

ARTICLE – Interconnectedness in the Swedish financial system

In recent decades, the financial system has become increasingly advanced and complex. This article aims to provide a picture of the central players in the Swedish financial system, how the central infrastructure systems work, what interconnections there are and what risks these may pose. The Riksbank's assessment is that there are particular risks and vulnerabilities due to individual central players being closely interconnected. It is therefore important to carefully monitor the development within this area and which implications it has for financial stability.

An interconnected financial system poses risks

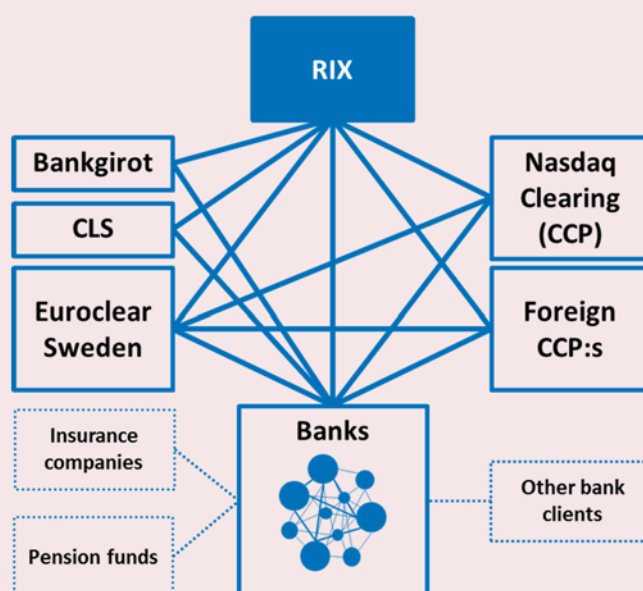
The financial system is central to the functioning and growth of the economy. At the same time, it is sensitive to shocks. This is partly because central parts of the financial system, such as banks and financial markets, have intrinsic vulnerabilities.⁹⁷ Furthermore, the different parts of the system, players and infrastructure systems, can be more or less interconnected with each other, for example, via various types of financial exposures, such as loans or derivative contracts that directly link financial players together. Financial players can also be indirectly interlinked via the ownership of similar assets or their dependence on the same infrastructure.

Interconnectedness means that problems arising in one part of the system can quickly spread to other parts and players.⁹⁸ This can have serious consequences for financial stability in the system as a whole, with potentially large costs to society as a result. It is therefore also important to identify and consider this interconnectedness when analysing the stability of the financial system. Many analysts, including the Federal Reserve, FSB, CPMI, IOSCO and BIS⁹⁹ have highlighted and analysed this interconnectedness from a financial stability perspective.¹⁰⁰

Systemic risk is linked both to the risk associated with individual players and to how this risk can spread in the system through interconnections. It is hence important that all players and links in the system function well and minimise the risks so that the system as a whole is stable.¹⁰¹ A general description of the central players in

the Swedish financial system and how they are interconnected is given below (see Figure C:1).¹⁰²

Figure C:1. A simplified illustration of links between players in the financial system, focusing on the infrastructure



Source: The Riksbank

The Swedish financial infrastructure¹⁰³

The financial infrastructure is an important component of the financial system. It consists of systems through which payments are made and transactions with financial instruments are handled. The infrastructure makes it possible for individual households, companies and authorities to perform payments in a safe and efficient

⁹⁷ See Chapter 2.

⁹⁸ Glasserman, P. and Young, H.P. (2016), Contagion in Financial Networks, *Journal of Economic Literature* 2016, 54(3), 779-831 for a research review of contagion risks in financial networks.

⁹⁹ FSB: Financial Stability Board. CPMI: Committee on Payments and Market Infrastructures IOSCO: International Organisation of Securities Commissions. BIS Bank for International Settlements.

¹⁰⁰ Analysis of Central Clearing Interdependencies, July 2017. BIS, CPMI, FSB and IOSCO. See also Yellen, J. (2013), Interconnectedness and Systemic Risk: Lessons from the Financial Crisis and Policy Implications, *Speech at the American Economic Association*. Board of Governors of the Federal Reserve System.

¹⁰¹ For a review of the risks associated with individual players, see Chapter 2.

¹⁰² The chart does not, however, show the significance of individual players in the financial system or the degree of interconnectedness between the various participants in the system. This is because the data on interconnectedness is either inadequate or not in the public domain. As mentioned previously, interconnectedness can also take different forms. This means that it can be difficult to compare different types of infrastructure system and exposure with each other. Some players are also alone in their role, which means that the degree of systemic importance cannot be measured by, for example, a financial flow.

¹⁰³ For a detailed overview of the Swedish financial infrastructure, see *The Swedish Financial Market 2016*. Sveriges Riksbank.

manner. It also makes it possible to safely and efficiently pay for and deliver shares, debt securities and other financial instruments traded on the financial markets. The financial infrastructure thereby plays a central role and is a prerequisite for the functioning of the financial system.

Banks and other financial institutions are participants in financial infrastructure systems and in many cases these systems also participate in each other's systems. This interconnectedness means that systems are dependent on each other to be able to function without disruptions.

The Riksbank has identified the Riksbank's own payment system for large payments (RIX), Nasdaq Clearing, Euroclear Sweden and Bankgirot as systemically important and critical systems in Sweden.

RIX

RIX is an important hub in the financial infrastructure as basically all large payments in Swedish kronor between banks and the various infrastructure systems are settled¹⁰⁴ via this system. In 2017, transactions for just over SEK 13,000 billion were performed every month.¹⁰⁵ From a financial stability perspective, however, the number of transactions is not the crucial aspect. The key aspect is that most payments go via RIX, and this set-up has been the same for a long time.¹⁰⁶

Euroclear Sweden

Clearing is a central concept as regards financial infrastructure and involves the compiling of instructions and information about transactions.

Euroclear Sweden is an infrastructure system that offers clearing and settlement services and operates Sweden's central securities depository. Among other things, the system is used for securities transactions and the storage of securities in electronic form. Euroclear Sweden also makes it possible for players to use their securities to pledge collateral, which is of central importance for a functioning market. Collateral is needed, for example, for a loan between banks, to borrow from the Riksbank or for central counterparty clearing, which is described in the next paragraph. When a securities transaction is settled, securities are exchanged for liquid funds simultaneously. Cash settlement is done in central bank money on Riksbank accounts,¹⁰⁷ i.e. without credit risk. On average, equity transactions for SEK 46 billion are settled per day and the equivalent of SEK 436 billion in fixed-income market transactions. From a financial

stability perspective, however, the key aspect is not the number of transactions but rather the fact that Euroclear Sweden is currently alone in its role on the Swedish market.

Bankgirot

Bankgirot is Sweden's payment system for retail payments,¹⁰⁸ where mostly payments between households and non-financial corporations are compiled and cleared. The banks are participants in Bankgirot and submit payment instructions from their customers. Ultimately, Bankgirot's payments also go via RIX. An average of over four million transactions to a total value of SEK 53 billion are cleared through Bankgirot's system each bank day.

Nasdaq Clearing

Nasdaq Clearing is known as a central counterparty (CCP). As a CCP, Nasdaq Clearing takes over the counterparty risk¹⁰⁹ that transactions between two players would otherwise involve. Nasdaq Clearing conducts central counterparty clearing for different types of derivatives and for repos. The last part of this article describes in more detail the role played by a CCP in the financial system.

Stability risks primarily arise as a result of mutual financial dependencies between CCPs and CCP participants, mostly banks. This is a difference compared with the other infrastructure systems where it is mainly operational risks that constitute a stability risk.

International infrastructure systems

There are also some international central counterparties operating on the Swedish market, including London Clearing House (LCH). They offer clearing for both interest rate derivatives and equities. Other examples are EuroCCP and SIX x-clear, who offer clearing for equity transactions.

Another important international system is CLS Bank International. CLS reduces the risk in a foreign exchange transaction by the parties involved in the transaction first paying their respective exchange amounts into CLS. Then, once the money of both parties has been received, CLS simultaneously transfers the exchange amounts to the parties (known as "payment-versus-payment"). CLS payments in Swedish kronor are settled in RIX.

¹⁰⁴ Final regulation of claims between or within account operators, which is to say the transfer between accounts by which the transaction is considered to have been concluded.

¹⁰⁵ The figure represents an average for the whole of 2017.

¹⁰⁶ The current version of the RIX system was brought into operation in February 2009, although earlier versions of RIX have also fulfilled the same function.

¹⁰⁷ The Riksbank has also tasked Euroclear Sweden to administrate accounts used for the settlement of securities transactions, so that the funds deposited in Euroclear Sweden's accounts constitute a claim on the Riksbank.

¹⁰⁸ A retail payments system handles payments of relatively small amounts made in large numbers, most often between private individuals, companies and authorities.

¹⁰⁹ Counterparty risk refers to the risk that the counterparty, in, for example, a derivative contract, cannot fulfil its payment obligations.

The major Swedish banks

The four major Swedish banks are key players in the Swedish financial system and are responsible for the vast majority of all transactions in the Swedish financial infrastructure. For example, in 2017, the four major banks accounted for about 80 per cent of all RIX transactions and 65 per cent of the total turnover.¹¹⁰ The banks perform some transactions on their own behalf, but they perform the majority in their capacity as an agent for private individuals, companies and financial institutions that do not have direct access to the infrastructure themselves. In turn, the banks are tightly interlinked,¹¹¹ which means that problems in one bank can easily spread to other banks and ultimately also affect the functioning of the financial infrastructure. All banks, and particularly the four major banks, hence play a key role in the Swedish financial infrastructure in several respects.

Insurance companies and investment funds

There are also other key players in the Swedish financial system that are not as tightly interlinked with the Swedish infrastructure systems. These instead use banks as agents in order to access the infrastructure. Two examples of such key players are insurance companies and investment funds. These are interlinked with the banks in several ways, not just because the banks act as their agents. For instance, they hold large quantities of the major banks' covered bonds (see Chart 2:9 in Chapter 2).

Interconnectedness between banks and CCPs

The mutual financial link between banks and CCPs is described here in order to clarify how agents and infrastructure systems can be interconnected.

As described above, a CCP acts as an intermediary in different types of financial transactions. This involves both the buyer and the seller having the CCP as a counterparty rather than being exposed to each other. When a bank or other player has many bilateral transactions with many counterparties, it can be difficult to keep track of the risk associated with all counterparties. If instead the CCP acts as intermediary, this problem is reduced as there is only one counterparty. Another advantage with CCPs is that so-called "netting" and economies of scale enable more effective use of the collateral pledged in transactions.

A CCP is specialised in managing counterparty risks and must therefore follow strict regulations. This is one of the reasons why it is considered less risky to have a CCP as a counterparty rather than another player. The Riksbank is

therefore positive to increased central counterparty clearing as it poses less risk than bilateral clearing. No arrangement is totally risk-free, however, which is why it is important to monitor the risks that may arise in central clearing.

Banks use CCPs partly due to legal requirements,¹¹² but also it gives them the opportunity to reduce their capital requirements¹¹³ and their overall costs for risk management. Banks and CCPs are thus closely interlinked and dependent on one another.

All banks participating in a CCP must contribute to a common *default fund*¹¹⁴ as well as pledging collateral in order to enter any contracts. If a participant in a CCP defaults and the participant's own pledged collateral does not cover the debts, the common default fund will be used. This means that all participants in a CCP can be affected by losses incurred by a single participant. Furthermore, a CCP can make use of so-called assessment rights if its total resources are exhausted. This means that the banks must contribute more funds in relation to their original contribution to the default fund, usually between 100 and 200 per cent of the contribution to the default fund.

The total contributions of the major Swedish banks to default funds at the most important CCPs amount to about SEK 5.5 billion. Putting the contributions of the major banks to the default funds of CCPs in relation to, for example, their CET1 capital or their liquidity reserve provides an indication of how exposed the major banks are to problems in a CCP.¹¹⁵ The major Swedish banks' total contributions to CCP default funds correspond to less than two per cent of their combined CET1 capital. This figure is even less if a comparison is made with their liquidity reserves. Liquidity is important as the banks must have the capacity to replenish the default fund if it has been used in a crisis situation.

The fact that the banks' contributions to the default funds are small in relation to their capital and liquidity reserves does not, however, provide a complete picture of the banks' exposure and risk. As central clearing has become more common, the banks' counterparty risk has decreased in relation to individual players but at the same time been concentrated to a small number of large CCPs. This is also illustrated in the above-mentioned report that analyses interconnectedness in central counterparty clearing.¹¹⁶

¹¹⁰ The Riksbank's own RIX transactions are excluded from the calculation.

¹¹¹ See Chapter 2.

¹¹² ESMA provides a register of all derivatives covered by the clearing requirement: https://www.esma.europa.eu/sites/default/files/library/public_register_for_the_clearing_obligation_under_emir.pdf

¹¹³ According to the regulations that banks must follow, increased use of central counterparties implies less counterparty risk and hence lower capital requirements.

¹¹⁴ A *default fund* consists of compulsory contributions from the participants in the CCP. The contributions are proportionate to the participants' exposure.

¹¹⁵ A larger default fund contribution can, all other factors being equal, also indicate more conservative risk management and reduce the risk associated with counterparty clearing.

¹¹⁶ Analysis of Central Clearing Interdependencies, July 2017. BIS, CPMI, FSB and IOSCO.

The percentage of transactions via CCPs has risen sharply in recent years. For example, 75 per cent¹¹⁷ of global interest rate transactions were cleared via CCPs in 2016 compared with 16 per cent in 2007.¹¹⁸ As central counterparty clearing increases and a small number of CCPs take on an ever more important role in the financial system, it can be assumed that the systemic risks associated with a CCP failure would also increase.¹¹⁹ As mentioned above, the increased use of central counterparties has, most likely, still contributed to a reduction in systemic risks since the financial crises.

CCPs are dependent on banks

CCPs are in turn dependent on banks in different ways. A bank can be a:

- CCP participant.
- Credit supplier to a CCP. The credit is primarily used to guarantee liquidity in a stressed situation.
- Representative of players who do not have direct access to a CCP or a settlement bank for other CCP participants.
- Provider of collateral used by a participant to, for example, contribute to the default fund.
- Investment counterparty. As CCPs must invest both their own funds and the cash funds they receive as collateral from participants, banks can also act as investment counterparties for these purposes.

Even if Nasdaq Clearing has reduced its dependence on individual players to a certain extent, it is still an example of a CCP that is heavily dependent on a small number of banks. This is due partly to a number of banks having several roles in relation to Nasdaq Clearing and partly to some of these banks being particularly important within certain roles. This effect is amplified by the fact that the banks are interconnected to a high degree and hence dependent on each other to be able to perform tasks they have undertaken in relation to the CCP. The interconnectedness of the banks means that shocks can quickly spread from one bank to other banks and in turn lead to problems for a CCP. The interconnectedness between banks and CCPs therefore constitutes a financial stability risk.

More knowledge about interconnectedness is needed

The financial system is a complex interplay between different types of players that can be more or less closely interconnected. This makes the system vulnerable and creates risks to financial stability. It is therefore of major

significance that all central players in the financial system have good resilience and function as safely and efficiently as possible. An example of existing interconnectedness is banks and central counterparties being dependent on one another in order to conduct their operations.

More public data and analyses are required to be able to assess various links and interdependencies and thereby create more comprehensive understanding of the risks and vulnerabilities that are most relevant to the system. The Riksbank continues to work on these issues and participates actively in international working groups and in forums for the analysis of interconnectedness in the financial system.¹²⁰

¹¹⁷ BIS semi-annual OTC derivatives statistics, May 2017. BIS.

¹¹⁸ Derivative Market Analysis: Interest Rate Derivatives, ISDDA Research Note, January 2016. International Swaps and Derivatives Association.

¹¹⁹ Analysis of Central Clearing Interdependencies, July 2017. BIS, CPMI, FSB and IOSCO.

¹²⁰ Billborn, J. (2018), The Riksbank's oversight of the financial infrastructure, Economic Commentaries No. 7. Sveriges Riksbank.