



Contagion in the interbank market: Funding versus regulatory constraints[☆]



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ABSTRACT

The contagion potential of mark-to-market accounting rules interacting with regulatory constraints is compared to that of funding constraints in a network of banks. The fair value accounting rules were amended at the height of the crisis to break the vicious link between allegedly irrational market prices and regulatory constraints. Anecdotal evidence from the recent crisis suggests that funding constraints posed more serious problems to banks than regulatory constraints. Simulation results show that, for low equity and high levels of short-term debt relative to liquid asset holdings, the contagion potential arising due to funding constraints is higher than the one due to accounting induced regulatory constraints. Allowing balance sheet valuation to affect the expectations about future insolvency, and implicitly, the roll-over decision of short-term creditors, can mitigate or amplify systemic risk depending on which contagion channel is dominating. These results could be interesting for a regulator wishing to achieve a trade-off between transparency, the main goal of fair value accounting, and financial stability.

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1. Introduction

This paper compares the contagion potential of mark-to-market accounting rules interacting with regulatory constraints to that of funding constraints in a network of banks during a crisis. Mark-to-market valuation has been criticized for fuelling the balance sheet contagion channel during the 2007–2008 financial crisis. Critics blame the accounting regime for creating a mechanical link between the decrease in asset prices, accounting losses and the resulting asset fire sales needed to satisfy regulatory constraints (see for example [Merrill et al., 2012](#); [Allen and Carletti, 2008](#); [Wallison, 2008](#); [Forbes, 2009](#)). The latter, the argument goes, will create additional downward pressure on prices, leading to further write-downs and regulatory constraints of banks holding the

same asset and applying mark-to-market valuation, reinforcing the above mentioned spiral.

Anecdotal evidence from the 2007 to 2008 crisis shows that illiquidity, and not regulatory insolvency due to large fair value losses lead to the demise of systemically important banks. Banks like Bear Stearns, Lehman Brothers, Fortis and Northern Rock experienced a silent run on their wholesale funds, although their regulatory capital ratios were adequate.¹ These funding constraints eventually spread to other banks in the system, potentially generating a negative feedback between funding constraints and asset fire sales. This type of contagion was potentially more serious than the one described by the asset fire sale – regulatory constraints channel, as frequently argued in the debate on the procyclical character of fair value accounting.

The theoretical literature on contagion due to funding constraints focuses on the combination of the decrease in the collateral value and the resulting increase in roll-over risk. In [Gai et al. \(2011\)](#), a shock to repo haircuts deteriorating the liquidity condition of all banks funded through repos leads to liquidity hoarding that eventually spreads to all banks in the system. In [Brunnermeier and Pedersen \(2009\)](#) the drop in asset prices causes margin calls and

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¹ See [Shin \(2009\)](#) for a detailed account on the run on Northern Rock.

asset fire sales, depressing prices even further. [Gai et al. \(2011\)](#) also considers the interaction of various network properties with these liquidity constraints, but they exclude asset fire sales as a source of liquidity. Overall these papers do not consider the negative feedback between regulatory constraints, the reporting regime and the resulting assets fire sales.

This paper considers both contagion channels in isolation and simultaneously. Their effect is not simply additive, since they are allowed to interact. In particular, liquidity risk interacts with future solvency risk, similar to [Gauthier et al. \(2010\)](#). The difference to their setting is that solvency risk arises due to the combination of regulatory constraints, mark-to-market accounting and asset fire sales. Regulatory constraints are deteriorated due to the negative feedback between falling prices and asset fire sales. Depending on which contagion channel dominates, the mutual reinforcement of the two channels is mitigated in the presence of unsecured debt. The roll-over decision on unsecured debt depends on the mark-to-market balance sheet value. Asset fire sales needed to satisfy regulatory constraints deteriorate the balance sheet value, possibly affecting the roll-over decision on unsecured debt. If the creditor considers that the default probability in the next period is too high, he will cut the unsecured credit line and ask for collateral, basing his roll-over decision on the value of the collateral. The creditor will update her roll-over decision conditional on the market value of the collateral, forcing banks to engage in fire sales, thus amplifying funding constraints.

The paper has four main findings. First, across a wide range of possible network structures, contagion risk increases with the degree of maturity transformation and decreases with the size of the liquidity buffer of banks in the network. In addition, the relationship between interconnectedness and system stability depends on the size of the initial shock to asset values. It seems that the funding constraints and the regulatory constraints channel have different thresholds for the size of the initial shock beyond which more interconnections amplify contagion. Second, at low levels of capital and high short-term debt relative to liquid asset holdings, the contagion potential is higher due to funding than due to accounting induced regulatory constraints; in contrast, when equity is high, funding constraints dominate regulatory constraints irrespective of the level of the liquidity buffer and the interbank short-term debt. Third, activating both contagion channels in the absence of unsecured debt leads to a mutual reinforcement of the two channels. Fourth, allowing the two contagion channels to interact through the relevance of accounting information for the roll-over decision on unsecured debt can mitigate or amplify systemic risk depending on which channel is dominating.

The intuition for these findings is that market discipline acts as a complementary tool to regulatory constraints. Low capitalized banks are sanctioned by the regulator through regulatory constraints. Even when banks are adequately capitalized from a regulatory perspective, the constraint imposed by creditors can be stricter than the one imposed by the regulator. Both the regulatory constraint and the roll-over decisions are relaxed by a higher liquidity buffer and a lower level of interbank short-term debt, albeit at a different rate. The dominance of one of the two channels is explained by the different sensitivity to these variables. The initial level of net worth plays a larger role for the regulatory constraints channel, implying that increasing capital is more effective in reducing solvency risk than liquidity risk. Intuitively, the latter is more sensitive to the degree of maturity transformation and the value of posted collateral. Thus, funding constraints are related to market valuation, can lead to contagion, and exist independently of the accounting regime. When the secured funding constraint is more binding than the regulatory constraint, allowing the two channels to interact can mitigate systemic risk. This is because

allowing accounting information to affect the funding decision of short-term creditors enables the access to unsecured debt, making asset fire sales due to funding constraints less likely.

Fair value accounting rules were relaxed at the height of the crisis after intense pressure from politicians and banks, allegedly in order to level the playing field with US banks and to enhance financial stability. The results show that the vulnerable balance sheet structure of banks poses a larger threat to financial stability than the balance sheet valuation per se. This source of vulnerability may be better addressed through adequate regulatory tools, like the NSFR and the LCR ratio,² rather than by changing the accounting regime. These results could be interesting for a regulator wishing to achieve a trade-off between transparency, the main goal of fair value accounting, and financial stability.

The rest of the paper is organized as follows: [Section 2](#) outlines the related literature, [Sections 3–5](#) present the model and the extensions, [Section 6](#) describes the data used to calibrate the model, [Section 7](#) discusses the results and [Section 8](#) concludes.

2. Related literature

This paper contributes to two strands of literature. The first is the literature on mark-to-market contagion arising due to the interplay between the accounting regime and regulatory constraints. The second strand of literature relates to the contagion due to funding constraints.

The reference setup on contagion due to the interplay between accounting and regulatory constraints belongs to [Cifuentes et al. \(2005\)](#). Contagion arises due to direct interbank links, common assets and asset fire sales depressing the value of the common assets in a network of banks facing regulatory constraints. In this setting, a higher liquidity buffer and capitalization mitigates contagion. [Gauthier et al. \(2012\)](#) use this setting to derive implications for macro-prudential capital requirements. [Nier et al. \(2007\)](#) study how the relationship between network connectivity and system fragility changes in the presence of asset fire sales driven by the default of one bank in the system. In the absence of liquidity effects due to asset fire sales, the relation between network connectivity and system stability is hump-shaped. Introducing asset fire sales outweighs the shock absorbing capacity of increased connectivity. This effect is particularly pronounced at low levels of net worth of the banks in the system. [Allen and Carletti \(2008\)](#) show how the mark-to-market accounting regime can play a key role in the contagion between the banking and insurance sector. The net asset value of banks turns negative because they hold the same asset as the insurance sector. Market frictions lead to liquidity pricing in bad states of the world, unrelated to the fundamental value of the asset. The funding constraints of these banks are not an issue for banks in [Allen and Carletti \(2008\)](#). It could be that banks pledge the same asset whose price is subject to liquidity pricing as collateral. These banks could face funding constraints before the regulatory constraints become an issue. This aspect is modeled in this paper in a network setting. The literature on contagion due to funding constraints does not consider the negative feedback between regulatory constraints and the accounting regime. The link between market liquidity and funding constraints is analyzed by [Brunnermeier and Pedersen \(2009\)](#). Margins increase as prices drop, as they are a function of asset price volatility. Arbitrageurs must finance the haircut on their investments with their own capital and they will be forced to sell assets in order to satisfy margin calls, depressing prices even further. This leads to higher margins

² NSFR and LCR are the Net Stable Funding Ratio and the Liquidity Coverage Ratio as defined under Basel III.

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