratio.<sup>34</sup> This argument is based on the claim that the repo rate's impact on inflation and GDP is relatively high while its impact on debts is low. However, this argument does not seem to correspond very well with the patterns in the actual data.<sup>35</sup> Although the results from the model do not rule out arguments of this type, the analysis of actual debt data rather indicates that people borrow so much more when the interest rate is lowered that this effect outweighs the positive effects on GDP, and the debt ratio *increases*.<sup>36</sup>

### The model may underestimate the effects of the repo rate on debts

The effects that the repo rate has on debts according to these estimates are based on the change in the repo rate being temporary. According to the arguments above, a lasting change in the interest

<sup>32</sup> See Laséen and Strid (2013) for a discussion.

<sup>33</sup> The mortgage margin itself can also affect debts. This is shown in Walentin Karl (2013), "Business Cycle Implications of Mortgage Spreads", *Working Paper* nr 275. Sveriges Riksbank.

<sup>34</sup> See Svensson Lars E. O. (2013), "Leaning Against the Wind Leads to a Higher (Not Lower) Household Debt-to-GDP Ratio", *Working paper*, Swedish Institute for Financial Research.

<sup>35</sup> See Laséen and Strid (2013) for a discussion of this. The results of the VAR model are in line with Iacoviello Matteo and Raoul Minetti (2008), "The Credit Channel of Monetary Policy: Evidence from the Housing Market", *Journal of Macroeconomics*, Vol. 53 No. 8, pp 69-96. The authors investigate, among other things, how debts react to a change in monetary policy in Finland, Germany, Norway and the United Kingdom.

<sup>36</sup> The results indicate that the households actively choose debt levels, loan-to-value ratios, refinancing and amortisation and that these choices can be governed by cyclical factors. See Hui, Michael Michaux, and Nikolai Roussanov (2013), "Houses as ATMs? Mortgage Refinancing and Macroeconomic Uncertainty", *NBER Working Paper* No. 19421 for a discussion of the factors that determine the financing decisions of US households.

rate would have a much greater impact on indebtedness. One risk of keeping the repo rate low for a long time is that this may affect the households' expectations of future interest rates so that they overestimate how long interest rates will remain low. In such a case, the effects of the repo rate may be more similar to those presented in figure A18. Due to its design, the model only captures the normal short-term effects and thus risks underestimating the effects of repo-rate changes on debts (and also on other variables).

Another important aspect is that the results here reflect an average relation. It may be the case, for example, that the effects of the repo rate on debts are different in a downturn than it would be in an upturn, or that the level of the rate may have an impact. Analyses based on an average effect may then easily be misleading.

### **Cooperation between several policy areas is required to reduce the risks associated with indebtedness**

An article in the Monetary Policy Report published in July 2013 discussed how monetary policy may need to take into account risks associated with financial imbalances, for example high indebtedness.<sup>37</sup> If monetary policy has a sufficient impact on debts it can help to reduce the long-term risks to the economy. It is therefore important to ascertain how great an impact a change in the repo rate has on debts.

This article presents an estimate of how the repo rate affects debts. The results indicate that lowering the repo rate leads to an increase in real household debt and in real GDP and that the change in debt normally exceeds the change in GDP so that the debt ratio increases when the repo rate is lowered. According to the estimate, significant changes in the repo rate could affect the debt ratio by a number of percentage points for a limited period of time.

Household debt is currently at a high level and is expected to increase further. However, cooperation between several policy areas is required to manage the risk associated with household indebtedness. The emergence of macroprudential policy as a new policy area presents new opportunities for counteracting risks.<sup>38</sup> However, knowledge about the effectiveness of the macroprudential policy instruments is as yet relatively limited. Knowledge concerning which measures are most effective and how different policy areas can cooperate best will, however, increase as and when various macroprudential policy measures are taken.

<sup>37</sup> See "Financial imbalances in the monetary policy assessment". Article in *Monetary Policy Report*, February 2013. Sveriges Riksbank.

<sup>38</sup> See "Macroprudential policy and monetary policy". Article in *Monetary Policy Report*, October 2013. Sveriges Riksbank.