

## C INITIAL CONSIDERATIONS REGARDING A MACRO-PRUDENTIAL INSTRUMENT BASED ON THE NET STABLE FUNDING RATIO<sup>1</sup>

*The financial crisis led to a broad consensus among policy-makers and regulators that macro-prudential frameworks, in addition to micro-prudential policy, must be part of the solution to ensure the resilience of the financial system. The counter-cyclical capital buffer represents the first step in this direction taken by the Basel Committee on Banking Supervision. Regarding liquidity issues, two micro-prudential standards have been designed. The delegated act implementing the liquidity coverage ratio (LCR) at the European level has recently been adopted by the European Commission and the net stable funding ratio (NSFR) standard has just been finalised by the Basel Committee on Banking Supervision and was published on 31 October. After implementing these new standards, it will be necessary to monitor their impact on banks' behaviour, market liquidity, monetary policy and financial stability before considering introducing any additional instruments. At this stage, the need for a liquidity-based macro-prudential tool is in the early stages of identification and discussion. Therefore, this special feature aims to provide some initial technical considerations regarding the macro-prudential use of the NSFR. The discussion considers two broad perspectives. The first is the need for a counter-cyclical NSFR to complement the counter-cyclical capital buffer. While capital and liquidity standards pursue different objectives, the two can also be used in conjunction depending on the specific risk to financial stability being targeted. The second perspective regards the use of the NSFR as a stand-alone macro-prudential tool, together with its potential trigger mechanism and its use in the current low yield environment.*

### INTRODUCTION

The financial crisis highlighted the risks of unstable funding mixes and maturity mismatches on banks' balance sheets. As a result, a series of micro-prudential standards have been developed, aimed at strengthening the resilience of banks confronted with liquidity shocks. One of the two instruments adopted by the Basel Committee on Banking Supervision in December 2010, together with the liquidity coverage ratio (LCR), is the net stable funding ratio (NSFR).<sup>2</sup> The purpose of the NSFR is to ensure banks achieve a "stable funding profile" by limiting their excessive reliance on short-term wholesale funding relative to the liquidity risk characteristics of their assets and off-balance-sheet exposures (see Box C.1 for more detailed information on the composition of the NSFR). It supplements the LCR – which promotes banks' short-term resilience to severe idiosyncratic and market-wide liquidity stress – by reducing the funding risk of institutions over a longer-term horizon.

Micro-prudential policy applies the same standards across banks, regardless of the impact of an institution's failure on the financial system. Consequently, the micro-prudential approach assumes that the sources of risk are independent and exogenous to the collective behaviour of financial institutions. This shortcoming is addressed by the macro-prudential approach, which takes a systemic view rather than focusing on individual institutions. By considering both the systemic impact of financial institutions (the cross-sectional dimension) and the evolution of system-wide risk (the time dimension), the macro-prudential approach addresses the negative feedback loop that may emerge between the financial system and the real economy.

There has been significant progress in the design of macro-prudential tools, most notably the counter-cyclical capital buffer<sup>3</sup> and the additional capital requirements for systemically important

*The NSFR is intended to increase the resilience of banks confronted with liquidity shocks...*

*... but as a micro-prudential tool, it might not be sufficient*

1 Prepared by Andreea Bicu, Daniela Bunea and Michael Wedow.

2 Basel Committee on Banking Supervision, *Basel III: the Net Stable Funding Ratio*, 2014.

3 Basel Committee on Banking Supervision, *Basel III: A global regulatory framework for more resilient banks and banking systems*, 2011.

banks.<sup>4</sup> Both tools require banks to hold greater amounts of capital, either in particular states of the economy (credit boom) or, in the case of systemically important institutions, at all times. However, in its discussions, the European Systemic Risk Board (ESRB)<sup>5</sup> has highlighted that capital regulation may not be sufficient to limit systemic risk. Four sources of banking sector systemic risk have been identified: i) excessive credit growth and leverage; ii) excessive maturity mismatch and market illiquidity; iii) direct and indirect exposure concentrations; and iv) misaligned incentives with a view to reducing moral hazard. A combination of macro-prudential tools designed to address systemic risks posed by all of these four sources is hence needed.

Despite the significant progress made in understanding liquidity cycles, a framework that identifies systemic liquidity risks and guides the implementation of macro-prudential liquidity tools is still missing. Since the NSFR is by construction a micro-prudential tool, there is a debate regarding how the NSFR could be used as a macro-prudential instrument and, if necessary, how it should be modified for this purpose. The NSFR is a new liquidity metric and is yet to be implemented. Therefore, it must be kept in mind that a monitoring period for the ratio as well as more data and analysis are necessary in order to assess its practical use and shortcomings. While further adjustments to the NSFR may be premature at this stage, this special feature seeks to put forward some initial considerations regarding the potential use of the NSFR as a macro-prudential tool.

<sup>4</sup> Basel Committee on Banking Supervision, *Global systemically important banks: updated assessment methodology and the higher loss absorbency requirement*, 2013; Financial Stability Board, *2013 update of group of global systemically important banks (G-SIBs)*, 2013.

<sup>5</sup> European Systemic Risk Board, *Flagship report on macro-prudential policy in the banking sector*, 2014; European Systemic Risk Board, *The ESRB handbook on operationalising macro-prudential policy in the banking sector*, 2014.

## Box C.1

### WHAT IS THE NET STABLE FUNDING RATIO?

The purpose of the net stable funding ratio (NSFR), as a structural liquidity risk metric, is to reduce maturity mismatches between assets and liabilities over a one-year time horizon and, thereby, to reduce funding risk.

Under this standard, banks are required to hold a minimum amount of stable funding relative to the maturity/liquidity profile of their assets in order to limit their structural liquidity mismatch. It complements the liquidity coverage ratio (LCR) and is intended to limit the proportion of banks' less liquid assets, such as long-term loans with maturities of over one year that are funded by short-term funding of less than one year, or funding sources considered less reliable and stable. In addition, the NSFR is intended to encourage a better assessment of funding risk across all on- and off-balance-sheet items and, overall, to promote funding stability.

The NSFR measures the ratio between the available amount of stable funding (ASF) and the required amount of stable funding (RSF). The ASF consists of weighted liabilities reflecting their contractual maturity or expected behavioural stability. The RSF consists of assets weighted by factors to reflect their contractual maturity or their expected market liquidity. The weights for assets and liabilities range from 100% to 0%. The ASF is the portion of a bank's funding structure that is a reliable source of funding over a one-year time horizon, while the RSF is the portion of a bank's assets and off-balance-sheet exposures viewed as illiquid over a one-year horizon and should thus be backed by stable funding sources.

The design of the NSFR underwent some changes in January 2014 compared with its initial design proposed in December 2010. These changes included greater granular differentiation in terms of maturity and sought to reflect that the NSFR is a structural liquidity risk metric rather than a ratio calculated for stress scenarios. Overall, the revisions have made the tool more suited to detecting outlier banks with excessive maturity mismatches and thus fragile funding structures, as well as brought it more into line with the LCR in terms of the treatment of high-quality liquid assets. The final calibration of the NSFR was published in October 2014 and its implementation is foreseen for 2018.

### LIQUIDITY AS A COMPLEMENT TO OTHER PRUDENTIAL MEASURES

The primary objective of micro-prudential regulation is “the promotion of safety and soundness of banks and the banking system”.<sup>6</sup> The main regulatory standards which aim to fulfil this goal are based on capital and liquidity requirements. It is thus important to better understand the different objectives of and interactions between capital and liquidity requirements.

*Adequate buffers for both capital and liquidity are necessary*

Capital and liquidity holdings are both important for increasing the resilience of banks. However, the nature of the shocks that capital regulation helps mitigate is different from the types of shock that liquidity regulation helps mitigate. The purpose of capital regulation is to limit the risk of insolvency, given the loss-absorbing capacity of this form of funding. By contrast, liquidity rules are intended to limit the maturity mismatch between liabilities and assets and, as a result, minimise funding liquidity risk (i.e. the inability to settle payment obligations) and market liquidity risk (i.e. the inability to sell or use assets without a significant impact on prices). Insufficient balance sheet liquidity can also lead to cash-flow insolvency<sup>7</sup>, even if a bank is still considered solvent from a capital perspective.<sup>8</sup> Liquidity and solvency are closely interrelated. On the one hand, higher capital holdings reduce the need for liquidity buffers, all else being equal. Banks, however, still need to maintain adequate liquidity regardless of their capital levels since the two cannot perfectly substitute for one another. Therefore, strengthening capital buffers is not sufficient by itself to address liquidity risks affecting both sides of the balance sheet.<sup>9</sup> Moreover, even a highly rated bank can have difficulties accessing private sources of funding, as the recent financial crisis has shown.<sup>10</sup> Conversely, liquidity buffers can compensate to some extent for low capital levels and protect the bank when faced with a confidence shock. The importance of maintaining adequate capital *and* liquidity levels supports the need for liquidity standards to complement capital regulation.

*Interactions between liquidity and other regulatory measures should be taken into account*

According to the Bank of England,<sup>11</sup> there are a number of channels through which the newly introduced liquidity standards interact with a bank’s capital position and vice versa. For instance, higher levels of capital give confidence to depositors and investors to provide or roll over funding to banks. Alternatively, increasing the NSFR/LCR by replacing illiquid loans with liquid assets leads to an improvement in capital ratios by decreasing risk-weighted assets. In addition, building capital and NSFR buffers is likely to be less costly for the bank when done in parallel, since an improvement in the NSFR will be accompanied by an increase in the capital ratio and vice

6 See Basel Committee on Banking Supervision, *Core principles for effective banking supervision*, 2012.

7 Cash flow insolvency is defined as the inability of a bank to repay its debts when they become due.

8 Farag, M., Harland, D. and Nixon, D., “Bank capital and liquidity”, *Quarterly Bulletin*, Bank of England, 2013.

9 European Systemic Risk Board, *The ESRB handbook on operationalising macro-prudential policy in the banking sector*, op. cit.

10 See van Rixtel, A. and Gasperini, G., “Financial crises and bank funding: recent experience in the euro area”, *BIS Working Paper*, No 406, 2013.

11 Farag, M., Harland, D. and Nixon, D., op. cit.

versa.<sup>12</sup> Moreover, the cost of increasing the NSFR gradually declines when more capital is raised, highlighting the synergies between the two standards.

In sum, prudential regulation should ensure that banks have sufficient capital and liquidity in order to avoid disrupting their financial intermediation function. The optimal combination should minimise the probability of distress, while balancing the benefits and costs of holding liquidity and capital.<sup>13</sup>

### WHAT HAPPENS TO THE NSFR WHEN THE COUNTER-CYCLICAL CAPITAL BUFFER IS BUILT UP?

Against the background of the link between the liquidity and capital standards, this section explores the relationship between the counter-cyclical capital buffer and the NSFR. It is important to understand how the two standards interact when the counter-cyclical capital buffer is activated. The starting point of the analysis is a stylised bank balance sheet with an initial NSFR close to the weighted average of the banks assessed under the Basel Committee's Quantitative Impact Study (NSFR = 115%). Moreover, under all scenarios, the bank fulfils the minimum Basel III requirements for the risk-based capital and leverage ratios. The effect of implementing the full counter-cyclical capital buffer (2.5% of risk-weighted assets) on the NSFR for different starting bank capital ratios (8%, 9% and 10%) is considered. Under a first scenario, the bank maintains its entire existing capital buffer, even if it is above the minimum requirement. However, if the bank already has a capital buffer above the minimum requirement before the counter-cyclical capital buffer is built up, it could also choose to reduce this buffer to limit the potential impact on income and costs. Hence, the second scenario considers the case where the bank meets the higher minimum requirement by relying on the existing capital buffer. These two scenarios define a range for banks' decisions when capital ratios need to be adjusted.

In order to estimate the effect on the NSFR of the build-up of capital, two broad benchmark cases are assessed, as illustrated in Chart C.1: (1) portfolio rebalancing via a shift towards assets with lower risk weights; and (2) balance sheet expansion resulting from an increase in capital.

#### Case 1 – Portfolio rebalancing

As an alternative to raising new equity, the bank may choose to decrease its risk-weighted assets while keeping the total size of the balance sheet unchanged. Under this scenario, replacing riskier assets by less risky assets is also likely to improve the NSFR, given that less risky assets are typically also more liquid and may thus also result in a lower required amount of stable funding (RSF).

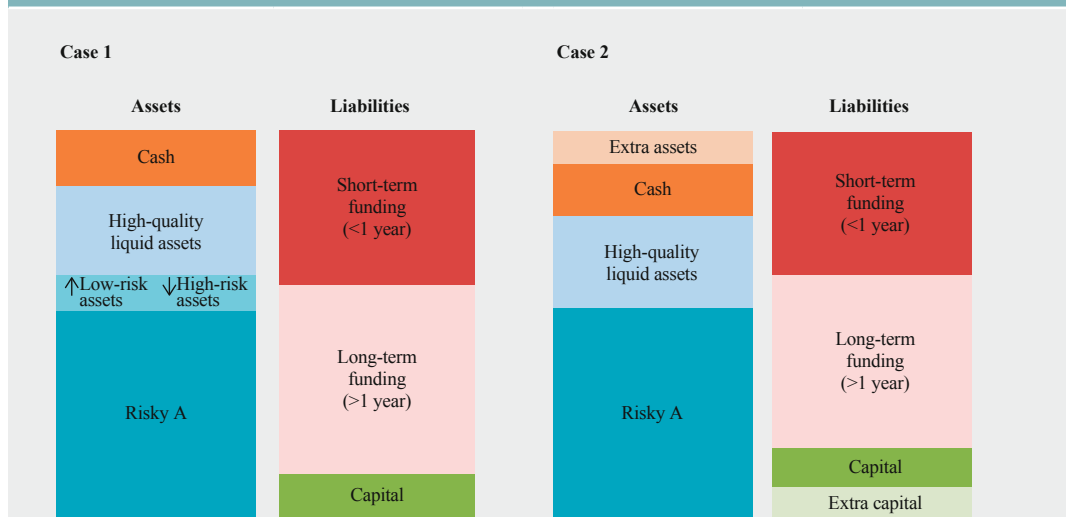
#### Case 2 – Balance sheet expansion

Under this scenario, the bank raises its capital ratio by issuing capital and/or retaining earnings, leading to an expansion of the balance sheet. Moreover, it is assumed that the bank invests the proceeds in assets requiring less regulatory capital. With regard to the NSFR, on the liability side, the increase in capital will lead to an improvement in the available amount of stable funding (ASF) of the same magnitude (100% factor). On the asset side, the investment will lead to a relatively smaller increase in the RSF for the majority of asset categories. As a consequence, the bank will see an improvement in its NSFR. The overall impact on the NSFR will be maximised by investing in assets with the lowest RSF, such as cash and sovereign bonds.

<sup>12</sup> See King, M.R., "Mapping capital and liquidity requirements to bank lending spreads", *BIS Working Paper*, No 324, 2010, and Basel Committee on Banking Supervision, *An assessment of the long-term economic impact of stronger capital and liquidity requirements*, 2010.

<sup>13</sup> There are potentially also further interactions between the NSFR and the possible requirements for "bail-inable" debt for resolution purposes. These interactions are not considered in this special feature given that the work on resolution requirements is still ongoing.

**Chart C.1 Possible strategies for meeting the counter-cyclical capital buffer requirement**



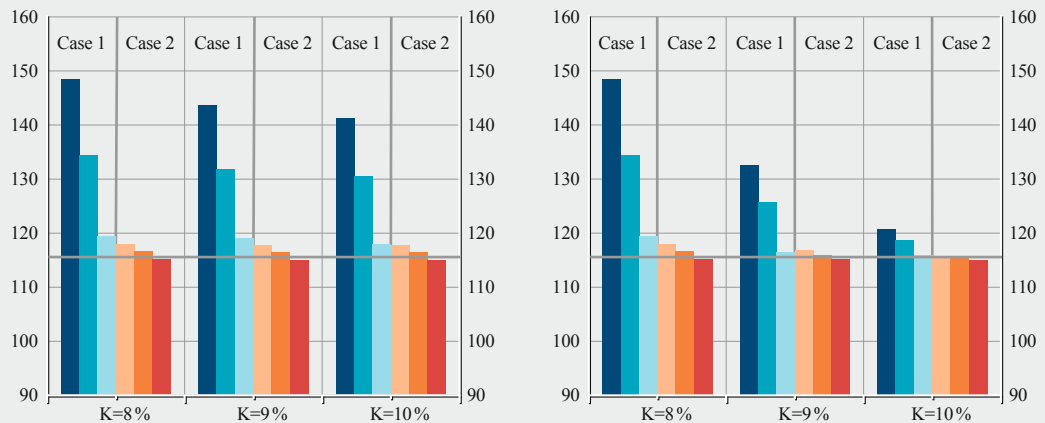
Note: The charts are used for illustrative purposes and are not based on actual balance sheet data used in the simulations.

*Implementing the counter-cyclical capital buffer can also improve NSFR levels...*

NSFR levels following the balance sheet adjustments described in the two cases above are computed for different initial levels of capital. Chart C.2 shows the results obtained from implementing the two strategies to different degrees in order to visualise the range of possible NSFR changes. The horizontal line represents the starting NSFR level and is included as a benchmark. The most significant improvement in the NSFR is obtained from a reduction in risk-weighted assets following a rebalancing of the portfolio (Case 1). Balance sheet expansions (Case 2) have a weaker effect on the NSFR. Note, however, that the bank may also experience a slight decline in its NSFR

**Chart C.2 Impact of the counter-cyclical capital buffer on the NSFR: maintaining a constant capital buffer (left) and including the existing capital buffer in the counter-cyclical capital buffer (right)**

(percentages)



Source: ECB calculations.

Notes: The vertical bars represent the NSFR following a range of balance sheet adjustments belonging to Case 1 (blue bars) or Case 2 (reddish orange bars) respectively. The capital level below each set of bars (labelled "K") indicates the starting risk-based capital ratio prior to activating the counter-cyclical capital buffer.

if it increases its holdings of assets with a very high RSF factor.<sup>14</sup> Overall, the simulations suggest an improvement in the NSFR as a result of implementing the counter-cyclical capital buffer. The rise in the NSFR is particularly pronounced for banks with low initial capital ratios which pursue adjustment strategies on the asset side and is largely muted for better capitalised banks.

Some caveats of our analysis should be noted. The mechanical scenarios do not take into account the potential offsetting behaviour of banks. Typically, a bank that follows one of the scenarios will try to offset the higher cost or the reduced income. Given that a bank cannot raise revenue by investing in riskier assets because of the impact on its risk-based capital ratio, it could compensate the increase in costs by shortening the term of its funding sources subject to any leeway obtained under the NSFR. Naturally, both cases are artificial in nature and banks typically use a combination of adjustments on both the asset and the liability sides. Moreover, given that the counter-cyclical capital buffer is likely to be implemented in buoyant times, raising capital appears the more likely scenario.

The analysis above has highlighted a positive relationship between the capital ratio and the NSFR, i.e. an increase in capital is also likely to increase the NSFR. This endogenous interaction can be desirable when there is a simultaneous need to build up resilience in terms of capital and the NSFR during a boom in the credit cycle. Under this assumption, macro-prudential policy could take this interaction between capital and the NSFR into account and, possibly, require a simultaneous build-up of an NSFR buffer. If, however, this is deemed unnecessary, banks should be allowed to flexibly use the additional stable funding resources. The subsequent section further discusses the potential use of the NSFR as a stand-alone macro-prudential instrument.

### LIQUIDITY AS AN INDEPENDENT MACRO-PRUDENTIAL MEASURE

In addition to micro-prudential rules, systemic liquidity risks need to be addressed by appropriately designed macro-prudential regulation. Systemic liquidity stress is defined by the ESRB as the failure of banks' normal funding channels, leading to the central bank intervening as the lender of last resort.<sup>15</sup> The recent crisis has highlighted that solvency regulation alone cannot fully address these risks and that macro-prudential liquidity instruments are necessary. The ESRB has identified the prevention of excessive maturity mismatch and market illiquidity as an intermediate macro-prudential objective.<sup>16</sup> Considering that the aim of the NSFR is to prevent such mismatches, a well-designed and targeted (possibly time-varying) ratio could therefore help mitigate systemic liquidity risks.<sup>17</sup>

Acharya et al.<sup>18</sup> discuss the counter-cyclical behaviour of liquidity in banks' asset holdings, i.e. it tends to be inefficiently low during the business cycle upturn and excessively high during downturns. During boom periods, this behaviour is supported by the ease of obtaining funding owing to banks' profitability as well as by a benign view on asset quality and liquidity, as reflected in the pledgeability of assets and low collateral haircuts. During downturns, by contrast, banks tend to have higher liquidity holdings as this acts as a form of insurance when facing uncertain liquidity withdrawals. Another reason is that they can then take advantage of fire sales if financial

*... however, banks may further adjust their balance sheets*

*NSFR adjustments may be necessary...*

*... considering the dynamics of banks' (asset) liquidity*

<sup>14</sup> The upper and lower bounds for the NSFR are obtained following very extreme balance sheet rebalancing and expansion strategies. The resulting interactions are hence relatively unlikely.

<sup>15</sup> European Systemic Risk Board, *The ESRB handbook on operationalising macro-prudential policy in the banking sector*, op. cit.

<sup>16</sup> *ibid.*

<sup>17</sup> The LCR supplements the NSFR by promoting the short-term resilience of banks to severe liquidity shocks. Owing to the NSFR's structural nature, the longer horizon it targets and the intermediate systemic risk objectives it addresses, this special feature focuses on the macro-prudential use of the NSFR. The potential use of the LCR as a macro-prudential tool is not discussed in this special feature.

<sup>18</sup> Acharya, V., Shin, H.S. and Yorulmazer, T., "Crisis resolution and bank liquidity", *The Review of Financial Studies*, Vol. 24, No 6, 2011, pp. 2166-2205.

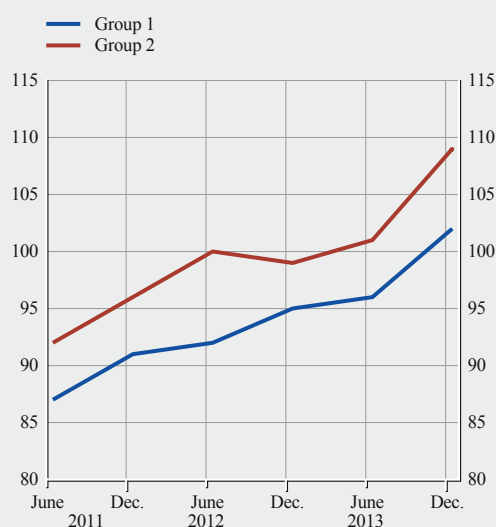
distress intensifies. From a financial stability perspective, this pattern raises a series of concerns. First, this counter-cyclical behaviour could support excessive credit growth during a boom and aggravate the economic downturn if banks hoard excessive liquidity during a bust. Second, the simultaneous large-scale sale of assets when financial distress intensifies leads to a vicious cycle of declining asset prices and losses on banks' balance sheets, possibly precipitating further sales. Since the magnitude of fire sales is directly related to the balance sheet liquidity of the overall system, the counter-cyclical behaviour of liquidity across many market participants reinforces systemic stress during downturns. In addition, banks with insufficient cash and cash-like holdings may want to avoid selling other (less liquid) assets at discounted prices when financial stress is escalating, and rather increase their demand for additional funding. A system-wide increase in the demand for liquidity can precipitate funding liquidity stress, leading to spikes in funding costs and a breakdown in markets. This market failure may subsequently make central bank liquidity interventions necessary. As vividly demonstrated during the financial crisis, if banks fail to adequately manage liquidity and funding risk, this creates significant systemic vulnerabilities and threatens financial stability. The recent crisis has highlighted that capital regulation alone cannot fully address such vulnerabilities and that both micro-prudential and macro-prudential liquidity standards and instruments are necessary.<sup>19</sup>

The liquidity dynamics highlighted above are likely to be muted by the implementation of the new minimum standards for liquidity. However, this counter-cyclical behaviour could potentially persist even after the introduction of the liquidity standard. This would, in turn, be reflected in the NSFR, leading to relatively low NSFRs during booms and rising NSFRs during stress periods. As highlighted in this special feature, building up the capital buffer may already help increase the level of the NSFR during a boom. Nevertheless, liquidity and funding risks fluctuate over time and may not be sufficiently reflected in the NSFR given the static factors applied in its calculation. If the NSFR and the counter-cyclical capital buffer prove to be insufficient for limiting these risks, there will be some grounds for considering an additional liquidity macro-prudential tool to help address pro-cyclical risk-taking behaviour and to increase the resilience of banks.

As regards real NSFR figures, EU banks have experienced a continuous improvement in their NSFR since 2011, mainly owing to readjustments in their balance sheets and changes in the calibration of the NSFR.<sup>20</sup> Chart C.3 illustrates the dynamics of the average NSFR for Group 1 and Group 2 banks<sup>21</sup> during the six quarters covered by the Basel III monitoring exercise. At this point in time, it is still premature to assess the existence and

**Chart C.3 NSFR levels for Group 1 and Group 2 EU banks**

(June 2011 – Dec. 2013; percentages, weighted averages)



Source: EBA Basel III monitoring exercise.

19 European Systemic Risk Board, *The ESRB handbook on operationalising macro-prudential policy in the banking sector*, op. cit.

20 European Banking Authority, *Basel III monitoring exercise*, September 2014.

21 The banks covered by the Basel III monitoring exercise are divided into two groups, with Group 1 made up of internationally active banks with Tier 1 capital of more than €3 billion and Group 2 representing all other banks.

magnitude of any cyclical behaviour in the NSFR. In December 2013, which is the latest date for which public figures are available, the weighted average NSFR was above 100% for both groups of EU banks, at 109% and 102% respectively.

Despite these relatively comfortable NSFR levels, some current risks to financial stability have been highlighted. More specifically, the search for yield has contributed to asset price misalignments, as highlighted in the Overview and Section 2 of this issue of the FSR. In the current environment of high funding liquidity but subdued credit and economic growth, the counter-cyclical capital buffer may not be fully adequate to mitigate this risk to financial stability. Given that the NSFR explicitly incorporates securities at market prices, analysis needs to be carried out to establish whether these fluctuations in the NSFR are beneficial from a macro-prudential perspective. Depending on the conclusions of this analysis, an exploration of the scope for using an additional liquidity tool to address this risk may thus be appropriate. An understanding of the elements most likely to affect the NSFR could help in designing the counter-cyclical features of this instrument. As a macro-prudential tool aimed at preventing the build-up of systemic risk, a well-designed buffer could impose prudence in activities where financial stress would create significant negative effects. This seems particularly warranted when the financial cycle and the liquidity cycle are disconnected and may help to overcome the “inaction bias”.

#### WHAT FORM COULD A COUNTER-CYCLICAL NSFR TAKE?

Imposing a *higher minimum threshold for the NSFR* when appropriate conditions are met would represent the most direct solution from an operational point of view. Similar to the counter-cyclical buffer, this would require the implementation of a trigger mechanism to signal when the NSFR minimum requirement is to be raised. While this is intuitively the most straightforward approach, it could have unintended consequences. For example, in the current environment, if banks increase their NSFR through even higher holdings of high-quality liquid assets, this could further aggravate asset price misalignments. A more targeted approach might therefore be warranted. In its current form, the NSFR relies on static RSF and ASF factors for assets and liabilities. Adjusting factors for particular asset classes, funding sources and/or sectors might therefore be preferable to imposing an overall higher NSFR requirement. Such an approach may, however, raise further complications in terms of implementation. Any deviation from internationally agreed standards should be subject to coordination and disclosure mechanisms across jurisdictions. Harmonisation is needed in order to ensure comparability and legal certainty within the Single Market.

With regard to assets, the RSF factors have been calibrated to reflect the need for stable funding sources. A possible avenue to address the risk of asset price misalignments could be to adjust the RSF factors upwards for those assets most affected, reflecting future risks of downward price adjustments, while leaving the overall minimum requirement of 100% unchanged. It should be noted that a rise in securities' prices would, *ceteris paribus*, already lead to a decline in the NSFR. Therefore, any change in the RSF factors would further dis-incentivise demand and reduce the upward pressure on prices. This may be warranted during times when easy access to funding more than compensates for any inflationary effect on the RSF. It should be noted that the factors currently applied, particularly for high-quality liquid assets, have already been set at relatively conservative levels. Securities and certain equities that have been included as high-quality liquid assets in the LCR also have lower funding requirements under the NSFR, given the view that they can be used quickly to obtain stable funding either by outright sales or by using them in secured operations.

*High NSFR levels may mask the build-up of risk*

*Banks could be required to maintain higher NSFR levels...*

*... or individual ASF/RSF factors could be adjusted*



Considering the overlaps, any adjustment in the RSF factors within the NSFR may thus also require further adjustments of the targeted assets included in the LCR. More generally, consistency across these two ratios may also be required in the broader context if either of the two ratios is used as a macro-prudential tool.

With regard to liabilities, a counter-cyclical NSFR could also be implemented by reducing *ASF factors* to reflect the (time-varying) stability of different funding sources. Revisions to ASF factors could be triggered by behavioural changes among depositors, by changes in the functioning of markets or if excessive reliance on certain funding sources emerges.

In the light of the discussion above, a set of trigger variables for the aggregate NSFR or for components of the ratio may be useful in the design of a counter-cyclical NSFR. This set of trigger variables could be based on volume and price-based indicators for liquidity risk. Cross-checking and combining information from multiple indicators may further improve accuracy when a warning signal is detected,<sup>22</sup> but may also further complicate the trigger mechanism.

In addition to the LCR and NSFR, the Basel Committee on Banking Supervision also proposes that banks should report a series of *additional liquidity monitoring metrics*.<sup>23</sup> These monitoring metrics may be particularly useful for identifying a systemic build-up of excessive funding risks. For example, the maturity ladder incorporates a broader set of maturity buckets going beyond the one-year horizon of the NSFR. Therefore, a counter-cyclical buffer could be activated when there is a build-up of maturing debt beyond the one-year horizon. This may be desirable when the maturity ladder across a wider part of the banking system indicates a future refinancing glut that could create strains in funding markets. By looking beyond a one-year horizon, mismatches could signal possible imbalances not yet captured by current NSFR levels. Regarding the monitoring metrics for the concentration of funding by counterparty/product, the NSFR could also target risk by reducing banks' over-reliance on specific liquidity providers and instruments rather than simply raising the minimum requirement. In this context, however, the NSFR would pursue structural rather than cyclical policy objectives. Moreover, other tools may be more effective at addressing some of these issues, such as the large exposure requirements. A number of important sectors could be monitored and, if a build-up of risk in a specific sector (e.g. mortgages) is detected, the factors assigned to assets or liabilities related to these sectors could be adjusted. Finally, there is also scope to apply the NSFR as a tool for detecting excessive mismatches in the currency composition of assets and liabilities. This could be implemented by setting currency-specific NSFR requirements. The build-up of currency mismatches between assets and liabilities captured by the liquidity monitoring metrics could therefore be addressed by currency-specific NSFR requirements.<sup>24</sup>

According to the ESRB,<sup>25</sup> simpler structural liquidity ratios such as the *loan-to-deposit ratio* and the *core funding ratio* are promising both in their role as indicators and as instruments addressing maturity mismatches and market illiquidity. The International Monetary Fund<sup>26</sup> finds that higher

22 European Systemic Risk Board, *The ESRB handbook on operationalising macro-prudential policy in the banking sector*, op. cit.

23 These metrics are: a maturity ladder, the concentration of funding by counterparty, the concentration of funding by product type, the concentration of counterbalancing capacity by issuer/counterparty, prices for various lengths of funding and the rollover of funding. See <http://www.bis.org/publ/bcbs238.pdf> for details.

24 Such an application would require taking into account banks' currency risk management, e.g. whether they hedge these risks with appropriate financial instruments.

25 European Systemic Risk Board, *The ESRB handbook on operationalising macro-prudential policy in the banking sector*, op. cit.

26 See International Monetary Fund, *Global financial stability report*, October 2013.

loan-to-deposit ratios are associated with greater bank distress,<sup>27</sup> both in advanced and emerging economies. Bologna<sup>28</sup> also investigates the predictive power of the loan-to-deposit ratio for bank failures and finds that high loan-to-deposit levels increase the likelihood of a bank failure occurring two to three years later. The level of loan-to-deposit ratios one year prior to a failure is, however, not statistically significant, a pattern also highlighted by Marino and Bennett,<sup>29</sup> who attribute this effect to a change in deposit composition and portfolio rebalancing at incipient signs of distress. Empirical research therefore suggests that the loan-to-deposit ratio is able to detect a build-up of risk with a substantial lead and it may thus be useful to include it in the design of the counter-cyclical NSFR as an early warning indicator. Moreover, considering the challenges associated with the operationalisation of a counter-cyclical NSFR, a time-varying loan-to-deposit ratio or core funding ratio may be easier to calibrate and implement.

The *liquidity mismatch index* proposed by Brunnermeier et al.<sup>30</sup> represents an alternative measure of mismatch between bank assets and liabilities.<sup>31</sup> It mirrors to some extent the NSFR design by assigning weights to balance sheet elements according to their ease of being sold (positive weights) as well as to the stability of funds and ease of rolling over debt (negative weights). Bai et al.<sup>32</sup> implement the liquidity mismatch index and connect the liquidity premium on issuing liabilities and, hence, the time-varying stability and ease of obtaining funding to the spread between overnight index swaps and Treasury bills. More negative weights, indicating an increase in the volatility of funding sources, are assigned across all maturities during periods when there is a significant widening in the spread. The rationale behind this is that if the liquidity stress episode is severe and, hence, possibly long lasting, the stability of funding, even with a term beyond one year, becomes uncertain. When compared with its static design, the liquidity mismatch index calculated using time-varying weights was thus better able to capture the build-up of mismatches before 2008 when applied to a large sample of US bank holding companies. While an aggregate liquidity mismatch index has potential as a monitoring tool and could be used in the design of a counter-cyclical NSFR, its appropriateness has not yet been explored in the context of the European banking sector.

As highlighted by Bai et al.,<sup>33</sup> the *spread between overnight index swaps and Treasury bills* contains important information regarding the stability of funding over the cycle. Moreover, the time-varying liability component is shown to be the main driving factor for liquidity mismatch dynamics. When spreads are compressed during boom periods, easing the access to funding, banks could be required to build up buffers since obtaining funding by issuing capital or liabilities can be achieved more easily and at lower cost. In a similar vein, Bloor et al.<sup>34</sup> consider *long-term funding costs* as a natural trigger for the counter-cyclical NSFR buffer. The NSFR incentivises banks' reliance on longer-term funding. Since the cost of accessing higher volumes of liquidity increases more steeply in long-term (less liquid) markets, meeting the requirement creates costs. This non-linear price-quantity relationship is further amplified in a crisis owing to high risk aversion and the drying-up of liquidity, especially at longer maturities. As a result, greater exposure to longer-term markets can lead to more adverse macroeconomic outcomes in the event of systemic market stress

27 A distressed bank is characterised by a low z-score, a low price-to-book ratio and a “sell” recommendation rating by bank equity analysts.

28 Bologna, P., “Structural funding and bank failures: Does Basel 3 net stable funding ratio target the right problem?”, *Journal of Financial Services Research*, September 2013.

29 Marino, J.A. and Bennett, R.L., “The consequences of national depositor preference”, *FDIC Banking Review*, Vol. 12, No 2, 1999, pp.19-38.

30 Brunnermeier, M., Gorton, G. and Krishnamurthy, A., “Liquidity mismatch measurement”, in Brunnermeier, M. and Krishnamurthy, A. (eds.), *Risk Topography: Systemic Risk and Macro Modelling*, NBER Books, 2014.

31  $LM^{\omega} = \sum_i \lambda_i^{\omega} A^i - \sum_j \lambda_j^{\omega} L^j$ , where  $\lambda_i^{\omega}/\lambda_j^{\omega}$  are weights applied to each asset and liability class  $i/j$  and are indexed by the state of the world  $\omega$ . The lower the index value, the higher the liquidity risk.

32 Bai, J., Krishnamurthy, A. and Weymuller, C.H., *Measuring liquidity mismatch in the banking sector*, 2013.

33 *ibid.*

34 Bloor, C., Craugie, R. and Munro, A., “The macroeconomic effects of a stable funding requirement”, *Discussion Paper Series*, DP2012/05, Reserve Bank of New Zealand, 2012.

and the pro-cyclical effect of funding spreads is amplified.<sup>35</sup> In periods of high funding liquidity and low long-term funding spreads, banks should thus be required to build up a buffer of long-term funding. Additionally, the buffer could be released during periods of stress to dampen adverse macroeconomic outcomes.

### BROADER CONSIDERATIONS REGARDING THE MACRO-PRUDENTIAL USE OF LIQUIDITY STANDARDS

The design of a counter-cyclical NSFR needs to take into account the possibility that the buffer, similarly to the LCR, can be used during periods of stress. There are two possible complementary options for the implementation of the counter-cyclical NSFR in this respect: requiring a positive add-on for the NSFR while keeping the 100% as a lower, binding constraint, or allowing the NSFR to drop below 100% when liquidity conditions deteriorate. To the extent that the market allows banks to fall below the minimum requirement of 100%, the added flexibility should be reflected in the build-up phase of a counter-cyclical NSFR. If a level below 100% is indeed tolerated by the market and a jump in the risk perception of the bank is not a constraining factor, a lower required add-on for the NSFR could be designed, limiting the negative effects of too stringent an upper bound. On the other hand, dropping below 100% could still be perceived negatively by the market, limiting access to funding and sharply increasing borrowing costs. The relationship between the demand for long-term funding and the associated costs could thus be reinforced when the market perceives a NSFR below 100% as a negative signal, especially during times of financial stress. Building an additional buffer during boom periods might therefore minimise the risk of liquidity shortages and reduce uncertainty. Moreover, considering that one aim of a higher requirement is to “lean against the wind” during a cyclical upswing, a high add-on might still be preferable, independently of the possibility to go below 100% during times of crisis.

*Liquidity regulation that is too stringent may have unintended consequences*

Well-designed macro-prudential tools should achieve maximum benefits with minimum costs. Additional changes to existing rules should be considered very carefully, taking into account that regulation that is too stringent might benefit other, less regulated parts of the financial sector and shift activity further towards the shadow banking sector. This would simply push the risks into these less regulated parts of the financial system and could even lead to an increase in systemic risk. On the other hand, the NSFR could contribute to the resilience of the financial system by dis-incentivising interlinkages between banks and non-bank financial institutions.

### CONCLUDING REMARKS

This special feature highlights some initial considerations on the design and use of a counter-cyclical NSFR. Interactions with the counter-cyclical capital buffer show a positive relationship between the two. The counter-cyclical behaviour of bank liquidity indicates that an increase in the NSFR during a boom would be beneficial from a financial stability perspective. Therefore, the special feature highlights that the improvement in the NSFR arising from this interaction could be preserved and, possibly, further built on. Additional analysis should thus be carried out to determine whether the new standards designed by the Basel Committee on Banking Supervision are sufficient to address the counter-cyclical behaviour of banks.

<sup>35</sup> The funding spread is the difference between long-term funding costs and the rollover of short-term funding. In good times, these spreads are compressed, while they increase in periods of stress. Costs of long-term funding may be further pushed upwards if demand is very high.

In designing the counter-cyclical features of the NSFR, various possible options have been highlighted. A higher minimum threshold would offer flexibility to banks in adjusting their balance sheet, while also being operationally easier to implement. On the other hand, a more targeted approach involving adjustments to individual ASF and RSF factors may be more appropriate if a build-up of risk in specific sectors or over different maturity horizons is detected.

Further work will be required to quantify the impact of the new Basel ratios after they are introduced. Second, the need for an additional instrument and its potential benefits and drawbacks have to be carefully assessed. Third, further work needs to be carried out on suitable trigger variables as well as on identifying appropriate buffer levels to be built up during upturns and released during downturns. Finally, it also remains to be analysed and discussed how other available macro-prudential instruments, such as the systemic risk buffer, might interact with a potential counter-cyclical NSFR, given the possible overlaps in the risk that these instruments address. The benefits of any mix of macro-prudential tools need to be assessed against the specific costs of implementation, including any distortions to the financial system or potential leakages.