Where Do Banks End and NBFIs Begin?[1]

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First Draft: August 28, 2023; This Draft: October 7, 2025

Abstract

In recent years, assets of non-bank financial intermediaries (NBFIs) have grown significantly relative to those of banks. These two sectors 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 NBFI and bank businesses and risks are so interwoven that they are better described as having transformed over time rather than as having migrated from banks to NBFIs. These transformations are at least in part a response to regulation and are such that banks remain special as both routine and emergency liquidity providers to NBFIs. We support this perspective as follows: (i) The new and enhanced financial accounts data for the United States ("From Whom to Whom") show that banks and NBFIs finance each other, with NBFIs especially dependent on banks; (ii) Case studies and regulatory data show that banks remain exposed to credit and funding risks, which at first glance seem to have moved to NBFIs, and also to contingent liquidity risk from the 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 discuss some potential regulatory responses, including treating the two sectors holistically; recognizing the implications for risk propagation and amplification; and exploring new ways to internalize the costs of systemic risk.

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

JEL: G01, G21, G23, G28

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[1] Originally prepared for Riksbank Macroprudential Conference, Stockholm, August 30-31 2023. The authors are grateful to Richard Cantor, Neil Esho, Kristin Forbes, Jeff Meli, Bill Nelson, Tomasz Piskorski, Anthony Saunders, David Scharfstein; participants at conferences and seminars, including the Riksbank Macroprudential Conference (August 2023), NBER Conference on Financial Frictions and Systemic Risk (Spring 2024), ECB Annual Research Conference joint with Hoover Institution (September 2025), the European Banking Authority, European Commission's Directorate-Generale for Financial Stability – Financial Services & Capital Markets Union (DG-FISMA), the Federal Reserve Bank of New York, NYU Stern Corporate Governance Luncheon, the United States Treasury, FSOC Deputies, FDIC, OCC, and OECD; members of the Financial Intermediation Department at the Federal Reserve Bank of New York; and to Saketh Prazad for excellent research assistance. The views expressed in this paper are those of the authors and do not necessarily represent those of the Federal Reserve Bank of New York, the Federal Reserve System, or any of their staff. Author e-mails: vva1@stern.nyu.edu, nicola.cetorelli@ny.frb.org, bt577@stern.nyu.edu

1. Introduction

Non-bank financial intermediaries (NBFIs) have surpassed banks as the largest global financial intermediaries. Data from the Financial Stability Board (FSB) show that global financial assets of NBFIs have grown faster than those of banks since 2012, to about $239 trillion and $183 trillion in 2021, respectively (Figure 1a). Or, 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 period. This trend is even more striking in the United States alone, where the NBFI share of financial assets exceeded 60% in 2021 (Figure 1b). 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.

1.a. The Parallel, Substitution, and Transformation Views of NBFIs and Banks

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 (Volcker, 2009).

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 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* official support of NBFIs, most notably during the GFC but more recently as well. Instances include 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.

A key challenge to policy based on the parallel view of the NBFI and bank sectors can be expressed in terms of our corollary to 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.

The substitution view of the NBFI and bank sectors, along with the implication that NBFIs can become systemically important, is very much 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. 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 (Kashyap, Rajan, and Stein, 2002) and access to safety nets (Gatev and Strahan, 2006), 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. 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 recent cases and empirical analyses. We discuss possible policy implications of this transformation view later in the paper.

1.b. More on the Transformation View and Its Implications

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

(i) *Loans and Mortgages:* Through recent history, 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 mREITs), 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 fully 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), or 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. While these activities used to be dominated by banks, they 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,[2] and bank-sponsored (or credit-enhanced) commercial paper. While perhaps harder to demonstrate empirically, another example would be proprietary trading, which was forced out of banks and into entities like hedge funds by the Volcker Rule, but continues to rely on bank funding through their prime brokerage businesses.[3] In any case, 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 previous category includes the regular or continuing use of short-term funding, which can take the form of credit lines, this third category includes 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 other entities 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 which regular or continuing financing shifts to NBFIs while unusual or emergency financing remains with banks. The nature of these transformations is easily explained by the inherent funding and liquidity advantages of

[2] 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 swiftly as opportunities arise without making irregular capital calls on their investors.

[3] See, for example, Levine (2024).

banks mentioned above. A relatively unheralded example in this category are derivatives, which had been bilateral before the GFC, but were subsequently mandated to be cleared, like interest rate swaps (IRS). This mandate has transformed the counterparty risk that banks faced as derivative counterparties of NBFIs to the liquidity risk banks face 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 is not a recent transformation of market arrangements.

Figures 2a-2c show the importance of the transformations just described in terms of bank loans and credit commitments to NBFIs from 2013 to 2023. (Section 3.c. discusses contingent funding.) Based on FR Y-14 data,[4] Figure 2a shows bank loans to NBFIs rising from about $125 billion to over $300 billion. The greatest growth is for bank loans to "Other Investment Pools and Funds," which includes money market funds, mutual funds, mortgage REITS, issuers of asset-backed securities (including CLOs), business development companies (BDCs), and private credit funds. In percentage terms, bank loans to NBFIs rise from about 10% to over 25% of total bank loans. Figure 2b shows 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. In percentage terms, credit line commitments to NBFIs rise from about 15% to over 20% of total bank credit line commitments. Figure 2c shows that both loans and credit lines to NBFIs have, in fact, risen as shares of banks' total loans and credit lines (i.e. to NBFIs and non-financial corporates combined), consistent with our prior of a shift in banks' business activity towards NBFIs.

To summarize, we posit that the transformations we describe are, at least in part, driven by "regulatory arbitrage," and feature enduring funding and contingent liquidity support for NBFIs being provided by banks.[5] By "regulatory arbitrage" we mean the process by which finance professionals optimize their businesses subject to pertinent regulations. For example, the management of a bank 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 internal charges. By this mechanism of Goodhart's Law, resources across the financial system flow to where they are most profitable relative to regulatory costs and constraints. Explicit attempts to circumvent regulations are in this way not necessary.

Opportunities for regulatory arbitrage exist if regulation and supervision do not perfectly internalize the resulting systemic risks or the costs of scarce public resources. In this paper, we do not attempt to identify the exact components of the current regulatory regime that present regulatory arbitrage opportunities for transforming NBFI and bank businesses as we describe, but we do believe that such opportunities exist. NBFIs are subject to relatively light regulation,

[4] The FR Y-14 dataset is a non-public loan-level data source collected through the ongoing Federal Reserve stress testing supervisory process.

[5] For theoretical modeling, see our companion paper Acharya, Cetorelli and Tuckman (2025a).

particularly with respect to capital and liquidity, and linkages between NBFIs and banks have evolved over time. Furthermore, while parts of bank regulations do treat bank exposures to NBFIs differently from other exposures, safety and soundness regulation of both banks and NBFIs is quite complex and works in combination with other parts of bank regulation, like anti-money-laundering rules, community reinvestment requirements, and operational risk charges. Finally, the academic literature discussed below has established many specific instances of regulatory arbitrage across NBFIs and banks. In short, it is reasonable to question whether the current regulatory regime, created largely in response to the GFC, correctly internalizes the systemics risks of the ever-transforming NBFI-bank landscape.

Accepting the premise that regulatory arbitrage has indeed driven the growth of NBFIs and that the transformation of NBFI-bank linkages continues to feature normal-time *and* stress-time liquidity provision by banks, the resulting financial system will likely be characterized by an inefficient allocation of activities and risks. The post-GFC tightening of bank regulation will likely overstate reductions in systemic risk. NBFIs and banks will jointly take more risk than socially optimal, including NBFIs demanding too much extraordinary liquidity from banks under stress. Authorities will consequently have to intervene more often than optimally to preserve the ecosystem of NBFI-bank intermediation, either by direct rescues of NBFIs or by indirect rescues through the banking system. Put another way, our analysis indicates a transformation of banking sector's systemic risk to a nexus of NBFI-bank systemic risk.

1.c. Related Literature

An important presumption of this paper, that the growth of the NBFI sector is at least in part due to bank regulation, is not new or controversial. One well-known and widely-accepted historical example is that Regulation Q, which capped the rate banks could pay on deposits, contributed to the creation of the money market fund industry in the early 1970s. But academic work has studied and documented many other more recent examples. Acharya, Schnabl, and Suarez (2013) demonstrate how bank capital requirements spurred securitization through the issuance of asset-backed commercial paper. 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 such as finance companies and FinTech lenders. Chernenko et al. (2022) and Kim et al. (2016) show the same, with a particular focus on the riskiest loans. Buchak et al. (2018) and Buchak et al. (2022) highlight the impact of regulation on the growth of NBFI market share in residential mortgages. Kim et al. (2018) and Kim et al. (2022) find evidence that non-bank mortgage originators and servicers (with looser regulatory constraints) 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.

A number of theoretical papers have also stressed the importance of bank regulation in explaining the growth of NBFIs. Harris, Opp, and Opp (2014) model how regulation and official

backstops affect competition between banks and NBFIs for lending opportunities. Plantin (2015) explores the systemic risk implications of capital requirements moving risk from banks to NBFIs. Donaldson, Piacentino, and Thakor (2021) develop a theory of why and how banks and NBFIs coexist based on the relatively low cost of bank capital (arising from the bank regulatory regime, deposit franchises, and official backstops).

While our paper focuses on regulation as a driver of the bank-NBFI landscape, we certainly acknowledge the importance of other factors. Just as regulation may change at the margin the cost conditions for banks to engage in intermediation activities, factors such as technological innovation may increase the return to intermediation activities at the margin for NBFIs. Buchak et al. (2018), for instance, attribute the growth of NBFIs in the residential mortgage market to both regulatory and technological advantages. Buchak et al. (2024) argue that the growth of non-bank credit provision can be explained by changes in bank regulation but also by technological improvements in securitization and a shift in the preferences of savers away from deposits. Moreover, technology may have even deeper effects, changing not only the marginal return to intermediation for NBFIs, but also introducing new forms of intermediation altogether. An interesting example may be that of new information technologies, such as consumer-permissioned data sharing, which have been feeding the growth of open banking (Babina et al, 2025).

Besides technology, other drivers have also been identified in the literature. For example, Sarto and Wang (2023) posit that the secular decline in *interest rates* might have played an important role in assets shifting from banks to NBFIs. Somewhat relatedly, Martinez-Miera and Repullo (2017) provide a theory in which the emergence of NBFIs can be explained by a search-for-yield in an environment with high levels of real savings.

Setting aside the drivers of the transformations we describe, our paper argues that bank and NBFI businesses are often complementary rather than parallel. Boyd and Gertler (1995) contend that the observed decline in bank assets overlooks the importance of the banking sector by ignoring the rising importance of off-balance sheet activities, such as credit lines and derivatives positions. Allen and Carletti (2006), a theory paper, discuss the welfare implications of credit risk transfer markets between banks and insurance companies. Mandel, Morgan, and Wei (2012) show the importance of bank-provided credit enhancement for securitizations. Berlin, Nini and Yu (2020) show that lighter covenant protection in term loans relative to revolving facilities reflects the growing importance of NBFI lenders as participants in those term loans. Kiernan, Yankov, and Zikes (2023) and Acharya, Gopal, Jager, and Steffen (2023) document NBFI drawdowns of credit lines from banks during periods of stress. Yankov (2020) illustrates both the impact of regulation and the existence of business complementarities by showing that the introduction of the liquidity coverage ratio (LCR) both increased liquidity reserves at banks and increased NBFI reliance on bank liquidity. Jiang (2023) shows that banks both fund and compete with non-bank residential mortgage originators, and Benson et al. (2023) explicitly show that banks that exited the business of purchasing, pooling, and securitizing

certain government-guaranteed mortgages then *"funded... a large share... of the nonbanks that replaced them."* Chernenko, Ialenti, and Scharfstein (2024) study bank lending to middle-market lenders rather than directly to borrowers and attribute this complementarity to relative capital requirements. Finally, closest to the broad perspective taken in this paper, Cetorelli, Mandel, and Mollineaux (2012), Cetorelli, Jacobides, and Stern (2021), and Cetorelli and Prazad (2023, 2024) discuss how banks adapt to a changing financial intermediation industry by transforming their businesses and increasingly including NBFI subsidiaries inside bank holding companies.

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 has been publicly available since spring 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.

Figures 3a, 3b, and 3c show the FWTW matrices 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 the 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 or 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)[6]; and "*Real Sector*" includes the balances of households, governments, 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*

[6] 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.

businesses, Property and Casualty Insurers, and *Pension Funds*. Furthermore, for the purposes of this paper, we aggregate across all financial instruments.

Figure 3a reports the matrix elements in billions of USD; for example, *Broker/Dealers* borrowed a total of $5.430 trillion, with $1.370 trillion coming from banks. Figure 3b, which we call the "Matrix of Liability-Dependencies," reports the elements as percentage shares of each issuing sector's total liabilities. For example, *Banks* are highly dependent for funding on the real sector (62%) and on the Rest of the World (15%). Lastly, Figure 3c, which we call the "Matrix of Asset-Dependencies," reports the elements as percentage shares of each holding sector's total assets; for example, 5% of *Bank* assets are liabilities of *Broker/Dealers*.

We draw three overall lessons from the FWTW interdependency data. 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. More specifically, Figure 3b shows that *Banks* get 77% of their funding from the *Real* and *Rest of the World* sectors and 10% from other banks, which leaves the liability-dependence of banks on the NBFI sector as a whole at a small though non-negligible 13%, which includes deposits and commercial paper investments from money market funds; bonds bought by insurance companies, pension funds and mutual funds; and repo loans from broker-dealers. However, banks are not liability-dependent on any individual NBFI sub-sector, with the largest sub-sector, *GSEs*, supplying only 4% of bank funding. Similarly, on the asset side, Figure 3c shows that *Banks* invest 89% of assets in the the *Real* and *Rest of the World* sectors, with the largest NBFI-sector investments of 11% in *GSE and Agency* (11%) and 5% in *Broker/Dealers*.

The second lesson from the interdependency data 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. According to Figure 3b, several NBFI sub-sectors depend meaningfully on banks for funding: *GSEs* at 35% of their liabilities; *Broker-Dealers* at 25%; *Equity REITs* at 25%; *Finance Companies* at 15%; and *ABS Issuers* at 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 in Figure 3c, several NBFI sub-sectors hold as assets meaningful amounts of bank liabilities: *Other Financial Businesses* at 19%; *Broker-Dealers* at 16%; *Equity REITs* at 13%; and *Money Market Funds* at 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 3b, 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. *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, in Figure 3c, *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.[7]

We find in unreported results that the interdependency data used for this discussion, which are as of Q1 2023, are relatively robust representations of dependencies over longer time-series. In support of this robustness, however, Figure 4 reports averages over the time-series of asset- and liability-dependencies between Q1 2000 and Q1 2023. Consistent with the conclusion 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 several examples and cases 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.

3.a. The Private Credit Market

In the private credit market, NBFIs typically make secured or senior loans to medium- and small-sized businesses. Assets under management have grown to over 30% of the total outstanding of high-yield bonds, syndicated loans, and private credit. Some of this growth seems attributable to tighter bank regulation, including the Federal Reserve's leveraged loan guidance capital requirements of the Basel III Endgame.[8]

While it may seem that banks are being displaced, the loan market has really transformed in that NBFIs making business loans themselves borrow from banks through loans and credit lines. As an example, in the wake of the regional banking 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 5a). Also, consider Blackstone Private Credit Fund (BCRED), one of the largest private credit fund in

[7] We note that the exact extent of asset- and liability-dependencies across banks and NBFIs would need to account for foreign banks and NBFIs that are included in the Rest of World aggregate.

[8] See, Blackstone (2022), Exhibit 2, Chernenko et al. (2022), Ren (2023), and van Steenis (2023).

the world with over $50 billion of assets.[9] According to its 10-K, BCRED subsidiaries had 19 secured credit commitment facilities as of December 2022, 18 of which and 98% of the total committed amount were provided by 13 banks. Furthermore, the outstanding or amounts drawn on these facilities accounted for about 50% of BCRED's total debt liabilities (Figure 5b).

It has been argued that the relatively low balance-sheet leverage of private credit lenders imply that they contribute little to systemic risk. But the transformation view highlights the liquidity risks of private credit lending as significant enough for these NBFIs to rely on bank funding and credit lines.[10] Therefore, to the extent that disruption of private credit intermediation disrupts the real economy, private credit liquidity risk does contribute to systemic risk, either directly or through the banking sector.

3.b. Mortgage Origination and Servicing

The bank share of mortgage origination and of mortgage servicing rights has fallen to less than 50% and about 40%, respectively. However, the NBFIs that have seemingly replaced banks are actually heavily reliant on banks. First, banks provide warehouse credit lines to non-bank originators, who draw down and repay these lines as they purchase loans and sell them into securitizations. Second, through credit lines or sponsorship of commercial paper, banks finance servicer advances to investors of delinquent payments in anticipation of recovery from borrowers or insurance. The risks to banks in this transformed industry were implicitly apparent when government-sponsored enterprises (GSEs) and other government insurers chose to give liquidity support to NBFI originators and servicers in 2020.[11]

3.c. Contingent Funding of NBFIs by Banks

The contingent funding category of Section 1.b. describes transformations in which components of businesses shift from banks to NBFIs, while unusual or emergency contingent funding remains the responsibility of banks. We explain these transformations as driven by the particular suitability of banks in providing liquidity insurance. First, deposit and lending franchises diversify liquidity risk because depositor demand for liquidity is not perfectly correlated with borrower demand for drawdowns (Kashyap, Rajan, and Stein, 2002). Second, bank 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 has great and unique value due to the high correlation of liquidity demand with financial conditions. Third, banks gain deposits in a systemic "flight to safety" because of these

[9] See privatedebtinvestor.com

[10] See Board of Governors (2023) and Berrospide, Cai, Lewis-Hayre and Zikes (2025). Subscription finance loans are a striking example of the business models of private capital relying on banks. Fleckenstein et al. (2020) and Ben-David, Johnson, and Stulz (2021) show that the NBFI difficulties in funding themselves during stress periods led to overall declines in lending to businesses.

[11] See Bancroft (2022), FDIC (2019), Chart 2, and Loewenstein (2021).

official backstops, precisely when liquidity is most scarce and valuable (Gatev and Strahan, 2006).

3.c.i. Drawdowns of Bank Credit Lines by Sector, Pre-COVID and During COVID

Quarterly loan-level data from FR Y-14 show that NBFIs drawdowns have generally increased over the past decade, both in dollar terms—reaching an all-time high of about $90 billion toward the end of 2022—and also as a percentage of all drawdowns on bank credit lines. In this section, we use the March 2020 "dash for cash" to illustrate the significance of bank credit lines in providing contingent liquidity to NBFIs. Figure 6 shows utilization rates, drawdown rates and net drawdown rates of bank credit lines to NBFIs ex-REITs, to non-financials, and to REITs, of varying credit quality, as captured by their probabilities of default (PD), both over the two years before the COVID shock (2018:Q1 to 2019:Q4) and during the shock itself (2020:Q1).

Several lessons emerge from Figure 6. First, in normal or non-stressed times, represented by the pre-COVID period, utilization and drawdown rates for bank credit lines tend to be highest for REITs and then for NBFIs, and lowest for non-financials. Second, again in normal times, the net drawdowns for all three groups are very small in absolute value. This implies that all of the sectors use credit lines as part of their ongoing businesses, regularly drawing down on the lines and repaying them. Third, during the COVID shock, use of credit lines as emergency, contingent funding spiked, that is, utilization, drawdown, and also net drawdown rates increased dramatically. Drawdown rates—though not utilization rates—are for the most part higher for non-financials than for NBFIs, indicating the suddenness with which non-financials drew down their lines. Fourth, perhaps not surprisingly, credit lines are used more intensely by firms of lower credit quality, with the lowest quintile having somewhat significant net drawdowns even in normal times. Fifth and finally, REITs stand out in their intensive use of credit lines even relative to other NBFIs, even in normal times, and particularly during the COVID stress.

Gopal, Jager, and Steffen (2023) point out that REITs are particularly important NBFIs with respect to bank credit lines. Along these lines, we expand briefly here on the behavior of REITs using the regulatory data available for this paper. First, recall from Figure 2b that REITs are among the largest NBFI users of bank credit lines. Second, the top-left panel of Figure 7 shows the rapid increase in the dollar amount of bank credit commitments to REITs over the last decade. Third, the top-right panel of the figure shows the dramatic spike of REIT drawdowns during the COVID stress, which places some of the discussion of the previous paragraph in a more historical context. Fourth, the bottom panel of Figure 7 shows that the drawdowns of REITs during the COVID stress spiked also when measured as a percentage of total drawdowns on bank credit lines.

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

Before the GFC, bank-dealers did not collect margin on IRS from many of their clients, like pension funds. Instead, bank-dealers managed their portfolio of counterparty risks by charging

fees and imposing credit limits. Post-GFC, regulations mandated that many derivatives, including most IRS, be cleared by central counterparties (CCPs), which require the posting of initial and variation margin. Many derivatives users, like pension funds, arranged loans and credit lines from their bank-dealers to manage the liquidity risks arising from these margin requirements. See Figure 8.

Defined-benefit pension funds around the world, including the U.K., tend to invest in available fixed income assets and to "receive fixed" on long-term IRS as hedges of the interest rate risk of their long-term liabilities. Hence, when long-term U.K. interest rates spiked higher in September 2022, in response to a government budget proposal, U.K. pension fund IRS positions suffered losses and triggered margin calls. Pension liabilities also fell in value, of course, but those portfolio gains did not generate cash that could be used to offset IRS margin calls.

While banks provided liquidity to U.K. pension funds through a variety of loans and advances, many funds were forced to sell government bonds to raise cash, which pushed prices lower, which in turn led to additional margin calls. As a result (which was exacerbated by certain institutional and operational shortcomings), pension funds that were clearly solvent—with respect to the value of their assets against the value of their liabilities—suffered losses anyway: they were forced either to liquidate bonds at depressed prices or to close out IRS hedges and incur portfolio losses as rates soon ricocheted back down.

In response to these stresses on pension funds and the government bond market, the Bank of England committed to purchase and fund large volumes of government bonds and expanded the scope of 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 of the Bank of England's contractionary monetary policy at the time.[12]

Another case illustrating the importance of bank liquidity for derivatives margin occurred in Europe as energy prices increased gradually in 2021 and then more steeply in 2022. Solvent electricity producers that had sold electricity futures contracts to hedge against falling prices faced liquidity pressures from variation margin calls and increases in initial margin rates. While several banks supplied significant liquidity to electricity producers in various ways, many governments nevertheless decided to intervene by offering these producers financial guarantees. Note that while electricity producers are not normally considered NBFIs, derivatives margin requirements mean that they have to manage liquidity like other NBFIs.[13]

4. Correlation and Causation of NBFI and Bank Systemic Risks

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

[13] See European Banking Authority (2022), Turnstead (2023), Wilkes and Turnstead (2022), and Wilson and Stafford (2022) for accounts of this episode.

According to the thesis of this paper, regulatory changes—like those following the GFC—can lead to a transformation of NBFI and bank businesses that increases their interconnectedness, which implies that stresses in one sector can 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_0 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 the 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 (e.g., banks or NBFIs) 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.[14] 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.

To study the correlation of the systemic risks of the NBFI and bank sectors, Figure 9a defines several sequential subperiods of interest from Jan 2000 to the end of April 2023: pre-

[14] 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.

GFC, GFC, post-GFC, Oil Price Shock, Rate Hike + Quantitative Tightening (QT),[15] Pandemic, Post-Pandemic, and Silicon Valley Bank (SVB) Stress or, more broadly, regional banking stress. The graph in Figure 9a then reports the median 20-day rolling correlation of log changes in bank and NBFI *SRISK* over each of the subperiods.

The results 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 is 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, these correlations 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 9b reports results from Granger-causality tests of *abnormal,* equally-weighted daily equity-return indices of NBFIs and banks. 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 the figure, with one column for banks causing NBFIs and another for NBFIs causing banks.

Three observations are striking. One, consistent with the *SRISK* correlation in the third column, 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 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.[16]

5. Implications for Financial Regulation

According to the transformation view, NBFIs and banks follow Goodhart's law to adapt endogenously to regulatory and other business conditions. As a result, the *components* of

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

[16] In Acharya, Cetorelli and Tuckman (2025b), we focus more explicitly and rigorously on the measurement and identification of potential systemic spillovers on banks from their provision of credit lines to NBFIs.

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 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; by drawing down on bank credit lines; or, by starting fire sales in the course of liquidating assets (Cetorelli, Landoni, and Lu, 2023). Hence, while NBFIs in the current regulatory framework are *de jure* outside the official safety net, they are *de facto* inside. If these conjectures are correct, then authorities may wish to consider the following suggestions for *ex-ante* and *ex-post* regulation.

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

A first approach for addressing systemic risks arising from NBFIs could be to measure those risks, not only as they appear in isolation, but also as they appear in the NBFI-bank interdependencies described in this paper. Existing examples of such approaches include European Central Bank (2023), FDIC (2019), and FSB (2022).

An additional, more proactive, approach would be for regulators to incorporate NBFI and bank interdependencies into their supervision. Fervent calls to revise the framework governing the regulation of financial intermediation and the application of prudential standards to institutions other than banks are typically heard in the aftermath of crisis. This has been the case post GFC (see, e.g., the SEC ruling on Investment Companies' liquidity risk management - SEC, 2016), and again post Covid (see, e.g., the FSB report on leverage in NBFIs - FSB, 2025). While attempts to close the regulatory gaps are necessary, history has taught us that the next batches of innovations will emerge exactly as a result of adaptations to whatever emerges as the new regulatory frontier. In fact, as we reasoned in this paper, it is also likely that banks will continue to have a role in any new intermediation activity in the NBFI sector, either as direct agents or in support of nonbanks, due to the liquidity advantages that banks enjoy relative to NBFIs.

Hence, effective approaches to gauge and monitor emerging intermediation activities and/or entity types in the NBFI space, combined with an assessment of their potential systemic footprint, may in fact need to pass through an instrumental use of bank supervisory resources: central banks have limited direct regulatory and oversight authority over nonbanks. Nonetheless, because of the demonstrated natural interconnection with banks, NBFIs are, and will continue to be, extensively observed through central banks' own bank supervisory programs. Internalizing these information linkages, for the purpose of monitoring intermediation innovations and associated risks to financial stability, seems like a low-hanging fruit (Cetorelli, 2012). Such holistic supervisory approaches have in fact begun to appear in recent years. For instance, with respect to the supervision of CCPs, CFTC (2019) and Bank of England (2022) conducted stress tests of simultaneous defaults of large clearing members and their largest customers to several CCPs, along with the resulting calls for liquidity from banks. More recently, the SWES initiative

of the Bank of England (Bank of England, 2024) and the explicit focus on banks' exposure to NBFIs via credit lines in the Federal Reserve's stress testing (Federal Reserve, 2025) are examples of regulatory agencies acknowledging the rising interconnectivity between banks and NBFIs and incorporating that knowledge in standard supervisory practices.

Yet another *ex-ante* approach would be to address the moral hazards that tend to arise alongside the interdependent activities of NBFIs and banks. We mention three existing proposals along these lines: Committed Liquidity Facilities (Nelson, 2023), Pawnbroker for All Seasons (King, 2016), and Federal Liquidity Options (Tuckman, 2012). All three share the feature of requiring banks to preposition collateral against future borrowing from central banks, at carefully constructed haircults, so as to internalize the systemic costs of banks extending credit to NBFIs.

b. State-contingent measures

Ex-ante approaches to mitigating systemic risk may not preclude particular NBFIs from growing in systemic risk over time. A possible direction for regulation, therefore, would be to adopt predetermined, state-contingent regulations to be imposed on NBFIs that, *ex-post,* become systemically important. For example, Acharya (2022) suggests that NBFIs receiving LOLR support could be presumptively subject to regulation by the Federal Reserve, while Acharya and Tuckman (2014) explore one-off corrective actions after such support, such as gradually deleveraging or increasing liquidity buffers. By enabling authorities to make credible commitments to regulate entities receiving official support, these *ex-post* approaches can potentially mitigate moral hazard, both on their own and in concert with the *ex-ante* approaches mentioned above.

6. Conclusion

We started with the observation of the relentless global growth of NBFIs over the past decade, to levels where they represent dominating asset shares in many financial markets. It is widely believed that this process has brought with it a number of unambiguous social benefits: enhanced market depth, growing investment opportunities, more effective risk management, and heightened financial inclusion. In this paper, we have focused instead on the ongoing debate as to how the NBFI and banking sectors relate to each other, the possible systemic implications of their co-existence and co-dependence, and the implications for financial regulation. A number of alternative views have been put forth. 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. This 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 some bank-like intermediation activities by NBFIs is a regulatory arbitrage that, almost by definition, increases systemic risk. In this view, safety-and-soundness bank regulation has to be supplemented by regulations that hinder 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; and some empirical support for the 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. Possible regulatory responses to the transformation view include measuring, monitoring, and accounting for the linkages we describe; attempting to internalize the systemic risk externalities of these linkages; predetermining the rules governing future decisions to designate NBFIs as SIFIs; and subjecting NBFIs receiving emergency support to additional regulatory oversight. Under the transformation view, these policies may contribute to financial stability.

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.

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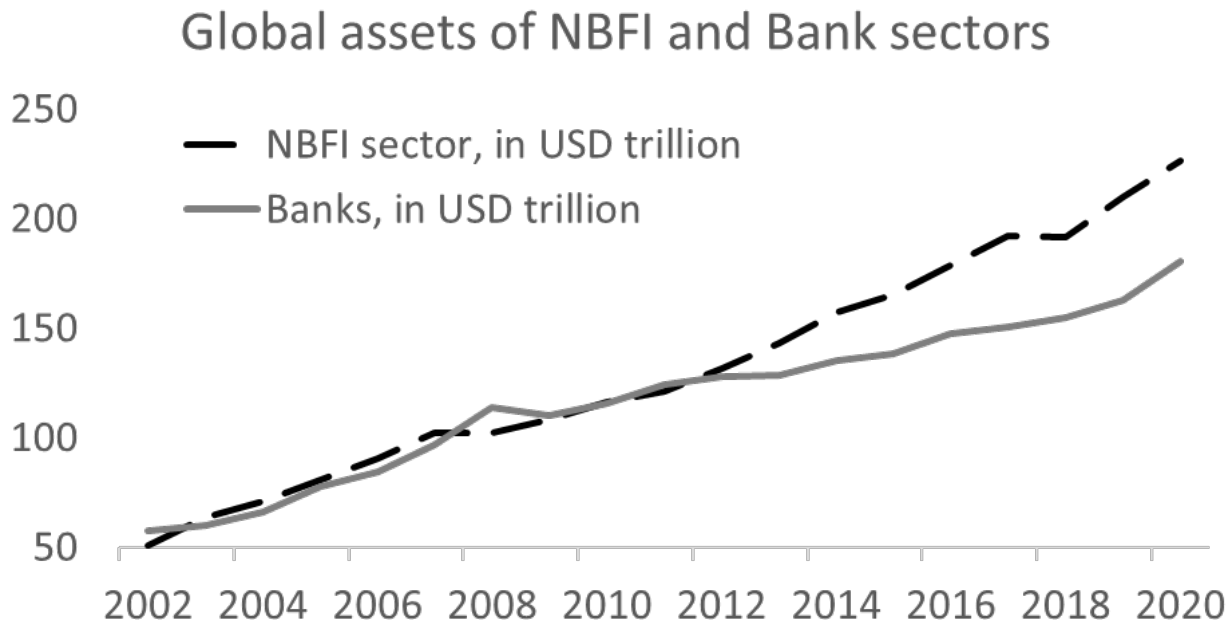
Yankov, V. (2020), "The liquidity coverage ratio and corporate liquidity management," FEDS Notes, 2020-02.

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 the United States.

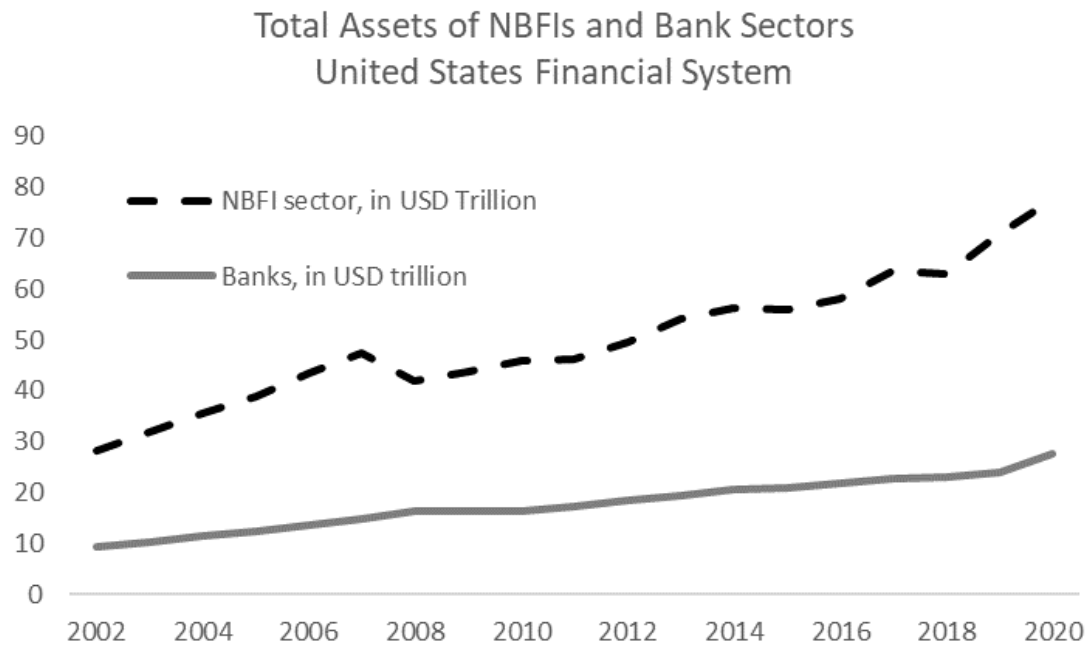
Source: Financial Stability Board [FSB] (2022).



Graph in Figure 1a displays growth in total assets of NBFIs and Bank Sectors globally, between 2002 and 2021

Figure 1b. Financial Assets of NBFI and Bank Sectors in the United States, 2002-2021

The NBFI sector includes all financial institutions that are not central banks, banks, or public financial institutions.
Source: FSB (2022)

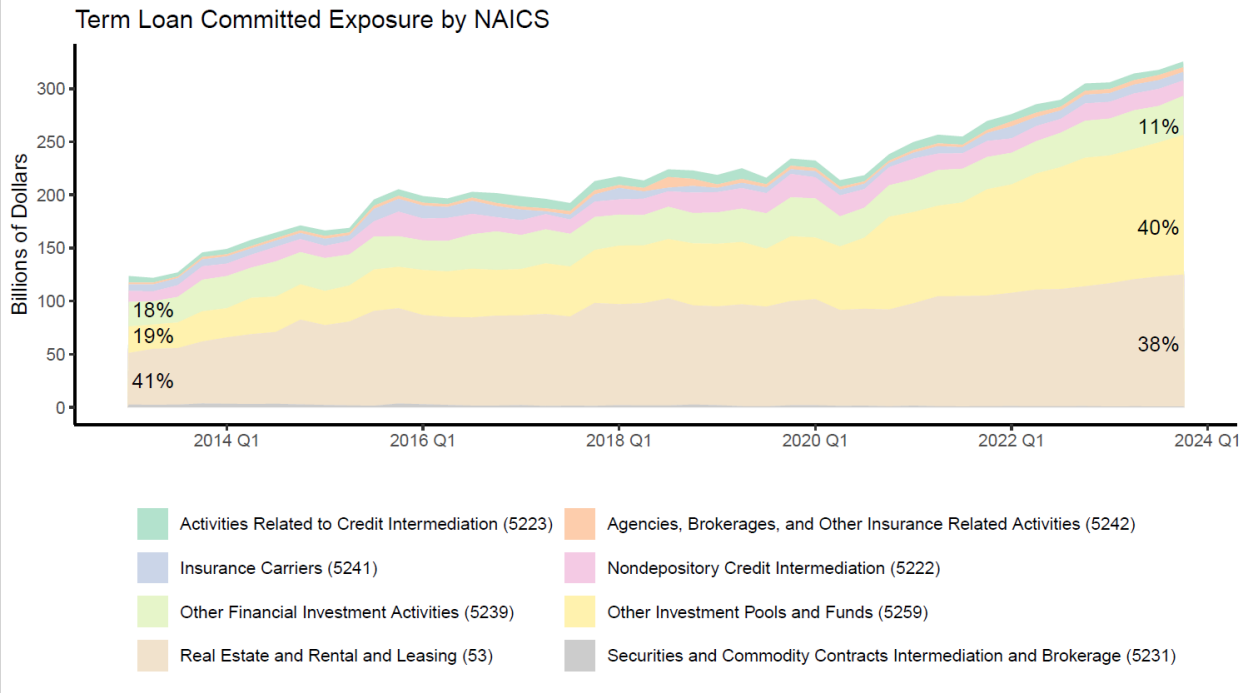


Graph in Figure 1b displays growth in total assets of NBFIs and Bank Sectors in the United States, between 2002 and 2021

Figure 2a. Bank Loans to NBFIs, by NBFI Sector, 2013-2024

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.



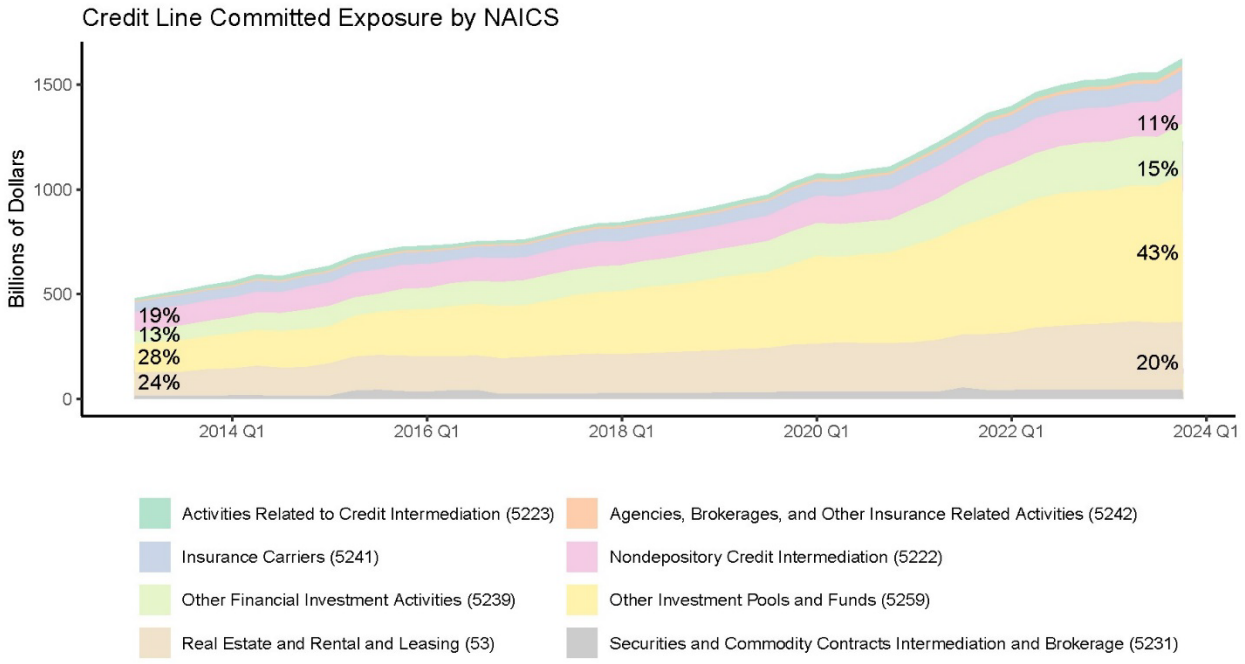
5223 Activities Related to Credit Intermediation. Examples: Mortgage and Nonmortgage Loan Brokers; Credit card processing services; Mortgages and other loans servicing
5242 Agencies, Brokerages, and Other Insurance Related Activities. Examples: Insurance agencies and Insurance brokerages; Insurance Advisory Services
5241 Insurance Carriers. Examples: Life Insurers; Property and Casualty Insurers
5222 Nondepository Credit Intermediation. Examples: Credit card issuers; Sales financing and leasing; Consumer finance companies, Mortgage Companies, Auto loan companies, Student Loan Companies
5239 Other Financial Investment Activities. Examples: Venture Capital companies; Private Equity Fund companies; Mutual funds management companies
5259 Other Investment Pools and Funds. Examples: Money market and mutual funds;; Mortgage REITS; Issuers of asset-backed securities (including CLOs), Business Development Companies and Private Credit Funds
53 Real Estate and Rental and Leasing. Examples; Equity REITs
5231 Securities and Commodity Contracts Intermediation and Brokerage. Examples: Securities brokers; Securities dealers; Securities underwriters.

Graph in Figure 2a displays growth in term loans to NBFI obligors, with each color representing an NBFI segment, grouped based on their business activities as identified by the North American Industry Classification (NAICS) code

Figure 2b. Bank Credit Line Commitments to NBFIs, by NBFI Sector, 2013-2024

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.



5223 Activities Related to Credit Intermediation. Examples: Mortgage and Nonmortgage Loan Brokers; Credit card processing services; Mortgages and other loans servicing
5242 Agencies, Brokerages, and Other Insurance Related Activities. Examples: Insurance agencies and Insurance brokerages; Insurance Advisory Services
5241 Insurance Carriers. Examples: Life Insurers; Property and Casualty Insurers
5222 Nondepository Credit Intermediation. Examples: Credit card issuers; Sales financing and leasing; Consumer finance companies, Mortgage Companies, Auto loan companies, Student Loan Companies
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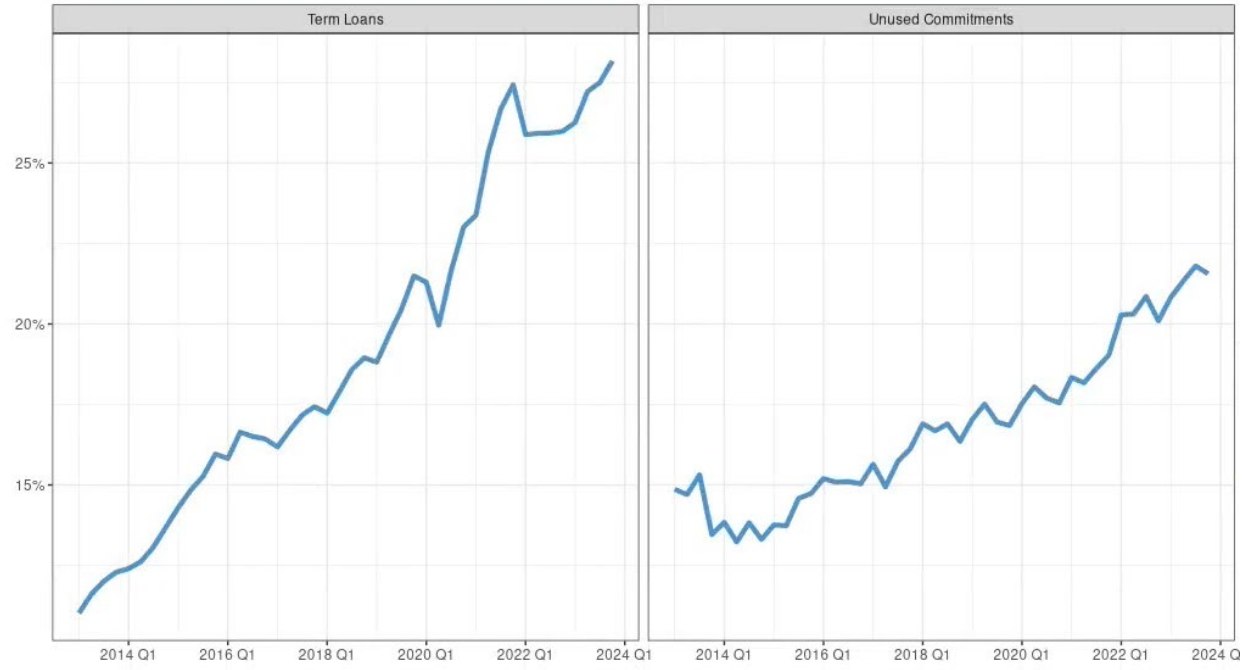
53 Real Estate and Rental and Leasing. Examples; Equity REITs
5231 Securities and Commodity Contracts Intermediation and Brokerage. Examples: Securities brokers; Securities dealers; Securities underwriters.

Graph in Figure 2b displays growth in credit lines to NBFI obligors, with each color representing an NBFI segment, grouped based on their business activities as identified by the North American Industry Classification (NAICS) code

Figure 2c. Bank Loans and Credit Line Commitments to NBFIs as Shares of Total Bank Loans and Credit Line Commitments, 2013-2024

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.



Left-panel graph if Figure 2c displays growth in term loans to NBFI obligors as a share of total term loans; Right-panel graph displays growth in credit lines to NBFI obligors as a share of total term loans

Figure 3a: 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 Issuers	Broker/Dealers	Equity REITs	Finance Companies	GSE and Agency	Life Ins.	MMF	Mortgage REITs	Mutual Funds	Other Fin. Bus.	PC Ins.	Pensions	Real Sector	Rest of World	TOTAL
	Banks	3,127	0	685	43	56	1,096	555	429	21	232	247	143	301	18,800	4,425	30,161
NBFIs	ABS Issuers	143	0	4	0	1	11	573	45	0	39	68	116	27	45	375	1,448
NBFIs	Broker/Dealers	1,370	0	1,285	0	0	112	9	459	0	30	3	3	0	571	1,587	5,430
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	1,338
NBFIs	GSE and Agency	3,209	0	102	1	1	234	276	791	171	543	0	135	408	1,892	1,361	9,123
NBFIs	Life Ins.	328	178	8	7	4	145	519	9	2	10	0	23	1,006	6,708	206	9,152
NBFIs	MMF	0	0	0	0	0	0	77	0	0	237	435	42	288	4,385	200	5,664
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	1,471	0	0	0	0	31	4,868	10,700	1,052	18,137
NBFIs	Other Fin. Bus.	49	0	878	5	3	4	27	19	2	11	107	6	68	399	37	1,616
NBFIs	PC Ins.	35	1	0	5	3	8	27	1	2	7	0	200	61	1,876	326	2,551
NBFIs	Pensions	0	0	0	0	0	0	0	0	0	0	0	0	0	27,100	0	27,100
	Real Sector	16,200	1,275	679	256	1,197	10,500	3,477	1,214	333	3,365	186	1,214	12,400	43,400	22,100	117,795
	Rest of World	3,799	1	520	7	466	98	1,156	438	4	928	233	570	670	8,257	0	17,146
	TOTAL	28,737	1,483	4,226	337	1,744	12,236	8,491	3,462	550	5,591	1,300	2,554	20,269	124,630	32,473	

The table in Figure 3a displays the matrix of asset and liability interdependencies across financial and real sector segments, as reported in the United States Financial Accounts (Flow of Funds). The figures are dollar billions. The rows report the figures from the perspective of the issuers of liabilities. The columns the corresponding breakdown of claim holders.

Figure 3b: 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 issuers	Broker/Dealers	Equity REITs	Finance Companies	GSE and Agency	Life Ins.	MMF	Mortgage REITs	Mutual Funds	Other Fin. Bus.	PC Ins.	Pensions	Real Sector	Rest of World	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 3c: 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 issuers	Broker/Dealers	Equity REITs	Finance Companies	GSE and Agency	Life Ins.	MMF	Mortgage REITs	Mutual Funds	Other Fin. Bus.	PC Ins.	Pensions	Real Sector	Rest of World
	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

The tables in Figure 3b and 3c above report the same matrix depicted in Figure 3a, where the dollar amounts are reported as shares of total liabilities (row total equal to 100) – Figure 3b, or shares of total claims (column total equal to 100) – Figure 3c.

Figure 4: Summary of Bank-NBFI Asset- and Liability-Dependencies, 2000-2023

As an example from the columns on the left, 15% of assets of Broker/Dealers were liabilities of Banks, constituting 3% of the total liabilities of Banks, on average over the sample. As an example from the columns on the right, 23% of the liabilities of Broker/Dealers were held by banks, constituting 5% of the assets of Banks, on average over the sample.

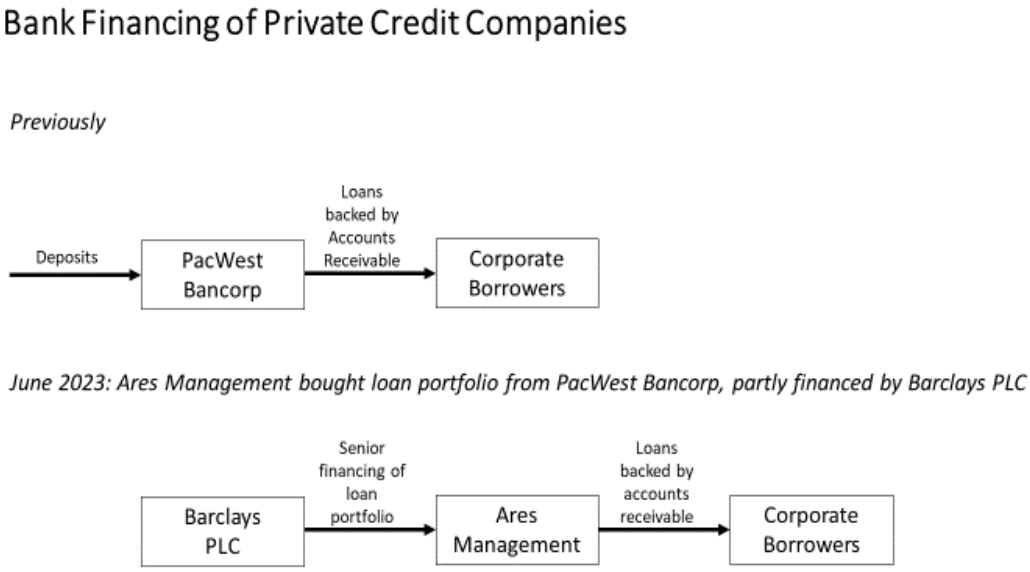
Source: Federal Reserve System, Enhanced Financial Accounts (From Whom To Whom)

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%

The table in Figure 4 above report averages over time, between 2000 and 2023, of the shares reported in Figure 3b and 3c, for Banks as issuer and all other segments as holders (left side of the table) and for all segments as issuers and Banks as holders (right side of the table).

Figure 5a: An Example of Transformation in the Corporate Credit Market—PacWest Loans on Accounts Receivable, June 2023

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



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 5a shows examples of a transformation in the corporate credit market. It displays in a flow chart how a bank (PacWest) would previously directly lend to corporate borrowers, versus how in June 2023, Ares Management, a large private fund manager, purchased the portfolio of loans of PacWest, receiving the financial support of another bank, Barclays PLC.

Figure 5b: 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 ($ amounts are in thousands)

Funding Facility	Bank	Principal Committed ($000s)	Outstanding Principal ($000s)
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 5b shows the list of funding facilities of Blackstone Private Credit Fund, by bank providing each facility, and the dollar value of both principal committed amounts and outstanding principal.

Figure 6: Bank Credit Line Utilization and Drawdown Rates by Risk Category for NBFIs (Ex-REITs), Non-financial Corporates and REITs before (2018:Q1-2019:Q4) and during the COVID-19 shock.

The utilization rate of a credit line is the amount that has been drawn divided by the committed amount. The drawdown rate is the amount drawn in a quarter divided by the then undrawn amount. The net drawdown rate adjusts the drawdown rate for other cash flows. Weighted average rates weight rates across credit lines, where each line is weighted by its undrawn amount divided by the undrawn amount of all lines. PD is the probability of default assigned to the credit lines.

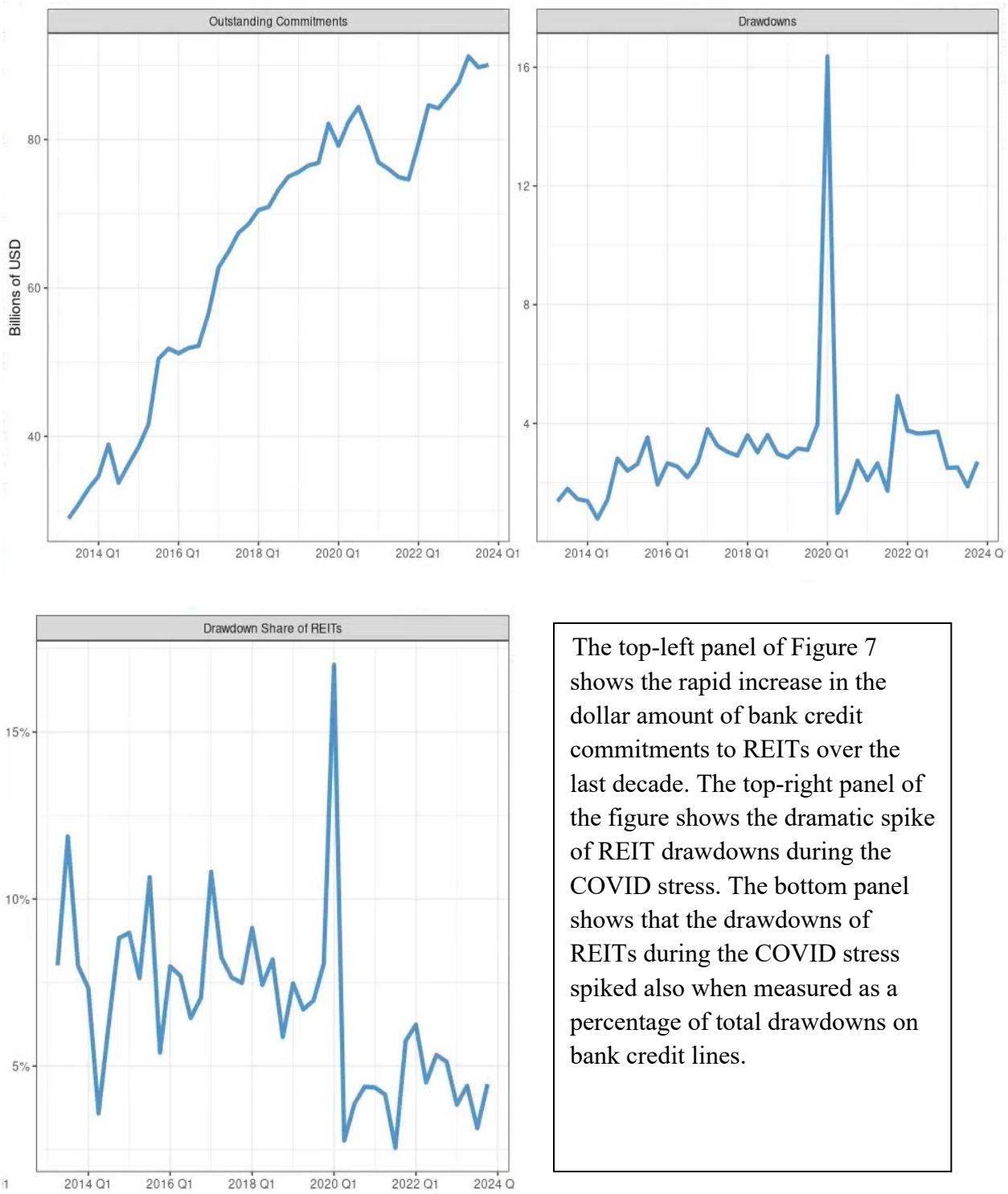
Source: Form FR Y-14Q, Schedule H.1

	NBFIs (Ex REITs)		Non-Financial		REITs	
Risk Category	2018:Q1-2019:Q4	2020:Q1	2018:Q1-2019:Q4	2020:Q1	2018:Q1-2019:Q4	2020:Q1
Weighted Average Utilization Rate						
First Quintile: PD < 0.15%	0.085	0.155	0.056	0.123	0.143	0.340
Second Quintile: 0.15% <= PD < 0.33%	0.166	0.268	0.115	0.210	0.203	0.383
Third Quintile: 0.33% <= PD < 0.67%	0.257	0.337	0.178	0.299	0.241	0.430
Fourth Quintile: 0.67% <= PD < 1.67%	0.356	0.533	0.207	0.380	0.321	0.448
Fifth Quintile: 1.67% <= PD	0.290	0.458	0.258	0.407	0.239	0.673
Weighted Average Drawdown Rate						
First Quintile: PD < 0.15%	0.015	0.070	0.011	0.078	0.044	0.211
Second Quintile: 0.15% <= PD < 0.33%	0.030	0.111	0.023	0.132	0.045	0.221
Third Quintile: 0.33% <= PD < 0.67%	0.052	0.129	0.033	0.170	0.038	0.245
Fourth Quintile: 0.67% <= PD < 1.67%	0.049	0.135	0.039	0.191	0.066	0.202
Fifth Quintile: 1.67% <= PD	0.056	0.197	0.041	0.185	0.082	0.278
Weighted Average Net Drawdown Rate						
First Quintile: PD < 0.15%	-0.002	0.053	-0.001	0.072	-0.003	0.191
Second Quintile: 0.15% <= PD < 0.33%	-0.005	0.079	0.000	0.123	-0.002	0.203
Third Quintile: 0.33% <= PD < 0.67%	0.008	0.097	-0.001	0.156	-0.009	0.234
Fourth Quintile: 0.67% <= PD < 1.67%	0.000	0.105	0.001	0.172	0.012	0.194
Fifth Quintile: 1.67% <= PD	0.015	0.169	0.002	0.167	0.033	0.245

Figure 6 shows utilization rates, drawdown rates and net drawdown rates of bank credit lines to NBFIs ex-REITs, to non-financials, and to REITs, of varying credit quality, as captured by their probabilities of default (PD), both over the two years before the COVID shock (2018:Q1 to 2019:Q4) and during the shock itself (2020:Q1).

Figure 7: Outstanding Bank Credit Commitments to REITs and their Quarterly Drawdowns

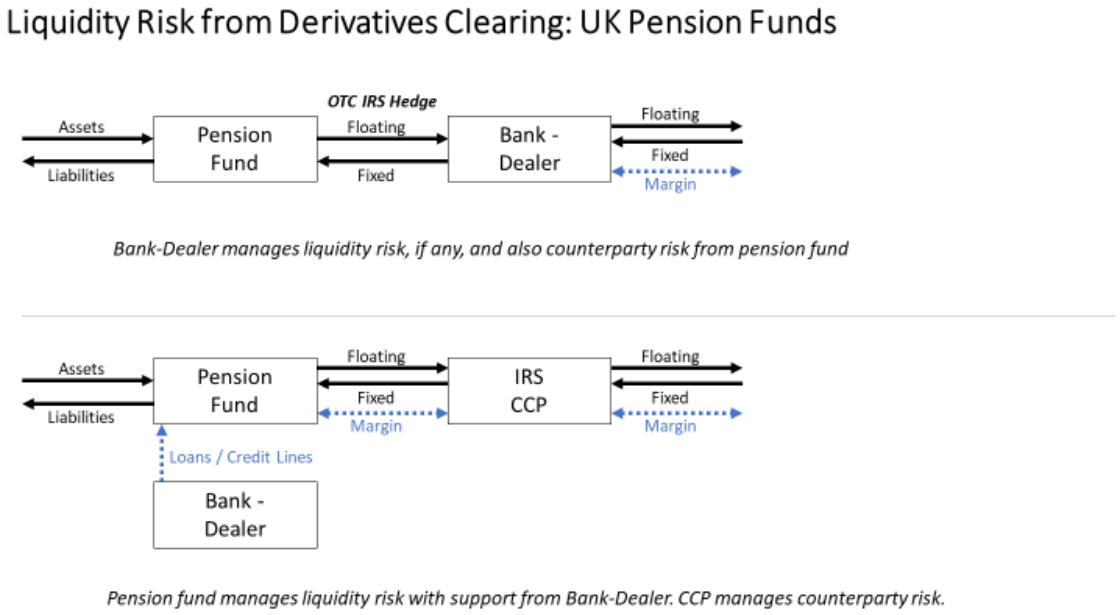
Source: Form FR Y-14Q, Schedule H.1



The top-left panel of Figure 7 shows the rapid increase in the dollar amount of bank credit commitments to REITs over the last decade. The top-right panel of the figure shows the dramatic spike of REIT drawdowns during the COVID stress. The bottom panel shows that the drawdowns of REITs during the COVID stress spiked also when measured as a percentage of total drawdowns on bank credit lines.

Figure 8: 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 manage the liquidity risk arising from the CCP's margin requirements, usually with loans and credit lines from a Bank-Dealer.



The flow chart in Figure 8 shows how before the GFC, bank-dealers did not collect margin on interest rate swaps (IRS) from many of their clients, like pension funds. Instead, bank-dealers managed their portfolio of counterparty risks by charging fees and imposing credit limits (top chart). Post-GFC, regulations mandated that many derivatives, including most IRS, be cleared by central counterparties (CCPs), which require the posting of initial and variation margin. Many derivatives users, like pension funds, arranged loans and credit lines from their bank-dealers to manage the liquidity risks arising from these margin requirements

Figure 9a: 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) and is computed at vlab.stern.nyu.edu/srisk. Aggregate *SRISK* for a financial subsector (banks or NBFIs) is computed as the sum of the positive *SRISK* values of individual publicly-listed institutions in that subsector with equity valuation of at least $100 million. The graph on the right reports the median 20-day rolling correlation of log 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

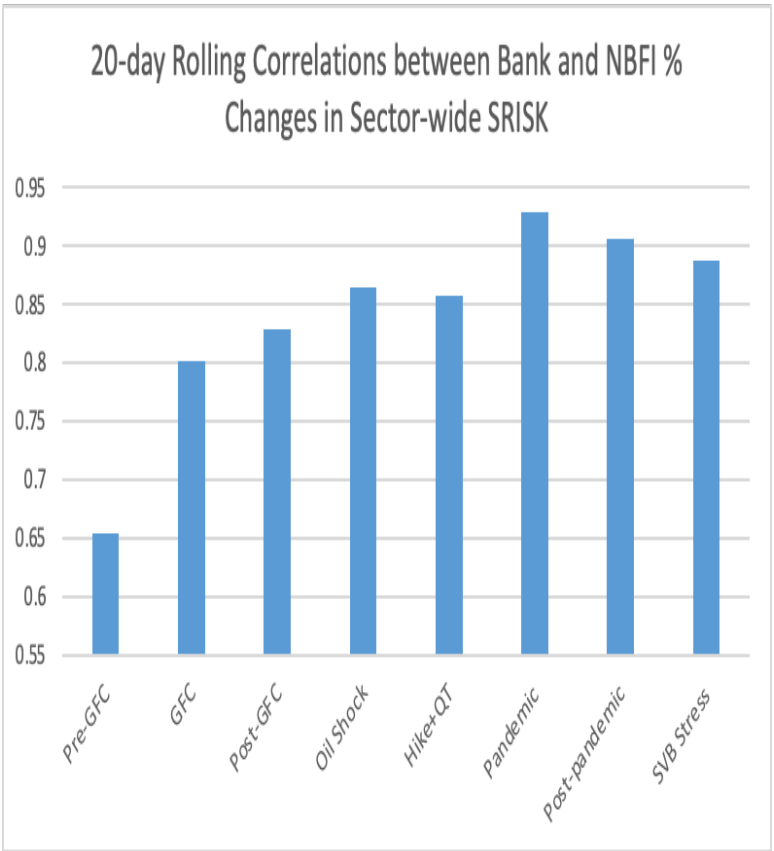


Figure 9a defines several sequential subperiods of interest from Jan 2000 to the end of April 2023: pre-Global Financial Crisis (GFC), GFC, post-GFC, Oil Price Shock, Rate Hike + Quantitative Tightening (QT),[1] Pandemic, Post-Pandemic, and Silicon Valley Bank (SVB) Stress or, more broadly, regional banking stress. The graph in Figure 9a then reports the median 20-day rolling correlation of log changes in bank and NBFI *SRISK* over each of the subperiods. *SRISK* measures market-equity-based capital shortfall under aggregate market stress (Acharya, Engle, and Richardson, 2012). The graph shows 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.

Figure 9b: 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 sub-period 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%

Figure 9b reports results from Granger-causality tests of *abnormal,* equally-weighted daily equity-return indices of NBFIs and banks. The fraction of days in each subperiod for which the p-value of the Granger-causality test is less than 10% is reported in the figure, with one column for banks causing NBFIs and another for NBFIs causing banks.