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Macroprudential policy instruments: a bulwark against interbank contagion risk

Financial institutions are connected among themselves through multiple contracts: loans, bilateral security holdings, derivatives contracts, etc. In normal times, these relationships allow for risk-sharing. However, in times of stress, they turn into channels of shock propagation, through solvency default cascades, funding shortages and asset-fire sales.

Macroprudential policy aims to mitigate these effects using different instruments, such as higher capital surcharges for systemic institutions.

Public authorities monitor in particular financial interconnections by exploiting information on the bilateral relationships between financial institutions. They notably take these elements into account in the stress tests applied to the entire financial system.

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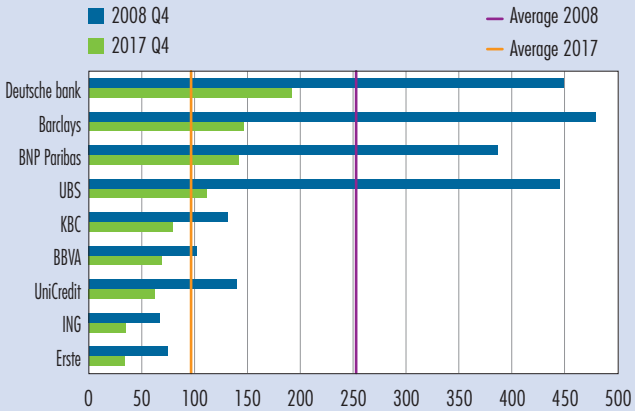
JEL Codes
G01, G21, G28

Average ratio

253%
in 2008

97%
in 2017

Non-core liabilities ratio in 2008 and 2017
(in %)



Source: Standard & Poor's, S&P Global market intelligence; authors' calculations.
Note: The higher the ratio, the more a bank relies on non-core liabilities, generally considered as less stable.

The 2008 financial crisis underlined the interconnected nature of the financial system, which significantly contributed to spreading stress through the system. Financial institutions are linked to each other through multiple contracts, such as loans, stock and bond holdings, derivative contracts as well as through holdings of common assets. When a market shock hits a financial institution, losses suffered by this firm may spread to others connected to it; the latter in turn may transmit this shock to their counterparties, and so on. There are several channels through which an initial shock is propagated and amplified.

All these channels were present to differing extents during the recent crisis and played a role in the amplification of initial shocks. In response to these risks, public authorities have implemented macroprudential instruments that aim to monitor risks related to financial interconnections, improve the resilience of the financial system and mitigate channels of shock amplification.

1 Shock propagation between financial institutions

Shock transmission mechanisms

A stylised balance sheet displays the links between institutions in order to better understand the shock transmission mechanisms. On its asset side, a bank has assets external to the interbank system and interbank short- and long-term assets. External assets correspond to marketable securities, which can be traded on the secondary market, such as sovereign bonds, stocks and bonds of non-financial corporations, and non-marketable assets, such as loans to households and firms. Interbank assets correspond to loans and security holdings (bonds, stocks, etc.) issued through financial institutions. The liability side has a similar structure with external liabilities that correspond to obligations to non-financial entities, such as deposits. The difference between assets and liabilities is equity.

Stylised balance sheet of a bank

Assets	Liabilities
Marketable external assets	External liabilities
Non-marketable external assets	
Short-term interbank assets	Short-term interbank liabilities
Long-term interbank assets	Long-term interbank liabilities
	Capital

The first transmission channel is direct exposure or solvency cascades: this can occur in two ways. First, banks exposed to their defaulted counterparty through long-term loans suffer a loss equal to their exposure amount corrected by a recovery rate.[1] Second, falls in the price of securities (stocks and bonds issued by banks) may affect other banks via their direct exposure: for example, if bank A directly holds stocks (or bonds) issued by bank B. In this case, banks may suffer losses even in the absence of counterparty default as a result of the fall in the price of these marked-to-market securities. These loans and cross-holdings of marketable securities are classified as interbank assets in the balance sheet above.

The second channel, "funding shortage", relates to banks' behaviour in times of stress: when banks lose confidence in the market, they may stop lending or rolling over short-term loans either because they require liquidity for their own needs or as pre-emptive measures. Their counterparties that particularly rely on this type of funding will experience difficulties in refinancing and may become illiquid. This occurred during the collapse of Lehman Brothers in 2008, for example.[2] This second channel takes place through interbank liabilities. External liabilities, such as deposits, are deemed more stable as they are less subject to this loss of confidence: depositors are protected by a deposit guarantee fund, unlike interbank creditors.

1 A recovery rate will vary depending on the exposure type. For long-term unsecured interbank loans, a recovery rate may be zero given the length of bankruptcy procedures. For secured loans, counterparties immediately obtain the collateral backing the loan.

2 A few studies of interbank markets during the 2007-2008 crisis: Afonso, Kovner and Schoar (2011) for the US federal funds market, and Gabrieli and Georg (2014) for the European interbank market.

The third identified channel acts through asset fire sales of overlapping portfolios. Institutions experiencing difficulties may deleverage and sell assets. Since asset sales are made in deteriorated market conditions, market prices drop even more. Other institutions holding the same assets will suffer losses since assets are marked-to-market. They may then also sell their assets to readjust their portfolios of securities. This may trigger a spiral of devaluation. This last channel concerns the negotiable external assets of the balance sheet: for example a stock or a bond to a given company.

Representing propagation risk using financial networks

A financial network is defined as a set of financial institutions connected by their direct bilateral relationships and by the common elements of their securities portfolios. Network analysis takes into account the individual characteristics of each entity in the network, as well as the diversity and number of interconnections. The historical analysis of networks shows that financial networks have become both more interconnected and more complex with links through a large variety of instruments and contracts (see Box).

BOX

Costs and benefits of financial networks: the contribution of economic literature

The financial network literature focuses on measuring the costs and benefits of interconnections: which network structures are more efficient in distributing resources and more resistant to shock propagation? Seminal papers of the network literature include Eisenberg and Noe (2001) and Furfine (2003) who propose algorithms of solvency default cascades. Gai and Kapadia (2010) show that financial systems exhibit a "robust-yet-fragile" tendency: they make it possible to share most of the shocks, but are particularly vulnerable to large shocks of low probability. The more connected the system, the smaller the probability of default when there is no contagion. However, higher connectivity increases the probability of large default cascades when contagion begins. Gai et al. (2011) look at the resilience of the financial system to funding shocks. They show that when banks start pulling liquidity from each other, lower connectivity is associated with less probable and less severe contagion. When considering how to reinforce the financial system, several studies show that targeted higher capital requirements or liquidity provisions are efficient (see, for exemple, Gai et al. (2011) for funding shocks, Amini et al. (2016) and Alter et al. (2015) for capital requirements).

The links between several balance sheets define a network. The diagram below represents such a stylised network. Each node represents a bank and each arrow represents a link. An arrow pointing from bank B1 to bank B2 represents a claim of B1 on B2. Conversely, bank B2 is indebted to bank B1. An arrow from bank B1 to asset 1 indicates that the latter is present in the portfolio of bank B1. This asset is common to both banks if both have an arrow pointing to one or more identical assets. The size of the arrows is proportional to the amount of cross-exposures (the diagram is only a stylised example).

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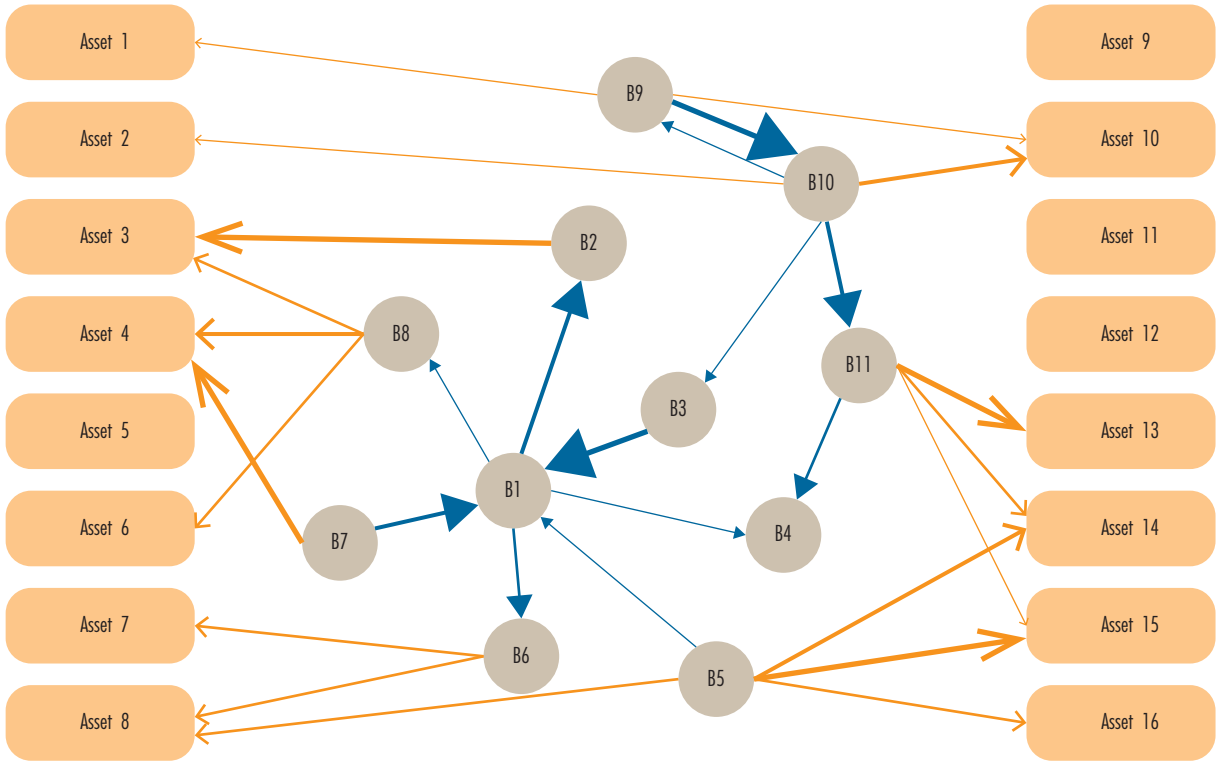
Diagram Stylised interbank network



Source: Banque de France.
Note: Circles (nodes) correspond to banks and rectangles to assets. Banks are connected to each other in two ways.
(i) Direct exposures (blue lines) corresponding to different types of contracts, for example long-term interbank loans. An arrow going from bank B*i* to bank B*j* represents funds lent by B*i* to B*j*.
(ii) Indirect exposures (orange lines) corresponding to holdings of common assets, for example corporate or sovereign bonds. Arrows point to the direction of exposure: bank B*i* holding asset *k* and lending to bank B*j* is exposed to asset *k* and bank B*j*. Arrow width is proportional to the exposure size.

2 Quantifying financial contagion

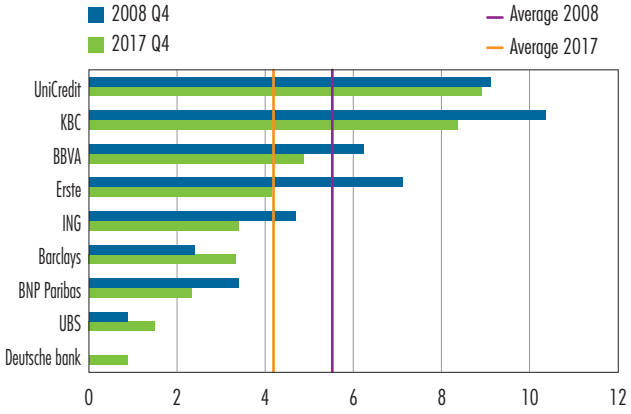
In order to monitor changes in risks due to financial interconnections and to be able to react in time, financial supervisory authorities use different data on bilateral relationships. Recent initiatives include the Financial Stability Board (FSB) Data Gap Initiative (FSB, 2014), the European Union EMIR regulation on derivatives (EMIR – European market and infrastructure regulation, 2012), the Securities Holding Statistics of the European Central Bank (ECB, 2017). These data are confidential but used by financial authorities for internal purposes such as constructing interconnection indicators and the conduct of stress-test exercises. In this section, we provide some indicators using public data[3] in order to show how risks of financial contagion can be assessed.

Direct contagion

Chart 1 plots the **ratio of interbank exposures** to total assets for a number of European banks at end-2008

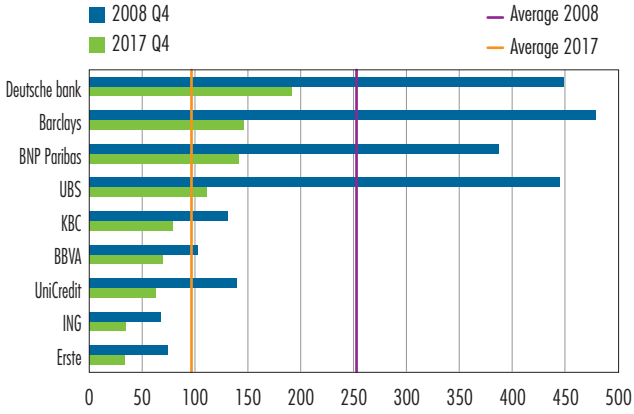
3 For example the data provided by Standard & Poor's, S&P Global market intelligence (previously known as SNL Financial) and the results of the European Banking Authority's 2016-2017 transparency exercises (EBA, 2016 and 2017).

C1 Interbank exposure ratio in 2008 and 2017
(in %)



Source: Standard & Poor's, S&P Global market intelligence (previously known as SNL Financial); authors' calculations.
Note: The ratio is computed as interbank assets/total assets for a sample of European banks. Data on interbank deposits for 2008 are not available for Deutsche Bank.

C2 Non-core liabilities ratio in 2008 and 2017
(in %)



Source: Standard & Poor's, S&P Global market intelligence (previously known as SNL Financial); authors' calculations.
Note: The ratio is constructed as (total liabilities – total deposits)/ total deposits. The higher the ratio, the more a bank relies on non-core liabilities, generally considered as less stable.

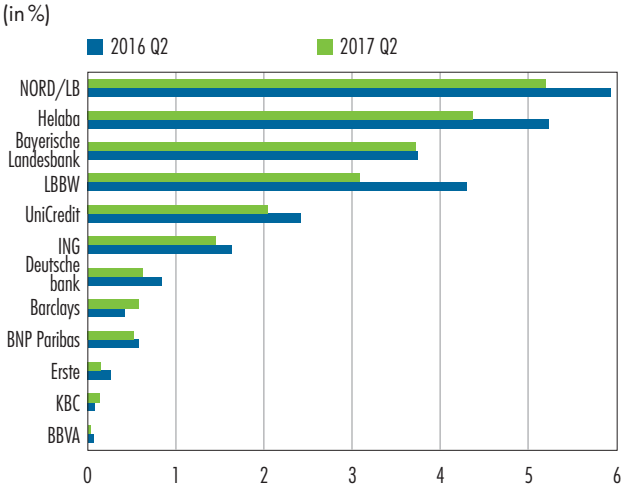
and end-2017. This ratio illustrates how important a solvency channel is. We observe that interbank assets represent less than 10% of total assets for the majority of banks and, on average, 5.5% in 2008 and 4.2% in 2017. We notice that almost all banks in the sample reduced their interbank exposures from 2008 to 2017 by as much as 42% for some banks. The indicator only provides a partial assessment of the risk of contagion since there are several potential transmission channels.

To understand the importance of the second channel, that of the **funding shortage**, we need to look at the liabilities side of the balance sheet. Chart 2 plots the ratio of non-core liabilities to total deposits in 2008 and 2017. Traditional retail deposits, or core liabilities, are considered stable funding. However, during the 2008 crisis, investment banks turned to other funding sources, referred to as non-core liabilities. As suggested by Hahm et al. (2013), this non-core liabilities ratio can serve as an indicator of vulnerability to a crisis. Indeed, we observe that in 2008 our sample of banks relied significantly on other sources than deposits: for a number of banks non-core liabilities were almost five times higher than deposits whereas in 2017 this ratio barely exceeds two. The average value for the sample is equal to 253% in 2008, against 97% in 2017. This means that in 2017 there was a certain rebalancing of banks' funding sources, and the average bank used an almost equal share of traditional deposits and other funding sources to finance its assets.

Indirect contagion or interconnections through overlapping portfolios

Banks can also interact indirectly, through holdings of similar assets, for example, sovereign bonds and equities. In 2011-2012, markets were concerned about the bank-sovereign nexus whereby all banks of a particular country were highly exposed to the sovereign risk of that country. Certain assets, such as German sovereign bonds (German Bunds) are often considered to be a safe and highly liquid asset, and financial institutions can hold them for precautionary reasons. Chart 3 plots the ratio of banks' German sovereign bond holdings to total assets as reflected in the European Banking Authority's transparency exercise in June 2016 and June 2017. We observe significant heterogeneity among the banks in the sample, with some banks, mostly German (due to a domestic bias), holding up to 6% of their total assets in German Bunds and the majority of banks holding less than 1%. Holdings decreased from 2016 to 2017, potentially suggesting an improvement in their financial situation. Diversification, not only at the institution level, but also at the system level, is desirable to limit indirect contagion phenomena.

C3 Ratio of banks' German sovereign bond holdings to total assets in 2016 and 2017



Sources: Data of the European Banking Authority's 2016-2017 transparency exercises and Standard & Poor's, S&P Global market intelligence (previously known as SNL Financial); authors' calculations.
Note: The ratio is constructed as German sovereign debt securities/total assets.

3 Macroprudential policy and the resilience of the financial system

To improve the resilience of the financial system, the Basel committee designed a set of new regulations for banks, Basel III, including micro- and macroprudential tools. We can distinguish three types of tools that contribute to financial stability.

Macroprudential instruments

Several capital surcharges were introduced following the 2008 crisis to protect the financial system from the most destabilising institutions, i.e. systemically important banks. First, instruments specifically designed to mitigate channels of shock amplification: the capital buffer for systemically important institutions (defined by the Basel Committee) and the systemic risk buffer (SRB). While the buffer for systemically important institutions focuses on the individual features of financial institutions, the SRB targets the structural vulnerabilities of the banking system as a whole. For example, a bank can be diversified at its level, but the banking system can rely heavily on specific assets that could lead to strong indirect contagion phenomena. Capital requirements work in two ways. First, higher capital improves the overall resilience of banks and the financial system since banks are able to withstand larger shocks and are less likely to start pre-emptive actions that are individually optimal but may be destructive at the system level. Second, since capital is expensive, banks may adjust their portfolio by reducing risk exposure and therefore comply with the capital surcharge.

Microprudential instruments with systemic consequences

Second, other instruments, designed for a broader purpose of contributing to financial stability, also affect the way in which shocks are propagated. Requirements for the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR), and limits on individual exposures are essentially microprudential tools since they deal with the liquidity or the solvency of an individual institution. The liquidity measures aim to prevent banks from using too much of their short-term funding to fund long-term assets. The LCR requires banks to hold high-quality liquid assets sufficient to cover 100% of their stressed net cash requirements over 30 days. This aims to mitigate the market impact in the event of forced liquidation, and thus limits contagion. The NSFR requires longer-term and less liquid assets to be funded by longer-term, more stable liabilities, such as deposits. Limits on individual exposures prevent banks from taking excessive risks with respect to individual counterparties and thus mitigate concentration risk.

Instruments for monitoring financial risk

Lastly, a set of instruments aim to monitor system-wide risks: greater transparency of bilateral relationships and system-wide stress tests. Since the 2008 financial crisis, a significant effort has been made to provide supervisory authorities with more granular data on bilateral exposures, especially in the segments of interbank lending, securities and derivative holdings and short-term funding. First, these data make it possible to build indicators for monitoring changes in risk stemming from interconnections in the system and potentially activate necessary measures. Second, they improve the design and conduct of top-down stress tests to assess the potential for contagion in the financial system as a whole on a regular basis.

Significant progress has been made in assessing and containing financial contagion in the banking system. However, several challenges are still in front of us. First, most major banking systems have significant cross-border activities, whereas regulation and supervision remain national or at the level of the Banking Union in Europe. Information exchanges between national authorities are a key ingredient for efficient supervision and regulation. The presence of international bodies such as the FSB and the European Systemic Risk Board (ESRB) is very important to monitor the development of risks at a supra-national level. Second, risks stemming from interconnections between banks and other financial institutions have still to be understood and properly measured. And, third, data on non-banking sector interconnections are gradually becoming available but progress still needs to be made with regards to data quality and exploitation, as pointed out in the 2018 Financial Stability Review of the Banque de France.

Conclusion

Banks and other financial institutions are connected by a variety of contracts that allow them to share risks. However, the same links can be a source of fragility for each individual bank and for the entire system.

The Basel III framework proposes a package of tools for monitoring changes in systemic risks and for reinforcing the financial system by taking account of the channels of shock amplification and transmission. However, there is still some way to go before we can achieve a comprehensive understanding of interconnectedness in the entire financial system beyond banking. The first step would be to ensure effective data sharing among the regulators of different sectors at the national level, as well as at the global level. As seen in 2008, financial crises are not only banking crises and never stop at borders.

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