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Economic Commentaries

The funding of the major Swedish banks and its effect on household mortgage rates

Richard Eidestedt, David Forsman and Emre Ünlü

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Mortgage rates are of interest for many Swedish households, not least because mortgage costs are a large and recurring expense. Mortgages also make up a large proportion of banks' assets. How mortgage rates develop is therefore of importance for the Riksbank in its monetary policy considerations and its analysis of financial stability.

Changes in the Riksbank's policy rate, the repo rate, affect mortgage rates and other market rates. In recent years, the Riksbank has conducted an expansionary monetary policy and households have therefore had low mortgage rates. But the development of mortgage rates for Swedish households does not depend solely on changes in the Riksbank's policy rate, and the difference between the average mortgage rate and the repo rate has varied over time. An important reason is that household mortgage rates are also affected by how banks fund themselves and how their funding costs develop. In addition, other factors, such as regulatory amendments and competition on the mortgage market also affect the interest rates that banks offer their customers.

In this Economic Commentary, we divide the difference between the repo rate and mortgage rate into various sub-components, mostly to show how the funding components have influenced household mortgage rates over time. What is defined in the Commentary as the bank's margin is the sub-component that has contributed the most to the variable mortgage rate over the last ten years but we don't go into any more detail on this development. Of the funding components we review here, it is the risk premium associated with covered bonds and the difference between 3-months Stibor and the repo rate that make the largest contribution to the bank's funding costs. The major Swedish banks use wholesale funding to a considerable extent to fund the mortgages. This means that their funding costs vary over time and can increase sharply particularly in times of financial stress. However, these increased costs are mitigated by central bank measures.

For several reasons, the Riksbank needs to have a good understanding of how the major Swedish banks fund themselves.

Their funding has considerable bearing on the interest rate levels for household and corporate bank loans, and thereby affects the transmission mechanism, the financial stability analysis and the Riksbank's monetary policy considerations.

It is also important for households to understand what can affect mortgage rates when they take on debt and choose interest-rate fixation periods.

In this Economic Commentary, we provide a general description of how major Swedish banks are funded and how changes in market conditions affect funding costs and ultimately household mortgage rates.

¹ Emre Ünlü helped to write the Commentary while he was working at the Financial Stability Department but he is not working at the Riksbank anymore. The authors would like to thank Jesper Hansson, Mattias Hector, Jens Iversen, Reimo Juks and Olof Sandstedt for valuable comments. The views presented in this Commentary are the authors' personal opinions and are not to be regarded as an expression of the Riksbank's view on these issues.

The connection between the funding of major Swedish banks and the mortgage market

Sweden has a large, concentrated mortgage market dominated by a small number of participants

Swedish household debt has been increasing over a long period of time. At the end of 2019, it amounted to over SEK 4,200 billion, which is 85 per cent of Sweden's gross domestic product (GDP). The majority of this, just over SEK 3,400 billion, was made up of mortgages.

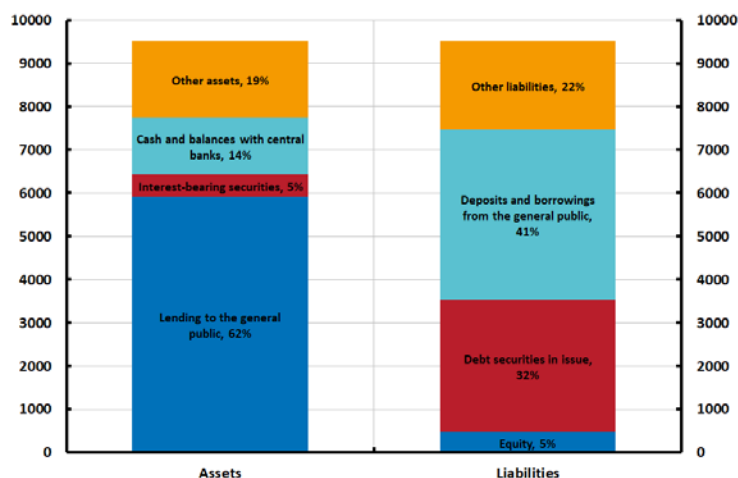
The Swedish mortgage market is concentrated with a small number of participants supplying the majority of mortgages. The country's four major banking groups currently have around 75 per cent of the mortgage market.² This means that the lending rates of just a few banks dictate the majority of household mortgage rates.

Mortgages make up a large share of the major Swedish banks' assets and they fund these mortgages in similar ways

Lending to the general public, i.e. which is mostly to households and non-financial corporations, by the major Swedish banks constitutes about 60 per cent of their total assets (see Diagram 1) and exposures to property, either in the form of mortgages, commercial real estate companies or loans with property as collateral constitute in turn about three-quarters of this lending.

Diagram 1. Aggregated balance sheet of the major Swedish banks

June 2020, SEK billions



Note. Derivative contracts and interbank loans are included in other assets and other liabilities. The major Swedish banks are Handelsbanken, SEB and Swedbank.

Sources: Banks quarterly reports and the Riksbank

In addition, the major banks fund themselves in a relatively similar way. Traditionally, banks fund their lending mainly via deposits from the general public.³ However, the banking system in Sweden has a deposit deficit of just over SEK 3,000 billion. This means that bank deposits in Sweden are insufficient to fund bank lending and the banks cover this deficit through

² These banking groups are Handelsbanken, Nordea, SEB and Swedbank.

³ See, for instance, Beau et al. (2014) or McLeay et al. (2014).

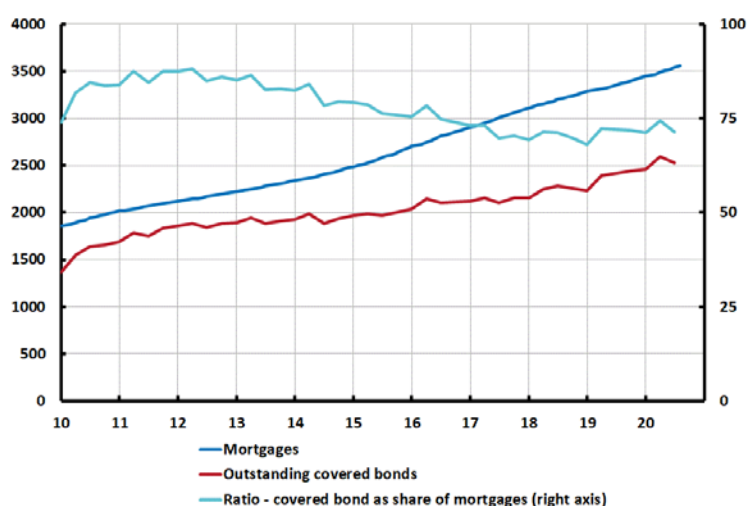
wholesale funding, mainly by issuing securities. The deposit deficit depends on both how the Swedish general public choose to save and how the banks prefer to fund themselves.⁴

The banks issue several different types of securities, and Diagram 1 only gives a general picture of their funding. Wholesale funding is obtained in both Swedish kronor and foreign currency and at different maturities (see Diagram 8 in the appendix).⁵ How the banks choose to fund themselves depends on a number of factors, including regulations governing liquidity requirements and capital requirements.⁶

Covered bonds constitute the largest source of funding for a Swedish mortgage

However, not all sources of funding are of equal significance for the pricing of mortgages, and this Economic Commentary will therefore focus more closely on certain funding components. The single largest source of funding for a mortgage is covered bonds.⁷ For the banking system as a whole, covered bonds constitute about 70 per cent of the total funding for Swedish mortgages (see Diagram 2). The remaining 30 per cent are funded via a mix of other liabilities and equity.

Diagram 2. Outstanding covered bonds and lending to households for housing purposes
SEK billion (left axis) and per cent (right axis)



Sources: The Riksbank, Statistics Sweden and the Swedish Bankers' Association (www.ascb.se)

⁴ See, for instance, Nilsson et al. (2014) or Sveriges Riksbank (2014a).

⁵ The high degree of foreign funding reflects both that the banks' operations are conducted abroad to a considerable extent, and that the major banks have access to more liquid markets and a larger investor base there, and thus to cheaper and more diversified funding.

⁶ For more information on liquidity requirements and capital requirements, see www.finansinspektionen.se. For more information on minimum requirements for eligible liabilities (MREL), see www.riksdagen.se.

⁷ This is a form of funding whereby the mortgages are earmarked and invested in a collateral volume (a so-called "cover pool"). Those who have invested in the covered bonds are entitled to receive cashflows and underlying collateral in this cover pool if the bank is unable to repay its liability. For a more detailed review of covered bonds and their connection to financial stability, see Fager Wettergren et al. (2013).

A mortgage rate can be decomposed so that the various funding cost components are more clearly visible

Banks normally fund a mortgage at the same maturity regardless of the interest-rate fixation period chosen by the household...

A mortgage normally has a repayment period of several decades and a customer stays many years with the same bank in general. In order not to expose itself to too much refinancing risk, the bank therefore needs to obtain long-term funding.⁸ The bank obtains funding at approximately the same maturity regardless of whether the household has chosen a fixed or variable interest-rate period for the mortgage. This funding is mostly obtained by the bank issuing covered bonds with a maturity of several years at a fixed interest rate.⁹

... but the way the bank funds itself differs depending on whether the customer chooses a fixed or variable interest rate

In somewhat simplified terms, Figure 1 shows a decomposition of a fixed mortgage rate, which is the different components of the bank's funding costs and the margin on the mortgage. Assume that the interest-rate fixation period for the mortgage is five years. Assume also that the bank matches the maturity of the funding with the interest-rate fixation period for the mortgage; in other words, it issues a bond with a five-year maturity period. As both the interest rate on the covered bond and the mortgage rate are fixed, both the bank and the customer know their interest payments in advance for the entire interest-rate fixation period. The interest rate on the covered bond can be divided up into a risk-free interest rate and a risk premium. The basis of this decomposition is the Riksbank's policy rate; the repo rate, which guides the shortest market rates. The repo rate constitutes the risk-free part of the interest rate on the bond. However, the final bond rate must also cover various types of risk associated with the bond. First, the bank must pay a certain risk premium as lending to a bank is not risk-free. As the funding is mostly at a maturity that is longer than one day, the bank must also pay a certain maturity premium.¹⁰ The red part in Figure 1 symbolises both these risks.

In addition to funding via covered bonds, the bank also needs to use other funding, which we have chosen to call the "funding mix" (the turquoise part in Figure 1 below) and we will return to this later on in the Economic Commentary. Somewhat simplified, the bank's funding costs for the mortgage will be the sum of both the interest demanded by investors for purchasing the covered bond and the cost for the funding mix.

The yellow part of Figure 1, the margin, is not just the bank's profit margin but consists of several components.¹¹ The margin shall cover various costs for managing the mortgage such as costs for staff, offices and IT systems. The margin shall also cover expected losses and costs for the capital or liquidity that the bank needs to hold. If a bank chooses to keep its margin unchanged, the mortgage rate is affected when the bank's funding costs change. However, the extent to which the bank can compensate for this depends on how much competition there is on the market. However, this Economic Commentary will not focus any more closely on the development of the margin even though it has a bearing on mortgage rate levels.

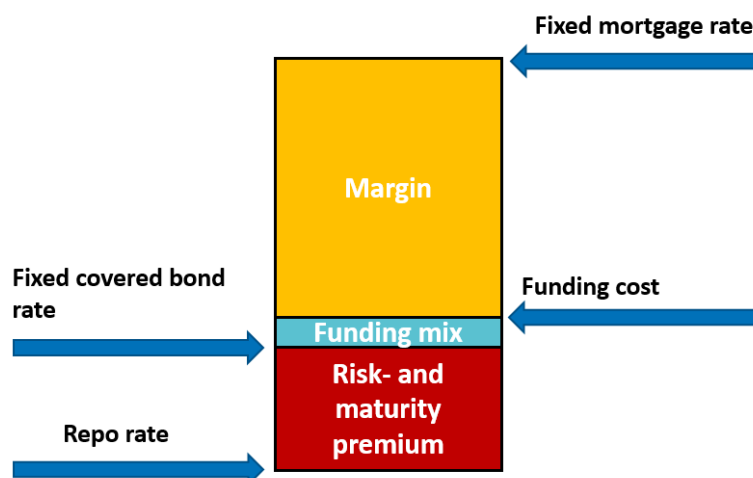
⁸ See Sveriges Riksbank (2016) for a discussion on maturity transformation in banking operations and on how this generates structural liquidity risks in the banking system.

⁹ The average maturity for all outstanding covered bonds is about 3 years and about 5 years for newly issued covered bonds. See www.ascb.se for more information.

¹⁰ A maturity premium is a type of compensation demanded by investors for investing in assets, for example, bonds with longer maturities. Expectations about the future level of the repo rate can also affect the difference between the present repo rate and a market rate with a longer maturity.

¹¹ We calculate the margin in a similar way to Finansinspektionen (see <https://www.fi.se/sv/publicerat/statistik/bankernas-marginal-pa-bolan2/>). In contrast to Finansinspektionen, we consider the average maturity for all outstanding bonds. See also the note on Tabell 2 in the appendix for more details.

Figure 1. A simplified decomposition of a fixed mortgage rate



Note. In the figure above, the cost for capital is assumed to be included in the *margin*. The same applies to costs for staff, offices, IT systems, etc.
Source: The Riksbank

To obtain the level of the fixed mortgage rate, the sub-components are added together.

Fixed mortgage rate = interest rate on the covered bond + interest rate contribution from the funding mix + the loan margin

The majority of mortgagors in Sweden have chosen variable, not fixed, interest-rate fixation periods

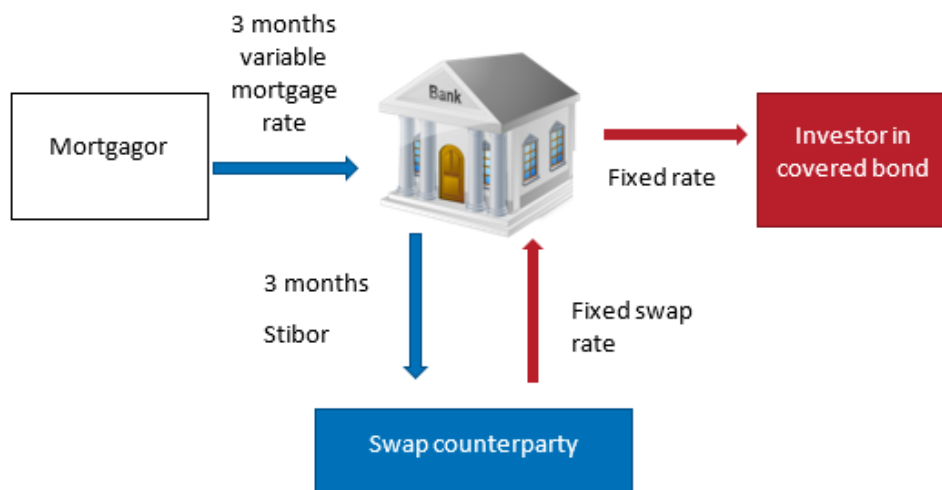
As variable interest rates are most common for households, constituting about 60 per cent of outstanding mortgages, we concentrate primarily on the funding costs for a variable-rate mortgage.¹² As the interest-rate fixation for variable-interest loans often changes, new and old borrowers will basically have the same interest rate. We therefore bundle new and old loans together into *variable-rate mortgages* without making any difference between them. We also assume in this Economic Commentary that the banks do not use the current funding cost for their issued bonds, known as the marginal cost, when they price a variable-rate mortgage. As the bank issues bonds all the time, it uses an average bond cost over several years in its pricing of variable-rate mortgages.

The bank transforms the fixed funding cost into a variable one in order to match the variable rate of the mortgage

To reduce the interest-rate risk that arises due to the bond rate being fixed and the mortgage rate being variable, banks transform the fixed rate on the covered bonds into a three-month Stibor rate via interest derivatives (see Figure 2). The difference between the fixed rate paid by the bank for the covered bonds and the fixed part in the swap contract, which the bank receives from the swap counterparty, is the bond's risk premium. The bank's funding cost can therefore be expressed as Stibor 3 months plus a risk premium.

¹² In this context, a variable interest rate has a three-month interest-rate fixation period. See also Sveriges Riksbank Financial Stability Report 2020:1, Chart 20, p. 20.

Figure 2. Simplified picture of certain interest flows that arise in the funding of a variable-rate mortgage via covered bonds



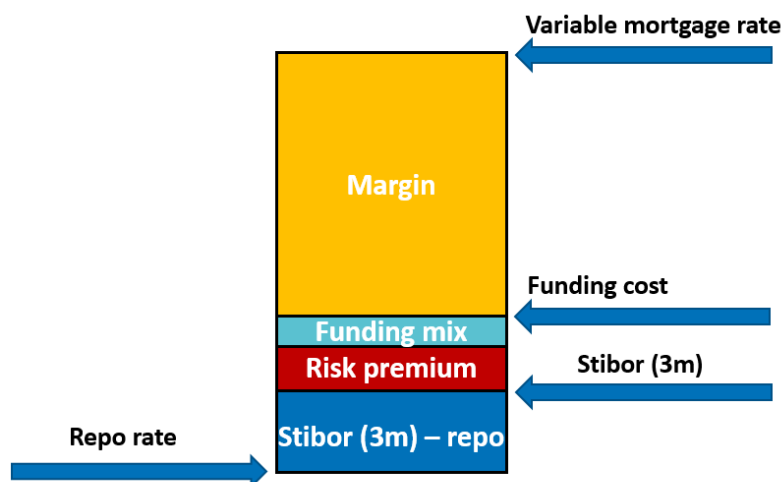
Note. The difference between the fixed interest rate paid by the bank to the investor and the swap rate received by the bank from the swap counterparty constitutes the risk premium for funding via covered bonds.

Source: The Riksbank

Similar to Figure 1, the funding cost for a variable-rate mortgage is illustrated in Figure 3 below. As we have noted previously, the bank’s funding usually has the same maturity, regardless of the interest-rate fixation period on the customer’s mortgage. Just as in the earlier example with a fixed mortgage rate, we assume therefore that the majority of the funding consists of a covered bond with a five-year maturity and fixed interest rate. With a fixed mortgage rate, the bank’s funding cost is known for the entirety of the bond’s maturity period. When decomposing a variable-rate mortgage, it becomes slightly more complex than in the case with a fixed mortgage rate. As the mortgagor will pay a variable rate in this case, the bank wants to transform the fixed bond rate into a variable one, in order to match their inflows from the loan with their outflows for funding. The sub-components in Figure 3 are therefore somewhat different to those in Figure 1. The new sub-components are Stibor 3 months minus the repo rate (the blue part of Figure 3) and a risk premium linked to the covered bond (the red part of Figure 3). In this case, the risk premium is therefore the difference between the bond’s fixed rate and the swap rate. As the banks regularly issue new bonds, this occurs with different risk premia depending on the conditions that apply when the bond is issued. The risk premium used by the bank in its pricing and described in the figure below is therefore the weighted average of the risk premia on the bank’s outstanding covered bonds. Stibor (Stockholm Interbank Offered Rate) is the Swedish reference rate set every day by the largest banks on the Swedish market. In turn, Stibor reflects the funding costs of these banks at different maturities, including three months.¹³

¹³ The Swedish Financial Benchmark Facility (SFBF) took over the calculation and administration of Stibor in April 2020. Stibor is to be adapted to the new legislation on reference rates (European Benchmark Regulation, BMR) by the end of 2021. Since 21 April 2020, the calculation of Stibor has changed somewhat, including changes to the weights in the currency basket on which Stibor is based. Despite this, a good understanding of how Stibor works can be gained from, for example, Sveriges Riksbank (2012) and Sveriges Riksbank (2014b).

Figure 3. A simplified decomposition of a variable mortgage rate



Note. In the figure above, the cost for capital is assumed to be included in the *margin*. The same applies to costs for staff, offices and IT systems. The risk premium constitutes the difference between the fixed rate paid by the bank for the covered bond and the fixed part in the swap contract, which the bank receives from the swap counterparty.

Source: The Riksbank

To obtain the level of the variable mortgage rate, the different sub-components are added together.

Variable mortgage rate = repo rate + (Stibor 3 months – repo rate) + risk premium related to covered bonds + interest rate contribution from the funding mix + the loan margin

The Stibor reference rate affects the level of variable mortgage rates

Figure 2 illustrates not only how the risk premium of the bond arises but also the fact that the funding cost for the bank occurs at a variable rate after the transformation. This differs from the previous example of fixed-rate mortgage funding, in which the funding cost is fixed and therefore known for the whole interest-rate fixation period. The funding cost for a variable-rate mortgage is thus linked to the three-month Stibor rate. As Stibor is in turn based on the banks' short-term funding sources, a change in the pricing of these sources will also affect those with variable-rate mortgages. The difference between Stibor 3 months and the repo rate (the blue part of Figure 3) will therefore vary when the cost for the short-term funding changes. The Swedish money market is basically non-existent (see Diagram 8 in the appendix) and banks' short-term funding consists mostly of certificates in USD and EUR. Stibor is therefore affected both by banks funding via foreign money markets and by the cost of transforming the foreign currency into Swedish kronor via the foreign exchange swap market.^{14,15,16}

The cost for the remaining funding of a mortgage (the funding mix) depends in part on the total composition of the funding

The cost for the remaining funding of a mortgage, the funding mix (the turquoise part of Figure 3), depends first of all on how much of the mortgage's total funding it constitutes. For

¹⁴ See, for instance, Sveriges Riksbank (2020a).

¹⁵ See Hilander (2014) for a more detailed discussion of how banks use these derivative contracts.

¹⁶ A currency swap consists of both a purchase and a sale of the same currency pair (for example USD/SEK) but on two different occasions. An example of this is when a bank sells dollars in exchange for kronor via a spot deal and simultaneously enters into a forward deal in which it shall buy back dollars in exchange for kronor in the future.

the Swedish banking system in total, this figure is currently about 30 per cent (see Diagram 2), although it may vary for individual banks. Secondly, it depends on how this funding is composed, that is what funding sources are included in the funding mix and how its volume develops. In somewhat simplified terms, we have assumed that this funding is composed of deposits and unsecured bonds.¹⁷ Thirdly, the cost depends on how the rate for deposits and the rate for unsecured bonds¹⁸ develop.

We have now presented the parts of a bank's funding that are important for the funding cost for a variable-rate mortgage. Apart from the repo rate, the risk premium on covered bonds, Stibor 3 months, the deposit rate and the interest-rate cost for the bank's unsecured bonds is of interest. We go through the development of these funding sources in the next section.

How the funding costs for the major Swedish banks have developed

The risk premium for the secured funding increases in periods of stress

In general, the cost of borrowing money on the financial markets has decreased since the global financial crisis just over ten years ago, due in part to the expansionary monetary policy and the increasingly eager search for yield by investors.¹⁹ The funding cost has been particularly favourable for banks deemed to have high profitability, including Swedish banks. During this period, the long-term funding of the major Swedish banks in the form of covered bonds has been cheap, both in EUR and SEK, relative to that of other European banks (measured as a risk premium, which is the difference between the bond rate and the swap rate). Diagram 3 illustrates the development of risk premia (symbolised by the red part of Figure 3) for two- and five-year covered bonds. The diagram shows how the risk premia typically increase in periods of financial stress, such as 2008–2009, 2011, 2015 and the start of 2020. It also shows that the five-year bond is on a higher interest-rate level than the two-year bond – due in part to the extra premium demanded by investors to buy a bond with a longer maturity.

¹⁷ Other sources of funding may also be included (such as certificates and subordinated liabilities), but these do not make up any significant part of the total sources of funding for a mortgage. Equity also funds a mortgage but here we have inserted the cost of this in the margin.

¹⁸ The fixed rate on the unsecured bonds is also transformed into a three-month rate when funding a variable-rate mortgage.

¹⁹ Other factors, such as demographic changes and increased saving in Asia, have also contributed to the trend towards lower real interest rates. See, for instance, Lundvall (2020).

Diagram 3. The development of risk premia on covered bonds
Per cent



Note. The bonds are issued in Swedish kronor (SEK). Refers to the difference between the interest rate on the covered bond and the swap rate on the corresponding maturity. The bonds are zero coupon rates calculated using the Nelson-Siegel method.

Source: The Riksbank

The difference between Stibor and the repo rate tends to increase during periods of stress and this has primarily been driven by an increased cost for banks to obtain short-term funding in foreign currency

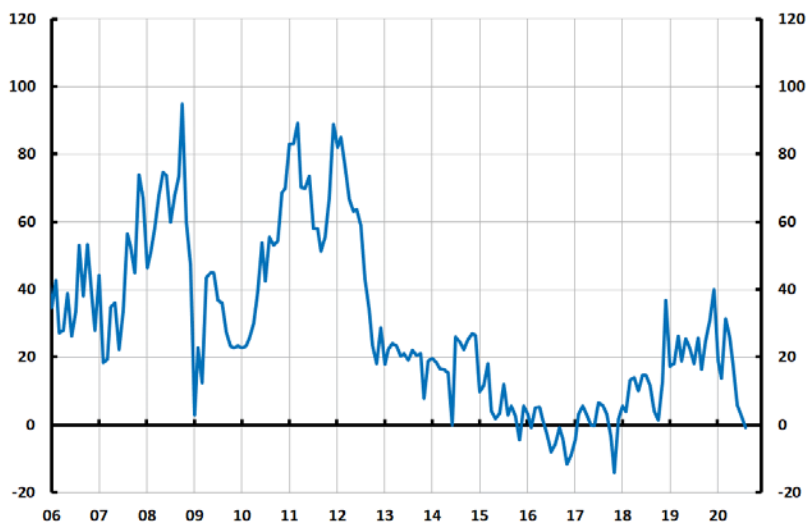
As we have already mentioned, short-term wholesale funding occurs almost exclusively in foreign currency, and it has been particularly advantageous to transform short-term dollar funding into Swedish kronor via FX swaps.²⁰ However, Diagram 4 shows that the difference between Stibor 3 months and the repo rate has varied over time. During stressed periods, the difference tends to increase due to increased short-term funding costs. The differences are not just linked to the short-term funding cost in itself, however, but also to the access to foreign currency. The price and access to foreign currency can vary considerably in turbulent times. This became clear during the global financial crisis in 2008, the European sovereign debt crisis in 2010-2013, and now most recently in the early stages of the coronavirus pandemic. For example, the most recent turbulence led to a deterioration in the banks' access to dollars at the same time as the FX swap markets began to function increasingly poorly. The consequence of this was that the price of short krona-funding also increased, with a greater difference between Stibor and the repo rate as a result (see Diagram 9 in the Appendix).²¹ After the Federal Reserve took measures both in the United States and globally to give banks greater access to dollars, however, the stress on the dollar market has decreased and the dollar market is currently functioning well. Large-scale purchases of assets by several central banks, including the Riksbank, have also increased liquidity in the market, which has further reduced money market rates.

²⁰ See, for instance, Sveriges Riksbank (2020b).

²¹ See, for instance, Avdjiev (2020).

Diagram 4. Stibor 3 months - the repo rate

Basis points



Source: The Riksbank

Deposits are normally a relatively cheap form of funding compared with short-term wholesale funding but this situation can change if the policy rate is negative

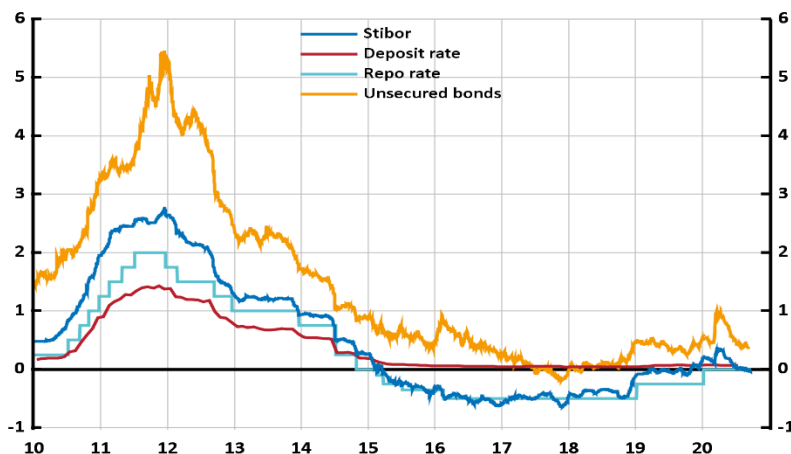
Before the Riksbank cut the repo rate to negative levels in 2015, the cost for deposits from the general public was relatively cheap in comparison with wholesale funding (see Diagram 5). When the Riksbank introduced a negative repo rate, the major banks only cut their deposit rates for financial and large non-financial corporations to negative levels. In comparison with reference rates such as Stibor and other short-term wholesale funding, the average rate on deposits from the general public was therefore higher during the period with a negative policy rate, as deposits remained at zero while short-term rates turned negative. After the repo rate was raised to zero at the end of last year, deposit rates have once again been lower than Stibor in periods.²²

The funding cost for unsecured bonds, which we pool together with deposits and call the funding mix, has the same tendency as other wholesale funding to increase rapidly in times of financial stress and turmoil (Diagram 5). Generally speaking, the development is more volatile than for covered bonds due to the higher risk in the instrument. But as the source of funding is not used to the same extent to fund a mortgage, this affects mortgage rates to a lesser extent.

²² Stibor 3 months is currently back at negative levels.

Diagram 5. Development of the interest rate on deposits from the general public and five-year unsecured bonds in comparison with the repo rate and 3-months Stibor

Per cent

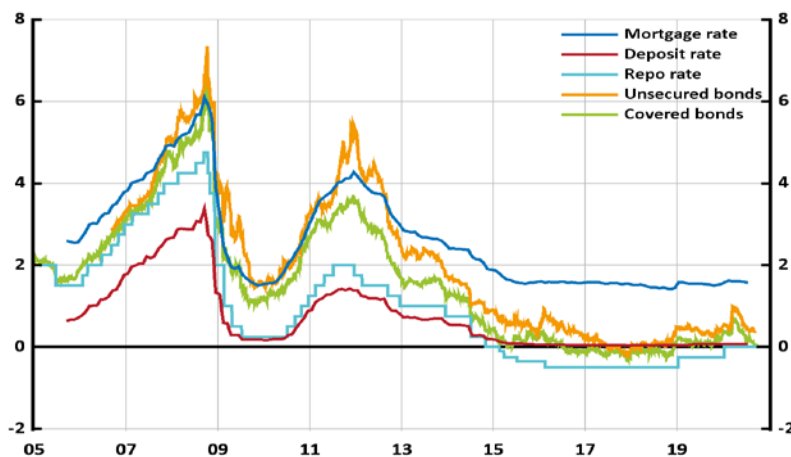


Note. Deposit rate refers to new agreements for both households and non-financial corporations. Due to limited access to data on rates for senior unsecured bonds, we use the five-year Credit Default Swaps (CDS), as there is a theoretical relationship between CDS spread and bond rates over the swap rate in particular. See, for instance, Hull (2004). These CDSs are denominated in EUR, and have therefore been transformed into SEK using five-year cross-currency basis swaps.
Sources: The Riksbank and Statistics Sweden

Diagram 6 below adds the various funding costs we have reviewed so far together with the development of the mortgage rate. It is also shown that the repo rate and the mortgage rate have a clear covariation but that the difference between these rates varies over time.

Diagram 6. Development of the Riksbank’s repo rate and various funding sources and mortgage rates offered by banks to their customers

Per cent



Note. Here, covered bonds refer to the risk premium (measured as five-year covered bond minus swap rate with corresponding maturity) plus Stibor 3 months. The deposit rate refers to new agreements, as well as the mortgage rate. The mortgage rate here is a variable rate, which is 3 months maturity.
Sources: The Riksbank and Statistics Sweden

Changes in the pricing of funding sources impact mortgage rates at different speeds

The fact that the costs for certain sources of funding, such as the risk premia when new covered bonds are issued, typically rise in times of stress leads to higher marginal costs for banks. But, as we discussed earlier, changes in risk premia tend to affect banks’ total costs slowly, as it takes time for new bonds to replace the entire stock of outstanding bonds. On

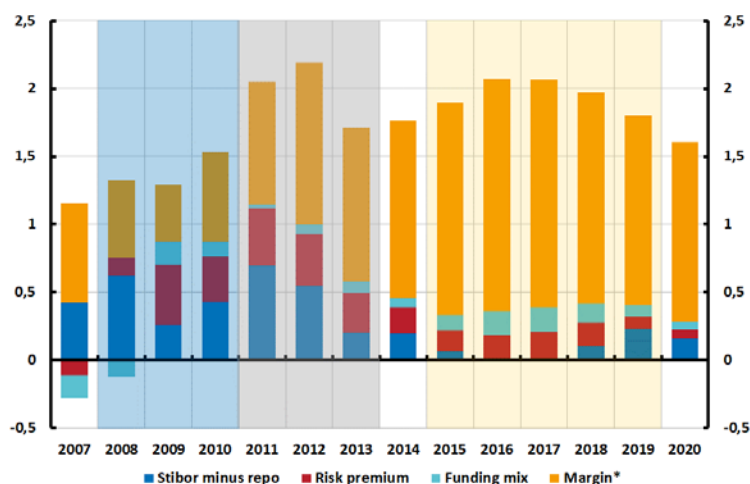
the other hand, as we have already described, a bank's funding cost for variable-rate mortgages is linked to Stibor and changes in Stibor may rapidly impact total funding cost. In the next diagram (Diagram 7), the different components are weighted in accordance with the average length of maturity for the various funding sources and the proportion of the individual component included in the banks' total funding cost. This provides a better picture of the average funding cost used by the banks when pricing a mortgage.

The sub-components of the banks' funding costs have affected mortgage rates in various ways over time

Diagram 7 shows, among other things, the contribution made by the various components of the funding cost to the lending rate. The diagram shows that the contribution made by various funding components and the margin has varied over the period.²³ Here, it can also be seen how the various sub-components are affected by economic developments and the stress level in financial markets.

The component that makes the biggest contribution to the difference between the repo rate and the variable mortgage rate (apart from in 2008 and 2009) is the margin. Regarding the components that we have reviewed in previous sections, the difference between 3-months Stibor and the repo rate (the blue part in the figure) also plays a major role. Similarly, the risk premium (the red part in the figure) makes a relatively significant contribution in certain years while the funding mix is of slightly less significance.

Diagram 7. Decomposition of the difference between the repo rate and a variable mortgage rate in different periods
Per cent



Note. Note that the diagram does not add up to the mortgage rate as the repo rate is absent from the figure – the mortgage rate therefore becomes the height of the bars plus the repo rate at that time. The blue area represents the global financial crisis, followed by the European debt crisis in grey and finally a period of low interest rates and expansionary monetary policy in yellow. Some costs already started to increase in 2007, before the global financial crisis had fully erupted. 2020 extends until the end of August.

Sources: The Riksbank, Statistics Sweden, Markit, Macrobond and Bloomberg

The difference between Stibor and the repo rate tends to increase in periods of stress and was widest in 2007–2012, that is during the global financial crisis and the sovereign debt

²³ However, Figure 7 may obscure and underestimate cost increases as the data used has been calculated as an average over the year. For example, the difference between Stibor and the repo rate has varied more than the above diagram illustrates (see for example Diagram 4).

crisis. This component also increased at the beginning of the coronavirus pandemic after having been low for several years. However, the difference between Stibor and the repo rate has once again decreased and is currently even negative, driven primarily by the support measures taken by central banks and other actors.

The risk premium has previously developed in approximately the same way as the difference between Stibor and the repo rate and made the biggest contribution in 2009–2013. One difference that can be seen is that risk premia have decreased after the Riksbank started using asset purchases in its expansionary monetary policy in 2015.²⁴ At the start of the coronavirus pandemic, risk premia increased across the board but after the large-scale support measures and continued asset purchases, they are now at historically low levels.

In the diagram above, we have totalled the contribution from deposits and the cost of unsecured funding under the heading *Funding mix*. In Table 2 in the appendix, we have divided the funding mix into these two components. The table shows that the cost for deposits has often made a negative contribution, meaning that deposits have often been a cheap source of financing compared to the Stibor rate, an example being in 2007 and 2008. However, in 2015–2019, the deposit rate was close to zero per cent, while the repo rate and other market rates were negative, meaning that deposits were expensive in comparison. Diagram 7 shows that the contribution from the funding mix therefore increased over this period. Unsecured bond funding is normally more expensive than deposits. This has been accentuated in periods of stress, but the contribution to the total funding cost is not as large as its share of the funding is relatively small (see Table 2 in the Appendix).

Diagram 7 shows that the margin has varied over time. Finansinspektionen (Swedish Financial Supervisory Authority) introduced higher capital requirements after the global financial crisis (in 2010 and 2011), which increased the cost of capital for banks. To retain the same profitability on mortgages, banks have increased the margin, which can also be seen in the figure. Studies of the funding costs for banks and their effect on lending rates indicate that banks tend to compensate for increased funding costs by charging their customers a higher interest rate. In other words, they try to maintain their margins even when costs are rising.²⁵ When the repo rate was negative, the margin also increased, one of the likely reasons for this being that banks compensated extra for the relatively more expensive deposits although the high demand for mortgage may also have played a part. The extent to which banks can compensate in this way varies depending on several factors, including market competition.²⁶

What will happen to the variable mortgage rate if funding costs change in the future?

A number of typical examples of what may happen to the mortgage rate as a result of various changes to funding costs are given below. In the examples, the bank is assumed to want to maintain its margin, and changes to funding costs will therefore have consequences for mortgage rates. In practice, however, the bank may instead choose to change its margin rather than change household mortgage rates.

Changes to long-term rates

Long-term rates on covered bonds can change in two different ways.

Either the **risk premium** for the covered bonds changes, which would directly affect the marginal cost for banks. In addition, covered bonds make up such a large part of the total

²⁴ The Riksbank had already purchased bonds in 2012–2013, but to a lesser extent. The purchases amounted to SEK 10 billion.

²⁵ See, for instance, Illes (2015).

²⁶ See, for instance, Engström (2020) or Sveriges Riksbank (2018).

funding of a mortgage that a change in their risk premium affects the total funding cost to a large extent. But as the average maturity on this funding is several years, the average funding cost will be affected by only a few per cent per months. This adjustment therefore occurs gradually over time.²⁷ Alternatively, **risk-free interest rates**, such as swap rates, can change.²⁸ Variable mortgage rates are not normally affected by this as long as short-term rates remain unchanged. But if long risk-free interest rates change, there is normally an expectation that short risk-free rates will also change in the future, which means that variable mortgage rates should also be affected in the longer term.

Changes to short-term rates

Changes in short-term rates have a considerable impact on variable mortgage rates. Stibor and other short-term market rates can change when the risk-free interest rate, the **repo rate**, is adjusted. Stibor is also affected by banks' short-term funding costs. Changes in the Stibor reference rate in turn affect banks' funding costs for variable-rate mortgages, as they have tied their funding costs for covered bonds to the Stibor reference rate via interest rate swaps. This means, as mentioned above, that changes to short-term rates lead to relatively immediate changes in variable mortgage rates.

Rates change for funding sources in the funding mix

As the majority of **deposits** have short interest-rate fixation periods, an interest rate adjustment has a relatively rapid impact on banks' interest expenditure. However, the funding cost related to **deposits** only has a moderate effect on the total funding cost as it constitutes a small proportion of the total funding for mortgages.

Unsecured bonds, on the other hand, have a maturity of several years, which means that the average funding cost for this source of funding, like covered bonds, is affected only marginally per months. **Unsecured bonds** also constitute a small proportion of the total funding cost.

Table 1 summarises the above text. Somewhat simplified, the table shows the extent to which and how quickly changes in various interest rates affect the funding cost for a variable-rate mortgage.

Table 1. Summary table, funding cost for variable-rate mortgages

	Long-term interest rates		Short-term interest rates		Funding mix*	
	Risk premium, covered bonds	Swap rate	Stibor - repo rate	Repo rate	Unsecured bonds	Deposit rates
<i>Effect on funding cost</i>	High	**	High	High	Moderate	Moderate
<i>How quickly does a change make an impact?</i>	Slowly	**	Direct	Direct	Slowly	Direct

Note. * Funding mix refers to interest rate changes in the sources of funding included in the funding mix. ** Does not affect the funding for mortgages at variable interest rates, but only for mortgages with fixed interest rates. But as long risk-free interest rates change, there

²⁷ We assume here that the bank wants to use the average risk premium for bonds issued over the last three years. If, in one month, the bank obtains funding at a higher cost than the previous month, it means that an individual month will affect the average cost by $1/36 =$ just under 3 %.

²⁸ The risk premia are assumed to be unchanged here.

is normally an expectation that short risk-free rates will also go in the same direction in the future, which means that variable mortgage rates should also be affected in the longer term.

Concluding remarks

Mortgage rates for Swedish households co-vary with the Riksbank's repo rate, but are also dependant on several other factors. One of these is how Swedish banks are funded and how the cost of their funding develops.

As Swedish banks largely use wholesale funding to fund a mortgage, mortgage rates for Swedish households can be affected when funding market conditions change. This could be due to changes in the interest expenses for banks' bond funding, or changes in the Stibor reference rate, which is based on their short-term funding. Risks on financial markets or in individual banks can therefore be of interest to households with mortgages as their mortgage rate is affected if these risks materialise.

In previous crises, funding costs for the banks have increased for various reasons and increased funding costs can in turn lead to higher mortgage rates. However, this can be countered to a large degree by expansionary monetary policy. We also saw an initial increase in certain bond rates and banks' short-term funding costs (Stibor) at the beginning of the coronavirus pandemic, but this increase has since been mitigated by central bank measures and funding costs are now back at very low levels.

In addition to the measures taken by central banks during periods of financial stress, banks and households can take preventive action in normal times. The choice of interest-rate fixation period by households for their mortgages and the choice of maturity by banks for their funding are decisive factors when it comes to the effect of temporary stress in the funding markets on total funding costs and ultimately on the mortgage rate for households. A longer maturity on banks' funding and longer interest-rate fixation periods for household mortgages could make mortgage rates less sensitive to financial market stress. This could benefit financial stability, which in turn creates the conditions for stable monetary policy transmission.

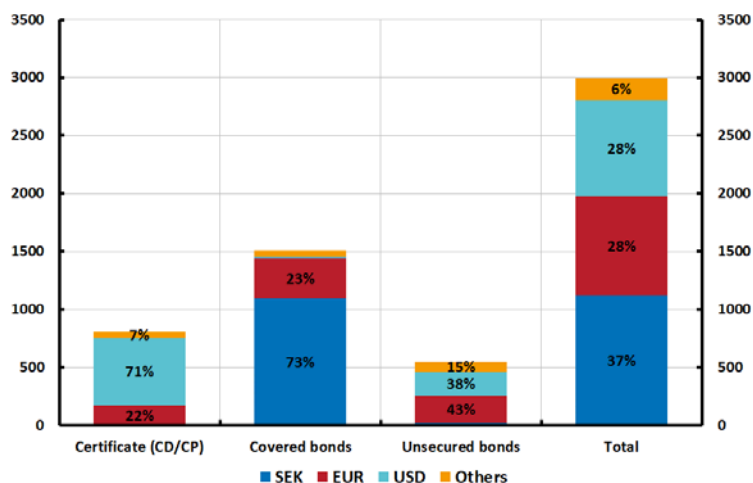
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Figures and tables

Diagram 8. The securities funding of the major Swedish banks

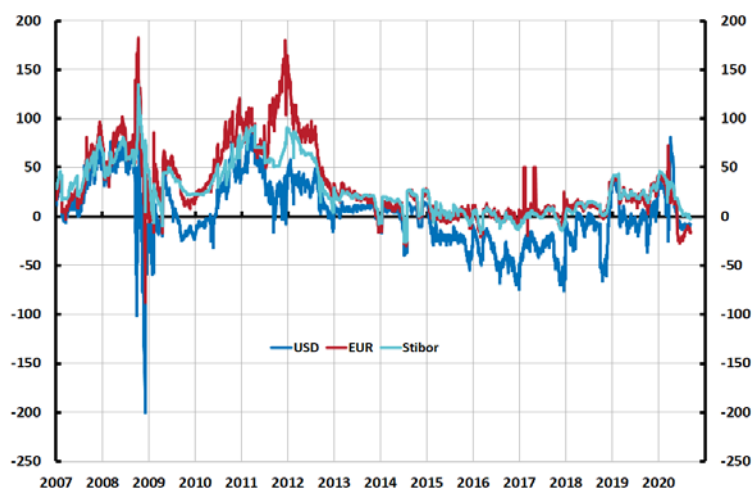
SEK billion, percentages show how large a share of the category the respective currency represents



Note. Represents outstanding values as of 30 July 2020. CD is the abbreviation for *Certificate of time deposits*, and CP stands for *Commercial Paper*. Both are short-term financing instruments. Short-term here refers to a maturity of less than one year.
Source: The Riksbank

Diagram 9. Spread between short-term funding costs in Swedish kronor and repo

Basis points



Note. The implicit SEK interest rates refer to the interest rates at which banks obtain funding by first borrowing in dollars or in euros and then converting this to Swedish kronor via foreign exchange swaps. They are calculated by using the covered interest rate parity ratio, based on spot and forward rates, as well as the domestic 3-months interest rates (EURIBOR and LIBOR).

Sources: Bloomberg and the Riksbank

Table 2. Average values of various rate differentials and their contribution to funding costs

Per cent

	Funding mix					Mortgage rate minus repo
	Stibor minus repo	Covered bonds (risk premium)	Unsecured bonds	Deposit rate minus Stibor		
2007	0,42	-0,14	0,13	-1,83		0,88
2008	0,62	0,17	0,98	-1,96		1,21
2009	0,26	0,59	1,66	-0,30		1,29
2010-2014	0,41	0,33	1,23	-0,48		1,85
2015-2019	0,08	0,23	0,65	0,43		1,96
2020	0,16	0,10	0,45	-0,04		1,60

	Funding mix					Total funding cost	Margin	Mortgage rate minus repo
	Stibor minus repo	Covered bonds (risk premium)	Unsecured bonds	Deposit rate minus Stibor				
2007	0,42	-0,11	0,01	-0,18		0,14	0,73	0,88
2008	0,62	0,13	0,12	-0,24		0,63	0,58	1,21
2009	0,26	0,44	0,21	-0,04		0,87	0,42	1,29
2010-2014	0,41	0,33	0,11	-0,03		0,81	1,04	1,85
2015-2019	0,08	0,16	0,08	0,06		0,38	1,58	1,96
2020	0,16	0,07	0,06	-0,01		0,28	1,32	1,60

Note. The calculation for the lower part of the table (B. Weighted contribution per item) is as follows:

Column 1: Difference between the average Stibor (3 month) and the repo rate is calculated for the respective period.

Column 2: The daily difference between covered bonds and swap rates with an equivalent maturity, from this spread an average is then calculated for the respective period. Then the average value for 2 and 5 year averages is taken. This cost is subsequently weighted using the ratio Outstanding mortgages/Outstanding amount of covered bonds. For the years 2010 and onwards, we then assume a duration of 3 years in the outstanding amount of bonds, meaning that each year is given 1/3 of the weight.

Column 3: Five-year CDS premium plus five-year cross-currency basis swap, both series on a daily basis, is calculated to then be recalculated as an annual average. This item is then weighted by (1-proportion of funding via covered bonds)/2, before then again being weighted again with the assumption that the stock has a duration of approximately 2 years.

Column 4: Monthly average Stibor (3month) is subtracted from Statistics Sweden's reporting of deposit rates offered by banks to households. This assumes that repricing impacts the entire stock immediately. This item is then weighted by (1-proportion of funding via covered bonds)/2.

Column 5: Sum of previous columns.

Column 6: Mortgage rate minus repo rate, minus Column 5.