Banking sector interconnectedness: what is it, how can we measure it and why does it matter?

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- Banks can be connected to each other in a number of ways. Greater interconnectedness means that stresses tend to spread more rapidly and extensively across the financial system.
- Various regulatory initiatives have been introduced to mitigate financial stability risks arising from interconnectedness. On some measures, such as interbank credit exposures, interconnectedness has decreased materially since the financial crisis.

Overview

During the 2008 financial crisis, many banks ran into difficulties as shocks spread rapidly across the financial system. One of the main reasons for this is that the global financial system had become highly interconnected in the run-up to the crisis.

In a highly interconnected financial system, where banks are connected to each other both directly and indirectly, stresses in one part of the system are likely to be transmitted to other parts of the system, resulting in a reduction in the aggregate provision of financial services such as lending to the real economy.

Banks can be directly interconnected via bilateral transactions. The greater the degree of interconnectivity between banks, the greater the likelihood that a default by one bank could trigger contagion to other banks. The **summary chart** shows that UK interbank exposures are dominated by a small number of 'core' banks, whose distress could propagate extensively throughout the network.

Banks may also be interconnected through indirect channels: for example, fire sales by a distressed bank may lead to falls in asset prices and associated mark-to-market losses for other banks.

Broadly speaking, direct interconnectedness from interbank credit exposures has declined since the financial crisis, while other types of direct interconnectedness, such as banks' exposures to central clearing counterparties, have increased.

Summary chart UK interbank exposure network[a][b]

Sources: Prudential Regulation Authority (PRA) and Bank calculations.

(a) Data as at end-2013. Exposures are net of collateral.
(b) Each node represents a bank and the size of the node is scaled by the total amount of exposures to and from that bank. Each arrow points from one bank to another bank that it has exposure to. The layout is designed so that for any two banks in the network, the greater the exposures between them, the more closely they are positioned.

The analysis presented here suggests that correlations in banks' credit default swap premia increased since the crisis, which may reflect higher indirect interconnectedness, but is more likely to be driven by common reactions to shocks.

Since the financial crisis, a number of regulatory initiatives have been introduced in order to mitigate the financial stability risks posed by interconnectedness between banks. Bank interconnectedness is included in the set of core indicators used by the Financial Policy Committee to monitor risks to the UK financial system.

(1) The authors would like to thank Jamie Coen for his help in producing this article.

The financial crisis in 2008 was particularly severe because a considerable number of banks, operating in different countries and in different markets, all ran into difficulties at the same time. When Lehman Brothers failed on 15 September 2008, there was rapid contagion across the financial system. One of the main reasons for this was that the global financial system had become highly *interconnected*.

Interconnectedness between banks is not always a bad thing: transactions between financial market participants enable them to obtain funding or transfer risk. But from the perspective of the stability of the financial system, greater interconnectedness between banks increases the likelihood that distress will spread more rapidly across the system. So interconnectedness is a key determinant of the speed and strength of contagion.(1) For example, banks that lend or borrow in the interbank market are interconnected, as the failure of one bank can lead to losses for its counterparties. In a highly interconnected financial system, it is more likely to see bank stresses or failures occurring at the same time, due to such contagion effects.

This article first sets out at a high level the concept of interconnectedness, before describing some of the different types in more detail. The final section summarises the policy responses that have been developed to date to mitigate financial stability risks emanating from interconnectedness.

What is interconnectedness?

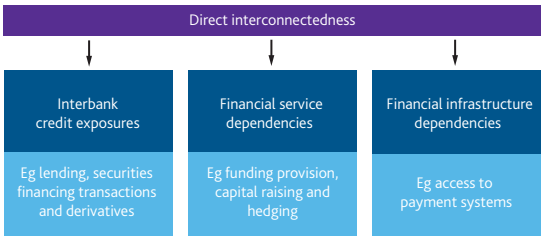
Broadly speaking, interconnectedness can be divided into two types: direct and indirect. Direct interconnectedness arises from bilateral transactions or relationships between banks. For example, if Bank A lends money to Bank B in the interbank market, the two banks are directly connected. While this transaction might be in the interests of both parties, in the event that Bank B were to become insolvent (and assuming it had borrowed on an unsecured basis), Bank A would suffer losses.

There are also indirect ways in which banks can be interconnected. For example, a distressed bank may seek to sell a large amount of assets in a short period of time, which may lead to declines in asset prices and mark-to-market losses for other banks. These concepts are explained in more detail below.

Direct interconnectedness

The most common type of direct interconnectedness is credit exposures between banks (shown on the left-hand side of **Figure 1**). A bank that has lent money to another bank has a credit exposure to that bank, which features on the lending bank's balance sheet as an asset (specifically, an interbank loan). As well as straightforward cases of interbank lending, credit exposures between banks could also arise from activities such as securities financing transactions, derivatives, and holdings of securities issued by other banks.(2)

Figure 1 Examples of direct interconnectedness



Credit exposures can be measured in a number of ways. Broadly speaking, a bank's 'gross exposure' refers to the amount that it could be exposed to *vis-à-vis* a given counterparty — for example the notional amount of a loan — in the event that the counterparty were to default. In the case of derivative contracts, the gross exposure would be the current mark-to-market value of the contract if it is 'in the money'.(3) If the counterparty had posted collateral, the net of collateral exposure is the gross exposure minus any collateral posted. In this article, credit exposures are measured net of collateral,(4) unless otherwise specified.

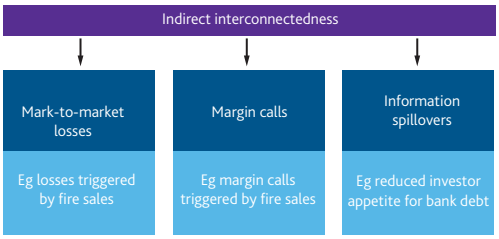
Figure 1 also shows other examples of direct interconnectedness, apart from credit exposures. For example, even if Bank A does not have any direct counterparty credit exposures to Bank B, if it relies on borrowing short-term funds *from* Bank B to maintain its operations, then the failure of Bank B might trigger financial difficulties for Bank A if Bank A were unable to find alternative sources of funding.(5) Bank A may also depend on other services provided by Bank B, such as risk hedging via derivatives or access to payment systems. This will be explained in more detail later.

Indirect interconnectedness

There are many ways in which the distress or failure of one bank could affect other banks even in the absence of direct relationships. This article highlights three channels of indirect interconnectedness (**Figure 2**).

(1) A related but separate notion is the 'connectedness' of the node within a network as a measure of how connected a node is to other nodes in the network (see Finan, Lasaosa and Sunderland (2013) for more details). This article focuses instead on the interconnectedness of the system as a whole.
(2) See Langfield, Liu and Ota (2014) for further explanations of financial instruments in the interbank market.
(3) A derivative is 'in the money' if the bank has made a gain on the contract that is owed by its counterparty. See Hull (2008) for more explanations of how derivatives work.
(4) For derivatives, exposures also take into account the potential increase in the current exposure after the counterparty default and before the position can be closed out. This is consistent with how derivative exposures are calculated in the regulatory capital regime for banks.
(5) See Farag, Harland and Nixon (2013) for further explanations of funding liquidity risk.

Figure 2 Examples of indirect interconnectedness



Mark-to-market losses triggered by fire sales

Fire sales refer to the situation where a bank tries to sell a large amount of financial assets in a short period of time. Banks typically hold securities that are traded in financial markets. Some of these securities are regularly marked to market, depending on the accounting treatment. When a large bank fire sells its assets, other banks that hold related assets will need to mark them to a lower price and report a loss, known as mark-to-market losses.

A bank might be forced to sell assets under time pressure for a number of reasons. It may not have enough liquid assets — such as central bank balances and Treasury bills — to meet its obligations (such as withdrawal of funds by investors). Or, a bank facing capital constraints may sell its holdings of securities to boost its capital ratio, because the sale of securities reduces its risk-weighted assets, which is the denominator of its capital ratio. Alternatively, when a bank defaults, its counterparties may sell securities received as collateral to cover losses.

Margin calls and haircuts

Many banks use repurchase agreements (repos) to fund their holdings of securities. In a repo transaction, one counterparty borrows cash from another and posts securities as collateral for borrowing the cash. The collateral is marked to market on a daily basis, so that if the collateral falls in value, the borrower of cash needs to post additional collateral to make up the difference. This is known as a margin call. In addition, in order to protect the cash lender from counterparty risk, a repo transaction is typically overcollateralised, and the difference between actual collateral posted and cash lent is known as the haircut.

In the event of a fire sale and subsequent declines in the value of collateral, borrowers in the repo market need to post additional collateral and may come under pressure if they do not have sufficient liquid assets.(1) Moreover, haircuts on repo transactions are typically set according to the volatility of the price of the assets posted as collateral. Substantial price changes may lead to an increase in haircuts, which is a further way that distress can be transmitted around the system.(2)

Information spillovers

The distress or failure of one bank may be interpreted as a negative signal about other banks by financial market investors.(3) For example, during the financial crisis, the failure of Lehman Brothers and Washington Mutual in the United States were expected to result in losses for senior debt holders; this, in turn, reduced the appetite for all bank debt.(4) Moreover, in the weeks surrounding the bankruptcy of Lehman, investors withdrew a huge amount of short-term wholesale funding from other investment banks as they lost confidence in these firms.(5) That exacerbated the funding difficulties experienced by other banks across the globe.

Why does interconnectedness matter for financial stability?

In a highly interconnected financial system, distress in one part of the system is likely to be transmitted to other parts of the system, resulting in a reduction in the aggregate provision of financial services. As a result, when considering possible consequences of a downturn in macroeconomic or financial market conditions, the impact will typically be larger when there is a greater degree of interconnectedness, either direct or indirect. For this reason, interconnectedness is one of the key factors of the framework for assessing systemic risk in the banking sector developed by the International Monetary Fund (IMF), Bank for International Settlements (BIS) and Financial Stability Board (FSB).(6)

Direct credit exposures between banks can lead to contagion via so-called domino effects. In a financial system with long and complex chains of intermediation, the failure of a highly interconnected financial institution could cause major disruptions to the financial system as a whole as it causes a series of other banks to fail.(7) For example, AIG, despite being an insurance company, was a large player in the derivatives market. It was bailed out during the financial crisis mostly due to concerns about the derivative exposures of other financial institutions to AIG.(8)

When banks are indirectly interconnected, shocks may materialise for many institutions at more or less the same time. A fire sale by one bank could lead to mark-to-market losses for other banks simultaneously. As more banks suffer losses and become distressed, market conditions may further deteriorate via indirect contagion channels, leading to a negative feedback loop.

(1) See Balluck (2015) for more details on the risk of margin calls.
(2) See Gorton and Metrick (2012) for further information on procyclical repo haircuts.
(3) See Acharya and Yorulmazer (2008) for a theoretical model of information spillover between banks.
(4) Bank of England *Financial Stability Report*, October 2008, available at www.bankofengland.co.uk/publications/Documents/fsr/2008/fsrfull0810.pdf.
(5) See Scott (2012).
(6) See IMF, BIS and FSB (2009).
(7) See Bank of England *Financial Stability Report*, November 2013, available at www.bankofengland.co.uk/publications/Documents/fsr/2013/fsrfull1311.pdf.
(8) See Scott (2012).

Developments in direct interconnectedness

Broadly speaking, direct interconnectedness from credit exposures has declined since the financial crisis. Direct interconnectedness from financial service and infrastructure dependencies remains significant, but there are a number of policy initiatives directly aimed at addressing risks arising from such dependencies.

Direct interconnectedness from credit exposures

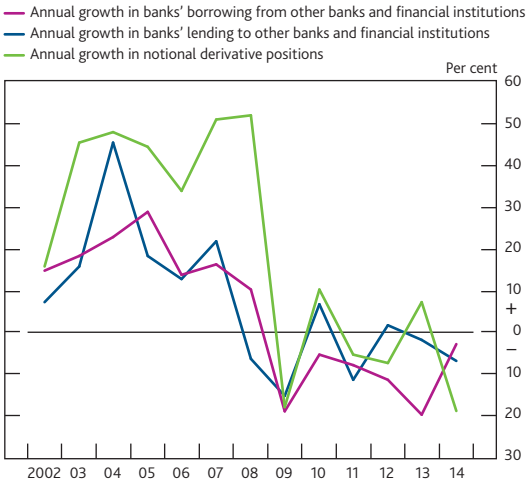
Many academic studies have shown that contagion could occur in interbank markets, if credit exposures are large enough relative to the lenders' capital.(1) Moreover, the structure of the financial network may have implications for the magnitude of systemic risks. As shown in the **summary chart**, the UK interbank system closely resembles a 'core-periphery' network, in which 'core' banks are connected to all banks in the network and peripheral banks are only connected to the 'core' banks.(2) Core-periphery network structures possess a 'robust-yet-fragile' property — they tend to be robust because core banks can act as fire-stops against contagion since they tend to be more diversified, but they are also potentially fragile because a core bank's distress could propagate extensively throughout the network.(3)

At the Bank of England, the Financial Policy Committee (FPC) has the objective of identifying, monitoring and taking action to remove or reduce systemic risks, including those associated with interconnectedness. It has identified three core indicators on direct interconnectedness: (1) the growth rates of UK banks' lending to, and (2) borrowing from, other banks and financial institutions; and (3) the growth rate of the notional value of derivative contracts. As shown in **Chart 1**, interconnectedness grew rapidly in the run-up to the crisis, but has been falling since then according to all three indicators.

Since the financial crisis, direct credit exposures (net of collateral) of UK banks to other financial institutions have fallen significantly, driven by a number of factors, such as a reduction in firms' risk appetite and higher capital requirements. As **Chart 2** shows, UK banks' reported large exposures — defined as exposures equivalent to 10% or more of the bank's capital base — to financial institutions fell from more than £1.2 trillion at the height of the crisis to under £200 billion by end-2013.(4)

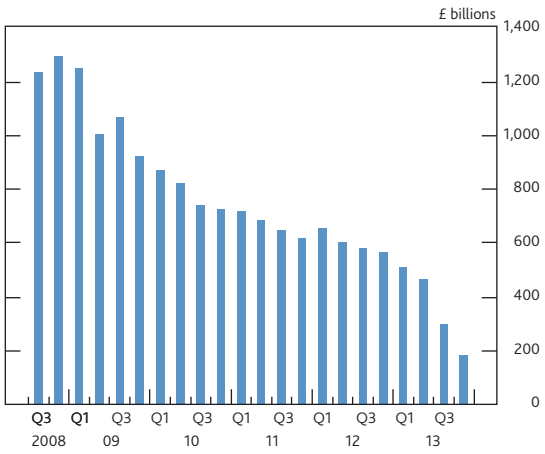
In the derivatives market, direct interconnectedness from credit exposures has also decreased. Data from the BIS, for example, indicate that total gross exposures (measured by current mark-to-market values) in over-the-counter (OTC) derivatives globally fell from $35 trillion in 2008 to $21 trillion in 2014. To a large extent, this is likely to have been driven by the migration of the clearing of OTC derivative trades to central counterparties (CCPs). CCPs effectively place themselves between the buyer and seller of an original trade,

Chart 1 FPC core indicators on interconnectedness



Sources: Published accounts and Bank calculations.

Chart 2 UK banks' reported large exposures (net of collateral) to other financial institutions(a)(b)



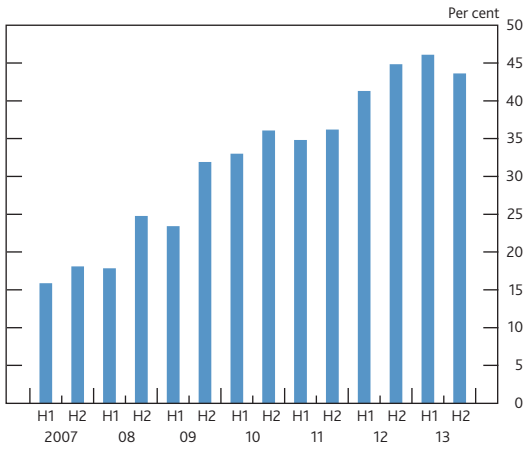
Sources: PRA and Bank calculations.

(a) Sum of all large exposures to financial institutions reported by UK banks. Exposures are net of credit risk mitigation.
(b) Only exposures equivalent to 10% or more of a given bank's capital are reported, so declines in reported exposures may be driven by higher capital, a reduction in the concentration of exposures, or both.

thereby reducing bilateral counterparty credit risk exposures in the markets in which they operate.(5) G20 leaders agreed in 2009 that all standardised OTC derivative contracts should be cleared through CCPs in order to improve authorities' access to data and reduce interbank interconnectedness. This migration is occurring at a fast pace. For example, the percentage of global OTC interest rate derivatives(6) centrally cleared in the United Kingdom has increased by a factor of three since January 2007 (**Chart 3**). Banks' exposures to CCPs have increased as a result, which is discussed in the next section.

(1) See Upper (2010) for a comprehensive literature review.
(2) See Langfield, Liu and Ota (2014).
(3) See Haldane (2009).
(4) **Chart 2** does not include data after 2013 because they are not comparable with earlier data due to the introduction of new regulatory reporting standards.
(5) See Rehlon and Nixon (2013).
(6) Interest rate derivatives are by far the largest type of OTC derivatives, accounting for over 80% of outstanding notional derivatives positions.

Chart 3 Percentage of global OTC interest rate swaps centrally cleared in the United Kingdom[a]



Sources: Bank of England, BIS and Bank calculations.

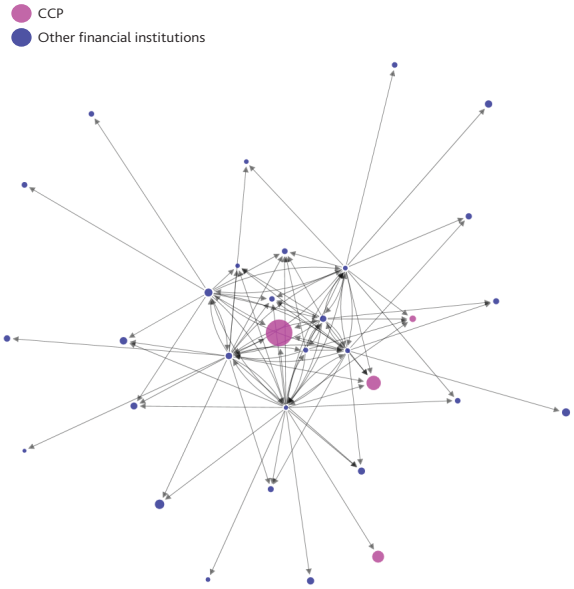
(a) Based on outstanding derivatives positions. Post-compression notional values of open trades have been used.

As discussed above, financial institutions may be directly interconnected if they depend on each other for key financial services or infrastructure. Without access to such services or infrastructure, financial institutions may not be able to continue operating their businesses.

For instance, the migration of OTC derivatives to CCPs helped reduce bilateral exposures between banks, but also made banks and other financial institutions more dependent on CCPs. As shown in **Chart 4**, one CCP is by far the largest counterparty in the UK derivatives market (in terms of net mark-to-market exposure).(1) In the event that a major CCP defaults, market participants may not only suffer losses on their exposures to that CCP, but also fail to find an alternative CCP to clear new transactions. There are regulatory regimes and policy initiatives in place to ensure that CCPs have robust risk management standards and recovery and resolution arrangements, as described in the final section of this article.

Banks can also be connected to each other via payment systems.(2) CHAPS, the United Kingdom's high-value sterling payment system, has historically had a small number of clearing banks (banks that participate directly in the system, also known as settlement banks), with a much larger number of indirect participants who access the system through a clearing bank. Currently, over 80% of small UK banks and building societies do not use more than one clearing bank (**Chart 5**). If a major clearing bank were to fail, some of these firms might not be able to make wholesale payments if they could not find a replacement clearing bank within a short period. The final section of this article briefly discusses post-crisis policy initiatives focused on payment systems.

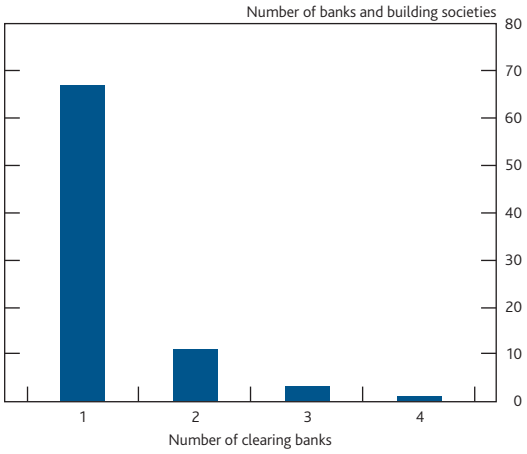
Chart 4 UK derivatives exposure network[a][b]



Sources: PRA and Bank calculations.

(a) Data as at end-June 2014. Each node represents a financial institution and the size of the node is scaled by the total amount of exposures to that institution. Each arrow points from one institution to another institution that it has exposure to. Some market participants with small exposures are excluded from this chart.
(b) Exposures are measured as the mark-to-market values, net of collateral. The layout is designed so that for any two institutions in the network, the greater the exposures between them, the more closely they are positioned.

Chart 5 Number of clearing banks used by small UK banks and building societies



Source: PRA.

Developments in indirect interconnectedness

When banks are indirectly interconnected, the distress or failure of one bank can affect multiple other banks, for example via mark-to-market losses, margin calls and information spillovers. This section presents some general evidence on indirect interconnectedness based on banks' financial prices, as well as other measures that capture some specific channels of indirect interconnectedness.

(1) Moreover, banks may also be exposed to CCPs via equity ownerships and contributions to default funds. See Rehlon and Nixon (2013).
(2) See Finan, Lasaosa and Sunderland (2013).

Chart 6 Correlation between the changes in CDS premia of large global banks[a][b]

Sources: Thomson Reuters Datastream and Bank calculations.

(a) Data up to end-June 2014. Banks in the sample are selected based on size and data availability.
(b) Red (green) indicates high (low) correlation. See the main text for more information.

Correlations in banks' CDS premia

One way to monitor interconnectedness is to look at changes in the financial prices for major banks, and in particular, the correlation between the movements in any two banks' financial prices. Strong positive correlation can suggest many things, including that the correlated group are perceived to have strong interconnections (either direct or indirect); or that they have been subject to a common shock.

In this article we focus on correlations of banks' credit default swap (CDS) premia since this is a timely measure of market participants' assessment of the risks facing an individual bank. A CDS is a derivative contract that typically provides insurance against the default of a bond. The CDS premium represents the cost of such insurance, expressed as a percentage of the face value of the bond issued by the bank. This premium increases when the reference bond becomes more risky and so can be used to gauge investors' perceptions of a bank's credit risk.

A heat map of correlations in banks' CDS premia

Chart 6 is a heat map representing the pairwise correlations between the daily changes in CDS premia of twelve large global banks: three from the United States, four from the United Kingdom and the remainder from other European countries. The heat map has four panels, and each panel or matrix corresponds to a different historical period. Rows and columns in the matrices represent individual banks, and each square in a matrix represents the correlation between changes in CDS premia (over a specified period) of the banks in the specific row and column. Red squares indicate high correlation, and green squares indicate low correlation, as illustrated in the colour bar on the right-hand side of the chart. The diagonals of the matrices are always red, because each bank is perfectly positively correlated with itself.

Panel A in **Chart 6** shows that correlations between the changes in CDS premia of large global banks stayed relatively low before the crisis (2005–06). During the financial crisis (2007–09, Panel B), correlations increased significantly as risk aversion in global financial markets surged. In 2010–12 (Panel C), correlations between EU banks increased further, potentially as a result of the sovereign debt crisis in the euro area, and stayed at high levels in 2013–14 (Panel D). Given the reduction in direct interbank exposures since the crisis, indirect interconnectedness and common shocks are likely to be the main drivers behind the increase in correlations since 2007.

Interpreting the heat map

However, there are reasons why this heat map may overstate the degree of indirect interconnectedness between banks post-crisis. Moreover, the low correlation observed pre-crisis could to some extent be illusory given the absence of large

shocks affecting CDS premia over the period. The average daily movement in sample banks' CDS premia prior to 2007 was just 0.3 basis points, much lower than the average movement of 4.2 basis points after 2007.

Strong positive correlations between banks' CDS premia since 2007 may suggest that the stress or failure of one bank conveys adverse information about other banks, and/or that banks are being affected by large common shocks. One way to gauge the extent to which banks were affected by common shocks is to examine the historical relationship between average CDS correlations and the VIX index, which is a leading measure of stock market volatility and can be used as a proxy for financial market shocks.(1) If correlations between banks were solely driven by common shocks, one would expect the average correlation to move together with the VIX index. In contrast, strong average correlation in the absence of significant changes in the VIX index might suggest high indirect interconnectedness. As shown in **Chart 7**, during the 2010–12 period, the eurozone sovereign crisis was a system-wide shock that probably accounted for a lot of the increase in the average correlation. However, during 2013–14, the VIX index remained broadly flat with no significant changes.

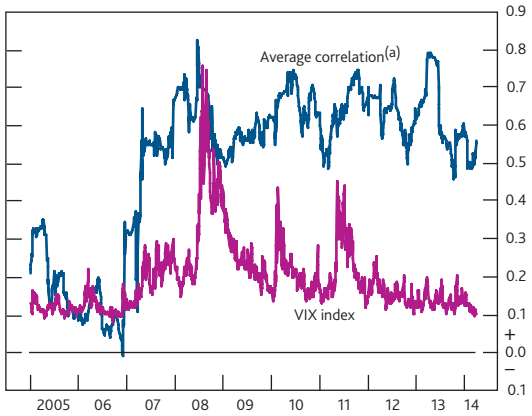
Another approach is to look at CDS correlations between banks in the same geographic location, which tend to be affected by regional shocks. For example, the normalisation of euro-area sovereign bond spreads was an important stabilising shock in 2013–14, which may not be reflected in the VIX index. **Chart 8** shows the average of correlations between banks within the same geographical location (United Kingdom, rest of Europe and United States) as well as between banks across all of the different geographical locations. European (excluding UK) banks were more correlated than banks in other locations in 2013–14 as the eurozone bond market stabilised. This suggests that the high level of CDS correlation between banks in 2013–14 was largely driven by common positive shocks.

Overall, correlations between banks' CDS premia remain elevated relative to pre-crisis. Although some of this may reflect higher indirect interconnectedness, low levels of CDS correlations pre-crisis may have been illusory, and a significant part of CDS correlations post-crisis could be driven by common shocks.

Other evidence on indirect interconnectedness

Since the crisis, UK banks have been reducing their trading book assets (assets that are held for trading purposes and marked to market). In particular, UK banks now hold less trading book securities as a percentage of total assets (**Chart 9**). This may suggest that the risk of indirect interconnectedness from fire sales by UK banks has fallen, although more granular data on banks' trading portfolios would be needed to assess the risk more accurately.(2)

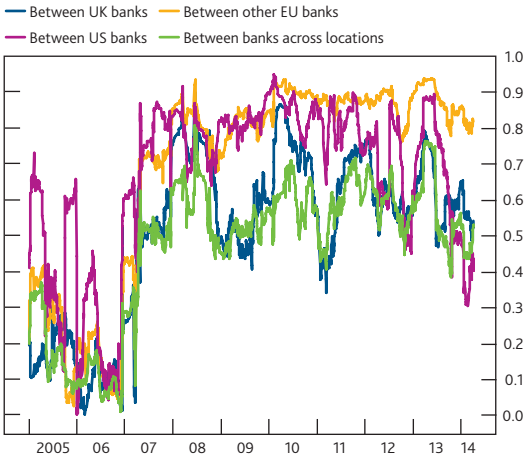
Chart 7 Average correlation between changes in banks' CDS premia and the VIX index



Sources: Thomson Reuters Datastream and Bank calculations.

(a) Average of the three-month rolling pairwise correlations between changes in CDS premia for the twelve global banks in the sample.

Chart 8 Average correlation broken down by geographical location of banks(a)



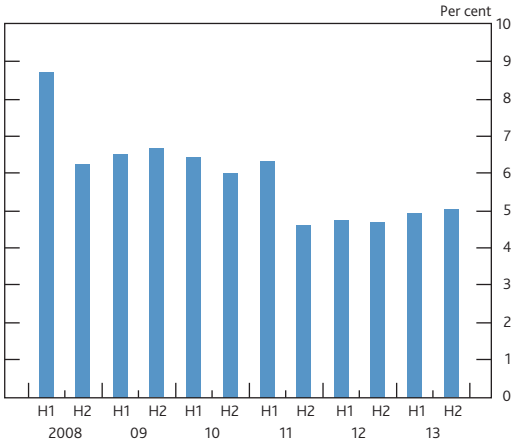
Sources: Thomson Reuters Datastream and Bank calculations.

(a) The average correlation is the average of three-month rolling pairwise correlations between changes in CDS premia of sample banks.

There is also evidence that UK banks are now less exposed to the risk of margin calls in repo markets. UK banks are typically both borrowers and lenders in repo markets. In the event of a large-scale asset price decline, UK banks would only have to find additional collateral for posting margin on their net repo borrowing position, because they can re-use the margin received from counterparties to which they have lent to meet margin calls on their repo borrowings. **Chart 10** suggests that UK banks have reduced the size of their net repo borrowing against 'non high quality' collateral significantly since 2012, especially when compared to their holdings of liquid assets.

(1) For example, see Adrian and Shin (2008).
(2) It is worth noting that risks to banks from a shock to financial asset prices may have increased in recent years given that there has been a deterioration in underlying market liquidity. See Bank of England *Financial Stability Report*, December 2014, available at www.bankofengland.co.uk/publications/Documents/fsr/2014/fsrfull1412.pdf.

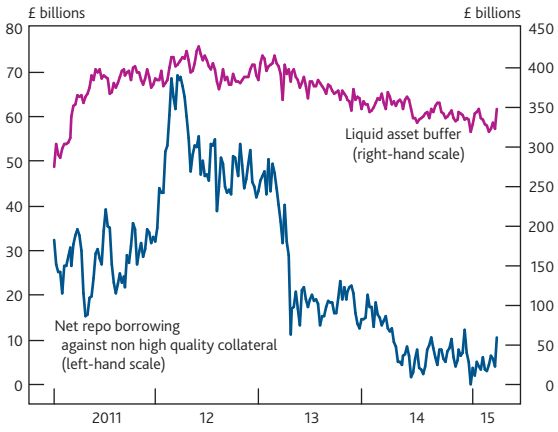
Chart 9 Trading book securities held by major UK banks as percentage of total assets(a)



Sources: PRA and Bank calculations.

(a) Total assets are on a net-derivatives basis. Trading book securities include equities and bonds.

Chart 10 Major UK banks' net repo borrowing against non high quality collateral and holdings of liquid assets(a)



Source: PRA.

(a) 'Non high quality' collateral is defined as all collateral excluding liquid assets and high-quality government bonds.

Policy responses to date

Since the financial crisis, a number of regulatory initiatives have been introduced in order to mitigate the financial stability risks posed by interconnectedness between banks, via monitoring, limits on exposures and structural changes. Some of these policy responses focus specifically on direct or indirect interconnectedness, while others — such as stress testing or macroprudential tools — can mitigate risks arising from both types of interconnectedness.

Direct interconnectedness between global systemically important banks (G-SIBs) is now monitored much more closely with the FSB collecting and analysing data on individual exposures and funding dependencies between G-SIBs.(1) In the United Kingdom, balance sheet interconnectedness is included in the core indicators that the FPC uses to monitor systemic risks,(2) and prudential regulators have collected detailed information on exposures of UK banks to other financial institutions since 2011.(3) Interconnectedness (both direct and indirect) also feeds into the Bank of England's top-down stress-testing model (RAMSI).(4)

Regulatory authorities have tightened limits on direct exposures between systemically important financial institutions. The large exposures framework published by the Basel Committee in 2014 introduced a lower large exposures limit for exposures between G-SIBs of 15% of Tier 1 capital as opposed to the 25% limit applied to other counterparties.(5) In addition, the level of interconnectedness was included as one of the indicators for identifying G-SIBs.(6) Such firms are required to hold additional capital buffers, so this is a further deterrent from becoming excessively interconnected.

Finally, structural reforms in the banking sector and the wider financial system should also help mitigate risks associated with interconnectedness. As discussed previously, the migration of the clearing of standardised derivative trades to CCPs should reduce the direct interconnectedness between banks, but will also make banks more interconnected with CCPs. Regulators are taking a number of actions to mitigate risks associated with banks' dependencies on CCPs and other financial market infrastructure, including ring-fencing of banks and recovery and resolution plans,(7) increasing the number of direct members in CHAPS and CREST, stress testing of a member failure in payment systems(8) and the introduction of resolution tools for CCPs.(9)

Conclusion

Financial transactions enable market participants to transfer and diversify risk, but also create the potential for contagion and systemic risk, either via direct links or indirectly. Banks are unlikely to fully take into account the system-wide risks associated with such transactions. As a result, there can be a case for policy interventions to reduce the associated risks.

This article describes different types of interconnectedness, and their importance for financial stability. The findings suggest that some types of interconnectedness, such as interbank credit exposures, have decreased materially since the financial crisis. Correlations in banks' CDS premia remain

(1) www.financialstabilityboard.org/wp-content/uploads/r_130418.pdf.
(2) www.bankofengland.co.uk/financialstability/Pages/fpc/coreindicators.aspx.
(3) See Langfield, Liu and Ota (2014).
(4) For example, feedback effects through counterparty credit exposures and mark-to-market losses triggered by asset fire sales are included in RAMSI.
(5) www.bis.org/publ/bcbs283.pdf.
(6) www.bis.org/publ/bcbs255.pdf.
(7) See Gracie, Chennells and Menary (2014) for more details on the Bank of England's approach to resolving failed institutions.
(8) See Finan, Lasaosa and Sunderland (2013) for further information on recent initiatives on payment systems.
(9) See Bailey (2014) for more information.

elevated relative to pre-crisis, which may reflect higher indirect interconnectedness, but is more likely to be driven by common shocks.

This article has focused on interconnections between banks. The interconnectedness between banks and non-banks, as well as between non-banks, is beyond the scope of this article, but is important for financial stability given the growing importance of non-banks in the financial system. At present, sufficiently granular data to asses such risks is much more limited.

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