Default, Credit Constraints, and Banks

When a lender makes a loan there is some chance that the borrower will not repay; that is, the borrower may default. Obviously the probability that a borrower will default is an important issue for a lender to consider. The probability of default may depend on many variables, but the variable we wish to focus on now is the interest rate. The greater the financial stress to which the borrower is subject, the greater is the likelihood of default. One factor that will increase this stress is the interest rate charged on the loan. The higher the interest rate, the higher the payments the borrower must make, and so the bigger the chance the borrower will not be able to honor his debt. This interaction between the interest rate and the probability of default presents a lender with a potential problem. For the lender to increase her exposure to risk requires a higher rate of return. To earn a higher return, the lender will want to charge a higher interest rate, however the higher interest charge increases the chance that the lender will default. We examine this problem below.

**Default Risk and the Expected Rate of Return**

We let the rate of interest on loans be $R$ and the probability of default we call $d$. We will make things as simple as possible by supposing that the loan is only for one period and that it is completely paid off or the borrow defaults. In this setting the expected rate of return on the loan is just $R$ times the probability that the loan is repaid, $1-d$. In symbols we write

$$\text{expected rate of return} = (1-d)R + d*0$$

$$= (1-d)R$$

At first, it looks like the expected rate of return will increase when $R$ increases, but such a conclusion fails to take into account the effect of an increase in $R$ on the probability of default, $d$. 
Let's consider two extreme cases. First, if the interest rate is zero, then the expected rate of return will be zero too. Second, there will be an interest rate sufficiently high (a million per cent per year should do it) to render default a certainty. In this case, the expected return will again be zero. Interest rates between zero and the sufficiently high rate, $R^{SH}$, will earn a positive rate of return. The relationship between $R$ and $(1-d)R$ implied by these considerations is drawn in Figure 1. The interaction between the interest rate and the probability of default means that there will be some maximum expected rate of return equal to $(1-d)R^{max}$.

**Expected Return and Loan Supply**

The quantity of loans that a lender is willing to supply depends on the expected return. The expected return for the lender in question is maximized at $R^{max}$, and so quantity of loans the lender is willing to supply is maximized at $R^{max}$. Let's write this maximum quantity as $L^{max}$. At interest rates below $R^{max}$ the quantity of loans supplied will contract and fall below $L^{max}$, and we will see a similar contraction if the interest rate rises above $R^{max}$. A picture of the relationship between loan supply and the interest rate is shown in Figure 2.
Equilibrium

We assume the usual relationship between the interest rate and loan demand. A decrease in the interest rate will increase the quantity of loans demanded. By definition, in equilibrium no party can unilaterally make themselves better off. This will not be the case on the downward sloping part of the loan supply curve. If a lender finds themselves on the downward sloping part of the curve, the lender could reduce the interest rate and increase the expected return from a loan. Since a lower interest rate will draw more willing borrowers, the lender will be able to expand their lending. So, by lowering the interest rate the lender will be able to make more loans and each will have a higher expected return. This combination surely makes the lender better off. This means that lenders will never be on the downward sloping part of the loan supply curve.

We know that equilibrium will not occur on the upward sloping part of the loan supply curve. There are still two possible states in equilibrium. Consider Figure 3. Here the loan demand curve intersects the labor supply curve on its ascending portion. In this case equilibrium interest rate will be R* and equilibrium loans will be L*. In this equilibrium, people can
borrower all they desire to borrow at the interest rate $R^*$. There are no borrowers who are turned away.

Now suppose that the loan demand curve does not intersect the loan supply curve. This is shown in Figure 4. In this case the equilibrium will occur at the interest rate $R^{\text{max}}$ and the quantity of loans $L^{\text{max}}$. At this combination, lenders are earning the maximum expected return and are able to make all the loans they wish at the going rate. Importantly, borrowers are not able to borrow all they desire at the going rate, but lenders will not raise rates, so some borrowers will go unsatisfied. When borrowers cannot borrow all they desire at the going interest rate, we say that borrowers are credit constrained; and Figure 4 describes an equilibrium with credit constrained borrowers. The dashed line in Figure 4 is a measure of the degree of constraint felt by borrowers.

Since all willing borrowers cannot find willing lenders in equilibrium, credit will have to be rationed. In short, if prices do not adjust to "clear" a market, something else must. For example, lenders may place credit limits for borrowers. In this case, all borrowers may have access to some funds, but not all they wish. Rationing may also be based on the characteristics of the borrower or the project the borrower seeks to finance.
Credit Constraints and Monetary Policy

How does credit rationing affect our ideas about monetary policy? Suppose we are discussing bank lending and the equilibrium is described by Figure 4. Now the Fed increases the monetary base. Since this increases the amount of excess reserves in the system, banks are likely to increase the quantity of loans they are willing to make at $R^{\text{max}}$. This willingness has the effect of shifting the loan supply curve out and to the right. This is pictured in Figure 5. Note that the quantity of loans increases even though there is no change in the interest rate. This means that the Fed may be able to affect spending in the economy even if we don't see a decline in interest rates. Instead, an increase in the monetary base, an expansionary policy, increases spending by reducing the degree of constraint in the market for bank loans. That is, expansionary policy induces an increase in the quantity of loans from $L_1^{\text{max}}$ and $L_2^{\text{max}}$. 
Conclusion

Asymmetric information may lead to adverse selection in credit markets. It may appear that higher interest rates can compensate lenders for their exposure to more risk, but the remedy of higher interest rates may not be sufficient. Higher interest rates result in a more risky pool of potential borrowers and eventually the cost of this increase in riskiness will more than offset the benefit from a higher interest rate. If this offset occurs at relatively low interest rates, then credit rationing may occur. If credit is rationed, then interest rates may not send the correct signal of the impact of Fed action. For example, expansionary monetary policy may increase the amount of loans available and hence increase spending, even if the expansionary monetary policy does not lower interest rates.