Economics of Banking
Lecture 13

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Economics of looting

Model over $t = 0, 1, 2$.

At $t = 0$: Initial capital W_0, liabilities L_0

Used to and purchase assets $A = W_0 + L_0$. By capital regulation: $W_0 \geq cA_0$.

Assets give payments $\rho_1(A)$ at $t = 1$ and $\rho_2(A)$ at $t = 2$.

At $t = 1$, dividends Δ_1 are paid out.

After the payment of dividends, the liabilities are

$$L_1 = (1 + r_1)L_0 - \rho_1(A) + \Delta_1.$$

Liabilities over the years

At $t = 2$, business can be finished after receipt if $\rho_2(A)$.

The liabilities are

$$(1 + r_2)L_1 = (1 + r_2)[(1 + r_1)L_0 - \rho_1(A) + \Delta_1],$$

and Net worth is value of assets minus value

With **full liability:** Solve (at $t = 2$)

$$\begin{aligned} V^* &= \max_{A,\Delta_1} \frac{\rho_2(A) - (1 + r_2)[(1 + r_1)L_0 - \rho_1(A) + \Delta_1]}{1 + r_2} + \Delta_1 \\ &= \max_A \frac{\rho_2(A)}{1 + r_2} + \rho_1(A) - (1 + r_1)L_0 \end{aligned}$$

subject to

$$0 \leq cA_0 \leq W_0.$$

Strategic default

With **limited liability:** Government imposes an upper bound $M(A)$ on dividend at $t = 1$:

Now the problem is:

$$\max_{A,\Delta_1,\Delta_2} \left[\frac{\Delta_2}{1 + r_2} + \Delta_1 \right]$$

under the constraints

$$0 \leq cA_0 \leq W_0, \Delta_1 \leq M(A),$$
$$\Delta_2 \geq \max\{0, \rho_2(A) - (1 + r_2)[(1 + r_1)L_0 - \rho_1(A) + \Delta_1]\},$$

The general result

Let M^* be maximum of $M(A)$ given that $0 \leq cA_0 \leq W_0$.

Theorem

(1) If $M^* \leq V^*$, then the thrift chooses A so as to maximize the true value.
(2) If $M^* > V^*$, then the thrift chooses A so as to maximize $M(A)$, it pays dividends M^* in period 1 and defaults in period 2.

Example

"Riding the yield curve"

The firm acquires a bond with maturity at $t = 2$ for borrowed money. Yearly interest payment on loan r_L given by

$$(1 + r_L) + (1 + r_L)r_L = (1 + r_1)(1 + r_2)$$

so that $r_L \sim (r_1 + r_2)/2$.

Assume $r_1 > r_L > r_2$:

First year interest $r_1 > r_L$ paid out as dividend. Second year: $r_2 < r_L$ and default!

A simple mortgage loan model

Investment project: Outcome $y_h > 1$ with probability π, otherwise $y_l < 1$.

Banks' profit:

$$\pi R_L + (1-\pi)y_l - R = \pi R_L - (1-\pi)(R - y_l) - \pi R$$

Define $\nu = (1-\pi)(R - y_l)$: value of option on property with strike price R at $t = 1$.

If bank profit is 0 (due to competition), then

$$R_L = \frac{\nu}{\pi} + R$$

The option given to the borrower is a cost for the lender.

Consequences

If banks neglect the cost of the option: $R_L \to R$

Loan rates do not reflect true cost $\to$ oversupply of (unsafe) credit!

But why do banks neglect the implicit option?

Bank managers may be

- myopic (wrong perception of possible downturn)
- compete for total assets rather than maximal expected profits

Evergreening

Investments:

Time:	0		1		2
Fast	1	$\longrightarrow$	Y		
Slow	1	$\longrightarrow$	$Y - 1$	$\longrightarrow$	Y
Very slow	1	$\longrightarrow$	$\longrightarrow$	$\longrightarrow$	Y_2

Bank is funded at interest rate r.

Probability of success:

If monitored	1
If **not** monitored	p

Monitoring cost m

Saving the bank after failed engagement

Suppose the bank chooses **not** to monitor a **slow** investment

Borrower defaults with probability $1 - p$

If net gains $p(r_L - r)$ are smaller than losses $(1 - p)(1 + r)$ *and revealed*, the regulator closes the bank.

Instead: Carry on (pretending that the investment is *very slow*), profits at $t = 2$ are $p(1 + r_L)^2 - (1 + r)^2$. If

$$p(1 + r_L)^2 - (1 + r)^2 > (1 - p)(1 + r) - p(r_L - r)$$

then the bank survives.
If $m > (1 - p)(1 + r_L)^2$ then not monitoring is better than monitoring!

Technology of money laundering

Placement	legal organisations
Layering	many transactions between individuals
Integration	sales as legitimate transactions

Crying wolf: A simple model

Two agents: Bank and Government.

Bank observes transaction: prior probability α (say $= 0.1$) of ML

ML has cost h to society

ML can be prosecuted, reduces h by a percentage $\rho (= 0.8)$.

Bank may monitor transaction at cost $m (= 0.02)$, receives a signal $\sigma \in \{0, 1\}$. Probabilities are

	Money laundering	Legal transaction
$\sigma = 0$	$1 - \delta$	δ
$\sigma = 1$	δ	$1 - \delta$

Here: $\delta = 3/4$.

Result of observation

We can compute posterior probability of ML:

$$\beta_0 = P[ML|\sigma = 0] = \frac{0.1 \cdot 0.75}{0.1 \cdot 0.25 + 0.90 \cdot 0.25} = 0.04$$
$$\beta_1 = P[ML|\sigma = 1] = \frac{0.1 \cdot 0.75}{0.1 \cdot 0.75 + 0.9 \cdot 0.25} = 0.25$$

Bank reports if received signal. Reporting has a cost $c(= 0.01)$

Government also exerts effort I ($=$ probability of verifying ML) at cost $\frac{1}{2}I^2$, I_0 if no report and I_1 if report.

Fine $F(= 10)$ to bank if government discovers an unreported ML

The Monitoring and Reporting Game

Bank chooses a policy (M, T)

$M \in \{0,1\}$ for monitoring, $T \in \{0,1\}$ for reporting when signal is $\geq T$.

Let q_{1T} (q_{0T}) be the probability of ML (no ML) given monitoring and reporting.

Then $q_{01} = \beta_0 = 0.04$, $q_{11} = \beta_1 = 0.25$.

If $T = 0$, then reporting is uninformative, so that $q_{10} = q_{00} = \alpha = 0.1$.

We also use probability p_T of reporting T, $p_1 = 0.1 \cdot 0.75 + 0.9 \cdot 0.25 = 0.3$

Social welfare

For society, F is a transfer between agents and doesn't matter

Bank chooses $(1, 1)$.

Marginal gain from effort should equal marginal cost:

No report	Report
$I_0^* = q_{01}\rho = 0.03$	$I_1^* = q_{11}\rho = 0.2$

But can this optimum be sustained?

Setting the fine

Yes if the fine F can be determined so that

(a) Expected cost for bank not smaller if $M = 0$,

$$\alpha I_0^* F \geq (1 - p_1) q_{01} I_0^* F + p_1 c + m,$$

or

$$F \geq \frac{p_1 c + m}{[\alpha - (1 - p_1) q_{01}] I_0^*} = 5.65$$

(b) Expected cost should not increase if the bank monitors but reports at all signals,

$$c + m \geq (1 - p_1) q_{01} I_0^* F + p_1 c + m,$$

or

$$F \leq \frac{(1 - p_1) c}{(1 - p_1) q_{01} I_0^*} = 9.8.$$