Credit Traps

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Our Paper

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- Analyze situations in which liquidity is injected into banking sector but little lending takes place as a result – scenarios we call *credit traps*

- Financing frictions and interplay between liquidity and collateral values hinder the translation of liquidity injections into increased credit and investment.
    - Characterize problems created by credit traps as well as policy implications.
    - When does Quantitative Easing work?
    - Role of fiscal policy and direct injections of liquidity into firms
    - Sense in which central bank can act too late?

Our Paper

- Model not specifically tailored to current crisis – rather, shows how credit traps can arise in which banks hoard injected liquidity even when healthy.
    - Does not rely on depletion of bank equity capital.
    - Main friction regards weak balance sheet and lack of liquidity in corporate sector

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- Model not specifically tailored to current crisis – rather, shows how credit traps can arise in which banks hoard injected liquidity even when healthy.
    - Does not rely on depletion of bank equity capital.
    - Main friction regards weak balance sheet and lack of liquidity in corporate sector
- Baseline model onto which other frictions can be added:
    - Bank capital depletion
    - Uncertainty regarding strength of bank balance sheet
    - Precautionary bank saving
    - Debt overhang / Asymmetric information frictions in bank financing

Brief Literature Survey

- **Credit Channel of Monetary Policy:** Bernanke and Blinder (1988); Kashyap and Stein (1994, 1995, 2000); Lamont et al. (1994); Gertler and Gilchrist (1994); Bernanke and Gertler (1995); Stein (1998);Allen and Gale (2000); Caballero and Krishnamurthy (2005)

- **Credit cyclicality and the financial accelerator:** Bernanke and Gertler (1989); Shleifer and Vishny (1992); Kiyotaki and Moore (1997); Holmstrom and Tirole (1997); Fostel and Geanakopols (2008)

- **Liquidity, fire sales, and asset prices:** Shleifer and Vishny (1992), Allen and Gale (1994), Acharya and Viswanathan (2009), Acharya, et al. (2009), Rampini and Viswanathan (2009)

- **Current financial crisis:** Diamond and Rajan (2009), Kashyap, Rajan and Stein (2008), Shleifer and Vishny (2009), Bolton and Freixas (2006)

- Collateral eases financial frictions thereby increasing firm debt capacity. (e.g. Hart-Moore, 1998).

- Collateral values determined both by potential value of assets as well as *liquidity constraints of industry peers*. (Shleifer and Vishny, 1992).
 - Sale price of collateral determined in part by what other industry bidders can pay.

Feedback Loop

- Feedback between lending, liquidity and collateral values:
  - Increased collateral values enables more lending.
  - More lending increases liquidity in corporate sector.
  - Greater liquidity in corporate sector increases collateral values.
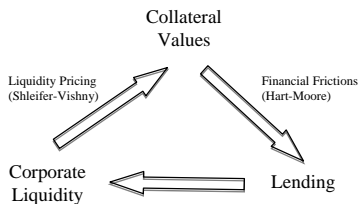
Feedback Loop and Central Bank

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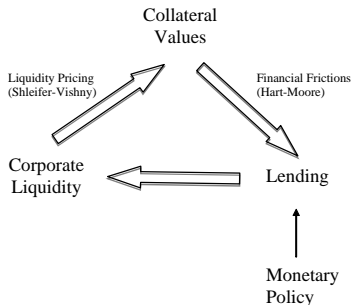
Central Bank trying to influence financial accelerator

Effect of Monetary Policy

Central Bank can impact feedback loop through its impact on bank reserves:

1. Central bank eases monetary policy increasing supply of loanable funds. (Bernanke Blinder 1988, Kashyap Stein 1995)

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4. Increased liquidity in the corporate sector increases liquidation value of assets (Shleifer Vishny 1992).

5. As in balance sheet channel (e.g. Bernanke Gertler, 1990, 1995), endogenous increase in liquidation values improves firms' collateral positions, which enables them to borrow additional liquidity which was injected into the banks by the central bank.

Lending Under Rational Expectations

- Banks obtain liquidity and subsequently undertake lending decision under rational expectations:
  - If banks lend, corporate liquidity will increase, implying that collateral values will increase as well
  - Actual lending occurs only when increase in collateral values (and concurrent increase in debt capacity) is sufficiently large to justify additional lending
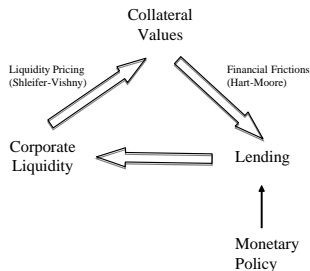
Three Types of Equilibria

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  - Stems from convexity in relation between lending and collateral values
  - Banks rationally understand that when they can employ only moderate amount of reserves to lend to firms, implied collateral values are too small to justify any actual lending.
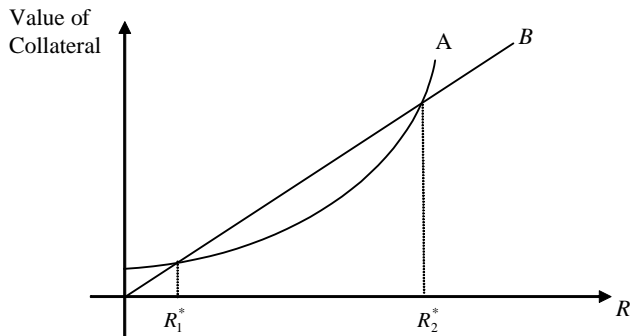
Curve A: Value of collateral assuming that an amount R is lent out by banks.
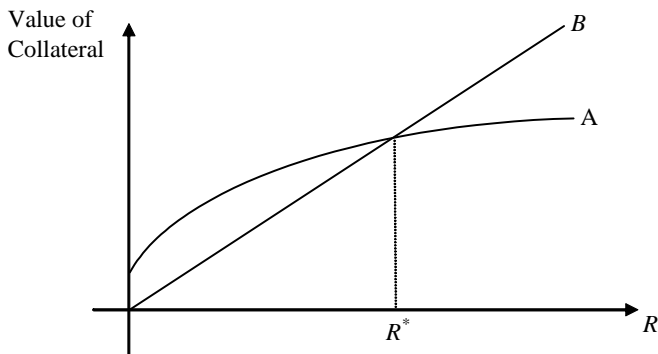
Curve B: Minimum level of collateral needed to extract R in loans from banks.

Jump Start Equilibrium

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Curve B: Minimum level of collateral needed to extract R in loans from banks.

Additional Results

- Fiscal policy (or direct liquidity to corporate sector) acting together with monetary policy can be useful in alleviating credit traps

  - State-contingent fiscal policy multiplier.

- Small changes in monetary policy, fiscal policy, and productivity can lead to large crashes in collateral values and lending.

- Level of liquidity in corporate sector at time of intervention has important implications for monetary policy efficacy

  - Central bank leveraging internal corporate liquidity to provide more liquidity
  - CB can act too late.

- Interest rate on loans not effective measure of stance of monetary policy.

Setup

- Economy comprised of firms, banks and a central bank.
- Each firm endowed with project generating future cash flow.
  - Investing in project creates assets which serve as collateral
  - Can be liquidated at interim date
- Outside option of investing in security yielding return normalized to zero.

Setup: Borrowing, Collateral, and Loan Demand

- Firms need to borrow capital from banks to invest in their project.
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- Firms need to borrow capital from banks to invest in their project.
    - Cannot commit to repay more than value of collateral.
- *Demand schedule for loans is determined, in part, by collateral value.*
    - Some firms want to borrow at prevailing interest rate but can't.
    - Effective demand schedule.

Setup: Endogenous Collateral Value

- Liquidation value (=Collateral value) determined, in part, by liquidity constraints of industry bidders. (SV 1992)

- If liquidity available to industry peers is sufficiently low, value obtained for asset will be lower than its first-best value.

Setup: Loan Supply

- For simplicity assume that supply of loanable funds directly determined by Central Bank.
    - Open Market Operations, as in Lending Channel literature (e.g. Bernanke and Blinder 1988, Kashyap and Stein, 1995)
    - Direct (and subsidized?) Central Bank loans to banking sector: Term Auction Facility
    - Equity injection by government

- Interest rate on loans is determined in equilibrium so as to equate demand and supply of loanable funds.

Solution: Endogenous Liquidation Values of Assets

Monetary policy influences asset values through feedback loop, trying to relax borrowing constraints.

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Feedback Loop
For any given loan supply:

- Asset Value $\implies$ Debt capacity and effective loan demand $\implies$

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    - *Asset value both influence and depend on lending to corporate sector*

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- Look for fixed point in asset values, $L^* = p(L^*; R)$

    - L − liquidation value of assets
    - R − loan supply
    - $p(L; R)$ − price of assets implied by liquidation value, L, and loan supply, R

Behavior of Pricing Function, p(L;R)
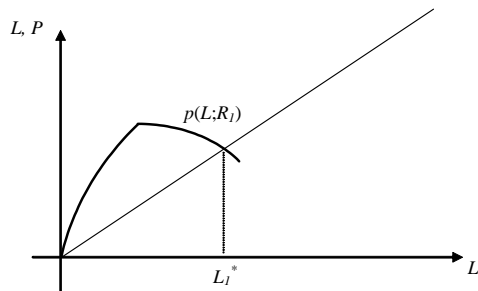
- Nonmonotonic:
- Holding loan supply, R, constant, increasing L has two effects: (1) Increases credit provided and (2) Increases interest rate

# How do changes in loan supply affect indirect pricing function p(L;R)?
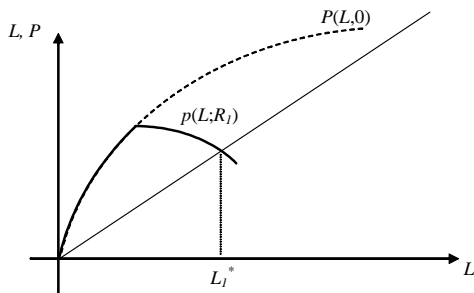
- $p(L; R)$ expands under the envelope of $P(L, 0)$.
- $P(L, 0)-$ implied value of collateral assuming liquidation value L and zero interest rate.

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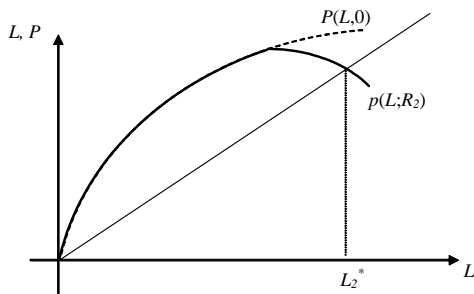
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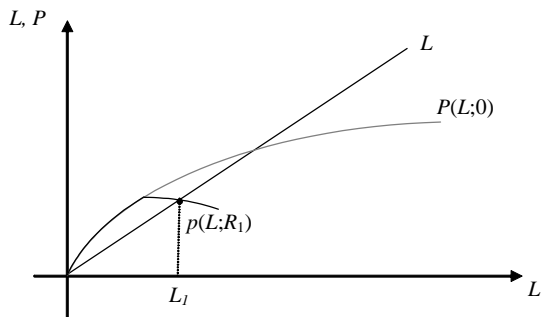
Conventional Equilibrium
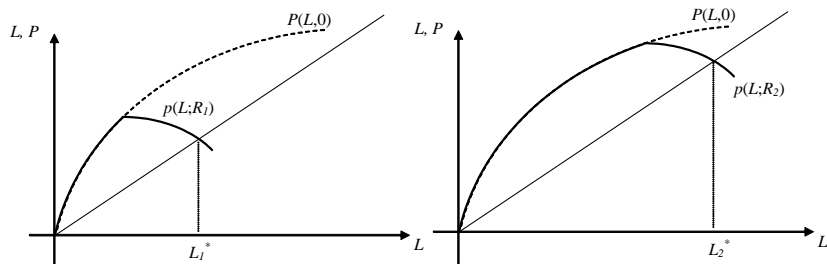
- Chain of events: (1) Increased reserves increases loan supply; (2) lending to corporate sector increases (3); the increased liquidity in the corporate sector increases collateral values; (4) The increase in collateral values increases firm debt capacity and enables the increase in lending.

- **Expansion in reserves translates into an increase in lending and an increase in collateral values.**

Conventional Equilibrium (2)

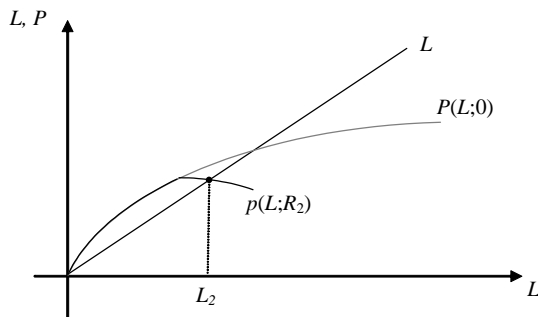- Effect on equilibrium interest rates of a shift in loan supply is less clear cut:
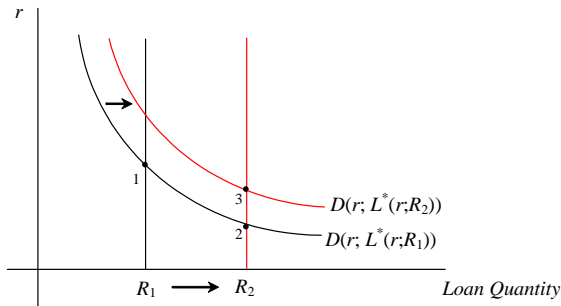
- Increase in reserves affects *both* loan supply and effective loan demand.
- Small changes in interest rates can be associated with large changes in lending and investment.
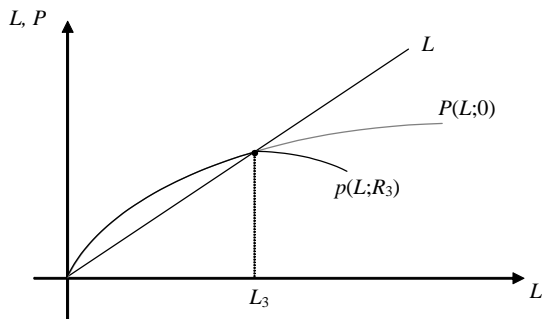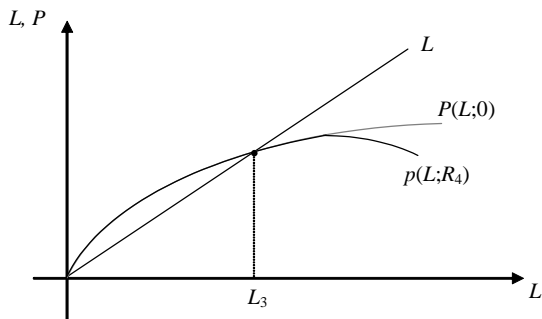
Credit Trap

- Monetary policy is ineffective beyond certain point:
  - Equilibrium collateral value remains stuck at low level.
  - Equilibrium lending remains constant, with incremental liquidity hoarded in banks.
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Credit Trap Intuition

- In credit trap equilibrium, aggregate lending is constrained by low collateral values.
- To increase collateral values, Central Bank would need to induce banks to inject additional liquidity into corporate sector so as to increase firms' ability to purchase assets of other industry participants.
- However, marginal increase in collateral values stemming from additional lending is not sufficient to extract the additional lending.
- Credit will thus remain stuck in banks and collateral values will not increase.
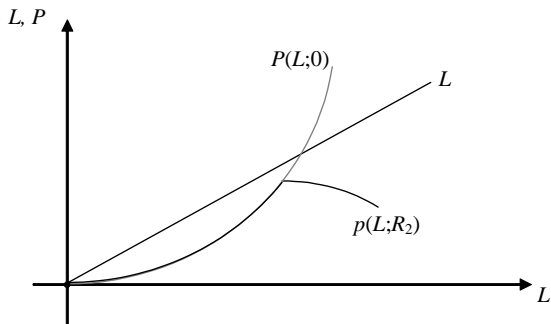 *Credit is trapped, collateral values remain low, and MP is ineffective.*

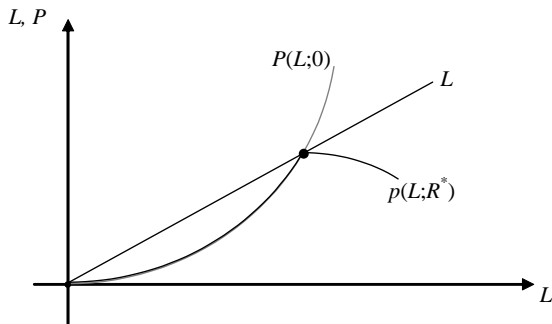# Jump-Start, Quantitative Easing Equilibrium
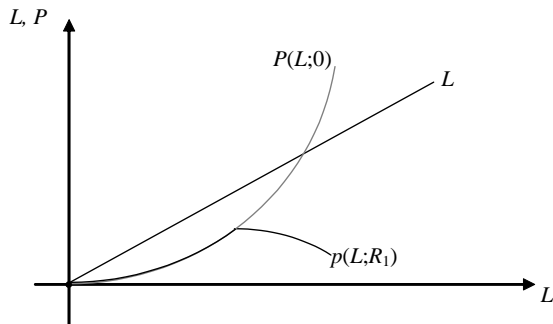
- Monetary policy ineffective at moderate levels of reserves
  - Lending and collateral values unresponsive to increase in loan supply
  - Interest rate stuck at zero.
- At $R = R^*$ monetary policy becomes effective
  - High lending / high collateral value equilibrium arises.
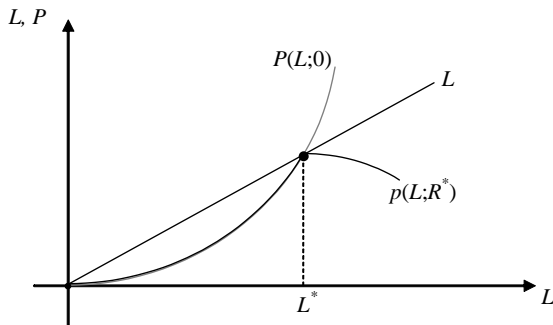
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Jump Start, Quantitative Easing Equilibrium

- Rational for Quantitative Easing policy
- Moderate levels of reserves do not induce lending: Banks rationally understand that when they can employ only moderate amount of reserves to lend to firms, implied collateral values are too small to justify actual lending
  - Credit remains in banking sector
  - Collateral values remain low
- But, Central Bank can induce lending when acts forcefully enough
  - High Lending - High Collateral value equilibrium arises

- Small changes in monetary policy can lead to collapse of lending and collateral values
  - Collapse of collateral values $\implies$ drop in interest rates (since effective demand collapses)
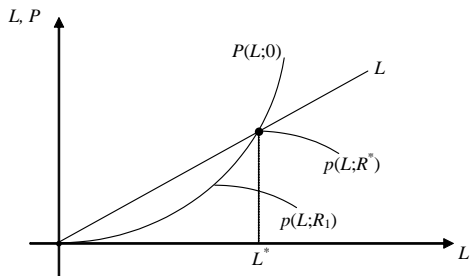
- "[...] crash of Japanese land and equity values in the latter 1980s was the result (at least in part) of monetary tightening; and that this collapse in asset values reduced the creditworthiness of many Japanese corporations and banks, contribution to the ensuing recession." Bernanke and Gertler 1995

Credit Trap and Jump Start Equilibria

- Difficult for policy maker to distinguish whether in a Credit Trap or Jump Start/Quantitative Easing equilibrium
    - *locally* observationally equivalent
    - Monetary easing does not induce lending and does not reduce interest rate.
- Difference arises only when increase reserves by large amounts.
- Shape of envelope function, $P(L, 0)$ determines equilibrium type – credit trap or jump-start.
    - Locally concave or convex?

Some Micro Foundations for Shape of Collateral Pricing Function

- Standard diminishing marginal returns argument suggests concave shape, and hence credit trap.
- Potential reasons for convexity of envelope function, and hence quantitative easing equilibrium:
    - Two effects of extra dollar of lending: (i) more liquidity and (ii) more potential buyers for assets
    - Distribution of firm internal wealth important: increased liquidity may bring more potential buyers to market.
    - Lower asset redeployability increases prevalence of convexity.
    - Fixed costs of searching for a matching buyer.
- Ongoing research

Fiscal Policy in Credit Trap

- By circumventing banks and providing direct liquidity injections into corporate sector, fiscal policy can ease credit traps.
  - Fiscal policy increases maximal borrowing capacity of firms and enables liquidity to be pulled out of banks.
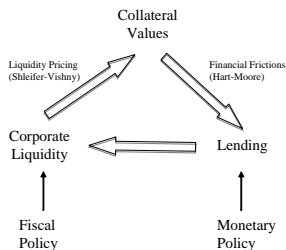
Fiscal Policy in Credit Trap

- In credit trap, expansionary fiscal policy increases the maximal aggregate loan supply which the banking sector can successfully lend to firms.
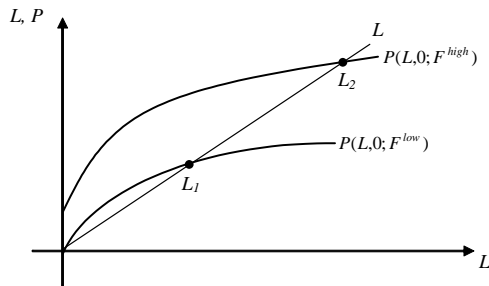
Importance of Initial Corporate Liquidity

- If aggregate liquidity is too low at the point of intervention, credit trap arises
- As aggregate date-0 liquidity decreases, credit trap becomes more severe.
    - Sense in which CB can act too late:
- Intuition:
    - In providing liquidity to corporate sector, banks rely on aggregate liquidity already present in the corporate sector, as this determines, in part, the value of collateral.
    - Central Bank is (indirectly) also relying on the initial level of liquidity in the corporate sector.
    - Central Bank is leveraging initial level of aggregate liquidity to inject additional liquidity into the corporate sector.

Conclusion

- Credit Channel of monetary policy $\Longrightarrow$ Credit Trap
  - Different from: Money Channel of monetary policy $\Longrightarrow$ Liquidity Trap

- Credit trap: financing frictions and interplay between liquidity and collateral values hinder the translation of liquidity injections into increased credit, investment and collateral values.
  - Study these frictions and attendant policy implications.

Example of Market for Assets

- If bank repossess assets of a firm, must redeploy them and sell to other industry participants.
  - Each firm has N potential bidders randomly drawn from population; only firms that obtained financing have know-how to bid.
  - Assume bank has all bargaining power: in sale, bank obtains cash balance of wealthiest bidder ($X_1 < X_2$).
- Price of asset is $P(L, 0) = \int_0^L (X_1 - B) dG_{(1)}$
  - $G_{(1)}$ is $1st$ order statistic of N draws of G.
- $P(L, 0)$ convex when $(X_1 - L)\frac{g'(L)}{g(L)} - (N-1)\frac{(X_1 - L)}{1 - G(L)} > 1$