Credit Rationing

Credit is rationed when some person or some firm is not able to borrow as much as he she or it wants at the market interest rate, in other words he is liquidity constrained. A bank which is getting the market interest rate on its loans might not be willing to loan to the liquidity constrained agent at that or even a higher interest rate for two reasons; moral hazard and adverse selection.

Moral hazard means that the borrower may do
something with the money which he would not do if it were his own e.g. he might blow it all on one huge party and run away (ordeclare bankruptcy).

Adverse selection means that only borrowers which the bank would rather not loan too will want to borrow. An example of adverse selection will be discussed below. The key point is that over some range an increase in the interest rate the bank charges might reduce the profits it earns.

For example if the bank charges interest so high that the borrower would have to devote all of his possible future income to repaying a $1 loan, moral hazard problems might arise (what would you do if you borrowed from such a bank).

The bank will not want to change an interest rate higher than the profit maximizing interest rate even if some borrowers are willing to pay a higher interest rate. There might be excess
demand for credit at the profit maximizing interest rate. If so credit will be rationed.

A Simple Model of Adverse Selection and Credit Rationing

There are many entrepreneurs each of which has an idea for an investment project. Each project is risky. Each project requires a fixed investment of 1 unit of capital.

For simplicity we assume that there are only two possibilities, projects can succeed or fail. If a project fails, the investment is lost. If a project succeeds with probability p it yields $S = A/p^{0.5}$.
This means that the expected value of the project is $p^{0.5}A$.

Entrepreneurs borrow the unit of capital from the bank and agree to repay 1+r the next period. If their project succeeds they do, in fact, pay 1+r, but if it fails, they are bankrupt and so they pay nothing. So the bank gets an average of (1+r)p for each unit it lends to entrepreneurs with projects that have chance p of success. An entrepreneur will wish to borrow if and only if

1) $S - (1+r) > 0$

that is if

2) $p^{0.5}A > p(1+r)$

that is if

3) $p < A^2/(1+r)^2$.

Notice that the entrepreneurs with the most risky projects are most eager to borrow. This is true because bankruptcy protects them from the risks of failing. Notice also that increasing r causes the bank to get worse projects.

Assume that there are the same number of entrepreneurs with each p between 0 and 1. Then the average value of p for projects undertaken if the interest rate is r is given by

4) $p- = E(p|p<A^2/(1+r)^2 = \min(A^2/(2(1+r)^2),1/2)$

The average probability of success is 1/2 if A is greater than 1+r, since, if A is greater than 1+r, all entrepreneurs are glad to borrow from the bank. This means that the average probability of success of entrepreneurs who borrow is just equal to the average probability of success of all entrepreneurs -- 1/2. If 1+r is greater than A, those entrepreneurs with p greater than $A^2/(1+r)^2$ will not want to borrow. The average probability of success of those who do want to borrow istherefore $A^2/(2(1+r)^2)$).

The expected gross return received by the bank per unit lent -- $E(\pi)$ -- is 1+r times the average probability of the funded projects succeeding. If 1+r is greater than or equal to A then

5a) $E(\pi) = (1+r)p- = A^2/(2(1+r))$.
If 1+r is less than A, then
5b) $E(\pi) = (1+r)p- = (1+r)/2$.
5a and 5b give $E(\pi)$ as a function of 1+r.

So the banks expected return per unit lent is maximized at 1+r = A. This means that the bank will never charge r greater than A - 1, no matter how many eager borrowers it has to turn away at that interest rate. A higher interest rate reduces the expected return per unit lent and can only reduce the number of units lent as demand for loans is reduced. This means that raising r can only lower the banks wealth at the end of the period.

To be a little more explicit; assume that the bank starts out with wealth W_0 and that there are $N > W_0$ entrepreneurs so there are Np entrepreneurs with probability of success less than or equal to p. furthermore assume that A is equal to 3. If the 1+r is less than or equal to A=3, all entrepreneurs want to borrow but the bank only has $W_0 < N$ units of capital, so it rations credit. That is gives W_0 entrepreneurs a loan and turns the others away. It is assumed that the bank can't tell the entrepreneurs apart so it must choose the lucky borrowers at random. If 1+r is less than A the average probability of success of the borrowers is 1/2 so the banks wealth at the end of the period is $W_0\,(1+r)/2$. For 1+r = 3 this equals $3W_0/2$. If 1+r is greater than A = 3 only entrepreneurs with p less than $A^2/(1+r)^2$ will want to borrow, so the total amount lent will be the smaller of W_0 and $NA^2/(1+r)^2$. The amount lent can't be greater than the wealth of the bank but it can be less if the interest rate is so high that demand for loans is less than the wealth of the bank. The average probability of success of the borrowers will be $A^2/(2(1+r)^2))$ so the wealth of the bank at the end of the period is the lesser of $9W_0/(2(1+r))$ and $W_0 + N(A^4/(2(1+r)^3))$. In any case it is certainly less than $3W_0/2$ if 1+r is greater than 3. This means that the optimal strategy for the bank is to set 1+r = 3 and turn potential borrowers away at random which isn't nice.

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