

Economic Commentaries

Market liquidity on the Swedish bond market and its importance for financial stability

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In recent years, several international authorities and institutions as well as market participants have expressed concern about the deterioration in market liquidity, especially for bonds. Such a deterioration can threaten financial stability, particularly if it is unexpected, severe and prolonged. In this article, we look at how market liquidity on the Swedish bond market has evolved after the financial crisis and whether this development poses any risk to financial stability. We use quantitative measures to analyse how market liquidity has evolved. But different measures provide somewhat divergent pictures and they are not all that easy to interpret. Even if it is therefore difficult to draw any unequivocal conclusions about how market liquidity has evolved, there are indications that it has deteriorated somewhat. For the time being, the development does not seem to have increased the risks to financial stability but it does not rule out negative consequences in the future.

In recent years, market participants and several international authorities and institutions have expressed increased concern about a global deterioration in market liquidity for bonds. Several analyses of how market liquidity has evolved have been performed.² Several of these analyses conclude that market liquidity deteriorated for bonds during the financial crisis. Thereafter it has continued to decline gradually for some bonds globally, while it has improved for others.

If market liquidity for a bond declines, it will be more difficult for its holder to buy and sell significant volumes of the bond, at a low transaction cost and without the transaction having a negative impact on the market price. A deterioration of market liquidity can increase the risks to financial stability. This is particularly true if, in the event of a sales pressure, it unexpectedly drops sharply for bonds that normally have a good level of market liquidity, and persists for such a long period that investors are no longer able to hold off selling their bonds until it improves again.

The aim of this economic commentary is therefore to examine how market liquidity for Swedish bonds has evolved since the financial crisis and whether this development has increased the risks to financial stability in Sweden. The analysis is limited to bonds issued in Swedish kronor by Swedish banks, non-financial corporations or the central government.³ Covered bonds are an important source of funding for Swedish banks and are therefore of considerable importance for financial stability in Sweden, as government and corporate bonds are as well.⁴ Furthermore, the three markets are not entirely isolated from one another, which means that if market liquidity declines on one of them, it can lead to consequences on the others and, in the long term, for financial stability.

We begin with a review of what market liquidity is and its importance for the efficiency of the bond market and for financial stability. We then look at how market liquidity has evolved, in particular on the Swedish bond market, and what may have driven this development.

1. Helpful comments and suggestions on earlier drafts by Riksbank staff are gratefully acknowledged.

2. See, for example, the IMF (2015), BoE (2014) and PWC (2015).

3. One could also include inflation-indexed bonds issued by the Swedish government as well as unsecured bonds issued by banks, local authorities and county councils. However, these bonds are not as central to these participants' funding.

4. Market liquidity for bonds issued in foreign currency by Swedish participants can also be of significance for financial stability in Sweden as such bonds constitute an important source of funding for many Swedish participants. These bonds are not included in the analysis due to a lack of data.

Market liquidity

There are different types of liquidity

Different participants such as the public sector, banks and non-financial corporations can obtain funding on the bond market. They do this by issuing bonds on what is known as the primary market. On a primary market, where it is easy to issue bonds, funding is easy to obtain. In such a situation, *funding liquidity* is said to be good. It is easier to achieve good funding liquidity on the primary market if investors who have bought bonds on the primary market can sell these on to other investors. They do this on the secondary market, which is where different investors can sell and buy the bonds several times before they mature. *Market liquidity* is, in its broadest sense, a way of describing how rapidly and at what cost a financial asset can be converted into liquid funds. When significant volumes of a bond can be rapidly bought and sold on the secondary market at a low cost and without the transaction having a marked effect on the market price of the bond, market liquidity is said to be good.⁵

There are several different dimensions of market liquidity

There are several different dimensions of the concept of market liquidity. The economic literature normally lists four different dimensions of market liquidity:

- *Immediacy*, which refers to how quickly an order can be executed and settled.
- *Tightness*, which refers to transaction costs, for example the difference between bid and ask prices.
- *Depth*, which refers to the spread of bid and ask interest around the prevailing market price.
- *Resilience*, which refers to the degree of new bid and ask interest that arises after a sudden imbalance in supply and demand of a bond, and that pushes the market pricing back to its fundamental value.

In practice, however, it is not easy to obtain a picture of the development of a bond's market liquidity. There is, for example, no single measure that captures all the dimensions of market liquidity. Neither is there always data available to measure all the dimensions.

Market makers' significance for market liquidity

Bonds are usually traded OTC (Over The Counter).⁶ Trade is facilitated by the existence of market makers, normally banks, who, with the help of their balance sheets, are ready to act as intermediaries in the event of large differences in supply and demand. The market makers have often, in some way – formally or informally – undertaken to do this. In this way, they assist investors with market liquidity when it is needed and thereby help to improve market liquidity. To be able to do this, market makers keep an inventory of bonds that they can either sell bonds from or add purchased bonds to. These inventories are referred to as trading books. If an investor demands a bond that is not available in the market maker's trading book, the market maker can borrow the bond on the so-called repo market.⁷ On the repo market, the market maker can also obtain funding for parts of its trading book by borrowing with the use of the bonds as collateral. Hence, for OTC trading, it is not necessary that there is a counter-interest on the market for an investor to see his deal go through. Instead, the market maker can act as counterparty.

5. In addition to funding liquidity and market liquidity, there is also the concept of *central bank liquidity*. The Riksbank can create central bank liquidity via its different types of facilities or by buying financial assets on the market. When the Riksbank raises the balance of one of its counterparties' accounts at the Riksbank, in exchange for collateral or as payment for asset purchases, the amount of liquidity increases in the form of central bank money in the banking system.

6. Over-the-counter trading is conducted outside regulated trading platforms.

7. A repo transaction with bonds means that the bond holder sells the bond to a counterparty in exchange for liquid funds. At the same time, the parties agree that the seller will purchase the bond back again at a later point in time.

The main explanation why bond trading is done over-the-counter is because the interests of the buyer and seller do not always coincide in the same bond and at the same time. One explanation for this is that issuers on the bond market usually have a large number of different bonds outstanding in contrast to, for example, equity markets, where there are only one or two equities for each company. Another explanation is that there are fewer participants on the bond market than on the equity market. The majority of them are also professional investors, which means that the transactions performed are often large and relatively few in number. Furthermore, bonds have a limited maturity and it is common for investors to keep them until maturity, which reduces the number of transactions.

OTC trading with market makers has its advantages for participants who wish to be able to sell quickly on occasions when there are no matching purchase interests from other investors. The risk is, however, that investors have too much faith in the ability of market makers to contribute market liquidity also under stressed market conditions. It is, however, not certain that market makers are able to act as counterparties on the market in such a situation.

Market liquidity is of significance for the conversion of savings into investments

A bond's market liquidity is of significance for how well the bond market functions. The bond market enables savings to be converted into investments as efficiently as possible. It constitutes a funding option for, among others, the public sector, banks and non-financial corporations. But for market-based funding to be a good option, the market must function well. Generally speaking, well-functioning and efficient markets are characterised by, for example, the existence of a secondary market on which it is possible to trade issued securities. Participants who obtain funding through the bond market don't necessarily have the same time horizon as lenders. If, for example, a company wishes to fund a lengthy project by issuing a long-term bond at the same time as lenders do not wish to grant a similarly long-term loan, lenders may still wish to invest in the bond if they know that they can sell it on the secondary market.

In the same way, market liquidity on the secondary market is important for investors such as investment funds. They wish to have the option of being able to quickly trade parts of their bond holdings depending on the purchases and withdrawals made by investors into/from the fund. They may also wish to make reallocations among their investments. Many financial assets, such as investment fund holdings, are also valued on a regular basis based on the prices on the secondary market. This is also true for assets that are submitted as collateral either in exchange for funding or when trading derivatives. The valuation of such assets will be more reliable if the assets are traded on a secondary market as it is then easier to verify the price. In order to use an asset as collateral, it must also be possible to sell it quickly, and preferably at least at the same price as the value for which it is collateral. A well-functioning secondary market facilitates this.

Market liquidity does not have to be good for every individual bond. There are bonds that can be issued on the primary market despite the lack of a well-functioning secondary market. Some investors, such as life insurance companies, often invest in bonds with the intention of keeping them until maturity. For such assets, there is generally no expectation of good market liquidity from investors.

Market liquidity also varies over time. Sometimes, there are periods when market liquidity temporarily declines. This does not normally lead to any problems for the efficiency of the market. If the markets are functioning efficiently, the most liquid bonds will have a lower risk premium and vice versa. This means that those who issue bonds with poorer market liquidity will have to pay more to borrow than those who issue more liquid ones. The

purchaser of a bond with poorer market liquidity is therefore compensated for the risk of it being more difficult to sell on the secondary market than more liquid bonds.

Substantially reduced market liquidity poses risks to financial stability

If a bond market stops working as a result of a lack of market liquidity, it may have negative effects on the financial system, the real economy, and ultimately financial stability. Gradual deterioration of a bond's market liquidity need not be negative for financial stability, however. From a financial stability perspective, it is not the average level of market liquidity that is most important but rather what happens when market liquidity, in the event of sales pressure, unexpectedly drops sharply for bonds that normally have a good level of market liquidity, and it persists for such a long period that investors are no longer able to hold off selling their bonds until it improves again.⁸ In this section, we analyse how this can pose risks to financial stability.

It is often not a deterioration in market liquidity in itself that triggers a negative chain of events that may later have negative consequences for financial stability. It is more likely the case that a deterioration in market liquidity can amplify the chain of events in a stress scenario and lead to greater price falls than the trigger event would otherwise justify. There are several different factors that could trigger a stressed scenario. It could, for example, be a result of a fall in Swedish housing prices (The Riksbank 2015c). Such a situation can lead to investors becoming uncertain about what the covered bonds are actually worth. If they perceive there to be a lack of information about the value of the bonds, it may lead to a reduction in their willingness to own them. This may amplify the sales pressure and lead to a deterioration in market liquidity for this type of bond. If the deterioration is prolonged, there is a risk that the investors' confidence in the bond may fall, which may in itself lead to its market liquidity declining even further.

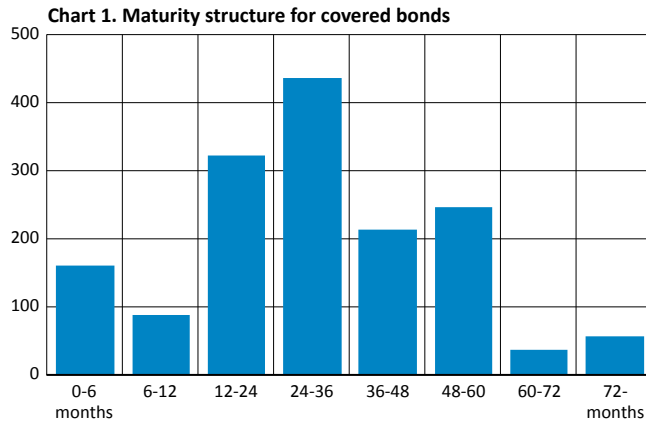
In the worst case, it may lead to the cessation of trading on the secondary market. In such a scenario, the ability to obtain funding on the primary market may also deteriorate as issuers need to compensate investors for the liquidity risk by paying a higher rate of interest when they issue new bonds. Depending on how much compensation investors require for the liquidity risk, the costs may become so high as to make the issuing of new bonds economically indefensible. In the worst possible scenario, confidence in the secondary market is undermined to the point where issuance is impossible. In an economy where certain participants are dependent on wholesale funding, this can create risks to financial stability.

The major Swedish banks, all of which have a large proportion of wholesale funding, can be very adversely affected by a sharp decline in market liquidity. For example, they fund a large share of their mortgages on the covered bond market and continuously need to issue new bonds as the old ones mature. If something were to happen to cause the functioning of the primary market for covered bonds to deteriorate or even stop working, it could rapidly have negative effects for the Swedish banking system. During the financial crisis, general uncertainty arose among investors around the world. In conjunction with this, foreign investors started, on a large scale, to sell covered bonds issued by Swedish banks on the secondary market. This general uncertainty, combined with sales pressure on the secondary market, resulted in it becoming more and more difficult for the Swedish banks to issue bonds.⁹ In such a scenario, the distribution of when the banks' outstanding bonds mature and thereby need to be replaced by new funding is of significance for how badly affected they will be. It determines whether they will be forced to renew large parts of their bonds

8. See Cecchetti and Schoenholtz (2015).

9. See the Riksbank (2013).

during stressed conditions or if they are able to wait until market liquidity improves again. A closer look at the maturity structure of Swedish covered bonds shows that it is spread over time but about 13 percent need to be replaced within six months (see Chart 1).



Note. The statistics refer to covered bonds in Swedish kronor, issued by Swedish institutions.

Source: Statistics Sweden

Swedish non-financial corporations also obtain part of their funding by issuing bonds. If market liquidity for corporate bonds declines so much that this funding possibility is no longer an option, companies need to find funding elsewhere, for example via a bank loan. If it is not possible to secure a bank loan, it may initially cause liquidity problems for companies. In addition, it may ultimately lead to profitability problems and in the worst case to bankruptcy. In cases where banks are exposed to companies that issue bonds, it may also lead to negative consequences for the Swedish banking system, for example in the form of greater credit losses.

As far as investors are concerned, poor market liquidity for the bonds they have invested in can cause the value of these to drop. This can affect different investors in various ways. For life insurance companies, falling asset valuations could worsen the companies' financial position, i.e. their solvency.¹⁰ If the solvency deteriorates so that it approaches the statutory minimum level, these companies may be forced to sell off their riskier assets. As life insurance companies are major investors on the Swedish bond market, it may have spillover effects on many other assets. As far as the banks are concerned, falling asset valuations would impair their capital adequacy. This can in turn have a negative effect on confidence in the banks.

Mutual funds are generally not affected in the same way as banks and insurance companies if market liquidity deteriorates. A decline in the value of the funds' bond holdings usually does not affect the funds but instead those saving in the funds. On the other hand, if fund investors start to sell their holdings, the funds may need to sell parts of their holdings on the secondary market to meet the withdrawals. This may lead to further price falls, value reductions and sales. Finally, investors who have used bonds as collateral to borrow money for additional bond purchases, may be forced to sell these if their value falls below the amount for which they form the collateral. This may lead to a negative spiral with further price falls. If part of the bond market starts to function poorly, there is also a risk of the problems spreading to other sub-markets depending on how investors act. In a situation where market liquidity for certain bonds is very limited, thereby making them difficult to sell,

10. See the article "Swedish financial institutions and low interest rates" in the Riksbank (2015c).

investors may face a choice between selling other bonds, which may have a negative effect on their market liquidity, or instead selling bonds at prices that are under their fundamental value. In such cases, the price falls even further, which causes a loss of value for other investors who in turn may be forced to sell assets, which can further amplify the price fall.

A chain of events similar to the above occurred for several US banks during the financial crisis. On some markets that had functioned well up until the crisis, market liquidity suddenly declined so sharply that they stopped working. It then became difficult to value certain types of financial assets, even those that were normally among the most liquid. The development led to banks having problems obtaining funding on the bond market, while they themselves owned a large share of illiquid instruments which they were forced to sell at falling prices. Those banks that were acting as market makers gradually withdrew from the market as a result of this. This, in turn, made it difficult for investors to sell their holdings, which became particularly problematic in cases where they had used these holdings as collateral to borrow money for further purchases.

Development of market liquidity in Sweden and other countries

As mentioned previously, a gradual deterioration in a bond's market liquidity does not necessarily increase the risks to financial stability. Instead, the risks increase when the decline is sharp and entirely unexpected for bonds that normally have a good level of market liquidity, and when the decline persists for such a long period that investors cannot wait before selling their bonds until market liquidity improves again. It is difficult to predict how great the risks are of such sharp declines occurring. But by studying how market liquidity has developed in calm periods and analysing what has driven the development, we can get an indication of how the risk has changed. In the next section, we examine the development of market liquidity since the financial crisis in Sweden and in other countries and the drivers of this development.

Market liquidity on the Swedish bond market

As mentioned previously, a bond's market liquidity is said to be good when it is possible to *rapidly* buy or sell sizable *volumes* at a *low transaction cost* and with limited *market price impact*. The concept of market liquidity therefore contains several different dimensions, as we have described earlier. There is, however, no single measure that captures all the dimensions. There is instead a number of different measures that, in a variety of ways, try to capture one or a few of the dimensions. Combining these different measures will hopefully give us a better picture of how a bond's market liquidity has evolved. A lack of data restricts us in our choice of measures that can be used on the Swedish bond market. This is not least true for the market for corporate bonds, where market liquidity is generally difficult to examine. We therefore use a couple of measures below to study how market liquidity has changed in Sweden since the financial crisis in 2008.¹¹

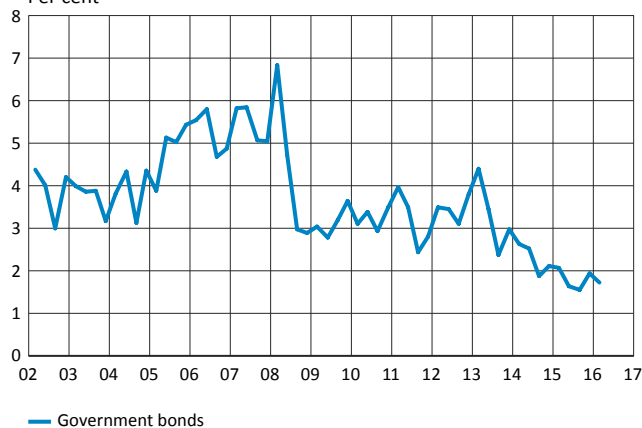
One of the most common measures calculates transaction costs by describing how the difference between a bond's bid and ask price changes over time. When the difference increases, it indicates a deterioration in market liquidity as it will then be more costly to sell or buy a bond. There is, however, no point in using this measure for Swedish bonds as the available price data does not comprise tradeable prices but only indicative prices determined on the basis of assumptions from market makers regarding relatively constant differences between bid and ask prices.

11. See Annex 1 for a technical description of these measures.

Turnover provides a mixed picture of development

Another common measure is turnover on the secondary market. In order to obtain a better picture of market liquidity, we can put *turnover in relation to outstanding volume*. Market liquidity can be expected to be worse when few bonds are bought and sold in relation to the total amount of outstanding bonds. If turnover drops, it is an indication that market liquidity is deteriorating. According to the measure, market liquidity fell sharply for government bonds at the onset of the financial crisis (see Chart 2). Thereafter, it stabilised on levels close to those that prevailed a few years before the outbreak of the financial crisis only to fall gradually towards the end of the period. But the lower turnover of government bonds in connection with the financial crisis was not due to a difficulty in selling government bonds. Demand increased instead when investors sought safer investment options. Hence, the lower turnover did not involve the same type of risk to financial stability as described above.

Chart 2. Daily turnover of government bonds in relation to outstanding stock
Per cent

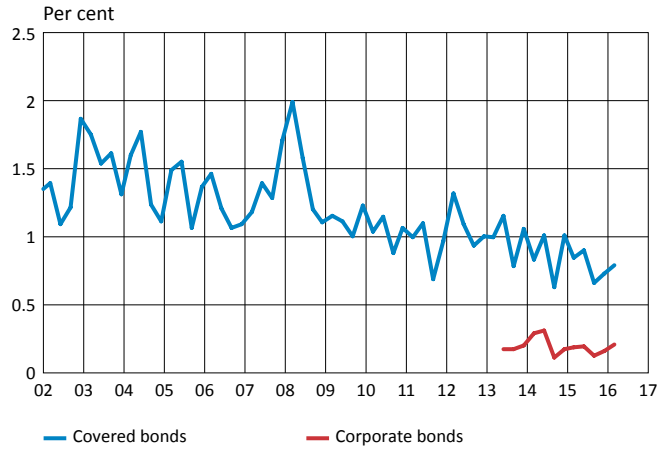


Note. Refers to quarterly averages of turnover.
Sources: The Riksbank, the Swedish National Debt Office and Statistics Sweden

Turnover has also fallen for covered bonds, first sharply in connection with the financial crisis and then gradually (see Chart 3). In connection with the decline during the financial crisis, there was considerable sales pressure and market liquidity for covered bonds plummeted. This indicates that the good market liquidity before the crisis was no guarantee that it would continue to be good. Instead, it disappeared when it was most needed. Good market liquidity is therefore no guarantee that it will not fall sharply in a stressed market. The gradual deterioration that has occurred afterwards is primarily a result of an increase in the outstanding stock.

No major changes have occurred for corporate bonds (see Chart 3). It is obvious, however, that market liquidity for corporate bonds is considerably lower than for government bonds and covered bonds, when we measure it based on turnover on the secondary market.

Chart 3. Daily turnover of corporate and covered bonds in relation to outstanding stock

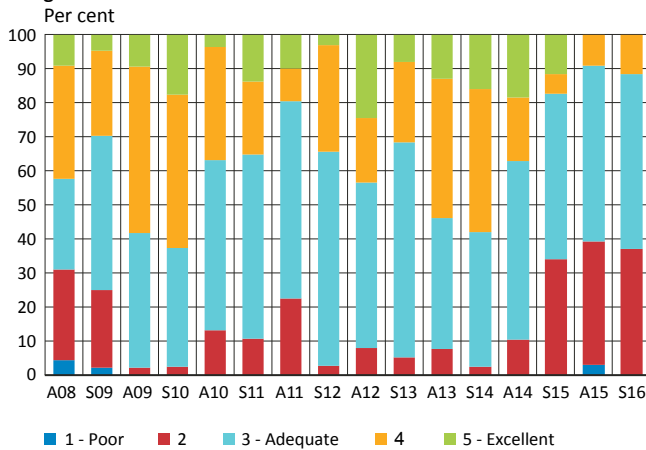


Note. Refers to quarterly averages of turnover. There is no outstanding stock for one of the banks whose bonds are included in the turnover statistics. This should not affect the development of the measure to any great degree, however.

Sources: The Riksbank, the Swedish National Debt Office and Statistics Sweden

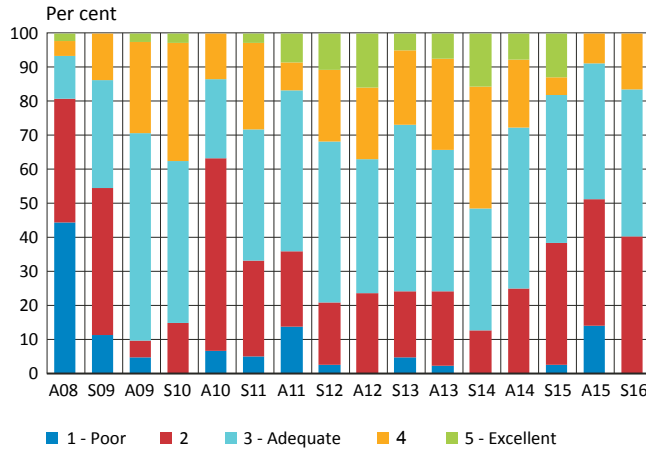
By analysing turnover on the secondary market, we can see that market liquidity has declined for both government and covered bonds in recent years. This picture has also been confirmed by market participants on the Swedish bond market (see Chart 4 and Chart 5).

Chart 4. Market participants' perception of market liquidity for government bonds



Source: The Riksbank

Chart 5. Market participants' perception of market liquidity for covered bonds

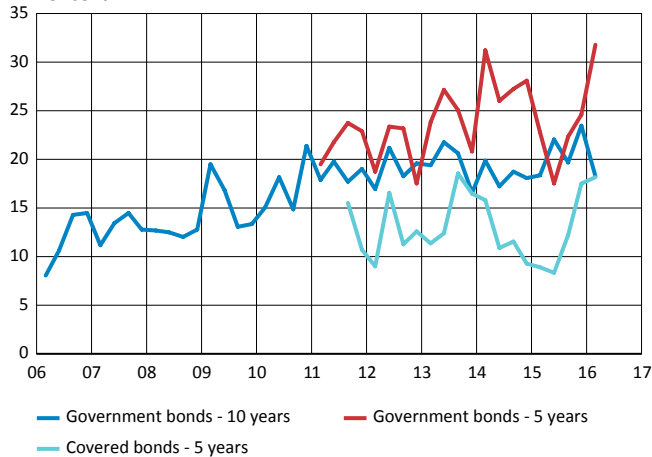


Source: The Riksbank

Market liquidity has been concentrated to the most liquid segments

In addition to market participants stating that market liquidity for Swedish bonds has declined, in terms of turnover, after the financial crisis, they also state that it has been concentrated to the most liquid maturity segments for each issuer.¹² We can confirm this picture if we look at the turnover for government bonds with “benchmark status”, which are among the most liquid maturity segments.¹³ The turnover of such bonds with both five- and ten-year maturities has increased in relation to the total turnover of government bonds (See Chart 6). For covered bonds, there is only data from 2011 and onwards and it does not indicate any clear change.

Chart 6. Share of total turnover that consists of special benchmark bonds



Note. Refers to quarterly averages of turnover for government bonds and covered bonds respectively.
Sources: Nasdaq and the Riksbank

But the turnover measures do not give a complete picture of market liquidity. One shortcoming is, for example, that they do not indicate the size of individual transactions. If a bond's market liquidity looks as though it is increasing but the rise is due to a few large

12. The information is based on interviews conducted with a number of market participants.

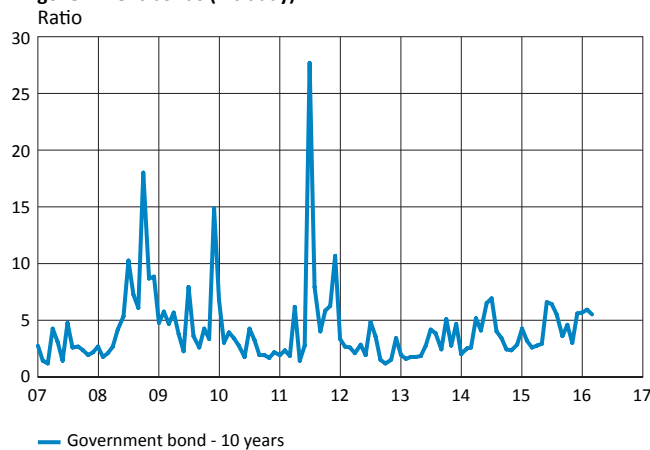
13. The corporate bond market has been excluded here as there are no corporate bonds with benchmark status.

transactions, it can provide an inaccurate picture of market liquidity. Neither does it say anything about how such transactions have affected the market price of the bond. The measure therefore needs to be supplemented with others.

Price impact shows an unchanged development

A measure that provides another perspective puts turnover in relation to changes in the price of a bond.¹⁴ We have chosen to use a measure that puts the daily price changes of bonds in relation to turnover. When the price fluctuates markedly in relation to turnover, it may be an indication of a deterioration in a bond’s market liquidity. The measure then rises. For 10-year government bonds, the price impact measure rose during 2008 and 2011, indicating that the market liquidity for these deteriorated in conjunction with the outbreak of the financial crisis and the sovereign debt crisis (see Chart 7). But as we have already pointed out, there was no substantial sales pressure for government bonds during the financial crisis, nor during 2011. Instead, demand increased as investors went in search of relatively safe assets. For 5-year covered bonds, market liquidity deteriorated according to the price impact measure in connection with the sovereign debt crisis in 2011 (see Chart 8). No noteworthy or prolonged change in market liquidity can be seen thereafter, either for government bonds or covered bonds. In a study of market liquidity on the Swedish bond market, Finansinspektionen (2015) also shows a similar picture with the help of a similar measure. At the same time, various market participants convey a more negative development of the price impact for government bonds. The amount that can be traded without it affecting the interest rate has decreased, according to the participants, for both government bonds and covered bonds in recent years.¹⁵

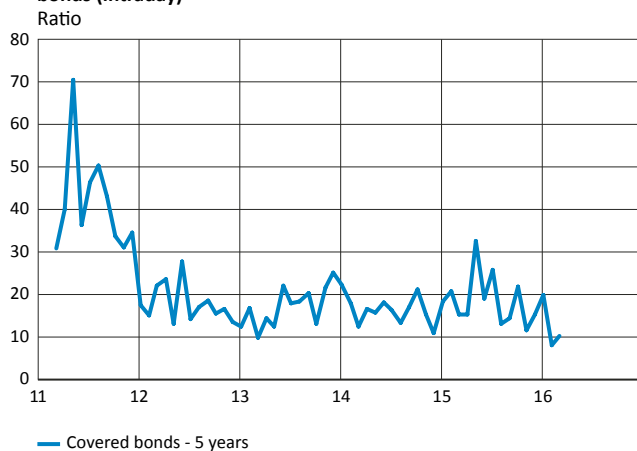
Chart 7. Bond price change per billion turnover for ten-year government bonds (intraday)



Note. Price change refers to $(\text{highest price} - \text{lowest price}) / ((\text{highest price} + \text{lowest price}) / 2)$. Refers to monthly average of turnover adjusted for differences in maturity.
Sources: Nasdaq and Bloomberg

14. A bond’s price moves in the opposite direction to the interest rate. It is, however, not the direction that is of significance for the measure, only the size of the change.
15. The information is based on interviews conducted with a number of market participants.

Chart 8. Bond price change per billion turnover for five-year covered bonds (intraday)



Note. Price change refers to $(\text{highest price} - \text{lowest price}) / ((\text{highest price} + \text{lowest price}) / 2)$. Refers to monthly average of turnover adjusted for differences in maturity.
Sources: Nasdaq and Bloomberg

One problem with measuring price impact is that the price changes are not only due to changes in a bond's market liquidity but also to other factors such as whether the credit risk changes. It is therefore possible that the market liquidity looks better or worse than it actually is. Furthermore, the price impact measure only provides a picture of the development for a certain maturity period.

In conclusion, our analysis indicates that market liquidity for government bonds and covered bonds has gradually fallen in recent years according to the turnover measure. This is also the picture conveyed by market participants. When we study price impact, however, we see a more sideways development. This does not correspond to the market participants' perception. We also see tendencies that market liquidity for government bonds has been concentrated to bonds with benchmark status. For corporate bonds, the analysis is limited as a result of short data series but market liquidity is significantly lower for them than for government bonds and covered bonds. In conclusion, it is our assessment that market liquidity for Swedish bonds, has, if anything, deteriorated since the financial crisis.

Market liquidity on foreign bond markets

CGFS (2014) has studied how market liquidity has evolved for government and corporate bonds in different countries since the financial crisis.¹⁶ Just as for Swedish bonds, different measures indicate different courses of development. CGFS finds that market liquidity, measured as turnover, deteriorated sharply in most market segments around the world during the financial crisis. Thereafter, it has returned to pre-crisis levels for several segments. This is especially true for the most liquid government bonds. For corporate bonds, CGFS states that market liquidity, measured as turnover in relation to outstanding stock, has largely deteriorated since the crisis. A large share of the turnover of corporate bonds has also been concentrated to the bonds that were already the most liquid.

For several bonds, market liquidity, measured as transaction costs, has, however, improved compared to the period before the financial crisis. CGFS (2014) asserts that one explanation for the fact that transaction costs, that is the difference between ask and bid prices, have not risen is that market participants have instead chosen to divide their transactions into smaller

16. The market for covered bonds is not included in the study due to the fact that its use is generally not as well developed internationally as it is in Sweden.

items in order to be able to trade their bond holdings more easily. This has resulted in it taking longer to trade larger amounts. Market liquidity measured as depth, i.e. the spread of bid and ask interests, has deteriorated for many types of bonds, even the most liquid ones such as the market for 2-year US government bonds. At the same time, however, it is important to remember that market liquidity was very good prior to the financial crisis and is therefore not the perfect reference point, just as is the case for the Swedish market.

Factors that have affected market liquidity

As we have described above, it is difficult to draw unequivocal conclusions regarding how market liquidity for Swedish bonds has evolved, but, if anything, it has deteriorated. The question is what has driven the development. Market liquidity is affected by both short-term factors, which vary over time, and more long-term structural factors. Short-term factors include for example whether different participants have the same access to price-impacting information, the general development of interest rates and how much risk appetite there is on the financial markets. More structural factors include changed business models for banks, new financial regulations and behavioural changes among investors. It is difficult to assess how different factors have affected market liquidity, not only because different measures of market liquidity provide divergent pictures of how it has developed but also because different factors affect a bond's market liquidity in a variety of ways. A number of attempts have been made internationally, however, and some of these are summarised below.

Short-term factors have probably had a positive effect on market liquidity

There are short-term factors that may have had a positive effect on market liquidity in recent years. Low interest rates is one such factor. Low interest rates make it cheaper for market makers to fund the trading books they use to provide the market with market liquidity.¹⁷ The search for yield due to the low interest rates may also have made a positive contribution to market liquidity for covered bonds and corporate bonds. This led to an increase in the demand for such bonds. At the same time, there are participants who point out that the bond purchases of central banks, including the Riksbank's purchases of government bonds, have had a negative effect on their market liquidity, primarily because the purchased volumes are then not traded on the market.¹⁸ This, according to the participants, leads to reduced turnover and a shortage of government bonds (CGFS 2016, the Riksbank 2015a, the Riksbank 2015b and the Riksbank 2016). All in all, it is likely that the low interest rates have had a positive effect on market liquidity in recent years. But this also means, however, that there is a risk of market liquidity deteriorating when interest rates turn and become less favourable (CGFS 2016).

Difficult to draw conclusions about how the long-term factors have affected market liquidity

Something which may have had a more lasting negative effect on market liquidity is the fact that some banks that were previously active in bond trading changed their business models after the financial crisis. They chose safer and less volatile sources of income and therefore became less active in bond trading, either across the board or for certain types of bonds. It is mostly banks in the United States and Europe that report less willingness to act as market makers in bond trading and this is particularly true for the least liquid bonds (CGFS 2014). The IMF (2015) has examined the relationship between the banks' willingness to use their balance sheets to act as market makers and how market liquidity evolves. It bases its analysis on the size of the market makers' bond trading books and comes to the conclusion

17. For more information on the link between funding liquidity and market liquidity, see Brunnermeier and Pedersen (2008).

18. The Riksbank announced for the first time in February 2015 that it would start buying government bonds.

that when the trading books are small or when the banks have less scope to act as market makers, the likelihood of a deterioration in market liquidity for those bonds increases. At the same time, Adrian et al (2015) show that market liquidity for US corporate bonds is good despite a decrease in the market makers' books of such bonds since the financial crisis. The conclusion is not therefore unequivocal as regards the effect banks' reduced risk appetite has had on market liquidity.

Another more lasting factor that may have affected market liquidity for bonds is the various types of new financial regulations that have already been or will shortly be introduced. Market participants often say that these regulations have had a negative effect on market liquidity (The Riksbank 2015a, the Riksbank 2015b and the Riksbank 2016). They point out that new regulations have led to greater capital costs for banks, which affects their willingness to act as market makers when differences emerge in supply and demand on the market. But how much new regulations have affected banks' willingness to act as market makers is difficult to assess since they affect different asset types in a variety of ways.

CGFS (2014) has attempted to analyse how various regulatory frameworks might affect banks' willingness to act as market makers by interviewing banks around the world. According to the banks interviewed, the leverage ratio requirement¹⁹ would have the greatest negative effect on bond trading. This is because the leverage ratio requirement would make it more expensive for market makers to maintain trading books in all types of bonds, making it less profitable for them to act as market makers. The Liquidity Coverage Ratio (LCR), which regulates banks' reserves of liquid assets in relation to potential outflows, would, according to the banks, be detrimental to corporate bond trading as corporate bonds are not as useful in the liquidity reserve. At the same time, the basic idea of these regulatory frameworks is to create more robust banks, which should increase their resilience to large falls in assets prices and market liquidity. According to Anderson et al. (2015) and CGFS (2016), bond market resilience has improved due to the new rules, as market makers' resilience has increased. This is because more stable and robust market makers have reduced the risk of market liquidity deteriorating sharply in a stress scenario. Even if these regulations have led to a deterioration in market liquidity for bonds, they have simultaneously also reduced the risk of market liquidity appearing to be better than it actually is in a normal situation, a so-called "liquidity illusion". This has also reduced the risk of market liquidity suddenly deteriorating in a stress scenario.

In addition to banks being more stable and the fact that systemic risks in the financial system are decreasing, it is also possible to attribute more specific positive effects to the new rules. For example, less risk-taking among banks leads to cheaper funding of their trading books (CGFS 2014). This compensates in part for the effects of increased capital costs mentioned previously.

Market participants also expect new rules on transparency (MiFID2/MiFIR) to have a negative effect on banks' willingness to act as market makers for bonds. The reason is that it will be difficult to manage large transactions, especially on small markets like the Swedish one. MiFIR, for example, requires the publication of information on price and amount of the most liquid bonds prior to and after a transaction. Since the Swedish market only has a limited number of market makers, the fear is that they will be forced to publish information after a deal that can be used by other market participants in a way that is disadvantageous for the market maker. In the worst case this may lead to a loss for the market maker. This, in turn, might lead to banks' becoming reluctant to act as market makers. On the other hand, there are studies indicating that greater transparency has had a positive effect on the market liquidity of some bonds. A number of studies have, for example, examined the effect on

19. A capital requirement with the aim to put a cap on how large a bank's total assets and off-balance sheet commitments are allowed to be in relation to its Tier 1 capital.

market liquidity of the introduction of transparency requirements for corporate bonds in the United States in 2001. Several of the studies find that market liquidity has generally improved in terms of a reduction in the difference between bid and ask prices and hence a similar reduction in transaction costs.²⁰ It is important to bear in mind, however, that the US bond market is much larger than the Swedish market and has more market participants, and that the effects are therefore not necessarily the same.

Another more long-term factor that might explain changes in market liquidity is behavioural changes among investors. There is information indicating that more bonds on the Swedish market are today owned by investors who tend to own them for a long time, and that fewer bonds are owned by investors who previously traded actively on the secondary market, such as foreign hedge funds and banks. This might have had a negative effect on market liquidity for these bonds. It is, however, difficult to confirm this development based on the statistics available.

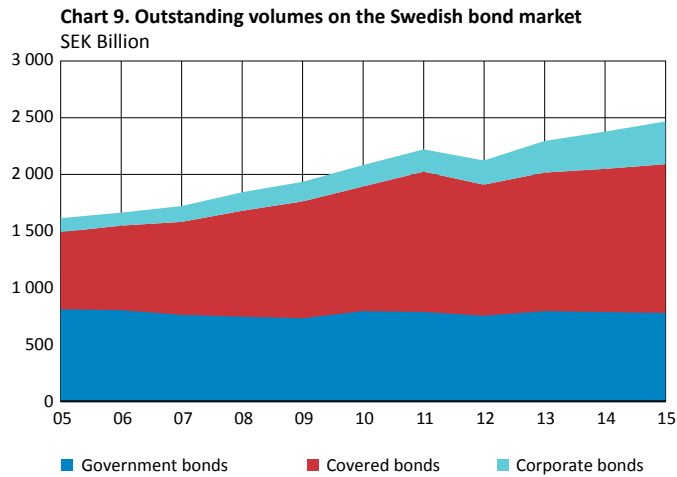
All in all, it is difficult to draw unequivocal conclusions regarding which factors have affected market liquidity during the period after the financial crisis, in what way they have affected it and what the final, aggregate effect on market liquidity is. The changed business models of banks may be an explanatory long-term factor that has had a negative effect on market liquidity. It is, however, difficult as yet to draw any conclusions regarding how new regulatory frameworks might affect market liquidity for Swedish bonds. At the same time, short-term factors have probably been favourable, which might have negative implications for market liquidity were they to rapidly shift to being less favourable (IMF 2015, CGFS 2016).

Conclusion

The aim of this economic commentary has been to examine how market liquidity for Swedish bonds has evolved since the financial crisis and whether this development has increased the risks to financial stability in Sweden. Based on our review, we can establish that it is difficult to draw any unequivocal conclusions regarding how market liquidity has changed since the financial crisis. It is clear that it deteriorated in connection with the financial crisis of 2008. But it is difficult to draw any definitive conclusions about how it has changed since then. This is due to the fact that different ways of measuring market liquidity provide divergent pictures of how it has evolved. Furthermore, it differs from one type of bond to the next. That being said, we can nevertheless establish that there are indications suggesting market liquidity for Swedish bonds has, if anything, deteriorated since the financial crisis. The decline after the financial crisis seems, above all, to have been the result of a decline in banks' risk appetite and a consequent change in their business models. Prior to the crisis, market liquidity was very good on several markets, in all likelihood due to low risk awareness and the fact that it was cheap for banks to fund their trading books as a result of low capital requirements. It is easy to be tempted by good market liquidity but, at the same time, events during the financial crisis show that good market liquidity is not a guarantee of it continuing to be good in a stress situation. Developments during the financial crisis also show that it is not good for the financial system and thereby for financial stability if market liquidity deteriorates rapidly and entirely unexpectedly from a high level.

Even if we find indications that market liquidity has declined for Swedish bonds since the financial crisis, we can establish that the Swedish bond markets do not seem to function any worse as a result. This is because we do not see any deterioration in funding liquidity. Issuances of covered bonds do not, for example, show any sign of slowing down. Issuances of corporate bonds have indeed slowed down slightly since 2014, but an explanation for this is that companies seem to find it easier to obtain bank funding, and therefore choose this over wholesale funding. Neither are there any signs of any substantial sales pressure on bonds.

20. See Besseminder et al. (2006).



Even if one explanation for lower market liquidity might be that new regulations are causing banks to be less active market makers, the rules have also created more robust banks that should be more resilient to large falls in market liquidity. The result of a more robust system of market makers is hopefully that the consequences of future large falls in market liquidity will be alleviated. The price participants have to pay in the form of poorer market liquidity in good times should in that case be counterbalanced by the fact that declines under stressed market situations will not be as large, and by a greater all-round awareness of liquidity risks.

The risks to financial stability in Sweden are therefore deemed not to have increased as a result of the development. This does not mean, however, that we can exclude the risk of a deterioration in market liquidity having negative consequences for financial stability in the future. It is therefore particularly important that bond holders are aware of the risks of a sharp deterioration in market liquidity. In light of this, it is important to continue to keep track of the development of market liquidity for Swedish bonds in the future in order to identify any changes that may increase the risks to financial stability.

Annex 1

In the following section, we present the measures that are included in the review in the section “Market liquidity on the Swedish bond market”. See EBA 2013 for a review of other measures.

Bid ask spread. This measure refers to the difference between the best dealable bid and ask price and measures tightness, i.e. the development of the transaction cost. It is calculated either as an absolute amount or as a proportion of the average value of the bid and ask price. The drawback of using the measure for Swedish bonds is that the prices available for Swedish bonds are not dealable but are only indicative, and that the indicative prices are established based on assumptions of relatively constant differences between the bid and ask price. Many market analysts therefore claim that it is not an accurate measure of market liquidity for Swedish bonds.

$$Spread_t = Ask_t - Bid_t$$

alternatively

$$Spread_t = \frac{(Ask_t - Bid_t)}{Mid_t}, \text{ where } Mid_t = \frac{(Ask_t + Bid_t)}{2}$$

Turnover and related measures. Turnover is a basic measure of both immediacy and depth. It can also be supplemented by turnover rate, i.e. turnover in relation to outstanding amounts. Turnover gives no indication of the size of each individual transaction, however. The size of individual transactions can therefore provide another dimension of immediacy and depth. Another example of measures used in practice is the number of trading days without turnover during a given trading period and the standard deviation of the turnover.

*Amihud illiquidity ratio.*²¹ This measure captures how much the price changes in relation to the traded volume. The thesis is that a transaction of a given amount leads to a relatively large price change for a relatively less liquid bond. One problem with the measure is that as the denominator, that is the traded volume, approaches zero, the measure approaches infinity. The choice of time parameters must therefore be adjusted based on the traded volume.

$$Amihud_t = \frac{1}{n} \sum_{k=1}^n \frac{|r_k|}{v_k}$$

where n is the number of sub-periods (e.g. days) during the time period t (e.g. month), r_k is the percentage return from the bond and v_k is the traded volume.

21. See Amihud (2002).

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