

The Failure Mechanics of Dealer Banks

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A bank is conventionally viewed as an intermediary between depositors, who desire short-term liquidity, and borrowers, who seek project financing. Occasionally, perhaps from an unexpected surge in the cash withdrawals of depositors or from a shock to the ability of borrowers to repay their loans, depositors may become concerned over the bank's solvency. Depositors may then "run," accelerating or worsening the bank's failure. The standard policy tools for treating the social costs of bank failures include regulatory supervision and risk-based capital requirements to reduce the chance of a solvency threatening loss of capital; deposit insurance to reduce the incentives of individual depositors to trigger cash insolvency by racing each other to withdraw their deposits; and regulatory resolution mechanisms, which give authorities the power to efficiently restructure or liquidate a bank.

During the recent financial crisis, major dealer banks—that is, banks that intermediate markets for securities and derivatives—suffered from new forms of bank runs. The most vivid examples are the 2008 failures of Bear Stearns and Lehman Brothers. Dealer banks are often parts of large complex financial organizations whose failures can damage the economy significantly. As a result, they are sometimes considered "too big to fail." The mechanics by which dealer banks can fail and the policies available to treat the systemic risk of their failures differ markedly from the case of conventional commercial bank runs. These failure mechanics are the focus of this article.

As an illustration, consider a protagonist dealer bank, whom we shall call Alpha Bank, whose capital position has just been severely weakened by trading losses. The

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cause need not be a general financial crisis, although that would further reduce Alpha's chances for recovery.

Alpha seeks new equity capital to shore up the value of its business, but potential providers of new equity question whether their capital infusions would do much more than improve the position of Alpha's creditors. They also feel too uninformed about the value of Alpha's assets and future business opportunities to offer a price for new shares that Alpha, given its own information, is willing to accept.

In a rational gamble to signal its strength and to protect its long-run brand reputation and customer network, Alpha uses some of its scarce capital to bail out important clients from the significant losses that they have suffered through investments arranged by Alpha. Alpha's managers understand their bank's vulnerability to the flight of its creditors, clients, and counterparties. As the cracks in Alpha's finances become more apparent, those who deal with Alpha nevertheless begin to draw back.

In particular, Alpha has been operating a significant prime brokerage business, offering hedge funds and other major investors such services as information technology, trade execution, accounting reports, and—more important to our story—holding the hedge funds' cash and securities. These hedge funds have heard the rumors and have been watching the market prices of Alpha's equity and debt in order to gauge Alpha's prospects. They begin to shift their cash and securities to better capitalized prime brokers or, safer yet, custodian banks. Because Alpha had relied in part on its clients' cash and securities to finance its own business, these departures reduce Alpha's financial flexibility.

Alpha notices that some of its derivatives counterparties (entities with whom Alpha has entered derivative contracts) have begun to lower their exposures to Alpha. Their transactions are more and more slanted toward trades that drain cash toward the counterparties and away from Alpha. In addition, other dealer banks are increasingly being asked to enter derivatives trades, called "novations," that have the effect of inserting the other dealers between Alpha and its original derivatives counterparties, insulating those counterparties from Alpha's default risk. As those dealers notice this trend, they begin to refuse novations that would expose them to Alpha's default. This damages Alpha's reputation. Further, the cash collateral placed with Alpha by its derivatives counterparties, which had been an extra source of financing to Alpha, is rapidly dwindling.

Alpha's short-term secured creditors see no good reason to renew their loans to Alpha. Potentially, they could get caught up in the administrative mess that would accompany Alpha's default. Most of them fail to renew their loans to Alpha. A large fraction of these short-term secured loans are in the form of repurchase agreements, or "repos." The majority of these repos have a term of one day. Thus, on short notice, Alpha needs to find significant new financing or to conduct costly fire sales of its securities.

Alpha's liquidity position is now grave. In the normal course of business, Alpha's clearing bank allows Alpha and other dealers the flexibility of "daylight overdrafts" of cash for the intra-day financing of trades. The clearing bank

Table 1
**Dealers Invited to an April 1, 2009,
 Meeting on Over-the-Counter
 Derivatives, Hosted by the
 New York Federal Reserve Bank**

Bank of America, N.A.
Barclays Capital
BNP Paribas
Citigroup
Credit Suisse
Deutsche Bank AG
Dresdner Kleinwort
Goldman, Sachs & Co.
HSBC Group
JPMorgan
Chase Morgan Stanley
The Royal Bank of Scotland
Group Société Générale
UBS AG
Wachovia Bank N.A., A Wells Fargo Company

Source: New York Federal Reserve Bank.

routinely holds Alpha's securities in amounts sufficient to cover these overdrafts. Finally, however, Alpha receives word that its clearing bank has exercised its right to stop processing Alpha's cash and securities transactions given the exposure of the clearing bank to Alpha's overall position. Unable to execute trades or to send cash to meet its obligations, Alpha declares bankruptcy.

Alpha Bank is a fictional composite, standing for any of a relatively small group of financial institutions that are significant dealers in securities and over-the-counter derivatives. These firms typify relatively large global financial groups that, in addition to their securities and derivatives businesses, may operate traditional commercial banks or have significant activities in investment banking, asset management, and prime brokerage. Most of these are among the dealer banks listed in Table 1 that were invited by the New York Federal Reserve to a meeting concerning over-the-counter derivatives on April 1, 2009. This list overlaps substantially with the list of primary dealers in U.S. government securities.¹ As Table 1 suggests, large dealer banks typically operate under the corporate umbrellas of holding companies.

This article will first review the main lines of business of large dealer banks, including: 1) securities dealing, underwriting, and trading; 2) over-the-counter

¹ The primary dealers that are not part of financial groups represented in Table 1 are Cantor Fitzgerald (an inter-dealer broker), Daiwa Securities America Inc., and Mizuho Securities USA Inc. The dealers shown in Table 1 that are not also primary dealers in U.S. government securities are the Royal Bank of Scotland Group, Société Générale, and Wachovia Bank (now owned by Wells Fargo).

derivatives; and 3) prime brokerage and asset management. I will include a brief discussion of sources of financing, including off-balance-sheet structures and short-term secured credit through repurchase agreements. I then examine the key failure mechanisms of dealer banks. As in the story of Alpha Bank, these include the flight of prime-brokerage clients, the sudden disappearance of short-term secured creditors, the defensive reactions of derivatives counterparties, and, finally, the loss of cash and securities settlement privileges at a clearing bank.

In the concluding section, I consider potential policy implications. Many of the business activities of the companies that operate large dealer banks are outside of the scope of traditional bank-failure resolution mechanisms, as explained by Bliss and Kaufman (2006). Since the financial crisis, however, all large dealer banks now operate as regulated banks or within regulated bank holding companies. During the financial crisis, dealer banks drew support from traditional and new sources of government and central-bank financing. Concerns remain over the systemic risk that some of these financial institutions could pose to the economy in the future. Although access to government support mitigates the systemic risk associated with catastrophic failures, it also creates a perverse incentive. The common knowledge that large financial institutions will receive support when they are sufficiently distressed—in order to limit disruptions to the economy—provides an incentive to large financial institutions to take inefficient risks, and for their creditors to cooperate by financing them at a lower cost than would be available without the implicit backstop of government support. As the financial crisis has made clear, it is important to consider alternatives to government and central-bank last-resort financial support. Among the additional mechanisms that might be used to address large dealer-bank failure processes are the central clearing of over-the-counter derivatives; dedicated “utilities” for clearing tri-party repurchase agreements under strict standards; and automatic recapitalization mechanisms, such as mandatory rights offerings of equity or forms of debt that convert to equity contingent on distress triggers.

What Large Dealer Banks Do

I will tend to simplify by treating large dealer banks as members of a distinct class, although in practice they vary in many respects. I focus here on their most significant lines of business. These include intermediation of the markets for securities, securities lending, repurchase agreements, and derivatives; prime brokerage for hedge funds; and asset management for institutional and wealthy individual investors. Dealer banks also conduct proprietary trading—that is, speculation on their own accounts. As a part of their asset-management businesses, some dealer banks operate “internal hedge funds” and private equity partnerships, of which the bank acts effectively as a general partner with limited-partner clients.

Dealer banks are typically parts of large financial organizations that operate other financial businesses, although these will not be our focus here. For example,

many large dealer-banks have conventional commercial banking operations, including deposit taking as well as lending to corporations and consumers. They may also act as investment banks, which can involve managing and underwriting securities issuances and advising corporate clients on mergers and acquisitions. Investment banking sometimes includes “merchant banking” activities, such as buying and selling oil, forests, foodstuffs, metals, or other raw materials.²

One suspects that some of the risk-management failures discovered during the financial crisis are associated with diseconomies of scope in risk management and corporate governance. In other words, some senior executives and boards simply found it too difficult to comprehend or control some of the risk-taking activities inside their own firms.³

Securities Dealing, Underwriting, and Trading

Dealer banks intermediate in the primary market between issuers and investors of securities, and in the secondary market among investors. In the primary market, the dealer bank, sometimes acting as an underwriter, effectively buys equities or bonds from an issuer and then sells them over time to investors. In secondary markets, a dealer stands ready to have its bid prices hit by sellers and its ask prices hit by buyers. Dealer banks dominate the intermediation of over-the-counter securities markets, covering bonds issued by corporations, municipalities, certain national governments, and securitized credit products. Over-the-counter trades are privately negotiated. Trade between dealers in some securities, particularly government bonds, can also be intermediated by interdealer brokers and electronic trading platforms (which are essentially “bulletin boards” on which bids or offers can be commonly observed by other dealers). Although public equities are easily traded on exchanges, dealers are also active in secondary markets for equities—for example, dealers often intermediate large block trades. Banks with dealer subsidiaries also engage in speculative investing, often called proprietary trading, which can be aided in part by the ability to observe flows of capital into and out of certain classes of securities.

Securities dealers also intermediate in the market for repurchase agreements, or “repos.” A repo is in essence a short-term cash loan collateralized by securities. One counterparty borrows cash from the other, and as collateral against performance on the loan, that counterparty posts government bonds, corporate bonds, securities from government-sponsored enterprises, or other securities such as collateralized debt obligations. For example, a hedge fund that specializes in fixed-income securities can finance the purchase of a large quantity of securities with a small amount of capital by placing purchased securities into repurchase

² The relevant research, for example Boot, Milbourn, and Thakor (1999), does not find a strong case for the net benefits of forming large diversified financial conglomerates of this type. There may exist economies of scope in information technology, marketing, and financial innovation. For potential synergies between commercial and investment banking, see Kanatas and Qi (2003).

³ For a case example of lapses in risk oversight, see UBS (2008) “Shareholder Report on UBS’s Writedowns,” especially Chapter 5: “Risk Management and Risk Control Activities.”

agreements with a dealer, using the cash proceeds of the repo to purchase additional securities. The majority of repurchase agreements are for short terms, typically overnight. These repurchase agreements are commonly renewed with the same dealer or replaced by new repos with other dealers. The performance risk on a repo is typically mitigated by a “haircut” that reflects the risk or liquidity of the securities. For instance, a haircut of 10 percent allows a cash loan of \$90 million to be obtained by posting securities with a market value of \$100 million.

For settlement of their repo and securities trades, dealers typically maintain “clearing accounts” with other banks. JPMorgan Chase and the Bank of New York Mellon handle most dealer clearing. Access to clearing bank services is crucial to a dealer’s daily operations. Transactions cannot otherwise be executed.

In order to mitigate counterparty risk, some repurchase agreements are “tri-party.” The third party is usually a clearing bank that holds the collateral and is responsible for returning the cash to the creditor. In principle, this facilitates trade and insulates the lender somewhat from the risk of a borrower’s default. In 2007, tri-party repos totaled \$2.5 trillion (Geithner, 2008). The same two clearing banks, JPMorgan Chase and the Bank of New York Mellon, are also dominant in tri-party repos. In Europe, tri-party repos are also arranged through specialized repo clearing services: Clearstream and Euroclear.

Over-the-Counter Derivatives

Derivatives are contracts that transfer financial risk from one investor to another. For example, a call option gives an investor the right to buy an asset in the future at a prearranged price, shielding the investor from the risk that the cost of acquiring the asset could rise. Derivatives are traded on exchanges and over the counter. Because over-the-counter derivatives are negotiated privately, they can easily be customized to a client’s needs. For most over-the-counter derivatives trades, one of the two counterparties is a dealer. The dealer usually lays off much or all of the risk of its client-initiated derivatives positions by running a “matched book,” that is, by aiming for offsetting trades, profiting on the differences between bid and offer terms. As in their securities businesses, dealer banks also conduct proprietary trading in over-the-counter derivatives markets.

The notional amount of an over-the-counter derivative contract is typically measured as the market value—or, in the case of bond derivatives, the face value—of the asset whose risk is transferred by the derivative. For example, a call option to buy one million shares of an equity whose price is \$50 per share represents a notional position of \$50 million dollars. The total notional amount of over-the-counter derivatives outstanding is roughly \$600 trillion dollars, according to the Bank of International Settlements. In notional terms, exchange-traded derivatives positions total to approximately \$400 trillion. The majority of over-the-counter derivatives are interest-rate swaps, which are commitments to make periodic exchanges of one interest rate, such as the variable London Interbank Offered Rate (LIBOR), for another interest rate, such as a fixed rate, on a stated notional principal until a stipulated maturity date. The largest over-the-counter derivatives dealer

by volume is JPMorgan, with a total notional position of approximately \$80 trillion, according to the U.S. Office of the Comptroller of the Currency (2009).

It is an accounting identity that the total market value of all derivatives contracts must be zero—that is, the total amount of positive (purchased) positions is equal to the total amount of negative (sold) positions. Contingent on events that may occur over time, derivatives transfer wealth from counterparty to counterparty, but do not directly add to or subtract from the total stock of wealth. Indirectly, however, derivatives can cause net losses through the frictional costs of bankruptcies, such as legal fees, and other costs associated with financial distress. Derivatives markets also serve a social purpose of transferring risk from those less equipped to bear it to others more equipped to bear it.

In addition to the risk associated with the contingent payments promised by a derivatives contract, there is also the risk that the counterparty could fail to meet its promised payments. A useful gauge of counterparty risk in the over-the-counter market is the amount of exposure to default presented by the failure of counterparties to perform their contractual obligations. These exposures can be reduced through collateral. For example, suppose a hedge who has posted \$60 million in collateral with a dealer defaults, leaving the dealer with a portfolio of derivatives that would have been worth \$100 million had the hedge fund not failed. This leaves the dealer with a net loss of \$40 million.

Normally, various over-the-counter derivatives trades between a given pair of counterparties are legally combined under a “master swap agreement” between those two counterparties, conforming to standards set by the International Swaps and Derivatives Association (ISDA). Among other provisions, master swap agreements spell out collateral requirements as well as the obligations of the two counterparties in the event that one of them cannot perform. As the market values of the derivatives contracts between two counterparties fluctuate, the collateral required is recalculated, normally on a daily basis, and is netted across the various derivatives held between the two counterparties. For example, suppose that A has an exposure to B of \$100 million on an oil derivative, while B has an exposure to A of \$80 million on an interest-rate derivative. If the master-swap agreement specifies full collateralization of the net exposure, then B posts \$20 million of collateral with A. Thus, netting under a master swap agreement lowers exposures and lowers collateral requirements.

As the financial crisis that began in 2007 deepened, the range of acceptable forms of collateral taken by dealers from their over-the-counter derivatives counterparties was narrowed. By 2008, over 80 percent of collateral for these agreements was in the form of cash, according to a survey conducted by the International Swaps and Derivatives Association (2009). The total amount of collateral demanded also nearly doubled in 2008, from about \$2 trillion in 2007 to about \$4 trillion in 2008.

Table 2 shows the total exposures represented by the over-the-counter derivatives portfolios of major dealers, in each of the major asset classes, as estimated from dealer surveys by the Bank for International Settlements (2009a). At least one

Table 2

**Exposures of Dealers in Over-the-Counter
Derivatives Markets by Asset Class, as of June 2009**
(*net exposures do not include non-U.S. credit default swaps*)

<i>Asset class</i>	<i>Exposure (\$ billions)</i>
Credit default swap	2,987
Interest rate	15,478
Equity linked	879
Foreign exchange	2,470
Commodity	689
Unallocated	2,868
Total	25,372
Total after netting	3,744

Source: Bank for International Settlements, November, 2009.

of the two counterparties of most over-the-counter derivatives is typically a dealer. Frequently, both parties are dealers. The final row of Table 2 shows a substantial reduction in exposure due to netting.

Dealers are especially likely to be counterparties to other dealers in the case of credit default swaps, which are in essence insurance against the default of a named borrower. When a hedge fund decides to reduce a credit default swap position, a typical step is to have its original credit default swap position “novated” to another dealer, which then stands between the hedge fund and the original dealer by entering new back-to-back credit default swap positions with each. In this fashion, dealer-to-dealer credit default swap positions grew rapidly. Based on data provided by the Depository Trust and Clearing Corporation (DTCC) in April 2009, of the current aggregate notional of about \$28 trillion in credit default swaps whose terms are collected by DTCC’s DerivServ Trade Information Warehouse, over \$23 trillion were in the form of dealer-to-dealer positions. Since mid-2008, when the total notional size of the credit default swap market stood at over \$60 trillion, the total amount of credit default swaps outstanding has been reduced by over one half through “compression trades,” by which redundant or nearly redundant positions among dealers are effectively canceled.

Prime Brokerage and Asset Management

Several large dealers are extremely active “prime brokers” to hedge funds and other large investors. A prime broker provides clients a range of services, including management of securities holdings, clearing, cash-management services, securities lending, financing, and reporting (which may include risk measurement, tax accounting, and various other accounting services). A dealer may frequently serve as a major derivatives counterparty to its prime-brokerage clients. A dealer often generates additional revenues by lending securities that are placed with it by

prime-brokerage clients. As of the end of 2007, according to data from Lipper, the majority of prime brokerage services were provided by just three firms: Morgan Stanley, Goldman Sachs, and Bear Stearns, whose prime brokerage business was absorbed by JPMorgan when it acquired Bear Stearns in mid-2008 (Hintz, Montgomery, and Curotto, 2009).

Dealer banks often have large asset-management divisions that cater to the investment needs of institutional and wealthy individual clients. The services provided include the holding of client securities, cash management, brokerage, and alternative investment vehicles, such as hedge funds and private-equity partnerships that are often managed by the same bank. Such an “internal hedge fund” may offer contractual terms similar to those of external stand-alone hedge funds and in addition can wrap the client’s limited-partner position within the scope of general asset-management services for that client.

A limited partner in an internal hedge fund may perceive that a large dealer bank is more stable than a stand-alone hedge fund and that the dealer bank might even voluntarily support an internal hedge fund at a time of extreme need. For example, near the end of June 2007, Bear Stearns offered to lend \$3.2 billion to one of its failing internal hedge funds, the High-Grade Structured Credit Fund (Barr, 2007b). In August 2007, at a time of extreme market stress and losses to some of its internal hedge funds, Goldman Sachs (2007) injected a significant amount of capital into one of them, the Global Equity Opportunities Fund. In February 2008, Citigroup provided \$500 million in funding to an internal hedge fund known as Falcon (CNBC, 2008). Such actions can be viewed as a rational attempt by dealer banks to protect their reputation and to reassure important clients that their financial position is secure.

Off-Balance Sheet Financing

Some large dealer banks have made extensive use of “off-balance-sheet” financing. For example, a bank can originate or purchase residential mortgages and other loans that are financed by selling the loans to a financial corporation or trust that it has set up for this express purpose. Such a “special purpose entity” pays its sponsoring bank for the assets with the proceeds of debt that it issues to third-party investors. The principal and interest payments of the debt issued by the special purpose entity are paid from the cash flows that it hopes to receive from the assets that it has purchased from the sponsoring bank.

Because the debt obligations of a special purpose entity are usually contractually remote from the sponsoring bank, under certain conditions banks have not been required to treat the assets and debt obligations of such entities as their own, at least for purposes of accounting and of regulatory minimum capital requirements. In this sense, a special purpose entity is “off balance sheet.” Some large dealer banks used special purpose entities to operate much larger loan purchase and origination businesses with a given amount of capital than would have been possible had they held the associated assets on their own balance sheets. For example, at June 2008, Citigroup, Inc. reported over \$800 billion in off-balance-sheet assets held in such “qualified special purpose entities.”

A particular form of special purpose off-balance-sheet entity that was popular until the financial crisis is the “structured investment vehicle,” which finances residential mortgages and other loans with short-term debt sold to investors such as money-market funds. In 2007 and 2008, when home prices fell dramatically in the United States and subprime residential mortgage defaults rose, the solvency of many structured investment vehicles was threatened—especially as some short-term creditors to these funds recognized the solvency concerns and failed to renew their loans.

Some large dealer banks bailed out investors in some of their structured investment vehicles. For example, in late 2007, HSBC voluntarily committed about \$35 billion to bring elements of its structured investment vehicles onto its balance sheet (Goldstein, 2007). Citigroup followed in December 2007 by bringing \$49 billion in assets and liabilities of structured investment vehicles onto its own balance sheet (Moyer, 2007). As with the support provided to distressed internal hedge funds, the equity owners and managers of these banks may have feared that the alternative of providing no recourse to their effective clients would have resulted in a loss of market value through a reduction in reputation and market share. Some of these banks, had they been able to foresee the extent of their later losses during the financial crisis, might have preferred to allow their off-balance clients to fend for themselves.

Failure Mechanisms for Dealer Banks

The relationships between a dealer bank and its derivatives counterparties, prime-brokerage clients, potential debt and equity investors, clearing bank, and other clients can change rapidly if the solvency of the dealer bank is threatened. The concepts at play are similar to those of a depositor run at a commercial bank. That is, fears over the solvency of the bank lead others to act so as to reduce their potential losses in the event of the bank’s default. Unlike insured depositors at a commercial bank, many of those with exposures to dealer banks have no default insurance, or do not wish to bear the frictional costs of involvement in the bank’s failure procedures even if they do have insurance. The key mechanisms that lead to the failure of a dealer bank are the flight of short-term creditors, the departures of prime-brokerage clients, various cash-draining actions by derivatives counterparties that are designed to lower their exposures to the dealer bank, and finally and most decisively, the loss of clearing-bank privileges. We will describe each of these types of “run-on-the-bank” behavior in turn and then discuss implications for potential improvements in market infrastructure or regulation.

The Flight of Short-Term Creditors

Large dealer banks tend to finance their assets in various ways, including by issuing bonds and commercial paper. Increasingly over recent years, they have financed the purchase of their securities inventories with short-term repurchase

agreements. The counterparties of these repos are often money-market funds, securities borrowers, and other dealers. Repos with a term of one day, called “overnight repo,” are common. Under normal pre-crisis conditions, a dealer bank might have been able to finance most of its holdings of agency securities, Treasuries, corporate bonds, mortgages, and collateralized debt obligations by daily renewal of overnight repos with an average haircut of under 2 percent. The dealer could therefore hold these securities with little incremental capital.

Before their failures, Bear Stearns and Lehman had leverage ratios (the ratio of assets to equity capital) of over 30, with significant dependence on short-term repo financing. Although the repo creditors providing cash to a dealer bank have recourse to collateralizing assets, with haircuts that protect them to some degree from fluctuations in the market value of the collateral, they may have little or no incentive to renew repos in the face of concerns over the dealer bank’s solvency. Additionally, the repo creditors could be legally required to sell the collateral immediately⁴ or could potentially face litigation over allegations of improper disposal of the collateral. The repo creditors can avoid these risks and other unforeseen difficulties simply by reinvesting their cash in new repos with other dealers.

If a dealer bank’s repo creditors fail to renew their positions en masse, the ability of the dealer to finance its assets with sufficient amounts of new private-sector cash on short notice is doubtful. The dealer may therefore be forced to sell its assets in a hurry to buyers that know it needs to sell quickly. This scenario, called a “fire sale,” can easily result in much lower prices for the assets than might be expected in a more orderly sale. The proceeds of an asset fire sale could be insufficient to meet the dealer’s cash needs, especially if the dealer’s original solvency concerns were prompted by declines in the market values of the collateral assets themselves. A fire sale could also lead to fatal inferences by other market participants of the weakened condition of the dealer. Further, the low prices recorded in a fire sale could lower the market valuation of the securities not sold, and thus reduce the amount of cash that could be raised through repurchase agreements collateralized by those securities, prompting a “death spiral” of further fire sales. For the same reason, fire sales by one large bank could set off fire sales by other banks, causing a systemic risk.

A dealer bank’s financing problems could be exacerbated during a general financial crisis. For example, haircuts of even investment-grade corporate bonds rose from under 5 percent before the financial crisis to around 20 percent in the weeks following the failure of Lehman Brothers, while repo financing of many forms of collateralized debt obligations and speculatively rated corporate bonds became

⁴ In the United States, money market funds, typically operating under Rule 2a-7 of the Securities and Exchange Commission, have restrictions on the types of assets they are permitted to hold and would be required to immediately sell many of the forms of collateral that they could receive in the event that a repo counterparty fails to perform. For text of this rule, see the “Securities Lawyer’s Deskbook” published by the University of Cincinnati College of Law at (<http://www.law.uc.edu/CCL/InvCoRls/rule2a-7.html>).

essentially impossible.⁵ Peter Fisher (2008) of BlackRock, an investment management firm, wrote: “I would also suggest that the prevalence of repo-based financing helps explain the abruptness and persistence with which the de-levering has been translated into illiquidity and sharp asset price declines.” Abate (2009) reported that corporate bond repo transactions (which include certain mortgage-backed securities not backed by government-sponsored enterprises) fell approximately 60 percent between March 2008 and March 2009. During the week leading up to the failure of Bear Stearns, Cohan (2009) reports on the increasing set of Bear Stearns’ normal repo counterparties who told Bear Stearns that they would not be renewing their repo financing to Bear or were applying more onerous haircuts and disputing collateral valuations.

A dealer bank can mitigate the risk of a loss of liquidity from a run by short-term creditors in various ways: by establishing lines of bank credit; by dedicating a buffer stock of cash and liquid securities for emergency liquidity needs; and by “laddering” the maturities of its liabilities so that only a small fraction of its debt must be refinanced within a short period of time. Major dealer banks have teams of professionals that manage liquidity risk by controlling the distribution of liability maturities and by managing the availability of pools of cash and of noncash collateral that is acceptable to secured creditors.

A common central-bank response to the systemic risk created by the potential for fire sales is broad and flexible lender-of-last-resort financing to large banks (Tucker, 2009). Such financing buys the time needed to liquidate financial claims in an orderly manner.

The U.S. Federal Reserve has always provided secured financing to regulated commercial banks through its discount window. Discount-window financing, however, is available only for a restricted range of high-quality collateral and is also believed to stigmatize banks that are so weak as to need to use it. Dealers that are not regulated as banks do not have access to the discount window. During the financial crisis, special credit facilities were established by Federal Reserve banks, allowing even dealers that did not have access to the discount window to arrange the financing of a wide range of assets or to temporarily exchange relatively less-liquid securities for Treasuries.⁶ Almost immediately after the failure of Lehman, the last two large dealers that had not been regulated as banks, Morgan Stanley and Goldman Sachs, became regulated bank holding companies, giving them

⁵ Ewerhart and Tapking (2008) and Hordahl and King (2008) review the behavior of repo markets during the financial crisis. Gorton (April, 2009) provides estimates of the haircuts applied to various classes of securities before and during the financial crisis. In July 2007, corporate bonds and structured credit products of many types, both investment grade and noninvestment grade, had haircuts of 2 percent or less. From the second quarter of 2008, many classes of these securities had haircuts in excess of 20 percent, while a number of classes of securities are shown by Gorton’s source to have no financing in the repo market.

⁶ These facilities include the Single-Tranche OMO Program, the Term Discount Window Program, the Term Auction Facility, transitional credit extensions announced on September 21, 2008, the Primary Dealer Credit Facility, the Term Securities Lending Facility, the Commercial Paper Funding Facility, and the Term Asset-Backed Securities Loan Facility.

access to the discount window, among other sources of government support like government debt guarantees.

Other central banks have taken similar steps. The European Central Bank (ECB) provides repo financing to Eurozone banks through regular auctions, by which the ECB accepts a wide range of collateral at moderate haircuts. Cassola, Hortacsu, and Kastl (2008) show that from August 2007, when the range of collateral that was acceptable in the over-the-counter repo market narrowed after a rash of sub-prime mortgage defaults, banks in the Eurozone bid significantly more aggressively for financing in these repo auctions. Tucker (2009) describes a range of new secured financing facilities of the Bank of England.

The extent to which a dealer bank is financed by traditional insured bank deposits may lessen its need during a solvency crisis to replace cash that is lost from the exits of repo counterparties and other less-stable funding sources. Insured deposits are less likely to run than are many other forms of short-term liabilities. However, under Rule 23A of the Federal Reserve Act, U.S.-regulated banks may not use deposits to fund broker-dealer affiliates of the bank.

The Flight of Prime Brokerage Clients

Prime brokerage, as described earlier, is an important source of fee revenue to some dealer banks. Under normal conditions, prime brokers can also finance themselves in part with the cash and securities that clients leave in their prime brokerage accounts.

Here's how it works. In the United Kingdom, securities and cash in prime brokerage accounts are generally commingled with the prime broker's own assets and are thus available to the prime broker for its business purposes, including secured borrowing. Cash in London-based prime brokerage accounts is, for practical purposes, equivalent to uninsured deposits. Prime brokers operating under United States rules may or may not fully segregate their client's cash, depending on the situation, according to Rule 15c3-2 of the Securities and Exchange Act of 1934. This SEC rule governs the treatment of "free credit balances," the cash that a client has a right to demand on short notice. Under Rule 15c3-3, a U.S.-regulated prime broker must aggregate its clients' free credit balances "in safe areas of the broker-dealer's business related to servicing its customers" or otherwise deposit the funds in a reserve bank account to prevent commingling of customer and firm funds.⁷

The ability to aggregate cash associated with clients' free credit balances into a single pool, although separate from the prime broker's own funds, provides flexibility to a prime broker in managing the cash needs of its clients. For example, the prime broker can use one client's cash balances to meet the immediate cash demands of another. Suppose that a dealer has two prime brokerage clients. It

⁷ The text of the SEC rules is available on-line at various places, such as the "Securities Lawyer's Deskbook" published by the University of Cincinnati College of Law. The text of Rule 15c3-2, on customers' free credit balances, is at (<http://www.law.uc.edu/CCL/34ActRIs/rule15c3-2.html>). Rule 15c3-3, on "Customer Protection—Reserves and Custody of Securities," is at (<http://www.law.uc.edu/CCL/34ActRIs/rule15c3-3.html>).

holds cash belonging to Hedge Fund A of \$150 million and has given a cash loan to Hedge Fund B for \$100 million. The excess cash of \$50 million must be held in a reserve account. But if Hedge Fund A moves its prime brokerage account to another dealer, then the original prime broker must come up with \$100 million of cash from new sources.

Prime brokers provide financing to their clients, typically hedge funds, secured by assets of those clients. For U.S. prime brokers, the amounts of such margin loans are limited by regulated “advance rates” that are set according to asset classes. For example, the maximum amount of cash that can be advanced for equities is 50 percent of the market value of the equities. Margin loans for a dealer bank can also be financed using the client’s own assets as collateral, through “re-hypothecation.” Specifically, the prime broker can obtain the cash that it lends a client, as well as additional cash for its own purposes, by using the client’s securities as collateral on a secured loan for itself from a third-party lender. For each \$100 of margin cash that it lends to a prime-brokerage client, the dealer is permitted by regulation to finance itself by using up to \$140 worth of the client’s assets as collateral on new secured loans. Re-hypothecation of securities received from prime brokerage clients is, under normal conditions, a significant source of financing for the prime broker.

When a dealer bank’s financial position is weakened, hedge funds may move their prime brokerage accounts elsewhere. A failure to run, as Lehman’s London-based clients learned, could leave a client unable to claim ownership of assets that had not been segregated in the client’s account and had been re-hypothecated to third parties (for discussions, see Farrell, 2008; Mackintosh, 2008a; Singh and Aitken, 2009).

In the United States, ironically, a prime broker’s cash liquidity problems can be exacerbated by its prime brokerage business whether or not clients run. Under its contract with its prime broker, a hedge fund could continue to demand cash margin loans from the dealer backed by securities that the hedge fund has left in its prime brokerage account. A prime broker whose solvency is known to be questionable may not itself be able to obtain cash by using those same securities as collateral with other lenders. The dealer’s potential secured lenders, as explained earlier, could find it preferable to lend elsewhere. Thus, even the absence of a run by prime brokerage clients could temporarily exacerbate a dealer’s liquidity crisis. A dealer could therefore even have an incentive to “fire” a prime brokerage client to avoid providing cash margin financing to the client!

If prime brokerage clients do run, however, the cash that they pull from their free credit balances is no longer available to meet the demands of other clients on short notice, so the prime broker may be forced to use its own cash to meet these demands.⁸ The exit of prime brokerage clients whose assets had been used by the prime broker as collateral for securities lending can eliminate a valuable source of liquidity to the prime broker. Even clients that do not move to another prime

⁸ Shortfalls are covered, up to limits, by the Securities Investor Protection Corporation (SIPC).

broker may, in the face of concerns over their broker's solvency, move some of their securities into accounts that restrict the access of the prime broker to the securities.

Sorkin (2009) discusses the extreme stress on Morgan Stanley's cash liquidity that was caused by the departure of prime brokerage clients during the week of the bankruptcy of Lehman Brothers. Singh and Aitken (2009) calculate that between August 2008 and November 2008, the securities that Morgan Stanley had received from its clients that were available for Morgan Stanley to pledge to others declined by 69 percent, from \$832 billion to \$294 billion. For Merrill Lynch and Goldman Sachs, the corresponding declines in re-pledgeable client collateral over this short period spanning the default of Lehman were 51 and 30 percent, respectively.

The flight of prime-brokerage clients in the face of a dealer bank's financial weakness could also raise concerns over the dealer's long-run profitability among potential providers of emergency capital.

In the days immediately following Lehman's default, credit default swap rates for Morgan Stanley exceeded 1000 basis points, meaning that the cost of insuring \$100 million of senior unsecured Morgan Stanley debt against default losses was above \$10 million per year. Some analysts believe that hedge funds are likely to diversify their sources of prime brokerage further and in the future place more of their assets with custodian banks rather than with traditional prime brokers (Hintz, Montgomery, and Curotto, 2009).

When Derivatives Counterparties Duck for Cover

If a dealer bank is perceived to have some risk of a solvency crisis, an over-the-counter derivatives counterparty would look for opportunities to reduce its exposure to that dealer bank. A variety of mechanisms are possible here. A counterparty could reduce its exposure by borrowing from the dealer. Another strategy is to reduce the exposure by entering new trades with the dealer that cause that dealer to pay out cash for a derivatives position. A counterparty could also seek to harvest cash from any derivatives positions that have swung in its favor over time, and thereby reduce exposure to the dealer. All of these actions reduce the dealer's cash position. If the dealer wants to avoid an adverse signal of its weakness, the dealer cannot afford to refuse its counterparties the opportunity to make these trades at terms prevailing elsewhere in the market.

As we have explained, a counterparty to the dealer could also reduce its exposure through novation to another dealer (International Swaps and Derivatives Association, 2004). For instance, a hedge fund that had purchased protection from a dealer on a named borrower, using a credit default swap contract, could ask a different dealer for a "novation." The new dealer would thereby offer protection to the hedge fund and buy protection itself from the original dealer, thus insulating the hedge fund from the default of the original dealer. When Bear Stearns' solvency was threatened in mid 2008, some of Bear Stearns' counterparties asked other dealers for novations, by which those dealers would effectively absorb the risk of a failure by Bear Stearns (Burroughs, 2008; Kelly, 2008; Cohan, 2009, p. 27). Although dealers routinely grant such novations because they facilitate normal

trading strategies, in this case other dealers began to refuse these Bear Stearns novations. This in turn is likely to have spread alarm over Bear Stearns's difficulties, leading to actions that are likely to have worsened Bear Stearns's cash position (for further discussion, see Yavorsky, 2008a; Leising, 2009).

Based on analysis by Singh (2009), the exposures of over-the-counter derivatives counterparties to Citibank, after netting and collateral, fell from \$126 billion in March 2008 to \$81 billion in March 2009, suggesting that counterparties significantly reduced their exposures to a dealer whose solvency was in question. Over the same period, by comparison, over-the-counter derivatives exposures to comparatively healthy J.P. Morgan grew from \$68 billion to \$86 billion.

As discussed earlier, over-the-counter derivatives agreements often call for posting collateral. Further, they call for increases in collateral from a counterparty whose credit rating is downgraded below a stipulated level. For example, in its 10K filing with the Securities and Exchange Commission dated January 1, 2009 (p. 82), Morgan Stanley disclosed: "In connection with certain OTC trading agreements and certain other agreements associated with the Institutional Securities business segment, the Company may be required to provide additional collateral to certain counterparties in the event of a credit ratings downgrade. As of November 30, 2008, the amount of additional collateral that could be called by counterparties under the terms of collateral agreements in the event of a one-notch downgrade of the Company's long-term credit rating was approximately \$498.3 million. An additional amount of approximately \$1,456.2 million could be called in the event of a two-notch downgrade." Collateral-on-downgrade triggers were the most proximate cause of the need by the insurance company AIG for a massive U.S. government bailout.

Master swap agreements include terms for the early termination of derivatives in a selection of contingencies, including the default of one of the counterparties. The actual procedures to be followed can be complicated, as appears to be case in the Lehman bankruptcy (Lehman Bankruptcy Docket, 2008a; 2008b). The general thrust of the settlement terms in the event of a default is that the nondefaulting counterparty is entitled to the replacement cost of the contracts it holds. For any contingent claim, including a derivative contract, other dealers offer one price to buy and a higher price to sell. This bid-offer spread implies an effective transaction cost that increases the replacement cost of the derivatives portfolio and thus raises the claim against the defaulting dealer. For example, Citibank had an over-the-counter derivatives portfolio with a total notional size of roughly \$30 trillion in the summer of 2009 (according to data from the Office of the Comptroller of the Currency). If the effective average bid-offer spread on this portfolio is, for example, 0.2 percent of the notional position amount, then the effective increase in liability to Citibank associated with a default termination of its derivatives portfolio would be on the order of \$60 billion. This termination loss on the derivatives portfolio would be above and beyond any loss associated with the fair market value of the portfolio (which is about halfway between the bid value and the offer value).

Further, most over-the-counter derivatives contracts are exempted by law as “qualifying financial contracts” from the automatic stay at bankruptcy that holds up other creditors of a dealer. The effect of unwinding the dealer’s derivatives portfolio is a large post-bankruptcy drain on the defaulting dealer, with priority to derivatives counterparties. This raises the incentive of other creditors to run from their exposures before default or to fail to finance a dealer threatened by a cash liquidity crisis, further accelerating the default.

One way to reduce the incentive of counterparties to flee from an apparently weak dealer bank is to have the derivatives contracts guaranteed by a “central clearing counterparty,” a special-purpose financial institution whose only business is to stand in between the original buyers and sellers of over-the-counter derivatives (Bank for International Settlements, 2007; Bliss and Steigerwald, 2006; Duffie and Zhu, 2009; Hills, Rule, Parkinson, and Young, 1999; Ledrut and Upper, 2007). A central clearing counterparty collects capital from all members and collateral against derivatives exposures to its members in order to cover any losses associated with defaults. Assuming that the central clearing counterparty has sufficient resources, the original counterparties to the dealer are insulated from the default of the dealer. As one example, Global Association of Central Counterparties (2009) describes the performance of central clearing counterparties in processing some of Lehman’s derivatives positions when it defaulted.⁹

Central clearing counterparties can handle only derivatives with relatively standard terms, however, and therefore would not have been in a position to mitigate the counterparty risks associated with the infamous credit derivatives of AIG Financial Products unit, which were highly customized.

Loss of Cash Settlement Privileges

The final step in the collapse of a dealer bank’s ability to meet its daily obligations is likely to be the refusal of its clearing bank to process transactions. In the normal course of business, a clearing bank would extend “daylight overdraft privileges” to its creditworthy clearing customers. For example, the cash required to settle a securities trade on behalf of a dealer client could be wired to the dealer’s counterparty (or that counterparty’s own clearing bank) before the necessary cash actually appears in the dealer’s clearing account on that day, under the premise that the dealer will receive sufficient cash from other counterparties during the day in the course of settling other transactions. Meanwhile, the dealer holds securities in its clearing account with a market value that is likely to be more than sufficient to

⁹Yavorsky (2008b) describes how many firms involved with Lehman—hedge funds, buy-side firms, and other dealers—tried in September 2008 to negotiate offsetting replacement trades that would reduce their exposure to Lehman. These trades would only take place if Lehman declared bankruptcy. Unfortunately, “the close-out session resulted in the replacement of only a relatively limited amount of all the outstanding trades.” The practical problems involved the large number of participants, the large number of outstanding positions, and the difficulties of agreeing on prices at a time of significant volatility in the market.

cover any potential shortfall.¹⁰ Abate (2009) estimates that the intraday peak level of overdrafts typically occurs at about 10 a.m. and “easily exceeds several hundred billion dollars.”

When a dealer’s cash liquidity comes into doubt, however, a clearing bank has a “right of offset,” a contractual right to discontinue making cash payments that would reduce the account holder’s cash balance below zero during the day, after accounting for the value of any potential exposures that the clearing bank has to the account holder. In the case of Lehman’s default, for instance, it has been reported that Lehman’s clearing bank, JPMorgan Chase, invoked this right, refusing to process Lehman’s instructions to wire cash needed to settle Lehman’s trades with its counterparties (Dey and Fortson, 2008; Teather, 2008; Craig and Sidel, 2008). Lehman was unable to meet its obligations on that day and entered bankruptcy.

Policy Responses

Policies for the prudential supervision, capital requirements, and failure resolution of traditional commercial banks have been developed over many years and are relatively settled. The financial crisis, however, has brought significant new attention to policies for reducing the risks posed by large systemically important financial institutions, particularly dealer banks.

The regulatory changes currently envisioned for systemically important financial institutions in both the United States and Europe include higher capital requirements, new supervisory councils, and special powers to resolve these financial institutions as they approach insolvency or illiquidity. Banks sponsoring securitization deals will also be required to hold at least a minimum level of exposure to the securitized cash flows, in an attempt to give them the incentive to lower the risk of these securitization structures. Capital requirements are likely to be higher for derivatives that are not guaranteed by a central clearing counterparty. Information about derivatives positions will be placed into repositories available to regulators. To this point, however, proposed regulations are unlikely to result in the safe resolution of dealer banks that depend on large amounts of overnight repo financing and have large over-the-counter derivatives portfolios. Most repos and over-the-counter derivatives are qualifying financial contracts that are exempt from automatic stays at bankruptcy (Bliss, 2003; Edwards and Morrison, 2005). Runs by short-term secured lenders and over-the-counter derivatives

¹⁰ In the U.S. interbank market, cash payments are settled by FedWire electronic transfer of federal funds from one bank’s account with the Federal Reserve to another’s. As far as the interest earned on its federal funds and its reserve requirements, what matters to a clearing bank on a given day is its federal funds balances as of 6:30 p.m. Eastern. The Fed charges banks a fee of 36 basis points for daylight overdrafts of federal funds. Clearing banks, in turn, may assess a similar fee to dealer’s, although the clearing bank’s overdraft in federal funds would typically be smaller than the sum of the overdrafts of its client dealers, given positive and negative dealer balances can be netted.

counterparties may continue to contribute to the failure mechanics of large dealer banks and to systemic risk.

Perhaps the most important source of systemic risk is the potential impact of dealer-bank fire sales on market prices and investor portfolios. In the recent financial crisis, the risk of fire sales was significantly mitigated by lender-of-last-resort financing by central banks (Tucker, 2009), and by capital injections into dealer banks, such as those of the Bank of England and the U.S. Treasury Department's Troubled Asset Relief Program (TARP). Some of these facilities are likely to be costly to taxpayers and to increase moral hazard in the risk taking of large dealer banks going forward, absent other measures.

Another set of policy steps considers the problems of short-term tri-party repos, which are a particularly unstable source of financing in the face of concerns over a dealer's solvency. Because tri-party clearing banks have an incentive to limit their exposures to a dealer bank, they are likely to limit the access of a weakened dealer bank to repo financing and to clearing account functions. Bernanke (2008; see also 2009) has pointed to the potential benefits of a tri-party repo "utility," which would have less discretion in rolling over a dealer's repo positions, meet high standards, and suffer from fewer conflicting incentives. Another approach, mentioned by Abate (2009) is central-bank insurance of tri-party repo transactions. Yet another approach under discussion is an "emergency bank," to be financed by repo market participants, that could manage the orderly unwinds of repo positions of weakened dealers. The emergency bank would have access to discount-window financing from the central bank and would insulate systemically critical clearing banks from losses in the course of the unwinding process.

The threat posed by the flight of over-the-counter derivatives counterparties can be lowered by central clearing. Sufficiently extensive and unified clearing can reduce the total exposure of market participants to any given dealer through the multilateral netting of positive against negative exposures (Duffie and Zhu, 2009). Obviously, the financial strength of large central clearing counterparties is crucial, as is their implicit government backing. Currently, the majority of over-the-counter derivatives positions are not centrally cleared. There has been modest progress toward clearing significant quantities of over-the-counter derivatives that are based on equities, commodities, and foreign exchange. Although a large quantity of interest-rate swaps are cleared, the majority are not. Even the recently established central clearing counterparties for credit default swaps will not easily treat a large quantity of positions in credit default swaps that are not standard enough to be cleared. The challenge of how to clear a greater share of derivatives and how to deal with the fact that many derivatives are not standard has only been partially addressed through legislative proposals that include higher regulatory capital requirements for uncleared derivatives.

A further set of proposals addresses the pre-failure resolution of dealer banks that are suffering grievous financial distress. Dealer banks could be given regulatory incentives or requirements to issue forms of debt that, contingent on stipulated distress triggers, convert to equity (Flannery, 2005; Squam Lake Working Group

on Financial Regulation, 2009). Duffie (2009) proposes that distress-contingent convertible debt be complemented with regulations favoring mandatory rights offerings of equity that, similarly, are automatically triggered by leverage or liquidity thresholds. These two new instruments can be designed to recapitalize a financial institution before a destructive run is likely to commence, and to reduce a financial institution's incentives for socially excessive risk taking.

The financial crisis has made clear the need to reconsider the systemic risks posed by the failure of dealer banks and has provided new insights into the mechanics by which they fail. The task of building new institutional mechanisms to address these failure mechanics is timely and urgent.

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