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United States: Will central bank reserves soon become insufficient?

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Will central bank reserves soon become insufficient?

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Over the past four years, the US Federal Reserve has reduced the surplus central bank reserves that it had built up under its quantitative easing programme. Over the same period, the Basel 3 banking regulations have, however, significantly increased banks' demand for central bank liquidity. Before Basel 3, all reserves in excess of "required reserves", in the monetary policy sense of the term, were, justifiably, treated as excess reserves. Since the new liquidity rules have come into force, only those reserves in excess of the regulatory constraint may be so treated. Although US banks have so far limited the initial effects of the reduction in reserves on their liquidity ratios, notably at the cost of increased dependence on the Federal Home Loan Banks, it would appear that the first signs of tension in liquidity are beginning to show.

The six years of quantitative easing conducted by the Fed resulted in an unprecedented expansion of its balance sheet, and (automatically) in the amount of reserves held by depository institutions. When the programme came to an end, in October 2014, these had peaked at more than USD 2,820 billion, from barely USD 90 billion before the programme began. Since then, monetary policy measures (repo transactions, Fed balance sheet reduction programme), combined with the upward trend in currency in circulation and issues of Treasury bills, have reduced this stock by more than USD 1,000 billion. Meanwhile, the Fed's balance sheet has shrunk by USD 360 billion since the ending, a year ago, of the full reinvestment of maturing debt in its securities portfolio. Now¹ the Fed's balance sheet and bank reserves stand at USD 4,150 billion and USD 1,760 billion respectively, which are historically high levels by pre-crisis standards.

Even so, there is some debate about the desirable level over the long term of the Fed's balance sheet and reserve balances. The Federal Open Market Committee (FOMC) has not provided detailed targets in this area. It has simply indicated that under the Fed's slimming programme "securities holdings will continue to decline in a gradual and predictable manner until the Committee judges that the Federal Reserve is holding no more securities than necessary to implement monetary policy efficiently and effectively²". The supply of reserve balances will gradually be reduced to a level "appreciably below" that of

recent years but larger than before the financial crisis. It will reflect the needs of the banking system in terms of reserves and the Committee's decisions about how to implement monetary policy in the future. In June 2017, the FOMC expected to "learn more about the underlying demand for reserves during the process of balance sheet normalization".

Constraints on central bank liquidity have increased significantly as a result of the Basel 3 banking regulations³. Before Basel 3, all reserves in excess of required reserves, in the monetary policy sense of the term, were, justifiably, treated as excess reserves⁴. Banks without sufficient reserves to meet the minimum requirement had to borrow from the central bank (open market operations) or from other banks⁵ on the Fed Funds market. But demand for reserves at the central bank has increased as a result of Basel 3 (Pozsar, 2016⁶). Since the introduction of the Liquidity Coverage Ratio (LCR), banks have been required to hold reserves (or more generally high-quality liquid assets) not only in proportion to the deposits registered on their balance sheets but more broadly in proportion to their debts falling due within 30 days⁷. Reserves at the central bank may therefore exceed the volume required under monetary policy (required reserves) but nevertheless be insufficient with a view to the overall liquid asset requirement. As has been highlighted by Randal Quarles⁸, Vice Chair for Supervision at the Fed, the challenge for monetary authorities is now to evaluate the extent to which LCR will affect the total demand for reserves and thus the size of the Fed's balance sheet over the long term.

³ L. Quignon, *Basel III, the money multiplier and monetary policy*, BNP Paribas, Conjoncture 13-12, December 2013.

⁴ By virtue of the required reserve coefficient, depository institutions must hold reserves with the central bank equivalent to a proportion of their deposits.

⁵ or from non-banks with an account with the Fed

⁶ Z. Pozsar (2016), *What excess reserves?*, Global Money Notes #5, Economic Research Credit Suisse, April 2016.

⁷ See Box 1 for a more precise definition. Some banks are also subject to the Comprehensive Liquidity Analysis and Review (CLAR) liquidity stress tests.

⁸ R. Quarles, *Liquidity Regulation and the Size of the Fed's Balance Sheet*, Remarks at Hoover Institution Monetary Policy Conference, May 2018 : <https://www.federalreserve.gov/newsevents/speech/quarles20180504a.htm>

¹ Figures at 21 November 2018.

² Addendum to the Policy Normalization Principles and Plans: <https://www.federalreserve.gov/newsevents/pressreleases/monetary20170614c.htm>



Simon Potter, Executive Vice President of the Federal Reserve Bank of New York, recently indicated that for the time being there are no visible signs of an insufficiency of reserves at the aggregate level⁹. Since the beginning of the year the interest rate at which central bank deposits have traded (the Effective Federal Funds Rate or EFFR) has certainly risen, taking it close to the Interest on Excess Reserves (IOER) rate. This increase has not, however, resulted from an increase in demand for Fed Funds so much as additional issuance of Treasury bills, which has pushed traditional lenders of Fed Funds (the Federal Home Loan Banks) towards the repo markets. According to Potter, evidence of a scarcity of central bank liquidity will only be manifested when there is a significant increase in lending at above IOER rates on the unsecured overnight markets, or when there is a clearer day-to-day relationship between shifts in the IOER-EFFR spread and in the stock of reserves.

On the scale of the banking system as a whole, trends in central bank reserves are exogenous, a function both of monetary policy decisions and of portfolio choices in the non-bank sector (1st part). Over the past ten years, the Federal Reserve has adjusted its supply of reserves through a range of non-conventional means. The first such resulted in a considerable increase in supply, with subsequent measures serving to stabilise and then restrict it. On the margin of monetary policy, the financial behaviour of non-bank agents has resulted in an increase in the money circulating in the economy and in deposits from the Treasury and foreign central banks held at the Fed. Overall, the aggregate availability of reserves has now been reduced as a result¹⁰.

The issue of the 'necessary' level of reserves is not simple at first sight. The LCR constraint was introduced in 2015 against a background of abundant central bank liquidity, which therefore naturally represented a substantial proportion of portfolios of liquid assets. In the third quarter of 2018, after four years of contraction in aggregate reserves, central bank liquidity still accounted for more than 40%, on average, of liquid assets under LCR of the eight biggest US banks (2nd part). The adjustment strategies adopted since 2015 (substitution of liquid securities for reserves, reduction in the use of short-term market debt) have, so far, helped offset part of the reduced availability of reserves. Analysis also shows that American banks are receiving increasing levels of support from the Federal Home Loan Banks. Although it is hard to say whether or not reserves are still 'sufficient', it does appear that we are seeing the first signs of pressure on liquidity, albeit outside the Fed Funds market, which runs contrary to the expectations of monetary authorities.

⁹ S. Potter, *US Monetary Policy Normalization is proceeding smoothly*, Remarks at Banque de France, October 2018: <https://www.newyorkfed.org/newsevents/speeches/2018/pot181026>

¹⁰ The ability of banks to protect their liquidity ratios is diminished all the more as the reduction in the Fed's balance sheet comes against a background of rising rates. The current increase in long-term interest rates depresses the value of securities held on bank balance sheets (notably Treasuries), and thus the value of the stock of liquid assets.

Monetary policy and aggregate reserves

Variations in central bank deposits are to an extent exogenous, a function of monetary policy and the financial behaviour of non-bank agents. We will examine the various non-conventional measures used by the Fed over the last few years. First, the Fed's securities purchasing programme increased aggregate bank reserves (1.1), before the full reinvestment of maturing debt stabilised them (1.2). Later, repo transactions (1.3) and finally the ending of the full reinvestment of maturing debt (1.4) began to reduce aggregate reserves¹¹.

Quantitative easing: a vector of growth in reserves

The effects. The Fed's quantitative easing (QE) policy from December 2008 to October 2014 consisted of three waves of securities purchases (US Treasury debt, agency debt securities and mortgage backed securities – MBS – issued by the Fannie Mae and Freddie Mac mortgage guarantee agencies¹²). This resulted in an expansion of the central bank's balance sheet both in its securities portfolio (on the asset side) and reserve balances of depository institutions (on the liability side, Chart 1). Banks' reserves at the Fed thus moved into a significant surplus relative to required reserves (the minimum levels in monetary policy terms). Domestic banks acted as intermediaries for their clients in QE, with the result that these purchases also contributed to a sharp increase in deposits on the liabilities side of bank balance sheets¹³.

The mechanics. If the banks themselves had sold their securities portfolios, QE would simply have resulted in a substitution of assets on their balance sheets (securities against reserves at the Fed), with no net effect on the size of their balance sheets (Example 1, Figure 1 p.20). However, between the end of the third quarter of 2008 and the fourth quarter of 2014, it was mainly US 'households' (the household sector includes hedge funds and private equity funds in US statistics), states and local government, non-bank financial institutions (notably the GSEs,

¹¹ See also J. Ihrig, L. Mize and G. Weinbach (2017), *How does the Fed adjust its securities holdings and who is affected?*, Finance and Economics Discussion Series, Divisions of Research & Statistics and Monetary Affairs, Federal Reserve Board, and D. Leonard, A. Martin and S. Potter (2017), *How the Fed changes the size of its balance sheet*, Liberty Street Economics, July 2017.

¹² Fannie Mae and Freddie Mac are the two big Government-Sponsored Enterprises (GSEs) placed under the protection of the US Treasury since September 2008. C. Choulet., *The fate of Fannie Mae and Freddie Mac is not yet sealed*, BNP Paribas, Conjoncture 18-03, March 2018.

¹³ In a previous article we analysed the various reasons why domestic banks (US-chartered banks and US branches of foreign banks) modified the 'natural' effect of QE on their balance sheet, resulting in a shift in the ownership structure of reserves with the Fed with no equivalent distortion of the structure of customer deposits on the liabilities side of their balance sheets. C. Choulet., *QE and bank balance sheets: the American experience*, BNP Paribas, Conjoncture 15-07, July-August 2015.



pension funds and money market funds) and non-residents who reduced their holdings of Treasury and/or agency securities (Charts 2 and 3). As these agents (with the exception of the Government-Sponsored Enterprises – GSEs) do not have accounts with the Fed, these transactions transited through bank balance sheets: in settlement of its purchases (increase of securities as assets on its balance sheet), the Fed credited the current accounts of banks (increasing excess reserves of the banks as liabilities for the Fed and assets for the banks) whilst the banks credited their customers' accounts (increase in deposits as liabilities at the banks – Example 2, Figure 1). All other things being equal, the Fed's quantitative easing therefore tended to increase the size of resident bank balance sheets by increasing their current accounts with the Fed and their liabilities to customers. Ultimately QE in the US resulted in growth in the monetary base (narrow money)¹⁴ and also in total money supply¹⁵.

Full reinvestment of maturing debt

The effects. In October 2014, the Fed ended its securities purchasing programme. In order not to upset the interest rate markets, it nevertheless maintained its programme¹⁶ of full reinvestment of maturing debt and thus stabilised the size of its balance sheet (Chart 4). Taken in isolation, this approach had no impact on bank reserves at the Fed.

Full reinvestment of maturing Treasuries

The mechanics. As it is not authorised to subscribe directly for Treasury issues, the Fed renewed its portfolio of Treasuries by swapping maturing for newly issued securities¹⁷. The maturing of Treasuries reduces the value of the securities portfolio in the Fed's assets and the Treasury General Account (TGA) held at the Fed¹⁸ (Stage 1, Figure 2 p.20). Without new issuance, outstanding Treasury debt would gradually reduce, as would its account at the Fed. Any new

Treasury issue automatically increases its debt and its current account with the central bank, at least temporarily¹⁹ (Stage 2, Figure 2).

Reserve balances of depository institutions with the Fed

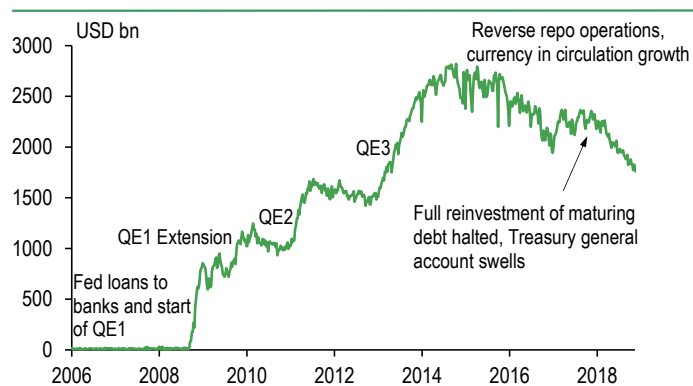


Chart 1

Source: Federal Reserve

Breakdown of Treasuries by holder sector, 2008-2014

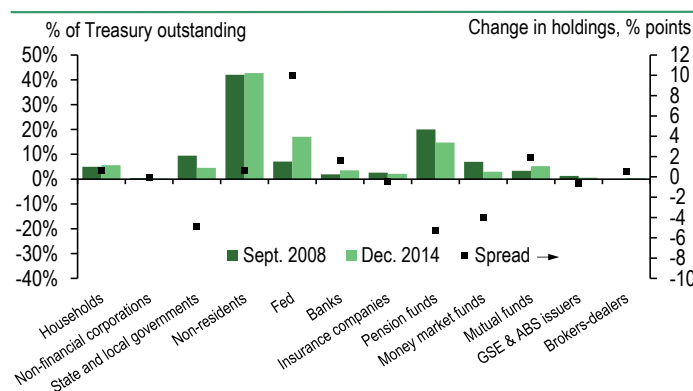


Chart 2

Sources: Federal Reserve, BNP Paribas

Breakdown of agency MBS by holder sector 2008-2014

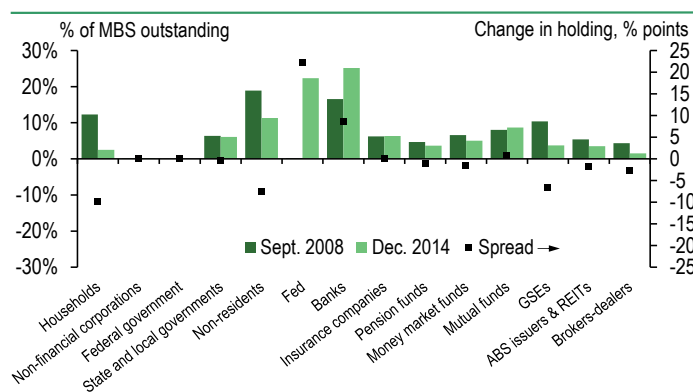


Chart 3

Sources: Federal Reserve, BNP Paribas

¹⁴ The monetary base includes notes and coins and reserves at the central bank.

¹⁵ This would have been less notable if only the banks, the GSEs (which have accounts with the Fed) and non-residents (whose deposits are not included in money supply) had sold securities. Moreover, second level effects could have either reduced or amplified the direct effects of QE on money supply. For example, if a US hedge fund had sold 100 units of securities to the Fed and invested the additional deposits created in securities issued by a non-resident, non-financial company, this would have resulted in a reduction of the effect. Conversely, if a non-resident had sold 100 units of securities to the Fed and invested the cash received in securities issued by a resident (thus increasing its deposits), this would have amplified the effect. Liquidity circulating between agents, who are the final owners of the deposits created by QE, is not directly identifiable.

¹⁶ Begun in August 2010

¹⁷ Non-competitive bids to Treasury auctions

¹⁸ We ignore interest payments, which constitute revenue rather than principal.

¹⁹ Perhaps very temporarily if the funds raised are immediately used to finance public spending.



The Fed's balance sheet

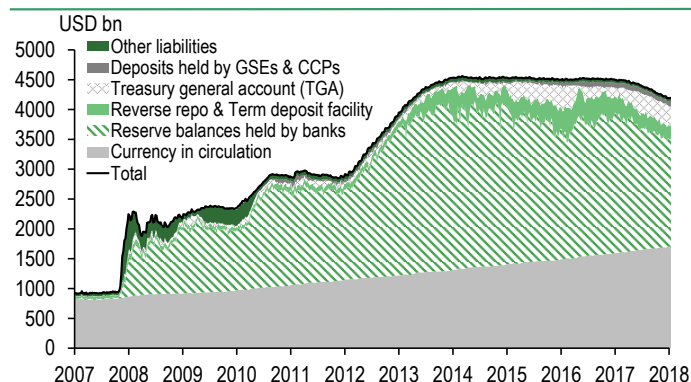


Chart 4

Source: Federal Reserve

Full reinvestment of loan repayments

The mechanics. Unlike the maturing of a Treasury security, the repayment of a mortgage loan used as an underlying instrument in an MBS is spread over time and gradually reduces the value of the MBS. Mortgage holders may also make early repayment due to sale of the property or a renegotiation or repayment of the debt. The pattern of repayment of principal and indeed of interest payments is therefore less predictable. Repayment flows transit through the original lending bank to the holder of the MBS via the MBS issuer (a GSE)²⁰.

The repayment by the household reduces its debt and its deposits (Stage 1, Figure 3 p.21). The commercial bank (which originated the loan but no longer carries it on its balance sheet) makes a transfer from its account with the Fed to that of the MBS issuer (the GSE which carries the loan on its balance sheet). The bank's reserves are reduced, those of the GSE increased. The GSE then transfers the funds to the account of the investor who holds the MBS (the Fed in this example). The GSE's reserves are reduced. Ultimately, the repayment of the loan results in a reduction in the Fed's balance sheet, in the bank's reserves and in deposits. The full reinvestment of the repayment cancels out these effects. Subscription for a new loan of a value equivalent to the repayment made increases the deposits and debts of the household (Stage 2, Figure 3). The bank sells the loan to the GSE. This sale results in a transfer from the GSE's account to that of the bank. The GSE issues an MBS secured in part on this loan (Stage 3, Figure 3). The Fed subscribes to this issue and credits the GSE's account. After reinvestment, the value of the Fed's MBS portfolio and the current account of the GSE with the Fed are unchanged, as are the commercial bank's reserves.

²⁰ To simplify explanations, we assume that repayment and reinvestment take place on the same date. We also ignore the transitory effects of repayments and reinvestment on the account of the Fed's custodian bank (JP Morgan) and the effect of interest payments.

Tools for reducing excess liquidity

The effects. At the margins of its programme for the full reinvestment of maturing debt, the Fed has conducted transactions which, whilst not affecting the size of its balance sheet, reduced banks' current accounts. In September 2013, with the aim of regaining control of short-term interest rates²¹, the Fed introduced two tools designed to reduce excess liquidity: the Term Deposit Facility (TDF) and the Reverse Repurchase Agreement Facility (RRP facility). In 2015, it also extended its reverse repo transactions with foreign central banks (FRRP). These measures, combined with the increase in currency in circulation, the additional issuance of Treasury bills and new constraints on margin calls from clearing houses²², reduced reserves by around USD 570 billion between October 2014 and October 2017 (Charts 5 and 6). As other liabilities replaced bank reserves, the Fed's balance sheet remained unchanged over this period (Table 1).

The Term Deposit Facility (TDF)

The mechanics. This measure consists of offering banks the ability to convert their reserves into term deposits for a number of days (Figure 4 p.21). This has no effect on the balance sheets of either the central bank or the banks²³. Thanks to an attractive yield, the sums converted reached USD 400 billion in December 2014 and again in February 2015. Transactions to convert reserves into term deposits have become rarer since then.

²¹ The unprecedented expansion of banks' reserves with the Fed depressed money market interest rates. From 2008, the Fed paid interest on banks' excess reserves (0.25%). The interest rate (IOER) serves as a floor for the effective Fed Funds rate as banks have no interest in lending their central bank reserves at a rate lower than IOER. However the GSEs, which have accounts with the Fed but are not able to receive interest on them, continued to lend liquidity at a rate lower than the IOER and thus dragged interest rates back down again. The volumes traded on the Fed Funds market remained modest due to weak demand from the banks.

²² Since February 2014, the biggest clearing houses have been able to hold an interest bearing account with the Fed. Their deposits are recorded under the heading "Other reserves with Federal Reserve Banks" alongside GSE reserves.

²³ In order to make them more attractive than at the time of the launch in September 2013, in October 2014 the Fed opportunistically adjusted the details of term deposits available to banks under the TDF. Initial offers fell foul of banking regulations. Following the finalisation of the LCR standard in September 2014, which indicated that a share of term deposits can be used to meet the inclusion criteria, provided that early withdrawal is possible, the Fed announced that from October it would offer 6-, 7-, and 8-day deposits, but this time with early withdrawal rights. This change allowed banks to make use of the facility without damaging (or improving) their LCR.



Tools for draining excess liquidity through Sept. 2017

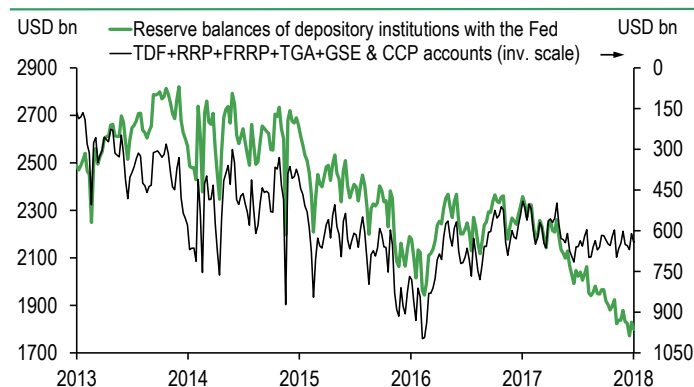


Chart 5 Sources: Federal Reserve, BNP Paribas

The Fed's balance sheet and reserve balances of banks

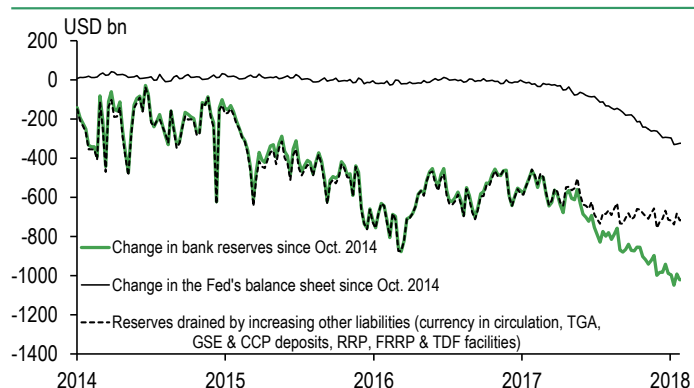


Chart 6 Sources: Federal Reserve, BNP Paribas

Reverse Repo operations (RRP)

The mechanics. This second liquidity reduction measure consists of conducting reverse repo transactions on Treasuries (sale with obligation to buy back) at a fixed rate and at capped amounts with an expanded list of counterparties (banks, primary dealers, GSE and money market funds). By using this facility a bank or non-bank makes a secured loan (cash against Treasuries) to the Fed. As with security purchases by the Fed, the repo transaction passes through the balance sheet of a bank (unless the counterparty is a GSE), whether it is the Fed's final counterparty (Example 1, Figure 5 p.21) or not (Example 2, Figure 5). As a result of the operation, the size of the central bank's balance sheet is unchanged, but the composition of its debt is modified (repo instead of reserves) and the account of its counterparty is debited. When a bank enters into a repo transaction with the Fed, the transaction results simply in an exchange of assets on its balance sheet (repo against reserves), with no effect on the overall size of its balance sheet (Example 1, Figure 5). Where the Fed's counterparty is a non-bank (for instance a money market fund), the commercial bank debits the account

of its client (Example 2, Figure 5). All other things being equal, on completion of the transaction the bank's reserves are reduced.

The Fed balance sheet: from one liability to another

Value USD billion	As at 03/09/08				As at 21/11/18
<i>Change USD billion</i>		<i>From 03/09/08 to 15/10/14</i>	<i>From 15/10/14 to 18/10/17</i>	<i>From 18/10/17 to 21/11/18</i>	
Fed's balance sheet	939.5	+3,578.1	-1	-362.5	4,154.1
of which:					
Currency in circulation:	836.7	+459.6	+288.9	+120.8	1,706
Reverse Repo (RRP and FRRP)	41.7	+179.4	+127.1	-97.4	250.8
Treasury General Account	5.6	+95.8	+94.7	+121.2	317.3
GSE and CCP accounts	0.3	+7.8	+71.1	-7.7	71.5
Other	50.7	+19.3	-17.2	-1.8	51
Bank reserves	4.5	+2,816.2	-565.6	-497.6	1,757.5

Table 1

Source: Federal Reserve

The Fed carried out the majority of its reverse repo transactions (via banks) with money market funds (MMFs), the only organisations with an incentive to take part²⁴. On average, between September 2013 and the end of 2017, some USD 120 billion in cash was 'loaned' to the Fed under RRP; the daily average reached USD 145 billion during 2017. These transactions resulted in a marked reduction in deposits in MMF assets (Chart 7, collateral effect of the LCR standard, see below). In 2018, secured lending by MMFs to the Fed fell significantly. Increased issuance of Treasury bills pushed up the repo rates on the triparty market, luring GSEs away from the Fed Funds market (see below) and the MMFs away from the less well remunerated reverse repos of the Fed (Chart 8).

²⁴ Whilst the interest rate on these operations remains below the IOER rate on excess reserves, banks have little incentive to participate. The facility might of course be of interest to those looking for very high-quality collateral to refinance themselves or meet initial margin requirements. However, at a prudential level, excess reserves and Treasuries (and repos guaranteed by Treasuries) are treated equally (receiving the most favourable treatment). Although the RRP interest rate is similar to IOER for non-banks, the involvement of the GSEs (notably the Federal Home Loan Banks, see Note 40) is limited for regulatory reasons. Thus the programme involves mainly (i.e. at more than 80%) money market funds, giving them a high-quality counterparty and collateral and making it easier for them to satisfy SEC requirements.

Repos vs deposits on the balance sheets of MMFs

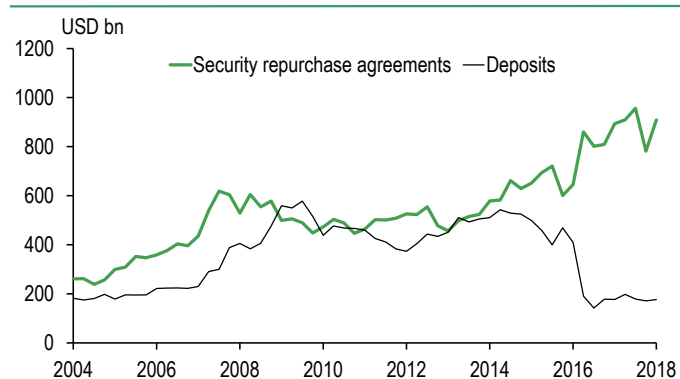


Chart 7 Source: Federal Reserve

Rate structure

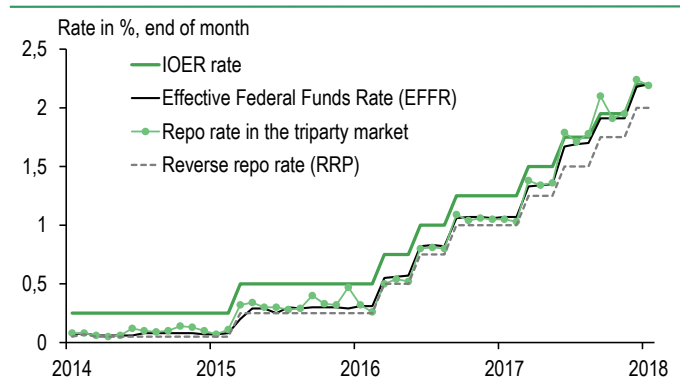


Chart 8 Source: Macrobond

Reverse repo transactions with foreign central banks (FRRP).

The mechanics. The Fed releases relatively little information about these transactions. Even so, their contribution to reducing excess bank reserves has been far from negligible for some years now (Pozsar, 2016²⁵). Having doubled between the end of 2014 and the end of 2015, average outstanding amounts have stood at USD 240 billion since early 2016 (Chart 9). As is the case with reverse repos with MMFs, these transactions pass via the balance sheets of commercial banks. When a foreign central bank has deposits with a resident bank, the transaction consists simply of an asset swap on its balance sheet (repo for deposits, Example 1, Figure 6 p.22). The balance sheet of the commercial bank is reduced (reduction in deposits on the liabilities side and reserves on the

asset side) and the composition of the Fed's debt is changed (repo instead of reserves). When the foreign central bank chooses to sell securities to increase its deposits (Example 2, Figure 6), the effects are identical to the previous example with the sole difference that it is the deposits of the financial clients of the commercial bank (hedge funds for example) that are reduced, rather than those of the foreign official sector.

Surge in Fed reverse repos

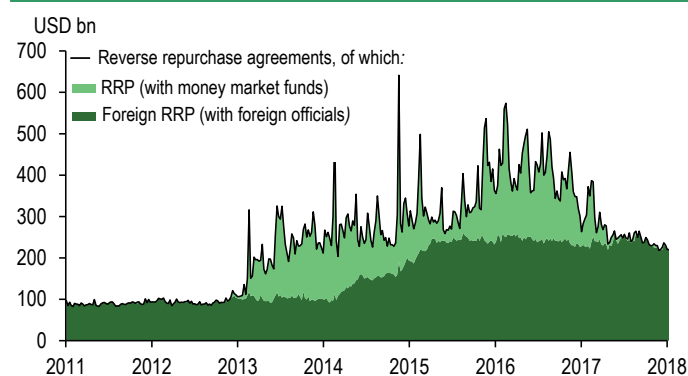


Chart 9 Source: Federal Reserve

The Fed does not publish continuous information on the interest rates for these transactions. It only provides the average rates for the first quarter, first half and first nine months of each year when it publishes its (unaudited) quarterly financial statements. We have extrapolated estimates on quarterly yields on the basis of these data. It appears that these transactions offer a very attractive return, above the rate paid on RRP and the one-month T-bill yield (Chart 10), such that it encourages foreign central banks to reduce their holdings of short-dated Treasuries in order to take full advantage of it (Chart 11). These securities could have been sold to financial institutions such as hedge funds or private equity funds whose non-operating deposits are less well remunerated (or even penalised) on the balance sheets of banks (collateral effect of the LCR standard, see below), or to MMFs that have been required to increase their exposure to government debt (since the reforms of 2014²⁶).

These transactions resulted in a sort of sterilisation of liquidity in the current accounts of foreign central banks. In the absence of a reduction in the interest rate paid, they will constitute a natural limit to the reduction in the Fed's balance sheet.

²⁵ Z. Pozsar (2016), *A tool of their own, The foreign RRP Facility*, Global Money Notes #4, Economic Research Credit Suisse, February 2016.

²⁶ C. Choulet, *US money market funds and US dollar funding*, BNP Paribas, Ecoflash, 16 July 2018.



FRRP offer attractive yields

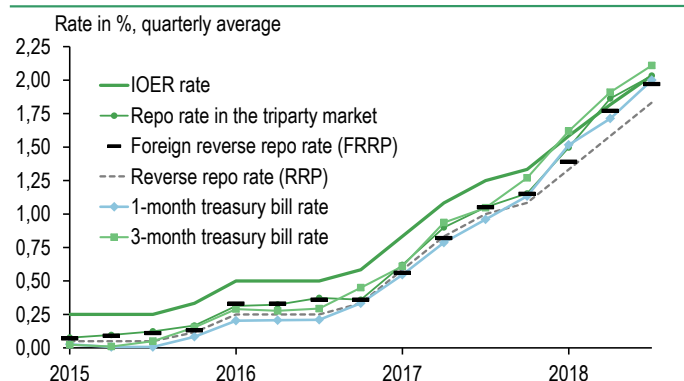


Chart 10 Sources: Macrobond, Federal Reserve, BNP Paribas

Repos vs Treasuries on the balance sheets of foreign officials

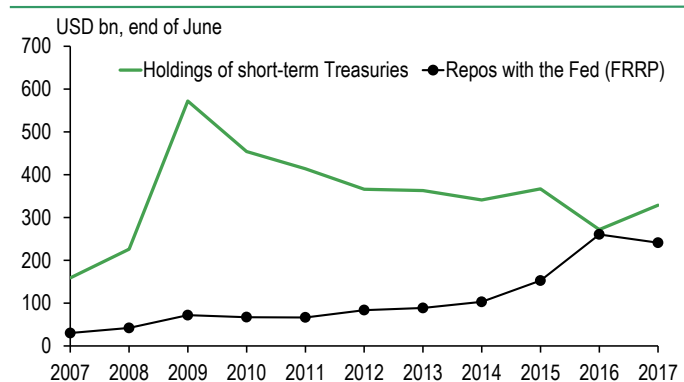


Chart 11 Sources: US Treasury, Federal Reserve

The effect of the Fed's reverse repos on non-operating deposits

As we have indicated, the increase in the Fed's reverse repo transactions put pressure on bank reserves and thus on the volume of liquid assets in the LCR definition (Box 1 p.17). However, these measures also contributed to reducing non-operating deposits of financial institutions which have been hit hard by changes to the regulatory framework, notably capital and liquidity requirements. Under the LCR liquidity requirement, in particular, these deposits were affected by an assumption that they would not be renewed at 100% (in the calculation of theoretical cash outflows used in the denominator of the LCR): this assumes that for each unit deposited, the bank must hold one unit of liquid assets of greater quality (the numerator of the ratio). The negative interest charged on deposits for institutional clients (hedge funds, private equity funds) by certain major US banks, such as JP Morgan, led to a refocusing of the liquidity of such funds on money market funds, and then from these funds to the Fed, thus supporting the RRP. Similarly, the FRRP had a positive effect on the LCR of certain banks when it came alongside a reduction in non-operating deposits

from financial institutions acquiring securities sold by foreign central banks.

In early 2016, JP Morgan congratulated itself on having reduced the regulatory capital surcharge arising from its position as a global systemically important bank (G-SIB)²⁷ thanks to the outflow, over the course of 2015, of around USD 200 billion in non-operating deposits from its balance sheet. At the time, JP Morgan did not indicate the scale of this positive effect on the group's LCR (the eight G-SIBs have only published LCR figures since the second quarter of 2017, see below). Data from the Call Report of the JP Morgan's main deposit bank (JP Morgan National Association) nevertheless provided some idea of this. Over the course of 2015, the reduction in non-operating deposits²⁸ virtually fully offset the contraction in reserves on the asset side of its balance sheet (chart 12).

The reduction in the Fed's balance sheet, another vector for reducing reserves

The effects. In October 2017, the US Federal Reserve undertook a programme to reduce the size of its balance sheet, by limiting the amount of reinvestment on maturity. Over the ensuing months the proportion of maturing debt reinvested was reduced. Since October 2018, the Fed's holding of Treasuries has been reduced by a maximum of USD 30 billion per month, with its holdings of agency debt securities and MBS being reduced by USD 20 billion. This policy has effects on the balance sheet of the Fed and the banks that mirror those of the securities purchasing programme: it results in the shrinking of the Fed's balance sheet, its securities portfolio and the reserves of resident banks on its balance sheet, irrespective of who holds the new securities issued. If banks subscribe to issues on their own account the size of their balance sheet will not change (swapping reserves for securities); if they act on behalf of a client, their balance sheet is reduced (fewer reserves and fewer deposits). It would appear that it was mainly US "households" who increased their holdings of Treasuries and agency MBS between September 2017 and July 2018 (Charts 13 and 14).

²⁷ From 4.5% to 3.5% of risk-weighted assets:

https://www.jpmorganchase.com/corporate/investor-relations/document/firm_overview_investor_day_2016.pdf (page 18)

²⁸ The analysis of deposits supplied in Call Reports does not allow precise identification of the stock of deposits affected by the highest run-off rate used in calculating the LCR. We have chosen to break deposits down into four major categories depending on their treatment under the LCR standard. "Non-operating deposits" include deposits from banks, deposits from non-resident clients (excluding public sector), term deposits and non-transaction accounts of retail clients and corporates.



The reduction in non-operating deposits virtually offset the contraction in reserves for JP Morgan

Securities and loan portfolios at Q4 2015

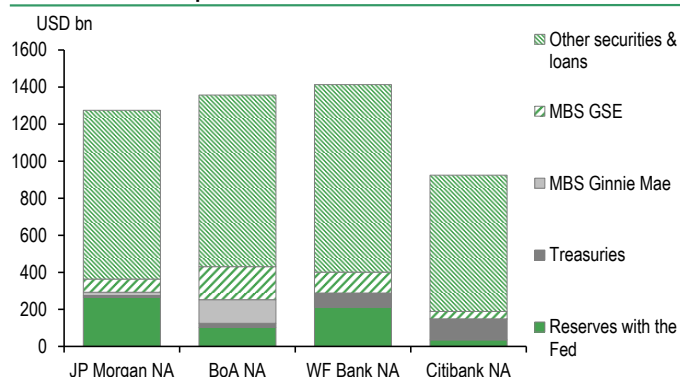


Chart 12a

Structure of deposits at Q4 2015

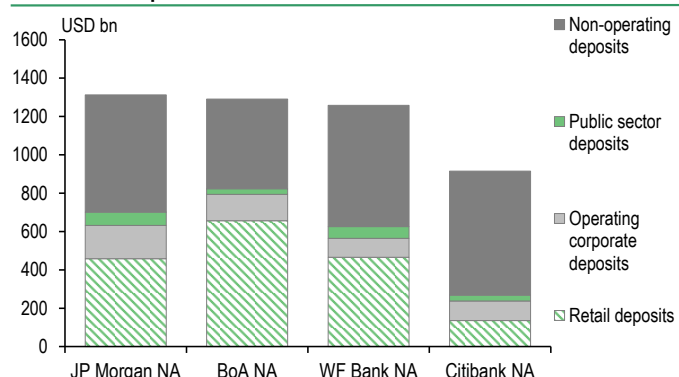


Chart 12b

Asset deformation, Q4 2014-Q4 2015

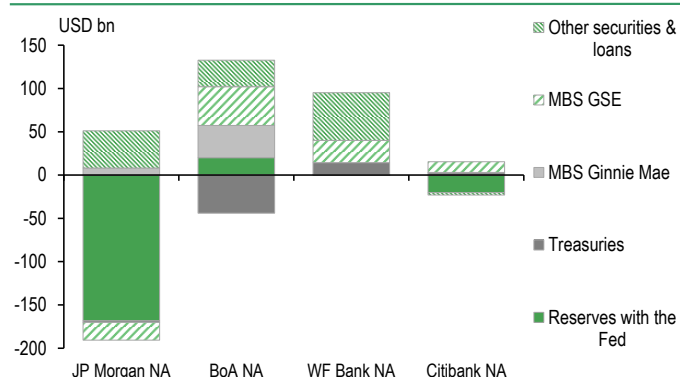


Chart 12c

Liabilities deformation, Q4 2014-Q4 2015

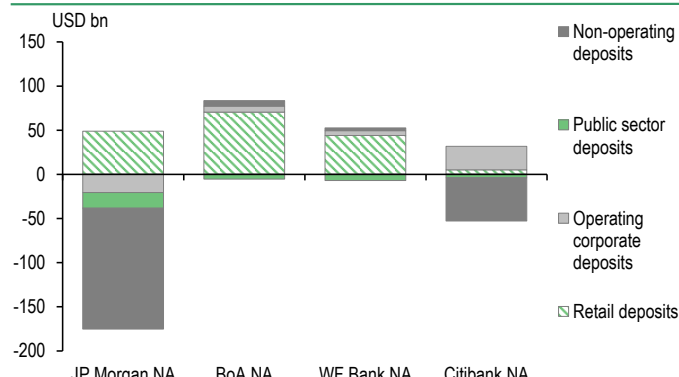


Chart 12d

Source: Call reports (FFIEC 031)

The mechanics. When the Fed does not reinvest the totality of maturing debt, a new issue of Treasuries (or MBS) results in a contraction of bank reserves with the Fed irrespective of the final holder of the securities issued (bank, pension fund, hedge fund). If a bank subscribes on its own account to an issue by the Treasury (or a GSE), there will be a transfer of cash from its account with the Fed to that of the Treasury (or GSE – Example 1, Figures 7 p.22 and 8 p.23). If a non-bank agent subscribes to an issue, the bank also makes a transfer from its account with the Fed to that of the issuer, but debits the same amount from the account of its client (reducing deposits – Example 2, Figures 7 and 8).

After partial reinvestment of maturing debt, the size of the Fed's balance sheet is reduced, and the current account of the Treasury (or GSE) with the Fed is unchanged²⁹ (as is its debt). Bank reserves at the Fed are reduced.

²⁹In practice, issuance of short-dated Treasuries has significantly exceeded maturing debt over the past year. The Treasury's account with the Fed has

Overall, the impact of the reduction in the Fed's balance sheet on the size of bank balance sheets and on money supply will depend on the nature – bank or non-bank – of the final holder of newly issued securities, as well as on any portfolio adjustment made by economic agents. Thus the money created through quantitative easing may not be eliminated through quantitative tightening. This would be the case, most notably, if domestic non-bank agents reduced their holdings of riskier assets rather than their deposits.

increased significantly, eating even further into bank reserves. It stood at nearly USD 329 billion in mid-November. The Treasury estimates that it could reach USD 410 billion by the end of the year, before falling back to USD 320 billion by end-March 2019: <https://home.treasury.gov/news/press-releases/sm535>



Breakdown of Treasuries by holder sector, 2017-2018

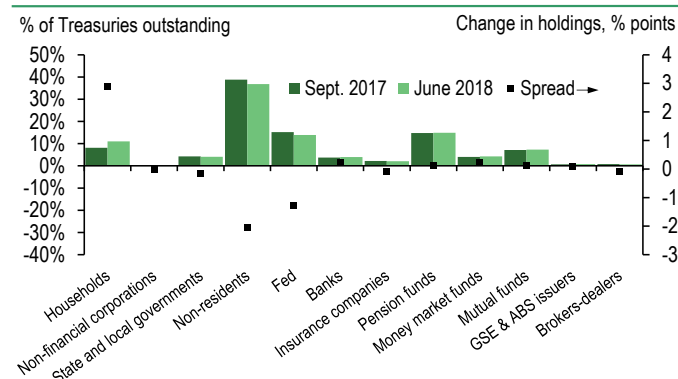


Chart 13

Sources: Federal Reserve, BNP Paribas

Breakdown of agency MBS by holder sector, 2017-2018

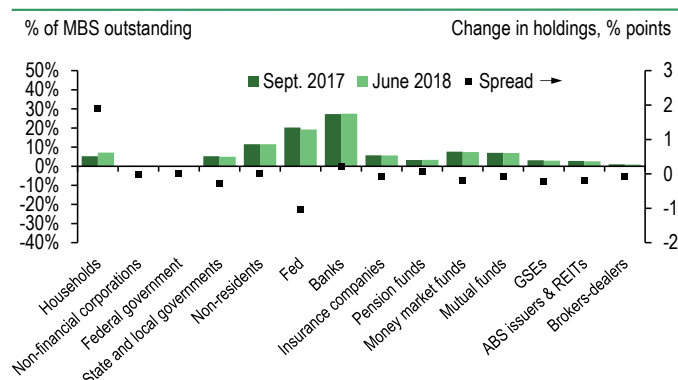


Chart 14

Sources: Federal Reserve, BNP Paribas

Adjustment strategies to the reduction in reserves

In the US, 36 domestic banking groups (24 US Bank Holding Companies and 12 US Intermediate Holding Companies of foreign banks³⁰), representing nearly 80% of bank assets, are currently subject to the LCR requirement (Box 2 p.18 and Table 2 p.19). Only those institutions subject to the full version of LCR publish the structure of their High-Quality Liquid Assets (HQLA) and the details of theoretical cash inflows and outflows (since the second quarter of 2017 for the eight G-SIBs and since the second quarter of 2018 for the rest).

³⁰ Since July 2016, foreign banks active in the US have been required to bring together all US subsidiaries within a single holding company when total consolidated assets of all subsidiaries exceed USD50 billion.

Institutions subject to the slimmed-down version of LCR will only report this information from the fourth quarter of 2018. The data available therefore does not allow a detailed analysis of the effect of a prolonged reduction in reserves at the central bank on liquidity at US banks. A few adjustment strategies have, however, emerged, notably the substitution of liquid securities for reserves (2.1) and the increasing use of financing from the Federal Home Loan Banks (2.2).

Preserving the stock of liquid assets

The expansion of portfolios of Treasuries and agency MBS has offset, to a degree, the reduced abundance of reserves.

The strong concentration and heterogeneous nature of liquid asset portfolios

The eight US G-SIBs currently hold 74% of the USD 3,100 billion of HQLA built up under the LCR requirement³¹. In the third quarter, their reserves with the central bank (which form part of Level 1 assets) represented 49% of reserves of all depository institutions with the Fed at end-September (55% of reserves in excess of required reserves), and 77% if we exclude branches of foreign banks (which are not subject to LCR on an individual basis). The range of Level 1 assets represented the bulk of HQLA (84% on average) but within this range, the respective weights of reserves and securities were fairly mixed (Chart 15). Similarly, for all banks subject to LCR, the structures of their HQLA was relatively diverse (Chart 16). The business profiles of the institutions in question, the more or less restrictive nature of capital requirements, the sensitivity to interest rate risk or indeed the level of risk tolerance are all possible explanations for this diversity (Ihrig, Kim, Kumbhat, Vojtech and Weinbach, 2017³²).

For the past year, the reduction in the Fed's balance sheet (and in so-called excess reserves) has been accompanied by a slight deterioration in the average LCR of the four biggest commercial banks (JP Morgan, Bank of America, Wells Fargo and Citigroup – Chart 17). In the last quarter, the rebuilding of their HQLA stocks other than reserves limited the fall in their ratios despite an increase in theoretical net cash outflows (Chart 18).

³¹ A figure cited by Randal Quarles in his speech (see note 8)

³² J. Ihrig, E. Kim, A. Kumbhat, C. Vojtech and G. Weinbach (2017), *How have banks been managing the composition of high-quality liquid assets?*, Finance and Economics Discussion Series, Divisions of Research & Statistics and Monetary Affairs, Federal Reserve Board.



HQLA structure of the 8 G-SIBs (at 30 Sept. 2018)

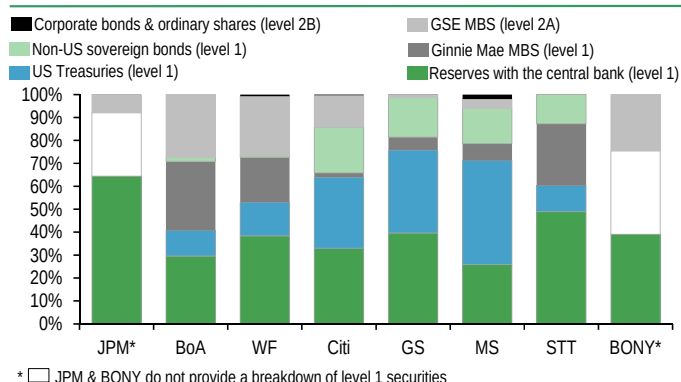


Chart 15 Sources: LCR disclosures, SEC 10-Q reports, BNP Paribas

Level 1 assets account for 80% of HQLA (at 30 Sept. 2018)

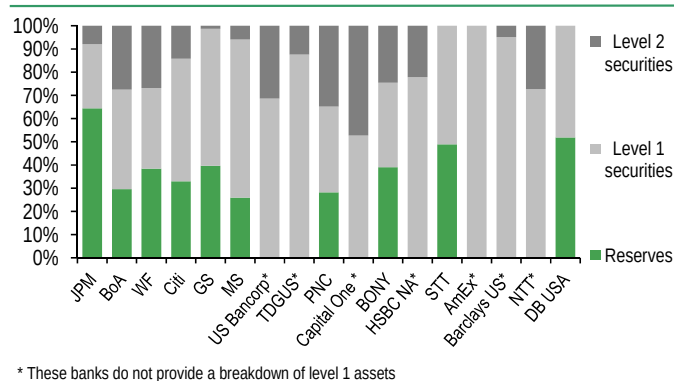


Chart 16 Sources: LCR disclosures, SEC 10-Q reports, BNP Paribas

Continued expansion of agency MBS portfolios

Given the lack of data over a longer period and for a greater number of banks, it is difficult to assess the impact of a prolonged reduction in reserves on the structure of HQLA portfolios. To a degree, Call Reports help fill this gap. In these reports, each institution indicates its deposits with the Fed and the structure of its securities portfolios, notably including its exposure to Treasuries and to MBS guaranteed by Ginnie Mae, Fannie Mae and Freddie Mac. However, this information gives only an approximate picture of HQLA as amongst these assets only reserves in excess of required reserves (in monetary policy terms) and only unencumbered securities (not used as collateral in refinancing transactions) are recorded as HQLA³³.

³³The weight of liquid assets on bank balance sheets indicated by these data is, however, very similar to the orders of magnitude discussed by Randal Quarles (see note 8).

Average LCR ratio for the 4 commercial G-SIBs

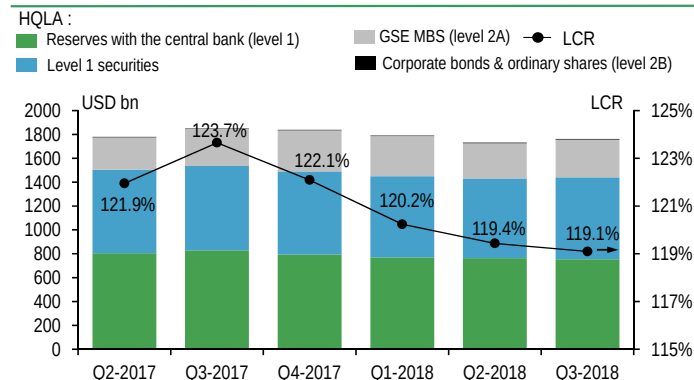


Chart 17 Sources: LCR disclosures, SEC 10-Q reports, BNP Paribas

Reconstitution of the HQLA of the 4 commercial G-SIBs

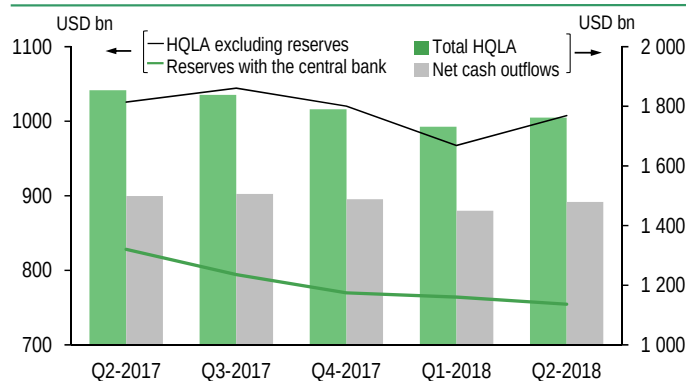


Chart 18 Sources: LCR disclosures, SEC 10-Q reports, BNP Paribas

The data show, in particular for the balance sheets of depository institutions with more than USD 10 billion of assets, an increase in central bank reserves between 2008 and 2015 (during the period of quantitative easing) followed by a contraction (reverse repo and reduction in the Fed's balance sheet – Chart 19). From the end of 2013, the prospect of the introduction of LCR into US regulations was accompanied by an expansion of portfolios of Treasuries on bank balance sheets³⁴. Whilst this phenomenon was common to all depository institutions with more than USD 10 billion in assets, it was particularly marked for those subject to LCR constraints on an individual basis (subsidiaries of banking groups subject to LCR). Since 2015, the reduction in central bank reserves seems to have been largely offset by increases in portfolios of agency MBS. This was particularly noticeable in the accounts of the main depository subsidiaries of Bank of America and Wells Fargo, where stocks of agency MBS increased by USD 92 billion and USD 141 billion respectively between end-2013 and

³⁴Against the background of falling yields, the valuation effect also came into play.



June 2018. Overall, the growth in stocks of liquid securities (Treasuries and agency MBS) has limited the effect of falling reserves (liquid assets represented 21% of bank assets in June 2018, from 23% in early 2015). This adjustment strategy may, however, prove to be less favourable if

the rise in long-term interest rates continues (as it will depress the value of securities held on bank balance sheets and thus the value of the stock of liquid assets).

Growth in portfolios of liquid assets

Reserves with the central bank (% of assets)

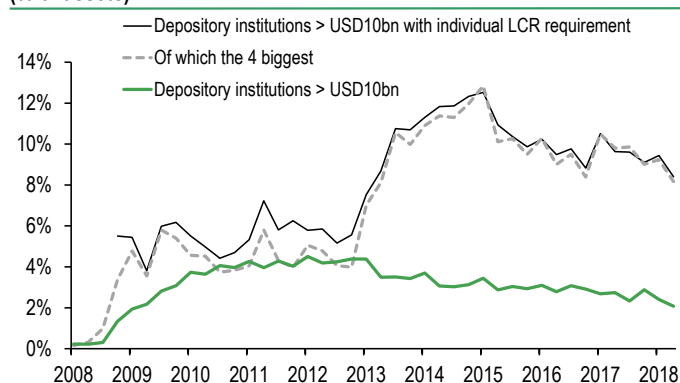


Chart 19a

Treasuries (% of assets)

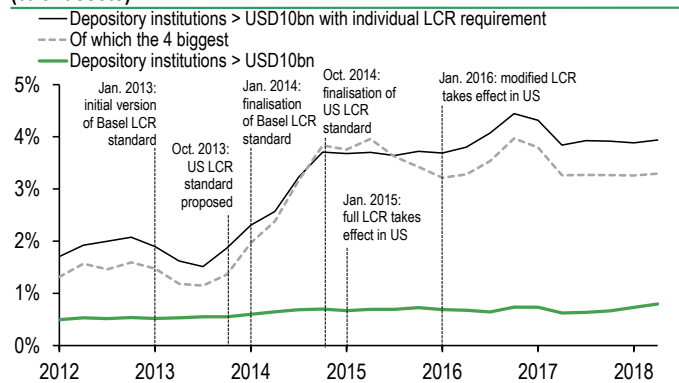


Chart 19b

MBS issued by the GSEs (% of assets)

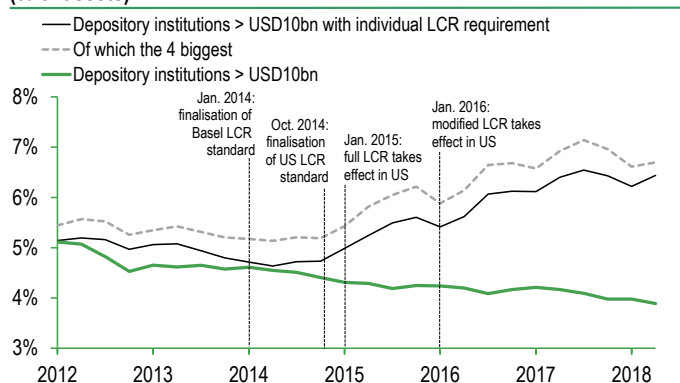


Chart 19c

MBS guaranteed by Ginnie Mae (% of assets)

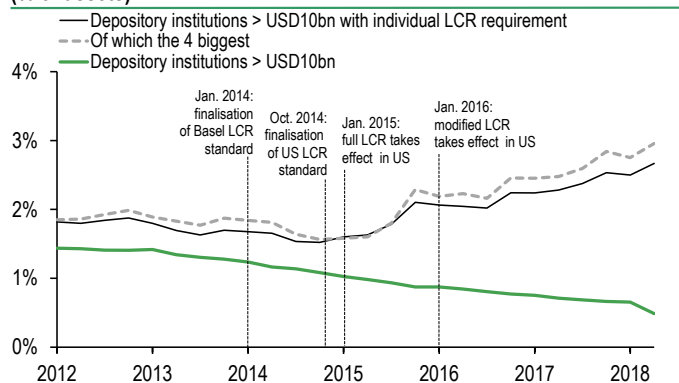


Chart 19d

Sources: Call reports (FFIEC 031), BNP Paribas

The sample of depository institutions with more than USD 10 billion in assets and subject to LCR constraints on an individual basis includes American Express Centurion Bank, Bank of America California NA, Bank of America NA, Barclays Bank Delaware, Capital One Bank NA, Capital One NA, Citibank NA, Deutsche Bank Trust Company Americas, Goldman Sachs Bank USA, HSBC Bank USA NA, JPMorgan Chase Bank NA, Morgan Stanley Bank NA, Morgan Stanley Private Bank NA, PNC Bank NA, State Street Bank and Trust Company, TD Bank USA NA, TD Bank NA, The Bank of New York Mellon, The Bank of New York Mellon Trust Company NA, The Northern Trust Company, U.S. Bank NA, Wells Fargo Bank NA. The four biggest institutions are Bank of America NA, Citibank NA, JPMorgan Chase Bank NA and Wells Fargo Bank NA.



Federal Home Loan Banks, coming to the rescue of banking liquidity

Whilst the approaches to adjusting to the reduction in reserves may have varied from one institution to the next, the growing support provided by the Federal Home Loan Banks (FHLBs) has been a common feature.

The FHLBs were created as part of the housing policies of the 1930s. The network consists of 11 credit cooperatives responsible for supporting the residential mortgage market financing through secured loans (advances) to their members (commercial banks, savings banks, insurance companies). The FHLBs are private companies owned by their members. As Government-Sponsored Enterprises they have the same status as Fannie Mae and Freddie Mac and hence benefit from the effective guarantee of the US Treasury (since the two big GSEs were placed under conservatorship in 2008). Since the financial crisis, the strengthening of their role with banks has coincided with the reform of money market funds in 2014 and the introduction of the LCR standard in 2015.

1st channel: secured loans

The reform of money market funds resulted in a massive reallocation of liquidity from prime funds, invested in private sector debt, to government funds, invested in public sector debt³⁵. The FHLBs benefited from an influx of resources at this time. In September 2018 money market funds financed 50% of their balance sheets (Chart 20), mainly at short term. Thus, although the transformation of maturities carried out by the FHLBs had been increasing steadily for several years, the reform of money market funds accelerated this trend (by shortening the maturity of their liabilities). At the end of September, 78% of FHLB debts were issued with a maturity of less than 1 year.

The FHLBs have largely used the resources raised to increase their lending to members (Chart 21), and in particular to US commercial banks. In September 2018, commercial banks accounted for 63.2% of advances made by the FHLBs³⁶. Such advances receive preferential regulatory treatment. Although they are backed by illiquid collateral (such as mortgage loans) these secured loans have a particularly low assumption of non-renewal under LCR (25% where residual maturity is less than 30 days, 0% otherwise) due to the 'quality' of the counterparty (by way of comparison, it is assumed that secured financing backed by non-HQLA assets, where the counterparty is neither the government

nor a GSE, will not be renewed). In other words the LCR calculation minimises the net cash outflows (denominator of the ratio) associated with FHLB advances, by assuming that banks will be in a position to renew 75% of their borrowing in the event of market stress.

Money market funds finance 50% of FHLBs' debt

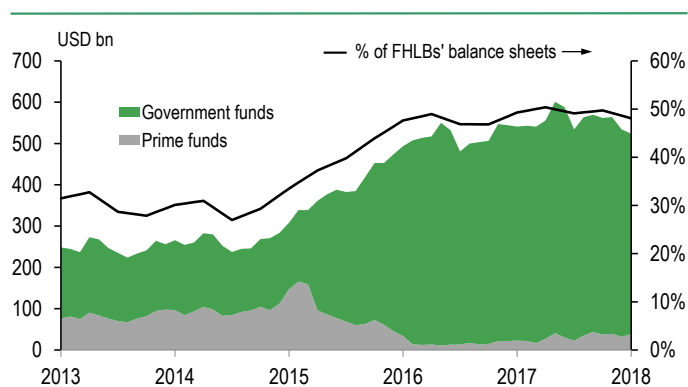


Chart 20

Sources: SEC, FHLB

Collateralised loans by FHLBs to members

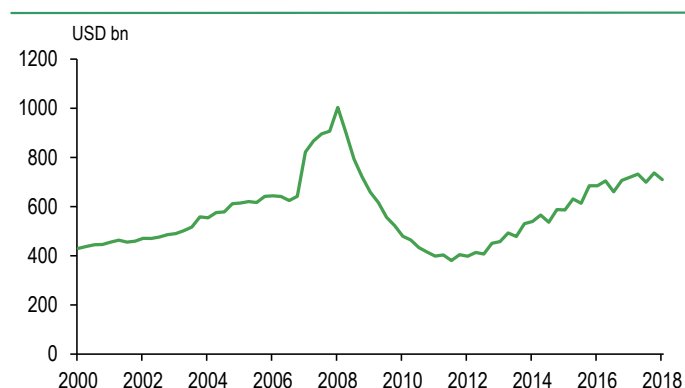


Chart 21

Source: Federal Reserve

However, this assumption runs contrary to the specific liquidity requirements for the FHLBs. The FHLBs are supposed to hold sufficient 'liquid' assets (short-term investments) to cope with two stress scenarios. Under the first, it is assumed that the FHLBs lose all access to capital markets for 5 days, but continue to renew maturing advances, except for the largest, best-rated members³⁷. In the second, the loss of market access is assumed to last for 15 days, but the FHLBs are assumed not to renew any of the maturing advances³⁸.

³⁵ See Note 26.

³⁶ Advances to the six big banks (Wells Fargo, JP Morgan, Bank of America, Citigroup, PNC Financials and Ally Financial) represented 26% of total outstanding advances in September 2018.

³⁷ See Regulatory Liquidity Requirements, page 38: http://www.fhlb-of.com/ofweb_userWeb/resources/2018Q3CFR.pdf

³⁸ In August 2018, the FHLB regulator recommended that their liquidity requirements be modified to bring them more into line with LCR. The new requirements may come into effect by the end of 2019.



Given the highly concentrated nature of the risks to which the FHLBs are exposed, the substantial maturity transformation that they conduct and the restrictive conditions surrounding their access to the effective federal guarantee³⁹ – and thus to government fund financing – the risk of a sudden interruption of access to secured FHLB lending to members should not be underestimated. For the biggest banks, which have access to other sources of financing, the consequences would come not so much in terms of refinancing but rather in greater difficulty in meeting the LCR constraint.

More recently, the FHLB contribution to the LCR of US banks has also come through two other channels: unsecured loans on the Fed Funds market, in the case of regional banks, and deposits in the case of the largest banks.

2nd channel: Fed Funds lending

For various reasons (abundant reserves, changes in the calculation method for the commission paid to the deposit guarantee fund, increase in the leverage requirement, levels of remuneration on surplus reserves set at the upper end of the range of Fed Funds rates, the penalty on interbank lending in the LCR calculation) loans between banks on the Fed Funds market have dwindled, disrupting the formation of effective interest rates. Recently, this market has been mainly a forum for the Federal Home Loan Banks⁴⁰ and US branches of foreign banks (due to access to dollars, attractiveness of the rates offered by the Fed on reserves, LCR requirements – Charts 22 and 23).

Lenders in the Fed funds market

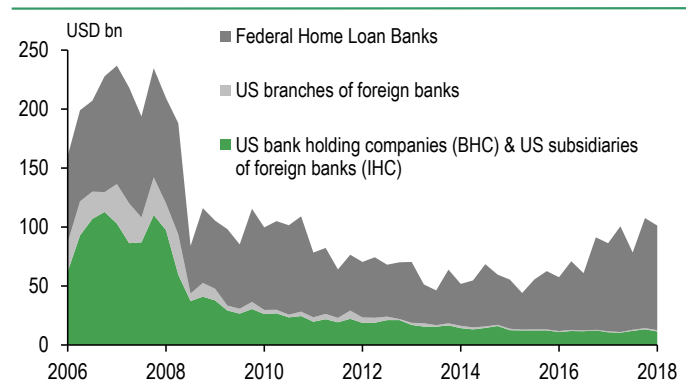


Chart 22 Sources: Federal Reserve, FRBNY, FHLB

³⁹ By contrast with Ginnie Mae, which enjoys an unconditional guarantee from the Federal government, the effective guarantee for the GSEs (Fannie Mae, Freddie Mac and the FHLB) is conditional on Fannie Mae and Freddie Mac remaining under conservatorship. See Note 12.

⁴⁰ FHLBs have an incentive to lend on this market as they do not earn interest on their deposits with the Fed and because the cash lent is typically returned early the next day, which allows them to meet the mid-day timing requirements of debt payment wires (unlike repo transactions which are often settled later in the day).

Borrowers in the Fed funds market

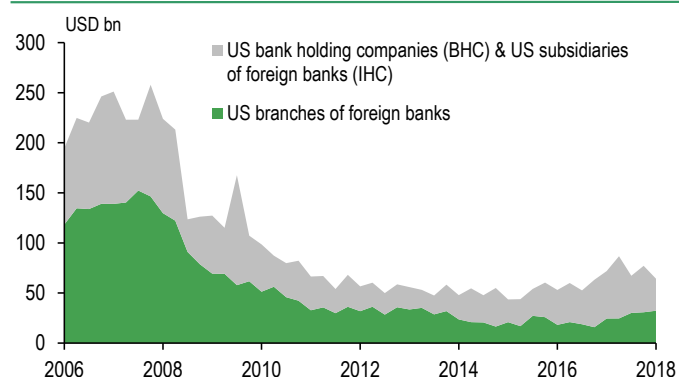


Chart 23 Sources: Federal Reserve, FRBNY

Since the end of 2017, US banks have nevertheless increased their borrowing on the Fed Funds market, a trend which has increased pressure on the effective Fed Funds rate (Chart 8). This is particularly true of certain major regional banks (Chart 24). Considered as deposits from the official sector, unsecured loans from the FHLB are not heavily penalised under LCR (the withdrawal rate for official sector deposits is set at 40% in the stress scenario) and allow banks automatically to boost their stock of reserves with the Fed (transfer of cash from the FHLB accounts with the Fed to those of banks).

The recent proposal by bank regulators could relieve most regional banks from the LCR constraint (with the exception of US Bancorp, where the constraint would just be relaxed) and thus reduce their demand for Fed Funds (Box 2). The proposal is, however, open for consultation until the end of January 2019, such that its application, once finalised, is unlikely before the final quarter of 2019 or perhaps early 2020⁴¹. Meanwhile, unless the Fed interrupts the process of normalising its balance sheet, the fall in reserves is likely to continue.

3rd channel: deposits

America's biggest banks, meanwhile, have not increased their Fed Funds borrowings, as these are not well suited to meeting their liquidity requirements (Pozsar, 2018⁴²). Lending in the Fed Funds market is overnight. The funds borrowed are generally repaid early next day (at 5.30am to 6.00am New York time) and trades renewed by noon. Although it thus releases liquidity for a few hours, Fed Fund borrowing can help LCR ratios, as these are calculated at the end of the day. However, this sort of borrowing does not meet the intraday liquidity

⁴¹ Regulators have not set out a precise time frame, but the EGRRC Act of May 2018 recommended delaying for 18 months after introduction any increase in the application threshold for enhanced prudential standards (including LCR) for banks with assets in excess of USD 100 billion.

⁴² Z. Pozsar (2018), *Fed funds and the market for intraday liquidity*, Global Money Notes #18, Economic Research Credit Suisse, October 2018.



needs of the biggest banks. The specific liquidity requirements of the resolution plans of the G-SIBs assume that maturity mismatches are minimised not on a daily but on an intraday basis. To meet this constraint, regulators recommend that G-SIBs hold a volume of liquid assets equivalent to the intraday peak of theoretical cash outflows⁴³.

Borrowing by the big regional banks in the Fed funds market

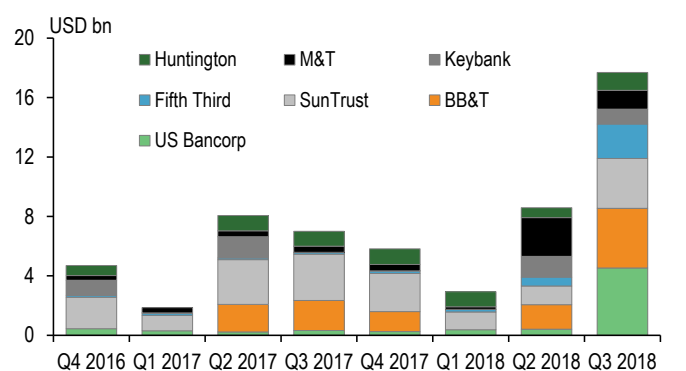


Chart 24

Sources: Call reports (FFIEC 031)

It appears that in effect, support from the FHLBs to liquidity at the biggest banks does not come only from advances, but also from their deposits with these big banks. Since the end of 2017, the FHLB's interest-bearing deposit accounts have expanded (Chart 25). The amounts deposited are not yet particularly large, and financial statements do not allow us to identify the banks with which the FHLBs have increased their deposits. The speed with which they have been built up since the third quarter of 2017 and the interest earned (which is above that for excess bank reserves with the Fed, see Chart 26) nevertheless suggest that they serve to help meet the liquidity constraints of the very large banks. Such deposits help satisfy their liquidity requirements (intraday and daily). However, in the event of a liquidity crisis it is likely that the FHLBs would draw down their deposits with banks, despite them being one of the resources considered as relatively stable by banking regulations. The growth in Fed Fund borrowing by regional banks and FHLB current accounts provide more than merely anecdotal evidence of the initial signs of pressure on liquidity.

⁴³The Fed and the FDIC published their recommendations for 2017 resolution plans in April 2016. Specific recommendations for the 8 G-SIBs were released in April 2018: <https://www.fdic.gov/news/news/press/2018/pr18040.pdf>. Certain major US banks then reported the more constrictive nature of these recommendations, relative to LCR, in the management of their liquidity: <https://bpi.com/rethinking-living-will-liquidity-requirements/>

Rebound in FHLBs' interest-bearing deposit accounts

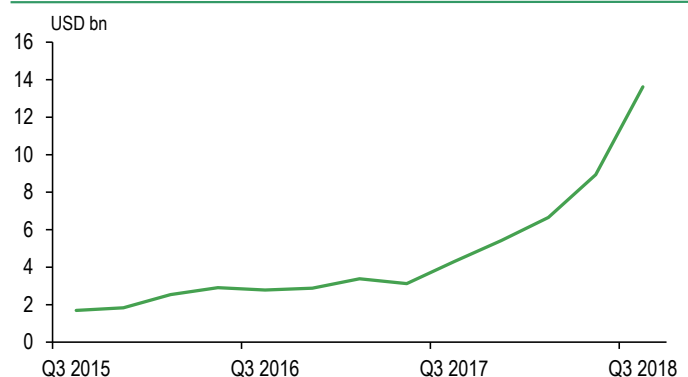


Chart 25

Source: FHLB

FHLBs' deposits: higher yields than on excess reserves

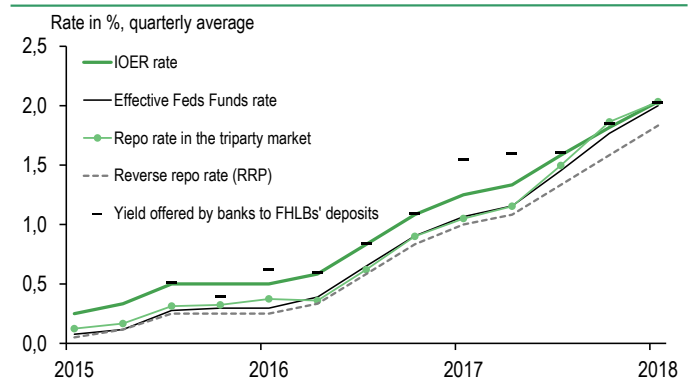


Chart 26

Sources: Macrobond, FHLB, BNP Paribas

In the spectrum of high-quality liquid assets, the liquidity provided by reserves with the central bank is unique. This is the sole liquid asset that does not need to be monetised (it is the money par excellence) and the only one with a constant value. Given the specific requirements applied to the biggest bank, there is little doubt that the Fed's balance sheet needs to be bigger than one might first imagine. Although the introduction of the LCR requirement sought to make the banking system less dependent on the central bank in times of crisis, it has paradoxically increased that dependence in normal times. Basel 3 shifted the paradigm. Over and above its well-known role as lender of last resort, the central bank is now taking on the mantle of lender of first resort (Quignon, 2013)⁴⁴. The notion of lender, borrowed from the economist Bagehot who developed the theory of "lender of last resort", should be understood in the broad sense of the term. One means of adapting it to US monetary policy would be to say that the central bank

⁴⁴ See Note 3.



will take on the role of the provider of liquidity of first resort (through ownership of large securities portfolios for example).

The US banks have so far been able to attenuate the effect of less abundant reserves on their LCR levels, but the first signs of pressure on liquidity appeared in the third quarter. This is reflected in the high interest rates on FHLB deposits with banks. In general terms, the preservation of liquidity ratios has hidden the greater use by banks of financing from Federal Home Loan Banks, which themselves are highly exposed to the risk of maturity transformation and highly dependent on money market funds.

According to Afonso, Armenter and Lester (2018)⁴⁵, who are a reference of US monetary authorities, the reduction in the Fed's balance sheet could theoretically put pressure on the Fed Funds rate without necessarily reflecting any shortage of aggregate reserves. This is the result of the very unequal distribution of excess reserves across the banking system. Based on data covering a very large sample of banks for the period 2015-2016, they estimate that below a level of excess reserves of around USD 850 billion, the Fed would be required to bring its balance sheet normalisation programme to an end, or redefine the target range for the effective rate⁴⁶.

However, we believe that the authors err in assessing bank liquidity needs using a narrow definition of excess reserves (those in excess of required reserves rather than liquidity requirements). As discussed earlier, this approach is no longer appropriate in the context of Basel 3. By overstating the point, we might even conclude, based on their estimates and the concentration of reserves (or more generally of liquid assets) on the balance sheets of the eight biggest US banks, that aggregate reserves are already insufficient. At the end of September 2018, aggregate reserves in excess of required reserves (USD 1,725 billion) less the reserves held just by the eight biggest banks for the purpose of their LCR requirements (USD 947 billion) stood at nearly USD 780 billion (or USD 890 billion if one considers the volume of reserves required for each of the G-SIBs satisfies an LCR of 115%). Maybe, in this new paradigm, the Fed's balance sheet has already reached its equilibrium level.

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Completed on 3 December 2018

⁴⁵ G. Afonso, R. Armenter and B. Lester (2018), *A model of the federal funds market: yesterday, today, and tomorrow*, FRBNY Staff Report n°840, February 2018.

⁴⁶ For the time being the IOER rate is 5 basis points below the top end of the range for Fed Funds rates.



The Liquidity Coverage Ratio

This Basel standard requires banks to hold sufficient unencumbered⁴⁷ high-quality liquid assets (HQLA, the numerator of the LCR) to cover the net outflows of cash over 30 days in the event of a liquidity crisis (denominator of the LCR). In the US, this requirement was finalised in September 2014 and phased in between January 2015 and January 2017.

The assets considered as the most liquid (those that can be converted into cash on private markets with very little or no loss of value) include reserves with the central bank and claims on, or guaranteed by, public issuers such as Treasury securities or agency securities. Treasuries are classified as Level 1 HQLA, and their value is not therefore discounted at all. Given that the GSEs (Fannie Mae, Freddie Mac and the Federal Home Loan Banks) have enjoyed an 'effective'⁴⁸ federal guarantee since they were placed under conservatorship, the debt securities and MBS they issue (excluding preferred securities) are included in the Level 2A group of liquid assets. A 15% discount is applied to these. Level 2B assets consist of corporate debt securities and eligible ordinary shares. A 50% discount is applied to these.

For the denominator of the LCR, the valuation of cumulative net outflows over 30 days is based on a cash flow scenario defined by the regulator. The cash outflows consist of a flight of deposits and the non-renewal of other short-term resources. Cash inflows consist of maturing debt and contractual interest due within 30 days on performing assets only. They are deducted from theoretical outflows within the limit of 75% of the latter. In other words, a bank must hold liquid assets representing at least 25% of expected cash outflows in a stress scenario. Net cash outflows correspond to the difference between cumulative outflows and inflows over 30 days increased by an add-on. This last item corresponds to the difference between the highest daily value of net cash outflows under the stress exercise and the value of cumulative net outflows on the thirtieth day of the stress period (neither figure may be less than zero). The introduction of the peak-day maturity mismatch add-on (over and above the Basel recommendations) aims to prevent any potential maturity mismatch between cash inflows and outflows (for example the risk of substantial outflows at the beginning of the exercise, with inflows coming later).

In general terms, the likelihood that a debt will be renewed increases (and therefore the likelihood of a cash outflow decreases) as a function of the quality of the counterparty and/or the collateral. The greater the assumed likelihood of non-renewal, the greater will be the associated outflows of cash. The rates of flight of stable retail deposits (3%) and operating deposits from clearing, custody and cash management businesses (25%) are lower than the withdrawal rates applied to so-called unsecured wholesale financing from other financial institutions (100%). It is assumed that financing guaranteed by Level 1 assets (for example a repo backed by Treasuries) will be renewed and will not result in cash outflows; the discount applied where a transaction is guaranteed by Level 2 assets (repo backed by GSE MBS) is 15% irrespective of the counterparty. The withdrawal rate applied to financing secured on assets that are neither Level 1 nor Level 2A (i.e. Level 2B assets or non-HQLA) where the counterparty is the government or a GSE (for example secured loans from FHLB to their members) is 25% where their residual maturity is less than 30 days and 0% in other cases. The non-renewal rate associated with financing secured on non-HQLA is 100%.

Since 1 January 2017, the ratio must be at least 100%, but the Federal Reserve encourages banks to aim for a ratio of 115%.

Box 1

⁴⁷ Not used as collateral or guarantee.

⁴⁸ Not to be confused with the 'explicit' and unconditional guarantee enjoyed by Treasuries and securities issued by federal agencies such as Ginnie Mae.



Limited scope of application

In the US, banking regulators elected to differentiate the application of prudential rules for both capital and liquidity mainly according to the size of the institutions⁴⁹. Only 17 banks have been subject to the full Basel LCR since 1 January 2015. These are the 13 US Bank Holding Companies (BHC) using the advanced approaches for risk measurement (with consolidated assets of more than USD 250 billion, an international exposure of more than USD 10 billion, or who have requested it) and the 4 US Intermediate Holding Companies (IHC) of foreign banks⁵⁰ (Table 2). The LCR requirement must be met on a consolidated basis by each of the 17 banking groups and by each of their depository subsidiaries with total consolidated assets of more than USD 10 billion⁵¹. The ratio must be calculated on a daily basis. US regulators also introduced a looser version of the LCR requirement (modified LCR)⁵². This has been in force since 1 January 2016 for the other US BHC with assets of more than USD 100 billion and other US IHC, subsidiaries of foreign banking groups, with consolidated assets of over USD 100 billion⁵³, for a total of 19 institutions (11 BHC and 8 IHC). The ratio is calculated on the last business day of each month. In all, 36 domestic US banks (24 BHC and 12 IHC), representing nearly 80% of total banking assets, are now covered by LCR requirements (Table 2).

At the end of October, regulators proposed two rules in order to fine-tune the application of prudential standards in the US, no longer based solely on the size of institutions but also according to other criteria for the assessment of risk (cross-jurisdictional activities, weighted short-term wholesale funding, non-bank assets and off balance sheet exposure). They suggest excusing from LCR those BHC with assets of less than USD 250 billion (11 BHC, with total assets of nearly USD 1,700 billion, would be excused in this way) and to scale back the LCR constraint (to 70% or 85%) for BHC not considered as G-SIBs whose assets exceed USD 250 billion⁵⁴ (4 BHC, with total assets of USD 1,500 billion, would benefit from this). These waivers or relaxations would not apply to IHCs of foreign banks of an equivalent size. The number of banks subject to a 100% LCR would be reduced to 13 (9 BHC and 4 IHC), the number of banks applying the more relaxed constraint to 12 (4 BHC and 8 IHC). The application of these proposals would reduce by USD 1,400 billion the scope of application of full LCR (or by USD 1,650 billion if one takes account of the fact that Charles Schwab would have been subject to the regulation from 2019). In all, 25 resident US banks (13 BHC and 12 IHC), representing nearly 70% of total banking assets, would continue to be covered by LCR requirements (Table 2).

The Federal Reserve estimates, all other things being equal, that the narrower scope of application for LCR will result in a total reduction in HQLA of between USD 54 billion and USD 77 billion (depending on whether the modified LCR requirement is set at 85% or 70%). This proposal would therefore only reduce the total volume of HQLA of banks subject to LCR by 2% to 2.5%.

Box 2

⁴⁹ In the European Union regulators have applied them to all credit institutions.

⁵⁰ These 4 IHC are subject to certain constraints imposed on banks applying the advanced approaches for risk measurement. They do not apply internal models for the calculation of risk-weighted assets, but they are subject to the tighter leverage requirement and to LCR in particular.

⁵¹ The banking group's total HQLA excludes the amount of HQLA in excess of each subsidiary's standalone LCR requirement that is not transferable to non-bank affiliates within the group.

⁵² The list of HQLA and stress assumptions are identical. However, the denominator of the modified LCR does not include the peak-day maturity mismatch add-on (see Box 1) and is multiplied by 0.7, which automatically reduces the requirement for liquid assets.

⁵³ The final rule of October 2014 introducing LCR requirements in the US (in its complete or modified version) would have covered all banks with more than USD 50 billion in assets. Since the passage of the Economic Growth, Regulatory Relief and Consumer Protection Act in May 2018, the US Bank Holding Companies with assets of less than USD 100 billion have been excused from the requirements of modified LCR. By contrast, IHC with less than USD 100 billion in assets (such as BBVA Compass Bancshares), subsidiaries of foreign groups with consolidated assets of more than USD 100 billion, did not benefit from this waiver.

⁵⁴ Or where recourse to short-term debt markets, non-banking activities or off balance sheet exposure exceeds USD 75 billion. Northern Trust will not benefit from these lower requirements as its cross-border activities exceed the threshold.



LCR: scope of application in the US

		Total assets USD billion (average over the 4 quarters to 30/09/2018)		LCR	modified LCR
1	JP Morgan	2,587.2	BHC	✓	
2	Bank of America	2,310.1	BHC	✓	
3	Wells Fargo	1,905.0	BHC	✓	
4	Citigroup	1,900.5	BHC	✓	
5	Goldman Sachs	954.0	BHC	✓	
6	Morgan Stanley	862.9	BHC	✓	
7	US Bancorp	462.0	BHC	✓	
8	TD Group US Holdings LLC	380.6	IHC (CAN)	✓	
9	PNC Financial	380.2	BHC	✓	
10	Capital One Financial Corporation	363.9	BHC	✓	
11	BONY	362.0	BHC	✓	
12	HSBC North America Holdings Inc.	280.4	IHC (UK)	✓	
13	Charles Schwab Corporation	256.4	BHC		✓
14	State Street	242.8	BHC	✓	
15	BB&T Corporation	222.0	BHC		✓
16	Suntrust Banks	207.4	BHC		✓
17	American Express Company	183.8	BHC	✓	
18	Ally Financial Inc.	170.4	BHC		✓
19	MUFG Americas Holdings Corporation	158.3	IHC (JAP)		✓
20	Barclays US LLC	158.0	IHC (UK)	✓	
21	Citizens Financial Group	155.0	BHC		✓
22	Fifth Third Bancorp	141.5	BHC		✓
23	BMO Financial Corp	141.1	IHC (CAN)		✓
24	BNP Paribas USA Inc.	140.2	IHC (FRA)		✓
25	UBS Americas Holdings LLC	138.8	IHC (SWI)		✓
26	Credit Suisse Holdings	138.5	IHC (SWI)		✓
27	Keycorp	137.8	BHC		✓
28	Northern Trust Corporation	133.9	BHC	✓	
29	RBC USA Holdco Corporation	131.2	IHC (UK)		✓
30	DB USA Corporation	130.5	IHC (GER)	✓	
31	Santander Holdings USA Inc.	129.8	IHC (SPA)		✓
32	Regions Financial Corporation	124.1	BHC		✓
33	M&T Bank Corporation	118.1	BHC		✓
34	Huntington Bancshares Inc.	104.9	BHC		✓
35	Discover Financial Services	102.7	BHC		✓
36	BBVA Compass Bancshares	88.4	IHC (SPA)		✓
Number of banks subject to LCR:					
Current rules (September 2014 and May 2018)				17	19
October 2018 proposals				13	12

BHC: Bank Holding Companies, IHC: Intermediate Holding Companies

Table 2

Sources: FFIEC, SNL, Federal Reserve, BNP Paribas



LCR ratios at 30 September 2018

USD billion	Level 1 assets					Level 2A assets	Level 2B assets	Liquid assets (HQLA)	Net cash outflows	LCR
	Central bank reserves	Treasury securities	Ginnie Mae MBS	Non-US sovereign debt	Total	GSE MBS	Corporate debt securities and ordinary shares			
JP Morgan	344.7		147.9		492.6	41.8	0.6	535.0	466.8	115%
BoA	130.0	49.0	132.6	6.9	318.5	121.0	0.0	439.5	365.9	120%
Wells Fargo	140.8	53.6	71.6	2.2	268.2	95.8	2.5	366.6	295.8	124%
Citigroup	138.9	130.5	7.8	84.2	361.3	58.2	1.3	420.8	350.8	120%
GS	67.6	61.7	9.6	29.5	168.4	2.0	0.1	170.6	133.1	128%
MS	49.0	85.6	14.0	29.3	177.9	7.4	3.7	189.0	139.5	135%
US Bancorp			60.9			27.8	0.0	88.7	81.7	109%
TD Group US			44.8			6.3	0.0	51.2	48.1	107%
PNC Financial	18.8		24.7		43.5	23.2	0.0	66.7	60.4	110%
Capital One			21.7			19.5	0.0	41.2	30.3	136%
BONY	45.6		42.4		88.0	28.6	0.0	116.6	96.6	121%
HSBC North America			35.7			10.1	0.0	45.8	37.3	123%
State Street	30.5	7.1	16.8	7.9	62.4	0.0	0.0	62.4	57.0	109%
AmEx			21.4			0.0	0.0	21.4	12.5	171%
Barclays US			15.7			0.8	0.0	16.5	11.9	138%
NTT			39.6			14.4	0.4	54.4	47.9	113%
DB USA	14.0		13.0		27.0	0.0	0.0	27.0	13.9	195%

Table 3

Sources: LCR disclosures, SEC 10-Q reports, BNP Paribas

QE's impact on balance sheets

Example 1: a commercial bank sells 100 units of securities to the central bank

Central bank				Commercial bank				Customer			
Asset		Liability		Asset		Liability		Asset		Liability	
Securities	+100	Bank reserves	+100	Reserves	+100						
				Securities	-100						
Balance sheet size: +100				Balance sheet size unchanged							

Example 2: a commercial bank acts as an intermediary for its client (which sells 100 units of securities to the central bank)

Central bank				Commercial bank				Customer			
Asset		Liability		Asset		Liability		Asset		Liability	
Securities	+100	Bank reserves	+100	Reserves	+100	Deposits	+100	Deposits	+100		
								Securities	-100		
Balance sheet size: +100				Balance sheet size: +100							

Figure 1

Impact on balance sheets of full renewal of Treasuries portfolio

Stage 1: 100 units of the Treasury debt securities portfolio held by the Fed mature

Stage 2: the Treasury issues 100 units of debt, the Fed renews its Treasuries portfolio

Central bank				Commercial bank				Treasury			
Asset		Liability		Asset		Liability		Asset		Liability	
Securities	-100	TGA	-100					TGA	-100	Debt	-100
Securities	+100	TGA	+100					TGA	+100	Debt	+100
Balance sheet size unchanged				Balance sheet size unchanged				Balance sheet size unchanged			

Figure 2



Impact on balance sheets of full reinvestment of MBS debt repayments

Stage 1: a household repays 100 units of its loan

Stage 2: a different household borrows a sum equivalent to the repaid debt; the bank sells the loan to the GSE

Stage 3: the GSE issues an MBS to which the Fed subscribes in its entirety

Central bank				Commercial bank			
Asset		Liability		Asset		Liability	
MBS	-100	Bank reserves	-100	Reserves	-100	Deposits	-100
MBS	+100	GSE reserves	+100	Loans	+100	Deposits	+100
		GSE reserves	-100	Loans	-100		
		Bank reserves	+100	Reserves	+100		
		GSE reserves	-100				
		GSE reserves	+100				
Balance sheet size unchanged				Balance sheet size unchanged			

GSE				Customer			
Asset		Liability		Asset		Liability	
Loans	-100	MBS	-100	Deposits	-100	Loans	-100
Reserves	+100	MBS	+100	Deposits	+100	Loans	+100
Reserves	-100						
Loans	+100						
Reserves	-100						
Reserves	+100						
Balance sheet size unchanged							

Figure 3

Impact on balance sheets of the Term Deposit Facility: conversion of reserves into term deposits

Central bank				Commercial bank			
Asset		Liability		Asset		Liability	
		Reserves	-100	Reserves	-100		
		Term deposits	+100	Term deposits	+100		
Balance sheet size unchanged				Balance sheet size unchanged			

Figure 4

Impact on balance sheets of the Reverse Repo Facility: conversion of reserves into repos

Example 1: Repurchase agreement between the central bank and the commercial bank

(the central bank puts 100 units of securities in pension with a commercial bank)

Central bank				Commercial bank				Customer			
Asset		Liability		Asset		Liability		Asset		Liability	
		Repo	+100	Repo	+100						
		Reserves	-100	Reserves	-100						
Balance sheet size unchanged				Balance sheet size unchanged							

Example 2: Repurchase agreement between the central bank and a money market fund

(a commercial bank acts as an intermediary for its client, which takes 100 units of securities on pension from the central bank)

Central bank				Commercial bank				Money market fund			
Asset		Liability		Asset		Liability		Asset		Liability	
		Repo	+100	Reserves	-100	Deposits	-100	Repo	+100		
		Reserves	-100					Deposits	-100		
Balance sheet size unchanged				Balance sheet size: -100							

Figure 5

Impact on balance sheets of the Foreign Reverse Repo Facility: conversion of reserves into repos

The central bank puts 100 units of securities in pension with a foreign central bank

Example 1: the central bank reduces its deposits with a resident commercial bank

Central bank		Commercial bank		Foreign Central Bank	
Asset	Liability	Asset	Liability	Asset	Liability
	Repo +100	Reserves -100	Deposits _F -100	Deposits _F -100	
	Reserves -100			Repo +100	
Balance sheet size unchanged		Balance sheet size: -100		Balance sheet size unchanged	

Example 2: the foreign central bank reduces its holdings of securities

Stage 1: the foreign central bank sells securities to a financial institution, increasing its deposits

Stage 2: it enters a repo agreement with the central bank

Central bank		Commercial bank	
Asset	Liability	Asset	Liability
	Repo +100	Reserves -100	Deposits _H -100
	Reserves -100		Deposits _F +100
			Deposits _F -100
Balance sheet size unchanged		Balance sheet size: -100	

Foreign Central Bank		Hedge fund	
Asset	Liability	Asset	Liability
Securities -100		Deposits _H -100	
Deposits _F +100		Securities +100	
Deposits _F -100			
Repo +100			
Balance sheet size unchanged		Balance sheet size unchanged	

Figure 6

Impact on balance sheets of partial reinvestment of Treasuries

Example 1: the bank subscribes to a Treasury issue on its own account

Stage 1: 100 units of the Treasury debt securities portfolio held by the Fed mature

Stage 2: the Treasury issues a debt security: the Fed reinvests part of the maturing debt in this issue, the balance is subscribed by a commercial bank

Central bank		Commercial bank		Treasury	
Asset	Liability	Asset	Liability	Asset	Liability
Securities -100	TGA -100	Reserves -30		TGA -100	Debt -100
Securities +70	TGA +100	Securities +30		TGA +100	Debt +100
	Reserves -30				
Balance sheet size: -30		Balance sheet size unchanged		Balance sheet size unchanged	

Example 2: the bank subscribes to a Treasury issue on behalf of a client

Stage 1: 100 units of the Treasury debt securities portfolio held by the Fed mature

Stage 2: the Treasury issues a debt security: the Fed reinvests part of the maturing debt in this issue, the balance is subscribed by a household

Central bank		Commercial bank	
Asset	Liability	Asset	Liability
Securities -100	TGA -100	Reserves -30	Deposits -30
Securities +70	TGA +100		
	Reserves -30		
Balance sheet size: -30		Balance sheet size: -30	

Treasury		Customer	
Asset	Liability	Asset	Liability
TGA -100	Debt -100	Securities +30	
TGA +100	Debt +100	Deposits -30	
Balance sheet size unchanged			

Figure 7

Impact on balance sheets of partial reinvestment of MBS debt repayments

Example 1: the bank subscribes to a GSE issue on its own account

Stage 1: a household repays 100 units of its loan

Stage 2: a different household borrows a sum equivalent to the repaid debt; the bank sells the loan to the GSE

Stage 3: the GSE issues an MBS to part of which the Fed subscribes; the balance is subscribed by a commercial bank

Central bank				Commercial bank			
Asset		Liability		Asset		Liability	
MBS	-100	Bank reserves	-100	Reserves	-100	Deposits	-100
MBS	+ 80	Bank reserves	+100	Loans	+100	Deposits	+100
		GSE reserves	-100	Loans	-100		
		GSE reserves	+ 80	Reserves	+100		
		Bank reserves	- 20	MBS	+ 20		
		GSE reserves	+ 20	Reserves	- 20		
Balance sheet size: -20				Balance sheet size unchanged			

GSE				Customer			
Asset		Liability		Asset		Liability	
Loans	-100	MBS	-100	Deposits	-100	Loans	-100
Loans	+100	MBS	+100	Deposits	+100	Loans	+100
GSE reserves	-100						
GSE reserves	+ 80						
GSE reserves	+ 20						
Balance sheet size unchanged							

Example 2: the bank subscribes to a GSE issue on behalf of a client

Stage 1: a household repays 100 units of its loan

Stage 2: a different household borrows a sum equivalent to the repaid debt; the bank sells the loan to the GSE

Stage 3: the GSE issues an MBS to part of which the Fed subscribes; the balance is subscribed by a household

Central bank				Commercial bank			
Asset		Liability		Asset		Liability	
MBS	-100	Bank reserves	-100	Reserves	-100	Deposits	-100
MBS	+ 80	Bank reserves	+100	Reserves	+100	Deposits	+100
		GSE reserves	-100	Reserves	- 20	Deposits	- 20
		GSE reserves	+100				
		Bank reserves	- 20				
Balance sheet size: -20				Balance sheet size: -20			

GSE				Customer			
Asset		Liability		Asset		Liability	
Loans	-100	MBS	-100	Deposits	-100	Loans	-100
Loans	+100	MBS	+100	Deposits	+100	Loans	+100
GSE reserves	-100			MBS	+20		
GSE reserves	+100			Deposits	-20		
Balance sheet size unchanged							

Figure 8



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