Liquidity, Contagion and Crisis

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Learning from Crisis

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The “classic” view

“our credit system [is] much more delicate

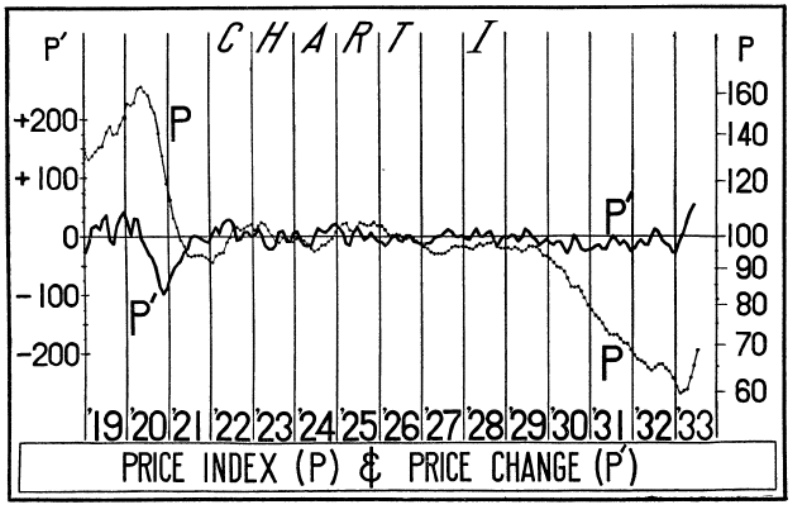
at some times than at others ...

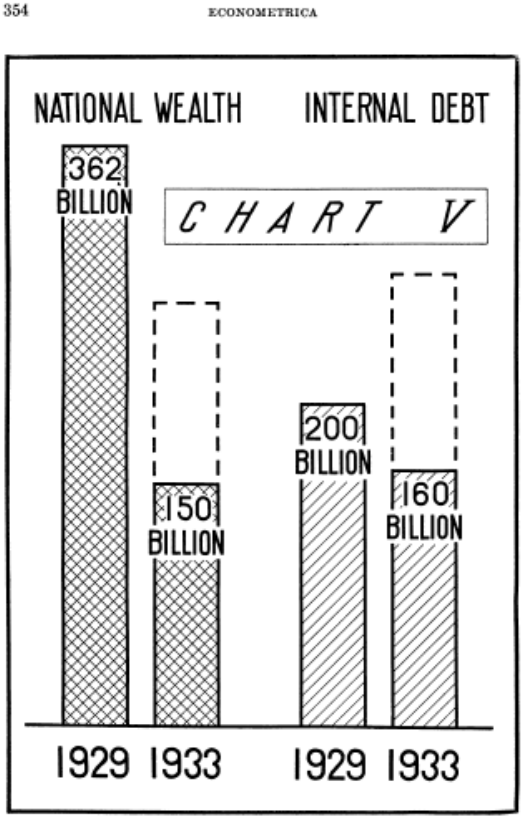
panics come according to a fixed rule ...

every ten years or so we must have one of them”

Walter Bagehot, Lombard Street, 1873 Ch. V:
“Why Lombard street is often very dull and sometimes extremely excited”

The Fisher Effect





Source: Fisher, *Econometrica,* 1933

Related literature

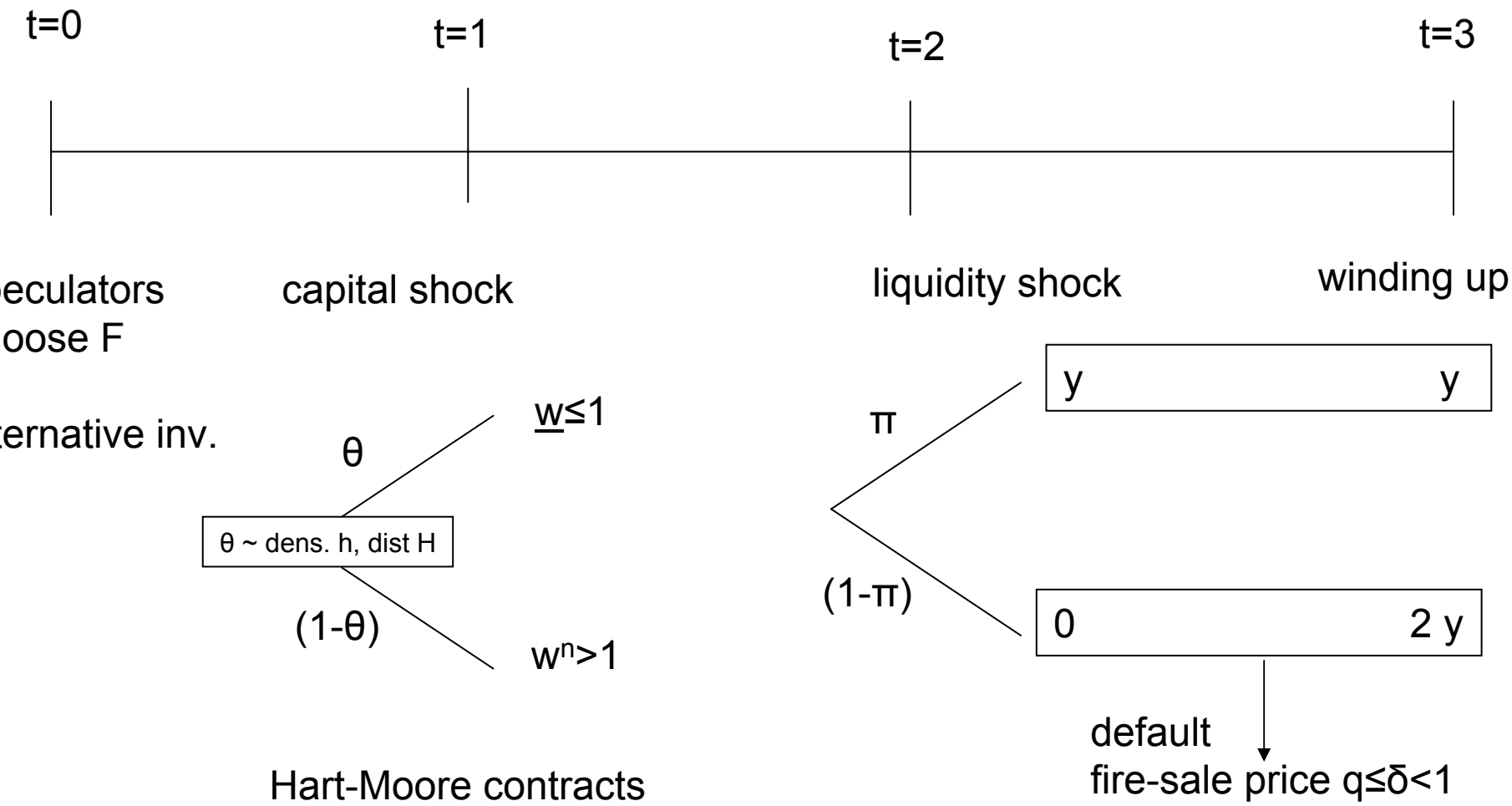
- Corporate finance & macroeconomics
  - Bernanke & Gertler (1989)
  - Kiyotaki & Moore (1997, 2000)
  - Suarez & Sussman (1997, 2007)
- Role of liquidity for corporations
  - Complete contracts: Holmstrom & Tirole (1998, 2008)
  - Spot markets: Caballero & Krishnamurty (2001, 2003, 2004), Lorenzoni (2008)
- Equilibrium supply of liquidity
  - Gorton & Huang (2004)
  - Fostel & Geanakoplos (2008)
  - Acharya, Shin & Yorulmazer (2009)

Main results

- Integration: ***debt***, liquidity, contagion. crisis, ...
  - all implied a market “abnormality”:
    - supply and demand are both downwards sloping
- (Very) preliminary: quantitative implications
- Equilibrium is generically inefficient
  - but welfare gains of policy are small
- Crisis and liberalized capital flows

The model

- Agents: speculators and entrepreneurs (measure 1)
  - entrepreneur + project (size 1) = “company”



The model (cont.)

- All earnings: observable but not verifiable
- Deter. aggregate capital: $W = \theta \underline{w} + (1-\theta) w^n = 1$
  - no economic distress
- Liquidation destroys value
- Clearing house: all repossessions are sold off
- Arbitrage: $\rho_1 = \frac{\delta}{q}$

Abnormality: demand is decreasing in q

- Demand: $\theta(1-\pi)\, q \cdot b(q)$
  - b(q): fraction of investment collateralized

- As liquidation become more costly
  - their equilibrium volume increases

$$b(q) = \frac{\frac{\delta}{q}(1-\underline{w})}{q(1-\lambda\pi)+\lambda\pi y}$$

Parameterization

Table 1

Structural parameters for the numerical examples below.

Description	Model's notation	Parameterization
Project parameters		
IRR	$2y-1$	150%
prob. liquidity shortage	$1-\pi$	25%
capital shortage	$1-\underline{w}$	40%
depreciation	δ	50%
bargaining power	λ	50%
Market parameters		
ex-ante riskless rate	$\rho_0 - 1$	5%
worse-case incidence of shortfall	$\overline{\theta}$	40%
distribution of θ	h	uniform

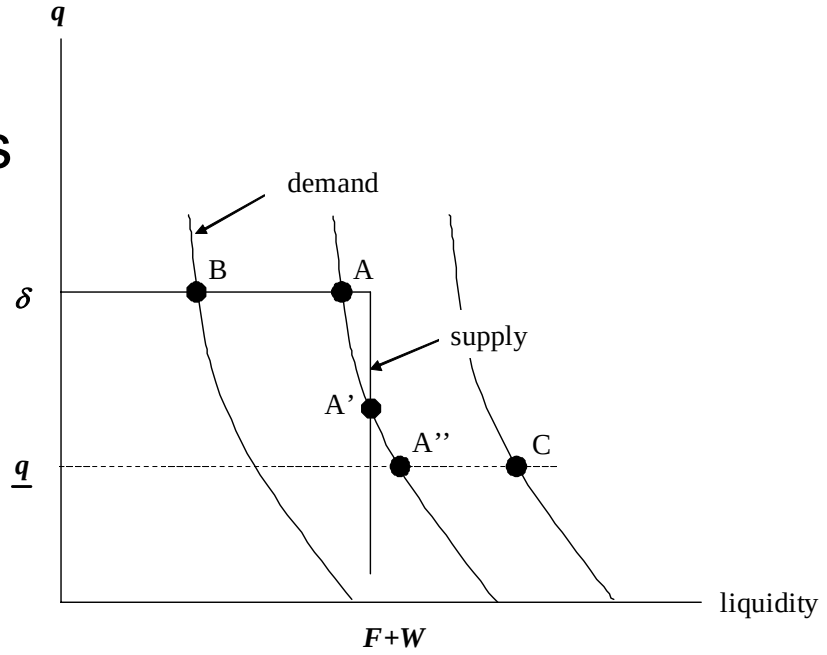
t=0,...,3 is interpreted as five years

Ex-post equilibrium

- Three equilibrium regimes
  - liquidity slack: $q=\delta$, $\beta=b(\delta) \leq 1$
  - liquidity shortage: $q=\underline{q}$, $b(\underline{q})=1$
    - credit rationing, with probability: $(1-\mu)$
  - in between: multiple equilibria

Implications of the “abnormality”

- contagion
  - ***no “domino assumption” needed***
- liquidity black holes
- crisis: discont. price drops
- panics
  - multiple equilibria
- multiplier effects



and also

- simul. hoarding-rationing

Ex-ante equilibrium

- Assume: the government coordinates expectations
  - towards the “good” equilibrium – credit guarantees
  - that have zero fiscal cost (once the policy is successful)

- There is a unique ex-ante equilibrium,
  - with cut-off θ^*, probability of crisis is $1-H(\theta^*)$
  - $H(\theta^*)+[1-H(\theta^*)](\delta/q)=\rho_0$

- Crisis is part of the “normal” functioning
  - of competitive financial markets!

Quantitative fitness

Table 2

Competitive equilibrium, numerical example. For structural parameters see Table 1. Source for actual data is Reinhart and Rogoff (RR), from top to bottom: (a) peak-to-trough house and equity price decline, RR (2009) Figures 1 and 2; (b) calculations based on depth and duration of GDP decline, annualized (left) or stretched over a five-year period relative to a growth trend of 2% per annum (right), RR (2009) Figure 4; (c) share of years in banking crisis, RR (2008) Table 5a.

Description	Model	Values	Actual data
Competitive equilibrium			
price drop in crisis	$\frac{q}{\delta} - 1$	-39.3%	$-35.5\%, -55.9\%^{(a)}$
loan to security	$\frac{(1-w)}{b(\delta)}, \frac{(1-w)}{b(\underline{q})}$	$78\%, 40\%$	–
output drop at θ^*	$Y\|_{q=\underline{q}} \,/\, Y\|_{q=\delta} - 1$	-3.9%	$-3.5\%, -8.8\%^{(b)}$
credit rationing at θ^*	$[1 - \mu(\theta^*)]$	1.1%	–
probability of a crisis	$1 - H(\theta^*)$	7.7%	$7.2\%^{(c)}$

Welfare analysis

- Competitive equilibrium is generically inefficient
  - fire sale price do not reflect “fundamental” value
- We consider
  - liquidity injection, to the fire-sale market
    - “monetary policy” (in a dolarized economy)
  - equity injection, E, lump-sum transfer, indiscriminately
  - bailouts, of distressed companies only
- Funded by government borrows at ρ_0
  - repaid by lump-sum taxes

Policy: results

- With uniform h, optimal liquidity injection: (1-H)=0
  - the crowding out problem
    - $H(\theta^*)+[1-H(\theta^*)](\delta/q)=\rho_0$ still determines H
- Equity injections dominate liquidity injections
  - consider the supply of liquidity
  - $F + (1-\theta)(w^n+E-1) + \theta(1-\mu)(\underline{w}+E)$

Bailouts

- Since distress is not verifiable
- Applying for a bailout must be incentive compatible
- γ = units bailed out / units liquidated
- or equivalently
  - $\sigma = \gamma / (1-\gamma)$, a subsidy paid upon liquidation
  - crucial: companies cannot fake a liquidation

- Incentive compatibility constraint: $\sigma \leq (y-q)/q$

Quantitative implications

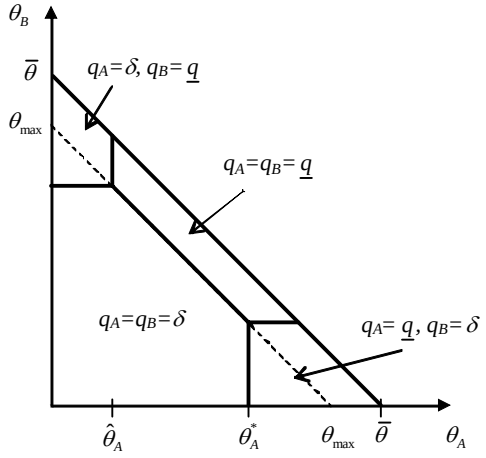
Table 4

A comparison of welfare and national debt (ND) under competitive equilibrium (CE), liquidity injection (LI), equity injection (EI) and bailouts (BO). EI is implemeted at two levels: either bringing the probability of crisis down to zero (ZC), or at ND $= 1\%$. BO is implemeted at a level that would achieve the same β as the second EI policy (for any realization of θ), leaving the government with a slack of liquidity, generically. ND is expressed as a percentage of full-capacity (i.e. no rationing) capital stock, namely one unit. For structural parameters see Table 1.

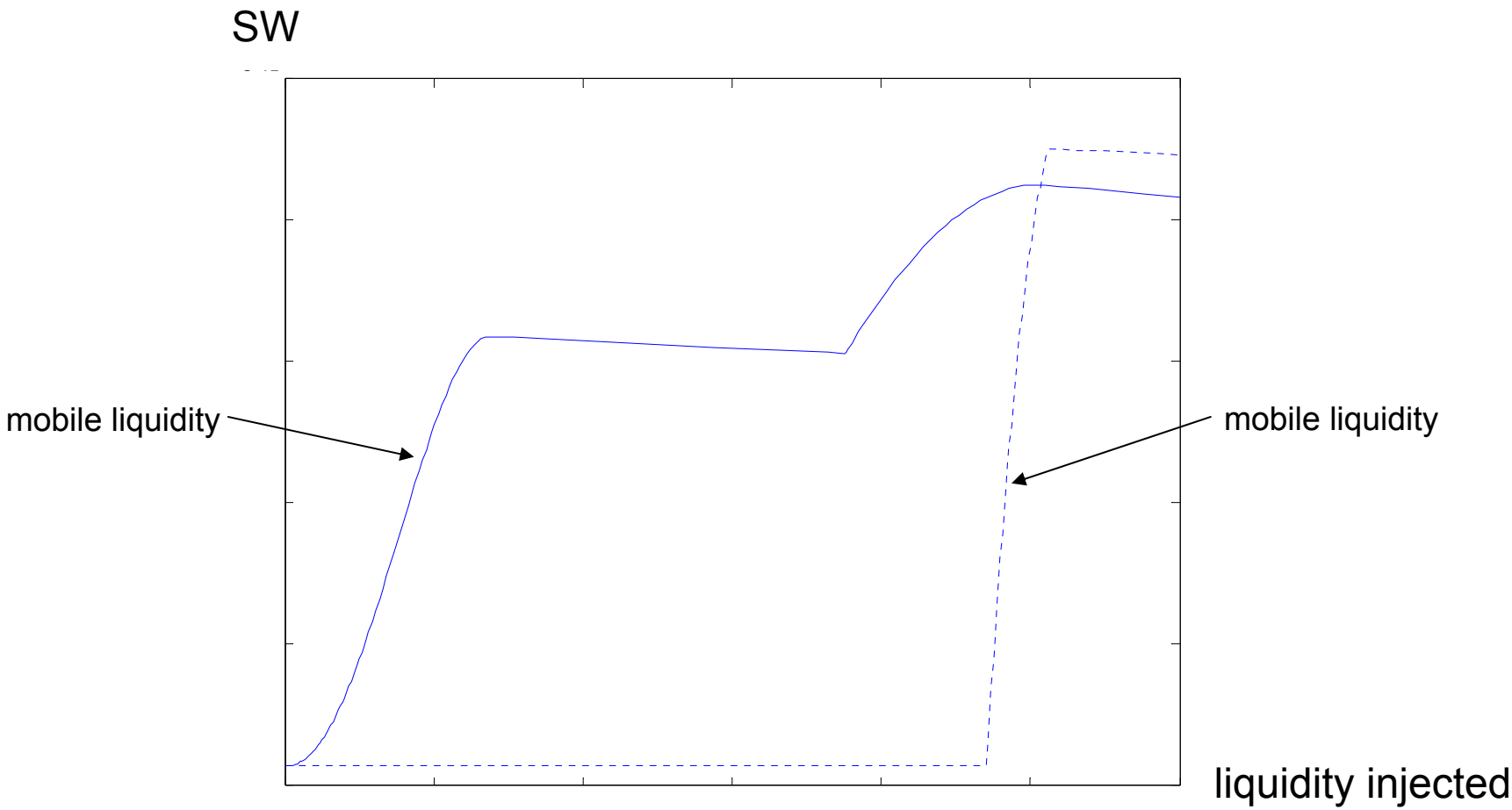
Description	Model	Value
Liquidity injection		
welfare gain at ZC	$SW^{LI-ZC}/SW^{CE}-1$	0.3%
ND under LI-ZC	$\overline{\theta}\delta(1-\pi)\beta$	2.6%
Equity Injection		
welfare gain at ZC	$SW^{EI-ZC}/SW^{CE}-1$	0.4%
ND under EI-ZC	$\overline{\theta}\delta(1-\pi)\beta^{EI}$	2.4%
welfare gain at 1% injection	$SW^{EI-1\%}/SW^{CE}-1$	0.06%
ND		1%
prob. of crisis	$1-H\left(\theta^{EI-1\%}\right)$	7.4%
Bailouts equivalent to 1% EI		
ND	$\overline{\theta}\delta(1-\pi)\beta^{BO}$	0.3%
government's liquidity slack		0 to 0.3%

Extension: an island model

- Split the shock, θ, across "regions" A and B
  - with a joint density $h(\theta_A,\theta_B)$
  - such that $\theta_A+\theta_B$ is, still, uniformly distributed
- A region: a bank, a sector or a country
- Each region has domestic liquidity
  - L_A and L_B
- Pooled liquidity, F serves both islands



Domestic versus mobile liquidity



Regional liquidity would vanish in a competitive equilibrium

Summary (policy)

- Is the case for “financial stability” policy that clear?
  - quantitatively!
- There is room for pure coordination policies
  - but how do we identify, in practice, these cases?
- Does “monetary policy” effective at all?
- Were the recent bailouts incentive compatible?