Journal of Financial Stability 25 (2016) 193–205

Contents lists available at ScienceDirect

Journal of Financial Stability

journal homepage: www.elsevier.com/locate/jfstabil

The cost of collateralized borrowing in the Colombian money market: Does connectedness matter?

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ARTICLE INFO

Article history:
Received 17 February 2015
Received in revised form 8 July 2015
Accepted 8 October 2015
Available online 21 October 2015

JEL classification:
C21
G21
G32

Keywords:
Money market
Interbank
Collateral
Lending relationships
Spatial econometrics

ABSTRACT

We estimate two standard spatial econometric models in order to study the cost of collateralized borrowing among Colombian financial institutions, and its relationship with traditional determinants (leverage, size, and borrowing concentration), and with the observed linkages among financial institutions (spatial variables). Our main findings indicate that (i) the selected models are able to capture the extent and significance to which linkages matter for money market's liquidity pricing in the form of a spatial dependence parameter; (ii) spatial effects play a significant role in the pricing of liquidity in the collateralized money market; (iii) direct and spill-over effects from financial institutions' size and the spatially lagged value of financial leverage and borrowing concentration most significantly determine the cost of collateralized borrowing; (iv) traditional determinants are of low explanatory power by themselves. Concurrent with contemporary lending relationships literature, our results emphasize the importance of connectedness among financial institutions, and are essential in the context of a macro-prudential perspective of financial stability and systemic risk.

1. Introduction

The Global Financial Crisis that begun in 2007 has prompted connectedness as a risk factor worth including in models that deal with complex systems, where the latter are characterized by their connectedness and hierarchical structure (Casti, 1979). In this vein, making connectedness an explanatory variable is important because (i) it concurs with the view that *the market* is not a mythical institution that mediates all economic interactions, but a weighted and directed network of institutions (Barabási, 2003), and (ii) it breaks with the traditional – reductionist – understanding of financial markets, which concurs with the current interest in the macro-prudential perspective of financial stability.

Krugman (1996, p.9) acknowledges a major shortcoming of mainstream economics: How do economists routinely deal with the question of how the economy organizes its use of space? The short answer is that mostly they do not deal with the question at all. Traditional econometric models are non-spatial in nature, where the multidirectional dependence among the sample observations is ignored. Nevertheless, some econometric models have acknowledged the importance of spatial concepts, such as distance, adjacency or linkages between observations. Such models have been labeled as spatial econometrics.

Accordingly, we make connectedness an explanatory variable of the cost of collateralized borrowing in the Colombian money market by means of spatial econometrics. In our case connectedness is defined by the existence and intensity of collateralized borrowing/lending flows (i.e. transactions) among local financial institutions in a six-month period. Making connectedness an explanatory variable follows a rather recent strand of economics literature that regards the network approach to financial systems as particularly important for assessing financial stability and for capturing externalities (see Allen and Babus, 2009). This strand of literature has risen since the early work of Allen and Gale (2000), who demonstrated (theoretically) that contagion effects depend on the pattern of connections between financial institutions, and

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http://dx.doi.org/10.1016/j.jfs.2015.10.003
1572-3089/

has flourished thereafter with numerous theoretical and empirical studies[1].

Thus, we attempt to answer a fundamental question: does connectedness matter for the cost of collateralized borrowing in the Colombian money market? Our attempt hinges on (i) collateralized lending spreads over the Central Bank's reference rate as the cost of secured borrowing in the Colombian money market, as suggested by León (2012); (ii) the Colombian money market collateralized borrowing network as the spatial variable for the models; and (iii) two basic specifications of spatial econometric models (i.e. a Spatial Autoregressive and a Spatial Durbin model), which enable us to decompose spatial effects (network effects) into those caused by a change in a financial institution's variables on the lending cost of its counterparties and – hence – on its borrowing costs (i.e. direct effect) and those that affect other financial institutions' borrowing costs (i.e. indirect effects).

The dataset and its usage under the spatial econometrics framework are unique. A detailed set of all collateralized lending transactions between financial institutions during a six-month period is not publicly available on a regular basis for most markets. Moreover, despite network analysis techniques have been implemented in order to understand money markets' observed connective structure[2], financial institutions' borrowing costs in the money market have not been studied under an approach that includes network (spatial) effects as an explanatory variable—to the best of our knowledge.

Our work is related to Fecht et al. (2011). They also used a detailed set of collateralized transactions (repos), but in their case the borrowers are German banks that bid for liquidity from the European Central Bank in discriminatory price auctions. Therefore, despite borrowers are likely to bid according to their liquidity needs, the European Central Bank does not exert any counterparty risk assessment or monitoring that affects liquidity pricing or rationing accordingly. In our case, as the borrowing is among financial institutions with limited liquid resources, the market discipline content of our dataset is expected to be stronger. Our dataset includes credit and non-credit institutions, whereas Fecht et al. (2011) only considers credit institutions; however, due to Colombian money market characteristics, we work with a smaller sample. The econometric approach also differentiates both research works: in our case the actual borrowing network is used as an explicit spatial variable within a spatial econometrics framework.

Besides being a novel approach to further understanding financial networks and the money market, the results contribute to related literature in four ways. First, we find that traditional variables, such as leverage, size, and borrowing concentration, are of low explanatory power by themselves. There is a positive and significant effect of the spatial variable (i.e. the borrowing network) on the cost of borrowing among financial institutions, which suggests the existence of spillover effects and positive feedbacks in the money market. Moreover, spatial effects of the same traditional factors result in a model able to explain the existence of borrowing spreads that vary across financial institutions despite the collateralized nature of the local money market.

Second, results contribute to lending relationships literature by examining how spatial effects (i.e. the structure of borrowing networks) may determine the cost of borrowing in money markets along with traditional explanatory variables (e.g. size, leverage). Concurrent with Cocco et al. (2009), Babus (2012), and Afonso et al. (2013), results confirm that lending relationships play an important role in the pricing of liquidity in the money market. But, unlike those authors, we use the actual borrowing network within two spatial econometric models to make such confirmation.

Third, we contribute to the lending relationships literature by examining how collateralized lending affects liquidity pricing. Literature suggests that trading against collateral should result in direct trading among all financial institutions, resembling an anonymous trading exchange (see Babus, 2012; Afonso et al., 2013), in which the access to and cost of liquidity should be rather homogeneous in cross-section. This is, in a world with known values for collateral and no transactions costs, the cost of collateralized liquidity should be equal to the risk-free rate, and spread should be zero, because there is no fear of default as the collateral could be freely seized and sold (Gorton and Metrick, 2012). Our results confirm that spatial and non-spatial effects may be significant even when local sovereign securities are used as collaterals in financial institutions' borrowing. Consequently, our results confirm that lending relationships not only play an important role in the pricing of liquidity in the non-collateralized money market (as in Cocco et al., 2009), but also in the collateralized one. Our results overlap with those of Gorton and Metrick (2012), who find a significant correlation between financial institutions' counterparty risk and repo spreads in the US during the Global Financial Crisis. Likewise, our results are related to those reported by King (2008), who finds significant market discipline in 20 years of panel data containing an equivalent and stable mix of collateralized (i.e. repos) and non-collateralized (i.e. Fed funds) borrowing between financial institutions in the US.

We suggest some plausible explanations for this finding. As in León (2012), local sovereign securities may not be ideal (i.e. information insensitive, functioning like cash) in the sense of Gorton and Metrick (2010), which could explain why financial institutions raise repo spreads to attract funds (see Gorton and Metrick, 2012). Also, as reported by King (2008) and French et al. (2010), the potential costs resulting from having a collateral trapped during a bankruptcy proceeding may explain why repo rates reflect counterparty risk[3].

Finally, our results demonstrate the relevance of connectedness to analyze financial markets and financial stability. The spatial econometric model is able to capture the extent and significance to which linkages matter for money market's liquidity pricing in the form of a spatial dependence parameter. The level and dynamics of the spatial dependence parameter provide information on the degree and evolution of potential contagion among money market participants, respectively, and may serve as a measure of the potential effect of connectedness on financial contagion and systemic risk.

This article is structured as follows. The next section introduces the Colombian money market and the market discipline content of its collateralized transactions. The third section introduces spatial econometric models, while emphasizing on the selected Spatial Autoregressive and Spatial Durbin models. The fourth section describes the datasets, and the fifth presents the estimation results. The last section presents some relevant remarks about the results, along with several potential research avenues.

[1] For instance, Gai and Kapadia (2010), Haldane and May (2011), Battiston et al. (2012a, 2012b).

[2] Several references on interbank networks analysis are available. For instance, Inaoka et al. (2004) for Japan; Bech and Atalay (2010) and Soramäki et al. (2007) for the U.S.; Boss et al. (2004) for Austria; in't Veld and van Lelyveld (2014) for the Netherlands; Craig and von Peter (2014) for Germany; Fricke and Lux (2014) for Italy; Cajueiro and Tabak (2008) for Brazil; Martínez-Jaramillo et al. (2012) for Mexico; and León et al. (2014) for Colombia.

[3] According to Gorton and Metrick (2010), the ideal collateral is a security that functions like cash: this is, collaterals must be information-insensitive securities by design, with their price being immune to adverse selection whenever they are traded. Therefore, if collaterals are not information-insensitive securities, concerns arise about the ability to recover the collateral value when sold in the market if the counterparty did default. French et al. (2010) highlights that if failure is a concern despite pledged collateral is senior to the claims of other creditors, the potential cost of having the collateral trapped in a bankruptcy proceeding for even a short period is large relative to the interest due on a one-day loan.