Dollar liquidity from the Federal Reserve to other central banks

Marushia Gislén, Ida Hansson and Ola Melander*

The authors work in the Financial Stability Department of the Riksbank.

A central bank can always increase the volume of money in its domestic currency. However, a central bank might also need access to other currencies, for instance in order to provide liquidity assistance in foreign currency to banks. It is for this reason that central banks hold a foreign currency reserve. Sometimes, central banks can also get access to foreign currency through liquidity swap agreements ('swaps') with other central banks. In this analysis, we focus on dollar liquidity from the Federal Reserve through such swaps because it is important in helping to alleviate stress on global financial markets in a crisis. This paper aims to describe why the Federal Reserve has entered into swap agreements with other central banks, and how such swaps have worked in practice during the global financial crisis and so far during the covid-19 pandemic. Experience shows that liquidity swap agreements have contributed to lower global dollar funding costs and helped alleviate stress on financial markets. However, there is never any guarantee that the Federal Reserve or other central banks will provide foreign currency liquidity in a crisis. Therefore, liquidity swap agreements cannot replace central banks' foreign currency reserves, but rather serve to complement them.

1 Introduction

A central bank essentially has unlimited possibilities of increasing the volume of money in its domestic currency. However, it might also need access to other currencies, for instance to provide liquidity assistance in foreign currencies to banks and other important market participants in a crisis, or to sell foreign currency with the aim of influencing the exchange rate. For this reason, central banks usually hold a foreign currency reserve in the form of securities in foreign currencies. If needed, a central bank can sell these securities to obtain liquid funds in foreign currencies.[1]

In certain conditions, some central banks can also temporarily exchange domestic currency for foreign currency through arrangements known as liquidity swap agreements with other central banks. In the global financial crisis of 2008–2010, the central bank of the United States, the Federal Reserve, entered into swap agreements with a number of select central banks, including the Riksbank, to help provide dollars to the local market. During the covid-19 pandemic as well, the Federal Reserve has entered into swap agreements with

* We wish to thank David Farelius, Joanna Gerwin, Linda Goldberg, Jesper Hansson, Johan Molin, Marianne Nessén, Christina Nordh Berntsson and Olof Sandstedt for valuable comments. We are responsible for any remaining errors. The views expressed in this paper are those of the authors and are not necessarily shared by the Executive Board of Sveriges Riksbank.

1 Central banks usually also hold a reserve in the form of gold. They can use the gold reserve to obtain liquid funds in foreign currencies. The total reserve is called the gold and foreign currency reserve.

these same central banks.[2] Through these agreements, the Federal Reserve can provide dollar liquidity to another central bank in exchange for the currency of the receiving central bank, during a certain predetermined period. The demand for dollar liquidity in auctions held by the receiving central bank determines the amount of liquidity provided by the Federal Reserve within the limits of the agreement. At the end of the period, the central banks swap the currencies back at the same rate that applied at the beginning of the period. The transactions entail currency exchanging owners, which is why they are known as 'swaps', and the foreign central bank pays a fee – a certain interest rate – to the Federal Reserve.

The purpose of this paper is to describe why the Federal Reserve has provided other central banks with dollar liquidity through swap agreements, and how these swaps have worked in practice. We focus on dollar swaps from the Federal Reserve because they are of great significance to the functioning of global dollar funding markets in a crisis. However, it is worth noting that other central banks too, such as the European Central Bank (ECB) and the Riksbank, have entered into swap agreements to provide liquidity to other central banks.[3] In section 2, we provide a number of explanations as to why the Federal Reserve has entered into swap agreements in global crises. In section 3 we provide a brief history of the Federal Reserve's swap agreements from the 1960s and onwards, with a focus on the global financial crisis and the euro crisis. In order to understand the role and effects of the swap agreements, it is important to understand how the dollar funding market works and what happens when the market does not work in a crisis. Therefore, in section 4 we describe how the dollar market works today, its vulnerabilities and risks and how these came to materialise during the covid-19 pandemic. In section 5, we go on to describe how the swap agreements helped alleviate the stress on the dollar market during the covid-19 pandemic with a particular focus on the dollar liquidity provided to the Riksbank and other Scandinavian central banks. In section 6, we explain why the existence of swap agreements does not reduce the need for a central bank to hold a foreign currency reserve to secure foreign currency supply in a crisis. To round off, we present conclusions in section 7.

2 Why does the Federal Reserve collaborate with other central banks to provide dollar liquidity in global crises?

During both the global financial crisis and the covid-19 pandemic, the purpose of the Federal Reserve's swap agreements has been to manage stress on global and domestic dollar funding markets, see Federal Reserve (2020a). Because the US dollar is a central currency on global funding markets, shocks on the international dollar market can spread to the US credit market and affect financial stability. This could in turn lead to a credit crunch for US households and businesses, and hence affect the performance of the real economy in the United States. Through swap agreements, the Federal Reserve can support the provision of dollar liquidity via select central banks. The swap agreements are also important for signalling that central banks are prepared to act jointly to manage a global crisis. Below, we describe the purposes of the Federal Reserve's swap agreements in more detail.

2 Standing swap arrangements with the Bank of Canada, Bank of England, Bank of Japan, the European Central Bank, and the Swiss National Bank. Temporary swap agreements with the Reserve Bank of Australia, Banco Central do Brasil, Danmarks Nationalbank, Bank of Korea, Banco de Mexico, the Reserve Bank of New Zealand, Norges Bank, the Monetary Authority of Singapore, and Sveriges Riksbank.

3 During the global financial crisis, the Riksbank entered into swap agreements with a number of nearby countries and in November 2020 the Scandinavian central banks reached an agreement on a set of principles for liquidity swap agreements in times of crisis.

2.1 Improving liquidity on financial markets and avoiding a credit crunch in the United States

Swap agreements existed already before the global financial crisis, although they often had purposes other than managing stress on global financial markets. According to Goldberg et al. (2011), swaps were used in the past to fund interventions on the foreign exchange market. Humpage and Shenk (2008) describe how the Federal Reserve, in the 1970s, used swaps to obtain foreign currencies, which were then used to buy dollars, thus defending the value of the dollar. The Federal Reserve also used swaps to provide temporary funding for Mexico during the 1982 and 1995 crises.[4] However, McCauley and Schenk (2020) observe that swap agreements, already before the global financial crisis, were not only used for foreign exchange interventions and temporary funding, but also to manage shocks on the dollar market by providing liquidity in dollars.

According to the Federal Reserve, swap agreements today have the purpose of improving liquidity on financial markets by enabling other central banks to offer dollar funding to financial institutions during periods of financial turbulence (Federal Reserve 2020a). Otherwise, shocks on the international dollar market could spread to financial markets in the United States and lead to a credit crunch and hence lower growth. A lack of dollar funding can force banks and other financial institutions to sell assets in dollars, and if many act in the same way, this could in turn lead to plummeting asset prices. By helping to stabilise financial markets and supporting economic development in other countries, the Federal Reserve can thus also contribute to better economic development in the United States. The experience from the covid-19 pandemic shows that swap agreements support the flow of credit to US corporations from US branches of foreign banks providing loans in the US, see Cetorelli et al. (2020a).

2.2 Supplying global liquidity instead of central banks needing to sell assets from their foreign currency reserves

One way for another country's central bank to gain access to liquidity in dollars in a crisis is to sell US government bonds from its foreign currency reserve. In Box 1 below we discuss this and other ways of gaining access to dollar liquidity. If several central banks simultaneously sell US government bonds, there is a risk that this would push down the price and increase the yield on the bonds. This causes an undesirable tightening of financial conditions during a crisis. Swap agreements from the Federal Reserve reduce the need of other central banks to sell assets out of their foreign currency reserves during a crisis to obtain liquidity in foreign currencies.

Bordo et al. (2014) also point out that when central banks sell off dollar assets from their foreign currency reserves, this does not increase available dollar liquidity globally. The buyers of dollar assets pay the central bank in dollars, which initially disappear from the market, to then be lent again from the central bank to the banking sector. By using its foreign currency reserve, the central bank can manage the domestic banking sector's dollar need, but the volume of dollars in circulation is thus unchanged. Only the Federal Reserve can supply new liquidity in dollars. For this reason, dollar reserves held by other central banks can never replace swap agreements when it comes to managing global stress on financial markets in a crisis.

Overall, swap agreements from the Federal Reserve serve an important function in a global crisis, because they can help avoid tightening of financial conditions in the US and globally by supporting the provision of liquidity in dollars. In normal circumstances, there are many other ways for a central bank to gain access to dollars; in a crisis, however, swap agreements from the Federal Reserve play a unique role.

4 See also Toniolo (2005) for a description of swap agreements between the Federal Reserve and other central banks from 1962 to the end of the 1990s.

BOX 1. Other ways for a central bank to gain access to dollar liquidity in a crisis

There are many ways other than liquidity swap agreements for gaining access to dollars in a crisis. A central bank such as the Riksbank can for instance sell assets out of its foreign currency reserve. However, there are also other alternative ways, such as:

i. borrowing dollars once a crisis has struck,
ii. exchanging domestic currency for dollars on the foreign exchange market and
iii. applying for a loan programme from the International Monetary Fund.[5]

Below we discuss these various options for managing a dollar shortage in a crisis from the Riksbank's perspective.[6]

Selling assets out of the foreign currency reserve

Both during the global financial crisis and the covid-19 pandemic, the Riksbank funded dollar lending to banks through the foreign currency reserve. During the financial crisis of 2008–2010, the foreign currency reserve accounted for around SEK 50 billion or approximately one fifth of the Riksbank's total lending in foreign currency to the Swedish banks. The remainder, around SEK 200 billion, was funded using swap agreements. So far during the covid-19 pandemic, the Riksbank has funded lending in dollars to the Swedish banks of USD 2 billion through the foreign currency reserve. It has not been necessary to use the swap agreement with the Federal Reserve because the demand for dollar loans has been low so far.

According to Nyberg (2011) this worked well during the global financial crisis, even though it is somewhat more complicated and time-consuming to sell dollar assets out of the foreign currency reserve than using swap agreements with the Federal Reserve. Assets need to be sold and the proceeds deposited in an appropriate bank account before they can be lent to Swedish banks. The time lag is however relatively small.[7]

Borrowing dollars once a crisis has struck

A pre-funded foreign currency reserve involves an ongoing cost that is similar to an insurance premium. This can be avoided if the Riksbank instead relies on the ability to borrow dollars via the National Debt Office once a crisis has struck. However, depending on the type of crisis, the National Debt Office might have limited possibilities of quickly obtaining loans and thus increasing the sovereign debt without having too much of an impact on interest rates. There are different opinions about how easy it would be to borrow large amounts, in a short space of time and at a reasonable cost, via the National Debt Office in a crisis.

The National Debt Office (2013) and the Riksbank Inquiry (SOU 2019:46) find that the National Debt Office could, without any difficulty, increase borrowings on behalf of the Riksbank with the purpose of restoring a foreign currency reserve that has been used to provide liquidity assistance in foreign currency. The earlier Flam Commission on the Riksbank's financial independence also advocates this option (see SOU 2007:51). Sveriges Riksbank (2017) however finds there is a risk that funding, which is raised once a crisis has struck, will be more expensive, take longer to carry out and affect the transmission of monetary policy. One problem is that large amounts might need to be borrowed within a short space of time. In the 2008 crisis, the Riksbank lent dollars equalling SEK 200 billion in the space of just four weeks. There is a risk of rapid borrowings of such large amounts pushing up state borrowing costs and, at worst, it might be difficult to borrow the amount needed in time.

Exchanging SEK for USD on the foreign exchange market

The Riksbank could create Swedish kronor and exchange them for dollars on the foreign exchange market. An increase to the foreign currency reserve would thus be funded by a greater liability in Swedish kronor. Because the Riksbank would, in that case, have an asset in foreign currency and a liability in Swedish kronor, currency risk on the Riksbank's balance sheet would increase. In a crisis, there is however a risk that large and rapid purchases of foreign currency would be expensive, take time to carry out and affect the exchange rate, and thus come into conflict with monetary policy (see Sveriges Riksbank 2017).

---

5 There are also other ways to gain access to dollars: borrowing dollars in a swap transaction secured by gold, selling gold from the gold reserve, selling assets in another currency from the foreign currency reserve in exchange for dollars and entering into swap agreements in dollars with a central bank other than the Federal Reserve.

6 One alternative to increasing the *supply* of dollars in a crisis would be to reduce *demand* for dollars by amending the rules governing the actions of pension and insurance companies on financial markets. More specifically, it would be a case of reducing requirements regarding currency hedging. This would however take time, be complicated and increase the risks in the companies. Another way of attempting to circumvent the need for a foreign currency reserve is to rely on state guarantees for the banks' foreign funding. According to the National Debt Office, this is an effective way of facilitating banks' funding in a crisis. Sveriges Riksbank (2017) however finds that it is uncertain how well a guarantee would work given that the Swedish banking system is currently several times larger than GDP.

7 As already mentioned, the sale of assets in foreign currency reserves cannot however replace swap agreements in a global crisis. There would be a risk of yields on US government bonds rising if many countries simultaneously sold bonds, and also it is only the Federal Reserve that can supply liquidity in dollars (see Bordo et al. 2014).

Applying for a lending programme from the International Monetary Fund (IMF)

For Sweden to qualify for a lending programme with the IMF, the foreign currency reserve would have to be so low that we could not fund our international payments. Also, the IMF imposes certain requirements for economic policy to grant loans. This alternative would therefore put a limitation on freedom of economic policy action during a crisis. Sveriges Riksbank (2017) therefore finds that it is not appropriate to act in such a way that increases the probability of needing to apply for an IMF programme. It is only reasonable to see an IMF programme as a viable alternative once all other options are exhausted.[8]

Moreover, several economists have argued that the IMF should have a role when it comes to currency swap agreements between central banks. Reis (2019) suggests for example that the IMF could bear the responsibility for analysing the risk of a decline in value in the currency of the receiving central bank, which would reduce the value of the lending central bank's collateral in the form of currency. According to the proposal, the IMF would decide which 'haircut' to use when activating a swap agreement. If the receiving central bank does not honour its obligations according to the agreement, the IMF would assume the risk from the liquidity-providing central bank by stepping in with a loan programme, see also Levy Yeyati (2020) for similar suggestions.

Truman (2013) proposed instead that the IMF's role should be to analyse the need for increased global liquidity in the international financial system and, if needed, recommend activation of swap agreements between central banks. The lending central banks would then decide on activating (or not activating) a swap agreement.[9] However, there has not been any support for the proposals for the IMF to have an extended role because the lending central banks have wanted to maintain control over the swap agreements.

8 The Riksbank can also sell its holding of Special Drawing Rights (SDR) to gain access to dollars or euro. However, the volume is limited to just over USD 3 billion (see Gislén and Kangas 2020). A sale of SDR should, at best, be considered a complement to other tools.

9 During the global financial crisis, Truman (2008) suggested instead that the Federal reserve should establish a swap agreement with the IMF to increase the Fund's dollar-lending capacity.

2.3 Signalling that central banks are acting jointly to manage the crisis

Swap agreements clearly signal that the Federal Reserve stands prepared to act together with other central banks to jointly manage a global crisis. Such a signal can in itself help to calm financial markets and hence reduce the need to draw on the swap agreements. The Federal Reserve and the other central banks therefore often coordinate their communication and announce the agreements at the same time (Sheets et al. 2018).

3 The Federal Reserve's swap agreements

Swap agreements were established already in the early 1960s between the Federal Reserve and a number of central banks; mainly European, but also those of Canada and Mexico, see for example McCauley and Schenk (2020), Sheets et al. (2018), and Bordo et al. (2014). During the Bretton Woods system with its prevailing gold standard, the main motive was to reduce the risk of several central banks exchanging dollars for gold at the same time, which could put great pressure on US gold reserves. During this period swap agreements were initiated by both sides in the agreements – that is to say, both European central banks and the Federal Reserve (see Bordo et al. 2014). After leaving the fixed exchange rate system, the Federal Reserve used the swap agreements to defend the value of the dollar by borrowing foreign currencies which were then used to purchase dollar. In the 1970's there was even a debate in the United States regarding the risk of the swap agreements undermining the independence of the Federal Reserve, as the central bank was dependent on the swap transactions, and ultimately the European central banks' willingness to continue lending their currencies against dollars, in order to implement its foreign exchange policy. At the end of the 1980's, the Federal Reserve stopped funding its foreign exchange interventions through swap transactions.

3.1 The 2008 financial crisis – from limited swap agreements to unlimited dollar liquidity

During the global financial crisis, the Federal Reserve gradually assumed the role of an international lender of last resort. This meant that the Federal Reserve acted as a global central bank in the sense that it provided unlimited dollar liquidity to other select central banks to address strains on dollar funding markets and help stabilise financial markets.

Crisis measures are extended through swap agreements to European central banks

Early on in the global financial crisis, the Federal Reserve created a new lending facility – the Term Auction Facility (TAF) – to provide banks located in the US with liquidity. Also, new swap agreements were extended to some central banks in Europe to enable them, if needed, to supply banks located in Europe with dollar liquidity. Within the TAF framework, liquidity was allocated to US banks through an auction procedure in which they placed bids with the Federal Reserve. Similarly, the European central banks held dollar auctions for banks located in Europe. The Federal Reserve's TAF auctions and the European central banks' dollar auctions were coordinated in the sense that the Federal Reserve held its TAF auction first, without communicating the outcome until the dollar auctions of the other central banks had been held a day later, see Goldberg et al. (2011). At the TAF auctions, dollars were allotted to the banks according to the highest interest-rate bid, and with an interest-rate floor that was initially set at the Overnight Index Swap (OIS) rate for the maturity concerned. All bids were allotted at the lowest offered interest rate.

The ECB and the Swiss National Bank (SNB) were first to secure liquidity swap agreements with the Federal Reserve in December 2007. The agreements were to run for six months and the volume was limited to USD 20 billion for the ECB and USD 4 billion for SNB. During this time, the ECB offered dollar loans at the OIS rate for the maturity concerned, while the SNB initially held auctions with OIS as a floor to subsequently also switch to a fixed price (the OIS rate). The fixed price applied in Europe at that time meant that European banks could obtain dollar liquidity at a lower price than the banks in the United States, if the US banks placed the lowest interest-rate bid above the OIS rate. Already after the first auctions in December 2007, both central banks had utilised the entire volumes and in the following months, the maximum amounts were increased several times. Despite these increases, demand was on average more than twice as high as what was offered at the ECB's auctions until the Federal Reserve, in coordination with the ECB, decided to switch to full allotment in October 2008. In that process, the Federal Reserve also adjusted the price to OIS + 100 basis points. In the same month, the Federal Reserve also reduced the price of liquidity via TAF for banks located in the US. Cetorelli et al. (2011) show that foreign banks located in the US drew significant dollar amounts via the TAF funds that were then channelled, via internal lending, to other parts of the bank. Following the expansion of the swap agreements in late 2008, internal lending by these banks decreased significantly while draws on the swaps through national central banks increased.

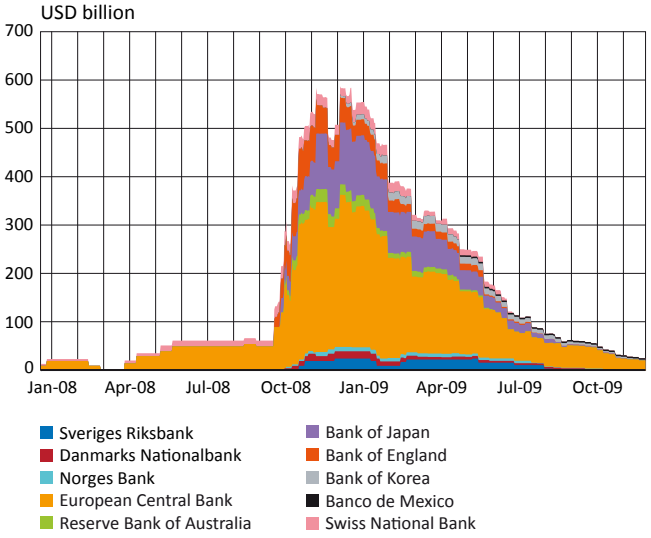
High demand for dollars results in further global expansion of the swap agreements

In September 2008, the Federal Reserve expanded the circle of counterparties for the swap agreements to include the Bank of Canada (BoC), Bank of England (BoE), Bank of Japan (BoJ), Danmarks Nationalbank, Norges Bank, Reserve Bank of Australia (RBA) and the Riksbank. One month later, the circle of counterparties was further expanded to include the central banks of Mexico, South Korea, Brazil and Singapore; their financial sectors were considered to have a sufficiently large need for dollars to influence interest rates on the international dollar market.

When the swap agreements with the ECB, SNB, BoE and BoJ in October 2008 were changed to full allotment at a fixed price (OIS+100 basis points), there was a substantial

increase in the dollar liquidity provided through the swap agreements (see Figure 1). During the financial crisis, the central banks that had full allotment could receive dollar liquidity with terms of one day, one week, one month and three months. The remaining central banks had limited swap agreements with maturities of one and/or three months, with the possibility, in consultation with the Federal Reserve, to decide on pricing and themselves determine the auction procedure. This possibility caused differences in pricing and auction procedures between different central banks, even between the Scandinavian central banks (see Appendix for details on the swap agreements of select central banks).

Figure 1. Outstanding dollar liquidity from the Federal Reserve provided through swap agreements during the global financial crisis
USD billion

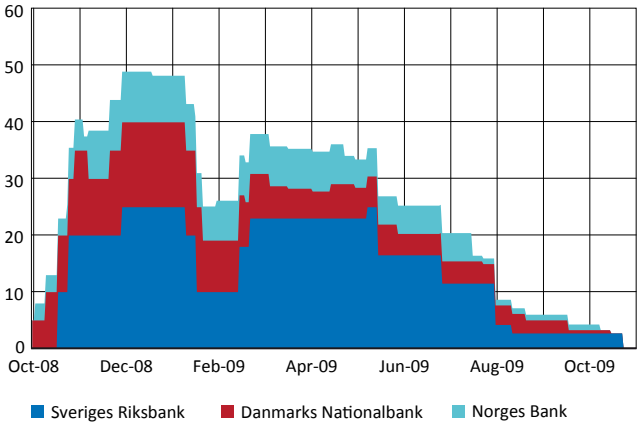


Source: Federal Reserve

Out of the close to USD 600 billion that was provided through swap arrangements from the Federal Reserve during the crisis, the ECB accounted for the majority, followed by BoJ and BoE. The central banks of three countries never utilised their swap agreements with the Federal Reserve: New Zealand, Canada and Brazil. At the time, the price OIS + 100 basis points was applied for swap agreements with full allotment. It might therefore seem odd that the BoC entered a swap agreement with the Federal Reserve, since the Canadian banks could obtain cheaper funding in dollars through their US branches. The fact that BoC nevertheless entered swap agreements with the Federal Reserve could be due to the important signalling aspect of the swap agreements; that is to say, communicating well-functioning cooperation and a coordinated response between the major central banks during a crisis.

The swap agreements of the Scandinavian central banks with the Federal Reserve varied somewhat. For example, Danmarks Nationalbank and Norges Bank offered dollar loans to the banks at maturities of both one and three months, while the Riksbank only offered loans at a three-month maturity. Pricing also varied (see Appendix). At most, the Riksbank utilised USD 25 billion during the financial crisis, and hence not the entire sum of USD 30 billion that was specified in the swap agreement. Danmarks Nationalbank, which had a lower volume specified in its swap agreement (USD 15 billion), utilised the entire amount at the peak of the crisis at the end of 2008, and Norges Bank utilised smaller volumes throughout the entire crisis (Figure 2).

Figure 2. Outstanding dollar liquidity from the Federal Reserve provided to the Scandinavian central banks through swap agreements during the global financial crisis
USD billion



Source: Federal Reserve

It is worth mentioning that swap agreements were also established between other central banks, besides cooperation with the Federal Reserve. For example, the ECB entered into swap agreements with the central banks of Denmark and Sweden after the global financial crisis to secure euro liquidity if needed, as well as temporary agreements with the central banks of Lithuania, Poland and Hungary. Also, the Riksbank entered into swap agreements with the central banks of Iceland, Estonia and Latvia during the global financial crisis and with the central bank of Ukraine in 2015 to support financial stability in the region and, ultimately, in Sweden (read more in Box 2 below).

BOX 2. The Riksbank's swap agreements with nearby countries[10]

The financial crisis of 2008–2010 hit Iceland and the Baltic countries hard. At that time, two of the largest Swedish banks had extensive lending operations in the Baltic countries, which meant that stability in the Swedish financial system was at risk through financial exposures. The Riksbank entered into swap agreements with the central banks of Estonia, Iceland and Latvia to reduce risk by safeguarding macroeconomic and financial stability in these countries.

The Riksbank considered that a financial crisis in Iceland could spread and cause financial instability. This could in turn have negative implications for the ability of Swedish banks to obtain funding and for the Swedish real economy. On 16 May 2008, the Riksbank therefore decided to enter into a swap agreement with the Icelandic central bank, Seðlabanki Íslands, of EUR 500 million in exchange for Icelandic kronor. This was also done at the same time and with the same amounts by the central banks of Denmark and Norway.

In December that year, the Riksbank took a very serious view to the risk of a financial crisis in Latvia potentially spreading. In particular, the large share held by Swedish banking groups of the Latvian lending market could harm the Swedish banking system if extensive credit losses were incurred there, and ultimately also financial stability and the Swedish economy at large. Financial stability in Latvia was thus closely interlinked with stability in Sweden. Therefore, the Riksbank entered into a swap agreement enabling the Latvian central bank, Latvijas Banka, to borrow EUR 500 million from the Riksbank and Danmarks Nationalbank in exchange for Latvian lats. The Riksbank's share was EUR 375 million, while Danmarks Nationalbank's share was EUR 125 million. The agreement had an original term of three months, but was extended twice – in April and September 2009. Throughout the entire period, Latvia had a loan programme with the IMF.

In February 2009, the Riksbank also entered a swap agreement with the Estonian central bank Eesti Pank, enabling the latter to borrow up to SEK 10 billion against Estonian kroon. The swap agreement had a somewhat different purpose because it was given primarily to ensure the ability of the Estonian central bank to provide liquidity assistance to the subsidiaries of Swedish banks. Eesti Pank never utilised the swap agreement however, and it expired on 31 December 2009.

10 For a detailed description of the Riksbank's actions and swap agreements during the financial crisis, see Leung (2020).

Overview of the Riksbank's swap agreements with Nordic-Baltic central banks during the global financial crisis 2008–2010

	Decision date	Currency	Purpose	Swap volume	Notes
Iceland	16 May 2008	Euro	Maintain financial stability in the region	EUR 500m	Coordinated with the central banks of Norway and Denmark and followed by a loan programme with the IMF.
Latvia	16 December 2008	Euro	Maintain financial stability in the region	EUR 375m	Coordinated with the central bank of Denmark and IMF loan programmes were in place during the entire period.
Estonia	26 February 2009	Swedish kronor	Secure liquidity assistance for the subsidiaries of Swedish banks, and ultimately maintain financial stability	SEK 10bn	The swap agreement was never utilised.

In 2015, the Riksbank entered into a swap agreement with the Ukrainian central bank (NBU) for USD 500 million as part of a broader support package together with the IMF. It was judged that support from the international community was crucial for Ukraine to succeed with its economic reform programme. Also, there was a risk that a full-blown crisis in Ukraine would spread to Sweden's neighbouring area and potentially have a negative impact on economic conditions in Sweden. At the same time, the Riksbank initiated technical assistance cooperation with Ukraine, whereby the Riksbank shared with the NBU its knowledge and experience within important central-bank related fields.

3.2 Positive effects of the Federal Reserve's swap agreements during the global financial crisis

Funding costs decreased for both US and non-US banks in connection with the announcement of the swap agreements with the Federal Reserve and the implementation of the dollar auctions by the other central banks, see Goldberg et al. (2011) and Eguren-Martin (2020). When the Federal Reserve communicated full allotment to the largest central banks in October 2008, the Libor-OIS spread narrowed by a full two percentage points (see McCauley and Schenk 2020).[11] A few years after the crisis, the ECB concluded that the transition to full allotment was crucial to reducing stress on the dollar market (see ECB 2014). In order to distinguish the effects of swap agreements from other factors, the effects of the announcements of the extended swap agreements on financial markets need to be examined. Such empirical studies by for instance Baba and Packer (2009) show that the swap agreements contributed to reducing stress on the dollar market in areas where the central banks had full allotment. Aizenman and Pasricha (2010) look specifically at the effects of the swap agreements in emerging markets and find noticeable effects on both spreads and exchange rates in the countries that entered into swap agreements with the Federal Reserve.[12] Barajas et al. (2020) show that stress on national financial markets subsided in countries that entered into agreements with the Federal Reserve due to the coordinated communication surrounding the swap agreements during the global financial crisis and while the agreements were active. The same analysis shows that the banking sector in countries

11 USD Libor is the interest rate for unsecured interbank loans in US dollars and is affected by various risk premiums (for example credit risk). The Overnight Index Swap (OIS) rate is a derivative contract based on the Fed Funds rate, which is a short-term rate, and reflects the average expected short-term rate over a certain period of time, but is not affected by risk premiums. Both Libor and OIS are affected by the market's expectations about future monetary policy and the spread between Libor and OIS thus reflects a risk premium. An increase in the risk premium, or the spread, can thus indicate financial stress.

12 Emerging market economies that entered into swap agreements with the Federal Reserve were Brazil, South Korea, Mexico and Singapore.

with an active swap agreement with the Federal Reserve did not reduce their dollar lending. On the other hand, the banking sector in countries without a swap agreement reduced their dollar lending by just over 5 per cent. According to the authors, the reduction was only half as large if the central bank maintained dollar reserves above 10 per cent of the country's gross domestic product.

3.3 Continued use of swap agreements during the euro crisis

The swap agreements ended temporarily on 1 February 2010. However, already in May that year, they were resumed between the Federal Reserve and BoE, BoJ, ECB, and SNB with full allotment and fixed price (OIS+100 basis points). The Federal Reserve and BoC also signed a swap agreement with the volume limited to USD 30 billion. A difference from before was however that liquidity was now almost exclusively provided with a one-week maturity. The smaller central banks did not obtain extended swap agreements during the euro crisis, however.

To start with, there was little demand for dollar lending and in November 2011 the price was reduced by 50 basis points to OIS+50 basis points. Also, the ECB started once more to offer loans to banks in the euro area with a three-month maturity. Dollar lending in Europe then increased, but was still much lower than during the previous crisis. It is possible that the European banks felt a degree of stigma surrounding utilisation of the dollar facility, out of fear of signalling difficulty to borrow dollars elsewhere. However, Bahaj and Reis (2020) find this is improbable because the ECB does not disclose which banks utilise the dollar facility. Moessner and Allen (2013) find that the swap agreements reduced stress on the dollar market, but that the effect was smaller than during the global financial crisis. This may be a result of banks only drawing on the dollar facility at the end of the euro crisis.

Standing dollar facilities with a number of central banks

After the euro crisis, in October 2013 the temporary swap agreements were turned into standing facilities for the ECB and the central banks of Canada, the United Kingdom, Switzerland and Japan. At this point, the BoC also entered into a swap agreement with full allotment. Once a week, they could receive dollar liquidity with one-week maturity and once a month liquidity with three-month maturity, still at a fixed price. In the communication around the agreements, assurances were given about the availability of the liquidity backstop, while certain other details were kept intentionally unspecified for instance which circumstances would lead to the activation of the agreements (ECB 2014). Other more operational aspects, such as price or collateral requirements, were kept flexible and could be adjusted to specific market developments. This was done to reduce moral hazard, that banks would take on higher risk if they knew the exact rules that would apply in a crisis. After the crisis, the swap agreements were still active and could be used in the event of renewed turbulence, although they were barely utilised between the euro crisis and until March 2020.

4 The dollar market today and stress during the covid-19 pandemic

The next section focuses on how the Federal Reserve's swap agreements have worked during the covid-19 pandemic. However, to understand both the need for them and their role and effects, it is important to understand how the dollar market works today, the vulnerabilities and risks that exist and how these came to materialise during the covid-19 pandemic. This is described in this section.

4.1 The dollar market features complex interlinkages between various participants and markets

The US dollar is the most important currency in the international monetary and financial system. For example, according to BIS (2020), around half of all cross-border loans and international debt instruments today are denominated in dollars, 85 per cent of all foreign exchange transactions involve the dollar, and around half of international trade is invoiced in dollars. The dollar is also the most important reserve currency and accounts for almost two thirds of the official foreign currency reserves.

In the following, we describe how the dollar market, in a complex way and often across borders, links together various participants and markets.

Banks, both US and non-US, play a key role

Banks are the main intermediaries between other participants on the dollar market. US banks account for a substantial share of the dollar transactions, although a significant proportion of the transactions take place directly between non-US banks. BIS (2020) shows that as much as almost half of the banks' cross-border claims in dollars against other countries do not involve a US participant on either side.

The availability of dollar funding for banks differs depending on whether or not they are based in the US. Non-US banks generally do not have access to stable dollar funding because they rarely have sizeable dollar deposits from households and businesses, and neither do they participate on the US interbank market. They must instead use less stable forms of dollar funding. For example, they issue short-term, unsecured debt instruments such as certificates of deposits (CDs) and commercial paper (CP) on securities markets. These instruments are mainly purchased by money market funds that invest in short-term debt instruments issued by banks or non-financial corporations. Such funds are known as 'prime money market funds' (prime MMFs) and are the main lenders of dollars to non-US banks (see for instance Eren et al. 2020b).[13, 14]

Non-US banks are interested in dollar funding for several reasons. The dollar market is attractive because its size and liquidity often make the cost of dollar funding lower than that of other funding sources, particularly for banks with high credit ratings. Also, the broad investor base means that banks can diversify their funding. Additionally, some countries' own money markets are not sufficiently developed or liquid, making the banks more dependent on dollar funding. This is common in emerging market economies, but also applies to the Swedish money market.

Insurance companies demand large volumes of dollars through the foreign exchange swap market

Another important reason why banks are interested in dollar funding is the demand for dollars among their customers. This is particularly common in international industries in which the dollar is the standard currency, such as shipping. Insurance firms and pension funds, named collectively as insurance companies in this paper, also demand large volumes of dollars from the banks (see for instance Avdjiev et al. 2020, BIS 2020, Nilsson et al. 2014 and Sveriges Riksbank 2020a). They often have a large share of their investments in foreign currencies, usually in dollars, to diversify their portfolios to spread the risks and potentially increase their risk-adjusted return. For entities that have considerable assets to invest, some domestic asset markets might also be too small to offer sufficient investment opportunities

13 On the money market funds market, there are also 'government money market funds' which have a lower risk appetite and mainly invest in government securities.

14 The banks can also obtain dollar funding in other ways, such as by entering into repurchase agreements (repos), entering into transactions on the currency market and by issuing bonds (see BIS 2020).

without an excessive impact on pricing. Swedish insurance companies also act this way.[15] BIS (2020) emphasises that insurance companies worldwide have grown in size and significance in recent years. Their exposure to the dollar market has grown sharply, especially for Asian insurance companies.

Insurance companies generally have poorer access to dollars through securities markets or central bank lending facilities than banks have. They can instead fund their purchases of dollar assets by exchanging the domestic currency for dollars on the spot market, when they receive their continuing incoming payments from savers and policyholders. They can also enter foreign exchange swap transactions whereby they 'borrow' dollars in exchange for the domestic currency over a certain period. The insurance companies thus enter foreign exchange swaps with banks as counterparties, and these contracts differ from the swap agreements and swap transactions that take place between central banks described earlier in this paper. Through foreign exchange swaps, the insurance companies gain access to dollars and limit the currency risk that would otherwise arise from them holding assets in dollars and liabilities in domestic currency.[16] In this approach, it is characteristic that the swaps often have relatively short maturities while the underlying dollar assets, which are funded and currency-hedged through the swaps, generally have longer maturities (see Avdjiev et al. 2020, BIS 2020 and Sveriges Riksbank 2020a). This difference in maturity between assets and liabilities implies vulnerabilities for the insurance companies if conditions in the dollar markets change. It also makes the insurance companies dependent on the continuing willingness of the banks to offer dollars through foreign exchange swaps. We describe this in more detail in the next section.[17]

4.2 The characteristics of the dollar market implies vulnerabilities that materialised during the covid-19 pandemic

There are economies of scale and network effects in having the dollar as a funding currency that reduce borrowing costs. However, the financial infrastructure around the dollar also presents vulnerabilities because the global interconnectedness makes it possible for financial stress to spread across the globe. Below, we describe the vulnerabilities and risks in more detail, and how they came to materialise during the covid-19 pandemic.

Non-US banks can experience difficulties in obtaining dollar funding in the event of financial stress

As we have described above, non-US banks have poorer access to stable dollar funding than US banks and rely on the willingness of prime MMFs to buy their short-term debt instruments in dollars. Prime MMFs are sensitive to changes on the financial markets, and, in the event of stress, their possibilities of investing can swiftly decline when investor risk appetite wanes. At the start of the covid-19 pandemic, there were large and rapid outflows from prime MMFs as investors sold their fund units. At the end of March 2020, over USD 150 billion had been withdrawn, equalling 20 per cent of total assets under management in prime MMFs, see Figure 3.[18]

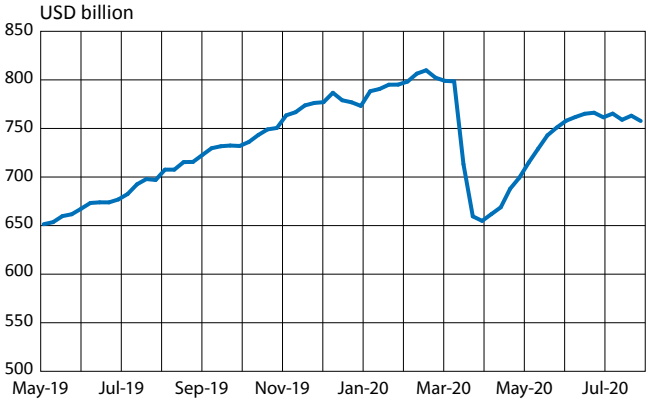
15 Nilsson et al. (2014) argue that capital in the Swedish financial system is flowing out of Sweden because part of the collective pension savings is invested in assets abroad. This might be a reason for why Swedish banks obtain a large share of their funding abroad.

16 Through a foreign exchange swap, the insurance company 'borrows' dollars for a certain period of time, which must be repaid upon maturity of the swap. During the duration of the swap, the insurance company thus has a liability in dollars which matches its assets in dollars, which hence reduces the currency risk.

17 There are also other non-banks besides insurance companies, such as hedge funds and non-financial corporations, that are highly active on the foreign exchange market. However, BIS (2020) shows that, overall, the short and long dollar positions of these entities on the foreign exchange market offset each other, while insurance companies overall have a short position in dollars.

18 At the same time, government MMFs (funds that invest in safer assets) saw major inflows. At the end of March 2020, assets under management in these funds had increased by 30 per cent (see Eren et al. 2020a).

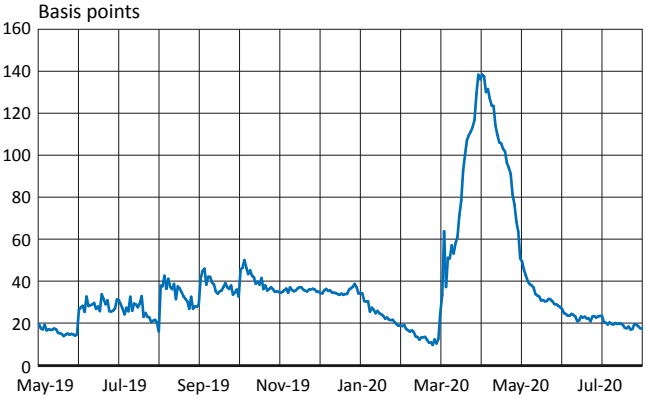
Figure 3. Fund assets for prime money market funds
USD billion



Note. Prime money market funds invest primarily in short-term debt instruments issued by banks and non-financial corporations.
Source: Investment Company Institute (ICI), Macrobond

The major withdrawals from the funds forced fund managers to sell off securities instead of investing in new ones, which brought the CDs and CP markets to a halt. Banks and businesses worldwide therefore had difficulties in renewing their dollar funding, and the cost of unsecured dollar funding increased sharply, even for entities with high credit ratings. Because CD and CP interest rates are of great significance to banks' funding costs, this led to a rise in USD Libor. Stress on the market can thus be illustrated using the USD Libor-OIS spread, which widened sharply in mid-March, see Figure 4.[19]

Figure 4. The difference (spread) between three-month USD Libor and the OIS rate (Libor-OIS spread)
Basis points



Note. OIS stands for Overnight Index Swap and is based on the Fed Funds rate. The rate can be interpreted as the expected Fed Funds rate throughout the duration of the contract, commonly three months. USD Libor is the interest rate for unsecured interbank loans in US dollars.
Source: Bloomberg

The cost of dollar funding via the foreign exchange market can rise sharply in times of stress

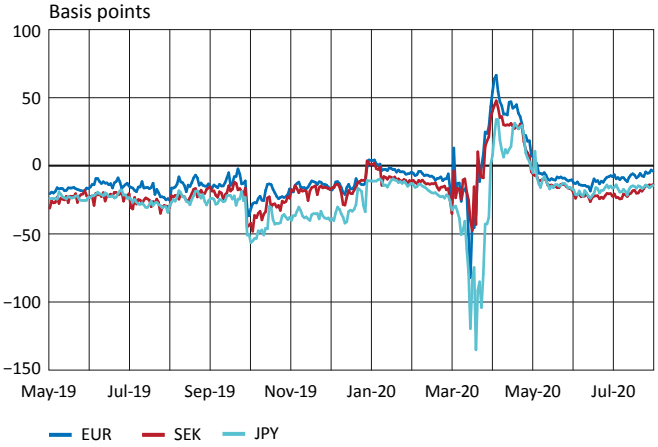
At the same time as banks' access to and possibilities of lending dollars deteriorate in financial stress, demand for dollars among other actors often increases. BIS (2020) describes how many businesses worldwide at the start of the covid-19 pandemic predicted lower revenues and therefore attempted to increase their funding to enable them to pay their

19 USD Libor is the interest rate for unsecured interbank loans in US dollars and is affected by various risk premiums (for example credit risk). The Overnight Index Swap (OIS) rate is a derivative contract based on the Fed Funds rate, which is a short-term rate, and reflects the average expected short-term rate over a certain time period, but is not affected by risk premiums. Both Libor and OIS are affected by the market's expectations about future monetary policy and the spread between Libor and OIS thus reflects a risk premium. An increase in the risk premium, or the spread, can thus indicate financial stress.

costs. Some companies also wanted to increase their liquidity as a precautionary measure due to the large prevailing uncertainty. Demand for dollars became particularly high due to the important role of the dollar as a funding currency and invoicing currency in international trade.[20]

Stress on the dollar market was apparent and clearly noticeable on the foreign exchange swap market, where prices rose sharply and it became more expensive to borrow dollars through foreign exchange swaps than to borrow dollars directly on the market.[21] In this context, foreign exchange swaps refer to swap transactions between market participants, such as between insurance companies and banks. They should not be confused with swap agreements and transactions between central banks. The difference in the cost of borrowing dollars on the market compared with converting another currency into dollars through a foreign exchange swap is usually known as basis spread. A negative basis spread means that it is more expensive to borrow dollars through a swap than directly on the market. A more negative basis spread is often interpreted as a stress indicator of dollar shortage in the same way as, for instance, widened Libor-OIS spreads (see for example Avdjiev et al. 2020 and Cetorelli et al. 2020b). As shown by Figure 5, basis spreads turned sharply negative in mid-March during the covid-19 pandemic.[22]

Figure 5. The difference in cost of borrowing dollars at three-month USD Libor compared with converting other currencies to dollars through foreign exchange swaps (the basis spread)
Basis points



Note. The basis spread (rate difference) between three-month USD Libor and the implicit USD rate, calculated through national interbank rate and cost of foreign exchange swap.
Sources: Bloomberg and Sveriges Riksbank

The cost of borrowing dollars through foreign exchange swaps rose sharply due to the banks' worsened access to dollars, which in turn made them less willing to lend dollars. At the same time, the insurance companies and other actors still needed to obtain dollars through foreign

20 BIS (2020) also finds that some financial institutions during the covid-19 pandemic were forced to make margin payments due to the appreciation of the dollar exchange rate, which might have pushed up the demand for dollars.
21 The implicit cost of dollars an entity has to pay by converting another currency into dollars through a foreign exchange swap is calculated using the covered interest rate parity based on spot and forward rates and the interest rates in the currencies concerned.
22 On a perfect market, such a difference in costs should present opportunities for arbitrage that ought quickly to disappear. Borio et al. (2016) find that new regulations have reduced the banks' possibilities of utilising such opportunities for arbitrage. Avdjiev et al. (2020) highlights that the fact that the swaps of insurance companies are often in one direction is a contributory factor. Avdjiv et al. (2019 and 2020) also find that an appreciation of the dollar exchange rate leads to greater deviations from the interest rate parity as the credit risk of global banks increases when the dollar appreciates, as their borrowers with liabilities in dollars and revenues in domestic currency are adversely affected by a stronger dollar. When the dollar appreciates, the banks are therefore less willing to expose themselves by lending dollars through foreign exchange swaps, the supply of dollar funding through foreign exchange swaps declines and the price of obtaining dollars through this channel increases.

exchange swaps (see for example Avdjiev et al. 2020, BIS 2020 and Sveriges Riksbank 2020a).[23] If insurance companies cannot renew their foreign exchange swaps at maturity, they must pay back large volumes of dollars. Insurance companies could obtain dollars through exchanging domestic currency for dollars on the foreign exchange spot market, but the volumes could be very large in relation to normally traded levels, which could affect exchange rates. BIS (2020) and Sveriges Riksbank (2020a) describe that the companies could be forced to sell off parts of their dollar assets to enable them to repay the dollars they have borrowed through the swaps. If unplanned sales have been preceded by a drop in asset prices, this could cause substantial realised losses for the insurance companies. Such 'fire sales' can cause a negative spiral with further drops in prices, especially on small or illiquid markets, and hence exacerbated financial turmoil.

In April 2020, stress on the foreign exchange swap market subsided. The reduced stress coincided with the Federal Reserve entering into swap agreements with a number of other central banks (including the Riksbank) and after the ECB and others started their comprehensive dollar auctions. We describe this in more detail in the next section.

5 The role and effects of swap agreements during the covid-19 pandemic

The early announcement of the new swap agreements with the smaller central banks, combined with a lower and more uniform interest rate, helped to reduce the initially high stress on the dollar market during the covid-19 pandemic. This was in spite of the fact that the dollar liquidity provided by the Federal Reserve under these agreements was much lower during the spring and summer of 2020 than during the 2008–2010 financial crisis. At that time, it was the ECB's dollar facilities for banks in the euro area that represented the majority of dollar lending globally. In contrast, so far during the covid-19 pandemic the Japanese central bank has had the largest demand for dollar liquidity from the Federal Reserve. Lower demand for dollar loans from European banks is most likely due to higher initial liquidity and capital, and lower dollar exposure than during the global financial crisis. Demand for dollar liquidity has also so far been much lower from the Scandinavian banks, just as in the rest of Europe.

5.1 The Federal Reserve and other central banks acted swiftly to supply liquidity

In response to the rapidly soaring stress on financial markets globally, the Federal Reserve, BoE, BoC, BoJ, ECB and SNB issued a coordinated statement on 15 March 2020, reducing the price of transactions within their existing liquidity swap agreements by 25 basis points to OIS +25 basis points. The Federal Reserve then started to provide dollar liquidity with a three-month maturity once a week, in addition to the existing auctions with one-week maturity.

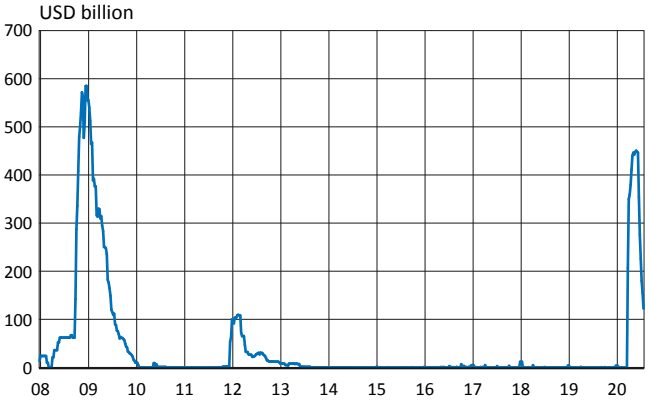
On 19 March, the Federal Reserve also entered into swap agreements with nine additional central banks – the same central banks as during the financial crisis.[24] These agreements now allowed for larger volumes than during the financial crisis, albeit still with limited volumes. Due to high demand for dollar loans early in the crisis, it was decided already on 20 March that the central banks with standing swap agreements would hold daily auctions of loans with one-week maturity. This swift reaction shows a concrete lesson learned from the global financial crisis and the euro crisis: that the impact of swap

23 In Sweden, the stress was noticeable in that the insurance companies traded lower amounts per foreign exchange swap and shortened the maturities during this period, see Sveriges Riksbank (2020a).

24 Australia, Brazil, Mexico, Korea, New Zealand, Singapore, and also Denmark, Norway and Sweden.

agreements can be increased if unlimited liquidity is supplied at an early stage. Figure 6 clearly shows by how much, and how quickly, demand for dollars via the Federal Reserve's swap agreements increased globally in March 2020.[25]

Figure 6. Outstanding dollar liquidity from the Federal Reserve to other central banks provided though swap agreements
USD billion



Source: Federal Reserve

A shift in demand for dollars from Europe to Asia

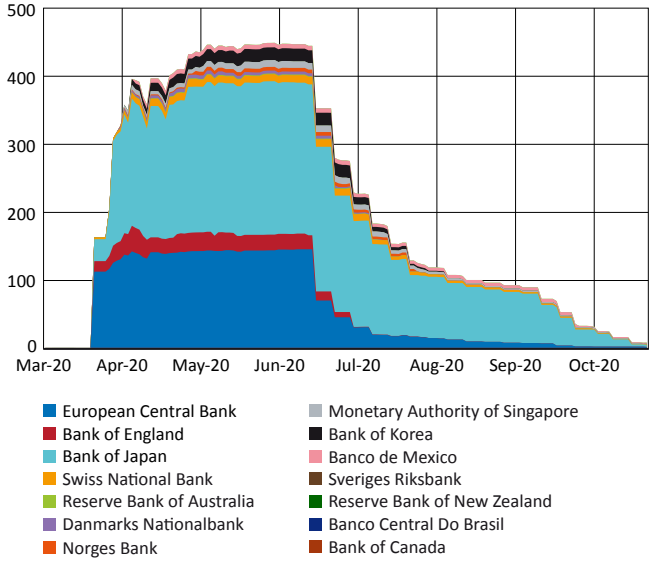
During the global financial crisis, it was European-based banks that, through the ECB's dollar providing facility, had the greatest demand for dollars. During the covid-19 pandemic, on the other hand, Japanese banks have, through the BoJ, demanded the majority of dollars. The ECB has, however, also drawn a significant amount, even if less than during the global financial crisis. Between March and October 2020, BoJ drew USD 225 billion via the Federal Reserve swap arrangement to Japanese banks, compared with USD 144 billion and USD 37 billion by the ECB and BoE respectively. This can be compared with the just over USD 300 billion that was lent to banks in the euro area during the 2008–2010 financial crisis. Figure 7 shows the total outstanding dollar liquidity provided though swaps from the Federal Reserve in 2020. It should however be mentioned that this does not always correspond to the total volume which is then lent to banks by other central banks, because it is also possible to fund dollar lending in other ways (see Box 1).

There may be a number of reasons why Japanese banks in particular has had the largest demand for dollar liquidity during the current crisis, while the demand from European banks has been lower. Japanese banks have increased their dollar exposure significantly since the global financial crisis and Asian life insurers have doubled their dollar assets compared with five years ago (see BIS 2020 and IMF 2019). At the same time, European banks have reduced their dollar exposures. On the other hand, European insurers have increased their dollar exposures, albeit at a slower pace than Asian insurers.[26] Another factor that may have curbed the European banks' demand for dollars so far during the covid-19 pandemic, is the new rules regarding liquidity and capital buffers introduced after the financial crisis have put them in a better initial position than when the global financial began, see ECB (2020) and Sveriges Riksbank (2020b).

25 On March 31 2020, the Federal Reserve also introduced a new repo facility that enabled foreign and international monetary authorities (FIMA) account holders at the Federal Reserve to temporarily exchange US treasury securities for dollars, which could then be lent to banks, see Federal Reserve (2020b).

26 See Sveriges Riksbank (2020a) and Nilsson et al. (2014) for a description of the foreign investments of Swedish pension funds and insurance firms.

Figure 7. Outstanding dollar liquidity provided from the Federal Reserve to other central banks through swap arrangements during the covid-19 pandemic
USD billion



European Central Bank
Bank of England
Bank of Japan
Swiss National Bank
Reserve Bank of Australia
Danmarks Nationalbank
Norges Bank
Monetary Authority of Singapore
Bank of Korea
Banco de Mexico
Sveriges Riksbank
Reserve Bank of New Zealand
Banco Central Do Brasil
Bank of Canada

Source: Federal Reserve

5.2 The swap agreements contributed to reduced stress on the dollar market

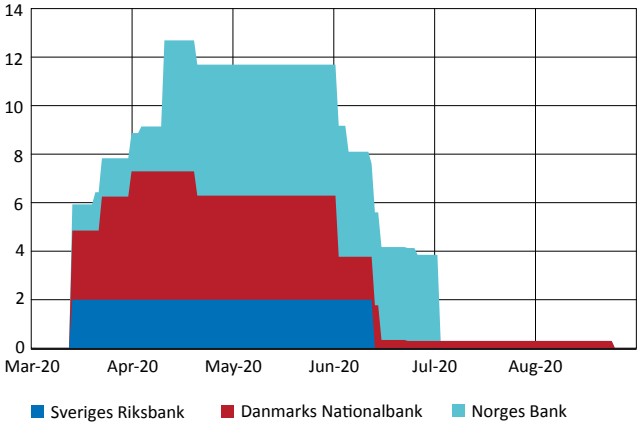
Towards the end of April 2020, the Libor-OIS spread had narrowed and stress on the foreign exchange swap market had subsided. Demand for dollars also levelled off after initial high demand primarily from central banks with standing swap agreements with the Federal Reserve. Several studies show that the swap agreements contributed to curbing financial stress on the dollar market.[27] The foreign exchange swap market in Europe, including Sweden, started to function better particularly once the ECB commenced its extensive dollar auctions. That way, non-US banks had greater possibilities of borrowing dollars directly from the central banks and did not need to rely solely on their possibilities of issuing CDs or CP or borrowing dollars from each other. Dollar liquidity through swap agreements had a clear effect on the cost of market funding, particularly after the interest rate was reduced to OIS+25 basis points (see Bahaj and Reis 2020 and Moessner and Allen 2020). BIS (2020) finds that the reduced stress also coincided with the Federal Reserve entering into swap agreements with smaller central banks in mid-March. The transition to daily auctions for one-week maturity swaps also appears to have had a stabilising effect on the foreign exchange swap market, according to Cetorelli et al. (2020b). Bahaj and Reis (2020) also argue that, even though the announcement itself of swap agreements appears to have helped stabilise interest rates, it was primarily when the central banks drew on the swap agreements that a substantial effect was seen. Cetorelli et al. (2020a) also find that non-US banks whose central banks used the standing swap agreements with the Federal Reserve helped supply liquidity to their US branches and hence supported the US corporate credit market. Because the dollar market is so intertwined and integrated, dollar auctions also benefit banks and the financial systems of countries whose central banks have not taken part in the auctions themselves. For example, Barajas et al. (2020) describe how the cost of dollar funding fell in other countries as well.

27 See Cetorelli et al. (2020a and 2020b), Eren et al. (2020b), Avdjiev et al. (2020), Eguren-Martin (2020), Bahaj and Reis (2020) as well as Moessner and Allen (2020).

5.3 Dollar lending from the Riksbank and other Scandinavian central banks during the covid-19 pandemic

On 26 March, the three Scandinavian central banks held their first dollar auctions. It was also the only time so far during the covid-19 pandemic that Swedish banks utilised the Riksbank's dollar facility.[28] The banks' demand for dollar loans from the Scandinavian central banks has so far been much lower than during the global financial crisis, just like in the rest of Europe. Together, the three Scandinavian central banks lent just over USD 12 billion in the spring of 2020 compared with almost USD 50 billion in the autumn of 2008.

Figure 8. Outstanding dollar loans from the Scandinavian central banks during the covid-19 pandemic
USD billion



Sources: Danmarks Nationalbank, Norges Bank and Sveriges Riksbank

Differences in auction procedure between the Scandinavian central banks

All Scandinavian central banks offered dollar loans with a three-month maturity. Danmarks Nationalbank also offered weekly dollar loans with a one-week maturity. So far during the covid-19 pandemic, Danmarks Nationalbank has lent in total USD 4.9 billion at a three-month maturity and just over USD 3 billion at one-week maturity, with longer maturities predominantly at the beginning of the covid-19 pandemic. Norges Bank has lent USD 5.4 billion in 2020 in total, and the Riksbank USD 2 billion.

28 The Riksbank's dollar auction of 26 March was funded through the foreign currency reserve and not through the swap agreement with the Federal Reserve.

Table 1. Dollar auctions by Scandinavian central banks at the beginning of the covid-19 pandemic
USD million

Auction date	Danmarks Nationalbank		Norges Bank	Sveriges Riksbank
	Maturity			
	1 week	3-month	3-month	3-month
26/03/2020	25	2,825	1,075	2,000
02/04/2020	–	–	500	0
06/04/2020	0	1,425	–	–
15/04/2020	1,000	40	–	–
16/04/2020	–	–	275	0
22/04/2020	1,000	0	–	–
23/04/2020	–	–	3,550	0
29/04/2020	1,000	0	–	–

Note. A dash means that no auction was held on that date. This table shows only auctions between March and April 2020. Since then there has been no demand for dollar loans from the Riksbank or Norges Bank. Danmarks Nationalbank lent smaller volumes between May and December 2020 (USD 650 million in total) at three month maturity.
Sources: Danmarks Nationalbank, Norges Bank and Sveriges Riksbank

In contrast to during the global financial crisis, the three Scandinavian central banks have had the same pricing during the corona pandemic so far, OIS +25 basis points (see Appendix). However, there are certain differences between how the central banks auction off their dollar loans. In Sweden and Denmark, the banks submit bids with an interest supplement. Those with the highest supplement have their bids accepted first, and so on in descending order until the offered volume for the auction has been reached. All bids are however allotted at the lowest accepted interest rate. In contrast, Norway allocates the loans according to the highest interest bid at the rates offered, just like during the global financial crisis. There are also differences when it comes to the lowest permitted volume of bids. While the Riksbank has set its lowest permitted bid at USD 100 million, Danmarks Nationalbank has permitted bids as low as 10 million and Norges Bank 25 million (see Table 2).

Table 2. The Scandinavian central banks' auction procedures during the covid-19 pandemic

	Total offered volume (billion USD)	Maturity	Lowest bid (million USD)	Max number of bids per bank	Max allotment per bank (billion USD)
Danmarks Nationalbank	30	7 and 84 days	10	3	No limit
Norges Bank	30	84 days	25	3	3
Sveriges Riksbank	60	84 days	100	10	4

Sources: Danmarks Nationalbank, Norges Bank and Sveriges Riksbank

The receiving central banks themselves bear the credit risk in their lending. This means that the central banks are responsible for the collateral they accept and the appropriate haircuts. In this respect too, there are certain differences between the rules of the Scandinavian central banks. Danmarks Nationalbank and Norges Bank accept the banks' own covered bonds, while the Riksbank only accepts them temporarily until December 2024. The Riksbank and Danmarks Nationalbank accept collateral with a rating of A–, while in Norway, collateral is accepted with a rating of BBB–. Because Norway lacks a sizeable bond market, Norges Bank also accepts foreign collateral with a rating of A–. In Sweden and Denmark, the domestic bond markets are larger and the Riksbank and Danmarks Nationalbank therefore accept foreign securities to a

lesser extent. It is noteworthy that the ECB accepts securities with a rating equal to BBB– and asset-backed securities (ABS), which for instance the Riksbank does not.

At the end of July 2020, the swap agreements were extended until the end of March 2021 and in December 2020, the Federal Reserve communicated a further extension until the end of September 2021.

BOX 3. Agreement of principle is established between the Scandinavian central banks

In November 2020, the central banks of Sweden, Norway and Denmark entered into an agreement regarding principles for currency swap agreements in times of crisis to support financial stability in the region.

The financial markets in the Scandinavian countries are closely interwoven. While this increases efficiency on the market of each country, it also presents vulnerabilities because a crisis can quickly spread across the borders. The time factor is often crucial in a crisis, and for this reason, in the autumn of 2020, the central banks of Sweden, Norway and Denmark prepared a set of principles according to which currency swap facilities can be established between these three central banks, if needed. In November 2020, principles were adopted that form the basis of bilateral swap agreements between the Scandinavian central banks. Bilateral swap agreements were entered into at the same time between Norges Bank and the Riksbank, and between Danmarks Nationalbank and Norges Bank. An agreement between Danmarks Nationalbank and the Riksbank is being negotiated.

Source: Sveriges Riksbank (2020c)

6 Swap agreements can never replace a central bank's foreign currency reserve

Liquidity swap agreements with other central banks can help to reduce the risk and alleviate the consequences of financial crises, but can never replace a central bank's foreign currency reserves. Central banks therefore also need to hold sufficiently large foreign currency reserves. Theoretically, swap agreements could reduce the need of central banks to hold large foreign currency reserves. If a central bank knew that it always had sound access to foreign currency through swap agreements, there would not be any reason to build up a large foreign currency reserve. That way, swap agreements could theoretically help reduce global imbalances that can arise when countries wish to strengthen their current account in order to increase their foreign currency reserves.[29] In practice however, a central bank cannot be certain of gaining access to foreign currency through swap agreements in a crisis.

Swap agreements cannot replace foreign currency reserves because there is never any guarantee that liquidity will be available in a crisis. Even swap agreements that have not had any limitations on the volume of dollar liquidity from the Federal Reserve have been limited in the sense that the Federal Reserve has always had the possibility of denying a certain transaction (see Sheets et al. 2018). Also, it can take time to negotiate and enter swap agreements, and timing is an important factor in the midst of a crisis. Swap agreements thus do not reduce the need for a foreign currency reserve.

The probability of being able to enter into a swap agreement is also greater if the receiving country has managed its economy prudently and held a sufficiently large foreign currency reserve (see Cecchetti 2014). For example, one of the criteria for a country to obtain a preventive credit line through the IMF's 'Flexible Credit Line' is that the foreign currency reserve must be sufficiently large (see IMF 2020). In that sense, swap agreements and foreign currency reserves complement each other.

29 See Moessner and Allen (2010) for a discussion of the pros and cons of swap agreements and other ways of supplying liquidity to the financial system.

In global crises, the Federal Reserve has on a number of occasions entered into swap agreements with smaller central banks in countries whose financial markets have been deemed sufficiently important for the global dollar funding market. On such occasions, the Federal Reserve has an interest in helping a broader circle of central banks to meet demand for dollars and in signalling that the central banks are prepared to act jointly. If a small country is struck by a domestic crisis that does not affect global financial markets, it is much less probable that the Federal Reserve would grant a swap agreement to that country (see Sveriges Riksbank 2017). In global crises, it might be possible to gain access to dollars through swap agreements, but in domestic crises, the central bank thus needs to rely on its own foreign currency reserve.

For a small country with a large banking sector in particular, it is important to hold a sufficiently large foreign currency reserve for insurance purposes. However, the banks' potential liquidity needs in a crisis, and hence the central bank's contingency need, depend on the size of liquidity risks present in the banking system. In Sweden, the authorities could for instance limit these by obliging the banks to hold greater liquidity buffers in foreign currencies or by restricting the proportion of short-term funding in foreign currency (see Flodén 2017). Cecchetti (2014) argues that the banks' liquidity risks in foreign currency should be regulated and limited, but that such measures do not suffice. Another option, which the Riksbank has suggested on a number of prior occasions, is to let the financial sector contribute to the funding cost for the part of the Riksbank's foreign currency reserve that is in place to provide liquidity assistance to the banks when needed (see for example Sveriges Riksbank 2017). There are thus different measures that could be taken to reduce the potential need for dollars in a crisis or to reduce the Riksbank's cost of holding a foreign currency reserve.

7 Conclusions

Liquidity swap agreements between central banks are important for safeguarding financial stability in global crises. We witnessed this in the global financial crisis, and have done so thus far during the covid-19 pandemic. The Federal Reserve's liquidity swap agreements with other central banks have been key to supplying global liquidity and avoiding a credit crunch. Although European banks have reduced their dollar exposure since the global financial crisis, the global financial system remains reliant on dollar funding. Not least, actors operating in international industries depend on the dollar market. Non-banks such as insurance companies invest a large share of their assets in dollars and thus have an ongoing need for dollar liquidity through the foreign exchange market. The exposure of this sector to the dollar market has also increased in recent years.

Availability of unlimited dollar liquidity from the Federal Reserve to central banks with standing swap agreements has proven to have significant effects through reducing stress on financial markets in a crisis. During the global financial crisis, the price set by the Federal Reserve for dollar liquidity also played an important role. Early during the covid-19 pandemic, the Federal Reserve acted swiftly and in cooperation with other central banks by enhancing provision of dollar liquidity via swap agreements with certain select central banks. This ensued from lessons learned from earlier crises and helped to increase dollar liquidity in the financial system, thus alleviating stress on financial markets.

Liquidity swap agreements can however not replace foreign currency reserves, but rather serve to complement them. A central bank cannot assume that swap agreements from the Federal Reserve will be possible to use in a crisis. With the exception of the standing swap agreements with select central banks, the Federal Reserve has generally only entered into swap agreements in global crises. Individual countries can therefore not count on support in a domestic or regional crisis, but must in that case secure access to dollars through their

foreign currency reserve. Also, the probability of a swap agreement being granted increases if the receiving country has managed its economy prudently and held a sufficiently large foreign currency reserve.

References

Aizenman, Joshua and Gurnain Kaur Pasricha (2010), 'Selective swap arrangements and the global financial crisis: analysis and interpretation', *International Review of Economics and Finance,* vol. 19, no. 3, pp. 353–365.

Avdjiev, Stefan, Wenxin Du, Cathérine Koch and Hyun Song Shin (2019): 'The Dollar, Bank Leverage, and Deviations from Covered Interest Parity', *American Economic Review: Insights*, vol. 1, no. 2.

Avdjiev, Stefan, Egemen Eren and Patrick McGuire (2020), 'Dollar funding costs during the Covid-19 crisis through the lens of the FX swap market', *BIS Bulletin,* no. 1, Bank for International Settlements.

Baba, Naohiko and Frank Packer (2009), 'From turmoil to crisis: dislocations in the FX swap market before and after the failure of Lehman Brothers', *Journal of International Money and Finance,* vol. 28, no. 8, pp. 1350–1374.

Bahaj, Saleem and Ricardo Reis (2020). 'Central Bank swap lines during the Covid-19 pandemic', *Centre for Economic Policy Research*, vol. 2.

Barajas, Adolfo, Andrea Deghi, Claudio Raddatz, Dulani Seneviratne, Peichu Xie and Yizhi Xu (2020), 'Global Bank's Dollar Funding: a Source of Financial Vulnerability', *IMF Working Paper*, WP/20/113.

BIS (2020), 'US dollar funding: an international perspective', *CGFS Papers,* no. 65.

Bordo, Michael D., Owen F. Humpage and Anna J. Schwartz (2014), 'The evolution of the Federal Reserve Swap Lines since 1962', *NBER Working Paper Series*, no. 20755.

Borio, Claudio, Robert McCauley, Patrick McGuire and Vladyslav Sushko (2016), 'Covered interest parity lost: understanding the cross-currency basis', *BIS Quarterly Review*, September, Bank for International Settlements.

Cecchetti, Stephen (2014), 'Towards an international lender of last resort', *BIS Working Paper,* no. 79, Bank for International Settlements.

Cetorelli, Nicola and Linda Goldberg (2011), 'Global banks and their internal capital markets during the crisis', *Liberty Street Economics*, Federal Reserve Bank of New York, 11 July.

Cetorelli, Nicola, Linda Goldberg and Fabiola Ravazzolo (2020a), 'How Fed swap lines supported the U.S. corporate credit market amid COVID-19 strains', *Liberty Street Economics*, Federal Reserve Bank of New York, 12 June.

Cetorelli, Nicola, Linda Goldberg and Fabiola Ravazzolo (2020b), 'Have the Fed Swap Lines Reduced Dollar Funding Strains during the COVID-19 Outbreak?', *Liberty Street Economics*, Federal Reserve Bank of New York, 22 May.

ECB (2014), 'Experience with Foreign Currency Liquidity-providing Central Bank Swaps', *ECB monthly bulletin*, August, pp. 65–82.

ECB (2020), *Financial Stability Review*, May.

Eguren-Martin, Fernando (2020), 'Dollar shortages and central bank swap lines', *Staff Working Paper*, no. 879, Bank of England.

Eren, Egemen, Andreas Schrimpf and Vladyslav Sushko (2020a), 'US dollar funding markets during the Covid-19 crisis – the money market fund turmoil', *BIS Bulletin*, no.14, Bank for International Settlements.

Eren, Egemen, Andreas Schrimpf and Vladyslav Sushko (2020b), 'US dollar funding markets during the Covid-19 crisis – the international dimension', *BIS Bulletin,* no. 15, Bank for International Settlements.

Federal Reserve (2020a), 'Central bank liquidity swaps', last updated 29 July.

Federal Reserve (2020b), 'FIMA Repo Facility FAQs', 31 March

Flodén, Martin (2017), 'Specific comment on the Riksbank's consultation response on the Ministry of Finance's draft to the Council on Legislation, the Riksbank's financial independence and balance sheet', Sveriges Riksbank.

Gislén, Marushia and Maria Kangas (2020), 'Special Drawing Rights – the role as a global reserve asset, the Riksbank's experience and the way forward', *Economic Commentaries*, no. 7, Sveriges Riksbank.

Goldberg, Linda, Craig Kennedy and Jason Miu (2011), 'Central bank dollar swap lines and overseas dollar funding costs', *Economic Policy Review*, vol. 17, May, pp. 3–20, Federal Reserve Bank of New York.

Humpage, Owen and Michael Shenk (2008), 'Swap lines', *Economic Trends*, October, Federal Reserve Bank of Cleveland.

IMF (2019), 'Chapter 5: Banks' Dollar Funding: A Source of Financial Vulnerability', *Global Financial Stability Report,* October.

IMF (2020), 'IMF Flexible Credit Line (FCL)', Factsheet.

Levy Yeyati, Eduardo (2020), 'COVID, Fed swaps and the IMF as lender of last resort', VoxEU.org, 31 March.

Leung, Caroline (2020), 'The Riksbank's measures during the global financial crisis 2007–2010', Riksbank Study, February 2020, Sveriges Riksbank.

McCauley, Robert and Catherine Schenk (2020), 'Central bank swaps then and now: swaps and dollar liquidity in the 1960s', *BIS Working Papers,* no. 851, Bank for International Settlements.

Moessner, Richhild and William Allen (2010), 'Options for meeting the demand for international liquidity during financial crises', *BIS Quarterly Review*, September, pp. 51–61, Bank for International Settlements.

Moessner, Richhild and William Allen (2013), 'Central bank swap line effectiveness during the euro area sovereign debt crisis', *Journal of International Money and Finance,* no. 35, pp. 167–178.

Nilsson, Christian, Jonas Söderberg and Anders Vredin (2014), 'The significance of collective pension saving for the Swedish financial system', *Economic Commentaries*, no. 3, Sveriges Riksbank.

Nyberg, Lars (2011), 'Is it dangerous to borrow dollars?', speech, Svenska Handelsbanken, 17 May.

Reis, Ricardo (2019), 'A solution to sudden stops', *Finance & Developmen*t, June, vol. 56, no. 2.

Sheets, Nathan, Edwin (Ted) Truman and Clay Lowery (2018), 'The Federal Reserve's swap lines: lender of last resort on a global scale', Hutchins Center on Fiscal & Monetary Policy at Brookings.

SOU 2007:51, *The Riksbank's financial independence.*

SOU 2019:46, *A new Sveriges Riksbank Act.*

Sveriges Riksbank (2017), Consultation response to the Draft to the Council on Legislation, the Riksbank's financial independence and balance sheet.

Sveriges Riksbank (2020a), *Financial stability report,* 2020:1.

Sveriges Riksbank (2020b), *Financial stability report,* 2020:2.

Sveriges Riksbank (2020c), 'Scandinavian central banks in new cooperation' *Press release number 44,* 12 November.

The National Debt Office (2013), 'Borrowings to fulfil the Riksbank's need for a foreign currency reserve', Board Memorandum, 22 January.

Toniolo, Gianni and Piet Clement (2005), 'Central Bank Cooperation at the Bank for International Settlements, 1930–1973', Cambridge University Press.

Appendix A

Table A1. Overview of select central banks' swap agreements with the Federal Reserve, comparison financial crisis 2008–2010 and covid-19 pandemic 2020–.

		Auction procedure		Pricing		Maximum outstanding USDbn	
		Global financial crisis	Covid-19 pandemic	Global financial crisis	Covid-19 pandemic	Global financial crisis	Covid-19 pandemic
Standing agreements	European Central Bank	Fixed price	Fixed price	OIS, later OIS + 100 basis points	OIS + 25 basis points	Initially 20 and unlimited from October 2008	Unlimited
	Swiss National Bank	Auction, switched to fixed price in October 2008	Fixed price	OIS, later OIS + 100 basis points	OIS + 25 basis points	Initially 4 and unlimited from October 2008	Unlimited
	Bank of England	Fixed price	Fixed price	OIS, later OIS + 100 basis points	OIS + 25 basis points	Unlimited	Unlimited
Temporary agreements with Scandinavian central banks	Danmarks Nationalbank	Allotment according to highest bid, whereby the lowest permitted bid is applied as a price for all offers	Allotment according to highest bid, whereby the lowest permitted bid is applied as a price for all offers	Libor + 50 basis points	OIS + 25 basis points	15	30
	Norges Bank	Allotment according to highest bid	Allotment according to highest bid	TAF minimum rate + 50 basis points	OIS + 25 basis points	15	30
	Sveriges Riksbank	Allotment according to highest bid, whereby the lowest permitted bid is applied as a price for all offers	Allotment according to highest bid, whereby the lowest permitted bid is applied as a price for all offers	OIS + 50 basis points	OIS + 25 basis points	30	60

Sources: Goldberg et al. (2011), the central banks' websites and the Federal Reserve