Where Do Banks End and NBFIs Begin?[1]

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Abstract

Banks and non-bank financial intermediaries (NBFIs) are commonly viewed either as operating in parallel, performing different activities, or as substitutes, performing substantially similar activities, with banks inside and NBFIs outside the perimeter of banking regulation. We argue instead that the two sectors have interwoven businesses and risks, and that bank risks are better described as having transformed over time, especially in response to regulation, rather than as having simply migrated to NBFIs. Banks continue to remain special as liquidity providers for NBFI activities, including through stress conditions. Supporting this perspective, (i) The new and enhanced financial accounts data for the United States ("From Whom to Whom") show banks and NBFIs finance each other, with NBFIs especially dependent on banks; (ii) Case studies and confidential regulatory data show that banks remain exposed to credit and funding risks that have seemingly moved to NBFIs, as well as to significant contingent liquidity risk via provision of credit lines to NBFIs; and, (iii) Empirical work confirms bank-NBFI linkages through the correlation of their abnormal equity returns and market-based measures of systemic risk. We conclude that regulation must consider the two sectors holistically, rather than separately, and must recognize new mechanisms for risk propagation and amplification implied by the evolving nature of bank-NBFI funding linkages.

Keywords: non-bank financial intermediaries, nonbanks, shadow banking, bank regulation, macroprudential regulation, regulatory arbitrage, systemic risk, credit lines, derivatives margins

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1. Introduction

Non-bank financial intermediaries (NBFIs) have surpassed banks as the largest global financial intermediaries. And yet, most NBFIs continue to be lightly regulated relative to banks for safety and soundness, whether in terms of capital and liquidity requirements, supervisory oversight, or resolution planning. Figure 1a shows that the global financial assets of NBFIs have grown faster than those of banks since 2012, to about $239 trillion and $183 trillion, respectively, in 2021. In percentage terms, the share of the NBFI sector has grown from about 44% in 2012 to about 49% as of 2021, while banks' share has shrunk from about 45% to about 38% over the same time period.[3]

Figure 1b compares the assets of the NBFI and bank sectors in the United States alone. As in the global data, NBFIs in the United States have accumulated substantially more assets than banks over the period shown. However, the NBFI sector in the United States accounts for a much higher share of financial assets, which was over 60% in 2021. As an aside, this figure shows that NBFI assets fell substantially during the global financial crisis (GFC), as large volumes of special purpose vehicles were unwound, but that the NBFI sector as a whole subsequently resumed its steady growth.

One justification for the lighter-touch of NBFI regulation, despite the sector's prominence, is the view that banks and NBFIs pursue different or parallel intermediation activities. In particular, banks focus on deposits, loans, and payments, while NBFIs focus on capital markets. In this view, then, banks have to be heavily regulated to protect depositors and the real economy, while NBFIs can be lightly regulated and allowed to fail.[4]

This *parallel* view of NBFIs and banks has influenced financial regulation in the United States for at least 160 years, with banks being heavily regulated but restricted in the scope of their activities. The National Bank Acts of the 1860s prohibited national banks from many businesses, including trust activities, real estate lending, securities underwriting, and credit guarantees (Calomiris, 2020). The Glass-Steagall Act of 1933 renewed the attempt to exclude commercial banks from underwriting securities. And the Volcker Rule, part of the Dodd-Frank Act of 2010 (DFA), severely restricts bank participation in certain investment vehicles, and limits

[3] The other sectors in the breakdown of these data include central banks and public financial institutions.

[4] Paul Volcker described the parallel view very articulately in an interview just after the GFC. "*In a crisis, everybody runs back to the commercial banks. They, after all, run the payment system… They provide a depository outlet for individuals and businesses, and they are still big credit providers for small and medium-sized businesses, but they backstop most of the big borrowers as well. The commercial-paper market is totally dependent on the commercial banking market. They are an essential financial institution that has historically been protected. It has been protected on one side and regulated on the other side… [I]t is extraneous to that function that they [banks] do hedge funds, equity funds and that they trade in commodities and securities, and a lot of other stuff, which is secondary in terms of direct responsibilities for lenders, borrowers, depositors and all the rest. There is nothing wrong with any of those activities, but let you nonbank people do it… If you fail, you're going to fail, and I am not going to help you, and your stockholders are going to be gone, and your creditors will be at risk, and that is the way it should be.*" Volcker (2009).

proprietary trading at banks to government securities and corporate loans (Richardson and Tuckman, 2017).

However, the parallel view of NBFI and bank activity, along with the regulatory conclusion that NBFIs should be allowed to fail, does not square easily with the *de facto* aid to or rescue of NBFIs, most notably during the GFC but more recently as well, as in the Federal Reserve's interventions in the repo markets in 2019 and through the COVID pandemic and shutdowns (Duffie, 2020, Schrimpf, Shin and Sushko, 2020); the Bank of England's support of the gilt market in response to the liquidity problems of UK pension funds in 2022; and European governments' protection of energy producers and derivatives users, also in 2022. The dissonance of the parallel view with the realities of NBFI rescues is reflected in how the Federal Reserve's 13(3) powers to lend to NBFIs were changed by the DFA, namely, to raise the procedural hurdles to such lending and to prohibit such lending to individual NBFIs, but, in the final analysis, to leave these broad powers in place.

The failure of policy that is based on the parallel view of the NBFI and bank sectors can be understood in terms of our corollary of Goodhart's Law (Goodhart, 1975):

> *As the banking perimeter is used for "control" (regulatory) purposes, but activity around the perimeter can be "manipulated" (via regulatory arbitrage) by banks and NBFIs, the regulatory perimeter inexorably ceases to be useful for control purposes.*

Put differently, the NBFI and bank sectors do not exist in parallel, but are actually substitutes in that business lines and intermediation activities flow over time from banks to NBFIs at least in part because of relatively burdensome bank regulation. Furthermore, in this *substitution* view, NBFIs take on intermediation roles, in kind and volume, that can be systemically important and can lead to rescues by authorities in times of financial stress.

It is not controversial to recognize that the growth of the NBFI sector has been significantly driven by bank regulation. One very well-known and widely-accepted example is how Regulation Q, which capped the rate banks could pay on deposits, contributed to the creation of the money market fund industry. As to more recent academic work, Chen et al. (2017), Cortes et al. (2018), Gopal and Schnabl (2020), and Irani et al. (2020) show that bank regulations contributed to the migration of small-business lending from banks to NBFIs. Chernenko et al. (2022) and Kim et al. (2016) show the same, with a particular focus on the riskiest loans. Buchak et al. (2018) show that NBFIs gained market share in the residential mortgage market through a combination of both regulatory and technological advantages. Kim et al. (2018) and Kim et al. (2022) find some evidence that nonbank mortgage originators and servicers may not have sufficient resources to weather stress events. Duffie (2023) describes the regulatory capital requirements that have reduced the capacity of banks to make markets in the

U.S. Treasury market, and Metrick and Tarullo (2022) discuss how NBFIs are replacing that capacity.

The substitution view of the NBFI and bank sectors, along with the implication that NBFIs can become systemically important, is consistent with the powers given by the DFA both i) to the Financial Stability Oversight Council (FSOC) to designate NBFIs as systemically important financial institutions (SIFIs) and to regulate them accordingly; and ii) to the United States Treasury and Federal Deposit Insurance Corporation to resolve a failing large and complex financial company. Extending this logic, Metrick and Tarullo (2022) recommend dealing with the substitution problem through a "congruence principle," through which similar activities are regulated similarly, whether those activities are pursued within NBFIs or banks.

We take a different view of the NBFI and bank sectors in this paper, arguing that neither the parallel nor substitution views adequately describe how activities align across these sectors. Instead, we posit that intermediation activities—including the types of claims held by each sector, the manner of their financing, and contingent liquidity arrangements—endogenously transform across sectors so as i) to loosen regulatory constraints and reduce regulatory costs across the financial sector as a whole, along the lines of Goodhart's Law, and ii) to harness the inherent funding and liquidity advantages of bank deposit franchises and access to safety nets, whether explicitly in the form of deposit insurance and central bank lender of last resort (LOLR) financing or implicitly in the form of too-big-to-fail insurance (Kashyap, Rajan and Stein, 2002, Gatev and Strahan, 2006).[5] Our *transformation* view predicts that the intermediation activities and risks of NBFIs and banks become intricately intertwined, which is a result we demonstrate through a variety of cases and empirical analyses of recent developments. Finally, this transformation view has distinct implications for policy, which are discussed later in the paper.[6]

[5] This paper focuses on the regulatory causes of these transformations, but the business, financial, and technological environments no doubt play important roles as well. Sarto and Wang (2023) write that the secular decline in interest rates might have played an important role in the shift of assets from banks to NBFIs. Also, see Martinez-Miera and Repullo (2017) for theory that a search-for-yield by intermediaries in an environment of high real savings leads to the growth of non-monitoring banks, which can be understood as NBFIs, and in turn to a rise in financial fragility.

[6] Cetorelli and Prazad (2023) show the extent to which subsidiaries of bank holding companies engage in non-banking financial business activities. Yankov (2020) shows that the introduction of the liquidity coverage ratio (LCR) resulted in increased liquidity reserves at banks and greater reliance of NBFIs on bank liquidity. Other theoretical and empirical work that features both banks and NBFIs has focused on drawdowns on credit lines during stress events (Acharya, Gopal, Jager, and Steffen, 2023, Kiernan, Yankov, and Zikes, 2021); contagion via credit risk transfer (Allen and Carletti, 2006); spillovers in the design of capital requirements (Harris, Opp and Opp, 2014); haircuts for refinancing by NBFIs (Plantin, 2015); split governance rights via variation in covenant tightness between loans held by banks and those held by NBFIs (Mitchell, Nini and Yu, 2020); differential exercise of lender bargaining power by banks and NBFIs based on their access to safety nets (Donaldson, Piacentino and Thakor, 2021); and determination of asset activity shifts between banks and NBFIs based on their capacity to provide balance-sheet financing (Buchak et al., 2022).

Before proceeding with a more concrete discussion of the transformations we see occurring in financial markets, we clarify this paper's invocation of "regulatory arbitrage" in the context of Goodhart's Law. First, we view regulatory arbitrage as the process by which finance professionals optimize their businesses subject to their perception of pertinent regulations. For example, bank management sets a framework of internal charges for the use of balance sheet, capital, liquidity, etc., and then bankers at that bank seek out profitable transactions given those charges. By this mechanism, resources across the financial system flow to where they are most profitable relative to regulatory costs and constraints. Explicit attempts to circumvent regulations are not necessary.

Second, given the mechanism just described, regulatory arbitrage transformations of business lines across NBFIs and banks occur whenever regulations and supervision do not perfectly internalize the relevant risks or costs of scarce resources. In this paper, we do not attempt to identify the exact components of the regulatory regime that are not perfect from this perspective. We simply note that it is not difficult to imagine opportunities for this sort of regulatory arbitrage given the complexity of safety and soundness regulation of both banks and NBFIs, which actually works in combination with other components of bank regulation, like anti-money-laundering rules, community reinvestment requirements, and operational risk charges.

To explain our transformation view of the NBFI and bank sectors more concretely, Figure 2 gives examples of three categories of transformations that describe relatively recent trends in financial markets.

(i) *Loans and Mortgages:* Traditionally (post the Great Depression and the ensuing reforms), banks held corporate and mortgage loans and bore the associated interest rate and default risks. Over time, however, at least in part due to higher capital requirements and tighter regulations on leveraged lending, large volumes of these loans no longer reside on bank balance sheets. Instead, banks have retained indirect loan exposures through senior loans to private credit companies, collateralized loans to mortgage Real Estate Investment Trusts (mortgage REITs, or m-REITs), and the generally more senior claims of mortgage-backed securities (MBS) and collateralized loan obligations (CLOs). Hence, risks of the underlying loans may seem to have left the banking system, but have actually been transformed into more senior holdings of exposures to NBFIs.

(ii) *Activities Using Short-Term Funding:* Traditionally, banks participated in various businesses that rely on regular or continuing short-term funding. Examples include the following: securitization, in which the purchases of underlying assets are funded until they are securitized and sold as MBS (mortgage-backed securities), collateralized loan obligation (CLOs), other ABS (asset-backed securities); financing acquisitions in general, and leveraged buyouts (LBOs) in particular, in which acquisitions are funded in anticipation of bond sales to investors; and mortgage servicing, which requires servicers to fund payments of delinquent amounts to MBS investors until government insurance pays the related claims. These activities used to be

dominated by banks, but are now dominated by NBFIs. However, banks provide NBFIs with the short-term funding used to carry out these activities in the forms of direct loans, warehouse financing, credit lines, subscription finance loans,[7] and bank-sponsored (or credit-enhanced) commercial paper. Hence, activities using short-term funding are another category of activities that are better described as having transformed across the bank and NBFI sectors than as having shifted from banks to NBFIs.

(iii) *Contingent Funding:* While the second category of transformations just described refers to the regular or continuing use of short-term funding, which can take the form of credit lines, this third category refers to the provision of unusual or emergency short-term funding, or liquidity insurance, which is most often manifested in the drawing down of bank credit lines in unusually high volumes. Activities in this category are those in which NBFIs have replaced banks in financing or other activities but rely themselves on banks for the necessary contingent funding. In other words, the entirety of these activities is not a shift from banks to NBFIs, but a transformation in that regular or continuing financing shifts to NBFIs while the unusual or emergency financing remains with banks. This category of transformations is easily explained by the inherent funding and liquidity advantages of banks mentioned earlier. A relatively unheralded example of this is the post-GFC mandate to clear most derivatives, like interest rate swaps (IRS), that had previously been bilateral and traded over-the-counter (OTC). This mandate has transformed the counterparty risk that banks had as derivative counterparties of NBFIs to the liquidity risk banks have in providing credit lines to NBFIs to meet calls for additional initial and variation margin. Note that bank credit lines can also provide liquidity insurance for futures contracts, which have always been cleared, but this would not be an example of a recent transformation of market arrangements.

Figures 3a, 3b, and 3c show the importance of the first two transformations just described in terms of the increasing amounts of bank loans and credit commitments to NBFIs from 2013 to 2023. (Section 3.c. will present data on the third of these transformations.)

Figure 3a depicts the growth of bank loans to NBFIs rising from about $125 billion to over $300 billion. The greatest growth was for bank loans to "Other Investment Pools and Funds," which includes, e.g., both open-end and closed-end funds (money market and mutual funds), mortgage REITS, special purpose financial vehicles, among others. Figure 3b depicts the growth of bank credit line commitments to NBFIs rising from about $500 billion to over $1,500 billion, with the greatest growth again to Other Investment Pools and Funds. Figure 3c shows the top line of each of Figures 3a and 3b as a percentage of the sum of total bank loans and credit commitments. Hence, while Figures 3a and 3b show that funding of NBFIs by banks has increased in dollar terms, Figure 3c shows that this funding has also increased as a percentage of total bank funding.

[7] Subscription finance loans are made by banks to private equity funds and are secured by investor commitments to the fund. Using these loans, funds can invest swifty as opportunities arise without making irregular capital calls on their investors.

We develop this transformation view of bank risks and bank-NBFI linkages as follows.

Section 2 of the paper uses new and enhanced financial accounts data for the UNited States ("From Whom To Whom") to show that bank and NBFI businesses are significantly interdependent. More specifically, banks and individual NBFI sectors are both asset- and liability-dependent, that is, they hold each others' assets and rely on each other for funding. However, while banks are significantly dependent on the NBFI sector as a whole, they do not have significant asset- or liability-dependence on any individual sector of NBFIs. By contrast, individual NBFI sectors are heavily asset- or liability-dependent on banks. Furthermore, individual NBFI sectors are, in general, not asset- or liability-dependent on each other. In short, consistent with the transformation view described earlier, NBFIs have grown as financial intermediaries, but banks have retained their special role as financiers and intermediaries for NBFIs.

Section 3 presents concrete examples and case studies to support the qualitative and empirical importance of the transformations summarized in Figure 2. The topics covered include private credit markets; mortgage origination and servicing; drawdowns of bank credit lines, in general and by REITs, during the COVID pandemic and shutdowns; and drawdowns of bank credit lines in 2022 to meet increased derivatives margin calls on UK pension funds and European electricity producers.

In Section 4, we explain conceptually how shocks leading to fire sales can propagate extensively through the financial system and, in particular, can spread across the NBFI and bank sectors. One source of propagation are commonalities in asset holdings across sectors, which can lead to both direct effects—when one sector holds assets that are also held by a sector conducting fire sales under stress—and indirect effects—when a sector holds assets that were liquidated in a previous round of fire sales. Another (novel) source of propagation are liability dependencies, in which stress from fire sales causes an affected sector to restrict lending to other sectors.

Section 5 empirically confirms that the linkages between banks and NBFIs, which we have pointed out in earlier sections, are also evident in the interdependence of their abnormal equity returns and of their market-based measures of systemic risk, in particular, NYU Stern's *SRISK* measure of expected capital shortfall under aggregate stress.[8]

Section 6 draws out the policy implications of our transformation view of the NBFI and bank sectors. We first rationalize the observed extension of central bank LOLR (and other official backstops) to NBFIs, given our perspective that they are intimately tied to the banking system. We then derive implications for the ex-ante regulation of NBFIs to limit the need for such extension, primarily to suggest better monitoring of bank-NBFI funding linkages, ex-ante pricing of NBFI access to LOLR, ex-post supervision of NBFIs that access LOLR, and broadly, an integrated approach to managing risks across the bank and NBFI sectors.

[8] See Acharya, Engle and Richardson (2012) and vlab.stern.nyu.edu/srisk.

Section 7 concludes, briefly summarizing the paper and suggesting topics for future research.

2. Asset- and Liability-Interdependencies of Banks and NBFIs

The transformation view of the NBFI and bank sectors predicts that NBFI and bank businesses will be interwoven with complex interdependencies. But, given the special role of banks from their deposit franchises and access to official backstops, NBFIs can be expected to be more liability-dependent on banks than *vice versa*, and also more liability-dependent on banks than on each other.

We provide empirical evidence for these conjectures using a new version of the Federal Reserve System's Flow of Funds data, namely, FWTW (From Whom To Whom), which was introduced in the Spring of 2023. While Flow of Funds quantifies the aggregate asset and liability positions of each sector operating in the United States, and breaks down those aggregates by financial instrument, FWTW further breaks down each sector's assets and liabilities into positions against each other sector. For example, Flow of Funds gives the liabilities of banks by instrument (e.g., deposits, repurchase agreements, etc), but FWTW also gives the quantity of each of those instruments held by Life Insurers, Finance Companies, the Real Sector, etc. In other words, FWTW data quantify the entire bilateral matrix of asset-liability interconnections.

Figure 4a shows the FWTW matrix of asset- and liability-dependencies as of Q1 2023. Sectors are reported both in rows, as *Issuers*, in which case the entries represent their liabilities, and in columns, as *Holders*, in which case entries represent their assets. For convenience, we have aggregated some sub-sectors: "*Banks*" include "holding companies" (i.e., the unconsolidated balances of top tier bank/financial holding companies) and "private depository institutions" (i.e., U.S.-chartered depository institutions, foreign banking offices operating in the U.S., banks in U.S.-affiliated areas, and credit unions)[9]; and "*Real Sector*" includes the balances of households, government and non-financial corporations. We retain the *Rest of the World* sector and all of the NBFI sub-sectors, which include *ABS issuers*, *Broker-Dealers*, *Equity REITs, Finance Companies*, *government sponsored enterprises and Agencies (GSEs)*, *Life Insurers*, *Money Market Funds*, *Mortgage REITs*, *Mutual Funds*, *Other financial businesses, Property and Casualty Insurers*, and *Pension Funds*. Furthermore, for the purposes of this paper, we aggregate across all financial instruments. To illustrate the interpretation of the figure, then, consider the *Banks* row, that is, *Banks* as issuers. The rightmost column of this row shows that liabilities issued by *Banks* total about $30.2 trillion. Other entries of this row show that the largest holders of the liabilities of *Banks* are the *Real* sector, holding $18.8 trillion, and the *Rest of the World*,

[9] It is possible to adjust the results here so that the category of banks includes only depositories and so that broker-dealer subsidiaries of bank holding companies are moved to the category of broker-dealers. These adjusted results do not change our overall themes and are available on request.

holding $4.4 trillion. The remaining liabilities of *Banks* are spread across the banking sector itself, $3.1 trillion, and across NBFIs.

Figure 4b and 4c show the same matrix of asset-liability interconnections, with the entries in Figure 4b as shares of each issuing sector's total liabilities and in Figure 4c as shares of each holding sector's assets. We call Figure 4b the "Matrix of Liability-Dependencies," as it portrays the extent to which each sector depends on each of the others for funding. For example, *Banks* are highly dependent for funding on the real sector (62%) and on the Rest of the World (15%). On the other hand, we call Figure 4c the "Matrix of Asset-Dependencies," as it portrays the extent to which each sector is exposed to each of the others by holding their respective liabilities. For example, 16% of *Broker-Dealers* holdings and 13% of *Equity REITs* holdings are liabilities of *Banks*.

We draw three overall lessons from the FWTW interdependency matrices in Figures 4a, 4b, and 4c. First, while banks are significantly dependent on the NBFI sector as a whole, consistent, for example, with Forbes, Friedrich, and Reinhardt (2023), banks do not have significant asset- or liability-dependence on any individual sector of NBFIs. From Figures 4a and 4b, banks get $23.2 trillion or 77% from the *Real* and *Rest of the World* sectors and $3.1 trillion or 10% from other banks. These levels leave the liability-dependence of banks on the NBFI sector as a whole at a small though non-negligible $3.8 trillion or 13%, which, by the way, includes deposits and commercial paper investments from money market funds; bonds bought by insurance companies, pension funds and mutual funds; and repos loans from broker-dealers. However, banks are not liability-dependent on any individual NBFI sub-sector, with the largest sub-sector, *GSEs*, supplying only $1.1 trillion or 4% of bank funding. A similar result holds with respect to bank asset-dependence on NBFIs from Figures 4a and 4c. Banks hold $5.6 trillion or 19% of their financial assets in claims on NBFIs, but the greatest dependence is on *GSEs*, at $3.2 trillion or 11%.

The second lesson from the interdependency matrices is that NBFIs have significant asset- and liability-dependence on banks, in addition to their significant dependencies on the *Real* and *Rest of World* sectors. Starting with Figures 4a and 4b, several NBFI sub-sectors depend meaningfully on banks for funding: *GSEs* at $3.2 trillion or 35% of their liabilities; *Broker-Dealers* at $1.4 trillion or 25%; *Equity REITs* at $224 billion or 25%; *Finance Companies* at $196 billion or 15%; and *ABS Issuers* at $143 billion or 10%. To our knowledge, these significant NBFI dependencies on banks are not widely appreciated. Furthermore, we note that FWTW understates these dependencies because these data do not include undrawn bank credit commitments to NBFIs, which will be discussed further in Section 3.c. In any case, turning to the asset-dependence of NBFIs on banks, from Figures 4a and 4c, several NBFI sub-sectors hold as assets meaningful amounts of bank liabilities: *Other Financial Businesses* at $247 billion or 19%; *Broker-Dealers* at $685 billion or 16%; *Equity REITs* at $43 billion or 13%; and *Money Market Funds* at $429 billion or 12%.

The third and final lesson from these figures is that individual NBFI sub-sectors are, in general, not asset- or liability-dependent on other sub-sectors. In terms of Figures 4b and 4c, most of the relevant entries (i.e., those outside of the *Banks*, *Real*, and *Rest of World* rows and columns) are relatively small. There are, of course, some exceptions. On the liability side, *ABS Issuers* get 40% of their funding from *Life Insurers*; *Mutual Funds* get 27% from *Pension Funds*; and *Other Financial Businesses* get 54% from *Broker-Dealers*. And, on the asset side, *Broker-Dealers* hold 21% of their assets in *Other Financial Businesses*; *Life Insurers* hold 17% in *Mutual Funds*; *Money Market Funds* and *Mortgage REITs* hold 23% and 31%, respectively, in *GSEs*; *Other Financial Businesses* hold 33% in *Money Market Funds*; and *Pension Funds* hold 24% in *Mutual Funds*. But to repeat, there are relatively few significant dependencies of NBFI sub-sectors on other NBFI sub-sectors.[10]

We find in unreported results that the data in Figures 4a, 4b, and 4c, which are as of Q1 2023, are relatively robust representations of dependencies over longer time-series. In support of this robustness, however, we present Figure 5, which reports averages over the time-series of asset- and liability-dependencies between Q1 2000 and Q1 2023. As above, banks are not particularly asset- or liability-dependent on any particular NBFI sub-sector, while several NBFI sub-sectors are asset- or liability-dependent on banks.

In summary then, the FWTW are consistent with the transformation view of NBFIs and banks. The sectors are interlinked with many asset- and liability-dependencies, and, generally speaking, banks are more significant sources of funding for NBFIs than NBFIs are for banks or for each other.

3. Concrete Examples and Case Studies of the Transformation View

This section uses a combination of concrete examples and case studies to illustrate how intermediation activities in the financial system have not simply shifted from banks to NBFIs, but have transformed so as to be spread across the two sectors. The organization here follows that of Figure 2. To illustrate the transformation view under the category of "Loans and Mortgages," Subsection 3.a discusses how NBFIs borrow from banks to support their loans in the private credit market. Under "Activities Using Short-Term Funding," Subsection 3.b discusses how NBFI mortgage originators and servicers rely on financing from banks. And under "Contingent Funding," Subsection 3.c discusses two sets of cases and examples of NBFIs drawing down on bank credit lines. The first set concerns NBFIs in general and REITs in particular during the COVID pandemic and shutdowns, and the second set concerns the derivatives margin calls on UK pension funds and European electricity producers in September 2022. In addition to fleshing out Figure 2, then, this section illustrates the qualitative nature of some of the bank loans and credit line commitments to NBFIs that comprise Figures 3a and 3b.

[10] We should note that with even more granular data, the exact extent of the asset and liability dependencies for banks and NBFIs would recognize foreign banks and NBFIs that may be included in the Rest of World aggregate.

3.a. The Private Credit Market

The private credit market is a good example of the transformation of intermediation in the context of business loans. In this market, NBFIs make loans, which are typically secured or relatively senior in the capital structure of the borrowers, who are predominantly medium- and small-sized businesses. Assets under management for private lending are currently between $1 and $1.5 trillion and have grown over the last couple of decades to over 30% of the total outstanding of high-yield bonds, syndicated loans, and private credit.[11] The market also seems to be expanding most recently as a consequence of higher bank capital requirements from the Basel III Endgame.[12]

To begin, consider a recent set of transactions depicted in Figure 6a. PacWest, a regional bank that had been losing deposits in the wake of the regional banking crisis of March 2023, sold $2.3 billion of loans backed by various accounts receivable to Ares Management, which is one of the largest private fund managers in the world. The purchase of these loans, however, was financed in part by Barclays, that is, while the loans seemingly left the banking system through their sale from PacWest to Ares, some of the exposure to these same loans returned to the banking system through the financing of Ares' purchase by Barclays.[13]

The transformation of the corporate loan business in the private credit market is actually broader than this simple example, because banks are also partnering with NBFIs to create private credit funds.[14] In terms of policy then, prudential regulation faces the challenge of calibrating capital, liquidity, and other requirements as the private credit market expands and spreads exposures dynamically across banks and NBFIs. In fact, this challenge is often even more difficult because many private credit companies lend through insurance company subsidiaries, which are part of a separate regulatory environment.

For a somewhat more detailed case study, consider Blackstone Private Credit Fund (BCRED), currently the largest private credit fund in the world with over $50 billion of assets.[15] Figure 6b lists the 19 secured credit commitment facilities arranged by subsidiaries of BCRED as of December 2022. The total of the committed amounts was about $23.5 billion, and 98% of that total from 18 of these 19 facilities were provided by 13 banks, with the remaining amount in one facility from an insurance company. The outstanding or amounts drawn on these facilities was about $14 billion, which accounted for about 50% of BCRED's total debt liabilities.

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[11] See Blackstone (2022), Exhibit 2, and also Gopal and Schnabl (2022) who document that finance companies and FinTech lenders increased lending to small businesses after the GFC, substituting for a reduction in bank lending.
[12] See, for example, Ren (2023) and van Steenis (2023).
[13] See Lex (2023). Note that the entity of Barclays making the loans was outside of the UK ring-fenced bank.
[14] See Schneider et al. (2023) and van Steenis (2023).
[15] privatedebtinvestor.com

A systemic risk implication of the transformation view of NBFIs and banks is that authorities might rescue NBFIs in times of stress to preserve their intermediation in the real economy or to ease the strain on banks supporting that same intermediation. The reliance of BCRED on bank credit lines certainly supports this narrative, but this specific case study reveals an additional, more subtle systemic risk implication. BCRED is an affiliate of the Blackstone Group, which also manages a private equity business, which, in turn, controls nonfinancial corporations that, on their own, rely on bank credit lines. Hence, in a stress event, drawdowns could easily be coordinated by or at least highly correlated across NBFIs, like BCRED, and their affiliated non-financial corporations. In fact, at the start of COVID pandemic and shutdowns, in March 2020, Blackstone did request companies in its portfolio to draw down on their bank credit lines (Kiesche, 2020).

Board of Governors (2023), in a recent Financial Stability Report, concluded that the financial stability risks of the private credit market "are likely limited," because, while assets are illiquid and default risks difficult to evaluate, leverage is low and investors are subject to very long lockups. The report does note, however, that a deterioration of credit conditions "could limit the capacity of private credit funds to provide new financing to firms that rely on private credit." In terms of this paper, the report's conclusion is more along the lines of the "parallel" view of NBFIs and banks, while the caveat is more along the lines of the transformation view. To the extent that the private credit market is an important source of intermediation, and to the extent that banks and central banks are the ultimate sources of funding and liquidity under stress conditions, the essentially joint bank-NBFI business model has to be integrated into studies of financial stability.

3.b. Mortgage Origination and Servicing[16]

Since the late 1960s, banks have not held in their portfolios all of the mortgage loans they make. Instead, banks originate many mortgages specifically to be securitized into agency mortgage-backed securities (MBS). Put differently, many mortgage loans made by banks are then sold to investors in the form of MBS. Furthermore, banks often retain mortgage servicing rights, which means that banks collect fees for passing payments from borrowers to investors and for advancing payments to investors when borrowers become delinquent. (These advances are ultimately recovered either by subsequent borrower payments or through government mortgage insurance.)

Over the last couple of decades, however, the bank share of mortgage origination has fallen from about 70% to less than 50%. (See FDIC, 2019, Chart 2.) In parallel, the bank share of mortgage servicing rights has fallen to about 40% (Bancroft, 2022). At first glance, the shift of mortgage origination and servicing to NBFIs appears to move risk from the banking system to

[16] On the transformation of mortgage origination and servicing see Jiang (2023), Kim et al. (2018), and Kim et al. (2022). Benson et al. (2023) explicitly show that banks, which exited the mortgage origination business, "funded through warehouse credit lines a large share… of the nonbanks that replaced them."

NBFIs. However, as in the case of private credit, and consistent with the transformation view of this paper, the role of banks has been changing rather than vanishing. First, banks provide warehouse credit lines to nonbank mortgage originators, which draw down these lines as they make or purchase mortgage loans and then pay off these drawdowns as they sell these loans into securitizations. Second, either through credit lines or by sponsoring the issuance of commercial paper, banks finance the payment advances required of nonbank mortgage servicers. Hence, the funding risks of mortgage origination and servicing remain with banks through NBFIs. A systemic risk implication of this transformation manifested itself during the COVID-19 pandemic and shutdowns, when NBFI originators and servicers – and by implication the banks funding their operations – were rescued from stress by the government-sponsored enterprises (GSEs) and other government insurers. This rescue likely implies that banks would have otherwise experienced stress as well.[17]

3.c. Contingent Funding of NBFIs by Banks

The third category of Figure 2, contingent funding, describes transformations in which certain parts of businesses shift from banks to NBFIs, but unusually high or emergency contingent funding remains the responsibility of banks. As mentioned earlier, banks are particularly suited to provide liquidity insurance. First, their deposit and lending franchises diversify liquidity risk because depositor demand for liquidity is not perfectly correlated with borrow demand for drawdowns (Kashyap, Rajan and Stein, 2002). Second, the high correlation of liquidity demand with financial conditions brings enormous and unique value to banks having access to official backstops such as deposit insurance, central bank lender-of-last-resort financing, access to funds from Federal Home Loan Banks (in the United States), and implicit too-big-to-fail guarantees. Third, because of these official backstops, banks gain deposits in a systemic "flight to safety," precisely when liquidity is most scarce and valuable (Gatev and Strahan, 2006).[18]

This section, focusing on NBFI drawdowns of bank credit lines in times of stress, is a particularly dramatic illustration of the systemic risk implications of the transformation view of NBFIs and banks. Subsection 3.c.i presents data on the extent of drawdowns by the NBFI sector as a whole and by REITs in particular over time. Subsection 3.c.ii describes how the mandatory clearing of the most commonly traded derivatives, like IRS, handed banks the responsibility of financing margin calls on NBFI positions and how, despite bank provision of liquidity to meet elevated margin calls in 2022, both for IRS and for electricity futures contracts, authorities felt obliged to rescue two distinct groups of NBFI derivatives users.

3.c.i. Drawdowns of Bank Credit Lines by NBFIs (and REITs)

[17] See Loewenstein (2021) for further details.

[18] Acharya, Almeida, and Campello (2013) and Acharya and Mora (2015) provide some empirical support for the claims of this paragraph.

Figures 7a and 7b, reproduced from Acharya, Gopal, Jager and Steffen (2023), describe the extent to which NBFIs drew down on bank credit lines over time and, in particular, during the dash for cash of the COVID-19 pandemic and shutdowns. The left plot in Figure 7a shows that the dollar amount of NBFI drawdowns rose to a peak of $69 billion in Q4 2008, following the collapse of Lehman Brothers, and then fell precipitously with the post-GFC contraction of the NBFI sector, mentioned above. Since 2010, however, the dollar drawdowns of the sector have generally increased. There was a peak at $91 billion in Q2 2015, during the 18-month oil price correction starting in December, 2014, and then an all-time peak at $113 billion in Q1 2020.

The right plot of Figure 7a shows the share of NBFI drawdowns as a percentage of the sum of NBFI and non-financial corporation drawdowns. The NBFI share averages 26% over the sample period. It is particularly low, at between 20% and 21% in Q3-Q4 2008, partly with the contraction of the NBFI sector and partly with the large-scale drawdowns by non-financial corporations at the time (Ivashina and Scharfstein, 2010). The NBFI share was also below average, at between 21% and 24%, during Q1 and Q2 2020, again due to the larger than usual drawdowns of non-financial corporations (Acharya, Engle, Jager and Steffen, 2021). This does not imply that NBFI utilization rates of their bank credit lines, measured as the ratio of the drawn down portion of commitments to total outstanding commitments, were low. In fact, Figure 7b shows that utilization rates for the lower-rated NBFIs were higher than those of equivalently-rated non-financial corporations not only during Q1 2020 but also on average during 2005 to 2019.

We next turn to REITs, which emerged by 2023 as among the largest users of bank credit lines. See Figure 3b. REITs mix debt and equity financing in their capital structures, with mortgage REITs relatively more reliant on repo financing. REITs tend to use bank credit lines as warehouse financing, drawing on them to purchase assets, meaning property in the case of equity REITs and mortgages in case of mortgage REITs. Figures 8a and 8b, also from Acharya, Gopal, Jager, and Steffen (2023), describe the use of credit lines by REITs over time.

The left graph of Figure 8a shows that the dollar amounts of bank credit commitments to REITs have increased more than 2.5 times, from under $60 billion in Q1 2009 to over $150 billion in Q1 2020. The right graph of the figure shows that the dollar drawdown by REITs roughly follows the time series pattern for all NBFIs, as shown in the left graph of Figure 7a.

Figure 8b shows that REIT utilization of credit lines is somewhat different from that of other NBFIs. First, the left graph shows that REIT utilization rates are relatively high compared with those of all NBFIs during normal times and at onset of the pandemic (see Figure 7b): utilizations for REITs in normal times are between 25% and 35%, while utilizations in peak times are above 40% and 45% during the GFC and the COVID pandemic and shutdowns, respectively. Second, the right graph of Figure 8b shows that the share of REIT drawdowns did not fall through the GFC and the onset of the pandemic and shutdowns, as did those of the NBFI sector as a whole in the right graph of Figure 7a.

3.b.ii. Bank Liquidity Provision for Derivatives Clearing

We now turn to the role of banks in providing liquidity to support NBFI positions in cleared derivatives. There were extraordinary demands for liquidity in two derivatives markets in the third quarter of 2022: U.K. pension funds faced large margin calls from their IRS positions that hedged against falling interest rates, and European electricity producers faced large margin calls from their electricity futures positions that hedged against rising electricity prices. European electricity producers are usually not considered NBFIs, but have to be liquidity managers, in the manner of other NBFIs, on account of margin calls on their cleared derivatives positions. In any case, banks provided significant amounts of liquidity in both instances, but conditions ultimately worsened enough to result in the intervention of authorities.

Figure 9 illustrates how the post-GFC shift from bilateral to centrally-cleared IRS resulted in a transformation of NBFI and bank businesses. The top schematic shows a bank-dealer with a bilateral IRS facing a pension fund. As was typical before the GFC, the bank-dealer does not collect margin from this pension fund. Hence, the bank bears counterparty risk from the trade and may have to manage its own liquidity risk from margin calls on IRS that it executes with other dealers to hedge its IRS with the pension fund. In contrast to this bilateral trade with the pension fund, the bottom schematic shows a pension fund with a cleared IRS against a central counterparty (CCP), which requires the pension fund to post initial margin and to be prepared to make variation margin calls. Furthermore, to manage these margin requirements, the pension fund engages a bank to make loans to cover initial margin and to provide credit lines to finance variation margin payments and increases in initial margin requirements. All in all then, Figure 9 illustrates how the shift from bilateral to cleared IRS transformed the role of the banking system from bearing counterparty risk from derivatives trades with clients to providing loans and credit lines to clients managing derivatives margin.

It should be noted that the margin implications of the shift from bilateral to cleared derivatives were quantitatively massive, both in trend and through stress events. Customer funds in cleared swap accounts at U.S. intermediaries rose from a bit over $20 billion in 2014 to about $120 billion by the end of 2019, before jumping to about $150 billion during the COVID-19 pandemic and shutdowns (FIA, 2020, p. 13). Furthermore, and particularly relevant for the cases to be discussed presently, are margin amounts held at European CCPs in Q3 2022. For interest rate products, margin for interest rate products rose from about €40 billion through 2021 to about €100 billion in Q3 2022. For commodities contracts, which are mostly futures that have always been cleared—and as such not part of the transformation of Figure 9—margin rose from about €10 billion in early 2021 to about €90 billion in Q3 2022 (European Systemic Risk Board (2023), Chart 23).

U.K. Pensions in September 2022

U.K. defined-benefit pension funds hedge the interest rate risk of their long-term liabilities by investing in long-term fixed income assets, like government bonds, or gilts; government-issued inflation-linked bonds, or linkers; and corporate bonds. But—-as in other countries—total pension fund liabilities in the U.K. are rather large relative to the supply of long-term fixed income assets. Hence, to balance the interest rate risk of their assets and liabilities, U.K. pension funds also "receive fixed" and “pay floating” in long-term IRS, which has the same effect on interest-rate exposure as buying long-term government bonds.

Long-term interest rates had been increasing in the U.K. (and globally) since early 2022, but spiked sharply up on September 23 after the unveiling of a government budget proposal that would have increased borrowing without offsetting increases in revenue. Most U.K. pension funds seem to have been relatively well-hedged against increasing interest rates or, if anything, were positioned to benefit slightly from rate increases. Despite that economics, however, rapidly rising rates greatly reduced the value of their IRS positions and generated large margin calls. In response, banks provided liquidity to pension funds through a variety of loans and advances.[19]

Despite the liquidity support from the banking sector just described, many pension funds were forced to sell gilts to raise cash, which pushed prices lower (and rates higher), which in turn led to additional margin calls. There were several institutional and operational factors that added to the liquidity challenges of the funds at this time, but funds that were clearly solvent—with respect to the value of their assets against the value of their liabilities—suffered losses by having to liquidate assets in fire-sales to raise cash to meet margin calls or by being forced out of hedges for failing to meet margin calls, which exposed them to subsequent portfolio losses when rates declined.

In response to the stress on pension funds and the resulting stress in the gilt market, the Bank of England intervened on September 29 and again on October 11 to contain falling gilt prices by committing to purchase and fund large volumes of bonds and by adding linkers and corporate bonds as eligible collateral against loans made to banks to be passed on to pension funds. This intervention was particularly striking in that it ran in the opposite direction as the Bank of England's contractionary monetary policy at the time.

In this episode, the liquidity resources of U.K. pension funds were overwhelmed by sudden and large margin calls on their IRS positions. Years ago, bank-dealers might have been exposed to counterparty risk from bilateral interest rate derivatives with pension funds. But with the shift to the central clearing of IRS mandated by post-GFC regulation, banks in 2022 instead had exposure from loans and liquidity provision to pension funds that were scrambling to meet margin obligations. In short, the linkages between banks and NBFIs have not been eliminated

[19] Banks loaned money to some pension funds on the collateral of their bonds, or loaned money to market participants purchasing bonds from pension funds on a levered basis. Also, banks that are members of IRS clearing houses or CCPs somewhat eased liquidity pressures by settling intraday margin calls from the CCPs on behalf of their pension fund clients while continuing to call those pension funds for margin on an overnight basis.

with clearing arrangements for derivatives but simply transformed. Furthermore, these transformed risks were substantial enough in September 2022 to lead to turmoil in the U.K. government bond market and, ultimately, to the intervention of the Bank of England, with the possibility that banks would have suffered significant losses otherwise.[20]

European Electricity Producers in Q3 2022

Energy prices began to increase in Europe in 2021 for a variety of reasons, including the emergence of economies from pandemic lockdowns and a Russian supply squeeze. Prices rose higher after Russia's invasion of Ukraine in February 2022 and increased even more steeply from July through August 2022. Electricity producers that had sold electricity futures contracts to hedge against falling prices were perfectly solvent, but faced liquidity pressures from variation margin calls and increases in initial margin rates.

As the demand for liquidity to meet margin calls increased, banks increased their exposures to the energy sector by supplying significant amounts of liquidity in several forms.[21] And, in addition to this liquidity provision by banks, support in the form of guarantees was offered or provided to electricity producers by many governments, including Austria, Czech Republic, Germany, Finland, Denmark, Norway, Sweden, United Kingdom, and Switzerland.

In short, while electricity producers are not normally considered NBFIs, derivatives margin requirements mean that they have to manage liquidity like other NBFIs. Furthermore, while banks were not directly exposed to counterparty risk from electricity producers' (cleared) futures positions, they were exposed to the sector through lending and credit lines and through bilateral electricity derivatives contracts that producers substituted for futures positions over the course of the stress so as to avoid future margin calls. Finally, as bank liquidity support proved insufficient, government authorities felt compelled to intervene with guarantees.[22]

4. Propagation of Risks arising from Bank and NBFI Linkages

[20] See Plender (2022), for example, for a news account of this episode.

[21] These included margin waivers by clearing members based on letters of credit or guarantees from other banks; intraday or overnight advances of margin and other short-term credit lines; credit lines backed by uncollateralized guarantees of other banks; uncollateralized guarantees to clearinghouses (when European regulators temporarily allowed this); committed repurchase agreement facilities (to borrow cash on bond collateral); collateral transformation services (providing cash or highly liquid bonds in exchange for less liquid collateral at a haircut); relatively low-margin bilateral swaps (as a substitute for high-margin futures); and liquidity swaps (in which banks took over high-margin futures positions in exchange for low-margin bilateral swaps). Of course, not all banks were accommodating: some asked clients to reduce risk or to take their business elsewhere. See European Banking Authority (2022) for further details.

[22] See Turnstead (2023), Wilkes and Turnstead (2022), and Wilson and Stafford (2022) for news accounts of this episode.

A key manifestation of the transformation view of the NBFI and bank sectors advanced in this paper is that these sectors have asset- and liability-dependencies, that is, the asset portfolio values and sources of funding of each sector depend on the other sector. And these interdependencies have systemic risk implications, because shocks within one of the sectors can readily spread to the others. Cetorelli, Landoni and Lu (2023) study another way in which shocks can propagate across the financial system, and in particular across NBFIs and banks, namely the direct and indirect effects of fire-sale liquidations. Their line of argument is illustrated in Figure 10a.

Consider a shock to the real economy that reduces the value of claims on nonfinancial firms depicted in the upper-right corner of the figure. This shock, by distressing the portfolio of, say, asset managers holding those claims, could trigger forced sales of any or all of the assets held by those asset managers. In the stylized example of Figure 10a, asset managers respond to the original shock by selling both Treasuries and corporate bonds. Banks—who in this simple example are assumed to hold Treasuries and loans, but not corporate bonds—suffer losses due to the depressed, fire-sale prices of Treasuries. This direct effect is referred to and labeled in the figure as the "Round 1" effect.

Continuing with the example, the asset manager's fire sales of corporate bonds stress the portfolios of life insurance companies, which contain corporate bonds and bank loans, and cause those insurers to liquidate some of their bank loans. The resulting price pressure on these loans could inflict additional losses on bank portfolios. This indirect effect of asset managers selling corporate bonds on bank portfolios is referred to and labeled in the figure as the "Round 2" effect.

Cetorelli, Landoni and Lu (2023) show empirically that Round 2 effects can be quite large relative to Round 1 effects, based on bank and NBFI sector portfolio holdings from the Federal Reserve's Flow of Funds data as of Q4 2021. For example, there are large Round 1 effects on banks of *pro rata* portfolio liquidations of life insurers and finance companies, because these sectors are significant holders of bank loans. The impact on banks is large in the case of life insurer liquidations because life insurer portfolios are particularly large, while the impact on banks is large in the case of finance companies because finance company portfolios are particularly concentrated in loans. The Round 2 effect on banks of finance company liquidations is not large, however, because the high concentration of their portfolios in loans means that their liquidations do not affect other NBFI sectors enough to generate indirect effects on banks.

In contrast to finance companies, Cetorelli, Landoni and Lu (2023) show that liquidations of equity mutual funds do have large Round 2 effects on banks. The Round 1 effect of equity mutual fund liquidations on banks is very small because banks are not significant holders of equities. But liquidations by equity mutual funds inflict significant losses on other NBFI sectors, like P&C insurers, with large holdings that meaningfully overlap those of banks. All in all, then,

equity mutual fund liquidations have a Round 1 impact on P&C insurers, which liquidations, in turn, have a Round 2 impact on banks.

Cetorelli, Landoni and Lu (2023) define the "network multiplier" of an NBFI sector on banks as the sector's Round 1 effect on banks as a fraction of the total of its Round 1 and Round 2 effects. Consistent with the brief discussion here, the empirical network multiplier of finance companies on banks was estimated at 32% and that of equity mutual funds on banks at 98%. (For completeness, the analogous multiplier for life insurers was estimated at 68%.) In short, equity mutual funds and banks share little asset commonality, but the Round 2 effects of equity mutual funds on banks are nearly as large as their Round 1 effects. Furthermore, of the 12 NBFI sectors defined in Cetorelli, Landoni and Lu (2023), 11 were estimated to have multipliers above 50% and 8 with multipliers above 80%. Hence, a systemic analysis of Round 1 effects alone would severely underestimate the propagation of shocks across the system.

Combining the insights of Figure 10a with the NBFI and bank liability dependencies presented in Sections 2 and 3 reveal the potential for even further rounds of shock propagation. In particular, following on from Figure 10a, banks experiencing the Round 1 and Round 2 impacts depicted may, in turn, reduce lending to NBFIs and spark additional rounds of propagation. Figure 10b illustrates how this may play out. Banks may reduce credit lines to, say, REITs and reduce loans to CLOs in a Round 3 propagation. Then, these NBFIs might reduce their investments in the real economy, that is, REITs might reduce their investments in real estate and CLOs might reduce their investments in leveraged loans in a Round 4 propagation. Once again, the propagation of shocks along the lines of this section seem necessary for a complete analysis of systemic risk across the NBFI and bank sectors.

5. Correlation and Causation of NBFI and Bank Systemic Risks

The transformation view of this paper, that post-GFC reforms have increased the interconnectedness of NBFI and bank businesses, implies that stresses in one sector can now more readily flow into the other. The purpose of this section is to present some suggestive, preliminary empirical evidence supporting this implication. First, we measure the correlation of the systemic risks of the NBFI and bank sectors. Second, we test whether abnormal equity returns of the two sectors Granger-cause each other (Granger, 1969).

To study the correlation of systemic risks, we use *SRISK,* a measure of market-equity-based capital shortfall under aggregate market stress (Acharya, Engle and Richardson, 2012). The *SRISK* measure is calculated for a publicly-traded bank or NBFI through the following equation:

$$SRISK = Exp_0\left[k(D_t + E_t) - E_t \mid Crisis\right] = k.D_0 - (1-k).(1-LRMES).E_0$$

where *Exp* is the expectations operator (at date 0), *Crisis* is taken to be an aggregate market stress scenario from time 0 to *t* (e.g., a 40% correction to the S&P 500 or MSCI Global index

over a six-month period); D_t denotes all non-equity liabilities of the institution at time t, which, for simplicity, is assumed to be constant between time 0 and t at D_0; E_t denotes the market equity value of the institution at time t; *LRMES* is its long-run marginal expected shortfall, i.e., the expected percentage loss in market value of its equity in the crisis scenario (estimated using dynamic conditional beta econometrics), so that $Exp_0\,[E_t \mid Crisis] = (1\text{-}LRMES).E_0$; and, k is a prudential market-equity-based capital ratio relative to which the capital shortfall *SRISK* is computed, e.g., 8%. *SRISK* is publicly available at vlab.stern.nyu.edu/srisk.

If the *SRISK* of an institution is positive, it is deemed to have a capital shortfall on the day of measurement. Aggregate capital shortfall for the financial sector as a whole or for a subsector (banks, NBFIs, etc.) is computed as the sum of the positive *SRISK* values of the individual institutions in the relevant set. Note that this calculation assumes a lack of perfect capital mobility across surplus and shortfall institutions, which is a reasonable assumption from a financial stability perspective given the uncertainties associated with the resolution of even mid-sized financial institutions. Also, because *SRISK* relies on publicly traded equity, it can be computed only for financial institutions with listed stocks traded at observable daily prices.[23] Finally, we restrict attention to institutions with at least $100 million of market capitalization of equity. The result is an aggregate *SRISK* series for banks and NBFIs.

Figure 11a reports the median 20-day rolling correlation of percentage changes in bank and NBFI *SRISK* over several sequentially defined subperiods of interest from Jan 2000 to the end of April 2023. The subperiods are the following: pre-GFC, GFC, post-GFC, Oil Price Shock, Rate Hike + Quantitative Tightening (QT)[24], Pandemic, Post-Pandemic, and Silicon Valley Bank (SVB) Stress or, more broadly, regional banking stress.

The results in Figure 11a show that the correlation of bank and NBFI *SRISK* has risen steadily from 64% in the pre-GFC period and remained elevated through the SVB Stress period. This increase in correlation seems at odds with the post-GFC reforms designed to strengthen the banking system and protect it from the failures of NBFIs, but seems entirely consistent with the transformation view of this paper. Banks and NBFIs operated more in parallel before the GFC. Since then, post-GFC reforms have encouraged transformations that split intermediation activities across NBFIs and banks so as, in fact, to make the sectors more interdependent. As a result, the systemic risk of the two sectors is more highly correlated after than before the GFC.

As an empirical matter, the correlations in Figure 11a might simply reflect that NBFIs and banks have similar exposures to markets. To demonstrate a stronger interdependence, consistent with the transformation view of this paper, Figure 11b reports results from Granger-causality tests of *abnormal,* equally-weighted daily equity-return indices of NBFIs and banks.

[23] These requirements mean that privately held NBFIs such as CLOs, pension funds, mutual funds, and ETFs, are not covered in our analysis of NBFIs' *SRISK*. On the other hand, there is good coverage of insurance companies, standalone broker-dealers, REITs, and financial services companies, which tend to be publicly listed.

[24] For simplicity, some months are added at the end of this period. QT ended in Sep 2019.

To construct abnormal returns, we adjust each daily index return for that day's S&P500 (market) return based on their 90-day rolling historical beta. Then, starting on the 91st day of each subperiod, as defined above, and until the last day of the subperiod, we conduct daily Granger causality tests for the abnormal NBFI and bank equity-return indices over the 90-day historical window. The fraction of days in each subperiod for which the p-value of the Granger-causality test is less than 10% is reported in Table 11b, with the left column for banks causing NBFIs and the right column for NBFIs causing banks.

Three observations are striking. One, consistent with the *SRISK* correlation in Figure 11a, NBFI and bank sector abnormal equity returns Granger-cause each other more robustly during and after the GFC than before the GFC. Two, NBFIs Granger-cause bank returns more frequently in the post-pandemic and SVB-stress periods. Three, the GFC and Pandemic periods are particularly characterized by banks and NBFIs Granger-causing each other. NBFIs likely caused bank returns in the GFC through banks' poorly performing (NBFI) off-balance sheet vehicles and in the Pandemic periods through NBFI drawdowns of bank credit lines. Banks likely caused NBFI returns during those periods through banks' role as the providers of liquidity and liquidity insurance to NBFIs.

Overall, the results in this section further advance the theme of the paper that financial regulation needs to pursue a holistic approach that recognizes NBFIs and banks as the highly interdependent sectors they seem to be.

6. Implications for Financial Regulation

As discussed in the introduction, different views of the NBFI and bank sectors have different implications for financial regulation. Under the parallel view, banks and NBFIs provide distinct intermediation services, with banks heavily regulated and supported by official backstops and with NBFIs lightly regulated and under the presumption that they will not be rescued out of failure. The substitution view, in contrast, accepts the realities that NBFIs provide some very bank-like intermediation services and have, in fact, been rescued by authorities in times of stress. According to this view, financial regulation has to eliminate the regulatory arbitrages that make it worthwhile for NBFIs to enter into systemically important, bank-like businesses.

This paper makes the case instead for the transformation view, in which NBFIs and banks, along the lines of Goodhart's law, endogenously adapt to regulatory and other business conditions. As a result, the components of intermediation activities that are under the heaviest burden of bank regulation tend to move from banks to NBFIs, while the components that benefit most from deposit franchises and access to explicit and implicit official backstops tend to remain at banks. It follows, then, that stressed NBFIs are bound to impose systemic externalities, whether by ceasing to function as significant intermediaries; by defaulting on obligations that

destabilize some combination of banks, other intermediaries, or parts of the real economy; or by starting fire sales in the course of liquidating assets. Hence, while NBFIs in the current regulatory framework are *de jure* outside the official safety net, they are *de facto* inside.

This section describes our suggestions for regulatory reform under the transformation view of NBFI and bank interdependencies. These suggestions are divided into two parts. First, we discuss the *ex-ante* measuring and monitoring of systemic risks and proposals for inducing both banks and NBFIs to internalize the systemic risks generated by their interdependent intermediation activities. Second, we argue that authorities should explicitly articulate state-contingent responses to distresses in the NBFI sector.

a. *Ex-ante* measuring, monitoring, and regulation

A straightforward first step in addressing systemic risks arising from NBFIs is to measure those risks, not only as they appear in isolation, but also accounting for the NBFI-bank interdependencies described in this paper. Some encouraging progress has been made by the regulatory community along these lines, including ECB (2023), FDIC (2019), and FSB (2022).

Another step in the right direction is for regulators to incorporate these NBFI and bank interdependencies into their supervision. Some holistic approaches along these lines have appeared with respect to the supervision of CCPs. CFTC (2019) conducted a stress test in which a set of large clearing members and their largest customers simultaneously defaulted to three CCPs. The analysis examined not only the resources on hand at the CCPs to meet the contingency, but also the CCPs' plans for drawing liquidity from the banking system. These plans included lists of individual banks to be tapped, the volumes of liquidity required from each bank, and each source of funds (e.g., bank deposits, lines of credit from banks, maturing overnight reverse repurchase agreements, and new repurchase agreements[25]). Bank of England (2022) conducted a similarly-spirited exercise.

A further step is regulation that addresses the moral hazards that lead to the interdependent activities of NBFIs and banks described in this paper. While introducing laws and rules to govern NBFIs along the lines of banks would represent a vast expansion of financial regulation, a bold but more limited approach could internalize the systemic costs of NBFI and bank linkages.[26] A complete analysis of reforms along these lines is beyond the scope of this paper, but we mention three existing proposals here:

[25] In its reverse repurchase agreements, a CCP lends money on securities collateral. In new repurchase agreements, the CCP would be borrowing money on securities it would have to post as collateral.

[26] Yankov (2020) discusses one attempt at regulatory reform along these lines. The Liquidity Coverage Ratio penalizes bank liquidity facilities to NBFIs more than those to nonfinancial businesses, with an assumed outflow rate of 100% for the former but 30% for the latter. This differential treatment, however, induced banks to shift to giving NBFIs liquidity facilities—which are designed as liquidity management tools, at that 100% outflow rate—to giving NBFIs credit facilities—which are for general corporate purposes, at an outflow rate of only 40%.

(1) *Committed Liquidity Facilities (CLFs)*. Under this proposal, banks would post collateral to CLFs at central banks against which, in the future, they could borrow funds at predetermined haircuts and rates. Furthermore, to incentivize banks to post collateral to these facilities, the amounts that banks could draw down on these facilities would count as high-quality liquid assets in satisfying liquidity coverage ratios (see Nelson, 2023). The existence of CLFs would likely raise the relative costs of the more unusual extensions of bank credit to NBFIs. To explain, say that accounts receivables from a particular corporation were accepted as collateral by the CLF at a certain haircut, while investor commitments to a private equity fund were not accepted at all. Then a bank lending against accounts receivables could post them to the CLF and gain HQLA equal to their ex-haircut value. By contrast, a bank lending against investor commitments would have to commit additional funds to claim the same quantity of HQLA.

(2) *Pawnbroker for All Seasons (PFAS)*. King (2016) proposed that all short-term bank and NBFI claims be fully collateralized at the central bank at appropriate haircuts. PFAS would significantly expand regulation over the NBFI sector. It would also significantly increase equity and long-term debt as a proportion of bank liabilities, because collateral haircuts – which under PFAS have to be funded by equity or long-term debt – are typically large relative to the currently required ratios of equity and long-term debt to assets.[27] However, by requiring that every short-term liability be fully collateralized, the PFAS proposal would discourage bank lending to NBFIs on unusual collateral that would attract relatively high haircuts.

(3) *Federal Liquidity Options (FLOs)*. Tuckman (2012) proposed that any bank or NBFI be able to purchase options on secured borrowing from the central bank at predetermined haircuts and rates. Furthermore, the central bank would sell a sufficient quantity of FLOs so that it could credibly commit to provide no additional liquidity in a crisis. If this commitment were indeed credible, then *ad hoc* crisis bailouts would no longer be necessary and banks and NBFIs would use FLO prices to internalize the cost of liquidity in stress scenarios.

A full evaluation and treatment of these proposals is left for future research, but we believe it is important that they be carefully considered. First, quantifying the liquidity risk implications of bank funding linkages to NBFIs is crucial to effective regulation of the two sectors. Second, to the extent that these linkages are the result of purposeful or fortuitous regulatory arbitrage and take advantage of explicit or implicit safety nets, reforms that narrow the scope for such arbitrage can be useful in mitigating systemic risk.

b. State-contingent measures

[27] See Nelson (2023), p. 7, for more details.

Ex-ante approaches to mitigating systemic risk, like those of the previous subsection, do not preclude the possibility of individual or groups of NBFIs becoming more systemically important over time or of failing, that is, *ex-ante* approaches are unlikely to get into "all the cracks" of the complex and dynamically evolving financial system described in this paper. We therefore propose in this subsection a state-contingent approach that predetermines regulatory safeguards to be imposed on those parts of the NBFI sector where systemic has *ex-post* materialized.[28]

The power of authorities in the United States to designate NBFIs as SIFIs, mentioned earlier, is not quite what we have in mind as designations are based on static criteria, like present size, market power, or centrality within the system. We are suggesting a more prospective assessment that requires an ongoing monitoring of evolving NBFI risks and of the NBFI-bank linkages highlighted in the rest of this paper. Regulators would follow predetermined, but principles-based criteria for (i) designation of NBFIs as SIFIs; (ii) classification of NBFI subsectors as "systemic as a herd" even without individual NBFIs that meet size or concentration criteria (e.g., the money-market fund industry); and (iii) inclusion of SIFI-designated NBFIs in regulatory stress tests for imposition of capital and liquidity requirements. Regulation of NBFIs along these lines would be forward-looking, time-varying, and state-contingent.

A special case of the prospective approach of the previous paragraph could be a determination that directly- or indirectly-rescued NBFIs are *prima facie* SIFIs and subject to the applicable regulatory regime. For example, during the GFC, the Federal Reserve included broker-dealers in its lending of last resort in the form of the Term Securities Lending Facility (TSLF) and the Primary Dealer Credit Facility (PDCF) without assuming any regulatory authority over the recipients (although they did remain for some time subject to regulation by the Securities and Exchange Commission). Similarly, the Federal Reserve's liquidity facilities in March 2020 benefited an expansive set of NBFIs with no discussion of expanded oversight.

We believe that it would be useful to debate the extent to which NBFIs that receive lender of last reserve support should be, at that time, presumptively subject to regulation by the Federal Reserve (Acharya, 2022). Another possibility would be to subject such recipients to one-off corrective actions, like deleveraging or increasing liquidity buffers, within a reasonable period of time. The objective of this debate is not necessarily to expand central bank regulation over NBFIs. Instead, a credible commitment by authorities to regulate entities receiving official support would work in concert with the *ex-ante* approaches of the previous subsection to mitigate moral hazard.

Finally, given that risk migration is typically toward entities subject to weaker capital and liquidity requirements, namely NBFIs, our transformation perspective may well reveal the

[28] An alternative approach of not expecting to get into "all the cracks" is to complement financial regulation with monetary policy that leans against the wind (Stein, 2013). This approach is not incompatible with the measures proposed in this paper.

financial system as a whole as financially more fragile than a viewpoint that separates banks and NBFIs and ignores their extensive linkages.[29]

7. Conclusion

There are a number of views of how the NBFI and banks sectors relate to each other, and each view has different implications for financial regulation. Under the parallel view, banks manage the payments system, take deposits, make loans, are supported by explicit and implicit official backstops, and are heavily regulated for safety and soundness. In contrast, NBFIs focus on securities markets, by making markets and providing liquidity, and are disciplined by the possibility of failure without any hope of official rescues. The parallel view is difficult to reconcile, however, with the realities that some NBFI intermediation looks very much like banking, that NBFI intermediation can be systemically important, and that, consequently, NBFIs have indeed been rescued by authorities in times of stress. These realities give rise to the substitution view, in which the assumption of some bank intermediation activities by NBFIs is a regulatory arbitrage that, almost by definition, increases systemic risk. In this view, safety and soundness bank regulation needs to be supplemented by regulations that in some way stop this regulatory arbitrage, either by preventing NBFIs from taking on certain business activities or by internalizing the societal costs of their doing so.

This paper argues for a transformation view, in which NBFIs and banks structure their intermediation businesses so as to loosen regulatory constraints and lower regulatory costs while retaining the liquidity benefits of the banking industry from deposit franchises and explicit or implicit access to official backstops. According to this view, the intermediation activities of NBFIs and banks are not distinct from one another or the same as one another, but interwoven in complex ways. In support of our argument, we present a variety of evidence: relatively new data on the asset- and liability-dependencies of the NBFI and bank sectors; case studies of businesses that have reallocated activities between NBFIs and banks; theory and empirical findings on how fire sales can propagate because of NBFI and bank linkages; and some empirical support for the

[29] Historically too, there is ample support for this view (see, e.g., Pozsar et al., 2010, and Acharya, Schnabl and Suarez, 2013). In particular, innovation – and changes in laws and regulations – that took place in the 1990s enhanced asset securitization, and the mode of intermediation shifted from one centered on banks taking deposits and issuing (and holding to maturity) loans, to one where loans could be packaged into securities and sold to investors. With this shift, several non-bank activities grew in importance, providing specialized services in support of the securitization process (specialty lenders, dealers, asset managers, insurers, among others). However, banks did not remain passive observers but rather adapted, transforming their business scope and increasingly incorporating under their organizational umbrella those nonbank types (Cetorelli, Mandel and Mollineaux, 2012), ripping synergistic benefits from it (Cetorelli, Jacobides and Stern, 2021). And in addition to transforming their scope, banks also played a crucial role in supporting the growth of nonbanks (Mandel, Morgan and Wei, 2012). Similar dynamics have been observed historically. For example, banks were already experiencing a diminishing trend in balance sheet activity in the 1990s, at the same time that money market funds, insurers, broker-dealers and other nonbank segments were growing. This trend was documented in Boyd and Gertler (1995) who argued and provided evidence indicating that banks' role as intermediaries was not diminishing, but rather banks were in the process of shifting away from lending and interest income into off-balance-sheet fee-based activities.

proposition that the systemic risks of NBFIs and banks have become more interconnected since the GFC.

In the transformation view of the NBFI and bank sectors, not only can NBFIs be sources of systemic risk, but their fate in a crisis is intricately interwoven with that of banks. The resulting policy implications are that regulation should measure, monitor, and account for the linkages we describe; should attempt to internalize the systemic risk externalities of these linkages; and should, to the extent possible, predetermine the rules governing future decisions to designate NBFIs as SIFIs and to subject NBFIs receiving emergency support to additional regulatory oversight.

Fleshing out an important part of our argument is left to future research, namely, to identify with much more care the imperfections of the current regulatory regime that explain the profitability of NBFIs and banks transforming in the way we describe. Other research possibilities include: creating a more complete taxonomy of the relevant regulatory arbitrages; further quantifying NBFI and bank interdependencies; conducting more rigorous econometrics as to the systemic risk linkages across the sectors; and expanding the agenda to countries and areas other than the United States. All of these agendas would be invaluable in better understanding our financial systems and in forming more effective policy responses.

References

Abad, Jorge, Marco D'Errico, Neill Killeen, Vera Luz, Tuomas Peltonen, Richard Portes and Teresa Urbano (2022) "Mapping exposures of EU banks to the global shadow banking system," Journal of Banking and Finance, 134, 106168.

Acharya (2022), Discussion of "Congruent Financial Regulation" by Andrew Metrick and Daniel Tarullo, in Brookings Papers on Economic Activity, January 2022.

Acharya, V., H. Almeida, and M. Campello, 2013, Aggregate risk and the choice between cash and lines of credit. *The Journal of Finance* 68 (5), 2059–2116.

Acharya, Viral V., Rob Engle and Matthew Richardson (2012) "Capital Shortfall: A New Approach to Ranking and Regulating Systemic Risks" *American Economic Review Papers and Proceedings,* 102(3), 59-64.

Acharya, Viral V., Rob Engle, Maximilian Jager and Sascha Steffen (2021) "Why Did Bank Stocks Crash During COVID-19?", Working Paper, NYU Stern School of Business.

Acharya, Viral V., Manasa Gopal, Maximilian Jager and Sascha Steffen (2023) "Shadow Always Touches the Feet: Implications of Bank Credit Lines to Non-Bank Financial Intermediaries", Work in progress, NYU Stern School of Business.

Acharya, Viral V., Maximilian Jager and Sascha Steffen (2023) “Contingent Credit Under Stress,” Working Paper, NYU Stern, prepared for the *Annual Review of Financial Economics*.

Acharya, V. and N. Mora, 2015, A Crisis of Banks as Liquidity Providers, *Journal of Finance*, 2015, 70(1), 1-44.

Acharya, Viral V., Philipp Schnabl and Gustavo Suarez (2013) “Securitization without Risk Transfer” *Journal of Financial Economics,* 107, 515-536 (lead article).

Allen, Franklin and Elena Carletti (2006) “Credit Risk Transfer and Contagion,” Journal of Monetary Economics, 53(1), 89-111.

Bancroft (2022), “Nonbank (Agency) MSR Market Share Just Shy of 61% at Year End,” Inside Mortgage Finance,” January 13.

Bank of England (2022), “2021-22 CCP Supervisory Stress Test: results report, October 13.

Benson, D., Kim, Y., and Pence, K. (2023), "Bank Aggregator Exit, Nonbank Entry, and Credit Supply in the Mortgage Industry," working paper.

Berlin, Mitchell, Greg Nini and Edison Yu (2021), “Concentration of Control Rights in Leveraged Loan Syndicates,” Journal of Financial Economics, 137(1), 249-271.

Blackstone (2022), “Private Credit’s Rapid Growth: A Secular Trend,” April.

Board of Governors of the Federal Reserve System (2023), Financial Stability Report, May.

Boyd, John and Mark Gertler (1995) “Are Banks Dead? Or Are the Reports Greatly Exaggerated?,” NBER Working Papers 5045, National Bureau of Economic Research.

Buchak, G., Matvos, G., Piskorski, T., and Seru, A. (2018), "Fintech, regulatory arbitrage, and the rise of shadow banks," Journal of Financial Economics 130, pp. 453-83.

Buchak, Greg, Gregor Matvos, Tomasz Piskorski and Amit Seru (2022) “Beyond the Balance Sheet Model of Banking: Implications for Bank Regulation and Monetary Policy”, Working paper, Stanford GSB.

Calomiris, Charles (2020), “The Evolution of Bank Chartering,” Moments in History, Office of the Comptroller of the Currency, December 7.

Cetorelli Nicola, Benjamin H. Mandel and Lindsay Mollineaux, “The evolution of banks and financial intermediation: framing the analysis”, Federal Reserve Bank of New York *Economic Policy Review*, 2012, vol. 18.

Cetorelli Nicola, Michael G. Jacobides, Samuel Stern, “Mapping a sector's scope transformation and the value of following the evolving core”, *Strategic Management Journal*, Volume 42, Issue 12, December 2021, Pages 2294-2327.

Cetorelli, Nicola, Mattia Landoni and Lina Lu (2023) “Non-Bank Financial Institutions and Banks’ Fire-Sale Vulnerabilities”, Staff Report, Federal Reserve Bank of New York.

Cetorelli, Nicola and Saketh Prazad (2023) “The Nonbank Shadow of Banks”, Liberty Street Economics, Federal Reserve Bank of New York, November 27.

CFTC (2017), “Evaluation of Clearinghouse Liquidity,” October.

Chen, B., Hanson, S., and Stein, J. (2017), "The decline of big-bank lending to small business: Dynamic impacts on local credit and labor markets," working paper.

Chernenko, Sergey, Isil Erel and Robert Prilmeier (2019) “Why Do Firms Borrow Directly From Nonbanks?” NBER Working Paper 26458.

Cortes, K., Demyanyk, Y., Li, L., and Strahan, P. (2018), "Stress tests and small business lending," Journal of Financial Economics 136, pp. 260-279.

Diamond, Douglas (1984) “Financial Intermediation and Delegated Monitoring,” Review of Economic Studies, 51(3), 393-414.

Diamond, Douglas and Philip Dybvig (1983) “Bank Runs, Deposit Insurance, and Liquidity,” Journal of Political Economy, 91(3), 401-419.

Diamond, Douglas and Raghuram G Rajan (2001) “Liquidity Risk, Liquidity Creation, and Financial Fragility,” Journal of Political Economy, 109(2). 287-327.

Donaldson, Jason, Giorgia Piacentino and Anjan Thakor (2021) “Intermediation Variety,” Journal of Finance, 76(6), 3103-3152.

Duffie, Darrell (2020) “Still the World’s Safe Haven? Redesigning the U.S. Treasury Market After the COVID-19 Crisis”, Hutchins Center Working Paper #62.

Duffie, D. (2023), "Resilience redux in the US Treasury Market," working paper, August.

European Banking Authority (2022), “EBA response to the European Commission on the current level of margins and of excessive volatility in energy derivatives markets,” September 29.

European Central Bank [ECB] (2023), “Financial Stability Review,” May.

European Systemic Risk Board [ESRB] (2023), “EU Non-Bank Financial Intermediation Risk Monitor 2023,” NBFI Monitor No 8, June.

FDIC (2019), “Bank and Nonbank Lending Over the Past 70 Years,” FDIC Quarterly 13(4).

FIA (2020), “Revisiting Procyclicality: The Impact of the COVID Crisis on CCP Margin Requirements,” October.

Financial Stability Board [FSB] (2022), “Global Monitoring Report on Non-Bank Financial Intermediation,” December 20.

Financial Stability Report [FSR] (2023), Board of Governors of the Federal Reserve System, October.

Finansinspektionen (2023), "Rapport: Analys av åtgärder på elderivatmarknaden," April 28.

Forbes, Kristin, Christian Friedrich and Dennis Reinhardt (2023) “Stress Relief? Funding Structures and Resilience to the Covid Shock,” Journal of Monetary Economics, 137, 47-81.

Gatev, Evan and Philip Strahan (2006) “Banks' Advantage in Hedging Liquidity Risk: Theory and Evidence from the Commercial Paper Market”, *Journal of Finance,* Volume 61, Issue2, Pages 867-892.

Goodhart, Charles (1975). "Problems of Monetary Management: The U.K. Experience". *Papers in Monetary Economics*. 1975, p. 1-20. Vol. 1. Sydney: Reserve Bank of Australia.

Gopal, Manasa and Philipp Schnabl (2022) “The Rise of Finance Companies and FinTech Lenders in Small Business Lending”, *The Review of Financial Studies*, Volume 35, Issue 11, November, Pages 4859–4901.

Gorton, Gary and Nicholas Souleles (2007), “Special Purpose Vehicles and Securitization,” in *The Risks of Financial Institutions*, National Bureau of Economic Research, University of Chicago Press.

Granger, C. W. J. (1969). "Investigating Causal Relations by Econometric Models and Cross-spectral Methods". *Econometrica.* 37 (3): 424–438.

Harris, Milton, Christian Opp and Marcus Opp (2014) “Higher Capital Requirements? Safer Banks: Macroprudential Regulation in a Competitive Financial System”, Working Paper, University of Chicago Booth School of Business.

Irani, R., Iyer, R., Meisenzahl, R., and Peydró, J. (2020), "The rise of shadow banking: Evidence from Capital Regulation," Review of Financial Studies 34, pp. 2181-235.

Ivashina, V., and D. Scharfstein, 2010, Bank Lending During the Financial Crisis of 2008, *Journal of Financial Economics*, 97(3), 319–338.

Jiang, E. (2023), "Financing Competitors: Shadow Banks' Funding and Mortgage Market Competition," *The Review of Financial Studies*, April.

Kashyap, Anil (2020), “The dash for cash and the liquidity multiplier: Lessons from March 2020”, Speech at London Business School.

Kashyap, A., R. Rajan and J. Stein, 2002, Banks as Liquidity Providers: An Explanation for the Coexistence of Lending and Deposit‐taking, *Journal of Finance* 57(1) 33.73.

Kiernan, Kevin, Vladimir Yankov and Filip Zikes, 2023, Liquidity Provision and Co-insurance in Bank Syndicates, Working Paper, Division of Financial Stability, Federal Reserve Board.

Kiesche, Liz (2020), "Blackstone urges virus-affected companies to tap credit lines," Seeking Alpha, March 11.

Kim, S., Plosser, M., and Santos, J. (2016), "Did the Supervisory Guidance on Leveraged Lending Work?" Liberty Street Economics, Federal Reserve Bank of New York, May 16.

Kim, Y., Laufer, S., Pence, K., Stanton, R., and Wallace, N. (2018), "Liquidity Crises in the Mortgage Market," Brookings Papers on Economic Activity, Spring.

Kim, Y., Pence, K., Stanton, R., Walden, J., and Wallace, N. (2022), "Nonbanks and Mortgage Securitization," Annual Review of Financial Economics 14, pp. 137-66.

King, Mervyn (2016), *The End of Alchemy: Money, Banking, and the Future of the Global Economy*, W. W. Norton & Company.

Lex (2023), "Ares/PacWest: Barclays is strange bedfellow in $2.3bn loan deal," *Financial Times*, June 26.

Loewenstein, Lara (2021), "Why Wasn't There a Nonbank Mortgage Servicer Liquidity Crisis?" *Economic Commentary*, Federal Reserve Bank of Cleveland, July 1.

Mandel, Benjamin H., Donald Morgan, and Chenyang Wei, "The Role of Bank Credit Enhancements in Securitization", Federal Reserve Bank of New York *Economic Policy Review,* July 2012, pp. 35-46.

Martinez-Miera, David and Rafael Repullo (2017) "Search for Yield," Econometrica, 85(2), 351-378.

Metrick, Andrew and Daniel Tarullo (2022), "Congruent Financial Regulation", in Brookings Papers on Economic Activity, January 2022.

Nelson (2023), "CLF Notes – What is a Committed Liquidity Facility?", Bank Policy Institute, June 22.

Plantin, Guillaume (2015) "Shadow Banking and Bank Capital Regulation," Review of Financial Studies, 28(1), 146-175.

Plender, John (2022), "Lessons from the gilts crisis," *Financial Times*, December 21.

Pozsar, Zoltan, Tobias Adrian, Adam Ashcraft and Hayley Boesky (2010), "Shadow Banking," Federal Reserve Bank of New York Staff Reports, No. 458.

Ren, S. (2023), "Private Credit's Dancing in the Streets Gets Wilder," Bloomberg, July 18.

Richardson, Matthew, and Bruce Tuckman (2017), "The Volcker Rule and Regulations of Scope," in Regulating Wall Street: Choice Act vs. Dodd Frank, Matthew Richardson, Kermit Schoenholtz, Bruce Tuckman, and Lawrence White, editors, NYU Stern School of Business.

Sarto, Andres and Olivier Wang (2023) "The Secular Decline in Interest Rates and the Rise of Shadow Banks", Working Paper, NYU Stern School of Business.

Schneider, E., Hudson, E., and Sage, J. (2023), "Struggling Borrowers Turn to Private Credit to Defer Interest," Bloomberg, September 28.

Schrimpf, Andreas, Hyun Song Shin and Vladyslav Sushko (2020) "Leverage and margin spirals in fixed income markets during the Covid-19 crisis", BIS Bulletin No. 2, 2 April.

van Steenis, H. (2023), "Private credit boom will trigger a new squeeze," Financial Times, November 28.

Stein, Jeremy (2013) "Overheating in Credit Markets: Origins, Measurement and Policy Responses", Speech by Governor Stein, Board of Governors of the Federal Reserve System.

Tucker, Paul (2018) Unelected Power: The Quest for Legitimacy in Central Banking and the Regulatory State, Princeton University Press.

Tuckman, Bruce, and Angel Serrat (2022), *Fixed Income Securities: Tools for Today's Markets*, Fourth Edition, John Wiley & Sons.

Tuckman, Bruce (2012) "Federal Liquidity Options: Containing Runs on Deposit-Like Assets without Bailouts and Moral Hazard", *Journal of Applied Finance* 2, pp. 20-38.

Turnstead, Rebekah (2023) "Alarm over gas futures market's ongoing flight to OTC," *Risk.net*, March 24.

Volcker, Paul (2009) "Think More Boldly", *Wall Street Journal.*

Wilkes, Samuel, and Turnstead, Rebekah (2022), "Who blew up gas prices? (It wasn't just Russia)," *Risk.net,* November 16.

Wilson, Tom, and Stafford, Philip (2022), "Why are Europe's power producers running out of cash?" *Financial Times*, September 5.

Yankov, Vladimir, 2020, The liquidity coverage ratio and corporate liquidity management, FEDS Notes, 2020-02.

Figure 1a. Global Financial Assets of NBFI and Bank Sectors, 2002-2021

The NBFI sector includes all financial institutions that are not central banks, banks, or public financial institutions. Included are all 19 Euro area countries, Argentina, Australia, Brazil, Canada, Cayman Islands, Chile, China, Hong Kong, India, Indonesia, Japan, Korea, Mexico, Russia, Saudi Arabia, Singapore, South Africa, Switzerland, Türkiye, United Kingdom, and United States. Source: FSB (2022).

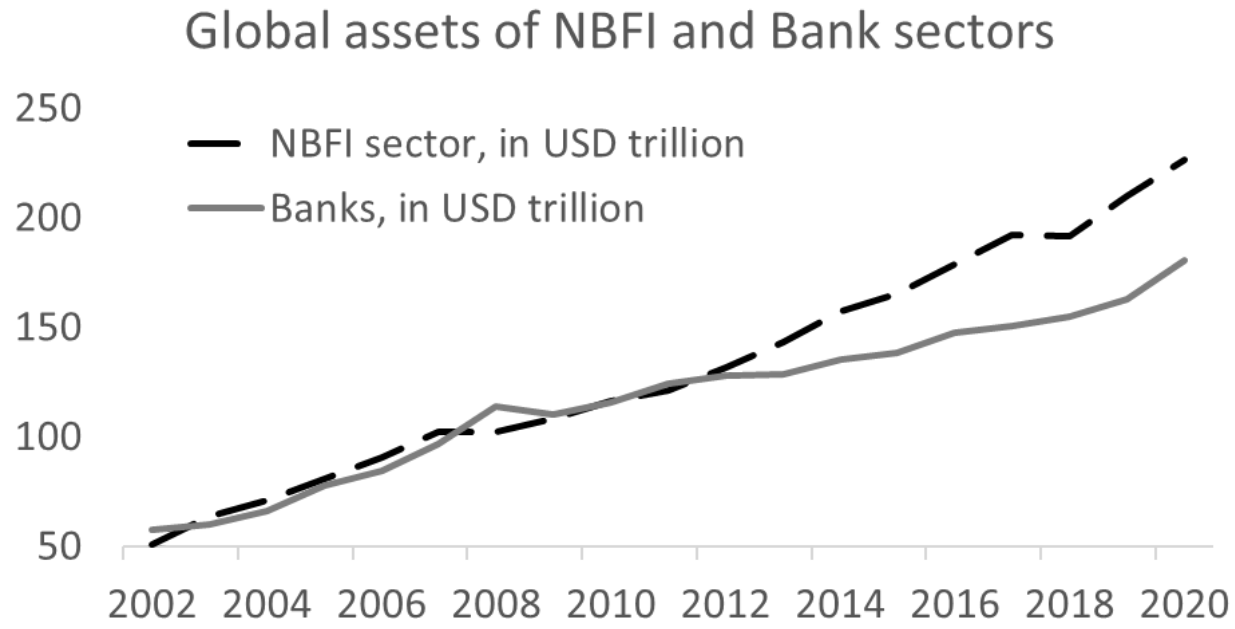


Figure 1b. Financial Assets of NBFI and Bank Sectors, 2002-2021
The NBFI sector includes all financial institutions that are not central banks, banks, or public financial institutions. Source: FSB (2022)

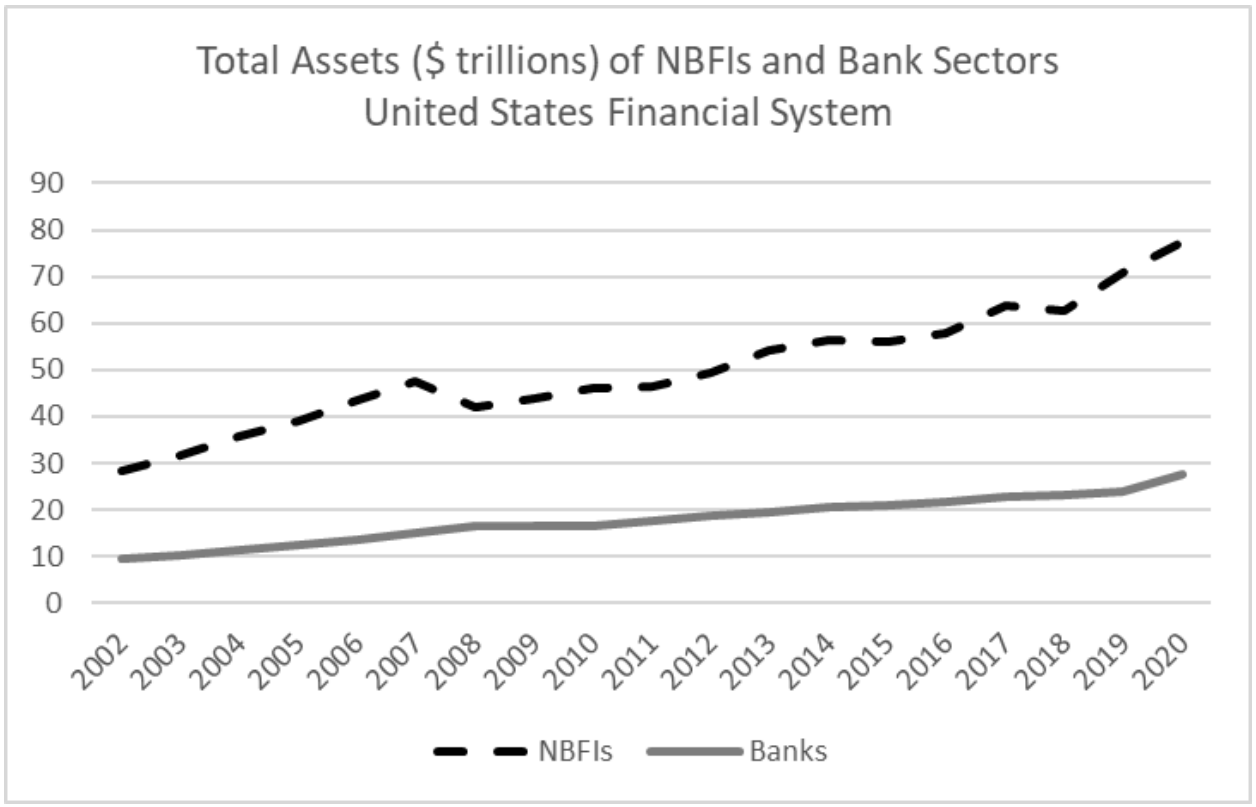


Figure 2. Examples of Transformations of Intermediation Activities Across the NBFI and Bank Sectors

Transformation	Activities and Products Historically Within the Banking System	Activities and Products Spread Across Banks and NBFIs
<u>Loans and Mortgages</u> Loans shift from being made and held by banks to being made by NBFIs with collateralized or senior financing provided by banks.	· Corporate loans · Mortgage loans	· Banks make senior loans to private credit companies. · Banks make collateralized loans to mortgage REITs. · Banks hold senior tranches of MBS and CLOs.
<u>Activities Using Short-Term Funding</u> Activities that require short-term funding transform from being conducted and funded by banks to being conducted by nonbanks and funded by banks.	· Mortgage, CLO, and other ABS origination · Acquisition/LBO financing · Mortgage servicing	· Banks offer warehouse financing to nonbank mortgage, CLO, and other ABS originators. · Banks make short-term loans to private equity companies, including subscription finance loans. · Banks sponsor CP or directly lend to nonbank mortgage servicers.
<u>Contingent Funding</u> While the footprint of NBFIs has grown relative to that of banks, banks retain responsibility for providing contingent funding in the form of credit lines to the NBFI sector.	· Credit lines to nonfinancial businesses · OTC bilateral derivatives	· Banks provide credit lines to NBFIs to be drawn down during periods of stress. · Banks bear mutualized counterparty risk as derivative clearinghouse members and provide credit lines to NBFIs to meet margin requirements.

Figure 3a. Bank Loans to NBFIs, by NBFI Sector, 2013-2023

Term loans from U.S. bank holding companies, U.S. intermediate holding companies of foreign banking organizations, and savings and loans holding companies with $100 billion or more in total consolidated assets. Borrowers are grouped based on their business activities as identified by the North American Industry Classification (NAICS) code. Source: Form FR Y-14Q, Schedule H.1.

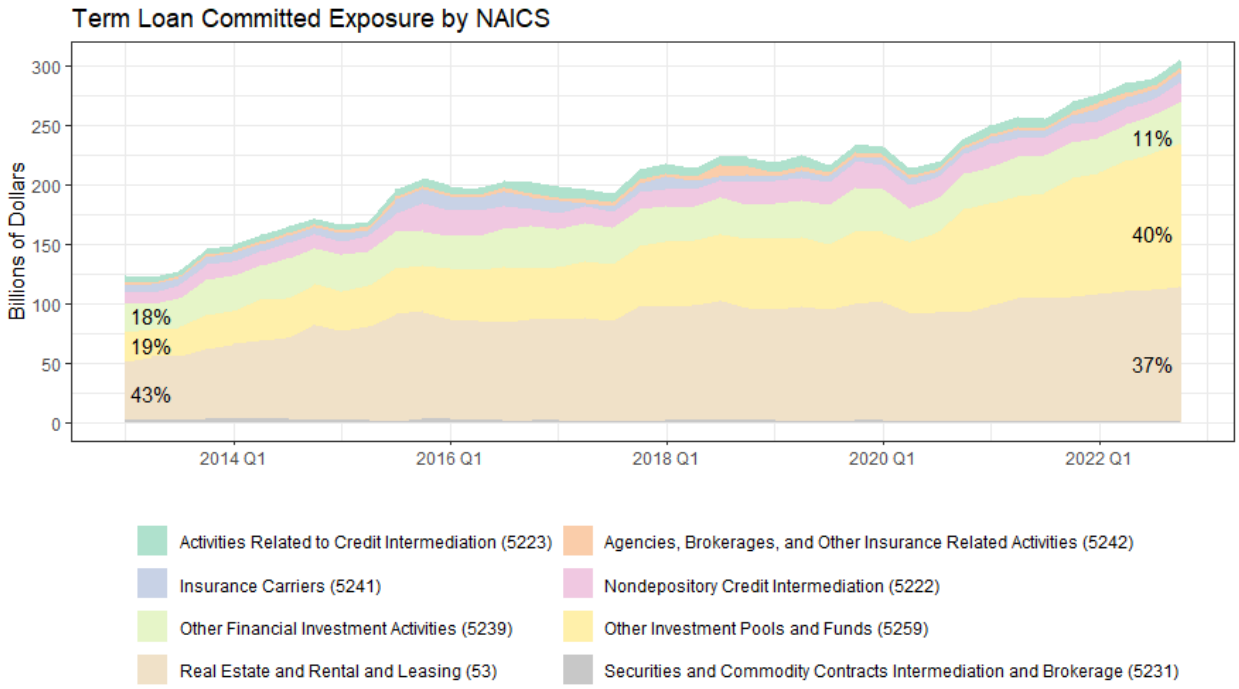


Figure 3b. Bank Credit Line Commitments to NBFIs, by NBFI Sector, 2013-2023

Credit line commitments from U.S. bank holding companies, U.S. intermediate holding companies of foreign banking organizations, and savings and loans holding companies with $100 billion or more in total consolidated assets. Borrowers are grouped based on their business activities as identified by the North American Industry Classification (NAICS) code. Source: Form FR Y-14Q, Schedule H.1.

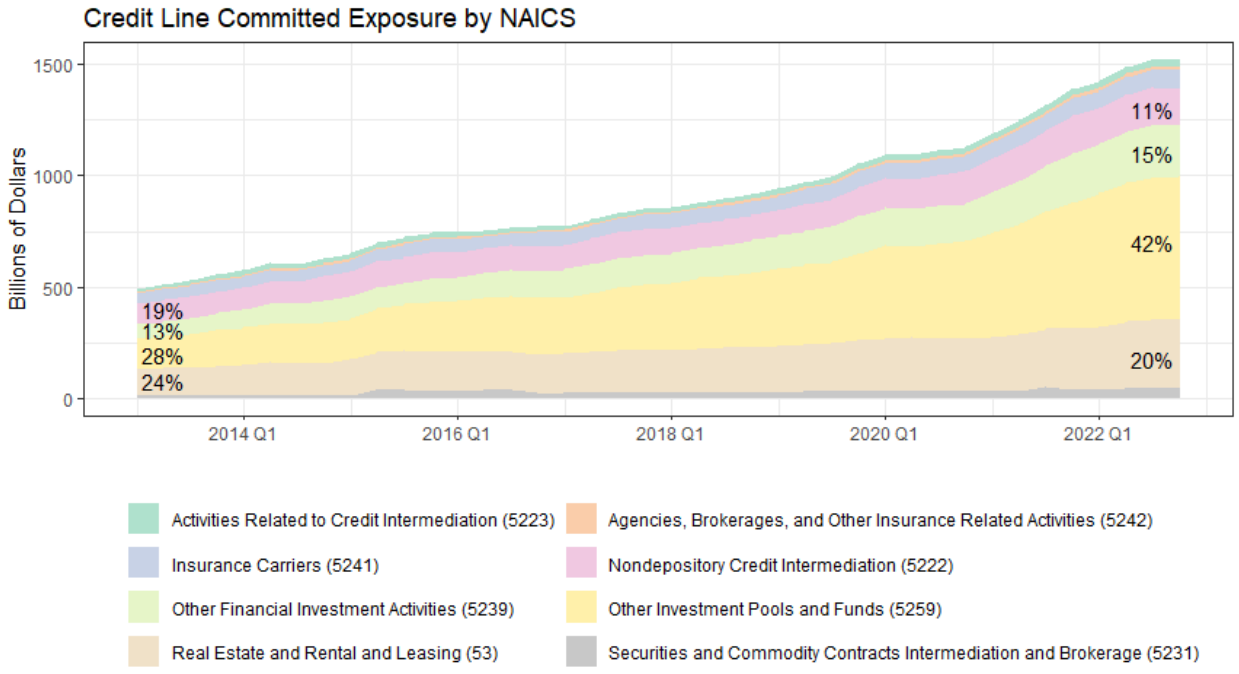


Figure 3c. Bank Loans and Credit Line Commitments to NBFIs as Shares of Total Bank Loans and Credit Line Commitments,

Term loans and credit line commitments from U.S. bank holding companies, U.S. intermediate holding companies of foreign banking organizations, and savings and loans holding companies subject to consolidated financial statement reporting requirements. Source: Form FR Y-9C.

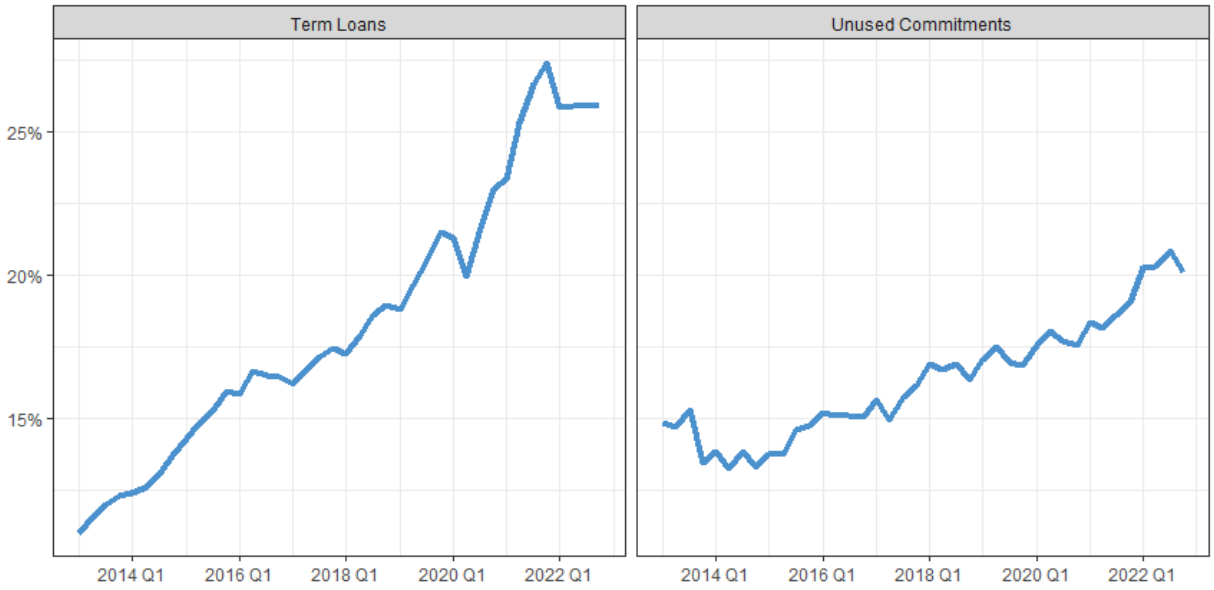


Figure 4a: Matrix of Asset- and Liability-Interdependencies, Q1 2023.

$Billions. For example, Broker/Dealers borrowed a total of $5.430 trillion, $1.370 trillion of which was from Banks. Source: Federal Reserve System, Enhanced Financial Accounts (From Whom To Whom)

		HOLDERS															
			NBFIs														
	ISSUERS	Banks	ABS	B/Ds	eREITS	FCs	GSEs	Life Ins.	MMF	mREITS	MFs	Other FB	PC Ins.	Pensions	Real	RoW	TOTAL
	Banks	3127	0	685	43	56	1096	555	429	21	232	247	143	301	18800	4425	30161
NBFIs	ABS Issuers	143	0	4	0	1	11	573	45	0	39	68	116	27	45	375	1448
NBFIs	Broker/Dealers	1370	0	1285	0	0	112	9	459	0	30	3	3	0	571	1587	5430
NBFIs	Equity REITs	224	29	0	9	5	12	130	0	15	61	2	24	62	169	160	903
NBFIs	Finance Companies	196	0	0	3	5	2	153	6	1	99	18	35	86	289	445	1338
NBFIs	GSE and Agency	3209	0	102	1	1	234	276	791	171	543	0	135	408	1892	1361	9123
NBFIs	Life Ins.	328	178	8	7	4	145	519	9	2	10	0	23	1006	6708	206	9152
NBFIs	MMF	0	0	0	0	0	0	77	0	0	237	435	42	288	4385	200	5664
NBFIs	Mortgage REITs	44	0	66	1	1	14	42	52	0	29	1	10	24	38	199	519
NBFIs	Mutual Funds	14	0	0	0	0	0	1471	0	0	0	0	31	4868	10700	1052	18137
NBFIs	Other Fin. Bus.	49	0	878	5	3	4	27	19	2	11	107	6	68	399	37	1616
NBFIs	PC Ins.	35	1	0	5	3	8	27	1	2	7	0	200	61	1876	326	2551
NBFIs	Pensions	0	0	0	0	0	0	0	0	0	0	0	0	0	27100	0	27100
	Real Sector	16200	1275	679	256	1197	10500	3477	1214	333	3365	186	1214	12400	43400	22100	117795
	Rest of World	3799	1	520	7	466	98	1156	438	4	928	233	570	670	8257	0	17146
	TOTAL	28737	1483	4226	337	1744	12236	8491	3462	550	5591	1300	2554	20269	105830	28048	

Figure 4b: Matrix of Liability-Dependencies, Q1 2023

Percentage of total issued liabilities. For example, 25% of Broker/Dealers liabilities are held by banks. Source: Federal Reserve System, Enhanced Financial Accounts (From Whom To Whom)

		HOLDERS															
			NBFIs														
	ISSUERS	Banks	ABS	B/Ds	eREITS	FCs	GSEs	Life Ins.	MMF	mREITS	MFs	Other FBs	PC Ins.	Pensions	Real	RoW	TOTAL
	Banks	10	0	2	0	0	4	2	1	0	1	1	0	1	62	15	100
NBFIs	ABS Issuers	10	0	0	0	0	1	40	3	0	3	5	8	2	3	26	100
NBFIs	Broker/Dealers	25	0	24	0	0	2	0	8	0	1	0	0	0	11	29	100
NBFIs	Equity REITs	25	3	0	1	1	1	14	0	2	7	0	3	7	19	18	100
NBFIs	Finance Companies	15	0	0	0	0	0	11	0	0	7	1	3	6	22	33	100
NBFIs	GSE and Agency	35	0	1	0	0	3	3	9	2	6	0	1	4	21	15	100
NBFIs	Life Ins.	4	2	0	0	0	2	6	0	0	0	0	0	11	73	2	100
NBFIs	MMF	0	0	0	0	0	0	1	0	0	4	8	1	5	77	4	100
NBFIs	Mortgage REITs	8	0	13	0	0	3	8	10	0	6	0	2	5	7	38	100
NBFIs	Mutual Funds	0	0	0	0	0	0	8	0	0	0	0	0	27	59	6	100
NBFIs	Other Fin. Bus.	3	0	54	0	0	0	2	1	0	1	7	0	4	25	2	100
NBFIs	PC Ins.	1	0	0	0	0	0	1	0	0	0	0	8	2	74	13	100
NBFIs	Pensions	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	100
	Real Sector	14	1	1	0	1	9	3	1	0	3	0	1	11	37	19	100
	Rest of World	22	0	3	0	3	1	7	3	0	5	1	3	4	48	0	100

Figure 4c: Matrix of Asset-Dependencies, Q1 2023.

Percentage of total assets. For example, 5% of Bank assets are the liabilities of Broker/Dealers.
Source: Federal Reserve System, Enhanced Financial Accounts (From Whom To Whom)

		HOLDERS														
			NBFIs													
	ISSUERS	Banks	ABS	B/Ds	eREITs	FCs	GSEs	Life Ins.	MMF	mREITs	MFs	Other FBs	PC Ins.	Pensions	Real	RoW
	Banks	11	0	16	13	3	9	7	12	4	4	19	6	1	15	14
NBFIs	ABS Issuers	0	0	0	0	0	0	7	1	0	1	5	5	0	0	1
NBFIs	Broker/Dealers	5	0	30	0	0	1	0	13	0	1	0	0	0	0	5
NBFIs	Equity REITs	1	2	0	3	0	0	2	0	3	1	0	1	0	0	0
NBFIs	Finance Companies	1	0	0	1	0	0	2	0	0	2	1	1	0	0	1
NBFIs	GSE and Agency	11	0	2	0	0	2	3	23	31	10	0	5	2	2	4
NBFIs	Life Ins.	1	12	0	2	0	1	6	0	0	0	0	1	5	5	1
NBFIs	MMF	0	0	0	0	0	0	1	0	0	4	33	2	1	4	1
NBFIs	Mortgage REITs	0	0	2	0	0	0	0	2	0	1	0	0	0	0	1
NBFIs	Mutual Funds	0	0	0	0	0	0	17	0	0	0	0	1	24	9	3
NBFIs	Other Fin. Bus.	0	0	21	2	0	0	0	1	0	0	8	0	0	0	0
NBFIs	PC Ins.	0	0	0	2	0	0	0	0	0	0	0	8	0	2	1
NBFIs	Pensions	0	0	0	0	0	0	0	0	0	0	0	0	0	22	0
	Real Sector	56	86	16	76	69	86	41	35	61	60	14	48	61	35	68
	Rest of World	13	0	12	2	27	1	14	13	1	17	18	22	3	7	0
	TOTAL	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Figure 5: Summary of Bank-NBFI Asset- and Liability-Dependencies, 2000-2023

As an example of the left side of the figure, on average over the sample, 15% of assets of Broker/Dealers were liabilities of Banks, and this holding constituted 3% of the total liabilities of Banks. As an example of the right side, on average over the sample, 23% of the liabilities of Broker/Dealers were held by banks, and these liabilities constituted 5% of the assets of Banks. Source: Federal Reserve System, Enhanced Financial Accounts (From Whom To Whom)

Issuer	Holder	Average Issuer Share	Average Holder Share	Issuer	Holder	Average Issuer Share	Average Holder Share
Banks	ABS	0%	0%	ABS	Banks	10%	1%
	Banks	12%	12%	Banks		12%	12%
	Broker/Dealers	3%	15%	Broker/Dealers		23%	5%
	Equity REITs	0%	24%	Equity REITs		33%	1%
	Finance Companies	1%	6%	Finance Companies		19%	2%
	GSE and Agency	4%	9%	GSE and Agency		29%	11%
	Life Ins.	2%	6%	Life Ins.		3%	1%
	MMF	3%	18%	MMF		0%	0%
	Mortgage REITs	0%	3%	Mortgage REITs		11%	0%
	Mutual Funds	1%	4%	Mutual Funds		0%	0%
	Other Fin. Bus.	1%	23%	Other Fin. Bus.		0%	0%
	PC Ins.	0%	5%	PC Ins.		1%	0%
	Pensions	1%	2%	Pensions		0%	0%
	Real	57%	14%	Real		15%	54%
	Rest of World	15%	17%	Rest of World		21%	13%

Figure 6a: An Example of Transformation in the Corporate Credit Market—PacWest Loans on Accounts Receivable, June 2023

In the wake of the regional bank crisis of March 2023, PacWest, a U.S. regional bank, sold a portfolio of loans backed by accounts receivable to Ares Management, a large private fund manager. Some of the purchase was financed by Barclays PLC.

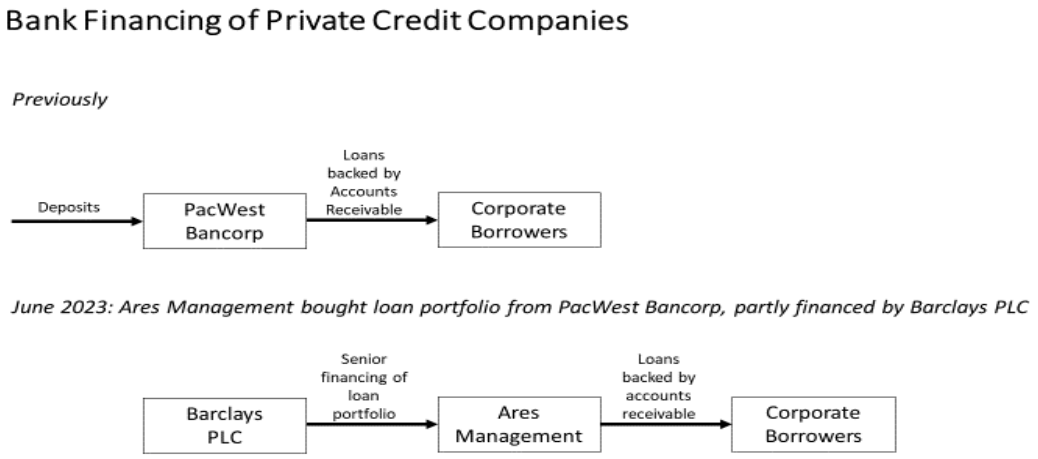


Figure 6b: Special Purpose Vehicle Facilities of Blackstone Private Credit Fund (BCRED), December 2022.

Source: Blackstone Private Credit Fund, Form 10-K, pp. 206-214, 227-228

Funding Facility	Bank	Principal Committed ($)	Outstanding Principal ($)
Bard Peak	BNP Paribas	1,650,000	1,235,414
Bear Peak		468,494	166,031
Castle Peak	Citibank, N.A.	1,600,000	1,146,600
Revolving Credit Facility		5,150,000	1,470,758
Maroon Peak	Morgan Stanley Bank, N.A.	300,000	300,000
Middle Peak		800,000	596,950
Summit Peak	Société Générale	2,300,000	1,691,844
2021-1 BSL WH		300,000	148,000
Denali Peak	Deutsche Bank AG	750,000	749,800
Bushnell Peak	Bank of America, N.A.	600,000	400,000
Bison Peak		1,500,000	1,182,000
Borah Peak		400,000	223,000
Granite Peak	Goldman Sachs Bank USA	750,000	647,600
Blanca Peak	Barclays Bank PLC	1,500,000	1,081,000
Windom Peak	Wells Fargo Bank	2,000,000	1,741,465
Monarch Peak	MUFG Bank	2,000,000	873,400
Naomi Peak	Natixis	400,000	400,000
Meridian Peak	Mass Mutual Life	500,000	170,000
Haydon Peak	HSBC Bank USA	500,000	49,000

Figure 7a: Quarterly Drawdowns of Bank Credit Lines to NBFIs

$Billions and as a share of aggregate drawdowns by non-bank corporations. Sources: Acharya, Gopal, Jager, and Steffen, 2023; Compustat, 2005-2020.

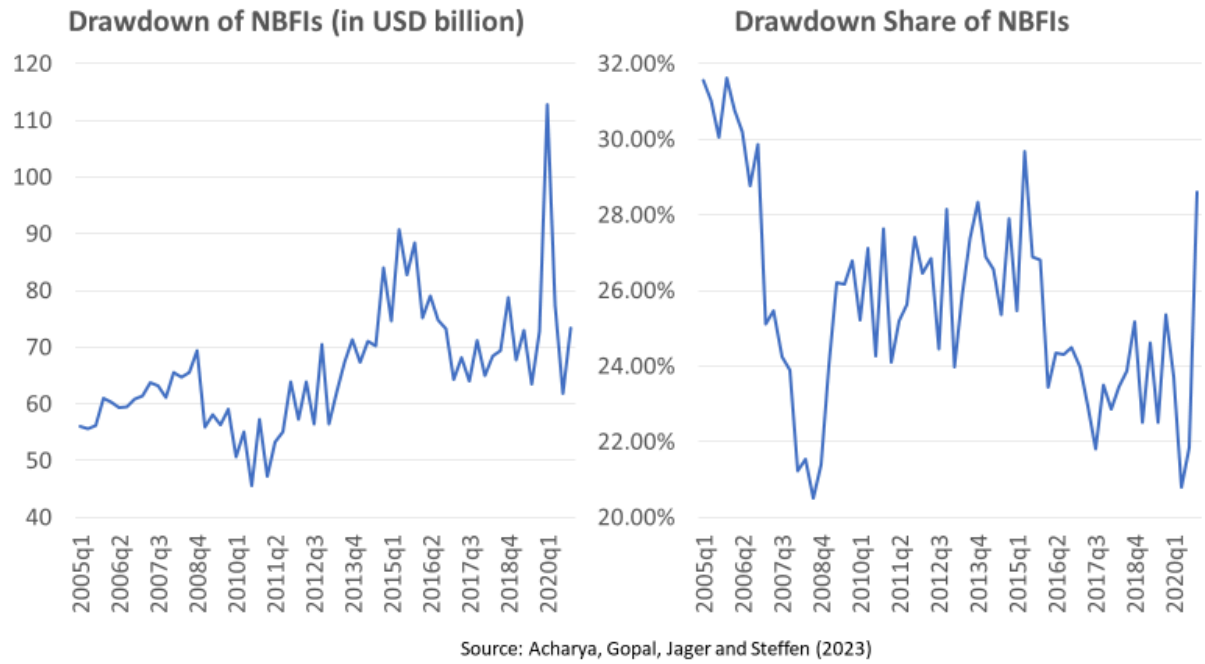


Figure 7b: Bank Credit Line Utilization by Non-financial Corporates and NBFIs during the COVID-19 shock.

Sources: Acharya, Gopal, Jager and Steffen, 2023; Compustat

Median Commitment Utilization Rates				
Rating category	**Non-financial corporates**		**Non-bank financial corporates**	
	2020Q1	**2005 to 2019**	**2020Q1**	**2005 to 2019**
AAA -- A	0%	0%	0%	0%
BBB	10%	0%	**28%**	9.8%
non-IG	36%	3.8%	**49%**	14.1%
non-rated	36%	10.3%	30%	1.6%

Figure 8a: Outstanding Bank Credit Commitments to REITs and their Quarterly Drawdowns

Sources: Acharya, Gopal, Jager and Steffen, 2023; Compustat, 2005-2020

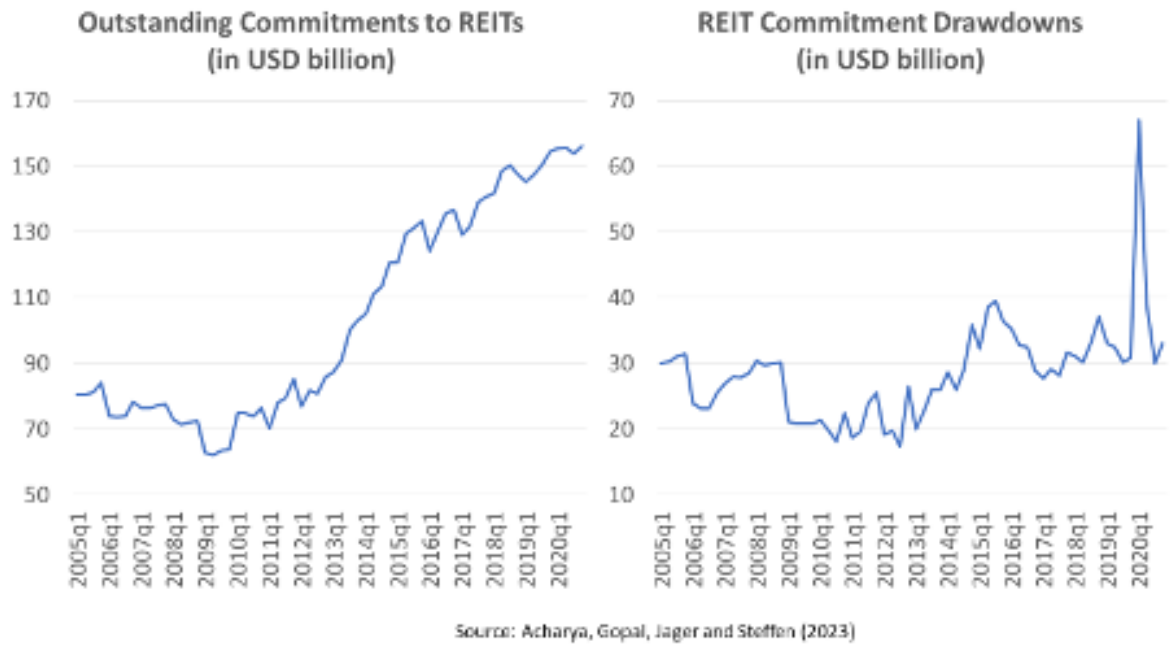


Figure 8b: Utilization Rate of Bank Credit Commitment to REITs and REIT Drawdowns as a Share of Aggregate Drawdowns by Non-bank Corporations

Source: Acharya, Gopal, Jager and Steffen, 2023; Compustat, 2005-2020

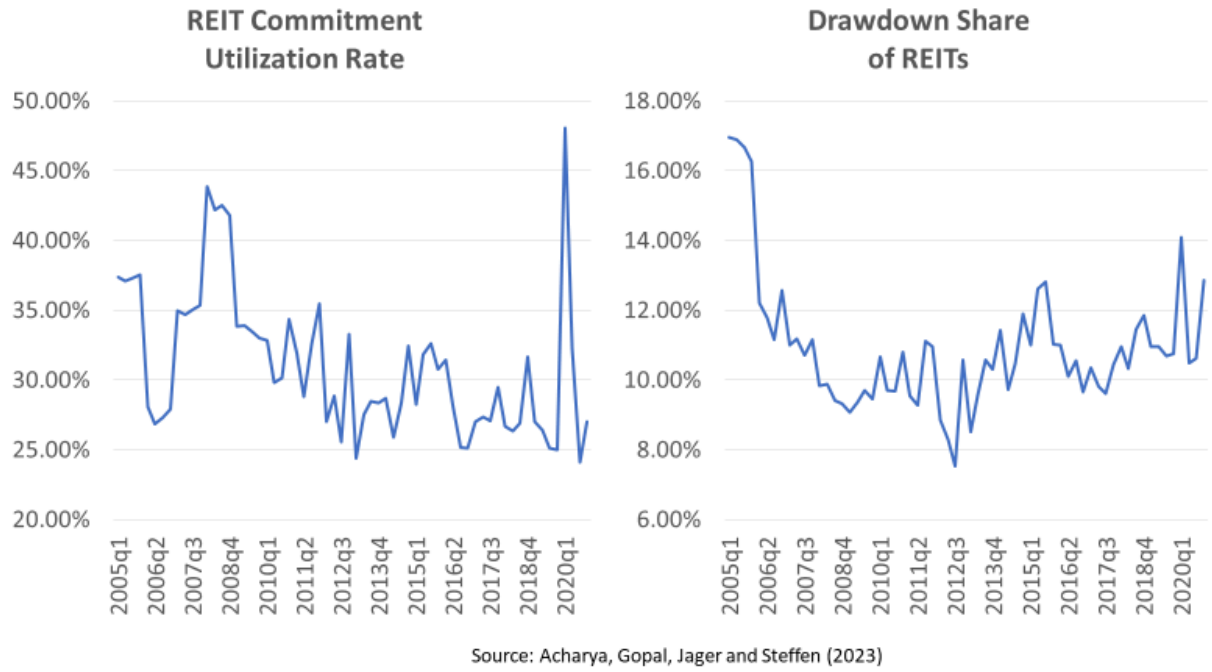


Figure 9: Transformation of Counterparty Risk to Liquidity Risk from Derivatives Clearing—UK Pension Funds

In the top part of the figure, representative of business practice before the GFC, the Bank-Dealer bore counterparty credit risk from its bilateral (and over-the-counter or OTC traded) IRS position with a Pension Fund, and the Bank-Dealer managed the liquidity risk arising from margin requirements from any IRS hedge of its trade with the Pension Fund. In the bottom part of the figure, representative of the post-GFC regulatory environment, the IRS of the Pension Fund is with a central counterparty (CCP), and the Pension Fund must itself manage the liquidity risk arising from the CCP's margin requirements.

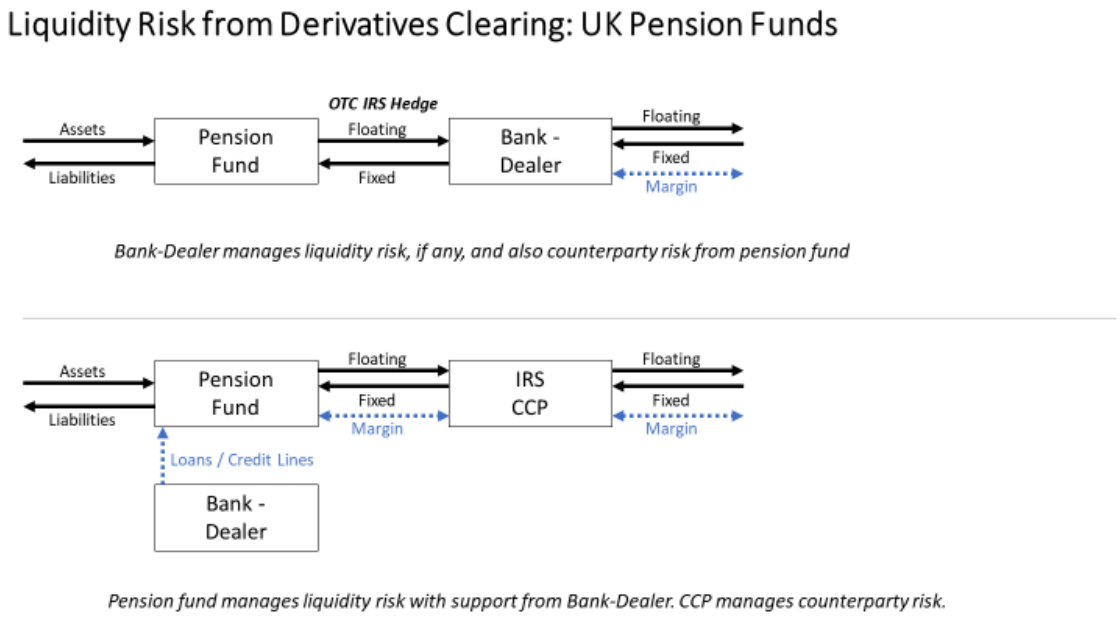


Figure 10a: An Illustration of How NBFI Shocks Affects Banks through Asset Commonality

A shock impacting Non-financial firms induces Asset Managers to sell Treasuries and Corporate Bonds. The resulting price pressure on Corporate Bonds induces Life Insurance Companies to sell Bank Loans. The portfolios of Banks suffer losses both from both the direct or Round 1 impact of falling prices of Treasuries and from the indirect or Round 2 impact of falling prices of bank loans.

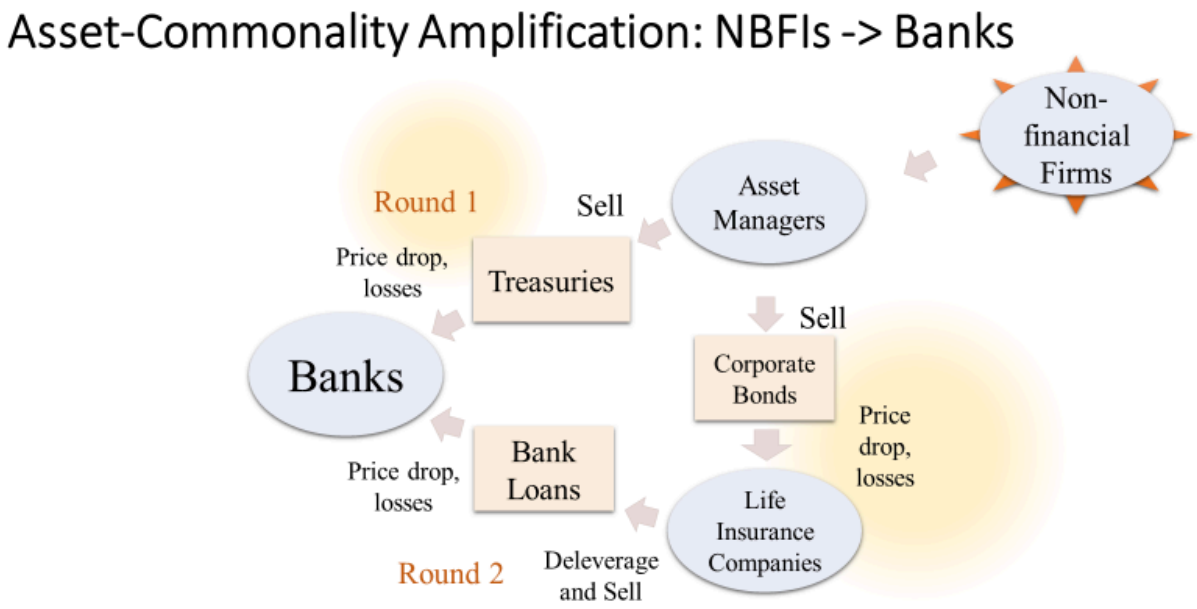


Figure 10b: An Illustration of How Bank Shocks Affect NBFIs through the liability-dependence of NBFIs on Banks.

Shocks to the portfolio values of Banks shown in Figure 10a result in Banks tightening credit both in the provision of credit lines to REITs and in the provision of loans to CLOs. This tightening of credit, in turn, has a negative impact on Real Estate and Leveraged Loans, which rely on the intermediation of these NBFIs.

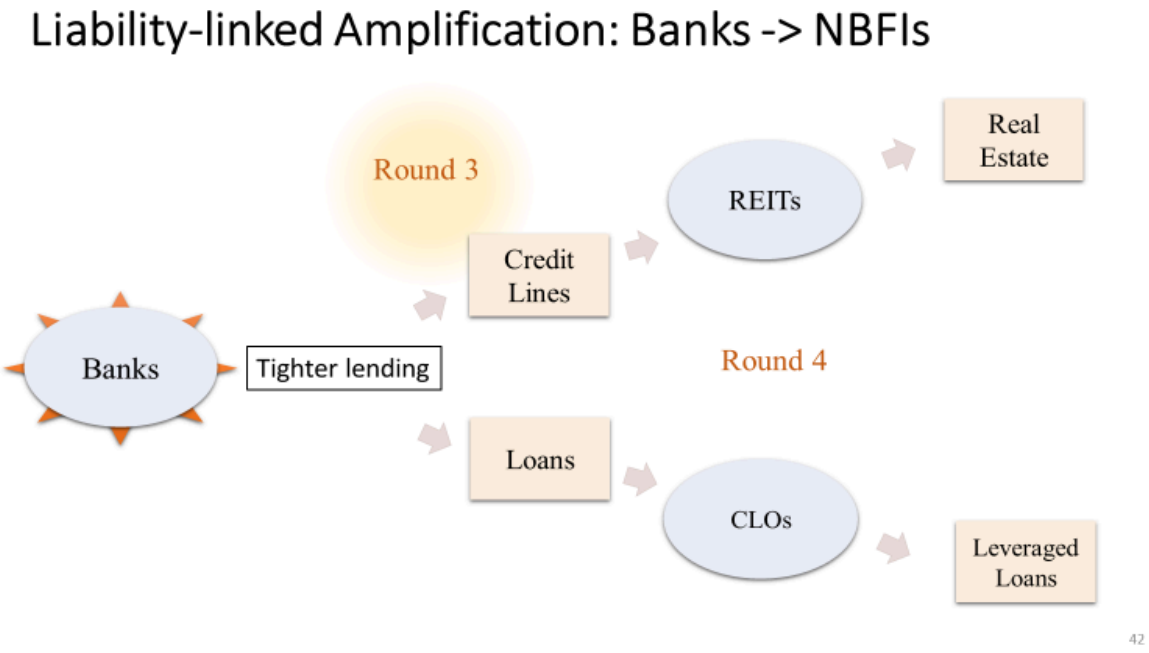


Figure 11a: Rising Correlation of Bank and NBFI *SRISK* over Time

SRISK measures market-equity-based capital shortfall under aggregate market stress (Acharya, Engle and Richardson, 2012). The graph on the right reports the median 20-day rolling correlation of percentage changes in bank and NBFI *SRISK* over the sequentially defined subperiods on the left, spanning the period from the beginning of Jan 2000 to the end of April 2023.

1-Jan-00 to 31-Jul-07	**Pre-GFC**
1-Aug-07 to 31-Oct-09	**GFC**
1-Nov-09 to 30-Nov-14	**Post-GFC**
1-Dec-14 to 30-Jun-16	**Oil Price Shock**
1-Jul-16 to 31-Dec-19	**Rate Hike + QT**
1-Jan-20 to 31-Oct-21	**Pandemic**
1-Nov-21 to 31-Dec-22	**Post-pandemic**
1-Jan-23 to 1-May-23	**SVB Stress**

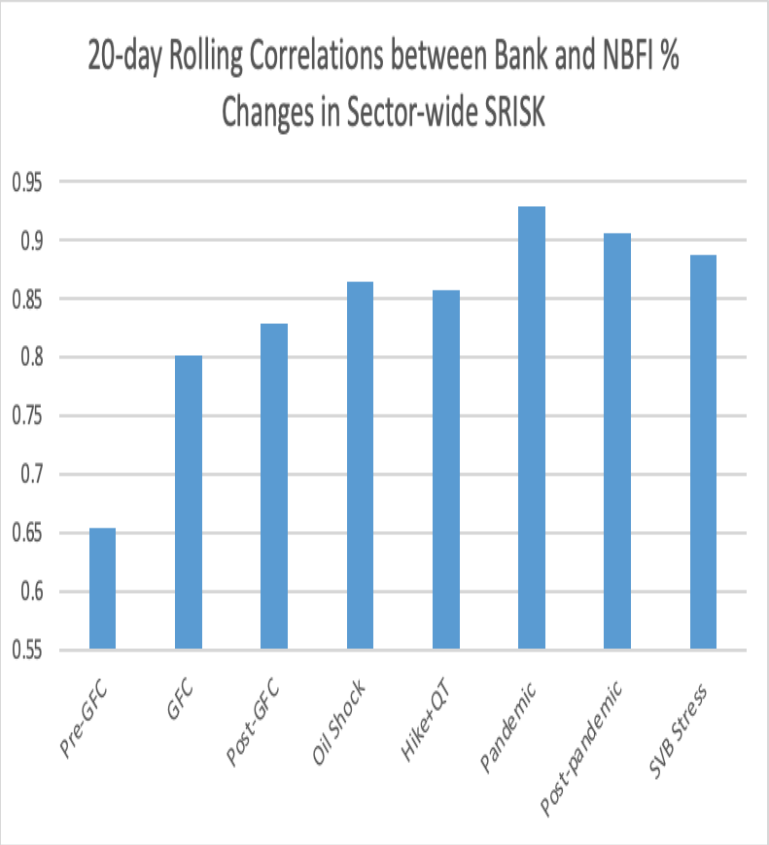


Figure 11b: Granger-Causality Tests of Bank and NBFI Abnormal Returns

Abnormal returns are computed by adjusting each daily NBFI or Bank index return for that day's S&P500 (market) return using a 90-day rolling historical beta. From the 91st day of each subperiod until the last day of the subperiod, daily Granger-causality tests are conducted for the abnormal NBFI and bank equity return indices over a 90-day historical window. The table reports the fraction of days in each subperiod for which the p-value of the Granger-causality test is less than 10%, with the left column for banks causing NBFIs and the right column for NBFIs causing banks. All tests are conducted using the optimal number of lags for the Granger-causality test, based on the Akaike Information Criterion (AIC).

		Fraction of days with p-value < 10% when	
	Period	**Banks cause NBFIs**	**NBFIs cause Banks**
1-Jan-00 to 31-Jul-07	**Pre-GFC**	**13%**	**5%**
1-Aug-07 to 31-Oct-09	**GFC**	**33%**	**25%**
1-Nov-09 to 30-Nov-14	**Post-GFC**	**18%**	**18%**
1-Dec-14 to 30-Jun-16	**Oil Shock**	**9%**	**0%**
1-Jul-16 to 31-Dec-19	**Hike + QT**	**13%**	**15%**
1-Jan-20 to 31-Oct-21	**Pandemic**	**36%**	**31%**
1-Nov-21 to 31-Dec-22	**Post-pandemic**	**26%**	**67%**
1-Jan-23 to 1-May-23	**SVB Stress**	**24%**	**62%**