CAPITAL MARKETS

Perfect Capital Markets

Present (an assumption) in many macro models, e.g. OLG
Implicitly present in IS/LM, IS/MP, ...

Means everyone in economy can borrow/lend as much money as he chooses at one, economy-wide r $(= i - \pi^e)$
always repays/is repaid, no default/bankruptcy.

One result of this:

each firm sets $MPK = r$

so $MPK_{FIRM\,A} = MPK_{FIRM\,B} = \ldots$

Efficient! (Pareto optimal).

If $MPK_{FIRM\,A} > MPK_{FIRM\,B}$,

we could increase output just by reallocating capital from B to A.

Another result:

Slope of IS curve (effect of Δr on spending) reflects diminishing MPK.

CAPITAL MARKETS (cont.)

Reality

1) Default/bankruptcy

2) Potential borrowers who might default
   must pay extra-high r
   can't borrow as much as they want, } "Credit rationing"
   perhaps can't borrow at all

3) Forms of borrowing/lending

   Equity (stock, shares): borrower promises to pay share of profit, not fixed amount of $

   versus

   Debt + bankruptcy: borrower promises to pay fixed amount of $ unless he declares bankruptcy. If borrower declares bankruptcy, lender can seize his assets.

4) Credit crunch
   Sometimes it is especially hard to borrow, credit rationing tightens.

"Financial market imperfections"

CAPITAL MARKETS (cont.)

Asymmetric information

General definition: one party to a potential deal knows/observes things other party(ies) can't ~~or~~ (or can learn only at a cost

In Financial markets,
models with asymmetric info can account for lots of Financial mkt imperfections etc.

Model in Romer 9.9 shows:

1) Why debt + bankruptcy contracts exist

2) Why Δr has big effect on spending (IS curve flat), bigger than effect of diminishing MPK

3) Why economy dies, credit crunch if potential borrowers lose net wealth (assets − existing debts)

— Fall in prices of houses, stocks

— "debt deflation"
Real burden of existing \$ debts ↑ if P↓

IMPERFECT FINANCIAL MARKETS

Romer 9.9

General assumptions

Two agent types:

- Entrepreneurs ("Es")
- Investors ("Is")

both "risk neutral": act to maximize expected value of income.

Es can initiate & control business projects, but don't have enough wealth to pay for required capital investment.

Is have wealth to invest in business projects, but can't initiate & control business projects.

Hence E & I must pool wealth, cooperate to initiate a project, share returns.

Both Es & Is have alternative to project: put wealth in risk-free investments that earn return r.

Many Is compete for investment opportunities, so E can get funds from I as long as E can credibly promise I expected return $= r$

recall risk neutrality

Imperfect FM

Romer 9.9

General assumptions (cont.)

Each E has one possible project

requires one unit of resources

has wealth $W < 1$ (can vary across Es

(not in Romer)

X Output generated by a project is random variable

Uniform distn $0 \quad \gamma \quad 2\gamma$

Expected value of output

can vary across Es/projects

To do project, E puts in his wealth W, must get $(1-W)$ from I.

Each I's wealth $> (1-W)$, so E need deal with just one I (just 2 people need to cooperate

Look at two cases:

1) Symmetric information
Both sides see γ and realized X

2) Asymmetric information
Both sides see γ but only E sees X, unless I pays a cost.

Imp. F. M.

Romer 9.9

Symmetric information

A deal that will work:

I gives E $(1-W)$

E promises to pay I a share of X

promised share $s = \dfrac{(1-W)(1+r)}{\gamma}$

When X is realized, both sides observe it,

I gets $\dfrac{(1-w)(1+r)}{\gamma} X$

E gets $X - \dfrac{(1-w)(1+r)}{\gamma} X = \left(1 - \dfrac{(1-w)(1+r)}{\gamma}\right) X$

I takes deal because

$$E\left[\frac{(1-w)(1+r)}{\gamma} X\right] = (1-w)(1+r)$$

same as riskless alternative

E offers deal as long as

$$E\left[\left(1-\frac{(1-w)(1+r)}{\gamma}\right) X\right] \geq w(1+r)$$

return from riskless alternative

$$\left(1-\frac{(1-w)(1+r)}{\gamma}\right)\gamma \geq w(1+r)$$

$$\gamma - (1-w)(1+r) \geq w(1+r)$$

$$\gamma - (1+r) + w(1+r) \geq w(1+r)$$

$$\gamma \geq (1+r)$$

IMP. F. M.

Romer 9.2

Symmetric info (cont.)

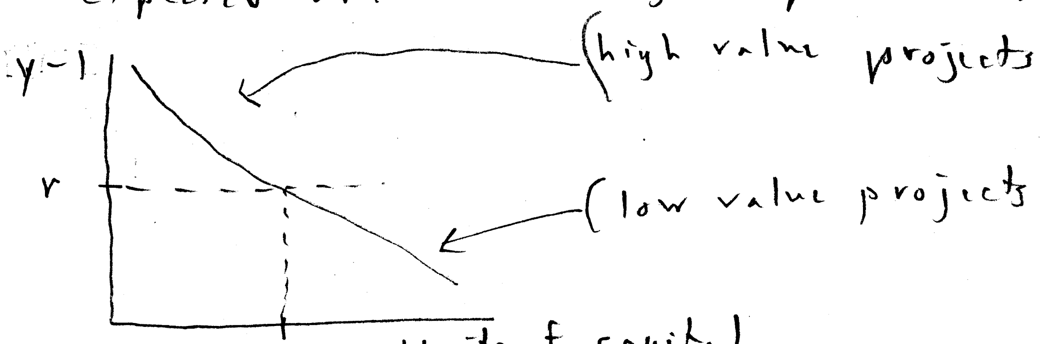
Recall project will be undertaken as long as

$$\gamma \geq (1+r)$$

cost

E[Marginal product] of an investment project is $\gamma - 1$

so this means project is undertaken as long as expected value of marginal product $\geq r$



Note this is analogue to $f'(k) = r$

It maximizes "net social benefit"

$(1+r)$ Opportunity cost of putting one unit of resources or output (capital) into business investment project

IMA . M.

Romer 9.9

Asymmetric info

E observes realized X at no cost,
but I cannot observe X
unless he pays cost $c < \gamma$
"Costly state verification"

Deals that won't work:

1) E promises to pay I a share of X,
E observes X & reports value,
I does not pay cost c.
Not credible. E will lie, report X is low.

2) E promises to pay I a fixed sum D no matter what X turns out to be.
Not possible: in the event that $X < D$,
E can't pay D.

Asymm. info (cont.)

Deal that will work, but won't happen: verify & share

E offers I share of output,

I pays c to observe realized X,

takes share · X.

I would get $sX - c$

s must be big enough to make

Promised share under symm. info

$$E[sX - c] = (1-w)(1+r)$$

$$sY - c = (1-w)(1+r)$$

$$s = \frac{(1-w)(1+r)+c}{Y} > \frac{(1-w)(1+r)}{Y}$$

E would get $(1-s)X$

$$= \left(1 - \frac{(1-w)(1+r)+c}{Y}\right) X$$

Expected return to E would be:

$$E[\quad] = \left(1 - \frac{(1-w)(1+r)+c}{Y}\right) Y =$$

$$= Y - (1+r)(1-w) - c < Y - (1+r)(1-w)$$

expected return to E under symm info

Imp. F M

Romer 9.9

Asymm info (cont.)

Why won't that deal happen?

There's a different deal that gives I expected return equal to $(1-w)(1+r)$ and gives E expected return greater than
$$y-(1+r)(1-w)-c$$ (verify & share

and gives E incentive to tell the truth about what he's required to report.

Debt contract

E takes $(1-w)$ from I & promises to pay fixed sum D if $X \geq D$.

If $X < D$, E reports "can't pay"

I pays cost c to verify value of X & can take all of X (E gets nothing, loses W)

E won't lie because:

- if $X < D$, E won't claim $X \geq D$: E can't pay D
- if $X \geq D$, E won't claim "can't pay" because if he did I would get to take all of X!

IMP. F M

Romer 9.9

Asymm info

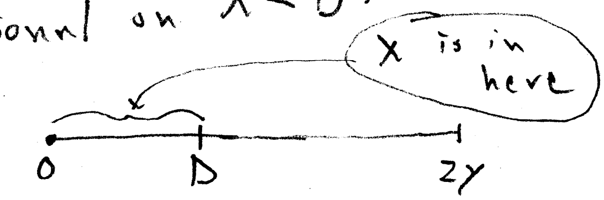
Debt contract (cont.)

probability $X < D$ so that E reports "can't pay":

$$\frac{D - 0}{2\gamma} = \frac{D}{2\gamma}$$ ← from uniform distn.

Expected value of X conditional on $X < D$:

$E[X / X < D] = \frac{D}{2}$ from



Given D, expected value of deal to I, $R(D) =$

$$\left(1 - \frac{D}{2\gamma}\right) D + \frac{D}{2\gamma}\left(\frac{D}{2} - c\right) = \frac{2\gamma - D}{2\gamma} D + \frac{D}{2\gamma}\left(\frac{D}{2} - c\right)$$

what I gets if he must verify

$$R(D) = \underbrace{\frac{2\gamma - D}{2\gamma} D + \frac{D}{2\gamma}\frac{D}{2}}_{\text{expected value of E's payment to I}} - \underbrace{\frac{D}{2\gamma} c}_{\text{"expected verification costs" A}}$$

To attract funds from I, E must offer a value of D so that above $= (1+r)(1-w)$

hence

1) better for E than verify & share

2) defines D^* offered by E

Imp. F M

Romer 9.9

Asymm info

Debt contract (cont.)

1) Better for E than verify & share

$$\text{Expected payment to } I - \frac{D}{2\gamma} c = (1+r)(1-w)$$

$$\text{Expected payment to } I = (1+r)(1-w) + \frac{D}{2\gamma} c$$

Expected value of return to E:

γ − Expected payment to I

$$= \gamma - (1+r)(1-w) - \frac{D}{2\gamma} c > \overbrace{\gamma - (1-r)(1-w)c}^{\text{verify \& share}}$$

as long as $D < 2\gamma$, which means probability E says "can't pay" is less than one.

2) Defines D^*

$$\frac{2\gamma - D}{2\gamma} D + \frac{D}{2\gamma}\left(\frac{D}{2} - c\right) = D - \frac{1}{2\gamma} D^2 + \frac{1}{4\gamma} D^2 - \frac{c}{2\gamma} D$$

$$= \left(-\frac{1}{2\gamma}\right) D^2 + \left(1 - \frac{c}{2\gamma}\right) D = (1+r)(1-w)$$

Use quadratic formula, solve for D^*, use smaller value

$$D^* = 2\gamma - c - \sqrt{(2\gamma - c)^2 - 4\gamma(1+r)(1-w)} < 2\gamma$$

IMP. FM

Romer 9.9

Asymm info

Debt contract (cont.)

Expected return to E:

$$\gamma - (1+r)(1-w) - A$$

where $A = \frac{D^*}{2\gamma} c = \left[\frac{2\gamma - c}{2\gamma} - \sqrt{\left(\frac{2\gamma - c}{2\gamma}\right)^2 - \frac{(1+r)(1-w)}{\gamma}} \right] c$

See: A depends on c, r, W, γ

$$\frac{\partial A}{\partial c} > 0, \quad \frac{\partial A}{\partial r} > 0, \quad \frac{\partial A}{\partial w} < 0, \quad \frac{\partial A}{\partial \gamma} < 0$$

or $A(c, r, W, \gamma)$ where $A_c > 0, A_r > 0, A_W < 0, A_\gamma < 0$ (9.41)

E can do project or put wealth in safe asset, so do project only if

$$\gamma - (1+r)(1-w) - A(c, r, W, \gamma) > (1+r)W \qquad (9.42)$$

R^{MAX}

From $R(D) = \frac{2\gamma - D}{2\gamma} D + \frac{D}{2\gamma}\left(\frac{D}{2} - c\right)$,

$R'(D) = 1 - [c/(2\gamma)] - [D/2\gamma]$

+ for $D < 2\gamma - c$

0 for $D = 2\gamma - c$ ← (D that maxes $R(D)$)

(−) for $D > 2\gamma - c$

$R(2\gamma - c) = R^{MAX} = [(2\gamma - c)/(2\gamma)]^2 \gamma$

If $R^{MAX} < (1-W)(1+r)$, I won't lend.

"rationing"

IMP. FM

Romer 9.9

Asymm info (cont.)

Results of debt contracts (or asymm info)

Compared with symm info,

1) Fewer projects done, less investment in projects

Recall γ varies across E's or projects.

Do project if:

Symm info: $\gamma \geq (1+r)$

Asymm: $\gamma - (1+r)(1-W) - A \geq (1+r)W$

$\gamma \geq (1+r)W + (1+r)(1-W) + A = (1+r) + A$

2) Δr has bigger effect on project investment

In symm info, $r\uparrow \rightarrow (1+r)\uparrow$

In asymm, $r\uparrow \rightarrow (1+r)\uparrow$ AND $A\uparrow$ (recall $A_r > 0$)

Under symm info, E's wealth W doesn't affect whether a project is done, but under asymm

3) If E's have less wealth, fewer projects done

Do project if $\gamma \geq (1+r) + A(c, r, W, \gamma)$

Because $A_W < 0$, if $W\downarrow \rightarrow A\uparrow$, some projects become unprofitable, because E must offer higher $D/(1-W)$

IMP, FM

Romer 9.9

Asymm info

Results of (cont.)

What would happen if we embed this story into a macro model?

1) New source of exogenous shocks

Exogenous shocks to c or W affect volume of investment resulting from a given interest rate r, hence current Y, future K, etc.

2) Endogenous W,

W is real value of entrepreneur's assets
 minus real value of pre-existing debts.

Thus, many ways that variables in a macro model could affect W.
W then affects Y, etc.

Some possible stories here: ...

Imp. FM

Romer 9.9

Asymm info

Results

2) Endogenous W (cont.)

Debt deflation

Debts denominated in \$

If price level turns out to be lower than expected when debts incurred (surprise disinflation or deflation),

then existing debtors have less real wealth,

" creditors have more,

Transfer of wealth from debtors to creditors.

Can this have macro effects, even though total wealth unchanged?

Yes. Say E's among set of existing debtors.

Then $(\pi < \pi^e) \rightarrow W\downarrow \rightarrow A(\quad)\uparrow \rightarrow$ investment$\downarrow$ etc.

IMP, FM

2) Endogenous W (cont.)

Financial accelerator

r↑, Y↓ could decrease value of assets
(shares in a business, MPK, PDV of expected future MPK...)
thus ⟶ w↓ → AC ( )↑ → investment↓ → Y↓ → etc.
could make Y↓ bigger & more persistent.