

SHADOW BANKING

- Shadow banks are financial intermediaries that conduct maturity, credit, and liquidity transformation without explicit access to central bank liquidity or public sector credit guarantees.
- The banks have played a key role in the market-based financial system, particularly in the run-up to the financial crisis.
- This study describes the institutional features of shadow banks, their economic roles, and their relation to traditional banks.
- The authors suggest that increased capital and liquidity standards for depository institutions and insurance companies will likely heighten the returns to shadow banking activity.
- Shadow banking, in some form or another, is therefore expected to be an important part of the financial system for the foreseeable future.

1. INTRODUCTION

Shadow banking activities consist of credit, maturity, and liquidity transformation that take place without direct and explicit access to public sources of liquidity or credit backstops. These activities are conducted by specialized financial intermediaries called shadow banks, which are bound together along an intermediation chain known as the shadow banking system (see “The Shadow Banking System” Online Appendix).¹

In the shadow banking system, credit is intermediated through a wide range of securitization and secured funding techniques, including asset-backed commercial paper (CP), asset-backed securities (ABS), collateralized debt obligations (CDOs), and repurchase agreements (repos). While we believe the term “shadow banking,” coined by McCulley (2007), to be a somewhat pejorative name for such a large and important part of the financial system, we have adopted it for use here.

Prior to the 2007–09 financial crisis, the shadow banking system provided credit by issuing liquid, short-term liabilities against risky, long-term, and often opaque assets. The large amounts of credit intermediation provided by the shadow banking system contributed to asset price appreciation in residential and commercial real estate markets prior to the financial crisis and to the expansion of credit more generally.

¹ This article is complemented by a series of online appendixes (listed in the box on the next page).

Zoltan Pozsar is a senior advisor at the U.S. Treasury Department’s Office of Financial Research; Tobias Adrian is a vice president and Adam Ashcraft a senior vice president at the Federal Reserve Bank of New York; Hayley Boesky is a vice chairman at Bank of America Merrill Lynch.

Correspondence: tobias.adrian@ny.frb.org

This study was first published as Federal Reserve Bank of New York staff report no. 458, July 2010 (www.newyorkfed.org/research/staff_reports/sr458.html). The views expressed are those of the authors and do not necessarily reflect the position of the Federal Reserve Bank of New York or the Federal Reserve System.

Online Appendices

These appendixes, which depict graphically the processes described in the article, offer a comprehensive look at the shadow banking system and its many components.

Map: The Shadow Banking System

https://www.newyorkfed.org/medialibrary/media/research/economists/adrian/1306adri_map.pdf

Appendix 1: The Government-Sponsored Shadow Banking System

https://www.newyorkfed.org/medialibrary/media/research/economists/adrian/1306adri_A1.pdf

Appendix 2: The Credit Intermediation Process of Bank Holding Companies

https://www.newyorkfed.org/medialibrary/media/research/economists/adrian/1306adri_A2.pdf

Appendix 3: The Credit Intermediation Process of Diversified Broker-Dealers

https://www.newyorkfed.org/medialibrary/media/research/economists/adrian/1306adri_A3.pdf

Appendix 4: The Independent Specialists-Based Credit Intermediation Process

https://www.newyorkfed.org/medialibrary/media/research/economists/adrian/1306adri_A4.pdf

Appendix 5: The Independent Specialists-Based Credit Intermediation Process

https://www.newyorkfed.org/medialibrary/media/research/economists/adrian/1306adri_A5.pdf

Appendix 6: The Spectrum of Shadow Banks within a Spectrum of Shadow Credit Intermediation

https://www.newyorkfed.org/medialibrary/media/research/economists/adrian/1306adri_A6.pdf

Appendix 7: The Pre-Crisis Backstop of the Shadow Credit Intermediation Process

https://www.newyorkfed.org/medialibrary/media/research/economists/adrian/1306adri_A7.pdf

Appendix 8: The Post-Crisis Backstop of the Shadow Banking System

https://www.newyorkfed.org/medialibrary/media/research/economists/adrian/1306adri_A8.pdf

The funding of credit through the shadow banking system significantly reduced the cost of borrowing during the run-up to the financial crisis, at the expense of increasing the volatility of the cost of credit through the cycle.

In particular, credit intermediaries' reliance on short-term liabilities to fund illiquid long-term assets is an inherently fragile activity that can make the shadow banking system prone to runs.² During the financial crisis, the system came under severe strain, and many parts of it collapsed. The emergence of shadow banking thus shifted the systemic risk-return trade-off toward cheaper credit intermediation during booms, at the cost of more severe crises and more expensive intermediation during downturns.

Shadow banks conduct credit, maturity, and liquidity transformation much like traditional banks do. However, what distinguishes shadow banks is their lack of access to public sources of liquidity, such as the Federal Reserve's discount window, or to public sources of insurance, such as that provided by the Federal Deposit Insurance Corporation (FDIC). Because the failure of credit intermediaries can have large, adverse effects on the real economy (see Bernanke [1983] and Ashcraft [2005]),

² Diamond and Dybvig (1983) initiated a large literature on bank runs modeled as multiple equilibria. Morris and Shin (2004) provide a model of funding fragility with a unique equilibrium in a setting with higher-order beliefs.

governments have chosen to shield the traditional banking system from the risks inherent in maturity transformation by granting them access to backstop liquidity in the form of discount window lending and by providing a credit put to depositors in the form of deposit insurance.

In contrast to traditional banking's public sector guarantees, the shadow banking system, prior to the onset of the financial crisis, was presumed to be safe, owing to liquidity backstops in the form of contingent lines of credit and tail-risk insurance in the form of wraps and guarantees. The credit lines and tail-risk insurance filled a backstop role for shadow banks (much like the role discount window and deposit insurance play for the commercial banking sector), but they were provided by the private, not the public, sector. These forms of liquidity and credit insurance provided by the private sector, particularly commercial banks and insurance companies, allowed shadow banks to perform credit, liquidity, and maturity transformation by issuing highly rated and liquid short-term liabilities. However, these guarantees also acted to transfer systemic risk between the core financial institutions and the shadow banks.

As the solvency of the providers of private sector puts came into question (even if in some cases it was perfectly satisfactory), the confidence that underpinned the stability of the shadow banking system vanished. The run on the system,

which began in the summer of 2007 and peaked following the failure of Lehman Brothers in September 2008, was curbed only after the creation of a series of official liquidity facilities and credit guarantees that replaced private sector guarantees entirely. In the interim, a large portion of the shadow banking system collapsed, and several shadow intermediation activities disappeared entirely.

The assets and liabilities that collateralized and funded the shadow banking system were the product of a range of securitization and secured lending techniques. Securitization refers to the pooling of mortgages, loans, receivables, and other financial cash flows into securities that are trashed according to credit and liquidity characteristics. Secured lending refers to lending transactions that are secured by collateral, particularly securities, loan, or mortgage collateral.

Securitization-based credit intermediation potentially increases the efficiency of credit intermediation. However, it also creates agency problems that do not exist when these activities are conducted within a bank. Indeed, Ashcraft and Schuermann (2008) document seven agency problems that arise in the securitization markets. If these agency problems are not adequately mitigated, the financial system is prone to excessive lowering of underwriting standards and to overly aggressive structuring of securities.

The failure of private sector guarantees to support the shadow banking system occurred mainly because the relevant parties—credit rating agencies, risk managers, investors, and regulators—underestimated the aggregate risk and asset price correlations. Specifically, the market did not correctly price for the fact that valuations of highly rated structured securities become much more correlated in extreme environments than during normal times. In a major systemic event, the price behavior of diverse assets becomes highly correlated, as investors and levered institutions are forced to shed assets in order to generate the liquidity necessary to meet margin calls (see Coval, Jurek, and Stafford [2009]).

Correlations can also increase because of mark-to-market leverage constraints that result in “fire sales” (see Adrian and Shin [2010a] and Geanakoplos [2010]). The underestimation of correlations enabled financial institutions to hold insufficient amounts of capital against the puts that underpinned the stability of the shadow banking system, which made these puts unduly cheap to sell (see Gennaioli, Shleifer, and Vishny [forthcoming] for a model of the link between shadow banking and neglected risk). As investors also overestimated the value of private credit and liquidity enhancement purchased through these puts, the result was an excess supply of credit. In addition, the likely underpricing of public sector liquidity and credit puts would have provided further incentives for risk-taking behavior.

The emergency liquidity facilities launched by the Federal Reserve and the guarantee schemes created by other

government agencies during the financial crisis were direct responses to the liquidity and capital shortfalls of shadow banks. For example, the Commercial Paper Funding Facility (CPFF) provided emergency lending to issuers of commercial paper, the Primary Dealer Credit Facility supplied a backstop for repo market borrowers, and the Term Asset-Backed Securities Loan Facility (TALF) offered ABS to investors at “haircuts” below those available in times of market distress. All three facilities directly provided liquidity support to shadow banking activities or entities, effectively offering a backstop for credit intermediation by the shadow banking system and for traditional banks as a result of their exposure to shadow banks.

Overviews of the shadow banking system are provided by Pozsar (2008) and Adrian and Shin (2009). Pozsar catalogues different types of shadow banks and describes the asset and funding flows within the shadow banking system. Adrian and Shin focus on the role of security brokers and dealers in the shadow banking system, and discuss implications for financial regulation. Our contribution with this article is to focus on institutional details of the system, complementing a rapidly growing literature on its collapse. As such, our study is primarily descriptive and focuses on funding flows in a somewhat mechanical manner. We believe that an understanding of the “plumbing” of the shadow banking system is an important underpinning for any study of systemic interlinkages within the financial system.

The next section defines shadow banking and estimates its size. Section 3 discusses the seven steps of the shadow credit intermediation process. In section 4, we describe the interaction of the shadow banking system with institutions such as bank holding companies and broker-dealers. Section 5 offers thoughts on the future of shadow banking.

2. WHAT IS SHADOW CREDIT INTERMEDIATION?

2.1 Defining Shadow Banking

In the traditional banking system, credit intermediation between savers and borrowers occurs in a single entity. Savers entrust their money to banks in the form of deposits, which the institutions use to fund the extension of loans to borrowers. Banks furthermore issue debt and equity to capitalize their intermediation activities. Relative to direct lending (that is, savers lending directly to borrowers), banks issue safe, demandable deposits, thus removing the need for savers to monitor the risk-taking behavior of these institutions.

Credit intermediation, the subset of financial intermediation that involves borrowing and lending through

credit instruments, consists of credit, maturity, and liquidity transformation. Credit transformation refers to the enhancement of the credit quality of debt issued by the intermediary through the use of priority of claims. For example, the credit quality of senior deposits is better than the credit quality of the underlying loan portfolio, owing to the presence of more junior claims. Maturity transformation refers to the use of short-term deposits to fund long-term loans, which creates liquidity for the saver but exposes the intermediary to rollover and duration-mismatch risks. Liquidity transformation refers to the use of liquid instruments to fund illiquid assets. For example, a pool of illiquid whole loans might trade at a lower price than a liquid rated security secured by the same loan pool, as certification by a credible rating agency would reduce information asymmetries between borrowers and savers.

Credit intermediation is frequently enhanced through the use of third-party liquidity and credit guarantees, generally in the form of liquidity or credit put options. A liquidity put option supplied by the private sector is typically provided in the form of contingent lines of credit by the commercial banking sector. Private sector credit put options are provided in the form of wraps, guarantees, or credit default swaps (CDS) by insurance companies or banks. Liquidity and credit puts provided by the public sector consist of discount window access and deposit insurance. We call financial intermediation activities with public sector guarantees “officially enhanced.”

Table 1 lays out the framework by which we analyze official enhancements.³ Official enhancements to credit intermediation can be classified into four categories, depending on whether they are direct or indirect and explicit or implicit.

1. A liability with direct official enhancement must reside on a financial institution’s balance sheet, while off-balance-sheet liabilities of financial institutions are indirectly enhanced by the public sector. Activities with direct and explicit official enhancement include on-balance-sheet funding of depository institutions, insurance policies and annuity contracts, liabilities of most pension funds, and debt guaranteed through public sector lending programs.⁴
2. Activities with direct and implicit official enhancement include debt issued or guaranteed by the government-

³ A formal analysis of deposit insurance was conducted by Merton (1977) and Merton and Bodie (1993).

⁴ Depository institutions, including commercial banks, thrifts, credit unions, federal savings banks, and industrial loan companies, benefit from federal deposit insurance and access to official liquidity backstops provided by the discount window. Insurance companies benefit from guarantees provided by state guaranty associations. Defined-benefit private pensions benefit from insurance provided by the Pension Benefit Guaranty Corporation and public pensions benefit from implicit insurance provided by their state, municipal, or federal sponsors. The Small Business Administration, the U.S. Department of Education, and the Federal Housing Administration each operate programs that provide explicit credit enhancement to private lending.

sponsored enterprises (GSEs), which benefit from an implicit credit put to the taxpayer.

3. Liabilities with indirect official enhancement generally include the off-balance-sheet activities of depository institutions, such as unfunded credit card loan commitments and lines of credit to conduits.
4. Activities with indirect and implicit official enhancement include asset management activities, such as bank-affiliated hedge funds and money market mutual funds (MMMFs) as well as the securities lending activities of custodian banks. While financial intermediary liabilities with an explicit enhancement benefit from official sector puts, liabilities enhanced with an implicit credit put option might not benefit from such enhancements ex post.

Finally, some activities do not benefit from any form of official enhancement and are said to be unenhanced. An example is guarantees made by monoline insurance companies. In addition, the securities lending activities of insurance companies, pension funds, and certain asset managers do not benefit from access to official liquidity.

We define shadow credit intermediation to include all credit intermediation activities that are implicitly enhanced, indirectly enhanced, or unenhanced by official guarantees.

2.2 Sizing the Shadow Banking System

Before describing the shadow intermediation process in detail, we provide a gauge for measuring the size of shadow banking activity. The chart shows two measures of the shadow banking system, net and gross, both computed from the Federal Reserve’s “Flow of Funds” data. The gross measure sums all liabilities recorded in the Flow of Funds that relate to securitization activity: mortgage-backed securities (MBS), ABS, and other GSE liabilities, as well as all short-term money market transactions that are not backstopped by deposit insurance: repos, commercial paper, and other MMMF liabilities. The net measure attempts to remove the double-counting.

We should point out that these measures are imperfect for several reasons. First, the Flow of Funds data do not cover the transactions of all shadow banking entities (see Eichner, Kohn, and Palumbo [2010] for data limitations of the Flow of Funds in detecting the imbalances that built up prior to the financial crisis).

Second, we are not providing a measure of the shadow banks’ net supply of credit to the real economy. In fact, the gross number sums up all shadow banking liabilities, irrespective of double-counting. The gross number should not be interpreted as a proxy for the net supply of credit by shadow banks, but rather as the total balance-sheet capacity allocated to shadow banking activities. The net measure mitigates the second problem by netting the money market funding of ABS

TABLE 1

The Topology of Pre-Crisis Shadow Banking Activities and Liabilities

Increasingly “Shadow” Credit Intermediation Activities →

Institution	Direct Public Enhancement		Indirect Public Enhancement		Unenhanced
	Explicit	Implicit	Explicit	Implicit	
Depository institutions	Insured deposits		Credit lines to shadow banks	Trust activities Tri-party clearing Asset management Affiliate borrowing	
Commercial banks, clearing banks, ILCs	Nondeposit liabilities				
Federal loan programs DoE, SBA, and FHA credit puts	Loan guarantees				
Government-sponsored enterprises Fannie Mae, Freddie Mac, FHLBs		Agency debt	Agency MBS		
Insurance companies	Annuity liabilities Insurance policies				Securities lending CDS protection sold
Pension funds	Unfunded liabilities				Securities lending
Diversified broker-dealers Investment bank holding companies	Brokered deposits (ILCs)		CP	Tri-party repo	MTNs Prime brokerage customer balances Liquidity puts (ABS, TOB, VRDO, ARS)
Mortgage insurers					Financial guarantees
Monoline insurers					Financial guarantees CDS protection sold on CDOs Asset management (GICs, SIVs, conduits)
Shadow banks					
Finance companies (stand-alones, captives)	Brokered deposits (ILCs)		CP ABCP		Team ABS, MTNs Extendible ABCP
Single-seller conduits		ABCP	Extendible ABCP		Extendible ABCP
Multiseller conduits		ABCP			
Hybrid conduits		ABCP	Extendible ABCP		Extendible ABCP
TRS/repo conduits		ABCP			
Securities arbitrage conduits		ABCP	Extendible ABCP		Extendible ABCP
Structured investment vehicles (SIVs)		ABCP	MTNs, capital notes		Extendible ABCP
Limited-purpose finance companies		ABCP	Bilateral repo		MTNs, capital notes Bilateral repo
Credit hedge funds (stand-alones)		Bilateral repo			Bilateral repo
Money market intermediaries Shadow bank “depositors”					
Money market mutual funds					\$1 NAV
Overnight sweep agreements					\$1 NAV
Cash “plus” funds					\$1 NAV

TABLE 1 (CONTINUED)

The Topology of Pre-Crisis Shadow Banking Activities and Liabilities

Increasingly “Shadow” Credit Intermediation Activities →

Institution	Direct Public Enhancement		Indirect Public Enhancement		Unenhanced
	Explicit	Implicit	Explicit	Implicit	
Enhanced cash funds					\$1 NAV
Ultra-short bond funds					\$1 NAV
Local government investment pools (LGIPs)					\$1 NAV
Securities lenders					\$1 NAV
European banks					
Landesbanks, etc.	State guarantees	ABCP	Credit lines to shadow banks		

Source: Pozsar et al. (2012).

and MBS. As such, it is closer to a measure of the net supply of credit provided by shadow banking activities, but it is still not a perfect measure.

Third, many of the securitized assets are held on the balance sheets of traditional depository and insurance institutions or supported off their balance sheets through backup liquidity and credit derivative or reinsurance contracts. The holding of shadow liabilities by institutions inside the government safety net makes it difficult to draw bright lines between traditional and shadow credit intermediation, prompting us to classify the latter at the instrument level and not the institution level.

As shown in the chart on the next page, the gross measure of shadow bank liabilities grew to nearly \$22 trillion in June 2007. For comparison, we also plot total traditional banking liabilities, which were around \$14 trillion in 2007.⁵ The size of the shadow banking system has contracted substantially since the peak in 2007, while total liabilities of the traditional banking sector have continued to grow throughout the crisis.

The government’s liquidity facilities and guarantee schemes introduced in the summer of 2007 helped ease the \$5 trillion contraction in the size of the shadow banking system, thereby protecting the broader economy from a collapse in the supply of credit as the financial crisis unfolded. These programs were only temporary in nature; however, given the still-significant size of the shadow banking system and its exposure to runs by wholesale funding providers, one open question is the extent to which some shadow banking activities should have more permanent access to official backstops and receive more oversight.

⁵ Adrian and Shin (2010b) and Brunnermeier (2009) provide complementary overviews of the financial system in light of the financial crisis.

3. THE SHADOW CREDIT INTERMEDIATION PROCESS

The shadow banking system is organized around securitization and wholesale funding. Loans, leases, and mortgages are securitized and thus become tradable instruments. Funding is conducted in capital markets through instruments such as commercial paper and repos. Savers hold money market balances instead of deposits with banks.

Like traditional banks, shadow banks conduct financial intermediation. However, unlike in the traditional banking system, where credit intermediation is performed “under one roof”—that of a bank—in the shadow banking system it is performed through a chain of nonbank financial intermediaries in a multistep process. These steps entail the “vertical slicing” of traditional banks’ credit intermediation process and include 1) loan origination, 2) loan warehousing, 3) ABS issuance, 4) ABS warehousing, 5) ABS CDO issuance, 6) ABS “intermediation,” and 7) wholesale funding. The shadow banking system performs these steps of intermediation in a strict, sequential order. Each step is handled by a specific type of shadow bank and through a specific funding technique.

Each of the seven steps of credit intermediation consists of a shadow banking activity, some of which is conducted by specialized shadow banking institutions while others by traditional financial intermediaries such as commercial banks or insurance companies. The seven steps of shadow bank intermediation are as follows:

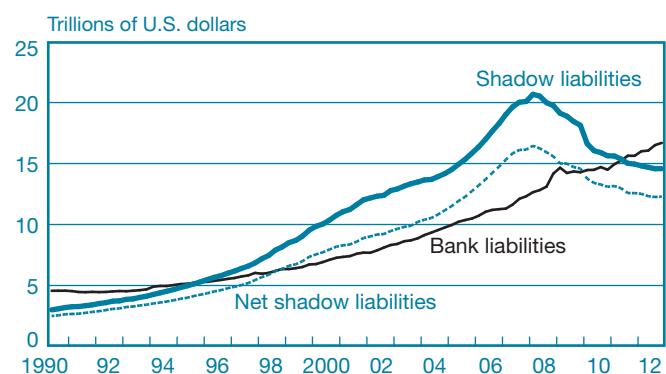
1. Loan origination (such as auto loans and leases, nonconforming mortgages) is performed by finance companies that are funded through CP and medium-term notes (MTNs).

2. Loan warehousing is conducted by single- and multi-seller conduits and is funded through asset-backed commercial paper (ABCP).
3. The pooling and structuring of loans into term asset-backed securities are conducted by broker-dealers' ABS syndicate desks.
4. ABS warehousing is facilitated through trading books and is funded through repurchase agreements, total return swaps, or hybrid and repo conduits.
5. The pooling and structuring of ABS into CDOs are also conducted by broker-dealers' ABS syndicate desks.
6. ABS intermediation is performed by limited-purpose finance companies, structured investment vehicles (SIVs), securities arbitrage conduits, and credit hedge funds, which are funded in a variety of ways including, for example, repos, ABCP, MTNs, bonds, and capital notes.
7. The funding of all of the above activities and entities is conducted in wholesale funding markets by funding providers such as regulated and unregulated money market intermediaries (for example, 2(a)-7 money market funds and enhanced cash funds, respectively) and direct money market investors (such as securities lenders). In addition to these *cash* investors—which fund shadow banks through short-term repo, CP, and ABCP instruments—fixed-income mutual funds, pension funds, and insurance companies fund shadow banks by investing in their longer-term MTNs and bonds.

Shadow credit intermediation performs an economic role similar to that of traditional banks' credit intermediation. The shadow banking system decomposes the simple process of retail-deposit-funded, hold-to-maturity lending conducted by banks into a more complex, wholesale-funded, securitization-based lending process. Through this intermediation process, the shadow banking system transforms risky, long-term loans (subprime mortgages, for example) into seemingly credit-risk-free, short-term, money-like instruments, ending in wholesale funding through stable net asset value shares issued by 2(a)-7 MMMFs that require daily liquidity. This crucial point is illustrated by the first and last links in the diagram, which depicts the asset and funding flows of the shadow banking system's credit intermediation process. The intermediation steps of the shadow banking system are illustrated in Table 2.

Importantly, not all intermediation chains involve all seven steps, and some might involve even more. For example, an intermediation chain might stop at step 2 if a pool of prime auto loans is sold by a captive finance company to a bank-sponsored multiseller conduit for term warehousing purposes. In another example, ABS CDOs

Shadow Bank Liabilities versus Traditional Bank Liabilities



Sources: Board of Governors of the Federal Reserve System, "Flow of Funds Accounts of the United States" (as of 2011:Q3); Federal Reserve Bank of New York.

could be further repackaged into a CDO squared, which would lengthen the intermediation chain to eight steps. Typically, the poorer an underlying loan pool's quality at the beginning of the chain (for example, a pool of subprime mortgages originated in California in 2006), the longer the credit intermediation chain will be to allow shadow credit intermediation to transform long-term, risky, and opaque assets into short-term and less risky highly rated assets that can be used as collateral in short-term money markets.

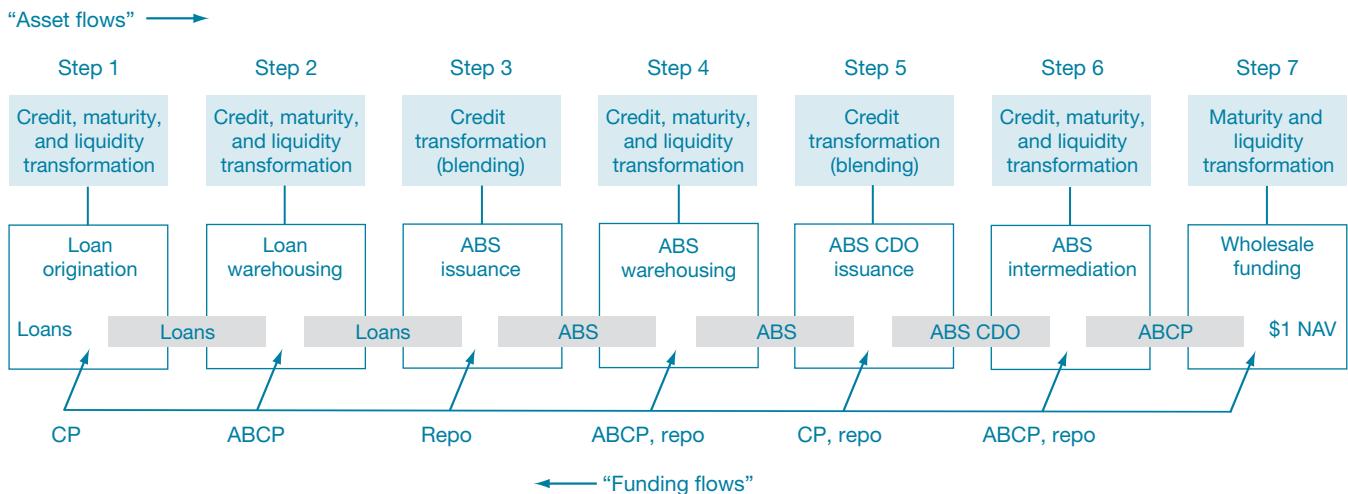
As a rule-of-thumb, the intermediation of low-quality long-term loans (nonconforming mortgages) involved all seven or more steps, whereas the intermediation of high-quality short- to medium-term loans (credit card and auto loans) involved usually three steps and rarely more. The intermediation chain always starts with origination and ends with wholesale funding, and each shadow bank appears only once in the process.

4. THE SHADOW BANKING SYSTEM

We identify three subgroups of the shadow banking system: 1) the government-sponsored shadow banking subsystem, 2) the "internal" shadow banking subsystem, and 3) the "external" shadow banking subsystem. We also discuss the liquidity backstops that were put in place during the financial crisis.

The Shadow Credit Intermediation Process

The shadow credit intermediation process consists of distinct steps. A credit intermediation chain, depending on the type and quality of credit involved, may entail as few as three steps and as many as seven or more. The shadow banking system conducts these steps in a string-sequential order. Each step is handled by specific types of financial entities, funded by specific types of liabilities.



Source: Pozsar et al. (2012).

4.1 The Government-Sponsored Shadow Banking Subsystem

The seeds of the shadow banking system were sown nearly eighty years ago with the creation of government-sponsored enterprises, which include the Federal Home Loan Bank (FHLB) system in 1932, the Federal National Mortgage Association (Fannie Mae) in 1938, the Government National Mortgage Association (Ginnie Mae) in 1968, and the Federal Home Loan Mortgage Corporation (Freddie Mac) in 1970. Each of these institutions is perceived by the marketplace to be a shadow bank given that its liabilities are implicitly guaranteed by U.S. taxpayers. The GSEs have had a large influence on the way in which the financial system is funded and conducts credit transformation. Arguably, they were the first providers of term warehousing of loans and invented the originate-to-distribute model of securitized credit intermediation.

GSEs largely securitize their loan and mortgage portfolios in pools of mortgage-backed securities, which are referred to as agency MBS. These MBS pass interest payments and principal payments through to the MBS holder, but the credit risk is retained by the GSEs. Agency MBS thus incorporate interest rate and prepayment risk, but not the default risk of individual borrowers. Freddie Mac issued the first pass-through certificate in 1971, while the first pass-through MBS were issued by Ginnie Mae in 1970 and Fannie Mae in 1981.

The MBS that are retained by the GSEs are funded with a maturity mismatch. Unlike banks, however, the GSEs are

funded not through deposits but through the capital markets, where they issue short- and long-term agency debt securities. These securities are bought by money market investors and real-money investors such as fixed-income mutual funds. The funding functions performed by the GSEs on behalf of banks and the way GSEs are funded are the models for wholesale funding markets (see Table 3 and Online Appendix 1).

The GSEs have embodied five intermediation techniques:

1. term loan warehousing provided to banks by the FHLBs,
2. credit risk transfer and transformation through credit insurance provided by the GSEs,
3. originate-to-distribute securitization functions provided for banks by the GSEs,
4. maturity transformation conducted through the GSE-retained portfolios, and
5. pass-through MBS funding of mortgage credit.

Over the past thirty years, these techniques were developed by dealers, banks, and the GSEs and became the foundation for the securitization process of shadow credit intermediation. The adaptation of these techniques fundamentally changed the bank-based, originate-to-hold credit intermediation process and gave rise to the securitization-based, originate-to-distribute credit intermediation process.

The government-sponsored shadow banking subsystem is not involved in loan origination, only in loan processing and funding.⁶ These entities qualify as shadow banks to the extent

TABLE 2

Examples of the Steps, Entities, and Funding Techniques of the Shadow Credit Intermediation Process

Step	Function	Shadow Banks	Shadow Banks' Funding Techniques
1	Loan origination	Finance companies	CP, MTNs, bonds
2	Loan warehousing	Single- and multiseller conduits	ABCP
3	ABS issuance	SPVs, structured by broker-dealers	ABS
4	ABS warehousing	Hybrid, TRS/repo conduits, broker-dealers' trading books	ABCP, repo
5	ABS CDO issuance	SPVs, structured by broker-dealers	ABS CDOs, CDO-squareds
6	ABS intermediation	LPFCs, SIVs, securities arbitrage conduits, credit hedge funds	ABCP, MTNs, repo
7	Wholesale funding	2(a)-7 MMMFs, enhanced cash funds, securities lenders, etc.	\$1 NAV shares (shadow bank "deposits")

Source: Pozsar et al. (2012).

Notes: Entries in bold denote securitized funding techniques. Securitized funding techniques are *not* synonymous with secured funding.

TABLE 3

Examples of the Steps, Entities, and Funding Techniques of the GSE Credit Intermediation Process

Step	Function	Shadow Banks	Shadow Banks' Funding Techniques
1	Mortgage origination	Commercial banks	Deposits, CP, MTNs, bonds
2	Mortgage warehousing	FHLBs	Agency debt, discount notes
3	ABS issuance	Fannie Mae, Freddie Mac through TBA market	Agency MBS (pass-through)
4	ABS warehousing	Broker-dealers' trading books	ABCP, repo
5	ABS CDO issuance	Broker-dealer agency MBS desks	CMOs (resecuritizations)
6	ABS intermediation	GSE retained portfolios	Agency debt, discount notes
7	Wholesale funding	2(a)-7 MMMFs, enhanced cash funds, securities lenders	\$1 NAV shares (GSE "deposits")

Source: Pozsar et al. (2012).

Notes: Entries in bold denote securitized funding techniques. Securitized funding techniques are *not* synonymous with secured funding.

that they are involved in the traditional bank activities of credit, maturity, and liquidity transformation, but without actually being chartered as banks and without having meaningful access to a lender of last resort and an explicit insurance of their liabilities by the federal government.⁷

4.2 The "Internal" Shadow Banking Subsystem

The development of the GSEs' activities has been mirrored by the development of a full-fledged shadow banking system. In recent decades, the largest banks were transformed from low-return-on-equity (RoE) utilities, originating loans and holding and funding them until maturity, to high-RoE entities that developed shadow banking activities in order to increase

⁶ By design, GSEs are prohibited from loan origination. They create a secondary market for mortgages to facilitate their funding.

⁷ Note that Fannie Mae and Freddie Mac had some explicit backstops from the U.S. Treasury in the form of credit lines prior to their conservatorship in 2008. However, these liquidity backstops were very small compared with the size of the agencies' balance sheets.

profitability. The largest banks and dealers played a central role in the development of shadow banking activities, particularly in the origination, warehousing, securitizing, and funding of credit. As a result, the nature of banking changed from a credit-risk-intensive, deposit-funded, spread-based business to a less credit-risk-intensive, wholesale-funded process subject to run risk.

The vertical and horizontal slicing of credit intermediation uses a range of off-balance-sheet securitization and asset management techniques, which enable banks to conduct lending with less capital than if they had retained loans on their balance sheets (Table 4). This process enhances the RoE of banks—or, more precisely, the RoE of their holding companies.

Shadow banking activities of bank holding companies (BHCs) are conducted off balance sheet through various subsidiaries. BHCs: 1) originate loans in their bank or finance company subsidiaries, 2) warehouse and accumulate loans in off-balance-sheet conduits that are managed by their broker-dealer subsidiaries, with funding through wholesale funding markets and liquidity enhancements by bank subsidiaries, 3) securitize loans through their broker-dealer subsidiaries by transferring them from the conduit into bankruptcy-remote

TABLE 4

Examples of the Steps, Entities, and Funding Techniques of the FHC Credit Intermediation Process

Step	Function	Shadow Banks	Shadow Banks' Funding Techniques
1	Loan origination	Commercial bank subsidiary	Deposits, CP, MTNs, bonds
2	Loan warehousing	Single- and multi-seller conduits	ABCP
3	ABS issuance	SPVs, structured by broker-dealer subsidiary	ABS
4	ABS warehousing	Hybrid, TRS/repo conduits, broker-dealers' trading books	ABCP, repo
5	ABS CDO issuance	SPVs, structured by broker-dealer subsidiary	ABS CDOs, CDO-squareds
6	ABS intermediation	SIVs, internal credit hedge funds (asset management)	ABCP, MTNs, capital notes, repo
7	Wholesale funding	2(a)-7 MMMFs, enhanced cash funds, securities lending subsidiary	\$1 NAV shares (shadow bank "deposits")

Source: Pozsar et al. (2012).

Notes: Entries in bold denote securitized funding techniques. Securitized funding techniques are *not* synonymous with secured funding.

special-purpose vehicles, and 4) fund the safest tranches of structured credit assets in off-balance-sheet ABS intermediaries (such as SIVs) that are managed from the asset management subsidiary of the holding company and are funded through wholesale funding markets with backstops by the bank subsidiaries (see Online Appendix 2).

This process highlights three important aspects of the changed nature of lending in the U.S. financial system, especially for residential and commercial mortgage credit. First, the process of lending and the uninterrupted flow of credit to the real economy no longer rely only on banks, but on a process that spans a network of banks, broker-dealers, asset managers, and shadow banks funded through wholesale funding and capital markets globally.

Second, bank subsidiaries' only direct involvement in the shadow credit intermediation process is at the loan origination level. The indirect involvement of commercial bank subsidiaries is broader, however, as the banks act as lenders to other subsidiaries and off-balance-sheet vehicles involved in the warehousing and processing of loans, as well as the distribution and funding of structured credit securities. Even though a BHC's credit intermediation process depends on at least four entities other than the bank, only the bank subsidiary of a BHC has access to the Federal Reserve's discount window and the benefits of deposit insurance.

Third, securitization techniques have increased the implicit leverage of bank holding companies, sometimes called "capital efficiency." As the financial crisis of 2007-09 showed, however, the capital efficiency of the process is highly dependent on liquid wholesale funding and debt capital markets globally. The exposure of BHCs to shadow bank entities increases the effective leverage of the BHC, even though that might not be obvious from looking at the balance sheet because much shadow banking activity is designed to be conducted off balance sheet. The implicit leverage in turn exposes BHCs to credit and liquidity risk and represents an important source of systemic risk.

This interpretation of the workings of BHCs is different from the one emphasizing the benefits of BHCs as "financial supermarkets." According to that widely held view, the diversification of the holding companies' revenues through broker-dealer and asset management activities makes the banking business more stable, as the holding companies' banks, if need be, could be supported by net income from other operations during times of credit loss. In our interpretation, the broker-dealer and asset management activities are not parallel, but instead are serial and complementary activities to BHCs' banking activities.

4.3 The "External" Shadow Banking Subsystem

Similar to the "internal" shadow banking subsystem, the "external" version is a global network of balance sheets. The origination, warehousing, and securitization of loans are conducted mainly from the United States, but the funding and maturity transformation of structured credit assets are conducted from the United States, Europe, and offshore financial centers. While the internal subsystem is designed primarily to raise the profitability of BHCs by increasing their effective leverage through off-balance-sheet entities and activities, the external subsystem has resulted from vertical integration and the exploitation of gains from specialization.

The external shadow banking subsystem is defined by 1) the credit intermediation process of diversified broker-dealers, 2) the credit intermediation process of independent, nonbank specialist intermediaries, and 3) the credit puts provided by private credit-risk repositories.

TABLE 5
Examples of the Steps, Entities, and Funding Techniques of the DBD Credit Intermediation Process

Step	Function	Shadow Banks	Shadow Banks' Funding Techniques
1	Loan origination	Finance company subsidiary	CP, MTNs, bonds
2	Loan warehousing	Single- and multi-seller conduits	ABCP
3	ABS issuance	SPVs, structured by broker-dealer subsidiary	ABS
4	ABS warehousing	Hybrid, TRS/repo conduits, broker-dealers' trading books	ABCP, repo
5	ABS CDO issuance	SPVs, structured by broker-dealer subsidiary	ABS CDOs, CDO-squareds
6	ABS intermediation	Internal credit hedge funds, proprietary trading desks	Repo
7	Wholesale funding	2(a)-7 MMMFs, enhanced cash funds, securities lending subsidiary	\$1 NAV shares (shadow bank "deposits")

Source: Pozsar et al. (2012).

Notes: Entries in bold denote securitized funding techniques. Securitized funding techniques are *not* synonymous with secured funding.

The Credit-Intermediation Process of Diversified Broker-Dealers

We refer to the stand-alone investment banks as they existed prior to 2008 as diversified broker-dealers (DBDs). DBDs vertically integrate their securitization businesses (from origination to funding), lending platforms, and asset management units. The credit intermediation process of DBDs is similar to that of financial holding companies (FHCs; Table 5).

The diversified broker-dealers are distinguished by the fact that they do not own commercial bank subsidiaries. Some of the major stand-alone investment banks did, however, own industrial loan company (ILC) subsidiaries. However, owning an ILC did not require the holding company to turn into a bank holding company. Since running one's own loan warehouses (single- or multiseller loan conduits) requires large bank subsidiaries to fund the contingent liquidity backstops that enhance the ABCP issued by the conduits, broker-dealers typically outsourced these warehousing functions to BHCs with large deposit bases or to independent multiseller conduits.

At the end of their intermediation chains, DBDs do not operate securities arbitrage conduits or SIVs. Instead, the dealers run internal credit hedge funds, fund trading books, and fund repo conduits. The intermediation process of DBDs tends to rely more on repo funding than that of FHCs, which rely on CP, ABCP, MTNs, and repos. The subsidiaries of DBDs do not have direct access to public sources of credit or liquidity backstops. It should be noted that the credit intermediation processes described here are the simplest and shortest forms of the intermediation chains that run through FHCs and DBDs. In practice, these processes are often elongated by additional steps involved in the warehousing, processing, and distribution of unsold ABS into ABS CDOs (see Online Appendix 3).

The Independent-Specialists-Based Credit Intermediation Process

The credit intermediation process that runs through a network of independent specialists is the same as those of FHCs and DBDs and results in the same credit intermediation functions as those performed by traditional banks. The independent-specialists-based intermediation process includes the following types of entities: stand-alone and captive finance companies on the loan origination side;⁸ independent multiseller conduits on the loan warehousing side; and limited-purpose finance companies, independent SIVs, and credit hedge funds on the ABS intermediation side (Table 6).

There are three key differences between the independent-specialists-based credit intermediation process and those of BHCs and DBDs. First and foremost, on the origination side, the three processes intermediate different types of credit. The BHC and DBD processes originate some combination of both conforming and nonconforming mortgages, as well as commercial mortgages, leveraged loans, and credit card loans. In contrast, the independent-specialists-based process tends to specialize in the origination of auto and equipment loans and leases, middle-market loans, franchise loans, and more esoteric loans. The obvious exceptions to this are stand-alone nonconforming mortgage finance companies, which have become largely extinct since the crisis.

The independent-specialists-based credit intermediation process is based on an "originate-to-fund" model (again, with the exception of the now extinct stand-alone mortgage finance companies), as opposed to the mostly originate-to-distribute model of the

⁸ Captive finance companies are finance companies that are owned by nonfinancial corporations, typically manufacturing firms or homebuilders. They are used to provide vendor financing to the clients of their parents and benefit from cross-guarantees. Stand-alone finance companies, as the name suggests, stand on their own and are not subsidiaries of any corporate entity.

TABLE 6

Examples of the Steps, Entities, and Funding Techniques of the Independent-Specialists-Based Credit Intermediation Process

Step	Function	Shadow Banks	Shadow Banks' Funding Techniques
1	Loan origination	Stand-alone and captive finance companies	CP, MTNs, bonds
2	Loan warehousing	FHC-sponsored and independent multiseller conduits	ABCP
3	ABS issuance	SPVs, structured by broker-dealers	ABS
4	ABS warehousing		ABCP, repo
5	ABS CDO issuance		ABS CDOs, CDO-squareds
6	ABS intermediation	LPFCs, independent SIVs, independent credit hedge funds	ABCP, MTNs, capital notes, repo
7	Wholesale funding	2(a)-7 MMMFs, enhanced cash funds, securities lenders	\$1 NAV shares (shadow bank "deposits")

Source: Pozsar et al. (2012).

Notes: Entries in bold denote securitized funding techniques. Securitized funding techniques are *not* synonymous with secured funding.

government-sponsored shadow banking subsystem and the credit intermediation processes of BHCs and DBDs.

While the GSE, BHC, and DBD credit intermediation processes depend heavily on liquid capital markets for their ability to fund, securitize, and distribute loans, independent specialists' seamless functioning is also exposed to the ability of DBDs and FHCs to perform their functions as gatekeepers to capital markets and lenders of last resort, respectively. This in turn represents an extra layer of fragility in the structure of the independent-specialists-based credit intermediation process, as failure by FHCs and DBDs to perform these functions in times of systemic stress runs the risk of paralyzing and disabling the process (see Rajan [2005]).

Indeed, this fragility became apparent during the financial crisis of 2007-09, as the independent-specialists-based process broke down and with it the flow of corresponding types of credit to the real economy. Online Appendix 4 describes the relative extent to which specialist loan originators (captive and independent finance companies) relied on BHCs and DBDs as their ABS underwriters and gatekeepers to capital markets.

Private Credit-Risk Repositories

The shadow credit intermediation processes of independent specialists, BHCs, and DBDs rely heavily on private credit-risk repositories (see Online Appendix 5). Private risk repositories specialize in providing credit transformation services in the shadow banking system, and include mortgage insurers, monoline insurers, diversified insurance companies, and credit hedge funds. These entities facilitate the securitization process by providing tail-risk insurance for structured credit products in various forms. For example, insurance companies might offer CDS written on mezzanine tranches of ABS, thus enhancing credit ratings at the resecuritization stage of the

shadow bank intermediation chain (step 5). By providing such tail-risk insurance, the private credit-risk repositories change the pricing of tail risk and ultimately affect the supply of credit to the real economy.

Different credit-risk repositories correspond to specific stages of the shadow credit intermediation process. As such, mortgage insurers specialize in insuring or wrapping whole mortgage loans; monoline insurers, which are bond insurance companies, specialize in wrapping ABS tranches (or the loans backing specific ABS tranches), and diversified insurance companies and credit hedge funds take on the risks of ABS CDO tranches through CDS.⁹

Effectively, the various forms of credit put options provided by private risk repositories absorb tail risk from loan pools, turning the enhanced securities into less risky ones (at least from the perspective of investors prior to the crisis). This in turn means that any liability issued against these assets is perceived to be less risky as well. Such credit puts provided by risk repositories to the shadow banking system thus play a role analogous to FDIC insurance for the commercial banking system.

The perceived credit-risk-free nature of traditional bank and shadow bank liabilities stems from two very different sources. In the case of traditional banks' insured liabilities (deposits), the credit quality is driven by the counterparty: the U.S. taxpayer. As a result, insured depositors do not need to examine a bank's creditworthiness before depositing money—it is the regulator that performs the due diligence. In the case of shadow bank liabilities such as repos or ABCP, perceived credit

⁹ CDS were also used for hedging warehouse and counterparty exposures. For example, a broker-dealer with a large exposure to subprime MBS that it warehoused for an ABS CDO deal in the making could purchase CDS protection on its MBS warehouse. In turn, the broker-dealer could also purchase protection (a counterparty hedge) from a credit hedge fund or credit derivative product company on the counterparty providing the CDS protection on subprime MBS.

quality is based on the credit enhancements achieved through private credit-risk repositories. Credit rating agencies, in turn, perform the due diligence on behalf of the ultimate investors.

The credit puts of private credit-risk repositories also perform a function similar to that of the wraps provided by Fannie Mae and Freddie Mac on conforming mortgage pools, as these government-sponsored, public credit-risk repositories allow senior mortgage tranches to achieve AAA ratings by removing credit risk.¹⁰

4.4 The “Parallel” Banking System

Many “internal” and “external” shadow banks existed in a form that was possible only because of the special circumstances in the run-up to the financial crisis. Some of these circumstances were economic in nature and some were due to regulatory and risk management failures. However, there are also examples of shadow banks that had competitive advantages relative to traditional banks. These shadow banks were driven not by regulatory arbitrage, but by gains from specialization as a “parallel” banking system. Most of these entities were found in the “external” shadow banking subsystem.

These entities include nonbank finance companies, which can be more efficient than traditional banks because of specialization and economies of scale in the origination, servicing, structuring, trading, and funding of loans to both bankable and nonbankable credits.¹¹ For example, finance companies have traditionally served subprime credit card or auto loan customers, as well as low-rated corporate credits such as the commercial airlines, none of which are served by banks. Furthermore, some ABS intermediaries could fund highly rated structured credit assets at a lower cost and at lower levels of leverage than banks could with high-return-on-equity targets.

Over the last thirty years, a number of activities have been pushed out of banks and into the parallel banking system. It remains an open question whether the parallel banking system will ever remain stable through credit cycles in the absence of official credit and liquidity puts. If the answer is no, then there are questions about whether such puts and the associated prudential controls should be extended to parallel banks or, alternatively, whether parallel banking activity should be severely restricted. (A spectrum of shadow banking activities by type is described in Online Appendix 6.)

4.5 Backstopping the Shadow Banking System

The Federal Reserve’s 13(3) emergency lending facilities that followed the bankruptcy of Lehman Brothers amounted to a backstop for all the functional steps involved in the shadow credit intermediation process. The facilities introduced during the crisis were an explicit recognition of the need to channel emergency funds into internal, external, and government-sponsored shadow banking subsystems. (To read about a pre- and postcrisis backstop for shadow banks, see Online Appendixes 7 and 8.)

As such, the CPFF was a backstop for the CP and ABCP issuance of loan originators and loan warehouses, respectively (steps 1 and 2 of the shadow credit intermediation process); the TALF was a backstop for ABS issuance (step 3); Maiden Lane LLC was a backstop for Bear Stearns’ ABS warehouse, while the Term Securities Lending Facility (TSLF) was a means to improve the average quality of broker-dealers’ securities warehouses by swapping ABS for Treasury securities (step 4); Maiden Lane III LLC was a backstop for AIG-Financial Products’ credit puts on ABS CDOs (step 5); and the Term Auction Facility (TAF) and foreign exchange swaps with other central banks were meant to facilitate the “onboarding” and on-balance-sheet dollar funding of the ABS portfolios of formerly off-balance-sheet ABS intermediaries—mainly SIVs and securities arbitrage conduits (step 6).¹²

The Primary Dealer Credit Facility (PDCF) was a backstop for the funding of diversified broker-dealers through the tri-party repo system. The Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility (AMLF) and the Money Market Investor Funding Facility (MMIFF) served as liquidity backstops for regulated and unregulated money market intermediaries, respectively (step 7). The FDIC’s Temporary Liquidity Guarantee Program, which covered various bank and nonbank financial institutions’ senior unsecured debt and corporations’ non-interest-bearing deposit transaction accounts, regardless of dollar amount, was another emergency backstop, as was the U.S. Treasury Department’s temporary guarantee program of retail and institutional money market mutual funds.

Upon the complete rollout of the liquidity facilities and guarantee schemes, the shadow banking system was fully embraced by official credit and liquidity puts and became fully backstopped, just like the traditional banking system. As a result, the adverse effect on real economic activity from the collapse of the shadow banking system was mitigated.

¹⁰ Credit wraps come in different forms and guarantee the timely payment of principal and interest on an underlying debt obligation.

¹¹ Carey, Post, and Sharpe (1998) document the specialization of finance companies and their servicing of riskier borrowers.

¹² The CPFF is documented in detail by Adrian, Marchioni, and Kimbrough (2011); the TSLF is described by Fleming, Hung, and Keane (2009); the TALF is described by Campbell et al. (2011) and Ashcraft, Malz, and Pozsar (2012); the PDCF is discussed by Adrian, Burke, and McAndrews (2009); the TAF is documented by Armantier, Krieger, and McAndrews (2008).

5. CONCLUSION

We document the specialized financial institutions of the shadow banking system and argue that these credit intermediaries played a quantitatively important role in the run-up to the financial crisis. Shadow credit intermediation includes three broad types of activities differentiated by their strength of official enhancement: implicitly enhanced, indirectly enhanced, and unenhanced.

The shadow banking system has three subsystems that intermediate different types of credit in fundamentally different ways. The government-sponsored shadow banking subsystem refers to credit intermediation activities funded through the sale of agency debt and MBS, which mainly include conforming residential and commercial mortgages. The “internal” shadow banking subsystem refers to the credit intermediation process of a global network of banks, finance companies, broker-dealers, and asset managers and their

on- and off-balance-sheet activities—all under the umbrella of financial holding companies. Finally, the “external” shadow banking subsystem refers to the credit intermediation process of diversified broker-dealers and a global network of independent, nonbank financial specialists that includes captive and stand-alone finance companies, limited-purpose finance companies, and asset managers.

While much of the current and future reform efforts are focused on remediating the excesses of the recent credit bubble, we note that increased capital and liquidity standards for depository institutions and insurance companies are likely to increase the returns to shadow banking activity. For example, as pointed out in Pozsar (2011), the reform effort has done little to address the tendency of large institutional cash pools to form outside the banking system. Thus, we expect shadow banking to be a significant part of the financial system, although almost certainly in a different form, for the foreseeable future.

REFERENCES

- Adrian, T., C. Burke, and J. McAndrews.* 2009. “The Federal Reserve’s Primary Dealer Credit Facility.” *Federal Reserve Bank New York CURRENT ISSUES IN ECONOMICS AND FINANCE* 15, no. 4 (August).
- Adrian, T., D. Marchionni, and K. Kimbrough.* 2011. “The Federal Reserve’s Commercial Paper Funding Facility.” *Federal Reserve Bank of New York ECONOMIC POLICY REVIEW* 17, no. 1 (May): 25-39.
- Adrian, T., and H. S. Shin.* 2009. “The Shadow Banking System: Implications for Financial Regulation.” *Banque de France FINANCIAL STABILITY REVIEW*, no. 13 (September): 1-10.
- . 2010a. “Liquidity and Leverage.” *JOURNAL OF FINANCIAL INTERMEDIATION* 19, no. 3 (July): 418-37.
- . 2010b. “The Changing Nature of Financial Intermediation and the Financial Crisis of 2007-2009.” *ANNUAL REVIEW OF ECONOMICS* 2, September: 603-18.
- Aitken, J., and M. Singh.* 2009. “Deleveraging after Lehman: Evidence from Reduced Rehypothecation.” *IMF Working Paper* no. 09/42, July.
- Armantier, O., S. Krieger, and J. McAndrews.* 2008. “The Federal Reserve’s Term Auction Facility.” *Federal Reserve Bank of New York CURRENT ISSUES IN ECONOMICS AND FINANCE* 14, no. 5 (July).
- Ashcraft, A. B.* 2005. “Are Banks Really Special? New Evidence from the FDIC-Induced Failure of Healthy Banks.” *AMERICAN ECONOMIC REVIEW* 95, no. 5 (December): 1712-30.
- Ashcraft, A. B., A. Malz, and Z. Pozsar.* 2012. “The Federal Reserve’s Term Asset-Backed Securities Loan Facility.” *Federal Reserve Bank of New York ECONOMIC POLICY REVIEW* 18, no. 3 (November): 29-66.
- Ashcraft, A. B., and T. Schuermann.* 2008. “Understanding the Securitization of Subprime Mortgage Credit.” *FOUNDATIONS AND TRENDS IN FINANCE* 2, no. 3 (July): 191-309.
- Bernanke, B. S.* 1983. “Nonmonetary Effects of the Financial Crisis in the Propagation of the Great Depression.” *AMERICAN ECONOMIC REVIEW* 73, no. 3 (June): 257-76.
- Brunnermeier, M.* 2009. “Deciphering the Liquidity and Credit Crunch 2007-2008.” *JOURNAL OF ECONOMIC PERSPECTIVES* 23, no. 1 (winter): 77-100.
- Campbell, S., D. Covitz, W. Nelson, and K. Pence.* 2011. “Securitization Markets and Central Banking: An Evaluation of the Term Asset-Backed Securities Loan Facility.” *JOURNAL OF MONETARY ECONOMICS* 58, no. 5 (July): 518-31.
- Carey, M., M. Post, and S. A. Sharpe.* 1998. “Does Corporate Lending by Banks and Finance Companies Differ? Evidence on Specialization in Private Debt Contracting.” *JOURNAL OF FINANCE* 53, no. 3 (June): 845-78.
- Coval, J., J. Jurek, and E. Stafford.* 2009. “The Economics of Structured Finance.” *JOURNAL OF ECONOMIC PERSPECTIVES* 23, no. 1 (winter): 3-25.
- Covitz, D., N. Liang, and G. Suarez.* 2009. “The Evolution of a Financial Crisis: Panic in the Asset-Backed Commercial Paper Market.” *Board of Governors of the Federal Reserve System FINANCE AND ECONOMICS DISCUSSION SERIES*, no. 2009-36.
- Diamond, D., and P. Dybvig.* 1983. “Bank Runs, Deposit Insurance, and Liquidity.” *JOURNAL OF POLITICAL ECONOMY* 91, no. 3 (June): 401-19.
- Eichner, M., D. Kohn, and M. Palumbo.* 2010. “Financial Statistics for the United States and the Crisis: What Did They Get Right, What Did They Miss, and How Should They Change?” *Board of Governors of the Federal Reserve System FINANCE AND ECONOMICS DISCUSSION SERIES*, no. 2010-20.
- Fleming, M., W. Hrung, and F. Keane.* 2009. “The Term Securities Lending Facility: Origin, Design, and Effects.” *Federal Reserve Bank of New York CURRENT ISSUES IN ECONOMICS AND FINANCE* 15, no. 2 (February).
- Geanakoplos, J.* 2010. “The Leverage Cycle.” In Daron Acemoglu, Kenneth Rogoff, and Michael Woodford, eds., *NBER MACROECONOMICS ANNUAL 2009*. Chicago: University of Chicago Press.
- Gennaioli, N., A. Shleifer, and R. Vishny.* Forthcoming. “A Model of Shadow Banking.” *JOURNAL OF FINANCE*.
- Gorton, G.* 2009. “Slapped in the Face by the Invisible Hand: Banking and the Panic of 2007.” Paper presented at the Federal Reserve Bank of Atlanta’s 2009 Financial Markets Conference on *Financial Innovation and Crisis*, Atlanta, Georgia, May 11-13.

REFERENCES (CONTINUED)

- Martin, A., D. Skeie, and E. von Thadden.* 2010. "Repo Runs." Federal Reserve Bank of New York STAFF REPORTS, no. 444, April.
- McCulley, P.* 2007. "Teton Reflections." PIMCO GLOBAL CENTRAL BANK FOCUS, September.
- Merton, R. C.* 1977. "An Analytical Derivation of the Cost of Deposit Insurance and Loan Guarantees: An Application of Modern Option Pricing Theory." *JOURNAL OF BANKING AND FINANCE* 1, no. 1 (June): 3-11.
- Merton, R. C., and Z. Bodie.* 1993. "Deposit Insurance Reform: A Functional Approach." CARNEGIE-ROCHESTER CONFERENCE SERIES ON PUBLIC POLICY 38, June: 1-34.
- Morris, S., and H. S. Shin.* 2004. "Coordination Risk and the Price of Debt." *EUROPEAN ECONOMIC REVIEW* 48, no. 1 (February): 133-53.
- Pozsar, Z.* 2008. "The Rise and Fall of the Shadow Banking System." Moody's economy.com.
- . 2011. "Institutional Cash Pools and the Triffin Dilemma of the U.S. Banking System." IMF Working Paper no. 11/190, August.
- Pozsar, Z., T. Adrian, A. Ashcraft, and H. Boesky.* 2012. "Shadow Banking." *Revue d'Economie Financière* 105: 157-84.
- Rajan, R.* 2005. "Has Financial Development Made the World Riskier?" Paper presented at the Federal Reserve Bank of Kansas City Symposium on *The Greenspan Era: Lessons for the Future*, Jackson Hole, Wyoming, August 25-27.
- Wachter, S., A. Pavlov, and Z. Pozsar.* 2008. "Subprime Lending and Real Estate Markets." In Stefania Perrucci, ed., *MORTGAGE AND REAL ESTATE FINANCE*. London: Risk Books.

The views expressed are those of the authors and do not necessarily reflect the position of the Federal Reserve Bank of New York or the Federal Reserve System. The Federal Reserve Bank of New York provides no warranty, express or implied, as to the accuracy, timeliness, completeness, merchantability, or fitness for any particular purpose of any information contained in documents produced and provided by the Federal Reserve Bank of New York in any form or manner whatsoever.