ECON 612: MONEY AND BANKING

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EXAMPLE 8.4*

SOLUTIONS AND EXPLANATIONS

COLOR LEGEND

- HEADINGS
- GIVEN/PREVIOUSLY FOUND INFORMATION
- CONCEPTS YOU SHOULD ALREADY KNOW
- ANSWER
- ANNOTATIONS AND EXTRA EXPLANATIONS

* A COPY OF THE PROBLEMS IS ATTACHED AT THE END OF THIS DOCUMENT. THERE MAY BE SOME DIFFERENCES BETWEEN THIS VERSION AND THE ONE AVAILABLE ON CANVAS.

GIVEN INFORMATION

$S(A) = \$150$

$P(S|A) = 0.8$

$F(A) = \$0$

$P(F|A) = 0.2$

$S(B) = \$162$

$P(S|B) = 0.5$

$F(B) = \$0$

$P(F|B) = 0.5$

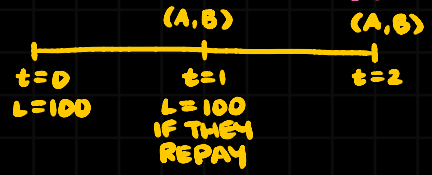
$K = \$5$

$L = 0.05$

CANNOT CHARGE MORE THAN 150 BASIS POINTS ABOVE BREAKEVEN

$L = \$100$

(1) DIAGRAM OVER THREE PERIODS



(2) (a) DEFINING ICC

ICC: $ER(A) \geq ER(B)$

$P(S|A)[S(A)-R] \geq P(S|B)[S(B)-R]$

ICC: $(0.8)(150-R) \geq (0.5)(162-R)$

(b) FINDING R^*

THIS ICC BINDS, SO WE CHANGE THE ≥ TO =.

$(0.8)(150-R) = (0.5)(162-R)$ ICC, FROM PART (a).

$120 - 0.8R = 81 - 0.5R$

$-0.3R = -39$

$R^* = \$130$

FINDING BS_1

$BS = P(S|A)[S(A)-R^*]$

$= (0.8)(150-130)$

$BS = \$16$

(c) FINDING $E\Pi$

$E\Pi = ER(A) - C$

$= P(S|A)R^* - (L+K)$

$= (0.8)(130) - (100+5)$

$E\Pi = -\$1 < 0 \therefore$ NO LENDING

(3) (a) DEFINING ICC

ICC: $ER(A) \geq ER(B)$

$P(S|A)[S(A) - R_1 + BS] \geq P(S|B)[S(B) - R_1 + BS]$

$0.8(150 - R_1 + 16) \geq 0.5(162 - R_1 + 16)$

ICC: $0.8(166 - R_1) \geq 0.5(178 - R_1)$

(b) FINDING R_1^*

THIS ICC BINDS, SO WE CHANGE THE ≥ TO =.

$0.8(166 - R_1) = 0.5(178 - R_1)$ ICC FROM PART (a).

$132.8 - 0.8R_1 = 89 - 0.5R_1$

$-0.3R_1 = -43.8$

$R_1^* = \$146$

(c) FINDING $E\Pi$

$E\Pi = ER(A) - C_1 - C_2$

$= \overbrace{ER_1(A) + ER_2(A)}^{ER(A)} - \overbrace{(L+K)}^{C_1} - \overbrace{P(S|A)(L+K)}^{C_2}$

$= P(S|A)R_1^* + P(S|A)P(S|A)R^* - (L+K) - P(S|A)(L+K)$

$= 0.8(146) + 0.8(0.8)(130) - (100+5) - 0.8(100+5)$

$E\Pi = \$11 > 0 \therefore$ LENDING OCCURS

(4) CONCLUSION

WITH THAT ADDITIONAL PERIOD, THE BANK CAN RAISE THE REPAYMENTS REQUESTED AND THE BORROWER WILL HAVE AN INCENTIVE TO GET THEIR SURPLUS IN THE LAST PERIOD.

Example 8.4

Consider a borrower, Kiddie Toys, Inc., that can choose between two projects: A and B. Project A yields \$150 with a probability of 0.8 and zero with a probability of 0.2, whereas Project B yields \$162 with a probability of 0.5 and nothing with a probability of 0.5. The bank's cost of funds is equal to the riskless interest rate of 5%.

As a banker, you cannot control your borrower's project choice directly because you cannot observe this choice. You are restricted to making unsecured loans. Assume universal risk neutrality. Moreover, you can charge Kiddie Toys not more than 150 basis points above your break-even interest rate or it will switch to another bank.

Answer the following questions under the following scenarios: (i) the bank and the borrower can contract with each other over only one period, and (ii) the bank and the borrower can contract over two time periods. In case (i), Kiddie Toys will request a single loan of \$100, and in case (ii), Kiddie Toys will need a sequence of two \$100 loans, with the ability to choose between S and R in each period.

(1) Draw a diagram depicting the conditions of lending from $t = 0$ to $t = 2$.

(2) Consider moral hazard with two periods:

- **(a)** Write the binding ICC so that the borrower will choose the safer project.
- **(b)** Using the ICC, find the optimal level of repayments and the borrower's surplus.
- **(c)** Find the bank's expected profits and decide if lending will occur.

(3) Consider moral hazard with three periods in which lending is possible, there is a sequence of \$100 loans, and the borrower will choose Project A in the last period.

- **(a)** Using your findings in **(2)** as the conditions for $t = 2$, write the binding ICC so that the borrower will choose the safer project in $t = 1$, allowing lending to be possible for $t = 2$.
- **(b)** Using the ICC, find the optimal level of repayments for the loan to be offered in $t = 1$.
- **(c)** Find the bank's expected profits and decide if lending will occur.

(4) Why does a multi-period contract work when a two-period contract failed?