

Liquidity and liquidity risk

The banks can suffer a shortage of liquid funds for a number of different reasons. One is failings in their internal liquidity management, which could lead to the bank being unable to find sufficient liquid funds to meet its payments. Another is a breakdown in the payment system, which could mainly be caused by extensive computer problems. There is also a risk that liquidity on a market central to the banks' financing could decline or disappear. Finally, a shortage of liquid funds could be a sign that the bank has, or is perceived to have, solidity problems. To summarise, the Riksbank assesses that the risk of liquidity problems forcing a major Swedish bank to default is relatively slight, as long as this does not happen in connection with the bank facing solidity problems.

The banks' traditional role involves receiving deposits and lending out its money for consumption and investments. As a depositor usually has the right upon request to immediately withdraw the money on deposit in his/her bank account, deposits are exceedingly liquid. On the other hand, the banks' lending to its borrowers is extremely *non-liquid*. A bank cannot easily sell one of its loans without giving a substantial discount. This is because the bank possesses special information on a borrower's capacity to pay, which makes it difficult or costly for an outsider to evaluate the risk involved in the loan. The difference in transitoriness of deposits and lending means that liquidity becomes a central concept in every bank, and it has traditionally been regarded as a fundamental issue for all bank operations.

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The banks also have a central task in the payment system, as their participation is required to enable almost all payments of goods and services. Payments can be made through transfers between accounts or by using banknotes and coins, and in both of these cases the banks are involved at some stage. The need for liquid funds to execute payments forms the basis of the banks' liquidity management. In practice, it is the variation in customers' payment patterns that occasions major changes in the banks' liquidity requirements.

Individual banks can thus have large fluctuations in their liquidity requirement. These fluctuations are due to the payments made between banks in the Riksbank's RIX system, and which largely

reflect the bank customers' payment patterns. All payments from one bank to another are made via the RIX system.³¹ As the increased turnover on the financial markets increases, the turnover in the RIX system has also increased and currently amounts to approximately SEK 450 billion a day.

It would be very costly for the banks to maintain such large liquidity reserves that they could themselves manage to execute all of the necessary payments on their own behalf and on behalf of their customers. One condition for the RIX system to work well is a continuous flow of payments between the banks, so that incoming funds can be used to execute each bank's own payments. In addition, the Riksbank supplies credit during the day. This 'intraday' credit is interest-free, but collateral must be provided in securities approved by the Riksbank. The banks currently hold securities corresponding to between SEK 60 billion and SEK 80 billion pledged to the Riksbank for the purpose of being able to execute their payments.

The banks are also able to borrow from the Riksbank at a certain interest rate, or to make deposits, from one day to the next, but they try to even out their positions between themselves at the end of the day, with banks that have a deficit borrowing from banks that have a surplus. To encourage this process, there is an interest-rate spread of 1.5 percentage points between the Riksbank's deposit and lending rates. When the banks loan from one another, they apply a rate that lies within this interval. These interbank credits are known as overnight loans, and normally run overnight, to be paid back the following morning.

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31 See "Settlement of payments in the RIX system", Sveriges Riksbank, 2000.

WHAT IS LIQUIDITY?

Liquidity refers to access to means of payment, i.e. means that can be used to execute payments. The Riksbank's banknotes are legal tender, but deposits in the Riksbank also comprise a means of payment for the banks. Similarly, the general public can use funds in their deposit accounts to make payments.

The *liquidity* of an asset depends on how quickly and at what cost it can be converted into a means of payment. Cash balances are completely liquid, as are deposits, under normal circumstances. A government security is less liquid than cash, but it is still a fairly liquid asset as it can be converted to cash or a deposit quickly and at a low cost. Other financial or non-financial assets can also be converted into a means of payment if there is sufficient time and the seller is prepared to accept the price a buyer is willing to pay. If the asset needs to be converted rapidly, the seller could need to reduce the price in relation to what the asset is considered to be worth to bring about a sale. An asset that can be difficult to sell, or where the price may vary, is thus less suitable as a liquidity buffer.

The liquidity of an asset also depends on the functioning of the market for buying and selling that asset. On a market where the participants act by setting buying and selling prices for assets, the difference between the buying price and the selling price, known as the spread, acts as a measure of the liquidity of the asset. The asset cannot be exchanged for a means of payment and then exchanged back again without the spread giving rise to costs. An asset that is traded with a smaller spread gives rise to a lower cost and is thus more liquid. The stability of the size of the spread over time also has significance for the liquidity of the asset.

For the type of assets in which there is organised trading, the concept of *market liquidity* is often used in financial economic theory (the market micro-structure field). This concept refers to the capacity to sell a large volume of an asset on the market with little effect on the price. Market liquidity can be described in three dimensions: width, depth and resilience. Width refers to how far the prices move from the average price and is measured, for instance, as the difference between the buying price and the selling price. Depth refers to the trading volume the market can manage without changing the prevailing price. Resilience refers to the speed at which price fluctuations occasioned by trading abate, or at which imbalances in the order flows are adjusted.

The market for certain assets can consist of a few participants and the price is then an object for negotiation. This applies, for instance, to many bank credits; the only potential buyers being other banks. This type of asset is usually less liquid than the assets traded on a market with many buyers and sellers.

Nevertheless, the liquidity of an asset is not merely dependent on the possibility and cost of selling the asset, but also the possibility to raise money on it. The cost of raising money on an asset can be lower than the cost of selling the asset and buying it back. Thus, the spread need not comprise an unequivocal measure of the liquidity of an asset. By supplying loans against collateral to households and companies, banks and other financial companies supply liquidity.

Lending against collateral involves a lower credit risk to the lender than lending without collateral, which means that the interest rate is lower on this type of lending. For instance, households can borrow money at a cheaper rate if they have a home to mortgage and the banks can normally borrow at a lower rate on the repo market than on the call money market. However, as holding collateral can involve costs, it is not self-evident that the total cost to a bank is lower with repo financing.

A company's *liquidity management* is aimed at ensuring that the company has sufficient means of payment at each point in time to meet its payment commitments. The company's capacity to manage this depends on how well it can predict the payment requirements that will arise from inward and outward payment flows, on market liquidity for the assets held by the company and on the company's conditions for borrowing funds.

Liquidity management in the Swedish banks

All of the four major Swedish bank groups have internal guidelines for how liquidity should be managed within the group. They have fairly similar methods for liquidity management, although there are some differences. The differences between the banks are often based on the fact that different focuses for their operations lead to different demands for the need to have measures and methods to effectively manage liquidity. For instance, the percentage of assets in foreign currency varies between the bank groups, which means that there are differences in liquidity management for various currencies. There are also differences in the level of sophistication of the banks' liquidity management.

The first stage in liquidity management involves assessing the size of the incoming and outgoing payment flows. Expected deficits in these flows must be funded at the lowest possible cost, while surpluses must be invested at the best possible return. The timing of certain transactions is well known, while others need to be forecast. For instance, it can be difficult to know whether a loan that falls due will be extended or how the customers' payment patterns look.

Liquidity management is based on forecasts of payment flows for various time horizons. The longest forecast horizon is normally around 30 days, while the shortest is for the same day. The purpose of this is to be able to identify possible deficits (or surpluses) at the earliest possible stage, as it is normally possible to find cheaper funding or to change the funding requirement if there is enough time. The banks' alternative opportunities for covering their liquidity requirements decline over time. Most long-term liquidity planning is required to enable the bank to be able to use subordinated debt, bonds or notes. When there is less time available, these instruments can no longer be used and the bank is forced to use, for instance, repos or intraday loans. The fastest means of all of finding liquidity, and the only means that can be used with in principle no time delay at all, is to borrow from the Riksbank. However, the choice of funding method is not merely governed by the time horizon for the funding requirement, it is also affected by the costs involved. For instance, a bank may choose to issue notes or bonds if the price is considered beneficial, even if it has no liquidity requirement at the time of the issue.

Liquidity limits are set to ensure that operations do not create large deficits of liquidity during a given day. These limits are set for the group as a whole, and then broken down into operations that can affect the need for liquidity. The limits thus become an important management instrument with regard to funding the bank at a low cost.

All of the four major banks have an internal bank that steers liquidity flows. The means of steering are the internal price of liquidity, the internal rate. This rate affects how profitable it is for the different parts of the bank to borrow or invest when they have a liquidity deficit or surplus. The role of the internal banks is thus to steer liquid funds from the parts of the bank with a surplus to the parts with a deficit. In several of the groups there is a policy to invest liquid funds in the internal bank. The mortgage institutions are large recipients of means of payment in kronor. In recent years,

these have had a need for increased liquidity to be able to fund the increasing percentage of housing loans at a variable interest rate.

The banks need to maintain a liquidity reserve of a certain size in order to be able to manage unexpectedly large liquidity outflows. This reserve consists of securities that can be pledged, repoed out or sold in order to create almost immediate liquidity. All of the major banks regard the assets that can be pledged in the Riksbank as fully liquid. Other types of assets are then broken down by the banks according to how liquid the bank considers them to be.

Management of liquidity in foreign currency mainly uses the same methods as management of liquidity in kronor. One difference is that the Swedish banks usually do not have access to accounts in foreign central banks. As long as the bank can find sufficient liquidity in kronor, it is always possible to create liquidity in other currencies by exchanging on the foreign exchange market. However, the price of finding liquidity in another currency may vary if the liquidity in the foreign exchange market deteriorates (see the discussion in the next section) or through a change in the exchange rate of the currency concerned.

Risks connected with liquidity

There are several reasons as to why a bank may experience an unexpected need for liquid funds. This section discusses four potential causes of liquidity problems. The first two derive from operational risks, both in connection with liquidity management and in the form of technical problems in the payment system. A possible third cause of liquidity problems is a shortage of liquidity in the market for various financial instruments. Finally, confidence problems can lead to a bank's depositors and other financiers withdrawing their money or reducing their limits towards the bank in question.

OPERATIONAL RISKS IN PRACTICAL LIQUIDITY MANAGEMENT

Regular liquidity planning is primarily aimed at management of the liquidity requirements that can arise in the bank's normal operations. There is an uncertainty in the forecasts of how large the actual liquidity requirement will be, which is due to the fact that unforeseen events can occur, such as unexpectedly large outflows as a result of problems experienced by a counterparty or large customer. It is only possible to survey the difference between unexpected outcome in the forecasts and more systematic miscalculations if the uncertainty in the forecast is followed up in a structured way. The Riksbank's interviews with the banks have indicated that there is no structured follow-up of these forecasts.

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An alternative method of dealing with the uncertainty in the requirement for liquid funds is by absorbing the effects of unexpected events through holding larger reserves of securities or other liquid assets. The Swedish banks hold relatively large stocks of assets that could be mortgaged to deal with any sudden, unforeseen liquidity requirements when settling payments in RIX.

According to the Riksbank's assessment, it appears unlikely that miscalculations of the liquidity requirement would be so great that they risk entailing serious liquidity problems. If miscalculations arise, there is always the opportunity to borrow funds in the intra-day market, at least as long as the bank has no other problems that make lenders unwilling to supply credit. In addition, the banks hold considerable reserves of securities that can be used for unforeseen funding requirements.

OPERATIONAL RISKS IN THE INFRASTRUCTURE

The existence of operational risks in the infrastructure, for instance, the payment and information systems, lies mainly outside of the individual bank's field of influence.

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Disturbances in communications between the payment or information systems could lead to an inability to execute payments or to the non-transmittal of the information that a payment has been executed. A fault in the systems can afflict one individual bank or several banks simultaneously. Most banks have suffered this type of problem at some point. If the payments cannot be executed, it will not be possible to redistribute the liquidity in the system between those with a surplus and those with a deficit. For instance, problems with the Riksbank's RIX system or the TARGET system could lead to this type of problem. On the occasions when RIX has experienced problems, it has been possible to use established emergency routines and execute the payments regardless.

Problems in the SWIFT system could mean that payments are still executed, but that the payment information did not reach the sender or recipient.³² After a day or more with a problem in the information systems, it is quite possible that a large bank could experience major difficulties in assessing its own liquidity situation and in knowing where in the group liquidity should be steered.

It can be concluded that problems in the payment system or the accompanying information system could have serious consequences for the banks. The effects of problems that have arisen so far in the computer systems have been alleviated with the aid of emergency routines. It is important to have emergency routines not only with the system administrator, but also with participating institu-

³² SWIFT (Society for Worldwide Interbank Financial Telecommunication) is a bank-owned organisation that runs a global network for exchanging financial messages. A SWIFT message could involve an instruction to transfer funds. The transfer (settlement) is then made through the payment system (in Sweden the RIX system).

tions. It is worth noting that certain types of system problems cannot be managed through liquidity reserves, as it may be impossible to utilise the reserves if the systems are down.

THE LIQUIDITY RISK IN THE MARKET

The events in connection with the LTCM and Russia crisis in autumn 1998 gave rise to discussion of what risks to the banks might arise in the event of a severe deterioration in market liquidity.³³ The turbulence on the financial markets caused liquidity in parts of the market to decline heavily. There was a particular drop in liquidity in certain derivative markets used by the banks to divest themselves of undesired risks.

However, the events of autumn 1998 had relatively little effect on the Swedish banks with regard to their funding. The banks themselves consider the effects to have been slight and one of the Swedish banks even saw positive effects for its funding situation.

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The reason why the Swedish banks were not affected was that they had relatively modest exposure towards the worst-hit markets, primarily bonds issued by *emerging market countries* and more complex OTC derivatives. The banks' securities holdings and derivative positions mainly concern trading in government bonds and mortgage bonds, as well as the foreign exchange market in Swedish kronor and the large currencies such as the US dollar, the euro and the yen. These markets were not affected to a great extent by the turbulence in autumn 1998.

What is meant when discussing market liquidity as a potential problem is the drastic changes in liquidity that could occur. The liquidity of an asset is determined, like its price, by the supply and demand ratio. If there are major changes in supply or demand, the price of a particular asset will change and at the same time, the liquidity of the asset will be affected. Very severe changes in the supply and demand ratio will lead to only sellers – or buyers – remaining in the market and liquidity will completely disappear, which is what happened on certain markets in connection with LTCM's problems.³⁴ This type of change arises mainly as a result of a substantial reassessment of the risk in an asset. Instruments that have a similar risk profile are often affected in a similar way by this type of event – there is a form of contagion effect. For instance, many bonds issued by emerging market countries were affected when Russia defaulted on its government bonds in 1998.

33 Long Term Capital Management (LTCM). An US-based hedge-fund that ran into problems in the autumn of 1998.

34 The interplay between the liquidity risk and the market risk becomes a question of how the demarcation is made between market liquidity and market. Two of the major Swedish banks do not differentiate between liquidity risk in assets and market risk; they consider all price fluctuations on assets to be market risks and measure them in the bank's VaR (Value-at-Risk).

The effects of a deterioration in market liquidity are largely beyond the banks' control. However, as with other risks in the banks' environment, the banks must maintain some form of readiness of how to deal with these problems if they arise. The methods for managing unforeseen liquidity requirement discussed in the previous section can also be used to manage this type of problem, for instance, sufficient reserves of securities that can be pledged and credit lines with other banks.

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Problems with market liquidity would only comprise a threat to one of the Swedish banks if they arose on one of the markets important to the bank's funding. The market for Swedish government securities is such a market, as the banks have large holdings of government securities, for funding repos and pledging in the Riksbank. Swedish mortgage bonds are also an important asset, as they can be used for pledging and repo funding. A severe deterioration in liquidity or heavily falling prices on one of these markets could primarily occur in the event of a crisis in central government finances, or if the mortgage institutions experienced solidity problems.

It is also possible to imagine that a substantial deterioration in liquidity could occur through a contagion effect, for instance, if Nordic government or mortgage bonds were to suffer severe problems. It is difficult to assess the size of the effects on Swedish bonds in this type of situation, and this would probably be largely governed by circumstance if it actually occurred.

The market on which the banks are most dependent for their short-term financing is the short international interbank market. If one Swedish bank is perceived to have solidity problems, all Swedish banks could experience problems in taking up loans in this market. This was the case, for instance, during the Swedish bank crisis. On the other hand, of course, access to and the price of long-term funding on the bond market can vary over time, which can make a bank more or less dependent on the interbank market. An excessive dependence on the short-term interbank market can constitute a problem for a bank, as the counterparties do not normally have unlimited facilities for lending to the bank in question.

The foreign exchange market is also important to the banks' funding in that it is used to exchange loans in foreign currency into Swedish kronor (the reverse can also be necessary). The market for exchanging at call or at short forward rates is very liquid and it is difficult to imagine that it would experience such large liquidity problems that it became impossible for the banks to exchange at all, or only for very small amounts, over a long period of time. A common factor in regard to liquidity problems in those markets, which are central to the banks, is that such problems likely do not occur alone. They are most likely consequences of other problems with the Swedish economy.

A shortage of market liquidity can also affect the function the banks fulfil as intermediaries for risk management products. In particular, a liquidity shortage in the derivative markets could mean that the banks were unable to divest themselves of undesired risks.

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CONFIDENCE PROBLEMS FOR THE BANKS

In the event that the bank has or is perceived to have problems with its solidity, both deposits and borrowing can be withdrawn via what is known as a *run*. A rapid withdrawal of the bank's financing would naturally create very severe liquidity problems for the bank and could directly threaten the bank's survival. Of course, this type of liquidity crisis, which is a direct consequence of feared or actual solidity problems, is not included in the normal liquidity forecasting.

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From a short-term liquidity perspective, it is not important whether a bank has an actual solidity problem or whether it is merely suspected in the market of having solidity problems. It is often difficult for participants in the market to obtain sufficient information in a short space of time to be able to judge whether or not a counterparty actually has solidity problems. Therefore, if a bank's solidity is questioned, the bank's creditors reduce their limits towards the bank. This reduction has a rapid effect and the bank experiences difficulty in finding financing on the market.

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The tendency for the banks' short-term funding to appear to move towards more overnight loans could intensify the banks' problems in the event of a crisis of confidence. A run, where deposits were withdrawn is less probable today, partly because deposits are to a large extent covered by the deposit insurance.

One example of when one or more banks' credibility has fallen so low that they cannot refinance themselves in the market was what happened to the Swedish banks in 1992. Some banks were considered to have such a low credit standing that it was difficult for them to find funding during certain periods.

The Riksbank has the possibility of providing emergency liquidity assistance to banks with problems obtaining funding, i.e. acting

as "lender of last resort". An important criterion for the Riksbank is that this assistance should only be granted if there appears to be a threat to the financial system as a whole. Another is that emergency liquidity assistance should be used for liquidity assistance, not solidity assistance. This means that the Riksbank must assess whether the bank has any actual solidity problems, when it experiences a shortage of liquidity.

SUMMARISING COMMENTS

Of the risks described above, operational incidents in liquidity management are relatively common, but their consequences are normally limited. With regard to market liquidity, there are fewer incidents in this area but they could be more difficult for the banks to deal with. Neither of these types of risk should in itself be able to force an otherwise solid bank to default. Banks that experience a major breakdown in their infrastructure or a crisis of confidence, would appear to face a greater risk of really serious consequences arising. It is also more probable that the Riksbank would choose to supply emergency liquidity assistance in this type of situation.

Although the operating risks in the internal liquidity management and the risks related to market liquidity do not appear to be so serious that they could threaten a bank's survival, it is important for the Riksbank to also monitor these risks, as they affect the vulnerability of the banks to other liquidity strains.

Above all, it appears that the banks could run into difficult problems if several of the above-mentioned threats to liquidity were to occur at the same time.

