Bank Liquidity, Interbank Markets, and Monetary Policy

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Interbank market during a crisis

- Does the interbank market provide optimal liquidity to banks during a crisis?
- Does access to interbank market liquidity help or hurt banks' incentives to hold liquid assets?
- Can CB policy help?

What should CBs do?

- Standard view: Monetary policy only plays a role if crisis affects inflation or real economy
  - CB can change the composition of its balance sheet to provide liquidity

- However, CBs often decrease the policy rate during disruptions, leading to criticism

Do CBs do the right thing?

- Buiter (2008) asks “Despite these worrying inflation developments, and with output not exactly falling off a cliff (and probably not even weakening enough to accommodate the necessary external rebalancing of the US economy) the Fed cut rates aggressively. What accounts for this anomalous, and in my view misguided, monetary policy behaviour?”

Our paper

- We argue monetary policy has a direct role by helping redistribution of liquidity in a crisis

- We show the CB can implement the efficient allocation by setting high rates in normal times and low rates during disruptions

Bank liquidity

- Two types of liquidity:
  - Bank liquidity: Held to provide risk-sharing
  - Interbank market liquidity: Ease of distributing liquidity between banks
- Definition: In a crisis banks have high uncertainty about their liquidity needs

The effect of interbank rates

- Ex ante high rate promotes depositor risk-sharing
  - Banks hold more liquidity because it is expensive to acquire it in the interbank market

- Ex post low rate promotes interbank risk-sharing
  - Redistribution of liquidity between banks is done more efficiently when interbank rates are low

Optimal CB policy

- The CB can choose interbank rates
- To promote risk-sharing between depositors, CB must promise high rates "on average"
- To promote risk-sharing between banks, CB must set low rate during a crisis

Literature

- IB market not part of optimal arrangement
  - Bhattacharya and Gale (1987)
  - Freixas and Holthausen (2005)
  - Freixas and Jorge (2008)
  - Heider, Hoerova, and Holthausen (2008)
- IB market part of optimal arrangement
  - Allen, Carletti, and Gale (2008)
  - Our paper

Literature (cont.)

- Trade-off between holding liquidity ex ante and acquiring liquidity ex post
  - Diamond and Rajan (2008): Lower rates are beneficial during a crisis but CB may be ineffective because of Ricardian equivalence
  - Bolton, Santos, and Scheinkman (2008): Timing of central bank intervention is key
  - Our paper: Focus on level of interbank rates. CB can implement the efficient allocation

Model (Standard DD)

- Three date: 0, 1, 2
- Many competitive banks
- Each bank has a unit mass of depositors
- Depositors can be impatient or patient
  - λ impatient depositors, want to consume at date 1
  - $1 - \lambda$ patient depositors, want to consume at date 2

Two types of banks

- Half of the banks have high liquidity needs
  - More impatient depositors than expected

- Other half has low liquidity needs
  - Fewer impatient depositors than average

- Idiosyncratic but no aggregate uncertainty

Endowments and Technologies

- Depositors have one unit of good at date 0
- Storage technology yields 1 unit at t for each unit invested at t-1, $t = 0, 1$.
- Long-term technology yields r at date 2 per unit invested at date 0. Cannot be liquidated.

Date 0

- Depositors deposit their endowment in banks

- Banks choose how much to invest in storage, $1 - \alpha$, and long term technology, α

- Banks maximize profits. Competition implies they maximize expected utility of depositors

Date 1

- Banks and consumers learn their private type

- $\lambda^{j\varepsilon}$ consumers of type-j banks are impatient
  - $\lambda^{j\varepsilon} = \lambda + \varepsilon$ for $j = a$
  - $\lambda^{j\varepsilon} = \lambda - \varepsilon$ for $j = b$

- Type-a banks have more impatient depositors than expected, type-b banks fewer

Date 1

- There are two states
  - Good times: $\varepsilon = \varepsilon'' = 0$ with probability $1 - \rho$
  - Crisis: $\varepsilon = \varepsilon' > 0$ with probability ρ

- Type-j banks borrows $f^{j\varepsilon}$ on interbank market

- Depositors who withdraw receive c_1

Date 2

- Type-j banks repays their loans $l^{\varepsilon} f^{j\varepsilon}$

- l^{ε} is interbank rate in state ε

- $1 - \lambda^{j\varepsilon}$ patient depositors of type-j banks share remaining goods and consume $c_2^{j\varepsilon}$

Assumptions

- ε is observable but not verifiable
- c_1 is constant (can be generalized)
- CRRA > 1. Banks provide liquidity insurance

First best

- Planner observes consumer types and chooses α and c_1 to maximize

$$\lambda\, u(c_1) + (1 - \lambda)\, u(c_2)$$

subject to

$$\lambda\, c_1 \leq 1 - \alpha$$

$$(1 - \lambda)\, c_2 \leq \alpha\, r$$

$$\alpha \leq 1$$

Bank optimization

- Choose c_1 and α to maximize

$$\lambda\, u(c_1) + (1 - \rho)\,(1 - \lambda)\, u(c_2'')$$
$$+ \rho[(1 - \lambda^{a}')\, u(c_2^{a}') + (1 - \lambda^{b}')\, u(c_2^{b}')\,]/2$$

subject to

$$\lambda^{j\varepsilon}\, c_1 \leq 1 - \alpha + f^{j\varepsilon}$$
$$(1 - \lambda^{j\varepsilon})\, c^{j\varepsilon}{}_2 \leq \alpha\, r - l^{\varepsilon} f^{j\varepsilon}$$

First order conditions

- $E[\, l^{\varepsilon} u'(c_2^{\varepsilon j})] = r\, E[\, u'(c_2^{\varepsilon j})]$

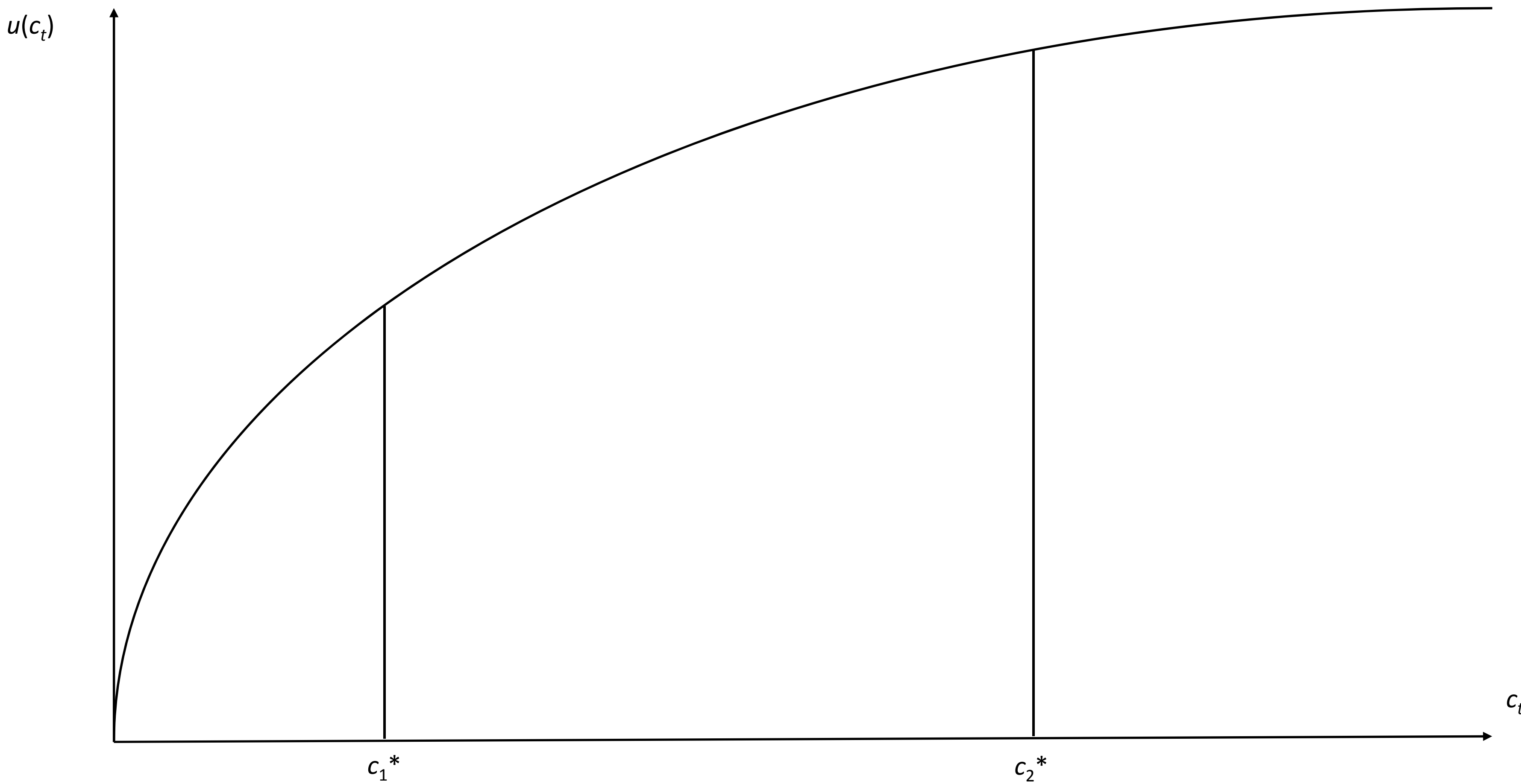
- $u'(c_1) = E[\, l^{\varepsilon} u'(c_2^{\varepsilon j})\, \lambda^{\varepsilon j}/\lambda]$

- Three unknowns, α, l', l'', and two FOCs

Results if $\rho = 0$

- Crisis never occurs
- FOC implies l'' = r
- Equilibrium allocation is optimal

Results if $\rho = 0$



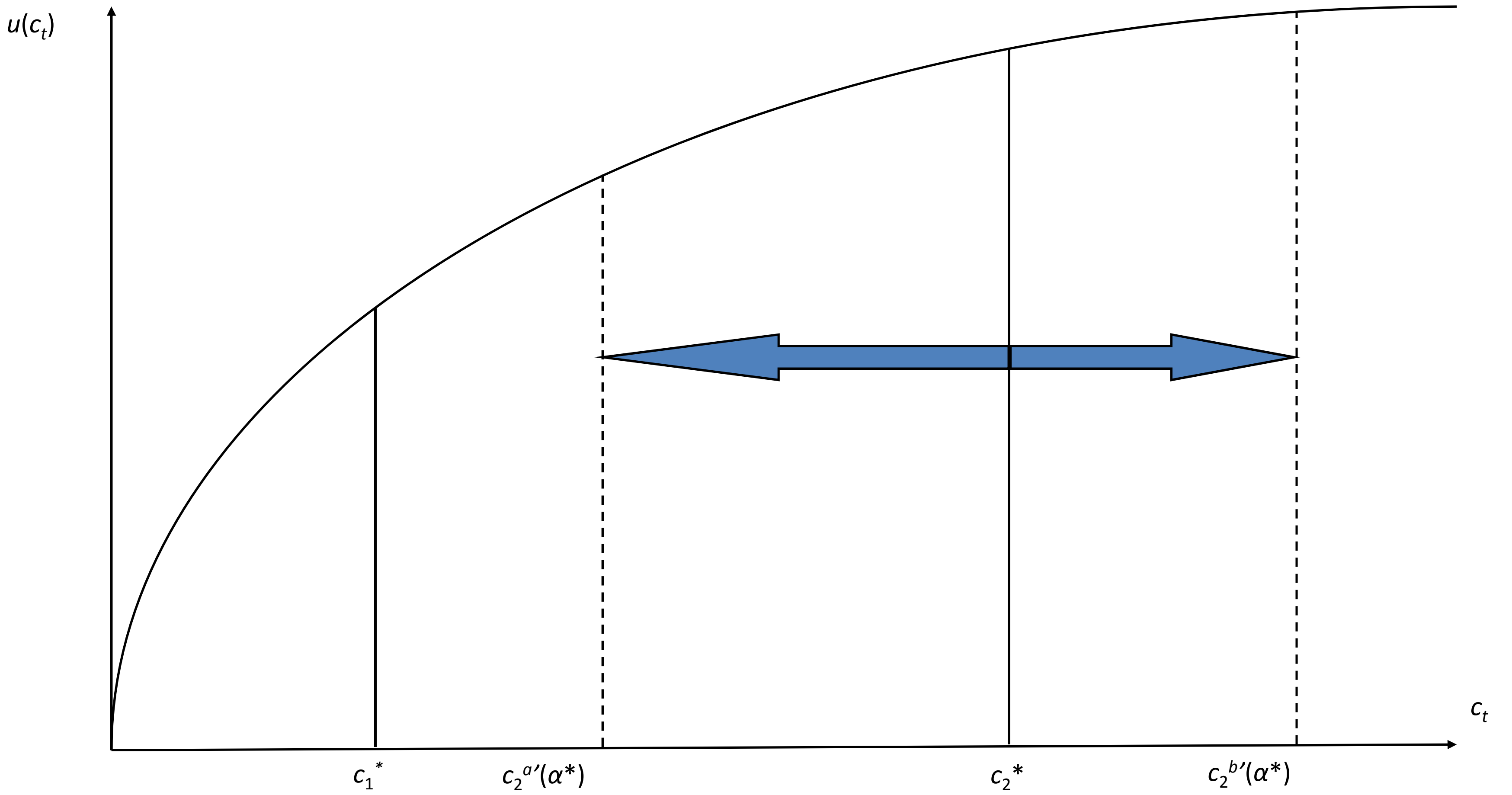
Results for $\rho = 1$

- "Crisis" always occurs

- FOC implies l" $= r > c^*_2/c^*_1$

- Patient depositors face risk

Assume $\alpha = \alpha^*$



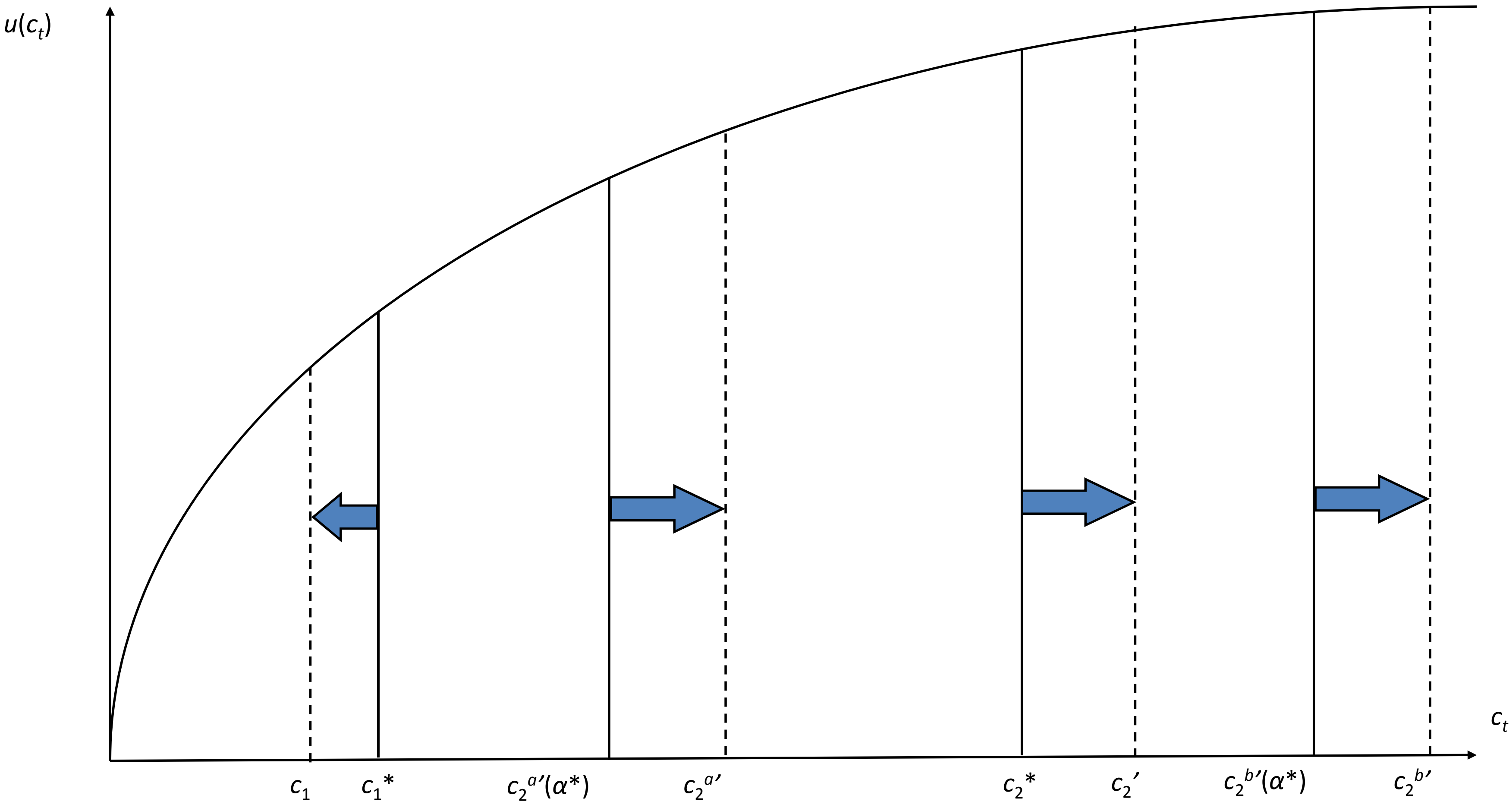
Results for $\rho = 1$

- In equilibrium, $\alpha > \alpha^*$

- To compensate patient depositors for the risk, banks increase their expected consumption

- There is too little storage in equilibrium

Results for $\rho = 1$



Results for $0 < \rho < 1$

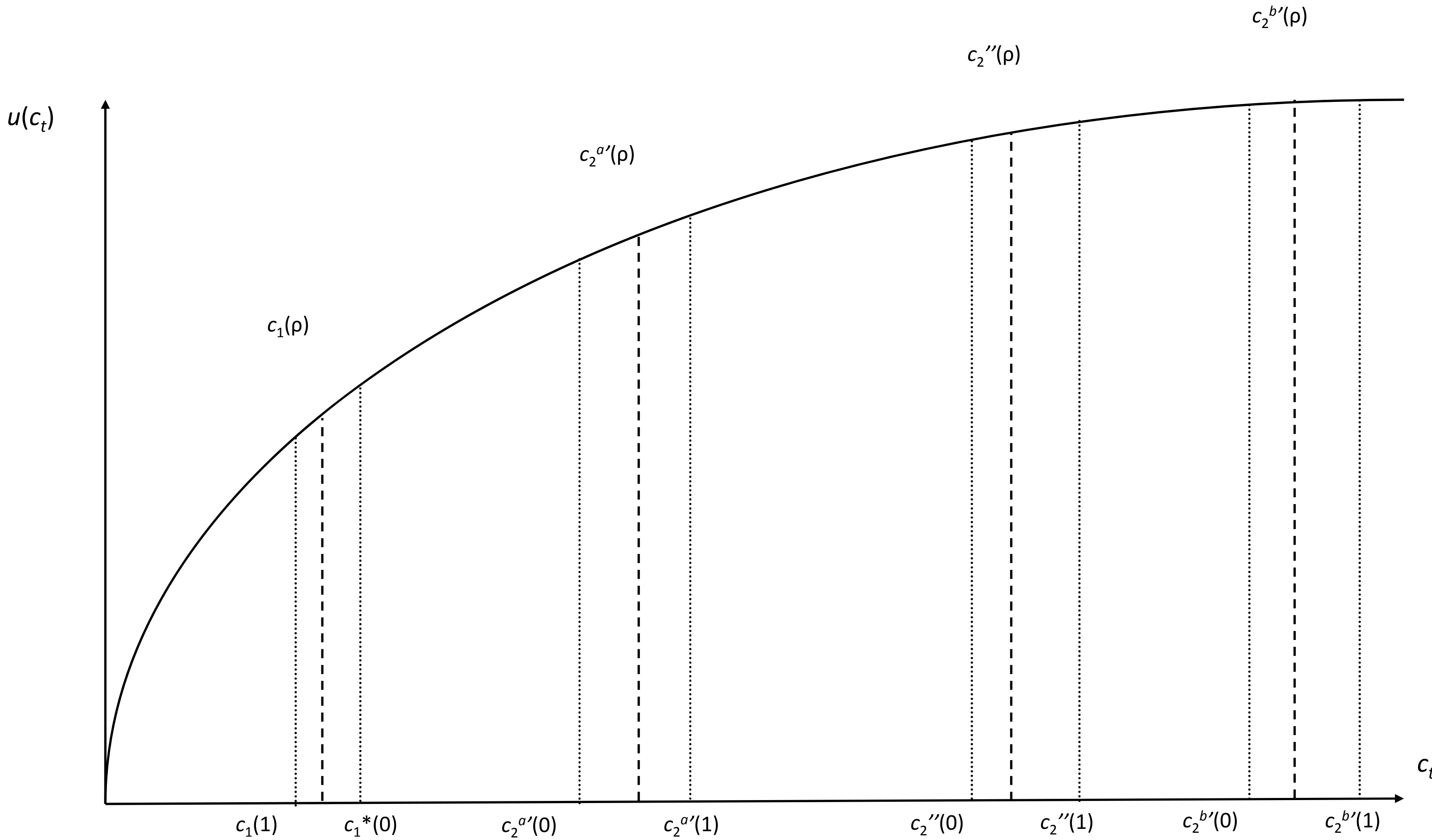
- Multiple rational expectations equilibria

- Any pair $\{l', l''\}$ that satisfies the FOC supports an equilibrium

- A fixed interest rate, $r = l' = l''$ is suboptimal

- Allocation is a "weighted average" other cases

Results for $0 < \rho < 1$



Results for $0 < \rho < 1$

- CB can implement the optimal allocation

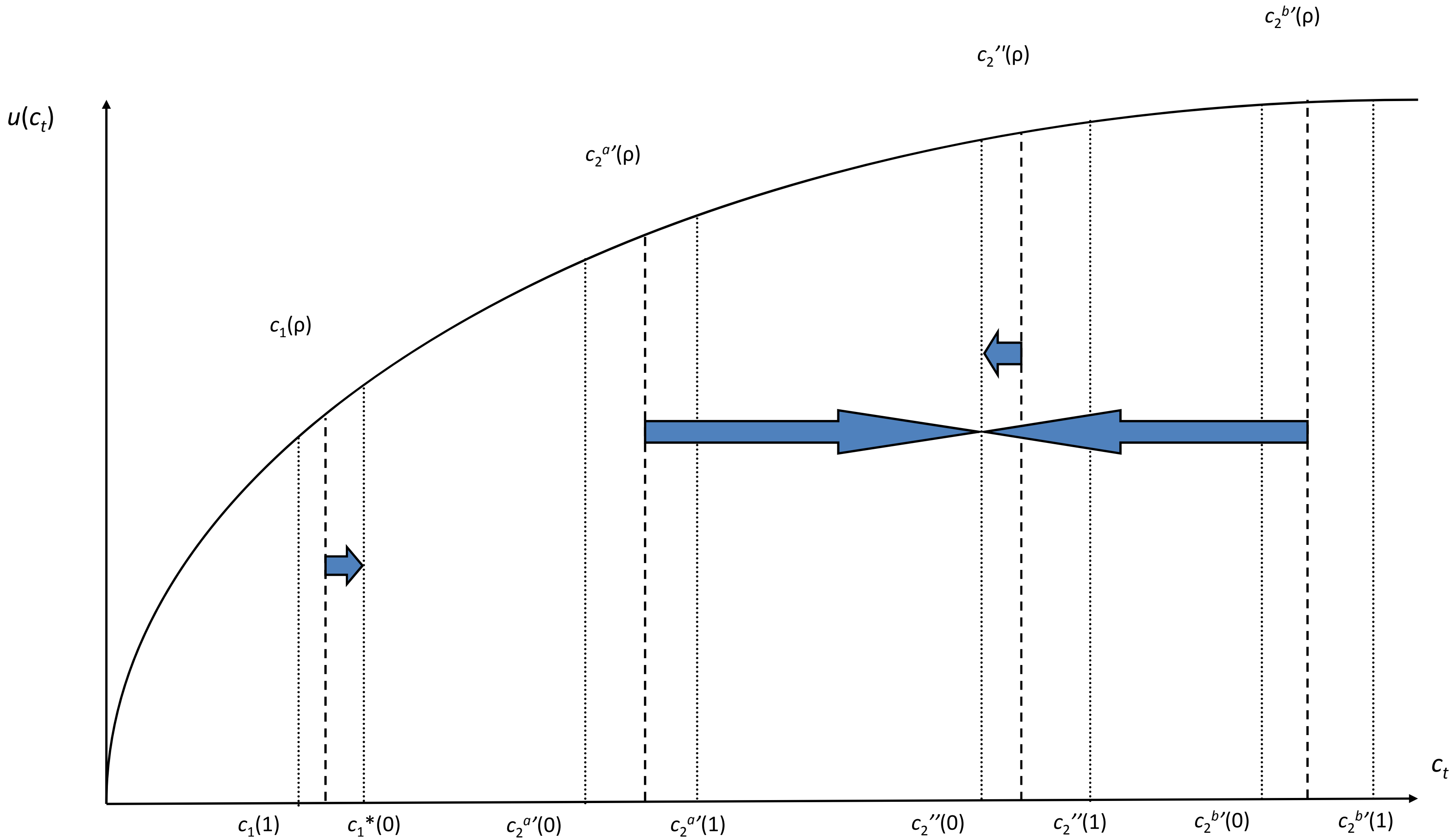
- Interest rate must be low in crisis:

$$l' = c^*_2/c^*_1 < r,$$

- Interest rate must be high on average

$$l'' = r + \rho(r - c^*_2/c^*_1)/(1 - \rho)$$

Results for $0 < \rho < 1$



CB can choose *l*’ and *l*’’

- The role of the CB is to set the rate on the interbank market optimally
- In an extension, along the line of Skeie (2008), we show the central bank can actively select and enforce its choice of interbank rates

Extension: CB policy and panics

- A bank panic occurs if $c_1 > c_2^{a'}$

- Patient depositors in banks that have many impatient depositors prefer to withdraw early

- If the CB does not follow the optimal policy and ε is large enough, then $c_1 > c_2^{a'}$ can occur

If CB sets $r = l' = l''$

- Equilibrium allocation tends to efficient allocation as $\rho \rightarrow 0$

- If ε and λ are large, $c_1 > c_2^{a'}$ can occur

- Banks do not choose a “run-preventing” contract if ρ is sufficiently small

If CB makes unexpected mistakes

- Suppose banks assume the CB follows the optimal policy

- In a crisis state, the CB unexpectedly chooses

$$l' > c^*_2/c^*_1$$

- If ε and λ are large, $c_1 > c_2^{a'}$ can occur

Extension: Liquidation

- Suppose banks can liquidate the long-term technology and get *s* unit of good at date 1

- This puts a ceiling on the rate in the interbank market: $l^{\varepsilon} < r/s$. Otherwise banks liquidate

- If *s* is high, it may not be possible to implement a high enough rate in good times

Conclusion

- If crises are periods during which banks are uncertain about their liquidity needs, CB can help by setting interest rates appropriately
  - Low rates in crises help redistribution of liquidity
  - High rate otherwise provide incentives to hold optimal investment portfolio (enough liquid assets)