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Financial crises, bank risk exposure and government financial policy

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ABSTRACT

A macroeconomic model with financial intermediation is developed in which the intermediaries (banks) can issue outside equity as well as short term debt. This makes bank risk exposure an endogenous choice. The goal is to have a model that can not only capture a crisis when banks are highly vulnerable to risk, but can also account for why banks adopt such a risky balance sheet in the first place. We use the model to assess quantitatively how perceptions of fundamental risk and of government credit policy in a crisis affect the vulnerability of the financial system ex ante. We also study the effects of macro-prudential policies designed to offset the incentives for risk-taking.

1. Introduction

A distinguishing feature of the recent U.S. recession – known now as the Great Recession – was the significant disruption of financial intermediation. The meltdown of the shadow banking system along with the associated strain placed on the entire financial system led to an extraordinary increase in financing costs. This increase in financing costs, which peaked in the wake of the Lehman Brothers collapse, is considered a major factor in the collapse of durable goods spending in the fall of 2008 that in turn triggered the huge contraction in output and employment.

The challenge for macroeconomists has been to build models that can not only capture this phenomenon but also be used to analyze the variety of unconventional measures pursued by the monetary and the fiscal authorities to stabilize credit markets. In this regard, there has been a rapidly growing literature that attempts to incorporate financial factors within the quantitative macroeconomic frameworks that had been the workhorses for monetary and fiscal policy analysis up until this point. Much of this work is surveyed in Gertler and Kiyotaki (2010). A common feature of many of these papers has been to extend the basic financial accelerator mechanism developed by Bernanke and Gertler (1989) and Kiyotaki and Moore (1997) to financial intermediaries (banks) in order to capture the disruption of intermediation.

Key to motivating a crisis within these frameworks is the heavy reliance of banks on short term debt. This feature makes these institutions highly exposed to the risk of adverse returns to their balance sheet in way that is consistent with recent experience. Within these frameworks and most others in this class, however, by assumption the only way banks can obtain external funds is by issuing short term debt.[1] Thus, in their present form, these models are not equipped to address how the financial system found itself so vulnerable in the first place. This question is of critical importance for designing policies to ensure the economy does not wind up in this position again. For example, a number of authors have suggested

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[1] Some quantitative macro-models with financial sectors include: Bernanke et al. (1999), Brunnermeier and Sannikov (2009), Christiano et al. (2009), Gilchrist et al. (2009), Mendoza (2010) and Jermann and Quadrini (2009). Only the latter considers both debt and equity finance, though they restrict attention to borrowing constraints faced by nonfinancial firms.

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that such a risky bank liability structure was ultimately the product of expectations the government will intervene to stabilize financial markets in a crisis, just as it did recently. With the existing macroeconomic frameworks it is not possible to address this issue.

In this paper we develop a macroeconomic model with an intermediation sector that allows banks to issue outside equity as well as short term debt. This makes bank risk exposure an endogenous choice. Here the goal is to have a model that can not only capture a crisis when financial institutions are highly vulnerable to risk, but also account for why these institutions adopt such a risky balance sheet structure in the first place. The basic framework builds on Gertler and Karadi (2011) and Gertler and Kiyotaki (2010). It extends the agency problem between banks and savers within these frameworks to allow intermediaries a meaningful trade-off between short term debt and equity. Ultimately, a bank's decision over its balance sheet will depend on its perceptions of risk, which will in turn depend on both the fundamental disturbances to the economy and expectations about government policy.

We first use the model to analyze how different degrees of fundamental risk in the economy affect the balance sheet structure of banks and the aggregate equilibrium. We then analyze the vulnerability of the economy to a crisis in each kind of risk environment. When perceptions of risk are low, banks opt for greater leverage. But this has the effect of making the economy more vulnerable to a crisis.

We next turn to analyzing credit policy during a crisis. Following Gertler and Karadi (2011), we analyze large scale asset purchases of the type the Federal Reserve used to help stabilize financial markets following the Lehman collapse. Within this framework, the central bank has an advantage during a crisis that it can easily obtain funds by issuing short term government debt, in contrast to private intermediaries that are constrained by the weakness of their respective balance sheets. Thus this kind of credit policy is effective in mitigating a crisis even if the central bank is less efficient in acquiring assets than is private sector.

What is new in the present framework is that it is possible to capture the side effect of the credit policy on moral hazard. In particular, as we show, the anticipated credit policy will induce banks to adopt a riskier balance sheet, which will in turn require a larger scale credit market intervention during a crisis. This sets the stage for an analysis of macro-prudential policy designed to offset the effects of anticipated credit policy on the incentives for bank risk-taking.

To be sure, there is lengthy theoretical literature that examines the sources of vulnerability of a financial system. For example, Fostel and Geanakoplos (2009) stress the role of investor optimism in encouraging risk taking. Others such as Diamond and Rajan (2009), Fahri and Tirole (2009) and Chari and Kehoe (2009) stress moral hazard consequences of bailouts and other credit market interventions. Our paper differs mainly by couching the analysis within a full blown macroeconomic model to provide a step toward assessing the quantitative implications.

There is as well a related literature that analyzes macro-prudential policy. Again, much of it is qualitative (e.g., Lorenzoni, 2008; Korinek, 2009; Stein, 2010). However, there are also quantitative frameworks, e.g., Bianchi (2009) and Nikolov (2009). Our framework differs partly by endogenizing the financial friction and partly by exploring the interaction between credit policies used to stabilize the economy ex post and macro-prudential policy used to mitigate risk taking ex ante.

Finally relevant are the literatures on international risk sharing and on asset pricing and business cycles.[2] Conventional quantitative models used for policy evaluation typically examine linear dynamics within a local neighborhood of a deterministic steady state. In doing so they abstract from an explicit consideration of uncertainty. Because bank liability structure will depend on perceptions of risk, however, accounting for uncertainty is critical. Here we borrow insights from these literatures by considering second order approximations to pin down determinate bank liability shares.

2. The baseline model

We now proceed to characterize the model.

2.1. Physical setup

Before introducing financial frictions, we present the basic physical environment. There are a continuum of firms of mass of unity. Each firm produces output using an identical constant returns to scale Cobb–Douglas production function with capital and labor as inputs. We can express aggregate output Y_t as a function of aggregate capital K_t and aggregate labor hours L_t as

$$Y_t = A_t K_t^{\alpha} L_t^{1-\alpha}, \quad 0 < \alpha < 1, \tag{1}$$

where A_t is aggregate productivity which follows a stationary Markov process.

Let S_t be the aggregate capital stock "in process" for period $t+1$. Capital in process at t for $t+1$ is the sum of current investment I_t and the stock of undepreciated capital, $(1-\delta)K_t$:

$$S_t = (1-\delta)K_t + I_t. \tag{2}$$

[2] See, for example, Campbell (1994), Devereux and Sutherland (2009), Lettau (2003) and Tille and Van Wincoop (2010).