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Information acquisition and financial contagion ☆

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Abstract

This paper incorporates costly voluntary acquisition of information *à la* Nikitin and Smith (2007) [Nikitin, M., Smith, R.T., 2007. Information acquisition, coordination, and fundamentals in a financial crisis. Journal of Banking and Finance, in press, doi:10.1016/j.jbankfin.2007.04.031], in a framework similar to Allen and Gale (2000) [Allen, F., Gale, D., 2000. Financial contagion. Journal of Political Economy 108, 1–33], without relying on any unexpected shock to model contagion. In this framework, contagion and financial crises are the result of information gathering by depositors, weak fundamentals and an incomplete market structure of banks. It also shows how financial systems entering a recession can affect others with apparently stronger economic conditions (contagion). Finally, this is the first paper to investigate the effectiveness of the Contingent Credit Line procedures, introduced by the IMF at the end of the nineties, as a mechanism to prevent the propagation of crises.

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> *''We are giving countries a greater financial incentive to adopt crisis-resistant policies by offering those that do Contingent Credit Lines to protect them from contagion effects''*

Stanley Fisher, First Deputy Managing Director of the IMF (1994–2001), Policy Issues Forum, Washington DC, April 28, 2001.

1. Introduction

Financial crises are costly and frequent events. During the last twenty five years, more than two thirds of the International Monetary Fund (IMF) member countries have suffered some kind of financial troubles (see Lindgren et al., 1996; Beim and Calomiris, 2001).

These financial crises reflect the fact that the financial system, and especially the banking sector, not only can amplify and transfer problems originated in other sectors of the economy, but can also be a main driver of such crises (for example, the financial crises of Mexico 1994, Korea 1997 and Turkey 2000 had the banking sector weaknesses at the core). Financial institutions are often linked to each other through direct portfolio or capital connections that are desirable ex ante, but during a crisis the failure of one institution can have direct negative effects on the other institutions linked to it (see Rochet and Tirole, 1996; Aghion et al., 2000; Freixas and Parigi, 1998; Freixas et al., 2000; Allen and Gale, 2000).

This paper provides a novel view on the interplay of sunspots and fundamentals in the development of financial crises. In particular, it does not rely on any unexpected shock to model contagion. In this framework, contagion and

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financial crises are the result of information gathering by depositors, weak fundamentals and an incomplete market structure of banks. It also shows how financial systems entering a recession can affect others with apparently stronger economic conditions (contagion). Finally, this is the first paper to investigate the effectiveness of the Contingent Credit Line procedures, introduced by the IMF at the end of the nineties, as a mechanism to prevent the propagation of crises.

We model a four region economy, where the representative bank of each region has access to an illiquid long term investment project that allows depositors to increase their expected welfare. Half of the banks are going to receive a low return on their investment and will be called "bad banks", the other half will receive a high return on their projects and will be called "good banks". Additionally, banks will maintain interbank linkages to reduce aggregate uncertainty. Nevertheless, full linkages among banks are not always possible and sometimes unstable structures are set and contagion may occur.

We present three different banking market structures. First, a market where all banks maintain interbank linkages (complete market structure). Second, the neighboring case, where banks are just financially connected to their neighbors but indirectly to all the others. Finally, the island case, where each bank keeps linkages with only one bank. We will show that in the complete market structure the first best allocation is achieved. In the neighboring case, different equilibria are possible: a verification equilibrium with partial runs (with and without contagion), a verification equilibrium with total runs, a full-run equilibrium and a no-run equilibrium.

In the verification equilibria depositors gather information and penalize inefficient banks. In one of those equilibria, bank runs only take place in bad banks (partial bank runs), although other banks might be affected as well (contagion). In the second equilibrium, there is a global withdrawal from the banking system in a contagious fashion. There is also a full-run equilibrium, where depositors do not gather information but withdraw in a pure panic way, and one, characterized by no runs and no information gathering. In the island case three different equilibria are possible: the verification equilibrium, the full-run equilibrium, and the no-run equilibrium. In the verification equilibrium, bank runs are partial and there is no contagion. Nevertheless, the expected utility is higher in the neighboring case than in the island case.

The equilibria with crises of the model are fundamentals-based and panic-based at the same time. Bank runs are related to fundamentals, although this does not mean that bad fundamentals per se cause the run. Investors' coordination on a particular equilibrium is triggered by a self-fulfilling prophecy. When the system is at rest, individuals do not find it optimal to gather information and so the model explains why there are periods in which individuals do not modify their expectations on banks. However, if for any reason they decide to invest in information gathering they would penalize those states of nature in which banks establish inefficient links. This would cause the liquidation of bad projects, but it might also generate contagion and financial crises when financial linkages are very inaccurate.

Following, we define the role for a Central Bank as a market completer. The mechanism we analyze is the one similar to the Contingent Credit Line (CCL) of the IMF. The idea of the CCL is to provide a precautionary line of defense for members with sound policies, who are not at risk of an external payments crisis of their own making, but vulnerable to contagion effects from capital account crisis in other countries. We show that the CCL is a powerful mechanism to prevent financial crises in environments characterized by incomplete markets and distrustful depositors.

The lack of strong evidence of contagious bank failures in the periods in which the Central Bank played an active role as a lender of last resort does not disprove the possibility of financial contagion through the banking system. The recent episode (September 2007) of depositors queuing at the Northern Rock bank in the UK trying to withdraw their money, has shown that it is possible to have distrustful depositors even in the presence of deposit insurance, authorities defending the solvency of the institution and a healthy real economy. Additionally, banks in England and other countries in Europe[2] attempting to get more liquidity is a warning of the possibility of contagion. Our model is an attempt to give some insights into this possibility, and in explaining that a healthy interbank market is crucial in preventing contagious bank failures. It is obvious that more work on anticipating and preventing such crises is needed, and our paper is an attempt to go in such direction.

This paper goes in line with Allen and Gale (2000), Saez and Shi (2004), Leitner (2005) and Castiglionesi and Brusco (2007) in the sense that banks maintain interbank linkages but with the purpose to insure against negatively correlated technological shocks (fundamentals). The proposed model incorporates voluntary costly acquisition of information *à la* Nikitin and Smith (2007), but in our case individuals are not allowed to maintain deposits in different banks, although this is done by banks themselves. This allows us to explain contagion.

As in Allen and Gale (2000), we model contagion as an equilibrium phenomenon. However, we do not require an unexpected event to model contagion. Banks maintain interbank linkages to insure against technological shocks and this makes them fragile against information acquisition by depositors. In such context, the "incompleteness" of the interbank claims will determine the possibility of contagion.

Saez and Shi (2004) introduce the concept of a liquidity pool, a claim structure where banks are indirectly connected, which guarantees liquidity in the presence of an insolvent bank and impedes contagion. In our case the

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[2] For example, the Deutsche bank had bought 3.56% of Northern Rock, consequently, the values of its shares were also affected.

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