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Imperfect interbank markets and the lender of last resort

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ABSTRACT

This paper presents a monetary model in which interbank markets have limited commitment to contracts. Limited commitment reduces the proportion of assets that can be used as collateral, and thus banks with high liquidity demands face borrowing constraints in interbank markets. These constraints can be relieved by the central bank (a lender of last resort) through the provision of liquidity loans. I show that the constrained-efficient allocation can be decentralized by controlling only the money growth rate if commitment to interbank contracts is not limited. Otherwise, a proper combination of central bank loans and monetary policy is needed to bring the market equilibrium into a state of constrained efficiency.

1. Introduction

Interbank markets are one of the most important systems in a modern economy because they allow liquidity to be readily transferred from banks with surpluses to those with deficits. Therefore, they are the focus of monetary policy and have significant effects on the whole economy. On occasion, however, the markets malfunction, as they did during the crisis that began in the summer of 2007. At these times, central banks must conduct large-scale interventions to prevent further economic deterioration. Dating back to Bagehot (1873), the importance of a lender of last resort (LLR) has been stressed by many economists, but there is much less consensus on the nature of its role. For example, Fischer (1999, p. 86) stated, "While there is considerable agreement on the need for a domestic lender of last resort, some disagreements persist about what the lender of last resort should do."[1]

The purpose of this paper is to provide a monetary model for understanding the role of an LLR in an economy with an imperfect interbank market. In my model, interbank markets provide insurance for banks against the risk of sudden liquidity demands, but this insurance may be damaged by the limited commitment problem. Limited commitment denotes the inability of individual banks to fully commit to debt repayment. If this problem is significant, banks' assets can be used as collateral, and banks that experience high liquidity shocks may be subject to borrowing constraints of the kind studied by Kiyotaki and Moore (1997). In a crisis, limited commitment is attributed to the inability of troubled banks to borrow money from healthy banks.

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[1] See also Goodfriend and King (1988), Bordo (1990), and Kaufman (1991).

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My analysis is based on the works of Champ et al. (1996) and Smith (2002). I employ an overlapping generations model in which spatial separation and limited communication generate a transactions role for fiat money. At the end of each period, a fraction of agents is relocated to a different location. The only asset they can use is fiat money. This allows money to be held even when dominated in the rate of return. Limited communication implies that relocated agents cannot transact using privately issued liabilities in the new location. However, agents who are not relocated are not constrained by the rule of limited communication: they can pay for consumption goods with checks or other credit instruments when they are old. The other asset is a storage technology. The stochastic relocations act as shocks to agents' liquidity preferences and create a role for banks to provide insurance against these shocks, as in Diamond and Dybvig (1983).

The model also assumes that a location is divided into a number of ex ante identical regions, each of which contains a number of depositors and a representative bank that behaves competitively. Different regions receive different liquidity shocks; this gives rise to regional heterogeneity, which motivates interbank trades. The basic role of interbank markets is to allow reallocations of liquidity from banks with excess to banks with deficits. As noted above, however, the markets may be imperfect because of the limited commitment problem.

The main results of the paper are as follows: (i) the market equilibrium can achieve constrained efficiency in perfect interbank markets when the central bank implements zero-inflation policy; (ii) when interbank markets malfunction because of limited commitment, banks cannot diversify their liquidity risks; consequently, the market equilibrium cannot achieve constrained efficiency even if the central bank implements optimal monetary policy; (iii) if the central bank prints money and lends freely to the banking system at the same interest rate as interbank markets do, all banks that face borrowing constraints can meet liquidity demands by obtaining the central bank loans; consequently, the market equilibrium will achieve constrained efficiency under the implementation of zero-inflation policy.

Several other papers have studied the imperfections of interbank markets and the role of central bank intervention in mitigating these imperfections. Allen and Gale (2000) analyzed the spread of banking failure through interbank markets. Diamond and Rajan (2005) investigated optimal liquidity provision by a central bank when interbank markets are subject to aggregate liquidity shocks and contagious failure. Acharya et al. (2012) studied the imperfections of interbank markets in times of crisis due to moral hazard, asymmetric information, and monopoly power, and found that central bank lending can ameliorate the inefficiency. Allen et al. (2009) considered incomplete interbank markets that result in limited hedging opportunities for banks and found that a central bank can implement the constrained-efficient allocation by using open-market operations. Freixas et al. (2010) examined two different types of liquidity shocks to the banking system and found that the central bank can implement the constrained-efficient allocation by setting interest rates that depend on the pattern of the shocks.

The main difference between these studies and mine is that my model explicitly assesses the role of money. In practice, the central bank has two important functions: to control the money supply and, as the LLR, to lend money to banking systems.[2] However, most of the existing literature on the LLR does not consider monetary policy. In contrast, the model described here allows us to study not only optimal monetary and LLR policy, but also the interaction between these policies.

This paper bears a theoretical similitude to the works of Antinolfi et al. (2001) and Antinolfi and Keister (2006). These papers studied the role of LLR policy by combining the overlapping generations model with random relocation. Antinolfi et al. (2001) studied the relationship between various LLR policies and inflationary equilibria in a pure-exchange economy. They found that an LLR policy in which the central bank freely lends money at a zero nominal interest rate generates Pareto optimal steady-state equilibrium and non-optimal inflationary equilibria, and discussed several LLR regimes that do not generate non-optimal equilibria. Antinolfi and Keister (2006) studied an LLR policy and a monetary policy in a similar environment and found that the policy combination achieves a state of the market equilibrium that closely approximates the first-best allocation of resources. Their LLR policy plays a key role in mitigating communication friction, which generates a transaction role for money. In contrast, this paper focuses on the inefficiency of interbank markets and a corrective LLR policy. That is, it focuses on using the LLR to reduce not communication friction but friction caused by limited commitment within interbank markets. Thus, this paper considers how the constrained-efficient allocation, as chosen by a planner facing communication friction but not limited commitment, can be decentralized through monetary and LLR policy.

The rest of the paper is organized as follows. Section 2 presents the model of the study, from which Section 3 derives the constrained-efficient allocation. Section 4 reviews the behavior of banks in economies with perfect and imperfect interbank markets and derives equilibria in both types of economies. Section 5 introduces the role of the LLR and considers an LLR-created equilibrium. Section 6 concludes the investigation. All omitted proofs are contained in the Appendix.

2. The model

I consider an economy consisting of an infinite sequence of overlapping generations that live for two periods. Periods are represented by $t = 0, 1, 2, \ldots$. At each period there is a single good that can be used for consumption and investment. The world is divided into two spatially separated locations, and each location consists of a number of regions of unit mass.

[2] Goodfriend and King (1988) refer to these functions as monetary policy and banking policy, respectively.