Diamond and Dybvig's Bank Run Model

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October 10, 2022

Diamond and Dybvig's bank run model conveys two separate insights in one model.

1 Bank as an insurance mechanism

Individuals in the economy face a liquidity shock. The liquidity shock may result from stochastic spending needs, or simply preference changes. She may need to spend money tomorrow, or the day after. She knows the probability of the shock, but by no means able to foresee the timing of the shock. When standing at the begging of the first period, she tries to make the plan, she has two options: either to save the money safely somewhere so that she could withdraw it by the face value to meet the spending need. Or she could make a long-term investment, which is expected to produce a higher return only the day after tomorrow. If she withdraws earlier, she could only get a discounted amount.

Let's consider an extreme case where the liquidation in advance the maturity date gives zero. The trade-off is the most obvious. If she saves everything for the long-term project, she will not have money in the case of spending need. But if she simply put it in risk-free technology, she misses the chance to earn a higher return. So she divides the money into two parts, one goes to the safe storage and the other goes to the long-term project. Ex-ante, the allocation should be such that the marginal rate of substitution across two states of the world equal to the relative price of the two states. The price of liquidity in tomorrow is one. The price of liquidity the day after is R minus one. The long-term return minus the opportunity cost of risk-free return.

Alternatively, we could simply disregard the safe storage technology and assume that liquidation in period one gives face value while R in maturity. In realization of the shock, the agent either consumes everything in face value if she turns out to be impatient tomorrow and consumes R if being patient on the day after. The problem is that in the regime of autarky, in the absence of banks, the risks faced by the individual is uninsured, leading to a sub-optimal result. Ideally, if a transfer from someone who turns out not to be in a rush to spend money, to an impatient one with urgent spending needs, is mutually beneficial. If some insurance mechanisms are provided, it would be welfare-improving.

What would social planer do? Intuitively speaking, he would pool everyone together, gives impatient consumers slightly more than 1 and gives patient ones slightly less than R only subject to the aggregate budget constraint. By flattening the yield curve, the first-period consumption increases while the second period decreases. The deposits by patient people allow the economy to generate some long-term returns while those impatient ones could also consume more.

In principle, social planer could attain the first-best allocation if he observes the type of each individual after nature draws their types. But this seems to be a very unrealistic assumption. It turns out that the result could be implemented through a demandable debt contract. The banks offer two interest rates associated with two different maturities.

So the first key insights from the model are that the bank provides an insurance mechanism to individuals who are subject to liquidity needs. This is why we need banks.

2 Banks are subject to a run

It seems that the first best is achieved in this way. But it is only ex-ante first best. In the realization of liquidity shock, there might be more people who turn out to be impatient. Then by requesting the optimal consumption amount, that means the saving in long-term projects becomes less than the ideal level. Thus, the patient people will get less in realization. If in the knife-edge case where exactly all deposits are withdrawn by the depositors, then all other patient people find it necessary to withdraw the deposit in the first period as well. Because waiting for the next period only gets you nothing. So the bank run equilibrium becomes that all people withdraw in the first period.