



Interbank loans, collateral and modern monetary policy



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ABSTRACT

This study develops a novel agent-based model of the interbank market with endogenous credit risk formation mechanisms. We allow banks to exchange funds through unsecured and secured transactions, which facilitates the flow of funds to the most profitable investment projects. Risk premiums result from banks' forecasting rules and depend on past performance of the benchmark risk factors and interest rates. Our model confirms basic stylized facts of the interbank interest rates and volumes. We also find that network structures within the secured market segment are characterized by the presence of dealer banks, while we do not observe similar patterns in the unsecured market. We perturb the model with exogenous shocks and policy scenarios which correspond to unconventional monetary policies.

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1. Introduction

Interbank markets proved to play a crucial role in propagating the distress during the recent financial crisis (Brunnermeier, 2009). Unsecured lending determines clear links between creditors and debtors, stating explicitly the risk relation. If a debtor defaults, the lender's risk materializes and she has to bear the losses. Once the losses cannot be absorbed anymore, a shock in one institution translates into a shock in the other, leading to a domino effect or contagion.

Secured lending is less susceptible to bank shocks. Once a debtor defaults, the creditor receives the collateral, dampening possible spillover effects. However, secured lending depends heavily on the quality of collateral. In fact, Gorton and Metrick (2012) argue that the recent crisis was ignited by a collateral shock, leading to the so-called “popcorn” effect in the entire financial system. Importantly, both interbank lending segments are heavily interdependent as, because of the equilibrium condition, there should be no arbitrage opportunities between them.

At the same time, because repo lending is usually backed by securities similar to those used in the Open Market Operations (OMO), secured lending serves as a key channel of the monetary policy transmission mechanism (Heider and Hoerova, 2009). Since the unprecedented policy measures taken by the Federal Reserve, the Bank of Japan and the European

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Central Bank (i.e. collateral policies, asset purchase programs and forward guidance; often referred to as the Modern Monetary Policy (MMP)), the amount of collateral and its valuation have been heavily affected. This indeed raises questions on the management of the interbank lending, on the quality of collateral and on the effectiveness of the monetary policy transmission.

For instance, [De Andoain et al. \(2014\)](#) document significant fragmentation of the TARGET 2 settlement system in the period from June 2008 until August 2013. Although the ECB's non-standard policy actions have alleviated the tensions, they report that the fragmentation remains considerable in the European unsecured money market. [Bech et al. \(2015\)](#) focus on changes in lending patterns between fed funds market participants around the time of the Lehman Brothers failure. They confirm the emergence of significant lending patterns in the aftermath of the implementation of the “Interest on Reserves” policy by the Federal Reserve on October 9, 2008. In particular they find that around the Lehman failure the banks formed separate lending clusters with each other, confirming market fragmentation.

As a consequence of lack of market confidence, an increased amount of funds has been traded in the secured market at the cost of decreased volumes in unsecured markets. In 2013 the total amount of unsecured transactions has decreased by 34%, whereas in the same time the repo market grew by 17% ([European Central Bank, 2013](#)). After the slowdown following the onset of the financial crisis, the value of interbank repos has increased and reached around EUR 5499 billion by the end of 2013 ([European Central Bank, 2014](#)).¹ The crisis revealed that although the repo rates are less susceptible to market distress, the haircuts can be significantly exacerbated ([Mancini et al., 2015](#)). This can be both a result of either a run on repo ([Gorton and Metrick, 2012](#)) or a credit crunch spiral ([Krishnamurthy et al., 2014](#)).

This study develops a novel Agent-Based Model (ABM) with endogenous network and credit risk formation mechanisms, providing a generic framework to simulate the interbank dynamics. By doing so, this paper contributes to the already existing literature which assumes exogenous credit risk premiums ([Heider and Hoerova, 2009](#)) or exogenous network structures ([Gai et al., 2011](#)). In our model the risk premiums in the unsecured and secured market result from the banks' forecasting rules and therefore depend on the past performance of the benchmark risk factors and interest rates. Consequently, because credit risk forecasts affect the demand and supply of interbank liquidity, the interbank network can form non-trivial structures, which we confirm in our stylized experiments.

We consider a set of banks who have to decide on the optimal allocation of their assets across asset classes. Banks can choose to invest in bonds, investment projects or can decide to lend out money in the secured or unsecured interbank market. This allocation is made on the basis of the expected returns in each market and the covariance between market returns, in line with the [Markowitz \(1952\)](#) portfolio theory. The expected returns on the bond and interbank markets are predicted with either a trend-following or adaptive rule. A requirement threshold is invoked on the amount that is kept in reserve and there are restrictions on going long and short. Banks that enter the interbank market are repeatedly matched based on their offered rate, such that the banks with the best offers transact together, until no further trades are possible. At the start of a new period the bond portfolios mature, investment projects end and banks pay back their debt in the interbank market. If at any point the equity of a bank become negative, or if a bank fails to pay back their debt, the bank is declared bankrupt.

We confirm higher interest rate and lower volume in the unsecured market compared to the secured interbank market. Additionally, we replicate stylized fact about the distribution of a number of bank balance sheet characteristics. We invoke different scenarios, either exogenous or policy-driven, to the model and analyze their effects on the system dynamics and interbank network structures.

The model reveals non-trivial interbank network structures, such as clustering patterns and the emergence of dealer banks in the repo market segment. Our model shows that banks might take advantage of deteriorating macroprudential regulations, like higher target leverage ratios, exacerbating financial risks and increasing the number of bank failures.

The model suggests that MMP can significantly change the interbank market structures. For instance, an exogenous repo shock, which decreases the quality of collateral securities, can be contained by a central bank asset purchase programs both through price and quantity channels. Additionally, forward guidance makes banks more precise in the forecasts which restores market confidence and shifts asset allocation towards more risky classes.

The organization of this paper is as follows. A review of the related literature is discussed in [Section 2](#). The model and the trading mechanism are described in [Section 3](#), together with the timing of the markets. [Section 4](#) shows the resulting behavior of the baseline model and [Section 5](#) presents the scenario analyses. Finally, [Section 6](#) concludes.

2. Literature review

Because of its increased importance as a source of interbank liquidity, the secured market attracted a lot of attention in the professional literature. Analyzing a large data set of repo transactions, [Mancini et al. \(2015\)](#) find that the central counterparty-based segment of the repo market (where the majority of interbank repos are traded) can act as a shock absorber during a period of distress. They argue that this characteristic is driven by anonymous trading via a central counterparty and reliance on safe collateral. For practical reasons our model assumes a kind of repo market maker, or a

¹ Compared to EUR 4633 billion in 2008 at the time when the financial crisis erupted.

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