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SPEECH

Remarks on the Role of Central Bank Interactions with Financial Markets

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It is a pleasure to have the opportunity to speak to you today. Having taught classes at New York University (NYU), I know firsthand the quality and analytical rigor of the students and faculty. You should all be proud of the excellent curriculum and education you are receiving here at NYU. I would like to thank Kim for giving me the opportunity to speak this evening and the public service he is providing through his leadership of the center.

My remarks today will focus on the role of central bank interactions with financial markets. Because of the New York Fed's position within the U.S. financial system, our staff is in continuous contact with financial market participants, including investors, intermediaries, financial market utilities and analysts. Much of this contact occurs through the Markets Group at the New York Fed. For most of my professional life prior to becoming head of the Markets Group earlier this year, I had been a research economist working at the New York Fed. Like many research economists, I was trained to understand the economy with mathematical models that contain at best a rudimentary description of a financial system. But even in the capacity of a research economist at a central bank, my understanding of financial markets and the economy was greatly informed by the many types of interactions central banks have with financial markets.

Today I will first reflect briefly on the nature and purposes of central bank interactions with financial markets. I will highlight the operational and market monitoring responsibilities of the New York Fed Markets Group and how these responsibilities evolved since the onset of the financial crisis in 2007. Next, I will share some of my personal experience as a research economist at the time trying to make sense of the unprecedented events of the financial crisis through the prism of economic theory, and the lessons I learned. Let me emphasize that my remarks represent my personal views and do not necessarily represent the views of the Federal Reserve Bank of New York or the Federal Reserve System.

Pre-Crisis Central Bank Interaction with Financial Markets

The Markets Group interacts with financial markets in several important capacities. It is perhaps best known for the role it plays in the implementation of monetary policy by conducting open market operations (OMOs) at the direction of the Federal Open Market Committee (FOMC). As most of you probably know, in an OMO the central bank purchases or sells securities in the market in order to influence the level of central bank reserves available to the banking system. The Federal Reserve Act limits the types of securities the Federal Reserve may purchase in its OMOs, and under its Authorization for Domestic OMOs the FOMC only authorizes transactions in U.S. government securities, which includes Treasury and agency securities.[1]

The staffs that have direct responsibility for executing OMOs are known as "the Desk." Until late 2008, the primary role of the Desk was to influence the daily federal funds rate by adjusting the aggregate level of reserves in the banking system through transactions in Treasury securities arranged with designated primary dealers–counterparties operating in the government securities market. OMOs typically employ an auction format to ensure competitive bidding and are structured in a manner that minimizes disruptions to market functioning.

The Markets Group has several other critical transactional responsibilities as well. It is responsible for lender of last resort activities in the New York Federal Reserve District, operating the discount window as a source of short-term loans for banks in sound financial condition but otherwise in need of funding. As fiscal agent of the U.S. Treasury, the Markets Group plays a role in conducting Treasury auctions and facilitates payments and other financial services for the Treasury. The Markets Group also provides important payment, custody and investment services for the dollar holdings of foreign central banks and international institutions.

In addition and as a crucial complement to its operational responsibilities, the Markets Group has responsibility for monitoring and analyzing financial markets. These activities serve to support existing operations and provide vital knowledge as new types of operations are contemplated. They also supply an important source of unique market intelligence for policymakers on developments in an array of financial markets that could affect the economy or have policy implications. These efforts tend to focus on understanding broad financial market conditions, expectations for monetary policy and the real economy, and financial stability risks. My use of the phrase "market monitoring" is intended to capture much more than following prices and trading activity in asset markets and conversing with market participants globally about the causes behind market developments, as

important as that is. It includes broader responsibility for analyzing both immediate and longer-term trends in global financial markets and linkages among financial institutions, and it rests upon a deep understanding of the microstructure of financial instruments and markets and of the motivations of market participants.[2]

By maintaining deep expertise in particular asset classes and detailed knowledge of market behavior and infrastructure, the Desk is able to structure and execute operations to achieve the objectives of policymakers. This deep expertise also enhances the quality of the information and staff assessments about current market developments that is communicated to policymakers throughout the Federal Reserve System through a variety of briefings, conversations and written products.

Crisis Response: Change in Central Bank Interactions with Markets

The Markets Group's monitoring responsibilities and broad array of contacts across different market segments were critical to identifying underlying causes of the increased volatility and sharp repricing observed across a wide range of financial markets in 2007 and 2008. This information contributed to policymakers' understanding of where and how to target liquidity support measures beyond the traditional form of discount window lending to depository institutions. The temporary liquidity facilities were designed by drawing upon skills across the Federal Reserve System including market and operational experts, lawyers, economists and accountants. Given the unprecedented shocks to the market and the economy more broadly, the facilities had to be set up very quickly—in a matter of days or weeks. These included facilities designed to lend to banks and primary dealers to ensure adequate access to short-term credit, such as the primary dealer credit facility (PDCF) and the Term Securities Lending Facility (TSLF). Other programs were designed to lend directly to borrowers and investors in critical nonbank markets, such as the Commercial Paper Funding Facility (CPFF) and the Term Asset-Backed Securities Loan Facility (TALF).[3]

Since the federal funds rate target reached its effective lower bound late in 2008, the FOMC has considered additional ways of providing further policy accommodation. At the direction of the FOMC, the Desk has designed and implemented asset purchase programs that have greatly expanded the balance sheet of the Federal Reserve and changed the composition of the types of assets it holds. Market monitoring and the knowledge of market functioning has been crucial for the effective translation of broad policy directives for these purchase programs into concrete operational plans.

In the case of agency mortgage-backed securities (MBS) purchases, initially the Federal Reserve used external investment managers, acting at the direction of the Desk, as a means of implementing MBS purchases. This was necessary because the Desk had not transacted in MBS prior to the crisis and thus did not have either the systems or the market knowledge needed to execute purchases efficiently. As the Markets Group staff developed the operational capacity and analytical expertise, partly by working closely with the investment managers, it began to execute MBS purchases and assumed full trading responsibility in March 2010. Prior to assuming their trading role, staff gained an in-depth understanding of the fundamental aspects of the MBS market and technical trading conventions. This expertise allowed the staff to effectively synthesize numerous market indicators and apply them to its trading. For example, understanding supply and demand factors affecting the MBS market is essential in helping to ensure that operations can be executed smoothly. In addition, MBS have an embedded prepayment option, which affects the risk and prepayment characteristics of these securities, and consequently the way in which purchases of these securities influence policy objectives and the Federal Reserve's balance sheet over time.

The scope of the Desk's market expertise has had to expand in ways beyond supporting new modes of operation. As the financial crisis revealed the importance of maintaining a wide range of financial market knowledge, Desk staff covered a broader set of financial markets and instruments compared to the pre-crisis period. We also more explicitly focused on linkages between markets and underlying, longer-term trends that could present financial stability risks in the future. With the expansion of monetary policy into less conventional territory, our analysis of monetary policy expectations had to evolve as well, as evidenced by an increasingly comprehensive survey of primary dealer economists each FOMC cycle.[4] Lastly, our own internal analytical capabilities have also deepened, for instance with the creation of a portfolio analytics unit to better assess the risks and outlook associated with the Federal Reserve's expanded asset holdings.[5]

I anticipate that as the economic and policy environment changes, the Desk's interactions with the market will continue to evolve, both in terms of its operational capabilities and the focus of its market monitoring and analytical responsibilities needed to support Federal Reserve operations and the information needs of policymakers.

Lessons Learned on Market Interactions through Prism of an Economist

From the onset of the financial crisis until earlier this year, I acted in the capacity of a research economist at the New York Fed. I want to turn to some of the lessons learned as an economist trying to make sense of the crisis through economic theory and how it could be easy to misdiagnose the crisis without the multitude of interactions with financial markets that I have described. I will also apply these lessons to the current controversy about how economics should move forward after the crisis. In order to illustrate some of the lessons learned from the crisis, I offer two different perspectives: first as a research economist trying to make sense out of the initial phases of the crisis in real time and mostly failing; and second as a central banker directly observing and trying to counteract the panic that took hold of global financial markets in September 2008. My observations will further underscore the absolute criticality of a central bank's interactions with financial markets as a basis for properly diagnosing financial disruptions that threaten the economy and developing effective remedies.

In an immediate response to the onset of the crisis in August 2007, the New York Fed began to hold an in-depth discussion every afternoon about the day's developments. These discussions involved staff from all parts of the Bank and were usually led by Tim Geithner, the president of the New York Fed at that time. In addition to a summary of market developments, prices and liquidity conditions, staff would bring information from across a spectrum of financial institutions and market participants, the kind of information that throughout the crisis period would prove to be invaluable to policymakers. In addition to sharing information from across the Bank, discussions at these meetings would aim to synthesize diverse information gleaned from markets or if no synthesis was available generate new questions for the staff to gain intelligence on.

The basic skills that economists can bring to such meetings are a framing of developments based on the efficient markets hypothesis, which holds that financial markets will quickly incorporate all relevant information in asset prices, along with an understanding of economic fundamentals. Many commentators have associated a blind faith in efficient markets by market participants and regulators as one of the main underlying causes of the crisis.[6] This seems an overly simplistic and mostly incorrect characterization. A partially correct aspect of this critique is that market discipline failed in the period before the crisis. However, this is not a true rejection of the efficient markets hypothesis, as expounded by Gene Fama, but rather a failure for incentives to be appropriately aligned.[7]

An efficient markets explanation usually involves a great deal of the Monday morning quarterbacking: after observing market moves that prove an analysis incorrect, there is usually a tweak to this previous analysis prompted by the market move, which does not require any substantial changes to an underlying view. To outsiders this might sound like cheating, but if the efficient markets hypothesis has validity, then unexpected market moves always contain new information over the original analysis. Indeed, the ability of individual markets to efficiently aggregate diverse sources of information most of the time is why the efficient markets hypothesis gained empirical support.[8]

In normal times, the tension between efficient markets and actual developments is relieved by a series of these tweaked explanations without any substantial changes to underlying views. But as markets came under increasing stress it made the arbitrage and liquidity assumptions underlying efficient market explanations less tenable.[9] Further, the signals generated in different markets started to disagree markedly.

One of the basic quandaries at the start of the crisis was the differing perspectives from price developments in equity and fixed income markets. The fixed income and equity markets were giving very different signals about the outlook for the economy. Fixed income markets were indicating an abrupt slowdown in economic activity and through derivatives such as the ABX indices substantial credit losses on some of the newly issued structured products related to residential mortgages. The equity market in contrast reached a peak in October 2007 indicating little evidence of such a slowdown. Of course, fixed income and equity markets have different characteristics but perhaps a more important distinction is the role of heterogeneous beliefs and how this might be reflected in asset prices.

The economics profession has made great strides in its use of expectations in models but one of the short cuts required to produce these great strides was the simplification to homogenous beliefs. For much of the period leading up to the crisis this simplification was of no consequence. However, as we now understand from sophisticated analysis of models with heterogeneous beliefs, it can produce high valuations for certain set of assets and large abrupt moves in certain market prices when leveraged positions are unwound. [10]

How does this unwind express itself in real time in the views and actions of market participants? First, the views tend to become even more dispersed, as do the views regarding what the central bank should do about it. Second, market participants become more suspicious of each other and rumors can spread like wildfires. Many participants take defensive actions which if one is tracking market prices at a daily frequency add tremendously to the inherent noise in high frequency market moves.[11] More importantly, when the probability of a failure of a counterparty starts to increase the signal in market prices becomes a mixture of fundamentals and assessments of the likelihood of government intervention.

Elements of all this can be found in classic books such as Kindleberger's "Manias, Panics and Crashes"[12] but one would be hard pressed to predict from reading such "classics" the importance of novations of a derivative trade or additional collateral calls from a clearing bank to an investment bank for its tri-party book. Yet these were just the kinds of detailed market developments, often associated with the plumbing of financial systems that economists at the New York Fed were hearing at the afternoon meetings from New York Fed staff interacting with market participants in real time as the crisis progressed. However, since financial crises are almost impossible to fit into the standard framework of efficient markets, it was only after the near failure of Bear Stearns that we as economists were more able to piece a more accurate story together. One can find a clear and comprehensive description of these issues in Darrell Duffie's book, "How Big Banks Fail."[13]

My experiences as a central banker directly observing and trying to think of ways to counteract the panic that took hold of global financial markets in September 2008 also underscore that published statistics and market prices may at best tell part of the story of developments in financial markets and how they might be affecting the economy as a whole. These experiences highlight the need of policymakers for real time market intelligence and having staffs with operational experience and a solid grasp of market functioning to develop appropriate policy responses.[14]

Recall that in just over four weeks following the failure of Lehman Brothers the global financial system experienced a panic of unprecedented speed and destructive power. Observing the panic up close was a sobering lesson about how quickly a complex financial system can freeze up. Like the study of economic history, knowledge of nonlinear and complex dynamics is important to diagnose potential risks in the financial system. However, even more so than economic history, the study of complex biological or physical systems do not offer actual detailed prescriptions about how best to understand and regulate the current global financial system.

For economists who did not have the opportunity to observe the panic up close as I and most of my colleagues had, the developments in this four week period must have been bewildering given how widely events on the ground and theory diverged.[15]

At the time and at times since, some academic economists have questioned whether bank lending to nonfinancial corporations and individuals was really declining during this period in ways that posed a threat to the real economy. It is a fact that weekly measures of the stock of bank loans were increasing in this panic period. But for those following financial markets closely there was a keen awareness of the importance of securitization prior to 2007 and its collapse in 2008. More revealing than the stock of bank loans was the amount of loans being securitized, which with the exception of mortgages eligible for securitization by Fannie and Freddie fell effectively to zero. The TALF was designed to support the return of new securitization in certain markets.

Two facilities created earlier in 2008, the TSLF and PDCF, were set up to deal with the unwind of repo and other trades between private counterparties as doubts about the underlying collateral had increased.[16] As discussed by Gary Gorton this unwind was similar to a traditional bank run.[17] Since much of the credit boom leading up to 2007 was financed by repo-like trades, not only was the unwind affecting the health of broker-dealers, it was also restricting the provision of new credit to the real economy. These events were not observable in traditional banking statistics. Indeed as banks brought assets back onto their balance sheets to provide more traditional forms of funding, it appeared that lending was increasing.

The decline in interbank lending was also questioned. Again one can find statistical releases that show that volumes in the interbank market were high. But such statistics ignored the significant decline in term lending and most importantly did not capture one of the most important stresses in unsecured lending, the difficulty of foreign banks in obtaining dollar funding. This was fully appreciated by the staff within the Federal Reserve monitoring interbank activity on a real time basis. And the policy response to this decline was to open up dollar swap lines with a number of major central banks in conjunction with the TAF in late 2007.[18] The daily peak for the amount of dollars swapped was $586 billion on December 4th of 2008 giving the swap lines the distinction of being the most heavily used facility.

As a third example, some economists using statistics on the stock of outstanding commercial paper, argued that commercial paper issuance by nonfinancial corporations was not declining sharply at the time nor were rates rising to unprecedented levels. But this type of data contains little information about the ability of firms to issue new paper. Moreover, as the economy slowed abruptly the need to raise additional funds through new issuance increased. It was clear from our market contacts that the commercial paper market was rapidly grinding to a halt as both financial and non-financial institutions felt the need to build liquidity. The policy response was the CPFF which served as a liquidity backstop to facilitate issuance of commercial paper by highly rated firms.

In addition to showing how publicly available financial statistics in the absence of real time market intelligence can sometimes lead to incorrect diagnoses, these three examples demonstrate the importance of detailed information about markets in articulating the precise market failure that might justify a government intervention and the form the intervention should take given the failure. As noted above, many of the emergency liquidity facilities rolled out in the crisis were developed in a very short period of time by experts with years of experience in these various markets. All of the new facilities were designed to price the emergency liquidity such that as market stresses eased, their use would decline. This is exactly what happened. Furthermore, the most convincing evidence that the facilities correctly addressed market failures related to liquidity is the fact that none of them lost any money.[19]

Conclusion

The past few years have seen important changes in the role of central bank interactions with financial markets. Some of the main lessons I take away are: published statistics and market prices only tell part of the story of developments in financial markets, at best; beliefs of market participants and the distribution across markets matter, and information on them needs to be collected and analyzed on a frequent basis; active operations in financial markets allow central banks to flexibly respond to unexpected events and understand market functioning issues and changes in market infrastructure. Most importantly, the global financial system is constantly evolving and it requires constant monitoring and analysis since it is not a self-regulating system.

The main message I hope to leave you with is while economic and finance education may need to be supplemented, the analytical

rigor of such an education is indispensible for coming to grips with the complexity and ever changing structure of the global financial and economic system. Analytic rigor is not sufficient by itself, however, since it needs to be combined with practical experience of the actual workings of the financial system. The Center for Global Economy and Business gives you many opportunities to start to gain this practical experience.

Thank you.

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[1] For the full Domestic Authorization, see the minutes for the first FOMC meeting of each year. The minutes for the January 2012 FOMC meeting are as follows: http://www.federalreserve.gov/monetarypolicy/fomcminutes20120125.htm. OFFSITE

[2] To further this objective, the New York Fed also sponsors a private-sector group of market participants—the Treasury Market Practices Group—to support the functioning of Treasury, agency debt, and agency mortgage-backed securities markets. For further information, see the following: /tmpg/index.html. OFFSITE

[3] Lending through these temporary liquidity facilities was fully secured, as with the standing discount window facility, and almost every facility was designed to provide a useful source of funding during stressed financial market conditions but to be an unattractive source of funding once markets returned toward more normal functioning. All of the temporary short-term lending facilities had ceased extending new credit by early 2010 and were closed, although reciprocal swap facilities with foreign central banks were restored later that year, and some longer term loans arranged under the TALF remain outstanding.

[4] See the following for further information about the Desk's Primary Dealer Survey, along with historical questions and aggregated responses: /markets/primarydealer_survey_questions.html. OFFSITE

[5] This staff unit produces an annual report reviewing open market operations and other developments influencing the Federal Reserve's balance sheet. For a list of such reports, see as follows: /markets/annual_reports.html. OFFSITE

[6] See Adam B. Ashcraft and Til Schuermann (2008), "Understanding the Securitization of Subprime Mortgage Credit, OFFSITE PDF " Federal Reserve Bank of New York Staff Reports No. 318 (New York: Federal Reserve Bank of New York, March) for a discussion of how adverse selection and asymmetric information along with poor incentives caused a lack of market discipline.

[7] For further discussion of the efficient markets hypothesis and the crisis, see Eugene Fama's blog, "Fama/French Forum" OFFSITE (shared with Kenneth French). In particular, see Eugene Fama and Kenneth French (2008), "Q&A: Market Turmoil," OFFSITE *Fama/French Forum* (Santa Monica: Dimensional Fund Advisors, December).

[8] For a specific example of this phenomenon, see Richard Roll (1984), "Orange Juice and Weather, OFFSITE PDF " *American Economic Review*, vol. 74 (December), pp. 861-880.

[9] See Tobias Adrian, Paolo Colla, and Hyun Song Shin (2011), "Which Financial Frictions? Parsing the Evidence from the Financial Crisis of 2007-09, PDF " Federal Reserve Bank of New York Staff Reports No. 528 (New York: Federal Reserve Bank of New York, December).

[10] For example, see Alp Simsek (forthcoming), "Belief Disagreements and Collateral Constraints, OFFSITE PDF " *Econometrica*.

[11] For example, see Fischer Black (1986), "Noise, OFFSITE PDF " *Journal of Finance*, vol. 41 (July), pp. 529-543.

[12] Charles P. Kindleberger (1978), *Manias, Panics, and Crashes: A History of Financial Crises*, (New York: Basic Books, Inc.).

[13] Darrel Duffie (2010), *How Big Banks Fail and What to Do about It*, (Princeton: Princeton University Press).

[14] These experiences also, however, underscore the need for robust statistics on the financial system, and efforts are underway at numerous task forces and agencies to improve these statistics. For example, the Committee on the Global Financial System (currently chaired by New York Fed President William C. Dudley) created an ad-hoc group for the review of statistical proposals in 2010; see Committee on the Global Financial System (2012), "Improving the BIS international banking statistics, OFFSITE PDF " CGFS Papers No 47 (Basel: Bank for International Settlements, November). Similarly, the Financial Stability Board and International Monetary Fund are currently undertaking an effort endorsed by G20 finance ministers and central bank governors to address financial market information gaps; see IMF Staff and FSB Secretariat (2011), "The Financial Crisis and Information Gaps, OFFSITE PDF " Implementation Progress Report (June).

[15] An example of this bewilderment is V.V. Chari, Lawrence Christiano, and Patrick J. Kehoe (2008), "Facts and Myths about the Financial Crisis of 2008, OFFSITE PDF " Federal Reserve Bank of Minneapolis Research Department Working Paper 666 (Minneapolis: Federal Reserve Bank of Minneapolis, October). Note that the current posted version is updated from the version as initially published.

[16] These facilities were created under Section 13(3) of the Federal Reserve Act, which grants the Board of Governors of the Federal Reserve System the ability to authorize emergency lending under "unusual and exigent circumstances." More details are as follows: http://www.federalreserve.gov/aboutthefed/section13.htm. OFFSITE

[17] For example, see Gary Gorton and Andrew Metrick (2012), "Who Ran on Repo?, OFFSITE PDF " Yale School of Management Working Papers Series (New Haven: Yale University, October), and for a slightly different perspective, see Arvind Krishnamurthy, Stefan Nagel, and Dmitry Orlov (2012), "Sizing Up Repo, OFFSITE PDF " NBER Working Paper 17768 (Cambridge: National Bureau of Economic Research, January).

[18] The Federal Reserve established swap arrangements with the Reserve Bank of Australia, the Banco Central do Brasil, the Bank of Canada, the Danmarks Nationalbank, the Bank of England, the European Central Bank, the Bank of Japan, the Bank of Korea, the Banco de Mexico, the Reserve Bank of New Zealand, the Norges Bank, the Monetary Authority of Singapore, the Sveriges Riksbank, and the Swiss National Bank. For further information, see the following list of FAQs: http://www.federalreserve.gov/monetarypolicy/bst_swapfaqs.htm. OFFSITE

[19] See Michael Fleming (2012), "Federal Reserve Liquidity Facilities Gross $22 Billion for U.S. Taxpayers," OFFSITE *Liberty Street Economics* (New York: Federal Reserve Bank of New York, November).