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Explaining breakdowns in interbank lending: A bilateral bargaining model

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ABSTRACT

The paper provides a simple model for interbank loans. Since interbank trades are usually over-the-counter transactions, we use a bilateral bargaining model and apply the *Nash* bargaining solution. We determine the threat points and the bargaining frontier of debtor and creditor banks. We ask under which conditions interbank lending will break down.

1. Introduction

During financial crises, interbank markets become severely impaired. Interest rates for uncollateralized interbank loans rise and banks stop lending to each other. A common explanation for such interbank market breakdowns refers to informational asymmetries and argues that increases in counterparty risk or liquidity risk reduce banks' willingness to lend on interbank markets (Freixas and Holthausen, 2005; Heider et al., 2009). Other explanations assume trading frictions and bank participation constraints to justify interest rate spikes on interbank markets (Ashcraft et al., 2011). These papers model interbank market trades as the outcome of a competitive tender procedure where all banks are price-takers and implicitly assume that a large number of banks compete for liquidity

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offered by a large number of banks. This contrasts with the fact that interbank loans are typically carried out bilaterally, often as non-brokered over-the-counter (OTC) trades between single banks.

We present a model where unsecured interbank lending decisions are the outcome of a bargaining process between two banks. Each bank holds risky assets and is subject to an idiosyncratic liquidity shock. The outcome of the bargaining process depends on the two banks' threat points, which reflect the banks' liquidity shocks and the riskiness of their assets, and the bargaining frontier which describes other points 'northeast' of the threat points that both banks can reach by agreeing on an interbank loan. In our model, the likelihood of the conclusion of an interbank loan increases in the borrowing bank's project return and its success probability while the lending bank's success probability is irrelevant.

In contrast to existing models of bilateral interbank trades (Kahn and Santos, 2010; Acharya and Bisin, 2011; Castiglionesi and Wagner, 2013), we do not analyze underinsurance due to counterparty risk externalities which create a case for bank regulation. Instead, we explicitly analyze the bargaining process and take the relative bargaining power of lenders and borrowers into account which is decisive for the determination of interest rates (Bartolini et al., 2005; Bech and Klee, 2011; Ennis and Weinberg, 2013). Different from Mallick (2004, 2009), where bargaining failure results from the possibility that potential customers of the liquidity-poor bank will switch to another bank, we abstract from such client switching possibilities because they are relevant only for longer-term exposures (Schanz, 2009). Rather, we assume that banks must stick to their customers and explain bargaining failure as resulting from the projects' characteristics of the two banks. Finally, we do not consider search behaviour on interbank markets and thus differ from Afonso and Lagos (2012) who allow for several rounds of random bilateral trading but abstract from a counterparty risk. We, instead, analyse such a counterparty risk but neglect any search activities.

We abstract from the existence of central banks' standing facilities and concentrate on the conclusion of an interbank loan contract between two banks. Exclusion of a lending facility may be justified by the fact that central bank loans are only provided against collateral while we concentrate on the unsecured interbank market. In addition, a deposit facility may be excluded because in many countries such facilities did not exist until recently and because deposit rates are currently almost zero.

2. Set up

We consider two banks $i = 1,\ 2$ and a continuum of depositors of mass one. All agents are risk-neutral. Banks live for three periods. At $t = 0$, each bank raises 1 *EUR* from depositors who earn zero interest. Deposits are assumed to be fully insured, with the premium normalized to zero. Each bank decides to invest a share of $\alpha_i \in [0, 1]$ in an illiquid and risky project. Although we assume $\alpha_1 = \alpha_2 = \frac{1}{2}$ for reasons of tractability later on, we find that the model's structure is easier to grasp with the investment shares α_i rather than $\frac{1}{2}$ for both banks.

At $t = 1$, bank i learns the tuple (R_i, p_i), meaning that bank i's project yields the (gross) return $1 < R_i \leqslant 2$ with probability $0 < p_i \leqslant 1$ and the return 0, otherwise. The returns are independently distributed. The project payments are realized at $t = 2$, only. At $t = 1$, bank i suffers a liquidity shock because a fraction $\lambda_i \in (0, 1)$ of depositors demand repayment of their deposits. Depositors of bank i obtain λ_i at $t = 1$ and $1 - \lambda_i$ at $t = 2$, either from bank i or from the deposit insurance. Also at $t = 1$, banks bargain about an interbank loan.

A bank that cannot meet the depositors' claims either at $t = 1$ or at $t = 2$ is dissolved and has a payoff of zero. Bank i has two different sources for meeting the depositors' first-period claims:

- Bank i can use the liquidity reserve $(1 - \alpha_i)$.
- Bank i can take out a loan L_i from the other bank where $L_1 = -L_2 > 0$ indicates that 1 takes a loan from 2.

Additionally, we assume that the interbank loan is not collateralized and that banks are subject to limited liability. If a bank becomes insolvent at $t = 2$, depositors are paid out first.

We assume that bank 1 is the debtor bank. If bank 1 is in need of an interbank loan at $t = 1$, we have

$$L_1 = \alpha_1 + \lambda_1 - 1 > 0$$