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papers

The 2006 Summer Workshop on Money, Banking and Payments: An Overview

By Ed Nosal, Guillaume Rocheteau, and Randall Wright

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This *Policy Discussion Paper* summarizes the papers presented at the 2006 Summer Workshop on Money, Banking, and Payments. Every summer since 2002, some of the best researchers in the areas of theory, policy, and quantitative analysis relating to money, banking and payments systems have met in Cleveland to discuss their latest work. The papers presented at the 2006 workshop cover a vast spectrum of issues and use a wide variety of methods. Still, there is an underlying theme, which is an effort to enhance our understanding of monetary economics, broadly defined, and to uncover new ways to think about important substantive issues. Hopefully, this helps not only theoretical monetary economists, but also economists such as central bankers with a more practical policy-oriented view.

POLICY DISCUSSION PAPERS

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Introduction

The papers presented at the 2006 Summer Workshop on Money, Banking, and Payments cover a vast spectrum of issues and use a wide variety of methods. Still, there is an underlying theme, which is an effort to enhance our understanding of monetary economics, broadly defined, and to uncover new ways to think about important substantive issues.

Basic Research

In search models, the distribution of wealth may be nondegenerate, which makes analytic solutions difficult at best. As a result, efforts have been made to construct environments where the distribution is degenerate. One such environment is the large-household model, where each household consists of a non-atomic measure of agents. In the literature which uses this framework, perhaps surprisingly, there does not exist a perfectly clear notion or at least a definition of equilibrium. In "Equilibrium Concepts in the Large-Household Model," Tao Zhu formulates two concepts of equilibrium in the context of a monetary environment. In what he calls the no-commitment approach, individual household agents search for partners and make their own utility maximizing choices in separate meetings. In what he calls the commitment approach, the household chooses a contingent plan for individuals, who must abide by this plan. To obtain a degenerate distribution of money under the no-commitment approach, a large household with nonlinear preferences is converted into one with quasilinear preferences. In the commitment approach, commitment itself yields a degenerate distribution. However, allocations in the commitment approach are not subgame perfect, which results in a weaker equilibrium concept.

In "Anonymous Markets and Monetary Trading," C. D. Aliprantis, Gabriele Camera, and Daniela Puzzello point out that random anonymous matching is not in itself sufficient to make money essential in models with alternating decentralized and centralized markets (which many people are studying these days). They show eliminating money need not re- duce efficiency if the actions of trading partners are observable and if are sufficiently patient. The idea is that centralized trading allows rapid exchange of privately observed information, so a credible informal enforcement scheme exists, which sustains the efficient allocation without money. However, this "social norm" is not robust to adding a small amount of noise in observations. They go on to examine variations on the basic environment where money is essential. In particular, infinitely-lived agents repeatedly move in and out of markets populated by numerous anonymous agents, who are always complete strangers because their trading paths intersect at most once. In this environment money is essential. The authors' techniques can be used to expand the modeling of environments in which money has a necessary role.

Models such as Kiyotaki and Wright (1989) have both barter and monetary equilibria. These models, however, cannot explain the transition from a barter equilibrium to a

monetary equilibrium. In "The Rise of Money: An Evolutionary Analysis of the Origins of Money," Kevin Hasker and Tahmilci develop a model that addresses the issue. A standard theory of stochastic evolution is modified so that agents are able to calculate out-of-equilibrium continuation values. This is a subtle but important point because, in the context of monetary economics, accepting money today—which is an out-of-equilibrium action in a barter equilibrium—requires the agent to calculate the future value associated with this action. In the standard stochastic evolution model, agents are assumed to behave myopically (choosing the action that maximizes current period payoffs). Hasker and Tahmilci demonstrate that under reasonable conditions, nonconvertible fiat money emerges naturally in complex economies.

Despite the recently successful efforts at characterizing optima in models where money is essential, virtually all research on business cycles with money ignore optimality. This gap is in part explained by the prominence of real-business-cycle models for which the standard welfare theorem applies; that is, decentralized equilibria correspond to Pareto-optimal allocations. Since there are no welfare theorems for monetary economies, concerns about the optimality of responses to real shocks in a monetary context should be raised. In "Optimal Propagation of Real Shocks in a Cash-in-Advance Model" Ricardo Cavalcanti shows that the optimal allocations in monetary models can be history-dependent; that is, output is not only a function of the current realization of the real shock, but it depends on the entire history of the economy. Thus, monetary models may display business-cycles properties that are different in nature from their standard real counterparts, with different implications for amplification and propagation of shocks.

In "Learning by Matching," Manuel Amador and Pierre-Olivier Weill study the interaction between public and private learning channels in a large population. At the beginning of time, private information about the state of the economy is disseminated among a large number of agents. Then, in every period, each agent observes a public and private noisy signal centered around the average action taken by the population. The public signal represents an endogenous aggregate variable such as a prices or quantities. The private signal represents the information gathered through private communication and local interactions. Armador and Weill identify conditions such that the average learning curve is S-shaped; that is, learning starts slow, intensifies rapidly, and finally converges to the truth, as found by a number of empirical studies. Perhaps surprisingly, they show that increasing public information at the beginning slows down learning in the long run and, under some conditions, reduces welfare.

Fiscal Policy

In "Dynamic Taxation, Private Information, and Money," Christopher Waller studies optimal fiscal and monetary policy in a model where the frictions giving rise to money are modeled explicitly. Most of the literature on the inflation tax adopts a Ramsey approach.

government is assumed to be unable to use lump sum taxes and chooses distortionary taxes to maximize welfare of the representative agent. There are two drawbacks to this approach. First, lump-sum taxes achieve the first-best allocation, and the approach simply prohibits their use for unmodeled reasons. Second, money is "forced" into the model via some shortcut (money-in-the-utility function, cash-in-advance, etc.). Waller combines modern monetary theory with the .new dynamic public finance. using an overlapping generations model with agents born every other period. The young and old trade in perfectly competitive centralized markets. In middle age, agents receive preference shocks and trade among themselves in an anonymous search market where money is essential. The efficient allocation trades off risk sharing against production efficiency. For a government to replicate this outcome in a monetary economy, without record-keeping, distortionary taxation of money is needed: lump sum taxation is feasible, but not optimal.

Following the Ramsey tradition, Boragan Aruoba, and Sanjay Chugh study "Optimal Monetary and Fiscal Policy when Money Is Essential." Three important findings emerge: The Friedman rule (zero nominal interest rates) is typically not optimal; inflation should be stable over time; and optimal policy includes a subsidy to capital. The deviation from the Friedman rule emerges because of the Ramsey planner's desire to create a wedge between the decentralized market—where money is essential—and the centralized market—where it is not. They argue that inflation is not a substitute for a missing tax, as is sometimes assumed in standard models, but is precisely the right tax to use in this case. Inflation should be stable over time, in contrast to standard Ramsey models. Finally, since production in the decentralized market is lower than the optimal level, there is underaccumulation of capital, which can be ameliorated by a subsidy to capital income. These three findings contrast sharply with traditional Ramsey models.

Banking and Payments

In "Payment Networks in Search Model of Money," Antoine Martin, Michael Orlando, and David Skeie study a model that gives rise to a payment network. Specifically, they assume agents can pay a one-time cost to access a central database that keeps track of payments. This approach will prove fruitful to study payments in a general equilibrium setting. Two incentive constraints are key in this context: Agents must have an incentive to pay the cost to access the database, and agents with access to the data must have an incentive to produce. Conditions are determined under which these constraints are simultaneously relaxed. The analysis supports the "no surcharge rule" of credit card companies (the price of a good should be the same regardless of whether it is purchased with cash or credit card). Multiple equilibria can arise because of network effects, and policies are studied that ameliorate this. These policies include increasing the money supply and taxing agents who do not pay the access cost to the database, the latter being more efficient.

In "Banking, Inside Money, and Outside Money," Hongfei Sun studies a model with spatial separation, private information, and aggregate uncertainty. A bank provides two services: It intermediates by managing monetary payments, and it conducts stochastic monitoring. The optimality and operating characteristics of various payment arrangements are examined, including inside money, outside money, and the coexistence of both. Banking with only inside money strictly dominates. Outside money allows agents to participate in future markets, which provides a disincentive for them to pay off current obligations. Inside money that expires immediately after settlement, however, has no value in the future and, hence, avoids this result. Previous papers identify greater flexibility and the ability to respond to unanticipated shocks as benefits associated with private money; the current paper identifies another and quite novel advantage of private money.

The Friedman rule is optimal in a wide class of models and is a straightforward policy to implement, requiring only that the nominal interest rate be zero. Thus, models that imply the optimality of the Friedman rule also imply that monetary policy is simple. However, in practice, monetary policy appears to be difficult. In "Banks, Open Market Operations, and the Friedman Rule," Stephen Williamson studies four models of money. In the first three, some version of the Friedman rule is optimal, even in cases where it has been claimed in the literature that it is not. Therefore, the Friedman rule is even more robust than previously thought. However, in a model of money and credit with market segmentation, the Friedman rule is not optimal, and determining optimal monetary policy is a nontrivial task, consistent with reality. This ongoing work very much helps to integrate theory and policy.

A well-known model by Green and Lin assumes a version of the Diamond-Dybvig banking model with a finite number of agents, independent determination of each agent's type, and sequential service. For special preferences, Green and Lin show that the ex ante first-best allocation is the unique equilibrium outcome even with private information about types. In "The Role of Independence in the Green-Lin Diamond-Dybvig Model," David Andolfatto, Ed Nosal, and Neil Wallace show, via a simple argument, that uniqueness of the truth-telling equilibrium holds for general preferences—and, in particular, for a constrained-efficient allocation whether first-best or not. The crucial assumption that is needed is independence. This very much advances and helps our understanding of modern banking theory.

In "Competition in the Supply of Fiat Money," Luis Araujo and Braz Camargo model an economy where both the demand and supply of money are endogenously determined, and money is essential. This paper provides a formal assessment for a commonly held view that money should not be relegated to the market. For example, Friedman (1959) argued that "monetary arrangements have seldom been left entirely to the market, even in societies following a thoroughly liberal policy in other respects, and that there are

good reasons why this should have been the case." Two distinct market structures are considered. In one, there is natural monopoly in that only one agent produces money, and in the other, money can be produced by more than one agent. The authors focus on the dynamic incentives of the money supplier in providing a stable currency in order to build a good reputation, and how outcomes are affected by competition.

Standard theory implies the correlation between velocity and nominal interest rates is negative. However, in the 1984 to 2004 U.S. data, this correlation is positive. In "U.S. Money Demand: Theory and Evidence," Marcus Hagedorn develops a theory of money demand that reconciles these observations. After a careful look at the data, he builds a model where Diamond-Dybvig banks are integrated into a dynamic equilibrium framework. Households receive liquidity shocks that determine their rate of time preference, and firms receive productivity shocks. Households need money for transactions, but firms can use either bonds or money for investment. A bank is an intermediary that provides households with money or investments, and purchases bonds from firms. In the model, the monetary transmission mechanism works through banks and, specifically, through the way they manage the provision of liquidity. The model is consistent with the above-mentioned facts.

Money and Other Assets

Money and nominal bonds coexist, with bonds dominating money in the rate of return. In recent history, government bonds bear little default risk and they have most of the intrinsic features of money, but they do not act as medium of exchange to the same extent. The literature explains coexistence by assuming legal restrictions that reduce individuals' utility. Finding an efficiency role for legal restrictions, and hence for illiquid bonds, seems important. In "Welfare Improvement from Restricting the Liquidity of Nominal Bonds," Shoyoung Shi constructs a model in which a medium of exchange helps decentralized markets for goods, where individuals face shocks to tastes and production. Because capital markets are imperfect, they cannot insure against these shocks easily. A legal restriction prohibits nominal bonds from being used as a means of payment in a subset of trades. Shi shows this legal restriction can improve the society's welfare by effectively providing partial insurance against the shocks.

In "Counterfeit Money," Elena Quercioli and Lones Smith develop a tractable theory of counterfeiting. They assume counterfeiters compete against both law enforcement and the public, who must verify currency. There is variable verification effort. Hence, individuals play a "hot potato" game, where everyone seeks to avoid acquiring counterfeit currency. With higher denominations, counterfeiters producer better quality, and verifiers respond with greater effort. The theory yields some key time series and cross-sectional patterns of counterfeiting: (a) the ratio of seized to passed money rises in the denomination; (b) the vast majority of counterfeit money used to be seized before

circulation, while now the reverse holds; (c) the most counterfeited denominations are $10, $20, and $100, while $5 and $50 are least; and (d) the share of passed money found by Federal Reserve Banks generally falls with the value of the note, while their passed money rate is a U-shaped function of the economywide passed money rate.

In "Financial Market Frictions and Price Stability," Gabriele Camera and Francesco Ruscitti study the impact of inflation on real and financial activity in the Lagos-Wright model. Financial intermediaries are banks that collect deposits and make loans to provide working capital. The asset-transformation process, however, is subject to frictions that generate a random non-interest cost to banks. In the model, inflation amplifies the severity of financial market frictions, which affects productive activities. This paper complements a literature that studies mechanisms to which excessive inflation is especially disruptive. As inflation grows, the cost of liabilities rises, and banks reduce costs by undertaking fewer and cheaper projects. Also, there exists an inflation threshold beyond which the loan supply is so limited that firms cannot get enough funds to hire workers. This constrains employment, production, and consumption. This model constitutes an important step in understanding the role of monetary policy in financial intermediation.

Schumpeter long ago established a link between finance and innovation. Leo Ferraris and Makoto Watanabe, in "Money, Credit, and Collateral," examine an aspect of this link that has received scant attention: the relationship between innovation and means of payment. On one hand, innovators would like to sell innovations and reap rewards immediately; on the other, they want to have enough time to sell innovations without facing the competition from the first buyers, who may copy them. In a world with limited enforcement and limited property rights, the choice of the payment instrument will affect the extent to which innovations spread through the economy. The use of credit is beneficial for the innovator since it allows him to be a monopolist seller for some time into the future (until he delivers the blueprint), but the cost is that he receives a portion of this payoff in the future. This style of research, exploring the links between finance and innovation, is potentially very important for understanding growth and development. All of the work reviewed in this section help us to understand the interplay between finance and the macroeconomy.

Labor Markets

The relationship between inflation and unemployment is one of the most important issues in macroeconomic theory and policy. Much progress has been made on these issues recently by incorporating frictions using search theory, but existing models analyze either unemployment or inflation separately. Aleksander Berentsen, Guido Menzio, and Randall Wright develop a framework to analyze the two phenomena together in "Inflation and Unemployment." Their paper makes contributions to two disparate literatures and provides a unified model for theory, policy analysis, and quantitative work. The au-

thors calibrate their model and discuss the extent to which it can account for the salient aspects of the U.S. experience over the past 50 years with inflation, unemployment, interest rates, and velocity. They also discuss optimal fiscal and monetary policy.

In "Money in Production and Frictions in the Labor Market" Alok Kumar formalizes the idea that money facilitates the organization of production processes. In the model, a double-coincidence-of-wants problem arises due to the potential mismatch between what workers consume and what firms produce. Money facilitates trading in both the labor market and the goods market. The model allows a natural integration of imperfect labor markets into monetary economies. The paper studies the effects of inflation on output, employment, real wages, and welfare under three wage-setting mechanisms: individual bargaining, union bargaining, and an efficiency-wage mechanism. It is shown that an increase in inflation reduces output and employment under all three mechanisms and raises real wages under individual and union bargaining. Both this and the paper by Berentsen, Menzio, and Wright contribute to the integration of macrolabor and monetary economics.

Liquidity and Inflation

In "Liquidity," Ben Lester, Andrew Postlewaite, and Randall Wright develop a model with real assets and money, where these assets may have differential liquidity (i.e., a differential probability of being accepted in exchange). They study which agents and transactions are affected by monetary policy, and the effects on prices and allocations. They show that even agents and transactions that never use cash are affected by inflation or interest rates. They also endogenize liquidity in the model by introducing recognizability: For example, money may be perfectly recognizable, but not everyone is informed enough to distinguish real from counterfeit claims to other assets. Given the costs of becoming informed, the model determines who accepts what in equilibrium. A version with money and T-bills is used to analyze open-market operations.

In "Liquidity and Spending Dynamics," Veronica Guerrieri and Guido Lorenzoni study how financial frictions affect the response of an economy to aggregate shocks, focusing on liquidity constraints. They use the Lagos-Wright model, augmented with productivity shocks. They show that the response to aggregate shocks depends on the rate of return on liquid assets. When liquid assets pay a low return, agents hold smaller reserves, and the response tends to be larger. In this case, agents expect to be liquidity constrained and, due to a precautionary motive, their consumption decisions respond more to changes in expected income. On top of this, there is a general equilibrium effect that magnifies the economy's response. This model is extremely interesting because it shows that inflation (monetary policy) can, in principle, have a big impact on the response of the economy to real shocks.

In "Heterogeneity and the Suboptimality of the Friedman Rule," Paola Boel and Gabriele Camera attempt to harmonize various strands in the literature on the cost of inflation by retaining the explicit microfoundations found in the Lagos-Wright model, but enriching it by introducing some heterogeneity to generate a tractable distribution of wealth. The model is calibrated and used to quantify the welfare cost of inflation. At the aggregate level, estimates for the cost are not far from estimates in Lagos-Wright. However, heterogeneity affects the conclusions a lot. When distributional effects are examined, inflation can be welfare-increasing for a segment of the population. This is another example of how models with explicit microfoundations can greatly enhance our understanding of policy issues.

In "Search, Market Power, and Inflation Dynamics" by Allen Head and Beverly Lapham, buyers in each of two countries observe a random sample of prices posted by both domestic and foreign sellers. Shocks to money or productivity change the returns to search in both countries. Movements in search intensity result in changes in the average markup, and this has a number of implications for both price-level movements and fluctuations in both output and consumption across countries. Money is non-neutral in the short run as shocks to the money growth rate have different effects on agents' returns to search in the two countries. As even transitory shocks result in persistent movements of the distribution of wealth across countries, the responses of search intensity and thus the movements in the real exchange rate that they generate are persistent as well. The model can account for several facts difficult to capture with previous models.

In "The Welfare Costs of Expected and Unexpected Inflation," Miguel Faig and Zhe Li introduce imperfect information about nominal shocks à la Lucas into the Lagos-Wright framework. Now the welfare cost of erratic monetary policy depends not only on the variability it generates in real GDP, but also on the concentration of these effects on particular segments of the economy and on the tolerance of individuals to fluctuations in that segment. The empirical analysis indicates that the welfare gain of eliminating the U.S. monetary business cycle observed from 1892 to 2005 is only 0.0026 percent of GDP while the welfare gain of reducing the observed average rate of inflation to the Friedman rule is 0.2 per cent of GDP. This calls for a reconsideration of what issues are most policy relevant in monetary economics. All of the papers reviewed in this section suggest reconsideration of some fundamental policy issues.

Market Structure

Financial markets, such as the NYSE or the NASDAQ, are highly liquid, warranted by various market-makers, dealers and other specialists that facilitate trades. While their role as providers of immediacy may be inconspicuous in normal times, it becomes critical in times of large imbalances. In "Crashes and Recoveries in Illiquid Markets," Ricardo Lagos, Guillaume Rocheteau, and Pierre-Olivier Weill take seriously the line that asset markets

are not frictionless and that intermediaries are there to remedy these frictions. They assume that there are trading delays that limit investors' access to the market, while dealers have instantaneous access. The authors derive conditions on fundamentals under which dealers accumulate asset inventories when the aggregate demand for the asset falls. They show dealers' intervention is useful when a crisis is severe, short-lived, and unanticipated. They show dealers are less likely to intervene in times of crisis if they have high market power. And they show dealers are less likely to provide liquidity during a market crash when trading delays are short.

In "A Model of Money with Multilateral Matching," Manolis Galenianos and Philipp Kircher study a model of monetary exchange where goods are allocated according to auctions. Their novel result is that homogeneous buyers hold different amounts of money, leading to equilibrium price dispersion. Two important frictions are that the buyer can visit only one seller at a time and sellers have some capacity constraint. The intuition behind the main result that identical buyers choose to bring different amounts of money to the decentralized market is straightforward: If all buyers held the same amount of money, then a deviant bringing infinitesimally more would always win the good and hence enjoy a discretely higher probability of consuming for negligible additional cost. To examine how output is affected by inflation, an entry decision by sellers is introduced. The result is that entry is suboptimal except at the Friedman rule.

People produce goods so that they can be sold to others; when people sell goods they can then purchase the goods they desire. If there is little or no money in the economy, agents have to rely on barter, which can be especially tough for producers of specialized goods. If, however, there is a significant amount of liquidity in the economy, the problems faced by specialists are reduced. In "Money and the Variety of Goods," Ken Burdett and Andrei Shevchenko investigate the number of goods that will be produced. The model emphasizes the interpretation of goods as bundles of characteristics. Agents can produce specialist or generic goods. Preferences are heterogeneous, and each agent has a favorite variety: A generic good does not yield as much utility as your favorite. Barter and monetary allocations are compared, and the authors find that money encourages the production of specialist varieties. Although this is an old idea, is it useful to formalize it, and this model does deliver several new insights.

Lagos and Wright propose a framework for monetary policy analysis that is analytically tractable. The tractability, however, comes at a cost. By allowing agents to rebalance their portfolios for free every period, the centralized market in the Lagos-Wright model effectively provides an "insurance" that allows agents to undo all individual-specific trading shocks immediately. The special assumptions needed to generate tractability rule out potentially interesting effects. In "Endogenously Segmented Markets in a Search-Theoretic Model of Monetary Exchange," Jonathan Chiu and Miguel Molico add frictions that imply agents choose to attend the centralized market only infrequently and hence an

inventory of money for decentralized market trade. By endogenizing the decision to participate in the centralized market, the model endogenizes the responses of velocity, output, and other variables. The welfare cost of inflation is different from the baseline Lagos-Wright model because inflation can now distort the consumption profile, affect market participation, and redistribute money holdings. There are more channels through which inflation can affect welfare in the new model. First, it induces agents to participate in the centralized market more frequently, which is costly in terms of resources. Second, even if the participation rate were unchanged, agents spend their money faster to avoid the inflation tax, making consumption less smooth. Third, inflation redistributes money holdings. This new class of models greatly enhances our understanding of the effects of inflation.

In "Bidding for Money" Benoit Julien, John Kennes, and Ian King explore the robustness of the results from search-theoretic monetary models when the assumptions of random matching and bilateral bargaining are replaced with different microfoundations. In particular, they introduce directed search and multilateral matching into a model which is otherwise standard, based on Shi and Trejos-Wright (1995), and they consider two pricing mechanisms: ex ante price posting, and ex post bidding. Once search is directed (guided by prices) the arrival rate that sellers face is no longer given, but a function of the price associated with a seller. Thus, directed search allows for the existence of monetary equilibria with price posting—something that cannot be obtained with random matching. Overall, they show that this variation of the Shi-Trejos-Wright model preserves many of its original properties, and hence the conclusions of previous monetary models are actually quite robust.

Summary

The 2006 workshop provided an excellent opportunity to hear about work by, and to interact with, some of the best researchers in the areas of theory, policy, and quantitative analysis relating to money, banking and payments systems. Hopefully the insights offered in these papers helps not only theoretical monetary economists, but also economists such as central bankers with a more practical policy-oriented view.

Papers Presented at the
Summer Workshop on Money, Banking, and Payments

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Basic Research

Equilibrium Concepts in the Large-Household Model

Tao Zhu (Cornell University)

Anonymous Markets and Monetary Trading

C. D. Aliprantis, Gabriele Camera, and Daniela Puzzello (Purdue University)

The Rise of Money: An Evolutionary Analysis of the Origins of Money

Kevin Hasker and Ahmet Tahmilci (Bilkent University)

Optimal Propagation of Real Shocks in a Cash-in-Advance Model

Ricardo Cavalcanti (Getulio Vargas Foundation)

Learning by Matching

Manuel Amador (Stanford University) and Pierre-Olivier Weill (New York University)

Fiscal Policy

Dynamic Taxation, Private Information, and Money

Christopher Waller (University of Notre Dame)

Optimal Monetary and Fiscal Policy when Money Is Essential

Boragan Aruoba (University of Maryland), and Sanjay Chugh (Board of Governors of the Federal Reserve System)

Banking and Payments

Payment Networks in Search Model of Money

Antoine Martin (Federal Reserve Bank of New York), Michael Orlando (Federal Reserve Bank of Kansas City), and David Skeie (Federal Reserve Bank of New York)

Banking, Inside Money, and Outside Money

Hongfei Sun (University of Toronto)

Banks, Open Market Operations, and the Friedman Rule

Stephen Williamson (University of Iowa)

The Role of Independence in the Green-Lin Diamond-Dybvig Model

David Andolfatto (Simon Fraser University), Ed Nosal (Federal Reserve Bank of Cleveland), and Neil Wallace (University of Pennsylvania)

Competition in the Supply of Fiat Money

Luis Araujo (Michigan State University) and Braz Camargo (University of Western Ontario)

U.S. Money Demand: Theory and Evidence

Marcus Hagedorn (University of Frankfurt)

Money and Other Assets

Welfare Improvement from Restricting the Liquidity of Nominal Bonds

Shoyoung Shi (University of Toronto)

Counterfeit Money

Elena Quercioli (Tulane University) and Lones Smith (University of Michigan)

Financial Market Frictions and Price Stability

Gabriele Camera and Francesco Ruscitti (Purdue University)

Money, Credit, and Collateral

Leo Ferraris (London School of Economics) and Makoto Watanabe (Universidad Carlos III de Madrid)

Labor Markets

Inflation and Unemployment

Aleksander Berentsen (University of Basel), Guido Menzio (Northwestern University), and

Randall Wright (University of Pennsylvania)

Money in Production and Frictions in the Labor Market

Alok Kumar (University of Victoria)

Liquidity and Inflation

Liquidity

Ben Lester, Andrew Postlewaite, and Randall Wright (University of Pennsylvania)

Liquidity and Spending Dynamics

Veronica Guerrieri (University of Chicago) and Guido Lorenzoni (Massachusetts Institute of Technology)

Heterogeneity and the Suboptimality of the Friedman Rule

Paola Boel (Bowdoin College) and Gabriele Camera (Purdue University)

Search, Market Power, and Inflation Dynamics

Allen Head and Beverly Lapham (Queen's University)

The Welfare Costs of Expected and Unexpected Inflation

Miquel Faig and Zhe Li (University of Toronto)

Market Structure

Crashes and Recoveries in Illiquid Markets

Ricardo Lagos (New York University), Guillaume Rocheteau (Federal Reserve Bank of Cleveland), and

Pierre-Olivier Weill (New York University)

A Model of Money with Multilateral Matching

Manolis Galenianos and Philipp Kircher (University of Pennsylvania)

Money and the Variety of Goods

Ken Burdett (University of Pennsylvania) and Andrei Shevchenko (Michigan State University)

Endogenously Segmented Markets in a Search-Theoretic Model of Monetary Exchange

Jonathan Chiu (University of Western Ontario) and Miguel Molico (Bank of Canada)

Bidding for Money

Benoit Julien (University of New South Wales), John Kennes (University of Copenhagen), and

Ian King (University of Otago)

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papers

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