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Bank Liquidity Requirements: An Introduction and Overview

Banks play a central role in all modern financial systems. To perform it effectively, banks must be safe and be perceived as such. The single most important assurance is for the economic value of a bank's assets to be worth significantly more than the liabilities that it owes. The difference represents a cushion of "capital" that is available to cover losses of any kind. However, the recent financial crisis underlined the importance of a second type of buffer, the "liquidity" that banks have to cover unexpected cash outflows. A bank can be solvent, holding assets exceeding its liabilities on an economic and accounting basis, and still die a sudden death if its depositors and other funders lose confidence in the institution.

A key part of the regulatory reforms in the US and globally in response to the financial crisis has been to establish formal, quantitative requirements for the liquidity levels that banks must attain. This paper explains these requirements and how regulators try to balance the safety benefits and the economic costs of these new mandates.

Readers may also be interested in the transcript, video archive, and presentations from an event that we ran at the Brookings Institution at the end of April 2014 on bank liquidity requirements, central bank lender of last resort facilities, and the interplay between them. Ben Bernanke, former Chairman of the Federal Reserve Board, and Mary Miller, Undersecretary of Treasury for Domestic Finance, gave keynote addresses, and a number of distinguished experts served on various panels. More information can be found at http://www.brookings.edu/events/2014/04/30-liquidity-role-lender-of-last-resort .

This paper is organized around the following questions:

- What is liquidity at a bank?
- Why do we care about it?
- Why are banks prone to runs?
- How can banks achieve adequate liquidity?
- How much liquidity is enough?
- What is the economic value of maturity transformation?

- What are the new liquidity requirements?
- How does the Liquidity Coverage Ratio work?
- What are the policy issues around the LCR?
- How does the Net Stable Funding Ratio work?
- What are the policy issues around the NSFR?
- How does the Fed's Comprehensive Liquidity Analysis and Review work?
- What is the role of central banks like the Federal Reserve in providing liquidity?
- Can we distinguish between solvency and liquidity? How?
- How do liquidity requirements, capital requirements, and bank resolution rules interact?
- How have bank liquidity levels changed in recent years?

What is liquidity at a bank?

Liquidity at a bank is a measure of its ability to readily find the cash it may need to meet demands upon it. Liquidity can come from direct cash holdings in currency or on account at the Federal Reserve or other central bank. More commonly it comes from holding securities that can be sold quickly with minimal loss. This typically means highly creditworthy securities, including government bills, which have short-term maturities. Indeed if their maturity is short enough the bank may simply wait for them to return the principal at maturity. Short-term, very safe securities also tend to trade in liquid markets, meaning that large volumes can be sold without moving prices too much and with low transaction costs (usually based on a bid/ask spread between the price dealers will pay to buy -- the bid -- and that at which they will sell -- the ask.)

However, a bank's liquidity situation, particularly in a crisis, will be affected by much more than just this reserve of cash and highly liquid securities. The maturity of its less liquid assets will also matter, since some of them may mature before the cash crunch passes, thereby providing an additional source of funds. Or they may be sold, even though this incurs a potentially substantial loss in a fire sale situation where the bank must take whatever price it can get. On the other side, banks often have contingent commitments to pay out cash, particularly through lines of credit offered to its retail and business customers. (A home equity line is a retail example, while many businesses have lines of credit that allow them to borrow within set limits at any time.) Of course, the biggest contingent commitment in most cases is the requirement to pay back demand deposits at any time that the depositor wants.

Why do we care about it?

We care about bank liquidity levels because banks are important to the financial system and they are inherently fragile if they do not have sufficient safety margins. The recent financial crisis demonstrated in extreme form the harm that an economy can suffer when credit dries up in a crisis.

Capital is arguably the most important safety buffer, since it provides the resources to recover from substantial losses of any nature and also gives those dealing with the bank confidence in its safety. However, the proximate cause of a bank's demise is usually a liquidity problem that makes it impossible to survive a classic "bank run" or, nowadays, a modern equivalent, such as an inability to access the debt markets for new funding. It is entirely possible for the economic value of a bank's assets to be more than sufficient to cover all of its claims and yet for that bank to go bust because its assets are illiquid and its liabilities have short-term maturities.

Why are banks prone to runs?

Banks have always been prone to runs because one of their principle social purposes is to perform maturity transformation, also known as time intermediation. In other words, they take demand deposits and other short-term funds and lend them back out at longer maturities. Maturity transformation is useful because households and businesses often have a strong preference for a substantial degree of liquidity, yet much of the useful activity in the economy requires assured funding for multiple years. Banks square this circle by relying on the fact that households and firms seldom take advantage of the liquidity they have obtained. In particular, deposits are "sticky". Demand deposits can theoretically all be withdrawn in a single day, yet their average balances show remarkable stability in normal times. Therefore, banks can lend out the funds for longer periods with a fair degree of assurance that the deposits will remain available or that equivalent deposits can be obtained from others as needed, perhaps with a modest boost in deposit rates.

The problem is that sometimes depositors lose confidence in a bank, or in the banking system, and withdraw their funds *en masse*. This is the classic "bank run" that has killed many a bank over the centuries. The only sure way to counter a bank run is to restore confidence, as no bank that engages in a normal level of maturity transformation can survive a bank run unaided. As discussed below, there is much that a central bank can do to aid with liquidity crises, but there are limits to what can be accomplished.

The risks of deposit runs are great enough, and have been demonstrated often enough, that virtually all countries have a national system of deposit insurance. These guarantee that bank depositors will not lose their funds, up to certain specified amounts (currently $250,000 in the US) and sometimes with limits on what entities are insured, so that banks, for example, may not have insurance on their deposits in other banks. Deposit insurance is a very important protection against bank runs, which therefore reduces the need for bank liquidity, but does not eliminate it.

However, it is important to note that modern banks often rely to a significant extent on short-term borrowings in the capital markets, so that a run does not have to involve depositors, or not solely depositors, in order to become a serious problem. The inability to roll over debt through new securities issuances has a similar effect to deposit withdrawals. The recent financial crisis demonstrated this, since very few banks experienced deposit runs, yet this did not eliminate liquidity problems.

Large banking groups that engage in substantial capital markets businesses have considerable added complexity in their liquidity needs, in order to support repo businesses, derivatives transactions, prime brokerage, and other activities.

How can banks achieve adequate liquidity?

Banks can increase their liquidity in multiple ways, each of which ordinarily has a cost, including:

- Shorten asset maturities
- Improve the average liquidity of assets
- Lengthen liability maturities
- Issue more equity
- Reduce contingent commitments
- Obtain liquidity protection

Shorten asset maturities. This can help in two fundamental ways. First, if the maturity of some assets is shortened by enough that they mature during the period of a cash crunch, then there is a direct benefit. Second, shorter maturity assets generally are more liquid.

Improve the average liquidity of assets. Assets that will mature beyond the time horizon of an actual or potential cash crunch can still be important providers of liquidity, if they can be sold in a timely manner without an excessive loss. There are many ways that banks can improve asset liquidity. Securities are normally more liquid than loans and other assets, although some large loans are now designed to be relatively easy to sell on the wholesale markets, so this is a matter of degree and not an absolute statement. Shorter maturity assets are usually more liquid than longer ones. Securities that are issued in large volume and by large companies generally have greater liquidity, as do more creditworthy securities.

Lengthen liability maturities. The longer-term a liability, the less likely that it will mature while a bank is still in a cash crunch.

Issue more equity. Common stock is roughly equivalent to a bond with a perpetual maturity, with the added advantage that no interest or similar periodic payments have to be made. (Dividends are normally paid only out of profits and are discretionary.)

Reduce contingent commitments. Cutting back the volume of lines of credit and other contingent commitments to pay out cash in the future reduces the potential outflows, thereby improving the balance of sources and uses of cash.

Obtain liquidity protection. A bank can pay another bank or an insurer, or in some cases a central bank, to guarantee the availability of cash in the future, if needed. For example, a bank could pay for a line of credit from another bank. In some countries, banks have assets pre-positioned with their central bank that can be used as collateral to borrow cash in a crisis.

All of these techniques have a net cost in normal times. Financial markets usually have an upward sloping yield curve, meaning that interest rates are higher for longer-term securities than they are for shorter-term ones. This is so often the case that such a curve is called a "normal yield curve" and the exceptional periods are referred to as showing "inverse" yield curves. When the yield curve has an upward slope, shortening asset maturities decreases investment income while lengthening liability maturities raises interest expense. Similarly, more liquid instruments have lower yields, all else equal, reducing investment income. Equity, for its part, is more expensive than debt[1], and

[1] The Modigliani Miller theorem of finance holds that, under idealized conditions, holding more equity reduces the cost of each unit of equity and debt by enough to exactly counter the higher cost of equity versus debt. However, there are a variety of reasons why this does not hold to the full extent in practice, including the tax advantages that banks and other firms receive on payments of interest, but not of stock dividends. Therefore, the net cost of equity does exceed that of debt for the bank.

liquidity protection normally comes at a cost, although some central bank facilities may have little or no cost until drawn down.

How much liquidity is enough?

Since liquidity comes at a cost, a bank faces a trade-off between the safety of greater liquidity and the expense of obtaining it. This makes it difficult to answer the question of how much liquidity is enough. Worsening the difficulty is the complexity of the financial system and the challenge of predicting its future state and therefore the probability and severity of future cash crunches.

Banks try to ensure that they have sufficient liquidity to meet all relevant regulatory requirements, plus a buffer to reduce the likelihood that liquidity falls below these thresholds and triggers a regulatory or market response or creates constraints on the bank's actions. In a similar way, they try to ensure that they have sufficient liquidity to avoid a downgrade from the credit rating agencies to a level below the bank's target rating, although there always remains the option of accepting a lower rating. More sophisticated banks also try to hold the probability of a crippling liquidity crisis to below some fraction of a percent each year, based on their internal modeling.

What is the economic value of maturity transformation?

Policymakers face a similar trade-off to the banks when setting the appropriate regulatory requirements for bank liquidity. Banks will be considerably safer, all else equal, with very high liquidity requirements. However, all else is not equal. If maturity transformation is an important source of their profitability, then banks' business models could become more fragile with extreme liquidity requirements, unless the added costs can be passed through to borrowers and other customers, which has its own disadvantages for the economy.

More broadly, policymakers must consider the question of the social value of maturity transformation to the economy as a whole. If there is little added value, then the risks of bank runs and similar phenomenon would surely push regulators to set very high liquidity requirements. However, most analysts believe that maturity transformation serves an important social purpose by allowing the economy to accommodate both the need for longer-term investment funds and investor and depositor desires for a high level of liquidity.

Diamond and Dybvig (1983) contains the classic exposition of the case that maturity transformation is driven by a desire of consumers and businesses for a high level of liquidity for a significant part of their assets. More recently, Krugman (2010) made the case colloquially: "I think of the whole bank regulation issue in terms of Diamond-Dybvig, which sees banks as institutions that allow individuals ready access to their money, while at the same time allowing most of that money to be invested in illiquid assets. That's a productive activity, because it allows the economy to have its cake and eat it too, providing liquidity without foregoing long-term, illiquid investments. If you were to enforce narrow banking, you would be denying the economy one of the main ways we manage to reconcile the need to be ready for short-term contingencies with the payoff to making long-term commitments[2]"

Others, such as Calomiris and Kahn (1991)[3], argue that the use of demandable debt overcomes various agency problems by creating the right incentives for bank managements and shareholders.

However, other academics contend the high level of maturity transformation at banks, and sometimes other institutions such as money market funds, stems from market failures. Brunnermeier and Oehmke (2013)[4], for example, propose that there are incentives for lenders or depositors to shorten the maturity of their funding of a bank in order to effectively increase their seniority in the event that trouble begins.

Another set of critics argue that the actual need for maturity transformation to support the non-financial economy is not terribly large and that therefore the total social value is low and does not merit the risks generated by allowing it to occur. (See Salmon (2011)[5] and Parameswaran (2013)[6].)

I personally believe that there is a very large economic value to maturity transformation, given the huge amounts of money involved and the clear mismatch between the desire of consumers and businesses for extreme liquidity for a portion of their assets and the need for longer-term funding for most projects. However, it is very difficult to nail down

[2] Quoted in a blog post by Brad Delong in March 2010 on the Maturity Transformation Industry.
[3] Calomiris, Charles and Charles Kahn, "The Role of Demandable Debt in Structuring Optimal Banking Arrangements," Journal of Finance, 1991
[4] Brunnermeier, Markus and Martin Oehmke, "The Maturity Rat Race," Journal of Finance, April 2013
[5] Salmon, Felix, blog post, "Why do we need maturity transformation," January 12, 2011
[6] Parameswaran, Ashwin, "Financing investment in a world without maturity transformation," blog post of October 8, 2013 in Resilience

a good estimate of this value, making it harder for policymakers to find the right balance between the risks and benefits of maturity transformation.

What are the new liquidity requirements?

In the Basel III rules, regulators have, for the first time, designed global standards for the minimum liquidity levels to be held by banks. Prior to this there were a few countries that had quantitative minimum requirements, but the large majority, including the US, relied on subjective regulatory judgment as to when liquidity levels were so low that a bank should be forced to remedy them. In practice, very little was done to force banks to shore up liquidity.

The Basel III liquidity rules, which will be phased in starting in 2015, rely on two minimum ratios. The first is a "Liquidity Coverage Ratio" which is a kind of stylized stress test to ensure that a bank would have the necessary sources of cash to survive a 30-day market crisis. It appears that 30 days was chosen as the relevant period because it was viewed as long enough for central banks and governments to take the necessary emergency measures to calm a widespread market crisis of liquidity.

The second is the "Net Stable Funding Ratio" which tries to ensure that a bank's assets would be adequately supported by stable funding sources. The idea is to keep banks from engaging in excessive maturity transformation or doing it in too risky a manner.

Supervisors around the globe are also instituting formal stress test procedures to ensure that banks have sufficient liquidity to handle specific difficult economic and financial environments. In the US, the Fed has instituted the Comprehensive Liquidity Analysis and Review, starting in late 2012 for a few of the largest banks. This is a multi-step process that includes bank-run stress tests using their own models, with guidance and feedback from the Fed, as well as review of the governance and decision-making processes at the bank relevant to liquidity management.

How does the Liquidity Coverage Ratio work?

The LCR is calculated by dividing the bank's level of high quality liquid assets by the projected cash claims over the next 30 days. Basel III specifies what will be considered high quality liquid assets. Very safe, very liquid assets, including government bonds and cash held at central banks, are considered to be Level 1 assets. Safe and liquid assets of other types, including specified categories of private securities, are considered to be in

Level 2 and are subject to haircuts of up to 50% on their value to represent the potential loss in a fire sale during a time of crisis. Level 2 assets may constitute no more than 40% of the total. An assumption is also made as to what percentage of assets maturing in the 30 day period will be rolled over, since some assets are tied to ongoing business relationships and would be difficult to completely run off.

Basel III also specifies what percentage of liabilities with an indefinite maturity, such as demand deposits, will be assumed to run off. In practice, retail deposits tend to be "sticky" and not to move, especially when they fall within the deposit guarantee limits, and therefore little run-off is assumed from them. Corporate deposits are less sticky and are assumed to run off in greater volume. Assumptions are also specified about drawdowns of cash through lines of credit and other instruments where banks have promised to loan money up to certain limits if requested. Crisis times tend to result in many of these lines being drawn down.

Banks will be required to maintain LCR's of 100% or more; that is, to have sources of cash more than sufficient to cover their expected outflows over the assumed 30-day crisis period. However, the Basel Committee has indicated that national regulators should have the flexibility to allow the ratio to fall below 100% when a bank or the system is in trouble. That said, banks in normal times will almost certainly target a ratio above 100% in order to maintain a safety buffer to protect them from potential regulatory actions. They will also be loath to fall below 100% even in a time of crisis, although circumstances may force them to do so. Financial markets will react similarly and may substantially penalize banks that open themselves up to regulatory actions by allowing their ratio to decline to near or below 100%.

Appendix A contains a more detailed explanation of the Liquidity Coverage Ratio.

What are the policy issues around the LCR?

There is a fairly wide consensus in favor of the broad concept of the LCR, although not a complete one. Most observers support having a quantitative requirement that is essentially a simplified stress test to determine whether a bank has sufficient liquidity to survive a short-term, severe global cash crunch. Opposition to the concept centers around two concerns. First, that a global approach does not sufficiently consider local differences. Second, that a simplified formula, even one with as many elements as the LCR, cannot approximate a true stress test closely to be useful without providing distorted incentives.

Even commentators who support the LCR recognize some validity in these concerns, as does the Basel Committee itself. The Committee and national supervisors have worked considerably on ways to adapt the effective standard to take account of the most significant local differences, such as the lack of large, liquid financial markets in many developing nations, discussed below. Further, the Committee has endorsed the approach of running more detailed liquidity stress tests at the national level, as a complement to the LCR, since it is a single measure that clearly cannot capture every nuance of liquidity needs. These actions mitigate the two main concerns, but do not eliminate them. For example, if the LCR inappropriately penalizes certain financial activities, this will not be eliminated by adding a more detailed stress test, since the LCR will still remain in force.

More of the criticism of the LCR has been of specifics and not the broad concept. The main areas of concern are:

- The 30-day time period
- The specific weightings assigned to assets, liabilities, and off-balance sheet items
- The assumption of large liquid financial markets, especially for government bonds
- The breakdown between Level 1 and Level 2 assets
- The overall calibration

30-day time period

The LCR judges the ability of banks to survive a 30-day cash crunch. This presumably reflects a belief about the length of time that would be necessary for central banks and other authorities to counter a severe crisis. It seems a reasonable estimate, giving sufficient time for strong reactions without building in an excessive buffer of time, but one could certainly argue for a shorter or longer time period. It is not clear how a change would affect the overall levels of liquidity required, especially as different weightings would likely be chosen for the sources and uses of cash if the time period differed.

Specific weightings assigned to assets, liabilities, and off-balance sheet items

There are many arguments about the specific haircuts applied to assets, the percentages of liabilities that are assumed to run off, and the percentage of contingent commitments that will result in cash requirements. For example, bankers argue that the

volumes of lines of credit that were actually drawn down systemwide during the Global Financial Crisis were considerably less than the amounts assumed under the LCR. Since they view the crisis as a very severe stress test, this seems punitive to them and likely to make it difficult to provide the liquidity backstops that their large corporate customers value and find difficult to obtain elsewhere

Assumption of large liquid financial markets, especially for government bonds

In practice, the Basel capital and liquidity rules strongly reflect assumptions based on sophisticated financial systems in advanced economies. There were serious attempts to take account of the situation in emerging markets, but it is clear to most outside observers, including myself, that these were only partially successful. One of the issues that arise is that many emerging economies have quite small securities markets and therefore a seriously limited supply of high quality liquid assets. This is exacerbated for those nations that have small national debts and therefore few treasury bonds and bills to be held as liquid assets.

The fix for this problem in most affected countries is to create committed central bank facilities to lend as needed against pre-positioned collateral from the banks. Counting these committed facilities as sources of liquidity is sensible as long as there is a true commitment on both sides and no double counting of the liquidity otherwise provided by the same collateral. The approach is not ideal, but it is difficult to come up with a better choice given the inherent difficulties of finding sufficient government bonds or other securities of similar quality in some countries.

Breakdown between Level 1 and Level 2 assets

The LCR distinguishes between liquid assets that have very high levels of liquidity and safety, labeled Level 1, and those that are still liquid and safe, labeled Level 2. There is considerable controversy about which assets should go in which categories. In the US, there is pressure to include the securities of Fannie Mae and Freddie Mac as Level 1, with the argument that their liquidity levels are better than some US government bonds and their safety nearly as high. In Europe, a similar argument has been made for covered bonds, which are securitized assets that simultaneously carry a full guarantee from the issuing bank. Denmark in particular has been very vocal on the historically high liquidity and safety levels and appears to have convinced the European authorities to grant Level 1 status to most covered bonds. Covered bonds are an interesting case, because the Basel Committee does not deny the high level of liquidity, but operated

under the general principle that claims on banks must be excluded from the High Quality Liquid Asset buckets in order to avoid excessive interconnectedness and contagion risk in a financial system crisis. The Committee apparently viewed the inclusion of covered bonds in the Level 2 bucket as a concession to the arguments of Denmark and other nations with large covered bond markets and does not consider it appropriate to go even further and move them to Level 1.

Overall calibration

Some critics believe that the net effect of all the specific decisions has simply been to demand too high a level of liquidity, especially when taking into account the pressures banks will feel to carry a buffer of liquidity over and above the 100% level. Banks will be loath to be right at or very slightly above the 100% level, because they could find themselves under considerable regulatory and market pressure if some event caused them to slip below 100%.

These critics argue that bank liquidity has already improved very sharply since pre-crisis levels and that having to increase levels still further to meet LCR standards is going too far and will hurt the economy by increasing credit prices and hurting availability.

The Basel Committee conducted a Quantitative Impact Study using June 2013 balance sheet data for a sample of 102 very large banks (Group 1) and 124 smaller (Group 2) banks. This covers the vast majority of the Group 1 banks and a considerably lower percentage of the Group 2 banks. The Group 1 banks averaged a 114% LCR at that point in time, while the Group 2 banks averaged 132%. 72% of banks had at least a 100% LCR. These figures can be seen as good news (the average is above 100% and a solid majority of banks already meet the 100% requirement that will only take effect in 2019) or bad news (a substantial number of banks, especially the largest, have ratios below 100% and a significantly larger number presumably have ratios below the levels they will seek to run in order to have a buffer above the legal requirements.) These figures do seem to indicate that the system as a whole should be able to adapt to these requirements without drastic further actions, wherever one comes out on the comparison of the costs and benefits of the specific LCR requirements. Some individual banks, of course, may need to make much more significant moves, while others already easily meet the requirements.

A related issue to that of calibration is whether banks should be allowed to drop below 100% in a time of crisis. This is sometimes simplistically portrayed as a straightforward

"usability" issue, arguing that liquidity is intended for times of trouble, so it makes no sense to stop its "use" when it needs to be drawn down. However, the simplistic form of this argument glosses over how the calculations work by making it sound as if there is a pool of dollars available for outflows and every dollar paid out "uses" up liquidity and harms the liquidity ratio. In reality, if a bank depositor or funder demands a dollar during a time of crisis, both the numerator (liquid assets) *and* the denominator (required liquidity) go down, counterbalancing to at least some extent. The effect on the LCR depends on what type of liability was repaid and what type of asset was used to pay the dollar and what costs were incurred to raise that dollar by liquidating that asset. So, the real issue is whether the *total* cash outflows and inflows are *worse* than assumed in the liquidity ratio calculations.

A key to the "usability" question is what actions regulators will take when a bank falls below the required minimum. It would make no sense for regulators to order a bank not to make its legally required cash outflows, unless regulators intended to immediately put the bank into a formal resolution procedure (akin to bankruptcy proceedings in the rest of the corporate sector). Short of this, supervisors will allow the bank to continue to use its existing liquid assets to make required payments, while also requiring the bank to take a series of remedial actions to restore appropriate levels of liquidity. Therefore, they will not be rendering existing liquidity unusable, as is sometimes implied.

Nonetheless, there remains a strong argument to allow the ratio to temporarily fall below 100% during severe stress periods, while also mandating remedial actions. As noted earlier, the Basel Committee recommends that authorities have the flexibility to allow banks to dip into the liquidity reserves in such times. However, there is concern that it may be much harder in practice to drop below 100% without adverse market and regulatory reactions. Authorities may react too slowly or may take back the permission too soon or funders may flee from banks that "fail" the stylized stress test that is the LCR, figuring that a crisis is a poor time to stay with a bank that drops below the standard.

How does the Net Stable Funding Ratio work?

This ratio is the level of stable sources of funds divided by the level of assets, adjusted for their ability to be liquidated. Stable sources of funds consist of Tier 1 and Tier 2 capital, other preferred shares, liabilities with a maturity of more than one year, and portions of those liabilities with short or unspecified maturities, such as demand deposits. As with the LCR, the haircuts applied to the latter category depend on the

degree of perceived stickiness. The need for stable funding is reduced from the initial level of total assets by the exclusion of portions of the assets that can readily be sold. The haircuts that are applied are based on the relative degree of liquidity and therefore the ease of sale in troubled times and the potential impact of fire sale conditions.

As with the LCR, the NSFR is required to remain above 100%, with some flexibility for crisis times. Managements are likely to hold liquidity buffers above these levels and will be pressured by investors to do so, in order to avoid potential regulatory actions.

Please see Appendix B for considerably more detail on the mechanics of the NSFR.

What are the policy issues around the NSFR?

There is more controversy around the broad concept of the NSFR than there is for the LCR. The LCR has a well-defined purpose, to see whether a bank could survive a 30-day liquidity shock set at a fairly extreme level. The NSFR is intended to deal with a broader problem, to prevent banks from performing an excessive amount of maturity transformation by making too many illiquid long-term loans and investments funded with volatile short-term money. It is considerably more difficult to decide on the right metrics for this function, since there is no consensus on the right level of maturity transformation.

If the NSFR is viewed as a one-year stress test, its designers faced the difficult task of evaluating reactions over a one-year period of liquidity crisis. A 30-day crisis scenario is much easier to construct, because many of the potential reactions, such as raising equity, changing business models, or selling units, are difficult to do in that space of time, especially under adverse conditions. One year gives banks much more room to react and the authorities a much longer period to work to alter the environment.

If the NSFR was *not* designed as a stress test, then it is not clear how it *was* designed. In practice, it appears to represent a set of norms for dealing with funding mismatches that seemed broadly reasonable to the staff and members of the Basel Committee, but without an underlying quantitative basis.

It is also not clear why one year was chosen as the critical point, other than that, as a matter of convenience, markets have long defined short-term instruments as being less than one year in maturity. However, this mostly reflects the fact that our planet happens to revolve around our sun once every 365 and a quarter days and not any

deeper analytical reasoning. The Basel Committee has responded to this concern in part by moving away from a "cliff" approach of having 366-day instruments viewed entirely differently than 364-day instruments and instead added some gradation. However, the one-year horizon is still the central point for the regulations.

One of the difficulties in evaluating the NSFR is that there is not clear agreement on the social value of maturity transformation, as discussed elsewhere in this paper. Therefore it is hard to determine an appropriate level of maturity transformation that balances the rewards and risks of that activity. It should be noted that regulators focus on the stability of the source of funds as well as the level of maturity transformation, but the two concepts overlap considerably.

As with the LCR, there are also a series of disagreements about specific choices that were made by the Basel Committee or will need to be made by national regulators. For example, repurchase agreements between banks and non-financial institutions attract a 50% long-term funding requirement. Industry analysts argue that this will essentially cripple such transactions by forcing banks to price these transactions on the basis that they are funded 50% through long-term funds, which are considerably more expensive in a normal monetary environment than very short-term funding is. Since these transactions carry little credit risk, these observers do not believe that customers will be willing to pay the considerably higher margins that would be required. One counter-argument made by regulators is that the issue is the stability of the funds, not the maturity, so it is at least theoretically possible to fund repos with stable short-term funding, although it is difficult to believe regulators would like to see retail deposits, for example, earmarked for such use.

How does the Fed's Comprehensive Liquidity Analysis and Review work?

The Fed is complementing the standardized ratios (LCR and NSFR) with the CLAR. This is a multi-dimensional process rather than a single quantitative test. It includes:

A detailed bank-run liquidity stress test using the bank's own assumptions about the behavior of its clients, funders, and counterparties. This is intended to more accurately reflect the likely course of a liquidity crisis as it would play out at each bank, given its unique circumstances. Compared to the LCR, it has the advantages of much greater detail and the potential to much more closely reflect the specific situation of each bank.

An independent Fed review of the bank's analysis. In addition to providing guidance on how to conduct the tests, the Fed may also alter the outcomes to correct any biases it detects in the bank's calculations.

A Fed evaluation of the bank's liquidity planning processes and their governance. The Fed is concerned with the processes that will be used to plan for and deal with a liquidity crisis, not just the quantitative results of a current stress test.

The CLAR was first put into use in late 2012 for a small number of the most systemically important banks. It will be expanded over time, although it is unlikely to be applied to any but the largest banks in its full rigor.

The CLAR results are confidential, unlike the Comprehensive Capital Analysis and Review, and are used to help shape the Fed's supervisory decisions and the guidance given to banks, rather than acting as a bright line test like the CCAR. (Even the CCAR has its subjective elements, but the quantitative results have a more direct impact on the banks than the CLAR does at this point.)

Given the confidentiality, and the novelty of the CLAR, it is difficult at this point to assess the extent to which the CLAR will be a more binding constraint than the LCR and NSFR. This may also differ from bank to bank, depending in significant part on how similar their business model is to the norm assumed in the construction of the LCR and NSFR. For example, if a bank undergoing CLAR has demonstrably more sticky corporate deposits than the average, it might find that its liquidity looks better under this more detailed analysis than it does using the LCR.

What is the role of central banks like the Federal Reserve in providing liquidity?

Central banks, such as the Federal Reserve System in the US, are most often viewed these days as the managers of monetary policy, with all the important macroeconomic responsibilities that go with it. However, the original reason for the Fed and many other central banks was to assist with the problem of bank runs by providing a "lender of last resort" function.

Central banks are intended to halt bank runs against solvent institutions by lending against sound collateral to provide the liquidity necessary to pay out claims in a crisis. This function is not intended to be a bailout of an insolvent bank, nor would such a bank

have sufficient truly sound collateral to be able to borrow the necessary funds from the central bank. However, the difficulty of placing a value on the assets offered as collateral means that it can be hard to tell for sure whether a bailout may be occurring. It also raises the risk that a truly solvent bank will not receive the appropriate central bank funding due to a misunderstanding of the actual asset values.

The recent financial crisis underlined the importance of the lender of last resort function as well as the practical and political difficulties in its use on a widespread basis. As a result, regulators and the markets now demand that banks be considerably more liquid than was required before the crisis. One of the major miscalculations made by most of the market players and the regulatory community was a belief, often unstated, that the high levels of market liquidity typical of the preceding decade would make it possible to sell assets readily without too large a haircut. This proved to be quite wrong.

There is considerable debate about the appropriate limits of the lender of last resort function. One of them will be addressed in the next section, the question of where to draw the line between liquidity assistance and a bailout of an insolvent bank. Another is whether some non-banks must be protected in a way similar to banks. In the last crisis, it became apparent that some of the investment banks were crucial to the financial system, yet lay outside the safety nets of deposit insurance (for the most part) and the lender of last resort facilities of the Fed. In practice, the larger ones were pulled into the protected zone by having their holding companies convert to bank holding company status. There is real controversy on whether and how securities firms should be handled in this regard. Some analysts argue that such firms should be pushed back outside the safety net while others think the net should be extended to fully cover these firms, given their increasingly important role in the financial system.

Can we distinguish between solvency and liquidity? How?

One of the harder questions for lenders of last resort is to determine when a bank is solvent, but illiquid, and when the illiquidity is simply a symptom of an insolvent bank. Both situations occur. Most insolvent banks will eventually have a massive liquidity crisis, unless they are shut down first, as depositors and other funders flee from an institution that cannot afford to pay all of its bills over time. But, there are also many examples of banks that were fundamentally sound, but got caught up in a systemwide liquidity crisis.

One of the problems is defining solvency. In essence, a bank is solvent when the value of its assets is more than the value of the liabilities that it owes. The problem is in deciding what those values are. Liabilities for banks are usually well defined, since they generally consist of a promise to pay a depositor or other funder a fixed amount in the future. However, banks increasingly have liabilities through derivatives or contingent commitments, or even pension deficits, where key assumptions about the present or future financial markets or economy have to be made in order to place a specific value on the promise.

The bigger problem, though, comes on the asset side. In the old days, the problem was that bank assets largely consisted of loans and the value of loans depends to a considerable extent on whether they will be repaid or not. Many modern banks have more complicated asset structures with instruments that can be even harder to value than loans, such as tranches of complex mortgage securitizations that were on the balance sheets of many banks during the crisis.

The first question is whether assets and liabilities should be valued at *market* values or on the basis of standard accounting concepts, that is, "book value." The problem is that neither standard may be the right one, depending on circumstances. Ideally, for purposes of lender of last resort functions, assets should be valued based on their worth under normal market conditions, given their specific circumstances. That way, as normal conditions are re-established, the central bank can expect to recover its loans to the bank and, at the same time, fire sale valuations will not have been used that exaggerate the crisis by pushing solvent banks into insolvency procedures.

In theory, book values probably come closer to this ideal, since accounting rules are designed to reflect changes in underlying, long-term value, while muting the effects of market swings. However, accountants can be slow to react to underlying changes and there will always be pressures not to reduce valuations until it is unequivocally established that they are necessary. At times, market values may better reflect the underlying economics and are often quicker to reflect major changes in circumstances.

The second set of problems comes in applying whichever standards are chosen. Accounting standards, as noted, can be slow moving and provide too much flexibility to managements. Markets, for their part, can over-react, sometimes sharply. Further, some instruments proved to be very hard to place a market value on during the financial crisis and it is, of course, crisis conditions when the valuations are most crucial.

Some observers consider all of these caveats and conclude that many lender of last resort actions that are claimed to be liquidity actions are really a form of bailout. However, it would seem to be an over-reaction to apply this logic generally, even though there may be exceptions when it has been accurate. First, lenders of last resort usually require collateral to back their loans and set standards for this collateral that help ensure that a valuation can be placed on it on a reasonable basis, partly by insisting on a fairly high quality of asset. Second, haircuts are generally applied to the stated valuations, so that the central bank lends less than the calculated value of the collateral.

All of this, of course, also diminishes the capacity of a central bank to rescue an illiquid financial system, since there is only so much collateral of acceptable quality and the haircuts reduce the ability to lend to the banks still further. A wide enough crisis will almost certainly require capital infusions from the markets or the government as well, in order to ensure the solvency of the crucial banks. In the end, the key will always be to restore the confidence of funders in the banks and the banking system. No central bank can hold back the tide of a severe enough financial crisis on its own, simply through liquidity actions.

How do liquidity requirements, capital requirements, and bank resolution rules interact?

Liquidity requirements cannot be viewed in isolation, since they are only one part, albeit an important part, of the rules governing the banking system. The two sets of rules with which they interact most strongly are (1) the capital requirements for banks and (2) the rules governing the resolution of troubled banks by winding them up or restructuring or selling them.

All else equal, the higher the capital levels at banks, the less need there is likely to be for high levels of liquidity. Higher capital levels decrease the likelihood of a loss of confidence by funders and increase the ability of the central bank to perform its lender of last resort functions, as it will be clearer that banks are indeed solvent. (This is no guarantee, of course, and all banks need to maintain a substantial level of liquidity regardless of their capital levels.) Conversely, the lower the level of liquidity, the greater is the need for capital to protect a bank from a confidence shock. It is for this latter reason that the Federal Reserve is strongly considering requiring additional capital for those banks that it views as relying excessively on wholesale funding, which is deemed to be a less stable source of funding. This also works in the other direction, since very high levels of liquidity reduce the need for capital by alleviating some of the risks banks

face, although there will always be a need for a certain amount of capital whatever the liquidity situation.

Certain bank capital rules may also create incentives to hold less liquid assets. The leverage ratio, to the extent that it is the most binding of the capital constraints for a given bank, provides an incentive to move to riskier and higher yielding assets, which are normally less liquid. More risk-sensitive capital requirements, such as those based on risk-weighted assets or capital stress tests, provide a more consistent incentive to that of the liquidity requirements.

There is also an interaction between liquidity rules and bank resolution procedures. If the procedures make it possible to resolve any bank without major repercussions on the financial system or wider economy, then the safety benefits of higher liquidity levels lose some of their importance and the cost/benefit analysis likely tips to at least somewhat lower liquidity requirements. On the flip side, the worse the damage when a bank becomes troubled, the greater the benefits of beefing up liquidity and other safety margins to avoid such an outcome.

Bank resolution procedures may also change the availability or cost of various sources of funding. For example, if debt becomes more likely to incur losses in a resolution, such as is intended to be the case with the rules for "bail-in capital", then it will become more expensive and less available in the first place and harder to roll over in a time of crisis or when there is greater fear of a potential crisis. This effect would be particularly negative to the extent that is impacts short-term debt, as that would be the quickest to roll off if trouble hit and such holders are usually the least comfortable with evaluating and taking credit risks.

How have bank liquidity levels changed in recent years?

A recent study by the Clearing House Association[7], an industry trade group, provides some revealing figures on the substantial improvements already made in the industry's liquidity position, in response to the lessons of the crisis and in anticipation of future regulation. They found that US commercial banks in aggregate reduced their reliance on wholesale funding by well over one-third from the peak in 2008 to the second quarter of 2012. Wholesale funding fell from about 30% of total funding to roughly 18%. Further, they found that commercial banks went from being significant net users of short-term

[7] "Assessing the Basel III Net Stable Funding Ratio in the Context of Recent Improvements in Longer-Term Bank Liquidity," The Clearing House Association, August 2013

funding prior to the crisis to net suppliers in recent years. Specifically, the volume of short-term liabilities minus short-term assets fell from 10% of total assets to -6%.

Appendix A Details of the Liquidity Coverage Ratio

The Liquidity Coverage Ratio (LCR) is aimed at improving the resilience of banks during short-term periods of liquidity stress.[8] The LCR sets a minimum supervisory standard to ensure that banks have an adequate amount of unencumbered high quality liquid assets (HQLA) to meet liquidity needs for a 30 calendar day stress scenario. HQLA includes cash, or assets that can be converted into cash at little or no loss of value in order to meet liquidity needs.

The LCR has two components: (1) the value of the HQLA under stressed conditions, and (2) the total net cash outflows that would occur for 30 calendar days into the future under certain stress scenario parameters. The Basel Committee calls for the ratio of the stock of HQLA to the total net cash outflow measure to remain at or above 100%, except during a pronounced period of stress, when liquidity can temporarily be drawn down.[9] The LCR formula is:

$$\frac{Amount\ of\ HQLA}{Total\ net\ cash\ outflows\ over\ 30\ day\ period} \geq 100\%$$

In order to qualify as HQLA, at a minimum, assets must be: unencumbered[10] and managed in such a way as to be immediately convertible into cash at any time during the 30-day stress period, with no restrictions on the use of the liquidity generated. The Basel Committee establishes two categories of assets that can be included in the stock, irrespective of their residual maturity: "Level 1" assets, which can be included without limit, and "Level 2" assets, which can only comprise up to 40% of the stock. Additionally, a third category of assets, "Level 2B," may comprise no more than 15% of Level 2 assets after the application of relevant haircuts.

Level 1 assets can comprise an unlimited share of the pool and are not subject to a haircut under the LCR, although national supervisors may impose haircuts for certain securities at their discretion. Level 1 assets include:

- Coins and banknotes

[8] This discussion draws upon the Basel Committee on Banking Supervision's latest version of the LCR proposal, released in January 2013. Where appropriate, the exact language employed by the Basel Committee has been used.

[9] The Basel Committee offers in depth guidance for supervisors on addressing a reported LCR below 100% during a period of financial stress

[10] An asset may be considered 'unencumbered' if it is free of legal, regulatory, contractual, or other restrictions on the ability of the bank to liquidate, sell, transfer, or assign it.

- Central bank reserves, including required reserves, to the extent that central bank policies allow them to be drawn down in times of stress
- Marketable securities representing claims on or guaranteed by sovereigns, central banks, multilateral development banks, or other public sector entities, if they are assigned a 0% risk weighting under the Basel II framework and meet certain other qualifying conditions

Beyond these categories, the Basel Committee also allows banks operating in jurisdictions in which the sovereign has a non-0% risk weighting under the Basel II framework to include domestic sovereign or central bank debt securities as well as sovereign or central bank debt securities issued in foreign currencies as Level 1 HQLA in certain situations.

Level 2 assets, on the other hand, consist of two categories – Level 2A and Level 2B – and may not comprise more than 40% of the stock of HQLA after haircuts have been applied. Level 2A assets are subject to a 15% haircut to their current market value and include:

- Marketable securities representing claims on or guaranteed by sovereigns, central banks, multilateral development banks, or other public sector entities, if they have been assigned a 20% risk weight under the Basel II framework and meet certain other qualifying conditions

- Corporate debt securities, including commercial paper, and covered bonds that have received a minimum AA- credit rating or the equivalent, if they have not been issued by a financial institution and meet certain other qualifying conditions

National authorities also maintain the discretion to designate certain additional assets as Level 2B. Level 2B assets are subject to a larger haircut than that applied to Level 2A assets and include the following:

- Residential mortgage backed securities (RMBS) may be included subject to a 25% haircut if they meet certain qualifying conditions, such as that the underlying mortgages have an average maximum loan-to-value (LTV) ratio of 80% at

issuance and that the securitizations are subject to 'risk retention' regulations, which require issuers to retain an interest in the assets they securitize

- Corporate debt securities, including commercial paper, may be included subject to a 50% haircut if they have not been issued by a financial institution or its affiliate, have received the equivalent of between an A+ and BBB- credit rating, and meet certain other qualifying conditions

- Common equity shares may be included subject to a 50% haircut if they have not been issued by a financial institution or its affiliate, are exchange traded and centrally cleared, and meet certain other qualifying conditions

The above outline reflects the definition of high quality liquid assets relevant for most jurisdictions. In some cases however, there may be an insufficient supply of Level 1 and/or Level 2 assets to meet the aggregate demand of banks, such as in the case that a jurisdiction has an insufficient supply of HQLA in its domestic currency. To address such situations, the Basel Committee has developed several alternative treatments for holdings of HQLA, although the details of those alternative treatments will not be addressed here.

As explained above, "total net cash outflows" is the denominator in the LCR and is defined as a bank's total expected cash outflows minus total expected cash inflows during the specified 30 calendar day stress scenario. Total expected cash outflows are calculated by multiplying the outstanding balances of various categories of liabilities and off-balance sheet commitments by the rates at which they are expected to run off or be drawn down. Total expected cash inflows are calculated by multiplying the outstanding balances of various categories of contractual receivables by the rates at which they are expected to flow in, up to an aggregate cap of 75% of total expected cash outflows.[11]

Cash outflows are broadly categorized into three types of liabilities or commitments: (1) Retail deposits; (2) Unsecured wholesale funding; and (3) Secured funding. The Basel Committee sets forth additional requirements for the treatment of a variety of other factors that may affect cash outflows under the stress scenario, such as off-balance sheet credit and liquidity facilities, as well.

[11] Banks are not permitted to double count items such that if an asset is included as part of the stock of HQLA (i.e., the numerator) then the associated cash inflows may not also be counted as cash inflows (i.e., the denominator).

Retail deposits are divided into 'stable' and 'less stable' portions of funds with *minimum* run-off rates of 3% and 10% respectably. For deposits to qualify as 'stable,' they must, among other things, be fully insured by an effective deposit insurance scheme or by a public guarantee that provides equivalent protection. Less stable deposits could include high-value deposits, deposits from sophisticated or high net worth individuals, volatile foreign currency deposits, or any funds that are not fully covered by an effective deposit insurance scheme.

'Unsecured wholesale funding' is funds that a bank has raised from non-natural persons (i.e., legal entities) that are not collateralized by legal rights to specific assets held by the bank. For the purposes of the LCR, all such funds that may be recalled or that are due to mature within the LCR's 30 calendar day horizon are accounted for in this measure; the different types and their associated minimum run-off rates are as follows:

- Unsecured wholesale funding provided by small business customers: 5% run-off rate for the 'stable' (i.e., insured) portion of funding and 10% run-off rate or higher for 'less stable' buckets
- Operational deposits generated by clearing, custody, and cash management activities[12]: 25% run-off rate, depending on whether the balances exceed the minimum required to keep these clearing, custody, and cash management activities functioning
- Deposits in institutional networks of cooperative banks: 25% or 100% run-off rate, depending on, among other things, the arrangements of the institutional networks' mutual protection scheme against illiquidity and the nature of the specified deposits
- Unsecured wholesale funding provided by non-financial corporates, sovereigns, central banks, multilateral development banks, and other public sector entities: 20% or 40% run-off rate, depending on whether the deposit is fully covered by an effective deposit insurance scheme

[12] In short, operational deposits are deposits placed with a bank in order to facilitate certain payment and settlement systems, such as in order for the bank to act as an independent third party intermediary in a transaction; for a fuller definition of operational deposits however, see the Bank of International Settlement's explanation in "Basel III: The Liquidity Coverage Ratio and liquidity risk monitoring tools" (January 2013).

- Unsecured wholesale funding provided by other legal entity customers, including funds from other banks and all outstanding bonds and debt securities: 100% run-off rate

Similarly, secured funding – funds that are collateralized by legal rights to specific assets held by the bank – are broken down into various categories that each receive an associated run-off factor based on the funding source's stability and expected cash outflow under the stress scenario. The categories and their run-off factors are as follows:

- Funding backed by Level 1 assets or with central banks: 0% run-off rate
- Funding backed by Level 2 assets: 15% run-off rate
- Funding backed by public sector entities that have a risk weight of 20% under the Basel framework, or backed by RMBS eligible for inclusion in Level 2B: 25% run-off rate
- Funding backed by other Level 2B assets: 50% run-off rate
- All other secured funding: 100% run-off rate

Finally, as mentioned above, total net cash outflow is equal to a given bank's total expected cash outflow less its expected cash inflow, with the inflow measure capped at 75%. Cash inflows include a bank's contractual inflows, including interest payments, from outstanding exposures that are fully performing and for which the bank has no reason to expect a default within the 30-day time horizon. The categories of maturing *secured* lending transactions and their associated expected inflow rates are as follows:

- Maturing secured lending transactions backed by Level 1 assets: 0% inflow rate
- Transactions backed by Level 2A assets: 15% inflow rate
- Transactions backed by RMBS eligible for inclusion in Level 2B: 25% inflow rate
- Transactions backed by other Level 2B assets: 50% inflow rate
- Margin lending[13] backed by all other collateral: 50% inflow rate
- Transactions backed by other collateral: 100% inflow rate[14]

[13] "Margin loans" are collateralized loans extended to customers for the purpose of taking leveraged trading positions

[14] There are exceptions to the rates listed above however. For example, if the collateral obtained in a secured funding transaction is rehypothecated and used to cover short positions that could be extended beyond 30 days, a bank should assume that such reverse repo or securities borrowing arrangements will be rolled over and will not give rise to any cash inflows (i.e., resulting in a 0% inflow rate).

Appendix B – Details of the Net Stable Funding Ratio

The aim of the Net Stable Funding Ratio (NSFR) is to ensure that banks maintain a 'stable funding' profile based on the liquidity characteristics of its assets and off-balance sheet activities over a one-year time horizon.[15] Having a 'stable funding profile' reduces the likelihood of an institution failing and potentially disrupting financial markets. The NSFR seeks to achieve this objective by limiting banks' overreliance on short-term funding relative to the liquidity risk characteristics of their on- and off-balance sheet items.

The NSFR is the amount of 'available stable funding' relative to the amount of 'required stable funding.' It is suggested that supervisors require that the ratio be kept above 100% on an on-going basis, except, potentially, during periods of severe stress. The NSFR equation is thus as follows:

$$\frac{Available\ Amount\ of\ Stable\ Funding}{Required\ Amount\ of\ Stable\ Funding} \geq 100\%$$

The Basel Committee defines 'available stable funding' as the portion of capital and liabilities expected to be reliable over a given time horizon, which has been established as one year in the current supervisory framework. An institution's 'required stable funding,' on the other hand, is a function of the liquidity characteristics and residual maturities of the various assets and off-balance sheet exposures held by that institution.

In terms of available funding, longer-term liabilities are generally considered to be more stable than short-term liabilities, and funding provided by retail or small business customers is considered to be more stable than funding of the same kind from other counterparties, such as large corporations or high net worth individuals. The amount of available stable funding (ASF) is primarily measured based on the maturity of a bank's liabilities and the propensity of different funding sources to withdraw their funding. The exact amount of ASF is calculated by first assigning the carrying value of an institution's capital and liabilities to one of five categories with each category grouped by the relative stability of funding. The total amounts in each category are then multiplied by the category's corresponding 'ASF factor,' ranging from 0% to 100%, and the total ASF is the sum of the factor-weighted amounts. The five categories are as follows:

[15] This discussion draws upon the Basel Committee on Banking Supervision's latest consultative document on the Net Stable Funding Ratio, released in January 2014. Where appropriate, the exact language employed by the Basel Committee has been used.

- Liabilities and capital instruments receiving a 100% ASF factor: Tier 1 and tier 2 capital after deductions; other capital instruments and liabilities with effective residual maturities of one year or more
- Liabilities receiving a 95% ASF factor: 'Stable' (as per the LCR definition) non-maturity demand deposits and term deposits with residual maturity of less than one year provided by retail or small- and medium- entity customers
- Liabilities receiving a 90% ASF factor: 'Less stable' (as per the LCR definition) non-maturity demand deposits and term deposits with residual maturities of less than on year provided by retail or small- and medium- entity customers
- Liabilities receiving a 50% ASF factor: Funding with residual maturity of less than one year provided by non-financial corporate customers; operational deposits (as per the LCR definition); funding with residual maturity of less than one year from sovereigns, public sector entities, and multilateral and national development banks; and funding with residual maturity of between six months and one year from other sources, including central banks and financial institutions
- Liabilities receiving a 0% ASF factor: all other liabilities and equity not yet included, such as liabilities without a stated maturity; and derivatives payable, net of derivatives receivable, if payables are greater than receivables

The amount of required stable funding (RSF), the denominator in the NSFR formula, is measured based on the liquidity risk characteristics of an institution's assets and off-balance sheet activities. The RSF is calculated by first assigning the carrying values of an institution's assets to one of seven categories, with each category assigned a corresponding RSF factor. Likewise, an institution's off-balance sheet activities are categorized based on their liquidity risk characteristics and assigned an RSF factor reflecting their relative liquidity risk. As with the ASF calculation outlined above, the total RSF is equal to the sum of the amount in each RSF category, including both assets and off-balance sheet activities, multiplied by the associated RSF factor.

The RSF factors are intended to approximate the extent to which a particular asset would have to be funded, either because it may be rolled over or because it may be unable to be monetized through sale or used as collateral in a secured borrowing transaction on an extended basis without significant costs. Assets are allocated RSF factors based on their residual maturity and liquidity values. Securities that have been borrowed in secured financing transactions, such as reverse repos and collateral swaps, for which a bank does not have beneficial ownership are generally

excluded from the calculation. Securities that have been lent in securities financing transactions for which a bank does have beneficial ownership however, are to be included in the calculation. Furthermore, the NSFR assumes that banks may seek to roll over existing loans to maintain customer relationships and that investors will exercise any option to extend maturity. Additionally, the NSFR requires stable funding for some proportion of lending to the real economy in order to ensure the continuity of this type of intermediation.

Assets that are more liquid and likely to be available as a source of liquidity during an extended period of stress receive lower RSF factors and require less funding than do assets considered less liquid. The categories to which assets are allocated and their associated RSF factors are as follows:

- Assets assigned a 0% RSF factor: coins and banknotes; all central bank reserves, including both required and excess reserves; and unencumbered[16] loans to banks subject to prudential supervision with residual maturities of less than six months
- Assets assigned a 5% RSF factor: unencumbered Level 1 assets (as per the LCR definition), excluding coins, banknotes, and central bank reserves
- Assets assigned a 15% RSF factor: unencumbered Level 2A assets (as per the LCR definition)
- Assets assigned a 50% RSF factor: unencumbered Level 2B assets (as per the LCR definition); high quality liquid assets encumbered for a period of six months or more and less than one year; loans to banks subject to prudential supervision with residual maturities between six months and one year; deposits held at other financial institutions for operational purposes (as per the LCR definition); and all other assets not included in the above categories with residual maturities of less than one year, including, for example, loans to non-financial corporate clients and loans to retail and small business customers
- Assets assigned a 65% RSF factor: unencumbered residential mortgages and other loans not included in the above categories, excepting loans to financial institutions, with a residual maturity of one year or more and a risk weight of less than or equal to 35% under the Basel II framework

[16] According to the Basel Committee, 'encumbered assets' include but are not limited to assets backing securities or covered bonds. Unencumbered assets are those that are free of legal, regulatory, contractual or other restrictions on the ability of the bank to liquidate, sell, transfer, or assign the asset.

- Assets assigned an 85% RSF factor: other unencumbered performing loans with risk weights greater than 35% under the Basel II framework, excluding loans to financial institutions; unencumbered securities that are not in default and that do not qualify as HQLA, including exchange-traded securities; and physical traded commodities, including gold
- Assets receiving a 100% RSF factor: all assets that are encumbered for a period of one year or more; derivatives receivable net of derivatives payable if receivables are greater than payables; and all other assets not included in the above categories, including, for example, non-performing loans and loans to financial institutions with residual maturities of one year or more

Many off-balance sheet liquidity exposures require little immediate funding but may become a drain on funding over a longer time horizon. Off-balance sheet obligations that serve as a source of liquidity risk include credit and liquidity facilities as well as a variety of other contingent funding obligations. The Basel Committee assigns a 5% RSF factor to irrevocable and conditionally revocable credit and liquidity facilities to any client, and affords national supervisors the discretion to specify RSF factors for other off-balance sheet activities based on their national circumstances.

The explanation of the NSFR provided above is based on the Basel Committee's January 2014 update of the NSFR rule, which is the latest iteration and different from the previous version in a number of ways. While an in depth review of the differences is beyond the scope of this discussion, the key changes made to the NSFR largely adjusted the ASF factors assigned to various liabilities and the RSF factors to various assets. Other changes included a clarification on the treatment of secured funding and the recognition of operational deposits on the ASF side, and adjustments to the high quality liquid asset definitions on the RSF side in order to create greater consistency with the LCR definitions.