Credit Booms

14.454

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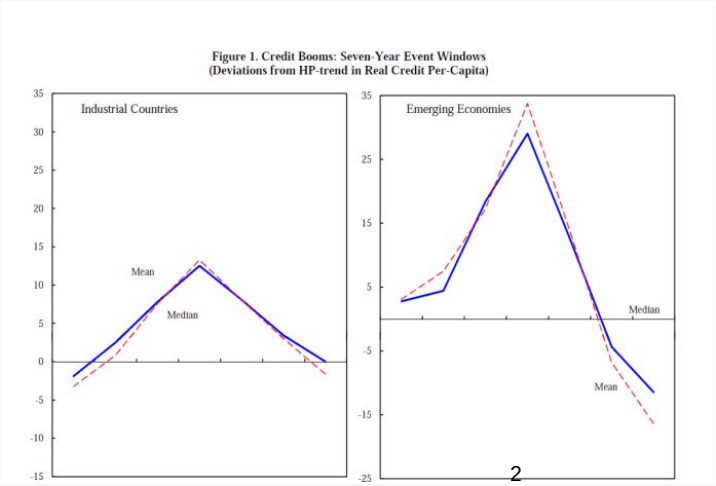
Economic Crises

Some Facts



Source: Mendoza and Terrones (2012)

Some Facts

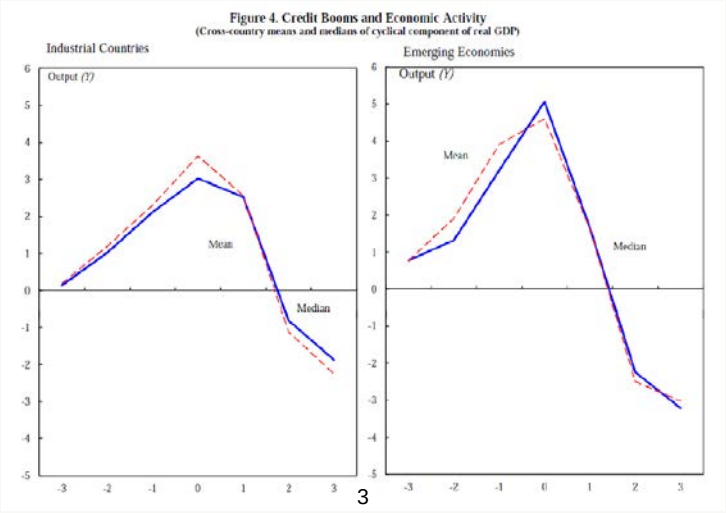


Figure 4. Credit Booms and Economic Activity
(Cross-country means and medians of cyclical component of real GDP)
Industrial Countries
Output (Y)
Mean
Median
Emerging Economies
Output (Y)
Mean
Median

Some Facts

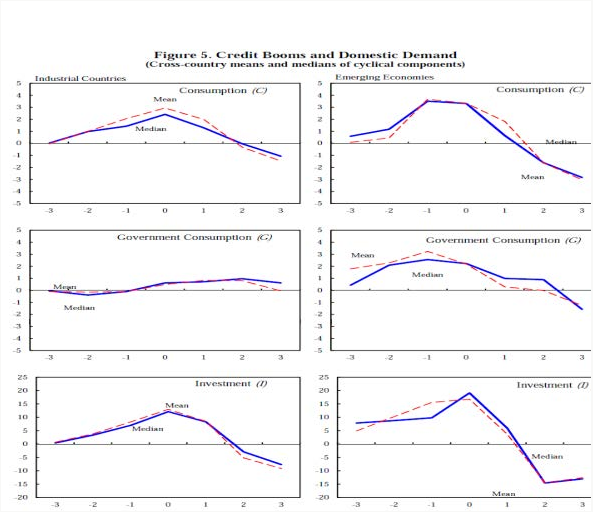


Figure 5. Credit Booms and Domestic Demand
(Cross-country means and medians of cyclical components)
Industrial Countries
Consumption (C)
Mean
Median
Emerging Economies
Consumption (C)
Median
Mean
Government Consumption (G)
Mean
Median
Government Consumption (G)
Mean
Median
Investment (I)
Mean
Median
Investment (I)
Median
Mean

References

(1) (*) Martin and Ventura, "Managing Credit Bubbles," *JEEA* 14(3), June 2016

Connects credit with RE bubbles (bubbles relax financial constraints)

(2) (*) Lorenzoni, "Inefficient Credit Booms," *Review of Economic Studies*, 75, 2008.

Explains why the (rational) private sector may overinvest

Managing Credit Bubbles (Martin and Ventura)

We will skip the "Managing" part and focus instead on the connection between bubbles and credit

Basic idea:

- Collateral constraints can be relaxed by "fundamental" collateral and "bubbly" collateral
- (New) Bubbles help in relaxing financial constraints (credit bubble – a crowding in mechanism)

- In a sense, borrower can obtain "excess" credit today because it is expected that there will be "excess" credit in the future as well
- But they can be excessive (crowding out of future investment)

The Model

- OLG with production (Diamond) + bubbles (Tirole) + credit market (intragenerational trades)
- Each generation starts a new bubble (of random size), which is traded alongside old bubbles
- Workers/lenders and Entrepreneurs/borrowers (owners of capital and bubbles)

- Bubble interpretation: Credit given in excess of fundamental to an entrepreneur [but the key is the NEW bubbles]
- (*) I will only develop a special subcase of 'quiet' bubbles (main insight)

Basic Setup

Workers and Entrepreneurs preferences

$$U_t^i = C_{t,t}^i + \beta E_t C_{t,t+1}^i$$

Workers

$$\begin{aligned} C_{t,t}^i &= W_t - L_t \\ C_{t,t+1}^i &= R_{t+1} L_t \end{aligned}$$

Entrepreneurs

$$\begin{aligned} C_{t,t}^i &= L_t - K_{t+1} - B_t \\ C_{t,t+1}^i &= F(K_{t+1}, N_{t+1}, t+1) - W_{t+1} N_{t+1} \\ &\quad + B_{t+1} - R_{t+1} L_t \end{aligned}$$

Basic Setup

Entrepreneurs invest and produce

$$F(K_t, N_t, t) = AK_t^{\alpha}(\gamma^t N_t)^{1-\alpha}$$

Entrepreneurs also initiate and trade bubbles. The total stock of bubbles is B_t, and it evolves according to (the $B_{t+1}^N \geq 0$ are the bubbles created by generation t):

$$B_{t+1} = R_{t+1}^B B_t + B_{t+1}^N$$

They face a financial constraint:

$$R_{t+1}L_t \leq \phi\left[F(K_{t+1}, N_{t+1}, t+1) - W_{t+1}N_{t+1}\right] + B_{t+1}$$

Characterization

Let $x \equiv \gamma^{-t} X_t$ and assume that $\beta\gamma > 1$: individuals are patient enough to save even if interest rate is below growth rate (otherwise interest rate never drops below growth and bubbly equilibria would not be possible)

Assume, however, that the frictionless economy is dynamically efficient and investment is always productive (first inequality). Thus bubbly equilibria only exist if the (effective) demand for funds is depressed (low collateral). The second inequality ensures that this is the case

$$\frac{1}{2} \leq \alpha \leq \frac{1}{1+\phi}$$

For a fixed n (value of new bubbles as a share of output), the economy converges to the following steady state:

$$k^* = \min \left\{ \frac{1-\alpha}{\gamma} A (k^*)^{\alpha} - \frac{b^*}{\gamma}, \; [\beta(\phi\alpha + n)A]^{\frac{1}{1-\alpha}} \right\}$$

$$b^* = \frac{\gamma n A (k^*)^{\alpha}}{\gamma - (\phi\alpha + n) A (k^*)^{\alpha - 1}}$$

Characterization

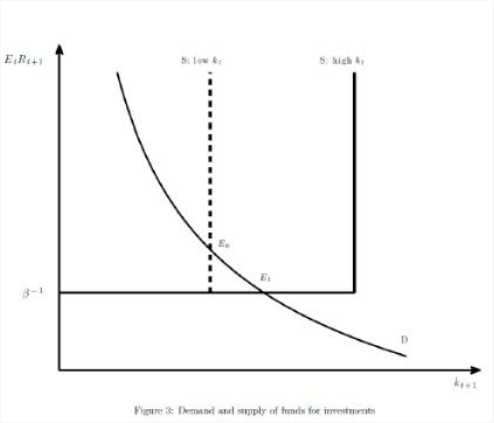
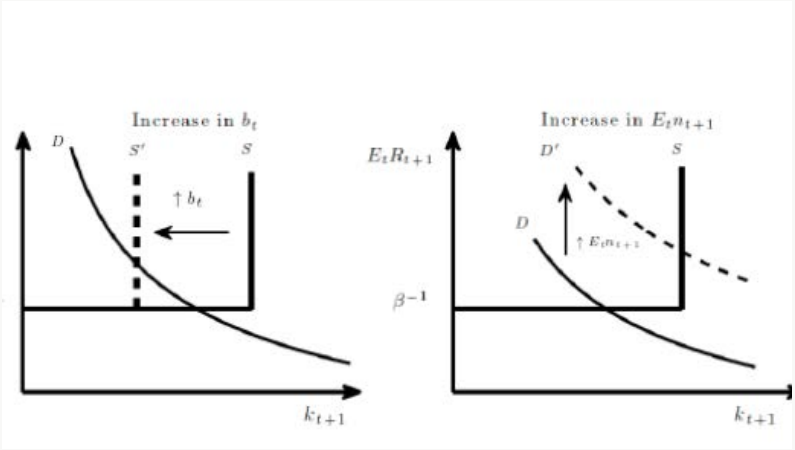


Figure 3: Demand and supply of funds for investments

Collateral abundant region—constrained by supply of funds (young's wages)

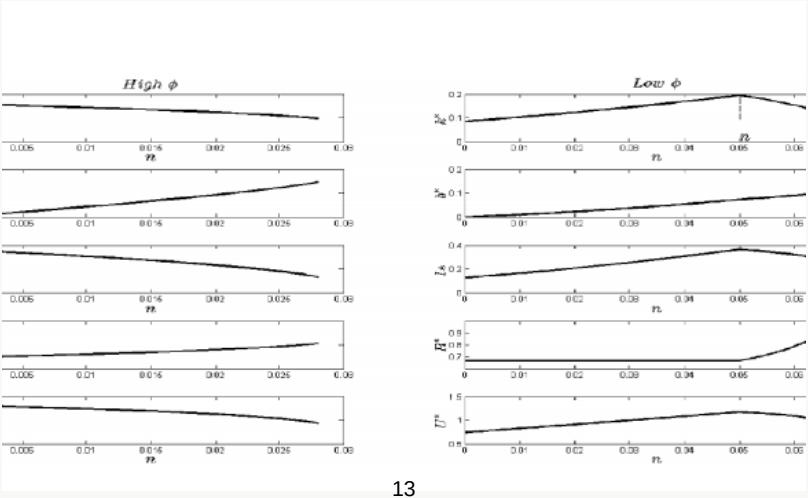
Collateral scarce region—constrained demand for funds

Characterization



where b and n are the value of old and new bubbles as a share of output, respectively

Characterization



Discussion

Distinction between bubble creation, n, and bubble realization, u. The latter crowds out investment as standard bubbles do. The former increases current collateral, and crowds out future investment

Note that the unconstrained economy is dynamically efficient but the interest rate is below the rate of growth of the economy in all cases explored. This can happen because pledgeable income is limited (financial constraint) — that is, the supply of assets for outside savers is less than the value of the stock of capital in the economy.

Inefficient Credit Booms (Lorenzoni)

There is a (near) consensus that rapid and large credit expansions need to be reined in by policy action

But why doesn't the private sector do the right calculations?

Main point: Even if agents are fully rational, the outcome may not be constrained efficient as private agents don't fully internalize the consequence of their borrowing during the downturn (excessive contraction and asset prices collapse)

Second point: Even if they don't internalize them, the outcome could still be constrained efficient...

Note: Pecuniary externalities are very prevalent in financial markets (next lecture: AD externality)

The Model

Three periods (0, 1, 2); two goods (perishable consumption and capital); two agents (consumers and entrepreneurs)

Agents:

- Consumers: Risk neutral and no discounting; receive endowment e (consumption goods) in each period
- Entrepreneur: Risk neutral but only consume in final period; begin life with endowment n (consumption goods) and receive no further endowments

Entrepreneurs invest at date 0 but may be hit by bad aggregate shock at date 1. If they do, they need to sell assets to fund operational losses

Buyers (consumers) are less efficient users of these assets (fire sales and welfare gains from having more of the assets in the hands of distressed entrepreneurs)

Setup

Consumption goods can be converted to capital one to one at any time, but the opposite is infeasible.

Entrepreneurs have access to an investment technology

- Choose k_0
- In period 1, it yields $a_s k_0$ where s is an aggregate state (low and high)
- Maintenance cost of γ per unit of capital maintained (rest is scrapped) requires $\gamma\chi_s$ units of consumption, and $k_{1,s} = \chi_s k_0 + (k_{1,s} - \chi_s k_0)$
- Date 2 production: $Ak_{1,s}$ (and then capital depreciates)

Consumers (and entrepreneurs) have access to a traditional technology at date 1, that produces $F(k_{1,s}^T)$ goods at date 2, with marginal product bounded below at $\underline{q}$ (greater than γ, so no scrapping in eq., hence I'm going to simplify going forward) and $F'(0) = 1 < A$

The price of capital at date 1 is denoted by q_s. It is 1 at date 0 as long as some investment takes place, and 0 at final date 2

Financial Contracts and Limited Commitment

State contingent contracts between entrepreneurs and consumers: $\{d_0, d_{1s}, d_{2s}\}$

The budget constraints for the entrepreneur are (we'll skip the consumer, which is boring):

$$\begin{aligned} k_0 &\leq n + d_0 \\ q_s(k_{1,s} - k_0) &\leq a_s k_0 - \gamma k_0 - d_{1s} \\ c_{2s} &\leq A k_{1,s} - d_{2s} \end{aligned}$$

Limited commitment: A fraction $1 - \theta$ of firms' current profit is lost if liquidated (if consumer doesn't accept a take-it-or leave offer from entrepreneur):

$$\begin{aligned} d_{1s} + d_{2s} &\leq (\theta a_s + (q_s - \gamma))k_0 \\ d_{2s} &\leq \theta A k_{1,s} \end{aligned}$$

Consumers have no commitment (i.e., imperfect insurance market):

$$\begin{aligned} d_{1s} + d_{2s} &\geq 0 \\ d_{2s} &\geq 0 \end{aligned}$$

Optimal Financial Contract (sketch)

Notation:

- NPV of promised repayments per unit of capital: $b_{1s} = (d_{1s} + d_{2s})/k_0$ and $b_{2s} = d_{2s}/k_{1s}$
- Net profit per unit of capital: $x_s = a_s - \gamma$

The entrepreneur chooses the financial contract $\langle d_0, \{b_{1s}, b_{2s}\}\rangle$ and the investment levels k_0 and $\{k_{1s}\}$ to maximize

$$\sum_s \pi_s (A - b_{2s}) k_{1s}$$

Subject to budget constraints, no default constraints, consumer participation constraints, and non-negativity constraints on k_0 and k_{1s}

Optimal Financial Contract (sketch)

Let z_0 and z_{1s} represent the rates of returns on entrepreneurial wealth at dates 0 and 1. Then, for a vector of eq prices $\{q_s\}$, an individually optimal contract satisfies the conditions

$$\begin{aligned} b_{1s} &= 0 \qquad \text{if } z_0 < z_{1s} \\ b_{1s} &\in [0, \theta a_s + q_s - \gamma] \qquad \text{if } z_0 = z_{1s} \\ b_{1s} &= \theta a_s + q_s - \gamma \qquad \text{if } z_0 > z_{1s} \end{aligned}$$

$$b_{2s} = \theta A$$

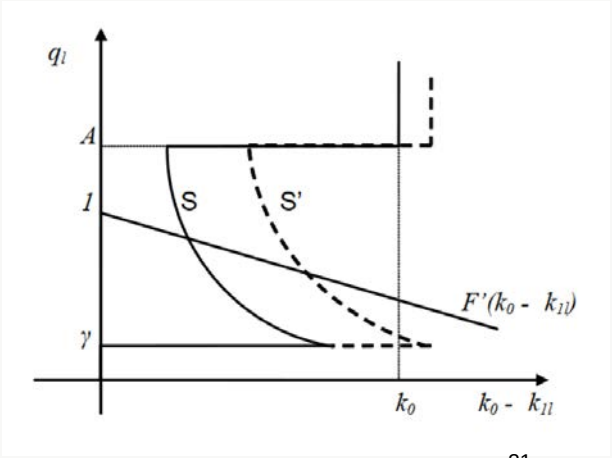
With:

$$z_{1s} = \frac{(1-\theta)A}{q_s - \theta A}$$

$$z_0 = \frac{\sum_s \pi_s z_{1s}(q_s + x_s - b_{1s})}{1-\rho}$$

$$\rho \equiv \sum_s \pi_s b_{1s}$$

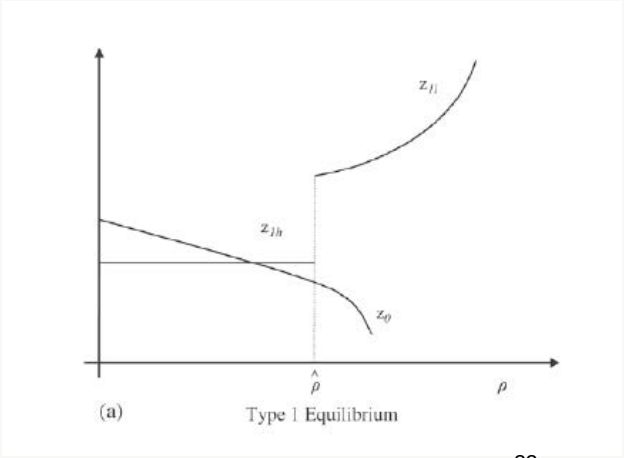
Asset Prices



Since investment is positive in the high state, $q_h = 1$.

In contrast, in the low state entrepreneurs need to sell some capital to consumers (traditional technology), so $q_l < 1$

Characterization of (Overinvestment) Equilibrium



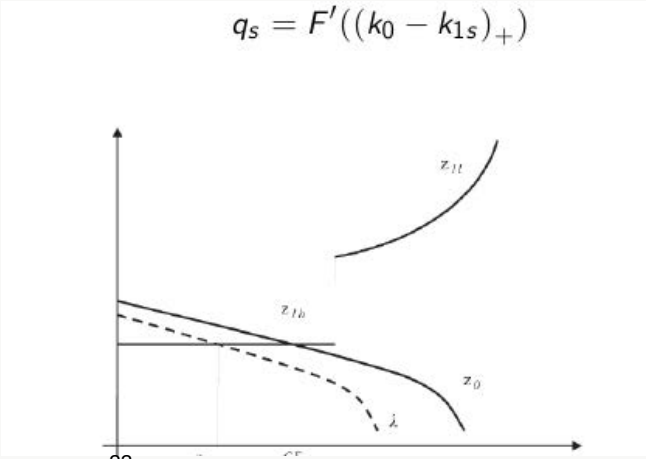
Where $\widehat{\rho}$ is the cutoff beyond which the entrepreneur also borrows against revenue in the low state

Overborrowing

Planner adds:

$$q_s = F'((k_0 - k_{1s})_+)$$

Entrepreneurs do not take into account the impact of their borrowing on q_l



Discussion

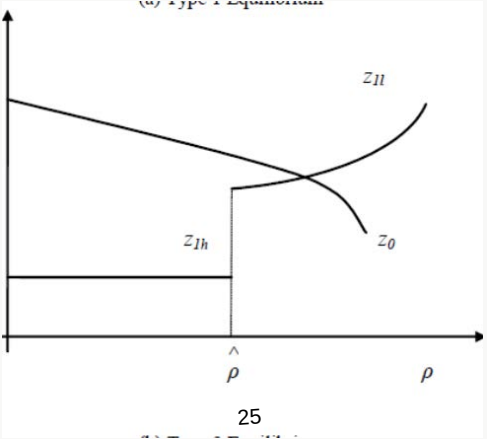
The source of inefficiency stems from both limited commitments problems (entrepreneur and consumer):

- Entrepreneur: By setting $\theta = 1$, first best is achieved
- Consumer's role is more subtle: $z_{1l} > z_0$ is key behind inefficiency, because ex-post value of funds for entrepreneur is greater than ex-ante, but this can only happen if there is limited insurance (entrepreneur cannot transfer resources from date 0 to 1 in bad state)

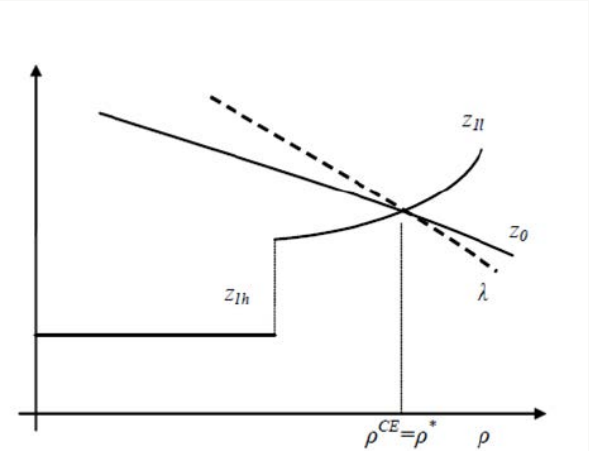
- A coordinated reduction in date 0 borrowing provides a little of the missing insurance by raising q_{l1}
- (This can be implemented with a combination of capital requirements and transfers)

Constrained Efficiency

I've highlighted the overborrowing case, but there is also a constrained efficient scenario, where limiting ex-ante investment is inefficient (warning for "macroprudential" policies)



Constrained Efficiency



(b) Type 3 Equilibrium

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