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The unfolding turmoil of 2007 - 2008: Lessons and responses

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**The Unfolding Turmoil of 2007–2008:
Lessons and Responses**

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Abstract

While the unfolding financial turmoil has involved new elements, more fundamental elements have remained the same. New elements include structured credit, the originate-to-distribute business model and the tri-party repurchase agreement. The recurrence of crises reflects a basic procyclicality in the system, which is characterized by a build-up of risk-taking and leverage in good times and an abrupt withdrawal from risk and an unwinding of leverage in bad times. To deal with the adverse liquidity spiral that has characterized the current crisis, central banks have tried to strike a balance between the importance of the continued availability of market liquidity as a public good and the moral hazard that any market intervention may induce. In proposing long-term responses to the crisis, the Financial Stability Forum has focused on areas where incentives for risk-taking may be aligned more properly and areas where risk management may be made more robust. Nonetheless a recognition that the procyclicality of the system lies at the root of the crisis would suggest more aggressive countercyclical measures are needed.

JEL Classification: E32, E44, E58, G14, G18, G21, G24, G28

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I. INTRODUCTION

The international economy is now well into the nearly yearlong financial crisis that has been extraordinary in its persistence, its global reach, and the questions it has raised about the workings of the financial system. In past episodes of systemic stress—such as the Asian financial crisis of 1997 or the market turmoil associated with the failure of Long-Term Capital Management in 1998—which have occurred from time to time in many economies over the years, the policy questions in the aftermath have tended to center around such issues as how to encourage more responsible behavior among borrowers and how to resolve bad-debt problems more effectively. While these questions have rightly been asked in the context of the current crisis, there have also been more fundamental questions about the financial system itself that need to be addressed.

To understand the crisis, financial authorities have had to look very closely at such questions as how credit has been intermediated, how losses are propagated, and how market liquidity is generated and lost. To address the problems, authorities have had to ask what information should be available about borrowers and instruments, how regulation can most effectively prevent unnecessary disruptions to the functioning of the system without stifling innovation, and how central banks should act in their capacity as lenders of last resort.

In this paper, we focus on the turmoil itself and the short- and medium-term policy responses it has elicited. First, we describe the chain of events that constituted the crisis, discuss the underlying causes, and draw lessons from the events. In characterizing the crisis, we distinguish among the elements that are new, those that have remained the same, and those that we do not understand. Second, we examine the policy responses thus far, both in terms of efforts by central banks to stabilize markets in the short term and efforts by financial authorities to strengthen the underpinnings of the system over the longer term. We end by emphasizing the importance of recognizing the issue of procyclicality.

II. ORIGINS OF THE CRISIS: WHAT'S NEW, WHAT'S THE SAME, AND WHAT WE DON'T UNDERSTAND

Most commentaries about the crisis have focused on the unusual structures of the financial system and the role of excessively complex financial innovations. It is true that an important factor in the run-up to the turmoil was the reckless use of recent financial innovations, especially in markets for credit risk transfer. However, as Borio (2008) argued, these are but idiosyncratic elements that represent “more fundamental common causes.” Indeed the current turmoil has displayed a number of important features that it shares with previous crises. At the same time, it is important to acknowledge that there are critical characteristics of the current crisis that we do not fully understand.

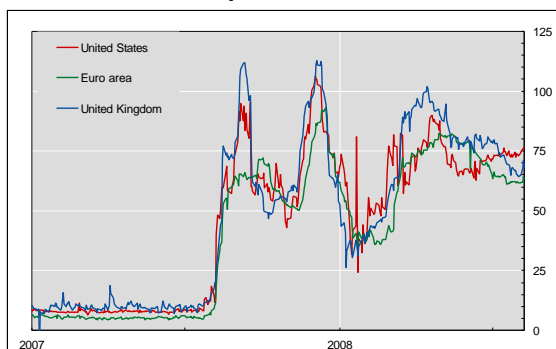
A. The chain of events

To understand what triggered the crisis and how it spread, it helps to follow the chain of events that preceded the crisis' onset. Two types of interest rate spreads are especially helpful in tracking events as they unfolded: the spreads of three-month London Interbank Offered Rate (LIBOR) over the overnight index swap (OIS) and spreads on credit default swaps (CDS). The former is a good indicator of liquidity in interbank markets and the latter of credit risk premia. As shown in Figure 1, LIBOR-OIS spreads in the United States (US), the euro area, and the United Kingdom (UK) rose sharply in August and September 2007, rose again in November and December 2007, and yet again in March and April 2008, each case indicating a lack of liquidity. For their part, average credit default swap (CDS) spreads in the same three regions followed almost the same pattern, except that the widening of these spreads became more pronounced in each successive episode, especially in February and

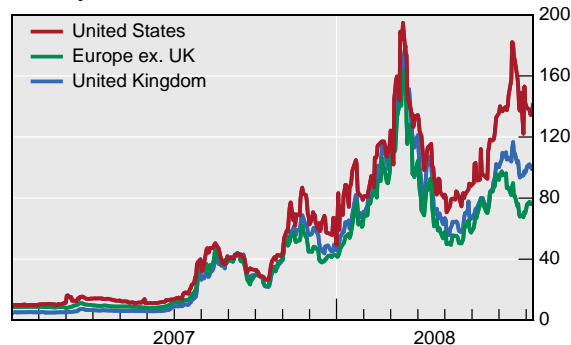
March 2008. There was also a jump in CDS spreads in July 2008 that was not echoed in LIBOR-OIS markets. What led these spreads to behave in this way?

Figure 1: Interbank Term Spreads and CDS Spreads

3-month Libor-OIS spreads



CDS spreads¹



Note: ¹ Five-year CDS spreads; simple average of major banks.

Sources: Bloomberg; JPMorgan Chase.

Although US subprime mortgage default rates, and the spreads on associated securities, had been rising since late 2006, the first significant event in the broader financial-market turmoil seems to have been the emergence of rumors during the third week of June 2007 about heavy losses in two hedge funds managed by Bear Stearns.¹ The losses were later confirmed, and they turned out to be related to positions in US subprime-backed structured securities. By July, major credit rating agencies had either downgraded or placed on review a large number of collateralized debt obligations (CDOs) that relied on mortgages as collateral. In August, the troubles spread to asset-backed commercial paper (ABCP) issued by entities that had invested in CDOs of mortgage-backed securities, and interbank markets around the world began to experience shortages of liquidity. On 9 August, the market received the shocking news that BNP Paribas, France's biggest bank, halted withdrawals from three of its investment funds because it could not "fairly" value their holdings. All these events culminated in September with a run on Northern Rock, a UK mortgage lender, when its liquidity problems became known. During this phase, the LIBOR-OIS spread rose to close to 100 basis points in the US interbank market and even higher in the UK market.

The second major event occurred in October 2007 as participants in the interbank and credit markets were again caught by surprise when large monoline bond insurers revealed losses related to credit enhancements they had provided to structured securities; not many observers knew that the insurers had even been involved in this business. The losses were large enough to threaten the AAA/Aaa ratings that the monolines needed in order to operate. In December, mounting concerns by various lenders, waves of margin calls in the repurchase markets (hereafter known as repo markets) and the anticipation of increased liquidity demands over the year-end led to widening CDS spreads and a second liquidity crisis in the money markets, prompting five major central banks to announce that they would take concerted action to make more funding liquidity available. The LIBOR-OIS spread in the US and euro area interbank markets reached unprecedented levels, while in the UK these spreads rescaled the peaks they had reached in September.

The third and perhaps most alarming period of the turmoil is also the most difficult to explain. In late February and early March 2008, a new wave of deleveraging suddenly engulfed the fixed-income markets. There seems to have been no significant event that could have precipitated this episode, although mounting concerns about monoline insurers, the continued worsening in the US economic outlook, and associated valuation and liquidity problems in high-yield corporate debt and in both prime and non-prime US housing-related

¹ For a good narrative of these events, see Chapter VI of BIS (2008).

paper certainly were part of the background.² What is evident is that concerns about counterparty risk became extraordinarily intense. Dealers in mortgage-backed securities and in over-the-counter (OTC) derivatives started asking for more collateral from their counterparties. In repo markets, lenders sharply increased their margin calls and refused to accept as collateral anything but US Treasury securities or German government bonds (*Bundesanleihen*, or bunds). Since bond dealers finance themselves in the repo markets, they abruptly withdrew from making markets in the broader fixed-income markets. Liquidity in US and European fixed-income markets seemed to vanish overnight.

In early March 2008, the news headlines began to report what has come to be known as an adverse liquidity spiral, in which Bear Stearns, a US investment bank, was rumored to be caught. On 16 March, after several days of customer outflows, shrinking capital, and fevered activity on Wall Street and at the US Federal Reserve, the troubled investment bank was taken over by a US commercial bank, JP MorganChase, with the help of an arrangement by which the Federal Reserve would lend up to US\$30 billion (later reduced to US\$29 billion) in order to finance Bear Stearns' portfolio of troubled securities.

Markets appeared to stabilize in the aftermath of the Bear Stearns episode, but remained subject to episodes of turbulence. Equity and debt markets were buffeted by concerns about the prospects for various segments of the US financial system, as losses spread to government-sponsored enterprises (GSEs) and small- and medium-sized banks. As of the summer of 2008, the impact of the financial system's troubles on the real economy remains a major source of uncertainty worldwide.

B. What's new

The blame for the turmoil has been linked to a wide variety of financial innovations. In particular, many observers have argued that, while these financial innovations have been fundamentally beneficial for the financial system, a reckless use of them has led to the crisis. Borio (2008), for example, identified the two most salient innovations as structured credit and the originate-to-distribute business model. As will be discussed in more detail below, we would suggest that, while these have been sources of substantial losses and uncertain valuations over the past twelve months, a little-noticed innovation in the repo market—the tri-party repo³—also contributed significantly to the crisis.

The innovation of structured credit includes both CDOs and CDSs. CDOs use the device of subordination to transform instruments with high credit risk into instruments that receive high credit ratings. The introduction of CDS contracts in turn allows CDOs to be created more easily by serving as the underlying instruments for what are called “synthetic CDOs.” The pricing of these instruments relies critically on assumptions about default correlations, which have been intractably difficult to model or measure.⁴

These instruments were developed in the 1990s and proved to be fundamentally important in improving the pricing and distribution of credit risks. But in the environment of the past few years, their use became quite widespread and complex variations on the instruments proliferated rapidly, aided by advances in modeling techniques. These variations included CDOs based on asset-backed securities (ABS), as well as ABCP issued by structured investment vehicles (SIVs) that held highly-rated credit instruments, including CDO, tranches. The sheer scale and variety of the use of these innovations outstripped the

² See Shellock (2008) and Rappaport, Mollenkamp, and Richardson (2008).

³ As explained below, a tri-party repo involves a clearing bank, which stands between the lender and borrower of a repo transaction and takes custody of the collateral.

⁴ For the most part, price discovery in credit markets now takes place in the trading of CDS indices and of component parts called “loss tranches.” The spreads on these indices and their loss tranches in turn drive spreads on single-name CDS contracts as well as prices of CDO tranches. The most common pricing models in these markets attempt to account for default correlations in an ad hoc way, typically through a “Gaussian copula.” See, for example, Duffie and Singleton (2003, pp 237-42).

capacity of even the most sophisticated dealers and investors to understand and manage the risks associated with them.

The proliferation of CDOs owed much to the originate-to-distribute business model pursued by many of the world's largest commercial and investment banks. The model itself is not new, having been used in the syndicated loan market for years. Nonetheless, it achieved new prominence in banks' business strategies with the securitization of mortgages. Under this model, a mortgage lender would routinely package its loans into mortgage-backed securities, which it would sell to investors, thereby providing funding for the loans. In the period leading up to the turmoil, the originate-to-distribute model contributed to the rapid growth of the US mortgage market (as Frankel [2006] has emphasized), but also evidently weakened the incentives of mortgage originators to properly screen loans. Once the first subprime mortgage defaults materialized, standard covenants of the securitizations forced the originators to take back newly minted loans. However, these types of securities had become so widely dispersed that a generalized crisis of confidence ensued. Banks were stuck with "warehouses" of unpackaged loans that could not be sold and rapidly lost value as markets fell. They also discovered that the "super-senior" CDO tranches (the tranches with the highest priority claims within the CDO structure), which the banks typically retained in order to facilitate the sale of other parts of the structure, were far riskier and less liquid than they had expected.

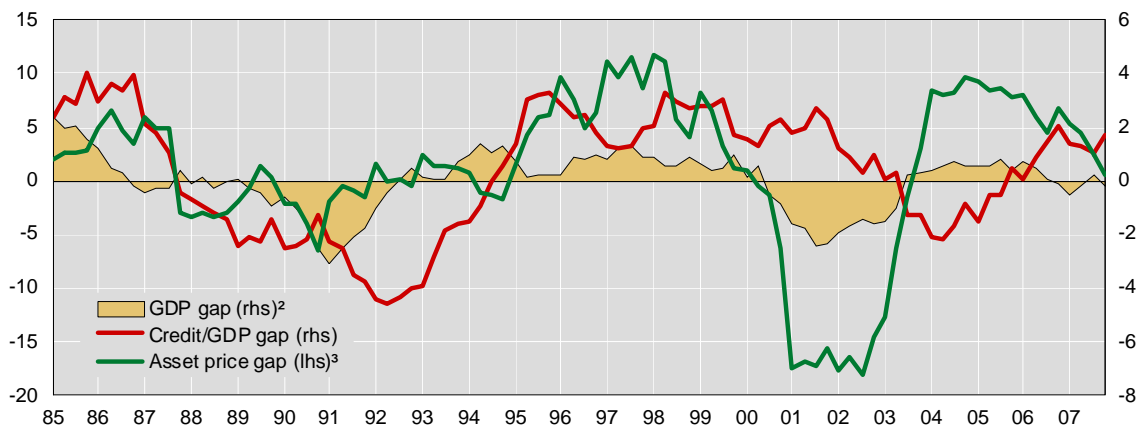
While the problems in CDS and CDO markets have been much commented upon during the crisis, the role of the tri-party repo has attracted less attention. This innovation has become the standard way of transacting in repo markets. In a tri-party repo, the third party is a clearing bank, which knows both the lender and borrower of a repo transaction and takes custody of the collateral. The arrangement has the advantages of avoiding delivery of collateral, facilitating substitution of collateral, and reducing clearing costs. In recent years, the tri-party repo has allowed the repo market to accept a wide range of collateral, including mortgage-backed securities, CDOs, and almost any asset that the clearing banks could hold in custody. Hence, it has allowed investors in various securities to more easily secure financing in the repo market by simply putting up their positions as collateral. However, an important factor contributing to the loss of liquidity in fixed-income markets in February and March 2008 was the sudden refusal of lenders in the repo market to accept as collateral the same wide range of assets as before. This made it difficult to impossible for holders to value the instruments and led to a sharp worsening of the liquidity profile of institutions—in the case of Bear Stearns, which had a large quantity of these assets on its balance sheets.

C. What has remained the same

The focus on what is new suggests that episodes such as this 2007–2008 unfolding financial turmoil are "black swans"—events so rare and unexpected that there is little that can be done about them. The truth, however, is that (just like real black swans) the underlying causes of the turmoil are, in many ways, familiar.

The early part of this decade saw a long period of unusually easy macroeconomic conditions, with low or negative real interest rates in the major economies and a glut of savings centered in East Asia and the Middle East. In this environment, the global weight of excess savings and excess liquidity fed a steady run-up in asset prices, especially in credit instruments and housing markets, which, in turn, encouraged a build-up in leverage and risk-taking, among both regulated and unregulated entities. When the environment turned bad, the overextension of risk resulted in heavy losses and a rush to unwind leverage. As shown in Figure 2, this risk-taking behavior has resulted in a correlation between credit growth, asset prices, and the real economy in what Goodhart (2004) has termed the "excessive procyclicality" of the financial system.

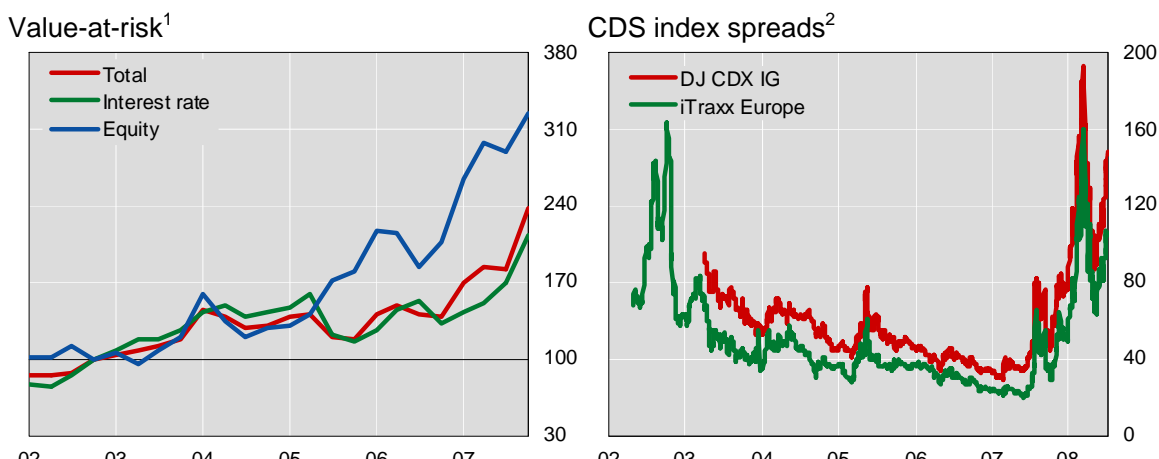
Figure 2: US Financial Markets and the Real Economy¹



Notes: 1. Deviations from trend. Each trend is derived on the basis of data available in real time; in per cent. Refer to the Graph 11 of Chapter 7 of the BIS Annual Report 78 for further information.
 2. Based on the logarithm of real GDP.
 3. Based on an index of real equity and residential and commercial property prices.
 Sources: IMF; Bloomberg; Datastream; national data.

An environment that was increasingly tolerant of risk was evident in the tendency of banks to take on more risk and in a decline in risk premia to low levels, especially in the case of credit instruments. As shown in Figure 3, the Value-at-Risk (VaR) estimates that banks themselves reported show that the banks took on more risk. This is especially striking given that the realized and implied volatilities of most major asset classes, which form a central input to VaR calculations, were falling steadily throughout this period (Bank for International Settlements (BIS) 2006). Even more striking was the steady decline in credit spreads as reflected, for example, in such traded CDS indices as the iTraxx in Europe or the CDX in North America.

Figure 3: Banks' Value-at-Risk and CDS Index Spreads²



Notes: 1. Five-year, on-the-run CDS spreads, in basis points. 2. Market capitalization-weighted average of value-at-risk data of Citigroup, Credit Suisse, Deutsche Bank, Goldman Sachs, JPMorgan Chase, Morgan Stanley, UBS, and Société Générale; 2002 Q4 = 100.
 Sources: JPMorgan Chase; BIS calculations.

But as the upswing in markets gathered pace, there were also important *qualitative* shifts in financial market participants' attitude towards risk-taking. At many large financial institutions, forward-looking risk assessments were poor, reflecting poor risk measurement and poor governance of risk-taking within those institutions. Misaligned incentives cropped up throughout the financial system, as the penalties for poor decisions were ignored. Subsequently, disclosure weakened, in part because investors slackened in their demand for it. Reviews by supervisors have also made it clear that some banks managed these risks

substantially better than others, thanks to closer engagement by senior management and more effective internal controls (Senior Supervisors' Group 2008). This suggests that at least a portion of the subsequent losses suffered by many banks were by no means inevitable.

In this world of ravenous appetites for risk, market participants became increasingly willing to hold rather complex instruments of unproven liquidity and increasingly reluctant to apply sound risk management practices to them. In the end, mistakes in the valuation and risk management of these instruments turned out to be the critical errors that triggered the crisis. Risk management errors with respect to the super-senior tranches of CDOs of sub-prime-mortgage backed securities evidently had especially significant systemic effects, thanks, in part, to maturity and liquidity mismatches involving these instruments. When investors lost faith in ABCP that had been issued by conduits and SIVs holding these instruments, a credit risk event turned into a liquidity event.

1. What we don't understand

The combination of a credit risk event and a liquidity event seems to have led to the unique depth and duration of the current crisis. Over the past decade or two, financial markets in the developed economies have become pretty good at absorbing large losses, resolving them, and moving on, albeit usually with an altered set of players and altered judgments about risks. In the current turmoil, by contrast, the underlying functioning of the system has come into question. Whole classes of previously abundant assets can no longer find buyers – notably CDOs of ABS, and the instruments based on them, but also seemingly unrelated products such as municipal auction-rate securities.

While stories explaining the turmoil abound, these remain “Just So Stories.” There are many fundamental things we just do not (yet) understand. How, for example, could defaults in a relatively small corner of the US mortgage market lead to such massive losses in broader credit markets and turn into a global turmoil of such proportions and such long duration? Greenlaw et al. (2008) argue that leverage was a major contributing factor. While it is clear that leverage did play a role in the magnification of losses, it is still puzzling how instruments that were designed to spread and diversify risks ended up concentrating the risks.

The sudden evaporation of market liquidity has been even more surprising. Three-month spreads in the international interbank lending markets widened in August 2007 and have remained wide ever since. By late February and early March 2008, investors had seen the near cessation of trading activity in all but the most liquid government securities. Repo markets, supposedly the most robust source of funding liquidity, experienced what can only be described as a run on all “eligible” collateral except for the highest rated government bonds. How could liquidity disappear so suddenly from markets that had not seen any sign of defaults or even credit rating downgrades? Brunnermeier and Pedersen (2007) demonstrated that the interaction of market liquidity and funding liquidity can generate what they describe as a liquidity spiral. Nonetheless, an explanation of the sudden disappearance of funding liquidity during February and March 2008 remains beyond the scope of their paper.

Deleveraging and the hoarding of liquid securities by market makers who also happen to be investors in a broad range of markets played some role in these phenomena. Indeed there were bouts of deleveraging in August 2007, December 2007, and February and March 2008. The first two episodes may have been triggered by disconcerting news about losses in hedge funds or banks. But it is hard to identify a specific trigger for the February-March episode. In conversations with market participants, all they can say is that they just had a “bad feeling about things.” The fact that many market participants seemed to get that bad feeling at about the same time suggests that a common factor was at work. But what that common factor was remains a mystery.

In trying to resolve the liquidity issues, monetary authorities have been mystified by the persistent stigma associated with borrowing from the central bank and the fact that this gets

worse at the very time when such borrowing becomes most critical. As discussed below, it is also surprising how the simple mechanism of an auction can make such stigma go away.

III. THE CHALLENGES FOR POLICYMAKERS: SHORT-TERM AND LONG-TERM RESPONSES

The challenges that this episode of financial market turmoil has posed for public authorities can be divided into those meriting short-term responses and those meriting long-term responses. In this section, we focus on the short-term efforts of central banks to provide liquidity and on the longer-term recommendations of the recent report of the Financial Stability Forum to the Group of Seven (G7) finance ministers and central bank governors (Financial Stability Forum 2008).

A. Short-term responses: What central banks did

The short-term responses of central banks to the unprecedented and fast-changing situation have been creative, energetic, and, in terms of the specific goal of keeping the system from grinding to a halt, effective. As Kearns and Lowe (2008) point out, market liquidity has a large public good component and a sudden loss of such liquidity is often the result of a market failure. At the same time, Davis (2008) emphasizes the moral hazard that accompanies any form of central bank emergency lending. In their efforts to restore market liquidity, central banks have clearly been seeking to strike the right balance between providing a public good and avoiding moral hazard.

With respect to operations in short-term money markets, central banks have initiated a wide variety of actions. One set of responses may be characterized as a broadening of the scope of their operations.⁵ This broadening took place along four dimensions:

- first, there was a widening of the collateral accepted, which means that central banks have taken a *de facto* interest in the liquidity of a wider range of asset markets;
- second, there was a widening of the set of counterparties, notably with the introduction of the Primary Dealer Credit Facility by the US Federal Reserve;
- third, central banks have done more to funnel liquidity in their own currencies to entities in other economies, through instruments such as swap agreements; and,
- finally, central banks have increased their operations at terms longer than overnight, in order to satisfy the market's increased demand for term liquidity.

A second set of responses by central banks was designed to deal with the stigma associated with borrowing from them. Perhaps the most interesting efforts have been those made by the Bank of England and the US Federal Reserve because they address issues of transparency and the appropriate pricing mechanism for liquidity support.

The Bank of England had, in past episodes, provided liquidity support to an ailing bank in secret, generally with good results. In September 2007, however, the central bank planned to depart from past practice by announcing liquidity support for Northern Rock. As Davis (2008) described the action, this plan was pre-empted by a leak to the British Broadcasting Corporation, which led to a run on the troubled bank. This was a forceful reminder of the stigma of borrowing from the Bank of England; subsequently, other banks refused to access the Bank of England's lending facilities. It remains an open issue whether the Bank of England would have been well-advised to keep to its practice of covert financing, or whether

⁵ The Committee on the Global Financial System (2008) provided a comprehensive review of these operations by the major central banks. Hilton (2008) provided a similarly comprehensive review of monetary operations by the US Federal Reserve.

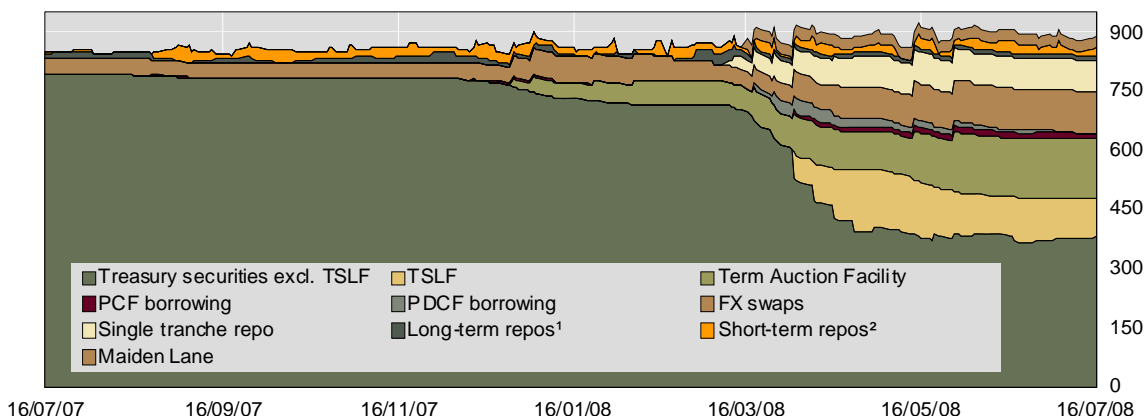
such financing would even have been feasible in the modern-day environment of more transparent financial markets.

In the case of the US Federal Reserve, banks were reluctant to make use of the discount window because of the stigma associated with borrowing from it. Various efforts to mitigate the stigma during the early phases of the crisis failed and the discount window remained inactive. For example, the Federal Reserve reduced from 100 basis points to 50 basis points the interest premium over the target federal funds rate for borrowing from the discount window and allowed banks to borrow funds for up to 30 days.⁶

What finally succeeded was an auction mechanism. The term auction facility was announced on 12 December 2007; the first auction was conducted five days later. It was a single-price auction with a pre-determined total amount of US\$20 billion and a fixed, 28-day term. Officials of the US Federal Reserve were no doubt pleased when 93 banks showed up for the auction and took up the entire amount. The question this episode raises is, why did such an auction work while Bagehot’s dictum to lend freely at a penalty rate, which underlies the operation of the discount window, did not? Is it because there appeared to be “safety in numbers” associated with the auction process? This may well be so. However, by relying on safety in numbers, such auctions may not ensure that liquidity goes to the institutions that need it most, as Goodhart (2004) pointed out.

One result of the central banks’ liquidity operations was to change the *composition* of their balance sheets. As Cecchetti (2008) explained, this is conceptually different from the usual operations related to monetary policy, which change the size of the central bank’s balance sheet rather than its composition. Indeed, in the case of the US Federal Reserve, the change in the composition of the balance sheet has been quite dramatic. As shown in Figure 4, the US Federal Reserve started out in July 2007 with a balance sheet of about US\$850 billion (excluding “other” assets), with outright holdings of Treasury securities accounting for 93% of the assets shown. One year later, the size of the balance sheet had risen to only US\$890 billion, but uncommitted outright holdings of securities now accounted for only 42% of the balance sheet, with the rest of the assets presumably consisting of less liquid securities obtained through the various liquidity operations. In effect, the US Federal Reserve used its balance sheet to supply the repo market with the assets that market participants now prefer; in turn, the American central bank has taken from the market those assets that were no longer desired.

Figure 4. Evolution of the Federal Reserve’s balance sheet
In billions of US dollars



Notes: ¹ Repos with an original maturity of at 10 to 19 days.
² Repos with an original maturity of at 2 to 9 days.

Sources: Board of Governors of the Federal Reserve System, Federal Reserve Statistical Release: H.4.1; Federal Reserve Bank of New York

⁶ See Almantier, Krieger, and McAndrews (2008) for a more comprehensive discussion.

Taken together, the above-mentioned liquidity operations by central banks more generally have helped to stabilize short-term money markets. Nevertheless, the short-term money markets remain plagued by wide spreads and, from time to time, volatile rates, reflecting the underlying balance-sheet problems that still need to be resolved. Moreover, in several cases, central banks will sooner or later have to decide whether these actions are temporary measures responding to unusual circumstances or whether they should retain a more permanent place in the banks' operational toolboxes.

At the same time, there are some worrying signs that policymakers may be sowing the seeds for future liquidity and credit problems and that market participants' expectations of inflation may already be on the rise as a result. Thanks to higher inflation expectations and falling or stable policy rates, global real monetary policy interest rates, which had already been at low levels for some years, have recently dropped to negative levels in many key jurisdictions. In addition, many countries, particularly emerging market economies, have been reluctant to allow their currencies to appreciate against the dollar and other major currencies, consequently continuing their massive foreign exchange intervention purchases. This combination of a rapid and very large decline in real policy interest rates in key jurisdictions and massive foreign exchange interventions by emerging markets has contributed to a large liquidity expansion at the global level.

B. Long-term responses: The Financial Stability Forum Report

None of these short-term responses by central banks will be sufficient to stabilize the financial system unless market participants can be reassured that the more fundamental issues that led to this turmoil are being addressed. In this section, we focus on the actions set out by the Financial Stability Forum (FSF) in their April 2008 report to the Group of Seven finance ministers and central bank governors. The report draws on an extensive body of work by national authorities and the main international regulatory, supervisory, and central bank bodies.

Speaking broadly, the goal of the FSF is a financial system where risks are more accurately identified and managed, perverse incentives are reduced, and build-ups of leverage pose less of a threat. There is no silver bullet that will accomplish all of these goals at once, but concerted action in a few key areas can accomplish a lot.

In the area of strengthened prudential oversight, the key steps recommended by the FSF report involve the capital and liquidity frameworks. Implementing the Basel II framework⁷ will by itself eliminate several of the perverse incentives that were created by the existing regulatory framework. The Basel Committee is also looking actively at ways to strengthen Basel II and, in particular, has proposed increasing capital charges for complex structured credit products, credit exposures in banks' trading books, and liquidity facilities provided to off-balance sheet vehicles. The committee has also issued guidance for strengthening liquidity risk management at regulated firms.

With respect to transparency, the FSF report sets out leading practices for disclosures based on a survey of large banks and securities firms, with an emphasis on exposures, such as US sub-prime products, that the marketplace considers especially risky. Supervisors in a number of countries have actively encouraged their banks to follow these practices for their 2008 mid-year accounts.

Current discussions about valuation are also important. Better disclosure means nothing if markets are not confident that the numbers are meaningful. The report makes clear that completely suspending fair-value accounting would be a mistake as such a step would do more to reduce confidence in the system than the positives that might result from any short-

⁷ The Basel II framework describes a more comprehensive measure and minimum standard for capital adequacy that national supervisory authorities are now working to implement through domestic rule-making and adoption procedures. A comprehensive description can be found in Basel Committee on Banking Supervision (2006).

term relief it might bring to holders of problem assets. But there are legitimate questions regarding how to value assets when markets are illiquid. In response to concerns expressed by the FSF, the International Accounting Standards Board (IASB) has established an expert panel—drawn from financial institutions, supervisors, investors, and auditors—to assist it in developing enhanced guidance in this respect. The objective will be to reinforce sound valuation practices and transparency, not to undermine confidence in accounting standards or valuations.

Beyond the issue of valuing assets when markets are illiquid, it is evident that, at least in the short term, asset prices tend to be driven by changes in investors' risk appetites rather than by what may be characterized as fundamentals. For example, Amato and Remolona (2005) show that CDS spreads are largely accounted for not by any measure of default risk, but rather by what can only be described as the general appetite for risk. This phenomenon calls into question the value of marking to market on a daily basis when, at this horizon, risk appetites rather than fundamentals drive market prices. Nonetheless, in the absence of reliable alternative measures of fundamental inputs such as correlation or expected volatility, market values are likely to be the most consistent, if imperfect, way to generate useful asset valuations. The challenge then becomes how to make effective use of the information market values contain without ignoring their limitations as guides to fundamental values.

This brings us to the issue of the role and use of credit ratings. Credit ratings clearly play an important role in financial markets by helping investors to filter information critical to their portfolio decisions. But the crisis revealed shortcomings regarding how the ratings are generated and how investors use ratings. The FSF has called on the rating agencies to:

- improve the quality of the rating process, including by better managing conflicts of interest in line with the revised International Organization of Securities Commissions (IOSCO) Code of Conduct (International Organisation of Securities Commissions 2008);
- differentiate ratings on structured finance from those on bonds, as a signal of the critical differences in their risk characteristics under stress; and,
- enhance the information they provide on the risk characteristics of structured products.

Others also have a role to play in improving the use of credit ratings. Investors need to better exercise due diligence and use their own independent judgment of risks, while regulators have begun to investigate the ways in which ratings are sometimes “hard-wired” into regulatory and supervisory frameworks.

Finally, the FSF has outlined a number of ways in which public authorities, at both the national and international levels, need to do a better job in assessing and responding to risks. In particular, public authorities need to:

- better translate risk analysis into action by upgrading their expertise and communicating more directly with the management and boards of regulated institutions about the risks they see;
- improve information exchange and cooperation—for example, through broader use of supervisory colleges for banks that are active in several national markets;
- enhance the effectiveness of international bodies, such as those that meet under the auspices of the BIS, by improving prioritization and conducting joint strategic reviews; and,
- clarify and strengthen national and cross-border arrangements for managing crises and dealing with weak banks.

IV. LIVING WITH PROCYCLICALITY

This paper began by discussing the broad rise in risk-taking and leverage that took place in the years preceding the crisis. The recent recommendations of the FSF and the subsequent work program deal with the various ways that regulators, firms, investors, and rating agencies can improve the system's ability to measure, assess, and manage risk, which are important steps. But whether there is anything more fundamental that financial authorities can do to prevent financial crises remains an open question. The 2008 crisis shares many characteristics with past crises in terms of underlying causes, most notably the inherent procyclicality of the financial system. It seems reasonable, therefore, to suggest that more could be done to reduce this tendency of the financial system to accumulate too much risk in good times and to shed it rapidly in bad times. But how can this be achieved?

In the foreword to its April 2008 report to the Group of Seven, the FSF stated its intention to examine the drivers of procyclical behavior and possible options to mitigate it. This process has now begun. Among the issues that are being considered are capital requirements, fair value accounting, compensation systems, and funding liquidity. In each case, the idea is to investigate the procyclical drivers involved and potential policy responses. This is not always easy, in view of ongoing structural changes in financial systems. Many more recent structures are only now being fully tested in a downturn. But the authorities can seek to ensure that regulatory systems, such as the capital regime, do not reinforce the natural cycles of the financial system. Authorities can also seek to ensure that the incentives are well-aligned, which points policymakers toward taking a closer look at private sector compensation systems and counter-party risk management to ensure that these do not foster excessive risk-taking behavior.

In a widely cited paper, Borio, Furfine, and Lowe (2001: 2) call for the use of supervisory instruments in an "explicitly countercyclical fashion." The object of this policy is to encourage the build-up of "a protective cushion in good times that can be drawn down in bad times." In principle, the cushion could take the form of loan-loss provisions as well as capital. It may also involve the lowering of regulatory loan-to-value ratios at times when the prices of the underlying assets have been rising at an especially rapid pace. Recent events suggest that a further cushion could take the form of robustly liquid securities—for example, highly rated and actively traded government bonds—which the repo markets will always accept as collateral, to guard against the runs that have been seen recently on most other forms of repo collateral.

Finally, an unusual buoyancy of markets should serve to remind the financial stability departments of central banks and supervisory authorities to monitor especially closely any related innovative financial instruments. This is because excesses in risk-taking tend to involve the use of such instruments. The object of these monitoring efforts would be to understand the various ways in which these instruments are used and track the channels through which they proliferate. The development of such market intelligence would then help alert the authorities to times when it would be appropriate to apply countercyclical supervisory instruments to particular segments of the financial markets.

V. CONCLUSION

In this paper, we have emphasized that certain elements are new to the current episode of financial turmoil, while many elements have remained the same. The new elements include structured credit, the broader use of the originate-to-distribute business model, and new arrangements in repo markets that allow the use of almost any financial asset as collateral. These are fundamentally good innovations but their reckless use has helped to underpin the

crisis. The elements that have remained the same are those processes that underpin the basic procyclicality in the system, that is, the tendency for a build-up of risk-taking and leverage to occur in benign economic environments and the abrupt withdrawal from risk and an unwinding of leverage that typically happens once the environment turns bad.

In their short-term response to the dramatic loss of liquidity, central banks have had to trade the importance of ensuring the continued availability of market liquidity as a public good against the moral hazard that any market intervention is likely to induce. Over all, central banks have acted to broaden the scope of their liquidity operations. At the same time, however, central banks have had to deal with the stigma often associated with borrowing from them, which seems to get worse at the very time when liquidity from the central bank is needed the most.

In proposing long-term responses to the crisis, the FSF has focused on areas where incentives for risk-taking may be aligned more properly—for example, through strengthened capital requirements and more judicious use of credit ratings. Strengthened capital requirements help align incentives by making sure that capital charges (which represent a cost to shareholders, since they limit the ability of the firm to increase its leverage) are higher for riskier exposures. Better use of credit ratings help align incentives by obliging lenders and investors to take account of the range of risks related to a given exposure (including liquidity, price volatility, and tail risks), rather than simply using a credit rating. The FSF has also focused on areas where risk management may be made more robust, such as through better disclosure rules and valuation standards. Nonetheless, recognizing that the procyclicality of the financial system lies at the root of this and other financial crises before it would suggest that more extensive policy responses may be required. The use of supervisory instruments in an explicitly countercyclical way is one avenue requiring further investigation. Policies here would be designed to build adequate buffers in the system to prevent shocks from propagating too far.

REFERENCES

- Almantier, O., S. Krieger, and J. McAndrews. 2008. The Federal Reserve's Term Auction Facility. *Current Issues in Economics and Finance*. July.
- Amato, J. and E. Remolona. 2005. *The pricing of unexpected credit losses*. Bank for International Settlement (BIS) Working Papers (190) November.
- Bank for International Settlements (BIS). 2006. *The recent behavior of financial market volatility*. BIS Working Papers (29) August.
- . 2008. *78th Annual Report: 1 April 2007 – 31 March 2008*. 30 June.
- Basel Committee on Banking Supervision. 2006. *International Convergence of Capital Measurement and Capital Standards: A Revised Framework, Comprehensive Version*. Basel: Bank for International Settlements.
- Borio, C. 2008. *The financial turmoil of 2007-?: a preliminary assessment and some policy considerations*. BIS Working Papers (251). March.
- Borio, C., C. Furfine, and P. Lowe. 2001. Procyclicality of the financial system and financial stability: Issues and policy options. In *Marrying the Macro- and Micro-Prudential Dimensions of Financial Stability*. BIS Economic Papers (1) March: 1–57.
- Brunnermeier, M. K. and L. H. Pedersen. 2007. *Market liquidity and funding liquidity*. National Bureau of Economic Research Working Paper 12939. February.
- Cecchetti, S. 2008. *Crisis and responses: the Federal Reserve and the financial crisis of 2007-2008*. NBER Working Paper 14134. June.
- Committee on the Global Financial System (CGFS). 2008. *Central Bank Operations in Response to the Financial Turmoil*. CGFS Publications (31). July.
- Davis, E. P. 2008. *The role of central banks as providers of liquidity*. Paper presented at the Reserve Bank of Australia Conference Lessons from the Financial Turmoil of 2007 and 2008. Sydney. 14–15 July.
- Duffie, D. and K. J. Singleton. 2003. *Credit Risk: Pricing, Measurement and Management*. Princeton and Oxford: Princeton University Press.
- Financial Stability Forum. 2008. *Enhancing Market and Institutional Resilience*. Report to the G7 Finance Ministers and Central Bank Governors. April.
- Frankel, A. 2006. Prime or not so prime? An exploration of US housing finance in the new century. *BIS Quarterly Review* (March): 67–78.
- Greenlaw, D., J. Hatzius, A. K. Kashyap, and H. S. Shin. 2008. *Leveraged Losses: Lessons from the Mortgage Market Meltdown*. Report prepared for the US Monetary Policy Forum. February.
- Goodhart, C. 2004. *Some new directions for financial stability?* The Per Jacobsson Lecture. Zurich. 27 June.
- Hilton, S. 2008. *Federal Reserve lending operations and reserve management*. Paper presented at the Reserve Bank of Australia Conference Lessons from the Financial Turmoil of 2007 and 2008. Sydney. 14–15 July.
- International Organisation of Securities Commissions. 2008. *Code of conduct fundamentals for credit rating agencies*. May.
- Kearns, J. and P. Lowe. 2008. *Promoting liquidity: Why and how?* Paper presented at the Reserve Bank of Australia Conference Lessons from the Financial Turmoil of 2007 and 2008. Sydney. 14–15 July.

Rappaport, L., C. Mollenkamp, and K. Richardson. 2008. New hitches in markets may widen credit woes. *Wall Street Journal*. 11 February.

Senior Supervisors' Group. 2008. Observations on risk management practices during the recent market turbulence. Available at http://www.newyorkfed.org/newsevents/news/banking/2008/ssg_risk_mgt_doc_final.pdf. Accessed on 20 October 2008.

Shellock, D. 2008. Overview: Credit concerns escalate across markets. *Financial Times*. 15 February.