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Construction and Evaluation of
an NSFR Proxy Using Publicly
Available Data

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Construction and Evaluation of an NSFR Proxy Using Publicly Available Data

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Abstract

We create a proxy for the Net Stable Funding Ratio (NSFR) using publicly available data from the FDIC’s Research Information System (RIS), in effect creating an offsite risk indicator that reflects both asset and funding liquidity. We construct the proxy for all banks for which we have data, including smaller banks that would not be subject to the NSFR, to allow for in-depth analysis of the NSFR as a risk metric. Banks that either failed before 2012 or participated in the FDIC’s Debt Guarantee Program (DGP) had lower proxy NSFRs on average than banks that did not, suggesting that the NSFR correlates with risk as intended. Our proxy NSFR allows us to examine the drivers for NSFR trends before the 2008 financial crisis and in various economic periods after the crisis, including during the COVID-19 pandemic. Our proxy shows that the share of domestic deposits in total funding for the banking industry increased immediately after the crisis, leading to a rise in aggregate net stable funding. In 2013, the net stable funding measures for larger banks started to diverge from those of smaller banks, as larger banks started managing their liquidity and funding stability in a manner distinct from that of other banks. This phenomenon is most pronounced for banks that are part of a banking organization with \$250 billion or more in total consolidated assets, which are more likely to be subject to NSFR regulations. Finally, our proxy shows the effect on NSFR of the recent increases in deposits and cash balances during the pandemic.

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I. Introduction

During the financial crisis that began in 2008, a sharp drop in housing prices and losses on mortgages and securities backed by mortgages triggered a liquidity crisis. The liquidity crisis and the accompanying recession resulted in numerous bank failures.¹ In response, the Basel Committee on Banking Supervision (BCBS) developed two regulatory standards designed to ensure that large and internationally active banks² maintain adequate liquidity: the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR).³ The LCR was designed to ensure that banks maintain enough high-quality liquid assets to withstand a liquidity stress event over a 30-day period. The NSFR was designed to address liquidity risk over a one-year time horizon by requiring banks to fund their activities with sufficiently stable sources of funding.

In 2016, U.S. federal banking agencies⁴ published a notice of proposed rulemaking (NPR) that outlined and requested public comment on a proposed NSFR standard.⁵ In 2019, the agencies issued a final tailoring rule that established categories of large banking organizations⁶ and proposed gradations of NSFR requirements across the categories.⁷ Since NSFR regulations had not yet been finalized when the final tailoring rule was issued, the tailoring rule did not subject any institutions to an NSFR requirement but instead specified the NSFR requirements that would apply to institutions in the different categories once a final NSFR rulemaking became effective. In 2021, the agencies finalized an NSFR rulemaking that applies an NSFR standard to large banking organizations subject to Category I, II, III, and IV capital standards and their depository institution subsidiaries (final NSFR rule).⁸

While the vast majority of depository institutions in the United States are not subject to any NSFR requirement, the NSFR is of independent interest as a liquidity and stable funding risk measure. Researchers have analyzed various versions of the NSFR and its efficacy as a risk measure for large banks. This paper builds on that literature in several ways. It introduces an NSFR proxy based on financial data reported by depository institutions on the FFIEC⁹ Consolidated Reports of Condition and Income (Call Reports). The NSFR proxy introduced in this paper is similar to Call Report-based NSFR proxies developed by other studies, including Hong et al. (2014) and DeYoung and Jang (2016). Compared with these earlier studies, the proxy used in this paper is based on more recent U.S. banking regulations as revised by the final NSFR rule and uses more recent data. It also expands on prior Call Report-based NSFR proxies to account for the maturity and encumbrance of assets and allow for comparisons of bank stable funding positions across periods of time when Call Report requirements changed. This paper uses the NSFR proxy to examine the relative liquidity profiles of failed banks and Debt Guarantee Program (DGP) participants from 2008 to 2012, to discuss how the liquidity risk profile of the banking industry changed after the 2008 financial crisis and to show how the stable funding profile of the banking industry evolved amid the pandemic.

Our NSFR proxy is in effect an offsite stable funding risk measure that rolls up considerable asset and liability data from quarterly Call Reports. We construct the proxy for insured banks because of superior data availability throughout the period of analysis relative to holding companies, and we view our insured bank results to be of independent interest.¹⁰ We calculate and analyze the performance of this offsite risk measure for all banks for which we have data, not only banks subject to the

¹ Federal Deposit Insurance Corporation (FDIC), 2017, *Crisis and Response: An FDIC History, 2008–2013*, Washington, DC: FDIC, p. xvi.

² For purposes of constructing and analyzing the NSFR proxy, this paper uses the term “bank” to refer to an FDIC-insured depository institution. However, the paper also uses the term “bank” to refer to any financial institution that is regulated by a U.S. federal banking agency or international equivalent.

³ See “Basel III: International Framework for Liquidity Risk Measurement, Standards and Monitoring,” December 2010, at <https://www.bis.org/publ/bcbs188.pdf>.

⁴ The Federal Reserve, the Office of the Comptroller of the Currency, and the Federal Deposit Insurance Corporation.

⁵ See 81 Fed. Reg. at 35124.

⁶ This paper uses the term “banking organizations” to refer to bank holding companies, foreign banking organizations, intermediate holding companies, savings and loan holding companies, and depository institutions, along with affiliates and subsidiaries of these organizations.

⁷ See 84 Fed. Reg. at 59230.

⁸ See 86 Fed. Reg. at 9120.

⁹ Federal Financial Institutions Examination Council. For more information about the FFIEC, including its purpose and its members, see <https://www.ffiec.gov/>.

¹⁰ The final NSFR rule applies both at the consolidated holding company level and at the level of large insured bank subsidiaries.

NSFR, which provides a larger dataset for analysis and a useful benchmark ratio for discussing changes in risk profiles across different bank size groups. It is important to clarify, however, that most banks with total assets below \$250 billion are not subject to the NSFR, and no plans exist to subject these banks to the NSFR. Neither the NSFR nor any proxy of it is used by the FDIC to assess the liquidity risk profile of small banks.

Our proxy NSFR can be a useful data tool for future research related to banking, funding stability, and default risk. Publicly available Call Report data can be used to quickly calculate the proxy NSFR and its components, including proxies for available and required stable funding. In Appendix C of this study, we decompose our proxy NSFR. This decomposition can be used to estimate how changes in individual assets and liabilities contribute to overall changes in funding stability.

While we calculate proxy NSFRs for every bank in our sample, we present our findings using an aggregated weighted average of the proxy NSFRs for banks within each of three author-defined categories: banks part of a banking organization with less than \$10 billion in total assets as of fourth quarter 2020 (small banks), banks part of a banking organization with \$10 billion to \$250 billion in total assets as of fourth quarter 2020 (midsize banks), and banks part of a banking organization with more than \$250 billion in total assets as of fourth quarter 2020 (large banks).¹¹

II. Prior Research

This paper builds upon prior academic research on the utility of the NSFR as a risk metric.

King (2013) used Bankscope data to estimate the NSFR, based on the BCBS (2010) definition, of a representative bank in 15 countries. He found that for banks with estimated NSFRs below 1.0, the strategies required to increase the NSFR to 1.0 (that is, holding more liquid assets, using more stable funding sources, or both) would reduce net interest margins 70 to 88 basis points on average.

Hong et al. (2014) constructed approximate measures of the LCR and the NSFR using Call Report data based on both the BCBS (2010) and BCBS (2014) definitions and found a negative relationship between the NSFR and bank failure and an insignificant relationship between the LCR and bank failure. Importantly, they find that idiosyncratic liquidity risk measures such as the NSFR and LCR were less effective than systemic risk measures in predicting bank failures in 2009 and 2010.

Bologna (2015) demonstrated empirically that the loan-to-deposit (LTD) ratio is a useful indicator of the probability of bank failure, and reasoned that the NSFR is an improvement over the LTD because the NSFR differentiates between stable and less-stable deposits.

Kang et al. (2017) examined data on South Korean banks and found that the NSFR performs better than the LTD ratio in ensuring the stability of bank funding because the NSFR recognizes that liquidity depends on the maturity and type of assets and liabilities.

Wei et al. (2017) found that NSFR regulations overcome the principal-agent problem between bank managers and stakeholders, leading to a socially efficient level of debt financing. Further, the authors found that the NSFR also reduces bank use of short-term funding and increases both ex ante profits and ex ante probabilities of survival for banks.

In a study on banks in Luxembourg, Giordana and Schumacher (2017) found that a higher NSFR decreases the average probability of default. The authors found that the effect of the NSFR on bank profits depends more on a bank's funding structure than on its asset composition.

¹¹ To determine the category of each bank, we calculate the four-quarter average of total assets, corrected for mergers, of the bank's global top tier parent institution, as reported by the National Information Center (<https://www.ffiec.gov/NPW>). If a bank ceased to exist before fourth quarter 2020, we use the total assets of the global top tier parent institution for that bank's final four quarters.

DeYoung and Jang (2016) constructed an approximate NSFR based on the BCBS (2014) definition for U.S. commercial banks using Call Report data. The authors found that, on average, banks actively managed their liquidity from 1992 through 2012 consistent with a traditional loan-to-core deposits ratio and the NSFR, which had not yet been introduced. They found that systemically important banks often managed their liquidity to lower standards than other banks and that these banks operated with liquidity levels lower than those recommended by the Basel III standards.

Hoerova et al. (2018) constructed approximate measures of the NSFR and LCR using data from the European Central Bank's (ECB) Individual Balance Sheet Items database. They found that full compliance with these measures as defined by BCBS (2014) would have reduced bank reliance on liquidity assistance during the global financial crisis of 2008 to 2009 and during the European sovereign debt crisis of 2011 to 2012, but would not have altogether eliminated the need for emergency liquidity assistance. They also found that liquidity regulations like the NSFR and LCR have modest effects on macroeconomic output relative to capital regulations.

Our paper builds upon the Call Report proxy framework introduced by Hong et al. (2014) and DeYoung and Jang (2016) in several ways. First, we consistently track Call Report line items across time and report form types using the FDIC's Research Information System (RIS) data warehouse, which includes Call Report data and derived variables. Prior NSFR proxies based on Call Report data use Call Report line items defined at a point a time, which may not appear in all periods or form types.¹² RIS also accounts for changes in regulations, such as an increase in the deposit insurance limit.¹³ Second, our methodology estimates the NSFR based on the updated definitions in the final NSFR rule in the United States rather than the NSFR as defined in BCBS (2010) and BCBS (2014). Finally, our methodology uses maturity and encumbrance data available on the Call Report to apportion balance sheet items to NSFR-relevant periods of maturity and encumbrance.¹⁴ These apportionments allow our proxy measure to capture an important dimension of stable funding risk and provide a vehicle to map changes in a bank's mean encumbrance (or maturity) to changes in its NSFR, as measured by the proxy.

Using our updated proxy for the NSFR, we extend the exercise conducted by Giordana and Schumacher (2017) that shows the relationship between NSFR and bank stress events. And we describe how changes in our NSFR proxy since the 2008 financial crisis appear to reflect the changing stable funding risk profile of the banking industry. Our research adds to the evidence that the NSFR as a risk metric is measuring what it is intended to measure.

III. How the NSFR Works

All versions of the NSFR rely on two key concepts. The first is available stable funding (ASF), which is intended to measure the portion of a banking organization's funding that is stable. For example, a bank funded by FDIC-insured retail transactional deposits and long-term borrowing would have high ASF. At the other extreme, an institution funded with overnight repurchase agreements would have low ASF.

The other key concept is required stable funding (RSF), which determines the amount of stable funding a banking organization needs based on its asset mix. A bank whose assets consist of unencumbered, liquid investments, for example, might be able to operate safely with lower levels of stable funding since it could more easily sell its assets for cash if other sources of funding were not available. Conversely, a bank with a large proportion of long-maturity, illiquid assets would require more stable funding sources since it could not easily convert its assets into cash if other funding becomes unavailable or prohibitively expensive.

¹² For example, cash and interest-bearing balances due from depository institutions are listed as line item RCON0071 in FFIEC Form 051 and as RCFD0071 on FFIEC Forms 031 and 041. Both are described by the RIS variable CHBALI.

¹³ For example, RIS variable NTRTMLGJ tracks time deposits over the deposit insurance limit, whether that limit is \$100,000 (1980 to 2008) or \$250,000 (2008 to present).

¹⁴ In constructing their NSFR proxies, Hong et al. (2014) and DeYoung and Jang (2016) assume all securities (and loans) are unencumbered.

Once these ASF and RSF amounts have been determined—in a manner we discuss shortly—the NSFR standard is that the ASF should be equal to or greater than a prescribed fraction of the RSF. As originally published by the BCBS, the standard would be that ASF should be equal to or greater than 100 percent of RSF. Defining the NSFR as the ratio of ASF to RSF, the minimum requirement would be an NSFR of one (or, expressed in different units, 100 percent). The final NSFR rule requires an NSFR of at least 100 percent for institutions subject to the Category I and II capital standards, those subject to Category III capital standards that have at least \$75 billion in average weighted short-term wholesale funding, and the depository institution subsidiaries of these institutions with at least \$10 billion in consolidated assets. Other institutions subject to Category III standards, along with their depository institution subsidiaries with at least \$10 billion in consolidated assets, are required to maintain an NSFR of 85 percent. Institutions subject to Category IV standards with at least \$50 billion in average weighted short-term wholesale funding are required to maintain an NSFR of at least 70 percent, while other institutions subject to the Category IV standards are not subject to an NSFR requirement. No depository institution subsidiaries of institutions subject to Category IV standards are subject to an NSFR requirement.¹⁵

To implement the NSFR, the concepts of ASF and RSF need to be operationalized. The ASF and RSF are generally weighted sums of balance sheet items, where the weights are based on certain liquidity characteristics of the balance sheet item. These characteristics include asset maturity and encumbrance, the marketability of assets, the sources and maturity of funding, and the size and type of off-balance sheet commitments.

A. Available Stable Funding

The ASF is calculated by applying ASF factors to each funding source. Higher ASF factors represent greater stability of that funding source (for example, longer-term borrowing) and thus increase the NSFR, while lower ASF factors (for example, shorter-term borrowing and repurchase agreements) represent relatively unstable funding sources and hence decrease the NSFR. Table 1 shows the ASF factor weights that the final NSFR rule assigns to various funding sources.¹⁶

Table 1	
The Final NSFR Rule Assigns Higher Available Stable Funding (ASF) Factors to Longer Term Liabilities and Deposits That Are Fully Insured by the FDIC	
ASF Factor	Description
100%	<ul style="list-style-type: none"> • Regulatory capital elements • Liabilities that mature one year or more from the calculation date
95%	<ul style="list-style-type: none"> • Affiliated sweep deposits • FDIC-insured retail deposits
90%	<ul style="list-style-type: none"> • Retail deposits not fully insured or insured under non-FDIC regimes • Fully insured brokered deposits^a • Brokered deposits^a with a remaining maturity of one year or more • Partially insured sweep deposits
50%	<ul style="list-style-type: none"> • Loans from nonfinancial sector entities that mature in less than one year • Loans from financial sector entities that mature in six months or more but less than one year • Securities issued with a remaining maturity of six months or more but less than one year • Operational deposits • Brokered deposits^a with remaining maturity of six months or more but less than one year • Brokered deposits^a that are not fully insured • All other liabilities with remaining maturity of six months or more but less than one year • Nondeposit retail funding

¹⁵ See 86 Fed. Reg. at 9128–9131.

¹⁶ For complete details, see 86 Fed. Reg. at 9141–9152.

ASF Factor	Description
0%	<ul style="list-style-type: none"> • Trade date payables • Brokered deposits^a with remaining maturity of less than six months • Loans from financial sector entities that mature in less than six months • Securities issued by a covered company with a remaining maturity of less than six months • Total derivatives assets minus total derivatives liabilities, if negative • All other liabilities with remaining maturity of less than six months, or that have open maturity
Source: 86 Fed. Reg. at 9120.	
^a The final Net Stable Funding Ratio rule groups brokered deposits into sweep deposits, reciprocal deposits, and all other brokered deposits. We use the term brokered deposits when referring to all other brokered deposits.	

Table 1 shows that the final NSFR rule typically treats funding sources as highly stable if they are provided by retail customers or counterparties, covered by deposit insurance, mature in more than one year, or have some combination of those features. The rule assigns lower ASF weights to shorter-term, uninsured funding sources. Funding from financial sector entities is typically assigned a lower ASF weight than funding from other types of customers and counterparties.¹⁷ Funding that matures in less than six months is treated as less stable than funding that matures over a longer period.

B. Required Stable Funding

The RSF is calculated by applying RSF factors to each class of assets to represent the relative liquidity of those assets. A higher RSF factor represents more illiquid assets (for example, long-term loans or complex structured investment products). Because the RSF is in the denominator of the NSFR, a higher RSF factor will, all else equal, decrease the NSFR. A lower RSF factor represents higher liquidity of assets (for example, cash or government securities) and, all else equal, increases the NSFR. Table 2 shows the RSF factor weights that the final NSFR rule assigns to various categories of assets. Assets are assigned higher RSF weights if they mature in more than one year, if the assets are past due by 90 days or more or in nonaccrual status, and if they are encumbered (that is, pledged as collateral), since those characteristics make an asset more difficult to sell.¹⁸

Table 2	
The Final NSFR Rule Assigns Lower Required Stable Funding (RSF) Factors to Shorter-Maturity Assets and Assets That Are Unencumbered and Fully Performing	
RSF Factor	Description
0%	<ul style="list-style-type: none"> • Currency and coin, including cash items in the process of collection • Reserve Bank balances or claims on Reserve Banks that mature in less than six months • Claims on foreign central banks that mature in less than six months • Trade date receivables • Any other level 1 liquid asset^a • Loans to financial sector entities that mature within six months and are secured by rehypothecatable level 1 liquid assets
5%	<ul style="list-style-type: none"> • Undrawn amount of committed credit and liquidity facilities provided to customers and counterparties
15%	<ul style="list-style-type: none"> • Level 2A liquid assets^b • Loans to financial sector entities that mature within six months and are not secured by rehypothecatable level 1 liquid assets

¹⁷ “Financial sector entities” are defined in the LCR final rule as “regulated financial companies, investment companies, non-regulated funds, pension funds, investment advisers, or a consolidated subsidiary of the foregoing.” See 79 Fed. Reg. at 6145.

¹⁸ See 86 Fed. Reg. at 9152–9189.

RSF Factor	Description
50%	<ul style="list-style-type: none"> • Level 2B liquid assets^c • Loans to financial sector entities that mature in six months or more but less than one year • Operational deposits held at financial sector entities • Assets with RSF weights of 0 percent to 15 percent encumbered for six months or more but less than one year • Lending to nonfinancial sector entities that matures in less than one year • All other assets that mature in less than one year
65%	<ul style="list-style-type: none"> • Retail mortgages that mature in one year or more, are assigned a risk weight of no greater than 50 percent, and are not 90 days or more past due or in nonaccrual status • Loans to nonfinancial sector entities that mature in one year or more and are assigned a risk weight of no greater than 20 percent
85%	<ul style="list-style-type: none"> • Retail mortgages that mature in one year or more, are assigned a risk weight of greater than 50 percent, and are not 90 days or more past due or in nonaccrual status • Loans to nonfinancial sector entities that mature in one year or more and are assigned a risk weight of greater than 20 percent • Publicly traded common equity shares that are not high-quality liquid assets • Securities, other than publicly traded common equity shares, that mature in one year or more, and are not high quality liquid assets • Commodities for which an active exchange-traded derivatives market exists • The fair value of a bank's contribution to a central counterparty's mutualized loss sharing agreement • The fair value of initial margin provided by the bank for derivatives transactions^d
100%	<ul style="list-style-type: none"> • Loans to financial sector entities that mature in one year or more • Any other unencumbered and performing asset not described above • Assets 90 days or more past due or in nonaccrual status • Assets encumbered for one year or more • Total derivatives assets minus total derivatives liabilities, if positive • 5 percent of total derivatives liabilities

Source: FDIC.

Note: Assets can receive an RSF weight of 0 percent, 5 percent, 10 percent, or 15 percent only if they are unencumbered or encumbered for less than six months, and if they are not past due by 90 days or more or in nonaccrual status. Assets can receive an RSF weight of 50 percent, 65 percent, or 85 percent only if they are unencumbered or encumbered for less than one year and are not past due by 90 days or more or in nonaccrual status. Assets encumbered for less than six months are treated as unencumbered to calculate the Net Stable Funding Ratio (NSFR) and Research Information System-NSFR. Assets encumbered for more than six months but less than one year receive an RSF weight that is the greater of 50 percent or the weight they would receive if they were not encumbered.

^a Level 1 liquid assets are defined in the Liquidity Coverage Ratio (LCR) final rule to include Federal Reserve Bank balances, foreign withdrawable reserves, U.S. government securities, certain sovereign and multilateral organization securities, and certain foreign sovereign debt securities. See 79 FR at 61455–61457.

^b Level 2A liquid assets are defined in the LCR final rule to include U.S. government-sponsored enterprise (GSE) securities and certain sovereign and multilateral organization securities. See 79 FR at 61457–61459.

^c Level 2B liquid assets are defined in the LCR final rule to include corporate debt securities and publicly traded shares of common stock. See 79 FR at 61459 – 61462. A 2019 rule amended the LCR rule to include investment-grade municipal obligations in Level 2B liquid assets. See 84 FR at 25975.

^d Initial margin is assigned an RSF factor that is the greater of 85 percent or the RSF factor assigned to the asset comprising the initial margin.

RSF factors are associated with the amount of time until the asset matures, the quality of the asset (i.e., whether contractual payment obligations have been made), and customer or counterparty type. For example, covered institutions generally need to maintain less stable funding to support loans to financial sector entities since, as stated in the preamble to the final rule, choosing not to roll over a loan to a financial sector entity creates less business and reputational risk than choosing not to roll over a loan to a different type of customer or counterparty.¹⁹ Off-balance sheet commitments can also increase required stable funding.

Like risk weights in capital calculations, the ASF and RSF factors may provide incentives to hold or use some assets and liabilities rather than others. For example, if a bank needed to increase its NSFR, management may have incentives to increase the relative amount of assets with low RSF factors and decrease the relative amount of assets with high RSF factors.

IV. How the RIS-NSFR Proxy Works

Calculating the NSFR of an institution requires asset and liability data that are disaggregated by counterparties, maturities, and encumbrances. Such data are not publicly available. Following the methodology introduced by Hong et al. (2014) and DeYoung and Jang (2016), we construct a weighted ratio of equity, liabilities, and assets based on public data. The ratio is intended as a proxy for the NSFR as it is defined in the final NSFR rule.

The proxy uses quarterly Call Report data reported by FDIC-insured institutions (henceforth, banks), as processed and stored in the RIS data warehouse. RIS assigns Call Report line items to standardized variables so that the line items are comparable across time and Call Report form. For example, the RIS variable NTRTMLGJ always represents a bank's "time deposits over the standard insurance limit held in domestic offices," whether the underlying data are from Call Report form 031, 041, or 051 and whether the deposit insurance limit is \$100,000 or \$250,000. Since the data in our calculations come from RIS, we will refer to our proxy as the RIS-NSFR.²⁰

We calculate RIS-NSFRs for all banks existing during the period 2002–2020 for which we have data.²¹ We also calculate aggregate RIS-NSFRs for certain subsets of banks by summing the ASFs and RSFs for all banks in a subset and finding the resulting quotient for that subset. The aggregate RIS-NSFR is algebraically identical to a weighted average RIS-NSFR of all banks in the subset, where the weights are individual bank ASFs. These calculations are meant to focus on the RIS-NSFR as a risk measure and not as a regulatory requirement. To reiterate an earlier point, the NSFR applies by regulation only to a small subset of insured banks and no plans exist to apply it to other banks.

Any Call Report-based proxy of the NSFR will be imperfect because a significant amount of the information needed to calculate the NSFR defined in the final NSFR rule is not reported on the Call Report. Nonetheless, as described by Hong et al. (2014) and DeYoung and Jang (2016) and revisited here, Call Report proxy measures of ASFs and RSFs for many Call Report categories are feasible. Insofar as we can translate the NSFR factor categories delineated in the final NSFR rule to a Call Report line item, we assign an ASF or RSF factor to the RIS variable corresponding to the Call Report line item.

A summary of the factor assignments is depicted in Table 3 and Table 4. A complete list of every RIS variable for which an ASF or RSF factor was assigned by the proxy is contained in Appendix A, along with a detailed discussion of the assumptions made in the calculations.

The RIS-NSFR differs from the other NSFR proxy measures discussed in Section II in several respects. The RIS-NSFR is based on the final NSFR rule as defined by U.S. bank regulators in 2021. The proxy developed by King (2013) is based on the

¹⁹ See 86 Fed. Reg. at 9153.

²⁰ A complete set of RIS data is available at <https://www.fdic.gov/foia/ris/>. A mapping of RIS variables to Call Report line items is available at <https://www5.fdic.gov/dict/app/templates/Index.html#!/Main>.

²¹ FDIC-insured institutions that filed Thrift Financial Reports are excluded.

Table 3	
The RIS-NSFR Assigns Available Stable Funding (ASF) Factor Weights to Funding Sources According to the Framework in the Final NSFR Rule	
ASF Factor	Description of Call Report Line Items Used to Calculate RIS-NSFR
100%	<ul style="list-style-type: none"> • Equity capital • Other borrowings, including subordinated debt, with maturities more than one year
95%	<ul style="list-style-type: none"> • Domestic time deposits from retail customers,^a excluding time deposits over the standard FDIC insurance limit^b and brokered deposits • Half^c of domestic transaction deposits of individuals, partnerships, and corporations
90%	<ul style="list-style-type: none"> • Half^c of deposits held in domestic offices and all deposits held in foreign offices^d of individuals, partnerships, and corporations • Savings deposits and money market deposit accounts, including those in foreign offices^d • Domestic time deposits from retail customers over the standard FDIC insurance limit^b • Foreign time deposits^d from retail customers • Insured brokered deposits with maturities more than one year
50%	<ul style="list-style-type: none"> • Time deposits from non-retail customers^a, including those in foreign offices^d and including insured brokered deposits with maturities less than one year • Transaction accounts other than those of individuals, partnerships, and corporations, including those in foreign offices^d • Half^e of other borrowings with maturities less than one year
0%	<ul style="list-style-type: none"> • All other liabilities

Source: FDIC.

Note: RIS is the FDIC's Research Information System. NSFR is the Net Stable Funding Ratio. Author assumptions used to develop certain elements of the RIS-NSFR are detailed in Appendix A.

^a Time deposits in domestic offices are assumed to have the same distribution of depositor type as nontransaction deposits in domestic offices.

^b The standard insurance limit was \$100,000 before March 2010 and \$250,000 afterward. The share of deposits over the insurance limit from retail customers is assumed to be identical to the share of all deposits from retail customers.

^c Apportioned equally to stable retail deposits (ASF factor of 95, assumed to be fully insured by the FDIC) and other retail deposits (ASF factor of 90, assumed to not be fully insured, or insured under non-FDIC deposit insurance regimes).

^d The distribution of foreign deposits among transaction accounts, savings accounts, money market deposit accounts, and time deposits is assumed to be the same as the distribution of domestic deposits among various account types.

^e Half of borrowings with maturities of one year or less are assumed to have maturities of less than six months, meaning they receive an ASF factor of zero.

BCBS (2010) definition of the NSFR. Hong et al. (2014) developed one proxy based on the BCBS (2010) definition and another based on the BCBS (2014) definition. Both DeYoung and Jang (2016) and Hoerova et al. (2018) base their proxies on the BCBS (2014) definition.

The data sources used to construct the proxies differ as well. Hong et al. (2014), DeYoung and Jang (2016), and the RIS-NSFR all use Call Report data to construct their NSFR proxies. King (2013) uses Bankscope data to construct his NSFR proxy, and Hoerova et al. (2018) use the ECB Individual Balance Sheet Items database to construct their proxy.

Any attempt to create an NSFR proxy using tangential data sources such as the Call Report requires making a number of assumptions, including assumptions about the distribution of retail versus wholesale customers and counterparties, the maturity of certain assets and funding sources, and encumbrance of assets. Section F of Appendix A compares the assumptions used to construct the RIS-NSFR to the assumptions King (2013), Hong et al. (2014), DeYoung and Jang (2016), and Hoerova et al. (2018) used to construct their NSFR proxies.

Table 4**The RIS-NSFR Assigns Required Stable Funding (RSF) Factor Weights to Assets According to the Framework in the Final NSFR Rule**

RSF Factor	Description of Call Report Line Items Used to Calculate RIS-NSFR
0%	<ul style="list-style-type: none"> • Cash and balances due • One-third of unencumbered^a and a portion^b of encumbered^c performing^d federal funds sold and reverse repurchase agreements^e • Unencumbered^a and one-third of encumbered^c performing^d U.S. government agency and Treasury securities (not including mortgage-backed securities (MBS))
5%	<ul style="list-style-type: none"> • Unused commitments and lines of credit
15%	<ul style="list-style-type: none"> • One-third of unencumbered^a and a portion^b of encumbered^c performing^d federal funds sold and reverse repurchase agreements^e • Unencumbered^a and one-third of encumbered^b performing^c loans to depository institutions with maturities of one year or less, net of unearned income^f and allowances for loans and lease losses (ALLL)^g • Unencumbered^a and one-third of encumbered^c performing^d MBS issued or guaranteed by U.S. government agencies or government-sponsored enterprises (GSEs) • Unencumbered^a and one-third of encumbered^c performing^d loans with maturities of one year or less to nondepository institutions, domestic branches of foreign banks or agencies, and other loans, net of unearned income^f and ALLL^g
50%	<ul style="list-style-type: none"> • One-third of unencumbered^a and a portion^b of encumbered^c performing^d federal funds sold and reverse repurchase agreements^e • Unencumbered^a and two-thirds of encumbered^c performing^d loans and leases with remaining maturities of one year or less,^h other than those given a 15 percent RSF factor, net of unearned income^f and ALLL^g • Unencumbered^a and two-thirds of encumbered^c performing^d investment grade debt securities or equity securities that are part of a major equity market indexⁱ • One-third of encumbered^c performing^d securities and loans that would receive an RSF weight of less than 50 percent if unencumbered and performing
65%	<ul style="list-style-type: none"> • Unencumbered^a and two-thirds of encumbered^c performing^d closed-end loans secured by first liens on 1–4 family properties with remaining maturities of more than one year,^h net of unearned income^f and ALLL^g • Unencumbered^a and two-thirds of encumbered^c performing^d leases and agricultural loans, commercial and industrial loans, loans to U.S. municipalities, loans to foreign governments, commercial real estate loans, loans secured by farmland, and consumer loans with risk weights of 20 percent or lessⁱ and remaining maturities of more than one year,^h net of unearned income^f and ALLL^g
85%	<ul style="list-style-type: none"> • Unencumbered^a and two-thirds of encumbered^c performing^d open-end loans secured by 1–4 family properties, and closed-end loans secured by junior liens on 1–4 family properties, with remaining maturities more than one year,^h net of unearned income^f and ALLL^g • Unencumbered^a and two-thirds of encumbered^c performing^d loans, securities, and trading assets with remaining maturities more than one year,^h net of unearned income^f and ALLL,^g other than those already listed • Unencumbered^a and two-thirds of encumbered^c performing^d non-investment grade debt securities or equity securities not part of a major equity market indexⁱ • Unencumbered^a and two-thirds of encumbered^c performing^d private-label MBS
100%	<ul style="list-style-type: none"> • All other assets, including loans to financial institutions with maturities of more than one year,^h nonperforming^d assets, and assets encumbered for more than one year,^h net of unearned income^f and ALLL^g • Five percent of the value of derivatives with positive fair value minus derivatives with a negative fair value, if the difference is positive

Source: FDIC.

Note: RIS is the FDIC's Research Information System. NSFR is Net Stable Funding Ratio. Author assumptions used to develop certain elements of the RIS-NSFR are detailed in Appendix A.

^a The percent of a loan (or security) that is unencumbered is assumed to be equal to the fraction of total loans (or securities) that are unencumbered or unpledged.

^b See Appendix A for the percentages of encumbered federal funds sold and reverse repurchase agreements assigned to the RSF 0, RSF 15, RSF 50, and RSF 100 categories.

^c Encumbered loans (or securities) are apportioned equally across the three encumbrance periods: less than six months, between six and twelve months, and more than twelve months. Assets are assumed to not be encumbered by more than their maturity (i.e., loans with maturities less than a year are not apportioned to an encumbrance of more than a year). We follow the encumbrances rules delineated in the final NSFR rule (See 86 FR at 9166). Those that are encumbered for more than one year are assigned an RSF factor of 100, those that are encumbered for six months to one year are assigned an RSF factor that is the greater of 50 or the factor they would be assigned if they were not encumbered, and those encumbered for less than six months are assigned the same RSF factor they would be assigned if they were not encumbered.

^d Performing loans are those not past due by 90 days or more or in nonaccrual status. The Call Report contains only aggregated debt securities 90 days or more past due and in nonaccrual status, so we assume the percent of each debt security type that is nonperforming is equal to the fraction of total debt securities that are nonperforming.

^e Unencumbered, performing federal funds sold and reverse repurchase agreements are equally apportioned across RSF factor weights of 0, 15, and 50, representing maturities of six months or less, six to twelve months, and more than one year, respectively.

^f We assume the fraction of unearned income in each loan category is equal to the fraction of total unearned income in total loans.

^g We assume the fraction of allowances for loan and leases losses (ALLL) in each loan category is equal to the fraction of total allowances for loan and leases losses in total nonperforming loans.

^h We assume the fraction of loans in each category that mature in one year or less is equal to the fraction of total loans that mature in one year or less.

ⁱ We assume a 1:1 split between investment grade and non-investment grade debt securities and between equity securities that are and are not part of a major equity market index.

^j We assume the fraction of each asset with a risk weight of 20 percent or less is equal to the fraction of total balance sheet assets with a risk weight of 20 percent or less.

A. RIS-NSFR Validation Exercises

As a check of the ability of RIS-NSFR to track the NSFR, we compared the RIS-NSFRs of the insured depository institution (IDI) subsidiaries of a few large bank holding companies (BHCs) to NSFR estimates for these BHCs. We find a strong positive correlation between the two measures. An anonymized summary is contained in Appendix B.

As the Call Report changes, some line items on the report are added or removed. To ensure our methodology is consistent over time, we check that the balance sheet items used in RIS-NSFR constitute the whole of assets reported by the banks. For every quarter since 2002, our methodology accounts for more than 96 percent of assets (or liabilities plus equity) reported by banks. Detailed discussions are provided in Sections B.6 and C.9 of Appendix A.

V. Results Part 1: Correlation With Bank Stress Events

The proxy RIS-NSFR appears to be a useful indicator of the ability of institutions to withstand liquidity stress. For this exercise, we calculated RIS-NSFRs for all non-thrift banks and examined differences in RIS-NSFRs across groups of banks that did or did not experience a liquidity stress event. Our bank universe does not include the large investment banks that experienced liquidity crises in 2008 or any thrift institutions that failed during the crisis. Nonetheless, the banks in our sample experienced sufficient stress such that we can determine if our proxy shows meaningful differences between the liquidity profiles of banks that did or did not fail and banks that did or did not participate in the DGP during the 2008 liquidity crisis.

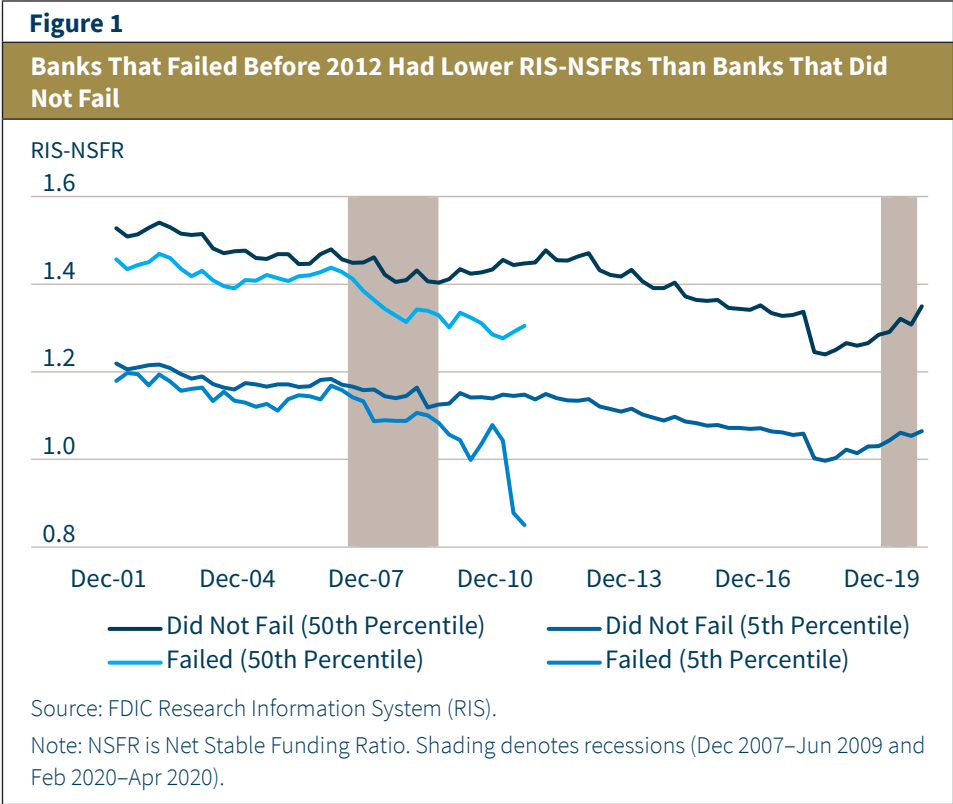
While this paper calculates and analyzes RIS-NSFRs for small banks, U.S. banking regulators have not required small banks to meet the NSFR standard and are not considering doing so. As noted, the FDIC does not use either the NSFR or

any proxy of it to assess the liquidity risk profile of small banks. We analyze small banks to examine the performance of the RIS-NSFR measure as a risk indicator and to discuss the recent liquidity positions and trends for small and midsize banks compared to those for large banks generally subject to the NSFR standard.

A. Low RIS-NSFR Associated With Higher Risk of Failure

If the NSFR is a good indicator of the ability of financial institutions to withstand a liquidity stress event, then institutions with lower RIS-NSFRs would have been more likely to fail or experience liquidity stress during the financial crisis. The RIS-NSFR is in effect a summary risk measure that captures the effects of loan concentrations, liquid asset holdings, and dependence on volatile funds. As such, it would be somewhat surprising if historical data did not show an association between low RIS-NSFR and bank failure.

In Figure 1, we show the median and lowest fifth percentile RIS-NSFRs for non-thrift banking institutions for each quarter from 2006 to 2012, distinguishing between banks that did or did not fail before 2012.²² Leading up to and during the financial crisis, the median and lowest fifth percentile of RIS-NSFRs of institutions that failed before 2012 were consistently lower than those of institutions that did not fail before 2012, suggesting that banks with lower RIS-NSFRs had a higher risk of failing during and immediately following the financial crisis.²³



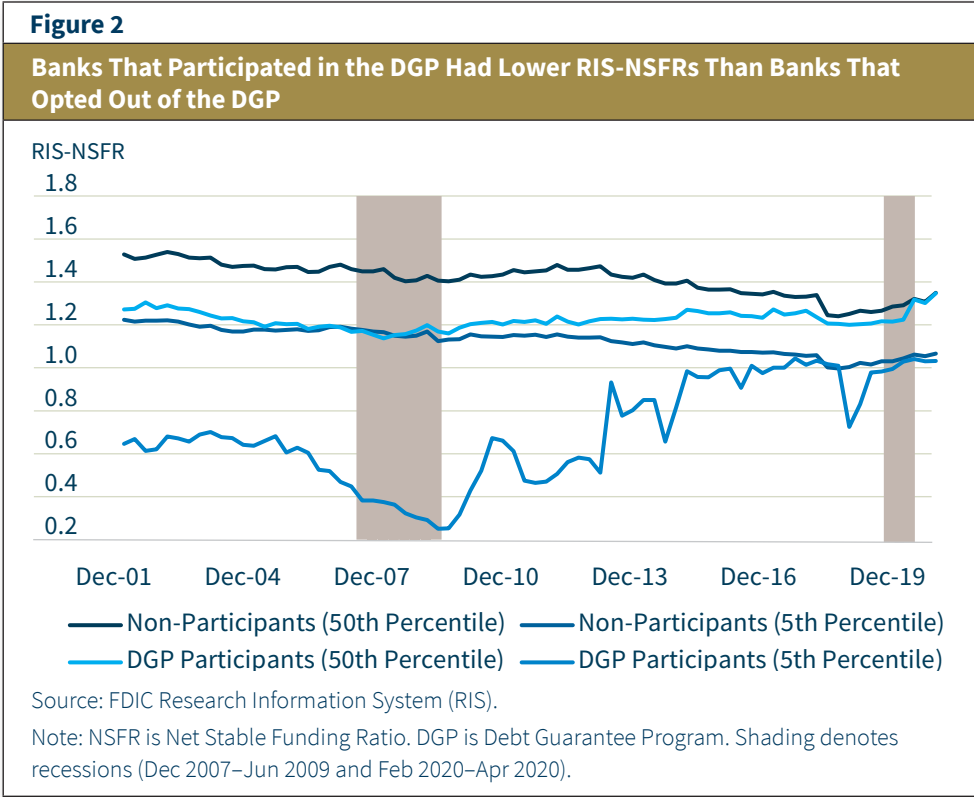
In interpreting Figure 1, one must keep in mind that institutions can fail for many reasons. Insufficient stable funding is one possible reason for failure, but the data do not distinguish between institutions that failed because of funding instability and those that failed for other reasons. However, the levels of median and fifth percentile RIS-NSFRs for institutions

²² For this analysis, banks were considered to have failed if they are on the FDIC’s Failed Bank List retrieved August 3, 2018, <https://www.fdic.gov/resources/resolutions/bank-failures/failed-bank-list/>.
²³ To support our results, we run a two-sample t-test on the RIS-NSFRs before 2012, comparing the distribution of RIS-NSFRs for institutions that failed before 2012 to the distribution of RIS-NSFRs for institutions that did not fail before 2012. We reject the null hypothesis that variances of the two distributions are equal ($p_F < .0001$) and the null hypothesis that the two means are equal ($t = 8.30$).

that eventually failed suggest that a low RIS-NSFR indicates a higher risk of failure.²⁴ Insufficient stable funding can be a contributing factor to bank failure or a consequence of other proximate causes for bank failure.

B. Institutions That Participated in the DGP Had Lower RIS-NSFRs

Given that not all failures during and immediately after the financial crisis resulted from insufficient stable funding, the value of the RIS-NSFR as an indicator of potential liquidity stress can be further tested by comparing the RIS-NSFRs of institutions that participated in the DGP to those of institutions that opted out. We consider institutions to have participated in the DGP if they are not included in the list of institutions that opted out of the program or if they were not subsidiaries of bank holding companies that opted out of the program.²⁵ While not all DGP participants were facing an emergency liquidity situation, we used DGP participation as a proxy for banks that experienced liquidity stress between October 2008 and December 2010, the period during which the DGP operated.



To show the relationship between DGP participation and NSFR, we chart the median RIS-NSFR for non-thrift banking institutions between 2006 and 2012, distinguishing between institutions that did or did not participate in the DGP (Figure 2). As expected, banks that participated in the DGP had a lower median RIS-NSFR leading up to and during the financial crisis

²⁴ While the RIS-NSFRs in Figure 1 are all above 1.0 in the years leading up to the crisis, the reader should note that RIS-NSFR probably overestimates the NSFR due to the authors’ conservative assumptions, as detailed in Appendix A. If RIS-NSFR overestimates NSFR by 13 percentage points, as shown in Appendix B for the largest banks, then Figure 1 would indicate that NSFRs for the lowest fifth percentile of failed banks were below 1.0 during and after the 2008 financial crisis.

²⁵ See Federal Deposit Insurance Corporation, “Temporary Liquidity Guarantee Program Opt-Out Lists,” <https://www.fdic.gov/regulations/resources/tlgp/optout.html>. Any institution that existed from March 2008 through December 2010 and was not included in the list of entities that opted out of the DGP was considered to have participated in the program for the purposes of this analysis. Not all of these institutions necessarily issued debt guaranteed through the DGP.

than banks that opted out of the program.²⁶ The RIS-NSFRs of both groups of institutions improved after the financial crisis and following the end of the program in 2011, likely from the economic and financial recovery.²⁷

We can also see in Figure 2 that the fifth percentile of banks that participated in the DGP had RIS-NSFRs well below 1.0 preceding and immediately following the 2008 financial crisis. Meanwhile, the fifth percentile of banks that opted out of the program had RIS-NSFRs greater than 1.0 over that period. The RIS-NSFRs of DGP participants improved beginning in 2009, while the RIS-NSFRs of institutions that opted out remained fairly stable and then declined between 2013 and 2019.

VI. Results Part 2: RIS-NSFR Trends and Drivers

In this section, we describe how our NSFR proxy can be used to track the stable funding positions of banks. We calculate aggregate RIS-NSFRs for the three groups of banks described in Section I: small, midsize, and large.²⁸ Since we assign banks to these groups using assets at a point in time, the set of banks in each group remains fixed during our analysis period.²⁹ We examine historical trends in the aggregate RIS-NSFRs and describe the underlying balance sheet changes.³⁰

Figure 3 below shows aggregate RIS-NSFRs since 2002 for the three groups of banks.³¹ An overview of the figure reveals several stylized facts:

1. Before the 2008 financial crisis, aggregate RIS-NSFRs were correlated with bank size and behaved similarly across the three size groups;
2. After bottoming out during the recession that accompanied the 2008 financial crisis, aggregate RIS-NSFRs increased between 2010 and 2013 for all three size groups;
3. Between 2013 and the end of 2019, the trends of aggregate RIS-NSFRs among the three size groups diverged; and
4. Aggregate RIS-NSFRs increased rapidly for all three size groups in 2020, a trend contemporaneous with the pandemic.

A. RIS-NSFRs Before the 2008 Financial Crisis

Figure 3 shows that before the 2008 financial crisis aggregate RIS-NSFRs were lower for large banks, suggesting a general correlation between net stable funding and asset size. In addition, the aggregate RIS-NSFR curves for the three groups generally moved in parallel. These parallel movements suggest that banks across all size groups shared similar strategies for managing stable funding risk in the years leading up to the crisis.

²⁶ To support our results, we run a two-sample t-test on the RIS-NSFRs before 2012, comparing the distribution of RIS-NSFRs for institutions that participated in the DGP to the distribution of RIS-NSFRs for institutions that did not participate. We reject the null hypothesis that variances of the two distributions are equal ($p_F < .0001$) and the null hypothesis that the two means are equal ($t = -4.00$).

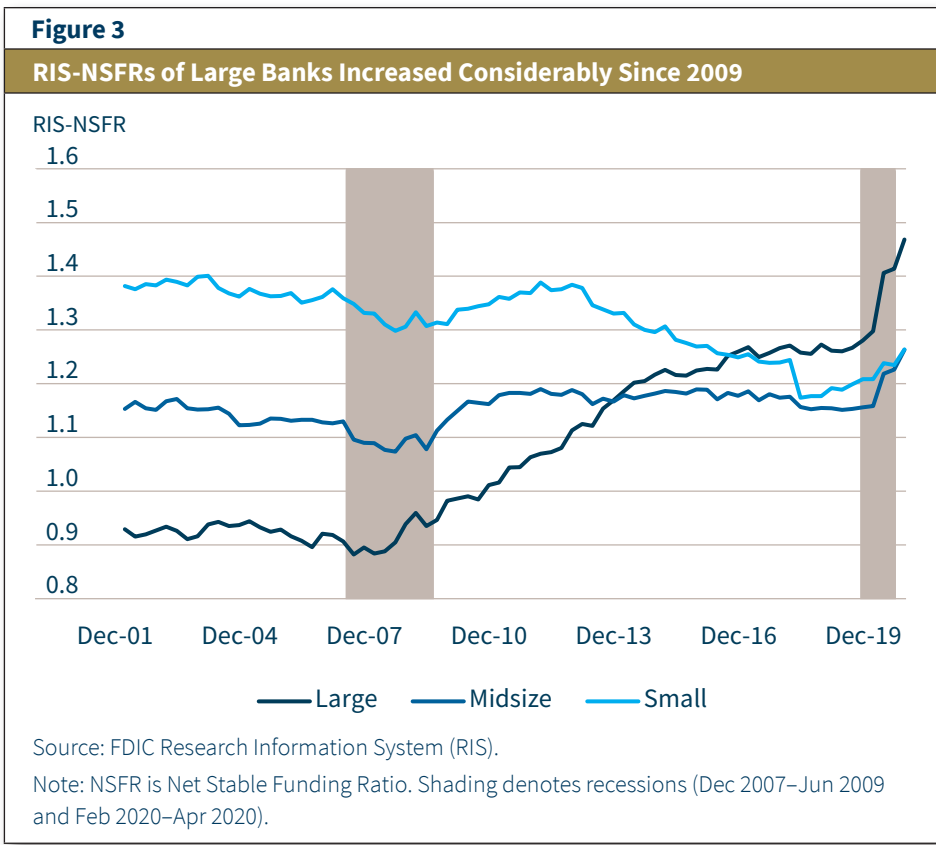
²⁷ To support our results, we run a two-sample t-test on the RIS-NSFRs after 2012, comparing the distribution of RIS-NSFRs for institutions that participated in the DGP to the distribution of RIS-NSFRs for institutions that did not participate. We reject the null hypothesis that variances of the two distributions are equal ($p_F < .0001$) but cannot reject the null hypothesis that the two means are equal ($t = 1.11$, $p_t = 0.2663$).

²⁸ As noted in Section I, our aggregate RIS-NSFR is a weighted average of the RIS-NSFRs in a group.

²⁹ See discussion at the end of Section I, with corresponding footnote 11, for size grouping details.

³⁰ A detailed methodology of the decomposition of a change in RIS-NSFR is presented in Appendix C. Note that since the aggregate RIS-NSFRs are weighted averages of RIS-NSFRs for individual banks, changes in the aggregate RIS-NSFRs over time could reflect changes in the composition of banks in a group, rather than the distributions of liquidity and stability of assets and liabilities within that group. As a robustness check, the authors compared the aggregate RIS-NSFRs charted in Figure 3 to median RIS-NSFRs for each of the three size groups. The trends of the two sets of lines were similar, with two notable exceptions: first, the median RIS-NSFR for large banks dropped 12 percentage points between 2001 and 2007, compared to just 3 percentage points for the aggregate RIS-NSFR for large banks; second, the median RIS-NSFR for midsize banks fell 15 percentage points between 2010 and 2018, compared to almost no change in the aggregate RIS-NSFR in the same time span.

³¹ Aggregate RIS-NSFR is calculated as the sum of total ASF for a group (for example, large banks) divided by the sum of total RSF for the group.



B. RIS-NSFRs Immediately After the 2008 Financial Crisis

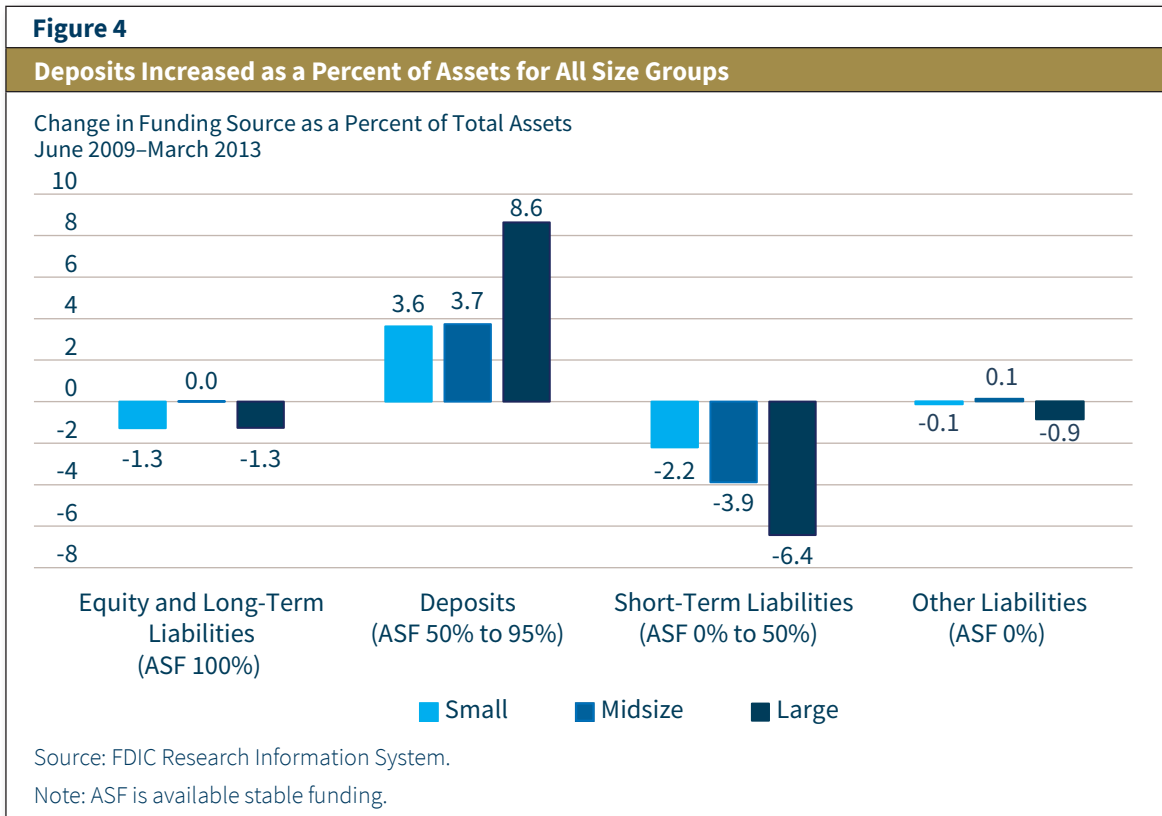
Figure 3 also shows how the funding and asset portfolios of banks changed after the 2008 financial crisis. Aggregate RIS-NSFRs for all groups increased between second quarter 2009 and first quarter 2013; the aggregate RIS-NSFR increased approximately 7 percentage points for the smallest banks, 10 percentage points for midsize banks, and 19 percentage points for the largest banks.³² An arithmetic decomposition of these increases reveals that portfolio concentrations of liabilities that had been assigned ASF factors of 90 and 95 percent (primarily retail deposits) accounted for at least 50 percent of the changes in aggregate RIS-NSFRs of all three size categories over the period immediately following the recession. In addition, RSF declined relative to total, unweighted assets for all three size categories, contributing to rising NSFRs over this period.³³ In the rest of this subsection, we delve into the specific assets and liabilities that make up these RSF and ASF categories and examine how these assets and liabilities changed from second quarter 2009 to first quarter 2013.

1. Changes in Funding Composition

Figure 4 shows changes in various bank funding sources between June 2009 and March 2013. For each funding source, the changes are broken out into three bar graphs representing the three size groups. The funding sources are then presented in order of declining ASF factor. The set of charts confirms the first decomposition observation described above: in the four years immediately following the end of the recession in 2009, banks in all three size categories increased their portfolio concentrations in liabilities with high ASF factors, particularly deposits. These concentrations contrast with the portfolio reductions of liabilities with ASF factors at or below 50 percent. All else equal, the reshuffling of bank portfolios from liabilities with low ASF factors to liabilities with high ASF factors would cause an increase in RIS-NSFR. The pattern can be observed

³² As summarized in Table C.1 in Appendix C.
³³ See the Asset Composition Effect of Table C.1 in Appendix C.

most prominently in Figure 4 for large banks. Over the four years, large banks increased their deposits as a portion of assets by 8.6 percentage points and reduced short-term and other liabilities by 7.3 percent. The aggregate effect of the shifting of funding sources from sources with low ASF factors to sources with high ASF factors increased the aggregate RIS-NSFR of large banks by 11 percentage points between June 2009 and March 2013, as calculated by our decomposition exercise.³⁴

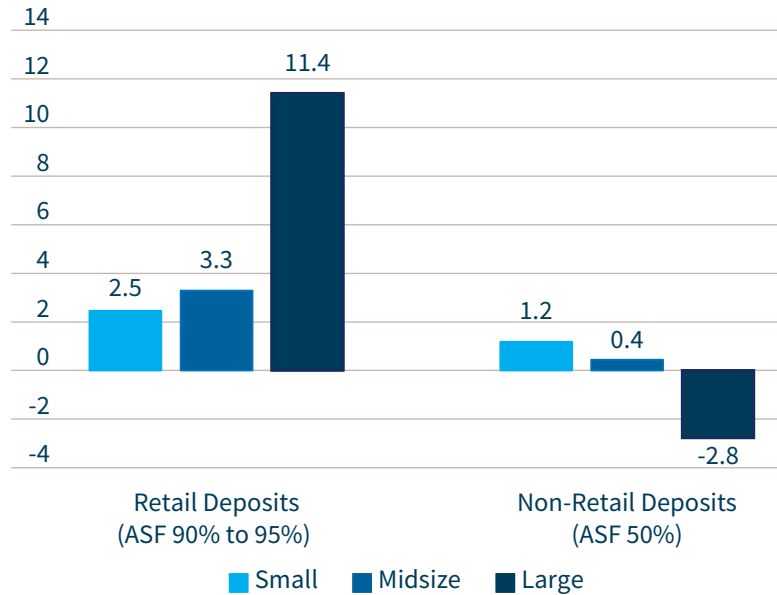


Since the growth of deposits is so prominent in Figure 4, we investigate this category further by separating the growth of deposits into retail and non-retail deposits, presented in Figure 5. Figure 5 shows that the increase in deposits as a share of assets was driven by retail deposits for all three size groups. Stable retail deposits, or fully insured transaction deposits of retail customers, receive ASF weights of 95 percent, while other retail deposits receive ASF weights of 90 percent. This trend in deposit growth would contribute to rising RIS-NSFRs for the banking industry in general, all else equal. Non-retail deposits, which increased for small and midsize banks and decreased for large banks, receive ASF weights of 50 percent. Figure 5 shows that retail deposits, which receive high ASF factors, increased more than non-retail deposits, which receive lower ASF factors, for all size groups. This observation supports the discussion above that aggregate RIS-NSFR growth between 2009 and 2013 was driven in part by the reshuffling of liabilities from low ASF factor categories to high ASF factor categories.

³⁴ See the Funding Composition Effect of Table C.1 in Appendix C.

Figure 5**Retail Deposits Increased for All Bank Size Groups**

Change in Deposit Type as a Percent of Total Assets
June 2009–March 2013



Source: FDIC Research Information System.

Note: ASF is available stable funding.

2. Changes in Asset Composition

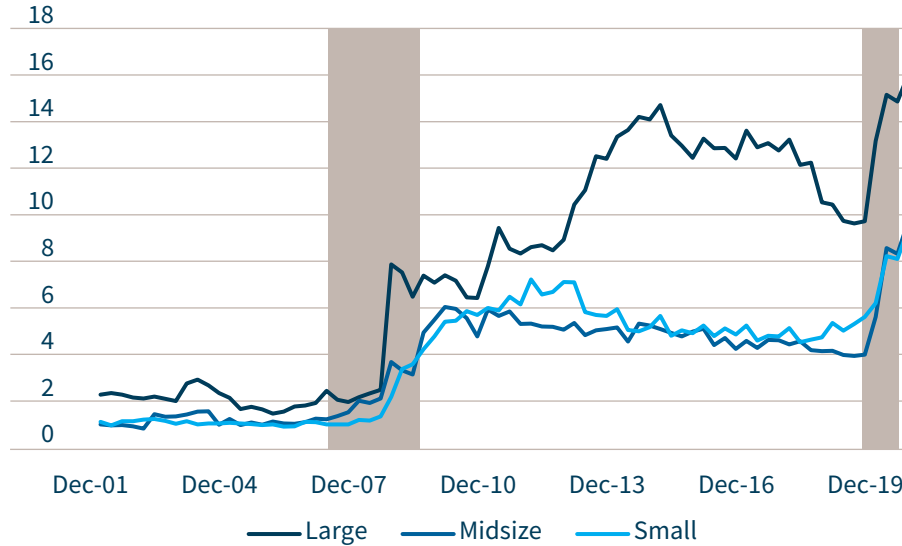
Changes in NSFRs can occur not only due to changes in the composition of bank funding sources but also due to changes in asset composition. A decomposition of the changes reveals that about 43, 44, and 73 percent of the changes in aggregate RIS-NSFRs of large, midsize, and small banks, respectively, between June 2009 and March 2013 were due to changes in RSF.³⁵ Cash balances, which carry an RSF factor of zero, increased as a percentage of assets for all three size groups. This increase in cash would increase the aggregate RIS-NSFRs of all three size groups, all else equal. Figure 6 shows holdings of interest-bearing cash balances for the three groups of banks, as percentages of their total assets, from June 2009 through December 2020. Since interest-bearing cash balances have an RSF factor of 0 percent, an increase in these holdings by banks would decrease their RSFs and correspondingly increase their NSFRs, all else equal. A comparison of the aggregate RIS-NSFR line graphs in Figure 3 and the interest-bearing cash balances line graphs in Figure 6 suggests that the increase in interest-bearing cash balances is largely responsible for the rise in aggregate RIS-NSFRs for all three size groups between June 2009 and March 2013.

³⁵ As presented in Table C.1 in Appendix C.

Figure 6

Interest-Bearing Cash Balances Represent a Relatively High Share of Assets for Large Banks

Interest-Bearing Cash Balances
Percent of Total Assets



Source: FDIC Research Information System.

Note: Shading denotes recessions (Dec 2007–Jun 2009 and Feb 2020–Apr 2020).

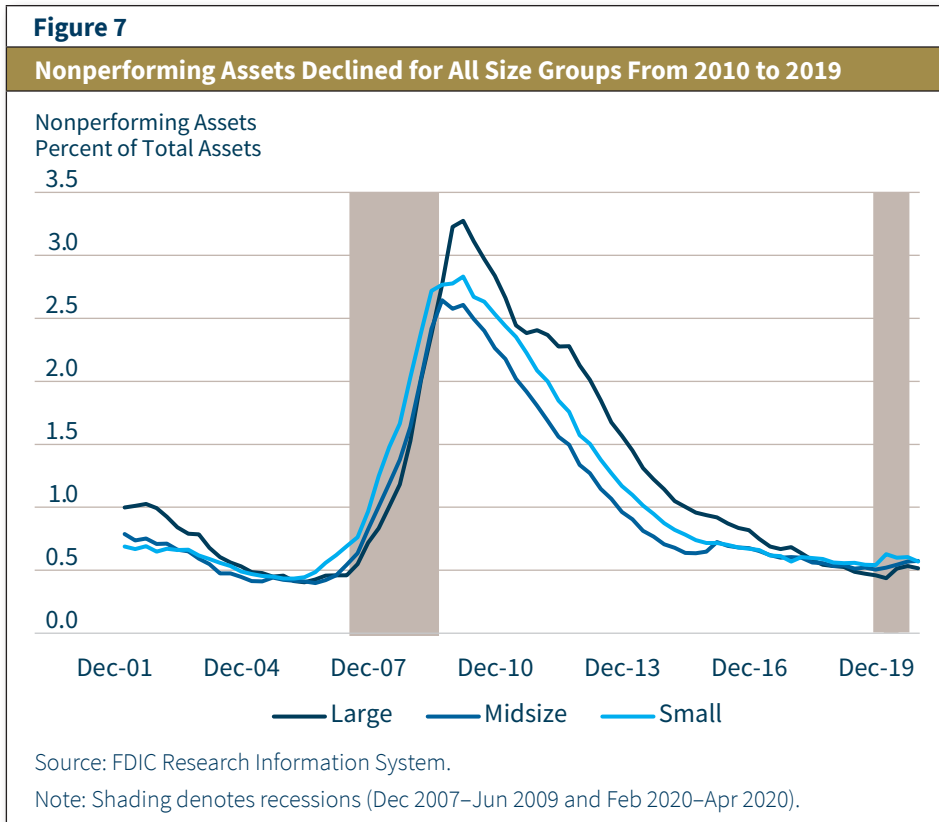
Banks also changed their holdings of assets with high RSF factors in the years immediately following the 2008 financial crisis. Nonperforming assets—that is, loans or debt securities for which payments are past due by 90 days or more—peaked shortly after the end of the recession for all three size groups and decreased considerably as the economy improved, contributing to rising aggregate RIS-NSFRs for all three size categories (Figure 7).

Assets past due by 90 days or more or in nonaccrual status receive a 100 percent RSF factor, which lowers NSFRs for institutions with a high percentage of nonperforming assets relative to total assets. This effect could cause NSFRs to improve industrywide when the economy is strong and to decline industrywide when the economy weakens. For the banking industry overall, the ratio of nonperforming assets to total assets peaked at 3.1 percent in March 2010 and declined to 0.5 percent by December 2020. While the drop appears large, it amounts to a difference of only 2.6 percent of total assets, making its effect on total RSF and therefore on RIS-NSFR fairly minimal. The RSF weight of 100 percent for past-due and nonaccrual assets may or may not be significantly higher than the RSF weight the asset would receive if it were performing.³⁶

To summarize this section, we return to Figure 3. The rise in aggregate RIS-NSFRs since the 2008 financial crisis is presented in varying degrees for all three groups of banks. Aggregate RIS-NSFRs increased for all three size groups between June 2009 and March 2013 as a result of increasing retail deposits, increasing cash balances, and declining nonperforming assets among the banking industry in general.

The next subsection explores the reasons for the divergent RIS-NSFR trends between March 2013 and December 2019.

³⁶ As of December 31, 2020, the largest category of assets is RSF_{85} , which comprises 22.4 percent of total assets, followed by RSF_0 at 21.5 percent. Even if most of the assets in RSF_{85} became nonperforming, the resulting RIS-NSFR increase would be less than 4 percentage points.



C. The 2013-2019 Divergence of RIS-NSFR

The next stylized fact gleaned from Figure 3 is that, between 2013 and 2019, the trend of the aggregate RIS-NSFR for large banks diverged from the trend of the aggregate RIS-NSFRs for small and midsize banks. Between March 2013 and December 2019, the aggregate RIS-NSFR of large banks increased from 1.12 to 1.28. Over the same period, the aggregate RIS-NSFR of midsize banks decreased slightly, from 1.18 to 1.16. Meanwhile the aggregate RIS-NSFR of small banks decreased from 1.38 to 1.21.³⁷ This divergence stands in stark contrast to the pattern before the 2008 financial crisis during which the aggregate RIS-NSFRs for all three groups generally moved in lockstep.

The disparity in aggregate RIS-NSFR trends between large banks and other banks suggests that after the crisis large banks started managing their liquidity and funding stability in a manner distinct from that of other banks. This change may have occurred in response to lessons learned during the crisis or large banks' anticipation of and compliance with LCR and NSFR requirements.

In the following subsections, we explore the trends in individual balance sheet items that drove changes in RIS-NSFR between 2013 and 2019.

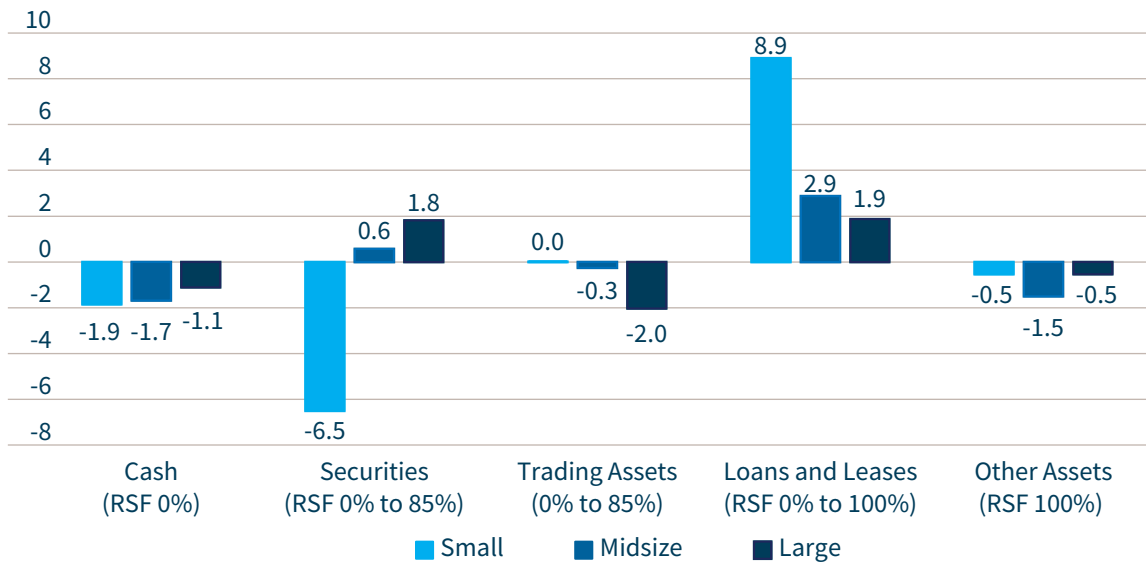
1. Changes in Asset Composition

Changes in the composition of a bank's asset portfolio would lead to changes in its NSFR (and RIS-NSFR). Holding more liquid assets—that is, assets that can be converted into cash relatively quickly even in a period of market stress—would lead to an increase in NSFR. Figure 8 shows how asset composition changed for the three size groups between 2013 and 2019.

³⁷ Summarized in Table C.2 in Appendix C.

Figure 8**Changes in Asset Composition Varied Between Small, Midsize, and Large Banks**

Change in Asset Type as a Percent of Total Assets
March 2013–December 2019



Source: FDIC Research Information System.

Note: RSF is required stable funding.

All three size groups decreased the percentage of total assets that they held in cash—that is, interest-bearing or noninterest-bearing balances held at other depository institutions, Federal Reserve banks, or other central banks—from March 2013 to December 2019. Cash receives an RSF weight of 0 percent, so these decreases in cash holdings would decrease the NSFR (and aggregate RIS-NSFR) for the industry, all else equal.

Between March 2013 and December 2019, small banks significantly decreased their holdings of securities as a percent of assets, while midsize and large banks modestly increased their securities holdings. Certain securities, such as U.S. Treasury securities and U.S. government agency debt, receive low RSF weights, while others such as equity securities, private-label mortgage-backed securities (MBS), and corporate debt securities below investment grade receive high RSF weights.

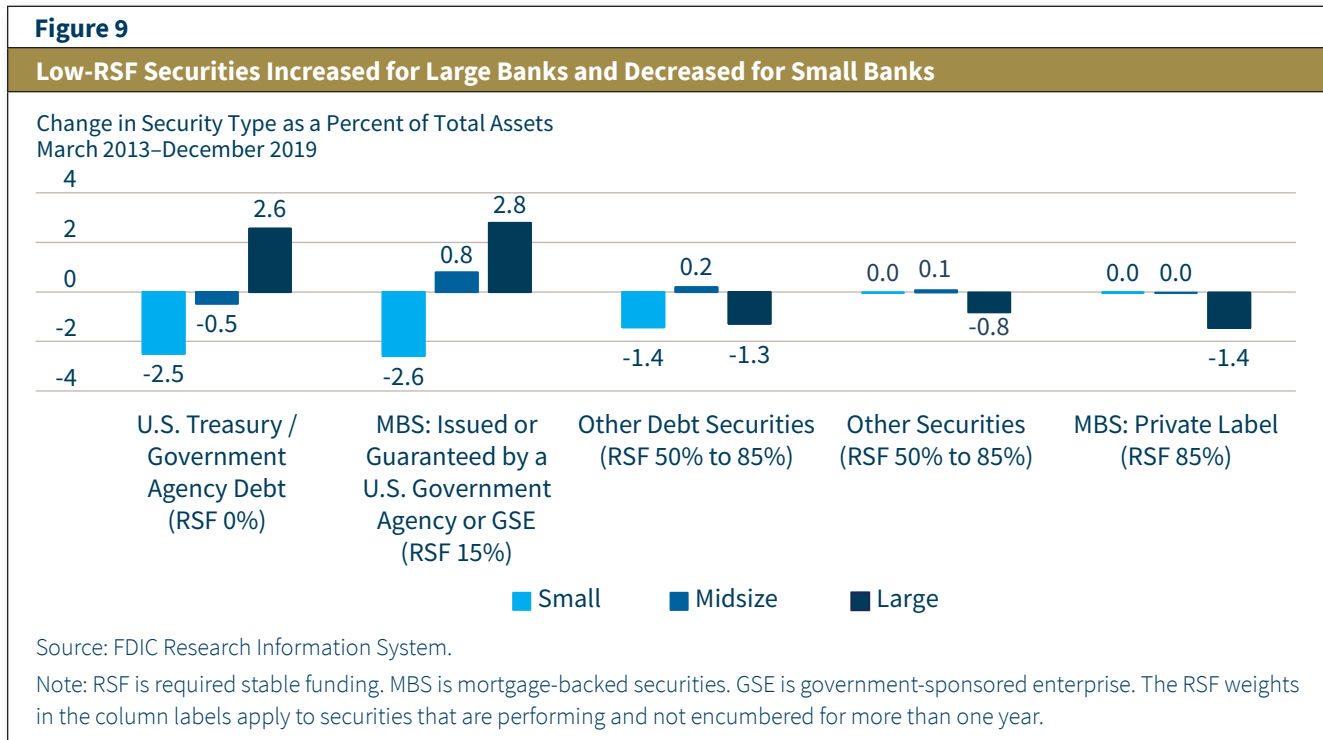
Loans and leases increased significantly for small banks and increased modestly for midsize and large banks. Loans generally receive high RSF weights, although short-term loans to financial sector entities receive low RSF weights.

Trading assets, which receive the same RSF weight as the asset would receive if it were held for a purpose other than trading, declined for large banks and changed minimally for small and midsize banks. The effect of the decline in trading assets on the aggregate RIS-NSFR of large banks is difficult to infer since trading assets potentially include assets with low RSF weights such as securities issued by the U.S. Department of Treasury or a U.S. government agency and assets with high RSF weights such as high-yield bonds.

The slight decline in “other assets” for each of the size groups would increase the aggregate RIS-NSFR of the industry, all else equal, since this category includes illiquid assets with high RSF weights such as bank premises, other real estate owned, and intangible assets. While the decrease in cash would generally decrease RIS-NSFRs for the banking industry in general, the effect on RIS-NSFRs of the changes in securities, loans, and trading assets depicted in Figure 8 is not clear. So, the overall effect of changes in asset composition on the aggregate RIS-NSFR of the banking industry is difficult to infer from Figure 8.

2. Changes in Securities Composition

Although Figure 8 shows the disparate changes in securities as a percent of assets across the three size groups, the resulting effects on aggregate RIS-NSFR are not immediately apparent because RSF factors for securities span a large range (0 to 85 percent). To further investigate the effects of securities holdings on aggregate RIS-NSFR, Figure 9 shows how different types of securities changed as a percent of assets for each of the size groups.



Large banks increased their relative holdings of securities with RSF weights of 0 percent, such as U.S. Treasury securities and U.S. government agency debt, and increased their relative holdings of MBS issued or guaranteed by a U.S. government agency or government-sponsored enterprise (GSE), which have RSF weights of 15 percent. They also decreased their relative holdings of private-label MBS and other debt securities, which have relatively high RSF weights of 50 to 85 percent, and “Other Securities,” which also have RSF factors of 50 to 85 percent and include assets such as asset-backed securities other than MBS, structured financial products, and equity securities. The increase in low-RSF securities and the decrease in high-RSF securities would increase the aggregate RIS-NSFR of large banks, all else equal.

Midsize banks increased their relative holdings of MBS issued or guaranteed by a U.S. government agency or GSE and decreased their relative holdings of U.S. Treasury and U.S. government agency debt, while their holdings of other types of securities changed modestly. Although holdings of securities overall as a percent of assets changed only modestly for midsize banks, the change in the composition of their securities portfolios shown in Figure 9 would likely increase the NSFRs and aggregate RIS-NSFR of midsize banks, all else equal, since the slight increase in securities as a percent of assets was driven by securities with low RSF weights.

Small banks decreased their relative holdings of securities that receive low RSF weights, including U.S. Treasury and U.S. government agency debt and MBS issued or guaranteed by a U.S. government agency or GSE. Small banks also decreased their relative holdings of other debt securities, which receive high RSF weights. However, the decline in low-RSF securities was greater than the decline in high-RSF securities, which would decrease their aggregate RIS-NSFR, all else equal. These differences in changes in the composition of the securities portfolios of large, midsize, and small banks help to explain the divergence in their aggregate RIS-NSFRs from 2013 to 2019.

3. Changes in Loan Composition

Small, midsize, and large banks all increased their relative holdings of loans and leases. The RSF weights of loans depend on collateral, borrower type, maturity, and risk weight. Figure 10 shows changes in loan types as a percent of assets for each size group.

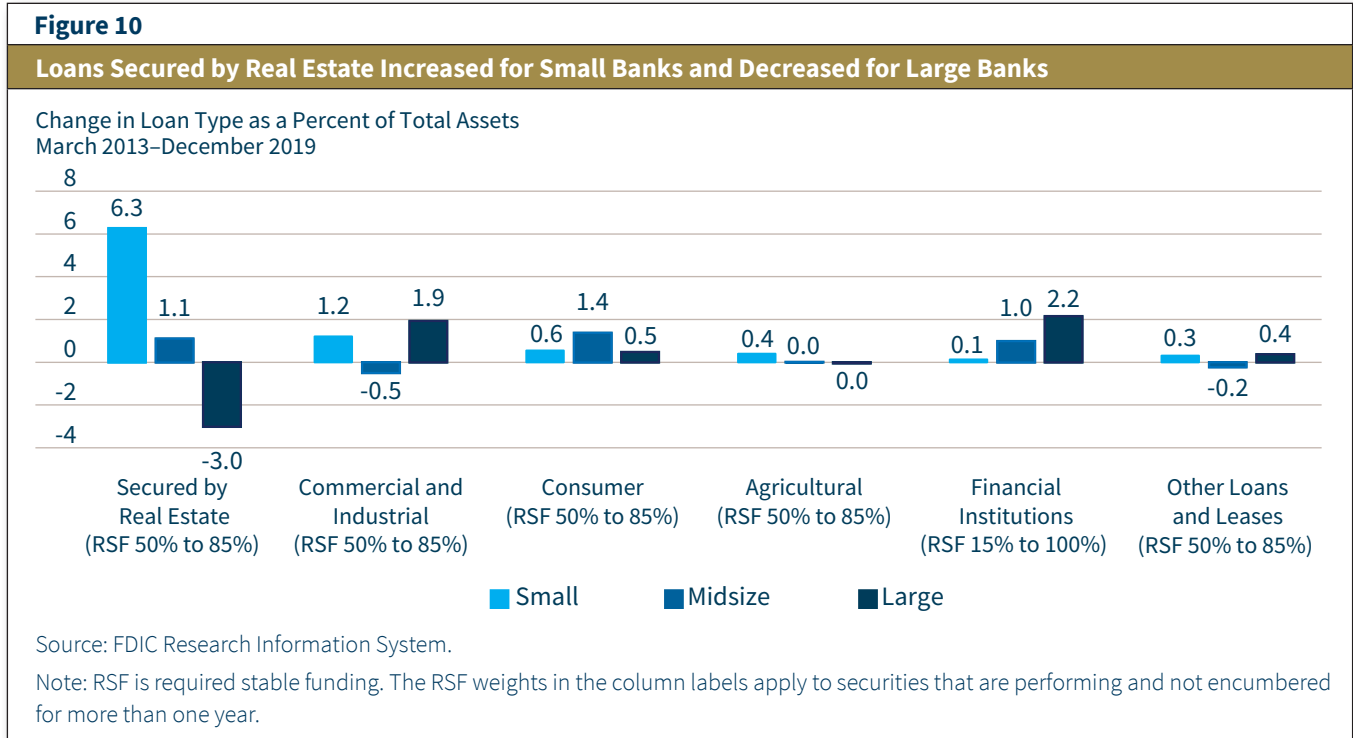
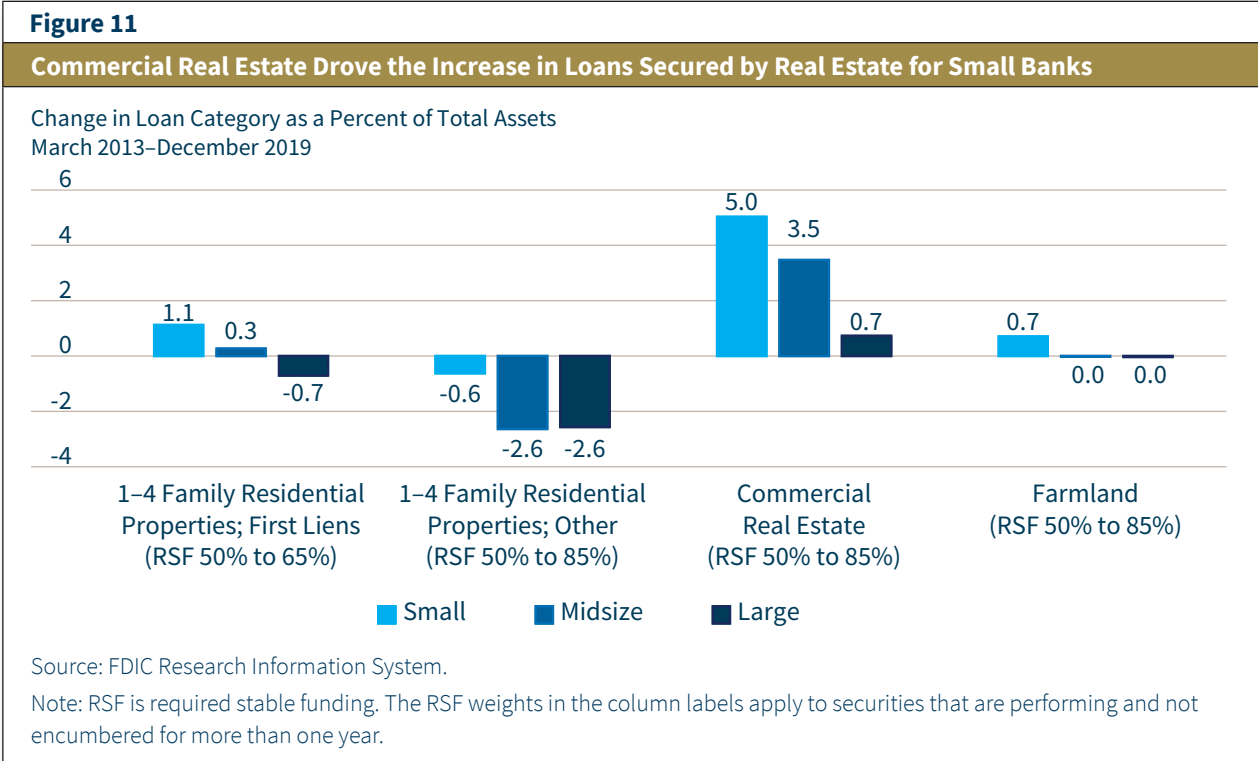


Figure 10 shows that loans secured by real estate, which receive RSF weights of 50 to 85 percent, increased for small banks and decreased for large banks. Commercial and industrial loans, which also receive RSF weights of 50 to 85 percent, increased for small and large banks and decreased slightly for midsize banks. Loans to financial institutions increased for all size groups. Loans to financial institutions can receive RSF weights of 15 percent if they mature in less than six months. They receive RSF weights of 100 percent if they mature in more than one year, making loans to financial institutions the only type of unencumbered, performing loan eligible for an RSF weight of less than 50 percent or greater than 85 percent. The maturity of these types of loans is not reported separately on the Call Report. However, considering that some portion of these loans likely meets the criteria for a 15 percent RSF weight and a 100 percent RSF weight, the increase in loans to financial institutions for all banks would have an ambiguous effect on their aggregate RIS-NSFRs.

The effects of the trends shown in Figure 10 on aggregate RIS-NSFRs are difficult to infer since loans can receive a wide range of RSF weights. To investigate further, we examine the components of loans secured by real estate which increased the most of all loan types for small banks and decreased the most of all loan types for large banks. Loans secured by first liens on 1–4 family residential properties, which receive a maximum RSF factor of 65 if they are performing and unencumbered, increased modestly for small and midsize banks and decreased modestly for large banks (Figure 11). Other loans secured by 1–4 family residential properties, which includes home equity lines of credit and retail mortgages secured by junior liens, declined for all size groups but decreased more for midsize and large banks than for small banks. Loans secured by commercial real estate—defined in our model as nonfarm nonresidential properties, multifamily (five or more families) residential properties, or properties intended for acquisition, development, or construction—increased the most of all loans secured by real estate as a percent of assets for small and midsize banks and increased slightly for large banks. Changes in loans secured by farmland were modest for each of the three size groups. The changes shown in Figure 11 would decrease the aggregate RIS-NSFR of small

banks and increase the aggregate RIS-NSFR of large banks, all else equal. The increase in loans secured by real estate for small banks was driven by loans secured by commercial real estate, which can receive RSF weights of up to 85 percent. The decrease in loans secured by real estate for large banks was driven by loans secured by residential real estate other than first lien mortgages, which includes open-end loans secured by residential real estate and loans secured by junior liens on 1–4 family residential properties. These loans can also receive RSF weights of up to 85 percent. The trends shown in Figure 11 would slightly decrease the aggregate RIS-NSFR of midsize banks, all else equal, since their increase in loans secured by real estate was driven by loans secured by commercial real estate. The changes in the composition of loans secured by real estate also help to explain the divergent performance of aggregate RIS-NSFRs for small, midsize, and large banks from 2013 to 2019.



The decline in loans secured by real estate as a percent of assets for large banks does not imply that real estate lending is declining among these institutions. Rather, it indicates that the volume of such loans has grown at a slower pace than the growth of total assets for those institutions. The volume of loans secured by real estate increased by 6.7 percent for large banks between March 2013 and December 2019, while total assets for those institutions increased by 24.2 percent, leading to a decrease in loans secured by real estate as a percent of total assets.

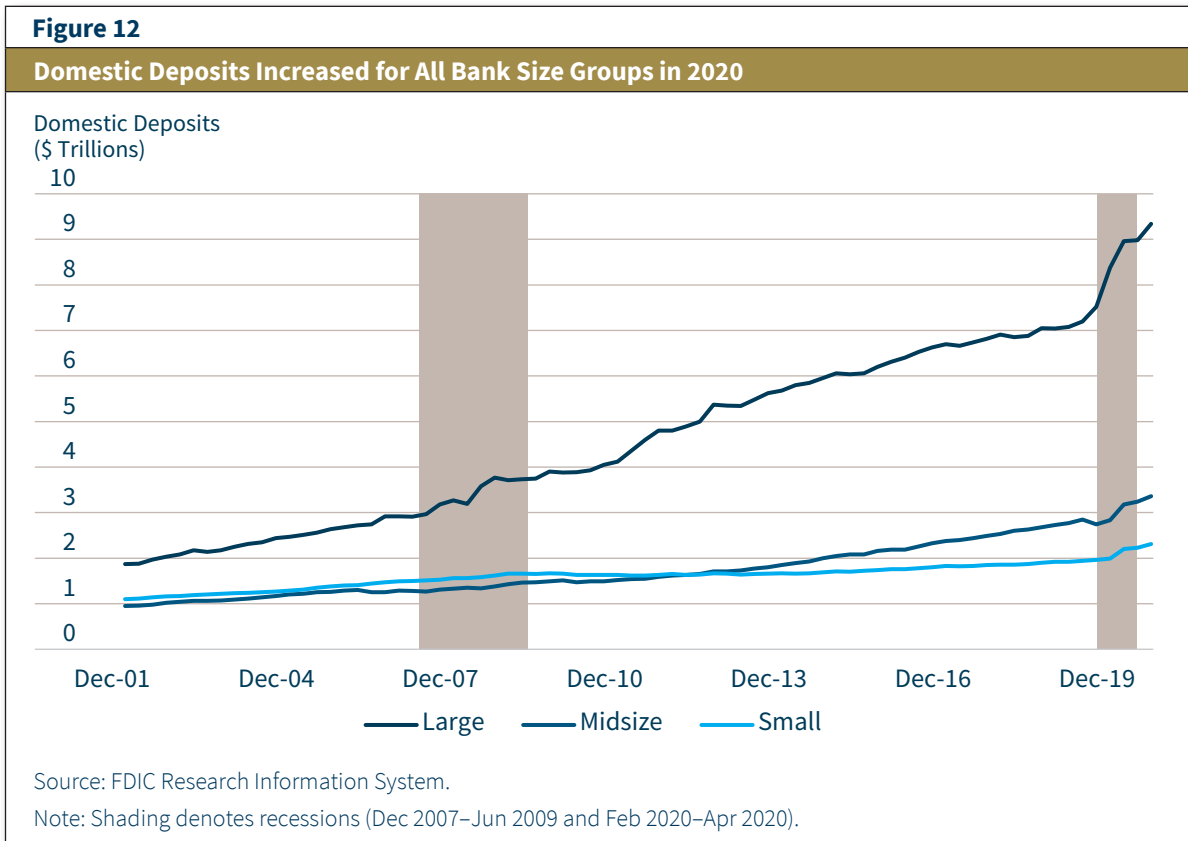
D. RIS-NSFR During the COVID-19 Pandemic

As Figure 3 shows, the post-crisis aggregate RIS-NSFRs for all three bank size groups sharply increased in the last four quarters of our data, representing the four quarters ending on March 31, June 30, September 30, and December 31, 2020. Between December 2019 and December 2020, the aggregate RIS-NSFR of small, midsize, and large banks increased by 6, 11, and 19 percentage points, respectively. The gains over these four quarters nearly match the gains over the four years following the recession that ended in June 2009.³⁸ These aggregate RIS-NSFR gains were contemporaneous with the outbreak of COVID-19 in the United States and around the world.³⁹ Because of the pandemic, economic activity slowed as global air travel

³⁸ As seen in Tables C1 and C3 in Appendix C.

³⁹ On January 21, 2020, the Centers for Disease Control and Prevention confirmed the first case of COVID-19 in the United States. See the Centers for Disease Control and Prevention, “First Travel-Related Case of 2019 Novel Coronavirus Detected in United States,” news release, January 21, 2020, <https://www.cdc.gov/media/releases/2020/p0121-novel-coronavirus-travel-case.html>.

was restricted,⁴⁰ public health emergencies were declared,⁴¹ and stay-at-home orders were issued.⁴² The absence of usual vehicles for spending, combined with programs enacted by the federal government to alleviate financial hardship resulting from the pandemic, contributed to an increase in bank deposits, which increased by nearly \$3 trillion dollars between December 2019 and December 2020. Deposits increased more for large banks than for midsize or small banks (Figure 12).



As shown in Figure 12, domestic deposits increased in 2020 for all three categories of banks, although most of the total increase was at large banks. Since domestic retail deposits carry ASF factors of 90 to 100 percent, the increase in domestic deposits would carry over to the RIS-NSFR.

Since the RIS-NSFR is a ratio, an increase in domestic deposits would not raise the RIS-NSFR if banks used those additional deposits to accumulate assets with high RSF factors. However, a comparison of the 2020 increases in Figure 6 and Figure 8 suggests that much of the influx of domestic deposits has been held as interest-bearing cash balances, which have an RSF factor of 0 percent. Cash increased considerably as a percent of assets for all three size groups between December 2019 and December 2020; from 10.8 percent of assets to 17.1 percent of assets for large banks, from 5.2 percent of assets to 11.0 percent of assets for midsize banks, and from 7.1 percent of assets to 10.9 percent of assets for small banks.

Nonperforming assets also increased during the pandemic. As Figure 7 shows, nonperforming assets increased as a percent of assets for all three bank size categories in 2020. These increases would decrease RIS-NSFRs, all else equal. However, these small increases were overshadowed by the large contemporaneous jumps in cash, deposits, and other RIS-NSFR-increasing balance sheet items.

⁴⁰ See “Proclamation on Suspension of Entry as Immigrants and Nonimmigrants of Persons Who Pose a Risk of Transmitting 2019 Novel Coronavirus,” January 31, 2020, <https://trumpwhitehouse.archives.gov/presidential-actions/proclamation-suspension-entry-immigrants-nonimmigrants-persons-pose-risk-transmitting-2019-novel-coronavirus/>.

⁴¹ See Presidential Proclamation 9994, “Declaring a National Emergency Concerning the Novel Coronavirus Disease (COVID-19) Outbreak,” March 13, 2020, <https://www.govinfo.gov/content/pkg/DCPD-202000156/pdf/DCPD-202000156.pdf>.

⁴² On March 19, 2020, California became the first state to issue a stay-at-home order. See State of California Executive Order N-33-20, March 19, 2020, <https://www.gov.ca.gov/wp-content/uploads/2020/03/3.19.20-attested-EO-N-33-20-COVID-19-HEALTH-ORDER.pdf>.

VII. Conclusion

The 2008 financial crisis and resulting recession were exacerbated by a lack of stable funding. This study has shown that low NSFRs, as measured by the RIS-NSFR, correlate with bank failures or use of liquidity assistance programs during the crisis.

The aggregate RIS-NSFR for large banks increased considerably between 2009 and 2020. Large banks had a lower aggregate RIS-NSFR than small and midsize banks in the years leading up to the crisis, and their aggregate RIS-NSFR increased more than those of small and midsize banks after the crisis. The rise in the post-recession aggregate RIS-NSFR for large banks occurred primarily because of a combination of increases in retail deposits as a percent of assets and increases in low-RSF assets such as cash, U.S. Treasury and U.S. government agency securities, and MBS issued or guaranteed by a U.S. government agency or GSE. Then, as deposits and cash balances increased during the pandemic, the aggregate RIS-NSFR of large banks increased sharply in 2020.

The aggregate RIS-NSFR for small banks (those that are part of a banking organization with total assets under \$10 billion) increased between June 2009 and March 2013 but decreased between 2013 and 2019 as these institutions decreased their holdings of low-RSF securities as a percent of assets and increased their holdings of loans secured by commercial real estate. The aggregate RIS-NSFR for midsize banks also declined slightly from 2013 to 2019 as these banks increased commercial real estate loans as a percent of total assets. These declines were reversed in 2020 for small and midsize banks as a result of an influx of retail deposits during the pandemic and significant increases in cash as a percent of total assets.

As of December 2020, large banks had a higher aggregate RIS-NSFR than small and midsize banks. Since these banks held more than 60 percent of industry assets as of that date, the industry, on the whole, was more resilient to liquidity stress events according to this measure. Virtually all institutions subject to the LCR or NSFR rule—whether directly at the entity level or indirectly through application at the parent bank holding company—are large banks, and these regulatory standards likely affected large bank decisions regarding their funding sources and asset portfolios. Most small and midsize banks are not subject to the LCR or NSFR.

While different regulatory requirements for these institutions likely explain some of the difference between the aggregate RIS-NSFRs of these banks and larger banks, several factors besides regulation may have influenced the portfolio composition of large institutions relative to midsize and small institutions, including the post-crisis interest-rate environment, the large injection of reserves into the banking system associated with quantitative easing, and the generally more stringent supervision of large banks in the aftermath of the crisis. Identifying the contributions of each factor to changes in the industry's risk profile is beyond the scope of this paper, but it is nonetheless reasonable to hypothesize that the LCR final rule and the final NSFR rule would have influenced covered banks' portfolio choices with regard to liquidity and stable funding.

Based on our results, we are confident in asserting that changes in the aggregate RIS-NSFR reflect changes in the stable funding risk profile of banks. In broad terms, liquidity and stable funding standards were intended to reduce risks to covered banks and the financial system as a whole, and our results support the contention that they have done so.

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Appendix A. RIS-NSFR Construction

A. Introduction

The RIS-NSFR (and NSFR) is defined by the following equation:

$$\text{RIS-NSFR} = \frac{\sum_{a \in A} a \times \text{ASF}_a}{\sum_{r \in R} r \times \text{RSF}_r}$$

where $A = \{100, 95, 90, 50, 0\}$ is the set of ASF factor weights, $R = \{100, 85, 65, 50, 15, 5, 0\}$ is the set of RSF factor weights, ASF_a is the sum of the RIS variables with corresponding factor a , and RSF_r is the sum of the RIS variables with corresponding factor r . When ASF_a and RSF_r are measured at the individual bank level, the resulting value is an individual bank's RIS-NSFR. When ASF_a and RSF_r are measured as sum values for a set of banks, the resulting value is the aggregate RIS-NSFR for that set.

As discussed in Section IV, RIS-NSFR is intended to estimate the NSFR as it was defined in the final NSFR rule, using data from the FDIC's RIS data warehouse. Challenges in implementing this approach include

1. Insufficient data on the maturity and encumbrance characteristics of assets and liabilities (for example, having data on maturities less than one year, but not on whether the maturities are from zero to six months or six months to one year)
2. Discontinuities in data series because of changes to bank reporting requirements
3. Double-counting when certain reported items are included within others

To overcome these challenges, our model uses proxies from available data when exact data on NSFR components do not exist in RIS. Where RIS does not provide granular data on various liquidity characteristics within an NSFR component (for example, securities with various maturities) the model apportions component-level data to subcomponents equally. In the rest of this appendix, we discuss these proxies and apportionments for each NSFR category.

B. ASF Factors Framework⁴³

ASF is the weighted average of all of a bank's funding sources, including equity, deposits, and borrowings. These weights, called ASF factors, range from 0 (least stable funding) to 100 (most stable funding).

1. ASF_{100} Factors

The final NSFR rule assigns a 100 percent ASF factor (ASF_{100}) to regulatory capital elements and long-term liabilities. The RIS data warehouse does not contain complete data for all banks on these items before 2015 because of disparate reporting requirements. As a proxy for regulatory capital elements, our model uses total equity capital on a consolidated basis (EQTOT). To proxy for long-term liabilities, we use the sum of other borrowings (OTHBOT) and subordinated notes and debentures (SUBND).

Included in these last two variables are some liabilities with maturities of less than one year and thus are assigned ASF factors of less than 100 percent. We remove these short-term liabilities from the 100 percent ASF category by subtracting reported values for subordinated notes and debentures with a remaining maturity of one year or less (SUBND1L) and Federal Home Loan Bank advances and other borrowings with remaining maturity of one year or less (OTHBFH1L+OTHBOT1L).

⁴³ See 81 Fed. Reg. at 35135–35139.

2. ASF_{95} Factors

The final NSFR rule assigns a 95 percent ASF factor (ASF_{95}) to stable retail deposits, which are not identified separately on the Call Report or in RIS.⁴⁴ To proxy for stable retail deposits, our model uses insured transaction deposits of individuals, partnerships, and corporations including certified and official checks held in domestic offices (TRNIPCOC). However, since these values include some retail deposits that are uninsured and are therefore not defined as “stable” retail deposits in the final NSFR rule, we include half the value of these variables in ASF_{95} and half in ASF_{90} . This split should not change RIS-NSFR significantly, however, since the net effect of mischaracterizing an ASF_{90} deposit under ASF_{95} is only 5 percent of the value of the deposit.

Our model also considers as stable retail deposits a proportion of insured time deposits held in domestic offices (NTRTIME - NTRMLGJ). The proportion is equal to the fraction of retail nontransaction deposits (NTRIPC) in total nontransactional deposits (NTR) and represents our estimate of the fraction of time deposits from retail customers.

The final NSFR rule treats long-term brokered deposits differently from other long-term liabilities, assigning them to ASF_{90} . To account for this treatment, we subtract total brokered deposits with maturities longer than one year (BRO-BROINS1Y-BROLG1YR) from ASF_{95} and assign them to other categories. If brokered deposits with maturities longer than one year contain deposits with a 95 percent ASF factor, this adjustment may underestimate the value of ASF_{95} and hence underestimate the RIS-NSFR. Brokered deposits that mature in one year or less, and that are fully insured and from retail customers, are included within TRNIPCOC and NTRTIME and are therefore assigned an ASF factor of 95 percent in our model.

3. ASF_{90} Factors

The final NSFR rule assigns a 90 percent ASF factor (ASF_{90}) to other retail deposits and fully insured affiliate, reciprocal, and certain longer-term retail brokered deposits. None of these items are identified on the Call Report or in RIS. To proxy for other retail deposits, our model uses the sum of the value of savings deposits, including money market deposit accounts (MMDA) held in domestic offices (NTRSMMDA), all other savings deposits (excluding MMDA) held in domestic offices (NTRSOTH), total time deposits above the FDIC deposit insurance limit (NTRMLGJ), and a percentage of total foreign deposits (DEPFOR) equal to the share of NTRSMMDA, NTRSOTH, and NTRMLGJ in total domestic deposits (DEPDOM). These amounts are then multiplied by the fraction (NTRIPC/NTR) to represent our estimate of the fraction of these deposits from retail customers. The amounts of DEPFOR are also reduced by 50 percent to reflect the consolidation rules under 12 CFR 329.109.

Half the value of TRNIPCOC is included in ASF_{90} to account for uninsured retail funding.

To proxy for fully insured affiliate, reciprocal, and certain longer-term retail brokered deposits, our model uses total insured brokered deposits with maturities longer than one year (BROINS - BROINS1Y), which is subtracted from ASF_{95} . Insured brokered deposits from retail customers that mature in one year or less are included as components of NTRSMMDA, NTRSOTH, and NTRMLGJ and therefore receive an ASF factor of 90 in our model.

4. ASF_{50} Factors

The final NSFR rule assigns a 50 percent ASF factor (ASF_{50}) generally to types of funding that mature between six months and one year, including

- Unsecured wholesale funding provided by, and secured funding transactions with, a counterparty that is not a financial sector entity or central bank and with remaining maturity of less than one year
- Unsecured wholesale funding provided by, and secured funding transactions with, a financial sector entity or central bank with remaining maturity of six months or more but less than one year

⁴⁴ As defined by the LCR rule. See 79 Fed. Reg. at 61480.

- Securities issued by a covered company with remaining maturity of six months or more but less than one year
- Operational deposits
- Other retail brokered deposits
- All other liabilities with remaining maturity of six months or more but less than one year

To proxy for those funding sources, our model uses the sum of all funding that matures in less than one year (subordinated debt (SUBND1L) and other borrowing (OTHBFH1L+OTHBOT1L)). However, since RIS does not distinguish between borrowings with remaining maturities of less than six months and borrowings with remaining maturities between six months and a year, the RIS-NSFR assigns half this value to ASF_{50} (assumed to mature in six months to one year) and the remainder to ASF_0 (assumed to mature in less than six months).

To proxy for operational deposits, our model uses the sum of transactional deposits held in domestic offices of the U.S. government (TRNUSGOV), foreign governments (TRNFG), states and political subdivisions in the United States (TRNMUNI), commercial banks and other depository institutions in the United States (TRNCBO), and commercial banks and other depository institutions in foreign countries (TRNFC). To account for similar deposits held in foreign offices, we apportion a share of total deposits in foreign offices (DEPFOR) equal to the share of (TRNUSGOV+TRNFG+TRNMUNI+TRNCBO+TRNFC) in total domestic deposits (DEPDOM) to ASF_{50} .

As discussed in the ASF_{95} and ASF_{90} sections above, a portion, equal to NTRIPC/NTR, of NTRTIME, NTRSMMDA, and NTRSOTH are assumed to be from retail customers and given appropriate ASF weights of 95 or 90. The balance of those variables are assumed to be from non-retail customers and included in ASF_{50} .

Finally, in addition to the short-term liabilities described above, the final NSFR rule assigns a 50 percent ASF factor to uninsured brokered deposits of any maturity. To account for these liabilities, we add longer-term uninsured brokered deposits (BRONINS – BROLG1YR) to ASF_{50} . BROLG1YR is subtracted from BRONINS because uninsured brokered deposits from non-retail customers are included as components of transaction accounts and nontransaction accounts of non-retail customers, and are therefore included in the variables listed above and receive an ASF factor of 50 in our model.

5. ASF_0 Factors

The final NSFR rule assigns a 0 percent ASF factor (ASF_0) to

- Trade date payables
- Certain short-term retail brokered deposits
- Certain short-term funding from financial sector entities
- Any other NSFR liability that matures in less than six months
- Derivatives liability amount

We include in ASF_0 half of SUBND1L+OTHBFH1L+ OTHBOT1L to estimate securities issued and other borrowing with remaining maturities of less than six months. We also include federal funds purchased and securities sold under agreements to repurchase on a consolidated basis to estimate short-term funding from financial sector entities (FREPP).

A bank's NSFR derivatives liability amount is the greater of zero and the difference between the bank's derivatives liability amount and derivatives assets amount. We proxy the derivatives asset amount with the reported amount of derivatives with a positive fair value (TRREVAL) and the derivatives liability amount with the reported value of derivatives with a negative fair value (TRLREVAL).

To estimate any other NSFR liability that matures in less than six months, we use trading liabilities (TRADEL) and other liabilities (OL).

6. Validation of ASF Coverage

To ensure that the ASF factors in the RIS-NSFR include all necessary elements across time, we summed all RIS components that were assigned each ASF factor and compared that sum to the reported total liabilities and equity capital line item (LIABEQ). For every quarterly Call Report since 2002, we accounted for more than 97 percent of industry LIABEQ, with an average coverage rate of more than 99.3 percent.

C. RSF Factor Framework⁴⁵

RSF is the weighted average of all of a bank's assets, with higher weights assigned to assets that have longer maturity, are encumbered, are not fully performing, or are otherwise less readily converted into cash. RSF factors range from 0 (most liquid) to 100 (least liquid).

1. RSF_0 Factors

The final NSFR rule assigns a 0 percent RSF factor (RSF_0) to unencumbered currency and coin, cash items in the process of collection, Federal Reserve Bank balances, claims on a Federal Reserve Bank or foreign central bank that mature in less than six months, and trade date receivables. As a proxy for these variables, our model uses cash and cash balances (CHBALI +CHBALNI) that correspond to Call Report Schedule RC-A and align with the definitions used in the final NSFR rule.

In addition, the final NSFR rule assigns a 0 percent RSF factor to unencumbered Level 1 liquid assets, which includes securities issued or guaranteed by the U.S. Department of Treasury and certain liquid and readily marketable securities. To proxy for those assets, our model uses values reported on Call Report Schedule RC-B that meet these definitions along with the corresponding trading assets on Schedule RC-D (listed in Table 4). The corresponding RIS variables include U.S. Treasury securities (SCUSTHA+SCUSTAF+TRSCUSTR) and U.S. government agency obligations (SCAOTHA+SCAOTAF+TRSCUSAG).⁴⁶ Our model also assigns a 0 percent RSF factor to the value of federal funds sold (FFSOLD). The Call Report instructions state that assets can only be reported as federal funds sold if they mature within one business day, so we consider these items to be equivalent to cash, trade date receivables, and Level 1 liquid assets from a liquidity standpoint.

Finally, the final NSFR rule assigns to RSF_0 the amount of unencumbered secured lending transactions with a financial sector entity or a subsidiary thereof that mature within six months and are secured by rehypothecatable Level 1 liquid assets. To proxy for those assets, our model uses one-third of the value of securities purchased under a resale agreement (REPOSOLD). RIS does not identify maturity data of REPOSOLD, so we assume that one-third of the value of REPOSOLD represents assets with remaining maturities less than six months and that are secured by rehypothecatable Level 1 liquid assets, one-third have remaining maturities less than six months and are secured by collateral other than rehypothecatable Level 1 liquid assets, and one-third have remaining maturities of more than six months but less than one year.

2. RSF_5 Factors

The final NSFR rule assigns a 5 percent RSF factor (RSF_5) to the credit and liquidity facilities that a covered company provides to its customers and counterparties. To proxy for these values, we use off-balance sheet commitments reported on Call Report Schedule RC-L including unused commitments for commercial real estate loans secured by real estate

⁴⁵ See 81 Fed. Reg. at 35141–35147.

⁴⁶ SCAOTAF and SCAOTHA are not populated variables for any banks between the June 2018 Call Report and the December 2020 Call Report. However, the effect of this discontinuity on the results of our model is likely minimal since the combined values of SCAOTAF and SCAOTHA account for a maximum of 0.2 percent of assets and an average of 0.13 percent of assets among all banks between March 2002 and March 2018.

(UCCOMRES); commercial real estate loans not secured by real estate (UCCOMREU); credit card lines (UCCRCRD); revolving, open-end lines of credit secured by 1–4 family residential properties (UCLOC); securities underwriting (UCSC); and all other purposes (UCOTHER). Also included in this category of off-balance sheet commitments are financial standby letters of credit and foreign office guarantees (LOCFSB), performance standby letters of credit and foreign office guarantees (LOCPSB), and commercial letters of credit (LOCCOM).

3. RSF_{10} Factors

Although the 2016 NPR assigned a 10 percent RSF factor to certain assets, the final NSFR rule does not assign a 10 percent RSF factor to any assets.

4. RSF_{15} Factors

The final NSFR rule assigns a 15 percent RSF factor (RSF_{15}) to level 2A liquid assets as set forth in section 20(b) of the LCR final rule without considering the requirements in section 22 or the level 2 cap in section 21.⁴⁷ This category includes certain liquid and readily marketable obligations issued or guaranteed by a U.S. GSE and certain obligations issued or guaranteed by a sovereign entity or a multilateral development bank.⁴⁸ As a proxy for these assets, our model uses the following RIS variables in RSF_{15} as indicated.

RSF_{15} includes one-third of the value of securities purchased with a repurchase agreement (REPOSOLD), representing the portion of securities purchased with a repurchase agreement that mature in less than six months but are secured by collateral other than rehypothecatable Level 1 liquid assets. The remaining two-thirds of REPOSOLD is assigned equally between RSF_0 and RSF_{50} .⁴⁹

RSF_{15} also includes other loans to financial sector entities with maturities of less than one year, including loans and acceptances to U.S. branches and agencies of foreign banks (LNDEPAUS), loans to depository institutions or commercial banks (LNDEPCOM), loans to other depository institutions (LNDEPUS), loans to foreign branches of other U.S. banks (LNDEPFUS), loans to other banks in foreign countries (LNDEPFOT), and loans to nondepository financial institutions (LNOTHER). Because these RIS variables also contain assets with maturities longer than a year, we account for the ambiguity by multiplying each variable by the share of loans and leases with maturities less than one year (LNLSLES1) in total loans and leases (LNLS) and apportioning half of that value to RSF_{50} ⁵⁰ and the other half to RSF_{15} .⁵¹ Note that this allocation method assigns equal weight to each factor because the authors do not have a priori beliefs about the distribution of maturities for these assets.

RSF_{15} also contains various securities such as U.S. government agency and corporation obligations excluding MBS (SCASPNAH+SCASPNAF),⁵² residential MBS issued by GSEs (SCFMNHA+SCFMNAF), residential collateralized mortgage obligations (CMOs) and real estate mortgage investment conduits (REMICs) issued or guaranteed by a U.S. government agency or GSE, or collateralized by loans or securities issued or guaranteed by a U.S. government agency or GSE (SCCOLHA+SCCOLAF+TRSCMB), commercial MBS issued or guaranteed by GSEs (SCCPTGHA+SCCPTGAF+TRSCCMBG),

⁴⁷ See 79 Fed. Reg. at 61529–61530.

⁴⁸ See 86 Fed. Reg. at 9158–9159.

⁴⁹ See discussion of RSF_0 .

⁵⁰ Representing maturities of 6 to 12 months.

⁵¹ Representing maturities of less than 6 months.

⁵² Some of the securities included in SCASPNAH and SCASPNAF are likely U.S. government agency or corporation bonds that carry a guarantee of interest and principal payment that is backed by the full faith and credit of the U.S. Treasury, and therefore should be assigned an ASF factor of 0 rather than 15. However, the effect of this possible mischaracterization of assets on the results of our model is likely minimal since the combined values of SCASPNAF and SCASPNAH amount to a maximum of 3.58 percent of assets, and an average of 1.85 percent of assets, from March 2002 through December 2020.

residential MBS guaranteed by GNMA (SCGNMHA+SCGNMAF+TRSCPAS), and other CMOs and REMICs guaranteed by GSEs (SCCMOGHA+SCCMOGAF).

We also assign to RSF_{15} a portion of other traded assets (TRLNOTH) equal to half of the proportion of loans and leases with less than one year of remaining maturity (LNLSLES1) in total loans and leases (LNLS).

5. RSF_{50} Factors

The final NSFR rule assigns a 50 percent RSF factor to unencumbered Level 2B liquid assets, secured lending transactions with a financial sector entity or a subsidiary thereof or a central bank that mature in six months or more but less than one year, operational deposits held at financial sector entities, secured lending transactions and unsecured wholesale lending to counterparties that are not financial sector entities and are not central banks and that mature in less than one year, lending to retail customers and counterparties that matures in less than one year, and all other assets that mature in less than one year.⁵³ To proxy for these RSF_{50} assets, our model includes the following RIS variables:

One-third of the value of REPOSOLD is assigned to RSF_{50} to account for repurchase agreements sold with maturities of between six months and one year.⁵⁴

RSF_{50} contains all loans and leases with remaining maturity less than a year that are not already assigned a lower factor weight. As a proxy for this variable, we use the value of loans and leases with less than one year of remaining maturity (LNLSLES1), except those that were assigned to RSF_{15} .

Level 2B liquid assets include equity securities that are part of a major index and investment-grade corporate and municipal obligations. Municipal obligations are included in the RIS variables SCMUNIHA, SCMUNIAF, and TRSCMUNI. RIS does not distinguish between municipal obligations that do and do not meet the criteria to be “investment grade.” As such, we assume half the value of these accounts represents investment-grade municipal obligations and assign them to RSF_{50} .⁵⁵

We assume half the values of domestic debt securities (SCODOTAF+SCODOTHA) and foreign debt securities (SCFORDAF+SCFORDHA) represent the investment-grade portion of these securities and assign those to RSF_{50} .⁵⁶

We assign to RSF_{50} a portion of other traded assets (TRLNOTH) equal to half of the proportion of loans and leases with less than one year of remaining maturity (LNLSLES1) in total loans and leases (LNLS).⁵⁷

Finally, we assume half of the value of equity securities (SCEQMV+SCEQFV) represent securities that are part of a major stock market index and assign those to RSF_{50} .⁵⁸

6. RSF_{65} Factors

The final NSFR rule assigns a 65 percent RSF factor (RSF_{65}) to retail mortgages that mature in one year or more and are assigned a risk weight of no greater than 50 percent.⁵⁹ As a proxy for this value, our model includes closed-end loans secured

⁵³ See 86 Fed. Reg. at 9159–9162.

⁵⁴ See discussion in RSF_0 .

⁵⁵ The other half is assigned to RSF_{100} .

⁵⁶ The other half is assigned to RSF_{85} .

⁵⁷ By assigning a portion of TRLNOTH to RSF_{15} , we are assuming that all loans included in TRLNOTH are loans to financial sector entities. TRLNOTH potentially includes some loan types that are not eligible for a 15 percent RSF factor, including loans to foreign governments and loans to states and political subdivisions in the United States, so this methodology understates RSF and, therefore, overstates the NSFR, to the extent that our model assigns a 15 percent RSF factor to assets that should be assigned a higher RSF factor. Call Report forms 031 and 041 require institutions to report loans secured by real estate held for trading, consumer loans held for trading, and commercial and industrial loans held for trading on form RC-D; all other loans held for trading are included in TRLNOTH. We expect that this assumption has a minimal effect on the quality of our model because loans to financial institutions make up the majority of loans reported on Schedule RC-C that could potentially be included in TRLNOTH, so they likely make up the majority of loans held for trading that could be included in TRLNOTH. Between March 2002 and December 2020, loans to financial institutions represented a minimum of 80.8 percent of all loans that are potentially included in TRLNOTH and an average of 86.0 percent of such loans. Further, TRLNOTH comprises a very small percentage of total assets between March 2002 and December 2020: the ratio of TRLNOTH to total assets had a maximum value of 0.15 percent, and an average value of 0.08 percent, over this period.

⁵⁸ The other half is assigned to RSF_{85} .

⁵⁹ See 86 Fed. Reg. at 9162.

by 1–4 family residential properties held in trading accounts (TRLNRR1) and all other closed-end loans secured by first liens on 1–4 family residential properties (LNRERSFC). Following our method to apportion loans and leases to different degrees of maturity,⁶⁰ we remove from RSF₆₅ a share of LNRERSFC equal to the share of LNLSLES1 in LNLS.

The final NSFR rule also assigns to RSF₆₅ secured lending transactions, unsecured wholesale lending, and lending to retail customers and counterparties that mature in one year or more and are assigned a risk weight of no more than 20 percent. As a proxy for this value, we include municipal loans (LNMUNI), loans to foreign governments (LNFG), loans to farmers (LNAG), loans to consumers (LNCON), loans secured by farmland (LNREAG), commercial real estate loans (LNRECNOC + LNRENF + LNREMULC + LNRENOWC + LNRENOTC), and commercial and industrial loans (LNCI). To account for the risk weight criterion, we apportion these variables using the share of total balance sheet assets assigned a risk weight of 0 percent, 2 percent, 4 percent, or 20 percent, as reported on Call Report Schedule RC-R.⁶¹ To account for the maturity criterion, we remove from RSF₆₅ a share of LNMUNI + LNFG + LNAG + LNCON + LNAG + LNRECNOC + LNRENF + LNREMULC + LNRENOWC + LNRENOTC + LNCI equal to the share of LNLSLES1 in LNLS.

7. RSF₈₅ Factors

The final NSFR rule assigns an 85 percent RSF factor to retail mortgages that mature in one year or more and are assigned a risk weight of greater than 50 percent.⁶² To proxy for this value, we include in RSF₈₅ other loans secured by 1–4 family residential properties including open-end loans and loans secured by junior liens on 1–4 family residential properties (LNRELOCC+TRLNRLC+LNRERS2C+TRLNRR2). Following our method to apportion loans and leases to different degrees of maturity,⁶³ we remove a share of these loans equal to the share of LNLSLES1 in LNLS.

RSF₈₅ also contains the balance of municipal loans (LNMUNI), loans to foreign governments (LNFG), loans to farmers (LNAG), loans to consumers (LNCON), loans secured by farmland (LNREAG), commercial real estate loans (LNRECNOC + LNRENF+LNREMULC+LNRENOWC+LNRENOTC), and commercial and industrial loans (LNCI) not assigned to RSF₆₅ or RSF₅₀ based on risk-weights and/or maturities. Following our method to apportion loans and leases to different degrees of maturity, we remove a share of these loans equal to the share of LNLSLES1 in LNLS.⁶⁴

As discussed in the section on RSF₅₀, we also include in RSF₈₅ half the values of domestic debt securities (SCODOTAF+SCODOTHA) and foreign debt securities (SCFORDAF+SCFORDHA) to represent the portion of these securities that does not meet the criteria to be considered investment grade. Similarly, RSF₈₅ contains half the value of equity securities (SCEQMV+SCEQFV) representing securities that are not part of a major stock market index, with the remaining half assigned to RSF₅₀.

RSF₈₅ also contains asset-backed securities and structured financial products, private-label residential and commercial MBS, and CMOs and REMICs not issued by or guaranteed by a U.S. government agency or GSE and not collateralized by securities or loans issued or guaranteed by a U.S. government agency or GSE: SCABSAF+SCABSHA+SCCMOPAF+SCCMOPHA+SCCPTPAF+SCCPTPHA+SCODPCAF+SCODPCHA+SCOPICAF+SCOPICHA+SCOPIOAF+SCOPIOHA+SCSFPAF+ SCSFPHA+ TRSCMBP+TRSCOTDB+TRSCOTMB.

⁶⁰ See discussion on RSF₁₅ and RSF₅₀.

⁶¹ The remaining value is included in RSF₀.

⁶² See 86 Fed. Reg. at 9163.

⁶³ See discussion on RSF₁₅ and RSF₅₀.

⁶⁴ See discussion on RSF₁₅ and RSF₅₀.

8. RSF_{100} Factors

The final NSFR rule assigns all other assets to the RSF_{100} category.⁶⁵ This category includes loans to financial institutions that mature in one year or more. To proxy for these loans, we use the value of loans to nondepository financial institutions and other loans (LNOTHER), other loans in trading accounts (TRLNOTH), loans and acceptances to U.S. branches and agencies of foreign banks (LNDEPAUS), loans to domestic commercial banks (LNDEPCOM), loans to other depository institutions (LNDEPUS), loans to foreign branches of U.S. banks (LNDEPFUS), and loans to other banks in foreign countries (LNDEPFOT). Following our method to apportion loans and leases to different degrees of maturity,⁶⁶ we remove a share of these loans equal to the share of LNLSLES1 in LNLS.

RSF_{100} also includes municipal obligations that do not meet the criteria to be considered investment grade (SCMUNIIHA+SCMUNIAF+TRSCMUNI). Our model assigns half the value of these accounts to RSF_{100} .⁶⁷

Our model also assigns to RSF_{100} all remaining assets such as premises and fixed assets (BKPREM), other real estate owned (ORE), investments in subsidiaries (INVSUB), investments in real estate ventures (INVSUORE), and other assets (OA).

Finally, the final NSFR rule contains a complex treatment for derivatives, including for initial margin and variation margin provided to and received from derivatives counterparties,⁶⁸ which are not reported on the Call Report and therefore do not correspond to any RIS variables. The rule requires covered companies to calculate their net derivatives liability or asset amount by subtracting total derivatives liabilities from total derivatives assets, and assigning the amount to RSF_{100} if the amount is positive or to ASF_0 if the amount is negative.⁶⁹ The net derivatives asset or liability calculation takes into account variation margin, so we cannot calculate the exact amount using RIS variables. However, we proxy for this value by subtracting reported derivatives with a negative fair value (TRLREVAL) from the reported amount of derivatives with a positive fair value (TRREVAL). The final NSFR rule also includes in RSF_{100} an amount equal to “5 percent of the sum of the covered company’s gross derivatives liabilities, when calculated as if no variation margin had been exchanged and no settlement payments had been made based on changes in the values of the derivative transactions.”⁷⁰ As a proxy for this amount, our model includes 5 percent of the total value of derivatives with a negative fair value held for trading (TRLREVAL) in RSF_{100} .

9. Validation of RSF Coverage

To check the coverage of our RSF factors across Call Report form type and time, we summed all RIS components discussed in this section, other than off-balance sheet commitments (unused loan commitments and letters of credit), and compared that sum to the reported total assets line item (ASSET). For every quarterly Call Report since 2002, we accounted for more than 96 percent of industry ASSET, with an average coverage rate of more than 99.8 percent.

D. Additional Adjustments

Our methodology reflects our interpretation of the final NSFR rule’s treatment of unencumbered, performing assets. However, we also account for the final NSFR rule’s treatment of encumbered and/or nonperforming assets. In addition, we account for unearned income on loans and some data discrepancies.

⁶⁵ See 86 Fed. Reg. at 9165.

⁶⁶ See discussion on RSF_{15} and RSF_{50} .

⁶⁷ See discussion on RSF_{50} .

⁶⁸ See 86 Fed. Reg. at 9171–9183.

⁶⁹ See 86 Fed. Reg. at 9172–9173.

⁷⁰ See 86 Fed. Reg. at 9182.

1. Past-Due and Nonaccrual Assets

The final NSFR rule assigns a 100 percent RSF factor to loans and securities 90 days or more past-due or in non-accrual status (i.e., nonperforming). RIS contains information on the amount of each loan type that is nonperforming. For example, RIS contains data on the volume of agricultural loans past due by 90 days or more (P9AG) or in nonaccrual status (NAAG). The amount of all loan types 90 days or more past due or in nonaccrual status are reported on the Call Report, enabling our model to apportion the total amount of past-due and nonaccrual loans between RSF categories with greater precision. For each RSF category, our model subtracts the nonperforming portion of loans and assigns them to RSF₁₀₀.

However, RIS does not contain granular data on nonperforming securities by type. Therefore, our model apportions the total amounts of securities 90 days or more past due (P9SCDEBT) and nonaccruing securities (NASCDEBT) proportional to the share of securities in each RSF category to total securities. The shares of securities that are nonperforming in each RSF category are then reassigned to RSF₁₀₀.

2. Pledged and Encumbered Securities

The final NSFR rule provides that loans and securities pledged as collateral or otherwise encumbered be assigned to different RSF categories based on the length of the encumbrance. While RIS reports the amount of pledged loans (LNPLEDGE) and securities (SCPLEDGE), RIS has no data on the amount to time for which the loan or security is pledged as collateral, the distribution of such pledged assets, or other encumbrances.

To incorporate pledged assets into our model, we first apportion the total amount of pledged loans/securities according to the share of performing loans/securities in each RSF category. For example, if 37.2 percent of a bank's performing loans are in RSF₈₅, then the model apportions 37.2 percent of pledged loans to RSF₈₅. Next, our model assigns one-third of the share of pledged assets in each RSF category to each of the three pledge durations: (1) zero to six months, (2) six months to a year, and (3) more than one year.⁷¹ Assets pledged for more than one year are assigned to RSF₁₀₀. Assets pledged for less than six months are treated as unencumbered and remain in their original RSF category. Assets pledged for between six months and one year are assigned to the greater of RSF₅₀ and the category to which they would be assigned if they were unencumbered.

3. Unearned Income

Banks report the total amount of any unearned income (UNINC) included in the values of the various types of loans and leases reported on Call Report Schedule RC-C. This amount is subtracted from the aggregate reported value of all loan and lease types reported on Call Report Schedule RC-C to derive the balance sheet value of total loans and leases held for sale or investment, as reported on Call Report Schedule RC. However, this amount is reported as a total across all loans and leases and not by loan and lease category. To account for the unearned income in each loan category, we apportion the unearned income across all performing loans by each loan category's share in total performing loans. These apportioned unearned income amounts are subtracted from each performing loan category. Since an institution's total assets are calculated based on the amount of loans and leases after subtracting unearned income, unearned income is not included in any RSF category.

4. Allowance for Loan and Lease Losses

Banks report on Call Report Schedule RC their allowance for losses on loans and leases (LNLSRES). This amount is reported as a total amount across all loans, rather than by loan category. To account for these allowances for losses, we apportion LNLSRES across all nonperforming loans by their share in total nonperforming loans. These apportioned amounts are subtracted from each nonperforming loan category. Total reported assets are reduced by the amount of the allowance for loan and lease losses to calculate total assets for each institution. Since this amount is not included in total assets, it is not included in any RSF category.

⁷¹ The authors have no a priori beliefs on the distribution of pledged assets and thus split the share evenly across the three durations.

E. Legacy Variables

In numerous cases, the information required on Call Reports has changed. For most cases, RIS attempts to use the same RIS variable to represent both the current Call Report line item and the legacy line item. In some cases, however, RIS does not continue reporting that line item. In such instances, our model uses the legacy variables up to the point where the data changed and then the new variables from that point forward. For example, banks have reported their amount of derivatives with a positive fair value (TRREVAL) on a consolidated basis only since 2008. To track this variable for periods before 2008, we use bank holdings of derivatives in domestic (TRREVALD) and foreign (TRREVALF) offices. While this treatment may create data discontinuities, it allows us to track similar assets across the entire sample period. The coverage of RSF categories is close to 100 percent of assets for the entire sample period, supporting our belief that the effect of these discontinuities on the estimated NSFR calculations is small.

F. Comparison of RIS-NSFR to Other NSFR Proxies

As discussed in Section IV, the RIS-NSFR differs from the NSFR proxies developed by King (2013), Hong et al. (2014), DeYoung and Jang (2016), and Hoerova et al. (2018) in several respects, including the database used to develop the proxy (King [2013] used Bankscope data, Hoerova et al. [2018] used the ECB's Individual Balance Sheet Items database, and Hong et al. [2014] and DeYoung and Jang [2016] used FFIEC Call Report data, which is the same data source on which we base the RIS-NSFR) and the definition of the NSFR used to develop the proxy (King [2013] used the BCBS [2010] definition, Hong et al. [2014] used both the BCBS [2010] and the BCBS [2014] definitions, DeYoung and Jang [2016] and Hoerova et al. [2018] used the BCBS [2014] definition, and the RIS-NSFR uses the NSFR as defined in the final NSFR rule). No public data source contains the information that a researcher would need to perfectly proxy the NSFR, so assumptions need to be made about certain characteristics of publicly available balance sheet items including the distribution of retail versus wholesale customers, the maturities of certain assets and liabilities, and the encumbrance of assets. Below we discuss key differences between the assumptions used to develop the RIS-NSFR and assumptions used to develop other NSFR proxies.

1. Distinguishing “Stable” Deposits From “Less Stable” Deposits

The final NSFR rule in the United States as well as BCBS (2010) and BCBS (2014) assign higher ASF factors to “stable” deposits than to “less stable” deposits. “Stable” deposits are defined as those that are covered by an effective deposit insurance scheme or a public guarantee that provides equivalent protection, the depositors have an established relationship with the bank, and/or the deposits are held in transactional accounts. Public data sources do not provide sufficiently granular data on deposits to allow researchers to unambiguously distinguish between stable and less stable deposits, so researchers must make assumptions to determine which deposits should and should not be considered stable for the purposes of generating an NSFR proxy.

As described in section B of Appendix A, to develop the RIS-NSFR, we assume that half of transaction accounts of individuals, partnerships, and corporations (RIS variable TRNIPCOC) are fully covered by deposit insurance and therefore meet the definition of stable retail deposits. Implicit in this approach is the assumption that all deposits in this category belong to customers with an established relationship with the bank.

King (2013) assumes that 70 percent of all deposits meet the criteria of stable deposits.

Hong et al. (2014) assume that 20, 50, or 80 percent of transaction accounts of individuals, partnerships, and corporations belong to customers with an established relationship with the bank in their pessimistic, baseline, and optimistic scenarios, respectively. They estimate the portion of that value covered by deposit insurance by multiplying it by the ratio of total deposits to total assets.

DeYoung and Jang (2016) assume that 100 percent of transaction accounts of individuals, partnerships, and corporations, as well as 100 percent of the value of non-MMDA savings deposits and non-brokered time deposits with values under \$250,000 that mature in less than one year, meet the definition of stable deposits.

Hoerova et al. (2018) assume that all household deposits, other than those that mature overnight, meet the definition of stable deposits.

2. Estimating the Maturity of Funding Sources

The final NSFR rule treats borrowing that matures in six months to one year as more stable than borrowing that matures in less than six months. The Call Report distinguishes between borrowing that matures in less than one year and borrowing that matures in more than one year, but not between borrowing that does and does not mature in six months or more.

As described in section B of Appendix A, in constructing the RIS-NSFR we assume that half of all borrowing that matures in less than one year matures in less than six months, and the other half matures in six months to one year.

King (2013) assumes that half of all borrowing matures in less than one year, and the other half matures in more than one year. King creates his NSFR proxy based on the BCBS (2010) definition, which assigns a 50 percent ASF factor to all funding that matures in less than one year and does not treat funding that matures in less than six months differently from funding that matures in six months to one year. Here, the difference between the NSFR proxy developed by King (2013) differs from the RIS-NSFR because the two proxies are based on different definitions of the NSFR.

Hong et al. (2014), DeYoung and Jang (2016), and Hoerova et al. (2018) assign a 50 percent ASF factor to borrowing that matures in less than one year and assign a 100 percent ASF factor to borrowing that matures in more than one year. They make no assumptions about the distribution of maturities among funding sources that mature in less than one year. Like King (2013), these researchers did not estimate the portion of funding that matures in less than six months. However, unlike King (2013), these researchers used data sources that identified funding that matures in less than one year, while King (2013) estimated the portion of borrowing that matures in less than one year. Further, these researchers based their proxies on the BCBS (2014) definition, which assigns an ASF factor of 0 percent to liabilities that mature in less than six months and an ASF factor of 50 percent to liabilities that mature in six months to one year, whereas King (2013) bases his proxy on the BCBS (2010) definition which does not make such a distinction.

3. Treatment of Time Deposits

We did not consider the maturity of deposits in developing the RIS-NSFR, because the final NSFR rule does not make a distinction between time deposits and other deposits. Under the final NSFR rule, deposits (including time deposits) that belong to retail customers receive a 95 or 90 percent ASF factor depending on whether they are fully covered by deposit insurance, and those that belong to wholesale customers receive a 50 percent ASF factor.

King (2013) does not distinguish between time deposits and other deposits in developing his NSFR proxy. He assigns a 90 percent ASF factor to 70 percent of all deposits (assumed to meet the definition of “stable” deposits) and an 80 percent ASF factor to the remaining 30 percent of deposits.

Hong et al. (2014) assign a 100 percent ASF factor to all time deposits that mature in more than one year. Time deposits that mature in less than one year receive an ASF factor of 95 percent if they are “small,” meaning fully covered by deposit insurance, and they receive an ASF factor of 50 otherwise.

DeYoung and Jang (2016), like Hong et al. (2014), assign a 100 percent ASF factor to all time deposits that mature in more than one year. Non-brokered time deposits that mature in less than one year and are fully covered by deposit insurance receive a 95 percent ASF factor, while those not fully covered by deposit insurance receive a 90 percent ASF factor. Brokered time deposits that mature in less than one year receive a 50 percent ASF factor.

Hoerova et al. (2018) assign a 100 percent ASF factor to time deposits that mature in more than one year. They assign a 95 percent ASF factor to time deposits from households that mature in less than one year, and a 90 percent ASF factor to other time deposits that mature in less than one year.

4. Estimating Encumbrance of Assets and the Duration of Encumbrance

As described in section D of Appendix A, we estimate the portion of each loan and security type encumbered by assuming that the amount of each loan and security type encumbered is equal to total pledged loans (securities) multiplied by the share of total loans (securities) represented by each category of loans (securities). We then assume, for each asset type, that exactly one-third of the assets that are assumed to be encumbered are encumbered for more than one year, another third is encumbered for six months to one year, and the final third is encumbered for less than six months.

King (2013), Hong et al. (2014), DeYoung and Jang (2016), and Hoerova et al. (2018) make no adjustments to their NSFR proxy calculations to account for encumbered assets.

5. Treatment of Nonperforming Assets

As discussed in section D of Appendix A, we subtract the nonperforming (past due by 90 days or more or in nonaccrual status) portion of each loan type from the RSF category to which the loan would be assigned were it performing, and assign a 100 percent RSF factor to the nonperforming portion. The Call Report contains data only on the aggregate volume of securities that are nonperforming, so we apportion nonperforming securities to each RSF category based on the share of total securities in each RSF category. We subtract the volume of securities assumed to be nonperforming in each RSF category from the RSF category to which the securities would be assigned were they performing, and assign a 100 percent RSF factor to the nonperforming securities.

DeYoung and Jang (2016) follow the same approach we do with respect to loans— that is, they subtract the nonperforming portion of each loan type from the RSF category to which the loan type would be assigned were it performing, and they assign a 100 percent RSF factor to the nonperforming portion. They make no adjustments to securities to account for nonperforming assets.

King (2013), Hong et al. (2014), and Hoerova et al. (2018) make no adjustments in their NSFR proxies to account for nonperforming assets.

6. Allocation of Residential Mortgage Loans to the 65 Percent and 85 Percent RSF Categories

The final NSFR rule assigns a 65 percent ASF factor to residential mortgages that mature in more than one year, are not encumbered or nonperforming, and qualify for a risk weight of no greater than 50 percent under risk-based capital rules issued by U.S. financial regulatory agencies. In addition, mortgages encumbered for more than one year are assigned an RSF factor of 100, those encumbered for six months to one year are assigned an RSF factor that is the greater of 50 or the factor they would be assigned if they were not encumbered, and those encumbered for less than six months are assigned the same RSF factor they would be assigned had they not been encumbered.

As described in section C of Appendix A, to construct the RIS-NSFR in accordance with the final NSFR rule, we assign a 65 percent RSF factor to closed-end loans secured by first liens on 1–4 family residential properties that are performing and that are apportioned by our methodology to mature in more than one year and be unencumbered (or encumbered for less than one year). All other performing and unencumbered (or encumbered for less than one year) residential mortgage loans, which include open-end loans secured by residential properties and closed-end loans secured by junior liens on 1–4 family residential properties, are assigned an 85 percent RSF factor in our model.

In slight contrast to the final NSFR rule, the BCBS (2010) and BCBS (2014) NSFR definitions assign a 65 percent RSF factor to unencumbered residential mortgages of any maturity that would qualify for a 35 percent or lower risk weight under the Basel II Standardized Approach for credit risk.

King (2013) assigns a 65 percent RSF factor to all residential mortgage loans.

Hong et al. (2014) do not distinguish between loan types or security types to develop their NSFR proxy. In their model, the RSF factors assigned to loans and securities are based exclusively on the risk weight the loans and securities receive under the capital rules issued by U.S. financial regulatory agencies. They assign a 65 percent RSF factor to all loans that receive a 20 percent risk weight, whether or not those loans are residential mortgages or other types of loans. Loans with other risk weights are assigned to different RSF categories.

DeYoung and Jang (2016) assign an 85 percent RSF factor to all loans secured by real estate, which would include residential mortgages.

Hoerova et al. (2018) assign a 65 percent RSF factor to all household mortgages that mature in more than one year.

7. Assigning the Maturity of Loans

As discussed in section C of Appendix A, we apportioned total loans and leases that mature in less than one year to each RSF category based on the share of total loans and leases that we assigned to each RSF category. We subtract loans and leases that are assumed to mature in less than one year from the RSF category to which the loan type would be assigned if it matured in more than one year and assign an RSF factor of 15 percent to that amount for loans to financial institutions, or 50 percent for all other loan types.

King (2013) assigns a 0 percent RSF factor to interbank loans that mature in less than one year and a 100 percent RSF factor to interbank loans that mature in more than one year. He assigns a 50 percent RSF factor to loans to corporate clients that mature in less than one year and a 65 percent RSF factor to loans to corporate clients that mature in more than one year. Finally, he assigns an 85 percent RSF factor to loans to retail clients that mature in less than one year and a 100 percent RSF factor to loans to retail clients that mature in more than one year.

Hong et al. (2014) and DeYoung and Jang (2016) do not adjust their models to account for the maturity of loans, likely because the Call Report reports only relevant loan maturities at the aggregate level and not at the level of individual loan types.

Hoerova et al. (2018) assign a 15 percent RSF factor to loans to financial institutions and a 50 percent RSF factor to government loans, regardless of maturity. They assign a 50 percent RSF factor to household loans, household mortgages, and loans to nonfinancial corporations that mature in less than one year. They assign a 65 percent RSF factor to all other household mortgages and an 85 percent RSF factor to all other loans to households and nonfinancial corporations.

8. Estimating Derivatives Asset and Liability Amounts

As discussed in section C of Appendix A, to construct the RIS-NSFR we subtract the value of derivatives with a negative fair value from the value of derivatives with a positive fair value, and assign an RSF factor of 100 percent to the difference if it is a positive value and an RSF factor of zero to the difference if it is a negative value. We also assign an RSF factor of 100 to 5 percent of the value of derivatives with a negative fair value.

King (2013), Hong et al. (2014), and Hoerova et al. (2018) do not include derivatives in their NSFR proxy calculations. DeYoung and Jang (2016) do not include derivatives in their calculation because the NSFR as defined by BCBS (2014) leaves the treatment of derivatives up to the national regulator that implements the NSFR standard.

Appendix B. Validation Check Using NSFR Data Reported by Banking Organizations

Given that RIS variables do not align perfectly to the NSFR categories, we check whether the RIS-NSFR can be a useful proxy for the NSFR by comparing the RIS-NSFRs for IDIs of selected banking organizations to actual NSFRs. Specifically, we calculate the aggregate RIS-NSFR for the set of IDIs under each bank organization's global top tier parent and compare our calculated aggregate RIS-NSFR to the NSFR reported by the banking organization to BCBS. The reported NSFR data are confidential and were provided to us by supervisory divisions within the FDIC. Our results show a strong, positive correlation between our NSFR proxy and actual NSFRs as calculated by banks.

BCBS has been monitoring the impact of Basel II/III reforms on participating banks.⁷² As part of this ongoing monitoring exercise, participating banks have provided to BCBS workbooks that identify 44 liability and equity line items, 103 asset items, and 11 off-balance sheet line items that constitute the NSFR.⁷³ Most line items were disaggregated by their remaining periods of encumbrance and remaining maturities. Each disaggregated line item is then assigned an ASF (or RSF) factor. For this check of our NSFR proxy, we used BCBS data provided by large U.S. bank holding companies for the quarter ending December 31, 2017.⁷⁴

For each BHC for which we had BCBS data, we combined the assets, liabilities, and other NSFR RIS variables for all of its IDI subsidiaries. Three BHCs were dropped from the analysis because their combined IDI assets constituted a share of the BHC's assets that was too small, or too large, to allow for a useful comparison of the RIS-NSFR to the BCBS data. For the remaining BHCs, RIS-NSFRs for the combined IDI assets were calculated and compared to the NSFRs reported by the BHCs. The two measures track each other well. Our modified RIS-NSFR exhibits strong positive correlations with the NSFRs reported to BCBS, with a statistically significant Pearson correlation coefficient of +0.65 and Spearman correlation coefficient of +0.73.⁷⁵

The calculated RIS-NSFRs were generally higher than the reported BCBS NSFRs, with an average deviation of 0.13. These deviations could arise from several sources. One possible reason for the differences is that the final NSFR rule assigns only certain regulatory capital elements to ASF₁₀₀, particularly tier 1 and tier 2 capital before applying capital adjustments or deductions. Data for these adjustments and deductions are missing from a large proportion of filers, so the RIS-NSFR methodology uses total equity capital (EQTOT), which is reported for 99.9 percent of firm-quarter observations in the data, to proxy for NSFR regulatory capital elements. If EQTOT overestimates these elements, the methodology overestimates ASF and thereby also overestimates NSFR. Additionally, RIS combines the transaction deposits of individuals, partnerships, and corporations into a single variable (TRNIPCOC). Our methodology allocates half of TRNIPCOC to ASF₉₅ to account for stable retail deposits and half to ASF₉₀ to account for other retail deposits. To the extent that liabilities in TRNIPCOC represent ASF factors with lower weights, such as operational deposits, our methodology overestimates ASF. Further, RIS reports some maturity data, such as the total amount of loans and leases with maturities less than one year (LNLSES1). However, LNLSES1 is aggregated across all loan types. To estimate the value of each loan type with a maturity less than one year, we use a constant fraction across all loan types. If this apportionment underestimates the remaining maturities of certain assets, our methodology overestimates NSFR.

For most assets, our apportionment for maturities does not extend to maturities of less than six months. Since we are missing this level of granularity, we assume that half of the values of assets with remaining maturities of less than 12 months

⁷² See "Basel III Monitoring Report," October 2018, at <https://www.bis.org/bcbs/publ/d449.htm>.

⁷³ Data provided by banks in the monitoring workbooks are confidential. Templates for the workbooks, which show the line items tallied, can be found at <https://www.bis.org/bcbs/qis/>.

⁷⁴ BCBS data were available for only one quarter (ending December 31, 2017), so the comparison represents a snapshot in time. Additionally, rigorous calculation and reporting instructions have not been established for the BCBS reporting, so their comparability is limited.

⁷⁵ These results are stronger than the results reported by Hoerova et al. (2018) who report a correlation of 0.55 between their proxy and reported NSFRs for banks in the euro area between 2014 and 2016.

have remaining maturities less than six months. For those assets for which we do not know whether the remaining maturities are more or less than 12 months, we assume that two-thirds of the value have remaining maturities of less than 12 months, and within that fraction, half have maturities of less than six months. If this assumption underweights ASF liabilities or overweights RSF assets, our methodology underestimates NSFR.

We use the total values of pledged loans and pledged securities to estimate the encumbrances of those respective assets. However, we also do not know the distribution of encumbrances across asset types or the distribution of periods of encumbrance within each asset. As we did with maturities, we estimate encumbrances by assuming all loan/securities types have the same fraction of encumbrances, and all encumbered loans/securities are equally encumbered across the three periods of encumbrances. If this apportionment underestimates the encumbrances of assets, our methodology overestimates NSFR.

Finally, our methodology does not account for items not reported on the Call Report, such as variation margin with derivative transactions.

Outside of our methodology, differences in the balance sheet composition of BHCs and their IDI subsidiaries would lead to differences between RIS-NSFR and BCBS NSFR. If, compared to their IDI counterparts, non-IDI subsidiaries of BHCs hold more long-term or higher risk-weighted assets, then BHCs would naturally have a higher NSFR.

While our RIS-NSFRs might overestimate NSFRs in this sample, it is still useful as a comparison across banks. RIS-NSFR is strongly positively correlated with reported BCBS NSFRs. To the extent that banks differ in their asset and funding composition, as reported on the Call Reports, our methodology can measure that effect on NSFR.

Our methodology can also track changes in a bank's NSFR over time due to changes in asset composition. For example, since cash and interest bearing balances (CHBALI) is assigned a 0 percent RSF factor in both the RIS-NSFR and BCBS NSFR calculations, an increase in CHBALI from 5 percent to 10 percent of assets would raise both measures. Therefore, our methodology allows us to examine trends in RIS-NSFR and use these trends to make reliable predictions of regulatory NSFRs.

Appendix C. Decomposition of Changes in the Net Stable Funding Ratio

This section explains a method for decomposing the total change in the NSFR (or RIS-NSFR) from one period to the next to determine the main drivers of the change. We follow the methodology used in Cohen and Scatinga (2014), as cited in Heynderickx, et al. (2016). This methodology can be used to decompose the change in the RIS-NSFR for an individual bank or the change in the aggregate RIS-NSFR for a set of banks. In the latter case, the decomposition does not consider the effects of institutions entering or exiting the set of banks, since it uses only aggregated asset and liability data at the two decomposition endpoints.⁷⁶

To decompose the change in RIS-NSFR between two periods, we deconstruct the NSFR into its components. We denote the initial period of analysis with the superscript 0 and the ending period with the superscript 1. Total Assets is denoted as TA. We divide NSFR¹ by NSFR⁰ and factor TA⁰/TA⁰ = 1 into the numerator and TA¹/TA¹ = 1 into the denominator:

$$\frac{NSFR^1}{NSFR^0} \equiv \frac{\frac{ASF^1}{RSF^1}}{\frac{ASF^0}{RSF^0}} \equiv \frac{ASF^1 \times RSF^0}{RSF^1 \times ASF^0} = \frac{(ASF^1 \times RSF^0 \times TA^0)/TA^0}{(ASF^0 \times RSF^1 \times TA^1)/TA^1}$$

⁷⁶ For example, the aggregate RIS-NSFR, and decomposition thereof, does not distinguish between a bank growing its asset size by raising new capital and the equivalent change in assets/liabilities that would occur if the bank acquired another institution.

Taking the natural logarithm of both sides and collecting terms, we get:

$$\Delta NSFR = F \times \left(\ln \left(\frac{ASF^1}{TA^1} \right) - \ln \left(\frac{ASF^0}{TA^0} \right) \right) + F' \times \left(\ln \left(\frac{RSF^1}{TA^1} \right) - \ln \left(\frac{RSF^0}{TA^1} \right) \right)$$

where F is a scaling factor given by:

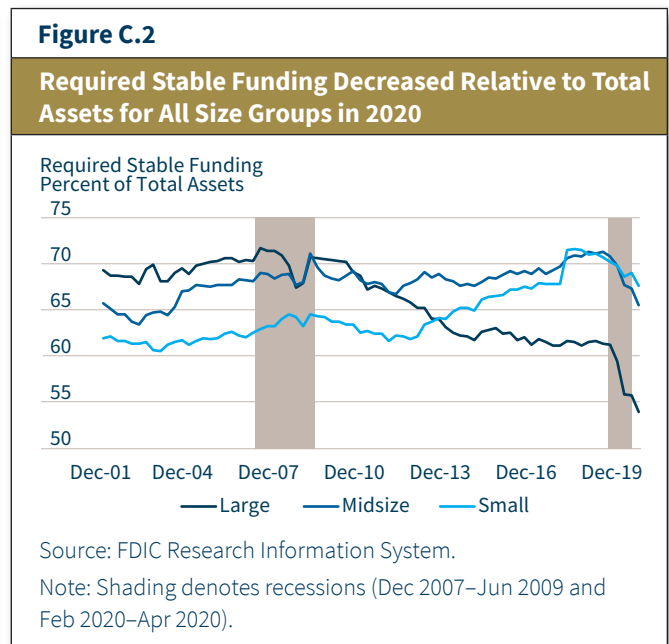
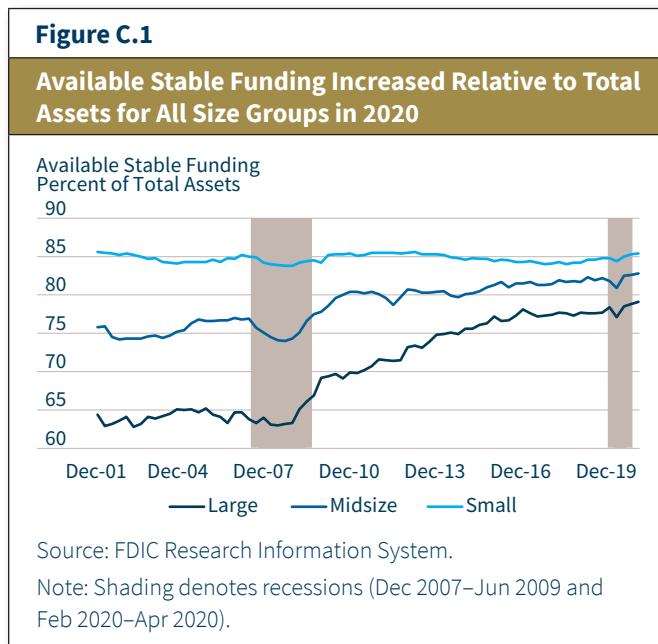
$$F = \frac{\Delta NSFR}{\ln \left(\frac{ASF^1}{RSF^1} \right) - \ln \left(\frac{ASF^0}{RSF^0} \right)} = \frac{\Delta NSFR}{\ln (NSFR^1) - \ln (NSFR^0)}$$

and:

$$F' = -F$$

The first term on the right-hand-side of the equation, the *funding composition effect (FCE)*, represents that portion of the change in NSFR associated with an improvement in available stable funding relative to total liabilities and equity, for example, by increasing equity or holding longer-term and insured deposits.⁷⁷ The second term, called the *asset composition effect (ACE)*, represents that portion of the change in NSFR associated with changes in required stable funding relative to total assets, for example, holding shorter-term, better-performing, less-encumbered, or less-risky assets. An improving asset composition will result in a positive term.

The funding composition effect and asset composition effect can be visualized by graphing the fractions ASF/TA and RSF/TA, respectively, as shown in Figures C. 1 and C.2.



To interpret Figures C.1 and C.2, note for example the movements of the large bank lines in 2020, the last year of the sample. During that period, the ASF for large banks increased slightly while the RSF for large banks dropped by more than 15 percentage points. Both movements result in an increase in RIS-NSFR, and the decomposition arithmetic, delineated

⁷⁷ Follows from the accounting identity: Total Assets = Total Liabilities + Total Equity.

in Table C.3, will show that the asset composition effect from the drop in RSF accounts for 18 percentage points of the 19 percentage point gain in the RIS-NSFR from December 2019 to December 2020.

We can further decompose the two factors into sub-factors for each RSF and ASF category. The FCE can be decomposed into individual ASF category effects by the formula:

$$F \times \left(\ln \left(\frac{ASF^1}{TA^1} \right) - \ln \left(\frac{ASF^0}{TA^0} \right) \right) = G \times \sum_{a \in A} a \times \Delta \frac{ASF_a}{TA}$$

where a is the ASF factor for category a , $\Delta (ASF_a / TA)$ is the change from period 0 to period 1 in the ratio of unweighted amounts in category a to total assets, and

$$G = \frac{F \times \left(\ln \left(\frac{ASF^1}{TA^1} \right) - \ln \left(\frac{ASF^0}{TA^0} \right) \right)}{\left(\frac{ASF^1}{TA^1} - \frac{ASF^0}{TA^0} \right)}$$

Similarly:

$$F' \times \left(\ln \left(\frac{RSF^1}{TA^1} \right) - \ln \left(\frac{RSF^0}{TA^0} \right) \right) = H \times \sum_{r \in R} r \times \Delta \frac{RSF_r}{TA}$$

where r is the RSF factor for category r , $\Delta (RSF_r / TA)$ is the change from period 0 to period 1 in the ratio of unweighted amounts in category r to total assets, and

$$H = \frac{F' \times \left(\ln \left(\frac{RSF^1}{TA^1} \right) - \ln \left(\frac{RSF^0}{TA^0} \right) \right)}{\left(\frac{RSF^1}{TA^1} - \frac{RSF^0}{TA^0} \right)}$$

We present these second-level decompositions for three time periods discussed in Section VI. Table C.1 shows the decomposition for the four years following the end of the recession in June 2009.

Table C.1

RIS-NSFRs for All Size Groups Increased From June 2009 to March 2013 as a Result of More Available Stable Funding and Less Required Stable Funding

Category		Large	Midsize	Small
Available Stable Funding (ASF)	100%	-0.02	0.00	-0.02
	95%	0.00	0.00	0.04
	90%	0.13	0.06	0.00
	50%	-0.01	0.00	0.00
	0%	0.00	0.00	0.00
	Funding Composition Effect (FCE)	0.11	0.06	0.02
Required Stable Funding (RSF)	100%	0.03	0.05	0.01
	85%	0.05	0.01	0.05
	65%	0.00	-0.02	-0.02
	50%	0.01	0.02	0.04
	15%	0.00	0.00	-0.01
	5%	0.00	0.00	-0.01
	0%	0.00	0.00	0.00
	Negative Value Derivatives	0.00	0.00	0.00
	RSF Adjustments	0.01	-0.01	0.00
	Asset Composition Effect (ACE)	0.08	0.04	0.05
Change in RIS-NSFR (FCE+ACE)		0.19	0.10	0.07

Source: FDIC.

Note: RIS is the FDIC's Research Information System. NSFR is the Net Stable Funding Ratio.

Table C.2 shows the decomposition for the period of divergence between 2013 and 2019.

Table C.2				
The Effect of Changes in Asset Composition on RIS-NSFRs From March 2013 to December 2019 Was Negative for Small and Midsize Banks but Positive for Large Banks				
	Category	Large	Midsize	Small
Available Stable Funding (ASF)	100%	0.00	-0.01	0.00
	95%	0.02	-0.04	-0.08
	90%	0.06	0.06	0.06
	50%	0.00	0.00	0.01
	0%	0.00	0.00	0.00
	Funding Composition Effect (FCE)		0.08	0.02
Required Stable Funding (RSF)	100%	0.04	-0.01	-0.01
	85%	0.06	-0.02	-0.14
	65%	-0.01	-0.01	-0.02
	50%	0.00	0.00	0.01
	15%	-0.01	0.00	0.02
	5%	0.00	0.00	0.00
	0%	0.00	0.00	0.00
	Negative Value Derivatives	0.00	0.00	0.00
	RSF Adjustments	0.00	0.01	0.00
Asset Composition Effect (ACE)		0.08	-0.04	-0.16
Change in RIS-NSFR (FCE+ACE)		0.16	-0.02	-0.17
Source: FDIC.				
Note: RIS is the FDIC's Research Information System. NSFR is the Net Stable Funding Ratio.				

Table C.3 shows the decomposition for the year 2020.

Table C.3				
Asset Composition Drove the Increase in RIS-NSFRs From December 2019 to December 2020 for All Size Groups				
	Category	Large	Midsize	Small
Available Stable Funding (ASF)	100%	-0.05	-0.04	0.00
	95%	0.05	-0.01	-0.01
	90%	0.01	0.06	0.03
	50%	-0.01	0.00	-0.01
	0%	0.00	0.00	0.00
	Funding Composition Effect (FCE)		0.01	0.01
Required Stable Funding (RSF)	100%	0.03	0.01	0.00
	85%	0.11	0.09	0.01
	65%	0.02	-0.02	0.01
	50%	0.01	0.01	0.01
	15%	0.00	0.00	0.00
	5%	0.01	0.00	0.00
	0%	0.00	0.00	0.00
	Negative Value Derivatives	0.00	0.00	0.00
	RSF Adjustments	0.00	0.00	0.02
Asset Composition Effect (ACE)		0.18	0.09	0.05
Change in RIS-NSFR (FCE+ACE)		0.19	0.11	0.06
Source: FDIC.				
Note: RIS is the FDIC's Research Information System. NSFR is the Net Stable Funding Ratio.				

To summarize the results of the decomposition, Tables C.1, C.2, and C.3 show that the RIS-NSFR for large banks increased by 19, 16, and 19 percentage points in the three periods described above, for a total increase of 54 percentage points between June 2009 and December 2020. The funding composition effect accounted for an 11 percentage point increase between June 2009 and March 2013, an 8 percentage point increase between March 2013 and December 2019, and a 1 percentage point increase from December 2019 to December 2020, for a total of 20 percentage points, meaning that 37 percent of the 54 percentage point increase for large banks between June 2009 and December 2020 was driven by ASF funding categories. Funding sources that are included in the ASF 90 and 95 percent categories, such as retail deposits, are responsible for much of these increases. Changes (i.e., decreases) in large bank holdings of assets in the 100 and 85 percent RSF categories are also responsible for much of the increase in RIS-NSFR for large banks over this period. Because the mechanics of the decomposition require multiplying by the corresponding factor, changes in the RSF category with a 0 percent factor (for example, Cash Balances) appear as 0 in the decomposition table. Thus, a positive change in each RSF line item should be interpreted as an increase in RIS-NSFR due to the reallocation of assets in that RSF category to the RSF 0 percent category. For example, Table C.3 shows that, in 2020, a reallocation of assets from 85 to 0 percent RSF resulted in an increase in RIS-NSFR of 11 percentage points.

Similar statements can be made for small and midsize banks.