

Lecture XXII: Credit Rationing

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Outline

Readings for next time
Introduction to Credit Rationing
Interest Rate as a Screening Device
The Theory of Collateral and Limited Liability

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Introduction to Credit Rationing

Interest Rate as a Screening Device

The Theory of Collateral and Limited Liability

Readings for Monday

- ▶ Innes, R.D. 2002. Market Failures and Second-Best Analysis with a Focus on Nutrition, Credit, and Incomplete Markets. *Handbook on Agricultural Economics*. Elsevier, pp. 1828-1892.
- ▶ Innes, R.D. 1990. Limited Liability and Incentive Contracting with Ex-Ante Action Choices. *Journal of Economic Theory* 52(1), 45-67.

Introduction to Credit Rationing

- ▶ Stiglitz, J.E. and A. Weiss. 1981. Credit Rationing in Markets with Imperfect Information. *American Economic Review* 71(3), 393-410.
- ▶ The starting point – the contraexample – is the scenario where the interest rate efficiently allocates credit in the market.
- ▶ The point is to develop a model where the interest rate does not provide an adequate allocation between borrower – credit must be rationed at a given interest rate.

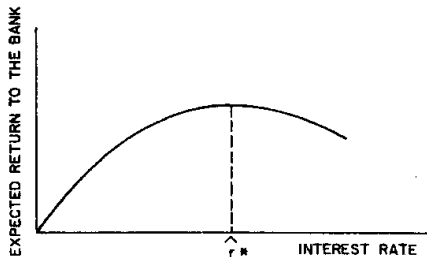


**FIGURE 1. THERE EXISTS AN INTEREST RATE WHICH
MAXIMIZES THE EXPECTED RETURN TO THE BANK**

Interest Rate as a Screening Device

- ▶ Assume that each borrower has an investment opportunity.
- ▶ Let $F(R, \theta_i)$ be the distribution function for the investment opportunity for borrower i . R is the random variable for the return on the investment. $f(R, \theta_i)$ is the probability density function.
- ▶ Next, we assume that the various investment opportunities are mean-preserving spreads

$$\int_0^{\infty} R f(R, \theta_1) dR = \int_0^{\infty} R f(R, \theta_2) dR \quad (1)$$

$$\int_0^y F(R, \theta_1) dR \geq \int_0^y F(R, \theta_2) dR$$

for some $y \geq 0$. Hence, θ_1 is more risky than θ_2 .

- ▶ Individuals borrow B at an interest rate $\hat{r}$.
- ▶ The individual defaults if the return plus the collateral C is less than the principle plus interest

$$C + R \leq B(1 + \hat{r}) \quad (2)$$

- ▶ The borrower's profit function can then be written as

$$\pi(R, \bar{r}) = \max(R - (1 + \bar{r})B; -C) \quad (3)$$

- ▶ The bank's profit function can then be written as

$$\rho(R, \hat{r}) = \min(R + C; B(1 + \hat{r})) \quad (4)$$

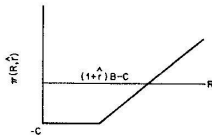


FIGURE 2a. FIRM PROFITS ARE A CONVEX FUNCTION OF THE RETURN ON THE PROJECT

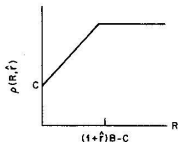


FIGURE 2b. THE RETURN TO THE BANK IS A CONCAVE FUNCTION OF THE RETURN ON THE PROJECT

- **THEOREM 1:** For a given interest rate $\hat{r}$ there is a critical value $\hat{\theta}$ such that a firm borrows from the bank if and only if $\theta > \hat{\theta}$.

$$\pi(\hat{r}, \hat{\theta}) \equiv \int_0^\infty \max[R - (\hat{r} + 1)B; -C] dF(R, \hat{\theta}) = 0. \quad (5)$$

- **THEOREM 2:** As the interest rate increases, the critical value of θ , below which individuals do not apply for loans increases.

$$\frac{d\hat{\theta}}{d\hat{r}} = \frac{B \int_{(1+\hat{r})B-C}^\infty dF(R, \hat{\theta})}{\frac{\partial \pi}{\partial \hat{\theta}}} > 0 \quad (6)$$

- ▶ **THEOREM 3:** The expected return on a loan to a bank is a decreasing function of the riskiness of the loan.
- ▶ **THEOREM 4:** If there are a discrete number of potential borrowers (or types of borrowers) each with a different θ , $\bar{\rho}(\hat{r})$ will not be a monotonic function of $\hat{r}$, since as each successive group drops out of the market, there is a discrete fall in $\bar{\rho}$ (where $\bar{\rho}(\hat{r})$ is the mean return to the bank from the set of all applicants at the interest rate $\hat{r}$).

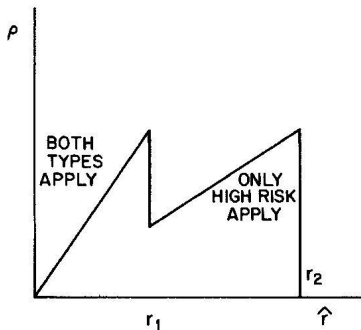


FIGURE 3. OPTIMAL INTEREST RATE r_1

- **THEOREM 5:** Whenever $\bar{\rho}(\hat{r})$ has an interior mode, there exist supply functions of funds such that competitive equilibrium entails credit rationing. (See Figure 14)

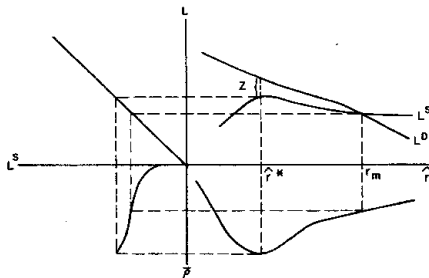


FIGURE 4. DETERMINATION OF THE MARKET
 EQUILIBRIUM

- ▶ **COROLLARY 1:** As the supply of funds increases, the excess demand for funds decreases, but the interest rate charged remains unchanged, so long as there is any credit rationing.

The Theory of Collateral and Limited Liability

- ▶ One of the basic concepts in the credit rationing literature is to separate the borrowers by offering differing contracts – trade the interest rate against the collateral requirement:
- ▶ Suppose that I offer a lower interest rate $\hat{r}_1 < \hat{r}_2$ but require more collateral $C_1 > C_2$.

- It is conceivable that I can construct the contract such that

$$\begin{aligned} & \int_0^y F(\max(R - (1 + \hat{r}_1)B; -C_1), \theta_1) dR \\ & \leq \int_0^y F(\max(R - (1 + \hat{r}_2)B; -C_2), \theta_1) dR \end{aligned} \quad (7)$$

and

$$\begin{aligned} & \int_0^y F(\max(R - (1 + \hat{r}_1)B; -C_1), \theta_2) dR \\ & \geq \int_0^y F(\max(R - (1 + \hat{r}_2)B; -C_2), \theta_2) dR \end{aligned} \quad (8)$$

- Thus, the borrowers segment into different credit markets.