Abstracts of Articles Accepted in Journals, Books, and Conference Volumes*

The Supplemental Security Income Program

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Forthcoming in *Means-Tested Transfers in the U.S.,* ed. Robert Moffitt. Cambridge, MA: NBER.

Supplemental Security Income (SSI) is a nationwide federal assistance program for aged, blind, and disabled individuals with low incomes. Rapid program growth, the changing composition of SSI beneficiaries, and increasing pressure to devolve federal responsibility for social programs to state governments, as well as to integrate traditional "nonworkers" into the labor market, all have raised questions about the role that SSI plays in the broader U.S. social welfare system. This paper provides the basic information necessary for SSI policymakers to make informed choices about its future.

United States Disability Policy in a Changing Environment

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Published in *Journal of Economic Perspectives* 16(1) (Winter 2002) pp. 213–224.

In this paper we provide a broader perspective from which to evaluate current disability policy. We begin by reviewing the major aspects of the Disability Insurance and Supplemental Security Income programs. We then examine trends in employment and disability benefit receipt among those with disabilities, paying particular attention to the last 15 years. Within this framework we summarize the primary difficulties in crafting an efficient and equitable assistance program for a heterogeneous population that changes with its environment. Finally, we place disability policy in the context of the broader United States social welfare system and consider how changes in other social welfare programs likely will affect disability program usage in the future.

Self-Reported Work Limitation Data: What They Can and Cannot Tell Us

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Published in *Demography* 39(3) (August 2002).

Data constraints make the long-term monitoring of the working-age population with disabilities a difficult task. Indeed, the Current Population Survey (CPS) is the only national data source that offers detailed work and income questions and consistently asked measures of disability over a 20-year period. Despite its widespread use in the literature, the CPS and surveys like it have come under attack of late, with critics discounting the results of any research obtained from such data. We put these criticisms in perspective by systematically examining what the CPS data can and cannot be used for in disability research. Based on comparisons with the National Health Interview Survey (NHIS), a data set with much more information on health than the CPS, we find that the work limitation-based definition of disability available in the CPS underestimates the size of the broader population with health impairments in the NHIS, but that the employment trends in these two populations in the NHIS are not significantly different from one another. We then show that the trends in employment observed for the NHIS population defined by self-reported work limitation are not statistically different from those found in the CPS. Based on these findings, we argue (1) that the CPS and other nationally representative employment-

*The abstracts are arranged alphabetically by FRB San Francisco authors, whose names are in boldface.

based data sets can be used to monitor trends in outcomes of those with disabilities and, (2) that the dramatic decline in the employment of people with disabilities we describe in the CPS during the 1990s is not an artifact of the data.

Black–White Wage Inequality in the 1990s—A Decade of Progress

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Published in *Economic Inquiry* 40(1) (January 2002) pp. 31–41.

Using Current Population Survey data, we find that the gap between the wages of black and white males declined during the 1990s at a rate of about 0.60 percentage point per year. Wage convergence was most rapid among workers with fewer than 10 years of potential experience, with declines in the gap averaging 1.40 percentage points per year. Using standard decomposition methods, we find that greater occupational diversity and reductions in unobserved or residual differences are important in explaining this trend. General wage inequality tempered the rate of wage convergence between blacks and whites during the 1990s.

Optimal Indicators of Socioeconomic Status for Health Research

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Published in *American Journal of Public Health* 92(7) (July 2002) pp. 1,151–1,157.

This paper examines the relationship between various measures of socioeconomic status (SES) and mortality for a representative sample of individuals. We use data from the Panel Study of Income Dynamics, sampling 3,734 individuals aged 45 and older who participated in the 1984 interview and tracking them between 1984 and 1994 using Cox event-history regression models. We found that wealth and recent family income were the indicators that were most strongly associated with subsequent mortality. These associations persisted after we controlled for the other SES indicators and were stronger for women than for men and for nonelderly than for elderly individuals. We found that the economic indicators of SES were usually as strongly associated with mortality as, if not more strongly associated with mortality than, the more conventional indicators of completed schooling and occupation.

Population Movements: Isolated Experience or Broad Policy Concern?

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Forthcoming in *What Is Causing the Decline in Employment of People with Disabilities,* Upjohn Institute for Employment.

Numerous researchers have shown that the decline in employment rates among working-age men and women with disabilities over the 1990s was not an artifact of measurement choices or research design, but robust across definitions of disability and data sources. Although this overall trend is disturbing, a greater understanding of what underlies it is needed before an appropriate policy response can be crafted. Specifically, policymakers need to know whether the recent employment decline was broad-based or concentrated among a few subgroups of the population, whether it reflects changes in the characteristics of the population with disabilities or changes in their behavior and/or labor market opportunities, and finally, whether it was associated with exogenous changes in health or changes in environmental factors. This paper addresses these issues. The results suggest that the decline in employment among those with disabilities was broad-based, present in a wide range of demographic and educational subgroups. In terms of population shifts, we find no evidence that compositional changes in the population with disabilities during the 1990s account for the average

employment decline during the period. In contrast, we find that compositional changes were important to the increase in employment among those with disabilities during the 1980s. Finally, we show that self-reported health among those with disabilities remained relatively stable in the latter half of the 1990s, making changes in health status an unlikely cause of declining employment rates.

Exploring the Role of the Real Exchange Rate in Australian Monetary Policy

Richard Dennis

Forthcoming in *Economic Record.*

An important issue in small open economies is whether policymakers should respond to exchange rate movements when they formulate monetary policy. Micro-founded models tend to suggest that there is little to be gained from responding to exchange rate movements, and the literature has largely concluded that such a response is unnecessary or even undesirable (Taylor 2001). This paper examines this issue using an estimated model of the Australian economy. In contrast to micro-founded models, according to this model policymakers should allow for movements in the real exchange rate and the terms-of-trade when they set interest rates. Further, taking real exchange rate movements into account appears even more important with price-level targeting than with inflation targeting.

Is Money Still Useful for Policy in East Asia?

Reuven Glick
Ramon Moreno

Published in *Inflation Targeting: Theories, Empirical Models, and Implementation in Pacific Basin Economies,* Proceedings of 14th Pacific Basin Central Bank Conference, Bank of Korea (2002).

Since the East Asian crises of 1997, a number of East Asian economies have allowed greater exchange rate flexibility and abandoned monetary targets in favor of inflation targeting, apparently because the perceived usefulness of money as a predictor of inflation (i.e., the information content of money) has fallen. In this paper, we discuss factors that are likely to have influenced the stability of the relationship between money and inflation, particularly in the 1990s, and then assess this relationship in a set of East Asian economies. We focus on (1) the stability of the behavior of the velocity of money; (2) the ability of money growth to predict inflation as measured by tests of Granger causality, and (3) the contribution of money to the variance of the forecast error of inflation. We find evidence that, with a few exceptions in which capital flows were particularly large, velocity remained generally stable, as did the relationship between money growth and inflation. However, the contribution of money to inflation forecast errors fell considerably in the 1990s, reducing its value as an information variable to monetary authorities.

Does a Currency Union Affect Trade? The Time Series Evidence

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Published in *European Economic Review* 46(6) (June 2002) pp. 1,125–1,151.

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Does leaving a currency union reduce international trade? We answer this question using a large annual panel data set covering 217 countries from 1948 through 1997. During this sample a large number of countries left currency unions; they experienced economically and statistically significant declines in bilateral trade after accounting for other factors. Assuming symmetry, we estimate that a pair of countries that starts to use a common currency experiences a near doubling in bilateral trade.

Payer Type and the Returns to Bypass Surgery: Evidence from Hospital Entry Behavior

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Published in *Journal of Health Economics* 21(3) (May 2002) pp. 451–474.

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In this paper, we estimate the returns associated with the provision of coronary artery bypass graft (CABG) surgery by payer type (Medicare, HMO, etc.). Because reliable measures of prices and treatment costs are often unobserved, we seek to infer returns from hospital entry behavior. We estimate a model of patient flows for CABG patients that provides inputs for an entry model. We find that FFS provides a high return throughout the study period. Medicare, which had been generous in the early 1980s, now provides a return that is close to zero. Medicaid appears to reimburse less than average variable costs. HMOs essentially pay at average variable costs, though the return varies inversely with competition.

Equilibrium Valuation of Illiquid Assets

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Published in *Economic Theory* 19(2) (January 2002) pp. 223–242.

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We develop an equilibrium model of illiquid asset valuation based on search and matching. We propose several measures of illiquidity and show how these measures behave. We also show that the equilibrium amount of search may be less than, equal to, or greater than the amount of search that is socially optimal. Finally, we show that excess returns on illiquid assets are fair games if returns are defined to include the appropriate shadow prices.

Incorporating Equity Market Information into Supervisory Monitoring Models

John Krainer
Jose A. Lopez

Forthcoming in *Journal of Money, Credit, and Banking.*

We examine whether equity market variables, such as stock returns and equity-based default probabilities, are useful to bank supervisors for assessing the condition of bank holding companies. Using an event study framework, we find that equity market variables anticipate supervisory ratings changes by up to four quarters and that the improvements in forecast accuracy arising from conditioning on equity market information are statistically significant. We develop an off-site monitoring model that easily combines supervisory and equity market information, and we find that the model's forecasts also anticipate supervisory ratings changes by several quarters. While the inclusion of equity market variables in the model does not improve forecast accuracy by much relative to simply using supervisory variables, we argue that equity market information should still be useful for forecasting supervisory ratings and should be incorporated into supervisory monitoring models.

Impact of Deposit Rate Deregulation in Hong Kong on the Market Value of Commercial Banks

Simon H. Kwan

Forthcoming in *Journal of Banking and Finance.*

This paper examines the effects of a series of events leading up to the deregulation of deposit interest rates in Hong Kong on the market value of banks. All the evidence suggests that banks earned rents from deposit interest rate rules and deregulation would lower these rents and hence bank market values. On average, the total abnormal return due to interest rate deregulation was around –4%. There is some evidence that large banks and banks with high deposit-to-asset ratios suffered a bigger drop in value, suggesting that these banks enjoyed a bigger subsidy under the interest rate rules.

Operating Performance of Banks among Asian Economies: An International and Time Series Comparison

Simon H. Kwan

Published in *Journal of Banking and Finance* 27(3) (March 2003) pp. 471–489.

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Per unit bank operating costs are found to vary significantly across Asian countries and over time. The strong correlation between per unit labor cost and physical capital cost suggests that there exist systematic differences in bank operating efficiency across countries. The declining operating costs between 1992 and 1997 is consistent with improving operating performance. Since 1997, the run-up in operating costs coincided with the Asian financial crisis, suggesting that banks incurred additional costs to deal with problem loans while outputs declined simultaneously. Labor cost share is also found to decline significantly between 1997 and 1999, perhaps because banks were able to cut labor force faster than physical capital. Significant differences in labor cost share across countries suggest cross-country differences in bank production functions. The positive relation between labor cost share and wage rate indicates that banks using more labor is due to labor force productivity, rather than labor being cheap.

Market Evidence on the Opaqueness of Banking Firms' Assets

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Forthcoming in *Journal of Financial Economics.*

We assess the market microstructure properties of U.S. banking firms' equity to determine whether they exhibit more or less evidence of asset opaqueness than similar-sized nonbanking firms. The evidence indicates that large bank holding companies (BHCs), traded on the NYSE, have very similar trading properties to their matched nonfinancial firms. In contrast, smaller BHCs, traded on NASDAQ, trade much less frequently despite having very similar spreads. We also find empirical support for the hypothesis that BHC asset categories differ in their opacity. Analysis of IBES earnings forecasts indicates that banking assets are not unusually opaque; they are simply boring. The implications for regulatory policy and future market microstructure research are discussed.

Hidden Cost Reductions in Bank Mergers: Accounting for More Productive Banks

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Published in *Research in Finance* 19, ed. Andrew H. Chen. London: Elsevier Press, 2002, pp. 109–124.

The bank mergers of the 1990s often triggered upward adjustments in reported depreciation and goodwill amortization expenses, apart from any change in actual costs, due to the conventions of purchase accounting. Thus, conventional measurements underestimated the sizable and long-lasting reductions in noninterest costs achieved following mergers.

The largest reductions in reported post-merger bank costs occurred in labor expenses, which were not subject to accounting revaluations. Reported premises expenses fell considerably less than that of labor when buildings were revalued. Other noninterest expense rose, partly because amortization increased due to the additional goodwill generated by mergers.

Measuring the CRA Subsidy in Mortgage Markets

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Published in *Proceedings of the 38th Annual Conference on Bank Structure and Competition,* FRB Chicago (May 2002) pp. 429–441.

The Community Reinvestment Act (CRA) encourages lenders to make mortgage loans to certain classes of borrowers. However, the law does not apply to all lenders, and lenders do not necessarily receive credit for all loans made to borrowers of a particular class. Specifically, only commercial banks and savings institutions are subject to the CRA, while mortgage bankers are not. Further, CRA credit is given for loans made to higher-income borrowers who purchase homes in lower-income neighborhoods but not to other higher-income borrowers. We use this variation to test whether or not CRA-affected lenders cut interest rates to CRA-eligible borrowers; in other words, we test for the presence of a regulation-driven subsidy. Our theory suggests that loans made by commercial banks and savings associations ("relationship lenders") and mortgage companies ("transaction lenders") will differ from one another depending on borrower risk and home-ownership benefits. Empirically, we find that CRA-eligible loans at CRA-affected institutions do carry lower mortgage spreads compared with other loans at the same institution. However, once we control for risk and benefit effects suggested by our theory, these differences in mortgage spreads become economically and statistically insignificant.

Fiscal Policy, Increasing Returns, and Endogenous Fluctuations

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Published in *Macroeconomic Dynamics* 6(5) (November 2002) pp. 633–664.

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This paper examines the quantitative implications of government fiscal policy in a discrete-time one-sector growth model with a productive externality that generates social increasing returns to scale. Starting from a laissez-faire economy that exhibits local indeterminacy, we show that the introduction of a constant capital tax or subsidy can lead to various forms of endogenous fluctuations, including stable 2-, 4-, 8-, and 10-cycles, quasiperiodic orbits, and chaos. In contrast, a constant labor tax or subsidy has no effect on the qualitative nature of the model's dynamics. We show that the use of local steady-state analysis to detect the presence of multiple equilibria in this class of models can be misleading. For a plausible range of capital tax rates, the log-linearized dynamical system exhibits saddle-point stability, suggesting a unique equilibrium, whereas the true nonlinear model exhibits global indeterminacy. This result implies that stabilization policies designed to suppress sunspot fluctuations near the steady state may not prevent sunspots, cycles, or chaos in regions away from the steady state. Overall, our results highlight the importance of using a model's nonlinear equilibrium conditions to fully investigate global dynamics.

The Empirical Relationship between Average Asset Correlation, Firm Probability of Default, and Asset Size

Jose A. Lopez

Forthcoming in *Journal of Financial Intermediation.*

The asymptotic single risk factor (ASRF) approach is a simplified framework for determining regulatory capital charges for credit risk and has become an integral part of how credit risk capital requirements are to be determined under the second Basel Accord. Within this approach, a key regulatory parameter is the average asset correlation. In this paper, we examine the empirical relationship between the average asset correlation, firm probability of default, and firm asset size measured by the book value of assets. Using data from year-end 2000, credit portfolios consisting of U.S., Japanese, and European firms are analyzed. The empirical results suggest that average asset correlation is a decreasing function of probability of default and an increasing function of asset size. The empirical results suggest that several factors may impact average asset correlations within an ASRF framework, and these factors may need to be accounted for in the final calculation of regulatory capital requirements for credit risk.

Supervisory and Regulatory Concerns Regarding Bank Internal Ratings Systems

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Published in *Credit Ratings: Methodologies, Rationale, and Default,* ed. M. Ong. London: Risk Books, 2002, pp. 305–314.

Internal rating systems are one of the oldest and most widely used credit risk measurement tools used by commercial banks. These systems distill the information on potentially thousands of borrowers into common ratings that summarize risk characteristics and permit comparisons across the entire loan portfolio. Many large banks use their ratings in several aspects of credit risk management, such as loan origination and pricing, credit portfolio monitoring, profitability analysis, and management reporting. Since internal ratings are such a key element of credit risk management systems, it is not surprising that they come under greater attention from international bank regulators and supervisors. In particular, the ongoing work of the Basel Committee on Banking Supervision to update international regulatory capital requirements, commonly referred to as the Basel II process, has brought internal ratings to the center of regulatory concerns. This increased emphasis and expanded use of internal ratings clearly should alert supervisory concerns since national bank supervisors will be faced with the task of implementing these regulatory requirements and monitoring bank adherence to them over time. In this paper, we discuss the supervisory con-

cerns that already exist and outline the regulatory issues arising from the Basel II process. We attempt to highlight where the Basel II process will affect supervisory concerns the most and discuss possible future directions for supervisory and regulatory concerns regarding internal rating systems.

Financial Structure and Macroeconomic Performance over the Short and Long Run

Jose A. Lopez
Mark M. Spiegel

Forthcoming in *Proceedings of the 2002 East-West Center/Korean Development Institute Conference on the Macroeconomic Implications of Post-Crisis Structural Change.*

We examine the relationship between indicators of financial development and economic performance for a cross-country panel over long and short periods. Our long-term results are consistent with much of the literature in that we find a positive relationship between financial development and economic growth. However, we fail to find a significant positive relationship after accounting for disparities in factor accumulation. These results therefore indicate that the primary channel for financial development to facilitate growth over the long run is through physical and human capital accumulation. We also identify a significant negative relationship between financial development and income volatility, suggesting that financial development does mitigate economic fluctuations in the long run.

We then turn to short-run analysis, concentrating on the period immediately surrounding the 1997 Asian financial crisis. Unlike our long-term results, our short-term panel analysis fails to find a significant relationship between financial development and economic performance during this period, both for a broad sample of countries and for a small sample of developing Asian nations.

Taken as a whole, our analysis appears to support a relatively new idea in the literature that while financial development is beneficial over the long run, it may exacerbate short-term volatility in isolated episodes. One reason for this discrepancy may be that financial liberalizations are typically only partial, resulting in increased financial market distortions. We analyze the Korean experience in the period surrounding the Asian financial crisis and argue that this experience supports the idea of distortionary partial liberalization.

Assessing Nominal Income Rules for Monetary Policy with Model and Data Uncertainty

Glenn D. Rudebusch

Published in *The Economic Journal* 112 (April 2002) pp. 1–31.

Nominal income rules for monetary policy have long been debated, but two issues are of particular recent interest. First, there are questions about the performance of such rules over a range of plausible empirical models—especially models with and without explicit rational inflation expectations. Second, there are questions about the performance of these rules in real time using the type of data that is actually available contemporaneously to policymakers rather than final revised data. This paper determines optimal monetary policy rules in the presence of such model uncertainty and real-time data uncertainty and finds only a limited role for nominal output growth.

Term Structure Evidence on Interest Rate Smoothing and Monetary Policy Inertia

Glenn D. Rudebusch

Published in *Journal of Monetary Economics* 49(6) (September 2002) pp. 1,161–1,187.

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Numerous studies have used quarterly data to estimate monetary policy rules or reaction functions that appear to exhibit a very slow partial adjustment of the policy interest rate. The conventional wisdom asserts that this gradual adjustment reflects a policy inertia or interest rate smoothing behavior by central banks. However, such quarterly monetary policy inertia would imply a large amount of forecastable variation in interest rates at horizons of more than 3 months, which is contradicted by evidence from the term structure of interest rates. The illusion of monetary policy inertia evident in the estimated policy rules likely reflects the persistent shocks that central banks face.

Eurosystem Monetary Targeting: Lessons from U.S. Data

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Published in *European Economic Review* 46(3) (March 2002) pp. 417–442.

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Using a small empirical model of inflation, output, and money estimated on U.S. data, we compare the relative performance of monetary targeting and inflation targeting. The results show monetary targeting to be quite inefficient, yielding both higher inflation and output variability. This is true even with a nonstochastic money demand formulation. Our results are also robust to using a P^* model of inflation. Therefore, in these popular frameworks, there is no support for the prominent role given to money growth in the Eurosystem's monetary policy strategy.

Sterilization Costs and Exchange Rate Targeting

Mark M. Spiegel, with
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University of California, Santa Cruz

Forthcoming in *Journal of International Money and Finance.*

We examine the movements of exchange rates and capital inflows in an environment where an optimizing central bank pursuing the joint goals of inflation and output targeting engages in costly sterilization activities. Our results predict that when faced with increased sterilization costs, the central bank will choose to limit its sterilization activities allowing target variables, such as the nominal exchange rate, to adjust. We then test the predictions of a linearized version of the saddle-path solution to the model for a cross-country panel of developing countries. We use OLS, IV, and GMM specifications to allow for the endogeneity of capital inflows. Our results confirm that monetary policy does respond to sterilization costs.

The Evolution of Bank Resolution Policies in Japan: Evidence from Market Equity Values

Mark Spiegel, with
Nobuyoshi Yamori, *Nagoya University*

Forthcoming in *Journal of Financial Research.*

We examine the evidence in equity markets concerning bank regulatory policies in Japan from 1995 to 1999. Our results support the presence of information-based contagion in Japanese equity markets. When the failure of a bank of certain regulatory status was announced, it adversely affected excess returns on banks with equal or lower levels of regulatory protection. Market participants therefore initially behaved as if only Second Regional and smaller banks would be allowed to fail. As the situation deteriorated, however, banks that traditionally enjoyed greater regulatory protection also were perceived to lose their too-big-to-fail status.

Financial Turbulence and the Japanese Main Bank Relationship

Mark Spiegel, with
Nobuyoshi Yamori, *Nagoya University*

Forthcoming in *Journal of Financial Services Research.*

The Japanese “main bank” relationship, under which a bank holds equity in a firm and plays a leading role in its decisionmaking and financing, may leave a firm dependent on its main bank for financing due to its information advantage over other potential lenders. While alternative sources of finance may mitigate this dependency, it may resurface during episodes of financial turbulence. We examine the sensitivity of returns on portfolios of Japanese firm equity to the returns of their main banks using a three-factor arbitrage-pricing model. We find no significant dependence on main bank returns when coefficient values are constrained to remain constant over the entire sample. However, the data strongly suggest a structural break subsequent to the last quarter of 1997, a turbulent period for Japanese financial markets. When a structural break is introduced, main bank sensitivity increases after the break, usually to significantly positive levels.

The Impact of Japan’s Financial Stabilization Laws on Bank Equity Values

Mark Spiegel, with
Nobuyoshi Yamori, *Nagoya University*

Forthcoming in *Journal of the Japanese and International Economies.*

In the fall of 1998, two important financial regulatory reform acts were passed in Japan. The first of these acts, the Financial Recovery Act, created a bridge bank scheme and provided funds for the resolution of failed banks. The second act, the Rapid Revitalization Act, provided funds for the assistance of troubled banks. While both of these acts provided some government assistance to the banking sector, they also called for reforms aimed at strengthening the regulatory environment. Using an event study framework, this paper examines the evidence in equity markets concerning the anticipated impact of the regulatory reforms. Our evidence suggests that the anticipated regulatory impact of the Financial Recovery Act was mixed, while the Rapid Revitalization Act was expected to disproportionately favor weaker Japanese banks. As such, it appears that the market was skeptical about the degree to which the new acts would lead to true banking reform.

Union Effects on Health Insurance Provision and Coverage in the United States

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Published in *Industrial and Labor Relations Review* 55(4) (July 2002) pp. 610–627.

During the past two decades, union density has declined in the United States and employer provision of health benefits has changed substantially in extent and form. Using individual survey data spanning the years 1983 to 1997 combined with employer survey data for 1993, the authors update and extend previous analyses of private-sector union effects on employer-provided health benefits. They find that the union effect on health insurance coverage rates has fallen somewhat but remains large, due to an increase over time in the union effect on employee "take-up" of offered insurance, and that declining unionization explains 20 to 35 percent of the decline in employee health coverage. The increasing union take-up effect is linked to union effects on employees' direct costs for health insurance and the availability of retiree coverage.

Measuring the Natural Rate of Interest

John C. Williams, with
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Federal Reserve Board of Governors

Forthcoming in *Review of Economics and Statistics.*

The natural rate of interest—the real interest rate consistent with output equaling its natural rate and stable inflation—plays a central role in macroeconomic theory and monetary policy. Estimation of the natural rate of interest, however, has received little attention. We apply the Kalman filter to estimate jointly time-varying natural rates of interest and output and trend growth. We find a close link between the natural rate of interest and the trend growth rate, as predicted by theory. Estimates of the natural rate of interest, however, are very imprecise and subject to considerable real-time measurement error.

Robust Monetary Policy with Competing Reference Models

John C. Williams, with
Andrew T. Levin,
Federal Reserve Board of Governors

Forthcoming in *Journal of Monetary Economics.*

The existing literature on robust monetary policy rules has focused largely on the case in which the policymaker has a single reference model while the true economy lies within a specified neighborhood of the reference model. In this paper, we show that such rules may perform very poorly in the more general case in which non-nested models represent competing perspectives about controversial issues such as expectations formation and inflation persistence. Using Bayesian and minimax strategies, we then consider whether *any* simple rule can provide robust performance across such divergent representations of the economy. We find that a robust outcome is only attainable in cases where the objective function places substantial weight on stabilizing both output and inflation; in contrast, we are not able to find a robust policy rule when the sole policy objective is the stabilization of inflation. We analyze these results using a new diagnostic approach, namely, by quantifying the *fault tolerance* of each model economy with respect to deviations from optimal policy.

The Performance of Forecast-Based Monetary Policy Rules under Model Uncertainty

John C. Williams, with
Andrew T. Levin,
Federal Reserve Board of Governors
Volker Wieland,
Johann Wolfgang Goethe-University and European Central Bank

Forthcoming in
American Economic Review.

We investigate the performance of forecast-based monetary policy rules using five macroeconomic models that reflect a wide range of views on aggregate dynamics. We identify the key characteristics of rules that are robust to model uncertainty: such rules respond to the one-year-ahead inflation forecast and to the current output gap and incorporate a substantial degree of policy inertia. In contrast, rules with longer forecast horizons are less robust and are prone to generating indeterminacy. Finally, we identify a robust benchmark rule that performs very well in all five models over a wide range of policy preferences.

Imperfect Knowledge, Inflation Expectations, and Monetary Policy

John C. Williams, with
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Federal Reserve Board of Governors

Forthcoming in *Inflation Targeting,* ed. Michael Woodford. Chicago: University of Chicago Press.

This paper investigates the role that imperfect knowledge about the structure of the economy plays in the formation of expectations, macroeconomic dynamics, and the efficient formulation of monetary policy. Economic agents rely on an adaptive learning technology to form expectations and to update continuously their beliefs regarding the dynamic structure of the economy based on incoming data. The process of perpetual learning introduces an additional layer of dynamic interaction between monetary policy and economic outcomes. We find that policies that would be efficient under rational expectations can perform poorly when knowledge is imperfect. In particular, policies that fail to maintain tight control over inflation are prone to episodes in which the public's expectations of inflation become uncoupled from the policy objective and stagflation results, in a pattern similar to that experienced in the United States during the 1970s. Our results highlight the value of effective communication of a central bank's inflation objective and of continued vigilance against inflation in anchoring inflation expectations and fostering macroeconomic stability.

Robust Monetary Policy Rules with Unknown Natural Rates

John C. Williams, with
Athanasios Orphanides,
Federal Reserve Board of Governors

Published in *Brookings Papers on Economic Activity* 2002(2) pp. 63–145.

We examine the performance and robustness properties of alternative monetary policy rules in the presence of structural change that renders the natural rates of interest and unemployment uncertain. Using a forward-looking quarterly model of the U.S. economy, estimated over the 1969–2002 period, we show that the cost of underestimating the extent of misperceptions regarding the natural rates significantly exceeds the costs of overestimating such errors. Naive adoption of policy rules optimized under the false presumption that misperceptions regarding the natural rates are likely to be small proves particularly costly.

Our results suggest that a simple and effective approach for dealing with ignorance about the degree of uncertainty in estimates of the natural rates is to adopt difference rules for monetary policy, in which the short-term nominal interest rate is raised or lowered from its existing level in response to inflation and changes in economic activity. These rules do not require knowledge of the natural rates of interest or unemployment for setting policy and are consequently immune to the likely misperceptions in these

concepts. To illustrate the differences in outcomes that could be attributed to the alternative policies we also examine the role of misperceptions for the stagflationary experience of the 1970s and the disinflationary boom of the 1990s.

Embodying Embodiment in a Structural, Macroeconomic Input-Output Model

Daniel J. Wilson

Forthcoming in *Economic Systems Research.*

This paper describes an attempt to build a regression-based system of labor productivity equations that incorporate the effects of capital-embodied technological change into IDLIFT, a structural, macroeconomic input-output model of the U.S. economy. Builders of regression-based forecasting models have long had difficulty finding labor productivity equations that exhibit the Neoclassical or Solowian property that movements in investment should cause accompanying movements in labor productivity. Theory dictates that this causation is driven by the effect of traditional capital deepening as well as technological change embodied in capital. Lack of measurement of the latter has hampered the ability of researchers to properly estimate the productivity-investment relationship. Wilson (2001a), by estimating industry-level embodied technological change, has alleviated this difficulty. In this paper, I utilize those estimates to construct capital stocks that are adjusted for technological change, which then are used to estimate Neoclassical-type labor productivity equations. It is shown that replacing IDLIFT's former productivity equations, based on changes in output and time trends, with the new equations results in a convergence between the dynamic behavior of the model and that predicted by Neoclassical production theory.

Is Embodied Technology the Result of Upstream R&D? Industry-Level Evidence

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Published in *Review of Economic Dynamics* 5(2) (April 2002) pp. 285–317.

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This paper provides an exploratory analysis of whether data on the research and development (R&D) spending directed at particular technological/product fields can be used to measure industry-level capital-embodied technological change. Evidence from the patent literature suggests that the R&D directed at a product, as the main input into the "innovation" production function, is proportional to the value of the innovations in that product. I confirm this hypothesis by showing that the decline in the relative price of a good is positively correlated with the R&D directed at that product. The hypothesis implies that the technological change, or innovation, embodied in an industry's capital is proportional to the R&D that is done ("upstream") by the economy as a whole on each of the capital goods that a ("downstream") industry purchases. Using R&D data from the National Science Foundation, I construct measures of capital-embodied R&D. I find they have a strong effect on conventionally measured total factor productivity growth, a phenomenon that seems to be due partly to the mismeasurement of quality change in the capital stock and partly to a positive correlation between embodied and disembodied technological change. Finally, I find the cross-industry variation in empirical estimates of embodied technological change accord with the cross-industry variation in embodied R&D.

Stylized Facts on Nominal Term Structure and Business Cycles: An Empirical VAR Study

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Forthcoming in *Applied Economics.*

This paper examines the importance of various macroeconomic shocks in explaining the movement of the term structure of nominal bond yields in the post-war U.S., as well as the channels through which such macro shocks influence the yield curve, using a structural vector autoregressive model. The results show that the monetary policy and the aggregate supply shocks are important determinants of the nominal term structure. Moreover, the monetary policy innovations have a large but transitory effect on the nominal bond yields, primarily by changing the slope of the yield curve, and the aggregate supply shocks from the private sector have a more persistent effect on the level of the yield curve but have little effect on the slope of the yield curve.