Illiquidity and Interest Rate Policy

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Motivation

- Illiquidity and insolvency are likely when long term assets are financed with short term debt.
  - Historically, banks
  - Now, investment banks and insurance companies
- In a crisis like today, government can bail out banks, set up directed lending to banks or firms, buy illiquid assets, or even repudiate contracts.
- In more normal times government is more inclined to act by lending/borrowing to change interest rates.

Motivation 2

- Interest rate policy is across-the-board, and when there is a systemic liquidity problem, it can give a boost to all of those reliant on short-term funding.
- It looks even less like a subsidized intervention that does a lender of last resort facility, which is often considered (e.g. by Bagehot) to have little moral hazard.
- What kind of policy will help most and what will be unhelpful?

Historical Examples

- US: Greenspan claimed that low commercial bank capital in the early 1990's was a constraint on US interest rate policy, requiring lower rates than otherwise.
- US: 2007-2008 policy of lower interest rates due to financial fragility.
- Was this right? What were the unforeseen effects? What about non-fragile times?

Questions we examine:

- What are the additional effects of interest rate policy in an economy where banks or firms must borrow short-term?
  - On lending (projects not liquidated) and bank solvency
  - On the set of possible contracts when banks can issue only simple deposit contracts (incomplete contracts).
  - On ex ante bank investment decisions
    - Liquid loans vs. Illiquid loans/assets
  - On ex ante bank leverage decisions

Outline

- Motivation and preview of results
- Model
- Intervention
- Moral Hazard
  - Leverage Choice
  - Illiquidity Choice by Banks
- Implications for policy

The Model

- Three dates: 0, 1, and 2
- On date 0, households are endowed with one unit of goods which are required inputs.
- Households have no production opportunities, but can lend them to banks, and banks can lend to entrepreneurs (with no own endowments).
- Banks are needed because either monitoring or relationship building is needed to force entrepreneurs to repay (e.g., Diamond-Rajan (2001).)

Households and endowments:

- Households are risk averse and consume at dates 1 and 2.
- Households each get date 1 endowment of $e_1 > 0$ and learn (on date 1) their date 2 endowment, which could be $e_2^L > 0$ or $e_2^H > e_2^L > 0$.

Households and Endowments

- Economy has two aggregate states:
  E (Exuberant) and N (Normal)
- The fraction of households with the High date 2 endowment, H, is greater in the Exuberant state.

$$\theta^E > \theta^N$$

- This implies higher real interest rates from date 1 to 2 in Exuberant state E.

Financial Contracts

- Banks must borrow using short-term deposits with the threat of runs to commit to collect the loans.
- General point: to use maximum debt capacity, borrowers must use short-term debt.

Banks and entrepreneurs

- Entrepreneurs: Project requiring a unit input at date 0 to produce $\tilde{Y}_2$ at date 2, or be liquidated for $X_1 > 0$ at date 1.
- The realization of $\tilde{Y}_2$ is learned at date 1.
- Bank can collect $\gamma\tilde{Y}_2$ from a borrower at date 2, with $\gamma \in (0,1)$ or liquidate for X_1 at date 1.
- Bank will make choice with biggest present value (given realized Y_2, project by project) and the market interest rate.

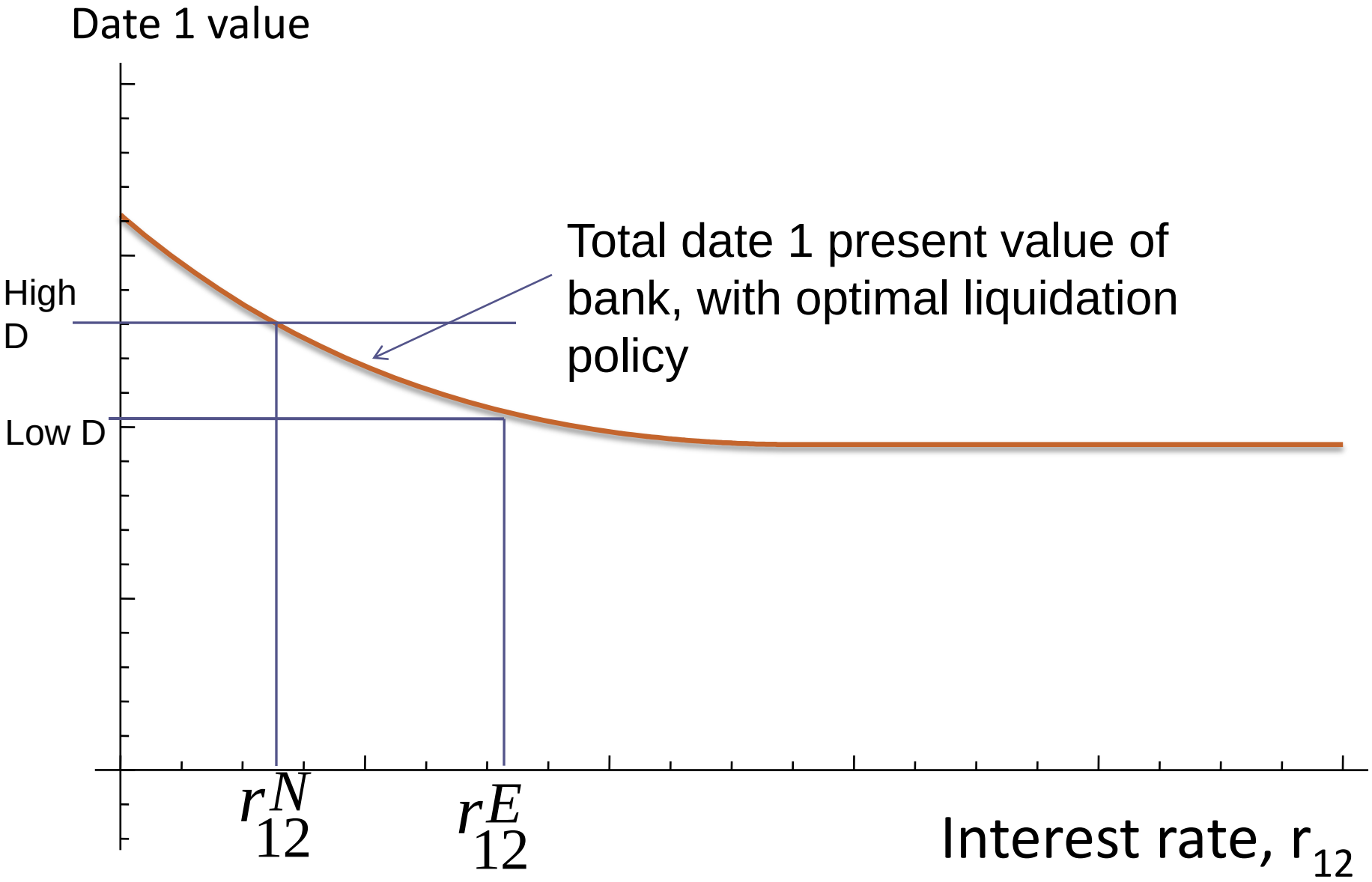
Date 0	Date 1	Date 2
Households invest 1 each in banks in return for a promised payment of D at date 1. Banks lend 1 to entrepreneurs.	State S $\in$ {E,N}, is revealed, more households get the high date-2 endowment H, in state E than in N. Banks offer market clearing interest rate r_{12}^{S} and choose which loans to liquidate. Households decide how much to withdraw (if a run, all withdraw everything and all loans liquidated) and how much to consume.	Projects mature, loans repaid, and deposits fully withdrawn from banks. All agents consume.

All Banks are Identical

- All banks are the same ex-post (no asset side uncertainty), with a known ex-post distribution of loan Y_2 realizations (no aggregate uncertainty)

On date 0, Banks choose D (must be constant)

- If probability of E state is low: Banks optimally choose a high D (with runs in E state).
- High interest rates r_{12}^{E} then bring down banks that must be financed short-term.
- If probability of E state is high: banks optimally choose a low D and are safe, without any runs.
- Competition forces banks to choose the D that maximizes investor welfare.


Date 1 value
High D
Low D
Total date 1 present value of bank, with optimal liquidation policy
r_{12}^{N}
r_{12}^{E}
Interest rate, r_{12}

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  - Leverage Choice
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Could intervention do better?

- If D (the amount payable on demand) could be state contingent, no.
  - But with demandable deposits it can be very difficult to make it contingent in time.
- Government can't re-write contracts, can't do bailouts.

Government can observe the aggregate state (Exub. Or Normal)

- Government can lend or borrow to influence interest rates, but must pass all costs and benefits of lending at market rates back to households in lump sum.
- This is not directed lending, like a discount window loan, but more like an open market operation.

Undirected Lending at date 1

- Government has ability to tax endowments.
- Can tax at date 1 and lend to banks (passing the interest earned to households) or tax at date 2 and sell bond claims on these taxes to banks in return for deposits.
- Households can't borrow against future endowments.

When does this have an effect?

- When government makes a loan at an interest rate that a household type would not make (reducing rates) or when government taxes future endowment and distributes current claims (increasing rates).
- This occurs when one type withdraws their entire deposit (this will be the H types, with high future endowments).
- If not on this corner, budget set is unchanged and Ricardian equivalence holds.

Implications of Interest Rate Policy (start with ex-post)

- Pushing down rates in Exuberant state, r_{12}^{E}, so the bank is just solvent, allows runs to be avoided at higher levels of D, allowing a Pareto improvement in the E state (compared to a run).
- Pushing rates further down in reduces liquidation and transfers from households to borrowers. Also increases MRS gap of H and L.
- Government interest rate policy depends on their welfare weights of the various agents.

Initial Results on Intervention

- Intervention can allow a set of contracts that makes investors better off than with none.
- The intervention depends on the goals of the "Fed," and can redistribute between households and borrowers as well as potentially make a Pareto improvement (ex-ante and ex-post).
- If ex-post optimal interventions favor borrowers, ex-ante competition leads to ex-ante Pareto dominated outcomes.

Part 2: Moral Hazard and Liquidity Choice

- Suppose that banks can choose between liquid loans and illiquid loans with higher long term payoffs.
- The more a borrower can repay at date 1 (by liquidating his project), the more liquid is a loan.
- One interpretation of liquid is that the bank monitors the borrower to make sure that the borrower maintains liquidity (and thus limiting longer term value).

What is an Illiquid Loan?

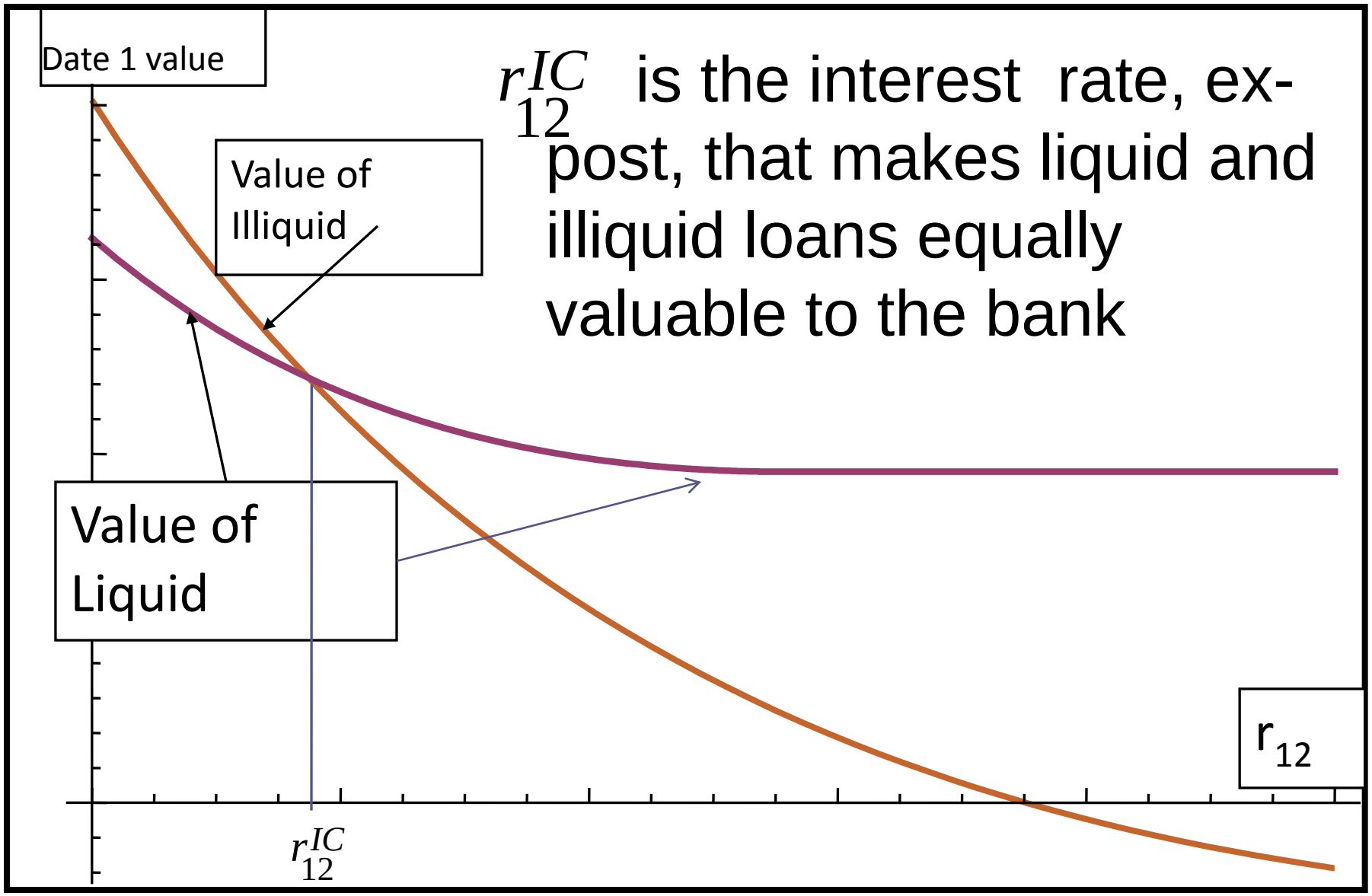
- An interpretation of illiquid is that the bank makes loans that it knows it will need to fully refinance in the future (as when it sets up a special interest vehicle (SIV) knowing that its ability to liquidate will be low).
- Or, as before, a loan where the bank does not monitor the entrepreneur's liquidity.

Liquidity Choice

- Let banks choose to lend either solely to
  - liquid projects or to illiquid projects after issuing deposits at date 0:
- Liquid loans have larger X_1 (internal liquidity at the borrower) and lower Y_2
- Can think of a mortgage-backed SIV as $X_1=0$ with a large Y.

Liquidity Incentive Constraint

- If liquidity choice is unobservable when selected, or if observable but not regulated or controlled, then the level of interest rates in the future will influence the choice.
- We now look at a case where the choice of liquid loans is what households would like to implement and examine the incentive constraint.

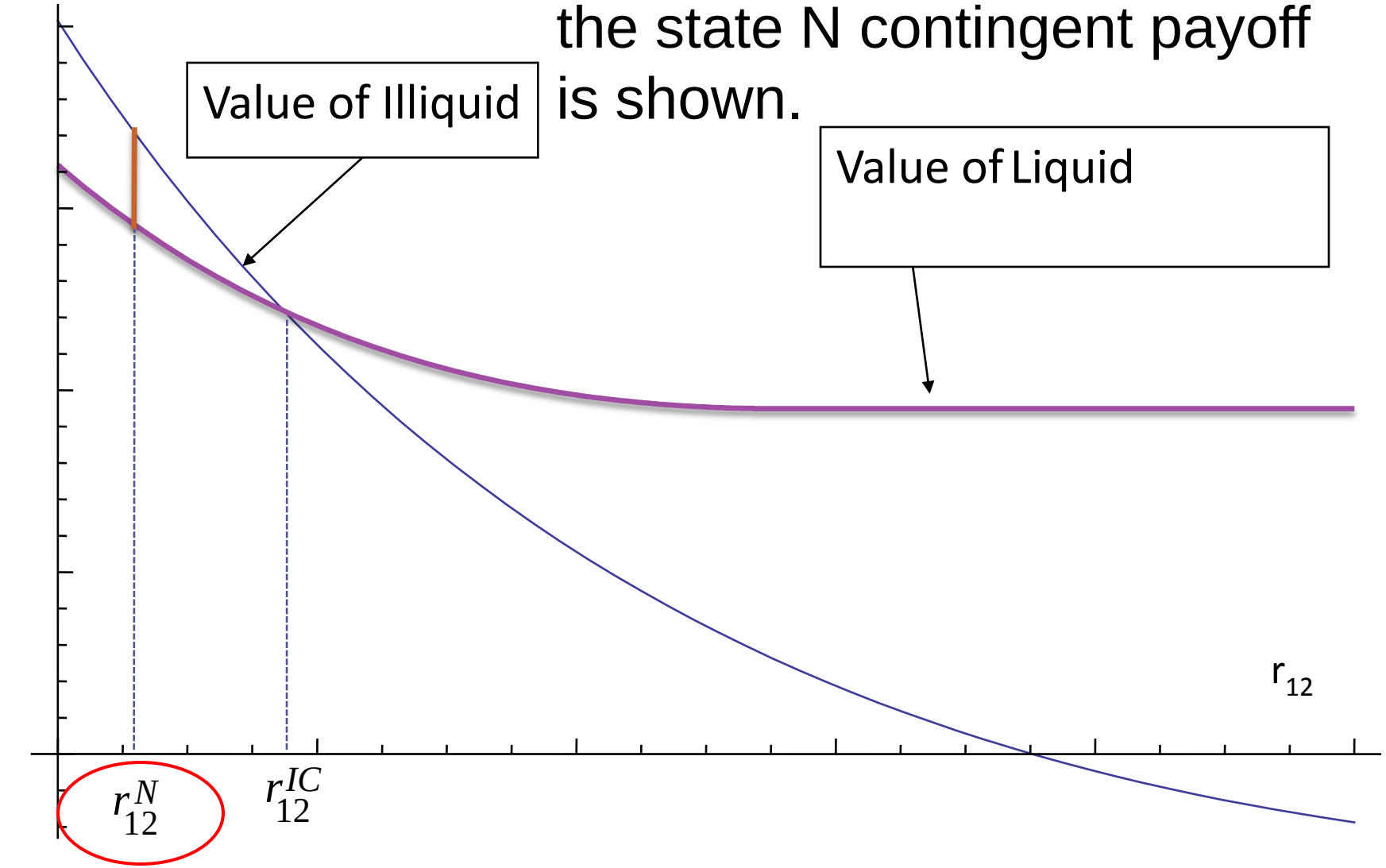


r_{12}^{IC} is the interest rate, ex-post, that makes liquid and illiquid loans equally valuable to the bank

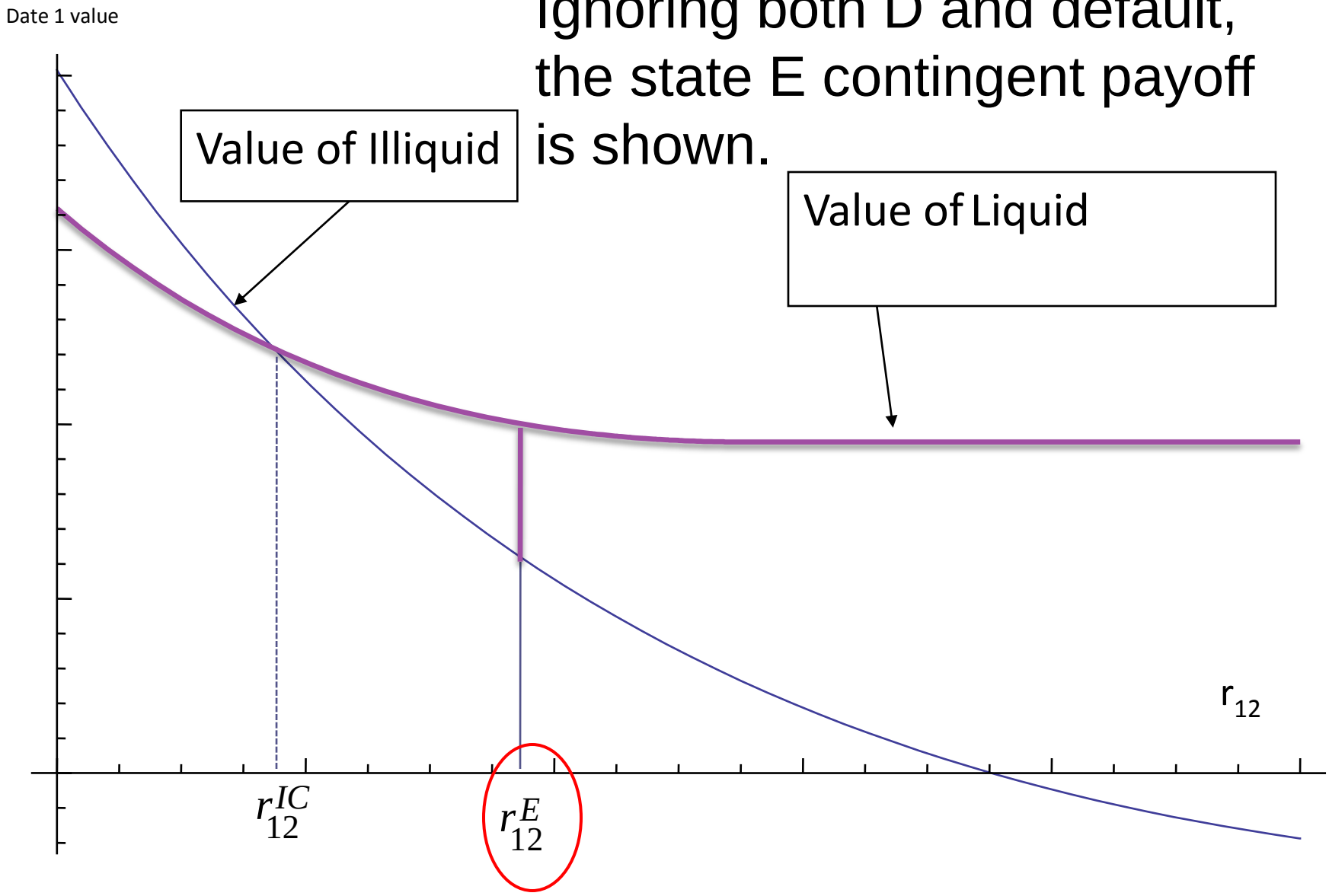
Incentive Constraint for liquid:

- Interest rates are uncertain (depend on the state E or N) when the liquidity is selected, and there is possible default if D is high and the bank is run.

Ignoring both D and default, the state N contingent payoff is shown.



Ignoring both D and default, the state E contingent payoff is shown.



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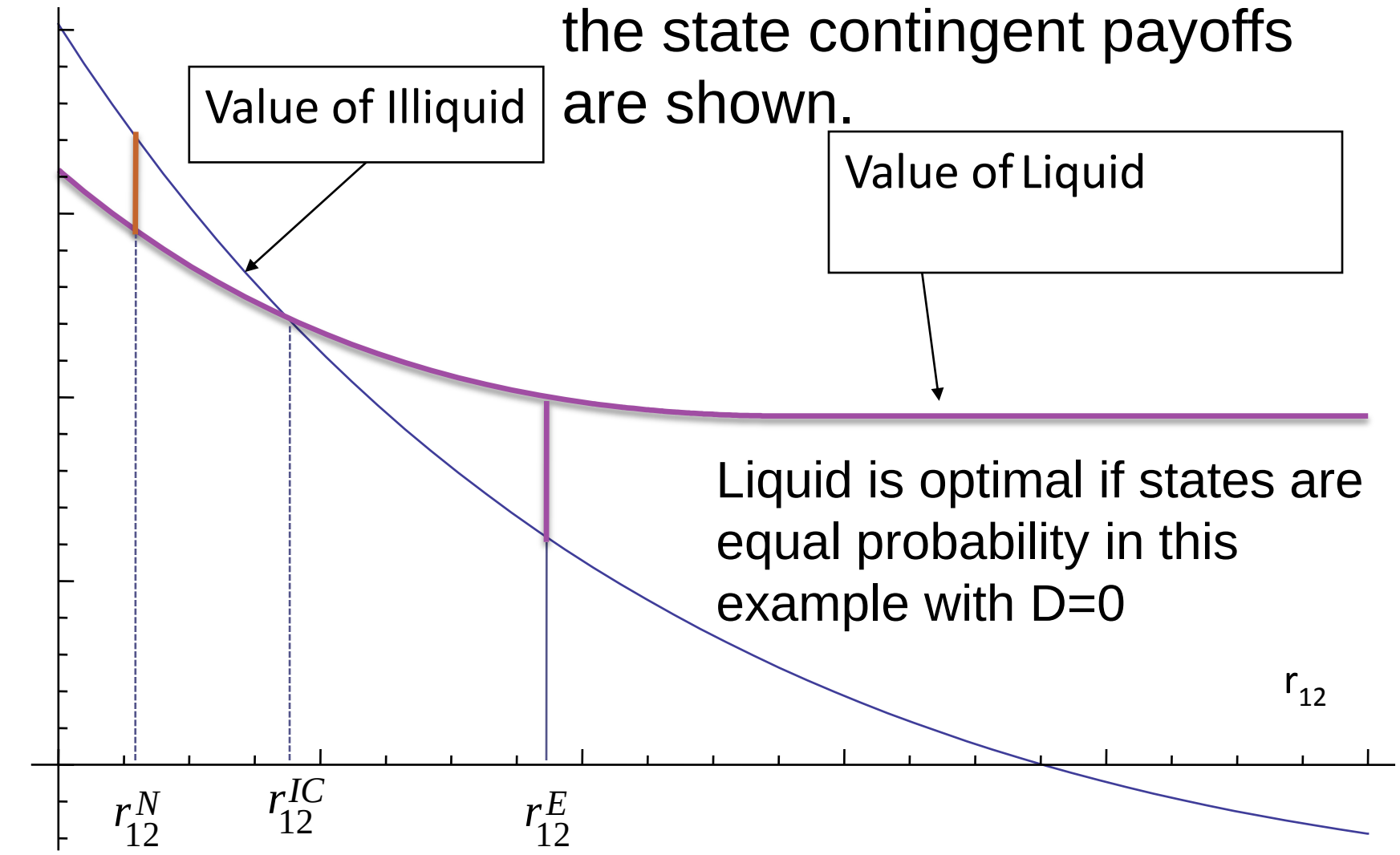
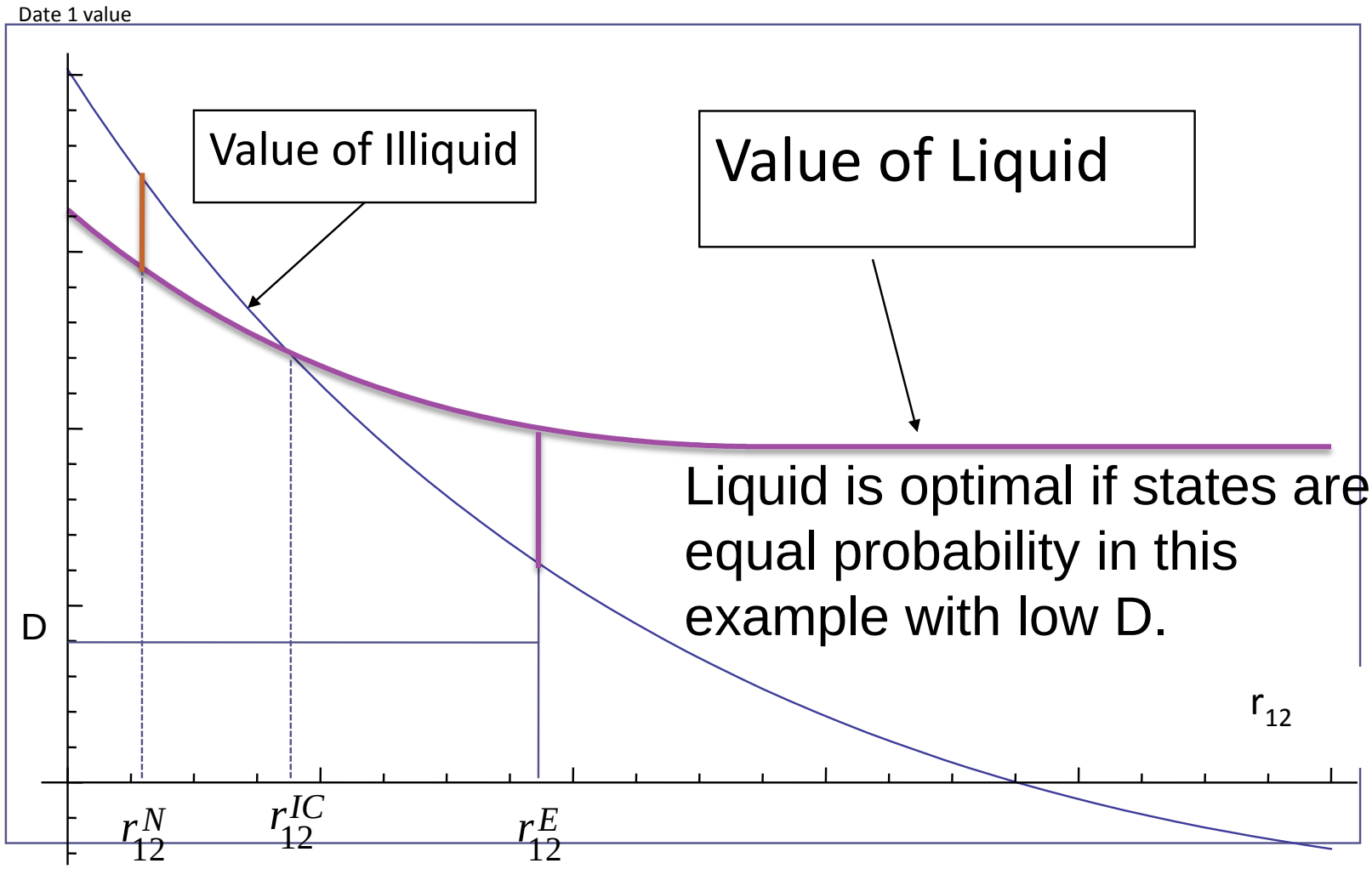


Values at date 1, with low leverage (low D)

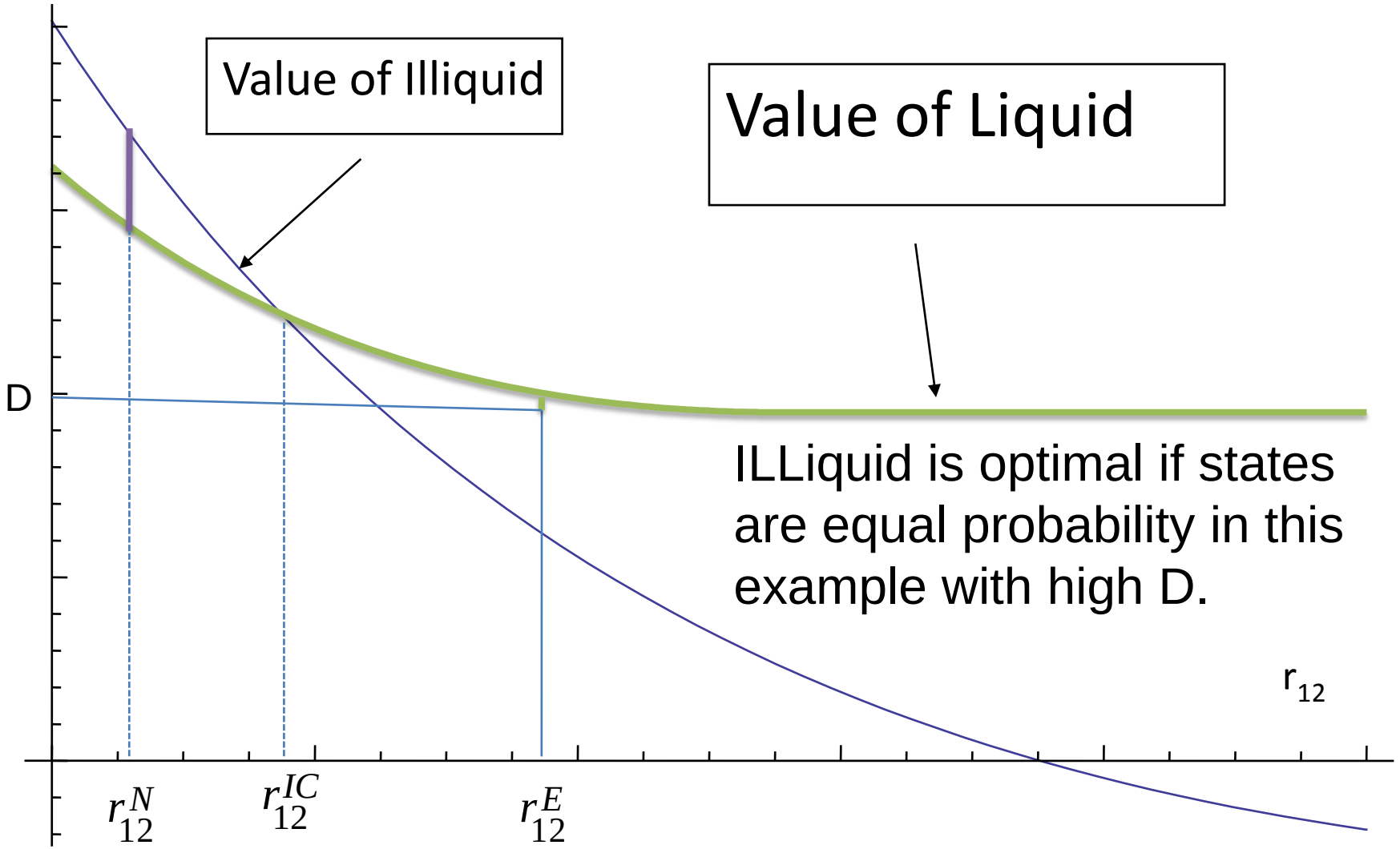


With very low leverage, D.

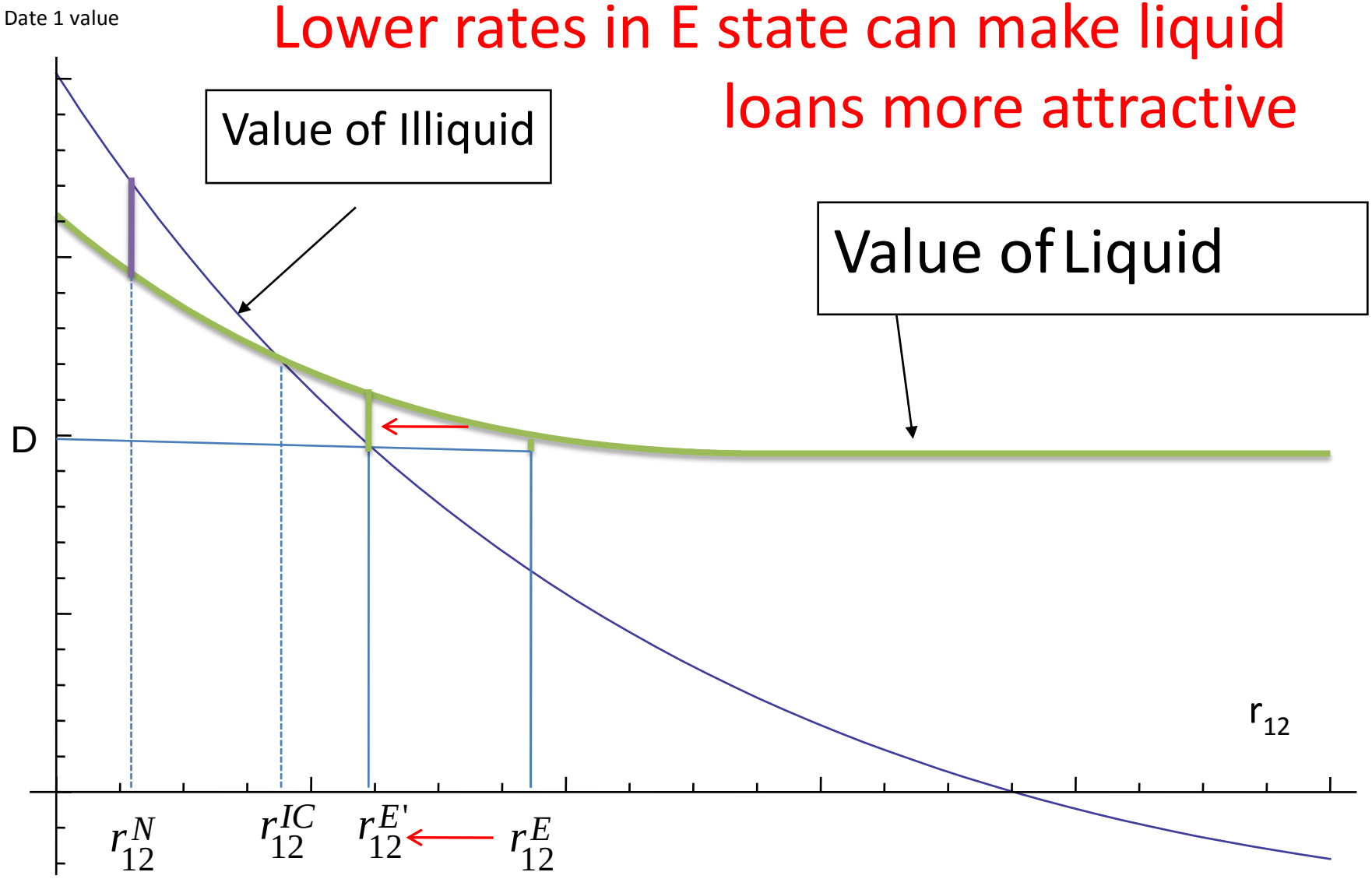
- Overall incentive constraint depends on the entire rate distribution.
- Higher rates in either state enhance the ex-ante incentive for banks to hold liquid loans.
- Reductions in E may require increases in N.
- What about for higher leverage, D, which is what banks will choose on their own accord to attract deposits?
- How does the level of bank capital matter?

Date 1 value

Equity Values at date 1, with high leverage (higher D)



Lower rates in E state can make liquid loans more attractive

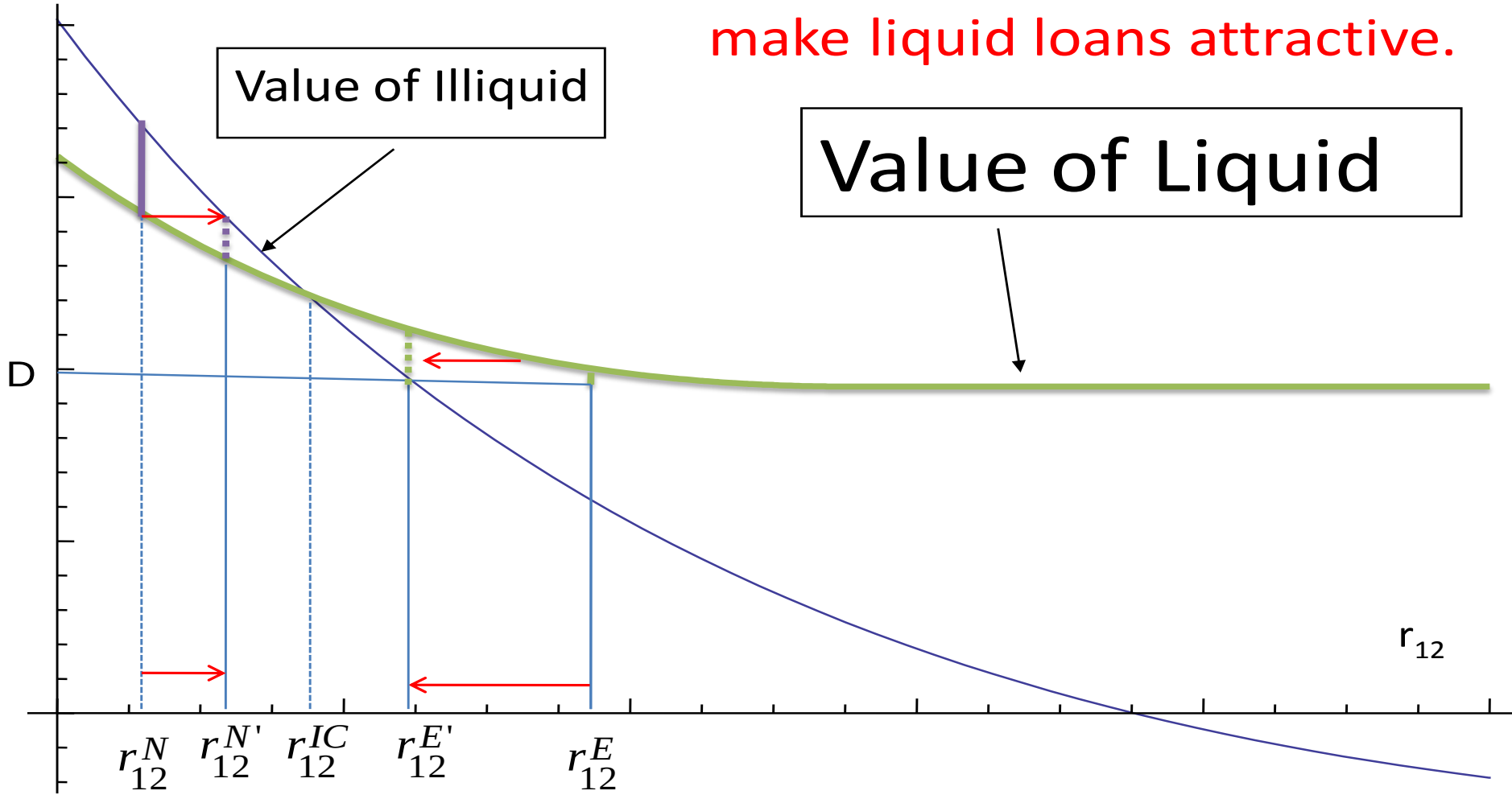


Intervention in Crisis times

- The possibility of very low rates to supply "bank capital" is a first line of defense and, surprisingly, this has "negative moral hazard" because it rewards banks who are more liquid in that situation (when illiquid banks would fail even at these low rates).
- This is better for bank incentives than bailouts or buying up the most illiquid assets, because it rewards good behavior.

Date 1 value

Lower rates in E state and higher rates in N state make liquid loans attractive.



With the equilibrium level of D

- Policies on interest rates should not just take into account the possibility of bank failures, but also the potential for banks to choose excessively illiquid projects or to choose excessive leverage, if they anticipate a low interest rate environment.
- Optimal interest rate policies may require committing to raising rates when relatively low and reducing them when high, in order to foster the right ex ante incentives.

Poor Policy in Normal Times

- Keeping rates too low in benign times (Greenspan 2002-2006) can make the next crisis a whopper (ask Bernanke about this one).
- Persistently low short-term rates and a flood of liquidity influence not just macro activity but the micro allocation of credit by intermediaries.