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Recent developments on money and finance: an introduction ⋆

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This symposium assembles some current theoretical work on monetary theory, banking, and finance. Its genesis was in the Spring of 2002, when Bruce Smith was considering editing a mini-symposium on banking and finance for *Economic Theory*. Independently, I was proposing to run a mini-conference on monetary theory at Purdue University, as I had done in May 2000. The Managing Editor of *Economic Theory,* Roko Aliprantis, suggested that Bruce and I join forces to host a conference at Purdue focusing on some of the best current theoretical work on monetary theory and finance. Bruce and I liked the idea, and in a short time we had a program ready. I loved working with Bruce; I had met him only occasionally prior to our cooperation for this symposium, but I felt as if I had lost a long-time friend when Bruce passed away on July 9, 2002.[1] The contents of this volume represent the finished product of what Bruce and I had envisioned when we first talked about this project in the Spring of 2002.

The papers published in this collection span a wide variety of themes, from monetary policy to the optimal design of financial systems, from the study of the causes of financial crises to payments system design. I am convinced they will serve as a useful reference to all researchers interested in the study of financial systems and monetary economies.

⋆ The papers in this symposium were presented at the conference "Recent Developments on Money and Finance" held at Purdue University in May 2003. The conference was sponsored by Purdue University's Department of Economics, and the Central Bank Institute of the Federal Reserve Bank of Cleveland. I wish to thank every conference participant, the symposium's referees, Steve Williamson for comments on this introduction, Denise Wilson for help with the logistics of the conference, and Beverly Cohen for editorial assistance.

[1] An obituary is in Economic Theory, 2003, **21**(4), p. A5. In this issue, we celebrate Bruce Smith's accomplisments in the field of Economics by publishing the remarks on his work presented by three prominent economists at the Bruce D. Smith Memorial Conference held in Austin, April 12 and 13, 2003, organized by Bruce Champ and Scott Freeman.

The papers are naturally organized into two groups. A first group focuses on topics related to the optimality of financial mechanisms, banking regulation, financial crises, financial fragility, and payment systems. A second group of papers is broadly concerned with the efficiency of the decentralized monetary solution in economies characterized by equilibrium heterogeneity.

To the first group belong the contributions of Antinolfi and Huybens, Boyd, Chang and Smith, Cavalcanti, Labadie, Hernandez-Verme, and Williamson. Perhaps the central element of commonality of these contributions is the emphasis on how informational frictions impinge on the operation of financial systems. Such frictions are introduced in the environment by exploiting – in several different ways – the notion of spatial/informational separation introduced by Townsend (1980). Most papers in this group embed these notions of separation in the overlapping generations framework of Samuelson (1958), one of the workhorses of monetary theory. Cavalcanti and Williamson differ in that the first author introduces frictions using a random-matching framework in the tradition of Kiyotaki and Wright (1989), while the second author proposes an entirely novel – and carefully constructed – economic environment with spatial separation.

The symposium is opened with a piece by Boyd, Chang and Smith. This work fills a gap in the literature on the optimal design of deposit insurance and bank regulation, in a general equilibrium context. The authors present an environment where banks face aggregate uncertainty, and there is scope for government-supplied deposit insurance. They consider several different methods to finance deposit insurance: insurance premium collections, taxes, and seignorage. The analysis shows that these methods interact in complex ways and that, in general, too heavy a reliance on one tool may cause an adverse economic impact. An interesting normative implication of the analysis, in particular, is that monetization of banks bailouts' costs is not necessarily inefficient. A key positive implication, instead, is the paper highlights the significance of conducting analyses of deposit insurance in a general equilibrium framework. The study shows how, in general equilibrium, the relationship between deposit insurance financing and economic activity is complex, and often general equilibrium effects lead to counter-intuitive implications.

Cavalcanti also focuses on optimal bank regulation. His study explains why banks provision of inside money should be coordinated with the intermediation of capital, a result that calls into question Friedman's (1959) recommendation that money and credit be separated. This intuition is developed in a model characterized by the sharing of storable goods, as in Diamond and Dybvig (1983), and the creation of inside money, as in recent extensions of the random-matching model of Kiyotaki and Wright (1989). In the model, financial intermediaries, or banks, are agents whose informational history is common knowledge; society can keep – and costlessly access – a public record of their actions. The remaining agents, non banks, are anonymous and sometimes have idle capital. Banks' informational advantages allow them to better allocate capital than can nonbankers, for three main reasons. These informational advantages give banks an incentive to make transfers to nonbankers, to avoid defection-induced punishments, and allow banks to produce for other bankers without having to use money (so their capital use is more efficient). Banks issue (but do not *over*issue) money, which increases the turnover

of capital. Hence, banks can be both conservative issuers of inside money, but also trustworthy receivers of idle capital.

The work of Labadie is also concerned with optimal financial arrangements, and it contributes to the literature on stochastic life-cycle models. The central theme is the study of the dynamic inefficiencies that arise in a stochastic pure exchange monetary overlapping generations economy, where risk sharing opportunities are limited. In particular, she studies the merit of different financial mechanisms that can provide intergenerational insurance. In addition to fiat money, these mechanisms include equivalent government-based approaches such as risk-free bonds, state-contingent taxes, social security, or income insurance. Labadie considers two categories of Pareto optimal allocations, 'conditional' and 'equal-treatment.' She finds that government involvement is not necessary to achieve conditionally Pareto optimal allocations, i.e. allocations where agents have state-dependent marginal rates of substitution. A self-financing transfer system is sufficient. However, state-contingent government taxation is required to achieve equal-treatment Pareto optimality, i.e. allocations where agents have state-independent marginal rates of substitution.

The next two papers, by Antinolfi and Huybens, and Hernandez, both deal with the issue of financial fragility. Antinolfi and Huybens set up a model that helps us better understand the possible causes of international financial crises. They adopt an overlapping generations framework to model a small open economy and present an example in which an increase in the world interest rate can be associated with a precipitous decline in economic activity. The paper highlights how the interaction of domestic informational frictions, perfect capital mobility, and foreign interest rates can combine to provoke a sudden depreciation of the exchange rate and a prolonged decline in output. In particular, the authors describe conditions under which two different equilibria exist. One has a high level of output and a minor costly-state-verification problem, and the other equilibrium has a higher level of output and a severe costly-state-verification problem. In addition, the authors show their model can successfully simulate a crisis path that is qualitatively consistent with occurrences such as the Mexican 1994 crisis.

Hernandez-Verme, also focuses on the study of small open economies within the context of an overlapping generations model. Unlike Antinolfi and Huybens, however, her main concern is the relative merits of different methods for achieving price stability. To do so she merges the overlapping generations model with a spatial model of Townsend to compare the merits of alternative exchange rate regimes – namely, fixed and flexible. This analysis is carried out within a context where financial intermediaries perform a real allocative function, there are multiple reserve requirements, and the economy is subject to credit market frictions. She finds there is scope for endogenous volatility independent of the exchange rate regime in place. Another key finding is that under floating exchange rates, a positive trade-off between domestic inflation and output can be exploited under credit rationing but only if inflation is small. In fact, there exists an inflation threshold beyond which domestic output suffers.

Williamson's contribution to the payment systems and monetary policy literatures, concludes this first group of papers. He explores the implications of private

money issue for monetary policy, and for the role of fiat money, constructing a model with spatial separation that is novel and that gives an explicit foundation for the existence of limited-participation financial frictions. These frictions, give rise to trade patterns where both money and credit are used to settle trades. Basically, the world looks like a matrix, with countable rows and columns. Each household consists of several agents, some of which move, in each period. Those travelling across rows trade with cash, while those moving across columns use credit. Two different competitive equilibrium regimes are studied: one in which private money is prohibited, and one in which it is allowed. In each case, the choice of using money or credit is dictated by random shocks that determine agents' trade locations. In the first regime liquidity effects are possible as – due to limited financial market participation – unanticipated cash injections alter the distribution of consumption. This effect vanishes when private money is allowed, hence the optimal monetary arrangement is different. Because the cash-constraints, which arise *endogenously,* are affected by monetary policy and financial restrictions, the paper warns us that the typical use of said constraints is not immune to the Lucas critique.

A second subset of papers, including papers by Berentsen, Camera and Waller, Corbae and Ritter, Peterson and Shi, and Shevchenko and Wright, belongs to an area of research in macroeconomics, that is mainly focused on studying the efficiency of allocations achieved via decentralized and uncoordinated private decisions. These articles are broadly concerned with the efficiency of the decentralized monetary solution in economies characterized by equilibrium heterogeneity. The themes considered are the equilibrium distribution of prices and monetary balances, the link between price dispersion and the process of money creation, the acceptability of money, and the interaction between money and credit.

The dominant element of commonality of this subset of papers is their modeling methodology, based on the search-theoretic approach to monetary economics developed by Kiyotaki and Wright (1989). This is an equilibrium model of search and matching in the tradition of, for example, Lucas and Prescott (1974), Diamond (1982), Mortensen (1982), or Pissarides (1990). The central concern of this methodology is the provision of an explicit connection between the environmental constraints – spatial and informational, in particular – the trading frictions assumed in the environment, and the possible allocations. These environmental constraints are made explicit by assuming pairwise matching and anonymous trading. This approach is appealing to some monetary economists for the following reasons. By moving away from the Walrasian paradigm – and towards a framework where trade is fragmented and subject to search frictions – money's medium-of-exchange role is made precise and its value determined in equilibrium, avoiding the imposition of ad-hoc constraints or intrinsic features of money.

The opening piece is by Shevchenko and Wright, who generalize the standard search-theoretic model of money, introducing exogenous heterogeneity along various dimensions (preferences, production technologies, storage costs, etc.). The paper's central concern is endogenizing the acceptability of money, showing how it reflects the different possible dimensions of heterogeneity in a very simple and intuitive manner. The authors rigorously prove that, in general, there can be multiple self-fulfilling equilibria with different degrees of acceptability. They also show

that acceptability responds to parameter changes in economically meaningful ways. Interestingly, existence of equilibrium can be demonstrated by means of a simple fixed point on $[0, 1]$, despite the multi-dimensionality of heterogeneity. The key element is finding a condition such that a simple summary statistic, or 'trait,' can be built to describe each agent type. Then, the distribution of this statistic is sufficient to characterize existence of equilibria. All agent types whose traits are below a certain threshold value accept money, and the others do not.

Berentsen, Camera and Waller's piece is also a methodological contribution to the study of random matching models with heterogeneity. In contrast to the previous paper, however, they focus on endogenously arising heterogeneity in nominal wealth and prices. The objective is to construct a tractable model where the equilibrium monetary distributions can be analytically characterized. The model relaxes the Trejos-Wright-Shi framework along two dimensions. Agents can hold multiple units of indivisible money, as in Camera and Corbae (1999), but can also trade using contracts with random components, in the tradition of Prescott and Townsend (1984). The possibility of random money transfers allows more flexible monetary offers, and so it cures some of the inefficiencies arising from money's indivisibility. The authors study a simple trading pattern – where every buyer is interested in making small purchases – and analytically characterize the monetary and price distribution. This is interesting because the ability to characterize price and monetary distributions can be quite helpful in studying the effects of money creation in economies when there is heterogeneity in money holdings, a classic question in monetary theory (e.g. Bewley, 1983).

The study of price dispersion is the central theme of the contribution of Peterson and Shi. They study the relationship between inflation, price dispersion, and welfare. To do so, the authors construct a search-theoretic model with heterogeneous goods and households that is based on the divisible-money framework developed by Shi (1997). In it, the monetary distribution is degenerate, but the money stock grows over time, generating inflation. They demonstrate how inflation affects price dispersion via two distinct channels. First, greater money growth rates create an allocative inefficiency because inflation lowers money's value, which in turn impairs the agents' ability to purchase their most desired goods. Also, this can engender higher price dispersion. Second, inflation can affect price dispersion via the buyers' search intensity. With endogenous search intensity, the economy can exhibit multiple equilibria. An increase in the growth rate of money – hence inflation – in some cases has the potential to increase search intensity only if an increase in the inefficiency in the allocation of goods associated with higher inflation raises the surplus to the buyer in a match.

The paper by Corbae and Ritter brings the symposium to a close. Theirs is a contribution to the foundations of monetary theory literature, whose central subject is the study of optimal trading arrangements, and in particular the use of credit, in monetary and non-monetary economies with explicit informational frictions. They construct random matching economies where a public record keeping device is unavailable, but agents can form long-term bilateral trading relationships. They do so by extending the standard indivisible-goods search model of money by allowing any two randomly matched agents to establish a long-term partnership, if it is in

their interest. In this way, agents can naturally exploit match-specific knowledge of trading histories to improve the decentralized monetary allocation. A result is particularly interesting, in this study. The authors carefully show how the introduction of money in a non-monetary economy generates a moral hazard problem. That is, the consumption insurance provided by money weakens incentives to form credit partnerships. Thus, although money and credit partnerships may co-exist, such equilibria can be dominated, in ex-ante welfare, by equilibria without money.

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