

The Macroprudential Regulator: Modeling the Financial Network

September 11, 2008

In his speech (the "Speech") on August 22, 2008 at the Annual Economic Symposium of the Federal Reserve Bank of Kansas City, Federal Reserve Board Chairman Ben S. Bernanke described several things that the Federal Reserve Board (the "Fed") has done or is considering in order to reduce systemic risk in the financial system. Mr. Bernanke pointed out that the Federal Open Market Committee maintains "a relatively low target for the federal funds rate"¹ and that the Fed has established "a variety of collateralized lending programs."² In addition, he noted, the Fed has cooperated with other regulators and developed new regulations regarding mortgage and credit card lending.

Mr. Bernanke then discussed the interest of the Fed in strengthening the physical systems, statutory and contractual frameworks, and business practices of the financial infrastructure. Included in these efforts are encouragement and assistance in improving the closing process for derivatives transactions and in developing more resilient markets for triparty repurchase agreements. In particular, the Fed wants firms to "reduce over time their reliance on triparty repos for overnight financing of less-liquid forms of collateral."³ It would also like to improve the insolvency process for non-bank financial institutions (including the management of the affairs of an institution approaching or threatened with insolvency) and obtain "explicit oversight authority for systemically important payment and settlement systems."⁴

Mr. Bernanke then discussed what he calls "macroprudential oversight,"⁵ a term he uses to refer to the supervision of the entire financial system as well as the individual participants in that system. He pointed out that the guidance of the federal banking supervisors about particular kinds of mortgages could be understood as macroprudential oversight, as could some of the international reviews in which the Fed participates. As one example of the difference between supervising individual institutions and macroprudential supervision, he mentioned the potentially different treatment of institutions and systems in times of economic weakness. In such circumstances it could be prudent for some institutions to restrain their lending, but for the system as a whole it might be prudent to encourage capable institutions to lend more. Similarly, different patterns of risk concentrations should perhaps receive differentiated supervisory treatment.

Americas

Europe

Russia/CIS

Asia Pacific

Africa

Middle East

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¹ Speech, p.1.

² *Id.*

³ Speech, p.4.

⁴ *Id.*

⁵ Speech, p.5.

As to whether regulators should try to "develop a more fully integrated overview of the entire financial system,"⁶ Mr. Bernanke expressed caution, because such an effort would be expensive and technically difficult. He also expressed the same type of caution with respect to the area of conducting stress tests of the entire financial system (as opposed to testing the exposures of individual institutions). In addition to being technically difficult and expensive, systemic stress-testing would also require prompt access to extraordinary amounts of data.⁷ Much of such data, one might speculate, would also have to come from institutions who are not now required to reveal that data to anyone.

Reactions of the type discussed in the preceding paragraph are natural responses to the patterns of behavior observed during the current financial crisis. Despite the technical and financial obstacles to macroprudential supervision mentioned by Mr. Bernanke, it is possible, nevertheless, that his conclusions may represent not a rejection but only a very cautious hint of the necessity of the kinds of efforts financial regulators may eventually need to undertake.

Macroprudential concerns relate, by definition, to the safety and effectiveness of the entire financial system – or at least to (sub)systems thereof that constitute or have a substantial impact on the parts of the economy in which funds and securities are stored and transferred and derivatives transactions with respect to those funds and securities are carried out. Unless there turn out to be simple or easily derived indicators or structural properties of those systems that permit a meaningful understanding in real time of how they are working, any regulator with macroprudential responsibilities will have to construct models of the system that require large amounts of data from many sources. In fact, the Counterparty Risk Management Policy Group III has already recommended in its August 6, 2008 report, "Containing Systemic Risk: The Road to Reform,"⁸ that large, integrated financial intermediaries model the risk exposure of their clients and counterparties as part of modeling their own risk exposure. Although it is not made clear in that report how much modeling is thought be enough, it seems quite likely that, to be useful, models of large portions of the overall financial system might eventually have to be built and constantly updated.

In addition, the report of the Counterparty Risk Management Policy Group III recommends that large, integrated financial institutions establish close information- and idea-sharing relationships with their regulators. If the Fed shares information and ideas with the institutions whose business requires them to model any substantial portion of the financial system, some interesting questions are likely to arise:

- Given the size and success of the large institutions, to what extent is it likely that they will be able to construct better or more elaborate models than the Fed?

⁶ Speech, p. 6.

⁷ *Id.*

⁸ Available at <http://www.crmpolicygroup.org/doc/CRMPG-III.pdf>.

- To what extent will or should the institutions and the Fed feel comfortable exchanging with one another data or conclusions drawn from their models?
- Would it be advisable for the Fed to serve as a regular (or even obligatory) source of data to the institutions, given that the effectiveness of models of the financial system is likely to depend, on the one hand, on the accuracy, extent and reliability of the data, and, on the other, on being able to associate specific data with identified individual market participants, all of whom are competitors and some of whom are not regulated by the Fed?
- To what extent would it be advisable for the Fed regularly to evaluate the models or the working results of the institutions either in order to improve its own understanding of the financial system or to discover weaknesses in the models that should be corrected, beyond whatever degree of evaluation might be required for safety and soundness supervision?

All of these questions seem to depend on three fundamental determinants of modeling: access to data about the holdings, intentions, costs and expected benefits of the market participants; access to the models used by those participants; and access to information about the linkages between those participants. The first type of access relates to the distribution of financial holdings in the market as it is and to what those holdings may look like in the near future, based on the intentions of the participants. The second relates to the formal structure of the models themselves and to the technical capabilities of those models independently of the particular data that they may use as input. The third relates to the way all of the market participants are currently connected with one another, information that allows the existing structure of the financial network to be specified.

In its efforts to develop and grapple with such determinants as part of its mastery of risk, it seems possible that a well financed and properly staffed financial firm could develop sophisticated modeling techniques and models that could be superior to those developed by the Fed. On the other hand, it seems somewhat less likely (although certainly possible) that the financial firm could have a set of data that is both more extensive and more current than that of the Fed. The financial firm could well, however, have access to types of data regarding institutions not supervised by the Fed that could be useful to the Fed in creating and upgrading its own models.

The existence of such capabilities in the hands of the Fed and some of the financial institutions it regulates (and some that it doesn't) may potentially create a financial system with dynamics that differ even from those with which the world is gradually becoming familiar as the subprime crisis runs its course and morphs into other crises. Even more than is currently the case, the Fed may have to construct a model of the financial system that takes into account the possibility that models constructed by financial firms may be explicitly taking into account the role of the Fed as an actor, and *vice versa*. In addition, the Fed may have to be even more aware than it may currently be that private participants in the market could have informational and modeling capabilities that rival those of a

regulator and that they are aware that they possess such capabilities. Although private participants have presumably sometimes had an analytical advantage over the Fed in emerging areas of technical specialization and an empirical advantage over the Fed in very specific areas of knowledge, it seems quite possible that both the competitive environment and the urgings of the regulators in connection with Basel II may have created the basis for a more general or broader private advantage.

Under such circumstances both the Fed and the large financial firms may need to become even more aware of and proficient in working with the characteristics of networks in general and financial networks in particular. Although this awareness and proficiency would be based in substantial part on the extensive experiential and intuitive knowledge the Fed and such firms already have, it will probably need to go beyond this and base itself even more than currently on academic work in this area that the Fed and the large financial firms sponsor or encourage. Such work would probably have to focus on, among other things, how the financial network is structured, and the way information and disturbances spread through the network.⁹

One example of this kind of study would be an evaluation of the use of a central counterparty for clearing certain derivatives transactions. Some of the potential structural problems created by such central counterparties were already discussed in the testimony of James A. Overdahl, Chief Economist of the Securities and Exchange Commission, on July 9, 2008 before the Subcommittee on Securities, Insurance, and Investment of the Senate Committee on Banking, Housing and Urban Affairs.¹⁰ More generally, however, such analyses would have to do justice to the fact that (i) derivatives by definition can create explicit links between disparate sectors of the financial markets whose links may previously have only been implicit in the data and (ii) these new, explicit links are inherently unrelated in magnitude to the implicit links to which they are giving expression. In other words, large exposures can arise without any intrinsic limit that is related to the size of the phenomenon which the explicit links are modeling. For example, a derivative could be based on the behavior of a security whose behavior is considered indicative of a more general trend. Exposures could arise that are large multiples of the amount of that security that is outstanding and could require corresponding amounts of collateral to cover such exposure.

From general studies of the network structure of financial markets insights could result into the ways in which that structure facilitates or slows the spread of disturbances in those markets. To take an example: The basic structure of the financial markets might possibly be described as consisting of a small group of institutions, each of which has a direct connection or relationship to each of the other members of that group, plus less

⁹ An interesting survey of work in these areas can be found in M.O. Jackson, *Social and Economic Networks* (Princeton 2008) ("Social and Economic Networks").

¹⁰ "Testimony Regarding Reducing Risks and Improving Oversight in the OTC Credit Derivatives Market," <http://www.sec.gov/news/testimony/2008/ts070908jao.htm>.

extensive connections between members of that small group and another set of intermediate institutions. These intermediate institutions might themselves be at the center of star-like structures linking each intermediate institution with a number of even smaller institutions. Given some of the formal characteristics of such structures, it is conceivable that the structure just hypothesized could have definable characteristics with respect to the transmission of financial crises from one financial institution to another and that certain general steps could be taken to make such a structure less vulnerable to crises or remedy a crisis once it has begun.

Social and Economic Networks contains numerous discussions of general network traits that are based either on the structure of the networks, or the nature of the relationships between adjacent nodes in the networks, or both. These discussions deal with phenomena such as the percolation of information through a network and the spread of infection, as well as with strategic games on networks and the game theory of network formation. To use the metaphor of infection, it seems quite realistic to assume that at meetings of top officers of large, integrated financial intermediaries with senior officials of their regulators (especially the Fed) as recommended in the report of the Counterparty Risk Management Policy Group III, the parties will need to discuss not only the specific capital and compliance status of the financial intermediary at the meeting, but also such topics as (i) capital structure as an immunizer, but perhaps not the only immunizer, against financial infection; (ii) how best (or whether) to isolate institutions thought to be infected with financial weakness; (iii) whether there are (or are not) effective ways to limit the exposure of financial institutions to infection other than the long-standing practice of managing concentrations of investments; and (iv) whether there are ways to slow contagion once it starts, other than providing auction access to safer securities and funding or utilizing conservatorships as circuit breakers.

Discussions such as these in effect require private institutions to be stewards of the financial system along with their regulators. This kind of role would certainly not be completely unprecedented. Most large financial institutions expect to assist in maintaining fair competition. Large institutions have frequently assisted regulators in containing specific financial crises. Investment banks serve to some extent as gatekeepers in the securities markets by performing due diligence. What seems to be approaching, however, is a broader, more systematic, more continuous and more complicated level of assistance in maintaining the functionality of the financial markets while at the same time maintaining the efficiency and competitiveness of those markets.

To master such a situation, any macroprudential regulator (whether or not it is the Fed) would need to have the authority and the determination to carry out or stay current with the kinds of network studies sketched above. Those studies and other economic and political considerations would contribute to the making of decisions (by Congress or the regulators) about the financial institutions that ought to be treated as part of the network and about any information about non-members of the network that might be useful or

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essential for macroprudential oversight. In order to model and judge the behavior of the financial network, the regulator will also need to understand models of the individual institutions, which, to some extent at least, probably requires it to be a microprudential regulator of at least some of those institutions.

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