



The major Swedish banks' structural liquidity risks

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Foreword

For some time, the Riksbank has pointed out that the major Swedish banks take significant structural liquidity risks. These risks are due in part to the mismatches between the maturities of the banks' assets and the maturities of their liabilities. The size and concentration of the Swedish banking system, together with the scope of these imbalances, indicate that the major banks' liquidity risks should be reduced to strengthen financial stability.

The Executive Board of the Riksbank has therefore tasked Kasper Roszbach, Head of the Financial Stability Department, with surveying the banks' structural liquidity risks and analysing how these risks could be reduced. A central part of this work has involved illustrating how a market for covered bonds with longer maturities could be allowed to emerge.

This publication consists of three separate articles and an introductory section where Kasper Roszbach provides an overall assessment, given the analyses made. One article is written by a former employee at the Financial Stability Department and two are written by external authors.

Marcus Pettersson, who previously worked as senior economist at the Financial Stability Department, surveys the major Swedish banks' structural liquidity risks from an international perspective. David Vander, the founder of Liquidatum, a data services and advisory company, illustrates how new regulation has affected liquidity risks in banks around the world and discusses how these risks can be further reduced. Pehr Wissén, PhD and Senior Adviser at the Swedish House of Finance at the Stockholm School of Economics, analyses the major Swedish banks' mortgage business and the available alternatives with regard to extending the maturity of the banks' covered bonds.

The Executive Board of the Riksbank

Summary and assessment of the major banks' structural liquidity risks and proposed measures

Kasper Roszbach

On behalf of the Executive Board of the Riksbank, the Financial Stability Department has surveyed the major Swedish banks' structural liquidity risks and analysed how they can be reduced. A central part of this work involves illustrating how a market for covered bonds¹ with longer maturities than those typical today can evolve.

The background to this project is that the Riksbank has for some time assessed that the major Swedish banks take substantial structural liquidity risks, which have been highlighted in the Financial Stability Report, for instance.² The average remaining maturity of Swedish covered bonds is only about three years, which is significantly shorter than the maturity of the mortgages they fund. Furthermore, only around 10 per cent of the major Swedish banks' outstanding issued securities have a maturity in excess of 5 years, which is low from a European perspective. The major Swedish banks' structural liquidity risks are also relatively large in relation to those of other European banks.

In the first article, Marcus Pettersson compares the major Swedish banks' structural liquidity risks with those of other European banks. The article also discusses where on the balance sheet the major Swedish banks' risks arise. In the second article, David Vander discusses what regulators around the world have done since the financial crisis to reduce liquidity risks in banks, and which alternatives are on offer if they wished to reduce these risks further. In the third article, Pehr Wissén analyses the major Swedish banks' mortgage operations and which alternatives could be pursued if one wishes to extend the maturities for the banks' covered bonds. Sofia Possne was the editor of the publication.

In this chapter an overall assessment is made based on these three articles and suggestions are given as to how the major Swedish banks' structural liquidity risks can be reduced. These suggestions include increasing the transparency of the banks' operations,

1 For a definition, see Sandström et al. (2013).

2 Sveriges Riksbank (2016).

BOX 1 – Structural liquidity risks

One means of categorising liquidity risk is to divide it up into short-term and long-term risk. Short-term liquidity risk is the risk that a bank has difficulty renewing its funding and thus would be unable to repay the liabilities that mature in the near term. Short-term liquidity risk can therefore be said to depend on how large a bank's liquid assets are in relation to the difference between the bank's expected cash outflow and cash inflow during a particular period of time.

Long-term liquidity risk is usually called structural liquidity risk. This refers instead to the maturity mismatch between assets and liabilities on the entire balance sheet – i.e. not just during the most immediate period. Even if a bank's short-term liquidity risk is small, the structural liquidity risk can be extensive. That is, the bank exposes itself to the risk of funding problems in the long run.

This study concerns structural liquidity risk.

tightening future regulatory frameworks, introducing further regulatory measures, introducing measures aimed at the banks' customers to get them to extend their interest-rate fixation periods and investigating whether the Swedish Covered Bonds Issuance act needs to be amended.

The most recent financial crisis underlines the need to manage liquidity risk

Banks play a central role in the economy as mediators of loans, payments and other financial services. For instance, banks receive deposits from the general public and then lend this money to other sections of the general public. In this way, savers have liquid forms of saving in that they can withdraw their money whenever they like, and borrowers are offered loans with long maturities, which increases their possibilities to invest in illiquid assets such as real estate. Banks also fund themselves by issuing securities. If an appropriate balance is maintained between the maturity of the funding and lending, banks can contribute to the economy through this liquidity and maturity transformation.

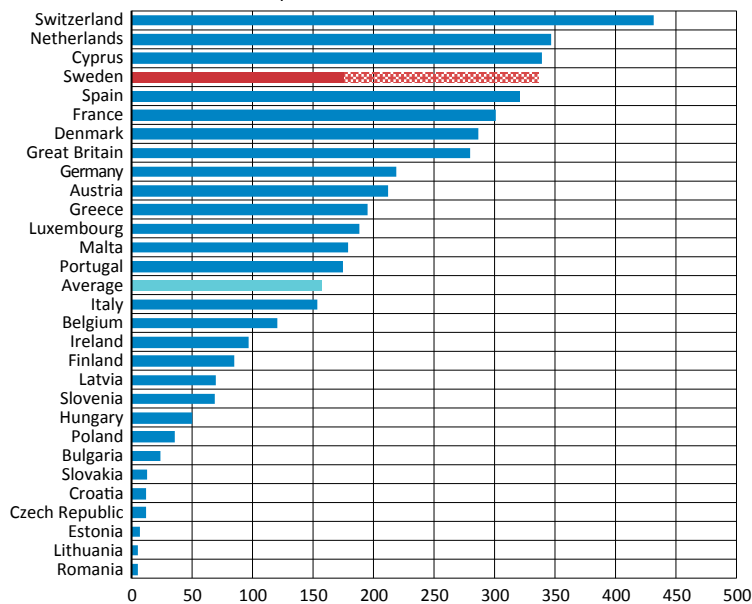
However, the financial crisis 2007-2009 showed that substantial maturity mismatches can entail liquidity risks that can threaten financial stability. When Lehman Brothers went bankrupt in autumn 2008, concern spread quickly throughout the world's financial markets. It became clear that banks around the world had taken on large liquidity risks. The great extent to which many banks – including Swedish ones – had relied on short-term funding in US dollars was particularly problematic. When the opportunities for refinancing such funding decreased, many banks suffered acute liquidity problems.

Consequently, many central banks and other authorities had to provide the banking system with liquidity in exchange for large volumes of illiquid assets to avoid a full-scale systemic crisis. During the financial crisis, the Riksbank lent more than SEK 450 billion to the banking system and the Swedish National Debt Office also guaranteed bank bonds for around SEK 350 billion to handle the liquidity problems in the Swedish banking sector. The consequence of this international financial crisis was that many countries experienced their largest economic slump since the 1930s.

The design of the Swedish banking system makes it particularly important to limit the banks' liquidity risks

At the end of 2015, the size of Sweden's banking sector amounted to 340 per cent of Sweden's gross domestic product (see Chart 1). Sweden thus has one of the largest banking sectors in the world, in relation to the size of the country's economy. This implies a risk that Swedish taxpayers may have to bear major costs if the country's banks suffer financial problems that require capital support from the state. Although the new EU Bank Recovery and Resolution Directive (BRRD) aims to minimise or limit the state's costs for handling a failing bank by allowing the bank's shareholders and creditors to cover losses and take responsibility for the bank's capitalisation, the regulations have not been fully tested in practice and have not yet been evaluated, either in Sweden or abroad.

Chart 1. The banks' assets in relation to GDP
December 2015, per cent



Note. Banking assets includes all of the assets of the national banking groups, that is both foreign and domestic assets. The banks' insurance operations are, however, excluded. The shadowed part of the red bar shows the four major banks' assets in foreign subsidiaries and branches abroad in relation to Sweden's GDP.

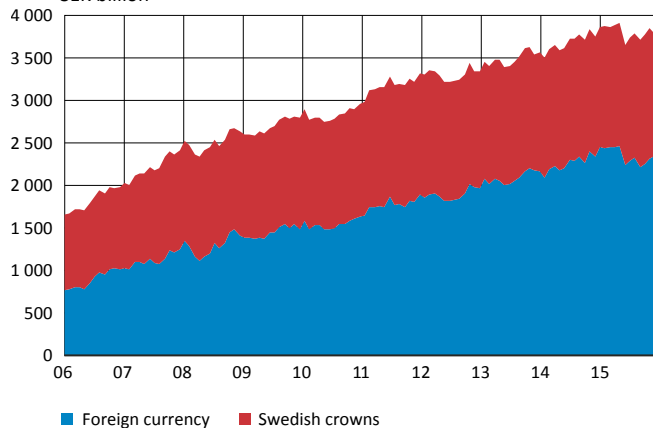
Sources: Eurostat, Swiss Bankers' Association, Swiss National Bank, Swiss Statistics, bank reports and the Riksbank

Moreover, the Swedish banking sector is very concentrated as the four major Swedish banks' assets comprise around 75 per cent of the entire banking sector's total assets. The major banks are also strongly interconnected, which is partly because they have substantial holdings of one another's securities. This cross-ownership amounted in December 2015 to roughly a quarter of the total equity of the major banks. The Swedish banks are an integral part of the payment system and closely interlinked with other participants in the Swedish financial system, due in part to Swedish insurance companies and mutual funds holding a large share of their covered bonds. They are thus particularly important to the Swedish economy, and financial problems in one bank would probably spread rapidly to other financial institutions and to the economy as a whole.

The Swedish banks use a large share of wholesale funding to finance their assets. This is partly because Swedish deposits are not sufficiently large to fund the banks' lending. Wholesale funding consists mostly of securities issued by the banks and bought by institutional investors. The liquidity risk in this part of the bank's operations arises through the maturity of the funding being shorter than the maturity of the lending. As mentioned above, some degree of maturity transformation is indeed a part of traditional banking operations, but the key question is when this transformation becomes too great.

Moreover, a large part of the major Swedish banks' liabilities are denominated in foreign currencies (see Chart 2). Historically, foreign investors have in many cases been quicker to withdraw their funding in times of unease than domestic investors. In other words, this funding has often proved to be less stable than funding in the domestic currency.

Chart 2. The major Swedish banks' wholesale funding via Swedish parent companies and subsidiaries
SEK billion



Note. Outstanding nominal amount.
Sources: Statistics Sweden and the Riksbank

Given this, it is important for the Swedish banks that investors retain their confidence in the banks' ability to repay their debt. The major Swedish banks currently have high risk-weighted capital ratios, their earnings are good and the loan losses are low. But this picture could quickly change. For instance, there are questions regarding how the banks' risk-based capital ratios from internal models are calculated.³ Moreover, the banks' equity in relation to the total assets has declined over time. The Riksbank has discussed this on several occasions.⁴ Given the high indebtedness among the banks' borrowers and the high housing prices in Sweden, the combination of good earnings and low loan losses could rapidly change if, for instance, housing prices were to fall substantially. If the banks were to begin reporting losses, or if their financial position were questioned for some other reason, it could be more difficult or more expensive to renew the funding.

One means of promoting a long-term, continuing confidence among investors is to ensure that the banks are sufficiently well-capitalised in relation to their risks. In addition, there is reason to create the conditions for the banks to issue bonds with longer maturities, which could reduce their liquidity risks.

Funding of Swedish mortgages has changed over time

The Swedish banking system has changed over time. It has consolidated and grown so that it now comprises operations in several countries and currencies. In addition, the banking system has become more dependent on wholesale funding, which to a great extent consists of foreign currency. Today, the major banks' lending in the form of mortgages is primarily through mortgage institutions that are part of the banking groups, with the exception of SEB, where the mortgage operations are included in the parent company. The funding of mortgages is mainly achieved through the institutions issuing covered bonds.

Between the 1950s and the middle of the 1980s, the Swedish financial system was governed by credit and currency regulations, which meant that banking operations in Sweden were organised in a different way than they are now. The currency regulations limited all funding in foreign currency and the credit regulations aimed to hold interest rates low and stable, and to steer the distribution of loans in the economy.⁵

³ See, for example, Basel Committee on Banking Supervision (2013).

⁴ See, for example, Sveriges Riksbank (2016).

⁵ See Sveriges Riksbank (2014).

During this period there was a relatively large number of commercial banks and mortgage institutions. As the law primarily permitted the commercial banks to fund their operations with short-term deposits and short-term bonds, they did not have the right to issue long-term mortgages at fixed interest rates.

Long-term mortgages were instead issued by special mortgage institutions. The largest issuers of loans with property as collateral were Sparbanksrörelsen and Stadshypoteks-föreningarna, which were both independent of the commercial banks.⁶

The mortgage institutions funded their operations by issuing mortgage bonds. These generally had a maturity of 30 years, but occasionally up to 40 years.⁷ This meant that the maturity of the bonds largely matched the maturity of the mortgages. Only a small proportion of the mortgage institutions' funding consisted of loans from other banks. To facilitate the funding of the mortgage institutions, in the mid-1980s the government, via the Riksbank, steered the demand for mortgage bonds via regulations for investors, among other things.⁸

During the 1970s the government took the initiative to gather the lending that came from the commercial banks' mortgage institutions into one large mortgage institution, Svensk Bostadsfinansiering AB, BOFAB. The government owned half of BOFABs and ten commercial banks owned the other half. The idea was to make mortgage lending more efficient by winding up the mortgage institutions of the various commercial banks and replacing these with BOFAB. In 1988, however, the operations of BOFAB were in turn wound up and the mortgages held by BOFAB were returned to the commercial banks' mortgage institutions.

During the 1980s most of the regulations that had governed the Swedish financial system were dismantled. The greatest change took place in 1985, when the credit regulations were abolished. One reason for the changes was that lending to companies and households had partly moved outside of the banking system, to what reminds of a shadow banking sector. The mortgage institutions' operations grew and were financed by issuing securities. Initially, the securities were issued in Swedish krona, but during the 1990s they also began funding themselves in foreign currencies.⁹ During the 1990s, the savings banks' mortgage institution (Spintab) became part of a large banking group when Sparbanken Sverige AB was formed. Sveriges stadshypotekskassa was reorganised and became Stadshypotek AB, which was then acquired by Handelsbanken at the end of the 1990s. This meant that the largest independent mortgage institutions became part of major banking groups. The link between the banks and the mortgage institutions was once again strengthened in 2007, when SEB incorporated mortgaging activities into the bank.

In the first decade of the 2000s, the banks and mortgage institutions continued to increase their funding through the securities market. This was primarily a consequence of it becoming easier to issue securities abroad and to borrow in foreign currency as the financial markets in different countries became more interlinked and easily accessible. Moreover, the Swedish banks began to issue covered bonds, which opened up greater possibilities to reach international investors.¹⁰

Chart 3 shows, somewhat simplified, how the maturities for mortgage bonds have changed over time for a typical Swedish mortgage institution. We can see in the chart that the average remaining maturity of the bonds issued has declined over time. Between the years 2011 and

6 With effect from 1942, the savings banks owned a commercial bank, Sparbankernas bank, which handled the individual savings banks' liquidity management. The building societies had a central body, Sveriges Konungarikets Stadshypotekskassa, that managed their funding via the bond market. This was capitalised by the government, representatives of which were also included on its board. Sparbanksrörelsen eventually began to conduct its own mortgage lending through a mortgage institution called Spintab, while the building societies began to issue mortgages through a mortgage institution called Stadshypotek.

7 However, the maturity for the mortgage bond was not regulated by law, see Sveriges Riksbank (2014).

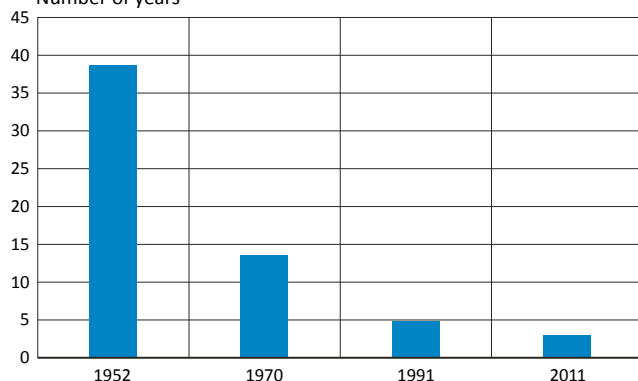
8 So-called liquidity ratios regulated, for example, how much the banks should invest in mortgage bonds and government bonds in relation to their deposits. The insurance companies were obliged to invest in mortgage bonds.

9 By 1989, most of the foreign exchange regulations had been abolished and the banks and mortgage institutions could borrow money by issuing bonds in foreign currency.

10 See Sveriges Riksbank (2014).

2016, the average remaining maturity for Swedish covered bonds has remained unchanged, at an average of 3 years.¹¹

Chart 3. Development in average remaining maturities for Swedish mortgage bonds
Number of years



Note. Remaining weighted maturity for outstanding mortgage bonds. For the years 1952, 1970 and 1991 statistics for Sveriges Konungarikets Stadshypotekskassa are used as a representative issuer of Swedish mortgage bonds. For the year 2011, statistics from the Association of Swedish Covered Bond issuers have been used and thereby cover all Swedish issuers of covered bonds. Sources: Swedish bonds book (Swedish Bankers' Association) from the years 1952, 1970 and 1991, the Association of Swedish Covered Bond Issuers and the Riksbank

Major mismatch between maturities on assets and liabilities

There is no individual measure that gives the complete picture of the liquidity and maturity transformation banks undertake. Instead, this has to be measured in several different ways (see Pettersson and Vander). But one way of estimating the size of the maturity mismatch is to compare the difference between the average maturity of a bank's assets and the average maturity of its liabilities. The greater this difference is, the larger the bank's maturity mismatch. It is because of this maturity mismatch that banks' structural liquidity risks arise.

Table 1 shows the average maturity for assets and liabilities for the four major Swedish banks and for an average of European banks. In the measure, the bank's assets are firstly divided up into different sub-items – for instance, loans to companies, loans to households and holdings of securities. An assessment of the length of the maturity is then made for each sub-item. That is, how long time it takes for the borrowers to repay their loans. One then does the same for the liabilities – they are first broken down into different parts, for instance, deposits from companies, deposits from households and issued securities. Then one makes an estimate for each sub-item of how long it takes before the bank is expected to repay the funds it has borrowed. A bank that has issued securities with long maturities will then, all else being equal, have a longer average maturity on its liabilities.

With the assumptions made in the example (see Pettersson for more information), the maturity of the assets is longer than the maturity of the liabilities for all banks. For each Swedish bank, the maturity mismatch measured in this way is moreover greater or at the same level as the average for the European peer group.

¹¹ Association of Swedish Covered Bond Issuers (2016).

Table 1. Maturity mismatch measured in years for the major Swedish banks and for European banks

	Assets	Liabilities	Maturity mismatch
Nordea	10.3	3.4	6.9
SEB	10.1	3.1	7.0
SHB	14.8	3.7	11.1
Swedbank	15.5	3.7	11.7
Average European banks	11.1	4.2	6.9

Note. Average maturity for assets, liabilities and the difference between them (maturity mismatch). December 2015.
Sources: Liquidatum and the Riksbank

The major Swedish banks are exposed to greater structural liquidity risk than many other European banks

To obtain a more complete picture of the banks' liquidity risks than that given in Table 1, one needs to measure risk in several different ways. All measures used by Pettersson show that the Swedish banks take greater structural liquidity risks than the average European comparison bank. This is due to the composition of their assets and liabilities. On the asset side, Swedish banks have a larger share of loans than many other European banks, which in many cases own a larger proportion of securities. Loans often have long maturities, which means that it takes a long time before the bank gets its money back. A large share of the Swedish banks' loans is moreover comprised of mortgages, which usually have a very long maturity.

On the liability side, the Swedish banks have a comparatively small share of deposits. Instead, they use wholesale funding to a large extent.¹² This entails risks for the banks, as earlier crises have shown that wholesale funding is often less stable than deposits from private individuals. Professional investors in bonds have namely proved to be less willing to continue lending money to banks in periods of stress than households who have deposits in banks, and who are to a large degree protected by a deposit guarantee. Wholesale funding can of course be regarded as a stable source of funding if the maturity is sufficiently long. However, Pettersson shows that the Swedish banks' securities funding is relatively short. For instance, they have a significantly smaller share of securities with a longer maturity than five years than many other European banks have.

All in all, this situation means that Swedish banks expose themselves and the economy to significant risks. The fact that the major Swedish banks' assets are also large in relation to the Swedish economy as well means that the consequences of potential liquidity problems could be serious.

Insufficient regulation so far

Following the most recent financial crisis, a number of international initiatives have been taken with regard to regulation. In addition to strengthening capital requirements, the Basel Committee has drawn up two quantitative minimum standards for liquidity. The first of these is the Liquidity Coverage Ratio (LCR), which aims to ensure that the banks have enough liquid assets to counteract liquidity stress in the short term. The second is the Net Stable Funding Ratio (NSFR), a measure placing a bank's stable funding in relation to its illiquid

¹² This can be largely explained by Swedish households having large savings in mutual funds instead of deposits directly with the banks. The funds in which households invest, in their turn choose to invest some of their capital in the banks' bonds. It is thus not necessarily an active choice when the banks to such a large extent finance themselves with wholesale funding, but rather an adaptation to the funding opportunities at their disposal (see Nilsson, Söderberg and Vredin (2014)). At the same time, the banks' deposit volumes should also depend on the interest rates they choose to offer their customers.

assets and which aims to increase the resilience of the banks over a longer period of time. In Sweden, Finansinspektionen (the Swedish Financial Supervisory Authority) introduced an LCR requirement in 2013. This requirement also contains separate prescriptions for certain currencies, namely the euro and the US dollar. According to the Basel Committee's timetable, the banks will have to meet a minimum NSFR level of 100 per cent from 2018. No formal requirement has been introduced yet, neither in Sweden nor abroad. Within the EU, the European Commission will present by 31 December 2016, if it so deems appropriate, a legislative proposal for the European Parliament and the Council regarding how to ensure that banks use stable sources of funding.

However, Vander argues that the Basel Committee's planned requirement regarding the banks' NSFR will not reduce the banks' liquidity risks to any great extent. This is because Vanders observes that international negotiations have watered down the requirement so much that a 100 per cent NSFR cannot be regarded as a credible minimum requirement to parry the banks' structural liquidity risks. Vander shows in his analysis that in a selection of 61 banks 54 per cent would have managed a level of 100 per cent in NSFR as early as 2007 (that is, with the balance sheet they had at that time), and 72 per cent would have had an NSFR of 95 per cent or more. The major liquidity problems that arose in 2007-2008 indicate that it is improbable that a 100 per cent NSFR will reduce the banks' liquidity risks as far as necessary.

In addition to up-coming regulation on structural liquidity risks not being sufficient, there are risks to the system that are not reflected in the measures for individual banks. When the individual banks assess their liquidity risks, the sum of their assessments is usually lower than the liquidity risk for the banking system as a whole. The individual bank normally only takes into account how long an asset is expected to remain on its own balance sheet. If one takes a mortgage as an example, it has a long contractual maturity but customers often change banks during the maturity of the loan. For an individual bank, it may therefore seem rational to estimate how long the customer is expected to be with the bank and then finance the asset on this basis. But seen from the perspective of the entire banking system, the asset has not disappeared because the borrower changes bank, it has merely moved to another bank. From a systemic perspective, the bank's assets thus have a longer maturity than the assets individually analysed by the respective bank.

Moreover, the banks buy one another's covered bonds. These purchases are normally funded short-term.¹³ In the case of such cross-ownership, no long-term funding has entered the banking system, despite the bank issuing a bond counting it as long-term funding. These systemic risks are a further reason for extending regulations so that liquidity risk can be limited.

Discussion of possible measures

Based on the survey presented in the three articles, we discuss below different ways of reducing the Swedish banks' structural liquidity risks.

Increase the transparency of the banks' operations

The Riksbank has long argued in favour of increasing transparency in the Swedish banks, primarily by recommending to the banks that they improve the information they publish on their liquidity risks. This would help investors to better understand the risks they take when investing in the banks' securities or shares. The benefits from increased transparency are also highlighted by Vander in his article.

¹³ Let us assume that Bank A offers a customer a mortgage, and that the bank finances this mortgage by issuing a covered bond with a maturity of five years. We then assume that the covered bond is purchased by Bank B, which in its turn finances this purchase by borrowing money at one week's maturity from Bank C. Viewed from the perspective of the banking sector as a whole, one can say that the mortgage has been funded with a one week maturity, despite Bank A considering that it has funded it over five years.

The major Swedish banks already report the LCR for all currencies together and separately in euros and US dollars. However, not all banks report their LCR in Swedish krona. It is important that all major banks increase transparency regarding their structural liquidity risks by also reporting their NSFR. This would increase insight into the banks' management of structural liquidity risks. If the major banks consider that other measures better illuminate the structural liquidity risks they are taking, the Riksbank urges them to report these measures together with the NSFR.¹⁴

Vander implies that investors would have better information if the banks were forced to report, in addition to the normal earnings reporting, earnings that are adjusted for the liquidity risk they take. In good times it can be profitable for banks to take substantial liquidity risks, as borrowing with short maturities is normally cheaper than borrowing with long maturities. Equity investors may therefore prefer banks that take large liquidity risks if they do not consider that liquidity risks can mean that the bank makes losses in bad times or may even fail. On the other hand, if the banks were forced to report earnings that have been adjusted for the liquidity risk they take, equity investors could make better-informed decisions. This would also give the banks greater incentives to reduce their liquidity risks.

There are several different ways of increasing transparency with regard to liquidity risks in the Swedish banks. That the banks report NSFR and provide increased transparency in line with Vander's proposal above are just two examples of how one can give investors better opportunities to compare the banks with one another and thereby exert influence on the banks to even out the differences in liquidity risks.

Tighten coming regulations

Although greater transparency could increase the incentives for the banks to reduce their liquidity risks, there is reason to take further measures. According to the Basel Committee's timetable, the banks will have to meet a minimum NSFR level of 100 per cent as of January 2018. The Riksbank has recommended the banks since 2011 that the banks should reduce their structural liquidity risks and attain the minimum level of 100 per cent in the NSFR.¹⁵ The Swedish banks have reduced their risks since the financial crisis and are in principle living up to the minimum level.

At the same time, Pettersson shows that Swedish banks still take considerable structural liquidity risks from a European perspective. This is due to the composition of the Swedish banks' assets and liabilities. On the assets side, the banks have a larger percentage of lending to households and companies than many of their European counterparts. On the liabilities side, the Swedish banks have a relatively small share of deposits and instead use to a large degree relatively short-term wholesale funding. Thus, they have a large proportion of funding with a maturity of just over one year. The NSFR measure treats all market funding with a remaining maturity of more than one year in the same way and as stable. This means that the structural liquidity risks are not fully captured in the measure.

Should a Swedish bank encounter liquidity problems, the Riksbank has an important role as "lender of last resort". This is due to the Riksbank's unique capacity to create, in principal, unlimited liquidity in Swedish krona, if considered motivated. In addition, the Riksbank can supply the financial system with foreign currency via its foreign currency reserve. Such lending gives rise to credit risk, however. Moreover, the Swedish banking sector is large in relation to the domestic economy. This means that the costs the Swedish state has to bear can be considerable if the banks suffer liquidity problems. This speaks for an even higher NSFR requirement for the Swedish banks than the one the Basel Committee proposes.

The regulation of structural liquidity risks could take into account system-specific properties and thus contain additional requirements for the NSFR. This could be managed

14 Sveriges Riksbank (2016).

15 Sveriges Riksbank (2016).

in the same way as the existing capital regulations and in the regulation of the short-term liquidity measure (LCR) where Swedish banks have requirements higher than the internationally-agreed minimum.¹⁶

Supplement coming regulations with requirements of further liquidity measures

Even if the requirement regarding the Swedish banks' NSFR is tightened, the banks can still have a large share of funding with a remaining maturity of just over one year. If the banks are exposed to stress over a longer period than one year and need to refinance large-scale bond redemptions it is therefore uncertain whether a tighter NSFR would suffice to ensure their liquidity in this situation.

During the most recent financial crisis the Riksbank's liquidity support were in force for more than two years. The ECB's purchases of banks' covered bonds began at roughly the same time and are still going on. It is therefore clear that a stressed period can last for longer than one year.

In the case of stress lasting longer than one year, problems may therefore arise if the banks fund themselves in a way that means they regularly have large redemptions of bonds after just over one year, even if their NSFR is over 100 per cent. Pettersson shows that the major Swedish banks can allow a large part of the funding to have a maturity relatively close to the one-year limit and nevertheless manage 100 per cent NSFR. Both Vander and Wissén observe that the current NSFR does not provide the banks with incentives to extend their funding to any great extent. The reason for this is that all market funding with a remaining maturity of more than one year is treated as entirely stable when calculating NSFR. This indicates that regulation may need to be introduced that complements NSFR.

Pettersson uses two measures similar to NSFR and shows that the major Swedish banks' structural liquidity risks are much larger than the corresponding risks in European banks, under the assumption that the banks' funding is calculated as entirely stable only when it has a maturity of more than five years.

Like the suggestions made by Vander and Wissén one could introduce a supplementary requirement similar to the NSFR but where longer maturities are required for funding to be classed as entirely stable. Both Vander and Wissén therefore propose new definitions of the NSFR, where liabilities are given successively higher weights the longer their maturities are. This would give the banks stronger incentive to extend their financing.

Another alternative would be to introduce a limit as to how large the mismatch can be between a bank's assets and liabilities within different maturity intervals. Vander shows that as the banks undertake a maturity transformation, they tend to have a larger volume of liabilities than assets in the maturity interval closest in time, while the opposite applies to the maturity interval further ahead. If one limits how large the difference can be within each interval, the maturity transformation would also be limited.

Regardless of which measure one chooses to work with, it needs to be standardised so that the same definitions apply to all of the banks. In this way, one attains a standard measure that can function as a starting point for how much maturity transformation the banks take or should take.

¹⁶ The Basel Accord places no requirements on the fulfilment of the LCR in individual currencies, but emphasises how important it is for a bank to have liquid assets that can cover outflows regardless of the currency these may be in. The Swedish regulations including specific requirements in dollars and euros are thus stricter than the internationally-agreed regulations. Additionally, the Swedish regulations are currently based on the LCR originally proposed by the Basel Committee in 2010, which is more conservative than the revised proposal from 2013. In addition, the LCR began to be applied from 1 October 2015 at EU level. The requirement is raised successively and should be fully implemented at 100 per cent with effect from 1 January 2018. Swedish banks are thus subject to parallel requirements. As for capital requirement, the four major banks each have a systemic risk buffer add-on of five per cent.

The external evaluation of the Swedish financial system recently carried out by the IMF also highlights the need to continue reducing the banks' liquidity risks. For instance, the IMF recommends that Finansinspektionen should also start to monitor the banks' liquidity coverage ratio (LCR) in dollars and in euros three months ahead in addition to the current 30-day LCR.

Increased transparency and measures that complement the planned NSFR would give the banks incentive to lengthen the maturity for their funding and thus reduce the structural liquidity risks.

Introduce measures aimed at the banks' customers – households' interest-rate fixation periods and links to maturities for the banks' funding

The imbalance between a bank's assets and liabilities could also be limited by introducing measures aimed at the banks' customers.

The current design of mortgage contracts in Sweden means that Swedish households to a large extent choose short interest-rate fixation periods for their mortgages. A customer with a long interest-rate fixation period will probably stay with their bank for longer than a customer with a short interest-rate fixation period, as there may be costs entailed in redeeming a mortgage before the interest-rate fixation period has expired (interest compensation). The fact that the Swedish banks' customers demand loans with short interest-rate fixation periods, and thus can easily change bank, is one reason why the banks also choose short-term funding (typically through issuing covered bonds at around four to five years). According to Wissén, this means that the banks do not have incentives to extend their funding to any great extent. If households had longer interest-rate fixation periods on their mortgage loans, they could be expected to stay longer in the bank and thus give the bank greater incentive to fund itself at longer maturities. Moreover, longer interest-rate fixation periods would reduce households' sensitivity to changes in short-term interest rates.

Finally, Wissén concludes in his article that if households are to have an incentive to borrow at long interest-rate fixation periods, the high cost of redeeming loans in advance is a problem that needs resolving.

Introduce requirement for direct limit for maturity mismatches in the Covered Bonds Act¹⁷

A fundamental principle for covered bonds is that they should be able to continue to operate as intended, even if the issuer (the bank) were to fail. If an issuer fails, the assets in the so-called cover pool¹⁸ and the covered bonds should as a rule be kept together and separated from the issuer's other assets and liabilities and the bond holders have the right to be paid according to the terms of the contract.

However, as mortgages in the cover pool (the assets) often have longer maturities than the covered bonds (the liabilities), a liquidity shortage may arise if the issuer fails. This liquidity shortage arises because the bonds mature before the mortgages are repaid. To be able to pay the nominal amount when the bond normally matures, the official receiver needs to sell mortgages from the cover pool or in some other way acquire new liquidity. Maturity mismatches that occur in the near term can be more difficult for an official receiver to manage than those occurring further ahead and which hence can be planned for. The liquidity risks thus become smaller the longer the maturity on the covered bonds. This also applies when the bank's day-to-day operations are functioning normally, as long maturities reduce the risk of the bank suffering financial problems.

The Covered Bonds (Issuance) Act contains requirements regarding matching of currency, interest rate and interest-rate fixation period between assets and liabilities. However, there

¹⁷ See Covered Bonds (Issuance) Act (2003:1223).

¹⁸ Covered bonds have a preferential claim on a special cover pool. The cover pool for Swedish covered bonds consists mainly of loans issued with property as collateral.

is no explicit requirement for matching maturities of assets and liabilities.¹⁹ There may thus be a need to investigate whether the Covered Bonds (Issuance) Act should contain a clearer requirement for limiting maturity mismatch risks. This could be a means of establishing a market for bonds with longer maturities and in this way increasing the degree of insurance in the banking system.

Further work towards implementing the proposals

As this introduction makes clear, this publication does not provide the answer to all questions concerning structural liquidity risks or the solutions to limit them. The investigation has, however, deepened our understanding of these risks. For example, we can observe that developments are moving towards the banks funding themselves at shorter maturities in bonds.

In this study we point to the need to increase the transparency of the banks' operations, to tighten future regulatory frameworks, to introduce further regulatory measures, to introduce measures aimed at the banks' customers to get them to extend their interest-rate fixation periods and to investigate whether the Swedish Covered Bonds Issuance act needs to be amended.

For Sweden, it is important in the near term to do further work based on, amongst others, these proposals towards establishing a market with longer maturities for covered bonds and thereby reduce liquidity risks in the Swedish banks, so that the stability of the Swedish financial market can be strengthened.

Kasper Roszbach

Head of the Financial Stability Department

¹⁹ The existing legislation contains only a risk management provision regarding liquidity matching that states that the issuing institution shall ensure that the payment flows regarding the assets in the cover pool, derivative agreements and covered bonds are such that the institution on each occasion can meet its payment obligations towards holders of covered bonds and counterparties in derivative agreements.

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The major Swedish banks' structural liquidity risks in an international perspective

Marcus Pettersson

Summary

In this article, we study the liquidity risks of the major Swedish banks. The study consists of a comparison of the liquidity risks in the major Swedish banks with a selection of other European banks. We also analyse which parts of the Swedish banks' balance sheets that give rise to the majority of their liquidity risks.

Using a number of different measures, we show that the Swedish banks take larger structural liquidity risks than their European counterparts. This is due to them having a greater proportion of illiquid assets and a smaller proportion of stable funding. On the asset side, the major Swedish banks have a high proportion of loans. Furthermore, these loans consist to a larger extent of mortgages that are often particularly illiquid as they have very long maturities. To finance their assets, the Swedish banks use wholesale funding to a large extent instead of deposits from private individuals. Historically, wholesale funding has been shown to be a less stable form of funding than deposits and therefore contributes to the liquidity risks.

1 What are structural liquidity risks?

A central component of a bank's operations is borrowing money, often at short maturities, and then lending it at longer maturities. This is known maturity transformation. Maturity transformation has some positive socio economic aspects as it gives savers liquid forms of saving – e.g. deposits that can be withdrawn at their request – while borrowers are offered loans with long maturities, making it easier for them to plan their economy.

However, maturity transformation also means that the bank is exposed to a liquidity risk. This risk arises because the bank's funding is due for payment before it gets back the money it has lent. The bank must therefore renew the funding several times during the bank loan's maturity period. Should the bank's ability to repay be brought into question by investors on any of these occasions, however, it is not certain that it will be possible to renew the funding. As a result, the bank risks becoming illiquid.

Liquidity risks can be divided into short-term and structural liquidity risks.¹ A short-term liquidity risk is the risk that a bank would be unable to repay liabilities that mature in the near term. Short-term liquidity risks can therefore be said to depend on how large the bank's liquid assets are in relation to the difference between expected out- and inflows from liabilities and assets during this time period. According to the current regulatory framework Liquidity Coverage Ratio (LCR), the most immediate time period is defined as the next 30 days.²

Structural liquidity risks refer instead to the maturity mismatch between assets and liabilities on the entire balance sheet – i.e. not just during the most immediate period. Even if a bank's short-term liquidity risks were small, it is also important to limit the structural liquidity risks. This is because funding problems may very well continue for a much longer period than, for example, the 30 days referred to in the LCR.

1 BCBS (2010).

2 BCBS (2013).

2 Structural liquidity risks need to be analysed using many different measures

In the simplest example, a bank's liquidity risk arises as a result of the bank borrowing money at a short maturity and then lending it at a longer maturity. This maturity transformation means that the bank needs to renew its funding several times before it gets back the money it has lent. Since it is not certain that this is always possible, the bank is exposed to a refinancing risk, and hence a liquidity risk. In this simple example, the size of the liquidity risk depends on how large the maturity transformation – that is the mismatch in maturities – is and how likely it is that the bank will be able to renew its funding when it is due for payment.

In reality, banks also have some funding that does not have a specified maturity period and that is instead to be paid back to the funder when he or she so wishes, for example a large proportion of deposits from private individuals and companies. In addition, some of the bank's assets can be sold to other market actors so that the bank can get back its money before the asset is due. For example, certain securities owned by the bank can have a long maturity period but still be liquid as they can often be sold quickly to other market actors. All in all, therefore, a bank's liquidity risks are not only due to the difference in maturity between its liabilities and assets. Instead, we tend to talk in terms of how *stable* a bank's funding is and how *illiquid* its assets are.

Stable funding here refers to funding with a long maturity. Securities issued by the bank are the most important example of this. Furthermore, it refers to funding that does not have a specified maturity but will probably remain for a longer period of time with the bank. Deposits from private individuals and small- and medium-sized enterprises (SMEs) tend to be regarded as a stable source of funding, while deposits from larger companies are normally considered to be slightly less stable.³

Illiquid assets refer to assets that have a long maturity and are not considered disposable when the bank needs money. The greater a bank's illiquid assets are in relation to its stable funding, the greater are its structural liquidity risks.

As it is impossible to determine with any certainty how stable a bank's funding is and how illiquid a bank's assets will be in the future, we have to make certain assumptions. But as it is not certain that these assumptions are correct, we should measure the bank's liquidity risks in several different ways. The Basel Committee has developed two measures – the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR). In addition, rating companies and other analysts use a number of other measures to assess banks' liquidity risks. In this article, we use a selection of measures that, taken together, we believe capture a bank's structural liquidity risks well.

Seven different measures are used in the analysis of banks' structural liquidity risks

To obtain a comprehensive picture of the banks' structural liquidity risks, we use seven measures in this article that all take a different approach to the bank's balance sheet and make different assumptions (see Table 1). All the measures have their pros and cons. Put together, however, they are considered to provide a good estimate of the banks' structural liquidity risks. The selected measures are described in more detail below.

Structural maturity mismatch is a measure that can be used to illustrate the maturity transformation made by banks. In the measure, the bank's assets are firstly divided into different sub-items – e.g. loans to companies, loans to households and holdings of securities.

³ In practice, the stability of deposits from different counterparties varies more than that. For example, it is reasonable to assume that a company with a strong relationship to a particular bank – either for business reasons or as a result of its ownership structure – may be more willing to keep its money in the bank than a company that has only a weak connection to the bank.

An assessment is then made for each sub-item of the length of the maturity. In other words, how long will it take for the borrowers to repay their loans. The same is then done for the bank's liabilities – they are first broken down into different sub-items, such as deposits from companies, deposits from households and issued securities, and then an estimate is made for each sub-item of how long it will take before the bank is expected to repay the funds it has borrowed. In this way, the difference between the average maturity for the bank's assets and the average maturity for its liabilities can be calculated. In the example given, this is expressed in years. The greater this difference is, the larger the bank's maturity transformation. Put another way, the bank needs to renew its liabilities several times during the time it owns its assets.

In this article we use average maturities for assets and liabilities for the four major Swedish banks and for an European reference group. In a simplified calculation, loans are assumed to have a maturity of 5 years apart from mortgages, which are assumed to have a maturity of 30 years. Deposits from households and smaller companies are assumed to have a maturity of 7.5 years and other deposits a maturity of 1 year. Other liabilities are assumed to have a maturity in line with their contractual maturity. Holdings of securities are excluded since they are assumed to be liquid.

Deposit-to-loan ratio (D/L) puts a bank's deposits from private individuals and non-financial corporations in relation to the bank's loans. A bank that has a 100 per cent D/L funds all its loans with deposits. A loan is seen as an illiquid asset as it normally has a long maturity period, which means that it takes a long time before the bank recuperates the money. In addition, a loan is difficult for the bank to sell on before the maturity period has expired – in contrast to certain types of securities. Loans are measured in relation to deposits from the general public as deposits have historically always been a stable source of funding. This is due to depositors being less inclined to withdraw their funding in periods of stress than financiers who lend to banks via securities or interbank loans (wholesale funding⁴).⁵ The fact that all deposits from the general public are used could be brought into question as deposits from certain large companies can be considered to be relatively unstable. Therefore, the measure is also tested using deposits from private individuals and SMEs only. Even though the measure is simple in its design and only takes some of the bank's balance sheet into consideration, it has been shown in previous crises to be good at predicting which banks might run into liquidity problems.⁶

According to the *core funding ratio*, a bank's deposits from the general public and wholesale funding with a remaining maturity of over one year, are assumed to be stable funding. The sum of these is set in relation to the bank's loans to the general public regardless of maturity and interbank loans with remaining maturity periods of over one year. As a high core funding ratio means that the bank has a large amount of stable funding in relation to its loans, it therefore indicates small structural liquidity risks. The measure complements the D/L as it also takes into account that wholesale funding should be seen as stable given it has a sufficiently long maturity. It can obviously be discussed how long the maturities for wholesale funding should be in order to be considered stable and how long they should be for interbank loans in order to be considered illiquid. In this measure, a one-year limit is used, similar to the NSFR and the Riksbank's structural liquidity risk measure.

Net stable funding ratio (NSFR) is the Basel Committee's measure of structural liquidity risks.⁷ The measure is more comprehensive than the deposit-to-loan ratio and the core funding ratio insofar as it takes into account the bank's entire liabilities and assets and off-balance-sheet exposures, such as granted credit facilities. Furthermore, the measure is

4 Wholesale funding and market funding refers to the bank's issued securities and interbank deposits.

5 Note that this refers to short-term wholesale funding. If the wholesale funding has a long maturity, it may well be more stable.

6 IMF (2013). Lallour and Mio (2016) also shows that a similar measure DtA (Deposits to Assets) had a good capacity to predict which banks had problems during the most recent crisis.

7 See BCBS (2014).

weighted, which means that the bank's liabilities and assets receive different weights from 0 to 100 per cent depending on how stable or illiquid they are considered to be. The measure uses a one-year limit, which means that funding that is assumed to still be on the bank's balance sheet in one year is seen as completely stable and is therefore given a 100-percent weight. Correspondingly, the majority of the assets that are neither going to mature nor are assumed to be disposable within one year are given a 100-percent weight.⁸ Furthermore, a six-month limit has been included to make the measure slightly less binary. Some funding and some assets with a maturity of between six months and a year are therefore weighted at 50 per cent.

Just as in the core funding ratio, the NSFR is calculated by dividing the bank's stable funding by its illiquid assets. A bank that has 100 per cent in the measure therefore has as much stable funding as it has illiquid assets, and a higher NSFR indicates lower liquidity risks.⁹

The Riksbank's structural liquidity risk measure resembles the NSFR insofar as it measures the relationship between stable funding and illiquid assets, and gives different weights to different liabilities and assets depending on how stable or illiquid they are considered to be. The weights used are, however, slightly more conservative than those used in the NSFR, which means that the average bank generally obtains a lower score in the Riksbank's measure than in the NSFR. In contrast to the NSFR, there is no six-month limit either, only a one-year limit. Wholesale funding and interbank loans with a longer maturity than one year are weighted as 100 per cent, just as in the NSFR.¹⁰

The one-year limit used in the NSFR and the Riksbank's measure is more or less arbitrary. A stressed period may very well continue for less than or more than one year. To see how the banks' results would have changed if other limits had been chosen, we therefore perform a further two tests in which we modify the Riksbank's measure slightly. In the first, the limit is set at five years instead of one. This means that market funding with a longer maturity than five years is seen as completely stable while market funding with shorter maturities are seen as completely unstable.¹¹ In the second test, we introduce three different limits: three months, one year and five years and give different weights to these various maturity intervals: 0 per cent for market funding within the maturity interval zero-three months, 25 per cent for the maturity interval three-twelve months, 50 per cent for the interval one-five years and 100 per cent if more than five years.¹² The reason we have chosen these particular intervals is because they are intervals that are publicly available for all the banks in the peer group.

8 Some assets, such as mortgages with maturities of more than one year have a 65-percent weighting provided they fulfil certain criteria. They must not be pledged and they need to have low credit risk.

9 For more information about the NSFR, see BCBS (2014).

10 For more information on the Riksbank's liquidity measures, see Sveriges Riksbank (2010).

11 Market funding includes issued debt and interbank borrowing. In addition, interbank lending is included.

12 The reason this is only done for the Riksbank's structural liquidity measure is because detailed NSFR data are not publicly available.

Table 1. List of the liquidity risk measures used in the article

Measure	Definition
Structural maturity mismatch	Difference between the average maturity of assets and liabilities
Deposit-to-loan ratio (D/L)	$\frac{\text{Deposits}}{\text{Loans}}$
Core funding ratio	$\frac{\text{Deposits} + \text{market funding} > 1 \text{ year}}{\text{Loans} + \text{interbank loans} > 1 \text{ year}}$
Net Stable Funding Ratio (NSFR)	$\frac{\text{Stable funding}}{\text{Illiquid assets}}$ <p>Stable funding and illiquid assets are calculated by weighting liabilities and assets according to how stable or illiquid they are considered to be. For example market funding with a longer maturity than 1 year are given a 100 percent weight and market funding with a maturity of between 6 months and 1 year are given a 50 percent weight.</p>
The Riksbank's structural liquidity measure (one-year limit)	$\frac{\text{Stable funding}}{\text{Illiquid assets}}$ <p>Like in the NSFR, stable funding and illiquid assets are calculated by weighting liabilities and assets according to how stable or illiquid they are considered to be. The weights are slightly different to those in the NSFR. For example, market funding with a longer maturity than 1 year is given a 100 percent weight while market funding with a maturity of less than 1 year is given a 0 percent weight.</p>
The Riksbank's structural liquidity measure (five-year limit)	$\frac{\text{Stable funding}}{\text{Illiquid assets}}$ <p>This measure is designed in the same way as the Riksbank's measure with a one-year limit, apart from the fact that only market funding with maturities over 5 years is given a 100 percent weight.</p>
The Riksbank's structural liquidity measure (maturity buckets)	$\frac{\text{Stable funding}}{\text{Illiquid assets}}$ <p>This measure is designed in the same way as the Riksbank's measure with a one-year limit, apart from the fact that market funding with maturities are given the following weights: 0-3 months – 0 per cent, 3-12 months – 25 per cent, 1-5 years –50 per cent and over 5 years – 100 per cent.</p>

Note. Deposits and loans are referred to the general public.

3 The major Swedish banks are exposed to larger structural liquidity risk than the European counterparts

In this section, we present the results of our comparison between the major Swedish banks and the European counterparts (the peer group¹³) and discuss why the Swedish banks' scores differ from those of other banks.

Structural maturity mismatch – larger in Swedish banks than in European counterparts

Table 2 shows that assets on average have longer maturities than liabilities in all banks. For all the Swedish banks, this difference, or maturity mismatch measured in this way, is greater

13 The peer group consists of 23 or 24 banks respectively. The banks included have been chosen to represent a large geographical area in Europe while they are also of a roughly comparable size and have similar business models to the major Swedish banks. When referencing to European banks' average, the Swedish major banks are included in the estimations.

or equal to the average for the European peer group. On average, the maturity mismatch is 6.9 years for the European banks while it is between 6.9 and 11.7 for the Swedish banks.

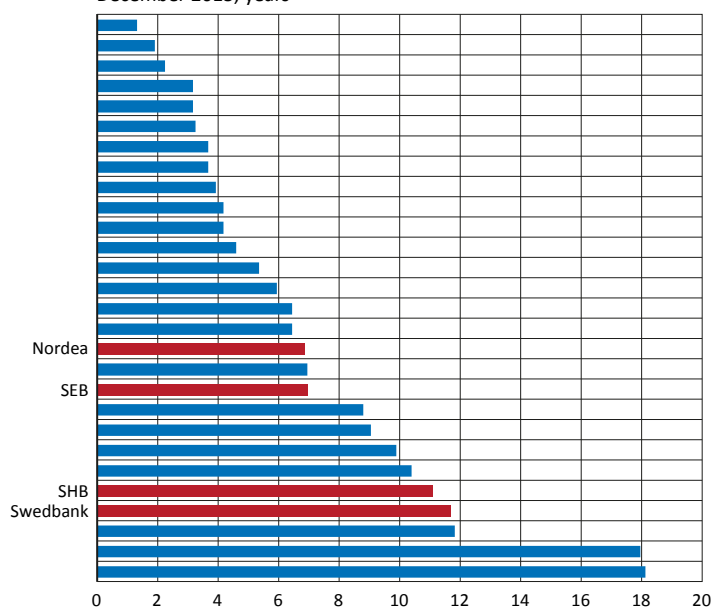
Table 2. Maturity mismatch measured in years for the major Swedish banks and for European banks

	Assets	Liabilities	Maturity mismatch
Nordea	10.3	3.4	6.9
SEB	10.1	3.1	7.0
SHB	14.8	3.7	11.1
Swedbank	15.5	3.7	11.7
Average European banks	11.1	4.2	6.9

Note. Average maturity for assets, liabilities and the difference between them (maturity mismatch), December 2015.
Sources: Liquidatum and the Riksbank

The Swedish banks are among the banks with the largest maturity mismatch (see Chart 1).

Chart 1. Maturity mismatch, measured as the difference between the average maturity for assets and liabilities
December 2015, years



Sources: Liquidatum and the Riksbank

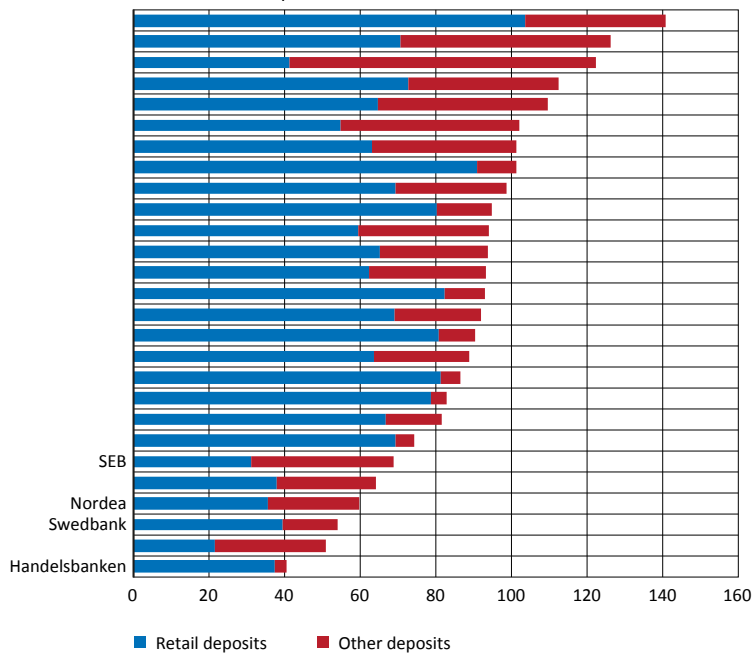
Deposit-to-loan ratio – small share of deposits in relation to total funding

The Swedish banks' deposit-to-loan ratios are low. They are between 41 and 69 per cent, which can be compared to the European average of 89 per cent (see Chart 2). This means, therefore, that the Swedish banks use a significantly larger share of wholesale funding to finance their loans than many of the other banks in the group.¹⁴

¹⁴ The result is roughly the same even if we only look at deposits from private individuals and SMEs.

Chart 2. Deposit-to-loan ratio

December 2015, per cent



Note. The measure puts the bank's deposits from the general public, divided into deposits from retail and other deposits, in relation to the bank's loans to the general public.

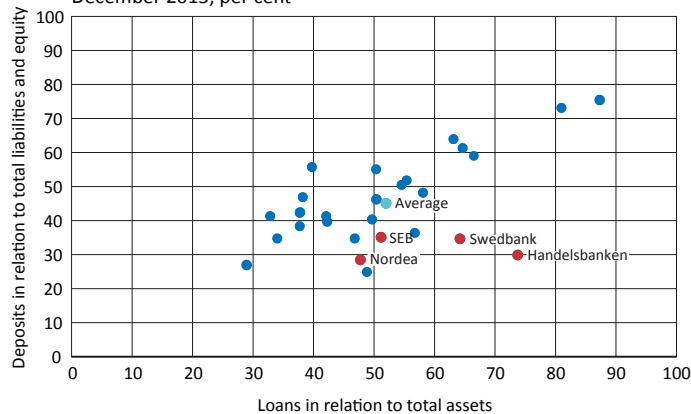
Sources: Liquidatum and the Riksbank

In Chart 3, every bank's deposit-to-loan score is divided into two parts: loans in relation to total assets and deposits in relation to total liabilities and equity. This makes it clear whether a bank has a low score because it relies on wholesale funding instead of deposits or whether it mainly depends on a larger proportion of the bank's assets consisting of loans. The higher up the chart a bank is, the more deposits it has in relation to its total funding and the further it is to the right, the greater the share of these assets consists of loans. All in all, this means that the closer to the right-hand corner a bank is, the lower its deposit-to-loan ratio.

As is clear from the chart, the Swedish banks' low deposit-to-loan ratios mainly depend on the fact that they have little deposits in relation to their total funding.¹⁵ But also that a few of them have a large share of lending in relation to total assets.

¹⁵ The fact that the Swedish banks have little deposits is partly due a large number of private individuals in Sweden saving in mutual funds – mostly through the collective pension savings scheme – instead of as deposits at the banks. These funds, in turn, invest some of their capital in bank bonds, which are made up of wholesale funding (see Nilsson, Söderberg and Vredin (2014)).

Chart 3. Decomposition of the banks' deposit-to-loan ratio
December 2015, per cent



Note. The closer to the lower right-hand corner a bank is, the lower its deposit-to-loan ratio. The turquoise dot shows the unweighted average value for all the banks in the comparison.

Sources: Liquidatum and the Riksbank

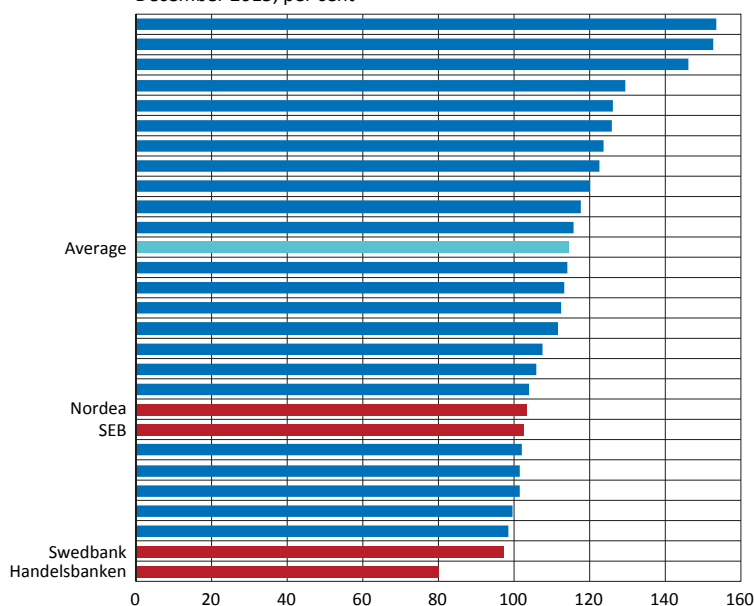
Core funding ratio – larger share of illiquid assets than European banks

As mentioned above, the deposit-to-loan ratio ignores the fact that wholesale funding should also be considered as stable if its maturity is sufficiently long. The core funding ratio, however, does take this into consideration. In the core funding ratio, securities funding and interbank borrowing is considered stable if the remaining maturity is longer than one year. From the assets side, all loans to the general public are included as are interbank loans with a remaining maturity of over one year.

As can be seen in Chart 4, the Swedish banks' score between 80 and 103 per cent. This can be compared to 114 per cent, which is the average for all the banks included in the group. As a low score suggests large liquidity risks, this measure also indicates that the Swedish banks take greater liquidity risks than many of the other European banks.

Chart 4. Core funding ratio

December 2015, per cent



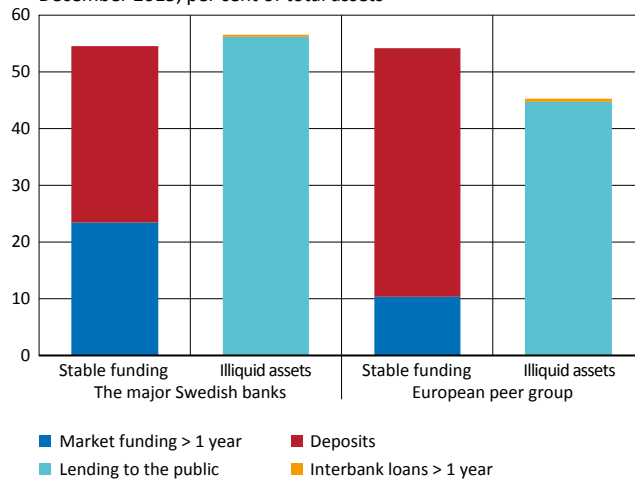
Note. The measure shows the sum of a bank's deposits and wholesale funding with a maturity of over 1 year in relation to the bank's loans to the general public and interbank loans with a remaining maturity of more than 1 year. A low score indicates large structural liquidity risks. The turquoise column shows the unweighted average value for all banks in the comparison.

Sources: Liquidatum and the Riksbank

In Chart 5, we break down the banks' core funding ratio to examine why the Swedish banks have a lower score than many of the European counterparts. As described earlier, a bank's core funding ratio depends on what the sum of its wholesale funding with a maturity of over one year and deposits is in relation to the sum of its loans to the general public and interbank loans with a maturity of more than one year. In the left-hand columns (funding), we have divided the three components included in the numerator by the size of the banks' balance sheets. In the right-hand columns (assets), we have done the same for the two components included in the denominator. The height of the columns therefore indicates what percentage of the bank's liabilities side and asset side respectively is considered to be stable or illiquid in the core funding ratio. In Chart 5, we see, for example, that 55 per cent of the Swedish banks' liabilities are considered to be stable and 56 per cent of the assets to be illiquid. The higher the left-hand column is in relation to the right-hand one, the higher the bank's core funding ratio.

As is evident from the chart, the Swedish banks' low scores are largely due to them having a greater share of illiquid assets than the European banks (56 per cent compared with 45 per cent). This is partly in line with the analysis from the deposit-to-loan ratio scores, but there it also emerged that the Swedish banks' low scores were largely due to their liabilities side being made up of a small proportion of deposits (see Chart 3). The difference between the scores is mainly due to the fact that the core funding ratio considers wholesale funding with a maturity of more than one year as a stable source of funding.

Chart 5. Decomposition of the core funding ratio
December 2015, per cent of total assets



Note. The stable funding columns show what percentage of the banks' liabilities are considered to be stable according to the core funding ratio, and which sources of funding constitute stable funding. The illiquid assets columns show how large share of the assets that is illiquid. For example, 55 per cent of the Swedish banks' liabilities are considered to be stable funding. 24 percentage points come from market funding and 31 percentage points from deposits. Sources: Liquidatum and the Riksbank

Net stable funding ratio – lower NSFR than in European banks

Both the deposit-to-loan ratio and the core funding ratio indicate therefore that the Swedish banks are exposed to greater structural liquidity risks than many of the other banks in the comparison. Both measures are, however, relatively simple and incomplete insofar as they do not take the entire balance sheet into consideration. In addition, they are completely unweighted. This means, for example, that deposits from large companies are considered to be as stable as deposits from private individuals. But there is reason to assume that large companies in many cases will be more inclined to move their deposits from a bank that runs into financial problems to another since large companies often use several banks.¹⁶ In the NSFR, different liabilities and assets are therefore given different weights based on how stable or illiquid they are considered to be. Just as in the core funding ratio, the bank's stable funding is put in relation to its illiquid assets. A higher score therefore indicates lower structural liquidity risks. The Basel Committee has adopted a global minimum requirement for this measure of 100 per cent.

The major Swedish banks have lower NSFRs than many European banks. The average for the major Swedish banks as of December 2015 was 101 per cent, which can be compared to 107 per cent for EU banks (see Chart 6)¹⁷.

The fact that the Swedish banks' NSFRs basically amount to the minimum requirement of 100 per cent, as adopted by the Basel Committee, should not be interpreted as their structural liquidity risks being adequately limited. As is clear from Vander (2016), there is a great deal to suggest that the NSFR, in its current design, is too watered-down for 100 per cent to work as a credible international minimum level for structural liquidity risks.¹⁸

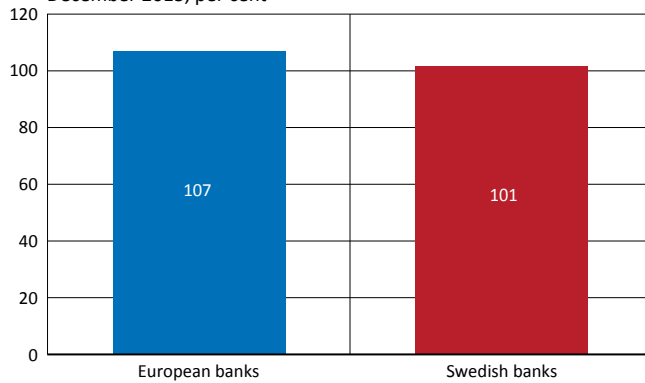
¹⁶ For this reason, deposits from companies are considered to be less stable funding in the Basel Committee measures, the LCR and NSFR (see BCBS (2013) and BCBS (2014)).

¹⁷ 189 European banks that are included in the EBA (2016).

¹⁸ See Vander in this publication.

Chart 6. Net stable funding ratio (NSFR)

December 2015, per cent



Note. The measure shows the ratio between a bank's stable funding and its illiquid assets. A low score indicates large structural liquidity risks.

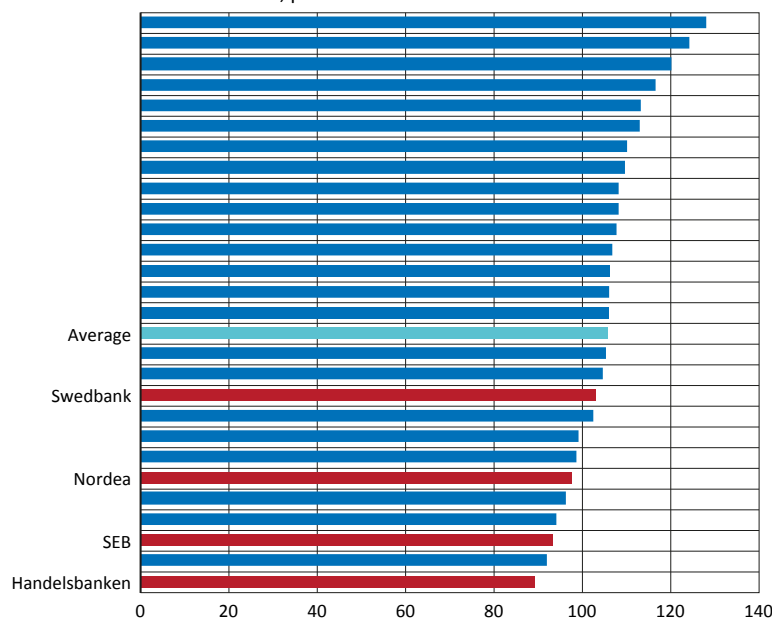
Sources: EBA and the Riksbank

The Riksbank's structural liquidity measure – shows the same results as the NSFR

The Riksbank's structural liquidity measure also shows that the major Swedish banks' liquidity risks are large (see Chart 7). As mentioned earlier, the measure is similar to the NSFR in that it weights liabilities and assets based on how stable or illiquid they are considered to be. The weights are slightly more conservative than in the NSFR, which means that the average bank obtains a slightly lower score. Just as in the NSFR, the size of the bank's stable funding is put in relation to its illiquid assets. The higher a bank's score, the lower the bank's liquidity risks are according to this measure. The Swedish banks' scores range from 89 to 103. The average score for all the banks in the survey is 106 per cent.

Chart 7. The Riksbank's structural liquidity measure

December 2015, per cent



Note. The measure shows the ratio between a bank's stable funding and its illiquid assets. A low score indicates large structural liquidity risks. The turquoise column shows the unweighted average value for all banks in the comparison.

Sources: Liquidatum and the Riksbank

To examine the reason why the major Swedish banks obtain low scores in the Riksbank's measure, we have decomposed their stable funding and illiquid assets.¹⁹ Chart 8 shows the banks' stable funding in relation to their total liabilities and equity and Chart 9 shows the banks' illiquid assets in relation to their total assets.

To understand what Charts 8 and 9 show, we can first imagine a hypothetical bank which only funds itself with equity and wholesale funding that has a remaining maturity of more than one year. As both these forms of funding are weighted at 100 per cent in the measure, the bank's stable funding in relation to total liabilities and equity would amount to 100 per cent. If the bank were instead to obtain half their funding from wholesale funding with shorter maturities than one year and half of their funding would be equity, its stable funding in relation to total liabilities and equity would instead amount to 50 per cent.

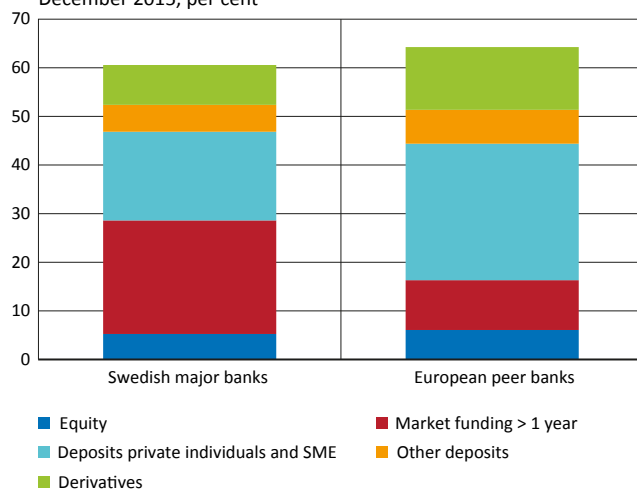
The first thing we see in Charts 8 and 9 is that the low scores of the Swedish banks are due both to the fact that they have a smaller share of stable funding in relation to total liabilities and equity (61 per cent compared to 65 per cent, see Chart 8) and to the fact that they have a larger share of illiquid assets in relation to total assets (63 per cent compared to 61 per cent, see Chart 9) than their European counterparts. This is in line with what we saw in the decomposition of the core funding ratio.

If we look more closely at the stable funding, we can see that the Swedish banks have a much smaller contribution (18 percentage points) from deposits from private individuals and SMEs than European banks (28 percentage points). On the other hand, Swedish banks have a larger contribution from wholesale funding with longer maturity than one year (23 percentage points compared to 10 percentage points). However, the Swedish banks have more than twice as much wholesale funding in relation to total liabilities as the European banks. However, an equally large proportion of the funding has a longer maturity than one year compared to the European peer group. All in all, this means that the major Swedish banks obtain twice as much stable funding from their wholesale funding than the European banks do. However, a large share of the Swedish banks' funding is relatively close to the one-year limit. This means therefore that a large share of their funding must be renewed in the near future.

¹⁹ The decomposition has been done by multiplying each liability item and each asset item by the weight that applies for the type of liability or asset respectively. This generates the amount of stable funding and illiquid assets that the liability or asset in question contributes. The sum of these values constitutes the bank's stable funding and illiquid assets. To make the items comparable between banks of different sizes, we have then divided the values by the size of each bank's balance sheet.

Chart 8. Breakdown of banks' stable funding in relation to total liabilities and equity

December 2015, per cent



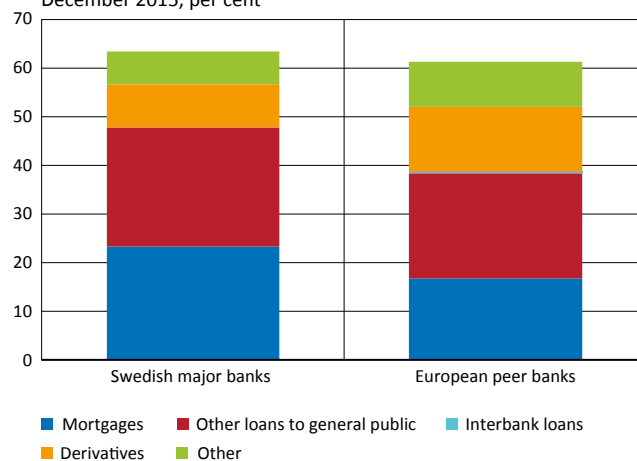
Note. The chart shows the contributions to banks' stable funding after the relevant weights have been applied.

Sources: Liquidatum and the Riksbank

On the asset side, it can be noted that loans to the general public contribute 47 percentage points (23 percentage points from mortgages and 24 percentage points from other loans) to the Swedish banks' illiquid assets, while the corresponding figure for the European banks is 39 percentage points (17 percentage points from mortgages and 22 percentage points from other loans).

Chart 9. Breakdown of the banks' illiquid assets in relation to total assets

December 2015, per cent



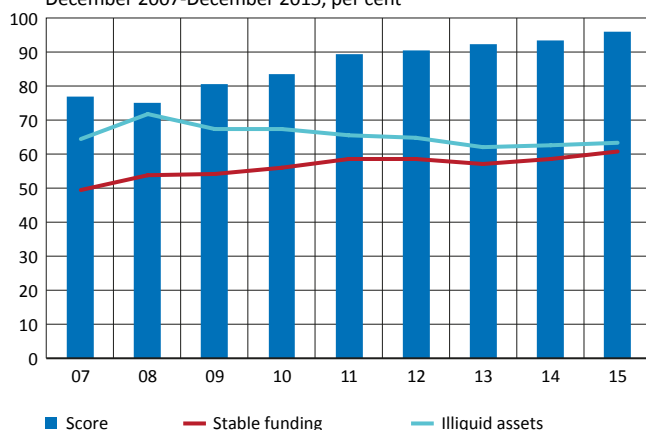
Note. The chart shows the contributions to banks' illiquid assets after the relevant weights have been applied.

Sources: Liquidatum and the Riksbank

Better scores in the Riksbank's structural liquidity measure since the financial crisis

It should be noted that the major Swedish banks have on average improved their scores from 77 to 96 per cent in the Riksbank's measure since the financial crisis (see Chart 10). The largest increase occurred between 2009 and 2011. Since then, the increase has slowed slightly. The increase in the scores is due partly to the banks having reduced the proportion of illiquid assets (from 64 to 63 per cent), but mainly to them having increased the share of stable funding (from 49 to 61 per cent).

Chart 10. The major banks' scores in the Riksbank's structural liquidity measure and development of stable funding and illiquid assets
December 2007–December 2015, per cent

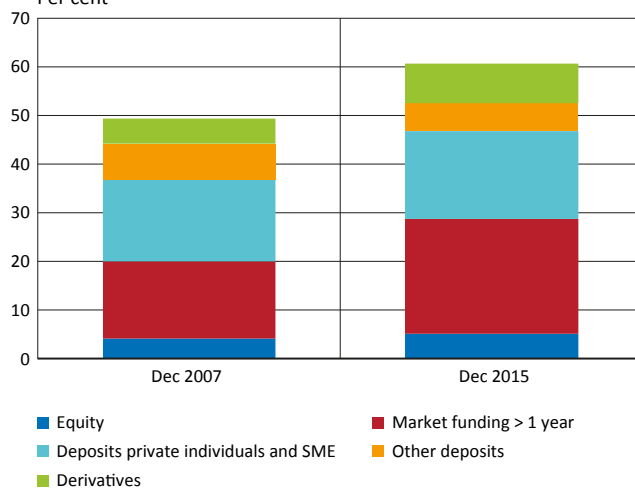


Note. The columns show the major Swedish banks' weighted average scores in the Riksbank's structural liquidity measure. The red and turquoise lines show their aggregate stable funding and illiquid assets respectively in relation to the size of their total balance sheets.

Sources: Liquidatum and the Riksbank

The largest share of the increase in stable funding is due to the banks' having increased the amount of wholesale funding with a maturity of longer than one year by 7 percentage points (from 16 to 23 per cent, see Chart 11). At the same time, the contribution from deposits from private individuals and SMEs has increased by one percentage point, while other deposits have decreased their contribution by two percentage points.

Chart 11. Breakdown of the banks' stable funding in relation to total liabilities and equity
Per cent

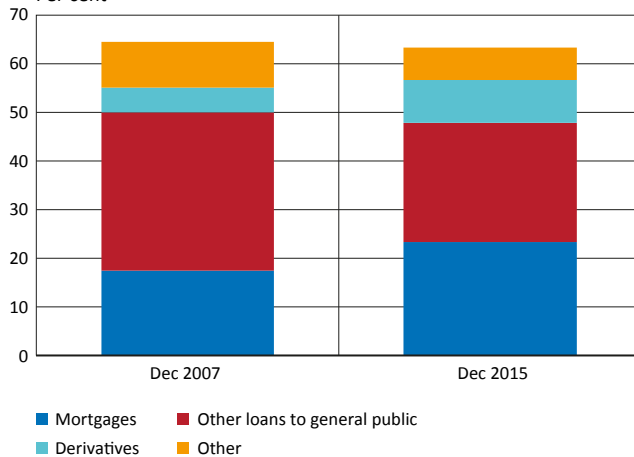


Note. The chart shows the contributions to banks' stable funding after the relevant weights have been applied.

Sources: Liquidatum and the Riksbank

On the asset side, we can see that loans to the general public as a share of total assets have decreased slightly between 2007 and 2015. This has resulted in a reduced contribution by 3 percentage points (from $18 + 32 = 50$ to $23 + 24 = 47$, see Chart 12). We can also see that the distribution between mortgages and other loans has changed markedly. While mortgages contributed by 18 percentage points in 2007, they contributed by 23 percentage points in 2015. On the other hand, the contribution from other loans has decreased from 32 percentage points to 24. These two types of loans are treated as equally illiquid in the measure, but since mortgages often have a much longer maturity than other types of loans, they can be considered to be particularly illiquid.

Chart 12. Breakdown of banks' illiquid assets in relation to total assets
Per cent



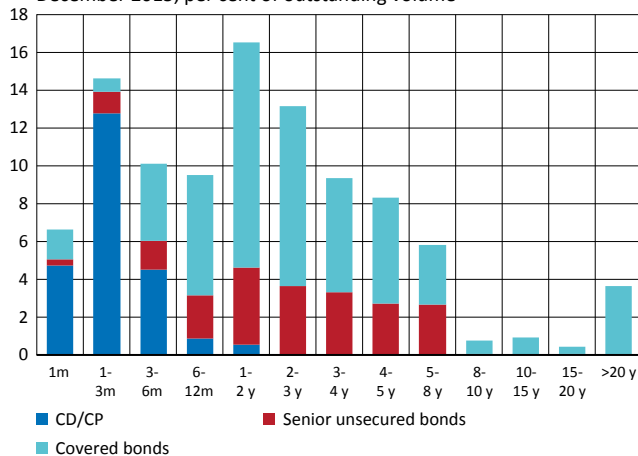
Note. The chart shows the contributions to banks' illiquid assets after the relevant weights have been applied.
Sources: Liquidatum and the Riksbank

The major Swedish banks have a large mismatch in maturities that are longer than one year

The measures we have used so far have treated all wholesale funding with a longer maturity than one year as completely stable, regardless of the exact maturity. But if a stressed period were to persist for longer than one year, funding with a one-year maturity would be due before the stressed period came to an end. It is interesting, therefore, to take a more detailed look at the banks' maturity structure. As we shall see, the Swedish banks have a large share of funding with a maturity that is between one and five years. Bearing in mind that a large share of their assets consists of mortgages with very long maturities, the Swedish banks could also be said to have a large mismatch in maturities that are longer than one year.

Chart 13 shows the maturity structure of the major Swedish banks' total outstanding securities. As we can see, the largest share of maturities are within the maturity interval of one to two years.

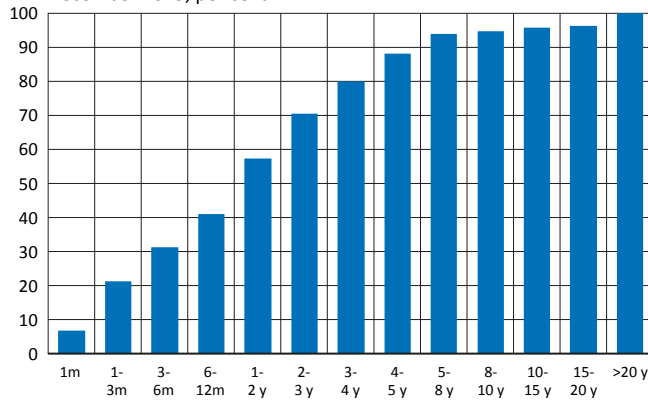
Chart 13. The major banks' outstanding securities broken down by remaining maturities and type of security
December 2015, per cent of outstanding volume



Note. The chart shows the maturity structure for the major Swedish banks' outstanding securities, broken down by type of security.
Source: The Riksbank

The banks' current maturity structure means that almost 60 per cent of their total securities funding will be due within a two-year period and 70 per cent within three years (see Chart 14). In the coming three-year period, these redemptions amount to over SEK 3 200 billion and correspond to about 75% of Swedish GDP as of December 2015.

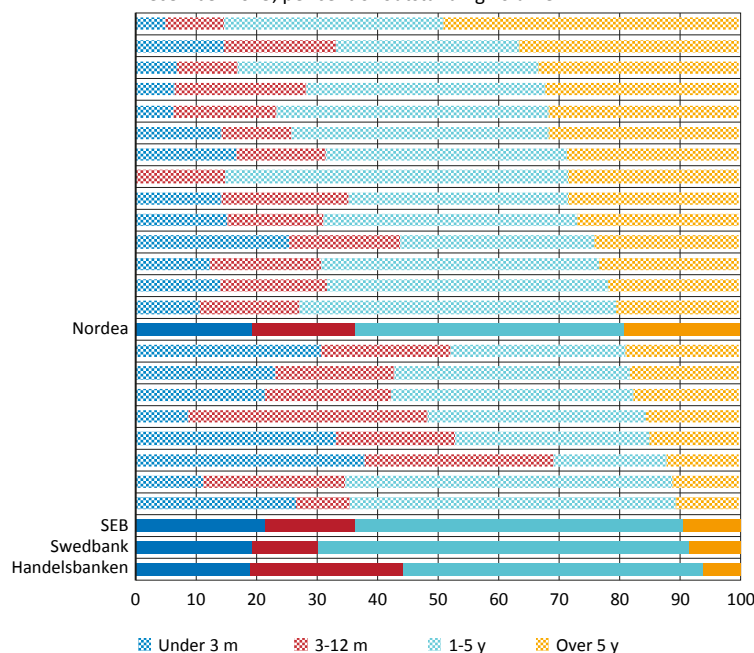
Chart 14. Cumulative maturity structure for the major Swedish banks' total outstanding securities
December 2015, per cent



Source: The Riksbank

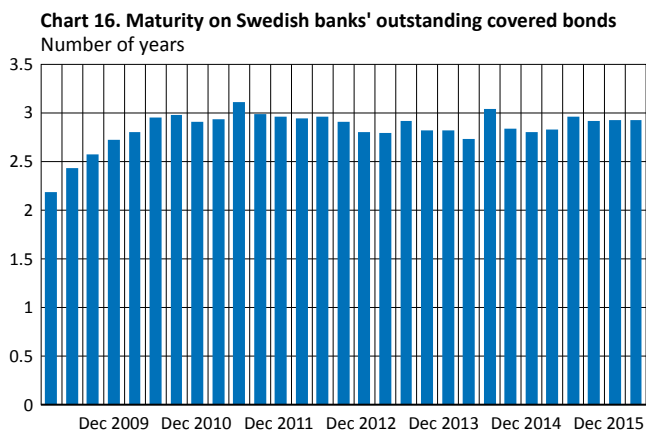
We do not have access to similarly detailed intervals concerning the maturity structures of the European banks. There is, however, public data on maturity intervals of 0-3 months, 3-12 months, 1-5 years and over 5 years. As is clear from Chart 15, three of the major Swedish banks have a much smaller proportion of funding with maturities that are longer than five years than the average of the European banks. The fact that the fourth Swedish bank, Nordea, is around the average of the banks is, amongst other things, due to their operations in Denmark. Sweden is clearly different in this respect as it has banks with a small share of long-term wholesale funding.

Chart 15. The banks' outstanding securities broken down by remaining maturity
December 2015, per cent of outstanding volume



Sources: Liquidatum and the Riksbank

The fact that the major Swedish banks have such a small proportion of long-term funding is particularly striking bearing in mind that around 30 per cent of their assets consist of mortgages. These have a very long maturity and a large proportion should virtually be considered eternal as many borrowers never repay the entire mortgage. If we only look at this asset type, the contrast to the funding is particularly clear. Mortgages are largely funded by covered bonds, whose average maturity is just under three years (see Chart 16). This maturity mismatch is hence an important cause of the major banks' structural liquidity risks, and makes it even clearer that they have large risks despite their NSFRs amounting to around 100 per cent.²⁰



Note. The diagram shows the weighted average maturity for all outstanding Swedish covered bonds. Consequently, the data does not just cover the major Swedish banks.

Source: Association of Swedish Covered Bond Issuers

The Swedish banks' scores in the Riksbank's structural liquidity measure deteriorate when the mismatch of maturities longer than one year is taken into account

As mentioned above, the Riksbank's structural liquidity measure treats all wholesale funding with a longer maturity than one year as completely stable, regardless of the exact maturity. A bank whose funding has a maturity of three years can therefore obtain the same score as a bank whose funding has a maturity of 10 years, despite their assets having the same maturity. To capture the maturity mismatch between liabilities and assets beyond the one-year limit, we have performed two tests in which we adjust the weights in the Riksbank's structural liquidity measure. In the first, we give 100 per cent weight to liabilities with a maturity of over five years while they receive 0 per cent weight if the maturity is shorter. In the second test, we use a slightly more detailed method in which several maturity buckets are used, each of which is given a different weight. Funding with shorter maturity than three months receives 0 per cent weight, maturities between three and twelve months receive 25 per cent weight, maturities between one and five years receive 50 per cent weight and everything with a longer maturity than five years is weighted at 100 per cent. In both measures, we therefore take into account how much of the funding has a longer maturity than five years.

²⁰ One might think that a bank that obtains funding with a shorter maturity ought to have a smaller share of funding with maturities longer than one year on each occasion than a bank that obtains funding with longer maturities. As a result, their NSFRs should also be lower. For example, one might think that for a bank that continually obtains funding every 3 years, 67 per cent (2/3) of its funding should have a remaining maturity that is longer than 1 year, while the same figure should be 90 per cent (9/10) for a bank that issues at 10 years. As a result, a smaller share of the first bank's funding should also be considered stable, which in turn should mean that it has a lower NSFR. This would also have been the case if the banks always allowed their issued securities to reach full maturity. But many banks, including Swedish ones, buy back some of their securities before their remaining maturity is less than 1 year. The Swedish banks can therefore maintain a relatively high score in the Riksbank's structural liquidity risk measure and the NSFR despite their security funding being relatively short-term.

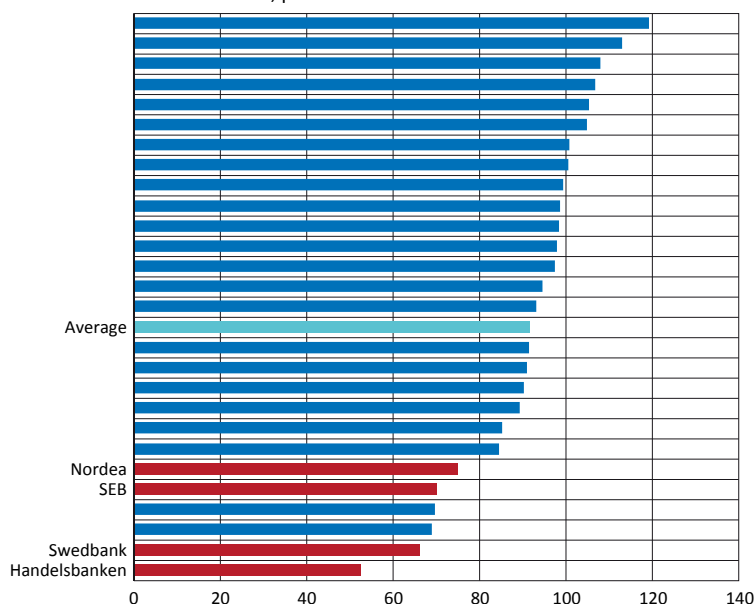
Table 3. Weights in the Riksbank's different structural liquidity measures
Per cent

Measure	0-3 months	3-12 months	1-5 years	More than 5 years
The Riksbank's structural liquidity measure (unadjusted)	0	0	100	100
The Riksbank's structural liquidity measure (five-year limit)	0	0	0	100
The Riksbank's structural liquidity measure (maturity buckets)	0	25	50	100

To get a feeling for how long-term a bank's funding needs to be for the bank to be able to obtain 100 per cent in the Riksbank's measures, we can imagine a bank whose only asset is loans to the general public and which exclusively uses wholesale funding. Furthermore, the bank allows the wholesale funding to mature until it is due. For the bank to obtain a score of 100 per cent, it would need to issue its securities for 33 years in the first test with a five year limit and 19 years in the test with maturity buckets. This can be compared with 7 years in the Riksbank's original measure. It should also be mentioned that as the weights for deposits from private individuals and companies are left unchanged, more deposit-funded banks will benefit in relation to other banks in the two adjusted versions of the measure.

As is evident from Chart 17, the Swedish banks obtain a worse score when the five-year limit is applied than in the unadjusted measure. This is true both in absolute terms (average for the Swedish banks is 66 per cent compared to 96 per cent in the unadjusted measure) and in relation to the other European banks (25 percentage points lower score compared to 10 percentage points in the unadjusted measure). The reason for this is that they have a small proportion of wholesale funding with longer maturity than five years.

Chart 17. The Riksbank's structural liquidity measure (5-year limit)
December 2015, per cent



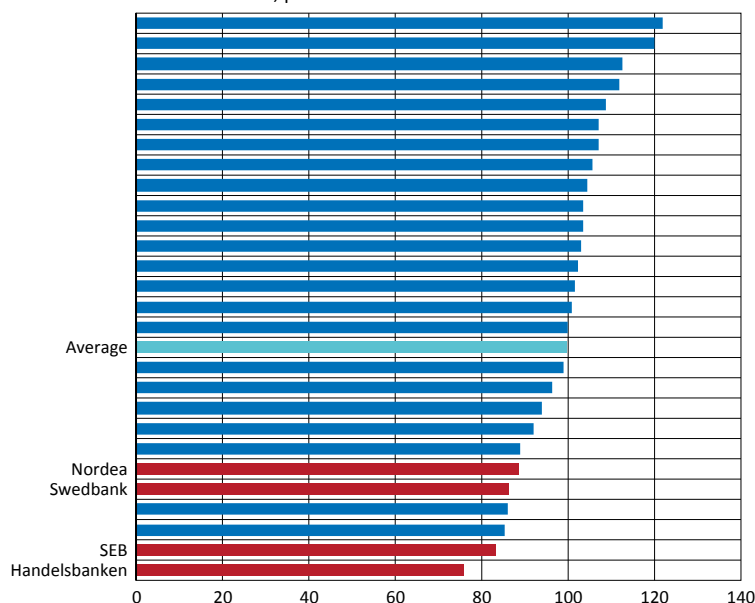
Note. The measure shows the ratio between a bank's stable funding and its illiquid assets. A low score indicates large structural liquidity risks. The turquoise column shows the unweighted average value for all banks in the comparison.
Sources: Liquidatum and the Riksbank

But even in the maturity bucket test, in which we use different weights for different maturities, the major Swedish banks obtain a worse score than in the unadjusted measure. The difference here is slightly less, however, with an average score of 83 per cent, i.e. 13

percentage points lower than in the unadjusted measure. The score can also be compared to the average of 100 per cent for the European banks (see Chart 18). The Swedish banks' scores in this second test are hence lower than in the unadjusted original measure but higher than when a simple five-year limit was used. The fact that the score is lower than in the unadjusted measure can be explained, as above, by the fact that the Swedish banks have a small proportion of wholesale funding with maturity over five years. The fact that the score is higher than when the five-year limit is used is due to funding with a maturity of between three and twelve months in this measure being credited with 25 per cent stable funding and funding between one and five years being credited with 50 per cent stable funding.

Chart 18. The Riksbank's structural liquidity measure (different weights for different maturity buckets)

December 2015, per cent



Note. The measure shows the ratio between a bank's stable funding and its illiquid assets. A low score indicates large structural liquidity risks. The turquoise column shows the unweighted average value for all banks in the comparison.

Sources: Liquidatum and the Riksbank

The proportion of the major Swedish banks' wholesale funding with longer maturities than one year is considered to be completely stable in the core funding ratio, the NSFR and the Riksbank's unadjusted structural liquidity measure. At the same time it has a significantly shorter maturity than in many other banks in the European peer banks. If we give a relative higher weight to longer term funding in the Riksbank's structural liquidity measure, the Swedish banks' structural liquidity risks appear to be even greater (see Table 4).

Table 4. Compilation of scores in the three different versions of the Riksbank's structural liquidity measure

Measure	Major Swedish banks (per cent)	European peer banks (per cent)	Difference compared to European banks (percentage points)
The Riksbank's structural liquidity measure (unadjusted)	96	106	10
The Riksbank's structural liquidity measure (five-year limit)	66	91	25
The Riksbank's structural liquidity measure (maturity buckets)	83	100	17

4 Summary

In this article, we have used seven different measures to compare the size of the major Swedish banks' structural liquidity risks with the risks in their European peer banks. All the measures indicate that the major Swedish banks take larger structural liquidity risks than many of their European counterparts (see Table 5). The Swedish banks differ in that they have both a larger proportion of illiquid assets and a smaller proportion of stable funding. On the asset side, the Swedish banks have a larger proportion of loans than their European counterparts, and a larger share of the loans is made up of mortgages, which often have a longer maturity than other types of loans. To fund the assets, Swedish banks use deposits from private individuals and SMEs to a lesser extent which have proven to be a relatively stable form of funding. Instead, they use wholesale funding to a larger extent. The wholesale funding is also relatively short-term with only a small share of it having a longer maturity than five years.

Table 5. Compilation of the scores in the measures used in this article

Measure	Major Swedish banks (per cent)	European peer banks (per cent)
Structural mismatch – difference in years	9.2	6.9
Deposit-to-loan ratio	56	89
Core funding ratio	96	114
Net Stable Funding Ratio	101	107
The Riksbank's structural liquidity measure (unadjusted)	96	106
The Riksbank's structural liquidity measure (five-year limit)	66	91
The Riksbank's structural liquidity measure (maturity buckets)	83	100

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What factors are affecting banks' decisions to raise long-term funding and what can regulators do to influence them?

David Vander

1 Introduction

A bank's long-term funding consists of either liabilities with long contractual maturities (e.g. a 10-year bond) or liabilities that are of a short-term nature but behave like a liability with long-term maturity (e.g. on-demand savings which are likely to remain on the balance sheet for a long time). The mismatch between these long-term liabilities (whether contractual or behavioural) and long-term assets is called a structural maturity mismatch. All banks have a structural maturity mismatch to some extent. The issue that needs to be resolved is what level is acceptable.

Why do regulators care about this mismatch? Principally because the last financial crisis demonstrated that banks with a large structural maturity mismatch pose a threat to financial stability, as this mismatch can potentially lead to their own demise. This can, in turn, have consequences for savers, including a likely knock-on effect for other financial institutions, and possible damage to confidence in the financial system as a whole.

Three groups in particular are interested in banks' structural maturity mismatches: shareholders, bond holders and legislators. Each has a different perspective on what level of structural maturity mismatch is acceptable. The combined impact of these three stakeholders determines the final maturity structure of a bank's balance sheet.

Banks have a significant role to play in providing long term liquidity to help promote economic growth. They do this through the maturity transformation of their liabilities, and their non-maturing deposits in particular. Banks' liquidity risk profiles are very important for governments. If consumer confidence in banks were to decrease, it may lead to a bank run. This would, in turn, affect the government, as a result of its role as lender of last resort. This means that the government, either through one or a number of official institutions, has to balance the benefits of banks fostering economic growth against what is prudent for the system itself. In addition, banks' shareholders might benefit from the external safety net that the government provides via emergency liquidity and implicit support.

Before considering any additional proposals, it is important to reflect on the changes coming from the proposals that have already been implemented or are in the process of being implemented, to understand what effects they might still have. To support my arguments, I have investigated how the balance sheets have developed between 2008 and 2014 for a selection of banks. In the majority of examples, the data I have used focuses on a list of 25 European peer banks from 11 countries, to argue the point (see Appendix for list of banks). This data is sourced from our own proprietary data base, which is used by banks, official institutions and fund managers to benchmark banks' liquidity risk profiles.

2 Regulatory initiatives

Basel III (or the Third Basel Accord) was the regulatory response to the 2007-2008 financial crisis and was endorsed by the G20 in November 2010. This accord has five main focus areas and entails the following:

- More and higher-quality capital in banks
- A more robust calculation of risk-weighted assets
- A leverage ratio to limit the system's exposure to the internal models used by banks to calculate the amount of capital required to support their assets
- A short-term liquidity risk metric to increase banks' short-term resilience or survival period
- A structural liquidity risk metric to reduce banks' reliance on the short-term funding of their long-term assets.

These regulations have affected or will affect the composition and structure of banks' balance sheets. The regulations focusing on bank capital and risk models will also affect banks' liquidity risk profiles.

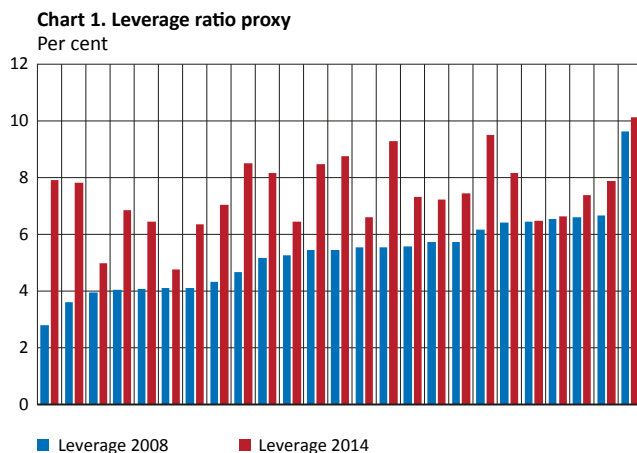
Bank treasurers tend mostly to look at the development of the asset base before considering the appropriate liability structure to fund the assets. It is therefore appropriate for us to study the development in a bank's assets before the development in its liabilities.

2.1 Regulatory initiatives and their effect on bank assets

2.1.1 Leverage ratio

Regulators are in the process of limiting the exposure to bank model risk by limiting the ratio of core equity to assets. This is being achieved via the introduction of a leverage ratio. The main benefit of a leverage ratio from a structural liquidity perspective is that it reduces or caps the size of the balance sheet and thus potentially reduces the structural liquidity risk within it.

How then have banks adjusted to the leverage ratio requirement? Banks currently disclose leverage ratios according to the present Basel III definition but there is no publicly available historical data set for the measure. As a proxy, I have used equity as a proportion of total assets (excluding derivatives, reverse repos and insurance). As can be seen in Chart 1, every bank in the sample has reduced its leverage, in most cases significantly so. This would suggest that the liquidity benefits of this, as a result of restricting asset growth, are already included in the 2014 balance sheets of banks and that there is unlikely to be much benefit to come.

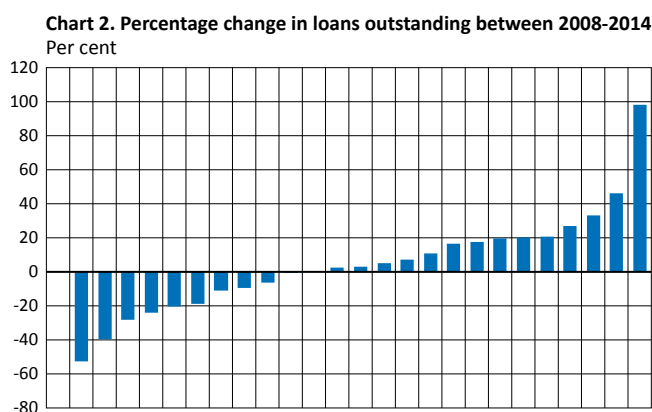


Source: Liquidatum

2.1.2 Quantity and quality of capital

As part of the initiative to improve the robustness of banks' balance sheets, regulators have also tightened up the definition of core capital and the calculation of risk-weighted assets. This has effectively increased the capital requirement for lending. In the same way as the leverage ratio requirement, this could lead to a reduction in banks' illiquid assets. If this were the case, it would reduce the need to change banks' liability structure.

Have the initiatives on better capital quality and higher capital levels and stricter rules governing the calculation of risk-weighted assets, along with other factors, had an effect on banks' lending and thus also affected their structural liquidity profile? The loan portfolios of 15 out of 25 surveyed banks actually increased between 2008 and 2014 (see Chart 2).



Source: Liquidatum

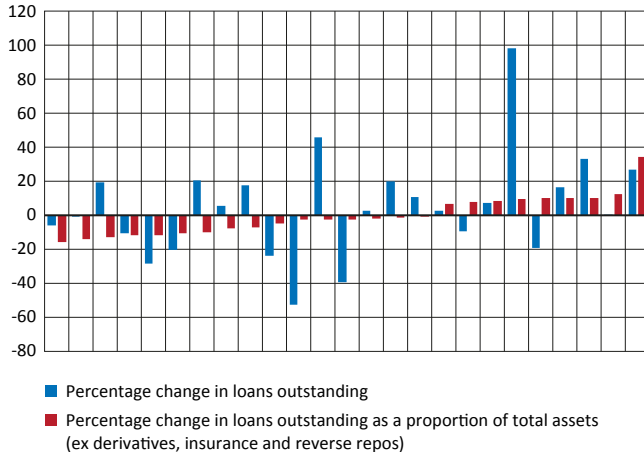
The loans outstanding therefore do not appear to have been adversely affected by the regulatory initiatives with respect to the quantity and quality of capital. As a result, neither do banks' structural liquidity profiles seem to have been affected in a consistent manner. Rather, banks would appear to have continued servicing their customers' needs and have adjusted the amount of capital and the structural maturity mismatch accordingly. The increased cost of capital (because of both increased amount and higher quality) has therefore been borne either by customers in terms of increased margins or by the banks themselves in terms of decreased profitability. Since longer-term funding also leads to higher costs for banks, it is reasonable to assume that any regulatory initiative with regards to funding maturity will be met in the same way.

However, the issue is more complicated. Chart 2 does not take into account corporate activity over this period (mergers, sell-offs etc.) and to better understand the influence of regulation, we need to review the changes in loans in the context of total balance sheet changes.

Chart 3 plots the change in proportion of customer loans relative to total assets (excluding derivatives, reverse repos and insurance). It also shows the percentage change in loans outstanding. The blue bars represent the change in bank loans between 2008 and 2014 in absolute amounts, i.e. it indicates whether bank lending was more or less in 2014 in comparison to 2008. The red bars represent the proportion of the balance sheet that is made up of loans and give a clearer picture of the effect of regulation, adjusted for mergers and acquisitions. The chart shows that 16 out of 25 banks reduced their lending in relative terms, i.e. loans made up a smaller proportion of their balance sheet in 2014 than they did in 2008. From a liquidity perspective, this adjustment has already had a positive effect and there is unlikely to be much benefit still to be derived from further changes in the proportions of loans of total assets and thus the need for long-term funding without banks more fundamentally changing their business models.

Does this give a clearer understanding of the effects of regulation? I am not sure. This picture does, however, counter the suggestions implied by Chart 2, that regulation has already had a significant impact on bank lending. This is important to bear in mind when considering the implications of any new liquidity requirements.

Chart 3. Percentage change in loans outstanding between 2008-2014
Per cent



Source: Liquidatum

2.2 Regulatory initiatives and their effect on bank liabilities

With respect to liquidity, regulators have focused on two initiatives. The first focuses on banks' liquidity buffers and is designed to ensure that banks are less exposed to short-term market shocks. It encourages banks to maintain a liquid asset buffer to be able to withstand an outflow expected in conjunction with a market shock. This is known as the Liquidity Coverage Ratio (LCR). The LCR has little impact on banks' structural maturity mismatches as it targets short-term (< 1 month) cash flows. The only benefit it has had on structural maturity mismatches is to differentiate between different types of customer deposits and to encourage a liability base built around deposits that are considered more stable in stressed environments or times of uncertainty.

The second initiative focuses on banks' structural maturity mismatches by attempting to ensure that they are less dependent upon short-term wholesale funding to finance their core (illiquid) assets. The ratio created to measure these mismatches is known as the Net Stable Funding Ratio (NSFR). The NSFR has been very hotly debated and undergone some changes since it was first introduced.

The NSFR is calculated both by establishing the amount of assets that banks are likely to continue to need to finance after a 12-month period, i.e. the bank's required stable funding, and by establishing the liabilities that are likely to remain with the bank over the same period, i.e. the bank's available stable funding. Assets and liabilities that mature within this 12-month period are assumed to roll over if they are considered to be core business activities (in the case of assets) and dependable, relationship-driven deposits or debt (in the case of liabilities). The output is expressed in terms of a ratio (the available stable funding divided with the required stable funding) and banks are required to have a NSFR ratio of > 100 per cent by 2018, i.e. they will have to have at least as much available stable funding as required stable funding, based on their assets.

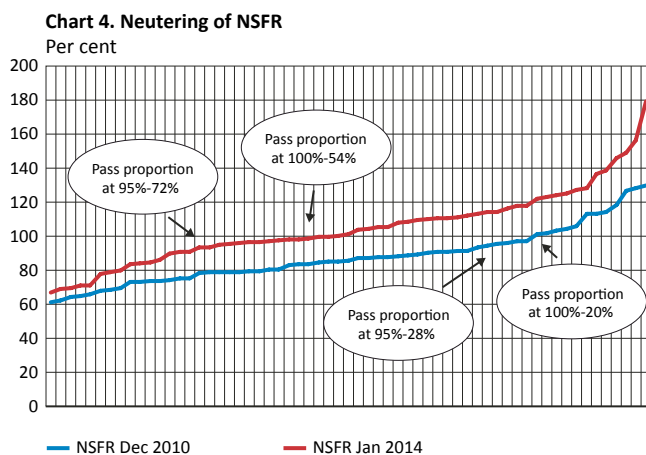
There are two issues however with respect to the NSFR related to the incentives for banks to raise long term funding.

The first issue is that the NSFR does not differentiate between a 13-month liability and a 30-year liability — they have the same stable funding value in the measure as both have a

maturity of more than 12 months, the point in time at which the ratio is calculated. Thus a bank with a 30-year loan can either fund it for 30 years or 13 months, and the NSFR will not differentiate between these two funding methods. This is despite the fact that a bank with a 13-month liability is clearly running a much greater liquidity gap than a bank with a 30-year liability. This is not a criticism of the NSFR per se. Its intention was to encourage banks to extend their liabilities from short-term wholesale funding by encouraging more long-term maturities and not necessarily to cover the long-term mismatch.

The second (bigger) issue, as far as I am concerned, is that the revised version presented in January 2014 means it no longer fulfils its original brief. Liquidatum carried out some research on a wider group of banks (61 country champion banks from Europe, Asia and Australia) and compared the effect of the original NSFR (December 2010) with the latest version of the measure (January 2014) on the balance sheets of the same banks in 2007.

Chart 4 shows the outcome for the 61 banks of the different versions of the NSFR on their balance sheets from 2007. The results for NSFR 2010 are represented by the lower blue line. The higher red line represents the results for NSFR 2014 and demonstrates the improvement in the ratio as a result of weakening the metric. According to Liquidatum's calculations, the revised version of the NSFR (NSFR 2014) has led to lower requirements and resulted in a 10-15 per cent improvement in most banks' NSFR ratios.

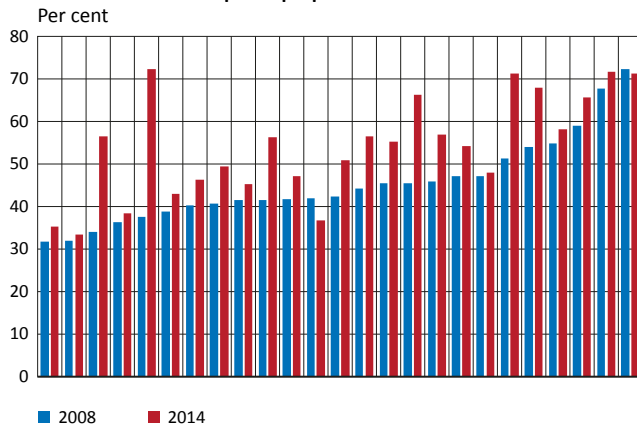


Note. Based on 2007 data, selection of banks (individual results of all the banks in the chosen data set).
Source: Liquidatum

Given that the NSFR was designed to reduce banks' dependence on short-term wholesale financing, it should be no surprise to discover that, according to the original version of the NSFR (2010), only 20 per cent of banks had an NSFR of 100 per cent or more and 28 per cent one of 95 per cent or more. The 2014 version on the same data set (2007) would have meant that 54 per cent of the banks had a ratio of 100 per cent or more and 72 per cent a ratio of 95 per cent or more, i.e. over 70 per cent of the banks would only have had to do some minor fine-tuning to their 2007 balance sheets to comply with the latest draft of the NSFR. This suggests to me that the NSFR is no longer fit for purpose.

Thus, from a regulatory perspective, there are no current initiatives that will address the structural maturity mismatch. This does not mean, however, that banks' liquidity risk profiles have not improved in the meantime. They have clearly made significant efforts as the following charts show.

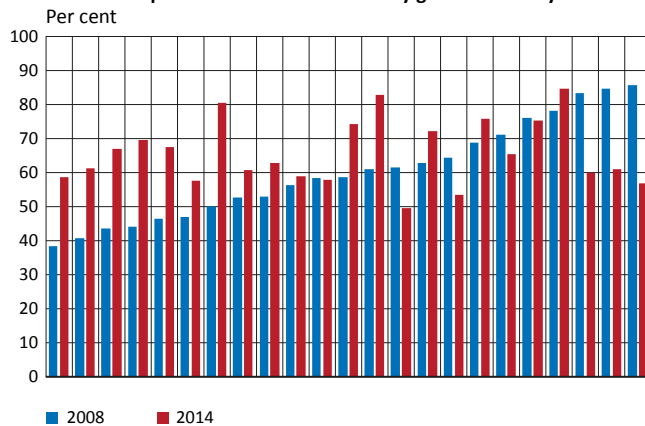
Regulators consider short-term deposits from the general public to be a much more stable source of funding than other short-term debt. As shown in Chart 5, 23 out of 25 banks in our sample have increased customer deposits as a proportion of total liabilities (excluding derivatives, repos and insurance). The average has risen from 45 per cent to 54 per cent.

Chart 5. Customer deposits proportion of liabilities

Note. Excluding derivatives, repo and insurances.
Source: Liquidatum

The above changes in the funding structure all depend on regulatory changes, either directly via proposals like the LCR or indirectly by some of the capital requirements and their effect on the balance sheet. However, it is interesting to see how their debt have developed, particularly as regards long-term funding, as this has not been affected by any regulatory changes proposed so far, and is unlikely to be, given the proposed changes to the NSFR.

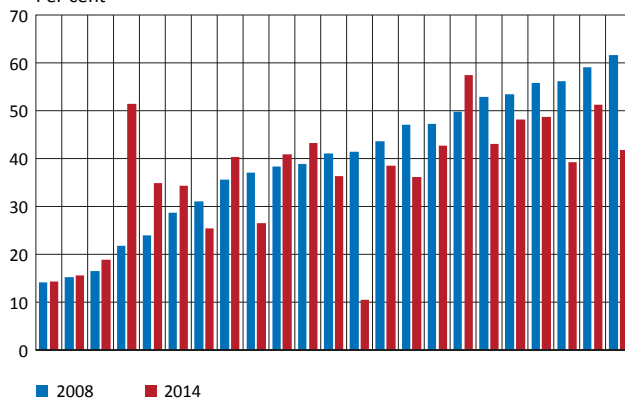
In 16 out of 23 cases, banks have already increased the proportion of their debt that matures after 1 year (Chart 6). In the remaining cases, where banks have reduced the proportion of debt greater than 1 year, 3 out of 7 banks had the greatest proportion of debt greater than 1 year. This would suggest that banks had already implemented extensive measures to lengthen the maturity of their funding. The average proportion of debt greater than 1 year has increased from 60 to 66 per cent.

Chart 6. Proportion of debt with maturity greater than 1 year

Source: Liquidatum

It becomes more interesting if you look at the breakdown of the debt greater than 1 year into two time buckets (1 to 5 years and greater than 5 years). In 13 out of 23 cases (Chart 7), the proportion of debt greater than 5 years has decreased between 2008 and 2014. The average has fallen from 40 to 37 per cent, i.e. the proportion of banks' outstanding debt of greater than 5-year maturities has fallen relative to 1-5 year maturities.

Chart 7. Proportion of debt greater than 1 year which is greater than 5 years
Per cent

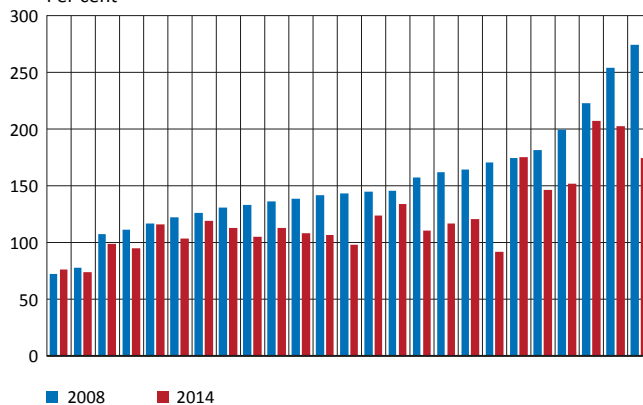


Source: Liquidatum

2.3 Regulatory initiatives and their effect on bank assets and liabilities

The increase in deposits, in conjunction with the development in loans we discussed earlier, has led to a significant improvement in the loan-to-deposit ratio (LTD), which is often used as an indicator of liability base stability. All in all, 23 out of 25 banks have improved their LTD, and one of the two that did not already had the lowest ratio (see Chart 8), demonstrating a decreased reliance on wholesale funding. LTD has fallen from an average of 153 per cent in 2008 to 123 per cent in 2014.

Chart 8. Loan to deposit ratio
Per cent



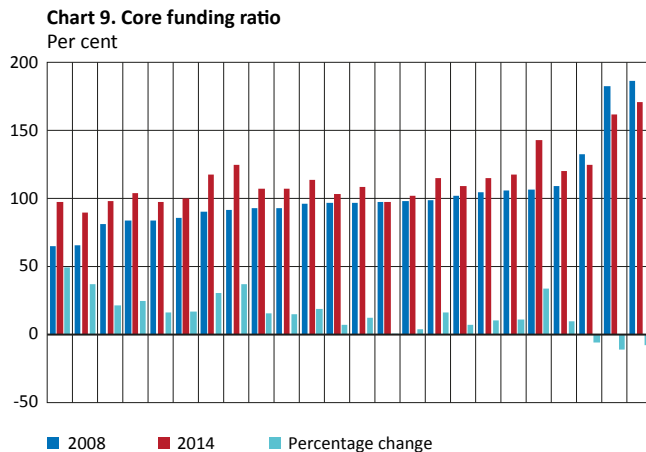
Source: Liquidatum

Another metric that captures more aspects of bank structural funding than the LTD is a Liquidatum metric called the core funding ratio. It is calculated as follows:

$$\frac{\text{Customer deposits} + \text{debt} > 1 \text{ year} + \text{interbank} > 1 \text{ year}}{\text{Customer loans and interbank} > 1 \text{ year}}$$

Whilst it is a relatively simple measure, the consistency of results across many banks suggests that they mostly use variations of it. Our experience is that it reflects the analysis performed by banks when reviewing their long-term funding needs.

In 2008, 16 out of 24 banks had a core funding ratio of less than 100 per cent (see Chart 9). By 2014, only 5 out of 24 banks had a ratio of less than 100 per cent. In total, 21 out of 24 banks had improved their ratio between 2008 and 2014, and the three that deteriorated had the three highest ratios in 2008.



Source: Liquidatum

2.4 Summary of regulatory initiatives and balance sheet development

In summary, if you review the changes in bank balance sheets between 2008 and 2014, the following positive observations (with respect to structural maturity mismatch) can be made of this period of dramatic market disruption and regulatory change:

- Banks have reduced their reliance on wholesale funding. Customer deposits now account for 54 per cent of liabilities on average, having increased from 45 per cent in 2008.
- In conjunction with the developments in the loan book, the loan-deposit ratio has fallen from 153 per cent in 2008 to 123 per cent in 2014.
- The proportion of debt that is greater than one year has increased from 60 per cent in 2008 to 66 per cent in 2014, with 16 out of 23 banks improving their profile.

On the negative side, and in the context of the brief for this article, we can see the following:

- The NSFR is no longer fit for purpose. In our selection of country champion banks from Europe, Asia and Australia, 54 per cent would have met the 100 per cent requirement for balance sheets in 2007 and over 70 per cent would have a ratio of 95 per cent or more and thus would only require minor fine-tuning to comply.
- The NSFR has not, in itself, encouraged banks to extend their maturity profile significantly beyond 1 year as it does not differentiate between 13-month and 30-year liabilities.
- While the proportion of debt greater than 1 year has on average increased from 2008 to 2014, the proportion greater than 5 years has fallen from 40 to 37 per cent.
- The variation among different banks regarding the proportion of debts greater than 1 year and the proportion of debts greater than 5 years is considerable. This lack of conformity suggests there is little external pressure, either from regulators or other stakeholders, to conform, and banks have therefore been able to choose their own structural maturity mismatch as they deem appropriate.

3 Other stakeholder pressure?

In addition to the regulators, the other major stakeholders in a bank's structural maturity mismatch are equity and fixed-income investors.

My conversations with equity investors would suggest that they are not particularly focused on the effects that differing liquidity risk profiles can have on earnings and thus valuations. This is despite the fact that the profits of banks with relatively short-term funding will be inflated relative to banks with longer-term funding due to the higher cost of long-term funding. Thus, you cannot expect any shareholder pressure in the near term to change banks' structural maturity mismatches.

Fixed-income investors are more concerned than equity investors with relative structural maturity mismatch when determining their investments and valuations. However, they tend to focus more on cash-flow and a survival horizon rather than on the structural maturity mismatch that would be needed to affect the long term liquidity profile of banks. The imminent bail-in issuance will again focus their attention on banks' capital and the valuation of their assets as a negative development affects the risk of debt being either wiped out through its loss absorbing capacity or being converted to equity. Some regulators have stated that they are more likely to support illiquid but better capitalised banks by widening the definition of the acceptable pool of eligible assets for these banks in an emergency. Such comments only exacerbate the perception that liquidity risk is viewed as less important than capital.

Thus, it would seem that in the current environment, one should not expect pressure from the private sector to encourage banks to reduce their structural maturity mismatch.

4 Choices facing regulators

The analysis in Section 2 would suggest that there is little reason to expect current legislation or other stakeholder interests to result in an improvement in a bank's liquidity risk profile. Regulators who want to decrease systemic liquidity risk by encouraging banks to increase the maturity of their liabilities face a number of choices and these can be separated into either a statutory approach and/or peer pressure as a result of improved disclosure.

Before deciding what to do, however, a common understanding is required between the taxpayer (politicians), shareholders and bond holders as to what is the banking system's ideal liquidity risk profile. This will then require a political decision, as it is the taxpayer who bears the cost of saving a failing institution. A greater understanding of what the taxpayer may be prepared to support in terms of risk profile will create greater market discipline and compliance. Ultimately, this discipline can only be demonstrated by letting institutions fail that do not comply or, through regulatory change, limit the extent of the externality.

When analysing bank liquidity risks, it is important to understand why banks' maturity assumptions and public disclosure of assets and liabilities are the way they are. The regulatory approach to date (LCR and NSFR) is based on stress tests and thus allows banks to include (some) cash flows from maturing assets and offset them against cash flows from maturing liabilities. In other words, it is assumed that some maturing loans will mature and not be rolled over or replaced with new loans.

However, a recent survey of large banks, focused on best practice for stress tests, found that banks do not treat maturing loans as inflows. Instead, they treat the loan book as constant, or even growing, to ensure their funding is stable enough to enable their operations to continue. The objective of regulators is to ensure that banks have sufficient liquidity to facilitate an orderly resolution. However, this is not sufficient for shareholders, as an orderly wind-down will lead to the value being lost as the business will no longer be a going concern.

I believe that an approach which treats customers' assets as constant, i.e. does not treat maturing assets as cash-inflows, is more appropriate for a shareholder-driven institution. This is because such institutions need to have sufficient liquidity to survive and even prosper, rather than to enable an orderly wind-down.

As regards transparency, the least that should happen is that banks should publicly disclose the contractual maturities for their assets and not just the maturity up to the next rate fix. Certain loans, particularly mortgages, are for an extended period of time (up to thirty years) but have a rate re-fix at a shorter date. However, it seems as if certain banks report the maturity for their lending up until the next rate fix, i.e. the interest-rate fixation period, and not up until the maturity actually expires. I believe this to be wrong and am of the opinion that they should report loans up to the contractual maturity. This would make the liquidity gap more transparent and encourage longer-term liabilities.

4.1 Statutory approach

In terms of the choices suggested below, compliance can be forced directly via the metrics proposed or by imposing a capital surcharge or specific contribution to a deposit fund, and this contribution could be linked to the degree of compliance with the various metrics. The specific contribution to the deposit fund would have the merit of linking the charge to the bearer of the externality and making all stakeholders aware of the relative liquidity gap of the charged institution.

Any proposal will need to look at the liquidity risk profile, as banks consider the liquidity risk of the entire balance sheet, i.e. both assets and liabilities. Thus, we need to be conscious of the fact that, if too severe, any new initiative could have unintended consequences and lead to a reduction in assets rather than an increase in the term of liabilities.

4.1.1 Returning the NSFR to its former glory or going even further (NSFR+)

The NSFR, as we have discussed, is no longer fit for purpose. Returning the NSFR to its original proposal will have significant impact on bank's liabilities as it excludes debt maturing between 6 and 12 months (currently given a 50-percent weighting).

However, this will re-introduce the "cliff effect" at 1 year. One way to remove this and prevent the trend highlighted above for more 1 to 5 year debt in comparison to greater than 5-year debt, is to gradually increase the weightings after one year. Currently, debt maturing between 6 and 12 months receives a 50-percent stable funding co-efficient and debt greater than 1 year receives a 100-percent stable funding co-efficient. If you assign a 0-percent co-efficient to all debt less than 1 year (as was originally the case) and stagger debt after 1 year (e.g. 20 per cent for debt of 1-2 years, 40 per cent for debt of 2-3 years, 60 per cent for debt of 3-4 years, 80 per cent for debt of 4-5 years and 100 per cent for debt greater than 5 years), this will encourage banks to significantly lengthen their debt maturity.

The issue of how to consider different maturities, i.e. should one assume a business-oriented or a contractual maturity for the bank's assets and liabilities, was discussed above. The NSFR is based on a business-oriented maturity with regard to banks' on-demand savings. The NSFR scenario assumes, for example, that 90-95 per cent of banks' household deposits will remain. It is assumed, however, that a greater share of the bank's lending will be repaid or that liquidity will be generated from other sources, such as unpledged mortgage portfolios. If we want to encourage banks to increase the maturity of their debt, an appropriate solution would be to remove the contractual inflow from maturing loans that constitute the bank's core activities. This, in combination with the changes suggested above with respect to differentiating the co-efficients for maturing debt greater than 1 year, would provide significant incentive for banks to increase the term of their liabilities. For the sake of simplicity, I will refer to the introduction of new time buckets and staggered co-efficients for debt greater than 1 year (depending on the time bucket) as NSFR+.

4.1.2 Introducing the loan-deposit ratio as a threshold for NSFR+

An alternative is to work with two different NSFR metrics, with the appropriate metric applicable to a bank being determined by a measure such as the loan-to-deposit ratio (LTD). If customer deposits are the funding instrument of choice for regulators, then they can be used to determine which NSFR metric should be applied. For example, for banks with an LTD of less than 125 per cent, a less intrusive NSFR metric might apply (e.g. Jan 2014 or December 2010 version). For banks with an LTD of greater than 125 per cent, NSFR+ can be applied.

It should be noted, when considering this approach, that banks with lower LTDs are less exposed to a market crisis and thus are less likely to contribute to a systemic crisis. But, at the same time, they are more exposed to an idiosyncratic issue and thus to an individual bank run on their deposits requiring more immediate assistance. Wholesale funding does not, in itself, create greater systemic risks – it is short-term wholesale funding that is the issue. If bank treasurers were forced to choose among different debt categories, most would prefer 10-year wholesale funding to on-demand deposits from households.

4.1.3 Introducing liquidity gaps by time bucket

An alternative approach is to set limits for the maximum outflows (in percentage terms) by time bucket, based on the contractual maturity of assets and liabilities, where on-demand deposits could be distributed across the time bucket.

Table 1. Example of balance sheet with time buckets

	Not applicable	On demand	0-12 months	1-2 years	2-3 years	3-4 years	4-5 years	> 5 years
Cash		100						
Interbank		50	50					
Consumer loans		250	250					
SME loans			300	100	100	100	100	
Mortgage loans				100	100	100	100	2 000
Other loans			200	200	200	200	200	1 000
Trading securities	250							
Derivatives	50							
Other assets	50							
Interbank		50	50					
Demand retail deposits		3 000	1 500	300	300	300	300	300
Savings retail deposits				200	200	200	200	200
Large corporate/ Financial Institution			500					
Debt			400	150	100	150	100	100
Derivatives	50							
Other liabilities	50							
Equity	450							450
Maturing assets as a proportion of maturing liabilities			33%	62%	67%	62%	67%	286%

The balance sheet above provides an example of how this might work. Assets are reported according to their contractual maturity, with the exception of securities which are treated as liquid, irrespective of their maturity. Term liability items are reported according to their contractual maturity, and on-demand deposits and equity are distributed across the various time buckets (see red figures). The sum of the assets that mature within a time bucket is expressed as a proportion of the sum of the debt that mature within the same time bucket, with limits for this ratio being placed for each time bucket. These limits can also vary from one time bucket to the next. Banks already follow this approach for their interest rate risk and thus it would not be illogical to follow it for liquidity risk.

The proposals could be implemented via Pillar 1, where regulators state how the maturity transformation is to be quantified and limited, or via Pillar 3, where banks explain how and why their internal assessments deviate.

4.2 Benefits of greater disclosure

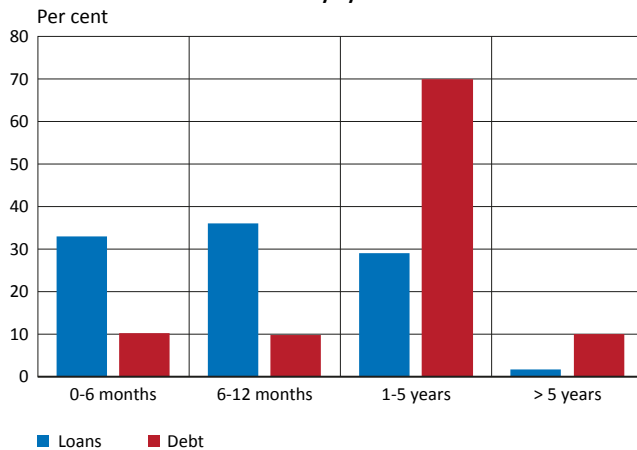
4.2.1 Consistent disclosure – complying with the EDTF recommendations

Swedish and Canadian bank liquidity disclosure is significantly superior to other G20 peers, in terms of frequency and timeliness. Swedish bank disclosure already complied with the Enhanced Disclosure Task Force recommendations prior to its publication in 2012 and was often cited as an example of best practice (the EDTF was established in May 2012 and is a private sector initiative, sponsored by the Financial Stability Board (FSB), whose aim is to support market confidence through improved disclosure). Canadian banks have rapidly followed the Task Force's recommendations but other banks have yet to fully meet the EDTF recommendations in terms of frequency and some in terms of granularity and frequency of liquidity risk disclosure. One problem is that banks that actually follow the recommendation often disseminate the information in different places instead of collating it in one single place.

It would be easier to do a peer analysis if all the information was available for all peers in a similar format and frequency. Otherwise, investors are less likely to spend the time needed to carry out a peer analysis, which diminishes the benefit of the Pillar 3 requirements.

For these comparisons to exert peer pressure in order to develop the composition of liabilities, a more consistent approach to disclosure based on a template (e.g. common Excel files to download in a consistent liquidity template) is required. This would facilitate comparisons both within the same jurisdiction and between different jurisdictions. There is also the issue of accuracy of the data that is currently disclosed.

Chart 10 presents the maturity structure for loans and issued liabilities in a European mortgage-focused bank by time bucket, as disclosed in its 2015 Annual Report. The amount of debt issued is 10 per cent greater than loans and the bank would appear to have a conservative structural maturity mismatch with a much longer maturity of debt than loans. I would, however, like to make a couple of observations.

Chart 10. Loan and debt maturity by time bucket

Source: Liquidatum

According to the bank's disclosure, 69 per cent of their loans, predominately mortgages, mature within 1 year and only 2 per cent have a maturity period of more than 5 years. Is this maturity profile realistic or are the bank reporting the data only up to the next rate-fix and not up to the final maturity of the contract? Even if the customer can exit the contract without penalty at the next interest rate re-fix, the repayment is unlikely to be as a result of the borrower suddenly becoming wealthy but due to the original mortgage being replaced by a mortgage from another bank. The money being repaid to the original lender should be considered as interbank money.

From a systemic perspective, assuming the mortgages outstanding for the system are relatively stable, it is not prudent for these loans to be considered only up to the next re-fix as this provides a misrepresentation of the maturity of the loans in the system. In my opinion, this approach will lead to the system having a much shorter maturity of liabilities than assets and will promote financial instability.

4.2.2 Engaging shareholders

As was mentioned in Section 3, equity investors, in our experience, do not adjust earnings for differing liquidity risk profiles. This is due partly to a lack of understanding of how they might measure it and partly to the lack of transparency in the data set. Last but not least, bank recapitalisations and potential future recapitalisations have, not surprisingly, grabbed their attention.

Equity investors can use our core funding ratio to adjust earnings for differing liquidity risk profiles. The results are very consistent across most banks, ranging from 100 per cent to 120 per cent. This suggests that banks follow this metric in some form and our experience is that it is close to metrics used by banks to calculate their long-term funding plans. It thus forms a useful metric to be used to adjust bank earnings for liquidity risk and unlike the NSFR, it assumes a business-as-usual approach rather than a stressed environment.

This ratio can also be expressed as a deficit/surplus which can then be used to normalise earnings for differing long-term maturity mismatches. To normalise the earnings, the cost of closing the deficit must be estimated and applied consistently by banks (a Pillar 3 approach).

Examples: Two banks have earnings of SEK 1 billion per annum each, but one (Bank A) has a deficit on the above metric of SEK 20 billion and the other (Bank B) is neutral. Clearly, they have different liquidity risk profiles, and the earnings of Bank A are less robust than those of Bank B.

If you assume a standard cost for covering the gap of 100 basis points (1 per cent) per annum, then the liquidity risk adjusted earnings of the Bank A would be SEK 200 million less

(20 billion x 1 per cent) i.e. adjusted earnings of SEK 800 million compared to the bank's actual earnings of SEK 1 billion.

Requiring banks to disclose adjusted earnings would make equity investors more aware of the risks within the institutions in which they are investing. This could lead to an adjustment in their investment decisions and thus to other capital costs for banks. Banks would then be encouraged to make a cost-benefit decision between their liquidity risk and cost of capital, which would help to reduce the long term liquidity gap, compared to the current situation.

5 Final comments

The comments made in this article are intended as suggestions for how regulators might encourage banks to lengthen their liability maturities. There is no silver bullet and it is likely that a number of initiatives might be required.

These comments do not say whether it is appropriate for regulators to force banks to lengthen their maturities as this was beyond the brief of this article. Banks, particularly in Europe in comparison to some other regions, are complex beasts given the particular role they play in economic development through the provision of credit and maturity transformation. The absence of a pan-European securities market makes this role particularly important for European banks. It is a difficult juggling act to regulate privately-owned institutions (at least in normal times) that have such a high social and economic impact on society. This is the reason for my comments earlier that a political dialogue and clear understanding as to the level of support offered to banks are crucial in determining the risks they run.

Annex

List of European peers

The banks are presented in alphabetical order, with no connection to how the data is presented in the charts.

Banca Intesa Sanpaolo

Bank of Ireland

Barclays

BBVA

BNP Paribas

BPCE

BSCH (Santander)

Commerzbank

Crédit Agricole Group

Credit Suisse

Danske Bank

DNB Nor Group

Erste Group Bank

KBC

Lloyds TSB/ Lloyds Banking Group

Nationwide

Nordea

Raiffeisen Group

RBS

SEB

SHB

Société Générale

Swedbank

UBS

Unicredit

Why do Swedish mortgage bonds have short maturities?

Pehr Wissén*

The Swedish market for mortgage bonds has long been characterised by short maturities in comparison to other bond markets. There have been discussions on the underlying reasons for these relatively short maturities but no consensus has been reached.

At the same time, households have increased their indebtedness gradually over a long period of time, and chosen increasingly short interest-rate fixation periods when taking on mortgages. The combination of high indebtedness and short interest-rate fixation periods can lead to macroeconomic instability. Longer interest-rate fixation periods for households' mortgages could therefore be a step in the right direction towards a more stable system.

It has also been noted that, unlike the interest-rate fixation periods, the maturities of the loan contracts between Swedish households and the mortgage lenders are 30 years or more, while the mortgage bonds issued by the mortgage lenders have shorter maturities. Does this mismatch mean that the banks have liquidity risks? We need to look at the mortgage contract to understand why banks fund themselves the way they do. Banks choose maturity and interest-rate fixation periods for their own funding to finance lending to their customers. If we are to understand why there are such short maturities on the Swedish mortgage bond market, we must thus understand how the banks' loans to mortgage customers are structured.

The purpose of this essay is to shed light on what governs households' choices of interest-rate fixation periods for their bank loans and what governs the banks' choice of maturities for the bonds they issue. We shall look at the design of the loan contracts between banks and household, how this governs the choice of interest-rate fixation periods and how the banks decide on maturities for the bonds they issue. We will see that the loan contract leads households towards choosing short interest-rate fixation periods.

If the assessment is that this is a stability problem that needs to be remedied, the question arises as to what can be done to create longer interest-rate fixation periods on households' mortgages with the banks and longer maturities on the mortgage bonds issued by the banks. The two are interlinked. The final section in this essay comprises a list of possible measures to bring about longer maturities.

The first section analyses the contract between the bank and the mortgage borrower. Analysis is needed to understand how the bank chooses to fund its lending. The contract regulates the borrower's, that is, the household's, interest-rate risks and liquidity risks. We will see that the design of the contract gives households an incentive to choose short interest-rate fixation periods. This in turn leads to households exposing themselves to interest-rate risks. The design of the contract thus affects how households choose interest-rate fixation periods for their loans and also how the banks fund their mortgage lending.

We therefore need to understand how the lenders, the banks and/or mortgage companies, behave. We do this in the second section. The third section discusses those who invest in mortgage bonds, especially insurance companies. A fourth section is devoted to a description of the market where the banks refinance their mortgage lending. Lastly, we discuss some possible methods for influencing the choice of interest-rate fixation period by the household and the choice of maturity by the banks issuing mortgage bonds.

* I would first and foremost like to thank Peter Englund, who has read and discussed all versions of this paper with unfailing patience. Niklas Ekwall, Staffan Viotti, Lars Hörngren, Olof Sandstedt, Marcus Pettersson and Martin Flodén have all contributed constructive comments on the text. Per Törnkvist and Jesper Ragnvid were very helpful with the initial work. Naturally, I bear sole responsibility for the contents.

One conclusion of the study is that if households choose much longer interest-rate fixation periods for their mortgages, it will probably lead to banks funding themselves at longer maturities, that is, we will have a longer bond market. In Denmark and the United States, for instance, households choose very long interest-rate fixation periods for their mortgages. These countries also have markets for very long bonds. The section discusses what would be needed in Sweden so that households borrow at longer interest-rate fixation periods than today, which would in turn lead to a longer bond market.

Mortgage contracts govern households' choices

Households finance their ownership of single-family dwellings and tenant-owned apartments with equity (savings) and loans from banks and mortgage companies. The loan contract that regulates the mortgage is normally designed so that the bank lends a certain amount, with or without amortisation, with a repayment period of 30-40 years. In some cases, the timing of the repayment is not actually specified, the loan is until further notice. Thus, in the Swedish system the customer has no liquidity risk, as the loan amount is guaranteed over a very long period of time. Of course, the bank can terminate the agreement if the customer neglects payments of interest or possible amortisation. But as long as the customer makes these payments, the bank has very limited opportunity to terminate the loan.

However, the customer rarely or never fixes the interest on the loan for a period of 30 years. This is because the loan contract allows the customer to choose how long the interest on the loan should be fixed. The shortest interest-rate fixation period on the Swedish market is 3 months. All of the Swedish banks' loans to the household sector, broken down into interest-rate fixation periods are shown in Table 1.

Table 1. Interest-rate fixation period for all household loans

Monetary Financial Institutions' (MFI) lending to households broken down by interest-rate fixation period, January 2016 (SEK million)

Up to 1 year	1-5 years	Longer than 5 years	Total
2,421,991	816,973	75,438	3,314,403
73%	25%	2%	

Source: Statistics Sweden's Financial market statistics (table 7.4.1)

With a few assumptions¹ regarding where average borrowing lies in the maturity interval in Table 1, we can assess that households on average fund themselves with an interest-rate fixation period of one year. Most of the assets funded by loans are homes, but households also borrow to buy other assets.

Figure 1. The mortgage contract – average maturities and interest-rate fixation period



1. Contractual maturity
2. Average loan time in banks' balance sheets
3. Average interest-rate fixation period for the loan

¹ I assume that "up to 1 year" is 6 months, "1-5 years" is 2.5 years and "longer than 5 years" is 7.5 years.

When the loan is granted, the loan sum is paid to the borrower, who determines how long the first interest-rate fixation period shall be. Let us assume that the borrower chooses one year. After one year, however, the borrower has the right to terminate the loan and take out a loan with another bank or to choose another interest-rate fixation period for the loan. The bank does not have any corresponding scope to terminate the loan.²

A borrower wishing to redeem a loan at some other point than an interest-rate setting time, must pay an interest compensation to the bank. This interest compensation comprises a cost for the customer, which can be avoided by terminating the loan contract at a time when the interest rate is to be set.

From the customer's perspective, one can see the mortgage contract in the example as a one-year loan with a commitment from the bank to lend for a further 29 years.

From the bank's perspective, the loan is formally for 30 years, but as households rarely live so long in their homes and as customers sometimes change bank, the actual maturity is shorter. The bank cannot know when an individual customer will choose to redeem the loan. On average, some banks expect to have the loan on their balance sheets for seven years.³

There are no loans on the Swedish mortgage market with long interest-rate fixation periods, that is, longer than 10 years, and with a right for the mortgage customer to terminate the contract in advance without paying any interest compensation. In Denmark, on the other hand, there are loans with these conditions. There, a customer can get a loan where the interest rate is fixed for 30 years and with the right to redeem the loan at any time without any extra charge. When the customer get the loan, however, the bank does make a charge for the right to redeem the loan at its nominal amount at any time. The size of the charge varies in accordance with the market conditions. This is thus a form of insurance. The household insures itself against additional costs if it should need to redeem a loan in advance and can fix an interest cost it knows in advance over a long period of time. The US mortgage market has a similar construction, with the right to prior redemption of the nominal amount in return for a charge when the contract is first signed.

Households have high interest-rate risks

The homes we live in, whether they are single-family dwellings or multi-family dwellings, have a long physical lifetime. They often stand for 100 years or more. But we do not know how long people will live in their houses or apartments, as there are no statistics on this. On the other hand, we do know that around 10 per cent of the stock of tenant-owned apartments and 3.5 per cent of single-family houses are traded every year.⁴ An estimated calculation shows people living on average around 10 years in a tenant-owned apartment and around 29 years in a single-family house. Calculated with regard to the percentage of single family houses and tenant-owned apartments in the stock, people on average live for 18 years in the same place.

Chart 1 shows the development over time of all of the households' financial assets and debts, including home ownership.⁵

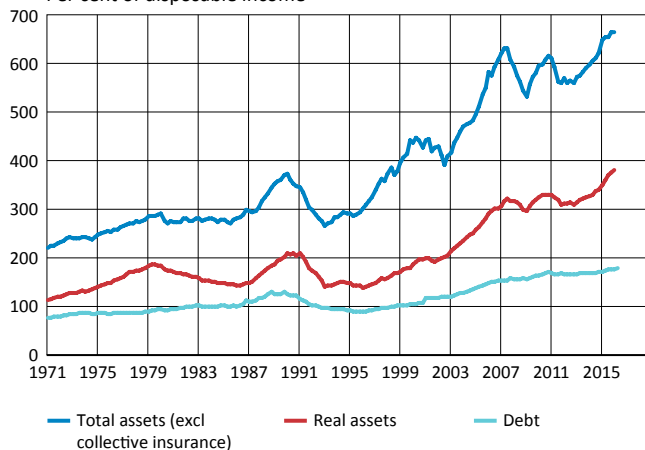
² If the borrower does not make any active choice of a new interest-rate fixation period when the first period of one year has expired, the loan will automatically be converted into a three-month interest rate for the following period.

³ Sveriges Riksbank (2014).

⁴ According to the Riksbank's calculations, based on Statistics Sweden's turnover statistics.

⁵ SNS Economic Policy Council report (2015).

Chart 1. Households' assets and debts 1971-2013
Per cent of disposable income



Note. Households' assets (inclusive houses, exclusive collective insurance) and debt in per cent of disposable income.
Sources: The Riksbank and Statistics Sweden

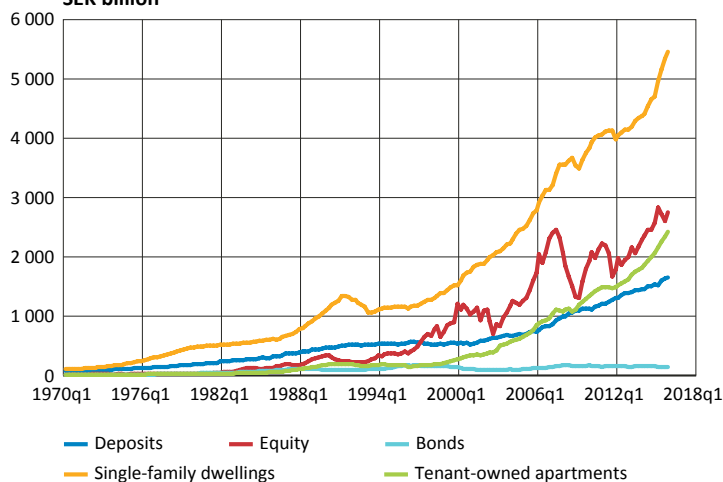
We see from Chart 1 that households' assets are greater than their debts. Their financial assets include equity and bonds (often held in mutual funds), cash and bank deposits. Real assets refer to single-family houses, second homes and tenant-owned apartments.

We lack sufficiently detailed statistics to be able to assess with any precision how the household sector would be affected by a rise in interest rates. The value of households' assets is dominated entirely by their holdings of single-family houses and tenant-owned apartments. If interest rates rise, the value of households' single-family houses and tenant-owned apartments will fall. Households' other assets are also negatively affected by an increase in the interest rate, but not as much. The debt is affected in the sense that it becomes smaller. As the debts have a short interest-rate fixation period, their present value is however not affected so much either if interest rates rise or fall (in other words, if the interest rate is fixed for one year there will not be so much "profit" or "loss" as if interest rates were fixed at 10 years). As assets are more sensitive to interest rate changes than debts, the value of households' balance sheets will increase when interest rates fall and decline when interest rates rise. If households had chosen longer interest-rate fixation periods on their debt, the value of their balance sheets would not have been as sensitive to changes in interest rates.

According to the Financial Accounts⁶, during the fourth quarter of 2015 Swedish households had assets to a value of SEK 12 432 billion. These can be broken down into 1 per cent bonds, 44 per cent single-family dwellings, 19 per cent tenant-owned apartments, 13 per cent bank deposits and 22 per cent equity. The breakdown over time is shown in Chart 2.

6 Statistics Sweden (2016).

Chart 2. The Swedish households' assets 1970-2015
SEK billion



Sources: Statistics Sweden and the Riksbank

Using a number of simplified assumptions, we can calculate roughly how sensitive to interest rates the household sector is.

If we assume that bonds fall 2 per cent in value if interest rates rise by one percentage point⁷, that the value of the equity and bank deposits is not affected at all by a change in interest rates and that the value of homes, single-family dwellings and tenant-owned apartments, falls by 3.5 per cent if interest rates rise one percentage point, then we can make a rough estimate.⁸

As we showed in Table 1, households have SEK 3,314 billion in debt, with an estimated interest rate fixation of on average one year. This means that the debts rise by 1 per cent, corresponding to SEK 33 billion, if the discount rate goes up by one percentage point. If the interest rate rises one percentage point, households' assets also decline in value by SEK 279 billion. The net result of the value of the household sector's balance sheet is then SEK 246 billion lower. This is of course a very simplified calculation that only gives an approximate indication.

The estimated net value of households' balance sheets here corresponds to what is referred to in corporate contexts as the value of equity. This value is one of the factors that determines how much one can borrow on the capital markets. When interest rates rise, households' capacity to finance themselves through loans thus falls, and when interest rates fall, it rises.

Households could become less sensitive to interest rate changes if they borrowed at longer interest-rate fixation periods. If they chose, for instance, 10-15 year interest-rate fixation periods, instead of today's loans with a one year interest-rate fixation period, the value of their balance sheets would not change as much when interest rates rise or fall.

But should households care about the value of their balance sheets? In principle, the following value answers the question: How great is the difference between the discounted present value of the cash flow from the assets minus the discounted present value of the cash flow from the debts? This net figure can be either positive or negative. If the net figure declines, it will become more expensive to finance the assets and the household will not be able to afford to consume so much. If the net figure remains stable over time, the household

⁷ We do not know how long the maturities for the households' bonds are. I assume as a standard that the bonds' sensitivity to interest rates corresponds to a two-year zero coupon bond.

⁸ The interest rate elasticity in housing has been estimated in connection with "The Riksbank's commission inquiry into risks on the Swedish housing market", from 2011. Three different models are estimated, and one finds that a rise in the interest rate of 1 percentage point leads to a fall in housing prices of between 2 and 5 per cent (see p.76). I assume a sensitivity midway between 2 and 5, that is 3.5.

knows how much it can afford and can plan its budget. The larger the figure, the better, as this means that the household has a larger equity. This means they have a better credit rating.

So why do households choose to finance themselves with such a short interest-rate fixation period? There are at least two possible explanations, which do not rule out one another.

Firstly, it could be so that the households only look at the interest rate on the loan and wants to minimize its borrowing costs. Normally, the market rate is higher for a long loan than a short one. One therefore expects that it will be cheaper to borrow short term. Interest rates in Sweden have now been falling almost without interruption since the mid-1990s. This is a twenty-year decline. With hindsight, the customer has minimized his or her interest expenditure in the short term by borrowing with a short interest-rate fixation period for the entire period. However, the probability of the falling interest rate trend continuing for another twenty years is very slight. The short-term borrowing that led to low borrowing costs came at the price of a higher risk for households as their equity risks are affected more by interest rate adjustments. If interest rates rise faster than markets have discounted today, it may be the case that, with hindsight, it will have been cheaper to have a longer-term loan.

A second possible explanation is that early redemption of a long-term fixed loan is expensive. The additional cost a household faces when redeeming a loan in advance at some other time than when the interest rate is due to be set is called interest compensation. A loan at a fixed interest rate for 15 years can thus create problems if one wants to sell the house sooner than expected as a result of unemployment, divorce, reduced work capacity or some other unforeseen event. On the other hand, if a household has a loan with an interest-rate fixation period of one year and redeems the loan when the interest rate was due to be set, it does not cost anything. Loans with a short interest-rate fixation period thus give better liquidity for the household and this liquidity has a value.

How should households choose interest-rate fixation periods?

There are studies in the academic research field “Household Finance” as to how households behave when choosing an interest-rate fixation period for their loans and also normative studies describing how a rational household *should* make a choice.

A study using data from a large number of countries⁹ has examined how households’ interest-rate expectations affect the choice between fixed and variable interest rates. The study concludes that households do not appear to take into account expectations of interest rates in the longer run. It is the short-term expectations that are important to them, and the difference in interest rates between the loan with a fixed rate and the loan with a variable rate at the time they borrow. The authors conclude that this behaviour is probably because borrowers want to borrow as much as their household budget allows to be able to buy the largest possible apartment or house.¹⁰

There are studies of how households *should* behave when they choose between a loan with a fixed interest rate and one with a variable rate.¹¹ Sodini and Guiso¹² conclude that loans at fixed interest rates should be preferred by households that strongly dislike risk and by households who borrow a large amount of money in relation to their income. A fixed interest rate should also be preferred by households with substantial variations in earned income and by those who expect to live in the same place for a long time.

9 Badarinza, Campbell and Ramadorai (2014).

10 Badarinza, Campbell and Ramadorai (2014).

11 Campbell and Cocco (2003).

12 Sodini and Guiso (2013).

Households with difficulties in borrowing often prefer to borrow at a variable rate that is usually lower than the fixed rate as such households want to borrow the maximum amount possible.

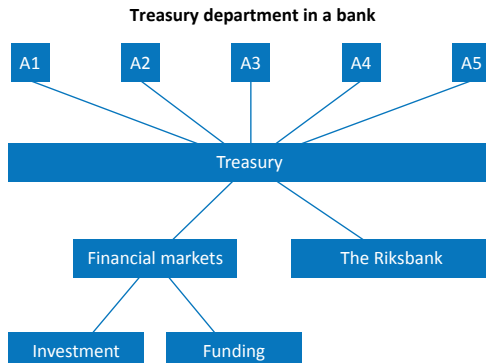
There is thus no general advice on how a household should choose between fixed or variable interest rates. A number of factors have an impact and it is important that the supply loan possibilities is so large that the funding needs of all types of household can be resolved. The percentage of short-term borrowing among all households in Sweden thus depends, if they are rational and behave in the optimal way according to the model, for instance on how large a share of the households have had substantial variations in income, how many borrow a lot in relation to their income and other factors that are important in the choice of fixed or variable rates. As we do not know how large the shares of the population are, we do not know how large the percentage of short-term borrowing “should” be for the entire population, if they behave rationally.

How the banks fund mortgages

When the 1990s crisis occurred in Sweden, the major banks did not have such extensive treasury departments as they have now. The data support for following up exposures to liquidity risks had not really been built up. The crisis caused the major Swedish banks to develop their so-called treasury departments substantially.

The basic structure of a treasury department is similar in all banks. The figure below illustrates this:

Figure 2. Sketch of the treasury department in a bank



In the general sketch above, A1-A5 are different business areas in a bank. Treasury is the central financial department that functions as an internal bank and also makes investments and borrows on the financial markets on behalf of the bank.

If a business area wants to give a mortgage that nominally has a maturity of 30 years, which can be expected to be on the bank’s balance sheet for seven years, and where the household wants to fix the interest rate on the loan for one year, the business area receives an internal interest rate from the treasury department. Internal interest rates are one of a bank’s most important methods of steering operations. The price reflects what it costs the bank to borrow on the market. The better rating the bank has, the cheaper it is to borrow, which gives the business area better competitiveness as it may borrow the money – the commodity – more cheaply than a competitive in a bank with a poorer credit rating. The price of the internal loan also reflects the capital cost of that particular loan and maturity. If the bank is counting on having the loan on its balance sheet for seven years, the bank must finance the loan for seven years to avoid liquidity risks and this affects the internal interest rate. Finally, the bank needs a margin to cover the other costs. If another business

area receives household deposits or other fixed-term deposits from a company, this also goes to the treasury department and is paid for with another internal interest rate. In this way, the treasury department is an internal counterpart that sets internal prices on all of the transactions that come into the bank and go out of the bank. The flows in and out of the bank do not necessarily match one another with regard to maturities, however. It is then the task of the treasury department to attain a degree of matching between the flows in and out of the bank that corresponds to the bank's risk preferences as expressed in the limits from the board of directors.

The treasury department calculates on a daily basis the bank's position with regard to liquidity and takes decisions on which markets the bank should borrow, what maturity the loans should have and whether to invest more or less money in the bank's liquidity reserve. The liquidity position is carefully monitored and reported regularly to the CFO, the CEO and at board meetings. The financial supervisory authority has insight into the bank's liquidity position. At the end of the day, it is the treasury department that makes liquidity-adjusting transactions with the Riksbank.

In addition to matching the balance sheet, the treasury department usually manages a liquidity reserve. Following the financial crisis, the major Swedish banks have built up large liquidity reserves that have grown from just under SEK 1,400 billion in 2011 to almost SEK 2,600 billion in 2016.

It is the decisions taken by the bank's customers that determine the maturities of the assets the treasury department is to match. If the bank's customers were to begin to demand fifteen-year interest-rate fixation periods instead of one-year periods for their mortgages, the treasury department could reasonably issue 15-year bonds to match the interest-rate fixation period on the lending. A customer who chooses a fifteen-year interest-rate fixation period gives a clear signal of his or her intention to retain the loan with the bank that long. If the bank wants to minimise its interest-rate or liquidity risks, it needs to match the fifteen-year interest-rate fixation period by borrowing for an equally long period on the market. If the average time the loan can be expected to stay on the bank's balance sheet increases, the bank will thus increase the maturity of its external funding.

New regulations following the crisis

The banks' treasury departments developed considerably after the 1990s crisis in Sweden. The same thing has happened after the crisis that began in 2007. The banks' treasury departments have since then obtained greater resources and learnt a lot about crisis management and what one can do to dampen the effects of a financial crisis in advance.

Moreover, as a reaction to the experiences during the financial crisis, a joint international regulatory framework was introduced to reduce liquidity risks in banks. The regulations created two measures of liquidity risk and set limits as to how large risks the banks may take in terms of these measures.¹³

One of these measures is called the Liquidity Coverage Ratio (LCR) and means that the banks must calculate how much funding could disappear in a very adverse scenario, a systemic crisis, and also calculate how large a liquidity reserve the bank has at its disposal if the funding disappears. The bank should always have sufficiently large reserves to manage being cut off from new funding for 30 days.

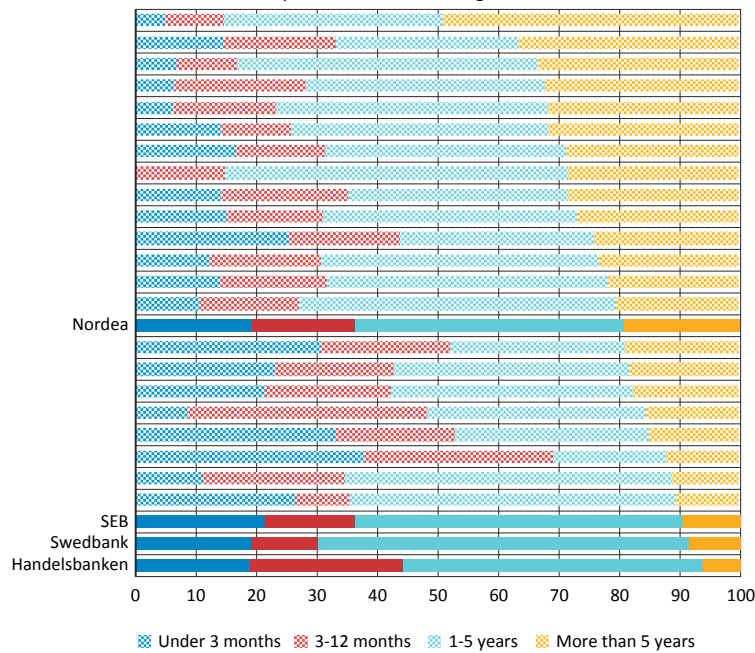
The second measure is called the Net Stable Funding Ratio (NSFR). It aims to measure the degree of matching in maturities for assets and liabilities on a bank's balance sheet. Different assets and liabilities are allocated weights that reflect how long they are. For instance, equity capital is eternal and included at full amount, while short-term securities deposits of, for instance, 30 days are not included at all.

¹³ See Marcus Pettersson's article in this study.

The ratio between weighted liabilities and weighted assets shall be greater than 1, according to the regulation. A bank must therefore have more stable, long-term funding than one has long-term commitments.

One weakness of the NSFR is that all funding of more than one year is considered to be long-term and worth an equal amount when it comes to creating a stable liquidity situation. Mortgage funding that runs for a year and a day thus has the same weight as fifteen-year funding with regard to meeting the NSFR. The regulations thus do not mean that the banks have any clear incentives to match their long-term commitments. Despite this, the Swedish banks' matching of assets and liabilities has improved since 2007.¹⁴

Chart 3. The banks' funding broken down according to maturity.
December 2015, per cent of outstanding volume



Note. Refers to outstanding securities excluding subordinated debt. The shaded bars show a sample of European banks for comparison.
Sources: Liquidatum and the Riksbank

Across Europe, the relative amount of banks' short term funding are both higher and lower compared to Swedish banks. The Swedish banks stand out in that they have relatively little funding at maturities in excess of five years. Nordea is the Swedish bank that has the most borrowing over five years, which is probably due to the Danish mortgage market, which has long maturities.

The financial crisis and the ensuing regulations have already affected how the banks manage their liquidity risks. However, the new regulations have not yet been implemented in full so it is too early to say how great the final effect will be on the banks' liquidity management.

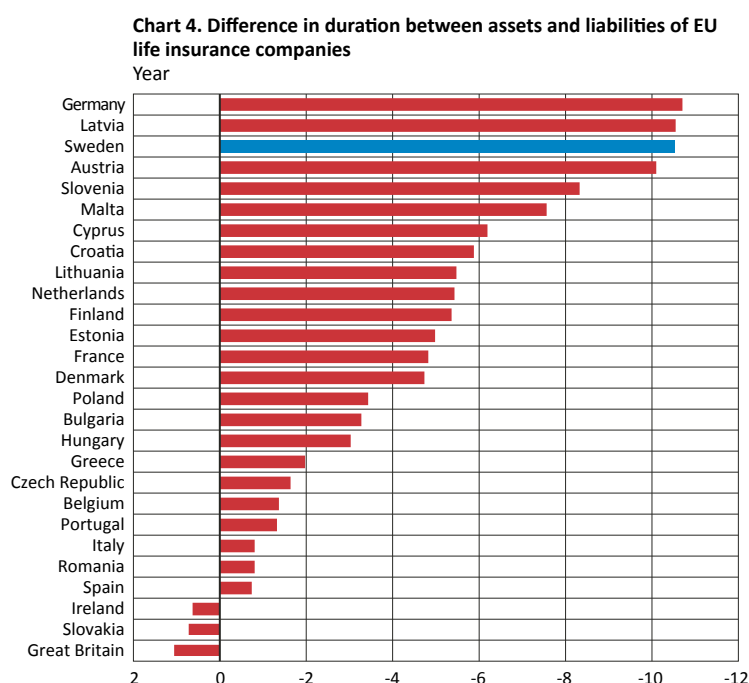
¹⁴ See Marcus Petterson's article in this study.

Insurance companies are investing in Swedish mortgage bonds

The mortgage bonds issued by banks are bought by investors. Swedish insurance companies are the biggest investors in Swedish mortgage bonds. Life insurance companies and pension insurance companies have long-term commitments of on average 15 years.¹⁵

The value of the insurance companies' balance sheets rises when interest rates go up. Their interest-bearing liabilities have longer maturities than their interest-bearing assets. They can also use the derivative markets to protect themselves against the effects of fluctuations in interest rates. However, like the banks, it is associated with costs and some risk¹⁶ when they protect themselves on the derivative markets.

Chart 4 shows how interest-sensitive (parts of) the Swedish insurance companies are in relation to insurance companies in other countries:



Note. Based on the EIOPA 2014 stress test for EU insurance companies. The chart refers to the duration of assets and liabilities.

Source: IMF Global Financial Stability Report 2015:1

The chart shows the difference in duration¹⁷ of insurance companies' interest-bearing assets and liabilities. Equity and property are thus not included. Duration is a measure of the average maturity for a bond and says something about its interest sensitivity. The higher the duration, the more sensitive the bond is to changes in interest rates.

If the value on the horizontal axis is zero, the company is matched so that the maturity of the bonds and liabilities has the same duration. This means that the insurance company is not sensitive to interest rate changes. One usually says that the balance sheet is immunised. Bars to the right of the line mean that the company has liabilities with a higher duration than the assets. This means that if interest rates rise, the balance sheet will be worth more while it will lose value if interest rates fall. This is the reverse relationship to households. Insurance companies can also make interest rate swaps, but probably do so to a lesser extent than the banks.

¹⁵ EIOPA (2014).

¹⁶ In particular, counterparty risk.

¹⁷ For a definition, see Nyberg, Viotti and Wissén (2006).

The chart shows that, for instance Spain and Italy have insurance companies that are relatively well matched¹⁸. Sweden, on the other hand, is one of the most poorly matched countries, together with Germany, Latvia and Austria.

According to a calculation by Finansinspektionen¹⁹, on 30 June 2009 a 1 per cent lower interest rate on all maturities would have meant that the value of the liabilities in the Swedish insurance sector would rise by around SEK 150 billion. Swedish interest-bearing assets in insurance companies would only rise by SEK 35 billion, so the net effect would be minus SEK 115 billion. If households borrowed at longer interest-rate fixation periods, the banks issued longer-term bonds and the insurance companies bought these, a large number of balance sheets in the economy, including those of the insurance companies, would be less interest-sensitive.

The financial system is sensitive to interest rates

When interest rates increase, households' living costs become more expensive. The value of their assets falls when interest rates rise – all else being equal. The value of their liabilities falls too, but not as much as they are so short-term. Thus, the value of the households' equity falls when interest rates rise. We saw that a rough estimate shows that households' balance sheets fell SEK 246 billion in value when interest rates rose by 1 percentage point in the fourth quarter of 2015.

The banks' income statements are not affected as dramatically by interest rate fluctuations. They can use the derivative markets to manage inadequate matching between interest-rate fixation periods for liabilities and assets.

The insurance companies ultimately benefit from rising interest rates. They have much longer maturities on their liabilities than on their assets. We saw that the value of the insurance sector's balance sheets would have increased by SEK 115 billion on 30 June 2009, in the case of an interest rate rise of 1 percentage point.

The fact that the financial system is sensitive to interest rates is not necessarily a problem. Problems can arise if some part of the financial system has such a high sensitivity to interest rates that it can threaten the financial system. This is what the debate on households' debt/equity ratios and ensuing exposure to interest rate rises is all about.

The Swedish bond market today

Put simply, one can say that interest rate fluctuations redistribute wealth between the generations that are active now and tomorrow's pensioners. As those active today will become pensioners later, they may be the same people. The redistribution of wealth occurs across an individual's life cycle. The redistribution is due to assets and liabilities in the different sectors not being matched with regard to interest-rate fixation periods.

We do not know what percentage of the household sector should have loans with fixed interest rates and what percentage should have short fixation periods if households made rational choices. This is an interesting research question, but it would require detailed data at individual level to answer it. What we do know is that the short interest-rate fixation periods have increased substantially in recent years, and it does not appear likely that the factors that explain how households make rational choices have changed significantly.

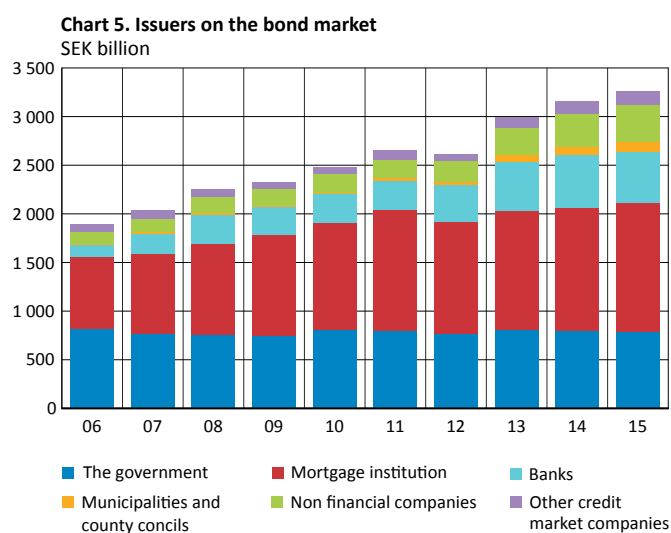
If Sweden is to have an efficient market for long-term mortgage bonds with maturities longer than those we have today, it will require household to choose longer maturities. But

¹⁸ The fact that equity and property is not included is a problem. However, it is also likely that they would decline in value when interest rates rise, just like bonds. On the other hand, it is not possible to define the duration of a property or share.

¹⁹ See Finansinspektionen (2009), page 27.

this also requires the possibility for early redemption of the loan as in Denmark or the United States.

So what kind of a bond market do we have now? Sweden has had an efficient bond market for more than 30 years.²⁰ It was long dominated by government bonds, but in recent years the mortgage bond market has taken over. Chart 5 shows the different types of bonds.



Note. Outstanding nominal amount.
Sources: Statistics Sweden and the Riksbank

We see that the market for mortgage bonds has grown substantially and that it is currently the largest one. The bonds cannot be redeemed in advance at their nominal amount and are not especially long. The average maturity of a Swedish outstanding mortgage bond (also called “covered bonds” because of their special construction²¹) was at the end of 2012 scarcely three years, while the average maturity for newly-issued mortgage bonds was four and a half years. This was less than in many other European countries. Around 40 per cent of mortgage bonds in other European countries had maturities in excess of seven years.²² Evidently, it is possible to create longer bond markets than the Swedish one.

Insurance companies are the largest investor category. The next largest is termed “abroad” in the statistics and consists of funds managed abroad and foreign insurance companies. The breakdown into investment categories is shown in Chart 6.

Swedish banks issue to some extent mortgage bonds to each other and the AP pension funds are also substantial investors.

20 See Wissén (2014).

21 See Sveriges Riksbank (2015).

22 See Sandström et al. (2013).

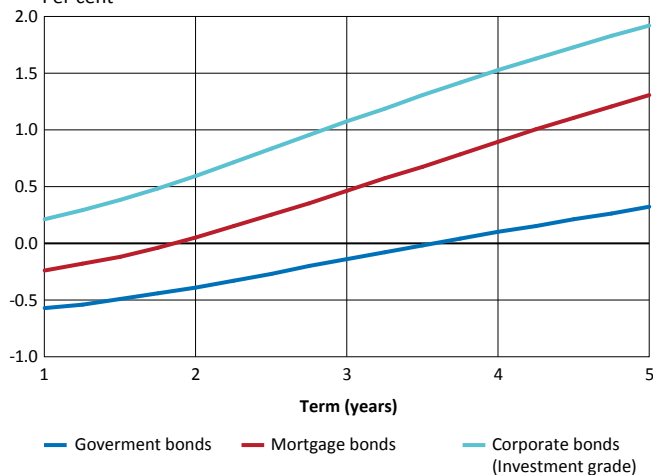
Chart 6. Investors on the bond market
SEK billion



Sources: The National Pension Funds, Statistics Sweden and the Riksbank

As shown in Chart 7, in December 2015 the so-called forward term premia for going from a very short loan to a five-year loans was around 80 basis points.

Chart 7. Yield curves for Swedish bonds, December 2015
Per cent



Sources: Thomson Reuters and the Riksbank

The size of the premium the bank has to pay to extend its financing varies over time and depends on market participant's expectations, among other factors.

Conclusions

The above discussion leads to some observations:

The banks have become increasingly better matched in terms of liquidity in recent years. The two measures of liquidity risk, the LCR and the NSFR, govern the banks' relationship to liquidity risk, but so do the limits set by the banks' boards of directors. The NSFR regards all financing that runs for more than one year as long-term, and does not differentiate between financing that lasts one year and one day and financing over 15 years.

In a **European comparison**, Sweden has a small market for covered bonds with a maturity of more than five years.

Individual households have chosen ever shorter interest-rate fixation periods on their mortgages in recent years. There are at least two possible explanations for this. *Firstly*, we have had falling interest rates over the past 15 years and borrowers have minimized their interest expenditure by choosing short interest-rate fixation periods. There are other factors that should affect the choice of short or long interest rates, but in the advice given, interest expectations have often been put forward as important. However, it does not appear very probable that we will see falling interest rates over the coming 15 years, too.

Secondly, the loan contract between the bank and the household is constructed so that it is expensive to prepay the loan. If the household were to borrow with an interest-rate fixation period of fifteen years and then after five years suddenly need to sell the house for some reason, the household would have to pay a high interest compensation. If the household were instead to choose, for instance, a one-year interest-rate fixation period, it would only have to wait at most a year before the loan matured and could then redeem it without any extra cost. Short interest-rate fixation periods give a liquidity in households' loans that has a value. However, academic research shows that different households should choose different interest-rate fixation periods for their loans, based on variables such as income, wealth, risk preferences, stability in earned income and so on. As the supply of long-term loans is as limited as it is now, one can fear that households that should borrow with long interest-rate fixation periods are not doing so because there is no opportunity to do so or because it is too expensive.

Swedish insurance companies have short interest-rate fixation periods on their assets, in an international comparison. The composition of their balance sheets means that the insurance companies' balance sheets rise in value when interest rates rise and fall in value when interest rates fall. In the household sector the effect is the opposite, and the banks are on the whole neutral to changes in interest rates.

The lack of matching between interest-rate fixation periods and maturities for households and insurance companies creates at least **two problems for financial stability**: *Firstly*, the interest-rate risk on both households' and insurance companies' balance sheets is high. This means that if we have a large upward or downward shift in interest rates, it will have major consequences for the value of households' and insurance companies' balance sheets. If interest rates rise, it will be more expensive for households to pay interest on their loans with short rates. This can mean that they reduce their consumption, which entails a decline in total demand in society and falling growth. At the same time, the value of the households' equity falls. This means they have a poorer credit rating. They find it more difficult to borrow money and therefore reduce their investments, too. Some sensitivity to interest rates in the household sector need not be a problem. However, it is a fact that households have gradually chose increasingly short interest-rate fixation periods on their mortgages and at some point we will find that this sensitivity is too great.

Secondly, if many households have short interest-rate fixation periods on their loans, the effects of a financial crisis will be tangible for a large group of households. If all interest-rate fixation periods are three months and a financial crisis occurs, this means that the entire loan stock funding homes will be allocated new interest rates during the crisis period. On the other hand, if the entire housing stock is funded by thirty-year loans, evenly distributed over the 30 years, then only 3 per cent of the stock will be affected by the crisis. The size of the loan stock allocated new interest rates during a crisis affects the impact of the crisis on the economy.

Possible measures

We have seen how the formulation of the mortgage contract contributes to households choosing short interest-rate fixation period for their mortgages. This makes households sensitive to changes in interest rates. If households chose longer interest-rate fixation period, this would reduce their sensitivity to interest rates. If one assesses that sensitivity to interest rates has become too high, there may be reasons to seek ways of giving households an incentive to choose longer interest-rate fixation periods for their loans. If they did this, it is likely that the banks would also choose to refinance their mortgages with longer-term borrowing. If households were to choose interest-rate fixation periods of fifteen years, the probability that the loan would stay longer on the bank's balance sheet would increase and it is then reasonable to believe that the bank would choose to refinance itself with a fifteen-year bond loan. When a household chooses a fifteen-year interest-rate fixation period and redeems the loan in advance, the bank receives interest compensation, which means that it still has an incentive to take up a fifteen-year bond loan.

Here are five possible measures, of different types, which could give households and/or banks incentives to choose longer interest-rate fixation periods for mortgages and longer maturities for bond loans. Reasonably, the measures could also lead to the bond market developing towards longer maturities for bond loans. The list is not a suggestion of what measures should be taken. It is a list of possible policy measures that could lead to longer maturities being chosen. Several of them have not been tested in Sweden and require further investigation.

Refine the Net Stable Funding Ratio. We noted above that the measure used by the Basel 3 regulations to influence the banks' matching between lending and funding at different maturities, the Net Stable Funding Ratio (NSFR), does not make any distinction between funding at one year and funding at thirty years. Both are considered long-term funding. This makes it a blunt instrument for measuring liquidity risk. As funding at thirty years is normally more expensive than funding at one year, this means of measuring risk gives a cost-conscious bank that wants to meet the requirement in the regulation a reason to choose the one-year funding and thus save money. There is thus reason to complement the NSFR with a further measures that takes into account the actual maturity of the banks' issued securities. The best way of doing this would be to give gradually higher weight to funding the longer the maturity is. This principle is already built into the NSFR and just needs to be applied more consistently. The measure would be a means of giving the banks the incentive to extend their funding without affecting households' choice of interest-rate fixation period.

Incentives for households to extend the interest-rate fixation period on their mortgages. It could be in the interests of financial stability to have longer interest-rate fixation periods on households' mortgages, but this would entail higher costs for households. Research²³ indicates that the factors determining whether a household should chose short-term or long-term funding are the households' income, wealth, access to bank financing, job security and willingness to take risk.

To give households an incentive to choose the longer-term and more expensive loans, one could consider setting the amortisation requirement lower for longer-term loans. In this way, the effects on households' cash flows would be alleviated or eliminated entirely without this entailing any direct budgetary costs. The regulations would become a little more complicated, but would give incentive to borrow at longer periods, reduce households' risk exposure and at the same time possibly create a larger supply of long-term bonds.

One might also consider giving households that choose longer interest-rate fixation periods a higher loan-to-value limit. If the household wished to have a short interest-rate

23 See Campbell and Cocco (2003).

fixation period to gain a low mortgage rate to be able to afford a larger loan and thereby a larger apartment, the effect of a long and more expensive interest-rate fixation period could be parried by raising the loan to value limit.

The loan to value limit has been lowered to reduce household indebtedness and thereby their risk-taking. However, all else being equal, the measure gives households an incentive to choose shorter interest-rate fixation periods.²⁴

Extend the products on the market with loans where the customer pays in advance for the right to repay the loan without interest compensation. If households are to have an incentive to borrow at long interest-rate fixation periods, the high costs of early redemption of loans are a problem. One way of dealing with this problem would be to create a market similar to the United States and Denmark, for long mortgages (ten years or more) and mortgage bonds, where the customer has an option to redeem the loan early at the nominal amount regardless of how high market rates are. A mortgage customer who unexpectedly has to sell his or her home and redeem the loan thus does not face any extra cost for doing so. On the other hand, the customer would have to pay an option premium for this right. This kind of option premium could be calculated theoretically and also priced by the markets. This is how it is done in the United States and Denmark. If interest rates fall, it will be worthwhile using the option and redeeming the loan and then taking up a new loan at the new, lower interest rate. A customer who has a loan with this property thus does not risk being stuck with expensive financing if interest rates fall.

Create means of control for the authorities to extend funding. In Denmark there are policy parameters that do not exist in the Swedish system. There are a number of regulation requirements as to how the banks' lending and borrowing should be distributed across maturities ("the supervisory diamond"). These requirements are changed every sixth month. If a bank gets into conflict with the regulations, it has to change its maturity structure. In the Danish system, the banks' lending and borrowing must match one another ("the balance principle"). This means that if the banks are to be able, for instance, to extend their funding, the bank must steer its customers' borrowing towards longer maturities. The banks do this by changing their pricing. If the balance sheet is to be steered towards longer maturities, one increases the interest rates on the shorter maturities so that the customers have an incentive to choose long maturities.

It is difficult to assess whether this would be possible to implement in a Swedish environment. It is a means that is relatively new in Denmark.

Create a larger rental market. Many households do not reasonably want to borrow large sums of money to have somewhere to live. Companies with labour forces that move often tend to complain that it is difficult and expensive to find anywhere to live in Stockholm. If one buys a tenant-owned apartment, one exposes oneself to a significant financial risk, which may perhaps not be so attractive if one only expects to have the home for a few years. It is also reasonable to believe that a housing company that finances a stock of rental properties is more professional in funding the stock than a group of tenant-owners would be and that the company would also choose longer-term funding. A larger stock of rental properties would reasonably be a step in the right direction towards a more stable financial market, at least in the dimension we discuss here.

²⁴ The conclusion is complicated by the banks making their own "discretionary income calculations". If the customer chooses a short interest-rate fixation period to be able to afford to borrow a lot but the bank calculates on the basis of a five-year interest rate and is unwilling to lend more than the customer can afford to pay a five-year interest rate on, the above reasoning will not work.

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