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Shadow Banking: Economics and Policy

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EXECUTIVE SUMMARY

Shadow banking is often seen as a form of regulatory arbitrage. It surely has such aspects, and they played a significant role in the run-up to global financial crisis. But beyond that, shadow banking also provides important financial intermediation functions distinct from those performed by banks and capital markets, as confirmed by its continued growth. These functions can be economically useful, and need to be understood and properly regulated.

The traditional Financial Stability Board (FSB, 2011) definition of shadow banking (“credit intermediation involving entities and activities outside the regular banking system”) may be too broad for policy analysis. This paper focuses on two functions of the shadow banking system that are most close economically to those of traditional banks: securitization and collateral intermediation. Both assist in intermediating funds from savers to investors, and both involve risk transformation.

After describing these two main functions, the paper reviews their economic values, highlighting how they cater to various demands. The securitization function, operating through the prime money funds complex, serves the needs of large institutional cash pools that seek safe, short-term investments and—more controversially—the demand of banks for assets that can be used to secure repo funding. And the collateral intermediation complex specializes in the efficient use of scarce collateral.

The paper then proceeds to describe the distortions and systemic risks in shadow banking. These include regulatory arbitrage by banks in securitization, the risks of runs on private “safe” assets, and fragilities in collateral intermediation. In a crisis, these risks may end up being “put” to the public safety net, as many shadow-banking-related entities—banks, dealer banks, and (under some conditions) money market funds—benefit from implicit or explicit guarantees. These “puts” make the system effectively subsidized, which amplifies risk-taking.

Proper understanding of the shadow banking system is essential for policy. Beyond the need to limit shadow banking regulatory arbitrage and “puts” to the safety net, shadow banking activities with a valid economic rationale require regulation to reduce systemic risks. Policy measures should try to correct market failures and externalities associated with the activities of the shadow banking system. The right policies are not all obvious yet, however, and one can only aim to further the debate by highlighting a number of priorities for a comprehensive policy response:

- Dealing with regulatory arbitrage;
- Addressing systemic risks in the shadow banking system, which includes developing a regulatory approach to dealer banks, money market funds, the tri-party repurchase market, and dealing with innovation and complexity;
- Considering demand-side pressures, including the merits of accommodating a shortage of safe and liquid assets with publicly guaranteed short-term debt;
- Better measuring and monitoring the shadow banking system; and
- Studying the shadow banking system’s macroeconomic effects and implications for monetary policy.

An appropriate set of policies may lead to a smaller shadow banking system, performing its useful economic functions of providing safe claims and credit to borrowers in better ways.

I. INTRODUCTION

The past decade has witnessed rapid growth in a distinct form of financial intermediation: shadow banking. Since shadow banking has only recently become a large segment of financial services provision, its economic role is not yet well understood. This paper offers a framework for analyzing shadow banking, describing its operations, economic role in catering to demand for certain financial services, systemic risks, and regulatory and broader policy implications.

The definition of shadow banking is not yet settled. The Financial Stability Board (FSB, 2011) defines shadow banking broadly as “credit intermediation involving entities and activities outside the regular banking system.” While this definition is comprehensive, a narrower focus may be more useful for policy analysis. This paper restricts itself to those activities that are economically most bank-like: involve risk transformation and a focus on reducing counterparty risks. As the literature has recognized (see Box 1), the two shadow banking activities that are most important economically and in terms of financial stability at present are *securitization* and *collateral intermediation*.

To formulate a policy response to shadow banking, one needs to understand its operations and drivers. Shadow banking is often seen as a form of regulatory arbitrage, but this is an incomplete view. Being a heavily regulated industry, the operations of the financial sector certainly involve various forms of arbitrage. Hence much analysis of financial services—including that of shadow banking—comes with the caveat that one cannot tell whether a particular service serves a genuine economic function or is a consequence of regulatory arbitrage. However, shadow banking, at least in part, also responds to genuine economic demand (although assessing its overall economic value is a topic that requires additional analysis). Understanding these demand factors, and how they affect the system’s operations and risks, is essential for formulating policy responses.

This paper therefore studies the two shadow banking functions that have distinct, large roles: securitization and collateral intermediation. Similar to traditional banks, which issue “safe” liabilities to fund risky projects, shadow banking focuses on intermediating credit from savers to borrowers and managing counterparty risks. However, its activities occur outside traditional banks, albeit with their support. The activities are also different from those performed by capital markets in that they are more about creating and distributing certain types of assets than about trading claims such as equity and bonds.

In its securitization function, shadow banking caters to the demand of savers by creating safe assets. The system, by unbundling and repacking risks, creates safe long-term (“AAA”) assets from debt obligations by tranching their cash flows (to transfer credit risks), and further makes the assets short-term by using maturity transformation vehicles funded in short-term money markets. These safe assets are then held by commercial banks (both long-term and short-term) and institutional cash pools (short-term assets, held through prime money funds).

Box 1. A Review of Literature on the Economics of Shadow Banking

The term “shadow banking” was coined by McCulley (2007) at the 2007 Jackson Hole Symposium, but Rajan (2005)—without actually using the term—had identified some of the vulnerabilities of what constituted shadow banking at the same symposium two years earlier. Since then, the academic literature has evolved in a number of key strands.

The first strand of the shadow banking literature identifies the demand for “private money”: investments perceived as highly safe, liquid, and redeemable at par as a key factor behind its development. Greenwood, Hanson, and Stein (2012) and Pozsar (2011) link the demand for private money to the investment needs of institutional cash investors, whose total balances significantly exceed the (inelastic) supply of short-term government debt and insured deposits (see also Turner, 2012). Gorton, Lewellen, and Metrick (2012) observe that the demand for safe assets as a ratio to GDP appears historically remarkably stable and has always been met by a combination of public and private instruments.

Other papers also investigate risks arising from private money creation. Gennaioli, Shleifer, and Vishny (2012a, 2012b) show that banks respond to a demand for private safe assets by producing them through tranching of cash flows, portfolio diversification, and residual risk retention, in the process becoming exposed to extreme adverse events (i.e., “tail risks”). Geanakoplos (2010) shows how perceptions of safety can lead to unstable expansions of leverage. Gorton and Metrick (2012) and Martin, Skeie, and von Thadden (2011) highlight the possibility of runs on private money supplied in the form of repurchase agreements. Ricks (2012) and Stein (2012) suggest that the amount of private money creation may be excessive because agents do not internalize the costs of crises.

The second strand of the shadow banking literature focuses on market failures in the securitization process. Pozsar (2008) and Pozsar and others (2010) map the flows and contractual links supporting securitization, identifying “puts” to large financial institutions. Stein (2010) and Gorton and Metrick (2012) focus on the fragility of the short-term funding that supports securitization. Adrian and Shin (2009) and Shin (2009) show that securitization allows financial institution to lever up more by using repo funding. Acharya, Schnabl, and Suarez (2012) highlight problems of regulatory arbitrage. The last three papers also emphasize imperfect risk transfers from banks.

Another strand of the literature analyzes the importance of shadow banks in supporting collateral-based operations in the financial system. This role of shadow banks has been articulated by Singh and Aitken (2010) and Singh (2011). Mehrling (2010) and Singh and Stella (2012) discuss more generally how such financial innovations can arise from structural changes and policy reforms, and how financial sector and (unconventional) monetary policies need to adapt to the challenges innovations pose. Related are prevailing legal rules, which can effectively subsidize the use of some derivatives and repo contracts, with negative implications for financial stability (Tuckman, 2010; Summe, 2011; Perotti, 2012).

In its collateral intermediation function, shadow banking serves the demand of agents for safety by reducing counterparty risk. Collateral underpins a wide range of financial transactions: secured funding (mostly by nonbank investors), securities lending, and hedging (including with over-the-counter (OTC) derivatives). As collateral is scarce, a key shadow banking function is to re-use collateral to support a large volume of transactions.

With these two functions, shadow banking ultimately serves two common financial intermediation roles. In its *liability-side role*, it provides safe claims (in securitization) or increases the safety of claims (in collateral transformation) for agents in the financial system, including ultimate savers. And in its *asset-side role*, it provides credit to borrowers—enabled by the fact that the safe liabilities created help attract savings.

The financial crisis has highlighted the systemic risks that shadow banking can pose. The securitization function to create private “safe” assets broke down before the crisis, as it became apparent that the process ignored some aggregate risks. The breakdown had significant real and financial spillovers. There are systemic risks in collateral intermediation, too, notably the inherent instability of the dealer-bank business model with risk of runs by customers and providers of short-term funding. Finally, the crisis revealed widespread regulatory arbitrage, a high procyclicality of shadow banking (with implications for monetary policy), and fiscal risks associated with crisis management in shadow banking. These risks, spillovers, and regulatory arbitrages call for policy responses.

While measures of shadow banking differ considerably, the system is large, comparable in size to traditional banking, and continuing to grow. Globally, shadow banking was \$65 trillion in 2011, compared to \$26 trillion in 2002, or on average 25% of financial assets and 111% of aggregate GDP. It was enabled by advances in financial innovation and technology (e.g., securitization, and improved origination and distribution systems) and a favorable overall environment (low interest rates and a global savings glut). While securitization has contracted since the crisis, collateral-based operations remain strong, as an increasingly globally-integrated financial system needs to manage heightened counterparty risks. As aggregate economic activity rebounds and as traditional bank regulations gets tightened, shadow banking is again increasing in prominence.

The U.S. has the largest system, but shadow banking is growing in importance in many countries. The U.S. dollar’s large role in shadow banking reflects several factors (Pozsar, 2011 and Shin, 2012). As a reserve currency, the dollar attracts much demand for safe assets. Many U.S. and non-U.S. firms manage their cash balances largely in dollars (as international transactions are often financed and settled in dollars). For a variety of historical reasons, the United States has a very developed non-bank asset management complex, in contrast to countries with more bank-based systems. Accordingly, investors and asset managers in other countries, such as European pension and hedge fund managers, also choose to use the U.S. system for their needs. Today, however, two-thirds of shadow banking now occurs outside the U.S., notably in the euro area and the U.K, with rapid growth in many emerging markets, offsetting the decline in the United States. Dealing with shadow banking systemic risks, procyclicality, complexity, and interactions with monetary policy is thus a concern for many countries.

The analysis allows us to outline four components of a comprehensive policy response: (1) Dealing with regulatory arbitrage, the focus of much recent regulatory actions; (2) addressing systemic risks within the shadow banking system (including the regulation of dealer banks and money market funds, and dealing with innovation and complexity); (3) addressing demand-side pressures, including possibly accommodating a shortage of safe and liquid assets with government (or publicly guaranteed) short-term debt issuance; and (4) importantly, considering its macroeconomic and monetary implications.

This Staff Discussion Note proceeds as follows. Section II discusses the securitization function of shadow banking. Section III discusses its collateral intermediation role. Section IV provides an overall view of the shadow banking system and discusses the key policy challenges associated with shadow banking, including its measurement.

II. SECURITIZATION AND PRIVATE SAFE ASSETS

The first key shadow banking function, securitization, is a process that, through tranching, repackages cash flows from underlying loans and creates assets that are perceived by market participants as fully safe. This function caters to institutional cash pools that seek deposit-like safe investments and to banks that use securitized debt for repo funding and to boost leverage. The risks and market failures in the securitization process include regulatory arbitrage by banks, extensive use through various “puts” of (implicit) public safety net subsidies, a disregard of tail risks, and a possibility of runs on money market funds. While securitization has declined since the crisis in response to realized risks and tighter regulation, many of these market failures remain and risks could reemerge.

A. The Mechanics of Securitization: Risk-Stripping

The shadow banking system transforms debt instruments through securitization and tranching into safe, money-like claims. The securitization-based production of safe, short-term, liquid assets mimics the classic banking functions of credit, maturity, and liquidity transformation. Unlike in traditional banks, though, it takes the form of risk transfer (risk-stripping) and is performed in steps along a chain of balance sheets. The first step is the tranching of cash flows from loans into an equity, mezzanine, and *safe* long-term “AAA” security—the transfer of credit risks. The second step is for the long-term AAA security to be sold to a vehicle funded in short-term money markets, transforming it into a *safe, short-term* asset—the transfer of maturity risks. The asset created can be referred to as a structured money market instrument (SMMI); the most common type of SMMI before the crisis was asset-backed commercial paper (ABCP). The third step is to make the *safe, short-term* instrument *liquid* through “puts”—the obligation from banks to provide liquidity support to the vehicle—and by having money market funds holding the assets issue stable net asset value (NAV) claims to their investors—the transfer of liquidity risks.²

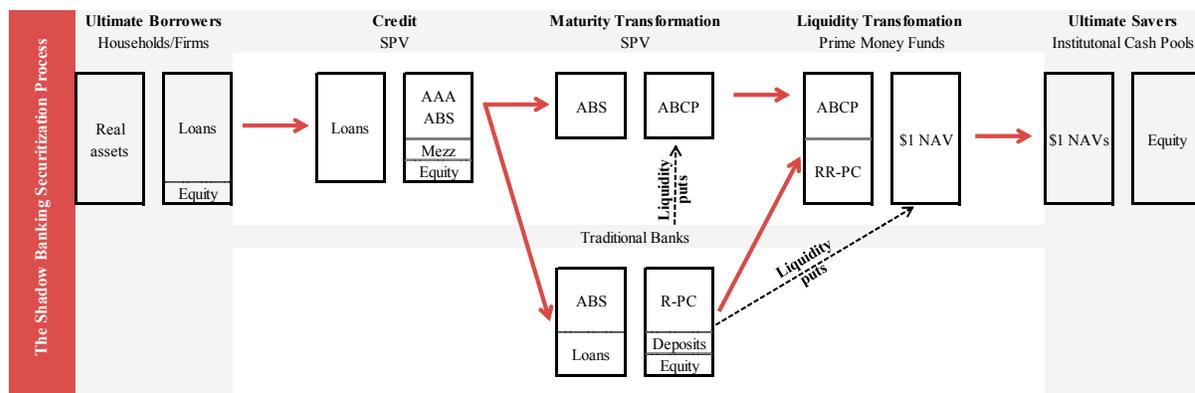
² In practice, before the crisis, some chains were longer than three steps. For example, many included an extra link of creating collateralized debt obligations (CDOs). The CDOs were used to resecuritize non-AAA tranches into equity, mezzanine, and AAA tranches in order to increase the volume of AAA claims. Stable NAV claims are claims that have an explicit or implicit commitment to return at least a principal of investment on demand.

This shadow banking securitization process is depicted in Figure 1. It shows how loans, through a chain of investment vehicles and various transformation processes, are repackaged into safe, short-term, and liquid claims held by investors. It also shows the role of banks in holding some securitized debt and providing liquidity puts to investment vehicles and money market funds. In the United States, this form of so-called private label securitization grew very rapidly before the crisis (Figure 2).

It is useful to contrast the intermediation using securitization with traditional bank-based intermediation, and the process by which savings are allocated to government debt (Figure 3). The key difference between bank-based intermediation and securitization is that banks transform risks on a single balance sheet, while in securitization the risks are supported by a chain of multiple balance sheets and various sources of capital and puts. And the key difference between securitization and the allocation of cash pool savings to government debt is that the latter does not involve credit risk transformation (although it still involves some maturity and liquidity risk transformation, since cash pools can prefer assets with shorter maturity and higher liquidity than that of long-term government debt).

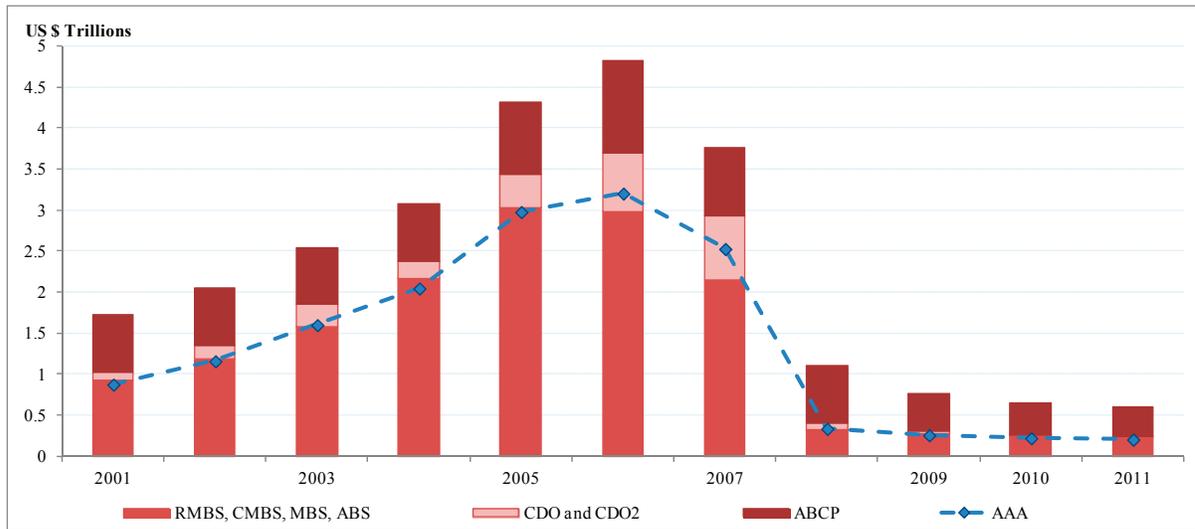
Securitization caters to two sources of demand. The first is the demand from corporations and the asset management complex for what are perceived as *safe, short-term, and liquid* “money-like” claims to invest their large cash balances. The second is the demand from banks (especially European banks) that use securitized *safe and long-term* “AAA” assets to attract repo funding (from institutional cash pools directly or money market funds) and boost leverage. The portion of AAA tranches of securitized assets held by U.S. and European banks was by 2006 at least a third of total issuance (Greenlaw and others, 2008), with the rest held by levered structured credit investors and “real money” accounts (insurance, pension funds, and the like). We now describe this demand in detail.

Figure 1. The Shadow Banking Securitization Process



Notes: The credit transformation special-purpose vehicles (SPVs) have matched maturity funding and issue asset-backed securities (ABS) or collateralized debt obligations (not shown). The maturity transformation SPVs are funded short term (are maturity mismatched) and issue asset-backed commercial paper (ABCP) or other structured money market instruments, such as auction rate securities (not shown). Private collateral (PC) includes ABS, corporate bonds, and equities. \$1 NAV is the stable net asset value (a promise to repay at least \$1 on \$1 invested). R = repo; RR = reverse repo.

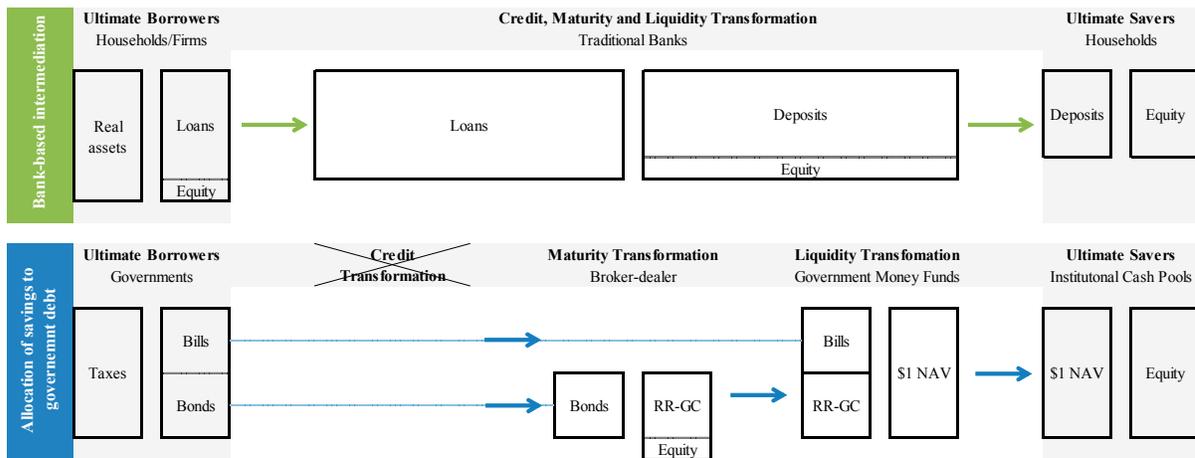
Figure 2. U.S. Private Label Securitization Market, 2001–11



Sources: IMF staff estimates based on data from JPMorgan Chase & Co., Board of Governors of the Federal Reserve Systems, the Commercial Real Estate Finance Council, and *Inside Mortgage Finance*.

Notes: MBS = mortgage-backed security; RMBS = residential MBS; CMBS = commercial MBS; ABS = asset-backed security; CDO = collateralized debt obligation; CDO2 = CDO-squared and CDOs backed by ABS and MBS; ABCP = asset-backed commercial paper. All year-end outstandings.

Figure 3. Bank-based Intermediation and Government Money Funds



Notes: GC = general collateral (includes repo collateral such as Treasuries, agency debt, and agency mortgage-backed securities). \$1 NAV is the stable net asset value (a promise to repay at least \$1 on \$1 invested). RR = reverse repo.

B. Demand for Safe Assets by Cash Pools

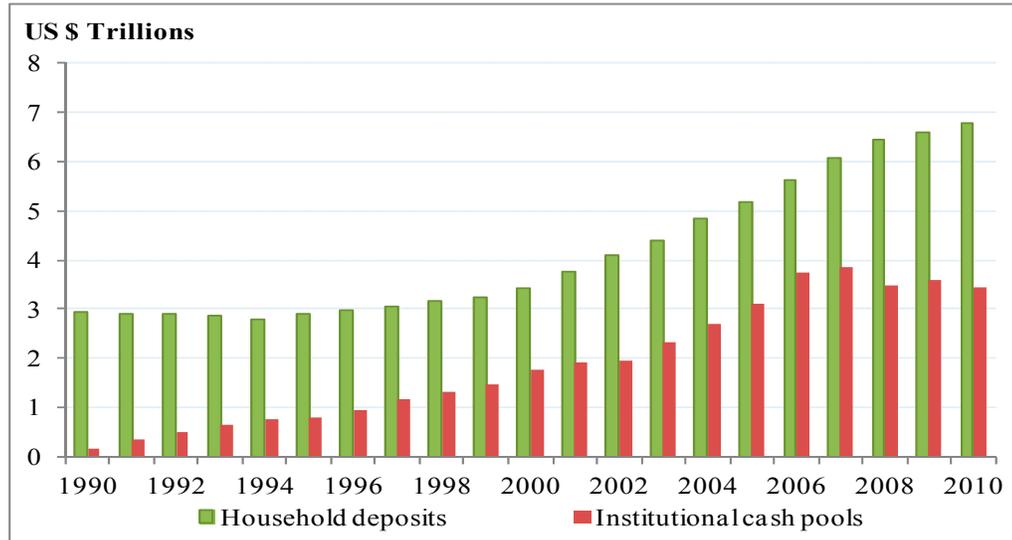
One key factor for securitization prior to the financial crisis was the demand for safe, liquid assets from corporations and asset managers. The standard analysis of savings intermediation generally focuses on households and their allocation of short-term savings to bank deposits and long-term savings to stocks and bonds (through mutual funds, pension funds, insurance companies, and other asset managers). This misses the fact that today a large part of demand for savings instruments comes from corporations and the asset management complex. Global corporate short-term savings grew from less than \$50 billion in 1990 to more than \$750 billion in 2007 and over \$1.2 trillion by the end of 2010.³ Also, the asset management complex transforms a significant portion of households' long-term savings into short-term claims to support synthetic investment strategies and securities lending (Pozsar, 2011). This process of "reverse maturity transformation" led the asset management complex' cash holdings to rise from \$100 billion in 1990 to over \$2.5 trillion in 2007 and \$2 trillion at end-2010.⁴ These institutional investors seek to invest some of their cash funds in safe, short-term, and liquid assets. Together, corporate and asset management ("institutional") cash pools have grown over the past decade by a factor of 30 to equal almost half of traditional deposits (Figure 4). While in the end households are the final owners, with their wealth allocation more delegated to corporations and asset managers, which prefer to hold cash, there is a sharp upward trend in the total (that is, retail and institutional combined) demand for safe, short-term assets.

Traditional banks are not well positioned to intermediate these investors' very large and growing cash balances. Prior to the crisis, U.S. bank deposits were insured only up to \$100,000—a trivial amount for cash pools. Since the crisis limits have been raised to \$250,000 for interest-bearing accounts, still low for cash pools, and unlimited for noninterest-bearing transaction accounts, but only through December 31, 2012. Leaving cash balances in interest-bearing accounts in excess of \$250,000 means unsecured, junior (e.g., compared to repos) exposures to banks, a risk even when the bank is a systemically important financial institution (SIFI). Also, a large part of U.S. cash holdings is held offshore, in part for tax reasons, making those holdings ineligible for U.S. deposit insurance.⁵ Institutional investors thus seek alternative investments.

³ To derive this number, Pozsar (2011) uses Capital IQ's firm-level data on holdings of cash and cash equivalents held onshore and offshore for all S&P500 constituents. The U.S. *Flow of Funds* puts corporate short-term savings at \$1.5 trillion at end-2010 and at 2012:Q1, but that figure includes not only large corporations but also small and medium-sized businesses, which manage most of their cash through banks.

⁴ While households are still the largest holders of safe, short-term assets in most countries, their individual holdings are small in denomination and held mostly (but not exclusively) in bank deposits.

⁵ While many institutional investors spread cash among banks in insured amounts, there are too few banks in the United States to fully insure a large institutional investor's cash pool, which ranges in average size from \$10 billion for corporations to \$100 billion for asset managers. About half of U.S. corporations' \$1.2 trillion in cash pools was held abroad at the end of 2011:Q1, partly for tax reasons See Helen Thomas and Jeremy Lemer, "U.S. Groups Hit as Tax Keeps Cash Overseas," *Financial Times*, July 27, 2011.

Figure 4. The Size of Cash Pools and Deposits

Sources: Federal Reserve; Capital IQ, Investment Company Institute; Risk Management Association; Bank for International Settlements; and Pozsar (2011).

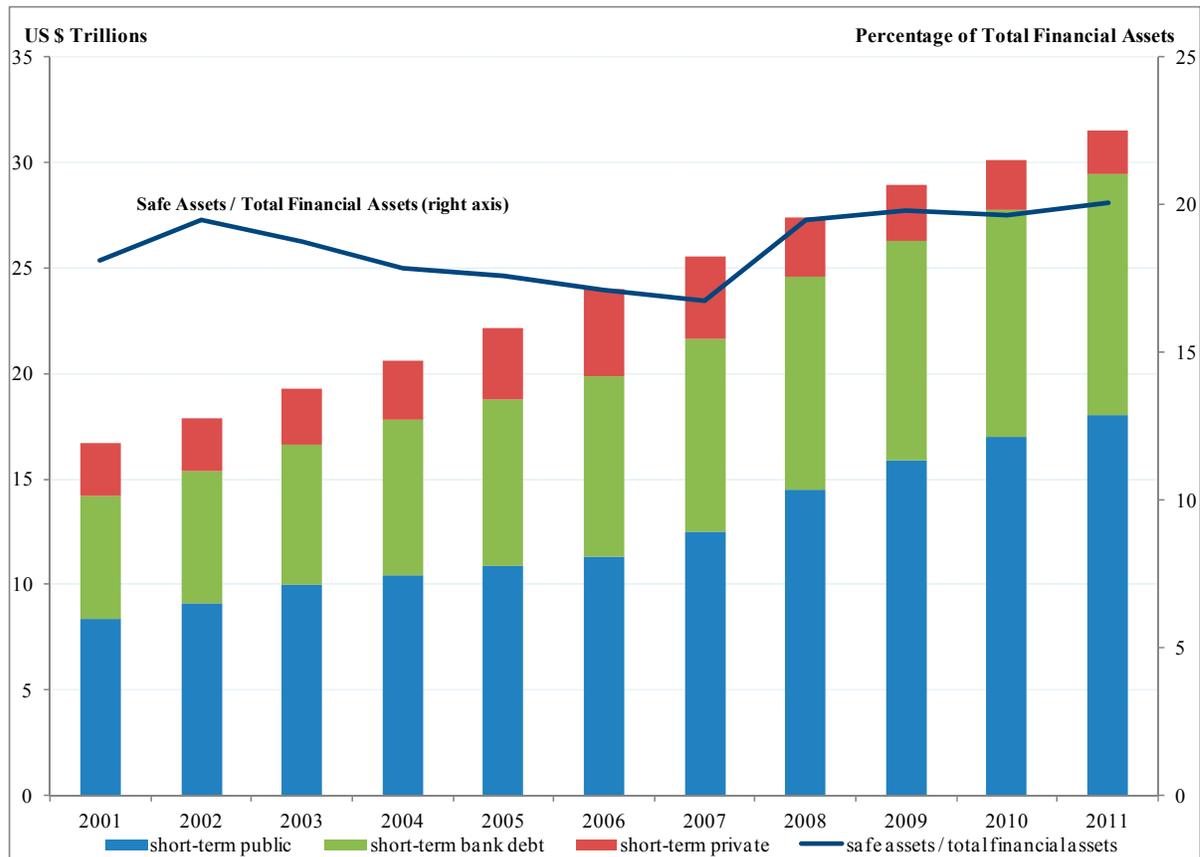
Given their perceived safety, the safe tranches of securitized claims distributed through prime money funds became the “next-best” alternative to insured deposits before the crisis. Money funds come in two types: *government-only funds* investing in short-term government debt and repos backed by it; and *prime funds* investing in commercial paper, SMMIs, uninsured bank deposits, and repos often backed by private collateral. As institutional demand for safe assets increased and as government-only money funds were limited by the supply of short-term government paper, institutional prime money funds grew to nearly \$1 trillion by June 2007, while government-only funds remained at just \$300 billion.

Prior to the crisis, prime money funds were perceived as almost perfect substitutes for U.S. Treasuries or other government-guaranteed short-term claims, including those held via government-only funds. Figure 5 shows short-term public debt, traditional bank deposits and short-term private debt. It highlights how the sum of these forms of safe instruments is quite stable as a share of total financial assets, between 17 and 20 percent (right axis), consistent with noncyclical demand for safe, short-term instruments (Gorton, Lewellen, and Metrick, 2012). There are large shifts, however, in the split between private and public debt. Before the crisis, private debt rose steadily, but during the crisis private debt rapidly declined as confidence in private short-term debt instruments was lost, while the role of public short-term debt instruments and insured deposits rose sharply.

Another factor behind the growth of securitization prior to the financial crisis was the demand from banks for securitized debt to use as collateral to attract repo funding, and through this to boost their leverage and returns. Banks already retained most of the equity tranche of securitizations (either directly or by providing protection to vehicles holding assets), as cash pool investors did not want to assume that risk (Acharya and others, 2009; Gennaioli, Shleifer and Vishny, 2012b). But in addition, banks also accumulated, on their balance sheets or in affiliated investment vehicles, a significant share of the long-term AAA claims produced by securitization. Banks used these claims in part as collateral for repo funding. By pledging high-quality securitized debt, banks could raise wholesale funds (and increase leverage) more cheaply and in larger volumes than if they relied on traditional liabilities, such as deposits and unsecured funding.

Another reason some banks held on to the safer securitization tranches was regulatory arbitrage. Regulations require banks to maintain capital against loans on their balance sheets. Securitization as practiced offered two ways to reduce such capital charges. One common way was to hold securitized debt through affiliated investment vehicles (e.g., SIVs) that were funded in short-term money markets and relied on both *implicit* (thus not requiring capital charges) and explicit credit and liquidity support from banks. And, given how ratings came about, banks could sometimes reduce capital charges simply by holding on their own balance sheet securitized but higher-rated claims instead of the same nonsecuritized debt.

Figure 5. Supply of Safe Assets Offset by the Private and Public Sectors



Sources: Flow of Funds, Federal Reserve

Notes: Short-term public debt is the sum of treasury securities and agency- and GSE-backed securities. Short-term bank debt is the sum of checkable deposits and currency and time and savings deposits. Short-term private debt is the sum of open market paper, federal funds and security repurchase agreements.

But even abstracting from regulatory arbitrage, bank holdings of securitized debt can be problematic. First, investments by banks in tradable debt can contribute to procyclicality, as it makes it easier for banks to load up on debt during periods of market exuberance and can lead to fire sales of assets by banks during downturns (Geanakoplos, 2010; Shleifer and Vishny, 2011; Boot and Ratnovski, 2012). Second, holdings of securitized debt by banks represent a lack of risk transfer from banks to the rest of the financial system, negating a potential benefit of securitization (Shin, 2009).

C. Risks in Securitization

The crisis showed some fundamental flaws in the securitization process. Regardless of its economic validity, the way in which the shadow banking system created safe assets was risky and unstable. Most importantly, also as the correlation among risks was ignored, the tranching process led to a buildup of “tail risks,” the occurrence of rare negative events. Agencies rated complex structured instruments as “AAA” and investors ignored the aggregate, undiversified exposures to low-probability risks (such as a broad decline in U.S. house prices). This created credit and liquidity risks when claims that were initially perceived to be safe proved to be risky. When market funding dried up, banks had to take investment vehicles back onto their balance sheets, leading to unexpected exposures, or let vehicles collapse, reneging on (implicit) liquidity puts.

The unraveling of securitization had particularly strong effects on banks. During the crisis, banks incurred losses on direct securitized debt holdings and affiliated investment vehicles. Together, such losses were major factors in banks’ weakness and failures during the crisis, including those of UBS, RBS, Lehman Brothers, and Bear Stearns. Besides commercial banks, unlevered “real money” investors, such as pension funds, mutual funds, and insurance companies, experienced large losses.⁶

The crisis showed an extreme instability in the private supply of safe assets, culminating in a run on prime money funds. Prime money funds—which held some of the problem structured assets—became perceived as risky and saw an outflow of over \$300 billion between August and September 2008. The money was relocated to government-only money funds that were regarded as safe havens. These saw an inflow of over \$500 billion (accommodating also outflows from others, including commercial banks). The run resembled historical bank runs, such as those in the United States in the early 1900s and other such cases.

Since the crisis, the volume of “private-label” securitization has remained low, and the future of securitization is unclear. Private-label (not government-guaranteed) securitization

⁶ Levered holders of securitized claims (such as hedge funds) were hit the hardest. With their thin capital bases quickly exhausted, their money market funding dried up fast, exposing them to fire-sale liquidations. While many hedge funds were forced out of business, this had little systemic consequences, showing that shadow banking does not always involve puts to the safety net.

dropped significantly in the United States (see Figure 2; also see IMF, 2012). One main reason is much diminished demand, since the assets produced via securitization are no longer regarded as safe and money-like. Furthermore, there is less supply of underlying loans from which to produce securitized products. Important regulatory changes under way are also negatively affecting supply.⁷ Once economic activity and private credit demand recover, securitization may resume in advanced countries. It will, however, likely more resemble how it was in the 1980s; that is, used as a technology to diversify idiosyncratic risk and funded by unlevered, real money accounts.

III. COLLATERAL INTERMEDIATION

Another key function of shadow banking is supporting collateral-based operations within the financial system. This involves the intensive re-use of scarce collateral, so that it supports as large as possible a volume of financial transactions. A small number of dealer banks, all SIFIs, are central in this process, which leads to systemic risks.

A. The Mechanics of Collateral Operations

Although less studied, collateral intermediation matters for the real economy and financial stability, as it underpins a wide range of financial transactions. These include secured funding (mostly of nonbank investors), securities lending, and hedging (including with OTC derivatives). Collateral itself can be of varying quality. Unlike securitization that focuses on safe assets, collateral intermediation involves assets varying from U.S. Treasuries or German Bunds to CCC rated bonds or equities. As long as it has a market-clearing price, even low-rated collateral can be used.

A small number of dealer banks, all SIFIs, are uniquely placed in their ability to facilitate collateral-based operations.⁸ It is hard to quantify these dealer banks' comparative advantage, but they probably include having incurred the fixed costs of entry, and benefitting from economies of scale and network centrality effects (compared to other traditional banks). A major concern is that their advantages also derive from the fact that they are perceived to have very low counterparty risks.

The best way to describe the re-use of collateral is to visualize it in chains. Dealer banks *source* collateral. They receive it from parties that require funding, or from agents that want to enhance their return by “renting out” their assets as collateral (Singh and Aitken, 2010). Then, collateral is *pledged* to other parties to obtain funding or support other contracts. This

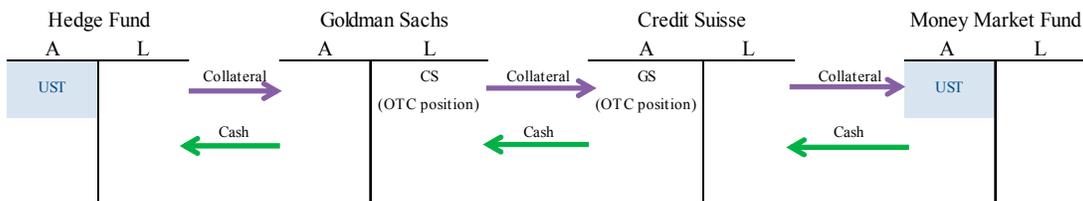
⁷ A number of regulatory changes are also negatively affecting the supply side of securitization: (1) Basel III makes it more costly to provide liquidity lines of credit, which are essential for risk transformation; (2) accounting rules require SIVs and conduits to be consolidated onto banks' balance sheets, raising capital costs; (3) retention requirements—the share of securitized assets held by banks—have been tightened, making securitization more costly; and (4) disclosure requirements for the underlying loans and the methods credit rating agencies use to obtain ratings have been tightened, making (some forms of) securitization less attractive. See FSB (2012c).

⁸ The main dealer banks are Goldman Sachs, Morgan Stanley, JP Morgan, Bank of America-Merrill Lynch, and Citibank in the United States; and Barclays, BNP Paribas, Crédit Suisse, Deutsche Bank, HSBC, Royal Bank of Scotland, Société Générale, Nomura, and UBS. All are classified as SIFIs by the FSB.

starts a system of repeated re-use of collateral where a single unit can support multiple transactions.⁹

The most common source of collateral is hedge funds and other investors that need to borrow cash or securities. Figure 6 illustrates how a piece of collateral (e.g., a U.S. Treasury bond) may be used by a hedge fund to get financing (“cash”) from a prime broker, such as Goldman Sachs. The same collateral may then be used by Goldman Sachs as margin for Credit Suisse on, for example, an “out-of-the-money” OTC derivative position. Credit Suisse may then pass the bond to a money market fund that will hold it for a short tenor (or until maturity). Notice that in this example the same Treasury bond has been used three times as collateral, from the original hedge fund owner to the money market fund.

Figure 6. An Example of Repeated Use of Collateral in a Dynamic Chain



Note: The over-the-counter (OTC) positions are in parentheses since they are off-balance-sheet items. UST = U.S. Treasury bond; GS = Goldman Sachs; CS = Credit Suisse.

Other providers of collateral include insurers, pension funds, and sovereign wealth funds (and other official sectors actors), which hold some of their assets with custodians. Typically, these owners “rent out” their securities through repo and securities lending to augment overall returns (earning a “convenience fee”).¹⁰ Users of rented collateral primarily include hedge funds and mutual funds, which need specific types of collateral to support their operations. By facilitating financial transactions, offering higher returns to savers, and offering lower funding costs to borrowers (e.g., when a hedge fund can, because of its use of collateral, leverage its net worth and take a long position in a corporate bond), collateral intermediation benefits the real economy.

⁹ Legally, rehypothecation is the re-use of collateral that involves an explicit title transfer and is generally used in prime brokerage activities. It is standard to use title transfer in repo, securities lending, and OTC derivatives contracts. The acquirer has full title to the collateral received and, as the new owner, is completely free to deal with the collateral as she sees fit. In return, the parties agree that once the collateral provider has discharged his financial obligation to the collateral taker, the collateral taker will return *equivalent* collateral to the collateral provider. OTC derivatives contracts under the International Swaps and Derivatives Association’s English Law agreements also use title transfer in collateral support agreements.

¹⁰ In a repo there is an outright sale of the security and a specific price and date at which the security will be bought back. Securities lending transactions generally have no set end date and no set price. A 30-year U.S. Treasury bond could earn more than its coupon over its tenor by being “rented out.” The rent on this loan is determined by the demand for the security being rented out, the counterparty risk of the intermediary, and the tenor of the loan. Even if the underlying instrument is of long maturity, loans are of short tenor, so the instrument returns to the original owner generally within a year.

B. Demand for Collateral Services

The stock of collateral and its velocity (the intensity with which it is used) both matter. The volume of collateral transactions has declined over the last three years from \$10 trillion to \$6.1 trillion, while the stock of collateral has declined from \$3.4 trillion to \$2.5 trillion (Table 1). The stock of collateral can decline as investors become more concerned about counterparty risk, making them less willing to lend securities and making collateral sit idle. It can also be affected by central bank measures, such as large-scale asset purchases (which drain good quality collateral from the system), or a widening of the pool of collateral-eligible assets (which increases the pledgeability of these assets as collateral (Singh and Stella, 2012). Collateral velocity—defined as the volume of secured transactions divided by the stock of source collateral—is affected by counterparty concerns and general risk aversion, which manifest themselves as restrictions on the re-use of collateral. Velocity can therefore change, like the velocity of money: it was 3 at end-2007, 2.4 at end-2010, and 2.5 at end-2011. The collateral intermediation function of shadow banking is important within the financial system and, to the extent that it supports credit, it is also important for the real economy (although quantifying the economic importance is complex). When collateral use drops, financial intermediation slows, with effects similar to the drying up of interbank markets (Singh, 2012a).

The collateral intermediation function is likely to become more important over time. In the short term, increased counterparty risks (as during 2007–08 and in Europe today) make secured funding more attractive. In the longer term, with more arm’s-length transactions in an increasingly globally integrated financial system, market participants are seeking the security of collateral to underpin a wider range of claims. New regulations, such as increased requirements for collateral in derivatives, including in central clearing (see Appendix 1), are also likely to increase the demand for collateral-based operations.

Table 1. Sources of Pledged Collateral, Velocity, and Collateral, 2007, 2010, and 2011
(In trillions of U.S. dollars; velocity in units)

Year	Sources			Volume of secured operations	Velocity
	Hedge funds	Others	Total		
2007	1.7	1.7	3.4	10.0	3.0
2010	1.3	1.1	2.4	5.8	2.4
2011	1.3	1.05	2.35	6.1	2.5

Sources: Risk Management Association; and IMF staff estimates. See also Singh (2011 and 2012a).

C. Risks in Collateral Intermediation

One source of systemic risk (and risk to the public safety net) in collateral intermediation is the liquidity exposure of dealer banks in collateral chains. Dealer banks routinely use some collateral obtained from customers (e.g., rehypothecation from hedge funds) for their own funding. A customer withdrawal may then have liquidity implications for the dealer bank, which will have to find new sources of collateral or liquidate its own positions (Duffie, 2010, Squam Lake, 2010b). Runs by prime brokerage

clients (e.g., hedge funds) wanting their collateral back meant major source instability for dealer banks in 2008 (including all stand-alone U.S. investment banks, such as Bear Stearns, Lehman Brothers, and Merrill Lynch), leading to large central bank and government support measures.

The “puts” to the safety net are especially significant when a dealer bank is also a depository institution. This creates scope for moving risks to the depository part (Singh, 2012b), which subsidizes the shadow banking activities by reducing the funding cost. Such conglomeration also creates conflicts and regulatory challenges, and increases risks to the taxpayer.¹¹ Recent proposals aimed at separating trading from other activities are in part motivated by these risks (Boot and Ratnovski, 2012).

Another source of puts and implicit subsidies is the qualified financial contract status for derivatives and repos. Prevailing legal rules, such as the “safe harbor” provision, allow some derivatives and repo contracts to be exempt from “automatic stay” during bankruptcy, i.e., they are prioritized in reorganization because they are deemed to be too interconnected with financial markets and thus too disruptive to tinker with. This exemption reduces market discipline and effectively subsidizes the contracts’ counterparties (dealer banks and the wider shadow banking system) at a cost to other creditors and the public safety net. While there is little to suggest that legal changes are imminent, recent studies highlight that the exemption status might not be economically justified (Summe, 2011; Bolton and Oehmke, 2011a, 2011b; Duffie and Skeel, 2012; Bliss and Kaufmann, 2005; and Perotti, 2012).

A distinct part of the collateral intermediation process, the tri-party repo (TPR) market, can present a different set of systemic risks. TPR is a major source of wholesale funding for banks and dealer banks, especially in the United States, where volumes approach \$1.8 trillion (down from \$2.7 trillion in 2007).¹² In a TPR, an intermediary (one of two clearing banks) facilitates a repo operation between counterparties. The TPR market has specific institutional arrangements and risks and is subject to an increasing amount of regulation to reduce (systemic) risks. Since this differs from the bilateral pledged collateral market, it is discussed separately (in Appendix 2).

IV. OVERALL VIEW AND POLICY IMPLICATIONS

Altogether, the shadow banking system is complex, with a multitude of nonbank agents, and many links to traditional banks and dealer banks. In part due to its complexity, its exact size is not even well known (Box 2). And its systemic risk raises policy challenges.

¹¹ For example, in the United States, after Bank of America (BoA) and Merrill Lynch (ML) merged, the OTC derivatives book of ML was “moved” to the depository part of the merged BoA-ML. As a consequence, taxpayers may now provide a stronger backstop to the bank’s overall derivatives position.

¹² In continental Europe and England, TPR activity has increased in recent years to roughly €1.1 trillion, largely due to multinational companies keeping money overseas and recent counterparty risk concerns regarding large banks. It takes place between four agents: Euroclear and Clearstream, two “utility-type” systems owned by users or a stock exchange, and Bank of New York and JP Morgan.

Box 2: Measuring and Monitoring the Shadow Banking System Better

Measures of the shadow banking system vary greatly as scope, institutional coverage, and methodology are not uniform. Private sector estimates of size vary from \$13 trillion to \$60 trillion (see Deloitte, 2012). A New York Fed study (Pozsar and others, 2010) put its size in the U.S. at \$20 trillion in 2008 and \$16 trillion in 2010. Singh (2012a) adds collateral reuse, which increases the size globally to \$25 trillion as of 2007 and \$19 trillion as of end-2011. The Financial Stability Board (FSB) (2011; 2012d) using aggregate data estimates the global size at \$60 trillion in both 2007 and 2010, and \$67 trillion in 2011. There is considerable diversity across jurisdictions in relative size, composition and growth. The U.S., according to the FSB, accounts for \$23 trillion in 2011, the euro area for \$22 trillion (far larger than the \$13 trillion estimate of Bouveret, 2011), and the U.K. for \$9 trillion.

Better measurement has to start with an agreement on whether to cover net or gross activities and stock or flows. The New York Fed study uses a *gross* measure, including all U.S. dollar denominated securitized assets (private and government sponsored); all nondeposit money market liabilities (including assets of banks, dealer banks, finance companies, government-sponsored enterprises, and a wide range of [now non-existent] maturity transformation vehicles funded in asset-backed commercial paper markets); and money market mutual funds. Such gross measures include significant double counting. While useful for financial stability purposes (to capture total exposures of a system), they can overestimate the importance of shadow banking. For collateral, it may be valid to count collateral as many times as it is used. If the objective were to measure the value of assets currently in use as collateral, however, it would be necessary to adjust for double counting.

While significant progress can be made by using existing data, improving data availability is needed (see further FSB 2012d). Data gaps are large in many countries and data often lack granularity. There is a great need to collect better data on various types of activities: (1) the demand of nonbank institutional cash investors for safe, short-term, and liquid assets; (2) collateral intermediation, specifically the ultimate sources and volume of source collateral, and its velocity and the length of collateral chains; and (3) the degree of (under) collateralization of OTC derivative exposures (see also Appendix 1). More information on maturity transformation, leverage, and interconnectedness is sorely needed. Existing data—such as aggregate flows of funds, surveys, hedge fund industry interfaces with dealers via prime brokerage, and financial statements of large institutions, including their footnotes (for pledged collateral)—can document some types of activities to a fuller extent. Nevertheless, a considerable amount of new data collection and the altering of reporting standards are needed to inform financial stability and monetary policy analyses. These may include data on the distribution of corporations' and asset managers' cash balances by size, and more detailed disclosures of exactly what instruments “cash and equivalents” entail.

Continuous monitoring of developments is required. While some risky shadow banking practices are now less frequent, the innovative nature of financial markets means new developments could arise that may pose a source of systemic risk. There is thus a need to collect more and better data on various shadow banking transactions, market participants, financial flows, and interconnections to obtain a full overview and be able respond to any emerging risks. Since many countries' authorities believe they are not legally able to ask for data from unregulated entities, changes to allow for such data collection can often be needed.

A. An Overall View

The shadow banking system is a complex ecosystem. It combines multiple nonbank agents, is linked to traditional banks, and uses the services of dealer banks. The system is described in a simplified way below and in Figure 7. There are two key processes:

- **Securitization chains** (top row of Figure 7), which transform risky assets into safe and liquid claims through the tranching of claims and the use of puts from the main banking system; and
- **Collateral chains** (bottom row), which re-use collateral to reduce counterparty risk between borrowers and lenders. Note that, unlike in one-way securitization chains, here the providers of collateral (hedge funds, real money, and custodians operating on behalf of the pension, insurance, and official sector) are scattered across the financial system.

There are important links with regulated (bank) and semi-regulated (broker-dealer) entities, which commonly (for broker-dealers, always) are SIFIs:

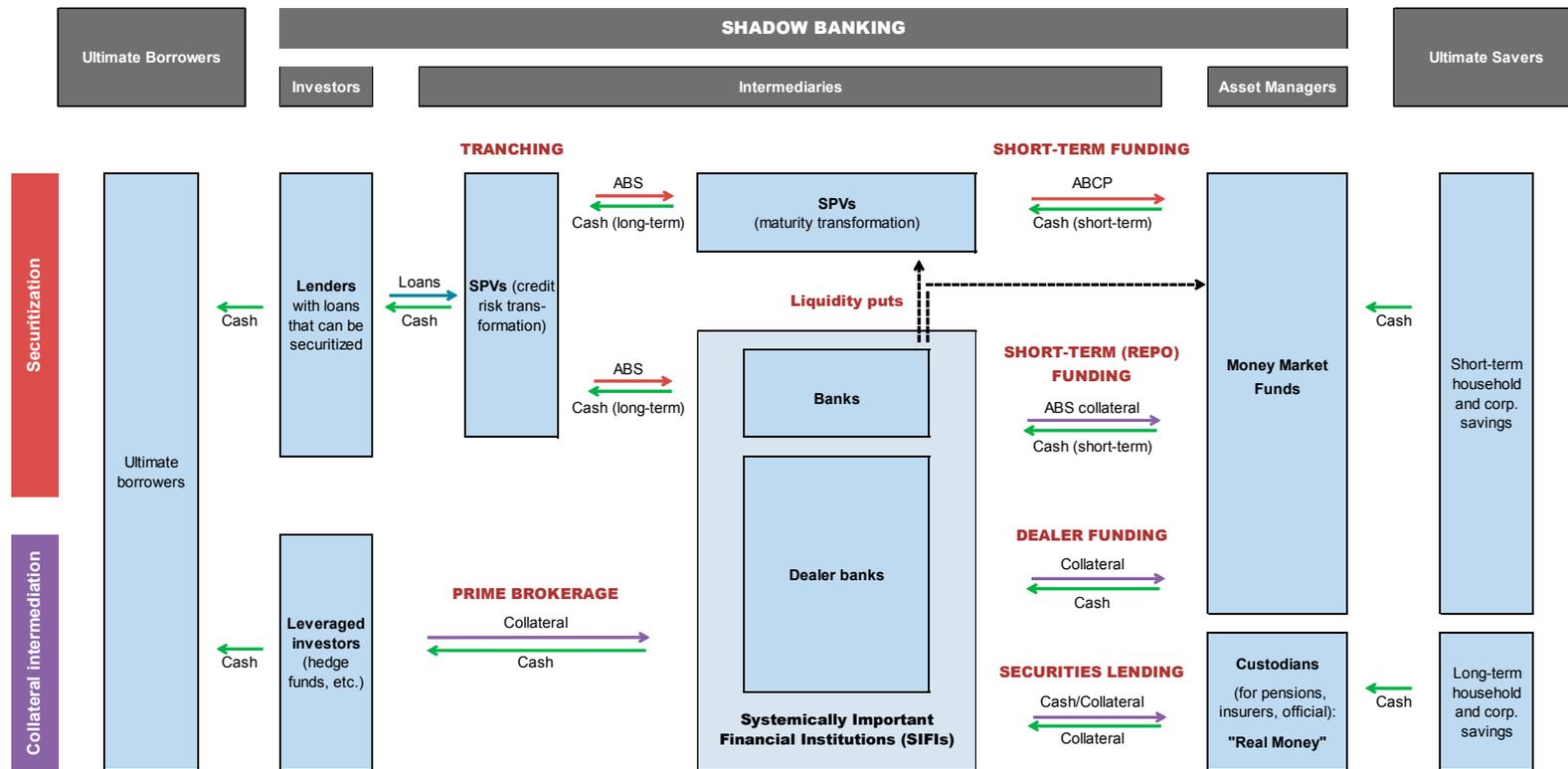
- **Commercial banks**, which are active in securitization chains. They offer explicit and implicit support to SPVs, and also directly invest in safe tranches of securitized debt; and
- **Dealer banks**, which play a central role in intermediating collateral.

The system links ultimate savers and borrowers:

- **Ultimate savers** (right column of Figure 7), which include short-term household and corporate savings and long-term household savings. The shadow banking system liaises with savers through the **asset management complex** (next-to-right column), which includes money funds and real investors (insurance, pension funds);
- **Ultimate borrowers** (left column), which include corporations and households, and associated **investors** (next-to-left column), which include lenders wishing to securitize assets and leveraged investors (primarily hedge funds) that seek to borrow against collateral.

A real-world depiction would be immensely more complex, with numerous more links within and outside (see Pozsar and others, 2010, and Singh, 2011 who describe solely the securitization and collateral intermediation process respectively.) This presentation still highlights key risks.

Figure 7. Financial Intermediation through the Shadow Banking System



Notes: ABS = asset-backed securities; ABCP = asset-backed commercial paper; SPV = special-purpose vehicle

B. A Framework for Policy Response

Understanding the operations and demand factors of the shadow banking system is a necessary starting point for a policy response. To the extent that many shadow banking activities have valid and valuable economic and financial market rationales, regulation should not be so strict so as to remove the positive aspects of shadow banking. However, this does not mean that a policy response is unnecessary, since systemic risk needs to be contained. The FSB has recently articulated an agenda to deal with regulatory weaknesses, spillovers and systemic risk in shadow banking (FSB, 2012c; see further Box 3). We do not aim to assess these proposals, in part since they are under consultation, but they are clearly a step forward.

A key required policy issue will be to address shadow banking activities based on weaknesses in regulations (other papers analyzing regulatory issues include Adrian and Ashcraft, 2012; Kane, 2012; and Gorton and Metrick, 2010). Examples of shadow banking based on regulatory weaknesses before the crisis include the use by banks of affiliated investment vehicles to offload credit risks (and economize on capital charges); credit and liquidity guarantees with too little provisioning; and investments in structured products where capital charges did not reflect underlying risks (Acharya and others, 2009). How to deal with regulatory weaknesses is being addressed by work coordinated by the FSB and others (see Box 3; see also Zhou and others, 2012; Pazarbasioglu and others, 2011; and Ötker-Robe and others, 2011). These ongoing reforms will help reduce the risk of spillovers from the shadow banking system to the main banking system and through it to the public safety net.

Beyond that, the shadow banking activities that have a valid economic rationale require specific regulations to reduce the systemic risk that they may pose. While there are dramatically varying views (Box 4), the most practical path is a macroprudential approach; that is, adopting policy measures that try to correct market failures and externalities arising from shadow banking that can lead to systemic risk. The right policies are not all obvious, however, and at this point, one can only aim to further the debate. There are two sets of issues to be further analyzed and addressed, both highlighting and complementing ongoing reform agendas: better supervision, regulation, and resolution of shadow banking entities; and dealing with mismatches between the demand and supply of safe and liquid assets.

It is also essential to get a grip on the macroeconomic implications of shadow banking. The condition of the shadow banking system affects monetary transmission in normal times and during crises. In crises, disruptions to shadow banking can have significant economic spillovers and may trigger fiscal outlays. The state of the shadow banking system can also affect the transmission of monetary policy. And, similar to how it affects traditional banks, monetary policy can affect risk-taking in the shadow banking sector.

Box 3. The Financial Stability Board Shadow Banking Agenda

The ongoing agenda on the shadow banking system coordinated by the Financial Stability Board (FSB) consists of five work streams:

1. Banks' interactions with shadow banking entities

Areas:

- Consolidation rules for prudential purposes
- Limits on the size and nature of a bank's exposures to shadow banking entities (large exposure regime)
- Risk-based capital requirements for banks' exposures to shadow banking entities
- Treatment of reputational risk and implicit support.

2. Money market funds

Policy options to consider:

- Mandatory move from constant to variable net asset value
- Enhancement of money market fund valuation and pricing framework
- Enhancement of liquidity risk management
- Reduction in the importance of ratings in the money market fund industry.

3. Other shadow banking entities

Steps:

- Develop a priority list of entity types with significant shadow banking risks
- Start developing policy recommendations for the prioritized entity types
- Prepare methodologies for identifying systemically important global nonbank financial institutions.

4. Securitization

Steps:

- Analyze global regulatory and industry initiatives on risk retention, transparency, and standardization
- Identify and assess material differences in regulatory/industry approaches and their impact
- Develop policy recommendations, if needed, to address the material differences identified.

5. Securities lending and repos

Areas:

- Overview of securities lending, leveraged investment fund financing and securities borrowing, inter-dealer repo, and repo financing markets
- Key drivers of the securities lending and repo markets
- Location of markets within the shadow banking system
- Overview of existing regulatory framework
- Financial stability issues: (i) lack of transparency, (ii) procyclicality of system leverage and interconnectedness through valuation, haircuts, and collateral re-use, (iii) other issues associated with re-use of collaterals, (iv) potential risks arising from fire sale of collateral assets; (v) potential risks arising from securities lending activities, (vi) shadow banking through cash collateral reinvestment, and (vii) insufficient rigor in collateral management and valuation.

Source: FSB (2012a); see also FSB (2012b, 2012c).

Box 4. “Polar” Views on Regulating Shadow Banking

One view on regulating shadow banking is that these banks should become, or merge into, traditional banks. The usual argument for merging (or expanding the regulatory perimeter) is that putting all activities in commercial banks will ensure supervisory coverage and help prevent regulatory arbitrage. But merging may come with downsides. Shadow banking is more procyclical (e.g., due to varying margin requirements), risky (because of scalability, low margins, and the ability to take large undiversified exposures), and harder to regulate (because risk profiles of market-based operations can change very rapidly) than traditional banks. Merging can then compromise commercial banks’ stability, including their retail operations. And in practical terms, the idea of merging shadow banking activities into traditional commercial banks goes against the spirit of some current proposals, such as the Volcker rule in the United States and the Liikanen proposal in the European Union, banning or limiting commercial banks from engaging in some trading activities.

Another view is that the shadow banking activities should be separated from traditional banks by severing links and establishing firewalls, and then left relatively unregulated. Rather than extending the regulatory perimeter, this argument calls for a greater distance of the shadow banking system from the commercial banking system, and notably from systemically important financial institutions, in order to reduce the risks of spillovers and limit the moral hazard arising from misuse of the public safety net. This view, however, ignores the fact that it may be impossible to fully separate traditional banking from shadow banking, and it would come with large costs. Commercial banks increasingly rely on hard and tradable claims, with the distinct economic benefits of hedging, diversification, and better availability of funding. And even if direct links were severed (e.g., as in how the Vickers proposal in the United Kingdom aims to separate a bank’s retail operations from its other activities), by virtue of its mere size shadow banking activity could still have macroeconomic and systemic implications, since externalities with adverse real-sector consequences can arise regardless. Also, by moving shadow banking outside the regulatory perimeter, policymakers may have less information on how it is operating.

Another set of models considers explicit limits on the supply of private safe assets. This can take the form of limiting the issuance of private safe assets to regulated firms with special charters (Ricks, 2012) or narrowly funded banks (Gorton and Metrick, 2010). These models are in many ways variants of the separation view. Some other supply approaches have been suggested, such as limits on financial innovations, where new products would have to be vetted by an agency (Fielding, Lo, and Yang, 2010).

C. Regulating Risks within the Shadow Banking System

Some parts of the shadow banking system are fragile and can pose systemic risks, yet commonly lack appropriate supervision and regulation, or procedures for safety net access and resolution. Addressing these issues is urgent, as reflected in the FSB work program. Some important questions—both in policy circles and in the conceptual understanding of risks—are highlighted here.

A pressing need is to develop a comprehensive regulatory approach to dealer banks.

The dealer banks' business model is inherently fragile (Duffie, 2010). They combine high leverage, procyclical businesses, and unstable, uninsured wholesale funding. All 14 major dealer banks are SIFIs. Since the crisis, all dealer banks have had access to central bank liquidity facilities through related commercial banks, even though the depository part can represent as little as 5 percent of the group's overall balance sheet (the highest is 60 percent; see Singh, 2012b). This offers stability of funding, but increases moral hazard, as a dealer bank can shift risky assets to its bank subsidiary. More generally, dealer banks can have incentives and abilities to increase risks in more extreme ways than commercial banks do (it is easier to take tail risks with tradable assets that can generate highly skewed payoffs; see Boot, 2011; and Boot and Ratnovski, 2012). The crisis has made it clear that the regulation and supervision of broker-dealers was not rigorous enough and orderly resolution is a challenge. Yet, a comprehensive framework for regulating broker-dealers that is as well-articulated as the one that exists for banks is lacking.¹³ Thus, systemic risks and puts to the safety net from dealer banks likely persist.

There is also need for progress on money market funds (MMFs). Although smaller than before the financial crisis, the U.S. money fund industry remains systemic and fragile. It offers on par guarantees that cannot, as the crisis has demonstrated, be supported in times of stress when asset values drop, necessitating government support (McCabe, 2011; Rosengren, 2012; Wermers, 2012). Solutions currently being discussed (Squam Lake, 2010a; SEC, 2012; and FSB, 2012c) include lowering the average asset maturity of MMFs, introducing capital requirements, requiring a floating NAV (as is largely the case in Europe), and using two-class claims on assets (one redeemable at par and the other contingent on the NAV). Choices are still to be made. It appears impossible, however, to fully remove risks of MMFs while preserving the system's current size and role for consumers. For example, imposing capital requirements may open the door to relaxing investment standards, make MMFs quasi-banks, and necessitate the need for detailed bank-type regulations. Or, removing the par guarantees (i.e., MMFs becoming a version of mutual funds) may dramatically shrink the system as investors shift funds to bank deposits and elsewhere. Besides, attempts to remove the par guarantees may be ineffective because some of the guarantees are implicit. As such, proposals can dramatically affect the architecture of the MMF industry.

¹³ In the United States, the Dodd-Frank Act gives authorities powers to move a systemically important broker-dealer under the supervision and regulation of the Federal Reserve. This may strengthen supervision by making it more comprehensive, but it does not address how to effectively regulate dealer banks—that is, a broker-dealer that is an integral part of a banking group. (Note that in the United States and elsewhere, while the safety net can extend to the whole SIFI, the broker-dealer operations can dwarf its banking part; for example, deposits of U.S. and EU SIFIs—that is, the bank part—are often less than a third of the overall assets of the SIFI in the bank holding company.) Similarly, while Dodd-Frank enables an orderly liquidation of a dealer bank by the Federal Deposit Insurance Corporation, the precise processes have neither been fully articulated in theory nor tried in practice. At the same time, Dodd-Frank has tightened the rules of lender-of-last-resort support to nonbanks (Tuckman, 2012). Individual firm assistance is no longer available, although broad-based lending programs are still allowed in systemic crises, subject to approval by the Treasury secretary. See Tucker (2012) and the testimony of U.S. Treasury Deputy Assistant Secretary Lance Auer to the House Financial Services Financial Institutions Subcommittee on Implementing Title I of the Dodd-Frank Act: Regulating Systemically Important Nonbank Financial Institutions (www.treasury.gov/press-center/press-releases/Pages/tg1580.aspx).

Finally, progress is needed as well on the tri-party repo market. While essential, current policy initiatives—limiting the duration of intra-day exposures and improving collateral management—do not address the fact that the heavy reliance in the United States on two private clearing banks (Bank of New York and JP Morgan) creates clear systemic risks. In principle, these functions could be transferred to a “market utility,” as is the case in some countries. This would make the two banks less systemic and segregate the risks of tri-party clearing, easing official support if required. More generally, how the tri-party market can be strengthened without compromising its role as a key intermediary between banks and broker-dealers and between mutual and pension funds requires more study.

Conceptually, two very difficult issues are financial innovation and the stability of complex systems. The shadow banking system has many links, internally and between banks and SIFIs, involving complex contractual arrangements and many implicit commitments. The design of financial instruments changes continuously with financial innovation, and the risks involved in holding those new instruments are often not fully understood by potential investors or even by those who design the instruments. A related problem is that complex systems are hard to resolve in times of stress. Recent experiences show how difficult it is to resolve contracts between multiple agents, even when the peak of a crisis is over (restructuring household mortgages in the United States that are securitized, for example, remains complicated due to the many parties involved and the varying incentives in renegotiation). Yet even if one were to decide to limit complexity and financial innovation, methods and policy options would be unclear. Some radical proposals have been made (Fielding, Lo, and Yang, 2010; see also Box 4), but their costs and effectiveness are uncertain. More practical, as reflected in FSB’s agenda, is a macro-prudential approach. That is, to identify market failures and externalities that can lead to systemic risk, and to adopt policy measures that try to correct them.

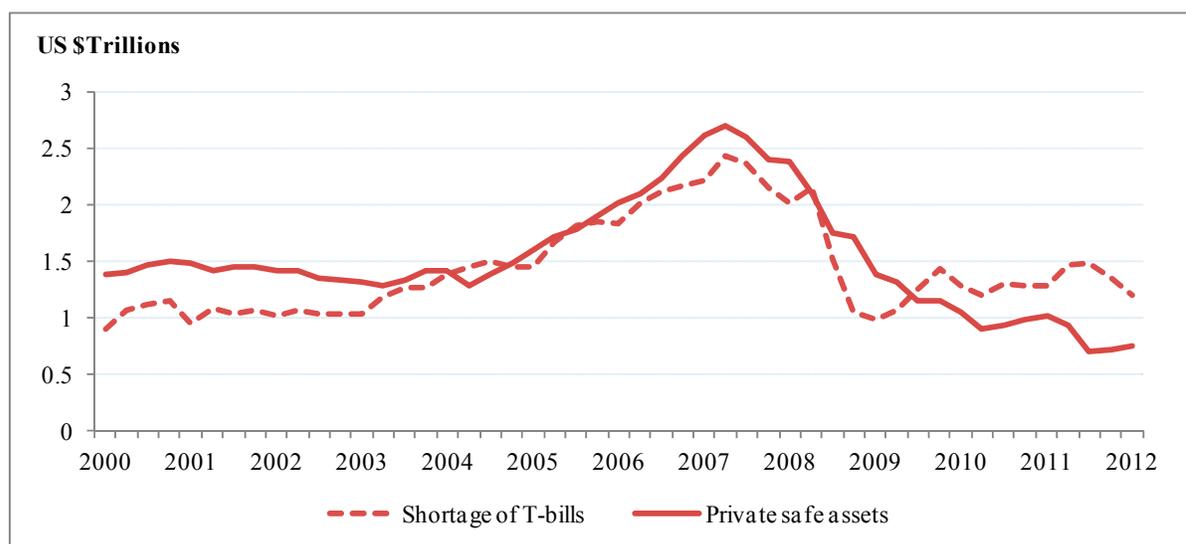
D. Demand-Side Policies

Accommodating cash-pools’ demand for safe, short-term liquid assets in volumes larger than those (inelastically) provided by short-term government debt, and possibly with higher return, has been one raison d’être for the shadow banking system. Such demand was a major force before the crisis behind the expansion of prime money funds and the assets they invested in (asset-backed commercial paper, repos, and cash investors’ related demand for collateral). It also played a large role in shaping the architecture of the tri-party repo market (Tarullo, 2012). The mismatch between the supply and demand for safe assets is only partly resolved by adjustments in relative prices—the rates of return on various types of assets.¹⁴ The reason is that the demand for safe assets (volume of cash pools) and the supply of truly safe assets (short-term government debt) are relatively price-inelastic, which can make the equilibrium price of government-guaranteed safe assets very high (and their yields very low or negative), creating incentives for the system to create private safe assets.

¹⁴ As documented by Duffee (1986) and Greenwood, Hanson, and Stein (2012), investors will pay a “premium,” i.e., accept a lower yield, for some types of T-bills, as they offer a preferred combination of safety and liquidity.

The mismatch then drives incentives to create private safe securities, which in turn can be unstable and pose systemic risk. As Figure 8 shows, the growth in the volume of secured wholesale funding (used against private safe assets) and in the mismatch between the demand and supply of privately provided “safe” assets had an almost one-to-one relationship prior to the crisis. The mismatch peaked at roughly \$2.5 trillion just before the crisis—after it had surged by \$1.5 trillion in the three preceding years—and has fallen since on the back of increased issuance of short-term government guaranteed debt.¹⁵ As long as such excess demand persists, there will be strong economic forces supporting the creation of private sector assets designed to appear safe in most states of the world.

Figure 8. Filling the Vacuum of Short-term Government Guaranteed Debt



Sources: CapitalIQ; Risk Management Association; Investment Company Institute; *The Economist*; U.S. Treasury, Treasury International Capital (TIC) System; and U.S. *Flow of Funds*.

Notes: Shortage of T-bills is calculated by subtracting from the volume of cash pools the volume of short-term, government-guaranteed securities (the sum of T-bills, Treasury notes with a remaining maturity of less than one year, and agency discount notes) not held by foreign official accounts. Private safe assets are the sum of the volume of structured money market instruments and repo-based wholesale funding.

Accordingly, a number of academics and policymakers have advocated correcting the mismatch directly by having the government at times expand the supply of safe, short-term liquid instruments to crowd out those supplied by the shadow banking system (Greenwood, Hanson, and Stein, 2012; Pozsar, 2011, 2012; see also Gorton, Lewellen, and Metrick 2012; Adrian and Shin, 2010; and Turner, 2012; and see Box 4 for other safe asset supply models.) In principle, the government is in a better position than the private sector to issue safe assets thanks to its power to tax. It could eliminate the mismatch by offering more

¹⁵ Given a lack of data, the relationship does not reflect the demand by banks and local government investment pools for safe assets, and may underestimate the volume of institutional cash pools.

short-term debt (“T-bills”). This would reduce demand pressures to create unstable private assets and remove a major source of systemic risk.¹⁶

While directly addressing a core systemic risk issue, adjusting the supply of short-term government debt can come with some challenges, particularly related to debt management. By issuing more short-term paper than other considerations call for, the government would take on some interest rate and operational risks from the private sector. Authorities may have to depart from widely accepted minimal cost rules in debt management. This might not be a major problem, however, if the private sector is more likely to create risky money-type claims when the yield curve is steeper, precisely the case when the issuance of short-term government paper is cheap (Adrian and Shin, 2010).

There may also be other conceptual and practical limitations to the effectiveness of demand-side policies. It is unclear whether it is appropriate for the government to engage in creating financial market assets with the sole purpose of catering to a particular investment clientele. For example, this may create moral hazard in that the private sector may come to expect that the government will accommodate its demand for specific types of assets. In addition, continually assessing the demand-supply balances to avoid safe claims shortages may be complex, since the definition of safe assets is not clear, constantly changing, and can vary internationally. Also, some demand for safe assets is driven by factors other than the investment needs of cash pools. For example, demand-side policies may implicitly subsidize banks’ investments in market-based debt instruments, which would be distortive. Finally, demand-side policies would do little to deal with systemic risks elsewhere in shadow banking, such as in collateral intermediation.

E. Macroeconomic Implications of Shadow Banking

Shadow banking is highly procyclical, which may have adverse real-sector consequences. Procyclicality is endemic to finance, but is especially high in shadow banking, and can have adverse real consequences. Secured lending and repos rely on mark-to-market prices and margins/haircuts that adjust over the financial cycle; in the extreme, some collateral may become unacceptable during periods of turmoil. More generally, investments by financial intermediaries in tradable, mark-to-market assets or the use of such assets as collateral encourage procyclicality in the form of more lax lending in upturns and a risk of fire sales in downturns (Brunnermeier and Pedersen, 2009).¹⁷ And securitization focuses on the “production” of claims that are safe in most states of the world but become risky in others, contributing to tail risks (Gennaioli, Shleifer, and Vishny, 2012a). Also, shadow banking services enable greater financial system interconnectedness, which helps reduce idiosyncratic risk through diversification but also exposes the system to spillovers in the event of large shocks (Acemoglu, Ozdaglar, and Tahbaz-Salei, 2012).

¹⁶ Central banks could also play a role in expanding the supply of safe assets by, for example, issuing central bank bills or extending the right to maintain deposit accounts with the central bank to nonbanks.

¹⁷ See also Adrian and Shin (2010), Boot (2011), Geanakoplos (2010), Gennaioli, Shleifer, and Vishny (2012b), Gorton and Metrick (2012), Gorton and Ordonez (2012), Shin (2012), and De Nicolò, Favara, and Ratnovski (2012).

Procyclicality arises from multiple factors. There are various elements that lead to the procyclicality of shadow banking, including mark-to-market rules, the evolution of margin requirements and lending standards relative to collateral values, and the design of compensation packages. The exact importance of each of these dimensions in leading to procyclicality is unknown. Procyclicality could perhaps be reduced by requiring margins or haircuts for certain classes of assets to have minimums or to be calibrated through the cycle (CGFS, 2010; Valderrama, 2010; Fegatelli 2010; FSB, 2012c). Such provisions could perhaps be implemented in tri-party repo and similar markets where there is a large official role, but will be more difficult in bilateral collateral agreements prevalent in most OTC markets. Furthermore, they can distort the price-setting for pledged collateral. Other reforms to specifically reduce procyclicality in shadow banking are less obvious, however.

Shadow banking is likely to have important interactions with monetary policy. Just as interest rate transmission can be impaired if the banking system is weak, so do the broader channels of monetary policy transmission depend on well-functioning capital markets, including shadow banking. The state of private, safe asset supply and the stock and velocity of collateral can therefore affect monetary policy transmission, with macroeconomic consequences. And monetary policy can affect risk-taking in shadow banking. When the interest rate is low, a steeper yield curve that increases the payoff to maturity transformation and risk-taking can lead shadow banking to expand rapidly, potentially leading to financial fragility (Adrian and Shin, 2010; De Nicolò and others, 2010; Singh and Stella, 2012). As such, the state of shadow banking needs to be considered in monetary policymaking.

And, during crises, shadow banking may require public support, leading to fiscal implications. During and after the 2008 financial crisis, the U.S. Federal Reserve had to support dealer banks (through its Primary Dealer Credit and Term Securities Lending Facilities) and MMFs (through its Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity and Commercial Paper Funding Facilities). The Federal Reserve and the Treasury also had to offer direct support to restructure Bear Stearns and to maintain the viability of AIG. In other countries, banks also had to be supported in part because of their shadow banking operations, sometime at significant costs to taxpayers. While in some cases ultimate fiscal implications were limited, the contingent liabilities and risks of such operations were significant. Unless the systemic risks in shadow banking are addressed, these contingent liabilities will remain in place, with perhaps larger actual costs in future crises.

V. CONCLUSION

Addressing the shadow banking system is a work in progress for regulators and policymakers, and research is yet to catch up fully with the issues. While driven partly by regulatory arbitrage, the shadow banking system performs a number of economically useful functions. However, research has not been able to differentiate the economic drivers of shadow banking from regulatory arbitrage, making policy recommendations more difficult. Regardless, a multifaceted policy response to systemic risks arising from shadow banking is necessary. Such responses, if effective, may make the shadow banking system smaller in size but able to perform its useful economic functions in safer ways. Since not all components of the response are yet clear, more policy-oriented research is needed.

Appendix 1. Over-the-Counter Derivatives: Central Counterparties and Under-Collateralization

Over-the-counter (OTC) derivatives markets straddle regulated systemically important financial institutions and the shadow banking world. Recent regulatory efforts focus on moving OTC derivatives contracts to central counterparties (CCPs). A CCP will be collecting collateral and netting bilateral positions. While CCPs do not have explicit taxpayer backing, they may be supported in times of stress. For example, the U.S. Dodd-Frank Act allows the Federal Reserve to lend to key financial market infrastructures during times of crises. Incentives to move OTC contracts could come from increasing bank capital charges on OTC positions that are not moved to CCP (BCBS, 2012).

The notional value of OTC contracts is about \$600 trillion, but while much cited, that number overstates the still very sizable risks. A better estimate may be based on adding “in-the-money” (or gross positive value) and “out-of-the money” (or gross negative value) derivative positions (to obtain total exposures), further reduced by the “netting” of related positions. Once these are taken into account, the resulting exposures are currently about \$3 trillion, down from \$5 trillion (see table below; see also BIS, 2012, and Singh, 2010).

Another important metric is the under-collateralization of the OTC market. The Bank for International Settlements estimates that the volume of collateral supporting the OTC market is about \$1.8 trillion, thus roughly only half of exposures. Assuming a collateral reuse rate between 2.5-3.0, the dedicated collateral is some \$600 - \$700 billion. Some counterparties (e.g., sovereigns, quasi-sovereigns, large pension funds and insurers, and AAA corporations) are often not required to post collateral. The remaining exposures will have to be collateralized when moved to CCP to avoid creating puts to the safety net. As such, there is likely to an increased demand for collateral worldwide.

Table 1: Under-collateralization in the OTC Derivatives Market

	Gross Market Value							
	H2 2008	H1 2009	H2 2009	H1 2010	H2 2010	H1 2011	H2 2011	H1 2012
GRAND TOTAL	35,281	25,314	21,542	24,673	21,296	19,518	27,285	25,392
A. Foreign exchange contracts	4,084	2,470	2,070	2,524	2,482	2,336	2,555	2,217
B. Interest rate contracts	20,087	15,478	14,020	17,533	14,746	13,244	20,001	19,113
C. Equity-linked contracts	1,112	879	708	706	648	708	679	645
D. Commodity contracts	955	682	545	457	526	471	487	390
E. Credit default swaps	5,116	2,987	1,801	1,666	1,351	1,345	1,586	1,187
F. Unallocated	3,927	2,817	2,398	1,788	1,543	1,414	1,977	1,840
Gross Market Value After Netting	5,005	3,744	3,521	3,578	3,480	2,971	3,912	3,668

Gross market values have been calculated as the sum of the total gross positive market value of contracts and the absolute value of the gross negative market value of contracts with non-reporting counterparties. The values in the red circle are the gross market value after taking into account legally enforceable bilateral netting agreements. Source: BIS surveys.

Source: Bank for International Settlements (BIS 2012, p. 23).

Appendix 2. The Tri-Party Repo Market

A tri-party repo (TPR) operation is an arrangement whereby a clearing bank acts as an intermediary for two repo counterparties. Around 50 to 70 percent of repo operations in the United States are cleared using TPR, with recent volumes approaching \$1.8 trillion, much below the \$3 trillion in 2008.¹⁸ The TPR market is a major source of wholesale funding for banks and dealer banks. The U.S. market is serviced by two clearing banks, Bank of New York and JP Morgan, both determined to be systemic by the Financial Stability Board. Pledged collateral is held with custodians and cannot be replighted. The TPR arrangement has several advantages: outsourcing collateral management to the TPR clearer, saving back-office costs for counterparties, and creating economies of scale, as securities are simply moved from one account to another within the clearer's books. It also allows market participants to exchange collateral baskets, outsource risk management (haircut calculation, margin calls, and substitution), pricing, and other ancillary tasks.

A distinguishing feature of the U.S. TPR market is the daily unwind process. Borrowers want to have access to their pledged securities for routine daily trading purposes. This is enabled by the daily unwind, where at the start of the trading day collateral is returned to borrowers and cash to lenders, even if these were pledged under term transactions. Collateral and cash are then returned back to the clearing bank before close of business. Since borrowers nevertheless have financing needs during the day, a clearing bank can extend them overdrafts as unsecured exposures (although regulators may start demanding collateral on such overdrafts). This means that risks associated with lending are fully transferred twice during a full day: they are with ultimate lenders and secured overnight, and with the clearing bank and unsecured during the day.

The unwind process creates multiple risks. Clearing banks carry large-scale unsecured exposures relative to their capital. Since money is returned to them daily, the lenders see their position as short-term and money-like, even for-term contracts. Given counterparty risk, the arrangement, though, is as inherently vulnerable as other private safe asset arrangements, and indeed only official sector support through the Primary Dealer Credit Facility helped avoid a run during the financial crisis similar to that experienced by prime money market funds.

The unwind process is currently the focus of regulatory response. Current regulatory efforts focus on limiting the duration of intra-day credit by pushing unwind to later in the day and improving intra-day collateral management (Copeland, Marin, and Walker, 2010; Tarullo, 2012). Still the intra-day exposures remain large and operationally difficult to reduce and the systemic importance of this market may preclude an unwinding of Bank of New York and JP Morgan. In continental Europe and the United Kingdom, TPR activity has increased in recent years to roughly €1.1 trillion due to multinational/corporate treasuries keeping money overseas and counterparty risk concerns regarding large banks, with the key agents Euroclear and Clearstream—which do not provide intra-day financing.

¹⁸ The size of the TPR can be compared to the bilateral pledged collateral market used by hedge funds and others. The non-TPR repo market is estimated at about \$750 billion (Singh 2012b), of which about \$500 billion is in the United States. Securities lending is estimated to be about \$800 billion in the United State and about \$200 billion in Europe, according to the Risk Management Association. Hence, the non-TPR market could be about 40 to 50 percent of overall repo activities.

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