Lecture 14:
Operational Risk, Bank Runs II

Before resuming the discussion of bank runs which we began on Thursday, we take another quick dive into the topics of risk management. Chapter 13 deals with Operational Risk, which is in many respect very different from what we have seen earlier, but it would take us too far to go into much detail so we read only the sections 13.1 and 13.4. This type of risk doesn't quite follow the standard scheme of our treatment (identifying risk factors, setting up a model of how the risk factors give rise to losses, and then finding loss distributions), since operational risks can take very many forms, and indeed operational risk is risk that doesn't fall into any of the well-defined categories (market risk, credit risk and – to be treated soon – liquidity risk). Consequently, formal methods are not as well developed as they are for the other risk types, and the standard approaches relying on fixed percentages are in widespread use. The main feature of the standard approach is that the capital ratio (proportion of capital which should have the form of equity set aside so that operational losses do not touch the deposits or other loans to the bank) should depend not on assets, which do not by themselves give rise to operational losses, but on activity, measured as average (over recent periods) gross income. Once again, Basel II allows for a more sophisticated approach using the internal data of the bank.

Returning now to interbank markets, we consider first the Bhattarachya-Gale model already commented upon in the last handout, and the we discuss the HHH(Heider-Hoerova-Holthausen)-model in Section 14.6, which is basically a variant of the Battarachya-Gale model. What has been added is that investments are no longer absolutely sure (as in the Diamond-Dybvig model), so that the outcome R will be obtained only with some (presumably high, but nevertheless..) probability. This probability is revealed to the investors only at $t = 1$, and if the probability is low and the bank is a net borrower in the internet market, then there is a possibility that the lender will not get the money back at $t = 2$.

The analysis of this model has two steps, in step 1 it is assumed that all banks observe all the success probabilities, so there is full information, and everything works as in the B-G model. Don't waste too much time on this.

In step 2 there is asymmetric information, banks know only the success probabilities of their own investments. If the formalism is too tedious, but skip it and follow the intuition: Lenders in the interbank market cannot observe the quality of their borrowers, so they go for a return corresponding to the borrowers that they actually get. Since this leads to high interest rates, some of the borrower banks – those with good

investments – may prefer to liquidate part of their investments rather than paying the high rates to the lender banks and we have adverse selection (good borrowers stay away).

The Diamond-Rajan model was among the first to outline exactly how this spreading of a liquidity crisis can occur. Essentially this is just another variation over the Diamond-Dybvig model, this time less simple, but try to follow, at least in outline, what is going on:

First of all, there is some randomness of investments: investment projects usually ripe after one year, but occasionally they take one year more. Entrepreneurs borrow everything in the bank, to be paid back after one year. If the project drags out, the bank may call back the loan:

The information on whether an investment project is short or long is made available at $t = 1/2$. Banks are funded by deposits, and if a bank has many borrowers with long projects, it must borrow from other banks or (notice this!) from entrepreneurs.

Now to the point (last half of p.289): If suddenly the fraction of long projects financed by a bank is larger than expected, then it would not get enough interbank loans, and the depositors become afraid of losing money, so they run the bank at $t = 1/2$. The bank defaults, and all its loans to entrepreneurs are called in. The entrepreneurs of short projects (which are still the majority) lose their profits, and then there will be much less funds for interbank loans. Consequently some banks having otherwise no problems will experience higher interest rates, their depositors may demand their money back, now we have several bank defaults, and this may proceed. Thus the original minor bank run is transformed to a major bank crisis.

The story in Section 14.7 takes the Diamond-Dybvig model into the framework of shadow banking. Since it looks (and is) rather technical, it is better to begin with the simple Diamond-Dybvig story to see the difference: Suppose that for some reason, some of the patient depositors want their money at $t = 1$ (in the shadow framework, this means that they demand that the bank should buy back the securities). The bank has no money for this (all has been used to pay the impatient according to the plan), so what can it do?

Here it matters that we have a shadow bank: It can arrange new repo trades with other securities, using the amount to pay the depositors running the bank. This will work provided that the original run was not all too big. You may pass quickly through the first two subsections, the main story is on p.296. (“New funding also at runs”). Here it is of course a little tricky to read the formalism without turning back to the first subsections, but give it a try and stick to the intuitive content.

We read: Chapter 13, Chapter 14, remaining sections.