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### **Modeling the Credit Card Revolution: The Role of Debt Collection and Informal Bankruptcy**

In the data, most consumer defaults on unsecured credit are informal, and the lending industry devotes significant resources to debt collection. The authors develop a new theory of credit card lending that takes these two features into account. The two key elements of their model are moral hazard and costly state verification that relies on the use of information technology. They show that the model gives rise to a novel channel through which IT progress can affect outcomes in the credit markets, and argue that this channel can be critical to understand the trends associated with the rapid expansion of credit card borrowing in the 1980s and over the 1990s. Independently, the mechanism of the model helps reconcile high levels of defaults and indebtedness observed in the U.S. data.

*Working Paper 13-12. Lukasz A. Drozd, The Wharton School, University of Pennsylvania, Federal Reserve Bank of Philadelphia Visiting Scholar; Ricardo Serrano-Padial, University of Wisconsin.*

### **Who Said Large Banks Don't Experience Scale Economies? Evidence from a Risk- Return-Driven Cost Function**

The Great Recession focused attention on large financial institutions and systemic risk. The authors investigate whether large

size provides any cost advantages to the economy and, if so, whether these cost advantages are due to technological scale economies or too-big-to-fail subsidies. Estimating scale economies is made more complex by risk-taking. Better diversification resulting from larger scale generates scale economies but also incentives to take more risk. When this additional risk-taking adds to cost, it can obscure the underlying scale economies and engender misleading econometric estimates of them. Using data pre- and post-crisis, they estimate scale economies using two production models. The standard model ignores endogenous risk-taking and finds little evidence of scale economies. The model accounting for managerial risk preferences and endogenous risk-taking finds large scale economies, which are not driven by too-big-to-fail considerations. The authors evaluate the costs and competitive implications of breaking up the largest banks into smaller banks.

*Working Paper 13-13/R. Joseph P. Hughes, Rutgers University; Loretta J. Mester, Federal Reserve Bank of Philadelphia and The Wharton School, University of Pennsylvania.*

### **Market Run-Ups, Market Freezes, Inventories, and Leverage**

The authors study trade between an informed seller and an uninformed buyer who have existing inventories of assets similar to those being traded. They show that these inventories may lead to prices that increase

even absent changes in fundamentals (a “run-up”), but may also make trade impossible (a “freeze”) and hamper information dissemination. Competition may amplify the run-up by inducing buyers to enter loss-making trades at high prices to prevent a competitor from purchasing at a lower price and releasing bad news about inventory values. Inventories also prevent seller competition from delivering the Bertrand outcome, in which prices match sellers’ valuations. The authors discuss both empirical implications and implications for regulatory intervention in illiquid markets.

*Working Paper 13-14. Supersedes Working Paper 12-8. Philip Bond, University of Minnesota; Yaron Leitner, Federal Reserve Bank of Philadelphia.*

### **The Cost of Delay**

In this study, the authors make use of a massive database of mortgage defaults to estimate REO liquidation timelines and time-related costs resulting from the recent post-crisis interventions in the mortgage market and the freezing of foreclosures due to “robo-signing” revelations. The cost of delay, estimated by comparing today’s time-related costs to those before the start of the financial crisis, is eight percentage points, with enormous variation among states. While costs are estimated to be four percentage points higher in statutory foreclosure states, they are estimated to be 13 percentage points higher in judicial foreclosure states and 19 percentage points higher in the highest-cost state, New York. They discuss the policy implications of these extraordinary increases in time-related costs, including recent actions by the GSEs to raise their guarantee fees 15-30 basis points in five high-cost judicial states. Combined with evidence that foreclosure delays do not improve outcomes for borrowers and that increased delays can have large negative externalities in neighborhoods, the weight of the evidence is that current foreclosure practices merit the urgent attention of policymakers.

*Working Paper 13-15. Larry Cordell, Federal Reserve Bank of Philadelphia; Liang Geng, Federal Reserve Bank of Philadelphia; Laurie Goodman, Lidan Yang, Amherst Securities Group, LP.*

### **Improving GDP Measurement: A Measurement-Error Perspective**

The authors provide a new and superior measure of U.S. GDP, obtained by applying optimal signal-extraction techniques to the (noisy) expenditure-side and income-side estimates. Its properties — particularly as regards

serial correlation — differ markedly from those of the standard expenditure-side measure and lead to substantially revised views regarding the properties of GDP.

*Working Paper 13-16. S. Boragan Aruoba, University of Maryland, Federal Reserve Bank of Philadelphia Visiting Scholar; Francis X. Diebold, University of Pennsylvania, Federal Reserve Bank of Philadelphia Visiting Scholar; Jeremy Nalewaik, Federal Reserve Board; Frank Schorfheide, University of Pennsylvania, Federal Reserve Bank of Philadelphia Visiting Scholar; Dongho Song, University of Pennsylvania.*

### **Competition in Bank-Provided Payment Services**

Banks supply payment services that underpin the smooth operation of the economy. To ensure an efficient payment system, it is important to maintain competition among payment service providers, but data available to gauge the degree of competition are quite limited. The authors propose and implement a frontier-based method to assess relative competition in bank-provided payment services. Billion dollar banks account for around 90 percent of assets in the U.S., and those with around \$4 to \$7 billion in assets turn out to be both the most and the least competitive in payment services, not the very largest banks.

*Working Paper 13-17. Wilko Bolt, De Nederlandsche Bank; David Humphrey, Florida State University, Federal Reserve Bank of Philadelphia Visiting Scholar.*

### **Dynamics of Investment, Debt, and Default**

How does physical capital accumulation affect the decision to default in developing small open economies? The authors find that, conditional on a level of foreign indebtedness, more capital improves the sovereign’s ability to meet its obligations, reducing the likelihood of default and the risk premium. This effect, however, is diminishing in the stock of capital because capital also tames the severity of the contraction following default, making autarky more appealing. Access to long-term debt and costly capital adjustment are crucial for matching business cycles. Their quantitative model delivers default episodes that mimic those observed in the data.

*Working Paper 13-18. Grey Gordon, University of Indiana; Pablo Guerrón-Quintana, Federal Reserve Bank of Philadelphia.*

## Estimating Dynamic Equilibrium Models with Stochastic Volatility

The authors propose a novel method to estimate dynamic equilibrium models with stochastic volatility. First, they characterize the properties of the solution to this class of models. Second, the authors take advantage of the results about the structure of the solution to build a sequential Monte Carlo algorithm to evaluate the likelihood function of the model. The approach, which exploits the profusion of shocks in stochastic volatility models, is versatile and computationally tractable even in large-scale models, such as those often employed by policy-making institutions. As an application, the authors use their algorithm and Bayesian methods to estimate a business cycle model of the U.S. economy with both stochastic volatility and parameter drifting in monetary policy. Their application shows the importance of stochastic volatility in accounting for the dynamics of the data.

*Working Paper 13-19. Jesús Fernández-Villaverde, University of Pennsylvania, Federal Reserve Bank of Philadelphia Visiting Scholar; Pablo Guerrón-Quintana, Federal Reserve Bank of Philadelphia; Juan F. Rubio-Ramírez, Duke University, Federal Reserve Bank of Philadelphia Visiting Scholar.*

## Subsidizing Price Discovery

When markets freeze, not only are gains from trade left unrealized, but the process of information production through prices, or price discovery, is disrupted as well. Though this latter effect has received much less attention than the former, it constitutes an important source of inefficiency during times of crisis. The authors provide a formal model of price discovery and use it to study a government program designed explicitly to restore the process of information production in frozen markets. This program, which provided buyers with partial insurance against acquiring low-quality assets, reveals a fundamental trade-off for policymakers: while some insurance encourages buyers to bid for assets when they otherwise would not, thus promoting price discovery, too much insurance erodes the informational content of these bids, which hurts price discovery.

*Working Paper 13-20. Braz Camargo, Sao Paulo School of Economics – FGV; Kyungmin (Teddy) Kim, University of Iowa; Benjamin Lester, Federal Reserve Bank of Philadelphia.*

## Credit Ratings and Bank Monitoring Ability

In this paper the authors use credit rating data from two large Swedish banks to elicit evidence on banks' loan monitoring ability. For these banks, their tests reveal that banks' credit ratings indeed include valuable private information from monitoring, as theory suggests. However, their tests also reveal that publicly available information from a credit bureau is not efficiently impounded in the bank ratings: The credit bureau ratings not only predict future movements in the bank ratings but also improve forecasts of bankruptcy and loan default. The authors investigate possible explanations for these findings. Their results are consistent with bank loan officers placing too much weight on their private information, a form of overconfidence. To the extent that overconfidence results in placing too much weight on private information, risk analyses of the bank loan portfolios in the authors' data could be improved by combining the bank credit ratings and public credit bureau ratings. The methods the authors use represent a new basket of straightforward techniques that enable both financial institutions and regulators to assess the performance of credit rating systems.

*Working Paper 13-21. Supersedes Working Paper 10-21. Leonard I. Nakamura, Federal Reserve Bank of Philadelphia; Kasper Roszbach, Sveriges Riksbank, University of Groningen.*

## Trend-Cycle Decomposition: Implications from an Exact Structural Identification

A well-documented property of the Beveridge-Nelson trend-cycle decomposition is the perfect negative correlation between trend and cycle innovations. The authors show how this may be consistent with a structural model where trend shocks enter the cycle, or cyclic shocks enter the trend and that identification restrictions are necessary to make this structural distinction. A reduced-form unrestricted version such as that of Morley, Nelson and Zivot (2003) is compatible with either option, but cannot distinguish which is relevant. They discuss economic interpretations and implications using U.S. real GDP data.

*Working Paper 13-22. Mardi Dungey, University of Tasmania, CFAP, University of Cambridge, CAMA; Jan P.A.M. Jacobs, University of Groningen, University of Tasmania, CAMA, CIRANO; Jing Tian, University of Tasmania; Simon van Norden, HEC Montréal, CAMA, CIRANO, CIREQ, Federal Reserve Bank of Philadelphia Visiting Scholar.*

## Large Capital Infusions, Investor Reactions, and the Return and Risk-Performance of Financial Institutions over the Business Cycle

The authors examine investors' reactions to announcements of large capital infusions by U.S. financial institutions (FIs) from 2000 to 2009. These infusions include private market infusions (seasoned equity offerings (SEOs)) as well as injections of government capital under the Troubled Asset Relief Program (TARP). The sample period covers both business cycle expansions and contractions, and the recent financial crisis. They present evidence on the factors affecting FIs' decisions to raise capital, the determinants of investor reactions, and post-infusion risk-taking of the recipients, as well as a sample of matching FIs. Investors reacted negatively to the news of private market SEOs by FIs, both in the immediate term (e.g., the two days surrounding the announcement) and over the subsequent year, but positively to TARP injections. Reactions differed depending on the characteristics of the FIs, and the stage of the business cycle. More financially constrained institutions were more likely to have raised capital through private market offerings during the period prior to TARP, and firms receiving a TARP injection tended to be riskier and more levered. In the case of TARP recipients, they appeared to finance an increase in lending (as a share of assets) with more stable financing sources such as core deposits, which lowered their liquidity risk. However, the authors find no evidence that banks' capital adequacy increased after the capital injections.

*Working Paper 13-23. Supersedes Working Paper 11-46. Elyas Elyasiani, Fox School of Business and Management, Temple University, and Fellow, Wharton Financial Institution Center; Loretta J. Mester, Federal Reserve Bank of Philadelphia, The Wharton School; Michael S. Pagano, Villanova School of Business, Villanova University.*

## Credit Access and Credit Performance After Consumer Bankruptcy Filing: New Evidence

This paper uses a unique data set to shed new light on the credit availability and credit performance of consumer bankruptcy filers. In particular, the authors' data allow them to distinguish between Chapter 7 and Chapter 13 bankruptcy filings, to observe changes in credit demand and supply explicitly, to differentiate existing and new credit accounts, and to observe the performance of each credit account directly. The paper has four main findings. First, despite speedy recovery in their risk scores after bankruptcy filing, most filers have

much reduced access to credit in terms of credit limits, and the impact seems to be long lasting. Second, the reduction in credit access stems mainly from the supply side as consumer inquiries recover significantly after the filing, while credit limits remain low. Third, lenders do not treat Chapter 13 filers more favorably than Chapter 7 filers. In fact, Chapter 13 filers are much less likely to receive new credit cards than Chapter 7 filers even after controlling for borrower characteristics and local economic environment. Finally, the authors find that Chapter 13 filers perform more poorly than Chapter 7 filers (after the filing) on all credit products (credit card debt, auto loans, and first mortgages). Their results, in contrast to prior studies, thus suggest that the current bankruptcy system does not appear to provide much relief to bankruptcy filers.

*Working Paper 13-24. Julapa Jagtiani, Federal Reserve Bank of Philadelphia; Wenli Li, Federal Reserve Bank of Philadelphia.*

## Congestion, Agglomeration, and the Structure of Cities

Congestion pricing has long been held up by economists as a panacea for the problems associated with ever increasing traffic congestion in urban areas. In addition, the concept has gained traction as a viable solution among planners, policymakers, and the general public. While congestion costs in urban areas are significant and clearly represent a negative externality, economists also recognize the advantages of density in the form of positive agglomeration externalities. The long-run equilibrium outcomes in economies with multiple correlated, but offsetting, externalities have yet to be fully explored in the literature. To this end, the author develops a spatial equilibrium model of urban structure that includes both congestion costs and agglomeration externalities. The author then estimates the structural parameters of the model by using a computational solution algorithm and matches the spatial distribution of employment, population, land use, land rents, and commute times in the data. Policy simulations based on the estimates suggest that naive optimal congestion pricing can lead to net negative economic outcomes.

*Working Paper 13-25. Jeffrey C. Brinkman, Federal Reserve Bank of Philadelphia.*

## Stress Tests and Information Disclosure

The authors study an optimal disclosure policy of a regulator who has information about banks' ability

to overcome future liquidity shocks. They focus on the following trade-off: Disclosing some information may be necessary to prevent a market breakdown, but disclosing too much information destroys risk-sharing opportunities (Hirshleifer effect). The authors find that during normal times, no disclosure is optimal, but during bad times, partial disclosure is optimal. They characterize the optimal form of this partial disclosure. The authors also relate their results to the debate on the disclosure of stress test results.

*Working Paper 13-26. Itay Goldstein, University of Pennsylvania; Yaron Leitner, Federal Reserve Bank of Philadelphia.*

### **Reverse Mortgage Loans: A Quantitative Analysis**

Reverse mortgage loans (RMLs) allow older homeowners to borrow against housing wealth without moving. In spite of growth in this market, only 2.1 percent of eligible homeowners had RMLs in 2011. In this paper, we analyze reverse mortgages in a life-cycle model of retirement, calibrated to age-asset profiles. The ex-ante welfare gain from RMLs is sizable at \$1,000 per household; ex-post, low-income, low-wealth and poor-health households use them. Bequest motives, nursing-home moving risk, house price risk, and interest and insurance costs all contribute to the low take-up rate. The model predicts market potential for RMLs to be 5.5 percent of households.

*Working Paper 13-27. Makoto Nakajima, Federal Reserve Bank of Philadelphia; Irina A. Telyukova, University of California, San Diego.*

### **Banking Crises and the Role of Bank Coalitions**

The goal of this paper is to provide a framework to analyze the effectiveness of bank coalition formation in response to an external aggregate shock that may cause disruption to the payment mechanism and real economic activity. The author shows that the kind of insurance mechanism provided by a specific type of bank coalition allows society to completely prevent any disruption to real activity that can be caused by a temporary drop in the value of banking assets, at least in the case of a shock that is not too big. If the shock is relatively large, then a private bank coalition will be unable to completely prevent a disruption in real activity even though it will be able to substantially mitigate the effects on equilibrium quantities and prices. Thus, the existence of a private bank coalition of the kind described in this paper can be an effective means of

preventing significant disruptions in trading activity.

*Working Paper 13-28. Daniel Sanches, Federal Reserve Bank of Philadelphia.*

### **Macroeconomic Dynamics Near the ZLB: A Tale of Two Equilibria**

This paper studies the dynamics of a New Keynesian dynamic stochastic general equilibrium (DSGE) model near the zero lower bound (ZLB) on nominal interest rates. In addition to the standard targeted-inflation equilibrium, the authors consider a deflation equilibrium as well as a Markov sunspot equilibrium that switches between a targeted-inflation and a deflation regime. The authors use the particle filter to estimate the state of the U.S. economy during and after the 2008–09 recession under the assumptions that the U.S. economy has been in either the targeted-inflation or the sunspot equilibrium. The authors consider a combination of fiscal policy (calibrated to the American Recovery and Reinvestment Act) and monetary policy (that tries to keep interest rates near zero) and compute government spending multipliers. Ex-ante multipliers (cumulative over one year) under the targeted-inflation regime are around 0.9. A monetary policy that keeps interest rates at zero can raise the multiplier to 1.7. The ex-post (conditioning on the realized shocks in 2009–11) multiplier is estimated to be 1.3. Conditional on the sunspot equilibrium, the multipliers are generally smaller and the scope for conventional expansionary monetary policy is severely limited.

*Working Paper 13-29. S. Borağan Aruoba, University of Maryland, Federal Reserve Bank of Philadelphia Visiting Scholar; Frank Schorfheide, University of Pennsylvania, NBER, Federal Reserve Bank of Philadelphia Visiting Scholar.*