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About this Newsletter

In this issue of FINANCE we discuss how the credit problems that began in the real estate market are now affecting the liquidity and solvency of the commercial banking system as a whole.

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Understanding the Credit Crisis:
The Treasury, the Fed, and the Banking System

By **George Oldfield and Michael Cragg**

Introduction

At the most basic level, current credit problems are rooted in questions about the real estate market's effect on the solvency of the commercial banking system. Now the problems that began in subprime mortgages have spread to other loan types, which increases banks' exposure to losses in equity capital. Refer to *The Brattle Group*'s Issue Brief, "Expanding Subprime Mortgage Crisis Increases Litigation Risks," March 2008.

Because the commercial banking system is the transmission network for federal financial operations, bank solvency is the crucial link between the U.S. Treasury, the Federal Reserve System (the Fed), and the private economy.

Without a solvent banking system, the private sector cannot support its own credit requirements, nor can it provide credit for the needs of the public financial sector. Bank equity capital floats the entire financial system. For this reason, the solvency of the banking system is a matter of intense public policy concern.

To understand how the banking system fits into the economy's financial network and how the recent Treasury and Federal Reserve assistance programs address the current crisis, it is useful to look at the big picture and work down to the particulars. Starting at the top of the financial system, we develop four points:

- The real estate crisis has created a crisis of confidence in the banking system's solvency.
- With a bank solvency crisis, a liquidity crisis ensues immediately in financial markets.
- The Treasury's $700 billion Troubled Asset Relief Program (TARP) is focused on banking system solvency; the Fed's parallel $736.5 billion loan programs are focused on banking system liquidity.
- Systemic risk threatens banks' solvency and liquidity.

Context of the Credit Problem

Beginning with an overview of the economy, we divide the balance sheet for the entire United States into two parts: the public or government sector, and the private sector of households, firms, and financial institutions (ignoring foreign holdings of U.S. assets for simplicity).

The public sector owns assets such as highways, dams, defense equipment, the Hope diamond, and the money creation franchise. This valuable franchise is owned by the Federal Reserve System, which is part of the public sector.[1] To finance its assets, the public sector issues to the private sector both debt instruments (such as 10-year Treasury bonds) and Federal Reserve liabilities (such as currency and bank reserves).

Bank reserves are the banks' deposits at the Fed. The Fed can increase or decrease these reserves through bank transactions (see "The Role of Federal Financial Institutions" on Page 3). Currency and reserves issued by the Fed equal the monetary base held by the private sector; the monetary base being the Fed's liability. The Fed funds its balance sheet and capitalizes its franchise to create money by issuing currency and reserves.

All credit in the private sector ultimately rests on the monetary base and is used in the final settlement of all financial transactions. For every dollar of currency and reserves issued by the Fed and owned by commercial banks, a large multiple (over 20 times) in deposits can be issued by the banking system. These deposits fund the private sector loans that keep the economy going. If a bank becomes insolvent and ceases operations, an uncontrolled reduction in the monetary base is created unless the Fed takes steps to offset the reduction.

The Treasury and the Fed are concerned with banking system solvency because insolvent banks threaten the stability of the monetary base. They also threaten the entire pyramid of private sector credit, which is balanced on bank reserves and currency. The central role of the monetary base in the private sector's credit creation process explains why the Treasury and the Fed are focused on the banking system rather than the problems of individual mortgagors.

The private sector's balance sheet is summarized by adding together businesses (including nonprofit organizations), financial institutions, and households. The private sector owns private assets like factories, farms and real estate, and public sector financing instruments such as Treasury bonds and the monetary base. Private sector assets are largely financed within the private sector.

A debt instrument issued by one private sector entity, such as a corporation, is an asset held by another private sector entity, such as a household. Therefore, corporate bonds, bank deposits, real estate mortgages, and other private debt instruments all net out in the private sector. The major private sector net liability is future taxes payable on the public debt. The remainder of the private sector balance sheet on the right-hand side is private net worth. This measures the net stock of private wealth in the U.S.

The largest asset category in the private sector is residential real estate. The value of this real estate fell from $20.16 trillion in mid-2007 to $19.43 trillion in mid-2008, a decline of about 3.6 percent.[2] A decline in the value of residential real estate has a direct effect on the value of private sector wealth. However, looking behind all the netting in private sector aggregation, one sees that private sector residential real estate assets are financed with mortgages owned by other private sector entities (about $10 trillion in mid-2007).

This means that trouble in real estate markets causes trouble for the institutions that hold the mortgages, in addition to these institutions' owners. Banks own large amounts of real estate-related assets, such as structured mortgage instruments, mortgage derivatives, and short-term loans collateralized by mortgage-backed securities (MBS).

From mid-2007 through mid-2008, U.S. banks took write-downs of about $400 billion and raised only $200 billion in new equity.[3] Moreover, the amount of bank equity in mid-2008 was only about $1.17 trillion.[4] Thus, additional defaults and write-downs on mortgage instruments and other types of loans threaten banking system solvency. This threat ensures that the Treasury and the Federal Reserve will get involved with banks' problems.

THE ROLE OF FEDERAL FINANCIAL INSTITUTIONS

The key federal financial institutions, the U.S. Treasury and the Federal Reserve System, have distinctly different roles in the economy. The Treasury manages the federal government's fiscal affairs. It collects taxes and duties, and borrows the funds necessary to finance both the federal government's day-to-day operations and its investments in real and financial assets. It also makes federal disbursements to the private sector. The Treasury owns assets that relate to money, like U.S. gold and silver stocks, and investments in international organizations, like the IMF and development banks. Investments in U.S. banks or bank assets would extend this asset category to domestic financial holdings.

The Fed is the central bank of the U.S. In this role, it manages the monetary affairs of the federal government. First, it operates as the Treasury's commercial bank, holding the Treasury's deposit accounts that the Treasury draws upon to make disbursements and lending it funds when necessary. Second, the Fed functions as the Treasury's investment bank, underwriting and conducting the periodic auctions of Treasury bills, notes, and bonds that the Treasury issues to raise funds from the private sector.

The Fed also manages the payment system in the U.S. economy. In this role, the Fed uses the commercial banking system to create private deposits and extend credit in the private sector. As the central bank, the Fed is the bank for commercial banks, the lender of last resort, and the source of temporary liquidity for banks that need immediate funds. The Fed issues monetary base to finance the assets it owns: a sizeable fraction of all publicly-issued U.S. Treasury instruments and loans (called discounts) to private sector banks. All transactions in the economy eventually settle in an exchange of monetary base between a buyer and a seller.

The Fed controls the composition of public sector liabilities held by banks: the fraction of monetary base and Treasury debt that banks own. This control of bank asset composition, called the Fed's monetary policy, is affected through transactions initiated by the Fed with the banking system. If the Fed's policy is to restrict credit, it sells Treasury debt from its inventory to banks. Banks pay the Fed for the Treasury bonds they buy by reducing their reserve accounts at the Fed. This reduces the monetary base and the amount of deposits and loans the bank system can support on its balance sheets.

At the same time, the Fed's offer of Treasury instruments from its own inventory tends to bid down the bonds' prices, which increases their market yields and the yields on other substitute investments, like corporate bonds. To increase private credit available, the Fed buys Treasury bonds from banks and pays the selling banks by increasing their reserve balances.

The Fed's open market purchases increase the monetary base and bid down market yields. This is how the Fed, with open market transactions, restricts or relaxes the supply of monetary base and raises or lowers the rates on credit available within the private sector. The Fed's intent in monetary policy is to provide an amount of monetary base adequate to support the credit needs of economic activity in the private sector without inflating the price level.

Banking system solvency underlies banking system liquidity. An illiquid bank cannot sell its assets quickly enough to meet demands for payments on its obligations. But an illiquid bank can always gain liquidity by posting collateral with the Fed and borrowing additional reserves. This is why the Fed is the lender of last resort.

When a bank becomes insolvent, its assets' values are less than the values of its liabilities (mostly deposits owned by other private sector entities). Its equity capital is wiped out and it must cease operations. It may remain liquid temporarily, but unless additional equity capital is invested, it will eventually default on some of its obligations and fail, which makes its reserves disappear. The Treasury's TARP initiative is directed at banking system solvency, while the Fed's lending programs address the banking system's liquidity (see "Bank Solvency and the Treasury's Troubled Asset Relief Program (TARP)" on Page 6 and "Federal Reserve Liquidity Programs" on Page 7).

Liquidity and Solvency in the Banking System

To define liquidity, one must distinguish among three concepts: liquid instruments, liquid institutions, and liquid markets. With a liquid instrument, a potential buyer and seller agree upon its price and can trade it immediately at low cost. A liquid institution is one that can meet its current obligations as they come due; it can sell liquid assets or borrow funds to make payments, at least for a while. A liquid market is one in which liquid instruments trade among liquid institutions.

All transactions in developed financial markets rely upon banking system liquidity. Banks are both buyers and sellers of credit instruments, which creates order flow. Banks finance dealers' securities inventories with short-term loans, which allow dealers to make markets. Finally, banks provide settlement services so that buyers can pay sellers with monetary base in the final settlement.

Money market instruments (commercial paper and CDs), claims for capital assets (stocks and bonds), and derivative assets (including commodity futures and foreign exchange) are all priced in financial markets. These prices direct investment funds to their best economic uses in the economy.

Without a solvent and liquid banking system, the efficient flow of capital in the private sector ceases. This is one reason why the Treasury and the Fed seek to support the banking system. A second reason is that a solvent banking system is required for the Fed to implement monetary policy with secondary market trades of Treasury instruments (see "The Role of Federal Financial Institutions" on Page 3).

The Fed's use of the banking system to regulate the amount of credit available in the private sector rests on a shallow foundation: the amount of equity capital provided to banks by private sector investors. A shortage of bank equity capital creates an insolvent banking system. Insolvency is different from illiquidity, but an insolvent institution becomes illiquid quickly. An illiquid institution can become insolvent unless it takes steps to meet payment obligations in a timely fashion.

Solvency underlies liquidity in institutions. A solvent institution is one whose asset value exceeds the value of its obligations. A liquid institution is one that can meet its current payment obligations. A solvent institution may not be liquid, but it will eventually be able to pay its creditors. A liquid institution may not be solvent, in which case its liquidity is transitory.

Because financial transactions do not settle in immediate cash (mortgage-backed trades take a month), a trade with an insolvent institution, even if it appears to be liquid, is a risky proposition. A buyer, if insolvent, may fail before it makes a payment. On the other side, a buyer of a security from an insolvent institution may delay payment, hoping for its counterparty to fold before payment is due. Thus, when a bank's solvency is questioned, its liquidity disappears.

The failures of Bear Stearns and Lehman Brothers appear to have been caused by the inability to sell or finance their inventories of opaque mortgage instruments at prices that would preserve their solvency (see "Bear Stearns" and "Lehman Brothers" entries in the Appendix). The next section discusses the Treasury's initiatives, which are mostly directed at bolstering banking system solvency, and the Fed's operations, which focus on institutions' liquidity.

Credit Crisis Programs and Transactions

This section describes the programs by the Treasury and the Fed to bolster the solvency and liquidity of the banking system in terms of public sector transactions with the private sector. While this gives an overview of the transactions, the goal of the Treasury and Fed programs is to affect the banking system within the private sector.

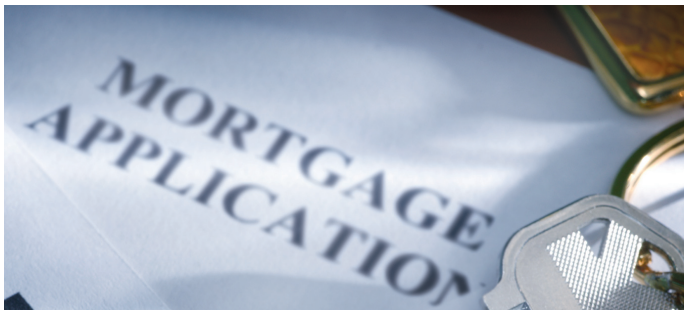
■ The Treasury's $700 Billion Bank Solvency Program

The Treasury's program to provide new capital to the banking system is two-sided. On one side, the Treasury is injecting new capital through a direct purchase of banks' equity securities. This moves a private sector asset (banks' stocks) directly onto the public sector's balance sheet. To finance its asset purchases, the Treasury issues public debt — indirectly through the Fed — to the private sector.

Whether the private sector's liability of future taxes payable increases or decreases depends upon whether the Treasury overpays or underpays for banks' stocks. If the equity prices are fair, the public debt's value equals the stocks' values, and no expected future tax liability is incurred.

On the other side, if the Treasury buys mortgage-backed instruments from banks, this moves different private sector financial instruments into the public sector. The Treasury pays for its purchases of private sector mortgage-backed instruments by issuing public debt (again through the Fed) to the private sector. This replaces mortgage-backed securities (MBS) investments in the private sector with the instruments held by selling private sector institutions.

The private sector's net assets increase by the amount of this public debt because the mortgage-backed instruments sold by banks to the Treasury netted out before the sale. But private sector liabilities increase as well, because private sector mortgage payments are now due to the Treasury. At the same time, the private sector's net liability of future taxes payable increases or decreases by the amount of Treasury overpayment or underpayment for the mortgage-backed instruments.[5] Within the private sector, holdings of mortgage-backed instruments fall while bank reserves increase. Bank solvency is improved only if the Treasury overpays for its purchases.



But solvency underlies liquidity, so improving banking system solvency improves liquidity in financial markets as well. For the potential effects on liquidity, and the potential problems in creating this liquidity through purchases of mortgage-backed instruments, refer to "The TARP Asset Purchase Plan" on Page 9.

In summary, the Treasury's $700 billion program to buy banks' equity securities and banks' holdings of mortgage-backed instruments affects the private sector by moving a private financial claim (and offsetting private sector payment obligation) into the public sector in exchange for reserves at the Fed (and potential future tax obligations). This can increase banks' solvency directly through equity purchases, or indirectly if the Treasury overpays for banks' mortgage-backed instruments.

■ The Fed's $736.5 Billion Bank Liquidity Programs

In a $736.5 billion series of *ad hoc* lending measures that parallel the Treasury's $700 billion solvency program, the Fed is providing temporary liquidity to the financial system with its ability to create credit through issuing monetary base (see "Federal Reserve Liquidity Programs" on Page 7).

When the Fed lends money to banks, the private sector's holding of monetary base increases, but there is an exact offsetting liability from private sector banks to pay off the Fed's loans. The Fed lends short-term against collateral supplied by borrowers; however, it does not take title to the collateral. Thus, private sector net worth is unaffected. The Fed's $736.5 billion programs to provide liquidity to financial institutions exceeds the Treasury's solvency program.

Bank Solvency and the Treasury's Troubled Asset Relief Program (TARP)

This program was created under the Emergency Economic Stabilization Act of 2008 (EESA), which was passed by Congress and signed into law by the president on October 3, 2008. Under this law, the Treasury is authorized to spend in three tranches. The first is $250 billion and requires no oversight; the second is $100 billion and requires the approval of the president; and the third is $350 billion subject to congressional approval (Sen. Christopher Dodd, "Summary of the Emergency Economic Stabilization Act of 2008.").

In formulating the program, the Treasury created seven teams/programs to implement elements required under the TARP (Kashkari and Neel, "Remarks Before the Institution of International Bankers," October 13, 2008.).

- ***Mortgage-Backed Securities (MBS) Purchase Program*** – Identifies which troubled assets to purchase, from whom to buy them, and the purchase mechanism.
- ***Whole Loan Purchase Program*** – Identifies which loans to purchase, how to value them, and the purchase mechanism.
- ***Insurance Program*** – Creates a program to insure troubled assets. In order to create the best program, the Treasury has solicited outside opinions on structuring options.
- ***Equity Purchase Program*** – Designs and oversees purchase of equity in a broad array of financial institutions. While this was originally designed as a voluntary program, recent evidence shows that this has not been the case. (See *New York Times*, October 15, 2008.)
- ***Homeownership Preservation*** – Makes an effort to help homeowners when buying loans and assets. Goals are consistent with other programs such as "Hope Now".
- ***Executive Compensation*** – Establishes important requirements in relation to executive compensation for participants in the TARP. This team is charged with implementing those requirements and establishing guidelines for banks.
- ***Compliance*** – Works to establish an oversight board with the General Accounting Office and the creation of a special Inspector General.

On October 14, 2008, the Treasury announced a program to purchase $250 billion in the senior preferred shares of financial institutions. Companies must elect to participate before 5:00 PM (EST) on November 14, 2008. The program would be available to qualifying U.S.-controlled banks and other depositories. The senior preferred shares will pay a cumulative dividend rate of 5% *per annum* for the first five years and 9% thereafter.

In addition, the Treasury will receive ten-year U.S. warrants to purchase common stock of an amount up to 15% of the senior preferred investment at the approximate market price of the common stock when exercised (U.S. Treasury Press Release, October 14, 2008.). The initial participating institutions in this program are ("Beneficiary Banks," *New York Times* graphic, October 14, 2008.):

- Citigroup - $25 billion
- Bank of America - $25 billion
  (includes $5 billion for its Merrill Lynch Purchase)
- JPMorgan Chase - $25 billion
- Goldman Sachs - $10 billion
- Morgan Stanley - $10 billion
- Wells Fargo - $25 billion
  (includes $5 billion for its Wachovia Purchase)
- Bank of New York - $2-3 billion
- State Street - $2-3 billion

Additional banks have been selected for equity investments by the Treasury, and other financial firms are lobbying for similar assistance.

Federal Reserve Liquidity Programs

Since the summer of 2007, the Federal Reserve has announced nine new programs to provide liquidity to the banking system's institutions (Federal Reserve Bank of New York Press Releases, October 2008.):

- ***Term Discount Window Program: August 17, 2007***
  Allows primary credit-eligible depository institutions to borrow on terms up to 90 days using any collateral that can be used at the discount window.
- ***Term Auction Facility: December 12, 2007***
  Allows primary credit-eligible depository institutions to borrow on terms of 28 or 84 days using any collateral that can be used at the discount window.
- ***Single-Tranche Open Market Operations Program: March 7, 2008 -*** Allows primary dealers to borrow on terms of 28 days using Treasury or mortgage-backed securities (MBS) as collateral.
- ***Term Securities Lending Facility (TSLF): March 11, 2008***
  Allows primary dealers to borrow securities on 28 day terms. This allows for the use of both investment-grade and illiquid securities as collateral in return for loans of liquid Treasury securities.
- ***Primary Dealer Credit Facility: March 16, 2008***
  Allows primary dealers to borrow on overnight terms using any collateral that can be used for the tri-party repo system, including non-U.S. dollar-denominated securities.
- ***Term Securities Lending Facility Options Program (TOPS): July 30, 2008 -*** Allows primary dealers to borrow on terms less than two weeks using all Treasury, agency MBS, or investment-grade debt securities as collateral.
- ***ABCP Money Market Fund Liquidity Facility: September 19, 2008***
  Allows all depository institutions, bank holding companies, and U.S. branches and agencies of foreign banks to borrow on a maximum term of 270 days using first-tier asset-backed commercial paper (ABCP) as collateral.
- ***Transitional Credit Extensions: September 21, 2008***
  Allows U.S. and UK broker-dealer subsidies of Goldman Sachs, Morgan Stanley, and Merrill Lynch to borrow on overnight terms using any collateral that can be used at the discount window or for the tri-part repo system.
- ***Commercial Paper Funding Facility (CPFF): October 14, 2008***
  Creates a credit facility to a special purpose vehicle (SPV), which will serve as a funding backstop to facilitate the issuance of commercial paper by eligible issuers. The SPV will purchase U.S. dollar-denominated commercial paper that is rated at least A-1/P-1/F-1. The SPV will begin purchases on October 27, 2008 and cease purchases on April 30, 2009, unless extended by the Fed.

By instituting these programs and through other activities, the Federal Reserve's assets have grown by approximately $736.5 billion over the last 18 months. The Fed has added liquidity of approximately $150 billion through the Term Auction facilities, $125 billion through primary and broker-dealer facilities, $37.5 billion through the most recent TSLF, $25 billion through the most recent TOPS, and $140 billion through the ABCP and Money Market fund facilities.

This gives a total of approximately $477.5 billion of liquidity through its new programs. Additionally, approximately $70 billion has been added through repurchase agreements and approximately $75 billion through loans to primary credit institutions, when compared to 18 months ago (Federal Reserve Statistical Release, Form H.4.1, March 8, 2007 and October 9, 2008.).

Finally, the Fed took on $29 billion of Bear Stearns' MBS portfolio and provided (initially) $85 billion of credit to AIG.

Systemic Risk in the Financial Sector

Most real estate purchases in the private sector are financed with mortgages issued to private sector investors. A large fraction of mortgages are securitized and many mortgage packages are further structured. Securitization is relatively benign, but structuring causes mortgage problems to surface throughout the private sector's financial system. This is termed systemic risk, because the whole financial system has a common potential source of failure.

■ Government-Sponsored Enterprises

Two techniques for securitization work side-by-side. For conventional residential mortgages that conform to the origination standards of Fannie Mae or Freddie Mac, these government-sponsored enterprises (GSEs) handle the securitization (about $4.25 trillion of mortgages are securitized by Fannie and Freddie).[6]

Securitization means that mortgages are sold into a GSE-sponsored private trust, which issues mortgage-backed instruments (agency pass-throughs) that convey pass-through claims on the principal and interest paid into the trust by the mortgagors. The GSE guarantees the principal and interest payments of the mortgages in the trust.

Such GSE-sponsored simple securitization has established a deep and liquid long-term bond market for unstructured mortgaged pass-throughs. Fannie's and Freddie's insolvency threaten this market's viability (see "Fannie Mae & Freddie Mac" entry in the Appendix).

■ Special Purpose Vehicles

For mortgages that do not conform to GSE origination standards, private-label securitization is generally used by originators (about $2.79 trillion of mortgages).[7] In this type of transaction, a package of mortgages is sold to a private entity called a special purpose vehicle (SPV). The SPV is a corporation, trust, or partnership established to own the package of mortgages and to finance its ownership through the issuance of private-label MBS.

The SPV is sponsored by a private sector financial institution such as a securities dealer or bank. So far, this mimics a GSE-sponsored transaction. But a private-label deal takes another step. The SPV is used as a mechanism to structure (slice and dice) payments from underlying mortgages into different, complicated pieces called SPV debt classes or tranches.

Establishing the SPV to own and finance the nonconforming mortgages enables a bank or dealer to structure and sell mortgage-backed instruments to a wide variety of financial institutions, many of which would not ordinarily invest in simple, GSE-sponsored mortgage pass-throughs. In this manner, complicated mortgage-backed investments without GSE insurance have become widely-held by financial institutions in the private sector.[8]

This is the economic purpose of mortgage structuring: to distribute broadly the fundamental real estate risk in the private financial sector, rather than to have that risk concentrated in one narrow industry like savings and loan institutions.[9] But structuring can cause wide-spread problems as well.

■ Credit Default Swaps

Further complicating the private sector picture are more complex mortgage derivatives like credit default swaps (CDSs). A CDS is an insurance contract on a financial instrument. A simple CDS works like the Fannie Mae or Freddie Mac guaranty on pass-throughs. For example, an insurance company might sell a CDS to an investor that owns a class of structured subprime mortgages (see "AIG" entry in the Appendix). This serves an economic purpose in channeling risk to risk-taking institutions, but it also widely spreads the number of investors potentially affected by mortgage default problems.

The CDS market is not limited to mortgage-backed instruments. High yield bonds and bank loan-based products have written against them as well. The notional amount of the CDS market is about $60 trillion.[10] Many CDS contracts are cash settled. This means that, in the event of default, the owner of the CDS gets a cash payment from the CDS seller that equals the size of the reference instrument's default-driven price drop.

This has an important consequence in that there is no need for either the buyer or seller of a CDS to actually own the reference debt instrument. Thus, for any debt instrument, far more CDS contracts written in terms of its default performance may exist than the actual instrument itself. CDS buyers and sellers are making credit side bets on some refer-

ence instruments' credit-worthiness. Writing such side bets on companies that failed apparently threatens the solvency of some large CDS writers like AIG.[11]

The whole series of links outlined in the mortgage, SPV class, and CDS transactions constitute the normal flows in sophisticated markets for innovative mortgage-backed instruments and derivative contracts. The profits on these transactions, which all ultimately come from the mortgagors whose mortgages were sold to the SPV, are earned by the shareholders of the transacting institutions.

An unanticipated failure of mortgagors to make timely payments creates an immediate, systemic problem throughout the entire chain of mortgage-backed instrument investors, banks that finance dealer inventories of mortgage-backed instruments, and CDS writers.

Note however, that only unanticipated failures by mortgagors create a problem. Anticipated defaults are priced into the contracts at the outset. If real estate values fall sharply in an unanticipated slump, this decline in asset values gets transmitted into the financial system through the market linkages outlined above.

With banks a major link in the transaction chain, as they must be through dealer financing and final payments for transactions, bank solvency is threatened when the transaction chain breaks down.

The TARP Asset Purchase Plan: So You Wanna Trade Mortgages?

The U.S. Treasury has proposed to buy mortgage instruments, but it is difficult to know exactly what this means. In addition to the scores of generic agency pass-throughs that exist, there are tens of thousands of classes of private-label mortgage-backed instruments. Each of these classes differs from the others in collateral, coupon, payment priority, subordination, and other terms.

Some mortgage–backed instruments are collateralized with mortgage-backed instruments from other deals. To complicate matters further, many classes of mortgage-backed instruments also have other types of loans for collateral — so-called collateralized debt obligations (CDOs). Most CDOs are created with off-shore entities so the actual owners of the collateral are non-U.S. persons, while the CDO owners are domestic institutions. Many mortgage-backed instruments are owned by hedge funds and foreign institutions, including central banks.

Some questions arise:

- What instruments will qualify for sale to the Treasury?
- Which institutions will be qualified to sell into the Treasury program?
- How long must an institution hold an instrument before it proffers the paper to the Treasury?
- Will qualified sellers be able to buy from unqualified investors and sell the instruments to the Treasury?
- How will the Treasury set prices?
- How will the Treasury finance its purchases?
- Will the Treasury make a simultaneous market to sell the instruments; that is, become a central marketplace to establish prices in an orderly fashion?
- What types of representations and warranties will the Treasury demand from sellers and provide to buyers for the myriad of mortgage instruments transacted?
- Will the U.S. SEC Rule AB apply to the Treasury if it becomes, in effect, an initial distributor of mortgage-backed deals?

Making a two-sided market would provide liquidity in the market for mortgage-backed products. Conversely, the Treasury might buy mortgage-backed instruments at a premium to inject public funds into private institutions with the intent of holding its purchases for a time while markets settle down. If bank solvency is the real concern, then this procedure would be in line with the Treasury's investments in bank stocks. Whatever its intent in buying mortgage-backed instruments, the Treasury must also plan for how it will eventually sell its positions.

CONCLUSION

How does this private sector transaction chain brew up a credit crisis? It depends on the definition of a crisis. In the current situation, it appears that the real value drop originated in the real estate market financed with subprime loans. The unanticipated rate of mortgage defaults in this market has been transmitted into the SPV debt, dealer inventory finance, mortgage insurance, and CDS markets. Now other credit instruments are being affected as well.

One view is that the forced sale of loan collateral might flood ordinarily thinly-traded markets (mortgage-backed SPV classes rarely trade because buyers must investigate the collateral) and force transitional collateral prices to very low values before a price recovery. This, in turn, might cause additional collateral sales as other similar collateral positions get marked down, resulting in further price pressure and cascading difficulties for borrowers, lenders, and banks. Because bank solvency is the issue, it appears that this downward price cycle for mortgage-backed instruments is what the Fed and the Treasury want to prevent.

Another view is that loan collateral has a low value and that policy steps taken to obscure this reality simply delay the eventual adjustment in market prices. Moreover, regulatory initiatives to tighten banks' credit extension standards, which improve banks' solvency and liquidity, naturally price some would-be borrowers out of the market. Unhappy, disqualified borrowers label this a credit crunch.

The current credit crisis shows that neither market-based nor regulatory-based incentives bite hard enough to induce many financial institutions to make adequate and timely disclosures, operate in a prudent fashion, or assume risk in a disciplined manner. Two observations illustrate this point:

- No troubled company's executives appear to have had sufficient motivation to attempt to recapitalize their company with their own wealth (even as they searched for other investors to do so).

- Each troubled company's capitalization was overseen by one or more state or federal regulatory agencies.

One path to improvement relies on regulation to mandate better risk management and disclosure by financial institutions. Another path is to create better incentives for disciplined financial management. This path relies on litigation. Whether the remedies exacted from legal actions will create the incentives necessary to avoid similar systemic problems in the future remains to be seen.

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APPENDIX: Disposition of Troubled Companies (in order of actions taken)

Countrywide Financial Corporation: In August of 2007, Countrywide received a capital injection of $2 billion by Bank of America (Countrywide Financial 8-K SEC Filing, filed August 28, 2007.). On January 11, 2008, Bank of America announced that it would acquire the remaining portion of Countrywide in an all-stock deal valued at $4 billion (Bank of America Press Release, January 11, 2008.).

Bear Stearns: On March 17, 2008, JPMorgan Chase announced that it would purchase Bear Stearns for $2 per share in a deal of approximately $225 million. With this agreement, the Federal Reserve Bank of New York (FRBNY) agreed to lend $30 billion to guarantee Bear Stearns' liabilities. On March 24, 2008, JPMorgan Chase announced that it was increasing the transaction price to $10 per share for a value of $1.1 billion and that it would issue a subordinated note of $1 billion, reducing FRBNY's loan to $29 billion (JPMorgan Chase 8-K SEC Filing, filed March 24, 2008.).

Fannie Mae & Freddie Mac: On September 7, 2008, the Federal Housing Finance Agency announced it was placing both companies under conservatorship. Included in this conservatorship are steps for the Treasury to give short-term credit up to an amount equal to any available collateral and inject capital through a $1 billion purchase of 10% dividend senior preferred stock from each company. The Treasury also received stock warrants to purchase up to 79.9% of common stock at $0.00001 and to provide up to $100 billion to each company if its quarterly liabilities exceed its assets (Fannie Mae & Freddie Mac 8-K SEC Filings, filed September 11, 2008.).

Lehman Brothers: Lehman Brothers filed for bankruptcy on September 15, 2008. At the time of bankruptcy, Lehman had $613 billion in debt against $639 billion in assets, making it the biggest bankruptcy in U.S. history ("Lehman folds with record $613 billion debt," *MarketWatch*, September 15, 2008.).

Merrill Lynch: Merrill Lynch was acquired by Bank of America in a deal announced on September 15, 2008. The deal was valued at $50 billion and was an all-stock transaction where each Merrill share would exchange for 0.8595 Bank of America common shares (Bank of America Press Release, September 15, 2008.).

American International Group (AIG): On September 15, 2008, AIG's credit ratings were downgraded, forcing collateral calls, which AIG covered by accessing $20 billion in capital from its subsidiaries. In response to growing concern over the company's fate, the FRBNY agreed to loan AIG $85 billion through a 24-month term facility on September 22, 2008. The loan was collateralized by all assets of AIG and a trust for the Treasury (outside the TARP initiative) received stock warrants for a 79.9% equity interest (AIG 8-K SEC Filing, filed September 22, 2008.). As of September 30, 2008, AIG had drawn $61 billion of the initial facility ("Fed grants AIG $37.8 billion loan," *International Herald Tribune*, October 8, 2008.). On October 8, 2008, FRBNY announced that it was creating an additional facility in which AIG could use investment-grade fixed-income securities to collateralize up to another $37.2 billion in FRBNY loans (AIG Press Release, October 8, 2008.).

Washington Mutual (WaMu): Starting on September 15, 2008, an outflow of $16.7 billion in deposits forced the Office of Thrift Supervision (OTS) to place the company under FDIC receivership on September 25, 2008 ("OTS Fact Sheet on Washington Mutual Bank," September 25, 2008.). Following this, the FDIC sold all of WaMu's banking operations to JPMorgan Chase for $1.9 billion (JPMorgan Chase Press Release, September 25, 2008.).

Wachovia: Wachovia was forced by the FDIC to accept Citigroup (Citi) as a buyer on September 29, 2008 (Citi Press Release, September 29, 2008.). Citi would pay Wachovia $2.16 billion in stock and assume debt of $53 billion. The FDIC agreed to provide loss protection on Wachovia's $312 billion mortgage portfolio, while Citi would be responsible for only the first $30 billion in losses. In addition, Citi agreed to provide the FDIC with preferred stock and warrants valued at $12 billion (Wells Fargo Press Release, October 3, 2008.). Despite the announcement of this deal, Wells Fargo announced on October 3, 2008 that it had signed a definitive agreement to merge the two companies through an all-stock deal in which 0.1991 Wells Fargo common shares would be exchanged for one Wachovia share; the transaction was valued at $15.1 billion. This deal received Federal Reserve approval on October 13, 2008 ("Wells Fargo wins Fed approval on Wachovia bid," *Reuters*, October 13, 2008.).

ENDNOTES

1. The Federal Reserve System is owned by its member banks in the private sector but its policies are determined by its board of governors appointed by the president of the United States and confirmed by the U.S. Senate. The ability of the Fed to buy interest-bearing assets by issuing interest-free monetary base generates seniorage profits for the Fed, the present value of which equals the value of its monetary franchise. Profits earned by the Fed are turned over to the Treasury. Refer to "The Role of Federal Financial Institutions" on Page 3.
2. Federal Reserve Statistical Release, Z-1, "Flow of Funds Accounts of the United States", Table B.100, September 18, 2008.
3. *Bloomberg*, WDCI, "Writedowns and Credit Losses vs. Capital Raised." Information aggregated from company statements and filings (10/27/08).
4. Federal Reserve Statistical Release, Form H.8, October 17, 2008.
5. The U.S. Treasury pays for the instruments it buys with its Fed deposit, but to obtain the funds to pay, the Treasury issues bonds to the Federal Reserve. The Fed pays for the Treasury bonds it buys by increasing the size of the Treasury's deposit balance at the Fed. Actual payment by the Treasury for its purchases of private sector instruments is affected by the Fed switching funds from the Treasury's deposit account to selling banks' reserve accounts. Then the private sector's holdings of public debt show in increased Federal Reserve debt (monetary base) rather than in Treasury bonds.
6. Federal Reserve Bulletin Statistical Supplement, Table 1.54, September, 2008.
7. *Ibid*.
8. Some SPVs have been established by security dealers and banks to own subprime mortgages and issue commercial paper as part of their financial structure. This is called asset-backed commercial paper. Ownership of this type of commercial paper has caused a few money market mutual funds to 'break the buck', that is, have a share value below a dollar. Public fear of losses by money market funds has led the Fed to its insurance program outlined in "Federal Reserve Liquidity Programs" on Page 7.
9. When the real estate risk was so concentrated in one type of depository, it became nationalized through the deposit insurance program in the thrift-centered mortgage crisis 20 years ago. Then the Resolution Trust Corporation was established by Congress to receive and sell the assets of thrifts seized by the federal government. This program cost about $124 billion in public funds. See Curry and Shibut, "The Cost of the Savings and Loan Crisis: Truth or Consequences," *FDIC Banking Review*, Vol. 13, No. 2, 2000.
10. See *The Economist*, October 16, 2008.
11. AIG settled its net Lehman Brothers CDS exposure for $6.2 million in October, 2008. The loss was small because AIG was hedged in its Lehman CDS position (*The New York Times*, October 23, 2008.).

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