

Swedish banks' use of the currency swap market to convert funding in foreign currencies to Swedish kronor

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Swedish banks currently fund some of their lending in Swedish kronor by issuing securities in other currencies. However, this requires a functioning market for currency swaps as the banks have to convert the foreign currency to Swedish kronor.¹

In this article we describe how Swedish banks use swaps to convert funding in foreign currency to Swedish kronor in order to fund long-term lending in Swedish kronor, such as Swedish mortgage loans. We show that the banks do largely restrict the extent to which they are exposed to the risks arising from these swaps. However, at the same time we conclude that the structure of the long-term swap market means that the swap market, and thus the banks' funding, is susceptible to disruption and is easily affected by uncertainty on other financial markets. In addition, the swap market contributes to a high concentration risk in the Swedish banking system. Perhaps the most important criteria in order to avoid disruptions on the long-term swap market are an effective short-term market in Swedish kronor and a well-capitalised banking system. However, in the longer term there are also other factors which could help to reduce the risks and make the Swedish swap market more robust. We discuss these factors in the latter part of the article.

Swedish banks fund some of their lending in Swedish kronor by issuing bonds and certificates on the capital market abroad, in currencies other than Swedish kronor. Some of these securities fund long-term lending such as mortgage loans. One important reason why the banks issue securities outside Sweden is that they do not want to make themselves dependent solely on the domestic market; instead, they want to ensure that they have flexibility in terms of access to funding. Moreover, credit rating agencies emphasise that

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1 In this article, "currency swaps" refers to both FX swaps and cross-currency basis swaps (CCY swaps). "Swap" is used synonymously with "currency swap" unless stated otherwise in the text. Also, long-term swap is used synonymously with CCY swap and short-term swap with FX swap.

banks should have a diversified investor base, which is facilitated if borrowing takes place in multiple currencies.²

However, to fund lending in Swedish kronor by borrowing in foreign currency entails that the banks are exposed to currency risk as their assets are in one currency and their liabilities are in another. The banks manage this currency risk by using derivatives in the form of currency swaps: FX swaps or cross-currency basis swaps (CCY swaps). A derivative contract of this kind means that a bank borrowing in foreign currency exchanges the foreign currency for Swedish kronor with the counterparty in the swap. This allows the banks to create a suitable currency match in their balance sheets, thereby managing the currency risk between assets and liabilities. A more detailed description of how FX swaps and CCY swaps are constructed and used is presented in Appendix 1.

Although only a smaller proportion of the banks' total lending in Swedish kronor is funded in this way, it is not irrelevant. Moreover, the swap market has proven to be susceptible to disruptions and unease on other financial markets in Sweden and abroad. Hence, through the swap market, uncertainty elsewhere in the world can affect the Swedish financial system. The problems which arose on the CCY market for swaps between euro and kronor in the autumn of 2010 provide one example of this. At that time, liquidity on the CCY market was impaired, while at the same time the cost of converting funding in euro to kronor, known as the cross-currency basis spread, rose considerably. This led to Swedish banks finding it both expensive and difficult to convert funding in foreign currency to kronor at longer maturities via the swap market. These problems were due to the uncertainty that arose regarding the shortest maturities of the Swedish money market as the last of the three extra ordinary loans that the Riksbank offered to the banking system during the crisis matured. Similar problems have also occurred on other occasions when the cause was problems outside Sweden. Nevertheless, since currency swaps are traded OTC; that is to say, bilaterally outside regulated marketplaces, only very little information has been compiled about the swap market and the banks' use of currency swaps.

The purpose of this article is to describe how the Swedish banks use currency swaps to convert funding in foreign currency to Swedish kronor in order to fund lending in Swedish kronor at longer maturities, such as mortgage loans. We also look at the risks this may entail. Consequently, the article concentrates on the conversion of long-term funding in foreign currency to kronor. It does not cover the banks' use of the swap market to convert short-term funding in, for example US dollars to kronor, in order to fund short term assets. As the emphasis in this article is on the currency swap market, we will not discuss the risk of disruptions on the foreign securities market which affect the banks' access to market funding in foreign currency. For the same reason, we will not discuss the interest rate risks which the banks hedge with interest rate swaps.

2 For the four major banks – Handelsbanken, Nordea, SEB and Swedbank – around half of the total funding is market funding, of which around two-thirds is in currencies other than Swedish kronor. Much of the borrowing in foreign currencies funds assets in these currencies. For example, in the Baltic countries the major banks' lending in euro is funded by means of borrowing in euro. However, some of their assets in Swedish kronor are funded with funding in foreign currency.

We start by describing how the Swedish banks use currency swaps to fund long-term lending in Swedish kronor. This description is based partly on data concerning Swedish banks' long-term swaps which was collected by the Riksbank in June 2011, partly on interviews with the Swedish banks and other participants in the swap market. In Section 2, we show the risks to which the banks are exposed as a consequence of using currency swaps, and how this can lead to risks in the Swedish banking system. In Section 3, we discuss what criteria have to be met in order for the swap market to function smoothly, as well as a number of factors which could help to make the Swedish swap market more robust henceforth. The article ends with a summary of our conclusions.

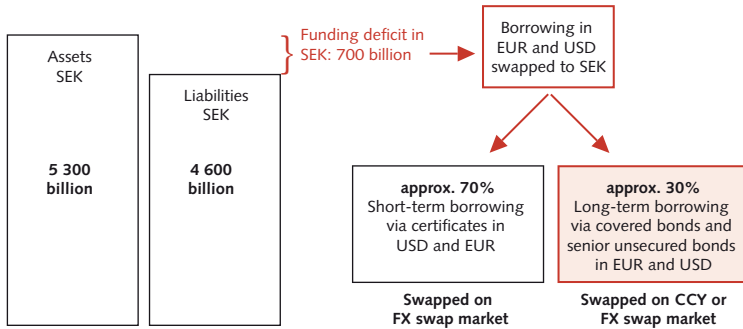
1 The Swedish banks' use of the currency swap market to fund long-term lending in Swedish kronor

Seven Swedish banks currently fund some of their lending in Sweden by borrowing on the capital markets: Handelsbanken, Nordea, SEB, Swedbank, SBAB, Länsförsäkringar bank and Landshypotek. In total, these banks have approximately SEK 5 300 billion in assets in Swedish kronor, of which they fund approximately SEK 700 billion by borrowing foreign currency on the capital markets abroad which they convert to Swedish kronor in the swap market.³ Approximately two-thirds of this amount relates to short-term funding via certificates, while around one-third is long-term funding through covered bonds and other bonds. This article concentrates on the latter (see the coloured box in Figure 1).⁴

3 The remainder is funded by means of deposits and market funding directly in Swedish kronor.

4 The banks' total funding deficit in Swedish kronor – that is to say, how much of the assets in Swedish kronor are funded by borrowing in other currencies – can be derived from their balance sheet and has been calculated on the basis of the situation in June 2011. The calculation of long-term and short-term borrowing swapped is based on information from the Riksbank's survey of June 2011. The need for funding in foreign currency and the breakdown between short-term and long-term funding may vary over time depending on the banks' funding strategies.

Figure 1. Swedish banks' use of the swap market to fund assets in Swedish kronor



Note. The numbers in the figure relate to Handelsbanken, Nordea, SEB, Swedbank, SBAB, Länsförsäkringar bank and Landshypotek. They are based on assets and liabilities reported in the banks' financial reports in June 2011 and the Riksbank's survey. The need for funding in foreign currency and the breakdown between short-term and long-term funding may vary over time depending on the banks' funding strategies.
Source: The Riksbank.

In 2011, the Riksbank carried out a survey on how Swedish banks are using currency swaps to convert their long-term funding in foreign currency to Swedish kronor. Some of the information presented in this article is taken from that survey. This includes sample data from the seven Swedish banks' currency swaps in June 2011. Interviews with the banks and other participants which were carried out as part of the survey also form the basis for the description in the following sections and the subsequent discussion.

1.1 USE OF FX SWAPS AND CCY SWAPS TO FUND LONG-TERM LENDING IN SWEDISH KRONOR

Essentially, the banks could convert their funding in foreign currency to Swedish kronor on the spot market. However, this could give rise to a large currency risk, so that the banks could risk parts of their earnings.⁵ Due to the large currency risks, significant further capital requirements are also imposed on the banks if they have large open – i.e. unhedged – currency positions in the balance sheet. Therefore, the banks use currency swaps to hedge themselves against the currency risk.

As regards the banks' covered bonds, the Swedish Act on Issuance of Covered Bonds and the credit rating agencies also lay down specific requirements for the banks to limit the currency risk between these and the underlying collateral; that is to say, the Swedish mortgages against which the banks issue their covered bonds (known as the cover pool). If the bonds are issued in a different currency to the mortgage loans, the banks must hedge

⁵ When the bank converts funding in foreign currency to Swedish kronor on the spot market, the bank receives an asset in Swedish kronor and a liability in another currency, which gives them an open currency position. Large open currency positions can lead to the bank making major losses even in the event of relatively minor exchange rate fluctuations. From a business perspective, therefore, there is no justification for a bank to take such a risk. See Appendix 2 for a more detailed example.

the cover pool against changes in currency exchange rates by means of swap agreements. Alternatively, the banks can ensure that the cover pool contains sufficient additional collateral (over-collateralisation) so that the value is above or equal to the value of the bonds even in the event of large currency exchange rate changes. However, to protect the owners of the covered bonds, the banks have opted to use swaps as far as possible to match the underlying mortgages in the cover pool with the covered bonds in respect of currency and interest rate period. In practice, the banks swap all (Swedish) covered bonds in foreign currency to Swedish kronor. Moreover, these swaps have more or less always the same maturity as the covered bonds.

As far as the owners of the bonds are concerned, it is sufficient that the swap is carried out with an internal counterparty, for example between the mortgage institution that issued the covered bond and its parent company. However, from the standpoint of the banking group, this does not change the currency distribution between assets and liabilities. Provided that a bank does not have assets in foreign currency which are equivalent to the value of the covered bonds in foreign currency, this could mean that the banking group has a currency risk. If the banks issue large amounts of covered bonds in foreign currency in relation to their balance sheet, they have to maintain large quantities of capital for the currency risk. As capital is generally perceived as expensive, the banks opt instead to eliminate this currency risk by making a further swap with an external counterparty. This protects both the owners of the covered bonds and the banking group against currency exchange rate fluctuations. The swap made internally is, from the standpoint of the group, comparable with a bookkeeping action (as it does not alter the currency distribution between the group's assets and liabilities). Therefore, in this article we will be concentrating on the swaps made by the Swedish banks with other banks in the market. Hence we will disregard the swaps which the banks opt to make internally between two legal entities within the banking group.

Data from the Riksbank's survey shows that different banks convert different proportions of their long-term funding in foreign currency to Swedish kronor in swap transactions with other banks. Essentially, the Swedish banks can be ranked on a sliding scale, from the banks which almost only have assets in Swedish kronor and which essentially swap all their funding in foreign currency to Swedish kronor, to the banks which hold most of their assets in currencies other than Swedish kronor and which swap only a small proportion of their long-term funding in bonds in foreign currency to Swedish kronor. However, all banks which also raise short-term funding through issuance of certificates in foreign currencies swap a relatively large proportion of this funding to Swedish kronor.

When the banks swap long-term funding in bonds, they have – in somewhat simplified terms – two options:

- (i) to use a CCY swap with the same maturity as the bond
- (ii) to use a swap with a shorter maturity than the underlying bond which is then renewed regularly during the bond's maturity, such as an FX swap.

The Riksbank's survey indicates that the banks largely match the maturity of their swaps with the maturity of the bonds they issued and want to convert to kronor. Still, it also happens that the banks do not match the maturity of the swap and the bond entirely, but use swaps with shorter maturity. A five-year bond can, for example, be converted to kronor by means of a one-year swap which the bank then renews (rolls over) every year.

Regardless of whether a bank chooses to use a maturity-matched CCY swap or to continuously renew a more short-term CCY swap or an FX swap, it is hedged against the currency risk that would arise if the foreign currency was instead converted to Swedish kronor on the currency spot market. However, one prerequisite for this is that the bank must renew the FX swap every time it falls due throughout the entire maturity of the bond. When the bank uses a swap with a shorter maturity than the maturity of the underlying bond, a maturity-mismatch occurs between the bank's assets and liabilities (on and off the balance sheet) in Swedish kronor and the foreign currency respectively. The bank's lending in Swedish kronor – that is, the asset – will have a longer maturity than the funding in kronor from the swap, while the bank's position in euro is vice versa. This can be said to constitute a refinancing risk in Swedish kronor as the bank does not know for certain whether it will be able to borrow kronor, or on what terms, when the FX swap falls due. A bank using a CCY swap has therefore, all things being equal, secured its access to Swedish kronor (and not just the foreign currency) for a longer time than a bank using an FX swap. We present a simplified example of this in Appendix 3.

However, if the bank matches the maturity of the swap and the bond, it needs to manage a greater counterparty risk compared with if it uses an FX swap or a CCY swap with a shorter maturity. To reduce these risks all Swedish banks use standardised contracts with more or less all their financial counterparties. In practice this includes all the swaps made by the banks in order to convert funding in foreign currency to Swedish kronor (see Section 2.1).

1.2 THE BANKS' COUNTERPARTIES IN LONG-TERM SWAPS

Most of the banks' long-term funding in foreign currency which is converted to Swedish kronor in the swap market is converted in CCY swaps with long maturity. Data shows that the Swedish banks have two main categories of counterparty in these swaps: foreign banks and other Swedish banks. In June 2011, these two groups were the counterparties to more than 80 per cent of the transactions executed by the Swedish banks in order to convert long-term funding in euro to kronor (see Table 3). The banks had other counterparties for less than one-fifth of the swaps. These included, for example, so-called arbitrage issuers⁶, as well as a couple of Swedish insurance and pension companies, although overall these did not have a particularly prominent part to play.

⁶ Arbitrage issuers issue in the currency that gives the lowest total funding cost. If the price for lending (i.e. supplying) Swedish kronor in a derivative contract is advantageous, they can opt to issue in Swedish kronor and swap the funding to the currency that they need, e.g., euro, instead of issuing directly in the currency that they need, so as to reduce their overall funding cost.

In general, the banks thus have a limited number of counterparties in the CCY swaps. This can be explained in part by the fact that the banks generally do not split a bond issue into a number of swaps. However, in the few instances in which this does take place, the banks concerned have a larger number of counterparties than other banks.

Table 1. Counterparties to the Swedish banks in CCY swaps

TYPE OF COUNTERPARTY	PERCENTAGE OF SWAPS WHERE A SWEDISH BANK RECEIVES KRONOR IN EXCHANGE FOR EURO
Other Swedish bank	40%
Swedish institution or company	15%
Foreign bank*	45%
Other foreign participant or company	< 5%

Note. The details in the table are based on data indicating the banks' gross exposures to their biggest counterparties in long-term CCY swaps in SEK/EUR during the period June-July 2011. The figures in the table are rounded and so add up to more than 100 per cent.

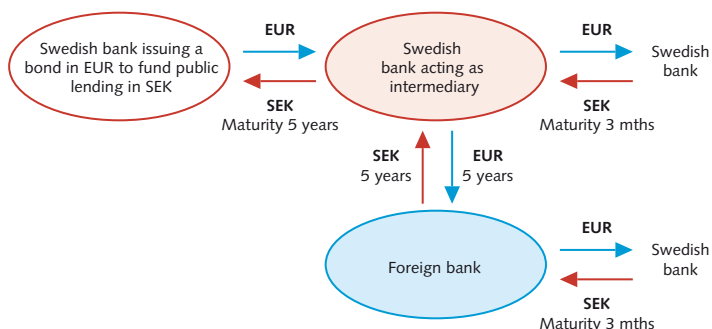
*Also includes supranational participants.

Source: The Riksbank.

However, both the foreign and the Swedish banks which lend Swedish kronor in CCY swaps must themselves get hold of the kronor which they then lend. The foreign banks in many cases do this at a shorter maturity than they lend on in the CCY swaps; often by entering an FX swap with a Swedish bank. Thus the foreign banks transform short-term funding to long-term lending in Swedish kronor in the swap market to a large extent, although the foreign banks at times obtain Swedish kronor at longer maturities for example from an arbitrage issuer which has issued in Swedish kronor but needs funding in euro. Consequently, when the foreign banks carry out the maturity transformation in the swap market they accept the liquidity risk associated with this.

Insofar as Swedish banks lend kronor in CCY swaps, it is typically the major banks that do this. This activity takes place within the scope of the banks' trading activities, which is separated from the banks' treasury. The Riksbank's survey shows that in swap transactions where the Swedish banks are a counterparty to another Swedish bank, also the Swedish banks borrow some of the kronor which they lend in the CCY swaps at a short maturity, thereby making a maturity transformation in Swedish kronor in the swap market. Yet, a large proportion of the kronor that they lend in CCY swaps they borrow at longer maturities by entering into a different CCY swap with a counterparty outside the Swedish banking system. In other words, they do a CCY swap with the same maturity, but in the opposite "direction". Typically, the counterparty in the other swap is a foreign bank. Hence, in these transactions the Swedish banks can instead be viewed as intermediaries, which "pass on" the risks stemming from the Swedish bank which issues a bond in euro to the foreign bank that carries out the maturity transformation (see Figure 2).

Figure 2. Example of a maturity transformation in the swap market



Note. A typical transaction in the swap market starts with a Swedish bank issuing a five-year bond in euro. This bank then enters into a swap with another bank, often a Swedish bank. This swap has the same maturity as the bond which the Swedish bank first borrowed euro in. The other Swedish bank funds half of the lending of Swedish kronor in the swap by entering into another swap with a foreign bank at the same maturity as the first swap. The remaining half is instead borrowed at a shorter maturity, often also from another Swedish bank, in the example at three-months. The foreign bank often funds its lending of kronor in the swap by borrowing from a Swedish bank at a shorter maturity. Source: The Riksbank.

Consequently, data of the banks' swap transactions suggests a certain degree of segmentation in the swap market, in the sense that the banks seem to carry out maturity transformation in the swap market to a varying extent. This may be linked with the banks' different abilities to manage risks. For example, foreign banks with large balance sheets in many currencies and a diversified business are generally in a good position to take risks and seem to carry out a large proportion of maturity transformation. They do this either as a direct counterparty to the Swedish banks which swap bonds in euro to kronor, or by providing other Swedish banks with kronor which they in turn lend to the issuers. In addition, the major Swedish banks themselves are responsible for part of the maturity transformation towards the smaller banks, while the smaller banks generally do not carry out any maturity transformation at all in the swap market.

A rough estimate of the risks taken by the Swedish banks in terms of CCY swaps alone indicates that they directly transfer their positions in approximately half of the swaps where they are counterparties to another Swedish bank. As the Swedish banks mostly do not carry out the maturity transformation themselves when they convert their own foreign currency funding to kronor, this means that the banks which are counterparty to other Swedish banks in swaps probably take a greater refinancing risk in Swedish kronor in swaps than they, or other Swedish banks, do in swaps in which they convert their own funding to kronor.

2 Risks associated with the use of currency swaps

The banks use currency swaps to hedge themselves against the currency risk occurring when their funding is in a currency other than the one in which they lend. Still, currency swaps result in that the banks are exposed to other risks. These include what we can refer to as *bank-specific risks*. As we have already pointed out, the choice of matching the maturity of the swap with the maturity of the underlying bond affects the bank's refinancing risk in Swedish kronor and its counterparty risk. Moreover, the banks are exposed to *structural risks* associated with the swap market, in particular the CCY swap market. The structural risks in turn are due to the market's structure which makes the swap market susceptible to disruptions.

2.1 BANK-SPECIFIC RISKS

When currency swaps are used to facilitate the funding of long-term assets in Swedish kronor, the bank-specific risks involve a refinancing risk in Swedish kronor, spread (or basis) risk, counterparty risk and settlement risk (see Table 2).

Table 2. Bank-specific risks

<i>Currency risk</i>	The risk of the value of the assets or liabilities being affected by changes in currency exchange rates
<i>Refinancing risk (currency)</i>	The risk of not being able to get funding in the same currency as the one in which the bank has assets
<i>Spread risk (basis risk)</i>	The risk of the bank making a loss as a consequence of a change in the surcharge above the market interest rate (spread) which the bank pays for the swap
<i>Counterparty risk</i>	The risk of the counterparty to the swap defaulting
<i>Settlement risk</i>	The risk of the bank transferring funds to the counterparty during settlement of transactions without getting paid in turn

Refinancing risk in Swedish kronor

Refinancing risk in Swedish kronor relates to the risk of the bank not getting hold of funding in kronor in order to fund lending in kronor, but essentially a refinancing risk can occur in any currency.

Refinancing risk in a particular currency occurs as a consequence of the banks funding themselves in a certain currency over a shorter maturity than the maturity of its assets in the same currency. This means that a bank issuing a bond in Swedish kronor in order to fund mortgage loans is taking a refinancing risk in Swedish kronor as the banks' lending in Swedish kronor consists largely of mortgage loans with very long maturities while the banks rarely issue bonds with a maturity in excess of five years. This risk is difficult, and not desirable to, avoid completely as it is one of the functions of the banking system to carry out a certain amount of maturity transformation. However, in this article we are concentrating on the refinancing risk in Swedish kronor which may occur beyond what is

due to the difference in the maturities of the bond and the lending; that is, when Swedish banks convert long-term funding in another currency to Swedish kronor in the swap market.⁷

As described previously, the refinancing risk in Swedish kronor occurs in the swap market when a bank uses a swap with a shorter maturity than for the bond in the foreign currency that is to be converted to kronor. Only when the bank enters a CCY swap with the same maturity as the foreign bond has it also secured funding in kronor during the entire period over which it originally borrowed currency via the bond. If the bank instead enters an FX swap with a shorter maturity, it has to renew the swap repeatedly during the maturity of the outstanding bond in order to continue to have funding in kronor.

But what could happen to a bank taking a refinancing risk in Swedish kronor by relying on the renewal of FX swaps? Normally, one can imagine that the bank would renew the swap with the original counterparty, that is, allow it to roll over for a further period. However, there is a risk that the bank's counterparty for some reason will be unwilling or unable to renew the swap. In that case the Swedish bank will have to acquire kronor in some other way. The bank will probably first attempt to replace the swap with a similar swap, or a swap with a shorter maturity with another counterparty. However, for a Swedish bank wishing to convert long-term funding to kronor a more short-term swap does in itself mean an increased refinancing risk in kronor. If the Swedish bank fails to renew the swap or enter into a new swap, a currency mismatch occurs in its balance sheet which is equivalent to the mismatch occurring if the bank converts kronor for itself on the currency spot market. This means that the bank is exposed to currency risk. However, in principle the bank will always be able to repay kronor to a swap counterparty not wishing to renew the swap as it can borrow either on the interbank market or from the Riksbank's standing facilities.

Spread risk

However, it is unusual for banks to not be able to renew their swaps at all. Instead, problems in the swap market typically manifest themselves by impairment in liquidity, increases in the cost of entering into a swap and shortening of maturities which the banks can use for swaps. The cost of entering into a swap is often expressed as the difference between two market interest rates, what is known as a *basis spread*, and the risk of this cost increasing is therefore known as a basis (spread) risk.

To understand what basis risk is and how it affects a Swedish bank which converts funding in foreign currency to kronor, we can consider the costs of a swap on the basis of the interest payments included in the swap. These can be expressed as a variable market interest rate, such as three month STIBOR, plus a fixed spread. In very simplified terms, the spread can be viewed as the additional cost which a bank pays to convert funding in

⁷ For a discussion about the Swedish banks' overall refinancing and liquidity risks, see for example Financial Stability 2011:2.

euro to kronor in the swap market, and it is specific to the swap in question. As the spread is fixed throughout the maturity of the swap, this means that a bank which swaps its euro funding in a CCY swap with the same maturity as the underlying bond knows what its funding cost will be throughout this entire period (in excess of the market rate). On the other hand, a bank which converts its euro funding to kronor in an FX swap risks changes in the spread to the disadvantage of the bank when the swap is to be renewed. Hence, with this strategy, it does not know what its future funding cost will be.

Counterparty risk

Counterparty risk relates to the risk of the bank making a loss as a consequence of the counterparty being unable to fulfil its obligations. Normally the counterparty risk is very small at the time the parties enter into the swap agreement, and it increases for example when currency exchange rates between the two currencies exchanged in the swap are changed. This is because the bank that received the weakened currency in the swap holds a currency that is worth less than the amount it lent and, therefore, risks making a loss on the difference if the counterparty defaults. Generally, the longer the maturity of a derivative and the more volatile the price of the underlying asset (in this case the currency), the greater the counterparty risk. This is because the longer the agreement remains in force, the greater the uncertainty concerning the future value of the swap agreement. In addition, the bank is bound by its counterparty for a long time in a longer agreement, while it may change counterparty more often if it enters into a shorter agreement. Thus a short-term FX swap does not give rise to such great counterparty risks. On the other hand, in long-term CCY swaps the counterparty risk can be considerable.

If a counterparty defaults, the bank also needs to replace its swap by entering into a swap with a new counterparty as the bank will otherwise have an open currency position in its balance sheet. In this case, the bank may obtain poorer terms with its new counterparty, which essentially means that an interest rate risk and spread risk arise when the counterparty defaults. The consequences of a swap counterparty defaulting are irrespective of whether the bank entered into an FX swap or a CCY swap. However, there is a risk of a greater loss in the case of a CCY swap as the value of the swap over time may have changed more.

Settlement risk

When two parties enter into a CCY swap, the underlying currencies are exchanged. A corresponding transfer occurs when the swap agreement matures. A settlement risk then arises, which means that one party transfers funds to the counterparty without getting paid in turn. Unlike most other financial contracts, FX and CCY swaps are settled on a gross basis, which means that both parties transfer the entire nominal amount in the relevant currency. Therefore, the settlement risk in these contracts is considerably greater than in other derivatives which are settled on a net basis; that is to say, when only one of the

parties transfers the market value of the contract at maturity. However, by settling the swaps in a settlement system, it is possible to transfer the underlying currencies in the swap simultaneously, which essentially means that the settlement risk is eliminated.

How do the Swedish banks manage bank-specific risks in currency swaps?

The Riksbank's survey shows that the banks normally use CCY swaps when converting bonds in foreign currency to Swedish kronor and largely fully match the maturity of the swap with the maturity of the underlying bond. This means not only that the banks are hedged against the currency risk resulting from the fact that they fund lending in Swedish kronor by borrowing in another currency. Moreover, they also limit the refinancing risk in Swedish kronor and the spread risk arising when they swap their long-term funding. On the other hand, the Swedish banks do take refinancing risk in their role as counterparties in the swap market. This risk-taking is regulated within the scope of the banks' trading operations and is normally separate from the funding activities of the banks. Nevertheless, the fact that the Swedish banks carry out maturity transformation is of significance to the structural risks in the swap market (see Section 2.2).

To reduce the counterparty risk in the swaps, the banks comply with a number of standards and market practice for OTC trading. For example, the banks use standardised netting agreements which enable them to offset their positions if a counterparty defaults. There are also special agreements which regulate how the banks transfer securities to one another as compensation for the counterparty risks arising in swap transactions.⁸

As regards the settlement risks, statistics from the fourth quarter of 2011 indicate that around 90 per cent of all currency transactions entered into by the Swedish banks were settled via the settlement system Continuous Linked System (CLS).⁹ The proportion of transactions settled via CLS varies among the banks. The main reason as to why the banks do not settle all their swap transactions via CLS is either because the system does not handle the specific currencies involved¹⁰ or the derivative type¹¹ – which is the case for CCY swaps – or because the bank's counterparty does not participate in CLS.

2.2 RISKS WITH THE STRUCTURE OF THE SWAP MARKETS

The Swedish banks largely match the maturity of the swaps with the maturity of the underlying bond and hence execute very little maturity transformation. Instead, the maturity transformation is carried out by the counterparties in the Swedish banking system

8 These agreements are often so-called ISDA Master agreements, with a supplementary agreement called a Credit Support Annex, (CSA).

9 Find out more about CLS in the Riksbank publication *The Swedish Financial Market in 2011*.

10 The currencies settled via CLS are US dollars, Australian dollars, British pounds, Danish kroner, euro, Hong Kong dollars, Japanese yen, Canadian dollars, Korean won, Norwegian kroner, New Zealand dollars, Swiss francs, Singapore dollars, South African rand, Mexican pesos, Israeli shekels and Swedish kronor.

11 The currency derivatives handled by CLS are FX spot, FX forwards, currency options, FX swaps and non-deliverable forwards.

or by the foreign counterparties. Although the banking system normally carries out the maturity transformation, there are risks associated with this structure.

i. Risks of foreign banks acting as counterparties to Swedish banks

One thing the foreign banks have in common is that they typically do not have deposits or issue securities in Swedish kronor. Nor do they have access to a *lender of last resort* in kronor.¹² Consequently, to be able to supply kronor in long-term swaps, they first have to borrow them from someone with access to kronor. This often takes place on short maturities from the Swedish banks. In turn, this means that these foreign banks – unlike the Swedish banks – meet a large part of their funding needs for Swedish kronor on the short-term market. This makes them susceptible to disruptions that occur in this market. Besides, the foreign banks' incentive to participate in the swap market is often speculative in nature. This increases the likelihood of the foreign banks leaving the Swedish market if problems arise which temporarily affect their earnings negatively.

Overall, this means that disruptions on the Swedish money market may have implications for the supply of long-term swaps, or other financial instruments at short-term maturities, which will affect liquidity and pricing in this market. During times when uncertainty increases, the spreads on market interest rates often rise and their volatility increases, which is also true of the spreads in the swap market. As the foreign banks borrow Swedish kronor in short-term swaps, their funding cost increases when the spreads rise. However, the spreads included in the interest rates which the foreign banks receive in the CCY swaps are locked for longer periods which they entered into in order to lend kronor. This means that the foreign banks may be forced to take a loss. To compensate for the increased uncertainty, the foreign banks must then raise the spreads included in the interest rates which they charge for new long-term CCY swaps or when they renew their outstanding CCY swaps.¹³ If the short-term interest rates are unpredictable – that is to say, there is a high degree of volatility in the interest rates – it will also be difficult for the foreign banks to assess their future funding cost. If there is too much uncertainty, this may lead to the foreign banks deciding to reduce their activity in the market.

As indicated previously, however, it is unusual for banks to be unable to renew their swaps at all. Foremost it is instead the liquidity in the swap market and the funding cost for the Swedish banks that is affected. When this happens, liquidity often deteriorates most for the longer maturities, which means that the banks are forced to fund themselves through swaps with even shorter maturities or pay a higher spread in the longer term swaps. This was in broad terms what happened in October 2010 when the last of the three long-term loans offered by the Riksbank during the financial crisis matured, which caused strain and

12 Some of the foreign banks are members of the Riksbank's payment system RIX and hence have access to Swedish kronor via the Riksbank's facilities. However, discussions with these banks have shown that membership of RIX is formal in nature and not something which the traders of swaps in these banks could utilise in order to access Swedish kronor, as this means that they could "inflate" the bank's balance sheet.

13 As the bonds issued by the banks have a shorter maturity than their lending, the banks have to renew the bonds when they mature and then also renew their CCY swap.

increased volatility, first, in the overnight-market and, thereafter, in the tomorrow-next market and ultimately along the yield curve. In turn, this led to a sell pressure on the CCY market which increased the costs for using the swap market and reduced the liquidity. The sell pressure on the CCY market was partly caused by the foreign banks which had funded their krona positions in CCY swaps with short-term FX swaps. In the long run, reduced liquidity and higher swap costs lead to increases in the banks' lending rates as the banks have to compensate for the increase in the funding cost.

ii. Risks of having a large number of swap counterparties within the Swedish banking system

Besides the foreign banks, the maturity transformation in the swap market is currently carried out by Swedish banks themselves. Certainly, they have access to kronor via the Riksbank's facilities and deposits from the general public and so are perhaps better suited to executing the transformation than foreign banks. However, from the standpoint of the Swedish banking system, the banks' long-term swaps cancel out one another and which means that the risks only are redistributed within the banking system. Since the Swedish banking system in total has more long-term assets than liabilities in Swedish kronor, this imply that the Swedish bank's lending of kronor in CCY swaps at some point are funded at shorter maturities. This means that the banking system's overall need for long-term funding is secured by the banks borrowing foreign currency with long maturity, but the need for Swedish kronor is only secured for a shorter period. If Swedish banks act as counterparties to one another to a great extent, this also increases the interconnectedness between them.

3 Criteria for a more robust swap market

So what criteria are required to reduce the risk of disruptions occurring in the swap market and to achieve a more robust swap market? To start with, there are two basic factors which are important so as to ensure that no disruptions take place on the long-term swap market:

- 1) an effective short-term market in Swedish kronor
- 2) a well-capitalised banking system.

These things may seem obvious, but at the same time they are often the factors that cause problems on the long-term swap market in Swedish kronor or in other currencies. The problems have been reinforced by specific circumstances in the swap market.

As the Swedish banks nowadays are dependent on foreign banks as counterparties in long-term swaps and these foreign banks often fund their lending of kronor to the Swedish banks on short maturities, the terms on the short-term market for kronor are particularly important. If either their access to or the price of Swedish kronor is perceived by foreign participants to be uncertain, this can lead to disruptions in the swap market. In addition, an effective swap market requires confidence in the Swedish banks, which in turn presupposes that the Swedish banks are well capitalised. If the foreign banks believe that

the counterparty risk in the Swedish banks is too great, they will be less willing to enter into swaps with long maturity with the Swedish banks. This applies to some extent on all financial markets, but it may be even more important in the swap market. This is because the Swedish banks are dependent on the foreign banks as counterparties to be able to fund their operations, while at the same time the foreign banks are not dependent on the Swedish banks in the same way. In this sense, the relationship between the Swedish banks and their counterparties is asymmetrical.¹⁴

Alongside an effective market and a well-capitalised banking system, there are a number of other factors which could help to bring about a more robust swap market.

i. The banks' own risk-taking on the currency swap market

Firstly, the banks themselves can reduce their susceptibility to disruptions in the swap market by handling and minimising their own risk-taking in swaps. The Riksbank's survey shows that the banks are already greatly reducing their bank-specific risks arising in currency swaps. All things being equal, this means less risk for individual banks and less susceptibility to disruptions in the swap market if they match the maturity of the swap and the underlying bond. Given the high degree of interconnectedness in the swap market, there may also be a risk of spill over if one bank has problems. At the same time, the risk of spill over between institutions justifies the banks making themselves less dependent on individual counterparties. Although the market at present comprises few participants, it should be possible for the banks to increase the number of counterparties they use to some degree.

However, for the Swedish banking system as a whole to benefit from the Swedish banks fully matching the maturity of their swaps with the maturity of the bond or increasing the number of counterparties, some participant outside the Swedish banking system has to take over the risks. This can be either a participant with a fundamental need to borrow long-term euro and lend long-term kronor, or a foreign bank. If an increase in matching leads to more swaps between Swedish banks, in a best case some of the banks will end up being less susceptible to idiosyncratic shocks.¹⁵ However, the overall refinancing risk in the Swedish system will remain unchanged.

ii. More participants with natural counterflows to the Swedish banks

Normally, it is the banking system that provides borrowers with long-term funding by carrying out the maturity transformation. However, even though the banking system is

¹⁴ The fact that capitalisation in banking systems is important to the swap market was also apparent during the crisis in 2007-2008. For example, it has been demonstrated that a factor which contributed strongly to the effects seen at that time in the swap market in EUR/USD was the fact that the counterparty risk was perceived to be much higher in European banks compared with American banks. See – for example – Baba and Packer, 2009.

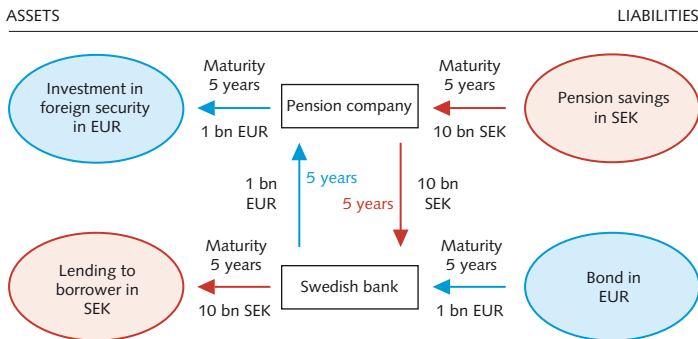
¹⁵ An idiosyncratic shock is an event specific to an institution; that is to say, it is not dependent on macroeconomic changes, for example. One example is if a bank makes a major loss due to a single trader exceeding his risk limits.

especially suitable for creating long-term lending, there are also other parties that can fulfil the same function. One example is life insurance and pension companies that acquire long-term kronor through their operations.

The Swedish life insurance and pension companies have long-term liabilities in kronor in the form of savings which they invest in part in long-term assets abroad. This means that these companies have a currency mismatch in their balance sheets which is the opposite of the currency mismatch in the balance sheet of a Swedish bank which funds part of its long-term lending in Swedish kronor with long-term funding in foreign currency (before the bank makes the currency swap).

To the extent that the life insurance and pension companies choose to hedge the currency risk that originates from the this currency mismatch they already do so using swaps. However, these companies mainly use FX swaps and so are not particularly active on the long-term CCY swap market, as confirmed by data from the Riksbank’s survey. As the life insurance and pension companies have liabilities and assets with long maturity, they can achieve a better maturity match in their balance sheets in each currency by entering into a long-term swap whereby they lend kronor and receive euro. In particular, they could hedge the currency risk in this way where they today use short-term swaps. In this case, they would make a natural counterparty to the Swedish banks (see Figure 3).

Figure 3. Schematic illustration of transactions in a long-term CCY swap between a Swedish pension company and a Swedish bank



Reading instruction: The figure shows a pension company which has long-term (five-year) liabilities in Swedish kronor in the form of pension savings, but wants to invest these savings in long-term securities in euro. To do this, the pension company has to enter into a swap whereby it lends the kronor and borrows euro. The Swedish bank, on the other hand, borrows euro in a five-year bond in order to lend Swedish kronor for five years. The bank also needs to swap, but unlike the pension company the bank needs to borrow kronor in exchange for euro. By entering into a five-year swap with one another, both the pension company and the Swedish bank can gain access to the currency they need for five years. If either of them chooses instead to swap at a shorter maturity, this means that they are taking a greater refinancing risk as the swap will have to be renewed more frequently. If this is not possible, the swap counterparty must be refinanced when the swap matures, in kronor in the case of the bank and in euro in the case of the pension company.

Source: The Riksbank.

There are a number of reasons as to why the life insurance and pension companies nevertheless choose short-term FX swaps over CCY swaps. One reason is that it is

difficult for some of these companies to enter into long-term swaps as they are constantly rebalancing their investments and hence would also need to adjust their CCY swaps, which they do not need to do to the same extent with FX swaps with short maturity. Another reason is that these companies already invest directly in the banks' bonds and either cannot or do not want to further increase their exposure to the banks. Furthermore, these companies sometimes lack technical systems and, in some instance, risk limits for making CCY swaps. However, information from participants in the swap market indicates that life insurance and pension companies have recently increased their participation in long-term swaps. If this continues, it may help in the long term to reduce the imbalance between supply and demand for Swedish kronor in long-term swaps and to make this market more robust.

Besides life insurance and pension companies, *arbitrage issuers*¹⁶ which issue in Swedish kronor could also contribute to balancing the demand and supply of kronor in the CCY swap market as these participants also need to convert long-term Swedish kronor. For the arbitrage issuers to be willing to participate in the Swedish swap market, they have to be able to reduce their total funding cost by funding themselves *via* the Swedish krona instead of issuing directly in the foreign currency that they need. This in turn requires that they receive a high interest rate for supplying kronor in the swaps. Compared to before the financial crisis, the cost for converting euro to Swedish krona has been relatively high. This is favourable for the arbitrage issuers, and in line with that their issues in Swedish kronor seem to have increased somewhat since then.

i. Use of systems in the financial infrastructure to manage risks on the currency swap market

The counterparty risk and settlement risk arising on the back of the trading in currency swaps can be reduced by market participants using systems in the financial infrastructure. Even today, market participants are using settlement systems for currencies, but to further reduce the risks and promote a more transparent market, new systems such as central counterparties and trade repositories for currency derivatives may be developed.

More currencies, derivatives and participants in the settlement system

It is up to the respective market participants to determine whether they should expose themselves to settlement risk by not settling their swap transactions via a global infrastructure for currency settlement or reducing the settlement risk by using this infrastructure. The proportion of FX swaps settled via CLS may increase further by increasing the number of currencies and participants in the system. CLS could also increase the number of derivatives which it manages, such as CCY swaps, which would further reduce the settlement risk on the currency swap market.

¹⁶ See footnote 6 for an explanation.

Central counterparty for currency derivatives

As things stand at present, there is no central counterparty (CCP) for currency swaps. A CCP replaces the original agreement with two new contracts and becomes the legal counterparty to both sides of the transaction – buyer to each seller and seller to each buyer. At the same time, the participants entering into a swap agreement must also provide collateral to the CCP for the commitments they have made. This means that the counterparty risk between two participants on the currency market could be reduced if a CCP were to be introduced on the currency swap market.

For CCP clearing to take place, the instruments to be cleared must be liquid and standardised. However, the CCY swaps which the banks are using at present are largely customised and, in some instances, difficult to standardise. Moreover, liquidity in the market for these swaps is often limited. Therefore it is not necessarily appropriate to use CCP clearing for CCY swaps. Instead, it could be the case that it is more reasonable for participants to provide collateral in order to reduce the counterparty risk for the currency swaps not cleared via a CCP. In this case, the participant in question has to make a fair valuation of the positions entered into and provide collateral in relation to these. The participant does not have the same opportunity to net its positions as with the derivatives cleared via a CCP. However, given the fact that Swedish banks have a structural need to borrow kronor against foreign currency, the option of netting these transactions via a CCP should be very limited.

Trade repository for currency swaps

The market for FX swaps and CCY swaps could also be made more robust if its transparency were to increase and both authorities and private participants were to have better opportunities to assess risks in this market. Mandatory reporting to a trade repository would lead to greater transparency and increase financial stability. Authorities would then have better chances of monitoring the positions of individual banks and their counterparties, and of assessing the systemic risk on the currency swap market. Market participants would also be able to assess some of this information, albeit at a general level.

4 Conclusion

Overall, the Swedish banks fund around SEK 700 billion of their lending in Sweden with market funding in foreign currency swapped to Swedish kronor, of which approximately one-third funds long-term lending such as mortgage loans.

The information collected by the Riksbank in June 2011 indicates that the banks hedge themselves against a major part of the bank-specific risks arising in currency swaps. More specifically, the data indicate that banks largely match the maturity of their swaps with the maturity of their underlying bonds when they convert funding in foreign currency to kronor, thus limiting their refinancing risk in Swedish kronor. In addition, the banks largely

use standardised agreements with their counterparties as well as the specific infrastructures for settlement of the transactions which are currently available in the market in order to reduce counterparty risks and settlement risks respectively.

At the same time, the use of currency swaps to fund long-term lending in Swedish kronor means that the Swedish banks become dependent on a small and concentrated market that is susceptible to disruptions. One important reason for this is that most of the transactions on the long-term swap market take place either between two Swedish banks or between Swedish banks and foreign banks. As the foreign banks often fund their krona lending in the swaps on a short-term basis, the Swedish swap market is susceptible to disruptions on the short-term interest rate market in Swedish kronor. However, the risks on the currency swap market would not be reduced if the Swedish banks were only to enter into swap transactions with one another.

Given this, for the swap market not to suffer from disruption, it is essentially necessary for the short-term interest rate market to be stable and predictable and that the Swedish banking system is well-capitalised to maintain the confidence in the Swedish banking is sustained.

Lastly, we can conclude that there is a mismatch between the demand and the supply for kronor in long-term swaps. However, recently participants such as life insurance companies, pension companies and arbitrage issuers, which all have a need to exchange long-term kronor for other currencies, seem to have increased their participation in long-term currency swaps. In the long term, this may have a stabilising effect on the Swedish swap market. The fact that more participants are using systems within the financial infrastructure may also reduce risks on the currency swap market, and also have a positive influence on the market by helping to increase transparency.

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Appendix 1. How does a currency swap work?

Assume that a bank has access to unsecured funding in euro for three months, but has no access to funding in kronor. By entering into a currency swap, the bank can convert this euro funding to Swedish kronor over a set period of time and at the same time eliminate the currency risk arising if an asset is held in one currency and a liability is held in another. Essentially, there are two types of currency swap: *FX swaps* and *cross-currency basis swaps (CCY swaps)*. These two instruments are similar in structure, but they differ in at least two important aspects. An FX swap normally has a maturity of less than one year and does not include any interest payments, while a CCY swap has a maturity in excess of one year and includes periodic interest payments.

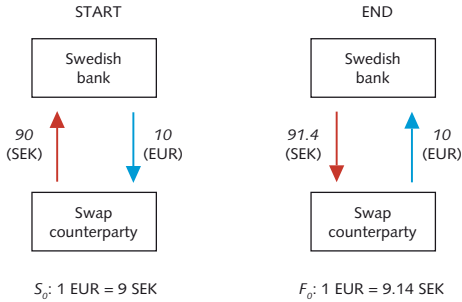
FX swap

An FX swap is an agreement between two parties to simultaneously buy and sell one currency against another at two different dates: when the parties enter into the agreement and when the agreement matures. As the transaction involves one currency being exchanged for another, it can be regarded as being partially secured. An FX swap often has a maturity of just a couple of days or months, and sometimes up to one year.

Figure A1 shows an example of the payment flows in an FX swap. The nominal amounts are exchanged both when the parties enter into the swap and when it matures. In this case, the Swedish bank exchanges kronor for euro at the current exchange rate (spot rate). If the spot rate is 1 EUR = 9 SEK, the Swedish bank pays 10 million euro and receives 90 million kronor (9 × 10 million). At the same time, the Swedish bank agrees with the swap counterparty to buy back 10 million euro in, say in three months' time. The amount to which this equates in kronor and that the Swedish bank will pay back when FX swap matures is determined using the forward rate at the time when the swap agreement is entered into: F_0 . In turn, the forward rate is determined by the interest rate differential between the two currencies which the parties exchange in the swap.¹⁷ If the forward rate in this case is 1 EUR = 9.14 SEK, the amount which the Swedish bank must pay back to the swap counterparty will be 91.4 million kronor.

17 $F_0 = S_0 * \frac{(1 + \text{Interest rate}_{SEK})}{(1 + \text{Interest rate}_{EUR})}$

Figure A1. Schematic representation of the flows in an FX swap
Millions



Note. In the figure S_0 is the spot rate between kronor and euro when the contract is entered into. When the swap matures, the repayment is determined by the forward rate between the currencies F_0 . The forward rate is agreed when the parties enter into the swap agreement and is based on the interest rate differential between the two swapped currencies at this time.

In an FX swap, the parties do not exchange interest rate flows during the maturity of the swap, but the interest expenses for the respective “loans” of currency are included in the payment made when the swap matures. The total cost of borrowing domestic currency via the swap market is known as the *FX swap-implied interest rate*.

Cross-currency basis swap (CCY swap)

A bank may, however, need to hedge its currency risks over a longer maturity than what is possible with an FX swap. Assume that a bank needs funding in kronor for six months but only has access to three-month FX swaps. In this situation, the bank can enter into a three-month FX swap today and then enter into a new three-month FX swap when the first swap matures. In this way, the bank can create funding in kronor for six months despite only having access to three-month FX swaps. Of course, this option is not limited to six months. The same transaction can be repeated so as to create funding in kronor with the required maturity. Thus a bank can use short-term FX swaps to manage currency risks at maturities which are considerably longer than for the individual swaps.

However, it is possible that the bank will not want to rely on its option of renewing or “rolling over” FX swaps over a long period. There is a risk that the bank for some reason may be unable to acquire kronor via the FX swap market in the future. To avoid this risk, the bank can opt today to enter into a transaction which provides access to funding in kronor over a longer period. For example, a bank can acquire funding for six months by entering into two transactions at once: an FX swap with a start date of today and maturity in three months, and an FX swap that will start in three months’ time and mature in six months’ time. To facilitate this type of transaction, an instrument has been developed which comprises such a package of FX swaps, which is known as a *CCY swap* (see Figure A2).

Figure A2. Long-term synthetic funding in kronor via a number of three-month FX swaps

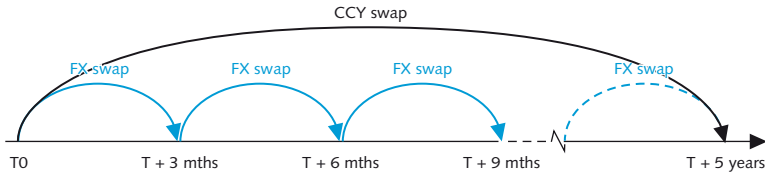
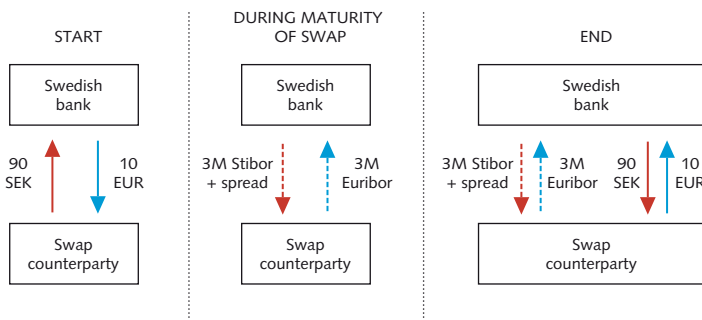


Figure A3 shows in schematic form the possible structure of the payments in a CCY swap. When the parties enter into the swap, the Swedish bank receives kronor from its counterparty and at the same time pays the equivalent amount in euro. If one euro is worth 9 Swedish kronor, that is to say $S_0 = 9 \text{ SEK/EUR}$, and the Swedish bank pays 10 million euro to the counterparty, it is able to borrow 90 million kronor. During the maturity of the swap, the Swedish bank pays quarterly interest on the kronor it has borrowed, typically specified as the Swedish three-month interest rate, STIBOR, plus a spread (that is to say, the price of the swap which the parties agreed upon when entering into the agreement). At the same time, the Swedish bank also receives three-month interest for euro from the counterparty every quarter. At the end of the contract, the Swedish bank pays back 90 million kronor to the counterparty, which at the same time pays back 10 million euro to the Swedish bank. The parties then also exchange the final interest payments.

In terms of structure, a CCY swap is thus very similar to an FX swap. In both contracts nominal amounts in the respective currency are exchanged when the contract is entered into and terminated. The difference lies in the periodic interest payments which take place between the parties during the maturity of the swap and in the fact that the maturity of the CCY swap is typically longer than in an FX swap. The size of the interest payments is not fixed; instead, a variable interest rate and a spread are specified.

Figure A3. Payment flows in a CCY swap
Millions



S_0 : 1 EUR = 9 SEK

Appendix 2. Currency risks related to open positions on the balance sheet

Essentially, a bank can convert funding in foreign currency to Swedish kronor by exchanging it on the spot market. However, this would involve a significant currency risk for the bank since it would result in an open currency position in the bank's balance sheet. That is to say, after the exchange the bank would have its assets in Swedish kronor and its liabilities in foreign currency, in euro in this example (see Table A1).

Table A1. Balance sheet of a bank borrowing in a five-year bond in euro and exchanging for kronor on the spot market

	ASSETS	LIABILITIES
Balance sheet items:	SEK 9 billion lending, 5 years	EUR 1 billion issued securities, 5 years
Off-balance sheet items:	0	0
<i>Total position in SEK</i>	SEK 9 billion	SEK 0 billion
<i>Total position in EUR</i>	EUR 0 billion	EUR 1 billion

The currency risk involves the bank being susceptible to currency rate fluctuations. If the krona were to weaken against the euro, the bank would then be forced to recognise a loss as the bank's liabilities, measured in krona terms, have increased. This would also affect the bank's capital. The bank may make significant losses even with only minor exchange rate fluctuations if its open currency position is large. For a retail bank, therefore, there is no justification from a business perspective to have large open currency positions on the balance sheet. A bank with an average profit margin on lending of approximately 0.5 per cent would lose all its earnings in the event of an exchange rate fluctuation of 0.5 per cent in this example, where the bank has a completely open currency position.

Moreover, if the krona remains weak against the euro after the five years have passed, the 9 billion kronor which the bank receives back from its customers will not be enough to repay the investors in the bond. On exchanging back to euro, the bank will have a lower spot rate in this case, and hence the amount that the bank obtains will not be sufficient to cover its obligation. The bank will then need to sell assets in order to cover the missing amount. Due to the major risks associated with open currency positions on the balance sheet, banks with large positions of this type are subject to significant further capital requirements.

Appendix 3. Currency and refinancing risks when the banks use FX swaps and CCY swaps

Assume that a Swedish bank on two occasions lends 9 billion Swedish kronor over five years in a mortgage loan and funds this by issuing 1 billion euro in a five-year bond in euro. The bank converts the bond in euro to kronor on the market using a swap. On one occasion, the bank enters into a CCY swap with the same maturity as the bond in euro, that is to say five years, while on the other occasion it enters into an FX swap with three-month maturity which is renewed every three months over a period of five years.

In both cases, the bank exchanges 1 billion euro which it has borrowed in the bond for 9 billion kronor with a swap counterparty, and can then lend the kronor to its Swedish customer. In the bank's balance sheet, there is a claim of 9 billion kronor to the bank's borrower (lending) and a liability to the bond investor of 1 billion euro (see Tables A2 and A3). Moreover, off-balance the bank has an asset in the form of a 1 billion claim in euro which is equivalent to the lending in the swap, and a liability of 9 billion kronor equivalent to the borrowing in the swap.

Table A2. Balance sheet for a bank which swaps a five-year bond in euro to kronor in a CCY swap with a maturity of five years

	ASSETS	LIABILITIES
Balance sheet items:	SEK 9 billion lending, 5 years	EUR 1 billion issued securities, 5 years
Off-balance sheet items:	EUR 1 billion lending in CCY swap, 5 years	SEK 9 billion borrowing in CCY swap, 5 years
<i>Total position in SEK</i>	SEK 9 billion	SEK 9 billion
<i>Total position in EUR</i>	EUR 1 billion	EUR 1 billion

Table A3. Balance sheet for a bank which swaps a five-year bond in euro to kronor with an FX swap with a maturity of three months

	ASSETS	LIABILITIES
Balance sheet items:	SEK 9 billion lending, 5 years	EUR 1 billion issued securities, 5 years
Off-balance sheet items:	EUR 1 billion lending in FX swap, 3 months	SEK 9 billion borrowing in FX swap, 3 months
<i>Total position in SEK</i>	SEK 9 billion	SEK 9 billion
<i>Total position in EUR</i>	EUR 1 billion	EUR 1 billion

In both cases presented above, the position which appears off-balance for the bank is a mirror to its position on the balance sheet. This means that an increase in the value of the

bank's euro liability in the balance sheet as a consequence of a currency exchange rate fluctuation will be perfectly offset by an increase in the bank's off-balance euro asset. Provided that the bank enters into a new FX swap every three months when the old one matures, throughout the entire five-year period, any increase in the bank's liabilities as a consequence of a fluctuation in the currency exchange rate will in both cases be offset entirely by an equally large increase on the bank's asset side. This means that the value of the bank's assets in both cases will be equivalent to the value of the bank's liabilities, irrespective of how the exchange rate between Swedish kronor and euro fluctuates. Hence the bank takes no currency risk.

However, as can be seen from Table A3, there is a maturity mismatch between assets and liabilities in kronor and euro respectively when the bank uses an FX swap, which is not the case when the bank executes a CCY swap. To avoid the currency risk, the bank must in the first instance regularly renew the FX swap during the maturity of the bond. However, the bank does not know whether it will be able to borrow kronor when the FX swap matures, or on what terms. Hence the bank takes a refinancing risk in Swedish kronor when using swaps with a shorter maturity than the underlying bond.¹⁸

¹⁸ In the example, the bank's lending also has the same maturity as the bank's funding in the bond in euro. In this case, therefore, the bank has access to kronor from its customer while at the same time having to repay kronor to its swap counterparty. However, this is a simplification. In reality, most of the banks' lending for mortgage loans has a considerably longer maturity than five years. As a consequence of this, the banks are dependent on being able to renew both their funding in foreign currency – that is to say, the bond in euro – and the CCY swap.