Volume Title: NBER Macroeconomics Annual 2011, Volume 26

Volume Author/Editor: Daron Acemoglu and Michael Woodford, editors

Volume Publisher: University of Chicago Press

Volume ISBN: 978-0-226-00214-9 (cloth); 978-0-226-00216-3, 0-226-00216-0 (paper)

Volume URL: http://www.nber.org/books/acem11-1

Conference Date: April 8-9, 2011

Publication Date: August 2012

Chapter Title: Comment on "Risk Topography"

Chapter Author(s): Darrell Duffie

Chapter URL: http://www.nber.org/chapters/c12413

Chapter pages in book: (p. 177 - 183)

Comment

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Systemic risk is the risk that the financial sector will suffer a significant loss of effectiveness. The key financial-sector services at risk are the intermediation of credit, capital, and risk, as well as the operation of various types of payments and settlements systems. It is now widely understood that the performance of the general economy depends significantly on the resilience and efficiency of the financial sector. In the event that financial firms or utilities that collectively provide a significant amount of these services become impaired through a loss of capital or liquidity, or suffer operational failures, one anticipates a commensurate deterioration in the ability of ultimate borrowers to obtain financing from ultimate lenders and in the ability of demanders and providers of risk bearing to execute efficient risk transfers.

Beyond the direct macroeconomic impact of a reduction in the effectiveness of the financial system, a mere increase in perceived systemic risk can lead producers, consumers, and financial market participants to take precautions such as reducing leverage and conserving liquidity. These defensive actions can decelerate the general economy, with effects that are magnified by a self-reinforcing "spiral" of asset price declines, further delevering, and further weakness in the financial sector.

The authors of "Risk Topography," Brunnermeier, Gorton, and Krishnamurthy, have suggested a general framework, including some novel tools, for monitoring systemic risk. My objective here is to re-emphasize some of the points made in their contribution, taking a slightly different perspective, and to suggest the importance of monitoring the entity-to-entity flows of risks through the financial system. Monitoring link-based systemic-risk information is an important supplement to monitoring the resilience of individual financial institutions because

978-0-226-00214-9/2012/2011-0302$10.00

some of the key mechanisms associated with the propagation of financial risk are associated with counterparty exposures and with defensive bilateral actions. Furthermore, an understanding of network-based risks can contribute to an understanding of the changing nature of risk concentrations across various types of assets and entities, can identify new systemically important financial institutions, and can trigger deeper supervisory attention of specific firms and markets.

In addition to the roles of regulated and central banks, the financial system depends on the services of asset managers (including hedge funds, mutual funds, sovereign wealth funds, and private-equity firms); brokers and dealers of securities, derivatives, and other assets; and special-purpose issuers of structured credit products such as collateralized debt obligations. For basic operational functionality, the financial system also depends on a range of financial utilities, the most critical of which are asset custodians, exchanges, and various providers of payment and clearing services such as FedWire, CLS Bank, central clearing parties (CCPs) for securities and derivatives, and tri-party repo agents. Connecting these various nodes of the financial system is a complex web of contractual links, the most relevant of which here are loans, master swap agreements, repurchase agreements, clearing agreements, prime-brokerage contracts, and securities lending contracts. These contracts are the main channels by which credit and risks of various types flow through the financial system and beyond.

The financial system is among the most intricate of inventions. Compounding the complexity of its institutional structure, many of the system's most important actors have significant discretion and incentives. The most destructive potential effects of these incentives from a systemic-risk viewpoint are socially excessive leverage at "risk-on" times and, at times of financial stress, a tendency to quickly delever, conserve liquidity, and run from weak counterparties. These destructive effects can be mitigated through improvements in market-wide infrastructure and institutional arrangements, such as clearing and judicious systemic-risk disclosures, and through regulatory capital and liquidity buffers.

In order to measure systemic risk, regulators routinely monitor the ability of individual financial firms to withstand specified financial shocks without failure or a need to quickly delever. Weaknesses uncovered at regulated firms can be mitigated through micro-prudential adjustments in capital and liquidity requirements.

Risk Topography, by Brunnermeier, Gorton, and Krishnamurthy (2011), provides a firm conceptual foundation for systemic risk moni-

toring, emphasizing the use of stress tests, by which one measures the gains or losses of market value associated with various types of macroeconomic and asset-price shocks. The authors' most innovative proposal is the monitoring of a Liquidity Mismatch Index (LMI) for important financial institutions. For this purpose, the liquidity weight $L(i)$ of the institution's i-th asset or liability is defined as the fraction of its contribution $V(i)$ to market value (which is negative for liabilities) that may be converted to cash on short notice. For example, an unencumbered bond that can be financed at a haircut of 10% has a liquidity weight of 0.90. An overnight liability has a liquidity weight of 1.The Liquidity Mismatch Index is $V(1)L(1) + \ldots + V(n)L(n)$. A low LMI implies a high exposure to loss of liquidity. An adverse change in liquidity mismatch is thus a concern. The authors propose various stress tests for the LMI in order to judge the vulnerability of the institution's liquidity to various potential changes, including changes in market prices and changes in the liquidity of various types of assets.

In my view, the LMI is an excellent new approach to monitoring levels and changes in liquidity. Some additional work will be needed to incorporate the illiquidity associated with certain types of financial relationships, such as over-the-counter (OTC) derivatives and prime brokerage, whose impact on liquidity is not directly related to their market valuations, as discussed in Duffie (2010a).

For example, the devastating loss in liquidity that can be caused by a prime-brokerage run is illustrated by the dramatic loss in liquidity suffered by Morgan Stanley during the days following the failure of Lehman Brothers. This loss in liquidity was largely associated with the reduced access of Morgan Stanley to financing associated with the ability to pledge the assets of its prime-brokerage clients. Of the $85 billion dollar reduction in Morgan Stanley's liquidity pool over the period September 15–22, $56 billion was due to prime brokerage liquidity loss, according to a supervisory communication from Morgan Stanley to the Federal Reserve that was disclosed under a Freedom of Information Act request. When "PB" clients left in droves, Morgan Stanley was forced to seek central-bank support. Rule 15c3 of the Securities and Exchange Act of 1934 places some limits on the ability of a US dealer to finance itself on the back of its clients' assets. The London-based businesses of these and other dealers, however, operate with few limits on the use of client assets. (This regulatory gap should be fixed.)

Going beyond the specific approaches suggested in Brunnermeier, Gorton, and Krishnamurthy (2011), I would emphasize the importance

of monitoring flows of gains and losses in market value and liquidity from entity to entity that are caused by financial shocks of various specified types. This would ease the detection of points of concentration of systemic stress across asset markets and among market participants. Further, the results of such link-based information may uncover new systemically important entities, enabling them to receive additional regulatory attention.

Among the most important flows of risk through the system are exposures to counterparty default. These can propagate financial stress through domino-style failures and incite runs on weak counterparties. Rapid defensive withdrawals of collateral and access to credit, or increases in proportional margin requirements ("haircuts"), are destabilizing. Monitoring should focus on total counterparty exposures, inclusive of loans and other debt instruments, equity investments, OTC derivatives, securities lending, and repo. Exposures should be measured before and after collateral. The amounts and types of collateral subject to disposal in fire sales should be quantified. General capital and liquidity requirements are blunt instruments for mitigating risks associated with counterparty default exposure because they do not treat the propagation of shocks. Regulations should therefore also focus on minimum levels of collateral or margin and, where amenable, central clearing.

Ongoing public disclosure of the sensitivity of the financial system to various sources of stress enables general market participants to reduce their exposures to increasing sources of risk before they become dangerously elevated. These exposure reductions may be direct responses to the disclosure or be indirectly induced by the endogenous repricing of the associated risks caused by disclosure. Systemic risk information should generally be provided publicly in only aggregated form in order to preserve socially efficient individual investment incentives and to mitigate runs on individual firms.

I disagree with former Federal Reserve Chairman Greenspan's remark that "regulators, and for that matter everyone else, can never get more than a glimpse at the internal workings of the simplest of modern financial systems."[1] I envision significant improvements in effective systemic risk monitoring.

A 10-by-10-by-10 Approach to Monitoring Systemic Risk

As a complement to other forms of systemic risk information, I have proposed in Duffie (2010b) a "10-by-10-by-10" approach to monitoring

systemic risk. By this approach, each of, say, "10" systemically important firms would report, for each of "10" systemic stress scenarios, its own gain or loss, and its gain or loss relative to each of its "10" largest counterparties for that particular stress. The gains and losses would be measured in terms of changes in market values and also in terms of cash flows over a short period such as 30 days. For each of the stresses, the identities of the largest 10 counterparties associated with the particular stress would also be reported.

Most of the stresses would be extreme-but-plausible specified changes in the prices or performance of large asset classes. I believe this approach benefits from relevance, ease of interpretation, comparability across reporting firms, and limited scope for measurement error or interpretation by reporting firms in comparison with probabilistic measures such as "Value at Risk" or generally described macroeconomic scenarios. Macroeconomic stress scenarios can be converted by a regulator to stipulated changes in the prices or performance of balance-sheet instruments.

One of the 10 stresses should be counterparty default, implying that the 10 associated counterparties for this stress are those presenting the greatest default exposures to the reporting firm, inclusive of loans, derivatives, repo, equities, and other contractual exposures.

The headline number "10" is a placeholder that signals my view that this form of monitoring should be tightly focused, at least until implemented and refined. This monitoring should be globally adopted, allowing inclusivity and comparability across reporting institutions in various major jurisdictions.

Despite significant progress in financial regulations since the crisis of 2007–2009, some large dealer banks likely remain vulnerable to sudden runs by their prime-brokerage clients, short-term creditors, and derivatives counterparties. The systemic risk associated with runs on major securities dealers by their clearing banks is now being lowered by operational reforms in the tri-party repo market. These reforms are reducing the daylight exposures of the two major clearing banks, JP Morgan Chase and BONY-Mellon, to participants in tri-party repos.

The latest approach to "resolving" systemically important financial institutions has not, in my view, substantially lowered the adverse systemic spillovers associated with their failures. Fortunately, the likelihood of financial distress is being reduced by significant ongoing improvements in regulatory capital and liquidity requirements. I would be more comfortable with the Basel III reforms if the liquidity coverage

requirements were more realistic regarding the vulnerability of certain large banks to losses of liquidity associated with runs by OTC derivatives counterparties and prime-brokerage clients.

Putting aside the risks to these large institutions themselves, the flows of risk and liquidity through the major dealer banks are generally indicative of the nature of financial risks in the system as whole. These banks have bird's-eye views of the financial system; a systemic-risk regulator can benefit from the information available from the same vantage points. This is a motive for the 10-by-10-by-10 approach to systemic risk monitoring.

Concluding Remarks

I anticipate substantial progress in understanding and lowering systemic risk within the financial system. I am not persuaded by the notion that regulators cannot hope to "keep up" with banks in the face of complexity, financial innovation, and compensation differences between the public and private sector. Much progress has been made recently, and there remains a significant amount of low hanging fruit yet to be tasted. High capital and liquidity standards are by far the most important bulwark against systemic risk, but I see the potential for significant additional reductions in systemic risk from better infrastructure, especially in the form of new approaches to systemic monitoring. The authors of Risk Topography offer a sophisticated and useful contribution toward this objective.

Endnotes

This comment was prepared for publication in the *NBER Macroeconomics Annual 2011*. For nonacademic relationships that may present a conflict of interest, please see www.stanford.edu/~duffie/. For acknowledgments, sources of research support, and disclosure of the author's material financial relationships, if any, please see http://www.nber.org/chapters/c12413.ack.

1. See Greenspan (2011).

References

Brunnermeier, Markus, Gary Gorton, and Arvind Krishnamurthy. 2011. "Risk Topography." In *NBER Macroeconomics Annual 2011*, edited by Daron Acemoglu and Michael Woodford. Chicago: University of Chicago Press.

Duffie, Darrell. 2010a. *How Big Banks Fail and What to Do About It*. Princeton, NJ: Princeton University Press.

———. 2010b. "Systemic Risk Monitoring—A 10-by-10-by-10 Approach."

Graduate School of Business, Stanford University, November. In *Systemic Risk and Macro Modeling*, Markus K. Brunnermeier and Arvind Krishnamurthy, editors. Chicago: University of Chicago Press, forthcoming.
Greenspan, Alan. 2011. "Dodd-Frank Fails to Meet Test of Our Times." *Financial Times*, March 29.
http://www.federalreserve.gov/newsevents/testimony/tarullo20100212a.htm.