

# The Rise and Fall of the Shadow Banking System

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This article provides an overview of the constellation of forces that drove the emergence of the network of highly levered off-balance-sheet vehicles—the shadow banking system—that is at the heart of the credit crisis. Part one of this four-part article presents the evolution of collateralized debt obligations and how they changed from tools to manage credit risk to a source of credit risk in and of themselves. Part two discusses the types of investors who ended up holding subprime exposure through CDOs, and why the promise of risk dispersion through the originate-to-distribute model failed to live up to expectations. Part three defines the shadow banking system, discusses the causes and repercussions of its collapse, and contrasts it with the traditional banking system. An accompanying chart provides an exhaustive view of the institutions, instruments and vehicles that make up the shadow banking system and depicts the asset and funding flows in it. Finally, part four discusses why it might still be too early to call an end to the credit crisis.

**Banking's changed nature.** The traditional model of banking—borrow short, lend long, and hold on to loans as an investment—has been fundamentally reshaped by competition, regulation and innovation. Everything from the types of assets banks hold to how they fund themselves to the sources of their income have changed dramatically. Competition from finance companies and broker-dealers in lending to consumers, corporates and sovereigns; changes in rules governing capital requirements; and innovations in securitization and credit risk transfer have been key facilitators of this

change, and have led to the gradual emergence of the originate-to-distribute model of banking.

The originate-to-distribute model has deeply changed the way credit is intermediated and risk is absorbed in the financial system, as these functions now occur less on bank balance sheets and more in capital markets. Banks no longer hold on to the loans they originate as investments, but instead sell them to broker-dealers, who in turn pool the underlying cash flows and credit risks and, using dedicated securities, distribute them in bespoke concentrations to a range of investors with unique risk appetites. To properly function, the originate-to-distribute model needs liquid money and securities markets to intermediate credit through the daisy chain of asset originators, asset packagers and asset managers.

The originate-to-distribute model and the securitization of credit and its transfer to investors through traded capital market instruments has been part of the financial landscape since the 1970s, when the first mortgage-backed securities were issued. But this model has grown increasingly more complex over the past decade, as securitization expanded to riskier loans and came in increasingly more opaque and less liquid forms such as structured finance collateralized debt obligations. These developments were driven by loose monetary policy and depressed yields in recent years and became most apparent in subprime mortgage lending. Low interest rates created an abundance of credit for borrowers and a scarcity of yield for investors. With the housing boom as the backdrop, exotic mortgages to borrowers with spotty credit histories

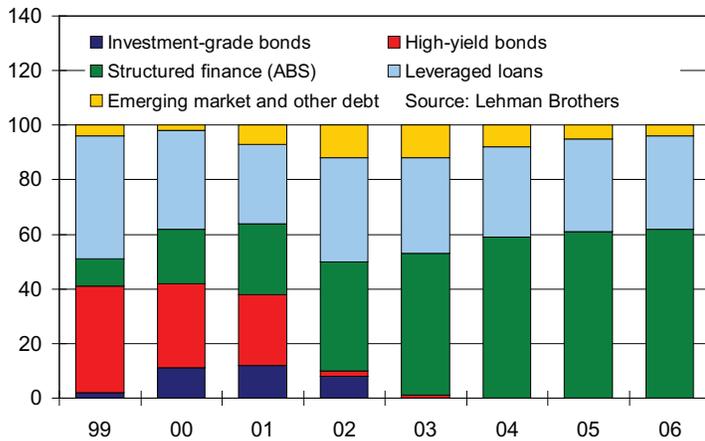
and investors stretched for yield made for a potent mix of inputs for trouble ahead.

**Part I—CDO evolution.** The 1988 Basel Accord was the main catalyst for the growth and development of credit risk transfer instruments. Following the banking crises of the late 1980s, which were triggered by loan defaults by Latin American governments, the accord applied a minimum capital requirement to bank balance sheets and required more capital protection for riskier assets. These rules prompted banks to reconfigure their assets using credit risk transfer instruments such as credit default swaps or CDOs. This was done either by purchasing insurance against credit losses using CDSs (reducing the gross risk of a loan portfolio) or by removing the riskiest (first loss) portions of a loan portfolio using CDOs.

Initially, CDOs were applied to corporate loans. A bank would pool the corporate loans on its books (the assets of a CDO) and carve up the pool's underlying cash flows into tranches with varying risk profiles (the liabilities of a CDO). Payouts from the pool were first paid to the least risky senior tranches, then the mezzanine tranches, and lastly to the most risky equity tranches. Conversely, losses were first allocated to equity tranches, then to the mezzanines, and only then to senior tranches. Correspondingly, equity tranches offered the highest yields and senior tranches the lowest in CDOs' capital structures.

Tranching did not reduce the overall amount of risk associated with the pool. It merely skewed the distribution of risks such that equity tranches ended up with a concentrated dose and senior tranches ended up with diluted ones. In this sense, equity tranches are overleveraged

**Chart 1: ABS CDOs Drive Demand for Loans**  
**Global cash flow/hybrid arbitrage CDO issuance breakdown, %**



instruments, whereas senior tranches are underleveraged instruments, and the leverage of the entire CDO, similar to whole loans and bonds, is one by construction.<sup>1</sup> This pooling and tranching of loans allowed banks to sell credit risk in concentrated forms using equity tranches and to hold on to credit risk in diluted form through senior tranches, allowing them to set aside a much smaller amount of capital than for whole loans.<sup>2</sup>

This initial *raison d'être* of CDOs changed over time. They were no longer used solely to fine-tune the risk profile of a bank's loan portfolios to manage capital requirements (so-called balance sheet CDOs), but also to pool traded whole loans and corporate bonds, earning a spread between the yield offered on these assets and the payment made to various tranches (arbitrage CDOs).

<sup>1</sup> The distribution of risks among tranches is achieved through overcollateralization and subordination. Overcollateralization is achieved by structuring CDOs such that value of the loan pool the CDO invests in exceeds the total principal amount of rated securities issued by the CDO. The size of overcollateralization is by definition equal to the size of the CDO's equity tranche. The secondary form of credit enhancement in CDO structures is subordination. Subordination is the sequential application of losses to the securities, starting with the equity tranche and then moving up the mezzanine, senior and super-senior tranches as discussed above.

<sup>2</sup> Basel II requires a 35% risk weight on residential mortgages, a 20% risk weight on AAA-rated residential MBSs, and a mere 7% risk weight on AAA-rated tranches of ABS CDOs that invest in residential MBSs. The sizes of these risk weights are logical, as individual mortgages are riskier than an MBS that invests in a pool of thousands of individual mortgages. Furthermore, the AAA-rated tranches are protected by overcollateralization and subordination. Similarly, CDOs investing in a diversified pool of MBS tranches have more credit enhancement built in through an extra layer of overcollateralization and subordination. The differences between individual loans, securitized loans and CDOs is explained in more detailed throughout the article.

As the originate-to-distribute model matured, arbitrage CDOs have become an integral part of the credit intermediation process, with their role changing from one of repackaging existing loans and bonds to one of facilitating the creation of new

loans. Through the slicing, dicing and dispersion of credit risk, CDOs enabled the underwriting of some loans—subprime mortgages, for example—that would never have been underwritten had banks been required to hold on to them as investments in the form of whole loans. On the flip side, CDOs also helped expand homeownership to those whose personal finances should have precluded them from buying a home in the first place.

At the very top of the housing and securitization boom, arbitrage CDOs' role further morphed into one in which they became a powerful source of demand for loans in and of themselves, driving the spectacular collapse in underwriting standards that occurred from 2005 to early 2007.

**Wrong assumptions.** The assets that CDOs were investing in have also changed over time. The first generation of arbitrage CDOs was backed by investment-grade corporate loans and bonds. The widening of corporate credit spreads in the wake of the tech bubble and corporate bankruptcies made it easy to structure CDOs, as wide spreads provided sufficient spread income to handsomely compensate the CDOs' originators, investors and managers. However, as the economy began to improve in 2003, corporate spreads narrowed, which made it harder to structure CDOs using investment-grade credit as collateral.

In response, underwriters shifted to new collateral types, such as mortgage-backed securities backed by subprime mortgages, and other asset-

backed securities backed by credit card receivables and auto loans (see Chart 1). CDOs that invested in these new collateral types came to be known as ABS (or structured finance) CDOs. Through the use of riskier classes of debt, ABS CDOs offered fat spread incomes and hence filled the vacuum created by the narrowing of spreads on CDOs that invested in investment-grade corporates.

Before 2004, the market for ABS CDOs was small, and ABS CDOs had a well-diversified pool of assets across the ABS/MBS universe. Over the 2005-2007 period, however, ABS CDOs' underlying portfolios became increasingly concentrated in MBSs referencing subprime mortgage pools. The typical ABS CDO issued during this period invested nearly 70% of its portfolio into subprime MBS according to Moody's Economy.com estimates.<sup>3</sup>

ABS CDOs have one crucial difference from CDOs investing in corporate bonds. Traditional CDOs invest in heterogeneous pools of corporate loans and bonds, spanning a range of names and industries, where diversification offers safety against company and industry idiosyncratic events, while systematic risk is controlled by having a mix of cyclical and countercyclical industries in the pool.

ABS CDOs' risk instead is driven by economy-wide factors such as interest rates, house prices, and the job market. These risks are systematic and cannot be diversified away. However, such a "diversification" was assumed to be present, as ABS CDOs were pooled from loans originated in different states with separate local economies and, apart from the Great Depression, the U.S. never experienced falling house prices or mortgage credit problems in multiple regions at the same time.

Due to the "diversified" nature of these pools, ABS CDOs were expected to perform well in most circumstances, but could suffer steep losses during times of system-wide stress, exposing investors to a "heads you win, tails you loose" risk profile. This high-correlation tail event could be driven by everything from collapsing house prices,

<sup>3</sup> Because ABS CDOs' underlying portfolios became concentrated in subprime MBS, the article henceforth discusses the portfolios and performance of ABS CDOs as if they were entirely made up of and driven by subprime mortgages.

payment shocks from ARM resets, or deteriorating underwriting standards. In fact, it is the combination of all of these factors that undid the low-correlation assumptions, which were instrumental to the economics behind the structuring of ABS CDOs.

**Collapsing standards.** Growth in the volume of CDOs outstanding was especially strong during 2005 and 2006. The CDO market kept on growing as their tranches offered fatter yields than comparably rated sovereign or corporate securities, which was a sure sell to investors such as pension funds that were struggling to match their fixed obligations with low-yielding government and corporate bonds. Meanwhile, broker-dealers earned hefty fee incomes for originating and managing CDOs and trading their tranches. Demand for CDOs was so strong, in fact, that they ended up driving demand for underlying mortgages in and of themselves. Due to this demand, prices of MBSs and mortgage loans remained extremely buoyant, cheating investors into a false sense of security as underwriting standards were collapsing.

As the prices of underlying MBSs/ mortgages rose and their yields fell correspondingly, some broker-dealers decided to outright purchase mortgage lenders so that they would have direct access to the loans and would avoid paying inflated market prices for them and avoid paying fees to middlemen—this was one avenue through which the roles of banks, finance companies and broker-dealers as credit intermediaries have been converging over time. Shrinking yield dynamics were similar to those that occurred in 2003 that made the construction of CDOs from corporate loans less feasible and led to the increased use of ABSs to structure CDOs.

The purchase of wholesale loan originators and finance companies by broker-dealers also meant that the

origination standards of the loans that the CDOs were investing in became increasingly driven by dealmakers' order books for CDOs and less by the credit views of the firms (in-house or independent) that originated them. Underwriting standards deteriorated through risk-layering, where lenders offered nontraditional mortgages to risky borrowers with extremely weak credit controls, such as high combined loan-to-value ratios, reduced documentation, and no down payment.

Demand for CDOs got to the point that there were simply not enough cash securities to fulfill demand.<sup>4</sup> This is when CDO managers and underwriters started to increasingly use credit default swaps referencing MBSs to create so-called synthetic CDOs. Synthetic CDOs are designed such that the portfolio of the CDSs they invest in mimic the performance and cash flow pattern of the MBSs that the CDSs reference. Because they are synthetic replicas of MBS securities and their performance, synthetic CDOs magnify the amount of leverage and credit risks in the financial system, and exponentially so, as the mortgage pools the CDSs in synthetic CDO portfolios primarily referenced mortgages that were originated during a period when underwriting standards were at their weakest. According to Federal Reserve estimates, the system-wide exposure to subprime mortgages through ABS CDOs referencing BBB-rated subprime MBS was 60% more than BBB-rated subprime MBS issuance in 2005, suggesting that synthetic CDOs issued that year added that much more subprime exposure to the financial system over and

above what was already present in the form of cash securities. The comparable figure is 93% for 2006.

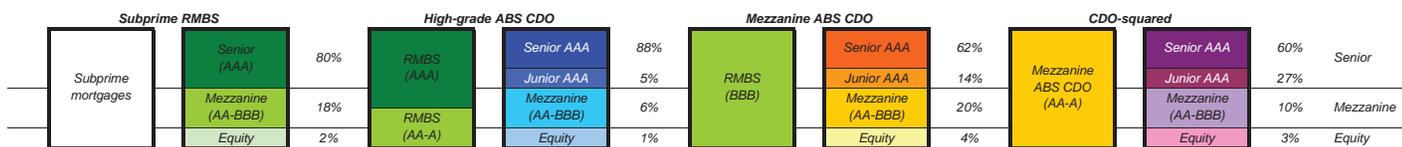
As underwriting standards were collapsing and yields on the underlying cash securities were getting compressed, it became increasingly difficult for underwriters to offer attractive yields on senior tranches. This pushed broker-dealers to use ever more risky assets as collateral. Riskier collateral, however, made it more difficult to secure AAA ratings on senior tranches. Broker-dealers found a solution by wrapping super-senior tranches with cheap insurance from monoline insurers. Insurance in the form of CDS contracts was cheap, as the financial system was swimming in massive amounts of CDS protection written as a byproduct of synthetic CDO issuance. Cheap insurance was good for protection buyers, but proved disastrous for protection sellers, who were grossly under compensated for the risks they took on. Similar to the synthetic CDO investors, monoline insurers got exposed to the worst loan vintages when deciding to wrap AAA tranches.

**Matryoshka CDolls.** ABS CDOs were sold to investors in various forms and flavors. Their recent crop can be divided into two groups based on the quality of the CDOs' collateral—high-grade ABS CDOs and mezzanine ABS CDOs. Both types were primarily investing in subprime MBS, with a minority of their portfolios invested in other MBS/ABS and tranches of other CDOs. High-grade CDOs resecuritized MBS and CDO tranches rated AAA through A, while mezzanine CDOs resecuritized MBS and CDO tranches rated BBB (see Table 1).

Demand was strongest for the extreme ends of CDO capital structures (AAA tranches offered safety, or so investors believed, and above-market yields, while equity tranches offered lots

<sup>4</sup> Cash securities refer to individual mortgages and MBSs backed by pools of mortgages. The cash flows of individual mortgages and MBSs are coming from the monthly interest and principal payments of homeowners. Cash securities also include ABS backed by pools of auto loans, credit card receivables, and student loans.

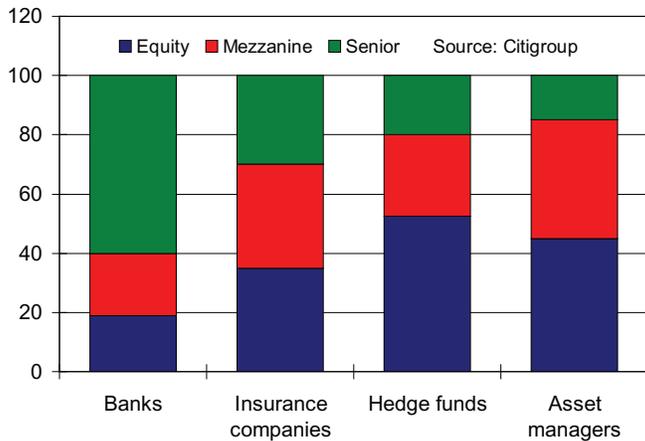
**Table 1: Matryoshka CDolls**  
% values refer to tranches' share of a structure's capital structure



Unrated equity tranches provide overcollateralization. Overcollateralization means a structure holding more assets than the value of its rated tranches (AAA-BBB). Equity tranches get thicker and senior tranches get thinner as the quality of underlying collateral used to structure a CDO weakens.

Source: IMF, Moody's Economy.com

**Chart 2: Breakdown of CDO Holdings by Tranche %, as of the first half of 2007**



of risk, but also abundant return), with demand for the remaining tranches relatively lukewarm. The AA, A and BBB tranches that banks could not sell were recycled into yet another CDO—a CDO-squared—with the usual capital structure of super-senior and lower-rated tranches and an equity cushion providing overcollateralization.

At the very top of the securitization boom, some broker-dealers issued CDO-cubeds, which were CDOs investing in the recycled tranches of CDO-squareds—CDO-cubeds were CDOs of CDOs of CDOs. The sole purpose of CDOs of higher power was to recycle CDO tranches that could not be sold as they were unattractive on a stand-alone basis.

**Part II—No risk dispersion.**

The main benefit of credit risk transfer instruments is that through the tranching of risk, they help ensure that those most willing and able to bear risk end up bearing it. Through the spreading of this risk across thousands of investors worldwide, no participant in the financial system was supposed to have an excessive exposure to risk. This enhanced the overall stability of the global financial system, so the argument went.

Indeed, the losses associated with mezzanine and equity tranches did end up being well-diversified. A large number of financial institutions worldwide have disclosed manageable losses from mezzanine exposures, and based on the dearth of headlines, equity investors, who do not typically break out CDO losses in their trading

results, presumably managed to absorb or hedge these exposures without a material impact on their operations.

In contrast, however, senior exposures did not end up dispersed at all, as they stayed with a small group of banks and monoline insurers (see Chart 2).

Monoline insurers have been providing traditional financial guarantees on municipal bonds, MBSs and ABSs for decades, and have primarily been guaranteeing securities that were investment-grade on a stand-alone basis. In recent years, monolines got into the business of insuring senior tranches of CDOs as well. Financial guarantors have written about \$125 billion worth of insurance in the form of CDSs referencing ABS CDOs according to the Bank for International Settlements.

Banks' exposure was more opaque, as their super-senior investments were predominantly held in off-balance-sheet structured investment vehicles, avoiding the radar of regulators and even investors. SIVs were leveraged entities, typically borrowing \$15 for each dollar of equity.

In addition to senior CDO tranches, banks also became exposed to subprime risks through their massive securitization pipelines. The very first ABS CDO deals were underwritten first by lining up investors and only then buying the collateral to structure the deal. As such, underwriters were only exposed to the risks of the CDO for the brief period that it took to assemble the CDO and place it with the investors who ordered them. However, as the CDO business grew, banks began to build up massive warehouses of mortgage loans (some even bought smaller mortgage lenders to serve as feeders for their booming CDO business), to make sure they had raw collateral for future deals. These warehoused exposures were also stored off balance sheets, in so-called conduits.

Similar to SIVs, conduits were treated as ongoing entities by sponsoring

banks, and could grow as they wished by issuing more debt. Unlike SIVs, however, which invested in structured credits, conduits held whole loans and receivables awaiting securitization. Thus, conduits were not an investment vehicle, but a part of banks' securitization pipelines. At their peak, conduits and SIVs held \$1.4 trillion and \$400 billion worth of assets, respectively, according to the IMF.

By design, these off-balance-sheet vehicles were motivated by regulatory and tax arbitrage, and allowed banks to reduce the capital associated with their super-senior investments, thereby supercharging their returns on book equity. Their growth was to a large extent motivated by the 1988 Basel Accord, which required more capital protection against riskier assets, and as such, encouraged banks to shift risky activities off their balance sheet, hiding them from regulators' and investors' scrutiny. Indeed, before the subprime financial crisis, few market participants knew that SIVs even existed.

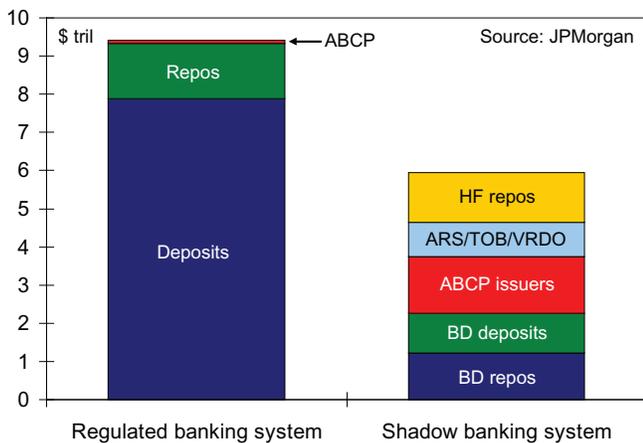
While growing securitization pipelines represented a growing exposure to subprime mortgages, their downsizing on prudential grounds and leaning against competition was nearly impossible, as rationalizing a pullback from the hottest, most profitable business around would have been hard to explain to shareholders. To paraphrase Citigroup's former CEO, Charles Price, as long as the music was playing, banks pretty much had to play along.

To play as safe as possible, some banks hedged their pipelines, but these hedges did not turn out to be as effective as assumed at their inception. Hedges using the ABX<sup>5</sup> index were not perfect because of basis risks<sup>6</sup>, and some proxy

<sup>5</sup> The ABX is an index derived from the price of credit default swaps referencing subprime MBSs. When concerns about the quality of subprime mortgages rise, the cost of insuring against a default on these securities rises, and the ABX falls. Shorting the ABX is a bet that defaults on subprime mortgages will rise and that the price of subprime MBSs will fall. A broker-dealer with significant subprime exposure in its securitization pipeline would short the ABX index to protect itself from the falling price of subprime mortgages. The ABX index was also used by speculators, betting on a deterioration of the performance of subprime mortgages.

<sup>6</sup> The risk is that offsetting investments in a hedging strategy will not experience price changes in entirely opposite directions from each other. This imperfect correlation between the two investments creates the potential for excess gains or losses in a hedging strategy.

**Chart 3: Nonbanks Start to Behave Like Banks**  
**Maturity transformation as of 2007Q2**



hedges were completely off. One bank, for example, reportedly took out short positions on emerging markets that it thought would retreat if subprime valuations collapsed. In fact, those asset classes rallied, further compounding the bank's losses. Credit protection purchased from monolines was also far from perfect and became most unreliable when they were needed the most.

**Part III—Shadow banking system.**

The accumulation of massive amounts of senior and super-senior CDO tranches in SIVs and the buildup of enormous securitization pipelines through conduits formed a network of highly levered off-balance-sheet vehicles that constituted a shadow banking system. This part of the article defines the shadow banking system, discusses the causes and repercussions of its collapse, and contrasts it with the traditional banking system. An accompanying map provides an exhaustive view of the institutions, instruments and vehicles that make up the shadow banking system and depicts the asset and funding flows in it (see Chart 4).

Different investors fund their investments differently. Insurance companies and pension funds use no leverage when making investments in order to juice returns, and they fund their long-term investments with funds that are committed to them for the long term. In contrast, both SIVs and conduits funded their assets with highly leveraged structures. SIVs were typically 15 times levered, whereas conduits' holdings were 100% debt-financed—essentially being levered through infinity.

More importantly, SIVs and conduits relied on short-term financing in the asset-backed commercial paper market to invest in long-term assets. In this way, they were exposed to the classic maturity mismatch typical of banks.

By borrowing short and lending long, conduits and SIVs were involved in the classic bank business of maturity

transformation. In this sense, conduits and SIVs were an alternative form of traditional banking, the crucial difference being that these alternative banks were not funded by depositors, but by investors in the wholesale funding market and that maturity transformation did not occur on bank balance sheets but through capital markets in off-balance-sheet vehicles outside the purview of regulators (and also investors, as prior to the crisis only a few market participants had heard of SIVs). Another crucial difference was that the safety net that is available to regulated banks (the option to borrow at the Fed's discount window and FDIC insurance to keep depositors from running) were unavailable for the shadow banking system of SIVs and conduits, and no alternatives existed.

Conduits and SIVs were not the only entities whose lifeline was the ABCP (wholesale funding) market. Other entities included finance companies such as Countrywide and Thornburg Mortgage in the U.S., and Northern Rock in the U.K. By borrowing short in ABCP markets to underwrite loans that they then sold to broker-dealers for securitization, these institutions were essentially asset feeders for the shadow banking system.

In fact, any investor investing in long-term credit products using short-term funding formed a part of the shadow banking system. Such maturity transformations include hedge funds and broker-dealers funding investments in credit products in the repo market, as well as auction rate securities, variable rate demand obligations, and tender-option

bonds.<sup>7</sup> Together with the funding of finance companies' operations and the holdings of conduits and SIVs in the ABCP market, \$6 trillion worth of credit was intermediated through the shadow banking system as of the second quarter of 2007 according to JPMorgan estimates, compared with the \$10 trillion intermediated through regulated banks funded primarily by deposits (see Chart 3).<sup>8</sup>

Stepping back for a moment, it is interesting to compare the traditional model of banking with the originate-to-distribute model. Under the traditional model, short-term funding and long-term lending occurred on banks' balance sheets—under one roof, so to speak—and loans were held on to as investments; loan portfolios were kept diversified and those systemic risks that were impossible to diversify away were hedged by building up reserves of liquid and safe assets to be used as cushions during bad times.

Contrast this to the new model where loans are sold after they are originated, and then are securitized into ABSs; ABS tranches are resecuritized into CDOs, which might even be resecuritized further into other CDOs; and the senior tranches of CDOs (themselves long-term credit instruments) are held by banks as investments in off-balance-sheet SIVs, which rely on short-term funding in the ABCP market, where the bulk of funds were provided by money market funds—the modern day equivalents of bank deposits. Thus, credit intermediation still means borrowing short and lending long, even in the originate-to-distribute model (see Chart 4).<sup>9</sup>

Moreover, while the originate-to-distribute model allowed for credit risk to be sliced, diced and dispersed, it did not eliminate credit risk itself, and at each step of the process, a myriad of

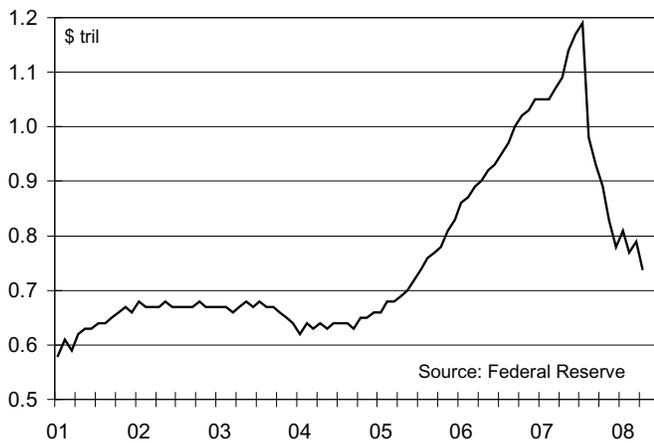
<sup>7</sup> Tender option bonds are synthetic short-term floating rate tax exempt bonds. They are "synthetic" because they combine highly rated long-term municipal bonds with an interest rate swap, thereby creating a floating rate municipal bond portfolio. This portfolio is financed by a two-tier debt structure, involving highly rated short-term floating rate securities (the TOBs) and a smaller piece of junior debt. Variable rate demand obligations differ from TOBs only in that the latter is structured as an off-balance-sheet special purpose vehicle, whereas the latter is not. Auction rate securities are another form of floating rate municipal securities with a coupon that is set every seven, 28 or 35 days in a Dutch auction process.

<sup>8</sup> Margaret Cannella and Jan Loeys. "How will the crisis change markets?" JPMorgan. April 14, 2008.

<sup>9</sup> A guide to how to read the map is available upon request.



**Chart 5: The Rise and Fall of the Shadow Banking System**  
**Asset-backed commercial paper outstanding**



other risks emerged, which have probably increased risks in the financial system on an aggregate level. These risks include liquidity risk (inability to roll over ABCP), basis risk (on hedges using the ABX index to protect against subprime exposure), risks inherent in proxy hedging, and concentration/wrong-way counterparty risks with regard to monoline insurers, whose ability to perform turned out to be the weakest when they were needed most. Moreover, because the complexity of ABS CDOs and the originate-to-distribute model itself made it so hard to dissect what was happening and what will happen next during the crisis, the model also comes with a heavy dose of what one could call complexity risk.

Similar to regulated banks that need to be able to continuously roll over their deposits to be able to fund their loans and provide liquidity to those who needed it, the shadow banking system needed to be able to continuously roll over its ABCP debt to perform the same functions. Banks' ability to continuously roll over their deposits stemmed from their reputations as prudent risk takers and the quality of the whole loans they carried on their books. The shadow banking system's ability to roll over ABCP depended on the quality of the structured credit products and warehoused loans it held; any sign of trouble with their assets could trigger ABCP investors (their "depositors") to dump and refuse to roll over their debt, and a run on the shadow banking system would ensue.

Such a run was triggered by rising delinquencies on subprime mortgages and the associated decay in the value of RMBS

on the shadow banking system. Conduits that held risky mortgages awaiting securitization also were denied funding, as were finance companies such as Countrywide and Thornburg Mortgage whose lifeline was the ABCP market. Finance companies' troubles were further exacerbated by the fact that they were stuck with mortgages for which demand evaporated as the performance of earlier vintages deteriorated rapidly. Unable to get funding and to recycle into cash the mortgages they originated, finance companies' lifelines were cut off and they came dangerously close to bankruptcy, with Northern Rock succumbing.

The increase in system-wide leverage that made deleveraging during the crisis so painful did not build up in the hedge fund universe (the concern *du jour* prior to the credit crisis) or the regulated banking system, but in the short-term ABCP markets that were the lifeline of the shadow banking system. Indeed, regulated banks' capital ratios were quite stable through just before the subprime crisis, but have fallen significantly since. Capital ratios fell as funding from the ABCP market dried up and the shadow banking system outright "collapsed" onto the regulated banking system and all the credit risk that was shoved off to off-balance-sheet vehicles during the previous decades became reintermediated onto regulated banks' balance sheets through the liquidity backstops provided to conduits and the reputational risks associated with SIVs. The forced reintermediation of these credits led to an involuntary expansion of bank balance sheets at a time when mark-to-market losses on reintermediated assets

that held these mortgages (see Chart 5). The falling value of subprime RMBS trickled through to the value of CDOs that referenced them. Investors who held these CDOs such as SIVs and the imploded hedge funds at UBS and Bear Stearns were denied short-term funding in the ABCP and repo markets, respectively, triggering the run

were eating away at bank capital. These developments pushed bank capital ratios lower and forced banks to pull back on discretionary lending.

To date, the pullback on discretionary lending was most obvious in the interbank market where spreads remain elevated, and among hedge funds and private equity funds who now have to operate in a world where leverage is more expensive and also harder to come by from banks than before. For hedge funds, the pullback in discretionary lending also came in the form of increased margins on borrowed securities and haircuts on securities pledged as collateral when borrowing short-term funds. Increased margins and haircuts were the primary drivers of deleveraging in the financial system and contagion across asset classes.

A pullback in discretionary lending to the real economy is also evident in the drying up of the issuance of commercial mortgage-backed securities, and the virtual disappearance of the nonconforming mortgage market and lending against home equity. The possibility that this pullback will spread to other loan types as their credit quality weakens in tandem with the economy, together with the tightening in loan underwriting standards across all loan types, is a downside risk to the economy that could keep growth well below potential once the near-term technical positives of the rebate checks and lean inventories fade going into 2009.

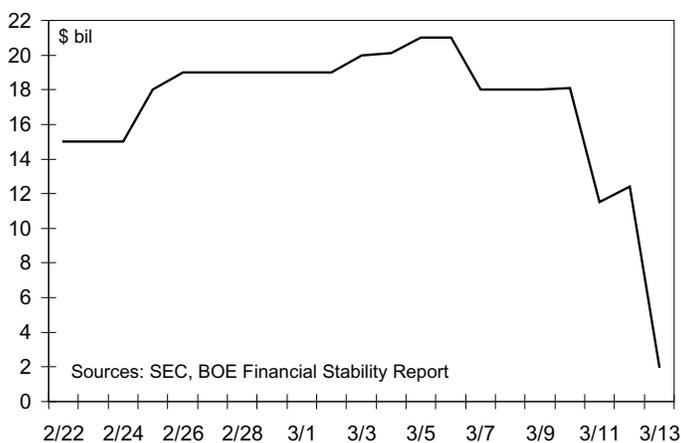
Three lessons from the crisis are abundantly clear. First, as the associated write-downs to the tune of close to \$450 billion<sup>10</sup> and subsequent rounds of capital raising illustrate, through the originate-to-distribute model the regulated banking system created far more credit and offered far more liquidity guarantees than what their capital bases were able to support. With only about \$350 billion<sup>11</sup> in capital raised to date, the banking system maintains a capital deficit compared with pre-crisis levels. Less bank capital and a more careful handling of leverage raise the risk that the reduced availability of credit will hold back the economy's rebound from the currently unfolding recession.

Second, the originate-to-distribute model and the strong demand for and

<sup>10</sup> Write-down league table, FT.com.

<sup>11</sup> GFSR Market Update, July 28, 2008, IMF.

**Chart 6: The Run on Bear Stearns**  
**Bear Stearns' liquidity pool, daily from 2/22 to 3/13**



from CDOs also enabled and encouraged the underwriting of some loans (subprime mortgages and leveraged loans) that would never have been made if banks had to hold on to them as whole loans.

Third, the originate-to-distribute model empowered credit markets to grow very large in size and significance relative to regulated banks in the credit intermediation process, but without access to a safety net that was available for regulated banks in times of stress. This safety net vacuum caused the demise of Carlyle Capital and Bear Stearns in March 2008 (see Chart 6), which eventually prompted the Fed to create the Term Securities Lending Facility and the Primary Dealer Credit Facility.

**Part IV—The beginning of the end.** With the financial crisis over a year old, hopes that the worst is already past are rising. It is important to note, however, that there are historical precedents for aftershocks following financial crises with lags as long as 12 months. Securitized taxi cab loans in Thailand were one trigger of the Asian financial crisis,<sup>12</sup> leading to a series of currency devaluations in Southeast Asia in August 1997, followed by a global recession. The recession led to a collapse in crude oil prices, which in turn led to falling tax revenues in Russia and the subsequent Russian debt default; this, in turn, triggered the Long-Term Capital Management crisis in August 1998. The link between the Asian financial crisis

<sup>12</sup> Jamie Dimon, CEO, JPMorgan Chase, panel discussion on Systemic Financial Risk at the 2008 World Economic Forum in Davos.

and its aftershocks—the Russian debt default and the LTCM crisis—was the real economy.

Similarly, the currently unfolding recession in the U.S. is a threat to the performance of leveraged loans and a slew of other types of credit, from nonmortgage consumer credit

to commercial mortgages and land development loans. Just as it took one year to get from the Asian crisis to the LTCM crisis, credit aftershocks could occur this summer and into 2009.

Some caveats are in order, however. Credit losses from commercial mortgages and land development loans will be smaller and easier to absorb than losses on subprime exposures because (individually) their outstanding volume is smaller than that of subprime mortgages, and because their underwriting standards never collapsed as much as those on subprime mortgages. Further, because these loans are far less often securitized than subprime mortgages, associated losses will primarily be borne by the balance sheets of thousands of smaller commercial banks, savings institutions and credit unions, as opposed to capital market participants.

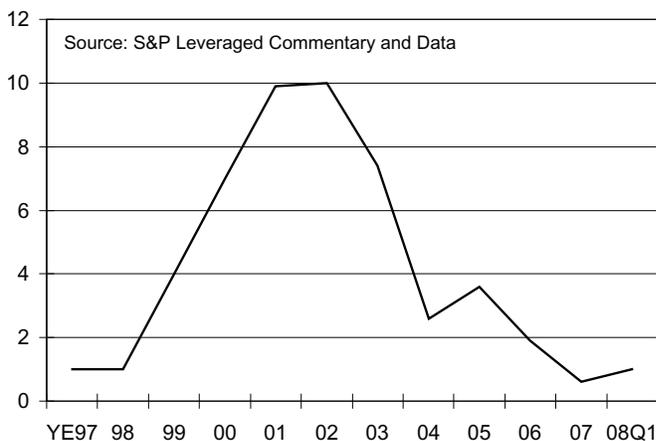
In contrast, leveraged loans and credit default swaps associated with firms that were taken private at the height of the private equity boom could haunt broker-dealers and hedge funds as the economy weakens. While default rates on leveraged loans are still near historic lows, these indicators do not necessarily

reflect strong performance, but rather lax covenants (see Chart 7). Problems with leveraged loans and associated privately held firms will surface this year and next as the economy slows further, revenues weaken, and high leverage multiples create problems. This could lead to bankruptcies and layoffs in a wide range of non-housing related industries (housing-related industries have been the main source of layoffs to date), which could potentially exacerbate consumer credit woes over and beyond what is expected today. Concerns involving leveraged loans can be placed into four groups.

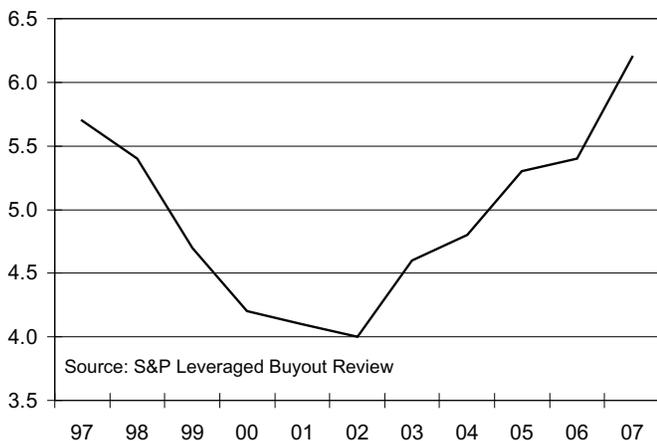
First, similar to what has happened in the subprime mortgage space, there has also been an increase in risk layering in the leveraged loan space in recent years. High loan-to-value ratios, interest-only and negative amortization loans, cash-out refinancings and home equity loans, zero down mortgages, and excessive house price gains all have their equivalents in the leveraged loan space, taking the forms of high debt-to-EBITDA multiples, covenant-lite and payment-in-kind toggle notes,<sup>13</sup> dividend recapitalizations, equity

<sup>13</sup> Covenant-lite loans came with an option to stop paying cash interest if companies ran into cash flow problems. Payment-in-kind toggle notes, also known as piks, give companies the option to pay interest either in cash or in kind by issuing investors more notes over a given period. The ability to suspend interest payments—a drain on cash flows—was a significant factor in the willingness of private equity firms to buy companies in cyclical industries, because it gives them time to ride out an economic downturn. Covenant-lite loans and piks are symptoms of the relaxation of lending standards during the private equity boom.

**Chart 7: A False Sense of Security**  
**% of outstanding leveraged loans in default or bankruptcy**



**Chart 8: Leverage Levels Got to Historical Highs**  
Average large LBO leverage multiples, debt/EBITDA



bridge loans, and purchase multiple expansions, respectively (see Chart 8).

Second, arguments that the covenant-lite and payment-in-kind loans should allow firms to sail through the economy's rough patch miss the importance of trade creditors. Thus, while it is true that weaker covenants mean that bank creditors can no longer exert discipline over borrowers, the firms that make up the borrowers' supply chain still can. Suppliers' refusal to extend trade credit, or difficulties in obtaining short-term funding in the commercial paper market, can also push firms into bankruptcy. Indeed, several firms in the retail sector that were taken private (Linens 'n Things, for example) have already filed for bankruptcy, and several more are struggling. Others are exercising their options not to pay interest on their debt, suggesting that they are facing cash flow problems.

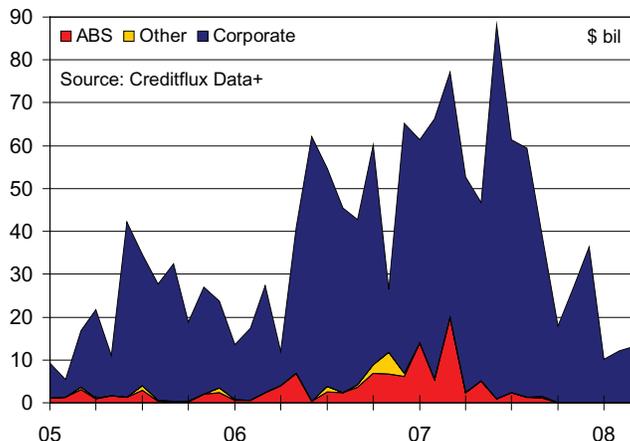
Third, the flip side of delayed bankruptcies is that firms are bleeding cash for a longer time than usual,

potentially reducing recovery rates and the chances of successful emergence from bankruptcy. This, indeed, is a major downside risk for the real economy.

Fourth, according to the IMF, over \$600 billion in leveraged loans are set to mature from 2008 to 2010, posing significant refinancing risks. The terms of the refinanced loans will be significantly stricter and their sizes smaller because of recent bank losses; this could spell trouble for deals that only looked attractive when credit was abundant and loan terms lax. Maturity on leveraged loans is so short because most private equity funds intended to keep their investments private for only a few years, and then exit them via an initial public offering into a buoyant market.

Coming corporate bankruptcies as the downturn takes hold also will test the CDS market (see Chart 9). Investors have hedged and spread around much

**Chart 9: Synthetic CDOs Mainly Reference Corporates...**  
Global synthetic CDO issuance



of the corporate credit risk through CDSs. Moreover, CDSs on debt involving firms that have gone private have grown exponentially in recent years. The currently unfolding

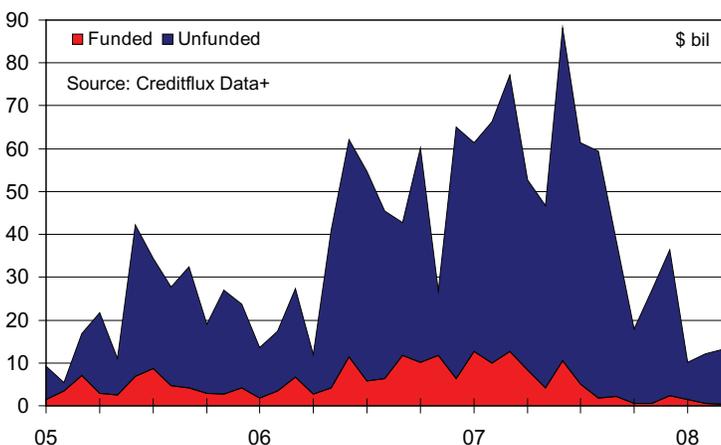
recession will be the first true test of CDSs as a whole. Since a vast majority of CDSs are unfunded—that is, they are not backed by collateral that eliminates the risk that a counterparty will be unable to meet its obligations—they represent a fault line in the financial system similar to the way subprime ARMs did prior to their resets (see Chart 10).

Problems could develop if the recession is deeper and longer than expected, and if firms with significant amounts of debt outstanding and associated CDSs default. That the deepest housing recession since the Great Depression would pass without the bankruptcy of a major homebuilder, or that a larger, cyclically sensitive business that was taken private in recent years under a saddle of debt would survive the recession unharmed, is increasingly unlikely.

Such credit events could cause serious payment shocks to investors who have written unfunded protection for such events, as well as hedge shocks for those who purchased unfunded protection for the same events. While CDSs on financial institutions' debt have been receding lately, interbank rates remain elevated and banks keep hoarding massive amounts of cash. One reason for caution and the buildup of cash reserves could be to guard against payment and hedge risks on CDSs.

To paraphrase Churchill, in conclusion, now this is not the end, but it is, perhaps, the beginning of the end. As the economy slides further into recession and risks remain that the recovery will be hindered by reduced credit availability in the banking system, there is plenty of bad news that could potentially roll in.

**Chart 10: ...And Only a Minority Have Real Money Behind Them**  
Global synthetic CDO issuance



# Appendix:

## A Map of the Shadow Banking System

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The map of the financial system presented in *The Rise and Fall of the Shadow Banking System* tracks the creation, securitization and dissemination of credit risk only. It does not track the flow of corporate equities or the securitization of conforming mortgages by the GSEs. This appendix explains the map in six steps. First the institutions and instruments involved in creating loans and securities are discussed. Second the flows of these securities within the shadow banking system is presented. Third, the institutions investing in these securities is discussed. Fourth, the way these investments are financed is discussed and the run on the shadow banking system is traced. Fifth, the capital and liquidity injections into the financial system and steps taken to avoid a systemic meltdown are discussed.

**Risk originators.** In the originate-to-distribute model, loans are sold and pooled with thousands of other loans. Using structured credit instruments (ABSs and CDOs, broadly speaking), the underlying cash flows and credit risks of loan pools are tranching, and then distributed in bespoke concentrations to a broad group of investors with unique risk appetites. To properly function, the originate-to-distribute model needs liquid money and securities markets at all times to intermediate credit through the daisy chain of asset originators (finance companies and commercial banks), asset packagers (broker-dealers and some hedge funds) and asset managers (hedge funds, SIVs, pension funds and insurance companies).

Three types of institutions feed the originate-to-distribute model with loans. These are finance companies, commercial banks and broker-dealers. The dotted lines linking these loan originators with loan types indicate what type of lending these institutions are primarily engaged in. Thus, finance companies originate mortgages, auto loans, credit card loans and student loans. Examples of such firms include(ed)

New Century Financial, Thornburg Mortgage, Capital One and GMAC.

In addition to the above loan types, commercial banks also originate commercial mortgages and corporate loans. Corporate loans include commercial and industrial loans, loans to finance companies, land development loans, as well as leveraged loans.

Broker-dealers also underwrite leveraged loans, and also corporate, sovereign and municipal bonds. Standalone broker-dealers include Goldman Sachs, Morgan Stanley, Lehman Brothers and Merrill Lynch.

Standalone commercial banks of any real size are hard to find, as competition from finance companies and broker-dealers for transactions that used to be structured as bank loans forced commercial banks to diversify their business lines. Such diversified financial institutions are called bank holding companies, which combine commercial banks and broker-dealers under one roof. Examples include Citigroup and JPMorgan Chase.

The performance of the loans these institutions originate depend on the originators' underwriting standards as well as the performance of the real economy (black dotted line). The performance of each loan type is driven by a unique set of macroeconomic variables.

**Asset flows.** Once originated, loans are sold. Sold loans are warehoused in asset-backed commercial paper conduits, where they await securitization.

Securitization involves the pooling of thousands of individual loans and carving up their cash flows into senior, mezzanine and equity tranches. Residential mortgages are packaged into residential mortgage-backed securities (RMBS), consumer credit receivables into asset-backed securities (ABS) and commercial mortgages into commercial mortgage-backed securities (CMBS).

Leveraged loans are packaged into collateralized loan obligations (CLOs), while corporate and emerging

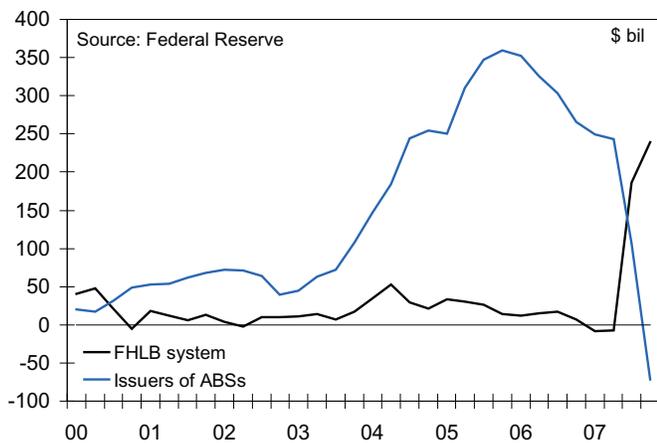
market bonds into collateralized debt obligations (CDOs). These credits are not channeled through conduits, however. These securitizations are all one-layer securitizations, as they have direct exposure to the underlying loans. Corporate and emerging market are also sold in whole forms to investors. Asset flows are mapped with solid black lines.

In recent years, RMBSs (and especially subprime RMBSs) and ABSs were increasingly recycled into ABS CDOs. ABS CDOs came in two flavors—high-grade CDOs and mezzanine CDOs. High-grade CDOs recycled the senior tranches of RMBSs and ABSs, while mezzanine tranches recycled mezzanine tranches of RMBSs and ABSs. Both issued super-senior, senior, mezzanine and equity tranches against their portfolio.

Synthetic CDOs were another form of two-layer securitization. Synthetic CDOs invest in CDSs and are structured such that their cash flows and performance mimic those of the cash securities that the CDSs in their portfolio reference. Through the synthetic creation of credit exposure, CDOs add to the amount of leverage in the financial system. CDSs used to issue synthetic CDOs reference anything from the tranches of RMBS, CMBS and ABS securities, leveraged loans involving companies that were taken private, and corporate and sovereign bonds (these linkages are represented by dashed purple lines). The “raw material” for synthetic CDOs comes from the credit default swap market where CDSs are written. Of the notional \$1.4 trillion in synthetic CDOs issued between 2005 and March 2008, some \$1.3 trillion invested in CDSs referencing corporates, with the remainder investing in CDSs referencing ABSs, according to data from Creditflux (see Chart 9 in main article).

Importantly, 85% of these synthetic CDOs are unfunded (see Chart 10 in main article), meaning that they are not backed by collateral that eliminates the risk that a counterparty will be unable

**Chart 1: Filling the Void**  
**Purchases of mortgages, two-quarter moving sum**



to meet its obligations. Also note, that synthetic CDOs discussed here are only a very small subset of the nearly \$60 trillion (notional) CDS market.

The volume of CDSs written on ABSs to create synthetic ABS CDOs depressed the price of credit protection in a classic insurance cycle. Monoline insurers guaranteeing the performance of senior and super-senior RMBS, ABS and ABS CDO tranches had no choice but to offer these guarantees at depressed premiums (dashed red lines leading from monolines to senior tranches).

**Risk bearers.** ABSs, ABS CDOs, CLOs and traditional CDOs were disseminated across a wide range of investors with varying risk appetites. These investors include SIVs, commercial banks, broker-dealers, hedge funds, asset managers, and insurance companies (for a breakdown of each investors' holding of these securities see Chart 2 in main article).

Of these investors, only asset managers and insurance companies were not exposed to maturity mismatch, as they fund their assets with long-term liabilities. All other investors were financing their investments in these long-term credit instruments using short-term funds, exposing themselves to the classic maturity mismatch of banks (maturity mismatches in the financial system are marked with red boxes at the bottom of the page).

Any institution that was financing long-term credit assets with short-term funds formed a part of the shadow banking system. These institutions include finance companies funding their loan originations using ABPC; loan warehouses financing their inventories using ABPC; SIVs funding

their investments using ABPC; broker-dealers and hedge funds financing credit investments using repos; as well as ARSs/TOBs/VRDOs investing in municipal bonds.

These short-term funding sources are marked with yellow boxes. Any sign of trouble with these structures' assets could trigger a run on the shadow banking system.

**Funding flows.** Such a run was triggered by ARM resets in early 2007. As resets triggered early payment defaults on loans, conduits exercised their options to sell defaulted loans back to their originator (dashed green line). Originators were obliged to buy them back, shielding conduits from losses. This shield soon broke, however, when some finance companies ran out of cash to buy back loans. Such a cash crunch led to the bankruptcy of New Century Financial. With the performance of earlier loan vintages deteriorating rapidly, conduits stopped buying new mortgages altogether and the securitization market froze.

Unable to recycle into cash the mortgages they originated, some mortgage lenders came dangerously close to bankruptcy, with Northern Rock in the U.K. succumbing. That no U.S. lender suffered the same fate was largely due to the Federal Home Loan Bank (FHLB) system, which by issuing federally guaranteed debt, stepped in to buy all the mortgages that banks originated for sale, but could not sell all of a sudden. The FHLB system (and indirectly the government) scooped up mortgages to the tune of \$240 billion during the second half of 2007 (see Chart 1).

Soaring delinquencies and defaults also started to hit the value of RMBSs and ABSs CDOs, causing the demise Dillon Read Capital Management at UBS and two hedge funds at Bear Stearns during the summer of 2007. As these hedge funds were forced to unwind their positions by their prime brokers, their assets were sold at fire-sale prices. These fire-sale prices of these securities

were reinforced by a massive wave of downgrades of ABS CDOs by the ratings agencies. The new marks and downgrades triggered a loss of confidence in ABS CDOs and structures exposed to them, notably SIVs.

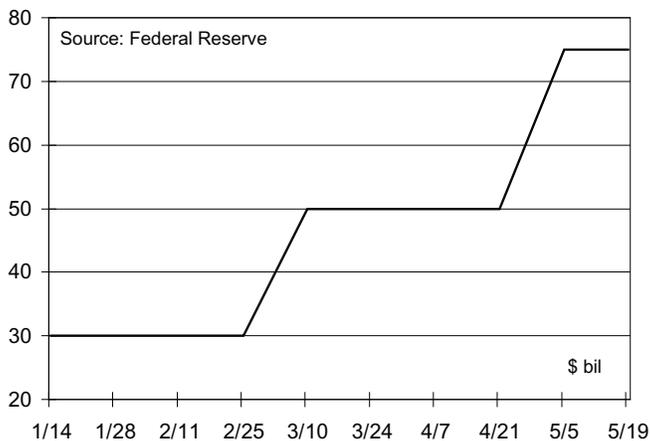
Money market funds quickly dumped all their ABPC holdings, and with no other investor willing to step in, the lifeline of conduits and SIVs was cut off (see Chart 5 in main article; solid red lines marked with explosion marks). A run on the shadow banking ensued (thick solid orange line running off the map).

This is when conduits' contractual liquidity backstops provided by commercial banks (or more precisely, the commercial bank arms of bank holding companies) kicked in, leading to a massive re-intermediation of loans back on to regulated banks' balance sheets (dashed blue lines leading from conduits to commercial banks). SIVs did not have contractual backstops with banks, but banks chose bring them onto their balance sheets nonetheless, due to reputational reasons and to avoid the fire sale of SIVs' AAA rated assets at depressed prices. This involuntary expansion in bank balance sheets (and simultaneous realization of mark-to-market losses as assets were reintermediated at depressed prices) depressed capital ratios and forced banks to pull back on discretionary lending. The pullback in discretionary lending and heightened counterparty risk led to massive strains in interbank lending.

**Capital and liquidity injections.** Rate cuts did not help much to ease strains in the interbank market, as the primary dealers (broker-dealers) through which the Fed injects liquidity into the interbank market were hoarding the cash they received from the Fed (dashed green line with explosion mark). Primary dealers had every incentive to hoard cash, as many of them were suffering from subprime exposure and/or internal hedge fund problems.

An alternative that existed for banks was to borrow at the Fed's discount window (dashed green line). This, however came with a stigma and the public perception that a bank is having financial problems. Banks were trying to avoid such perceptions at all cost in an environment where the fear of counterparties going under was running high. Banks were unwilling to use the discount window even after repeated

**Chart 2: TAF Borrowing**  
Auctions held every other week on Mondays



reductions of the penalty margin that applies to discount window loans. Banks remained starved for funds.

In response, the Fed introduced the Term Auction Facility (TAF; dashed black line). TAF disseminates funds at an auction, where banks can bid anonymously, solving the problem of stigma (see Chart 2). Furthermore, depository institutions could bid for these funds directly at the Fed, which solved the issue of primary dealers hoarding cash and not letting it flow through to the interbank market.

As subprime losses were mounting and the value of highly-rated securities were plummeting, monoline insurers came under increased pressure. Mark-to-market losses on the value of securities whose AAA-ratings they guaranteed threatened the AAA ratings of monolines themselves. In a tug of war between the monolines, short-sellers, banks,

regulators and ratings agencies, monolines were forced to raise more capital to maintain their AAA-ratings.

Injections came from private equity funds. Private equity funds went into the crisis with a massive war chest of uncommitted funds. Monolines were not the only firms hat in hand for capital. Bank holding companies and

broker-dealers raised over \$350 billion in capital from Middle Eastern and Asian sovereign wealth funds (dashed blue lines from private equity funds and SWFs).

Uncertainty about monolines' AAA ratings destabilized the municipal bond market, where many securities were wrapped by monolines to obtain AAA ratings (dashed red line with explosion mark going from monolines to municipal bonds). This in turn prompted money markets to withdraw from the short-term ARS/TOB/VRDO market.

As the ABCP and short-term muni markets were collapsing and bank balance sheets were hemorrhaging, troubles were also running high in the repo market. The falling price of securities with an exposure to subprime mortgages forced deleveraging across the board. With markets for problem assets frozen, investors were forced to sell their good assets.

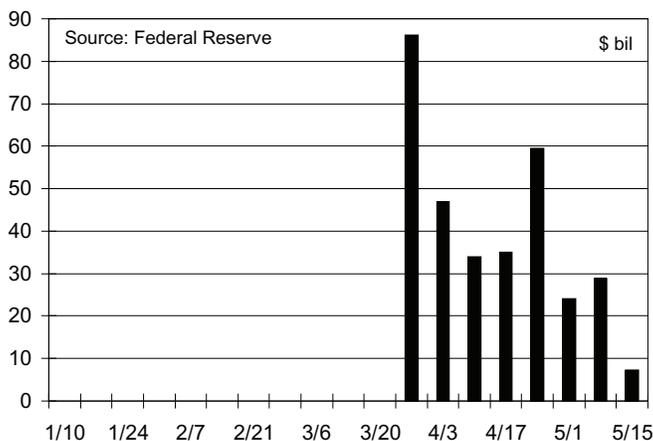
This in turn led to an increase in correlation across asset classes (making it increasingly hard to remain hedged as the turmoil unfolded) and increased volatility. The increase in volatility across all asset classes, together with the massive losses at broker-dealers, prompted prime brokers to raise margins and haircuts on securities lending to hedge funds.

A dangerous margin spiral ensued, where forced sales trigger plummeting prices, more forced liquidations, and still higher haircuts. This dynamic culminated in the Bear Stearns' liquidity crisis in March (see Chart 6 in main article; solid red line with explosion mark next to broker-dealers), constituting another form of a run on the shadow banking system (thick solid orange line running off the map).

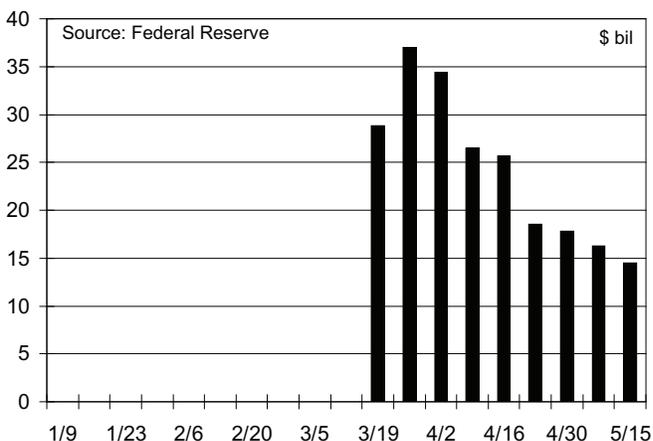
To break this margin spiral, the Fed introduced two new liquidity facilities lending against less liquid collateral; these facilities were the TSLF and the PDCF (dashed black line leading from the Federal Reserve through the triparty repo system to broker-dealers). The TSLF allows primary dealers (whose lifeline is the repo market) to exchange AAA-rated RMBS, CMBS and ABS in exchange for Treasury securities. The dealers then can take the Treasuries to the Treasury repo market to raise cash.

The TSLF did not only make dealers' balance sheets more liquid, but also helped the liquidity of the above securities and hence the price of ABS CDOs that reference those securities. All this improved liquidity in the entire triparty repo system and also in the repo

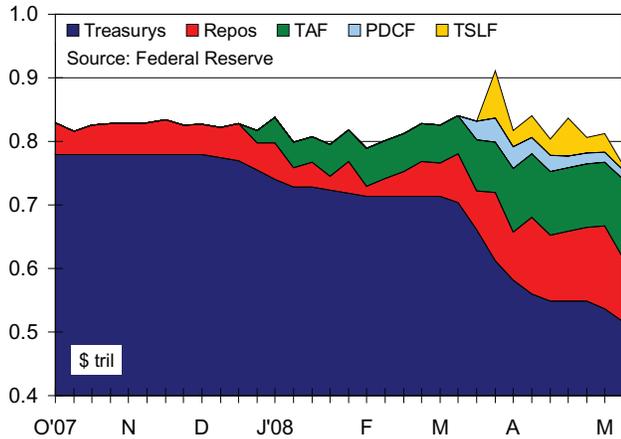
**Chart 3: TSLF Borrowing**  
Weekly auctions held on Thursdays



**Chart 4: PDCF Borrowing**  
Standby facility, average outstanding balance during week



**Chart 5: The Fed's Expanding Toolbox**  
**Assets of the Federal Reserve**



market that exists between hedge funds and broker-dealers (solid red and black lines between hedge funds and broker-dealers).

The PDCF, is a standby borrowing facility where primary dealers can obtain funds (as opposed to Treasuries under the TSLF) from the Fed in exchange for most major types of investment grade securities (see Charts 3 and 4).

to systematically important broker-dealers, the financial system as a whole and the real economy. All they do is to smooth deleveraging, but not prevent it.

With the introduction of the TAF, the TSLF and the PDCF, the Fed sold over \$260 billion in Treasuries from its balance sheet, and replaced it with riskier assets that serve as collateral for the new lending facilities. Together with

What the TSLF and PDCF accomplish is that by providing liquidity against less liquid collateral, they allow deleveraging to proceed in an orderly way (as opposed to the destructive manner that caused the demise of Carlyle Capital and Bear Stearns), minimizing potential damages that it might pose

the \$240 billion in mortgages scooped up by the FHLB system, the federal government assumed some \$500 billion in credit risk on its balance sheet.

Only the FHLB system's purchases were financed by freshly issued debt; the Fed's purchases were financed through the sale of Treasuries (see Chart 5). The inclusion of mortgages purchased by Fannie Mae and Freddie Mac and the \$30 billion in mortgage assets that collateralize the \$29 billion credit line by the New York Fed to grease JPMorgan's takeover of Bear Stearns would further inflate these figures.

**Pandora's box?** The black box of credit default swaps (CDS) has yet to be tested in a recession. Banks and broker-dealers are net buyers of protection and hedge funds, asset managers and insurance companies are net sellers of protection (dashed purple lines linking to net buyers' assets and net sellers' liabilities). The performance of the real economy and leveraged loans and corporate bonds hold the key to the severity of losses on CDSs and potential aftershocks in the financial system in 2008 and 2009.

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