IMPLICIT CONTRACTS AND INTEREST RATE RISK

The model

An example

Introducing relationship banking

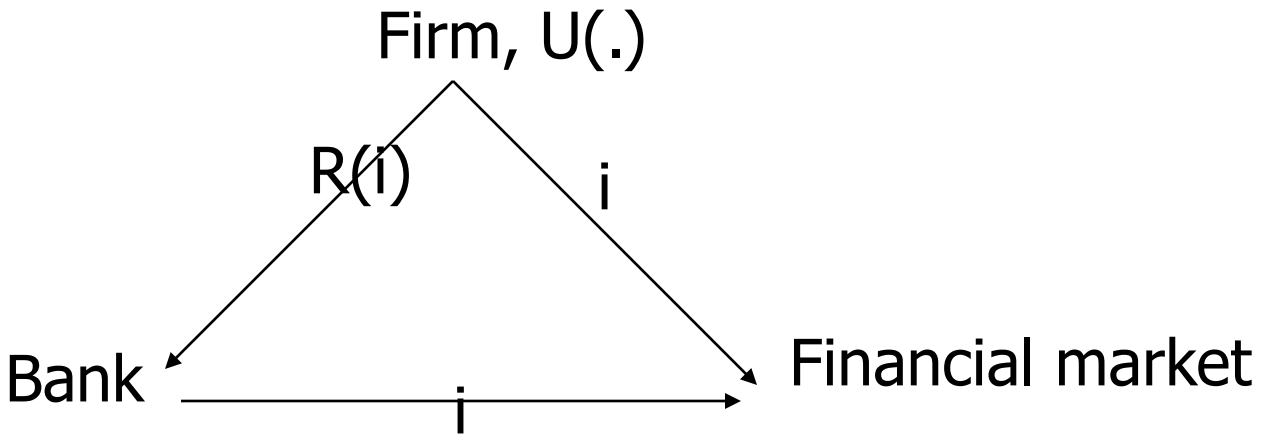
Credit rationing

1-IMPLICIT CONTRACTS AND INTEREST RATE RISK

- Main Idea
  - Between banks and firms, when interest rates are risky, optimal risk sharing can emerge as an implicit insurance contract
  - Necessary condition
    - Banks are less risk adverse than firms
  - Result
    - Sticky interest rates

1-IMPLICIT CONTRACTS AND INTEREST RATE RISK

- The problem



1-IMPLICIT CONTRACTS AND INTEREST RATE RISK

- The problem
  - Firms can issue commercial paper at a risky rate i
  - Firms can borrow from their banks at rate R(i)
  - Banks can refinance themselves and issue CD's at risky rate i; $i \xrightarrow{f(i)} I$
- Hypothesis
  - Firms are risk adverse; U, U'>0, U''<0
  - Banks are risk neutral
  - Credit market is competitive

1-IMPLICIT CONTRACT…:the model

- Notations
  - Firms have (sure) final wealth w
  - Firms borrow 1 from the bank or from the market
  - There are m firms; credit demand=m
  - Credit supply is given by [n(i), R(i)]
- A competitive equilibrium is the solution of the following problem:

1-IMPLICIT CONTRACT…:the model

$$MaxE(U)=\int_i [n(i)/m]U[w-R(i)]f(i)di+\int_i [(m-n(i))/m]U(w-i)f(i)di$$

$$s.t. \quad \int_i n(i)[R(i)-i]f(i)di = 0$$

$$n(i) \leq m$$

1-IMPLICIT CONTRACT…:the model

- E(U) is the expected utility of the firm
  - With prob (n(i)/m), the firm borrows from the bank at R(i)
  - Otherwise, it borrows from the market at rate i
  - Decision variables are R(i) and n(i)
- The 1st constraint characterizes the long run competitive equilibrium for the bank (coefficient μ(i))
- The 2nd one stays that supply of credit is never greater than or equal to demand (coefficient l)

1-IMPLICIT CONTRACT…:the model

- First order conditions/ R(i) and n(i)

$$-n(i)\,U'[w\text{-}R(i)]\,f(i) + l.n(i)\,f(i) = 0 \quad (1)$$

$$\mu(i)/f(i) = U[w\text{-}R(i)] - U[w\text{-}i] + l\,[R(i)\text{-}i\,] \quad (2)$$

- From (1), we get that U'[w-R(i)]=l, so R(i)=R
- The interest rate is not contingent to the market rate i

1-IMPLICIT CONTRACT…:the model

- Remember that U is concave; so from (2), we get that μ(i) (the Lagrange coefficient) is strictly positive , so that the constraint is binding and n(i)=m
- Conclusion
  - m=n(i) (supply=demand)
  - R(i)=R=E(i) (the bank interest rate is equal to the expected refinancing rate of the bank)

2-IMPLICIT CONTRACT…:example!

- A firm: $U(W)=10W-W^2 \quad (0<W<5)$
- An investment: 1 ⟶ Cash-flow=1,2
- Debt financing:
  - Either by issuing bonds
    - i=8% (1/2) or i=10% (1/2)
  - Or by bank debt
    - R is fixed at 9% with certainty
- What will you choose?

2-IMPLICIT CONTRACT…:example!

- Issuing bonds
  - I=8%, cash=1,2-1,08=0,12
  - I=10%, cash=1,2-1,1=0,10
  - U(0,12)=1,1856 (prob 0,5)
  - U(0,10)=0,99 (prob 0,5)
  - E(U)=1,0878

2-IMPLICIT CONTRACT…:example!

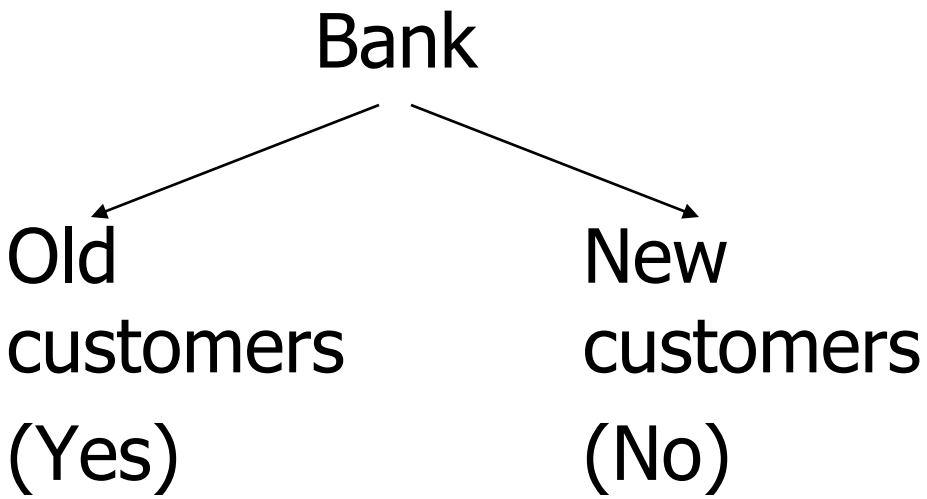
- Bank credit
  - R=9%
  - Cash=1,2-1,09=0,11
  - U(0,11)=1,0879
- So, you should choose the bank solution
- Congratulations! You have just verified the Jensen Inequality!
  - U(E)>E(U)

2-IMPLICIT CONTRACT…:example

- The firm prefers a sure bank credit at 9% than a risky bond issue at the 9% expected rate
- When it lends at 9% with a 9% refinancing expected rate , the bank just breaks even
- Interest rate rigidity is an optimal risk-sharing contract between banks and firms

3-IMPLICIT CONTRACT…:relationship banking vs transaction banking

- Should all the bank customers benefit from this implicit insurance contract?



3-IMPLICIT CONTRACT…:relationship banking vs transaction banking

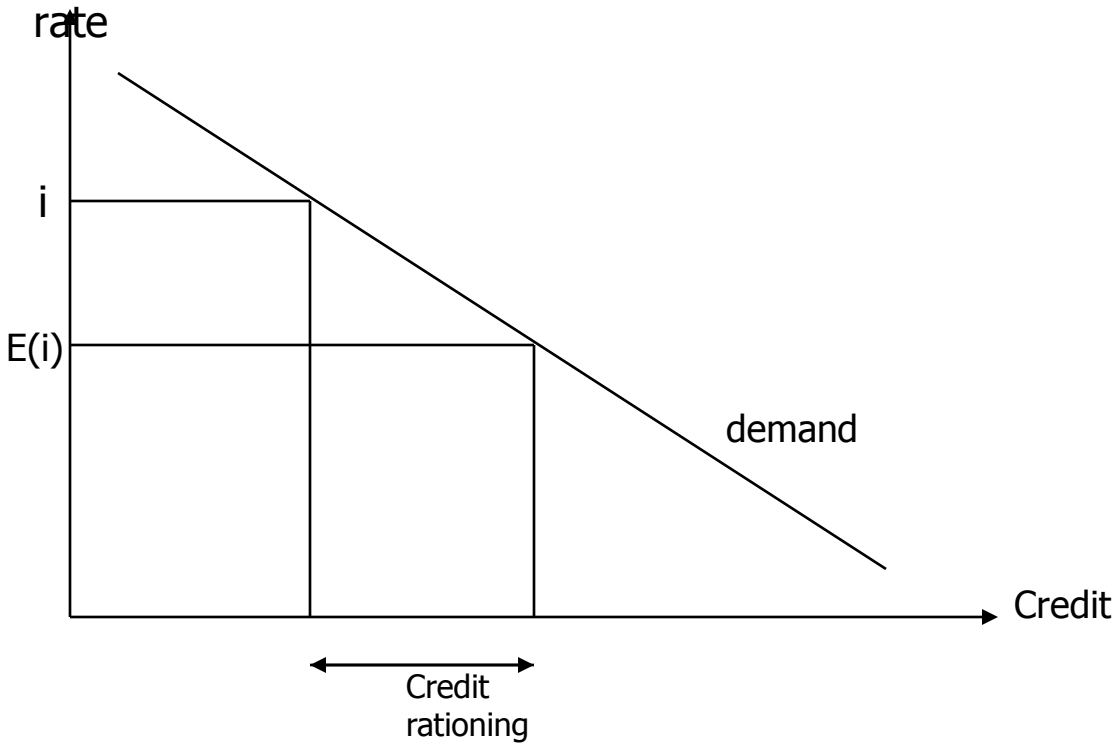
- Old customers
  - Can benefit from the insurance contract
    - Because they have already paid the insurance premium
    - Premium=to borrow from the bank when the market is cheaper
- New customers
  - Can’t benefit from such a contract
    - Because they didn’t pay yet the insurance premium

3-IMPLICIT CONTRACT…:relationship banking vs transaction banking

- 2 cases:
  - i<E(i)
    - New customers borrow from the market
    - Old customers borrow from the bank, pay the insurance premium (E(i)-i)
    - Bank makes a profit (E(i)-i) for each Euro lend
  - i>E(i)
    - Old customers are « insured » at the rate E(i)
    - New customers demand some credit at rate E(i) to the bank and are rationed (because they have not paid the premium); they can borrow at rate i.

4-IMPLICIT CONTRACT EQUILIBRIUM CAN EXHIBIT CREDIT RATIONING

- Credit demand by new customers



4-IMPLICIT CONTRACT EQUILIBRIUM CAN EXHIBIT CREDIT RATIONING

- Credit rationing and implicit contract theory
  - Concerns mainly new customers
  - Rat=k.Max[0,i-E(i)]
- If a firm wishes to max credit availability, it should prefer long term relationship with its main bank

SUMMARY

- Between banks and firms, when interest rates are risky, optimal risk sharing can emerge as an implicit insurance contract
- Equilibrium exhibits sticky loan rates and credit rationing
- New bank customers are more rationed than old bank customers

REFERENCES

- Fried, J. and Howitt, P. Credit rationing and implicit contract theory, *Journal of Money, Credit and Banking*, Vol.12, n°3, Aug. 1980.
- Lobez, F., Rationnement du crédit et contrats d'assurance implicites: théorie et tests économétriques, *Finance*, 1986.