Credit
Lectures 26 and 27

24 and 29 April 2014
Operation of the Credit Market

Credit may not function smoothly


2. Borrow has means to pay back loan, but simply finds it not in self interest to do so. **Strategic Default**
Institutional Need

- Domestic courts of law are often weak or absent.
- Monitoring of inputs is costly.
- Lenders use punitive means to enforce repayment (e.g., threat to not lend in the future).
- Less effective methods are impinging on credit market.
Verification Important

- Not enough to verify output, must be able to verify inputs.
- Formal institutions (banks) may insufficiently informed to make lending profitable.
- Informal Institutions arise to fulfill gaps.
Sources of demand for credit

Basically three:

1. Physical capital — new equipment or structures.
2. Working capital — finance purchase of seeds, fertilizer, ...
3. Consumption — unforeseen need (natural disaster), or large expenditure (wedding)
Credit most important for working capital and consumption for poor and disadvantaged in developing country.

Repay loan after harvest is in.

Uncertainty of production makes consumption credit important.

Harvest may fail. Moreover, seasonal variation in laborer wages (harvest high, lower in lean season).
Rural Credit Market
Sources of Credit

- Institutional Lenders of formal market. Government banks, commercial banks, credit bureaus etc.
- Informal lenders (large land owners, moneylender)
Limitations of Formal Lenders

In a nutshell: information Formal lenders often without personal knowledge of characteristics and activities of their debtors (clients).

Objectives of lender and borrower may diverge.

Consider simple example. Let market rate of interest be 10%.

A number of alternative projects exist, ea. startup cost of 100,000 Lira. There are two projects one with 15% and the other with 20% return.

In absence of uncertainty, and if both projects pay off at the end of next period, projects pay 115,000 and 120,000 Lira.
Example continued

In this case there is no divergence between lender and borrower. Bank wants its 10% back, and wants borrower to invest in optimal project (20%).

▶ Now introduce uncertainty. Assume no uncertainty on 20% return project.

▶ Assume Second project has no uncertainty. Return $120,000 - 100,000 = 20,000$.

▶ Assume first project returns 230,000 Lira with probability of $\frac{1}{2}$ and 0 with probability $\frac{1}{2}$.

▶ Lender wants borrow to pursue second project. However, which project does the borrower wish to pursue?

▶ Why?
Expected Payoff Project 1

Assume borrower able to repay loan if first project fails:

\[ E[R_1] = \frac{1}{2}(230,000 - 100,000) + \frac{1}{2}(0 - 100,000) \]
\[ = -100,000 + \frac{1}{2}(230,000) \]
\[ = 15,000 \]

So, with ability to repay loan if failed, payoff is 15,000 Lira. Less than the payoff from the risk free second project. So, again no divergence between borrower and lender.
Now, assume that borrower has limited liability and can repay nothing should the first project fail.

What is the expected return now?
However, first project returns are 230,000 Lira with probability 0.5 and 0 with probability 0.5.

\[
E [R_1] = \frac{1}{2} (230000 - 100000) + \frac{1}{2} (0) \\
= 60000.
\]
Limited Liability

If borrower can pay under every contingency, bank does not care which project the borrower selects.

However, under limited liability have divergence between borrower and lender.

Who is most likely to pay under every contingency? The rich.

This simple example indicates one reason why bankers (formal lenders) may discriminate against the poor.
Last time . . .

1. Why the credit market may not function smoothly.
2. Sources of credit, formal and informal.
3. Limitations on formal lenders.
4. Introduced Limited Liability in credit market.
The potential for **strategic default** gives rise to collateral — an asset that is forfeited should the borrower default on the loan.

Housing markets: collateral is the house beginning purchased. Need a downpayment of 80% of loan to asset value (or 20% downpayment) to avoid charge for PMI. And now to qualify for a mortgage (may be looser now).

In spring 2008, equity percentage dropped to zero, and only requirement was that the borrower had a pulse.

Lender defines what is acceptable collateral. Will vary by lender.
Informal Lenders

- Informal lenders arise because they serve an economic purpose — they finance transactions that the formal sectors lenders can or will not handle.

- Such as: greater flexibility on what they will accept as collateral:

  1. Example of small land parcel. May adjoin the farm of large landowner. Could be valuable to large landowner whereas not valuable to bank.

  2. An informal employer of rural labor may accept labor as collateral, should the borrower fails to repay.
An informal lender may have greater information regarding the characteristics and activities of the borrower.

1. Trader who lends working capital to farmer sometimes gets first claim on the harvest.
2. Landlord and lender living nearby borrower has easy access to activities of borrower.
Characteristics of rural credit markets

1. Informational constraints — fundamental. Strategic default.
2. Segmentation — Restricted set of borrowers, repeated transactions, within village
3. Interlinkage — Buyers and sellers where different hats, have different kinds of relationship. Landlord and lender; trader purchases grain from farmer and may extend credit.
4. Interest rate variation — borrowers not created equal
5. Rationing — limited credit at going interest rate
6. Exclusivity — borrower only one lender
Theories of Informal Credit Market

Why are interest rates in the informal credit market so high? 4-5% per month (4% per month is 60% per year).

1. Monopoly lender (Ray argues against)
2. Lender’s risk hypothesis — no excess profit, high rates to cover involuntary and voluntary losses.
3. Default and fixed–capital loans.
4. Default and collateral
5. Default and credit rationing
6. Informational asymmetries and credit rationing.
7. Default and Enforcement
Lender’s Risk Hypothesis

To show effect of default risk on interest rates

$L$ total amount of funds lent.

$r$ opportunity cost of funds.

$i$ interest rate charged in competitive equilibrium in informal sector.

$p$ fraction of loans repaid.
Zero Profit Condition

Competitive Equilibrium: Zero Profit Condition

\[ p(1 + i)L - (1 + r)L = 0 \]

Rearrange to yield . . .

\[ i = \frac{1 + r}{p} - 1 \]
Examples

Notice if $p = 1$ then $i = r$. (As expect)
What if $p = .50$ and $r = .10$ then

$$\frac{1 + 0.10}{0.5} - 1 = .20 = 20\%$$

Even under competition informal interest rates are sensitive to default risk.
Default and fixed–capital loans

- Previous calculation assumes default risk is independent of size of loan.
- Yet, expect risk of default to increase with size of loan.
- Some loans may never be made, because $p$ is so low that interest rate premium ($i > r$) is so large than affects chances of default.
- Default risk so large that some loans never made.
- Presence of strategic default overwhelming provision of informal loans for working capital or consumption.
Collateral can take many forms.

Two basic types:

1. Collateral valued highly by both borrower and lender.
2. Collateral valued highly by borrower.

Is it obvious why the third type (Collateral valued highly by lender) is not observed?

For strategic default whether (1) or (2) doesn’t matter.

Type (1) has advantage that it serves to protects lender against involuntary default as well.
Valuation of Collateral

- Strategic behavior possible by lender: Loan may be an avenue to obtain collateral.
- Example of large landowner who extends loan to tenant farmer with small plot of land adjacent to landowner’s farm used as collateral.
- Farmer in need of loan of size $L$.
- As above, let $i$ be the interest charged on the loan.
- Let $V_s$ be the value of the land to the small farmer (borrower).
- Let $V_B$ be the value of the land to the large landowner (lender).
- Let $F$ represent the loss to the farmer of default, beyond value of collateral.
Repay or not?

- Borrower may consider willful default. No repay: Gain $(1 + i)L$, Loss $V_s + F$
- Borrower will repay loan if:
  \[(1 + i)L < V_s + F\]
- Lender will prefer to be repaid if:
  \[(1 + i)L > V_B\]
Combine the two expressions: of interest to both parties to repay loan if:

\[ V_B < V_s + F \]

Lender’s valuation must not exceed borrower’s valuation by too much.

Case \( F = 0 \) implies \( V_B < V_s \).

To see the importance of this inequality, suppose it is not true.
If not true, then $V_B > V_s + F$.

When borrower want’s to repay loan, lender does want that to happen.

Lender prefers to receive the collateral than the loan repayment.

Lender may take action so that borrower defaults.
Actions Lender may Take

- How might the lender take action to secure collateral?
- Set $i$ high so that $(1 + i)L > V_s + F$.
- Example may explain why land inequality rises in poor societies. Example, applies to bonded labor—to secure supply of cheap labor.
- Debt contract written so borrower will fail.
- Example works best for consumption loans. Fixed need, whereas with production loans can be scale back size of loan to match production activity.
- Example may offer an explanation for why we observe dispersion in interest rate charged.
Assume the lender has many lending opportunities.
Lender wants to set the interest rate, $i$, as high as possible.
Convert working capital $L$ into output. Assume that production exhibits diminishing marginal returns to scale.
$f(L)$ describes the value of output for every loan of size $L$.
Total cost of Farmer of borrowing an amount $L$ is $(1 + i)L$. 

Production Loan
Production Loan

Figure 14–2

Credit
Equilibrium

- With competition in the credit market (many lenders), borrower must obtain $A$.
- If not, the borrower will go to another lender.
- Thus in equilibrium borrower will face an interest rate of $i^*$ and will obtain loan of $L^*$. 
Credit Rationing

- Credit rationing tied to risk of default.
- Credit rationing: at the going rate of interest in the credit transaction, the borrower would like to borrow more money, but is not permitted by the lender.
- Let’s operationalize the risk of default so that if a borrower defaults the (specific) lender will never lend to him again.
- If the Farmer defaults in the future he will go to the next best alternative.
Hence, to study default must account for the importance borrower attaches to future gains and losses.

Simplification: Assume farmer thinks $N$ periods into the future.

That is, the Farmer has decision horizon of length $N$.

The loan under consideration is for one–period.
Recall, $A$ is profit available to farmer at next best alternative.

Borrower interested in a loan at interest rate $i$ and loan size $L$ if

$$f(L) - (1 + i)L \geq A$$

Over horizon, $N$, borrower consider gains and losses. What is value if he defaults now:

- **Gain** $N[f(L) - (1 + i)L]$.
- **Loss** $f(L) + (N - 1)A$.

Default keep $(1 + i)L$ and then obtain $A$ from $N - 1$ future periods.
No Default Constraint

Will repay loan if gains exceed costs or

\[ N[f(L) - (1 + i)L] \geq f(i) + (N - 1)A \]

or

\[ f(L) - \frac{N}{N - 1}L(1 + i) \geq A. \]

Call this the no default constraint and notice that it is tighter than the participation constraint. \( \frac{N}{N-1} > 1 \).
What if $N = 1$. Farmer never considers the future.

$N = 1$, no default constraint is never satisfied and borrower always defaults.

So no loan is advanced (credit rationing).

If $N$ is very large then $\frac{N}{N-1} \approx 1$ so back to participation constraint.

Think of $N$ as some intermediate value.

Solution in Figure 14–3.
Now look at equilibrium conditions, but with cost of funds equal to $\frac{N}{N-1}(1 + i)L$.

Notice we have credit rationing. Borrower would prefer to borrow $L^*$ competitive equilibrium in which contracts costlessly enforced.
Figure 14–3

Loan Size
Output, costs, profits
$L(1+i^*)$

$f(L)$

$L^*$

$A$

$L^{**}$

$N(N-1)^{-1}(1+i^*)L$

$L(1+i^*)$

Credit
Informational Asymmetries and Credit Rationing

- Now consider situations where lender and borrower have different information.
- Borrowers have characteristics which are not observed by lenders. Characteristics that affect ability and willingness to repay loan.
- There may be excess demand for loans; some borrowers are rationed (would like to borrow more at going interest rate).
- Simple example to see why.
Lender faces Two types of borrowers:

**Steady–Edie:** always repay loan. Borrow $L$, earns $R > L$.

**Volatile Victor:** can obtain higher return $R' > R$, but this occurs only with probability $p$. With probability $1 - p$ goes bust, earns 0.

Volatile Victor a farmer who raises a cash crop which produces a large payoff in a good harvest, but his production is extremely susceptible to weather.
Example

- Lender free to charge interest rates as desired.
- Interest rate charged to steady-type: borrower return is $R - (1 + i)L$. So maximum interest rate is $i_1 = R/L - 1$.
- Interest rate charged to V. Victor: $E[R] = p[R' - (1 + i)L]$. So maximum interest rate is $i_2 = R'/L - 1$.
- Notice: $R' > R \implies i_2 > i_1$
Risky borrower is willing to pay a higher interest rate. And that rate is independent of the success probability(!)

Notice if the lender offers a rate higher than $i_1$ the steady borrowers will not apply for a loan. But once above $i_1$ no reason to charge less than $i_2$. (Why?)

If lender sets interest rate as $i_1$ then both types of borrowers apply for loan. Not able to distinguish between borrowers, then randomize (coin flip).
Example

Which interest rate to charge? Choice between $i_1$ and $i_2$. Assume types equal proportion.

If charge $i_1$, expected Profit is:

$$E[\Pi_1] = \frac{1}{2}i_1L + \frac{1}{2}[(1 + i_1)pL - L]$$

If charge $i_2$, expected profit is:

$$E[\Pi_2] = p(1 + i_2)L - L$$
Will select interest rate as option that yields highest expected profit.

Will select $i_1$ if $E[\Pi_1] > E[\Pi_2]$

or if

$$p < \frac{R}{2R' - R}$$

If $L = 1,000, R = 1,200, R' = 1,400$ then $i_1$ if $p < 3/4$. Rather high success rate because risky payoff (only) 20% higher than safe project.

If $L = 1,000, R = 1,200, R' = 2,400$ then $i_i$ if $p < 1/3$. 
Insight from Example

Provides rationale for credit rationing.

Under scenario, in which lender makes loans at $i_1$, then both types apply for loans, but only some of borrowers receive loans (50% due to coin flip).
Interlinked Transactions

- Interlinkage where credit transaction combined with another transaction.
- Common.
- Interlinkage is a marriage of convenience.
  1. Hidden interest
  2. Interlinkage and information
  3. Interlinkage and enforcement
  4. Interlinkages and creation of efficient surplus
Hidden Interest

- Arises when social conditions restrict interest that can be charged.
- Consumer regulation on maximum interest rate.
- Interlinked transaction, embed interest rate in another transaction.
- In consumer loans, charges processing fees, or late payment fees.
Hidden Interest

- Usury laws — charging interest on loan. Christian and Muslim Law.
- Same solution: associate interest with another payment.
- Example, trader (of grain) makes no-interest loan to farmer, with the stipulation that the farmer agrees to sell his crop at a discount to trader.
- Difference between market price and discount price represents the interest on the working capital loan.
Enforcement

- Provides example where landlord can offer consumption loan to laborer to carry over during slack period.
- The contract is \((w, i)\) a wage rate and an interest rate. Configure such that consumer is no worse off than next best alternative, and lender extracts surplus from transaction.
- Dual contract means worker is less likely to shirk (consumption loan at risk) and also more likely to pay off loan, because job and its earnings are at risk.
- Contract can take many forms, whether wage and interest rate are above/below opportunity wage and interest rate.
Alternative Credit Policies

1. Vertical formal–informal links
2. Microfinance
Grameen Bank

Make small loans ($< 200) to individuals within a group. If any one in group defaults, then all members unable to borrow in future.

Allows borrowers to use their information to form group that is mostly likely to repay loan. Don’t want “Slim” in group.

Peer monitoring.

Drawback: group is too conservative in choice of projects.