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Studies of Systemic Risk Draw Parallels between the Financial System and Complex Systems in the Sciences and Engineering

The stability of the financial system and the potential for systemic events to alter its functioning have long been important issues for central bankers. While it is difficult to define systemic risk, it is even harder to anticipate and manage it with precision. In recent decades, financial innovation, rising institutional consolidation, cross-border financial activity, and interconnectedness among firms have materially changed the nature of systemic risk in the financial system.

These developments suggest that older models of systemic shocks in the financial system may no longer fully capture the possible channels of propagation and feedback arising from major disturbances. Even existing models may not account entirely for the increasing complexity of the financial system.

To stimulate fresh thinking on the topic of systemic risk, the New York Fed and the National Academy of Sciences' Board on Mathematical Sciences and Their Applications cosponsored the conference "New Directions for Understanding Systemic Risk." The sessions drew a broad group of scientists, engineers, economists, and financial market practitioners to engage in a cross-disciplinary examination of systemic risk that could yield insights from the natural and physical sciences applicable to economics and finance.

The November 2007 issue of the Bank's *Economic Policy Review* summarizes the key observations and findings of the conference. Presenters from the natural and mathematical sciences and the engineering disciplines describe the tools and techniques used to study systemic collapse in interactive systems in nature and engineering. Similarly, research economists offer studies of systemic risk in cross-border investments,

Also in this issue...

liquidity risk, and the payments system. To provide a context for the discussions, risk managers at large finance institutions explain how systemic risk and shocks in the financial system affect trading activities. A discussion of potential applications to policy concludes the volume.

The conference identified certain concepts that were key for both economists and scientists in studying systemic risk, including nonlinearity, synchrony and coordinated behavior, path dependence, hysteresis, and multiple equilibria. However, differences were also found. For example, expectations and anticipatory behavior play a role in economics that is absent in analysis of ecosystems or the electrical grid in the natural sciences and engineering; conversely, researchers in the physical sciences and engineering use computational models that are on a much larger scale than those customarily used by economists.

The volume, observe the report editors, "was prepared to share some of the insight and excitement generated by the conference and to encourage further cross-disciplinary conversations." It is available at www.newyorkfed.org/research/epr/2007n1.html.

Publications and Papers

The Research and Statistics Group produces a wide range of publications:

- *The Economic Policy Review*—a policy-oriented journal focusing on economic and financial market issues.
- *EPR Executive Summaries*—online versions of selected *Economic Policy Review* articles, in abridged form.
- *Current Issues in Economics and Finance*—concise studies of topical economic and financial issues.
- *Second District Highlights*—a regional supplement to *Current Issues*.
- *Staff Reports*—technical papers intended for publication in leading economic and finance journals, available only online.
- *Publications and Other Research*—an annual catalogue of our research output.

New Study Identifies Manufacturers' Repricing Costs as an Important Contributor to Price Rigidity

One of the more puzzling phenomena in economics is price rigidity, or the tendency of prices to remain constant despite changes in supply and demand. In "Sticky Prices: Why Firms Hesitate to Adjust the Price of Their Goods" (***Current Issues in Economics and Finance***, vol. 13, no. 10), authors Pinelopi Goldberg and Rebecca Hellerstein argue that price rigidity derives in significant measure from repricing costs at the wholesale level.

Repricing costs, the authors explain, include the managerial time to determine a new optimal price and the costs of implementing and advertising the new price, as well as the risk of losing long-term customers if the price rises. While some earlier studies have suggested a link between repricing costs and price stickiness, no consensus on the size and importance of these costs has been reached.

Taking the imported beer market as their subject, Goldberg and Hellerstein estimate the costs of repricing to be 0.4 percent of firm revenue for manufacturers and 0.1 percent of firm revenue for retailers. While not large in absolute terms, these costs are of sufficient magnitude to discourage firms—especially manufacturers—from adjusting their prices.

Goldberg and Hellerstein also compare repricing costs with two other sources of price rigidity for imported goods: markup adjustment, or the tendency of firms to moderate any increase in their prices in order to preserve market share, and the existence of a "local" component in the price of imported goods that does not fluctuate with changes in the exchange rate. All three factors create price stickiness, the authors note, by limiting the responsiveness of prices to exchange rates or, "in the language of economists, by rendering the 'pass-through' of exchange rate changes to prices 'incomplete.'" The authors' calculations suggest that while markup adjustment and local costs account for the largest share of the incomplete pass-through observed in the data on beer prices, repricing costs are a "substantial contributor" to the low pass-through rates.

According to Goldberg and Hellerstein, the approach used in their study to analyze price rigidity is not specific to the beer market: "The methodology we propose . . . can be more generally applied to any market for which data are recorded at frequent enough intervals to identify the points of price adjustment."

The article is available at www.newyorkfed.org/research/current_issues/ci13-10.html.

New Titles in the *Staff Reports* Series

The following new staff reports are available at **www.newyorkfed.org/research/staff_reports**.

MACROECONOMICS AND GROWTH

No. 310, December 2007
Is There Still an Added-Worker Effect?
Chinhui Juhn and Simon Potter

Using matched March Current Population Surveys, Juhn and Potter examine labor market transitions of husbands and wives. They find that the "added-worker effect"—the greater propensity of nonparticipating wives to enter the labor force when their husbands exit employment—is still important among a subset of couples, but that the overall value of marriage as a risk-sharing arrangement has diminished because of the greater positive co-movement of employment within couples. While positive assortative matching on education did increase over time, this shift in the composition of couple types alone cannot account for the increased positive correlation.

MICROECONOMICS

No. 306, October 2007
Vouchers, Public School Response, and the Role of Incentives: Evidence from Florida
Rajashri Chakrabarti

Chakrabarti analyzes the behavior of public schools facing vouchers. The literature on the effects of voucher programs on public schools typically focuses on student and mean school scores. This paper attempts to go inside the black box to investigate some of the ways in which schools facing the threat of vouchers in Florida behaved.

Other New Publications

- *Upstate New York Regional Review*: In "Aging in Place in Upstate New York" (Volume 2, Number 4), Jane Humphreys argues that senior homeowners may find it hard to remain in their homes as they grow older because of a growing disparity between the features of the houses they own and the housing they need. The resulting change in demand for housing products and services is especially significant upstate, where most seniors are homeowners and the housing stock is dominated by older, single-family homes.
  www.newyorkfed.org/research/regional_economy/upstate/upstatenews2-2.html

- *Upstate New York At-a-Glance*: Jason Bram, James Orr, and Rae Rosen observe that the upstate economy has continued to undergo significant restructuring, with job gains in services sectors such as health care, education, business services, and leisure and hospitality offsetting losses in manufacturing ("Upstate New York Employment Trends," Number 3, December 2007). According to the authors, a modest upward trend should continue in 2007, with the creation of 20,000 net new jobs—but results will be mixed across upstate metro areas.
  www.newyorkfed.org/research/regional_economy/glance/upstate_glance2_07.html

Using highly disaggregated school-level data, a difference-in-differences estimation strategy, and a regression discontinuity analysis, she finds that the threatened schools tended to focus more on students below the minimum criteria cutoffs rather than equally on all; interestingly, however, this improvement did not come at the expense of higher performing students. Second, consistent with incentives, the schools focused on writing rather than reading and math.

No. 311, December 2007
Firms and Flexibility
Bart Hobijn and Ayşegül Şahin

Hobijn and Şahin study the effects of labor market rigidities and frictions on firm-size distributions and dynamics. They introduce a model of endogenous entrepreneurship, labor market frictions, and firm-size dynamics with many types of rigidities, such as hiring and firing costs, search frictions with vacancy costs, unemployment benefits, firm entry costs, and a tax wedge between wages and labor costs. The authors use the model to analyze how each rigidity explains firm-size differentials between the United States and France. They find that when all rigidities and frictions except hiring costs and search frictions are included, the model accounts for much of the firm-size differentials between the United States and France. The addition of search frictions with vacancy costs generates implausibly large differentials in firm-size distributions.

BANKING AND FINANCE

No. 304, October 2007
Buybacks in Treasury Cash and Debt Management
Kenneth D. Garbade and Matthew Rutherford

This paper examines the use of buybacks in Treasury cash and debt management. Garbade and Rutherford review the mechanics and results of the buyback operations conducted in 2000-01, during a time of budget surpluses, and assess the prospective use of buybacks in the absence of a surplus. Possible future applications include 1) managing the liquidity of the new-issue markets when deficits are declining; 2) actively promoting the liquidity of the new-issue markets; 3) limiting the accumulation of large Treasury cash balances; and 4) smoothing week-to-week fluctuations in Treasury bill offerings.

No. 305, October 2007
The Effect of Employee Stock Options on Bank Investment Choice, Borrowing, and Capital
Hamid Mehran and Joshua Rosenberg

The authors test the hypothesis that granting employee stock options motivates CEOs of banking firms to undertake riskier projects. They also investigate whether granting employee stock options reduces the bank's incentive to borrow while inducing a buildup of regulatory capital. Using a sample of 549 bank-years for publicly traded banks from 1992 to 2002, they find some evidence that the bank's equity volatility (total as well as residual) and asset volatility increase as CEO stock option holdings increase. In addition, it appears that granting employee stock options motivates banks to reduce their borrowing, as evidenced by lower levels of interest expense and federal funds borrowing. Furthermore, the authors show that banking firms that grant more options to their employees build up more capital in future years.

No. 307, November 2007

Macro News, Risk-Free Rates, and the Intermediary: Customer Orders for Thirty-Year Treasury Futures

Albert J. Menkveld, Asani Sarkar, and Michel van der Wel

Customer order flow correlates with permanent price changes in equity and non-equity markets. Menkveld, Sarkar, and van der Wel examine macro news events in the thirty-year Treasury futures market to identify causality from customer flow to risk-free rates. They remove the positive feedback trading effect and establish that, in the fifteen minutes subsequent to the news, intermediaries rely on customer orders to determine a substantial part of the announcement's effect on risk-free rates—about one-third relative to the instantaneous effect. Intermediaries appear to benefit from privately observing informed customers, since their own-account trade profitability correlates with access to customer flow, controlling for volatility, competition, and the macro "surprise."

No. 308, November 2007

Regulation, Subordinated Debt, and Incentive Features of CEO Compensation in the Banking Industry

Kose John, Hamid Mehran, and Yiming Qian

The authors study CEO compensation in the banking industry by considering banks' unique claim structure in the presence of two types of agency problems: the standard managerial agency problem and the risk-shifting problem between shareholders and debtholders. They empirically test two hypotheses derived from this framework: that the pay-for-performance sensitivity of bank CEO compensation 1) decreases with the total leverage ratio and 2) increases with the intensity of monitoring provided by regulators and nondepository (subordinated) debtholders. They construct an index of the intensity of outsider monitoring based on four variables: the subordinated debt ratio, subordinated debt rating, nonperforming loan ratio, and BOPEC rating. John, Mehran, and Qian find supporting evidence for both hypotheses.

No. 309, November 2007

Payday Holiday: How Households Fare after Payday Credit Bans

Donald P. Morgan and Michael R. Strain

Payday loans are widely condemned as a "predatory debt trap." Morgan and Strain test that claim by researching how households in Georgia and North Carolina have fared since those states banned payday loans in May 2004 and December 2005. Compared with households in all other states, households in Georgia have bounced more checks, complained more to the Federal Trade Commission about lenders and debt collectors, and filed for Chapter 7 bankruptcy protection at a higher rate. North Carolina households have fared about the same. This negative correlation—reduced payday credit supply, increased credit problems—contradicts the debt-trap critique of payday lending, but is consistent with the hypothesis that payday credit is preferable to substitutes such as the bounced-check "protection" sold by credit unions and banks or loans from pawnshops. ■

Papers Presented by Economists in the Research and Statistics Group

"Extracting Inflation Expectations from the Real and Nominal Term Structures," Tobias Adrian. European Central Bank workshop, Frankfurt, Germany, December 19. With Hao Wu.

"Liquidity and Leverage," Tobias Adrian. Bank of England seminar, London, England, November 8. With Hyun Song Shin. Also presented at a Duke University conference, Durham, North Carolina, November 16, and a European Central Bank conference, Frankfurt, Germany, November 28.

"The Federal Home Loan Bank System: The Lender of Next to Last Resort?" Morten Bech. University of Copenhagen seminar, Copenhagen, Denmark, December 19.

"Single European Payments Area: A U.S. Perspective," Morten Bech. Télécom Paris conference "The Economics of Payment Systems: From Theoretical to Empirical Issues," Paris, France, October 26.

"Are Charter Schools Perceived to Be Better than Regular Public Schools? Evidence from a New Approach Using Private School Enrollment Patterns," Rajashri Chakrabarti. Twenty-ninth Annual Association for Public Policy Analysis and Management Research Conference, Washington, D.C., November 10. With Joydeep Roy. Also presented at the Southern Economic Association annual conference, New Orleans, Louisiana, November 21.

"The Intended and Unintended Consequences of No Child Left Behind: Evidence from Wisconsin," Rajashri Chakrabarti. Twenty-ninth Annual Association for Public Policy Analysis and Management Research Conference, Washington, D.C., November 9. Also presented at the Southern Economic Association annual conference, New Orleans, Louisiana, November 20.

"Vouchers, Public School Response, and the Role of Incentives," Rajashri Chakrabarti. University of Arkansas seminar, Fayetteville, Arkansas, November 30.

"How Do Treasury Dealers Manage Their Positions?" Michael Fleming and Joshua Rosenberg. 2007 Financial Management Association Annual Meeting, Orlando, Florida, October 19.

"The Lending Channel in Emerging Markets: Are Foreign Banks Different?" Linda Goldberg. European Central Bank conference, Frankfurt, Germany, November 28.

"Macroeconomic Interdependence and the International Role of the Dollar," Linda Goldberg. International Monetary Fund conference, Washington, D.C., November 15.

"Credit Derivatives and Bank Credit Supply," Beverly Hirtle. European Central Bank conference, Frankfurt, Germany, November 30.

"Varieties and the Transfer Problem: The Extensive Margin of Current Account Adjustment," Paolo Pesenti. Columbia University Department of Economics seminar, New York City, October 31. With Giancarlo Corsetti and Philippe Martin.

"Market Sidedness: Insights into Motives for Trade Initiation," Asani Sarkar. Cornell University seminar, Ithaca, New York, November 16. With Robert Schwartz.

"Firm Heterogeneity and Credit Risk Diversification," Til Schuermann. Standard & Poor's, New York City, November 2. With Samuel Hanson and M. Hashem Pesaran. ■

Recently Published

Mary Amiti. 2007. "China's Export Boom," with Caroline Freund. *IMF Finance and Development* 44, no. 3 (September): 38-41.

Mary Amiti. 2007. "Trade Liberalization, Intermediate Inputs, and Productivity: Evidence from Indonesia," with Jozef Konings. *American Economic Review* 97, no. 5 (December): 1611-38.

Mary Amiti. 2007. "Will the Doha Round Lead to Preference Erosion?" with John Romalis. *IMF Staff Papers* 54, no. 2 (September): 338-84.

Morten Bech. 2007. "Central Banks' Interest Calculating Conventions: Deviating from the Intraday/Overnight Status Quo," with George Speight, Matthew Willison, and Jing Yang. In Stephen Millard, Andrew Haldane, and Victoria Saporta, eds., *The Future of Payment Systems*, 160-74. London: Routledge.

Morten Bech. 2007. "Congestion and Cascades in Payment Systems," with Walter E. Beyeler, Robert J. Glass, and Kimmo Soramäki. *Physica A: Statistical Mechanics and Its Applications* 384, no. 2 (October 15): 693-718.

Morten Bech. 2007. "The Diffusion of Real-Time Gross Settlement." In Stephen Millard, Andrew Haldane, and Victoria Saporta, eds., *The Future of Payment Systems*, 189-205. London: Routledge.

Morton Bech. 2007. "Interbank Payment System and Wide-Scale Disruptions." In Philipp Hartmann, ed., *Risk Measurement and Systemic Risk*. Proceedings of the 4th Joint Central Bank Research Conference on Risk Measurement and Systemic Risk. Frankfurt, Germany: European Central Bank.

Morten Bech. 2007. "New Approaches for Payment System Simulation Research," with Kimmo Soramäki, Walter E. Beyeler, and Robert J. Glass. In Harry Leinonen, ed., *Simulation Studies of Liquidity Needs, Risks, and Efficiency in Payment Networks*. Proceedings of the Bank of Finland Payment and Settlement System Seminars, 2005-06.

Morten Bech. 2007. "The Topology of Interbank Payment Flows," with Kimmo Soramäki, Jeffrey Arnold, Robert J. Glass, and Walter E. Beyeler. *Physica A: Statistical Mechanics and Its Applications* 379, no. 1 (June 1): 317-33.

Linda Goldberg. 2007. "Trade Invoicing in the Accession Countries: Are They Suited to the Euro?" In Jeffrey A. Frankel and Christopher A. Pissarides, eds., *NBER International Seminar on Macroeconomics 2005*, 357-93. Cambridge, Mass.: MIT Press.

Beverly Hirtle. 2007. "The Impact of Network Size on Bank Branch Performance." *Journal of Banking and Finance* 31, no. 12 (December): 3782-805.

Antoine Martin. 2007. "Barriers to Network-Specific Innovation," with Michael Orlando. *Review of Economic Dynamics* 10, no. 4 (October): 705-28.

Antoine Martin. 2007. "Optimality of the Friedman Rule in an Overlapping Generations Model with Spatial Separation," with Joseph H. Haslag. *Journal of Money, Credit, and Banking* 39, no. 7 (October): 1741-58.

Jonathan McCarthy. 2007. "Pass-Through of Exchange Rates and Import Prices to Domestic Inflation in Some Industrialized Economies." *Eastern Economic Journal* 33, no. 4 (fall): 511-37.

Hamid Mehran. 2007. "The Economics of Conflicts of Interest in Financial Institutions," with René M. Stulz. *Journal of Financial Economics* 85, no. 2 (August): 267-96.

Simon Potter. 2007. "Estimating and Forecasting in Models with Multiple Breaks," with Gary Koop. *Review of Economic Studies* 74, no. 3 (July): 763-89.

Kevin Stiroh. 2007. "Explaining a Productive Decade," with Stephen D. Oliner and Daniel E. Sichel. *Brookings Papers on Economic Activity*, no. 1: 81-137.

Andrea Tambalotti. 2007. "An Investigation of the Gains from Commitment in Monetary Policy," with Ernst Schaumburg. *Journal of Monetary Economics* 54, no. 2 (March): 302-24.

Chenyang Wei. 2007. "Governance Mechanisms and Bond Prices," with K. J. Martijn Cremers and Vinay B. Nair. *Review of Financial Studies* 20, no. 5 (September): 1359-88. ■

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Research and Statistics Group Publications and Papers: October-December 2007

Publications are available at www.newyorkfed.org/research/publication_annuals/index.html.

ECONOMIC POLICY REVIEW, VOL. 13

No. 2, November 2007
New Directions for Understanding Systemic Risk
A Report on a Conference Cosponsored by the Federal Reserve Bank of New York and the National Academy of Sciences, May 18-19, 2006

No. 3, December 2007
Hedge Funds, Financial Intermediation, and Systemic Risk
John Kambhu, Til Schuermann, and Kevin J. Stiroh

A Comparison of Measures of Core Inflation
Robert Rich and Charles Steindel

The Role of Retail Banking in the U.S. Banking Industry: Risk, Return, and Industry Structure
Timothy Clark, Astrid Dick, Beverly Hirtle, Kevin J. Stiroh, and Robard Williams

FORTHCOMING

Signal or Noise? Implications of the Term Premium for Recession Forecasting
Samuel Maurer and Joshua V. Rosenberg

Understanding Risk Management in Emerging Retail Payments
Michele Braun, James McAndrews, William Roberds, and Richard Sullivan

CURRENT ISSUES IN ECONOMICS AND FINANCE, VOL. 13

No. 9, October 2007
The Foreign-Born Population in Upstate New York
James Orr, Susan Wieler, and Joseph Pereira
Second District Highlights

No. 10, November 2007
Sticky Prices: Why Firms Hesitate to Adjust the Price of Their Goods
Pinelopi Goldberg and Rebecca Hellerstein

No. 11, December 2007
Financial Globalization and the U.S. Current Account Deficit
Matthew Higgins and Thomas Klitgaard

STAFF REPORTS

No. 304, October 2007
Buybacks in Treasury Cash and Debt Management
Kenneth D. Garbade and Matthew Rutherford

No. 305, October 2007
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