Financial Turmoil and Central Bank Responses: US, UK, EU and Japan

By

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I. Introduction

The protracted financial market turmoil in most industrial countries, which had its genesis in the US subprime mortgage market, has both elicited significantly different response from the various central banks (namely, the Federal Reserve, the European Central Bank, the Bank of England and Bank of Japan) and exposed significantly different structural defects in the national safety nets across the world's major financial markets, most notably in the US, UK and EU. The resulting issues run the gamut from questions about how central banks, and governments more generally, should respond to a financial crisis and provide needed liquidity when market disruptions arise to structural defects in deposit guarantee systems and financial safety nets. The purpose of this paper is to describe the market disruptions that have taken place from the fall of 2007 through September 2008 and to discuss and assess the various central bank and governmental policy responses to the turmoil.[2] It then goes on to point out defects in safety net design and suggests needed reforms to address these defects.

II. The Market Turmoil and What Contributed To It

The market turmoil that unsettled financial markets in the fall of 2007 is widely blamed on problems in the US subprime mortgage market. However, one can also make the case that the subprime market was simply where the financial market imbalances

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[2] For other discussions see Chailloux, Gray, Klüh, Shimizu and Stella(2008)

resulted in large measure from a series of international and domestic macro economic fiscal and monetary policy mistakes came unwound first. The policy mistakes are important and not confined to the United States. There were four major areas of policy problems. First, following the dot.com bust, the continued slowdown in the rate of inflation and the investment led recession, the Federal Reserve cut interest rates drastically from 6.5% for federal funds in 2000 to 1% in 2003 in order to stimulate the economy, forestall the recession and avoid so-called "unwanted deflation." Rates were kept low for a protracted period of time, and the resulting stimulus of housing and strong consumer spending fueled a huge run up in housing construction and home prices. See Figure 1. Strong housing demand combined with a flat yield curve stimulated increased leverage on the part of both consumers and lenders.

Second, the large and persistent federal deficits and growing trade imbalance interacted with policies of foreign governments, mainly China and Japan to keep their currencies undervalued, created the conditions for a perfect storm that supported and isolated the US economy in the short term from some of the natural economic equilibrating forces and supported continued and growing imbalances rather than acting to limit them. In order to create jobs and stimulate economic growth through exports, the Chinese government kept its exchange rate artificially low. The trade surplus with the US in particular resulted in the Chinese accumulating huge dollar reserves which flowed back into US financial markets in the form of increased demand for US Treasury liabilities (which were in ample supply, because of the US fiscal deficit).

Third, another contributing policy problem was the zero interest rate policy pursued by the Japanese in an attempt to stimulate their economy and finally recover from the

malaise of the 1990s. The Bank of Japan flooded the market with liquidity which gave rise to and stimulated the yen carry trade, in which investors borrowed low cost funds in Japan and purchased higher yielding US Treasuries or other high quality government issues assets in other countries.[3] This was a relatively riskless arbitrage, as long as exchange rates didn't move against the trade in what were very large and liquid markets. When combined with leverage, returns could be very large. The policies of Japan to stabilize interest rates, combined with both the carry trade and Chinese demand for US Treasuries, helped to keep downward pressure on US interest rates, especially on the long end of the yield curve. It also meant that foreigners and foreign governments were financing the US fiscal and trade deficits by keeping the demand for US dollars high and made the conduct of monetary policy easier than it would have otherwise been, had the Federal Reserve had to purchase US Treasuries in the market to keep the federal funds rate at it low target level. This external financing of the US deficit also helped keep domestic inflation low by limiting growth of the US money supply.

Fourth, low US interest rates not only encouraged and supported growth of the US housing industry, but also when combined with financial engineering techniques, contributed to the widespread use of leverage on the part of borrowers (ie. subprime borrowers) and increased risk taking by exposing low quality borrowers to interest rate risk should their variable rate loans with low teaser rates begin to be re-priced when interest rates moved significantly higher. Of course, the Federal Reserve did begin to tighten monetary policy in June of 2004 and continued to do so with eighteen 25 basis point cuts ending the fall of 2007. Short term interest rates, to which variable rate

[3] See Hattori and Shin (2007).

subprime mortgages were tied, moved up, with predictable consequences for repayment performance.

Increased leverage not only characterized housing, but also was a more general problem. The flood of liquidity combined with a relatively flat yield curve and declining risk spreads more generally, encouraged the use of greater leverage by many market participants, including by banks who sought to get loans off their balance sheets to avoid capital adequacy constraints through the use of special purpose entities, yet retain the fees for loan origination and loan servicing. Again, the growth of derivatives and the use of loan conduits and SIVs which were all highly leveraged and financed in the short term commercial paper market enabled firms generating high volumes of loans to place them in the capital markets. Many of these techniques were used to sell off subprime and other types of loans and/or to sell the credit risk to those unwitting or willing to take that risk using credit default swaps and other forms of credit derivatives. The common ground, here, whether one is talking about borrowers or lenders, was the use of extreme leverage enabled by ample liquidity and low risk spreads.

Of course, a description of "what went wrong" wouldn't be complete without some recognition that misplaced private sector incentives which emphasized fee and asset generation with little regard for the inherent risks in the assets, since they would be sold. This together with lender outsourcing of due diligence to credit rating agencies also were important in placing financial institutions in precarious financial position. Financial engineering and the use of complex pricing models to chop cash into designer instruments intended to meet customer cash flow needs also drove fee oriented structures which segmented responsibility for assessing and monitoring the risks associated with

low quality mortgages from those that simply earned fees for asset origination. This meant that less attention was paid to the actual risks in the loans since the originator was not usually held responsible for losses, should they originate.

Particularly problematic were the conflicted incentives in the credit rating industry. The credit rating agencies were paid by the originators of the assets to assess the underlying credit quality of the loans and derivative assets being created. Originators were incented to shop for favorable ratings while the rating agencies were incented by fees to "work with" the originators to create assets with the desired risk characteristics. Ratings were created that had the same letter grades as corporate and municipal bonds, but in fact the ratings were not designed to mean the same. Kane (2008a, 2008b) in particular points out that ratings of complex mortgage structures really should have been based upon probabilities with two sided ranges on the likely risks in the instruments rather than providing simply a letter grade. That practice encouraged the creation of instruments which just met the threshold for the desired rating but had a very high likelihood of being lower quality.

The point here is that there were both macro policy problems which, when combined with defective managerial incentives involving financial institution managers and the rating agencies, created an environment that proved susceptible when asset prices declined. And when housing prices defied expectations and actually did begin to decline because of over supply in many markets, such as California, Florida, Nevada and Arizona in particular, xcessive leverage only exacerbated the consequences of the fall in housing prices.

III. The Immediate Problem

While it is always difficult to pinpoint an exact catalyst for when an unsustainable financial position will suddenly begin to unwind, problems in the subprime market were clearly already developing by the start of 2006 and festered for the early part of 2007 before creditors suddenly began to have questions about the quality of mortgage backed assets, be they subprime or conventional mortgages. Positions became increasingly difficult to finance. Financial markets began to re-price and re-evaluate risk and essentially seized up in late August of 2007. The problems and policy responses, however, were different in the three main affected markets – the EU, UK and US. Table 1 provides a detailed chronology of some of the key emerging developments and the policy responses to them as background to the discussion that follows. That chronology suggests that the first signs of problems occurred in early 2007 with the failure of ResMae, a large residential mortgage lender, and the subsequent emergence of problems in other US lenders as well as in lenders in other parts of the world. This would include: losses and withdrawal of funding to the US investment bank, Bear Stearns, the rescue of two real estate oriented state-owned German banks, problems in the sponsored hedge funds of BNP Paribus, the takeover of the troubled mortgage lender, Countrywide, and the nationalization of the UK lender, Northern Rock.

All of these events had their genesis in the emerging problems in the US real estate markets. As Figures 2, 3 and 4 show, the US housing market began to slow in late 2005, whether measured by declining sales of new and existing houses (Figure 2) or by the fall off in new construction and issuance of new permits (Figure 3). At the same time, signs

of deterioration in the quality of outstanding mortgages, especially so called sub prime adjustable rate mortgages, whose delinquency rates began to reverse in 2005 the steady decline they had exhibited beginning in 2002 (see Figure 4). Sub prime fixed rate loans and prime adjustable rate maintained good performance through 2005 and didn't begin to show significant signs of weakness until 2006.

It was about the time when US housing markets began to exhibit the first signs of weakness that the growth of mortgage related derivatives activities took off. In particular, the widespread securitization of mortgages beyond conventional mortgages that had prospered under the sponsorship of Fannie Mae and Freddie Mac, to include sub prime and Alt-A mortgages, became a significant part of the market. Figure 5 from the Financial Stability Report of the Bank of England indicates that the growth of the issuance of real estate mortgaged backed securities backed by sub prime loans jumped to over $ 125 billion in 2004, but then almost doubled by the end of 2006, just when major problems hit the US housing market. Equally interesting, the chart suggests why the impacts of the problems in the US mortgagee market hit investment banks especially hard and spread quickly abroad. The main issuers of residential mortgage backed securities (RMBS)backed by sub-prime mortgages were investment banks, large European financial institutions and UK financial institutions, whereas, by comparison, US commercial banks, were relatively minor participants. Subsequently, it not surprising that there have been large losses and movement to bring assets back on institution balance sheets to preserve reputation, especially by investment banks, and to some extent, by the large money center banks. In part, this reputational effect reflects the fact that fee generation and trading revenues dominated the revenue generation activities for the large complex

financial institutions. Figure 6 shows how dominant these activities had become compared with traditional intermediation where funds are raised and loans made. Traditional lending now accounts for only about a quarter of the earning of large complex financial institutions whereas commissions and fees and trading income account for the bulk of earnings.

The financial problems triggered by the US real estate slowdown manifested themselves somewhat differently in the international money markets. This is due in part to some institutional differences and practices. At first, problems were seen as mainly being short term liquidity problems that affected spreads. However, as time progressed, it became apparent that there were deeper issues than simply a temporary pull backs by cautious liquidity providers. Differences in perception of the problems and their causes conditioned central bankers' and regulators' responses to the financial market turmoil that ensued. These are discussed in the next sections.

A. Germany, the EU and the ECB's Response

Credit quality problems in the US subprime market claimed its first casualty in the EU with Germany's IKB Deutshce Industriebank, AG. Originally a second tier institution specializing in lending to intermediate size businesses, IKB began investing in complex fixed income securities, collateralized debt obligations (CDOs) and derivatives through its subsidiary Rhineland Funding Capital Corp.[4] These relatively longer term assets, which included but were not limited to securities backed by US subprime loans, were funded by Rhineland with shorter term debt instruments placed with investors throughout the world. Funding short and lending long strategy worked as long as credit

[4] See Mollenkamp, Taylor and McDonald (2007) for a detailed discussion of IKB. The initial package was valued at about 3.5 billion euros (or $4.8 billion).

risk spreads and interest rates remained low, but began to unravel in early 2007 when US subprime defaults began to increase (see Figure 4) and the value of the securities they supported began to decline in value. As investors became increasingly concerned about refunding asset-backed commercial paper in general, IKB began to experience problems rolling over its funding, and on July 27, instead of honoring a credit line it had extended to IKB, Deutsche Bank reported IKB's, 2007 funding difficulties to BaFin (Bundesanstalt für Finanzdienstleistungsaufsicht) , the German financial regulator. BaFin arranged a rescue package for IKB that included an injection of funds by KfW Group, which was a state owned institution and a major shareholder of IKB. Other participants included other German banks, the Association of German Banks and other banking organizations. By involving other institutions, the hope was probably that the signal effects to depositors and other sources of funding that the institution was sound.[5]

About the same time that German institutions experienced problems in valuing holdings of subprime mortgages, similar problem began to surface in other markets outside Germany. In the US, for example, Bear Sterns was experiencing large losses on mortgages securities in two of its sponsored hedge funds. Shortly after the rescue of the German banks, two hedge funds sponsored by Bear Sterns filed for bankruptcy protection on July 31, 2007. It also invoked a lockout on another hedge fund.

[5] Central bankers commonly enlist other bankers to help rescue troubled financial institutions, which is likely to be a misguided policy. Regulators should seek to make bank failures isolated events, so as not to have problems in one institution infect healthy institutions. By inducing healthy institution to lend to or provide financial support to troubled institution, regulators only prove to the market place if there was uncertainty about potential contagion effects, the interconnection is now certain. It is partly for this reason that the US system seeks to shut down institutions before they become economically insolvent and doesn't rely upon cross-bank lending support. The US has not always been immune from this problem. Money center banks were induced by Fed chairman Paul Volcker to provide funds to Continental Illinois Bank, when it experienced financial difficulties.

Back in Germany problems began to surface in other institutions. Two German mutual fund managers (Union Investment and Frankfurt Trust) suspended withdrawals.[6] Finally, on August 17, 2007 a second German banking organization, SachsenLB, was rescued with a package that amounted to 17.3 billion euros (or $23.3 billion). This institution was owned by the German state of Saxony. The bailout was triggered when the bank's conduit, Ormond Quay, was unable to continue funding its operations because of its holdings of US subprime mortgages.[7] Shortly thereafter problems began to spread more widely within the EU as BNP Paribus, SA suspended withdrawals from three of its funds because of difficulties in valuing its US subprime mortgage holdings.[8]

Uncertainty about the quality of assets in financial institutions and those backing up derivative and related securities manifested themselves differently in Europe and in the US, and the responses of central banks were also markedly different. In Europe, where banks were the primary source of financial intermediation, credit spreads widened significantly in the interbank market which was the important channel for short term funding of highly leveraged institutions, affiliates and conduits. Figure 7 shows one-month Eurodollar, asset backed commercial paper and financial commercial paper rates, before and after the financial turmoil began. Asset backed paper and Eurodollar rates spiked after averaging less than 10 basis points prior to the turmoil and spreads relative to financial commercial paper on all instruments widened significantly.

Figure 8 highlights what happened to short term euro-LIBOR rates over the month of August as the turmoil began to unfold in response to certain triggering events and central bank interventions. On August 7th overnight euro-LIBOR rates spiked nearly 20 basis

[6] See Boyd(2007). Union Trust's action was on August 3.
[7] See Beams(2007)
[8] See Boyd(2007).

points (but virtually no significant movement was observed in the 1 and 3 month rates on that day). The overnight rate declined on Aug. 8th, but then spiked again on Aug.9, at which point the ECB made the first (95 billion euros) of several liquidity injections in an attempt to bring rates down again, and reinvigorate the interbank market, which many observers claimed had stopped functioning. The ECB followed with two more significant actions of 61 billion euros on Friday, August 10th and 48 billion euros on August 13.[9] Reportedly, the spike in rates was in response to a BNP Paribas announcement that it was suspending payments from two of its hedge funds because the assets were too hard to value. In total, the major central banks supplied $154 billion in funds on August 9, 2007 and another $135.7 billion on August 10th, the bulk of which – about $215 billion (See Figure 8) was supplied by the ECB. Central banks followed up on August 13 with more funds injections with 47.7 euro (or $65 billion) from the ECB and smaller amounts of $5 billion from the Bank of Japan and $2 billion from the Federal Reserve.[10]

The injections of funds appeared to work, because the overnight rate returned to at or below its pre-turmoil level and remained quiet until the end of August. [11] Interestingly, Figure 8 shows that there were no parallel movements in the 1 or 3 month euro-LIBOR rates to those of the overnight rate except for an upward drift consistent with the expectation that the ECB might continue its tightening of policy that had been in progress prior to the turmoil. Euro-LIBOR markets remained calmed until the beginning of

[9] The Economist(2007).

[10] ECB gives banks another cash injection .The Associated Press, August 13, 2007

[11] In a statement issued August 15, ECB president Jean-Claude, Trichet indicated that he believed that the financial turmoil was largely over and that market conditions had largely returned to normal Dougherty(2007).

September when attention focused on problems in the US mortgage market and the likely spill over effects to other markets and institutions. Difficulties again hit home outside the US when the credit problems in the UK mortgage lending institution Northern Rock began to become public and the focus of the turmoil turned to the UK (See figure 9) when overnight LIBOR spiked.

B. Problems in the UK

On September 10, rumors surfaced that the UK mortgage lender, Northern Rock, might become a takeover target because of funding problems in rolling over its short term debt.[12] On Thursday, September 13th the BBC disclosed that Northern Rock had asked for financial assistance from the Bank of England, and on Friday, September 14th British television showed scenes of lines outside of branches of Northern Rock as customers began withdrawing their deposits kindling the first bank run in the UK in over 100 years. At the same time, the overnight, but not one month or three month, LIBOR rates spiked (see Figure 9).

The following Monday, September 17th, Alistair Darling, UK Chancellor of the Exchequer, took the extreme measure of jettisoning the existing deposit guarantee structure by providing a 100% guarantee of all of Northern Rock's liabilities. Finally, UK authorities (the Bank of England, the FSA and HM Treasury) followed up its guarantee of Northern Rock's deposits with the unprecedented declaration that government guarantees would be extended to any other bank that experienced financial difficulties.[13] That Monday bank lending continued to be disrupted as UK rates again jumped for two days, before settling back again.

[12] See Thompson(2007).
[13] Darling(2007)

The UK response to the turmoil has been extremely interesting and has important implications for how safety nets should and shouldn't be constructed, for the efficacy of deposit guarantee schemes, for what the appropriate division of powers should be between a central bank, the banking supervisory and government, and for the usefulness of Memoranda of Understandings (MOUs) when more financial disruptions occurs.

At the time that the initial UK market problems with Northern Rock appeared, Bank of England Governor Mervyn King (2007) announced on September 12th that, while the Bank of England was prepared to provide funding to institutions that needed it, it would only do so on the traditional terms that were consistent with the tenants of Walter Badgot. That is, the Bank of England would only lend against the highest quality collateral and at a penalty rate. King emphasized that moral hazard associated with the central banks bailing out bad pricing and credit risks assessments had real long run cost implications for an economy.[14] Within a couple of days, however, pressure from within the Government let to an abrupt reversal, and the Bank of England, like the US's Federal Reserve and ECB, began a program of injection of additional liquidity into the market place. Shortly thereafter, UK Libor rates returned to where they were before the turmoil began, but jumped up again on September 26th with the announcement that the ECB's emergency liquidity fund had been tapped for 3.9 billion euros.

The political fallout from the turmoil in the UK was wide spread and was clearly directed at the three main governmental agency heads, who were widely characterize as pursuing a bumbling approach to crisis management. Both Governor King and Sir

[14] "If central banks underwrite any maturity transformation that threatens to damage the economy as a whole, it encourages the view that as long as a bank takes the same sort of risks that other banks are taking then it is more likely that their liquidity problems will be insured ex post by the central bank. The provision of large liquidity facilities penalizes those financial institutions that sat out the dance, encourages herd behavior and increases the intensity of future crises." See King(2007)

Callum McCarthy, head of the FSA were summoned before the House of Commons Treasury Select Committee to explain why they had pursued the policies that they did. Governor King justified the Bank of England's action in testimony before the House of Common's treasury committee as being necessary to stem the "liquidity crisis." Other actions that might have been taken were either precluded by either UK laws and/or directives that had been put in place effectively limiting the options available to the Bank and the FSA as to how a troubled financial institution might be resolved. Specifically cited were mandated public disclosures governing the takeover of a listed company, problems with the design of the deposit insurance contract, and laws that pitted the interests of depositors against those of shareholders and would have required Northern Rock to publicly disclose that it had been granted access to emergency liquidity by the Bank of England, thereby signaling to financial markets that it was in dire straights.

During their questioning of Governor King, MPs also spread blame for the embarrassing fiasco on the tripartite division of responsibility for financial stability among the Bank of England, the FSA and HM Treasury. However, the real problem lies in the existence of structural flaws in the design of the UK safety net, some of which have already been pointed out, and not how it is administered that are at the heart of the problem and explain why a Northern Rock style run is less likely to happen in the US.

C. The Problems in the US

The turmoil that erupted in Europe and the UK hit primarily the interbank markets, which were the primary sources of short term funding for banks. Rates spiked and banks stopped lending to each other. In contrast, in the US the problems initially associated with the sub-prime mortgage market quickly hit the asset-backed commercial

paper (ABCP) market first. This difference was because of the role that ABCP played in financing the pipeline of mortgage backed securities, that was critical to the transfer of mortgages through the "originate and distribute model" to the ultimate investors. It served as the major source of short term financing for the mortgage conduits, financing the holdings of mortgages until securities backed by those mortgages could be issued and sold. Many of these conduits were essentially funding the temporary holding of longer term assets with short term liabilities, not unlike S&Ls of the past, except the short term was really short term and the long term was just a bit longer. The profitability of the business depended upon two things – the ability to continually roll over the short term paper and a high degree of leverage.

The asset backed commercial paper market had exploded beginning in mid- 2005 into the fall of 2007. Figure 10 shows that asset backed commercial paper was about $690 billion at the start of 2005 and ballooned to over $1.2 trillion. In contrast, both financial and nonfinancial paper have been on a steady upward trend since the end of 2003, and while certainly becoming more volatile, both have remained on that trend path, despite the turmoil. Note too that the huge rise in asset backed commercial coincides with the period of time where slowing in the US housing markets became evident and credit quality problems began to appear. As concerns about increases in mortgage default probabilities increased through 2007 and questions arose about the likely quality of the more recent vintages of subprime mortgages in many of the asset backed securities pools grew, spreads widened and funding dried up. As a result the asset backed paper market collapsed back down to approximately pre-turmoil levels as of the end of July 2008.

1. US Mortgage Market

The low inflation and low interest rate environment coupled with a long and steady appreciation of housing prices in the US, and the growth of securitization of jumbo, sub prime and Alt-A mortgage loans combined to fuel the large growth in housing construction and highly leveraged mortgage debt in the US. The securitization of lower quality, high risk loans was the private sector's extension of the securitization process of prime loans fostered by the two large mortgage GSEs - Freddie Mac and Fannie Mae. Under the Freddie/Fannie model, nonconforming mortgages were originated and sold to Fannie Mae and Freddie Mac who in turn provided a credit guarantee which enabled the construction and issuance of securities against these mortgages at favorable rates.

The process offered many potential benefits to participants including improved transparency of the investments, enhanced diversification to the securities holders since the mortgages in the pools were from many parts of the country. It increased the liquidity of the mortgages and permitted banks to use their capital more intensely because the mortgages that were originated were no longer retained on bank or investment bank balance sheets. But the key to the acceptability of the instruments and that made the process viable in the market place was due to the credit guarantee provided by Freddie or Fannie which was implicitly regarded by market participants as being guaranteed by the US government.

Of course, there are limits to the kinds of mortgages that were eligible for the Freddie/Fannie programs, but financial innovations evolved that enabled the securitization of other mortgages and assets, particularly jumbo loans, so-called sub prime loans and Alt-A loans by private entities. The securitization of these instruments

substituted external ratings by credit rating agencies, mathematical valuation models and insurance provided by monocline and other insurance companies like American International Group (AIG) for the guarantees supplied by Freddie and Fannie. Issuers employed special purpose, bankruptcy remote vehicles – usually separately incorporated trusts that issued their own securities to fund the purchase of assets - relying upon leverage and a spread to make the whole process work from a profits perspective. But each component involved sacrificing some of the transparency and other attributes of the securitized assets that characterized the securities originated in Freddie and Fannie pools. None of these problems were critical, however, as long as housing prices continued to increase and the housing market flourished. [15]

2. Problems in Mortgage Lending Institutions[16]

More large financial institutions have experienced ruinous financial difficulties in the US and failed than in other countries to date. The most important of these have involved the both Fannie Mae and Freddie Mac as well as the primary dealer and nation's largest specialized mortgage lender, Countrywide Financial, the Alt-A mortgage specializing institution, IndyMac, and the investment bank and primary dealer, Bear Stearns.

The latter institutions either failed or were merged and the US Treasury and the FHFA (Federal Housing Finance Agency) placed both Freddie and Fannie into conservatorship on September 7, 2008 (see Table 2), cut dividend payments, provided protection to preferred stock and other debt holders and have begun the process of shrinking the institutions. But the problems didn't end there. In a series of stunning

[15] See the excellent discussion of this by Herring(2008)
[16] This section draws heavily upon Eisenbeis and Kaufman (2008).

events Lehman Brothers, a primary dealer failed; Merrill-Lynch sold itself to Bank of America; the insurance giant American International Group (AIG), who was a major player in providing credit insurance, was placed into conservatorship by the US government; the US Treasury extended insurance to money market funds; and major legislation is in process that would give the US Treasury virtually blanket authority to buy mortgages to support the housing industry. The remaining subsections review some of the key events that led up to this unprecedented government intervention into financial markets.

a. Countrywide

Countrywide Financial originated approximately 17% of the total mortgages underwritten in the US in 2007. At that time, it was a financial services holding company and had a federal savings bank subsidiary, together with others subsidiaries, that conducted mortgage banking, trading and underwriting mortgage backed securities and mortgage servicing. After growing very rapidly for several years, it began to experience financial difficulties at the end of 2006. Countrywide applied and was approved to convert to a savings and loan holding company and convert its bank to a federal savings bank. The conversion also enabled it to switch regulators from the Federal Reserve for its holding company and Comptroller of the Currency for its national bank subsidiary to the Office of Thrift Supervision (OTS).

Countrywide had adopted the originate and distribute model which meant that it relied heavily upon funding its mortgage warehousing business in the short term asset backed commercial paper market until it could securitize and sell the mortgages it had originated. However, when short term lenders suddenly abandoned the asset backed

commercial paper market in August of 2007 Countrywide's ability to finance its mortgage warehousing business essentially vanished. The rating agencies downgraded its credit rating, which increased its cost of funds. As mortgage delinquencies and default problems began to accelerate for both subprime and Alt-A mortgages, its ratings were downgraded further.

Like Northern Rock, which pursued a similar business model, Countrywide's stock price plummeted. By the middle of August, with the commercial paper market essentially closed to it, Countrywide began to draw down its bank credit lines for funding. Countrywide also turned increasingly to the Federal Home Loan Bank of Atlanta for funding. Advances (collateralized borrowings from the Home Loan Bank) increased to $ 50 billion from $30 billion by the end of September 2007 and accounted for approximately 25 percent of its total liabilities. Countrywide also benefited from the Federal Reserve's 50 basis point cut in the discount rate and broadening the eligible collateral for overnight repurchase agreements with primary dealers (of which Countrywide was one).[17] However, the continuing hemorrhaging of Countrywide and the drop of its stock price to nearly zero made it clear to the OTS and other federal regulators that its failure was imminent. As a consequence, its sale was encouraged by the Federal Reserve without financial assistance to Bank of America, which had earlier made a strategic investment of nearly $2 billion into Countrywide, for about $4 billion.

b. IndyMac

Similar to Countrywide, IndyMac (Independent Mortgage Corporation) was an originator and distributor of mortgage loans and mortgage backed securities.[18] It

[17] This occurred on August 14, 2007 and again on Sept. 18, 2007, see Table 1.
[18] Interestingly, IndyMac was a spin off from Countrywide Financial.

specialized in originating and servicing jumbo and Alt-A mortgages. It too was a thrift holding company regulated and supervised by the OTS. Like Countrywide, IndyMac grew rapidly, nearly doubling its size from $17 billion to $32.5 billion between March 2005 and December 2007.[19] Its funding depended heavily on Home Loan Bank advances, which accounted for from 32% to 45% of its total liabilities in any one quarter.[20]

IndyMac began to evidence financial problems in the middle of 2007 which was reflected in the decline in its book value capital from a high of $2.7 billion in June of 2007 to $1.8 billion in March of 2008 and in the rapid fall of its stock price. As it experienced funding problems, the bank began bidding aggressively for federally insured deposits under $100K. It was widely touted as one of the best places to purchase CDs because its rates were so high. IndyMac also increased its reliance upon Home Loan Bank advances.

OTS's January 2008 examination indicated IndyMac was in financial difficulty. It was faced with a decline in its capital and negative earnings. Nevertheless, the agency still concluded that it was adequately capitalized and it wasn't classified as a problem institution by OTS. In fact, the bank's March 31, 2008 10Q filing stated that IndyMac's Tier 1 capital leverage ratio stood at 5.74%, above the minimum 5% regulatory requirements for the bank to be classified as "well capitalized". Risk-based Tier 1 capital was 9% and total risk-based capital was 10.26%, compared to minimum required ratios of 6 and 10 percent respectively for "well-capitalized".

[19] Data from FDIC Quarterly Reports of Condition and Income.
[20] Data from FDIC Quarterly Reports of Condition and Income.

The decision to close IndyMac followed a run on the institution, albeit a run that did not take the form of Northern Rock's run. There was an outflow of about $1.3 billion, but it remains unclear what the mix was between insured and uninsured deposits. OTS maintained that it was actively seeking to resolve IndyMac but those efforts were frustrated by release of a letter that Senator Schumer has sent to OTS on June 26 that raised legitimate questions about the health of IndyMac. As a result, OTS closed IndyMac on July 11 and the FDIC became the receiver.

Applicable law in the US under the Federal Deposit Corporation Improvement Act of 1991 requires that the responsible federal regulator intervene as an institution's capital declines and to close the bank before its net worth goes to zero. The FDIC's initial estimates are that it will stand to lose between $4 billion to $8 billion in resolving the failure, but its latest estimate now places that figure at $8.9 billion. Eisenbeis and Kaufman (2008a) state that " (G)iven that IndyMac was supposedly adequately capitalized and was done in by a relatively small $1.3 billion of deposits run off, it stretches credibility that the bank's failure would lead between $4 and $8 billion in losses from the run."

While a number of other smaller financial institutions have also failed, the experience with these two institutions raise serious questions about the quality of federal supervision of depository institutions, like those raised in the UK about the supervision by the FSA of Northern Rock. Additionally, unlike the UK, which does not have a system of prompt corrective action and early intervention (PCA), the continued tendency of banking regulators to delay in closing institutions as they are required to do, with the resulting losses then having to be absorbed by other healthy institutions through higher

FDIC insurance premiums suggests there remain significant incentive problems within the banking agencies. One reason that supervisors are able to engage in delay is the fact that PCA is based upon book values rather than fair market values to determine capital adequacy.

c. Bear Stearns

While the financial condition underlying Bear Stearns was similar to Countrywide and IndyMac, the applicable regulatory regime and bankruptcy options were different. Bear Stearns was similar to the other two US institutions in that it was a major player in the mortgage derivatives market. It had highly leveraged positions that were financed in short term money markets, especially the asset backed commercial paper market. On Friday March 14, 2008 the Federal Reserve arranged a short term emergency loan to Bear Stearns through the discount window. However, over the ensuing weekend it became clear that without longer term drastic action Bear would have to declare bankruptcy because its funding had dried up. In Congressional hearings Alan Schwartz, who was Bear Stearns new chief executive, maintained that rumors had done the firm in an that if only the Fed had provided emergency funding earlier, the institution might have survived.

Bear Stearns problems were widely painted as a liquidity problem (a de facto run in the short term money market) due to a sudden inability to roll over its commercial paper. Management maintained that the institution was solvent. However, this assertion doesn't square with the facts. Bear Stearns had begun reporting problems with its real estate portfolio in 2006, which was accompanied by a drop in the firm's equity position and an increase in its leverage. In June of 2007 significant losses were reported in two it its hedge funds due to sub prime losses. In mid July, the firm notified investors

in those two hedge funds that little value remained and at the end of July suspended withdrawals from a third hedge fund. The firm also reported an actual loss for the fourth quarter of 2007, when it also became apparent that other mortgage lenders – namely Northern Rock in the UK and Countrywide in the US – were also experiencing problems with their sub prime loans. Financial stress was evident in the asset backed paper market and central banks began cutting rates and/or expanding lending facilities and injecting liquidity into markets.

By March when Bear Stearns was finally acquired by JP Morgan Chase with unusual assistance provided by the Federal Reserve Bank of New York, the problems in the mortgage market were well known. Bear Stearns with its highly leverage position clearly represented high risk to any knowledgeable investor.

There are many similarities between the Bear Stearns situation and Northern Rock. Both had minimal regulator supervision and oversight. Bear Stearns actually enjoyed less oversight than Northern Rock because it was an investment bank under the jurisdiction of the Securities and Exchange Commission, which provides oversight under a voluntary agreement with investment banks. The SEC does not employ bank-type supervision or regulation, nor did it regulate Bear's capital position or leverage. So like Northern Rock, which was subject to the "light touch" oversight of the FSA, Bear Stearns was essentially unsupervised.

More importantly, once the institution was faced with bankruptcy, the only legal option available to it was to rely upon the general bankruptcy process with all the delays and uncertainties that it entailed. In Bear Stearns case, it was asserted that because of it web of counterparty relationships with other financial institutions, its failure represented

a systemic risk that required unusual and non-standard treatment. Hence, the Federal Reserve stepped in and invoked emergency powers under Section 13 (3) of the Federal Reserve Act enabling it to create the Primary Dealer Credit Facility. That authority permits the Federal Reserve in emergency situations temporarily to lend to individuals, partnerships or corporations. Thus, this authority was employed to permit primary dealers, including investment banks, access to the discount window. The Fed also took the unusual step of helping to finance the arranged acquisition of Bear Stearns by JP Morgan Chase with the understanding that JP Morgan Chase would honor all of Bear's derivative and counterparty commitments. The Federal Reserve Bank of New York created a special purpose Delaware institution (Maiden Lane) which purchased some $30 billion of Bear Stearns assets funded with a $29 billion loan from the Federal Reserve Bank of NY. JP Morgan Chase provided $ 1 billion in financing and agreed to absorb the first billion of losses on those assets.

Given the widely feared systemic consequences that a Bear Stearns bankruptcy might pose to the financial system and the fact that bank-like insolvency and resolution policies were not available to the responsible agencies, US officials found themselves in a similar situation to the Bank of England, the FSA and Treasury in the UK in dealing with Northern Rock, and they were left with few options other and to facilitate the takeover of Bear Steams. Such support is a form of loss ex post loss sharing by the public sector that protects certain creditors at the expense of taxpayers and this intervention has now raised concerns about the structure of regulation and the moral hazard implications that such support implies for investment banks.

d. Freddie Mac and Fannie Mae

The conservatorship of Freddie Mac and Fannie Mae represented the culmination of a long standing series of problems with the underlying business model of these two entities.[21] Originally created by Congress as government sponsored entities to provide stability and liquidity in the secondary mortgage market, Fannie Mae was privatized in the late 1960s and Freddie Mac privatized in 1989. Through their direct investments in mortgages and their guarantee business they amasses a huge portfolio of loans and either directly or indirectly hold or guarantee the bulk of the securities in the US mortgage market. The business model flaw, of course, was the privatization of the gains from their mortgage activities, but because of their implicit government backing, they were able to expand without the effective constraint of market discipline and leverage themselves in ways that truly private sector firms were not. It also meant, as events have proven, that should their leverage result in huge losses, those losses would have to be born by the US taxpayer.

In recognition of the moral hazard that their business model represented, Congress established a regulatory regime to provide safety and soundness regulation and supervisory oversight of the two institutions by the Office of Federal Housing Enterprise Oversight (OFHEO). OFHEO was to enforce specific capital requirements and limits on their permissible activities. That oversight proved, for a number of reasons, to be ineffective. Both institutions engaged in heavy lobbing activities, they contributed substantial amounts to Congressional and presidential campaigns. Moreover, because their regulator was subject to the appropriations process for funding, the agency was

[21] See discussions in Eisenbeis, and Wall(2007), Frame and White(2004,2005),. Passmore(2005) and Pasmore, Sparks and Ingpen(2002).

continually subject to political meddling whenever its activities threatened to affect the profitability of the firms or the flow of funding to housing.

It was widely believed and argued that because historic losses on mortgage loans, of the kind that Freddie and Fannie supported, were low and their portfolios were geographically diversified, and these institutions engaged in sophisticated risk management processes, they could bet by with high leverage and a small capital cushion.[22] Not only were their assets highly diversified, but also their funding base was also internationally diversified. Their debt and preferred stock was widely held by investors within and outside the US including substantial portions held by foreign governments (because of their implicit US government guarantee).

The perverse incentives, due to high pay and little market discipline, not only resulted in rapid growth for both Freddie and Fannie, but also resulted in serious accounting scandals in the early 2000s in which the companies paid fines for misstating their earnings and to civil securities fraud charges brought by federal regulators. The accounting problems led to constraints being imposed on the institutions activities in 2006 and to the ouster of the management of both companies. Even despite remedial efforts both companies have had difficulties in presenting audited financial statements for the last 4 or 5 years.

The combination of bad and negligent management with high leverage really hit these firms, however, as the US mortgage market began to contract in 2006 and 2007. Losses continued into 2008 and finally reached such proportions that Congress first passed emergency legislation in July giving both Freddie and Fannie access to the Federal Reserve discount window. In addition, the Treasury was authorized to inject

[22] See Frame, Wall and Eisenbeis(2007).

equity funds if necessary to keep the institutions running because of their widely perceived importance to the functioning of the US housing market. Both measures proved insufficient to enable the institutions to absorb the losses they were facing and in September the Treasury put both institutions into conservatorship. They are now being run by the US Treasury, and in the short term, at least, their balance sheets will continue to expand in an effort to provide funds to housing.

e. Lehman Brothers and Others

Although through the end of 2007 Lehman Brothers seemed to have dodged the mortgage market problems, despite its large holdings of mortgage related securities, with profits up some 5%. Its stock price didn't begin to come off of its highs of about $65 per share in February of 2008. However, following the Federal Reserve's financial support of the takeover of Bear Stearns and placing of Freddie and Fannie into conservatorship under the US Treasury, weaknesses in Lehman Brothers and Merrill-Lynch gained market attention and their share prices fell drastically. By mid September is share price was near $5 per share, on the heels of a reported loss of more than $7 billion, due largely to deterioration in its mortgage and related assets. In an effort to save the firm, its chairman sought to sell one of its best assets, Neuberger Berman, which was its wealth management unit. But it was unable to find a price the firm deemed acceptable. Additionally, the firm announced that it would cut its real estate exposure to about $13 billion and reduce its commercial real estate lending to $32 and a half billion. These efforts only raised further questions about the quality of its assets and funding to the institution essentially dried up.

Merger discussions with Barclay's and Bank of America were terminated when their request for Maiden Lane type assistance from the Federal Reserve was rejected. It was estimated that the institution had over $60 billion in questionable real estate assets and that government support in the neighborhood of $80 billion had been requested. Furthermore, Treasury Secretary Paulson indicated that because markets had been aware of Lehman's problems than even the events leading to Bear Stearns demise, the likely financial disruptions would be less than in the Bear Stearns, if Lehman Brothers declared bankruptcy. Lehman Brothers filed for bankruptcy on September 14, 2008. Fearful that its own real estate losses would lead to additional financial pressures, Merrill-Lynch sought and reached a merger agreement to sell itself to Bank of America on September 15 for $50 billion.

The failure of the government to support the acquisition of Lehman Brothers after rescues of Fannie, Freddie and Bear Stearns came as a shock to markets and was interpreted as an effort to draw a line in the sand against moral hazard and the market's assumption that all Wall Street primary dealers were too-big-to-fail. That stand was quickly erased, however, when the Government stepped in on September 16, to provide $85 billion in support to the large insurer, AIG, who reportedly have large positions in credit default swaps with US and other firms around the world that would have to be unwound, should it fail. The result of these on-again, off-again rescues of troubled firms has created great uncertainty in financial markets, and triggered a government request of Congress on September 18th to provide more than $700 billion in virtually unfettered authority to the US Treasury to purchase mortgage and other assets from the public. At this writing the fate of that effort or its affect on financial markets is unknown, but the

approval by the Federal Reserve Board of emergency applications by Morgan Stanley and Goldman Sachs to become regulated bank holding companies spells the demise of independent investment banking that had been a hall mark of US financial markets for more than 150 years. These institutions will now be subject to prudential supervision and regulation by the Federal Reserve as the umbrella supervisor and will have to begin the deleveraging process to meet current capital adequacy standards. Universal banking seems to now be the model for the US like that of much of the rest of the world.

3. The Spread of Problems to Other Markets

Liquidity and spread problems not only have affected the mortgage market, banks and investment banks, but also have spilled over to other asset markets, and hit the municipal bond market especially hard. In virtually all incidences, part of the problem was associated with a perceived deterioration in the quality of guarantees and credit enhancements issued by either mono-line insurance companies, in the case of municipal bonds, or a decline in credit ratings and questions about the quality of underlying assets in the case of asset backed commercial paper. Figure 11 shows what happened to municipal bond yields on the Bond Buyer Municipal Bond Index and long term Treasuries. Typically, because of their tax treatment, municipal bonds trade at lower yields than Treasuries. But almost from the outset of the crisis in September of 2007 they have been trading at rates above Treasuries with spreads as high as 100 basis points and more despite their tax exempt status implying that at least high quality municipal bonds should be priced at rates below Treasuries.

The segment of the municipal market that was particularly decimated was the auction rate securities component. Banks and investment banks had helped support the market through their provision of liquidity facilities. But as the ratings of the monocline insurers fell and they stopped backing up the weekly auctions to prevent auction failures, more and more of the weekly auctions failed and interest rates skyrocketed. It suddenly became quite common to see these tax exempt securities suddenly begin to be priced not only as if the underlying insurance was worthless, but also trading at rates not only inconsistent with the underlying credit worthiness of the issuing municipality but also at rates substantially above Treasuries (despite their favorable tax treatment). Indeed, as large financial institutions began pulling back from this market, Attorneys General from many states, but especially New York launched investigations about behavior in this market. The allegation was that these securities were represented and sold to investors as cash equivalents, but when auctions began to fail, they no longer proved to be liquid. Settlements have been reached with many large institutions and this has resulted in nearly $ 1 billion in fines and institutions agreeing to buy them back at a loss and bring approximately $60 billion of these securities back onto their balance sheets as of mid-August 2008.[23]

4. Federal Reserve Responses

The Federal Reserve's responses to the crisis were more multi-dimensional than that of either the Bank of England or ECB, and were also prompt. The Fed's initial response to the August turndown was an injection of funds, albeit more modest than the interventions by the ECD, a 50 basis point cut in its target Federal Funds rate on

[23] Merrill-Lynch ($10-12 billion), Goldman Sachs ($1 billion), JPMorgan Chase (3.5 billion), Morgan Stanley($ 4.5 billion), UBS ($27 billion), Citi ($7.3 billion), Wachovia(5.7 billion), just to name a few.

September 18 from 5.25 percent to 4.75 percent (See Figure 1) and cut the spread between the Federal Funds rate from 100 to 50 basis points. Six additional rate cuts were made and the discount rate spread was cut by an additional 25 basis points. By April 30 the Funds rate stood at 2.0 percent.

The macro policy decision to inject liquidity by cutting the funds rate (in order to cut the funds rate, the Federal Reserve had to purchase government securities and expand its portfolio) was accompanied by a series of innovations to expand access to the discount window (see Figure 12 for the time line and approximate dollar amounts associated with each program and Table 2 for the details describing the programs) in order deal with the seizing up of financial markets and the drying up of liquidity. The innovations were of four types.[24]

First, in hopes of simply encouraging use of the discount window and reducing the stigma of borrowing, on August 17, 2007 the Board of Governors cut the differential between its Federal Funds target and the discount rate from 100 basis points to 50 basis points and lengthened the maximum maturity of borrowing to 90 days. Despite the attempt to encourage banks to come to the discount window, borrowing was limited. This stigma and evidence of both continuing and mounting liquidity problems, despite having by this time lowered the Federal Funds rate with two more cuts to 4.25 percent, the Federal Reserve announced its second funding innovation, the Term Auction Facility (TAF) on December 12.. Through the TAF, the Fed auctioned off a series of 28 day funds to bidders anonymously. The two initial auctions were for $20 billion and the term

[24] This discussion doesn't consider the fact that the Federal Home Loan Banks injected significant liquidity into the banking system by extending loans against assets of questionable value. For example, Countrywide had borrowed more than $50 billion from the Federal Home Loan Bank of Atlanta.

was for 28 days.[25] Additionally, currency swap arrangements were made with both the European Central Bank and Swiss National Bank of $20 billion and $4 billion respectively to support similar dollar auctions in the EU and Switzerland.[26] The Fed has subsequently lengthened the maturity of TAF transactions to include both 28 day and 84 day auctions.

The third innovation (as was already discussed under the section describing the events surrounding the problems with Bear Stearns) was to enable those primary dealers, who were investment banks, to temporarily have access to the discount window through the Primary Dealer Credit Facility. The fourth innovation was to expand its securities lending program (TSLF) which enables primary dealers (both banks and investment banks) to borrow Treasury securities for up to two weeks on an over night basis. The TSLF enables primary dealers effectively to swap temporarily their illiquid assets in exchange for Treasuries and to RP those securities out or to borrow against them to ensure short term overnight funding. This program was broadened in July of 2008 to also include options on securities borrowing. In virtually all four programs the Fed has broadened the range of eligible collateral to include not only Treasury and agency securities but also highly rated Residential Mortgage Backed Securities (RMBS), Collateralized Debt Obligations (CDOs) and other Asset Backed securities (See Table 2 for the appropriate details for each program and how the terms and collateral were broadened in subsequent announcements).

[25] The TAF was subsequently expanded in a series of actions to $ 150 billion outstanding by May of 2008.
[26] Swap arrangements were subsequently expanded so that the outstanding European TAF auctions for the ECB would be $ 110 billion and for the Swiss National Bank to $27 billion. Additionally, swap arrangements were established with the Bank of Japan ($60 billion), Bank of Canada ($10 billion) and Bank of England($40 billion). The total foreign TAF would be $247 billion as of September 19, 2008. See Table 2 for more details.

These actions amount to the extension of forbearance by the Federal Reserve to institutions with bad assets by allowing depository institutions and primary dealers to continue to carry illiquid assets at very favorable rates. It may ultimately result in potential losses to the Federal Reserve and the taxpayer while radically changing the composition of the Federal Reserve's balance sheet. Figure 13 details both how the Federal Reserve's balance sheet changed and how its holdings of Treasuries have shrunk. Also included is the impact of the Fed's securities lending programs which technically are off-balance sheet but do reflect the ability of participants to liquefy what might be otherwise illiquid assets on their own balance sheets. They can do this by temporarily swapping their illiquid assets for the Fed's treasuries and then using them as collateral in repurchase transactions. In total, the Fed effectively expanded use of its balance sheet by about $350 billion, with slightly more than half coming from the securities lending program (TSLF). The decline in the Fed's holdings of Treasury securities reflects the sterilization actions taken to offset what might otherwise be additional injections of high powered money into the system that would have implications for inflation. But when the Securities lending program is considered in conjunction with the European TAF's lending of dollars against euro-denominated collateral, the effects have not been fully sterilized.

All these new programs, except the TAF, were limited to primary dealers, of which there were nineteen as of September 11, 2008. (See the Federal Reserve Bank of New York's website for the current list). These institutions are the main conduit through which the Open Market Desk conducts daily open market operations and supposedly are among the strongest, largest, best run and most secure institutions. However, that this

support helped mainly primary dealers is more than coincidence. These institutions have been among the institutions most significantly affected financially by the problems in the mortgage markets and auction rate securities markets.[27]

Bianco Research periodically has published a compilation of the losses that have accumulated in major banks and investment banks as a result of the so-called subprime crisis.[28] These data shown in Table 3 indicate that somewhat more than 64 institutions have recognized about $512 billion in mortgage-related losses to date. Interestingly, financial institutions have been able to replace the lost equity with new capital. Large institutions report having raised $360 billion, but a large hole - $151 billion – remains, just to get their equity back to where it was pre-crisis. The capital demands are likely to be even greater since one can have little confidence that all the losses have been identified, as reflected in the discounts at which these firms are selling assets as well as themselves. Losses are not solely concentrated in US institutions. Bianco estimates that combined European and Asian losses are virtually equal to those of US institutions, with US firms reporting $261 billion, European institutions reporting $ 227.1 billion and Asian institutions reporting $23.8 billion..

The data also show, that a large portion of the losses have been concentrated in the primary dealers – the very institutions that have reaped the greatest benefits from the Fed's liquidity injection innovations. The data in Table 3 have been first sorted by primary dealer status and then their losses (the data also reflect the mergers that have taken place). The last column shows the ranking based solely upon losses reported to date with out regard to primary dealer status. There is a close correlation between

[27] What follows on the loss experience of the primary dealers draws heavily upon Eisenbeis(2008).
[28] See Bianco(2008) .

primary dealer status and loss ranking. The 16 primary dealers listed dominate the group in terms of losses having incurred $ 288 billion in losses or nearly 60% of the total. At the same time, they raised about $187.1 billion in new capital or about 53% of the total capital raised, leaving a short fall of about $ 100 billion or two thirds of the total shortfall. Finally, only two of the primary dealers – Barclays and Lehman Brothers(prior to its failure) actually more than replaced the capital lost, while the rest face in some instances, principally Merrill Lynch, UBS and HSBC, serious capital shortfalls. Merrill-Lynch's capital situation combined with uncertainty about its loss exposure clearly led management to sell the institution to Bank of America rather than risk a drop in its market capital (stock price) to zero. Note too from the previous section that some of the firms facing the need to raise more capital are the very same ones who are now also bringing the auction rate securities back onto their books.

IV. Concluding Remarks: Central Bank Responses and Who Did the Best?

The responses of the various central banks and their governments have been varied both in terms of the kinds of interventions they have pursued as well as the vigor with which liquidity has been provided. These actions have brought with them many different criticisms. Some commentators complain that some central banks responded too late to the initial problems – namely the Bank of England and Federal Reserve - or insufficiently as the downturn progressed (ie. the ECB, see Atkins(2008). Others assert that some have over-reacted to the crisis, namely the Federal Reserve.[29] Finally, concerns have been raised that some central banks have put in place programs that a) will be difficult to unwind, b) set themselves up through their special lending programs to be,

[29] Meltzer (2008). See also Kane(2007).

and are now being, arbitraged and subsidizing leverage, c) have unduly broadened the safety net beyond banks to investment banks and other institutions in ways that may bring significant moral hazard and risks to taxpayers in the future, d) subject themselves to undue risks of political pressure and regulatory capture, putting their independence at risk, e) now mean more and more institutions may be regarded as "too-big-to-fail and f) market participants may now feel that governments will always attempt to insulate markets from downside risks.[30] Clearly, the US is in the greatest risk position because of the takeover of Freddie and Fannie, the support extended to AIG, and the requested authority by the Treasury to purchase some $ 700 billion in mortgages in the market.

Despite both the varied responses and complaints of critics, there is little convincing evidence that any of central banks considered here significantly out performed the others in terms of the quality of their responses. Financial turmoil is still with us despite a year's worth of experimentation, rate cuts and liquidity injections. While it is true that while the general level of interest rates have come down, Figures 14 and 15 shows that credit spreads remain atypically high, whether measured against LIBOR, US agency debt, mortgage backed securities, high grade debt or high yield debt, and have proved to be volatile. So far as the macro real economies are concerned, none has yet slipped into an official recession, but growth seems to be slowing both in the US and abroad; unemployment has moved up, inflation remains a pressing problem, major housing markets show little signs of having bottomed out yet, and institutions continue to experience financial stress and are failing.

[30] See Buiter(2008a, 2008b) for detailed criticisms, especially for the monetary policy errors that have been made..

The similarities in financial and economic performance are quite striking, given the variety of responses that central banks have pursued. The ECB, for example, injected more funds into markets more quickly than did either the Fed or the Bank of England. The Fed cut its target policy rates more and quicker than any other central bank. The Bank of England has cut rates three times by a total of 75 basis points to 5%. The Bank of Japan has held rates constant and the ECB actually increased rates by 25 basis points in July, whereas the Fed cut rates a total of 7 times from 5.25% to 2% (see Figure 16). The result is that there are substantial differences in the current level of target policy rates across the world in economies facing essentially the same significant external price shocks to energy, food and other products.

In terms of liquidity provisions, the Fed received most of the attention because of the lending programs it initiated, but the ECB stands out in terms of actually expanding liquidity. Figure 17 shows that the four main central banks – the Bank of Japan, Bank of England, Federal Reserve and ECB – increased their balance sheets by slightly over $750 billion, with nearly 80% being accounted for by the ECB. The Fed (not considering its TSLF program which was off balance sheet) accounted for 6% of the increase, the Bank of England 2% and the Bank of Japan 13%. This suggests that monetary expansion was only large in the Eurozone countries, but this ignores the fungibility of funds and international currency flows.

A. Macro Policy Issues

There are three major macro policy issues that now confronting governments, central banks and the Federal Reserve and US most particularly. These are a) how to unwind the massive liquidity and asset acquisition programs that have been put in place,

b) how to bring the stance of current policy back into equilibrium with world monetary polices when economies and financial markets are now global in scope, and c) how to change the day-to-day structure of the conduct of open market operations.

1. Unwinding Liquidity Programs and Facilitating Deleveraging of the Financial System

The Federal Reserve has substantially altered the composition of its balance sheet. It has reduced significantly the amount of government securities it holds and substantially expanding the array of collateral it will take at both the discount window and its RP and other programs to include riskier securities. It has also put the taxpayer at risk through these programs as well as through its support of the Bear Stearns acquisition and lending to AIG. It has also expanded the types of institutions in beyond federally regulated banks that now have access to these programs – especially investment banks, the Federal Home Loan Banks, and Freddie Mac and Fannie Mae. The key issues are whether this access should be continued, and if so, under what conditions and what type of federal supervision and regulation is in order for the private sector institutions now using Federal Reserve credit.

As for facilitating the deleveraging of the financial system, most of the liquidity facilities put in place have benefited mainly the select few institutions that constitute primary dealers. As mentioned previously, these are the institutions that have experienced the greatest financial pressures in terms of their dependence upon the commercial paper market, their inability to fund substantial illiquid portfolios and the largest losses on their portfolios. Most of these institutions are also highly leveraged and now face the need to raise more capital.

While these institutions have had some measure of success in raising additional capital, they still are about $150 billion short in terms of replacing capital that has been written off. At the same time, they continue temporarily to fund illiquid portfolios by borrowing from both the Federal Reserve, other foreign central banks and in the market.[31] While seeking to de-lever their positions, they have only met with a modicum of success so far.[32] In fact, Bianco (2008) questions whether any delivering to a significant degree has as yet taken place. He estimates that while the 20 primary dealers have cut the positions they were carrying on their books by some $300 billion or about 20% reducing their holdings from $1.6 trillion to $1.3 trillion, but this is about the amount that he estimates is now being funded through the Federal Reserve's new lending programs. If this is true, then the primary impact of the aggressive restructuring of the Federal Reserve's portfolio is to subsidize the primary dealers who are essentially now relying upon the Fed for about 20- to 25% of their leverage at below market rates. Such subsidization combined with forbearance has long lasting implications.

2. Unwinding Current Policy Ease

As the data on current policy rates in Figure 16 shows, there is substantial dispersion among policy rates with those in Japan being still close to zero whereas Bank of England rates are currently at 5%. Real interest rates in the US are now highly negative and accommodative, despite concerns about inflation. These wide differences create arbitrage opportunities, of which the widely publicized Japanese carry trade is the primary example. The ability of institution to put in place highly leveraged positions to arbitrage differences in policy rates has proved to be a continuing problem and only

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[32] Tobias and Shin (2007) suggest that substantial deleveraging has taken place in the Japanese carry trade market by major institutions.

likely to grow as a policy problem and constraint on monetary policy formation in the future.

3. Federal Reserve Open Market Operations

Over the longer run, the current difficulties raise serious questions about the structure of Federal Reserve daily open market operations and the wisdom of only dealing with a few institutions heavily concentrated in New York. We learned from 9/11 that serious things can happen and jeopardize the smooth functioning of our money markets and payments systems. Is there justification for permitting investment banks, that have been among the biggest losers in the subprime debacle, to be primary dealers, given that they aren't subject to supervision and prudential regulation? Current daily operating procedures which rely upon only a few select institutions are a legacy of a pre-computer world. There clearly is no reason today that bids can't be accepted electronically from any well capitalized member bank. Bids are processed and allocated electronically, so there are currently no technical limitations to the ability to accept and process bids from institutions across the country on a wide range of Treasury securities.

B. Regulatory and Micro Structural Responses and Issues

There are several key issues that have shown up as a result of how central banks and related government agencies have chosen to respond to the crisis, and they relate primarily to how failed institutions have been dealt with, the design and structure of deposit insurance guarantees, the need to control regulatory incentives and the extension of the federal safety net beyond just banks.[33] Most affected to date have been the UK and

[33] Similar recommendations have also been made by Baily, Elmendorf and Litan (2008)

US, but some of the same concerns are applicable to the EU as well. [34] In contrast, there have been relatively few losses reported by Japanese institutions.

1. Deposit Insurance Contract and Related Structures

The run on Northern Rock and the subsequent extension of deposit guarantees by the government to deposits in all troubled UK institutions was necessitated by two fundamental problems. The first was the fact that UK deposit insurance only covered. 100 % of only the first 2,000 £ (about $4,100) and 90% of the next 33,000 £ (about $ 67,500), which provided for 10% co-insurance on deposits on deposits over 2,000 £ for even very small depositors . The second was the lack of a bankruptcy statute that would have permitted authorities to resolve the failure promptly. As it was, the UK system relies upon its general bankruptcy laws to resolve bank failures which can be a lengthy and drawn out process. In the mean while depositors and other customers would be faced with lengthy delays in accessing their funds and borrowers would be denied access to their lines of credit. Faced with a potentially costly inconvenience, it is rational for depositors to withdraw their funds at the first whiff of difficulties, despite the fact that they might ultimately made good by their deposit insurance system.

This is in contrast to the US, which not only has more generous coverage but has a well laid out process by which depositors can be assured that a failed institution will be resolved promptly – usually over a weekend – and most will have access to their funds the next business day. Furthermore, under the Federal Deposit Insurance Corporation Improvement Act of 1991, problem institutions are not supposed to fester. FDICIA prescribes a plan of prompt corrective action (PCA) policies and structured early

[34] Kaufman and Eisenbeis(2007, 2008) have provided extensive discussions of some of these issues, especially those facing the EU should a large, cross-border banking institution experience financial difficulties.

intervention and resolution (SEIR) policies requiring supervisors both to intervene before a liquidity problem becomes a solvency problem and in the unlikely event of a failure, to quickly resolve the problem through recapitalization, sale or creation of a temporary bridge bank before its net worth goes to zero so that depositors and borrowers have immediate (next day) access to banking services, thereby making the failure an isolated event rather than a banking system event. Despite their intent, however, these provisions have not always worked as intended which recent experience with IndyMac demonstrates.

2. Better Failure Resolution Regime

The contrasts between the failure resolution options both in the UK for Northern Rock and in the US for Bear Stearns, AIG and Lehman Brothers, which placed reliance upon the general bankruptcy statues, and those available to US bank regulators to deal with bank and thrift failures suggests the need for special failure and resolution regimes for systemically important institutions. The aim of these structures should be to enable responsible authorities legally to close an institution and to avoid the negative externalities associated with such failures which include loss of access to funds and borrowing relationships. The UK has recently released a second consultative paper laying out a proposed detailed framework to reform their failure and resolution process. The proposed "Special Resolution Regime" contains most of the features currently available to US regulators including prompt corrective action provisions, the ability to close an institution before it becomes insolvent, and the ability to facilitate a take over or

sale, the provision of a bridge bank option, the ability to arrange a partial purchase and assumption transaction, and even a temporary nationalization provision.[35] The policy issues for the US is whether such a regime is also necessary for investment banks, for just non commercial bank primary dealers, for hedge funds, or other types of institutions. Additionally, the Federal Reserve and Treasury have also proposed significant extension of federal regulation and oversight for payments and settlement systems. Finally, similar issues concerning bank and resolution failure regimes are also critical for the EU. Most EU countries typically rely upon general bankruptcy statues, like the UK. Eisenbeis and Kaufman(2008b, 2006, 2005) have discussed the potential problems the EU will face in resolving a large, cross-border bank failure in detail.

3. The Need to Control Regulatory Agency Incentives

The have been numerous instances even under PCA and SEIR in the US that the FDIC has been faced with significant losses in banking failures, despite the intention of FDICIA of 1991 that institutions be closed before their net worth goes to zero. The statute also includes reporting and other requirements when losses occur for additional reporting and evaluation by the agency's Inspector General. Despite these provisions, however, losses have occurred and most recently the failure of IndyMac is estimated, as noted earlier, potentially to cost the FDIC up to a third of the value of IndyMac's assets. Kane(1989, 1997, 2001) has highlighted this problem repeatedly but losses still abound. There have been clear breakdowns in both the quality of supervision, especially on the part of the OTS.

Similar incentive problems have been revealed in the detailed forensic investigations in the UK over the supervision and regulation of Northern Rock.

[35] See H.M. Treasury (2008a,b)

Regulators tend to engage in forbearance when institutions under their supervision get into financial difficulties. Whether this incentive is due to regulatory capture or to simply the desire for regulators to gamble that problems will be resolved and not appear as a "failure on their watch" is an open but important question[36].

4. The Need to Limit Leverage

Perhaps the biggest problem that the current crisis has brought to the fore as a pressing policy problem is the need to limit leverage. Dependence upon excessive leverage was the pervasive problem that created the conditions for the current financial turmoil. Borrowers, especially mortgage borrowers, were highly leveraged and this was especially true in the sub prime and Alt-A markets. Borrower leverage was not only tolerated but actively encouraged, in the case of the US, by Congress in the name of increasing home ownership. Derivative instruments were dependant, in many cases, upon highly leveraged positions in order to make them financially viable. Depository institutions were incented to created highly leveraged conduits and Special Investment Vehicles to get assets off their balance sheets and to generate fee incomes. These so-called bankruptcy remote schemes relied upon legal interpretations, but ignored reputational incentives, which de facto meant that their sponsors assumed the leverage of those vehicles when problems occurred. Investment banks were unconstrained by either regulation or the market from becoming highly leveraged. Under current bank regulatory policies – especially those in the EU and UK – rely heavily upon complex Basel I and Basel II capital adequacy determinations – concentrate on the allocation across asset classes and not on overall leverage of institutions. A complete rethinking of the Basel accords is in order ad attention should be directed first and foremost to the

[36] See Kane(2008a,b,c) for further discussions of the incentive issue.

measurement of net worth and the limiting of leverage if the next crisis is to be avoided or at least its effects limited.

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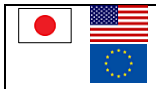
Table 1. Crisis Events and European Union, US, UK, Swiss National Bank and Japan Central Bank and Regulatory Responses		
	12-Feb-07	ResMae files for bankruptcy
	22-Feb-07	HSBC fired its first head of US mortgage lending business due to large losses
	12-Mar-07	Trading in share of New Century Financial were suspended due to bankruptcy fears and losses in sub prime loans
	13-Mar-07	US markets hit by sub prime fears
	20-Mar-07	People's Choice files for bankruptcy protection
	2-Apr-07	New Century Financial files for Chap. 11 bankruptcy
	3-May-07	UK sub prime lender Kensington agrees to takeover
	14-Jun-07	On June 14, Bear reports earnings declined for the first time in four quarters on weaker results from its mortgage securities business.
	15-Jun-07	Bear Stearns suffered big losses on sub prime mortgage investments in two hedge funds
	22-Jun-07	Bear Stearns reveals it spent $3.2 billion bailing out two hedge funds due to sub prime losses
	4-Jul-07	FSA takes action against 5 sub prime lenders for offering loans to people who couldn't afford them
	17-Jul-07	Bear Stearns notifies investors in two hedge funds that little value remains

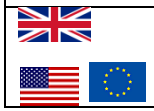
	20-Jul-07	Chairman Bernanke indicates that sub prime losses might reach $100 billion
	24-Jul-07	Sub prime losses hit profits at Countrywide
	30-Jul-07	IKB Deutsche Industriebank, a German Bank, is rescued.
	31-Jul-07	Bear Stearns stops withdrawals from third hedge fund
	6-Aug-07	American Home Mortgage files for bankruptcy
	7-Aug-07	Federal Reserve leaves Fed Funds rate at 5.25%
	9-Aug-07	Federal Reserve injects funds into markets.The European Central Bank, pumps a record 95 billion euros into money markets. Bundesbank organizes a meeting to recue IKB and Bafin indicates it was looking into a 417.5 billion special funding for Sachsen LB. Bank of Japan injects funds
	9-Aug-07	BNP Paribas freezes withdrawals on three of its hedge funds hit by the U.S. subprime market crisis.
	10-Aug-07	Fed notes banks are experiencing unusual funding needs because of dislocations in money and credit markets and says it would provide funds as needed. ECB injects additional 61 billion euros
	13-Aug-07	Fed injects more funds. ECB provides additional 47.7 billion euros into money markets.Bank of Japan injects more funds

	13-Aug-07	Goldman Sachs provides 43 billion in support of a hedge fund
	14-Aug-07	Bank of England alerted to the potential impact of the global credit squeeze on Northern Rock's business in a phone call with officials at the Financial Services Authority (FSA) and the Treasury.
	17-Aug-07	The Fed cuts the discount rate by a half percentage point to 5.7% and says it will act as needed to offset adverse effects on the economy arising from disruptions in financial markets.
	21-Aug-07	Barclays Bank borrows 314 million pounds from Bank of England's standing lending facility. This was the first use of the facility during the credit crisis
	23-Aug-07	Banks borrow $2 billion from discount window as Fed attempts to encourage borrowing
	23-Aug-07	Countrywide gets $2 billion cash injection from Bank of America
	28-Aug-07	To avoid failure the German regional bank Sachsen Landesbank was sold to Landesbank Baden-Wuerttemberg with 17 billion euro assistance.
	30-Aug-07	Barclays Bank borrows 1.6 billion pounds from Bank of England
	3-Sep-07	German regional bank IKB recorded subprime losses
	4-Sep-07	LIBOR rises to its highest level in almost nine years. The three-month loan rate hits 6.7975%, above the Bank of England's emergency lending rate of 6.75%. suggesting that banks are reluctant to lend money to each other.
	6-Sep-07	ECB injects more cash into markets bringing total to 250 billion euros. Leaves interest rate at 4%

	12-Sep-07	Bank of England states it will provide emergency loans to any bank that ran into short-term difficulties as a result of temporary market conditions. But BOE to rule out following the lead of the ECB and US Federal Reserve in pumping huge sums into the banking system to ease the liquidity drought.
	13-Sep-07	Northern Rock asked for and was granted emergency financial support from the Bank of England, in the latter's role as lender of last resort.
	14-Sep-07	Northern Rock says "extreme conditions" in financial markets forced it to approach the Bank of England for assistance. In a statement, the Bank, Treasury and FSA say they believe Northern Rock is solvent and that the standby funding facility will enable the bank to "fund its operations during the current period of turbulence in financial markets". Meanwhile, lines begin to form outside a number of Northern Rock branches with hundreds of worried savers seeking to withdraw their money. The bank's website collapses under the strain and all its phone lines are jammed.
	15-Sep-07	Run on Northern Rock occurs
	17-Sep-07	Crisis surrounding Northern Rock grows as lines at many of its 76 branches show no sign of dying down and the firm's shares plunge a further 40%. Chancellor Darling dramatically iagrees that Treasury will guarantee all deposits held by Northern Rock. Bank of England has been shopping Northern Rock.
	18-Sep-07	Federal Reserve cuts Federal Funds Rate by 50 bp to 4.75 and discount rate to 5.25%. Bank of England injects 4.4 billion pounds into money markets
	19-Sep-07	The Bank of England says it will inject £10bn into the money markets to try to bring down the cost of inter-bank lending. In another significant development, the assets that banks are allowed to use as collateral will be wider than usual, including mortgage debt. Critics accuse it of a U-turn and say it should have acted sooner to help Northern Rock.
	22-Sep-07	UK Chancellor Alistair Darling suggests government will consider boosting deposit savings guarantee to £100,000.
	26-Sep-07	Commercial banks shun Bank of England rescue fund

	27-Sep-07	ECB indicates it lent 3.9 billion euros (45.5billion) at its penalty rate of 5%
	1-Oct-07	Chancellor Alistair Darling announces that the scheme to protect savers with money deposited in UK banks is being expanded to guarantee 100% of the first £35,000 of savings. He adds that this is the first stage of a wider reform of the compensation system.
	9-Oct-07	9 OCTOBER 2007 The Treasury agrees to protect new savings deposited at Northern Rock. The decision extends the previous guarantee, made the previous month, which covered deposits made up to 19 September.
	9-Oct-07	Bank of England and FSA defend role in Northern Rock crisis
	15-Oct-07	Nomura closes it US mortgage backed securities business and takes a $621 million hit
	31-Oct-07	Federal Reserve cuts federal funds rate by 25 bp to 4.5% and discount rate cut to 5%
	15-Nov-07	US House of Representatives passes Predatory Lending and Mortgage Protection Act by wide majority. Federal Reserve provides $47.25 billion in temporary reserves
	26-Nov-07	The Fed promises more than the usual year-end liquidity and says it will lift limits on how much can be lent to any one bank.
	6-Dec-07	Bank of England cuts interest rate - first such cut in response to financial crisis. ECB keeps rate constant
	11-Dec-07	Federal Reserve cuts federal funds rate to 4.25%and discount rate
	12-Dec-07	As part of a global coordinated central bank effort, the Fed establishes the TAF to provide funds over a longer period to a wider range of banks to meet temporary shortages of funds. It also establishes foreign exchange swap lines with the ECB and SNB. The arrangements will provide up to $20 billion for the ECB and $4 billion for the SNB.

	13-Dec-07	Central Banks agree to coordinated action to inject at least $100 billion in short term inter-bank credit
	17-Dec-07	First TAF auction
	18-Dec-07	Fed tightens rules on subprime lending. Bank of England makes £10bn available to UK banks to ease credit crunch lends banks $500 billion
	20-Dec-07	Bear Stearns reports first ever quarterly loss
	3-Jan-08	The Fed raises TAF auction amounts to $30 billion from $20 billion for each of the two auctions in January. The European Central Bank and the Swiss National Bank also offer dollar funds in conjunction with the Fed auctions.
	4-Jan-08	Chancellor Alistair Darling tells the Financial Times he is planning to give the FSA more power to deal with failing banks to avoid another Northern Rock-style crisis. He proposes giving the FSA the power to seize and protect customers' cash if their bank gets into difficulties.
	11-Jan-08	The US Federal Reserve cuts interest rates by half a percentage point to 3.5%, it's biggest cut in 25 years.
	11-Jan-08	Countrywide bought by BofA
	26-Jan-08	The Commons Treasury Committee says the Financial Services Authority was guilty of a "systematic failure of duty" over the Northern Rock crisis. MPs say the UK's financial watchdog should have spotted the bank's "reckless" business plan. They also call for the Bank of England to set up a head of financial stability. The FSA says it has already admitted failings in relation to Northern Rock and insists it is "addressing" them.

	29-Jan-08	The House of Representatives passed an economic stimulus package with $146 billion in targeted tax relief.
	30-Jan-08	Federal Reserve cuts interest rates from 3.5% to 3%.
	1-Feb-08	Fed announces it will continue biweekly TAF auctions in February, holding the amount in each auction steady at $30 billion.
	13-Feb-08	Japan's financial watchdog says Japanese banks suffered losses of $5.6bn by the end of 2007. These have more than doubled in the last three months of the year.
	17-Feb-08	The government rejects offers for Northern Rock and takes the bank into public ownership in one of the largest British nationalizations since engine-maker Rolls-Royce in 1971.
	18-Feb-08	Trading in shares in Northern Rock are suspended. Northern Rock is nationalized.
	29-Feb-08	Fed announces two TAF auctions of $30 billion each in March. It says it intends to conduct auctions for as long as necessary to ease pressures in short-term funding markets.
	6-Mar-08	UK £1bn hedge fund run by Peloton Partners collapsed
	7-Mar-08	The Fed says it will inject $100 billion into the banking system by increasing the size of its two term auctions of short-term funding and start a series of term repurchase transactions with primary dealers expected to be worth another $100 billion.
	11-Mar-08	The Fed broadened the range of acceptable collateral in its securities lending program to include home mortgages. It will provide up to 4200 billion to primary dealers for 28 days and accepted federal agency home mortgage-backed securities, and highly rated priate mortgage-backed securities as collateral. The

		action was coordinated with the Bank of Canada, Bank of England, ECB and Swiss National Bank. Swap lines with the ECB and SNB were increased to $30 billion and $6 billion.
	11-Mar-08	Central Banks announce $200 billion of new emergency lending
	14-Mar-08	Federal Reserve provides emergency funding to Bear Stearns through JPMorgan Chase, the first such move since the Great Depression. Carlyle Capital fails
	16-Mar-08	The Fed in a surprise move cuts the discount rate it charges on direct loans to banks and announces new lending program to provide credit to other big Wall Street firms. In addition, it increases the maximum maturity of discount rate loans to 90 days from 30 days. The actions are taken in concert with a decision to approve special financing to facilitate the purchase of Bear Stearns by JPMorgan Chase.
	17-Mar-08	JPMorgan Chase agrees to buy Bear Stearns
	19-Mar-08	Federal regulators finally acted to allow Fannie Mae and Freddy Mac to buy more mortgages, easing pressures on the cash strapped mortgage market.
	24-Mar-08	Fed details its role in amended JPMorgan Chase & Co's planned purchase of ailing investment bank Bear Stearns Cos . It says it will assume control of a portfolio of Bear Stearns assets valued at $30 billion, pledged as security. Any profit from the assets will accrue to the Fed, while JPMorgan will bear the first $1 billion of any losses. The Fed will finance the remaining $29 billion on a non-recourse basis to JPMorgan.
	28-Mar-08	The Financial Services Authority admits failures in its supervision of Northern Rock but says it should continue to have responsibility for regulating the banking system. The FSA said there was "a lack of adequate oversight and review" by the agency of the troubled bank. It said too few regulators were assigned to monitor Northern Rock, which ran into trouble in September. The FSA said it would be overhauling its procedures as a result of the weaknesses identified
	31-Mar-08	Treasury announces plan to reform financial regulation in US
	9-Apr-08	The Fed says it is considering a plan in which the Treasury Department would borrow in excess of its requirements and deposit the surplus at the Fed. The central bank is also considering whether to issue debt under the Fed's name and seek authority to immediately pay interest on commercial bank reserves.

	13-May-08	The Fed writes to Congress seeking immediate authority to pay interest on reserves held by banks at the Fed. The central bank says this move will contribute to the efficiency of the financial system.
	12-Jul-08	IndyMac fails and is re-opened on July 15.
	13-Jul-08	The Fed authorizes government-sponsored entities Fannie Mae and Freddie Mac to borrow from its discount window as necessary for emergency funding. Any lending would be collateralized by U.S. government and agency securities. The Fed also agrees to take on a consultative role in setting capital requirements and financial safety and soundness standards for the two companies. Treasury proposes injecting equity funds into Freddie and Fannie.
	23-Jul-08	US Congress passes housing bill which includes rescue provisions for Freddie Mac and Fannie Mae
	30-Jul-08	Federal Reserve extends Primary Dealer Credit Facility (PDCF) and the Term Securities Lending Facility (TSLF) through January 30, 2009. Introduces auctions of options on $50 billion of draws on the TSLF. Adds 84-day Term Auction Facility (TAF) loans as a complement to 28-day TAF loans. Increase in the Federal Reserve's swap line with the European Central Bank to $55 billion from $50 billion.
	7-Sept-08	US Treasury and director of Federal Housing Finance Agency (FHFA) place Freddie Mac and Fannie Mae under conservatorship, replace management. The GSEs will modestly increase portfolios through 2009 and in 2010 will begin to shrink portfolios by 10% per year until they reach $250 billion. Treasury will make preferred stock injections as needed to ensure that Freddie and Fannie maintain adequate capital. Treasury established a new secured lending facility available to Freddie and Fannie and the Federal Home Loan Banks. Treasury will begin purchase of new mortgage backed securities
	14-Sept-08	The Federal Reserve broadened collateral beyond investment grade debt securities that could be pledged at the Primary Dealer Credit Facility to match the collateral that can be pledged in the tri-party repo system. The collateral for the Term Securities Lending Facility (TSLF) is expanded to include all investment grade debt, and TSLF auctions will be conducted every week rather than every two weeks. The Fed also temporarily suspended the prohibition in Section 23A of the Federal Reserve Act to permit insured depository institutions to provide liquidity to affiliates for assets typically provided in the tri-party repo market until Jan. 30, 2009.
	15-Sept-08	Lehman Brothers Holdings files for bankruptcy

	16-Sept-08	The Federal Reserve authorized the Federal Reserve Bank of NY to lend up to &85 billion to American International Group (AIG) under section 13(3) of the Federal Reserve Act. The loan term is up to 24 months with an interest rate of 850 basis points above the 3-month LIBOR. The loan was collateralized by all of AIG's assets including its subsidiaries. The US government will receive 79.9% of the equity and the right to veto dividend payments to common and preferred shareholders.
	17-Sept-08	US Treasury issues additional securities, the proceeds to be held at the Federal Reserve to expand the Federal Reserve's balance sheet.
	17-Sept-08	US Treasury issues additional securities, the proceeds to be held at the Federal Reserve to expand the Federal Reserve's balance sheet.
	18-Sept-08	The Bank of Canada, Bank of England, ECB, Federal Reserve, Bank of Japan and Swiss National Bank will expand dollar swap lines of up to $180 billion with an additional $55 billion (now to $110 billion total) with the ECB and an increase of $15 billion to $27 billion with the Swiss National Bank. New swap facilities were put in place with the Bank of Canada ($10 billion), the Bank of England ($40 billion) and Bank of Japan ($60 billion) to be in effect through Jan. 30, 2009.
	19-Sept-08	US Treasury establishes temporary guarantee program for US money market funds to prevent them from "breaking the buck" for a fee to be paid by the funds using $50 billion from the Exchange Stabilization Fund.
	19-Sept-08	Treasury announces that Freddie Mac and Fannie Mae will expand their purchases of mortgage backed securities and Treasury will expand its purchases of mortgage backed securities under the program announced on 7-Sept. Treasury also initiates talks with US Congress to establish a fund to purchase troubled mortgages.
	19-Sept-08	The Federal Reserve Board will extend non-recourse loans to US banks and bank holding companies to finance the purchase of asset-backed commercial paper from money market mutual funds. The Federal Reserve will also purchase from primary dealers federal agency discount notes issued by Freddie Mac, Fannie Mae and the Federal Home Loan Banks.
	21-Sept-08	Federal Reserve approves applications by Morgan Stanley and Goldman Sachs to become regulated bank holding companies.
Sources : http://en.wikipedia.org/wiki/Subprime_crisis_impact_timeline http://news.bbc.co.uk/1/hi/business/7007076.stm http://www.guardian.co.uk/business/2007/aug/10/usnews.internationalnews http://www.reuters.com/article/businessNews/idUSN09471209200804 09?sp=true http://www.creditwritedowns.com/2008/05/credit-crisis-timeline.html		

Table 2. Forms of Federal Reserve Lending to Financial Institutions

Federal Reserve Bank *of* New York

August 2008

Forms of Federal Reserve Lending to Financial Institutions

	Regular OMOs	Single-Tranche OMO Program (announced March 7, 2008)	Discount Window[1]	Term Discount Window Program (announced August 17, 2007)	Term Auction Facility (announced December 12, 2007)	Primary Dealer Credit Facility (announced March 16, 2008)[2]	Securities Lending	Term Securities Lending Facility (announced March 11, 2008)[2]	Term Securities Lending Facility Options Program[3] (announced July 30, 2008)[2]
Who can borrow?	Primary dealers	Primary dealers	Depository institutions	Primary credit-eligible depository institutions	Primary credit-eligible depository institutions	Primary dealers	Primary dealers	Primary dealers	Primary dealers
What are they borrowing?	Funds	Funds	Funds	Funds	Funds	Funds	U.S. Treasuries	U.S. Treasuries	U.S. Treasuries
What collateral can be pledged?	U.S. Treasuries, agencies, agency MBS	U.S. Treasuries, agencies, agency MBS	Full range of Discount Window collateral	Full range of Discount Window collateral	Full range of Discount Window collateral	U.S. Treasuries, agencies, agency MBS, investment grade debt securities[4]	U.S. Treasuries	U.S. Treasuries, agencies, agency MBS, AAA/Aaa-rated private-label RMBS, CMBS, agency CMO and other ABS	U.S. Treasuries, agencies, agency MBS, AAA/Aaa-rated private-label RMBS, CMBS, agency CMO and other ABS
Is there a reserve impact?	Yes	Yes	Yes	Yes	Yes	Yes	No (loans are bond-for-bond)	No (loans are bond-for-bond)	No (loans are bond-for-bond)
What is the term of loan?	Typically, term is overnight–14 days[5]	28 days[6]	Typically overnight, but up to several weeks[7]	Up to 90 days[8]	28 days or 84 days[6]	Overnight	Overnight	28 days[6]	Typically 2 weeks or less[9]
Is prepayment allowed if term is greater than overnight?	No	No	Yes	Yes	No	N/A	N/A	No	No
Which Reserve Banks conduct operations?	FRBNY	FRBNY	All	All	All	FRBNY	FRBNY	FRBNY	FRBNY
How frequently are operations conducted?	Typically once or more daily	Typically weekly	As requested	As requested	Every other week	As requested	Daily	Weekly	As necessary[10]
Where are statistics reported publicly?	Temporary OMO activity	Temporary OMO activity[11]	H.4.1 - Factors Affecting Reserve Balances	H.4.1 - Factors Affecting Reserve Balances	H.4.1 - Factors Affecting Reserve Balances	H.4.1 - Factors Affecting Reserve Balances	Securities lending activity	Term securities lending facility activity	Term securities lending facilty options program activity

[1] Discount Window includes primary, secondary and seasonal credit programs.

[2] The PDCF and TSLF will remain in operation through January 30, 2009 as announced on July 30, 2008.

[3] TOP auctions are sales of options granting the right to enter into TSLF borrowing.

[4] Investment grade debt securities include corporate securities, municipal securities, mortgage-backed securities and asset-backed securities.

[5] Open market operations are authorized for terms of up to 65 business days.

[6] 28-day and 84-day terms may vary slightly to account for maturity dates that fall on Bank holidays.

[7] Primary credit loans are generally overnight. Loans may be granted for term beyond a few weeks to small banks, subject to additional administration.

[8] Maximum maturity of term increased from 30 to 90 days on March 16, 2008.

[9] Loans are targeted to span potentially stressed financing dates.

[10] TOP auctions may be conducted on multiple dates for a single loan and may be conducted well in advance of a loan period.

[11] Data only available on days when 28-day term RP operations are conducted.

Table 3 Losses Recognized as of August 13, 2008

Source: Bianco Research L.L.C

	Losses Billions	Capital Raised Billions	Capital Short Fall- Losses Less Capital Raised Billions	Rank Based on Total Losses Recognized to Date
Citigroup*	**55.1**	**49.1**	**-6**	**1**
Merrill Lynch*	**51.8**	**29.9**	**-21.9**	**2**
Bank of America*	**21.2**	**20.7**	**-.05**	**6**
UBS*	**44.2**	**28.3**	**-15.9**	**3**
HSBC*	**27.4**	**3.9**	**-23.5**	**4**
Morgan Stanley*	**14.4**	**5.6**	**-8.8**	**10**
JPMorgan Chase*	**14.3**	**7.9**	**-6.4**	**11**
Bear Stearns*	**3.2**	**0**	**-3.2**	**38**
Deutsche Bank*	**10.8**	**3.2**	**-7.6**	**12**
Credit Suisse*	**10.5**	**2.7**	**-7.8**	**13**
Barclays*	**9.1**	**18.6**	**9.5**	**15**
Lehman Brothers*	**8.2**	**13.9**	**5.7**	**16**
Canadian Imperial	**6.3**	**2.7**	**-3.6**	**24**
Dredsdner*	**4.1**	**0**	**-4.1**	**31**
BNP Paribus*	**4**	**0**	**-4**	**32**
Goldman Sachs*	**3.8**	**0.6**	**-3.2**	**33**
Wachovia	**22.5**	**11**	**-11.5**	**5**
IKB Deutsche	**15.3**	**12.6**	**-2.7**	**7**

Royal Bank of Scotland	**14.9**	**24.4**	**9.5**	**8**
Washington Mutual	**14.8**	**12.1**	**-2.7**	**9**
Wells Fargo	**10**	**4.1**	**-5.9**	**14**
Credit Agricole	**8**	**8.8**	**0.8**	**17**
Fortis	**7.4**	**7.2**	**-0.2**	**18**
European Banks not on list	**7.2**	**2.4**	**-4.8**	**19**
Bayerische Landesbank	**7.2**	**0**	**-7.2**	**20**
HBOS PLlC	**7**	**7.6**	**0.6**	**21**
ING	**6.9**	**4.8**	**-2.1**	**22**
Societe Generale	**6.8**	**9.7**	**2.9**	**23**
Mizuiho Financial Group*	**5.8**	**0**	**-5.8**	**25**
Nnationla City	**5.4**	**8.9**	**3.5**	**26**
Lloyds TSB	**5**	**4.9**	**-0.1**	**27**
IndyMac	**4.9**	**0**	**-4.9**	**28**
West LB	**4.7**	**7.5**	**2.8**	**29**
Other Asian Banks excluding Mizuho, Normura	**4.6**	**7.8**	**3.2**	**30**
LB Baden Wuerttenberg	**3.8**	**0**	**-3.8**	**34**
Etrade	**3.6**	**2.4**	**-1.2**	**35**
Natixix	**3.3**	**6.7**	**3.4**	**36**
Nomura Holdings	**3.3**	**1.1**	**-2.2**	**37**
other US Firms	**2.9**	**1.9**	**-1**	**39**
HSH Norbank	**2.7**	**1.9**	**-0.8**	**40**
Landesbank Sachsen	**2.6**	**0**	**-2.6**	**41**

Unicredit	**2.6**	**0**	**-2.6**	**42**
Commerzbank	**2.4**	**0**	**-2.4**	**43**
ABN Amro	**2.3**	**0**	**-2.3**	**44**
DZ Bank	**2**	**0**	**-2**	**45**
Bank of China	**2**	**0**	**-2**	**46**
Fifth Third Bankcorp	**1.9**	**2.6**	**0.7**	**47**
Other Canadian Banks (Except CIBC)	**1.8**	**0**	**-1.8**	**48**
Bank Hapoalim	**1.7**	**2.7**	**1**	**49**
Rabobank	**1.7**	**0**	**-1.7**	**50**
Royal Bank of Canada	**1.5**	**0**	**-1.5**	**51**
Mitsubishi UFJ	**1.5**	**1.5**	**0**	**52**
Alliance and Leicester	**1.4**	**0**	**-1.4**	**53**
Marshall & Iisley	**1.4**	**0**	**-1.4**	**54**
Dexia	**1.3**	**0**	**-1.3**	**55**
US bancorp	**1.3**	**0**	**-1.3**	**56**
Caisse dEpargne	**1.2**	**0**	**-1.2**	**57**
KeyCorp	**1.2**	**1.7**	**0.5**	**58**
Hyo Real Estate	**1**	**0**	**-1**	**59**
Gulf International	**1**	**1**	**0**	**60**
Soverign Bancorp	**1**	**1.9**	**0.9**	**61**
Sumitomo	**0.9**	**4.9**	**4**	**62**
Sumitomo Trust	**0.7**	**1**	**0.3**	**63**
DBS Group	**0.2**	**1.1**	**0.9**	**64**
	503.00	**353.30**	**-149.70**	

* Bold Type indicates primary dealer designation. Source: Bianco Research LLC and Federal Reserve Bank of New York.

Figure 1. US Federal Funds Target Rate

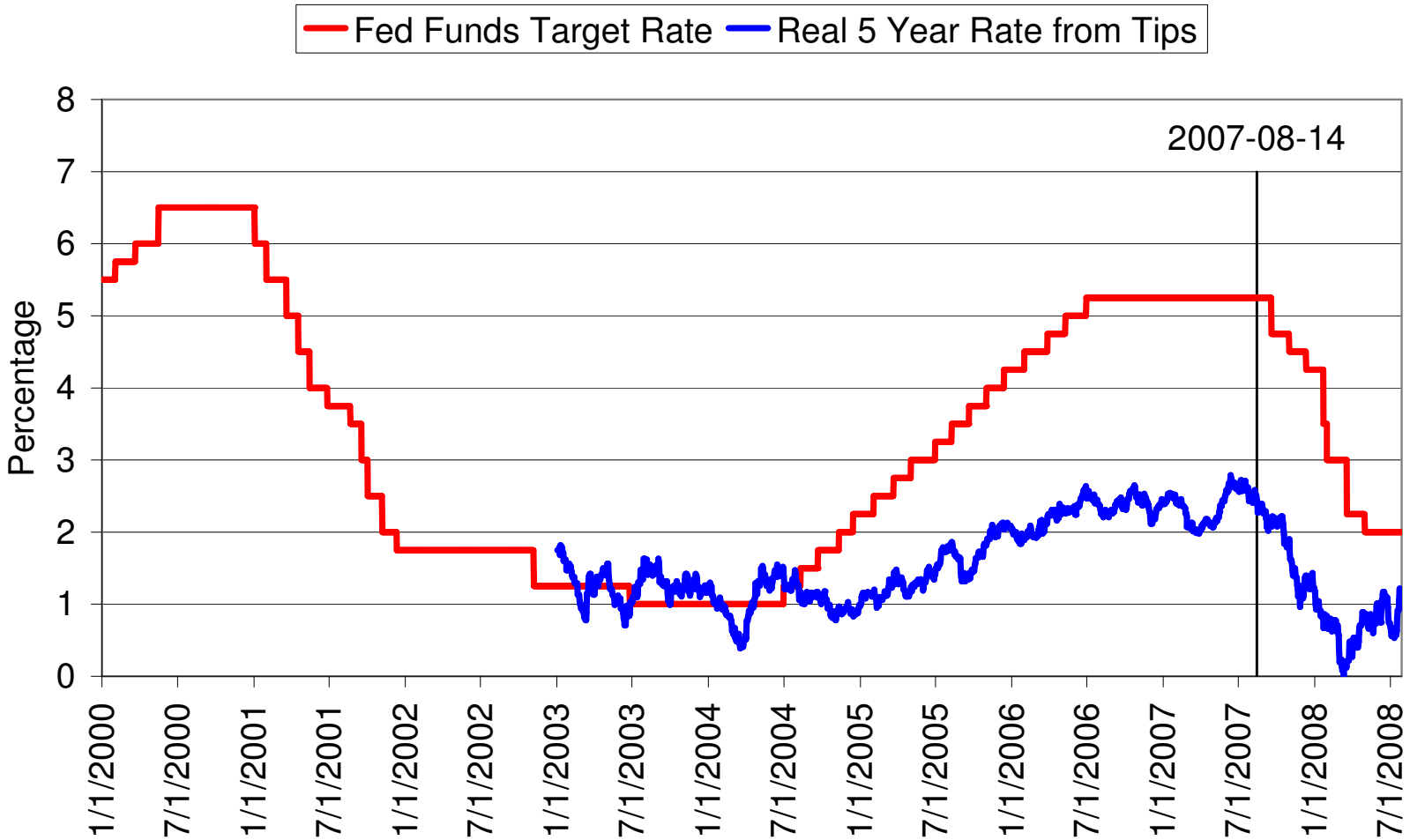
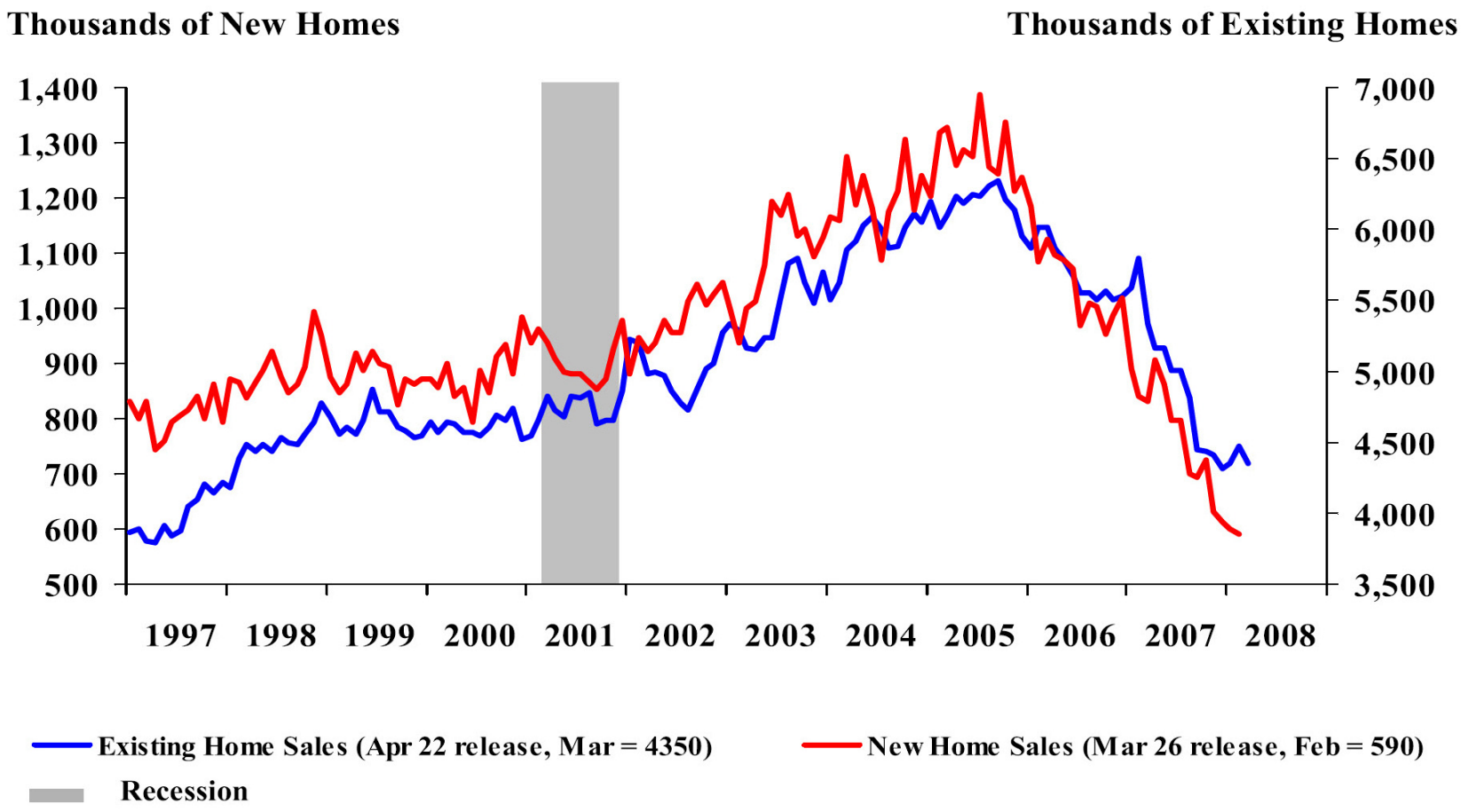


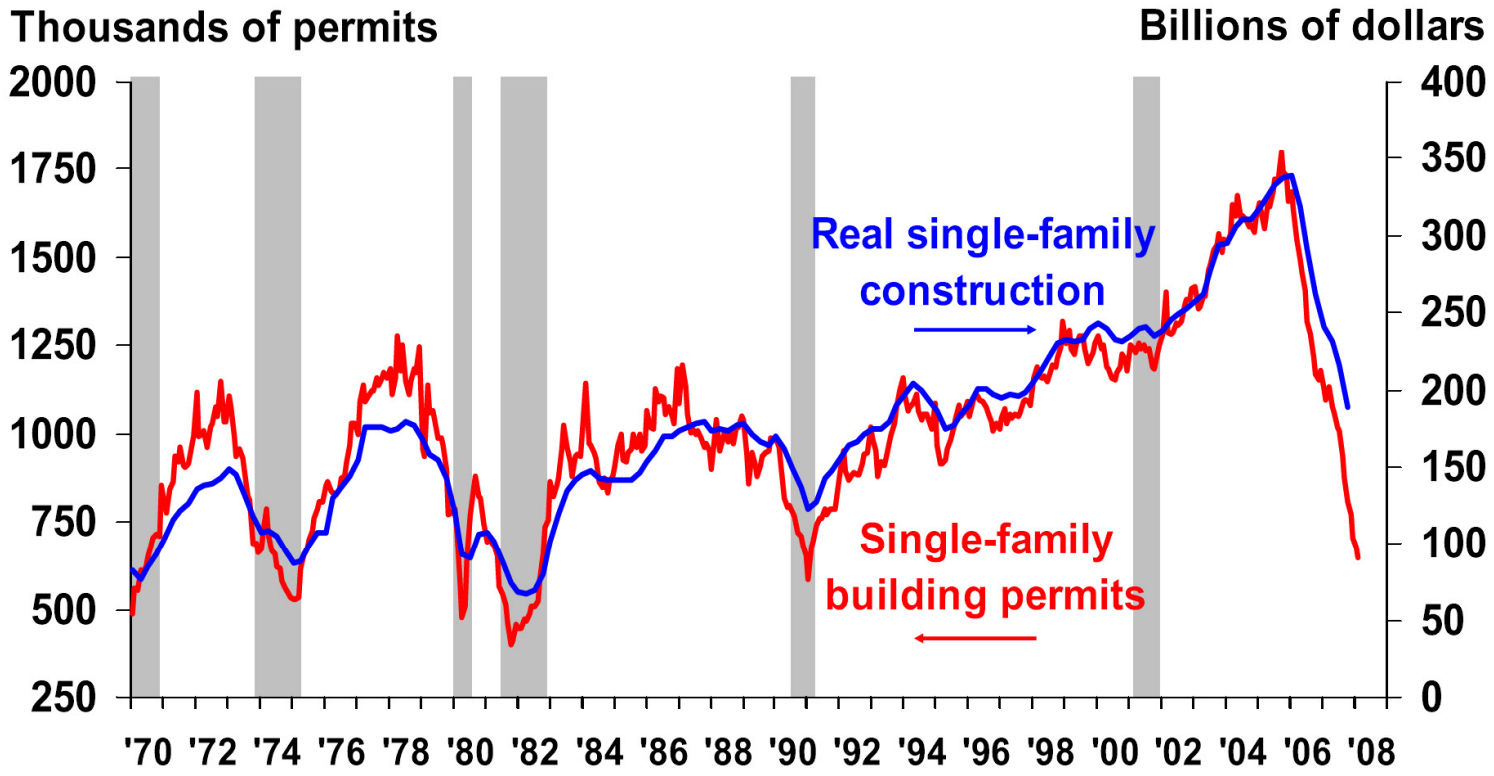
Figure 2.

Home Sales



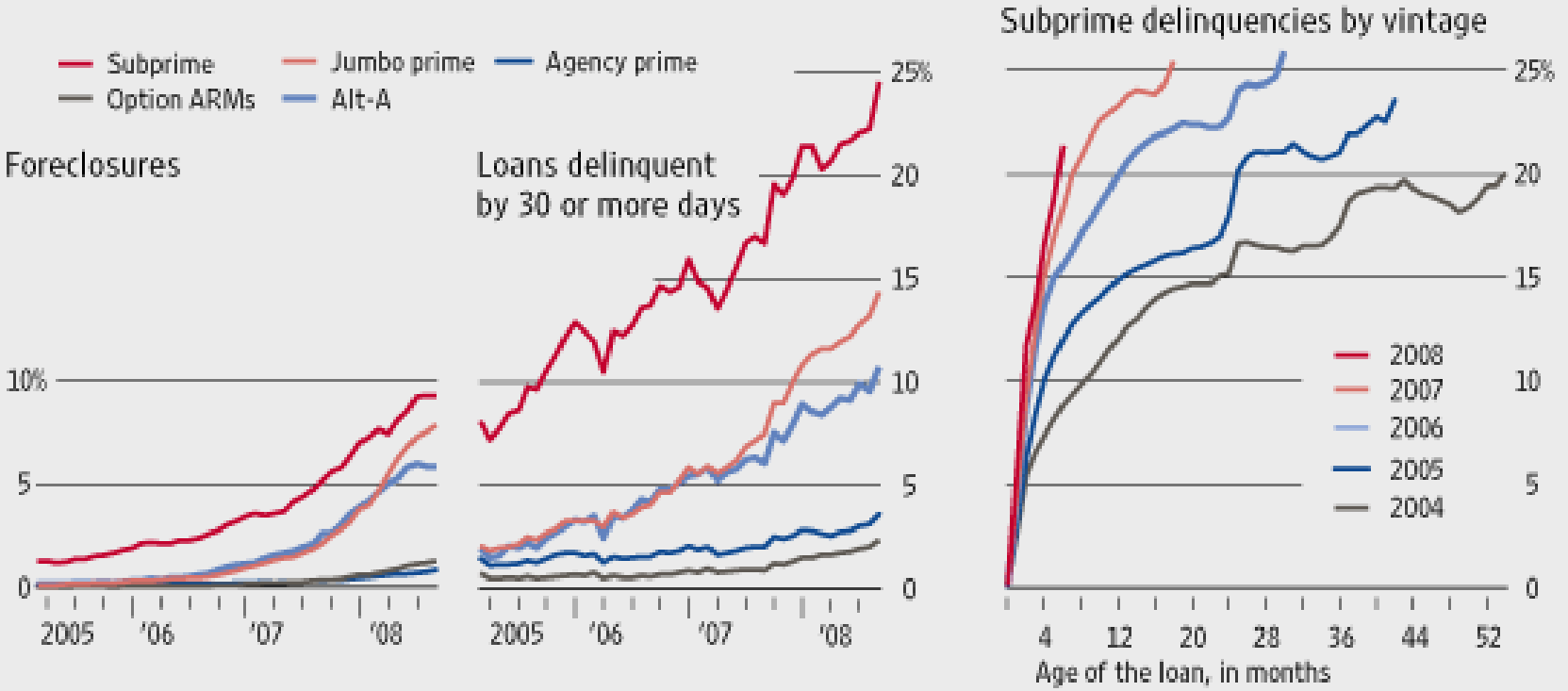
Source: Bureau of the Census, National Association of Realtors http://www.dallasfed.org

Figure 3. Permits



NOTES: Data are seasonally adjusted, annualized rates; contract values are chained, 2000.
Shaded areas denote recessions.
SOURCES: Census Bureau; Bureau of Economic Analysis.

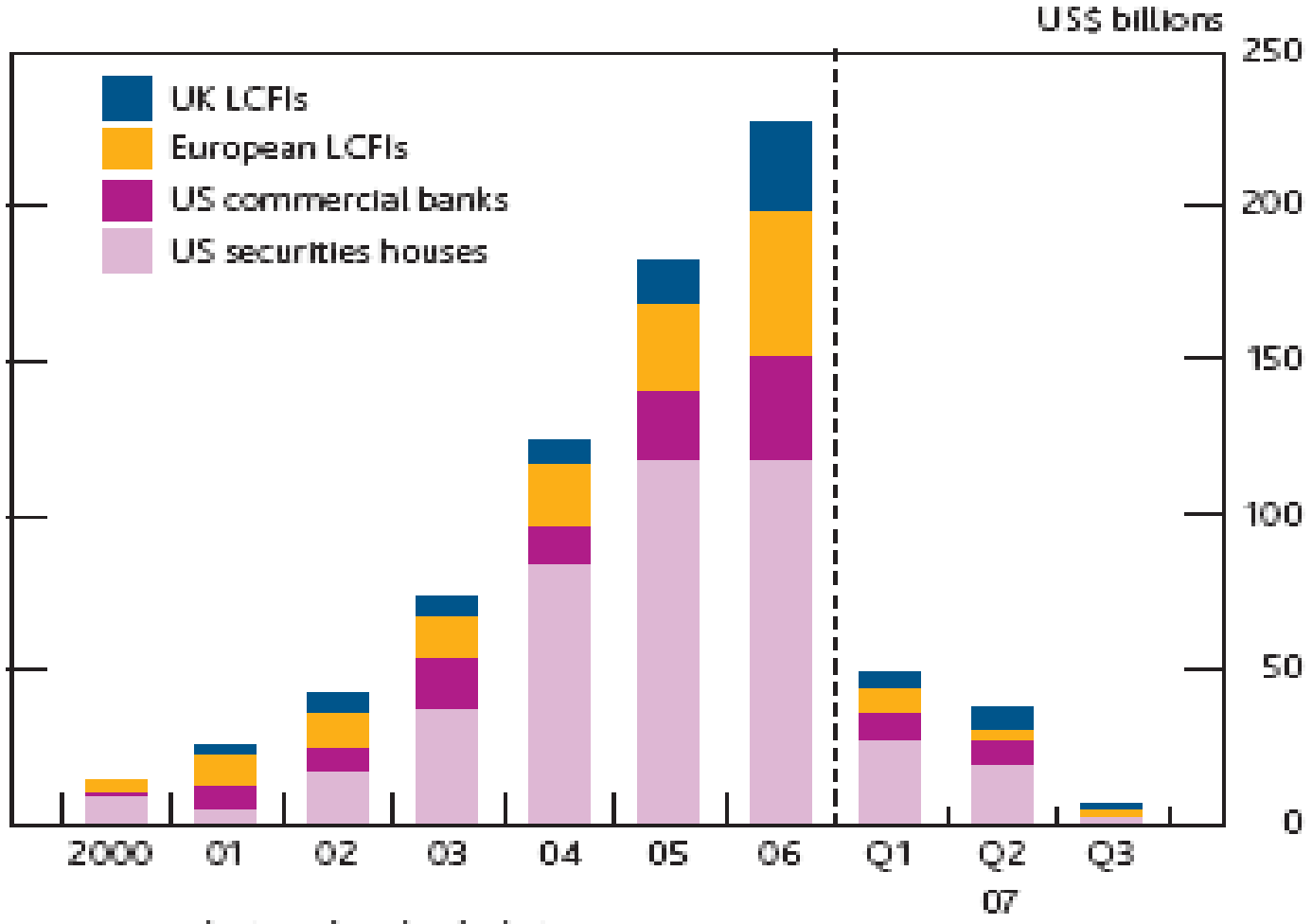
Figure 4. **Mortgage Delinquency Rates By Type and Vintage**



Notes: Mortgages originated between January 2004 and August 2008, excluding home-equity loans. Subprime and Alt-A loans are non-agency, non-government loans. Subprime loans are either identified as such by the servicer or have an original FICO score of less than 620. Alt-A loans are loans made without full documentation and have original credit scores of 620 to 719.

Source: LPS Applied Analytics **And Wall Street Journal,9/20/08**

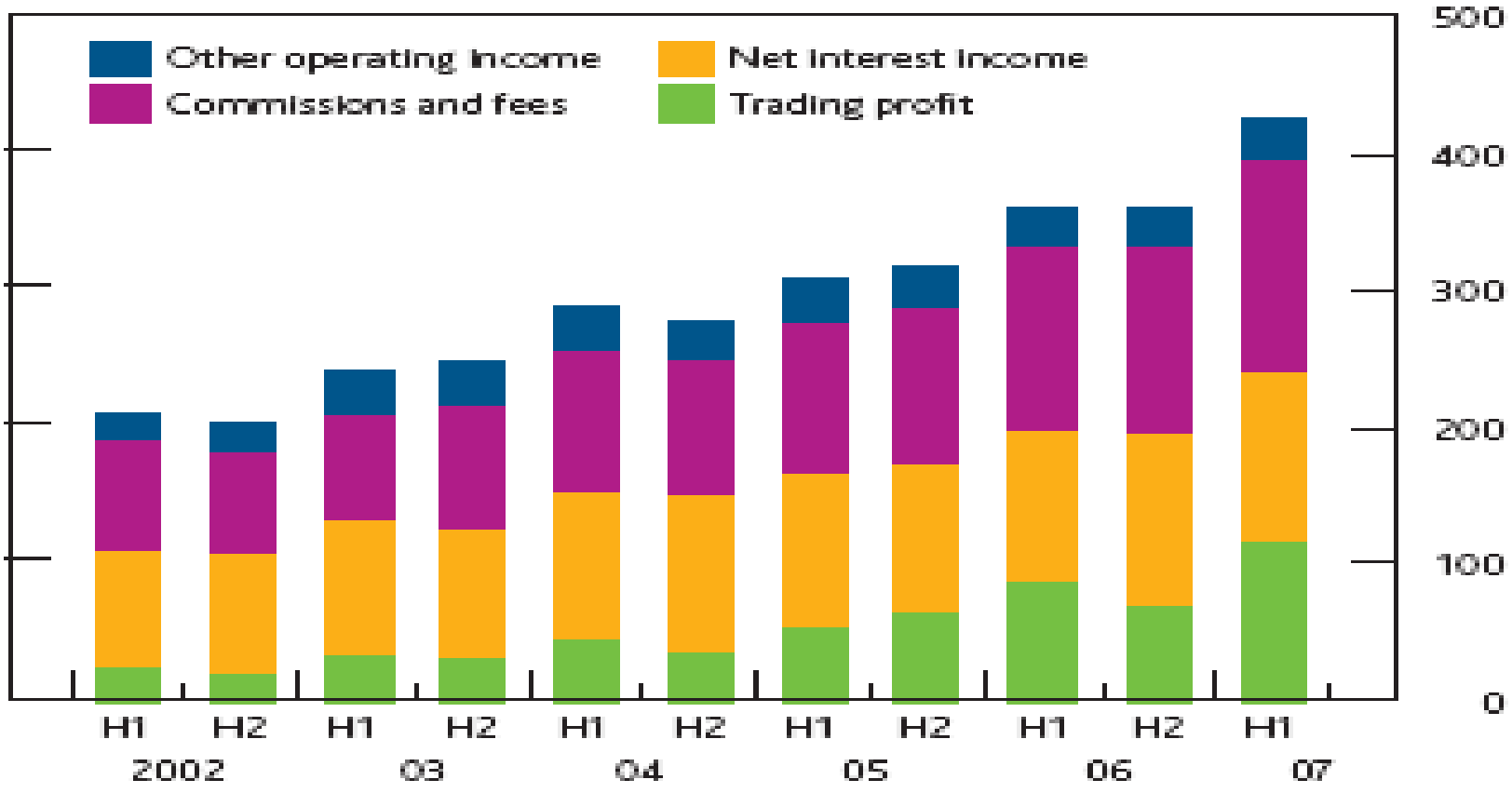
Figure 5. LCFI Issuance of RMBS backed by Sub-Prime Lending



Sources: Dealogic and Bank calculations.

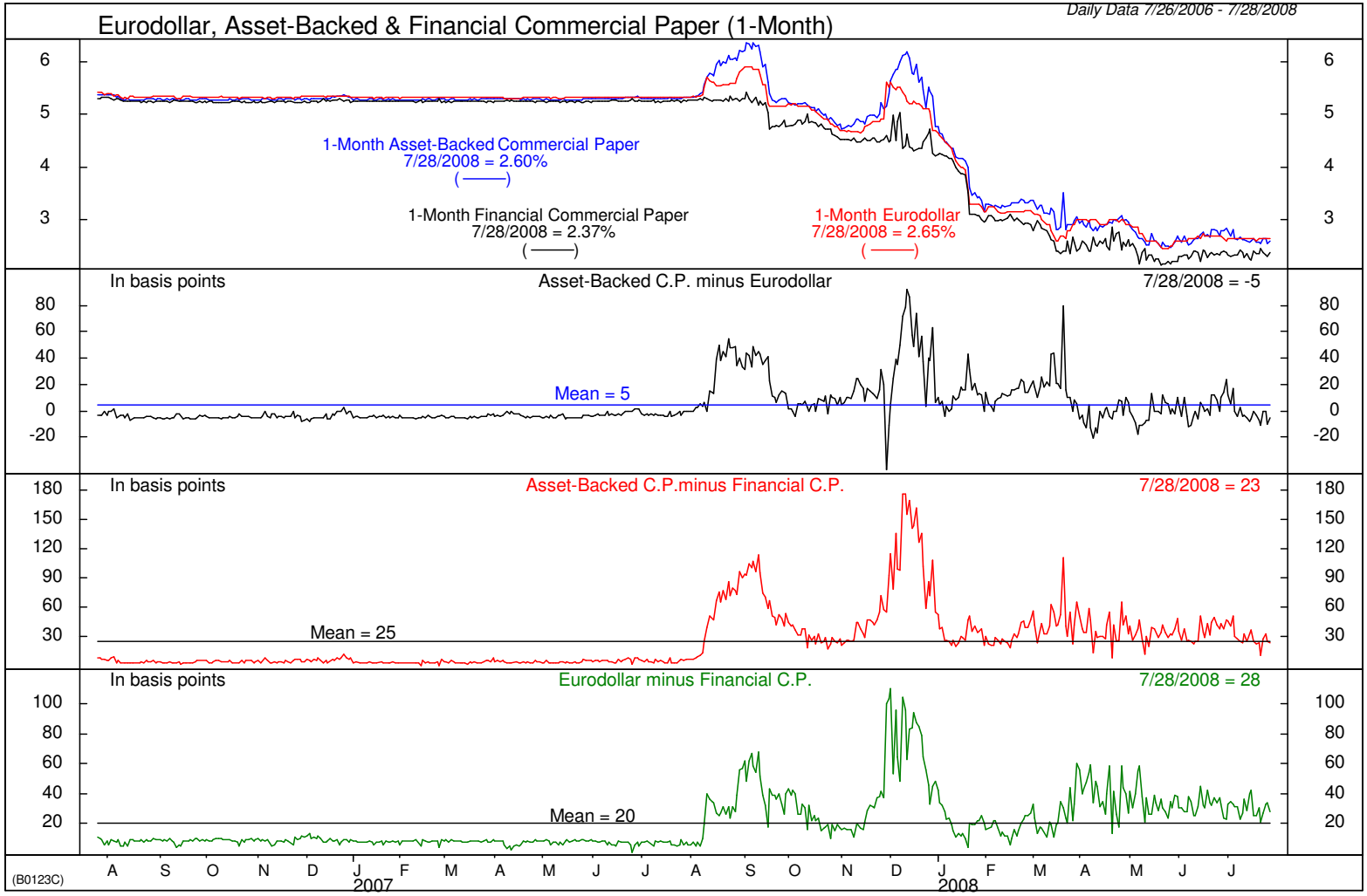
(a) Data include residential mortgage-backed securities (RMBS) backed by sub-prime and non-first lien mortgages.

Figure 6. Sources of Income for Large Complex Financial Institutions



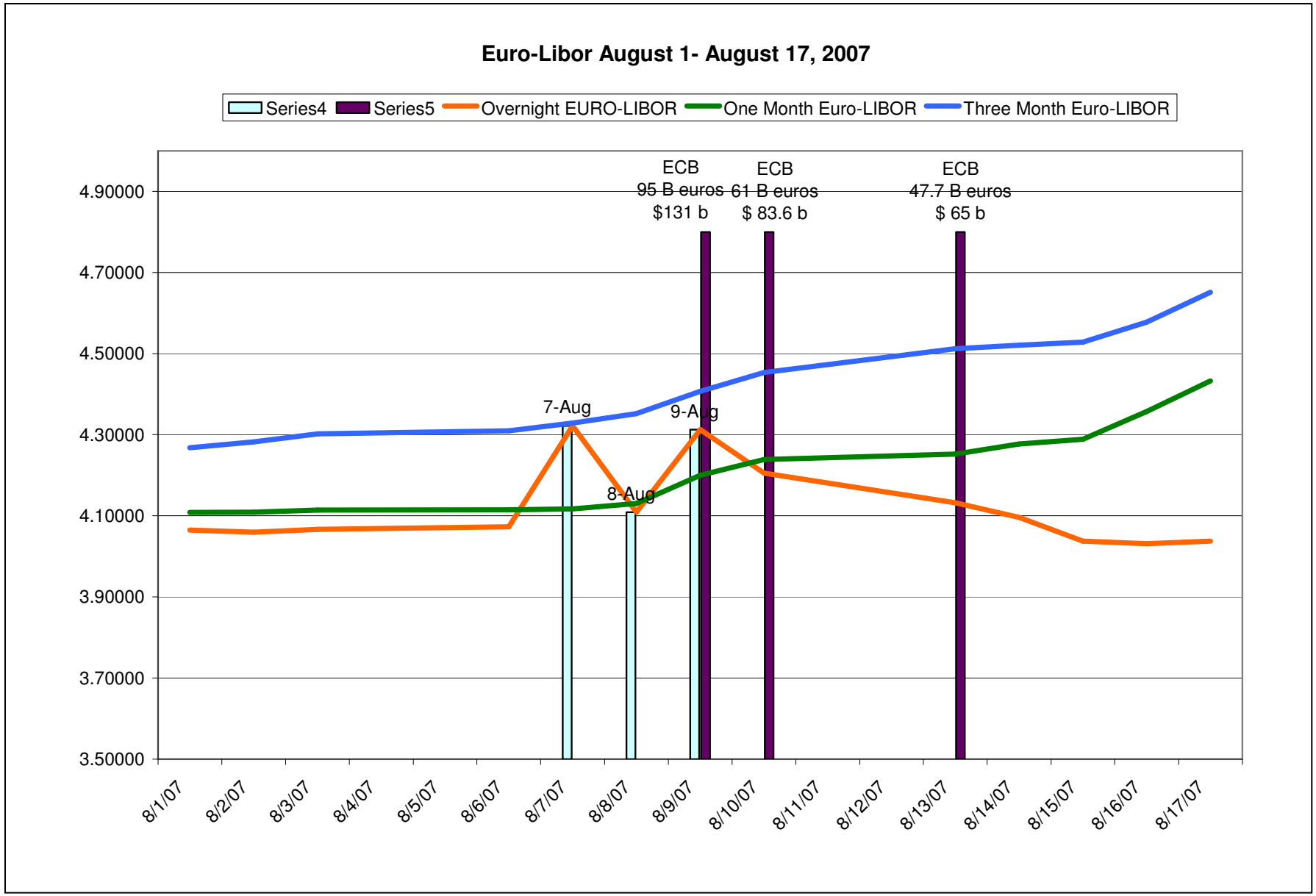
Sources: Bloomberg and Bank calculations.

Figure 7. Euro Dollar, Asset Backed and Financial Commercial Paper Rates and Spreads



Source: Ned Davis Research: www.ndr.com

Figure 8.


Euro-Libor August 1- August 17, 2007
Series4
Series5
Overnight EURO-LIBOR
One Month Euro-LIBOR
Three Month Euro-LIBOR
ECB
95 B euros
$131 b
ECB
61 B euros
$ 83.6 b
ECB
47.7 B euros
$ 65 b
7-Aug
8-Aug
9-Aug
4.90000
4.70000
4.50000
4.30000
4.10000
3.90000
3.70000
3.50000
8/1/07
8/2/07
8/3/07
8/4/07
8/5/07
8/6/07
8/7/07
8/8/07
8/9/07
8/10/07
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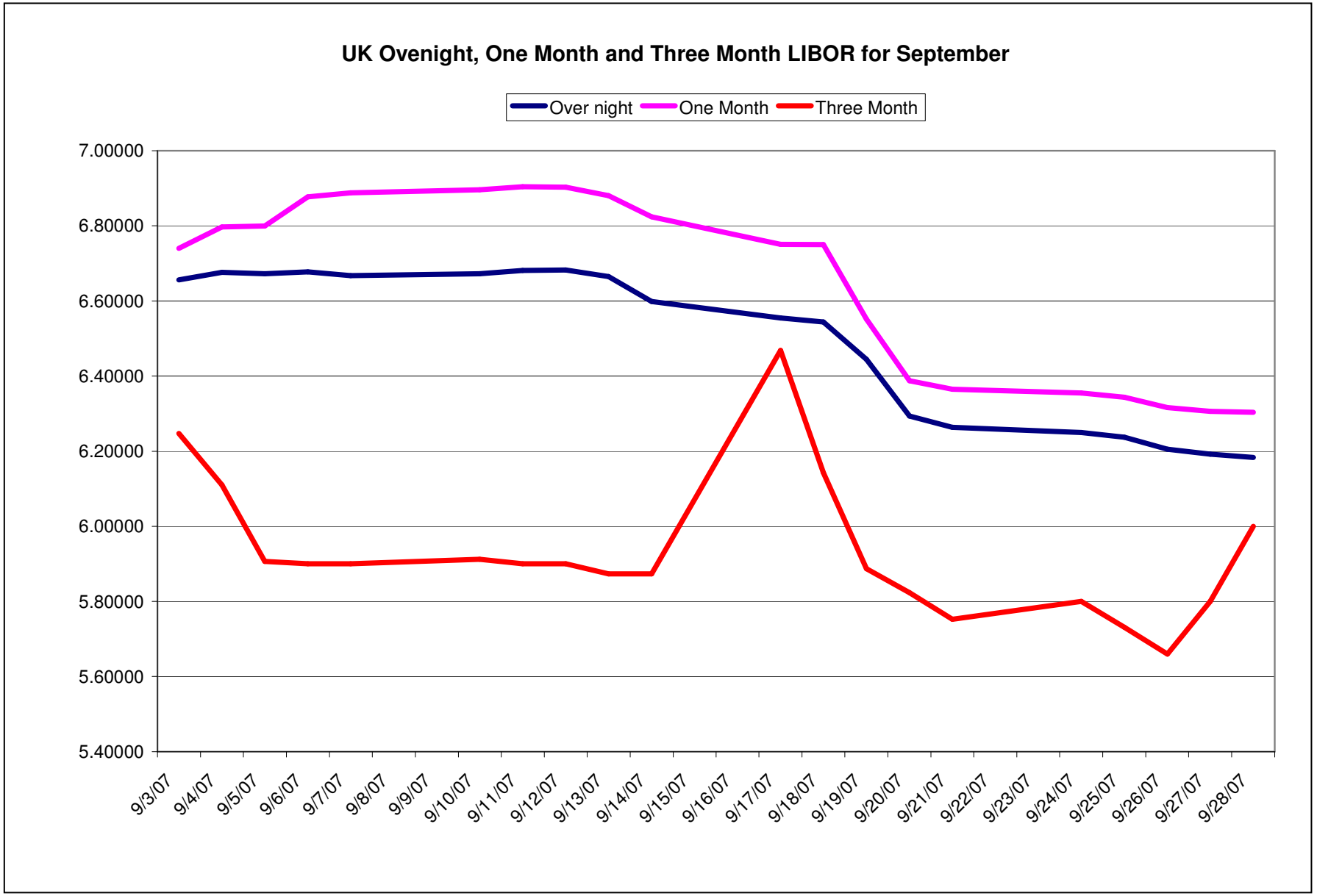
8/12/07
8/13/07
8/14/07
8/15/07
8/16/07
8/17/07

Figure 9.


UK Ovenight, One Month and Three Month LIBOR for September
Over night
One Month
Three Month
7.00000
6.80000
6.60000
6.40000
6.20000
6.00000
5.80000
5.60000
5.40000
9/3/07
9/4/07
9/5/07
9/6/07
9/7/07
9/8/07
9/9/07
9/10/07
9/11/07
9/12/07
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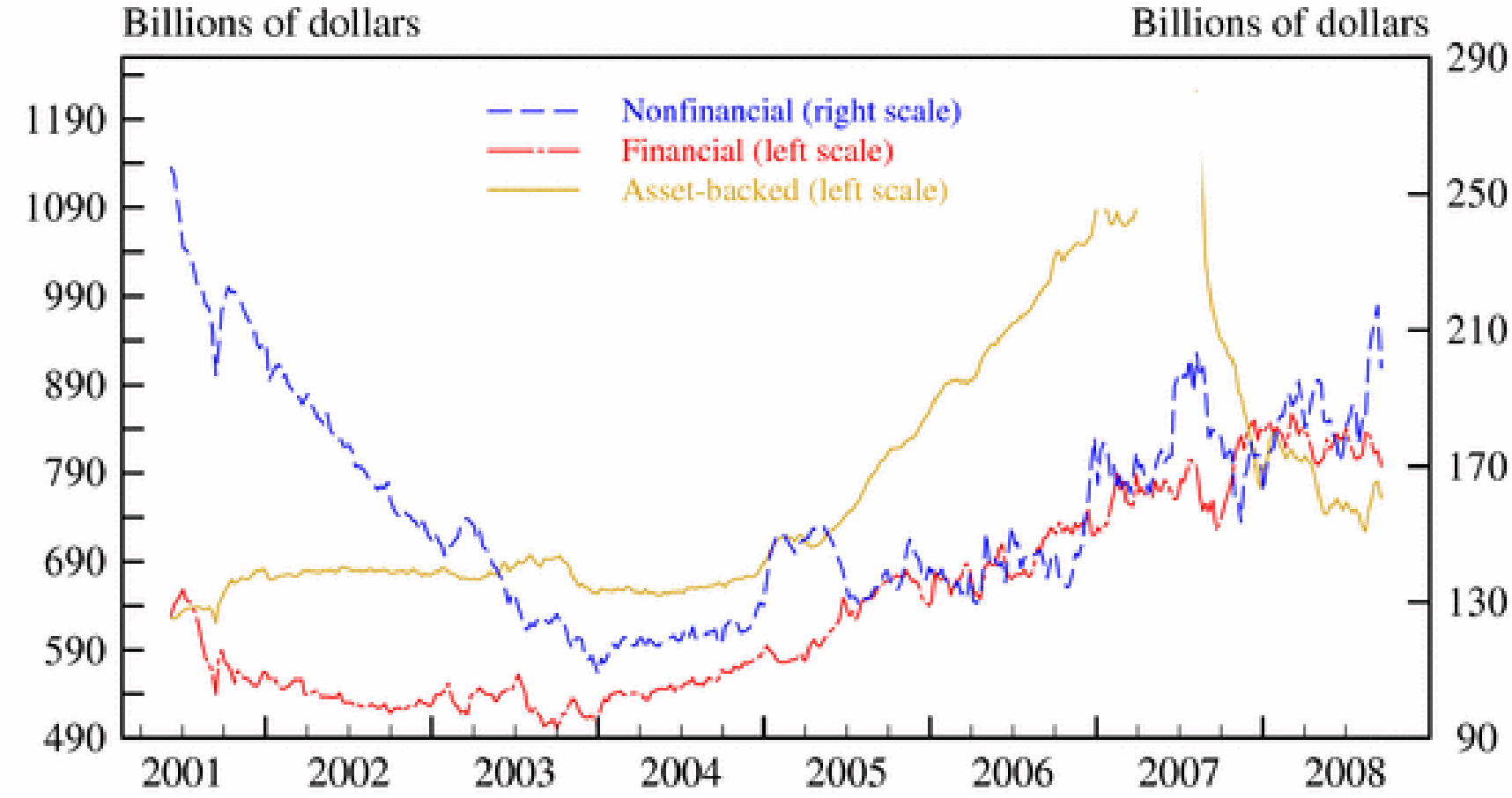
9/27/07
9/28/07

Figure 10.



Source: Board of Governors of the Federal Reserve System as of September 18, 2008

Figure 11 Yields and Yield Spread Between Bond Buyer Municipal Bond Index and 30 Year Treasury Bond

Figure 12

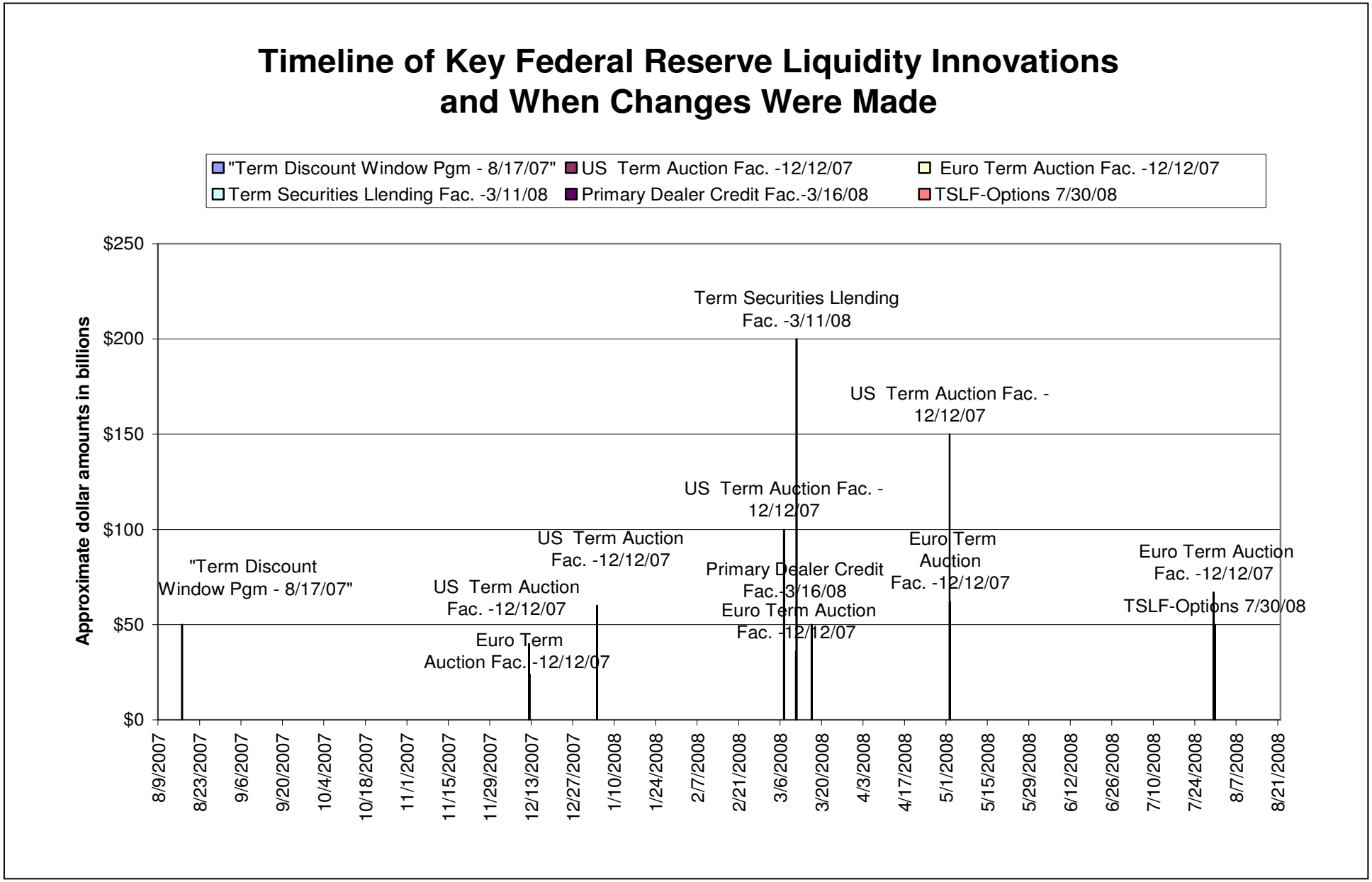

Timeline of Key Federal Reserve Liquidity Innovations and When Changes Were Made
"Term Discount Window Pgm - 8/17/07"
US Term Auction Fac. -12/12/07
Euro Term Auction Fac. -12/12/07
Term Securities Llending Fac. -3/11/08
Primary Dealer Credit Fac.-3/16/08
TSLF-Options 7/30/08
Approximate dollar amounts in billions
$250
$200
$150
$100
$50
$0
Term Securities Llending Fac. -3/11/08
US Term Auction Fac. -12/12/07
US Term Auction Fac. -12/12/07
US Term Auction Fac. -12/12/07
Euro Term Auction Fac. -12/12/07
Primary Dealer Credit Fac.-3/16/08
Euro Term Auction Fac. -12/12/07
Euro Term Auction Fac. -12/12/07
TSLF-Options 7/30/08
"Term Discount Window Pgm - 8/17/07"
US Term Auction Fac. -12/12/07
Euro Term Auction Fac. -12/12/07
8/9/2007
8/23/2007
9/6/2007
9/20/2007
10/4/2007
10/18/2007
11/1/2007
11/15/2007
11/29/2007
12/13/2007
12/27/2007
1/10/2008
1/24/2008
2/7/2008
2/21/2008
3/6/2008
3/20/2008
4/3/2008
4/17/2008
5/1/2008
5/15/2008
5/29/2008
6/12/2008
6/26/2008
7/10/2008
7/24/2008
8/7/2008
8/21/2008

Figure 13. Factors Adding to Reserves Plus Off-Balance TSLF
from 6/27/07 to 9/17/08

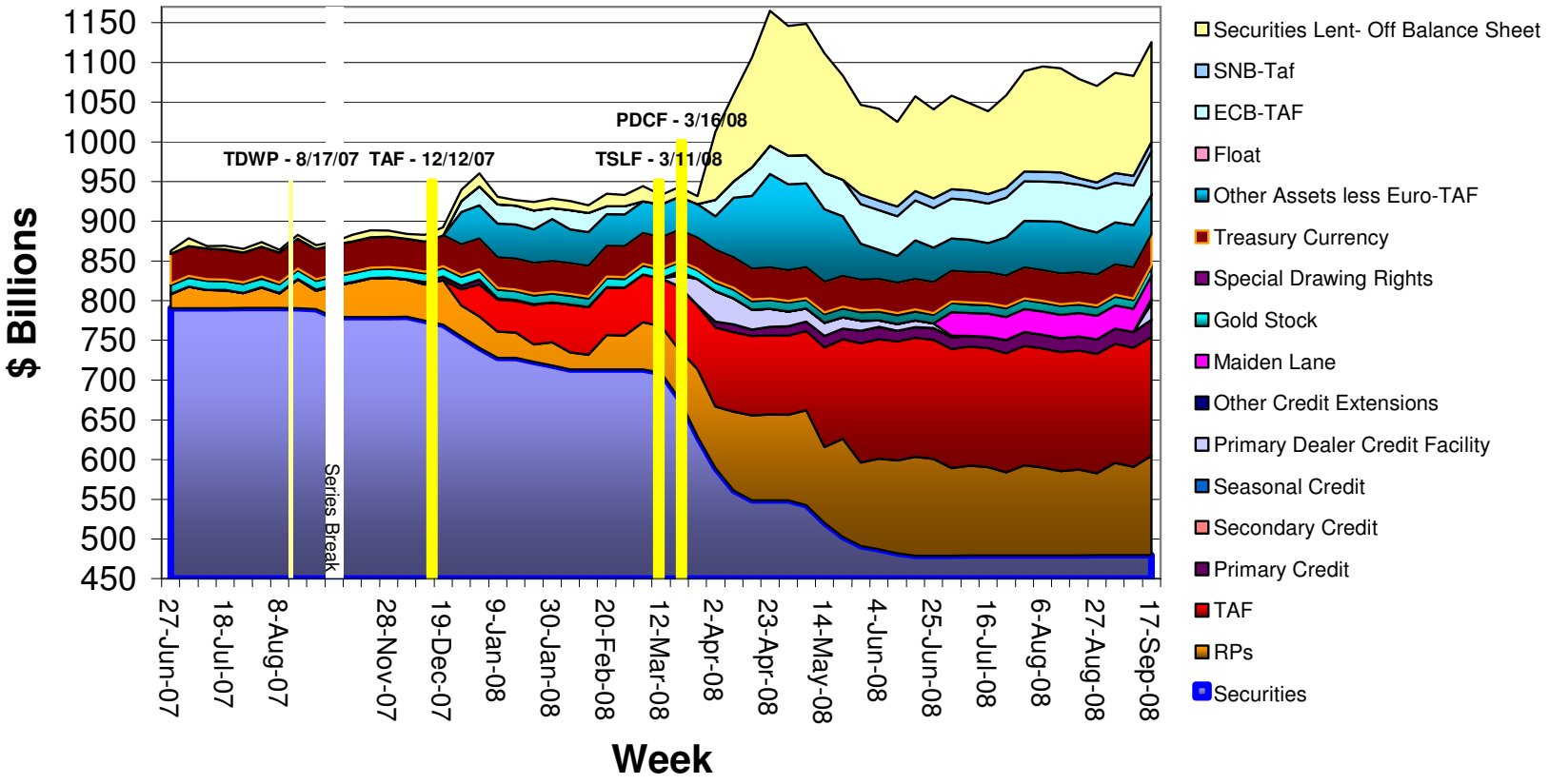


Figure 14. TED Spread and Fed Funds

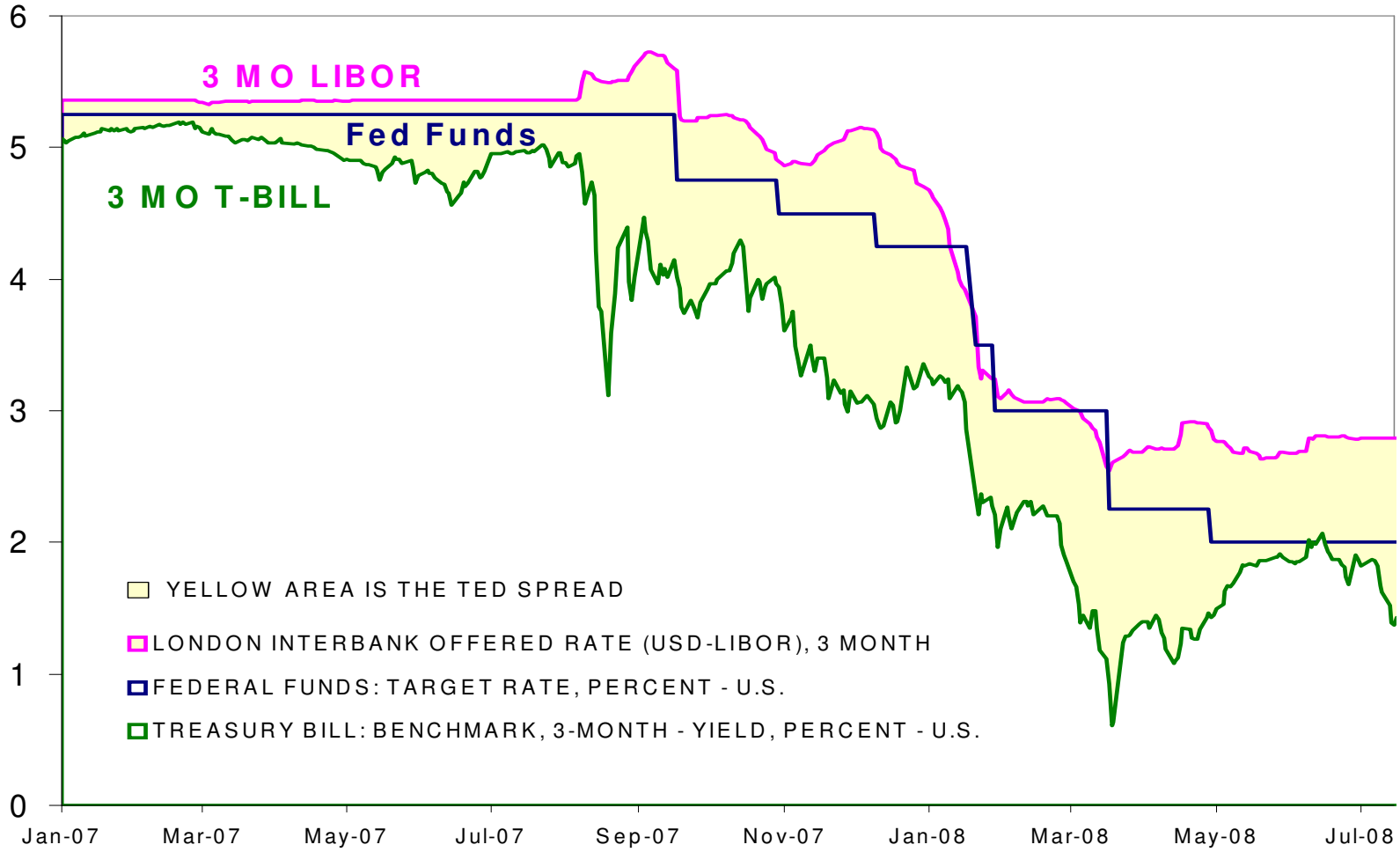


Figure 15. Option Adjusted Spreads on Agency securities Mortgage-Backed Securities and Bonds

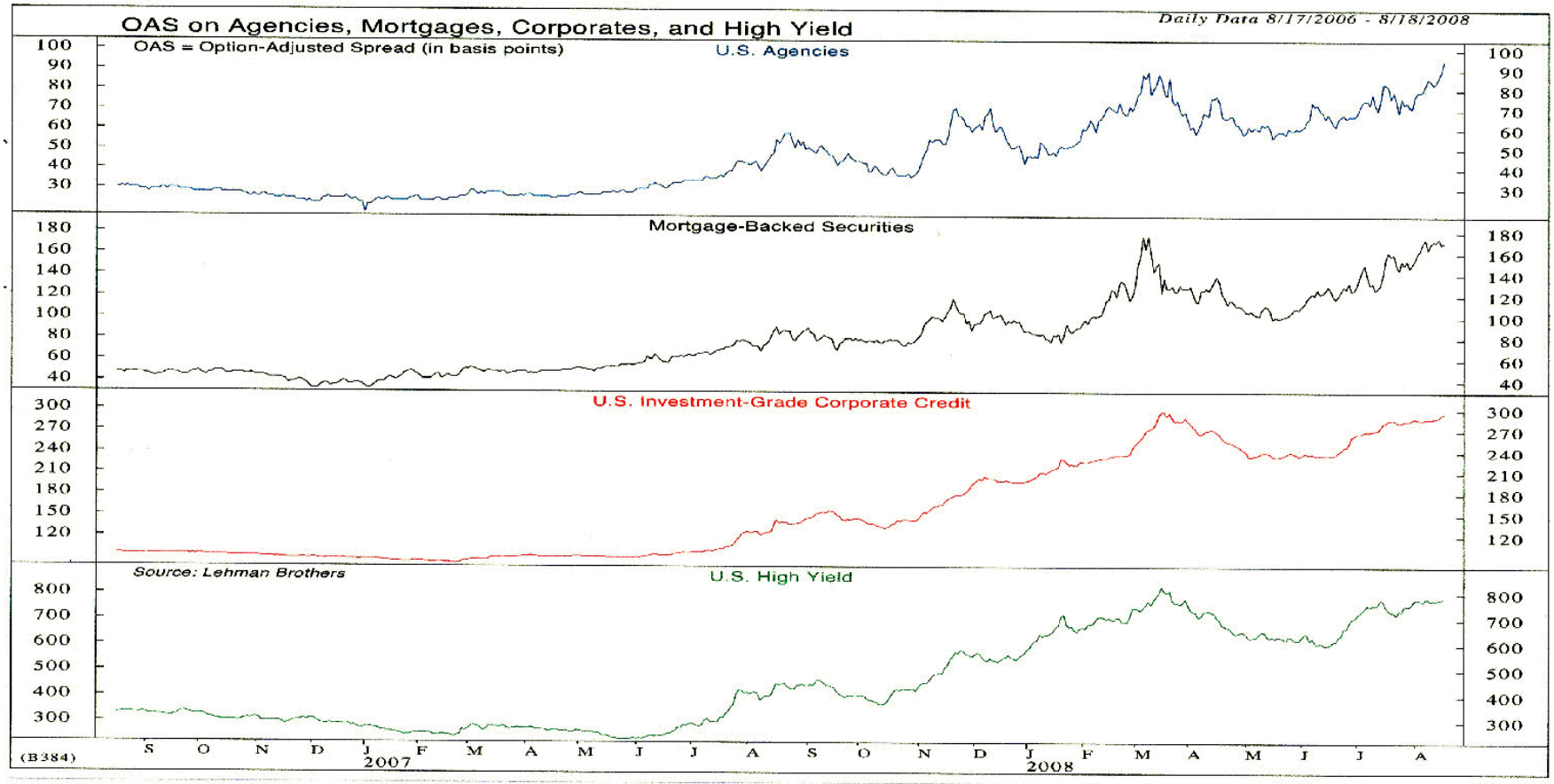


Figure 16. Central Bank Policy Rates - 2007-2008

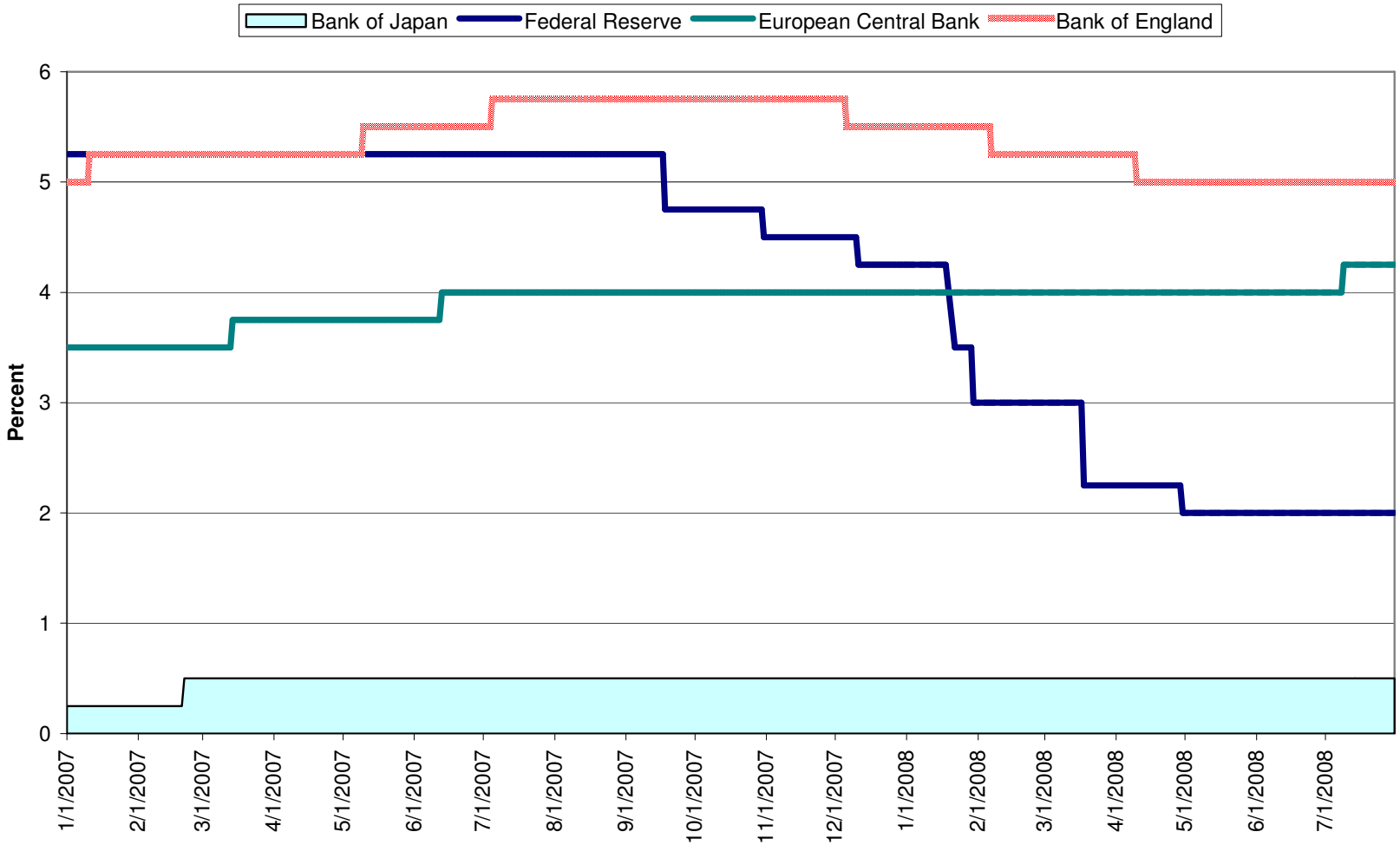
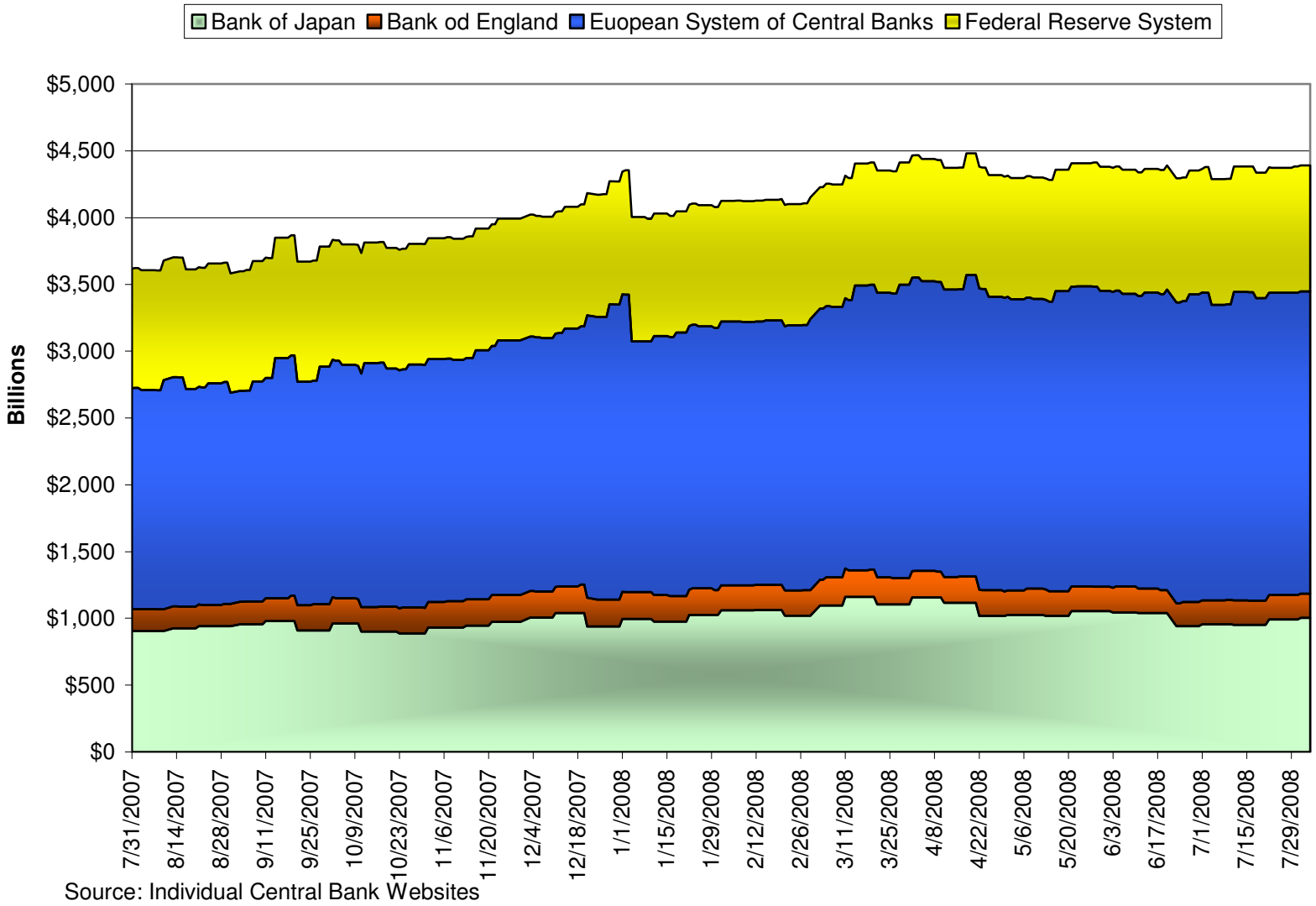
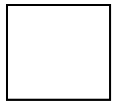


Figure 17. Assets in Dollars of Four Central Banks
July 31, 2007 Through August 4, 2008



Source: Individual Central Bank Websites

Yields and Yield Spread Between Bond Buyer Municipal Bond Index and 30 Year Treasury Bond



Source: Bank of England Financial Stability Review, October 2007, p. 38.