Rationing in the Credit market
(Macho-Stadler Perez-Castrillo (1995), chp. 3B2)

The model explains the existence of credit rationing (a firm cannot obtain the money it wants even thought it is prepared to pay the current market rate of interest) as a consequence of MH problem.

Suppose A can choose between two projects, a, b, which cost I.

Project i $(i = a, b)$ is risky and it generates

$$X_i \text{ with probability } p_i$$
$$0 \text{ with probability } 1 - p_i$$

where the more risky project is also the most profitable:

$$p_a X_a > p_b X_b > I$$
$$1 > p_a > p_b > 0$$
$$X_a < X_b$$

To obtain I, A must get a loan; it is assumed that the gross interest payment will be paid only if project is successful

The payoff of A is therefore

$$U(R, i) = p_i (X_i - R)$$

The payoff of the bank is

$$\Pi(R, i) = p_i R - I$$

Symmetric information
Optimal contract is: $R = X_a$ and it requires that only project a is undertaken

Choice of project unobservable
A chooses a if

$$p_a (X_a - R) \geq p_b (X_b - R)$$

that is if $R \leq \widehat{R}$, where

$$\widehat{R} = \frac{p_a X_a - p_b X_b}{p_a - p_b}$$

But now consider the bank's profit, they are

$$\Pi(R, i) = \begin{cases} p_a R - I & 0 \leq R \leq \widehat{R} \\ p_b R - I & \widehat{R} < R < X_b \end{cases}$$

where X_b is the highest amount A is willing to pay.

Assuming that the bank is a monopolist and has all the bargaining power, it will either charge $\widehat{R}$ or X_b. In particular, it will charge $\widehat{R}$ if

$$p_a \widehat{R} - I > p_b X_b - I \tag{1}$$

and X_b if the opposite holds.

Now suppose that the bank has funding equal to L with $NI \geq L \geq I$, where N is the number of firms requesting a loan of I.

Then when (1) does not hold and $R = X_b$, A's profit is zero and there is no credit rationing.

If instead (1) holds and $R = \widehat{R}$, A's profit is $p_a(X_a - \widehat{R}) > 0$ and all N firms will demand a loan. In this case since $NI \geq L$ there will be credit rationing. Credit rationing arises because banks voluntarily decide not to increase the interest rate as a response to excess demand in order to address the moral hazard problem.